RBF CONSULTING

June 30, 2004 JN 55-100148.001

Mr. Myles Pomeroy
Planning Department
CITY OF SAN DIEGO
202 C Street, Fourth Floor
San Diego, CA 92101

Subject: Final Report Submittal

Dear Myles:

RBF Consulting is pleased to submit to you the final report for the University Avenue Mobility Plan. We would like to thank the City of San Diego for the opportunity to work with City staff in the preparation of this document and for the opportunity to become an integral part of the Greater North Park Community over the past four months. It has been a pleasure working with you, SANDAG, the project team and the countless community members who dedicated their time and energy to developing this plan.

We look forward to future opportunities to work with you in Greater North Park and in other communities within the City of San Diego. If there is any additional information regarding the University Avenue Mobility Plan that we can provide to you, please call me at (760) 476-9193.

Sincerely,

Dawn L. Wilson, P.E.
Project Manager
Transportation Services

Attachments: Acknowledgements
Letter from Steering Committee
Final Report

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1944 60th ANNIVERSARY 2004

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A special thanks to the members of the community and the project team who dedicated their time and energy to the development of this plan:

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June 25, 2004

Gail Goldberg, Director
City of San Diego Planning Department
202 C Street
San Diego, CA 92101

Re. University Avenue Mobility Plan Final Report

Dear Ms. Goldberg:

The University Avenue Mobility Plan Steering Committee offers our gratitude to Caltrans, RBF Consulting, and City staff for their efforts in assessing the feasibility and functionality of the University Avenue Traffic Claming Conceptual Study. The Steering Committee, comprised of local business, public interest, SANDAG, Greater North Park Planning Committee, North Park Main Street, North Park Community Association, and North Park Redevelopment Project Area Committee representatives, embraces the collective recommendations contained in this report. Specifically, the Committee endorses the major features of the Conceptual Study:

- corner bulb-outs,
- additional pedestrian crossings,
- a dedicated transit lane in each direction,
- speed reduction features including the single through-lane and landscaped median.

In addition, the Committee recommends full implementation of two specific plan elements - the dedicated transit lanes, and relocation of parallel parking to side-streets - discussed further below.

The Mobility Plan study was designed to test, through computer modeling and other analytical tools, the feasibility of the original Conceptual Study, and suggest refinements based on the findings. This was a very significant step for North Park as the community has traditionally supported safe traffic flow, efficient mass transit, and an appealing pedestrian character, all of which are refined in the Mobility Plan, and all of which will support a vibrant North Park urban village. The contiguous landscaped median on University Avenue is a critical plan element in addressing these key aspects. Vital as well, to imparting the desired urban village texture, are amenities such as pedestrian bulb outs on intersecting side-streets, additional crossing opportunities as well as a reduction in traffic noise that will result from lower speeds.

Dedicated Transit Lanes

Given our interest in enhancing the future character and diversity of North Park we feel it essential that dedicated transit lanes extend throughout the corridor as initially called for

in the Conceptual Study. We believe the projected reduction in 2030 vehicular travel times cited in the report as the basis for eliminating an eastbound segment of the transit lane does not warrant the loss to transit efficiency. More importantly, clearly marking the transit lanes through the entire corridor of Park Boulevard to Boundary Street removes ambiguity, advertises the advantages of public transportation, and emphasizes the pedestrian/transit orientation of North Park's revitalization.

Parallel Parking

For the same reasons, we believe that rather than allowing parallel parking in the transit lanes during off-peak hours, the transit lanes should remain unimpeded by parked cars at all times of day. Dedicated transit lanes at all hours would provide a permanent buffer between vehicular traffic and pedestrian areas which would in turn enhance the pedestrian village character. The report suggests accommodating parking at off-peak hours as a means of mitigating loss of parking and curbside loading in a narrow portion of the eastern corridor. Community members of the Steering Committee will continue working with affected residents and businesses to look for parking solutions. The study process included diligent and objective consideration of the parking issues, the results of which lead to the proposed increase in side-street parking alternatives put forth in this report. As a result, the report shows that eliminated parking can be safely accommodated with new diagonal spaces on side-streets. The Steering Committee recommends that parking creation on side-streets be timed to coincide with parking removal on University Avenue. This would ensure the most smooth transition in shifting parking.

The concept presented in this work brings within our grasp a major step towards realization of the dreams held for the community of North Park by its residents, businesses and visitors. It is one which has garnered the City's support as evidenced by North Park's selection as a "Pilot Village". We urge the City to move diligently to identify funding for necessary engineering and environmental analysis required to begin implementing the Mobility Plan.

Andy Hamilton, Chair
University Avenue Mobility Plan Steering Committee

CITY OF SAN DIEGO
M E M O R A N D U M

DATE: November 9, 2004

TO: Myles E. Pomeroy, Senior Planner, Planning Department, MS 4A

FROM: Jeff L. Frazier, Deputy Chief, Operations

SUBJECT: San Diego Fire-Rescue Department University Avenue Mobility Plan (UAMP) recommendations

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After review of the University Avenue Mobility Plan (UAMP) the San Diego Fire-Rescue Department offers the following requests:

- Cut-outs or rollover access be provided for emergency vehicles mid block and at intersections which would be blocked for South/North turns off of University Avenue onto side streets by the proposed center median.

- The cutouts must accommodate fire and EMS apparatus. (Ambulances and Fire Trucks)

- No on University Avenue parking be permitted in any location where it is a single lane for public traffic and a transit (bus) lane. The choking of traffic down to one lane, even during off hours, would have a negative impact on our ability to respond code-3 and would not allow citizen's a lane to pull over into.

- Consideration be given to signage which would tell the public that they are permitted to pull over into the bus lane to move out of the way of approaching emergency vehicles.

- Opticom controls be installed at all intersections.

I am hopeful that the plan can move forward with these considerations. Please let me know if you have questions or comments.

Jeff L. Frazier
Deputy Chief

JF/jlf

cc: Tracy Jarman, Assistant Chief, Support Services
John Jondall, Assistant Chief, Operations
Operations Files

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EXECUTIVE SUMMARY

In 2002, the City of San Diego and community stakeholders developed a series of innovative traffic calming concepts for University Avenue to help enhance and rediscover the corridor as a pedestrian and transit friendly environment. A Preferred Concept Plan was developed that integrates a series of traffic calming elements that strikes a balance between all modes of transportation. The Preferred Concept Plan strives to meet the following objectives:

- Reduce Speeding
- Create Pedestrian Friendly Environment
- Improve Traffic Flow and Safety
- Provide for Bicyclists
- Improve Transit Flow
- Reduce Bus Conflicts
- Beautify the Corridor
- Increase Parking

In January 2004, the City moved forward with the second phase of the University Avenue project. This second phase, the University Avenue Mobility Plan, takes a closer look at how the traffic calming and transit-oriented concepts work together to meet the community goals. The project provided numerous opportunities for community review and input. A series of technical studies focusing on traffic, transit, pedestrians and bicycle were prepared to identify opportunities for improved mobility. The project ultimately resulted in a Refined Concept Plan that will enhance University Avenue as a place where people want to live, work, shop and play

The goal of the University Avenue Mobility Plan is to evaluate the operating conditions of the corridor associated with the elements of the Preferred Concept Plan. As constraints were identified through the detailed traffic modeling process used in this analysis, refinements and alternatives to the concept plan were proposed and evaluated. The end result of the project will be a refined concept plan that continues to meet the overall goals and objectives of the Preferred Concept Plan. The following sections and associated chapters in this document outline the analysis of the operations of the Preferred Concept Plan and the steps taken to refine the concept plan to strike a mobility balance along University Avenue.

CHAPTER 1 – DEVELOPMENT OF THE PREFERRED CONCEPT PLAN

Chapter 1 provides the history of the Preferred Concept Plan. A detailed discussion of the elements of the Preferred Concept Plan and goals of the University Avenue Mobility Plan are outlined in Chapter 1.

CHAPTER 2 - PUBLIC OUTREACH

A total of six public workshops were conducted over a six-month period that aimed to involve the community in the development of the Refined Concept Plan. Three meetings were held on Saturday mornings, two were held in conjunction with regularly scheduled meetings of the North Park Redevelopment Area Project Area Committee (PAC) and Greater North Park Planning Committee (GNPPC), and one special joint meeting of the PAC and GNPPC was held on a Thursday evening. Public meetings were held once per month during the project's six month schedule to keep the public informed of the project's progress and collect public input.

It was clear through the public outreach efforts established for this second phase of the project, that there was community awareness and support for the Preferred Concept Plan.

Input provided by the public at each of the community meetings is summarized and addressed in Chapter 2 of this document, including responses to all recommendations regarding changes to the Preferred Concept Plan.

CHAPTER 3 – OPERATIONAL ANALYSIS METHODOLOGY

University Avenue is home to one of the most heavily utilized transit routes in San Diego County – Route 7. In addition, traffic volumes along University Avenue during the peak hours result in significant delay and operational issues along the corridor. To fully understand the existing, future and Preferred Concept Plan operating conditions along the corridor, existing traffic counts were collected for this project and the 2030 traffic volumes were estimated using the SANDAG 2030 Traffic Forecast model. The VISSIM software program was used in conjunction with SANDAG traffic model data and traffic signal timing plans developed in the Synchro software program. VISSIM is an advanced traffic simulation software package that allows individual lane classifications and detailed multi-modal modeling.

Chapter 3 of this report outlines the detailed post-processing efforts associated with the SANDAG traffic model, the detailed transit forecasting efforts conducted by SANDAG for this project, and the measures

of effectiveness defined to evaluate operating conditions along the study corridor.

CHAPTER 4 – EXISTING CONDITIONS

University Avenue is classified as a four lane major arterial in the Greater North Park Community Plan through North Park but its functional classification is that of a collector street. Years ago, a historic streetcar operated along the corridor. Mapping of existing utilities along the corridor show that the tracks for the historic streetcar were buried in University Avenue. Researching the existing utilities also shows that University Avenue is laden with underground utilities, which includes a sewer line that extends near

the centerline of the roadway. This existing waterline may result in constrained planting opportunities for the proposed raised median included in the Preferred Concept Plan.

Four distinct modes of transportation are provided along the corridor: passenger vehicle, public transit vehicles, walking and bicycling. To evaluate the operating conditions along the corridor, peak hour and daily data was collected for each mode including intersection traffic count data, transit boarding and alighting data, pedestrian activity and crossing data, and bicycle activity data along the corridor.

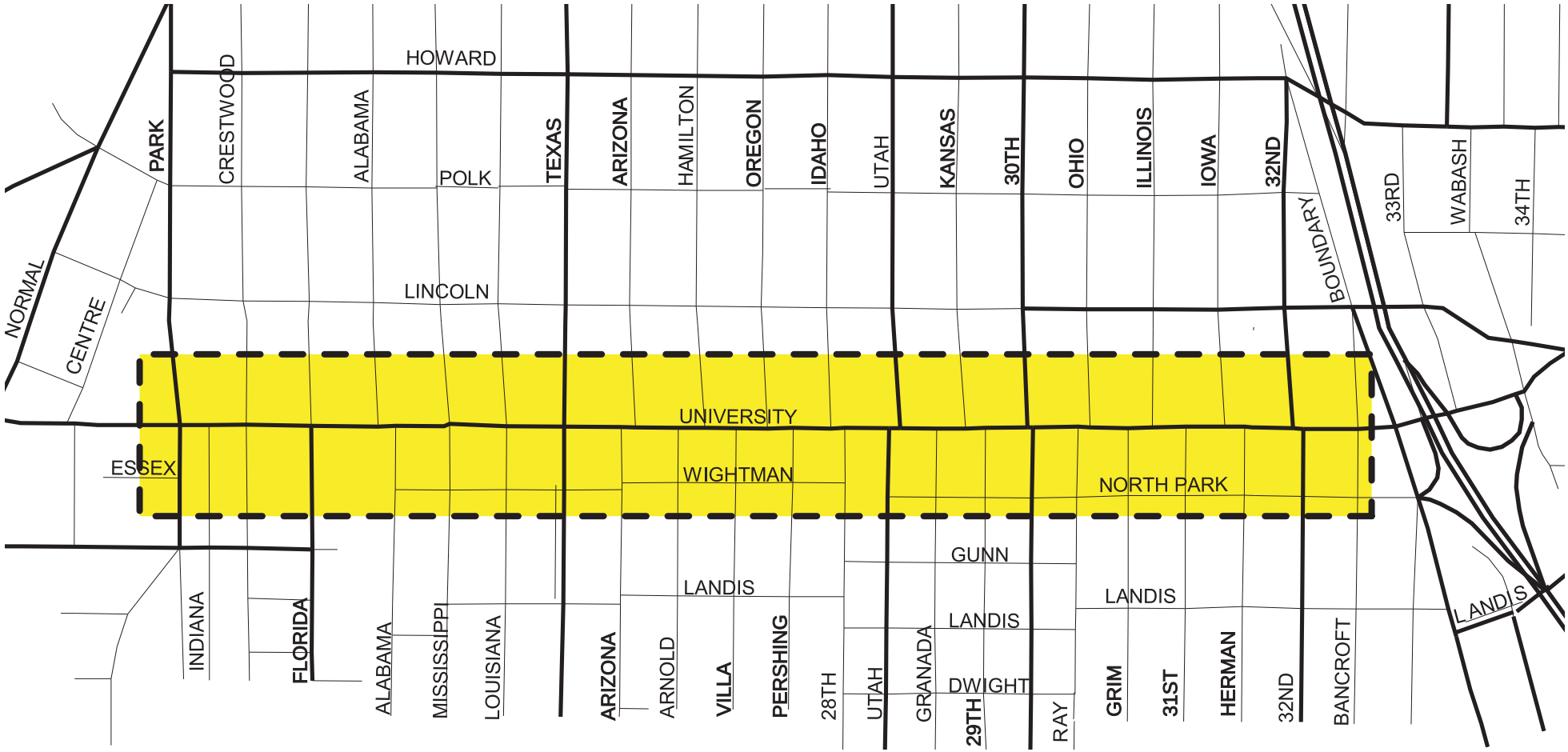
To evaluate the traffic operations of the corridor, a total of 30 intersections and 34 study roadway segments were identified, illustrated in Exhibit ES-1, in the study area. As shown, the study area extends beyond University Avenue in order to understand the impact of the Preferred Concept Plan on the surrounding roadway network. Based on intersection analysis, most of University Avenue operates at acceptable operating conditions with most intersections operate at less than 35 seconds of delay. Of particular interest are the intersections of University Avenue/Park Boulevard, Boundary Street/I-805 SB Ramps, and the northbound approach of University Avenue/Alabama Street- that operate at less than acceptable conditions (delay of more than 55 seconds). According to City roadway segment LOS thresholds, University Avenue currently operates at LOS F from Florida Street to 32nd Street.

Route 7 and Route 908 provide transit service along University Avenue. To assess the operating conditions of transit along the corridor, boarding and alighting data, pedestrian access data and on-time arrival data was collected for each of the transit routes. Much of the passenger data was provided by SANDAG for use in this study. The results of the existing conditions analysis show that both transit lines are well utilized with Route 7 having one of the highest ridership in the city. The highest utilized transit stops along the corridor are at 30th Street and Park Boulevard, where daily boardings and alightings exceed 4,000 per day for both Route 7 and Route 908.

Pedestrian access along the corridor is typically constrained to signalized intersections and a few unsignalized crossings. East of Utah Street, pedestrian access is good with sidewalk widths in excess of 10 feet. However, west of Utah Street, sidewalk conditions vary and in many cases the sidewalk is in need of repair.

Bicyclists along University Avenue share the travel way with buses and passenger vehicles. No existing bicycle facilities are provided along University Avenue. Although some die-hard cyclists are known to use University Avenue, on the average fewer than 12 bicycles per day travel along the corridor. Most bicyclists use parallel roads such as North Park Way and Lincoln Avenue.

Chapter 4 provides a detailed discussion of the existing conditions along the University Avenue corridor.



UNIVERSITY AVENUE MOBILITY PLAN STUDY AREA

55-100140.001 - March 2004 (2004-0331)

EXHIBIT ES-1

CHAPTER 5 – FUTURE YEAR CONDITIONS

The City of San Diego and San Diego Association of Governments provide horizon year forecast traffic volumes for most communities throughout the City. North Park is no exception. In 2004, SANDAG released the Series 10 traffic model, which forecasts to the year 2030. Land use in the year 2030 is based on the adopted community plan for North Park, which calls for overall density increases for University Avenue. Many of the currently planned projects in North Park are integrated into the SANDAG 2030 traffic model.

Chapter 5 provides a detailed summary of the future year modeling methodology, planned land use changes along the corridor, and operating conditions for the years 2010 and 2030.

The No Build condition refers scenarios analyzed without the Preferred Concept Plan. Both No Build study years assume no change in geometry or traffic controls when compared to existing conditions. Traffic signal timing optimized for future scenarios. The No Build condition does not include any change to transit service. However, ridership projections and traffic model data were used to forecast the vehicular flow along the corridor.

The results of the No Build 2010 and 2030 conditions show that 16 of the 30 study intersections are forecast to operate at acceptable delay. By 2030, passenger vehicle travel time along the corridor would exceed 14 minutes in the eastbound direction and 8 minutes in the westbound direction in the p.m. peak hour. This is an increase of over 7 minutes in the eastbound direction and over 2 minutes in the westbound direction compared to existing conditions.

By 2030, transit ridership is forecast to increase by nine (9) percent for both Route 7 and Route 908. Due to forecast increase in traffic flow along University Avenue, transit vehicle travel time would exceed 6 to 7-minutes in the eastbound direction and remain approximately the same in the westbound direction during the p.m. peak hour. This would result in an increase in travel time of approximately 7-minutes over existing conditions in the p.m. peak hour.

Pedestrian facilities for the years 2010 and 2030 are not planned to change over existing conditions. However, increased density, integration of mixed-use and high-density development on the corridor, and increased transit ridership will result in an increase in pedestrian activity along the corridor. This will result in increased pedestrian crossings at intersections, demand for wider sidewalks and contribute to improved economic vitality of the corridor.

Due to the high traffic along the corridor, bicycle activity along University Avenue is currently minimal and anticipated to remain minimal in 2010 and 2030. No bicycle facilities such a bike lanes or bike routes are planned for University Avenue. Therefore, it is anticipated that most bicycle activity will remain on parallel roads such as Lincoln Avenue and North Park Way under No Build conditions.

CHAPTER 6 – OPERATIONAL ANALYSIS OF THE PREFERRED CONCEPT PLAN

The Preferred Concept Plan integrates many traffic calming features that aim to slow traffic and create a more pedestrian friendly environment. Chapter 6 focuses on the operational analysis of the corridor with the key features of the Preferred Concept Plan in place. The SANDAG traffic model was used to forecast year 2010 and 2030 traffic model volumes for the corridor. Reducing the number of mixed flow travel lanes along University Avenue from four lanes to two lanes would result in some diversion of traffic from University Avenue to parallel routes. The primary alternative routes identified were Lincoln Avenue, North Park Way, El Cajon Boulevard and Upas Avenue. Approximately 20 percent of the total 2030 traffic forecast along University Avenue would be diverted onto parallel routes. This results in an overall reduction in traffic flow along University Avenue in the peak hours when compared to the No Build condition.

The traffic modeling efforts conducted for this study show that most trips along University Avenue in North Park are destined for North Park. In fact, less than 10 percent of the total volume entering North Park from either Park Boulevard or Boundary Avenue travels from one end to the other. This is a positive sign for the economic vitality of the community.

After considering the diversion of traffic from University Avenue to parallel roadways, traffic and transit measures of effectiveness were evaluated for the Preferred Concept Plan condition in both the year 2010 and 2030. The results of the 2030 analysis show that during the p.m. peak hour period, travel time in the eastbound direction for passenger vehicles exceed 21 minutes. In the westbound direction, passenger vehicle travel times are forecast to exceed 8 minutes. This is an overall increase in travel time of approximately 7 minutes in the eastbound direction and 3 minutes in the westbound direction with the implementation of the Preferred Concept Plan. It is clear that the Preferred Concept Plan reaches the goal of slowing traffic down through the corridor. However, the speed of travel along the corridor reaches unacceptable levels by nearly tripling the existing travel time along the corridor. The slow travel speed and congestion could negatively affect businesses along the corridor by deterring potential shoppers and visitors.

The Preferred Concept Plan proposes a reduction in the total number of transit stops along the corridor from 20 to 10. Average spacing of transit stops is approximately three blocks. Transit only lanes are also provided for the majority of the corridor, primarily from Florida Street to Idaho Street. However, transit travel times through the corridor with the Preferred Concept Plan are also forecast to increase in the a.m. peak hour in the eastbound direction when compared to the No Build condition. On the average, transit vehicle travel time in the eastbound direction is forecast in 2030 to be approximately 15 to 16-minutes and 9-minutes in the westbound, both measured for the p.m. peak hour.

The increase in travel time for both transit and mixed flow traffic can be attributed to some inherent constraints in the Preferred Concept Plan:

- Roundabout at Texas Street. As proposed in the Preferred Concept Plan, the roundabout at Texas Street is one lane. Capacity analysis of the roundabout shows that the Texas roundabout is forecast to operate at unacceptable delay. Queues with the single lane roundabout are forecast to extend as far west as Park Boulevard and as far east as 30th Street by 2030.

- Discontinuous Transit Only Lane. As proposed in the Preferred Concept Plan, the transit only lane extends from Florida Street to Boundary Street, but would not be continuous from Idaho Street to Iowa Street where parallel parking along University Avenue results in only one travel lane in each direction. The transit only lane would stop in the eastbound direction at Ray Street to allow for parking in the central core of University Avenue and begin again at Herman Street. In the westbound direction, the transit only lane would end at Iowa Street and buses would travel in mixed-flow lanes through Idaho Street to allow for parking. At either end of the central core of University Avenue, buses and passenger vehicles must merge into one lane. This merging results in high delays and excessive queues along University Avenue.

Chapter 6 provides a detailed discussion of the proposed changes to the Preferred Concept Plan that would help balance the flow of traffic and transit through the corridor.

The Preferred Concept Plan would increase the number of pedestrian crossing locations along the corridor and recommends enhanced crosswalk features to improve safety for both bicyclists and pedestrians. The proposed raised median provides a refuge for pedestrians crossing at unsignalized locations. The raised median should help to reduce the number of pedestrian crossings occurring illegally along the corridor today.

With the implementation of the transit only lane, bicycle activity on University Avenue has the potential to increase. The bicycling public could share the transit only lane when a transit vehicle does not occupy the lane. Since SANDAG does not have any long range plans to improve transit operations along the corridor, transit will continue to operate at about six-minute headways under existing, 2010 and 2030 conditions in the peak hours.

CHAPTER 7 – OPERATIONAL ANALYSIS OF CONCEPT PLAN ALTERNATIVES

Once the constraints of the Preferred Concept Plan were identified, alternatives were evaluated to determine if acceptable travel times through the corridor could be achieved while maintaining the walkable environment desired by the community. The alternatives identified provided the project team and stakeholders the opportunity to consider variations to the Concept Plan, related to the overall travel time to passenger vehicles and transit vehicles.

Chapter 7 provides a detailed summary of the initial six scenarios evaluated for the corridor, as well as the final three refined alternatives. The alternatives focused on three key components of the Preferred Concept Plan:

- **Relocation of Parking along University Avenue –** To provide a continuous transit only lane along University Avenue, all parallel parking along the corridor was shifted to the side streets. This modification to the Preferred Concept Plan resulted in travel time reductions of up to ten minutes for passenger vehicles and six minutes for transit vehicles.

- **Removal of the One-Lane Roundabout at Texas Street** – The alternatives assessed the operations of Texas Street as a signalized intersection and as a two-lane roundabout.

- **Realignment of Texas Street** – Texas Street is currently offset, which means that the north and south leg are not directly across from one another. Due to this offset condition, the north and south traffic through the intersection are provided green time in separate phase. Out of a 100 second cycle length, the north and south movements can consume as much as half of the available green time. In addition, a pedestrian phase is also provided at Texas Street. During this all-red phase, traffic in all directions is required to stop for up to 20 seconds. As a result of the split north-south phasing and the all-pedestrian phases, a small portion of the typical traffic signal cycle is allocated to University Avenue. To improve the east-west traffic flow through the intersection, consideration was given to realigning Texas Street on the south side of University Avenue.

- **Variation in Transit–Only Lanes** – Variations in the western limit of the transit-only lane were tested for the eastbound direction only to determine the benefit and impacts of the transit only lane along the corridor. The eastbound lane started at Park Boulevard in three scenarios and at Utah Avenue in two scenarios. The results of the analysis show that beginning the transit only lane at Park Boulevard would result in increased delay at Park Boulevard and increased travel time for passenger vehicles through the corridor. Beginning the transit only lane at Utah Avenue would have only slight impacts on the travel time for both transit vehicles and passenger vehicles. Delays at intersections west of Utah would be reduced due to the increase in capacity through those intersections. Higher delays and queues were forecast at Utah Avenue if the transit only lane were to begin at this location.

- **Removal of Ohio Traffic Signal** – Between 30th Street and Illinois Street, there are currently four signalized intersections. At three of the four locations, left turn access is permitted with the Preferred Concept Plan. To provide improved traffic flow through this section of the corridor, the removal of the Ohio Street traffic signal was tested. The results of this analysis show that the removal of the Ohio traffic signal can reduce travel

time and delay through the corridor and improve the coordination and flow through the corridor. Travel times are forecast to decrease by as much as three minutes with the removal of the signal at Ohio Street.

The alternatives evaluated were presented to the public and the project steering committee for review and evaluation. Through this public review process and detailed analysis of the operating conditions along the corridor, the Refined Concept Plan was identified. The Refined Concept Plan integrates the following changes to the Preferred Concept Plan:

- **Modification to Eastbound Transit Only Lane –** The Refined Concept Plan includes an eastbound transit only lane from Utah Street to Boundary Street. This design provides the necessary capacity and alternative routes for the eastbound passenger vehicle traffic along the corridor, while maintaining improved transit operations.

- **Removal of On-Street Parallel Parking –** The Refined Concept Plan recommends as a short term solution that in the core business area (Idaho Street to Iowa Street) during the off peak hours, on-street parallel parking would be permitted. During the peak hours (7-9 a.m. and 4-6 p.m.) on-street parallel parking through the core business district would be prohibited. Prohibiting on-street parallel parking greatly improves the efficiency of transit service through the core of the corridor (Idaho Street to Iowa Street). The long-term goal would be to attract businesses to University Avenue that do not have a need for on-street parking and heavy loading/unloading needs. This would enable on-street parallel parking to ultimately be prohibited along University Avenue.

- **Removal of Traffic Signal at Ohio Street –** The Refined Concept Plan recommends the removal of the existing traffic signal at Ohio Street. This traffic signal is one of four existing signals in less than one-quarter mile along the corridor. Three of the four signals allow eastbound left turn access. Removing the traffic signal at this location, and replacing the signal with an enhanced pedestrian crossing, improves traffic flow and transit efficiency along the corridor without compromising pedestrian or bicycle access.

- **Maintain Traffic Signal at Texas Street –** The Refined Concept recommends that Texas Street remains a signalized intersection. Analysis of the proposed single lane roundabout at Texas Street showed that significant delays and queues would form at this location if a single lane roundabout were constructed. Although a two-lane roundabout was shown to operate efficiently at this location, the two-lane roundabout would require significant right-of-way taking to construct. Therefore, it is recommended that traffic control at the Texas Street intersection remain unchanged.

The Refined Concept Plan is illustrated in Exhibit ES-2. Tables ES-1 and ES-2 summarize the forecast horizon year 2030 traffic and transit operating conditions for the Refined Concept Plan.

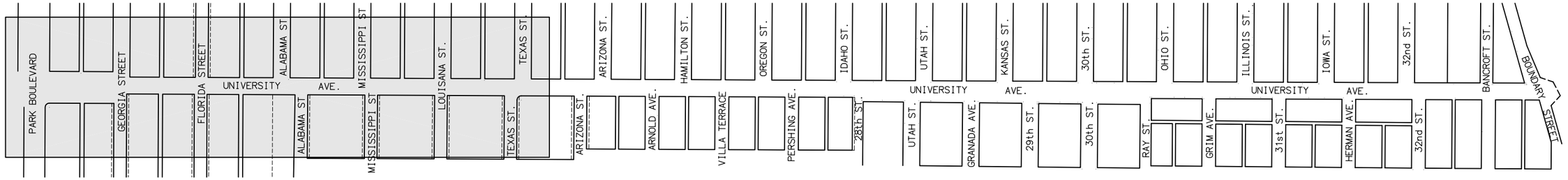
Table ES-1
Refined Concept Plan (Year 2030)
Travel Time

	Eastbound		Westbound	
	AM	PM	AM	PM
Passenger Vehicle	8.1	11.6	5.5	8.6
Route 7	8.1	10.5	9.0	9.6
Route 908	7.3	10.4	8.0	9.2

Table ES-2
Refined Concept Plan
Delay Summary

Study Intersection	Total Delay[1]		Concurrent Delay[2]		Conflicting Delay[3]	
	AM	PM	AM	PM	AM	PM
University Avenue/Park Avenue	34.5	47.4	29.8	42.6	40.3	51.4
University Avenue/Florida Street	19.5	40.1	3.7	12.1	84.3	104.4
University Avenue/Mississippi Street	11.4	18.8	4.3	9.1	49.4	57.7
University Avenue/Texas Street	40.0	68.9	30.1	58.2	63.9	89.0
University Avenue/Arnold Avenue	7.5	18.5	4.0	17.3	39.7	34.5
University Avenue/Oregon Street	3.9	17.0	3.4	14.3	39.4	59.4
University Avenue/Utah Street	24.4	58.8	17.9	63.2	46.2	49.8
University Avenue/30th Street	26.5	67.3	14.8	48.3	45.0	84.9
University Avenue/Ohio Street	0.2*	1.2*	0.0*	0.1*	12.2*	11.9*
University Avenue/Grim Street	6.1	8.8	2.9	4.3	40.7	55.1
University Avenue/Illinois Street	8.5	12.4	4.6	6.8	53.3	43.3
University Avenue/32nd Street	40.5	34.4	35.3	34.6	53.2	34.0
University Avenue/Boundary Street	36.7	65.7	30.0	75.4	53.4	46.6
University Avenue/Wabash Street	35.5	34.3	32.6	31.2	39.2	37.6

1 Intersection Delay = Average delay for all movements at the intersection (sec/veh)
2 Concurrent Delay = Delay imposed to eastbound & westbound vehicles along University Avenue (sec/veh)
3 Conflicting Delay = Delay imposed to northbound & southbound vehicles entering or crossing University Avenue (sec/veh)
* Unsignalized intersection under Refined Concept Plan scenarios.
4 Signalized intersection under Refined Concept Plan



KEY MAP

SCALE: 1"=500'

LEGEND

PEDESTRIAN IMPROVEMENTS

SYMBOL	DESCRIPTION
	RESTRIPE EXISTING CROSSWALK OR NEW CROSSWALK MODIFIED EXISTING CROSSWALK
	NEW ENHANCED SIDE STREET CROSSING
	NEW ENHANCED MID-BLOCK CROSSWALK
	REMOVE CROSSWALK

TRANSIT IMPROVEMENTS

SYMBOL	DESCRIPTION
	TRANSIT STOP
	TRANSIT ONLY LANE
	POTENTIAL TRANSIT ONLY LANE (ALT. 3)

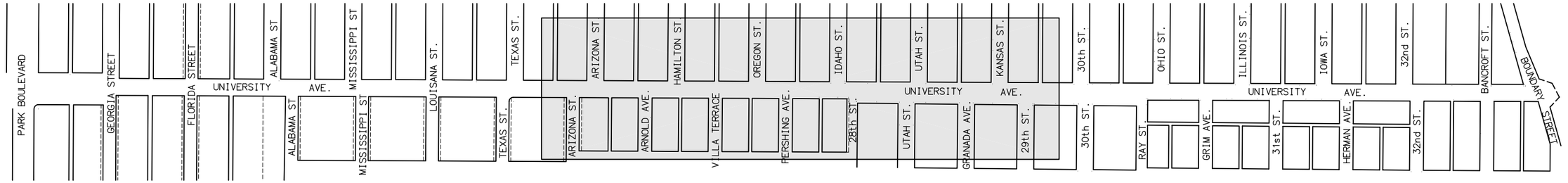
STREET IMPROVEMENTS

SYMBOL	DESCRIPTION
	PROPOSED CURB EXISTING CURB
	NEW "STOP" SIGN
	NEW "TRANSIT ONLY LANE AHEAD MERGE LEFT" SIGN
	NEW "RIGHT TURN ONLY LANE BUSES EXEMPT" SIGN
	RAISED MEDIAN WITH LANDSCAPE
	REPAINT EXISTING STOP BAR & SYMBOL
	STRIPE RIGHT TURN ARROW

SIGNAL IMPROVEMENTS

SYMBOL	DESCRIPTION
	STRIPE LEFT TURN ARROW & INSTALL NEW PROTECTED LEFT TURN ARROW
	NEW TRAFFIC SIGNAL
	REMOVE EXISTING TRAFFIC SIGNAL

Not to Scale



KEY MAP

SCALE: 1"=500'

LEGEND

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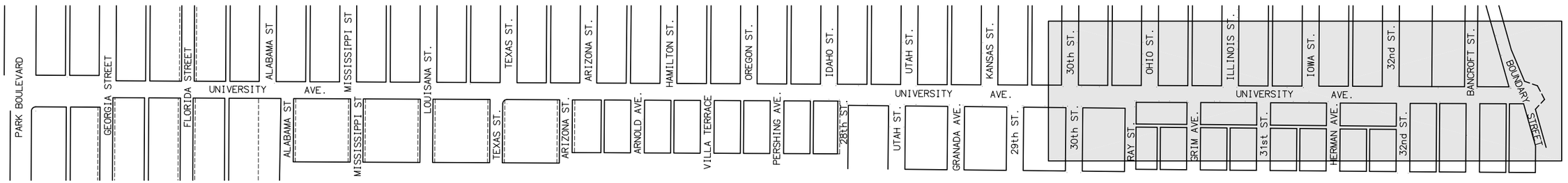
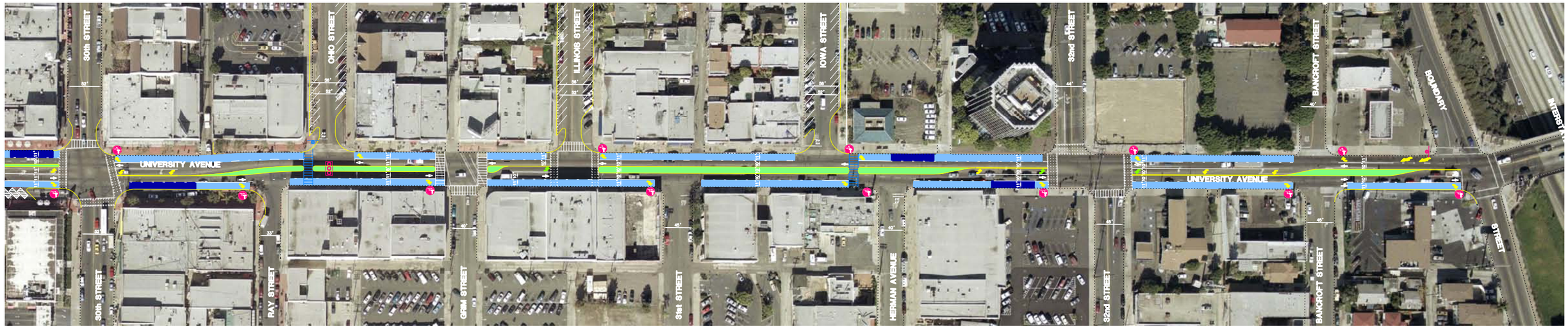


KEY MAP
SCALE: 1"=500'



LEGEND

PEDESTRIAN IMPROVEMENTS

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	NEW ENHANCED SIDE STREET CROSSING
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TRANSIT IMPROVEMENTS

SYMBOL	DESCRIPTION
	TRANSIT STOP
	TRANSIT ONLY LANE
	POTENTIAL TRANSIT ONLY LANE (ALT. 3)

STREET IMPROVEMENTS

SYMBOL	DESCRIPTION
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SIGNAL IMPROVEMENTS

SYMBOL	DESCRIPTION
	STRIPE LEFT TURN ARROW & INSTALL NEW PROTECTED LEFT TURN ARROW
	NEW TRAFFIC SIGNAL
	REMOVE EXISTING TRAFFIC SIGNAL

Not to Scale

Pedestrian and bicycle access would not be compromised by the Refined Concept Plan. With the Refined Concept Plan, five unsignalized crossings would be added to the corridor and two new signalized intersections would be added (Arnold Avenue and Oregon Street). The five new unsignalized crossings would be enhanced with the addition of in pavement flashing devices and overhead signs providing pedestrian greater visibility to cars and buses on the corridor. These improvements would improve north-south access along University Avenue and improve access to the consolidated transit stops. Sidewalk improvements at many intersections will include the construction of curb-extensions (or bulb-outs) along the side streets. These curb-extensions would narrow the curb-to-curb width at the intersection to a minimum of 24 feet, minimizing the pedestrian exposure time to vehicular traffic. The curb to curb distance is dependant upon the parking configuration on the side streets, based on design criteria in the Street Design Manual.

Bicycles currently share the travel way with passenger vehicles, buses and trucks. The Refined Concept Plan recommends the construction of transit only lanes along the corridor. Bicyclists would be permitted to ride in the transit in only lane, improving the overall accessibility for bicycles along University Avenue. Most bicyclists in the North Park area currently use alternate routes to bypass University Avenue (Lincoln Avenue, North Park Way and Wightman Way, for example), The increased number of mid-block crossings will improve north-south connectivity for the recreational and avid bicyclist.

One of the most controversial elements of the Refined Concept Plan is parking. The Preferred Concept Plan removed all parallel on-street parking west of Idaho Street along the corridor, but maintained much of the on-street parallel parking east of Idaho Street. All on-street parallel parking from 28th Street to 30th Street would not be removed. The operational analysis of the Preferred Concept Plan showed that the on-street parallel parking creates a significant bottleneck along the corridor. Therefore, it is recommended that the on-street parallel parking be removed from University Avenue and be replaced with improvements to on-street parking along the side streets.

At the May 6 Community Meeting, it was revealed that businesses located on the north side of University Avenue do not have rear access. Therefore, these businesses are dependant upon parking and loading zones along University Avenue to serve their businesses. To address the needs of the community, a total of five parking alternatives were developed, outlined in Chapter 8 of this document that focused on maximizing parking from Idaho Street to Iowa Street. To maximize peak hour operations for transit vehicles and passenger vehicles along the corridor, and to provide the necessary access to businesses, the selected parking alternative would allow parking to remain on University Avenue during off-peak hours. Between 7:00 and 9:00 a.m. and between 4:00 and 6:00 p.m., parking on University Avenue would be restricted to allow for the transit only lane.

Selection of the Refined Concept Plan and parking alternative focused on balancing the operational elements of the corridor. Involved in the selection process were the 13 member Steering Committee and representatives of SANDAG. Both SANDAG and the Steering Committee prefer that the eastbound transit only extend from Park Boulevard to Boundary Street, providing a dedicated lane in both the

eastbound and westbound direction for the entire length of the corridor. SANDAG and the Steering Committee also recommended that all on-street parallel parking be removed from the corridor to allow for no interruptions in the transit only lane throughout the day. Results of the surveys collected at the June 12th Community Workshop indicated that there is community support for removing the on-street parallel parking at all times of the day on University Avenue.

CHAPTER 8 – REFINED CONCEPT PLAN DESIGN ELEMENTS

Chapter 8 outlines the design elements associated with the Refined Concept Plan. The elements of the plan are consolidated into four key areas: Roadway Improvements, Pedestrian Improvements, Transit Improvements and Parking Improvements. Roadway cross-sections are provided for key sections of University Avenue, where the lane designation or parking configuration varies along the corridor.

The raised median proposed in the Refined Concept Plan would result in the construction of left turn pockets at all signalized intersection. Pocket length calculations for all existing and future signalized intersections were conducted to prevent left turning vehicles from blocking the through lane.

A traffic signal warrant analysis was conducted for the two new proposed traffic signals: Arnold Avenue and Oregon Street. The results of the analysis show that the Planning Analysis traffic signal warrant for Interruption of Continuous Traffic Flow is met by 2030 with Preferred Concept Plan traffic volumes.

Due to the diversion of traffic that is anticipated to occur by reducing the number of travel lanes from four lanes to two lanes, potential traffic calming measures were identified for the surrounding community. Traffic signal warrants were evaluated for the most directly impacted intersections along the corridor that are currently signalized. The results show that the intersection of Texas Street/Lincoln Avenue meets the warrants for a traffic signal. Other traffic calming measures recommended in Chapter 8 include the addition of curb extensions along North Park Way and Lincoln Avenue and parking modifications to increase parking supply and narrow the travel way.

CHAPTER 9 – IMPLEMENTATION PROGRAM

Several steps will need to be taken to move the Refined Concept Plan from paper to pavement. Chapter 9 outlines the costs of constructing the elements of the Refined Concept Plan, a recommended implementation plan and potential funding sources for the project. Based on the preliminary estimate of probable costs, the Refined Concept Plan may cost over $9 million to construct, which includes over $4 million in administrative, design, construction support and contingency costs.

The implementation plan recommends that the construction of the corridor roadway improvements (curb-extensions, signal modifications, crosswalks, raised medians, etc) be constructed as a single project with the raised medians as the final element of the design. This recommended implementation plan aims to maximize the capacity of the roadway during construction to minimize the impacts to the motoring public

and businesses along the corridor. By constructing the raised median as one of the final stages of the construction process, traffic could be shifted across the centerline of University Avenue during the construction of the curb-extensions, sidewalk improvements, and signal improvements.

A preliminary or test phase of the project could be undertaken immediately, that would not require physical improvements to the corridor. The entire corridor could be striped to reflect the design shown in the Refined Concept Plan. However, a striped median is not as effective as a raised median in controlling access from the side streets and therefore the benefits of constrained access may not be realized until the median is constructed.

Although actual street sections were not available when the preliminary design was prepared for this project, as-built drawings show that the streetcar tracks are buried in University Avenue. They are located down the center of the street. It is believed that the streetcar tracks are approximately 10 inches below the surface of the road, resulting in the six percent crossfall along University Avenue. The existing tracks may result in construction related issues associated with the raised median. Since 10 to 12 inches of excavation is required for the construction of the raised median, the rail tracks will be exposed when the excavation begins. It is recommended that the old tracks be removed and the road be reconstructed to a normal two percent crossfall. Reducing the slope of the crossfall would help transit operations and passenger loading along the corridor.

CHAPTER 10 – FEASIBILITY OF THE HISTORIC STREETCAR

The University Avenue "Traffic Calming Conceptual Study" prepared in November of 2002 proposed reintroducing a Historic Streetcar service along University Avenue. The reintroduction of the Historic Streetcar was ranked as the most popular feature for the corridor at the first community meeting held for the University Avenue Traffic Calming Project. Reintroducing the Historic Streetcar is intended to offer four distinct features for the North Park Community:

- Provide an enhanced transit experience to encourage transit ridership and reduce traffic.
- Encourage economic revitalization along University Avenue.
- Provide a sense of historic preservation.
- Encourage and increase tourism in the North Park community.

Voting conducted at the Community Workshop for the University Avenue Traffic Calming project also suggested that the Historic Streetcar service run along University Avenue and continues south on Park Boulevard connecting to downtown San Diego. The Park Boulevard terminus for the streetcar line is intended to be at or near the intersection of Park Boulevard (12th Avenue) and "C' Street.

The Historic Streetcar analysis outlined in this document focuses on the unique characteristics of the corridor, type of streetcar, design criteria set out in the Preferred Concept Plan, and the role the streetcar would play in providing transit options within the University Avenue corridor of San Diego. The evaluation of the Historic Streetcar analysis relies primarily on the physical requirements necessary to

implement the streetcar system effectively within the existing curb-to-curb width of University Avenue. To support this effort the consultant team defined several study objectives:

- Define the route or alignment and confirm the station locations.
- Define the streetcar or vehicle type – this greatly influences the design requirements.
- Establish the physical requirements and analysis
- Determine shared transit lanes feasibility
- Determine operations and maintenance responsibility
- Establish a general "estimated order of magnitude capital costs"

In general, the analysis determined that it is possible to physically implement and operate the Historic Streetcar within the curb-to-curb with of University Avenue through the study corridor. However, there are issues and physical design features that need to be further addressed as future planning and design of the alignment moves forward.

Although implementation is feasible, the Historic Streetcar would require a continuous and persistent effort by both the private and public sectors to see it through to realization. It is estimated that the capital cost of the historic streetcar from 32nd Street to Park Boulevard could exceed $25 million, which does not include a maintenance and storage facility. In addition to the cost, several physical and operational constraints will need to be overcome before the historic streetcar will be considered. Some of the key challenges facing the historic streetcar include:

- Lane widths
- Turn around location
- Storage and maintenance
- Operations in mixed flow lanes
- Interaction with existing transit service
- Operational entity – will SANDAG/MTS operate the streetcar?
- Cost and Funding

Chapter 10 provides a detailed discussion of the feasibility to implement the streetcar service based on the Preferred Concept Plan as designed for University Avenue.

CHAPTER 11 – SANDAG TRANSIT STUDY

Under separate contract, SANDAG completed an analysis of the feasibility of providing Rapid Bus service for the University Avenue corridor (existing transit service along University Ave. runs from the Old Town transit center and downtown San Diego to the City of La Mesa) to take advantage of the recommendations of the Refined Concept Plan. SANDAG's study evaluated transit demand along University Avenue and identified two alternatives for route restructuring to better meet the demand.

In reviewing the travel patterns of people coming from or going to University Avenue, SANDAG found a significant level of regional travel. Additionally, SANDAG's transportation forecasts show that work travel is getting lengthier throughout the region, primarily due to housing being located further away from employment. Providing a Rapid Bus Service would greatly enhance the quality of transit service for existing riders and hopefully attract new riders. Rapid Bus service is an express service that stops at fewer stations and provides a faster trip.

Both alternatives would realign existing transit service along University Avenue to better connect the corridor to major centers and transfer points. Chapter 11 describes both alternatives and the advantages and disadvantages of each. The difference between the options relates to the impact on local passengers and the service provided versus potential resource savings.

The first alternative would provide a comparable level of local service to the existing level and would provide express service during peak hour periods only. The second alternative would provide a lesser level of local service but with an expanded level of Rapid Bus service.

The study recommends the alternative selected for implementation should be subject to a greater level of analysis in order to determine overall passenger impact.

Chapter One – Development of Preferred Concept Plan

1.0 PROJECT HISTORY

In 2002, the University Avenue Traffic Calming Conceptual Study was conducted by the landscape architecture and planning firm of KTU+A through a Walkable Communities Grant issued by SANDAG. The project was lead by North Park Main Street and directed by City Staff. Stakeholders in the project included the local business community, residents, the Greater North Park Planning Committee, the Greater North Park Redevelopment Project Area Committee and a 22 person Steering Committee established for the project. The goal of the traffic calming study was to establish a plan to return the "Main Street" feeling to the corridor and encourage people to return to North Park as a place to shop and spend their time.

1.1 HOW CONCEPT PLAN DEVELOPED

The Preferred Concept Plan is the product of the community. Starting with a clean slate and no boundaries, the community worked together to develop a series of alternatives for the corridor that focused on each mode of transportation with the following goals:

- Reduce Speeding
- Improve Flow & Safety
- Create a Pedestrian Friendly Environment
- Reduce Bus Conflicts
- Beautify the Avenue & Help Businesses
- Increase Parking

In addition to several public meetings, surveys were distributed to get a sense of the public's priorities for the corridor and the lifestyles of the residents and business community. Through this process, several alternative proposals evolved and the Preferred Concept Plan was identified.

1.2 KEY FEATURES OF THE PREFERRED CONCEPT PLAN

The Preferred Concept Plan that emerged from the KTU+A study integrates many traffic calming concepts along corridor:

- **CURB-EXTENSIONS (BULB-OUTS).** Bulb-outs at intersections are identified to help reduce the crossing distance at several intersections. Bulb-outs are located along both University Avenue and side streets.

- **ON-STREET PARKING.** On-Street parking is maintained through the central business district, from Idaho Street to Iowa Street. With few exceptions, this on-street parking is

parallel to the travel way. Because of the constrained width of University Avenue, retaining the parking lanes in this area consumes one travel lane in each direction (the transit only lane in the Preferred Concept Plan). This results in only one lane of travel to be shared by passenger vehicles, transit vehicles and bicycles, in each direction along University Avenue through the central business district.

❖ **TRANSIT ONLY LANE.** East of Florida Street, the Preferred Concept Plan includes a dedicated transit lane that would run curbside to Idaho Street both eastbound and westbound. On-street parking and the Texas Street roundabout both result in breaks in the transit only lanes. All transit stops would be located in the transit only lanes, thereby reducing the potential delay to passenger vehicles along the corridor that may otherwise be blocked by a stopped transit vehicle. The goals of the transit only lanes are to improve travel time and on-time performance of transit along the corridor.

❖ **CONSOLIDATION OF TRANSIT STOPS.** There are ten existing transit stops on the north side of University Avenue and ten stops on the south side. The Preferred Concept Plan reduces the total number of stops to five on each side of the street located at:

Westbound

- Iowa Street
- 30th Street
- Idaho Street
- Texas Street
- Alabama Street

Eastbound

- Alabama Street
- Texas Street
- Pershing Street
- 30th Street
- 32nd Street

Transit stops would be located roughly 1,300 feet (2.5 blocks) apart, with improved pedestrian access to each stop.

❖ **RAISED MEDIAN.** The proposed raised median in the Preferred Concept Plan extends from Park Boulevard to Bounty Street. This raised median will result in closing left turn access to and from University Avenue at the following streets:

- Alabama Street
- Louisiana Street
- Arizona Street
- Hamilton Street
- Villa Terrace
- Pershing Avenue
- Idaho Street
- 28th Street
- Granada Street
- Kansas Street
- 29th Street
- Ray Street
- 31st Street
- Iowa Street
- Herman Street
- Bancroft Street

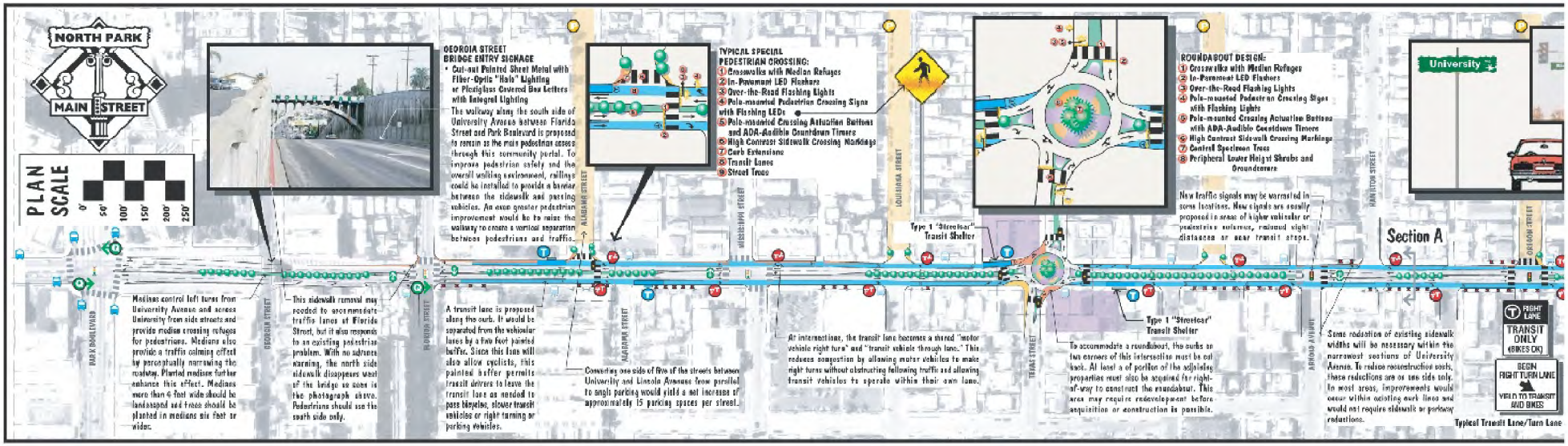
The raised median would provide for left turn pockets at all signalized intersections along the corridor, reducing the delays imposed to through traffic that typically occur under existing conditions when a through vehicle is caught behind a vehicle attempting to make a left turn from a shared lane.

❖ **NEW TRAFFIC SIGNAL.** Two new traffic signals are included in the Preferred Concept Plan: Oregon Street and Arnold Avenue. Both future signalized intersections would provide additional pedestrian access and would result in the removal of the overhead flashing lights and pedestrian signs that currently exist along the corridor.

❖ **ENHANCE PEDESTRIAN CROSSWALKS.** At unsignalized crosswalks, the Preferred Concept Plan includes the integration of enhanced pedestrian crossing elements. These elements do not include the installation of a pedestrian traffic signal. They do include the installation of in-pavement flashing beacons, roadside signage and potentially overhead signage.

❖ **TEXAS STREET ROUNDABOUT.** One of the optional traffic calming elements of the Preferred Concept Plan is the implementation of a single lane roundabout in place of the traffic signal at Texas Street.

Exhibit 1-1 illustrates the Preferred Concept Plan as presented in the University Avenue Traffic Calming Conceptual Plan report submitted by KTU+A in 2002.

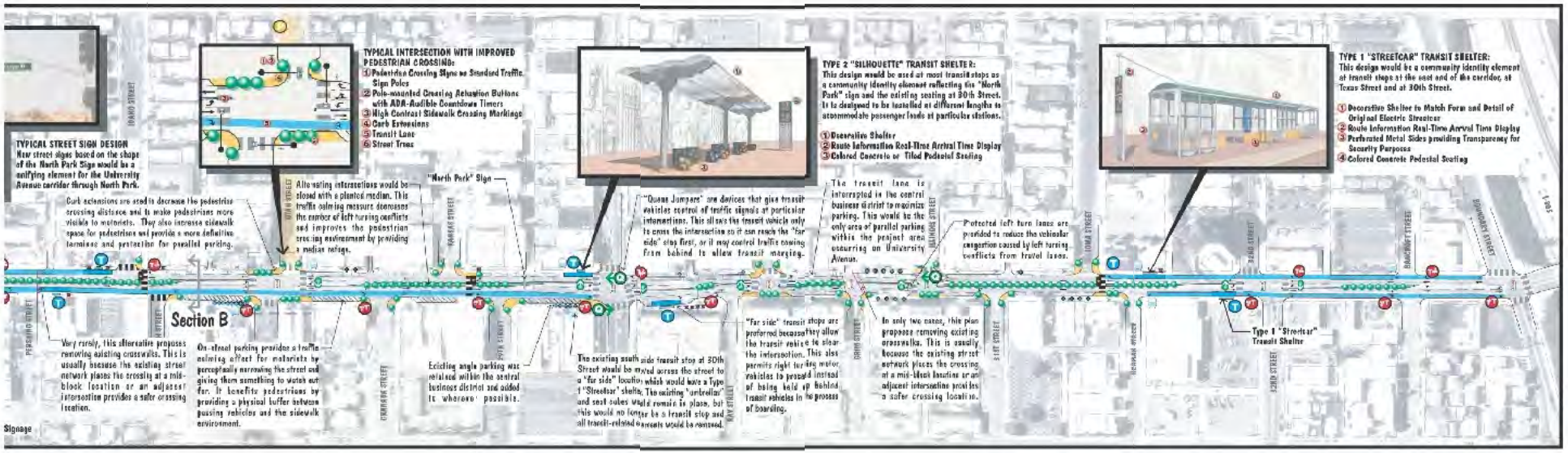


Source: "University Avenue Traffic Calming Conceptual Study, November 2002, KTU+A

PREFERRED CONCEPT PLAN

PREFERRED ALTERNATIVE A

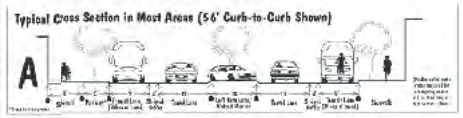
UNIVERSITY AVENUE • NORTH PARK • TRAFFIC CALMING

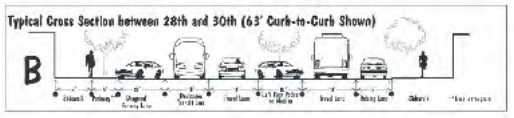


SUMMARY

5 Lane Option - 1 Unobstructed Vehicular Lane Each Way with Protected Left Turn Pockets and Medians for increased control of crossing traffic and elimination or unprotected and uncontrolled left turns from travel lanes, with Transit Lanes Each Way except within CBD: Install dedicated transit lanes striped separate from vehicular lanes throughout except for within CBD.

SECTIONS





Source: "University Avenue Traffic Calming Conceptual Study, November 2002, KTU+A

1.3 GOAL OF UNIVERSITY AVENUE MOBILITY PLAN – PHASE II

The goal of the University Avenue Mobility Plan project is to review the operational feasibility of the Preferred Concept Plan. Operational feasibility includes the analysis of passenger vehicle delays and travel times associated with the Preferred Concept Plan, transit vehicle operations including delay, ridership and travel time, pedestrian accessibility and safety, and bicycle access.

One of the main objectives through this process is to maintain the balance between pedestrians, bicycles, transit operations and vehicular flow, while providing for reasonable travel speeds and acceptable delays to the motoring public. The operational analysis will focus heavily on delay and travel time on the corridor for several reasons. First, the most significant changes associated with the Preferred Concept Plan affect the passenger and transit vehicles. Reduction in lanes through an already heavily traveled corridor will not only slow traffic, but will result in some diversion to other routes or other destinations. Parallel routes to University Avenue, including North Park Way and Lincoln Avenue are forecast to carry the bulk of the diverted traffic. It is necessary to address these routes, as well as University Avenue, to understand the overall operations of the study area. Second, if operations along the corridor are unacceptable, traffic congestion may preclude the motoring public from visiting North Park. University Avenue may be perceived as uninviting, resulting in a loss, rather than gain in economic activity along University Avenue.

Another objective of this analysis is to maintain the transit friendly nature of the corridor by looking for ways to improve transit operations. Route 7 is one of the highest traveled corridors in the City and County of San Diego. Improved on-time performance, reductions in travel time and removal of transit vehicles from the mixed flow lanes will help foster the transit friendly environment that is envisioned for University Avenue. The Preferred Concept Plan provides improved transit facilities along the corridor.

The evaluation of the feasibility of the historic streetcar along University Avenue is another objective of this study. The analysis of the streetcar focuses on operational issues and physical constraints as they relate to the Preferred Concept Plan and Refined Concept Plan. The historic streetcar analysis focuses on the alignment of the tracks, car types, and cost of implementation. Modifications to the proposed design of University Avenue may be necessary to accommodate the historic streetcar.

These objectives will be met without losing sight of the overall goal of the project: to provide a balanced transportation system and pedestrian/bicycle friendly environment in North Park. The project team strived to reach this goal through the analysis process outlined in this report, without compromising the overall vision for North Park.

Chapter Two – Public Outreach Efforts

2.0 INTRODUCTION

Community outreach and participation was a cornerstone to the University Avenue Mobility Plan (UAMP) approach. This chapter describes the outreach strategies used in developing the Refined Concept Plan and presents the findings from these outreach efforts.

2.1 GOAL OF PUBLIC OUTREACH EFFORTS

The public outreach goal was to prepare a traffic calming plan for University Avenue that is embraced by the local community, including property owners, business owners, residents, and other interested stakeholders. The project used interactive workshops, innovative technology, and a high level of communication to involve community members and develop a sense of local ownership.

2.2 PARTICIPATION OPPORTUNITIES

To involve and inform the local community, a number of different community participation opportunities were offered. The primary participation opportunities described below included community workshops, a steering committee, and an interactive project website.

- Six **community workshops** were held occurring at various points throughout the six-month planning process. Three interactive workshops aimed at a broad community audience were held on Saturday in the North Park neighborhood. Additionally, one workshop was held with the Greater North Park Planning Committee (GNPPC) and one with the Project Area Committee for the North Park Redevelopment Project (PAC). One joint workshop with both the GNPPC & PAC was held. Workshops included presentations, illustrative graphics, visual simulations of operating conditions, group exercises and activities, comment forms, and opportunities for questions and comments. Approximately 275 individuals were involved in these workshops.

- A 13-member UAMP **Steering Committee** comprised of key community stakeholders, including business owners, property owners, and residents provided guidance and direction through the planning process. The Steering Committee, most of who were also involved in the development of the original traffic calming concept from Phase I of the project, met monthly throughout the project.

- A project **website** was designed and maintained for the UAMP that allowed for 24-hour access to project information. The website included project history, draft reports, graphics, workshop dates, comment forms, as well as an email address allowing visitors to submit feedback and questions.

Promotional materials, including direct mailings, press releases, posting of colorful flyers, and distribution of UAMP bookmarks with workshop dates and the project website were used to encourage participation.

2.3 SUMMARY OF COMMUNITY WORKSHOPS

The format for each of the six workshops and the public comments recorded at each workshop are provided in the following section.

Community Workshop #1: January 31, 2004

The January 31st workshop served as an introduction to the University Avenue Mobility Plan, including an overview of the Preferred Concept Plan and the scope of the current study. Approximately 50 members of the public were present. After the brief introductory presentation, participants were divided into small groups to identify and present their primary likes and dislikes, as well as concerns, of the Preferred Concept Plan.

Overall, the comments and discussion on the concept plan were positive. In particular, participants overwhelmingly liked the idea of the roundabout and diagonal parking where possible. They also indicated a preference for limiting turns, the raised median, and bulb-outs for safer pedestrian crossings. There were, however, numerous questions and comments that surfaced.

Primary concerns and questions centered on how the transit-only lane would function, the increased distance between the bus stops (especially on the hill), a desire for streetcars, and the impacts of the Preferred Concept Plan on side street traffic (especially Florida Street and Lincoln Avenue). A variety of different new ideas and suggestions also emerged during the small group exercises, such as exploring another roundabout at Utah Street/University Avenue, and creating a major transit center at 29th Street by closing the street to vehicular access. Specific comments recorded during the workshop are identified below.

Roundabout

- Like modern roundabout/turn around (3)
- Roundabout is great
- Love the roundabout—we support this proposal
- Pershing/Redwood roundabout works well
- How do pedestrians use the roundabout?
  - Crossings are back from the roundabout
  - No traffic light as part of traffic circle slow traffic on University and Texas
- Texas Roundabout – do this first
  - Will it negatively impact bus or help?
  - Some like "perfect" (?????)
  - Need good examples to promote
- Consider another modern roundabout at University and Utah

Medians & Turning

- Like Medians
  - Limits lefts
  - Landscaping
  - Calming
  - Block alleys – good
  - Medians are important to single lane concept
- Like elimination of left turn lanes (like El Cajon Blvd)
- Medians – enough space?
- Like restricted left turns
- Park and University install No Right Turn on Red WB
- Hamilton to Oregon - need left turn in middle of hill too
- Georgia to Florida - how to get drivers to merge early before right turn, if turn lanes

Stoplights, Signs, & Speeds

- Like traffic light at Hamilton / Arnold
- Desire timed lights for smoother traffic flow

- Like standardization - signs and speed limit
- Need better standardization of signs and speed limits
- (Concerned about) Pershing Avenue blocked off (Left Turn Access)
- Hamilton / Arnold – Signal needed – none at present

Adjacent/Side Streets

- Texas to Pershing - determine how side streets affected; Florida closure?
- Need to have better access / circulation at Park
- Make sure to analyze rerouting of traffic
- Local travel vs. cross-town travel vs. tourist use
- 30th Street
  - Remove the flashing lights—very confusing
  - 30th / University bus stops Westside took all the parking spots
- 30th St. needs to be considered, especially between El Cajon Blvd. And Upas St.

Parking

- Like angled parking on Louisiana (2)
- Provide diagonal parking where left turns (3)
- Unanimous support for diagonal parking in residential areas.
- Parking - great – need to contact those affected by displaced parking
- What about parking meters?
- Left turn where diagonal parking
- Consider back-in diagonal parking

Transit

- Like dedicated transit lanes
- Removing travel lane except for right turners (transit-only lane):
  - Okay
  - But solve problem of drivers dashing into left lane from behind
  - How monitor bus / enforce
  - Make obvious
- How will bus way work for right turns and bikes?
- Transit only lane should be rubber tire easier to implement and can be modified to accommodate changes demographics
- Consider limited automobiles in transit only lanes
- Queue Jumpers (2) - also a benefit for automobiles/ buses not to "bunch"
- Buses stopping after traffic signals is a plus
- Include major bus stop for theater
- Losing bus stops? - concern for people w/access issues; analyze who uses (SANDAG)

- Bus stops too far apart?
- Need bus shelters to block wind
- Bus exhaust bad for pedestrians
- Will consolidated bus stops (19 to 10) lead to congestion at the stops, since each stop would help more people?
- Close 29th Street at University – develop a major transit stop there
- Can buses, rapid bus transit and trolleys / streetcars complement one another?
- Busses / Rapid Transit / Trolleys
  - Concern with reduction in stops / faster travel time with fewer stops
  - Local transit use vs. cross-town travel
  - Tourist vs. local use
  - Trolley – visual indicator
- Bus, not rail
- Public is supportive of historic streetcar
- Historic streetcar on rails: University Avenue to Park Blvd. (12th and C)
- Streetcar stations on Park Blvd. (University to C) correspond to Bus Rapid Transit Stations (fewer stops than bus)
- Historic streetcar should be operated by SANDAG
- Historic streetcar should be part of a system of streetcar lines, perhaps including 30th
- Benefits of streetcar on rails are:
  - Enhanced transit that people will ride
  - Economic revitalization
  - Historic preservation
  - Tourism
- Transit oriented development – commitment
- Is design redundant to actual trolley?
- Transit First

Pedestrians/Bicycles

- Like bulb outs
- Like bikes / pedestrian separation on University, east of Park
- Want safe pedestrian crossings at traffic lights and pedestrian-activated signals
- Bicycle paths on parallel streets if necessary, but ideally on University Avenue
- Bicycles couldn't use the transit lanes if there are rails
- Offsets streets create lots of pedestrian crossing possibilities
- Park to Georgia
  - Separate bikes / pedestrians
  - Rail should be skateboard-proof
- University/Park - need to ID there is a pedestrian crossing
- School – Jefferson: Kids are safety patrol –carefully design

- Explore the opportunity for a design competition at Georgia St. Bridge to improve walkability, accessibility, and aesthetics

Implementation

- Like maintaining existing right-of-way
- Maintenance concerns
- Implementation could be disruptive
- Care must be given so that no businesses are lost during implementation
- Need to ensure construction materials are high quality
- Who maintains improvements?
- Project will have to be done incrementally as funding is made available.
- Test with striping before full implementation (paint the medians and bulb-outs before actually building them)
- Implement small elements first. Implementation plan should identify parts that could be individually funded.
- Implement the roundabout first and the 30th Street Transit Station second
- Vote for Transnet extension in November!
- Funding could come partially from SANDAG. Also, there are federally funded programs that may be available in a couple of years. Transnet and Smart Growth incentive programs could also provide some funds.

Streetscape Design

- Themed bus stop benches - "Historic" at some locations
- Like landscaping / trees
- We support these (silhouette) types of bus shelters
- Landscaping of medians a must
- Street lighting not addressed in plan - streets too dark for pedestrians
- Street Lighting – Diffusers should be used
- Too dark
- Want a theme for all bus stops
- Concrete historic bus benches
- Pedestrian crossing at Kansas - consider enhancing with art special paving

Other Comments

- Take/provide field trips to other areas to see traffic calming concepts
- Concept is wonderful
- Plan is a lot to absorb
- Farmers market – what are location impacts?

GNPPC Workshop: February 17, 2004

A presentation was made to the Greater North Park Planning Committee that included an introduction to the UAMP, as well as an overview of the original traffic calming concept plan. Similar to the first community workshop, participants were asked to provide their input on what they liked about the original idea, as well as to identify potential issues and concerns. Approximately 30 GNPPC members and 15 community members were in attendance. The following comments were recorded during this large group brainstorm. Responses by the Project Team to specific questions are shown in italics.

Transit Stops

- Why remove so many bus stops - doesn't seem to encourage transit? *[response – looking at this issue through the analysis]*
- Stops shouldn't be more than 2 blocks apart
- Removing stops reduces the amount of travel time on the bus/need to balance speed of getting to location with convenience
- Like the concept of having buses go through signal before stopping

Mobility Scooters

- 20-30 years from now, they will be predominant
- 15% of transit riders likely to be on scooters; this should be considered

Number of Crosswalks

- Slowing speeds during rush hour
- Tracking timers has helped
- Side Streets
- Losing 52 spots on University, requires parking on side streets
- Clearly making parking spots on street needed

Texas to KFC

- Travelway is tight = anxiety

Angled Parking

- Like angled parking
- Can be difficult to pull out (especially at near store)

Florida to Park

- Are there plans to make it more walkable? [response – specifics were not included in concept, but is being considered]
- Bridge is a concern (maintenance, structural, aesthetic) – CalTrans is supposed to be in process of working on it

Pilot Village – Connections

- Will the Mobility Plan process connect to the Pilot Village process? *[response – yes; however, the Pilot Village process will continue after Mobility Plan is complete*]

Arizona to Villa Terrace

- Too narrow eastbound? Widen or acquire new property necessary? *[response – will be looked at through the study]*
- Convenience store – no on-street parking? [*response – as currently depicted in the concept, parking is removed*]

New Projects

- Will new projects (such as 30th & El Cajon and Lincoln & 30th) be taken into account? *[response – yes, they are assumed in the analysis]*

Ohio Street

- What are the allowable City threshold/capacities on this street? Other residential streets? *[response – varies based on street width, etc. Contact City for exact numbers]*

Stop Signs

- Does capacity increase with stop signs? *[response – generally no]*

Project Area

- How far south on side streets does the boundary extend? *[response – approximately one block]*

Community Workshop #2: March 20, 2004

Approximately 30 people attended the second Saturday workshop. The workshop was separated into three distinct segments:

- First, a presentation was made to the participants that included an analysis of potential impacts to traffic, transit, bicycles, and pedestrians based upon three scenarios: "existing conditions," "year 2030 without the project," and "year 2030 with the project."

- This presentation was followed by a series of 15-minute ***small group discussions*** in which each person was encouraged to discuss their thoughts on each of the following aspects of the plan and analysis: traffic, transit, historic streetcar, bicycles, and pedestrians.

- The final segment of the workshop was a ***dot exercise*** in which participants were given two green dots and one red dot and asked to identify those topics of most importance and the one of least importance.

Findings of the workshop are recorded below. Comments submitted by participants in writing after the workshop are identified in *italics*.

General Comments & Questions

- Concerns/discussion regarding number and location of bus stops
- Can the transit-only lane be used during rush hour traffic?
- Planned parking garage added should be considered in parking/traffic study
- Look at regional bike routes – overlay on concept plan

Small Group Discussions

Transit

- Make University a Transit Only Corridor
  - Divert traffic to other streets
  - Or One-way traffic along University
- Businesses would suffer if no traffic – only transit
- Trolley may revitalize the community
- Look at two-lane roundabout (X 3)
- Run model without roundabout (X 3)
- Extend transit lane to make it continuous between I-805 and Park (X 3)
- Continuous transit lane (west of 30th)
- Look at more angled parking on side street
- Supports realignment of transit stops
- Look at other options then roundabout at Texas
- Continuous transit lanes mitigated by angled parking & structures
- Too many stops today – favor less stops (X 4)

- One lane roundabout doesn't work (x 3)
- Like transit only lanes because they minimize negative interactions
- Parallel parking problematic in "core"
- Compare two-lane roundabout with traffic light at Texas
- No transit stop at theatre (X 4)
- Have buses leap-frog stops to speed up service
- Minimize crossing for transferring passengers
- Scramble cross at 30th/University to make transit connections easier
- Don't lose many parking spots if you eliminate parking in the core (X 4)
- Consider eliminating the transit only lane (X 3)
- *Decreasing the number of bus stops is desirable. This will have a positive impact on transit.*
- *Parking garage is needed in the Florida to Texas area and a parking garage is needed in the Texas to 28th Street area.*
- *Eliminate the roundabout. It creates a mess with traffic and transit and requires a major taking of property.*

Historic Streetcar

- Double sided – double ended vehicles
- Place streetcar on Lincoln
- Place Buses on Lincoln
- No turn around at end – big loop
- Catenary poles are a visual problem
- Go straight at Roundabout
- *Inclusion of the historic streetcar is critical! The transit, economic, and tourism benefits of the streetcar will be phenomenal. This has been documented nationwide with other such historic streetcar lines in other cities.*
- *With historic streetcar in place, #7 should go down 30th Street to Upas to Pershing to downtown.*
- *Streetcar should have identical stations as buses on University and BRT on Park Blvd.*
- *System should allow for the greatest variety of streetcar vehicles including PCC's, which historically operated from 1937 – 1949.*
- *Single ended vehicles must be allowed.*
- *Loop option at 32nd Street is ideal.*

Pedestrians

- Grim
  - Overall concern regarding removal of crosswalks at Grim.
  - Pedestrian crossing remove – ok
  - Why was Grim allowed a median break? Why not 31st median break?

- Keep Grim.
- Keep pedestrian crossing
- Future land use may drive a need to change configuration at Grim. In addition to maintaining the crosswalks, provide left turn access for the existing Post Office and future Library site

❖ Parking
- OK to eliminate parking on University if replacement parking on nearby side streets can be provided.

❖ Seniors
- Slower walking speeds crossing speeds leads to a need for longer pedestrian crossing times.
- Mobility scooter will become more utilized as the population ages.
- Bike lane – mobility lane – To allow for scooters and other motorized vehicles of the future.

❖ 30th Street
- Implement pedestrian scramble phase. Allows pedestrians to move from corner to corner in any direction. Will help pedestrians get to their transit stop and minimize the number of crossings at each intersection.
- Make sure pedestrian phase is long enough

❖ Co-locating
- At major intersection reduce number crossings near transit stops. Only allow pedestrians to cross when a bus is at the stop. This will reduce the number of ped crossings per hour and improve traffic flow along University.
- Coordinate pedestrian with transit
- Rush hour vs. non-rush hour pedestrian timing. Allow more frequent pedestrian crossings during off-peak times.

❖ Trolley
- Waiting time for pedestrian when trolley transitions

❖ *From 28th/Idaho streets to 32nd Street, sidewalks should be terracotta colored with diagonal scoring. This creates a sense of place in the main part of the business district and differentiates it from the surrounding area.*

Traffic

❖ Remove or modify the one lane roundabout
❖ Better coordination of signals
❖ The intersections at Texas and Utah need to be improved
❖ 2 lane roundabout option should be considered
❖ A continuous transit lane along the corridor would improve traffic flow
❖ Remove Grim left turn – 31st.

- Require over-parking of new development to offset any parallel parking loss on University due to continuous transit lane
- Keep signal at Lincoln/Texas as an alternative to roundabout
- Designate Lincoln as a bike route to get them off of University (many bicyclists already use Lincoln as an alternative)
- Don't remove left turn across from University to Bancroft (westbound)
- Protected lefts at signals instead of permitted may help traffic flow
- Block off Ray Street at North Park (southbound)
- Floating lane that changes with peak hours would provide additional capacity in the peak direction
- Signal operation at Boundary – access to 805
- Remove parallel parking on University for transit lane
- Implement a parking permit program
- Better signage to Lincoln/North Park
- Install a signal at Lincoln/Texas. This would allow through movements on Lincoln, which are currently blocked by a median
- Remove stops on Lincoln through traffic progression
- More left turn restrictions in vicinity of 30th
- Reduce volumes on University by moving traffic to side streets
- Remove parking on University to allow a continuous transit lane
- *Two-lane roundabout is even worse than a one-lane roundabout. It requires a major taking of property at all four corners.*
- *Is a one-lane automobile configuration really going to work? Carrying capacity is important.*
- *Timing of the traffic lights needs to be ideal for automobile flow.*
- *20 mph is an ideal speed for cars. Any less would be too slow.*

Bicycles

- Need bike lanes on alternative streets
- Parallel streets are safer
- University Avenue – Park to Florida – narrow transition is tricky
- Transit only lane would work with better technology (bus exhaust would be less of an issue for cyclists riding in transit only lane behind buses)
- Safety issue – University Avenue is not as safe as the alternative parallel streets.
- Lincoln should be an alternative
- Mixing bicycles and transit is a problem due to the potential to breathe exhaust fumes, especially during peak hour periods.
- Trolley and bicycles are incompatible due to the potential for bicycle tires to get caught in the track grooves.

- Lincoln may not be fast enough or wide enough for a bike lane but a Class 3 Bicycle Route could work (a bicycle route sign).
- Wightman, Lincoln and North Park Way are potential alternative routes.
- Bicycles should share lane with mobility scooters.
- Diagonal lanes conflict with bicycles.
- Use alternate routes for busiest stretches.
- University from Park to Mississippi is especially dangerous.
- Consider possible 2 levels on University – pedestrians up and bicycles underneath.
- Give bicycles transit priority too.
- Historic street cars vs. bicycles – a definite conflict.
- Cyclists need University to get into neighborhood coming from the west to Louisiana.
- With trolley, bikes should use Lincoln.
- Most cyclists now use Lincoln or Wightman or North Park Way.
- Don't change the existing pattern.
- Designate Lincoln as a Bike Route with Bike Lanes if possible.
- Tradeoffs
- Exhaust fumes on University vs. alternative routes
- Numerous stop signs on alternative routes or stop lights on University
- Bikes should use University only for short trips.
- *Bicycle inclusion is important but bicycle advocates should not derail the historic streetcar line.*
- *There should be bicycle lanes on Texas Street, on Lincoln Avenue and on Utah Street.*
- *Divert bicycle traffic to Lincoln Avenue, Wrightman Street, and North Park Way.*
- *Bicycle routes should be augmented with signage.*
- *There needs to be a good bicycle transition from Lincoln Avenue to University Avenue at Florida Street.*
- *Bicycles on University Avenue from Park Blvd. to Florida Street needs to be taken into consideration.*

Dot Exercise

Workshop participants were given one red dot and two green dots. Participants were asked to place their dots on the elements of the concept plan identified below. Red dots indicate elements of the plan which are lowest priority or least favorable. Green dots indicate elements of the plan that are most favorable or highest priority. A summary of the dot exercise is provided below.

- Pedestrian Enhancements
  - 0 = Red dots
  - 10 = Green dots
- Transit Improvements
  - 2 = Red dots
  - 14 = Green dots
- Historic Streetcar
  - 7 = Red dots
  - 16 = Green dots
- Traffic Signals At Arnold And Oregon
  - 2 = Red dots
  - 3 = Green dots
- Raised Median
  - 1 = Red dots
  - 2 = Green dots
- Roundabout At Texas Street
  - 13 = Red dots
  - 5 = Green dots

PAC Workshop: April 13, 2004

RBF Consulting presented the updated findings of the UAMP traffic/transit analysis to the Project Area Committee (PAC). Six Committee members and approximately ten community members were in attendance. As a result of the information presented at this meeting, the following comments and questions were raised. Responses to questions are noted in italics after the comment and comments from forms submitted after the meeting are noted in italics at the end of the list.

- Was closing Texas to the south considered?
- Bus intrusions into travel lanes needs to be addressed.
- How many parking spaces to be relocated? *[response: 68 parking spaces relocated]*
- Do we know number of handicapped bus passengers for 2030? will influence future delays
- Buses should be in transit lane all the time with all alternatives.
- What about past Boundary & Park? Are we burdening other areas?
- What about the Georgia Street Bridge?
- Slowing traffic – how does it affect businesses?
- Slowness vs. stop-n-go ... slow & smooth is the goal
- What about left turn pockets? *[response: yes]*
- Can cars use transit lanes while no buses?
- Can cars use transit lanes as acceleration lanes to enter traffic lanes?
- Pedestrian accident data? *[response: was collected in Phase I]*
- Realignment of Texas – cost? Recommend to compare costs with street closure
- Looking at parking on all side streets? *[response: yes]*
- Two big time-saving items seem to be - Ohio closure and relocation of parking
  - is grief of Texas realignment worth it?
  - should look at roundabout without transit
- Bus stops removal – based on previous community concerns, we should know time savings.
- Roundabout – how will it function for pedestrians? It will take time to get used to.
- Has the time it will take to make left turns been studied?
- *Do not remove the left turn (to South) on University just west of Boundary – the one before Sav-On on 32nd.*
- *Provide a rush hour speed/signalization and req. speed signalization.*
- *Show traffic flow around theater/garage w/800 spaces + through traffic.*
- *Protect residential parking with stickers from parking blight!*

Joint PAC/GNPPC Workshop: May 6, 2004

RBF Consulting presented the updated findings of the UAMP traffic/transit analysis to a joint meeting of the North Park Redevelopment Project Area Committee (PAC) and the Greater North Park Community Planning Committee (GNPCPC). Approximately 20 people were in attendance, including Committee representation and community members. As a result of the information presented at this meeting, the following list of comments and questions were raised. Responses to the questions are noted in italics.

Comments on Streetcar

- Location/destination concerns...
- Will tourists come to N. Park?
- Theater is an asset.
- Potential problems at Florida (dependent on transit-priority signal)
- Maintenance/storage facility – why not at "Bonanza Corvettes" spot?
- Look at this area, not in existing neighborhoods (homes) where homes removed
- Market St. (San Francisco) – can't the North Park car work similarly?
- Width? *[response: similar to bus]*
- Do people feel calmer around streetcars? *[response: fixed rail has been shown to make people feel more at ease]*
- Still opportunity for streetcar north of Park? C to Adams? *[response: not being pursued by SANDAG currently]*
- What about on El Cajon?
- Parking/loading/unloading primary concern on University
- Alley access
- Can streetcar operate in mixed
- Will there be less buses with streetcar?
- Fares – same as mass transit? Open air?

Comments on Refined Alternatives

- What about parking in front of businesses?
- How/were businesses informed?
- Large freights won't unload on side streets.
- Side streets already jammed
- Parking needs on side streets already high
- New loading zones will result in loss of proposed parallel parking on side streets.
- Residents will take new parallel spaces proposed.
- Business accessibility impacted
- Some businesses don't get foot traffic from buses.
- Bus drivers cause conflicts (transit-only lane should help).
- Use of alleys prohibited currently for loading/unloading
- Why accommodate buses?
- Couldn't side streets accommodate buses? Lincoln, etc.
- Shouldn't residents also have to deal with problems?
- Who we service vs. who we want to service is the question.
- What about Texas? How will it be changed? *[response: currently proposed to leave as is]*
- What about a backlash into Hillcrest?

- Temp parking/loading in off peak?
- Medians – are residents aware?
- What about other/surrounding communities? Have they been informed?
- Where are people traveling from?
- People aren't going to walk.
- Bus transition point is for pedestrians on bus, not foot traffic of shoppers

Community Workshop #3: June 12, 2004

The final Saturday workshop on June 12, 2004 included approximately 113 participants. The workshop included a summary presentation followed by an open house to allow community members to ask questions and view exhibits. Seven "stations" were included as part of the open house that provided specific details and particulars about the Refined Concept Plan under discussion for the University Avenue corridor:

- Parking
- Intersections
- Pedestrians
- Streetscape & Roadway Design
- Transit Improvements
- VISSIM Simulation
- Traffic Diversion Patterns

As part of the open house, participants were asked to respond to a two-page questionnaire to provide their feedback on the Mobility Plan. Additionally, comment boards were located throughout the room. The following list summarizes the comments received at the workshop and those received after the workshop (as of June 21, 2004).

Questionnaire

1. **Do you live in or near the University Avenue Corridor?**
   Yes **35** No **11**
2. **Do you own property or a business in the University Avenue Corridor?**
   Yes **27** No **19**

3. **How often during a typical week do you…ride the bus on University?**
   Never **35** 1-2 days **2** 3-4 days **0** 5-6 days **1** Every day **0**
   How often during a typical week do you…ride your bike on University?
   Never **33** 1-2 days **9** 3-4 days **0** 5-6 days **1** Every day **0**
   How often during a typical week do you…walk along University?
   Never **7** 1-2 days **19** 3-4 days **11** 5-6 days **7** Every day **4**
   How often during a typical week do you…drive along University?
   Never **0** 1-2 days **2** 3-4 days **12** 5-6 days **10** Every day **18**

4. **I like the concept of a TRANSIT-ONLY LANE along the University Avenue Corridor.**
   Strongly disagree **6** Disagree **3** No opinion **2** Agree **9** Strongly agree **26**

What additional comments do you have about the concept for TRANSIT as shown in the University Avenue Mobility Plan?

- Good for SANDAG, bad for North Park. Make bus lane into carpool lane
- Do not limit auto traffic in "only" lanes during rush hour
- Although I don't take bus on University Avenue, I do use the #2 to go downtown to Petco & to jury duty. I think better transit flow is important so you won't miss using your car.
- Yes to the Historic Trolley!
- With only one lane for regular traffic, I don't think the bus should ever enter that lane. Buses s/b in transit lane only.
- Prefer the concept of a transit-only lane with no parking. I don't know the feasibility of allowing restricted parking in that lane. I hate to see buses and cars sharing the same lane.
- I like the streetcar!
- The historic streetcar concept is great. This would bring a lot of new business to the corridor and reduce automobile traffic.
- Must follow both sides (N&S) of University
- Waivers for businesses that need deliveries.
- We would take the transit more often.
- I would like to see the proposed historic trolley route included in the plan.
- What happened to the trolley?
- The impact of removing two traffic lanes is severe to mobility vs the appearance of a bus every 5-10 minutes. What about a bus cut out?

- If trolley is restored, it will need its own lane.
- Excellent concept.
- I avoid University Avenue whenever possible now because of getting stuck behind busses.
- Not sure streetcar would work.
- Is this a good thing for merchants? Reduced traffic flow?
- The transit only corridor is going to eliminate precious parking spaces on University Avenue and eliminate traffic lanes that in turn will increase congestion.

5. I like the PEDESTRIAN improvements illustrated on the University Avenue Mobility Plan.

Strongly disagree **1** Disagree **3** No opinion **3** Agree **11** Strongly agree **26**

What additional comments do you have about the concept for PEDESTRIANS and BICYCLES as shown in the University Avenue Mobility Plan?

- Does not reflect "future" developments i.e. scooter & mobility cars (300% increase)
- Widen the crosswalk in front of the theatre so that it extends from 29th to Kansas and use special paving marked crosswalks on all side streets. Provide "scramble" pedestrian crossing at 30th and University Avenue.
- As a cyclist, I find the provisions for bicycles overkill. There are enough parallel routes. I find this consistent with the study showing 12-15 cyclists in an 8-hour window.
- Need a "scramble" pedestrian crossing at 30th and University. Wider crosswalks at Kansas to 29th.
- We need a better bicycle plan for side streets. Can we improve bicycle access on Lincoln Ave?
- Wonderful – This will help the North Park area finally accommodate all forms of transportation.
- This will make North Park corridor more pedestrian oriented.
- I recommend that lighted crosswalks be replaced with actual traffic signals (red lights) because presently, cars completely ignore flashing lights at crosswalks & it's very scary for pedestrians.
- Could diagonal crossing points be placed in high pedestrian intersection for convenience to pedestrian.
- At present, I've witnessed under utilized sidewalks except in the vicinity of 30th & Univ. Could buses & bikes share some common space?
- Need to study more
- A through bicycle route & facility should be identified

6. Please indicate your level of comfort with the PARKING concept by circling a number on a scale of 1 to 5.

Very uncomfortable **3** Uncomfortable **6** No opinion **2** Comfortable **24** Very Comfortable **11**

What additional comments do you have about the concept for PARKING as shown in the University Avenue Mobility Plan?

- Eliminate restricted parking – too confusing for motorists
- I am concerned about off-peak parking in the bus lane east of 30th St.
- I will lose the only parking in front of my property and is going to impact my property by the placement of a bus stop in front of my 2101 & 2103 University Avenue property.
- You will be removing more parking spaces than those that we will gain
- Side street expanded parking is essential – Alabama Street condo occupants have no place to park. Can you accomplish this first???
- 1. Additional parking very costly. 2. Loading/unloading?
- How will parking structure work? Can local businesses validate tickets at reduced rates?
- Parking will always be a problem in our business area
- I wonder if the parking allowed in the transit lane could be completely eliminated in favor of passenger drop-off + loading only. I find it difficult to drop off my elderly mother convenient to business.
- People will come and patronize businesses because it is a vibrant, safe place. Walking from a block away will not be a problem
- Eliminate restricted parking on north side of University – small benefit – confusing result – suggest eliminate these spaces entirely
- Nice start, but with more housing & retail on the horizon, significant increases are needed.
- How large would the proposed parking garage be behind the North Park Theater?
- Are any of the new parking spaces going to be marked for handicapped? Will you provide diagonal parking University to El Cajon?
- Eliminate "restricted hours" parking and simply remove any potential for parallel parking to avoid confusion + midday congestion. Short-term pain, but businesses will adjust + should adjust for long-term gain.
- About time!
- More diagonal side street parking, less parking on University
- Any individual business opposed to "losing" their parking is shortsighted + selfish. An area must provide a comfortable driving environment to attract more businesses + patrons. (unlike sports arena and Mission Valley)
- Plan will redirect through traffic into neighborhood parallel to Univ. becoming blighting influence! Rush hour traffic will be awful.
- 1. Diagonal parking will blight U.A. like it has done to City Heights. 2. Parking sticker (free) for residents. 3. Removal of "choke pt." Parking areas, within 1500' of Univ/30th

- Parking in the transit lane – I don't think it's a good idea. Then the buses have to go in the lane with cars?
- There should be no parking in the transit lane.
- Every possible effort should be made to fund on-street parking along University to improve the pedestrian experience as well as increase business.
- I feel parking off University is better for traffic flow & for the individuals parking. It would be safer & easier to park on side streets. Also having parking lots become parking structures & reduce # of lots only.
- "Peak" parking on University is not good. People will get angry if ticketed or towed. Also, peak/no peak parking conflicts with the historic streetcar

7. What do you like BEST about the University Avenue Mobility Plan?

- Slow traffic & beautify the corridor – more pedestrian friendly walking
- The median/left-turn facilities & pedestrian waiting area (refuge)
- Nothing yet! You need to involve residents and businesses in determining the future of a main street that will impact their daily lives the most.
- Pedestrian concept
- Style + function
- Beauty
- Better for pedestrian access and will keep cars moving by eliminate competition for bus traffic & left turns
- Pedestrian safety & enjoyment of (hopefully new + improved) storefront businesses.
- Better flow, limiting turns, median
- The old historic street cars
- Transit only lane pedestrian emphasis
- 1. Beautification. 2. Left hand turns
- Business friendly
- Transit only lanes
- The greenbelt
- The fact that the problem is being addressed! Don't let North Park have problems like Hillcrest!!!
- Center median
- Pedestrian improvements
- Pedestrian improvements
- Want it beautiful but practical. Solutions for businesses
- It can't be worse than it is right now
- The upgrade in appearance and traffic flow for through traffic can go for El Cajon
- Traffic moving along
- Trolley
- Fresh ideas – this works in other cities!

- The buses out of my lane – I'm afraid of them!
- Forward thinking! Easing the hassle of getting through the corridor + allowing beautification to increase overall allure
- Median, bulb-out improvements
- Interest of community vs. big business seems at hand
- 2 lanes & transit lanes
- Balanced approach for pedestrian, transit & auto needs
- Brings the avenue back to the immediate community
- Making it a desirable place to shop. Eliminating the issues of cars & buses competing. Eliminating the disruption caused by cars turning left
- Turning made easier for cars
- Bringing more pedestrian traffic to University Avenue & bus lanes & car lanes
- Slow traffic & beautify the corridor. More pedestrian friendly walking
- Transit promotion – increased transit use

8. What CHANGES would you most like to see on the University Avenue Mobility Plan?

- Transit lanes on both sides – Park to Boundary
- Initially, install a bus lane eastbound west of Utah – convert it to auto use only when demand requires. Some kind of landscape treatment needed at Texas St.
- Have a more coherent plan that preserves existing parking and possibly increasing parking, and planning bus stops at commercial locations instead of residential location.
- Create more parking
- Parking issues
- Diagonal crosswalks on heavy corners like 30th.
- Leave off median. Create a (unreadable) with one lane
- No parking in transit lane
- Faster implementation
- Masterful concept
- Protestors outside have a point. Plan must include way for businesses to get their freight
- The absence of left hand turns & single traffic lanes
- The trolley running up Park Blvd from Downtown and through North Park
- Designation for seniors/handicapped
- Trolley included
- Scrap it
- Bulb-outs, pedestrian crossings, medians, left-turn pockets
- Acceleration of completion
- None
- Safer crosswalks
- Bike/transit lane. Open up possibility of streetcar

- No meters ever. If there is landscaping in median, use low water plants – plants natural to climate/environment
- Another change that would improve the plan is to have more left turns from University to side streets, even if the intersection is not signalized
- See previous questions
- Removing parking bring back the trolley
- Movable divider for rush hour use diff. Speed limits for rush hour
- 1. Leave l. turn at Bancroft going N. 2. Install no right turn on red on North Park Way going west at 30th St. 3. Extend left-turn queue lane to east--- major issue
- Storefront improvements, more shade trees
- The current plan seems to be well thought out. I like the ideas of designated bus lanes & private vehicle lanes & better crosswalks to enhance pedestrian traffic

9. Please indicate your level of comfort with the University Avenue Mobility Plan by circling the appropriate number on a scale of 1 to 5.

Very uncomfortable **2** Uncomfortable **5** No opinion **2** Comfortable **19** Very Comfortable **16**

10. Have you attended any of the previous meetings and workshops regarding the University Avenue Mobility Plan? Yes **23** No **24**

11. How did you hear about this workshop?

- Flyer (7 responses)
- Mail & paper
- We received a personal notice – thank you - Brinton Family Trust
- North Park Main Street
- By mail. This is the first time I hear about this plan!
- North Park Main St.
- North Park Main St.
- Mailer (7 responses)
- Thank You!
- A member of Main Street. Did lots of discussion at our meeting
- Website & flyer in the mail
- Angry inflammatory fliers opposing the plan
- Flyer – misspelled buses (look up definition of buss)
- Only recently learned of this
- Saw flyer posted
- Recently purchased property in area.
- Last one.
- Flyer , poster
- Neighbor

- I walked into the office on University Ave.
- Café Calabria, mail
- Mail & store on University
- I'm heavily involved in community happenings
- Part of steering committee
- Community groups
- Helped select consultants. While to comp. Models are interesting they do not really address the streets adjacent to University & future ADA/scooter use – i.e. no new motorcycle parking! No major bike parking areas
- PAC
- North Park News (2 responses)
- Internet e-mail
- NPMS – NPCA – Friends – posters

12. Any other comments?

- Yes. Please keep me informed.
- If development occurs on University Ave, how would all that activity be handled within this traffic concept?
- We would love to have the historic streetcars running through North Park
- When is the expected time to start
- Wish I had been aware – thank you for mail notification
- I'm in favor of any improvements as long as funds are not diverted from repairing aging roads, sidewalks + curbs in surrounding areas
- How do I help?
- Very disappointed in you as consultants. I will contact Ms. Atkins also, "traffic calming" on Lincoln Ave. + no parkway. Yet when I asked about this, I was given no info & big brush off. If it's outside the project area, why highlight it on the flyer?
- How will the traffic affect safety for the families & children on the side streets where traffic will be diverted? Is it possible to create two main streets, one traveling eastbound, one traveling west bound as done in Palm Springs, CA
- Many people own more than 2 cars but live in dwellings w/o enough parking. Could resident parking decals be issued with a limit per dwelling & type like S.F. house vs (apartment unit that generally does not have street frontage for parking). I know, sounds discriminatory
- Please keep the trolley line as a consideration!
- Illinois is wide enough to land a B-52 – speeding & streetcar racing. People store their cars on the street for months.
- Did I mention I'd like to see the trolley included?
- Businesses who may be adversely affected have sufficient time to adjust businesses are easily relocated & there are plenty of available retail spaces with rear/side loading opportunities
- Thanks for all the creative works.

- It's important to make University Ave safer for pedestrians, even if this means a handful of businesses lose a loading area.
- Good job!
- This was an excellent presentation.
- E-mail
- Support as long as parking during slow times remains in plan
- Bring the trolleys back!
- RBF needs to take a very close look at the block on the south side on University between 30th and Ray. This block is a diagonal block in terms of its configuration. It helps transition University from wide to narrow at this point. What are you proposing to do on this block? Please analyze it carefully.
- Coordinate improvements w/ theatre plaza project.
- Trolley = folly
- Visual simulation would have been better with the street names included.
- In any plan, all stakeholders should be included. For the last 2 years, I wondered from the start about business. Now in the final stages, we know where they'll stand. Business should have had their input actively pursued from start.
- Talk to businesses on corners to reduce driveway cuts along University & increase or add driveway cuts on side streets to improve pedestrian safety. Synchronize traffic signals for pedestrians. Coordinate 29th St. improvements with that task force.
- If the proposed mobility plan is adopted, then parking on side streets should be mitigated by ensuring that all parking spaces are clearly marked on all side streets including North Park Way and Lincoln Ave.

Comment Board

- Alabama St going one way So. to No.
- Bus stops to stay the same. Seniors will not cross two street
- Transit only park to 30th east bound too
- Restricted parking bad idea in transit lane
- Diagonal parking is a blighting influence (see City Heights).
- Provide residents nearby w/free stickers n/500' of 30/Univ (permit parking only ...).
- Enforce no transient camper parking in N.P.
- Limit parking during rush hour.
- Create diagonal parking on Arnold on one side.
- Permit parking on Alabama St.
- Parking north of University on Arizona Primarily serves residents, (where diagonals are indicated) not Univ. businesses.
- Diagonal parking (AZ N of Univ) should be continued N. to Lincoln.
- SANDAG does not deserve priority over N.P. residents & they should clean their bus stop daily & provide cement pads to save our streets from asphalt mounding.

- Permit parking stickers (free) for residents to keep business out of neighborhoods
- Pedestrian: subways beneath Univ. bridges over Univ.
- We have a problem with off-street parking when we eliminate left turn on side street.
- Diagonal crosswalks on 30th & other heavy pedestrian crossings
- We think all proposed elements are right on target. We moved here from Cambridge, Mass where we saw central square vastly improved by similar changes. Keep up the good work.
- Please! Let's get the side street parking expanded A.S.A.P. – residents of Villa Sao Miguel on Alabama St. (3776-3778) do not have any place to park!!!!
- What happened to no parkway – I think that they should be included in the project. There are businesses in no parkway.
- I agree about having diagonal parking put in ASAP on those streets where there is no possibility of widening. Do alter inexpensive things RIGHT AWAY. Always possible to change after studying effects. Having diagonal parking NOW will make the businesses more amenable to other changes. Also: close any streets, put up "no right turn" "no left turn" signs NOW.
- Butt trays at bus stops for cigarette smokers to keep butts off sidewalk & into drainage system
- Concern about the blighted properties on Florida St. directly behind 3776 Alabama St. What can be done?
- Isn't traffic flow all right on Univ. now?
- Keep North Park a small residential community like La Mesa.
- Many people avoid University Ave now because it is so dangerous & difficult to navigate.

Letter

"I do not understand, however, why curb extensions and high-contrast sidewalk crossing markings are being planned for Alabama Street (north) – a relatively lower population density area – whereas no such are designated for Alabama Street (south) – a relatively higher population density area – where most of the hundreds of seniors mentioned above live and walk to grocery shopping. I am convinced that this is a serious oversight which must be rectified.

Neither do I understand the rationale for moving the east/west bus stops such that they would thereby force the senior community to cross Alabama Street (north) headed west and Alabama Street (south) headed east. How can this possibly be safer for the seniors than having the stops on or near the eastern corner of Alabama Street (north) and on or near the western corner of Alabama Street (south) nearby the ends of the new University Avenue crosswalk? This oversight also must be rectified.

As regards parking, there is none available on Alabama Street (south) to substitute for the spaces that are being eliminated along University Avenue (east). The parking on Alabama Street (south) is already oversubscribed to the point where resident-only parking sections should be designated. Neither does there seem to be any plan, it appears, to create diagonal parking spaces along Alabama Street (south). Indeed, it is not clear if that is even possible given the street's width."

2.4 SUMMARY OF COMMENTS FROM COMMUNITY PARTICIPATION

Although hundreds of varied comments, concerns and ideas were identified during the six-month process, several items raised regarding the University Avenue Mobility Plan were repeated numerous times. The following are key issues that emerged, along with a brief discussion on how they were or were not addressed in the Plan.

Parking and Deliveries on University Avenue

The potential loss of on-street parallel parking spaces along University Avenue was one of the most controversial issues discussed. While many people were in favor of removing parallel parking in order to provide a transit-only lane, a number of property and business owners were equally adamant about the need to retain these spaces for both parking and loading/unloading.

Parking will continue to be a key issue on this project. There are significant operational benefits to both transit and passenger vehicles, as well as safety and emergency vehicle access benefits associated with the removal of the on-street parallel parking. Selection of the Refined Concept Plan included an analysis of five parking scenarios. To meet the needs of both the business community and the peak hour operations of the corridor, a parking alternative was proposed that restricted the on-street parking in the peak hours (7:00-9:00 a.m. and 4:00-6:00 p.m.). During these peak hours, the curbside lane would be for transit vehicles only. SANDAG and the project Steering Committee both oppose the restricted on-street parking concept. To maximize transit operations along the corridor, SANDAG and the Steering Committee preferred the removal of all on-street parallel parking.

It should be noted that no on-street diagonal parking will be removed or modified as part of the Refined Concept Plan. The issues associated with parking pertain only to the parallel parking spaces on the corridor.

Increased Diagonal Parking on Side Streets

Generally, the idea of increasing diagonal parking on side streets was viewed positively by the community. However, residents expressed concern about the potential increase in traffic, as well as increased difficulty in finding resident parking.

Residents along the side streets will benefit from the additional parking. It is likely that if parallel parking remained on University Avenue, it would go underutilized. Traffic volumes along the corridor in a single lane of traffic bound by a raised median and a parking lane would make drivers uncomfortable with backing into a parallel parking space. Therefore, people would seek parking on the side streets to avoid this discomfort. By improving side streets to include more parking from University Avenue to El Cajon Boulevard north of University and to one block south of University Avenue (Wightman Way or North Park Way), residents will also benefit from the additional parking. This additional parking may generate a slight increase in traffic on the side streets.

However, the increase in traffic due to parking is anticipated to be counterbalanced by the anticipated decrease in traffic volume associated with restricting left turn access at all unsignalized intersections. A shift in local traffic is anticipated to occur to those streets where full access is provided (signalized intersections along University Avenue).

Diversion of University Avenue Traffic

The effects of diverted traffic onto side streets was a common concern by many residents and adjacent business owners in the North Park area.

Traffic will be diverted to the side streets and to the surrounding roadway network due to the constrained capacity along University Avenue. Existing traffic volumes in the peak hour exceed the single lane capacity. Therefore, it is anticipated that as this project is constructed, traffic will divert to other routes. The design elements of the Refined Concept Plan, discussed in Chapter 8 of this report, address some potential traffic calming elements for the roads forecast to see an increase in traffic volume. The implementation of diagonal parking on both sides of the street, as discussed in the previous section, is also a natural traffic calming measure.

Relocation and Elimination of Bus Stops

The relocation and elimination of certain bus stops along the corridor was negatively viewed by numerous community members. Most concerns were related to the convenience and safety of elderly and handicapped residents.

Transit stop relocation will provide equally spaced transit stops along the corridor. These stops are located within approximately 2.5 blocks (1,300 feet) of one another and will provide improved amenities such as bus shelters, seating, signage, and level boarding. Along University Avenue, where the slope of the road is steep (Park Boulevard to Arnold Avenue), passengers can walk downhill to reach a transit stop.

Utah Roundabout

Community members expressed interest in exploring an additional roundabout at the University and Utah intersection.

An analysis of the right-of-way impacts of the one-lane roundabout at Utah Street determined that the roundabout could not be implemented without significant right-of-way taking. The roundabout would extend outside the right-of-way on each corner of the intersection requiring the removal of several buildings. Therefore, the Utah Street Roundabout was rejected as a potential modification to the Preferred Concept Plan.

Pedestrian Scramble Light

A pedestrian scramble phase allows pedestrians to move freely within an intersection during a "pedestrian only phase". During this phase, all traffic would be required to stop. Currently, there are all-pedestrian phases at University Avenue/Texas Street and University Avenue/Utah Street. Both these intersections require split phasing north and south because the intersections are offset by several feet.

There was community support for the pedestrian scramble phase at 30th Street. Pedestrian scramble phases at standard intersections, such as 30th Street, result in higher delays for pedestrians. The greatest benefit is to people who need to cross two legs of the intersection, while the scramble phase is typically a disbenefit to people crossing only one leg. Pedestrians would be required to wait for up to 90 seconds to receive a pedestrian indication with the scramble phase. Pedestrians would be required to wait as all traffic signal phases cycle through before giving a pedestrian green light. With standard phasing, the pedestrian would be allowed to cross with the concurrent vehicle traffic signal phase and would typically be required to wait approximately 30 to 40 seconds to cross each leg of the intersection. Implementing the scramble phase would result in higher pedestrian delay times at 30th Street and would result in higher delays to passenger vehicles. Therefore, the pedestrian scramble phase is not recommended at 30th Street.

Dedicated Bicycle Lanes

The lack of dedicated bicycle lanes along University was a concern of many workshop participants.

Although the transit only lanes are not dedicated bicycle lanes, bicycles will be permitted to travel in the transit only lane. This is an improvement over the existing conditions, where bicycles are required to share the travel way with both buses and passenger vehicles. With bus headways of six to ten minutes, bicyclists will have several windows of opportunity to travel the corridor without an interaction with a bus.

Historic Street Car

The community expressed definite interest in the historic streetcar. The feasibility study showed that the historic streetcar is not infeasible, but would be costly to implement ($25 million) and there are some constraints in the Refined Concept Plan that would need to be addressed prior to implementation. For example, all parallel on-street parking would need to be removed from University Avenue to allow for the historic streetcar. To avoid unnecessary merging with mixed flow traffic, the streetcar should operate in its own 12-foot lane. The Refined Concept Plan allocates 11 feet to the transit only lane. Therefore, the transit only lane would need to be widened by one foot, either from the curb or from the raised median, to accommodate the historic streetcar. Other critical issues associated with the implementation of the historic streetcar are outlined in Chapter 10 of this report.

Chapter Three – Operational Analysis Methodology

3.0 INTRODUCTION

Operational analysis is the process of measuring and evaluating the ability of vehicles, pedestrians and bicycles to travel along, across or within a roadway. At the onset of the University Avenue Mobility Plan, three goals were established:

- Meet City of San Diego Traffic Impact Study Guidelines
- Generate Visual Simulations to Illustrate Operations
- Realistically Report Separate Traffic and Transit Operations

This chapter summarizes the methodology used to evaluate the operations of the Preferred Concept Plan. Based on the results of the operational analysis, alternatives to the Preferred Concept Plan were developed to further improve the overall operations along the corridor. Each alternative was further evaluated based on the measures of effectiveness (MOE's) outlined in this chapter.

The SANDAG traffic model was used to help forecast future daily and intersection traffic volumes in the study area. The VISSIM software program was used to measure travel time and intersection delay for all study intersections along the corridor. VISSIM is a micro-simulation traffic model that is capable of generating two-dimension and three-dimension models of traffic flow based on traffic volumes, signal timing and intersection geometry. The VISSIM traffic model generates average travel time and delay. The results are based on multiple model runs that simulate a range of potential traffic operations scenarios over two-peak hour periods, 7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.

After a thorough review of the MOE's reported for each of the alternatives, the alternative with the greatest overall balance of travel time and delay among the various modes and users along the corridor was identified as the Refined Concept Plan. The Refined Concept Plan was then reviewed to ensure that the plan met the initial traffic calming goals, as outlined in Chapter 1 of this document.

3.1 CITY OF SAN DIEGO TRAFFIC IMPACT ANALYSIS REQUIREMENTS

Generally, the purpose of a traffic impact analysis study is to forecast, describe, and analyze the traffic and transit effects a development will have on the existing and future circulation infrastructure. A traffic impact analysis quantifies the changes in traffic levels and translates these changes into transportation system impacts in the vicinity of a project.

In the San Diego region, a traffic impact analysis is typically required when a project is expected to generate 1,000 total average daily trips (ADT) or 100 peak-hour trips. However, when a project does not conform to the land use and/or transportation element of the general or community plan, thresholds of 500 ADT or 50 peak-hour trips are typically used.

This project is unusual in the fact that the proposed project, "University Avenue Mobility Plan" would result in the reduction in vehicle capacity, even as the intensification of land use along the corridor continues.

The following scenarios were analyzed to determine the impacts of the proposed changes in roadway capacity along the corridor:

- Existing Conditions
- Year 2010 Conditions with Existing Intersection Geometry
- Year 2010 with Preferred Concept Plan
- Horizon Year Conditions with Existing Intersection Geometry
- Horizon Year with Preferred Concept Plan

According to City standards, intersections are typically analyzed using the Highway Capacity Manual (HCM) methodology. Several software packages, such as Traffix, Synchro, and HCS, are available to evaluate traffic signals with the HCM methodology. The HCM methodology peak hour intersection analysis calculates the average delay per vehicle for all approaches of an intersection in the case of signalized and all-way stop intersections and for the stop-controlled approach only in the case of a minor street stop-controlled intersection. A letter designation ranging from A through F is then associated to the intersection operations based on a set of delay ranges. Levels of service (LOS) A, B, and C are generally considered acceptable, LOS D is considered marginal, and LOS E and F are considered unacceptable. Table 3-1 presents the delay range for LOS A through F at signalized and unsignalized intersections.

Table 3-1
Intersection LOS & Delay Ranges

LOS	Delay (seconds per vehicle)	
	Signalized Intersection	Unsignalized Intersection
A	0.0 – 10.0	0.0 – 10.0
B	>10.0 – 20.0	>10.0 – 15.0
C	>20.0 – 35.0	>15.0 – 25.0
D	>35.0 – 55.0	>25.0 – 35.0
E	>55.0 – 80.0	>35.0 – 50.0
F	>80.0	>50.0

Source: 2000 Highway Capacity Manual.

Roadway segment operations are generally evaluated by comparing existing and forecast average daily traffic levels to daily capacity thresholds. Daily capacity thresholds vary based on the street classification which is determined by functionality, roadway width, and the number of travel lanes. Table 3-2 presents the various street classifications and associated daily traffic thresholds for LOS A-E as published in the

City of San Diego Traffic Impact Study Manual (TISM). A roadway is considered to operate at LOS F if the daily volumes exceed the LOS E threshold. The TISM indicates that the volumes and the average daily levels of service listed in Table 3-2 are only intended as a general planning guideline. The table does not take other factors that affect actual roadway capacity into consideration, such as lane widths, presence of a raised median, presence of driveways, number and spacing of cross streets, traffic controls, presence of parallel or angled parking, grade, etcetera.

Table 3-2
Roadway Classifications, LOS, and ADT Thresholds

Street Classifications (# Lanes)	Levels of Service				
	A	B	C	D	E
Expressway (6)	30,000	42,000	60,000	70,000	80,000
Prime Arterial (6)	25,000	35,000	50,000	55,000	60,000
Major Arterial (6)	20,000	28,000	40,000	45,000	50,000
Major Arterial (4)	15,000	21,000	30,000	35,000	40,000
Secondary Arterial/Collector (4)	10,000	14,000	20,000	25,000	30,000
Collector, no center lane (4); continuous left-turn lane (2)	5,000	7,000	10,000	13,000	15,000
Collector, no fronting (2)	4,000	5,500	7,500	9,000	10,000
Collector, Commercial-industrial fronting (2)	2,500	3,500	5,000	6,500	8,000
Collector, multi-family (2)	2,500	3,500	5,000	6,500	8,000
Sub-Collector, single-family (2)	-	-	2,200	-	-

Source: City of San Diego Traffic Impact Study Manual

A project is considered to cause a significant impact at an intersection if the average delay at the intersection increases by two or more seconds per vehicle with the addition of the proposed project. A project is considered to cause a significant impact on a roadway segment if the volume-to-capacity (V/C) ratio increases by 0.02 or more with the addition of the proposed project. If a project is found to significantly impact a component of the roadway network, improvements that would mitigate the impact must be identified.

3.2 WHAT MAKES THIS PROJECT DIFFERENT

The University Avenue Mobility Plan (UAMP) project is not a typical traffic analysis. Rather than focusing on the change in land use, the study focuses on the reduction in capacity along the corridor as the change in land use intensifies over the next 30 years. Perhaps the most significant feature of the Preferred

Concept Plan that would affect circulation patterns in the project vicinity is the reduction of mixed-flow travel lanes on University Avenue from two lanes to one lane in each direction and the provision of a transit-only lane in each direction.

In order to understand the effects of the plan to the University Avenue corridor, an expanded assessment beyond the isolated intersection analysis (HCM) and daily roadway traffic level thresholds was necessary because those alone are not sensitive to the factors that affect operations along the corridor. In addition to the City's traffic study requirements the traffic operations of the corridor were also analyzed using VISSIM software that allowed for the comparison of additional measures of effectiveness.

3.3 VISSIM – WHAT IS IT?

The VISSIM analysis software is a microscopic model capable of simulating multi-modal traffic flows, including cars, trucks, buses, heavy rail, light rail, bicyclists, and pedestrians. The simulation capabilities of VISSIM are unlike typical HCM methods of analysis in that VISSIM tracks the individual vehicle interactions in the study corridor that affect overall operating conditions. Because of this, VISSIM quantifies overall and individual intersection delays more realistically, as well as other measures of effectiveness, such as travel time for specific vehicle types and intersection delay for specific vehicle types, amongst others. In addition, VISSIM measures the effects of transit signal priority measures so that their effectiveness can be evaluated at individual intersections.

VISSIM was selected as an analysis tool because it is sensitive to the conditions that affect transit and traffic operations along the corridor, and allows passenger vehicle and transit travel characteristics to be quantified separately. The measures of effectiveness used in this analysis are presented in the following section.

3.4 ESTABLISHED MEASURES OF EFFECTIVENESS

Traffic

The HCM methodology is the most widely accepted and familiar tool for analyzing intersection operations in the San Diego region. As such, the measure of effectiveness (MOE) of overall intersection delay using the HCM methodology is reported for the base and Preferred Concept Plan scenarios. VISSIM was used to report additional MOE's for the base and Preferred Concept Plan scenarios as well as for all alternative concept plan scenarios. The traffic MOE's are as follows:

- Intersections Delay (HCM Methodology and Simulated by VISSIM): Average delay for all approaches of an intersection, reported in seconds per vehicle.
- Roadway Segment Daily Volume-to-Capacity (V/C) Ratios (City ADT Thresholds): Reports a Level of Service (LOS) based on daily traffic levels and associated capacity thresholds.

- Passenger Vehicle Travel Time (VISSIM): Time it takes to travel from one end of the corridor to the other, reported in minutes per vehicle.
- Concurrent Intersection Delay (VISSIM): Delay associated with vehicles approaching an intersection from University Avenue, reported in seconds per vehicle.
- Conflicting Intersection Delay (VISSIM): Delay associated with vehicles approaching an intersection from the side street (not University Avenue), reported in seconds per vehicle.
- Person Delay (VISSIM): Amount of delay at an intersection in seconds per person (rather seconds per vehicle).
- Stops per Vehicle (VISSIM): Number of stops per vehicle along the corridor.

Transit

The Preferred Concept Plan provides for transit-only lanes and transit signal priority measures at signalized intersections. Additionally, a reduction of total transit stops and relocation of specific stops from nearside (before the intersection) to far-side (after the intersection) locations would affect transit operations along the study corridor. Some MOE's listed below are summarized qualitatively. For others, the VISSIM software was utilized to quantify results. The transit-specific MOE's are as follows:

- Transit Vehicle Travel Time (VISSIM): Time it takes for a transit vehicle to travel from one end of the corridor to the other, reported in minutes per vehicle.
- Transit Delay (VISSIM): Average Weighted delay time based on the number of transit vehicles and total delay imposed to transit vehicles during the peak hour.
- Stops per Transit Vehicle (VISSIM): Number of stops per transit vehicle along the corridor. Stop time is measured any time a bus slows to a speed of less than five miles per hour, including stops due to red lights, slowing due to merging or traffic queues and dwell time at scheduled bus stops.
- Transit Passenger Accessibility: Evaluates the effects of consolidating transit stops along the corridor.

Pedestrians

The walkability of the corridor under existing and Preferred Concept Plan conditions were reviewed and evaluated based on several different criteria as listed below. Based on the findings, recommendations to further enhance the walkable nature of the corridor were proposed. The pedestrian MOE's are as follows:

- Frequent Crossing Locations: Identifies the spacing of available crossing locations along the corridor.
- Clear Pavement Markings/Visiblity: Identifies whether pedestrian crossings are clearly marked and identifiable for pedestrians and drivers in their vehicles.
- Crossing Distance: Determines crossing widths and the need for center median refuge areas.

Bicycles

Bicycle circulation in the study area was reviewed and evaluated for existing and Preferred Concept Plan conditions based on several different criteria as listed below. The bicycle MOE's are as follows:

- Capacity: Identifies whether University Avenue would provide sufficient buffer space to permit bicycle use.
- Midblock Crossings: Identifies potential bicycle crossings across University Avenue and the effect that potential proposed raised medians would have.
- Linkage to Bicycle Master Plan: Evaluates potential alternative routes in the study area and whether direct linkage is provided to the study corridor.

Chapter Four – Existing Conditions

4.0 INTRODUCTION

One of the keys to forecasting future operating conditions along a corridor is to have a firm understanding of the existing conditions. Existing conditions include:

- Traffic Operations – Volume, Signal Timing, Lane Configuration, Parking
- Transit Operations – Headways, Ridership, Stops
- Physical Conditions – Topography, Utilities, Signing, Striping
- Pedestrian Access – Crosswalks, Sidewalks, Transit Stops
- Bicycle Access – Marked Bicycle Lanes, Transit Access,

The interaction of these elements results in the day-to-day operations of University Avenue. The objective of the existing conditions data collection efforts is two-fold: create a model that adequately reflects the existing operations on the corridor and identify the physical constraints that may affect the implementation of the Preferred Concept Plan.

The model established from the existing conditions data will be used to simulate traffic operations without and with the Preferred Concept Plan for the existing and future year alternatives. The VISSIM model melds the data collected for traffic, transit and pedestrian activity with the physical conditions of the roadway.

To establish the physical conditions along the corridor, an aerial photograph of the corridor was taken and ortho-rectified. City street As-Built drawings were researched and utility companies were contacted to identify all existing underground utilities along the corridor, which revealed that the original streetcar tracks remained buried along the centerline of the road. Existing curb, gutter, sidewalk and right-of-way were identified that will be used to estimate the costs of implementing the Refined Concept Plan as discussed in later chapters of this document.

This chapter provides a detailed review of the data collection efforts undertaken as part of the project to establish the existing conditions.

4.1 DESCRIPTION OF STUDY AREA

The project study area extends from Boundary Avenue to Park Boulevard along University Avenue. Due to anticipated diversion of traffic resulting from a decrease in capacity along University Avenue, roadway segments along North Park Way and Lincoln Avenue were also included in this analysis. A total of 12 signalized intersections, 17 unsignalized intersections and 28 roadway segments were analyzed.

Parking is provided on both sides of University Avenue throughout much of the corridor. Although the majority of the parking along the corridor is parallel parking, angled parking is provided between 28th Street and 30th Street. Parking is also permitted along all side streets. The configuration of the side street parking is typically a function of the width of the roadway, although several streets have sufficient curb-to-curb width to accommodate additional on-street parking by converting the existing parallel parking to diagonal parking.

SANDAG currently operates two routes along University Avenue, serving the community of North Park: Route 7 and Route 908. A total of 19 transit stops are located within the limits of the study area. Most transit stops are uncovered and without benches or amenities.

Sidewalks are currently provided along University Avenue on both sides of the street. Sidewalk widths range from 5 to 15 feet. Along the western portion of the corridor, the sidewalks are much older and much narrower than along the eastern portion of the corridor, particularly through the core of the community. Pedestrian crossings are permitted at all signalized intersections. Two intersections, Texas Street and Utah Street, have all-pedestrian phases. Two unsignalized pedestrian crossing locations are currently provided, that include flashing overhead lights to alert drivers of these unsignalized crosswalks:

- Pershing Avenue
- Arnold Avenue

No existing bicycle routes are provided along the study corridor. Bicycles are required to share the travel way with buses and passenger vehicles. No parallel bicycle routes are striped or signed along North Park Way or Lincoln Avenue.

4.2 EXISTING LAND USE

Land uses in the study area are a mix of retail, restaurant, office, and residential uses. Census data was collected in 2000, and used in the City and SANDAG traffic modeling efforts. The following provides a general summary of the existing land use one block north and one block south of University Avenue along the corridor:

- 174 Single Family Homes
- 1,168 Multi-Family Units – Apartments and Condominiums Included
- 24.5 acres of Commercial Retail and/or Restaurant Uses
- 1.8 acres of Office
- 1.3 acres of Church or Religious Uses

However, the community of North Park is evolving. Several new projects are planned and moving forward in the next five to ten years that will bring higher densities to the corridor. Such densities are compatible with the mixed-use and transit-oriented vision, as described in the University Avenue Traffic Calming Study.

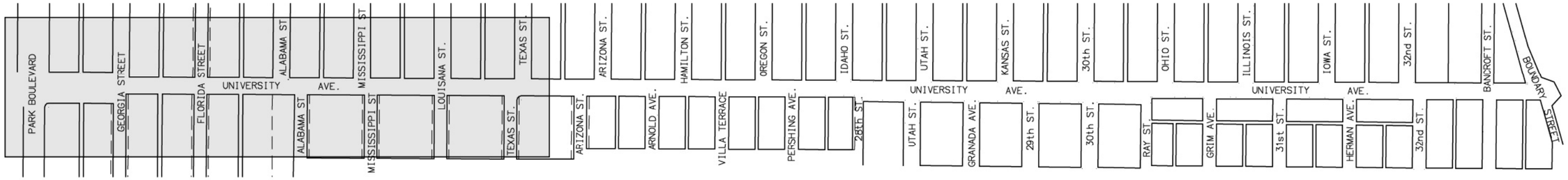
4.3 EXISTING UTILITIES MAPPING

As part of the base mapping processes for the corridor, dry utility companies were contacted including gas (SDG&E), telephone (SBC), and cable (Cox Communications). A copy of a map illustrating the study area and a request for utility information was sent out via fax to all identified utility companies along the corridor. Each company contacted provided the requested underground utility information.

As-built maps of the corridor, which illustrate existing right-of-way, curb, gutter, sidewalk, water, sewer and storm drain, were researched through the City of San Diego. RBF staff worked closely with City staff to locate as many as-built drawings as possible. Due to the age of the street, some as-built drawings could not be found.

Property and right-of-way mapping was researched through the County of San Diego. The existing conditions base map information was drafted into AutoCAD and laid over the aerial photograph flown specifically for this project. The aerial photograph was ortho-rectified to account for the curvature of the earth and the topographic conditions along University Avenue.

The existing utilities mapping is illustrated in Exhibit 4-1.



KEY MAP
SCALE: 1"=500'

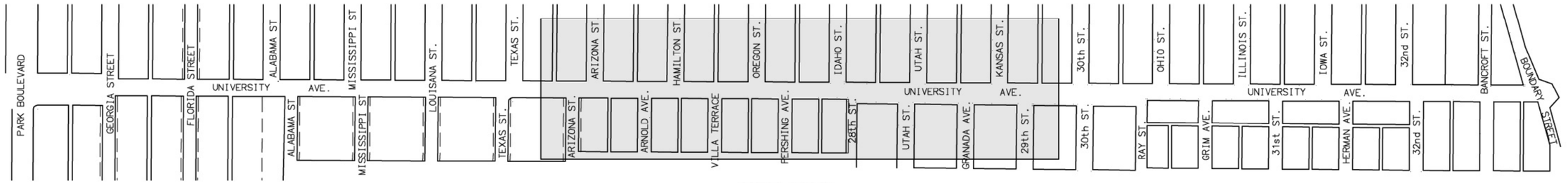
LEGEND

- W — Existing Water
- S — Existing Storm Drain
- SD — Existing Telephone
- T — Existing Cable TV
- CATV — Existing Electric
- E — Existing Electric
- Existing Curb
- G — Existing Gas

Not to Scale

EXISTING UTILITIES

EXHIBIT 4-1
SHEET 1 OF 3



KEY MAP
SCALE: 1"=500'

LEGEND

- W — Existing Water
- S — Existing Sewer
- SD — Existing Storm Drain
- T — Existing Telephone
- CATV — Existing Cable TV
- E — Existing Electric
- Existing Curb
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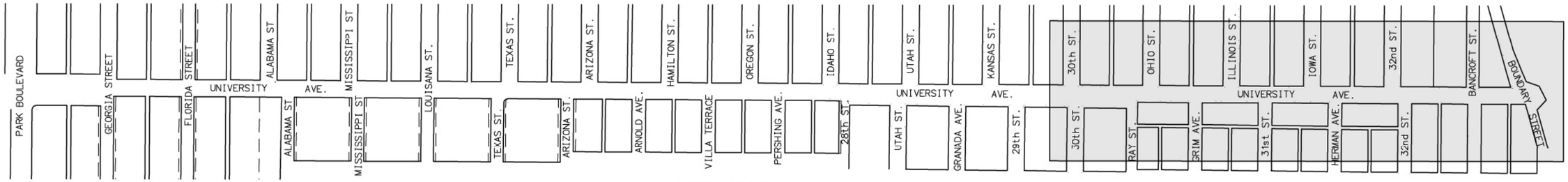
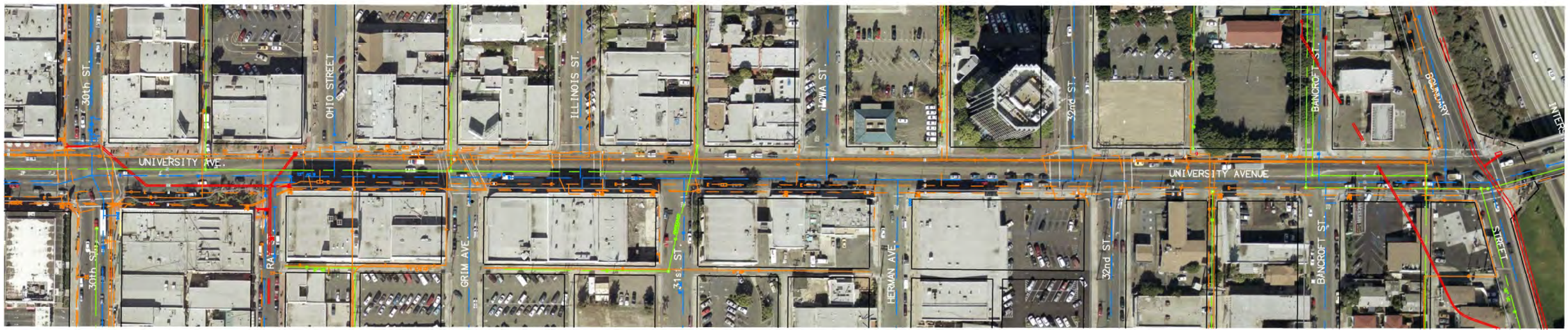
Not to Scale

EXISTING UTILITIES

EXHIBIT 4-1
SHEET 2 OF 3



KEY MAP
SCALE: 1"=500'



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Not to Scale

EXISTING UTILITIES

4.4 EXISTING ROADWAY NETWORK

RBF Consulting conducted a detailed field investigation of the existing roadway conditions along University Avenue that involved a survey of all existing parking spaces, existing lane widths, traffic control, bus stop locations and striping at the intersections. Exhibit 4-2 illustrates the intersection geometry observed at all of the intersections along the corridor.

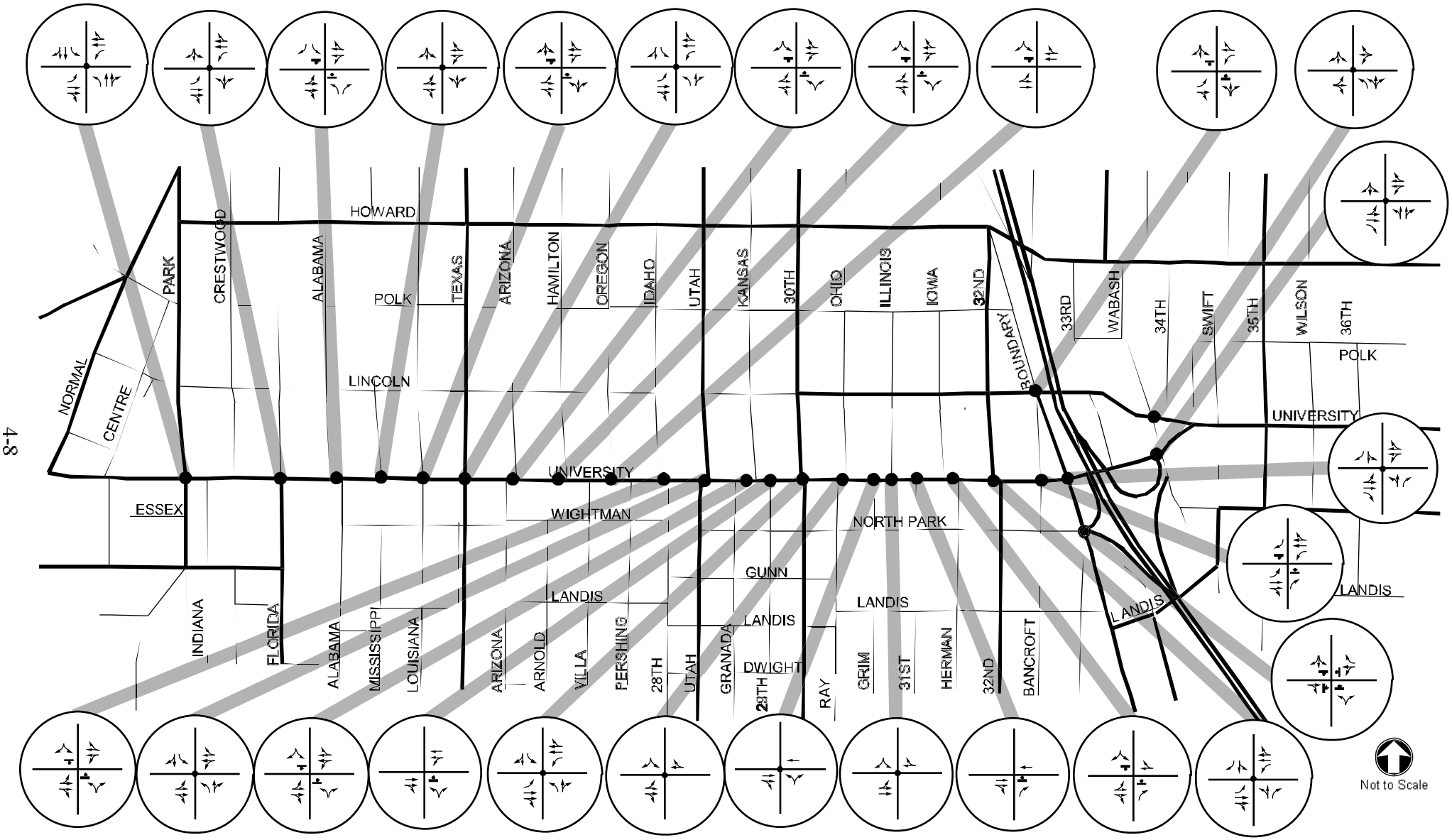
University Avenue: University Avenue is a four-lane secondary arterial as defined by the City of San Diego in the North Park Community Plan circulation element. It extends from Washington Street in the neighborhood of Mission Hills to Baltimore Street in the City of La Mesa. Through the study area, University Avenue narrows to one lane westbound and two lanes eastbound between 30th Street and 32nd Street. University Avenue was previously considered for a couplet design with Lincoln Avenue, through this constrained area per the community plan. Between Utah Street and where Lincoln and University intersect east of I-805, University was previously planned to have 2 lanes eastbound and one lane westbound and Lincoln Avenue was planned to have one lane eastbound and two lanes westbound. Due to opposition from the residents along Lincoln Avenue, the couplet design was never fully implemented.

Lincoln Avenue: Lincoln Avenue is a two-lane collector street located approximately 500 feet north of University Avenue. It extends from Park Boulevard to east of Boundary Street where it merges with University Avenue. Traffic is primarily controlled by stop signs and on-street parking is typically allowed on both sides of the street. East of Utah Street, a two-way left turn lane is provided along Lincoln Avenue increasing the capacity from 8,000 vehicles per day to 15,000 vehicles per day.

North Park Way: North Park Way is a two-lane collector street running parallel to and south of University Avenue. North Park Way extends from Utah Street to I-805, with access to I-805 southbound at its terminus. Parking is generally permitted along North Park Way. On Thursdays, North Park Way is closed to through traffic to allow for a local Farmer's Market street fair.

Park Boulevard: Located on the western end of the study corridor, Park Boulevard is generally four lanes with a striped median. Park Boulevard extends from Adams Avenue in University Heights to C Street in downtown, with a signalized intersection at University Avenue. At the time this report was prepared, Park Boulevard was under consideration for the Showcase Project, a transit improvement project that would integrate Bus Rapid Transit (BRT) concepts to the existing transit lines that operate along Park Boulevard.

Florida Street: Florida Street is a two-lane local road that runs generally north-south through the study area extending from Adams Avenue in University Heights to Pershing Avenue, via Balboa Park. The intersection of University Avenue and Florida Street is signalized.



LEGEND:

Lane Designation

Stop Sign

EXISTING INTERSECTION GEOMETRY

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 4-2

Mississippi Street: Running north-south through the study area, Mississippi Street is a two-lane local road that intersects with University Avenue at a signalized intersection. Parking is permitted on both sides of Mississippi Street north and south of University Avenue. Mississippi Street provides local access from Adams Avenue to Upas Street.

Texas Street: Texas Street is classified as a two-lane collector and provides access to Interstate 8 approximately 1.5 miles north of the study corridor. South of University Avenue, Texas Street extends to Upas Street along the northern boundary of Balboa Park. Texas Street is an offset intersection at University Avenue, resulting in a need for north-south signal phasing and a pedestrian walk phase. As a result, the minimum cycle length at this intersection exceeds the optimal cycle length for intersections east of Texas Street. Currently this intersection does not operate as part of a coordinated traffic signal system.

Utah Street: Utah Street is a two-lane collector, extending from north of Adams Avenue to Upas Street. Through the study area, parking is permitted on both sides of Utah Avenue. At University Avenue, Utah Street is offset requiring north-south split phasing and an exclusive pedestrian phase.

30th Street: Extending from Adams Avenue in University Heights to National Avenue in the Memorial neighborhood, 30th Street is a collector street with a two-way left turn lane through the study area. Parking is permitted on both sides of 30th Street. The intersection of University Avenue and 30th Street is signalized and has the highest pedestrian and transit activity of all the intersections in the study area.

Ohio Street: Ohio Street is a two-lane local road with on-street parking on both sides. At University Avenue, Ohio Street is a signalized intersection. Ohio Street extends from Adams Avenue to University Avenue.

Grim Avenue: Coupled with Ohio Street, Grim Avenue is also a two-lane local road. Westbound left turn access is prohibited from University Avenue onto Grim Avenue although the intersection is signalized. Grim Avenue extends from University Avenue extends from University Avenue south to Redwood Street.

32nd Street: Extending from El Cajon Boulevard to Juniper Street, 32nd Street is classified as a two-lane collector. At University Avenue, 32nd intersects at a signalized intersection and parking is permitted along both sides of the street.

Boundary Street: Boundary street parallels Interstate 805 to the west from south of El Cajon Boulevard to near the I-805/SR-15 interchange. Through the study area, Boundary Street is currently a two-lane collector. Between the I-805 southbound ramps and Upas Street, Boundary Street is one-way

southbound. At University Avenue, Boundary Street is a signalized intersection. Parking is not permitted along Boundary Street south of University Avenue to the I-805 southbound ramps.

4.5 EXISTING TRAFFIC CONDITIONS

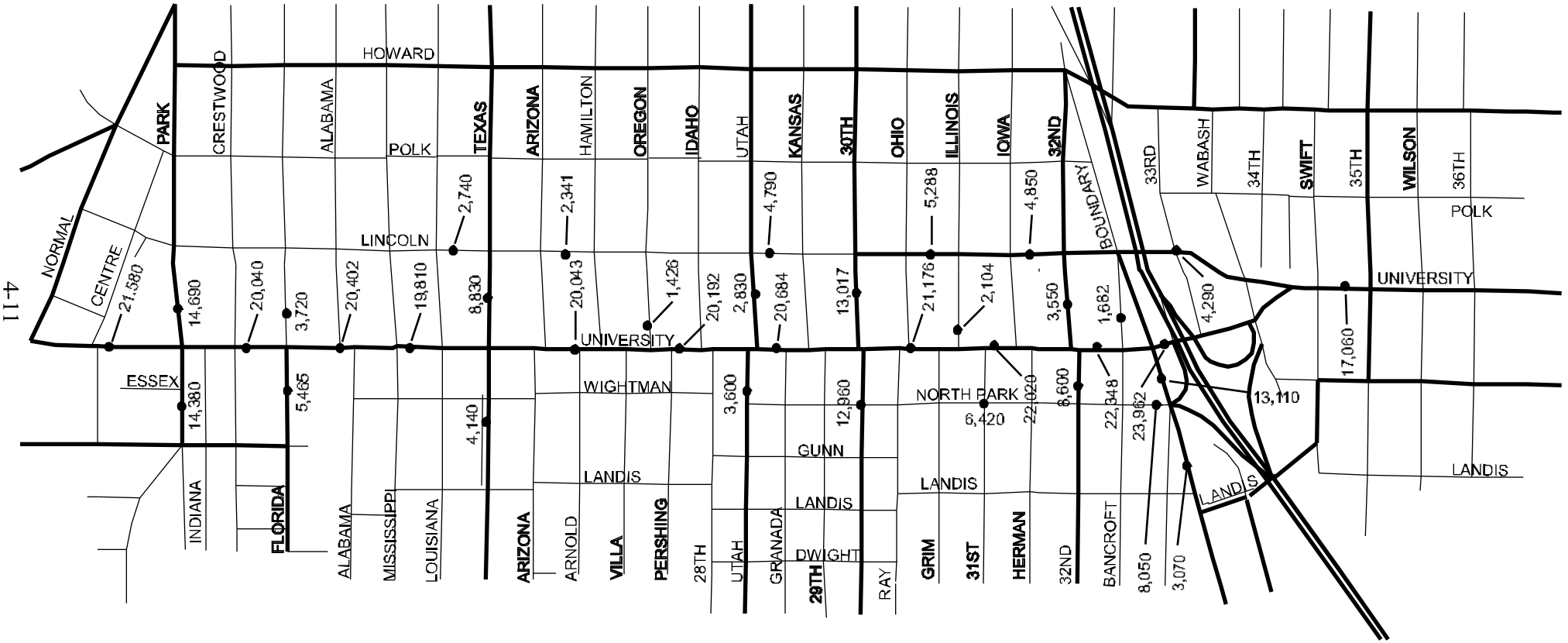
Data Collection Efforts

To evaluate the operations of the roadway segments, signalized intersections and unsignalized intersections along the study corridor, detailed traffic count data was collected for all intersections and several roadway segments along University Avenue.

Average daily traffic count data was collected for a 24-hour period at several locations along the corridor, as illustrated in Exhibit 4-3. This 24-hour data was used to assess the existing roadway segment operating conditions according to City of San Diego roadway classifications and level of service thresholds. The data was also used to determine the peak traffic volumes throughout out the day. The peak hours along the roadway were determined to fall between the hours of 7:00 and 9:00 a.m. and 4:00 and 6:00 p.m.

Based on this confirmation of the peak hours, intersection turning movement data was collected during this peak four hour period of the typical weekday (Tuesday, Wednesday or Thursday). Data for several intersections was provided by the City of San Diego. Where traffic data was not available, RBF Consulting teamed with a traffic count consultant (Counts Unlimited) to collect the remaining data in December 2003. Traffic count data also included counting pedestrian crossings and bicycle activity along the corridor.

Peak hour intersection turning movement volumes are illustrated in Exhibit 4-4.



LEGEND:

—— Existing Roadway

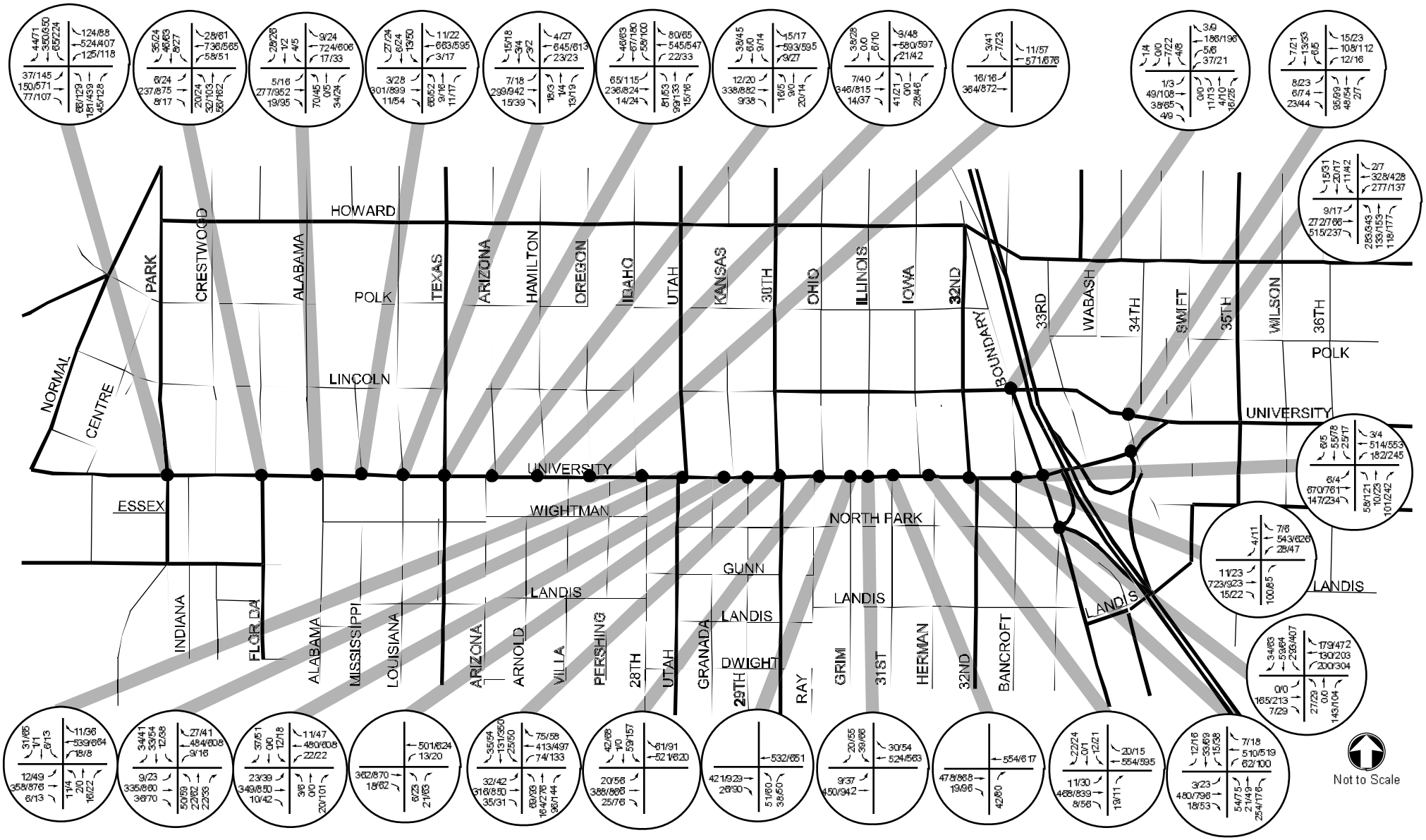
X,XXX Average Daily Trips

RBF

55-100140.001 - March 2004 (2004-0331)

EXISTING DAILY TRAFFIC VOLUMES

EXHIBIT 4-3



EXISTING PEAK HOUR TURN MOVEMENTS

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 4-4

HCM Level of Service

Existing traffic conditions were analyzed for the intersections and roadway segments in the study area based on the requirements set forth in the City of San Diego Traffic Impact Study Manual (TISM). As described in Chapter 3, study intersections were evaluated using the 2000 Highway Capacity Manual (HCM) methodology. Additionally, the VISSIM software program was utilized to report MOE's for the corridor as a whole and at signalized intersections. Traffic analysis worksheets for the existing conditions analysis are provided in the Appendix at the end of this report.

Tables 4-1 and 4-2 present the level of service at the signalized and unsignalized study intersections, respectively, based on the HCM methodology. As shown in the tables, the intersections of University Avenue/Park Boulevard and Boundary Street/I-805 Southbound Ramps currently operate at LOS F in the p.m. peak hour. The stop-controlled northbound approach of University Avenue/Alabama Street also operates at LOS F in the p.m. peak hour. The intersections of University Avenue/Boundary Street and University Avenue/Wabash Avenue currently operate at LOS D in the p.m. peak hour. The stop-controlled approaches to University Avenue at Louisiana Street and 29th Street also operate at LOS D in the p.m. peak hour. LOS D operations are typically considered acceptable but also marginal since it serves as the transition into LOS E and F operations, which are undesirable. All other intersections operate at LOS C or better in the a.m. and p.m. peak hours.

Delay at unsignalized intersections is measured only on the stop controlled approach and the left turn movements on the uncontrolled approach. As shown in Table 4-2, University Avenue/Alabama Street Northbound currently operates at LOS F in the p.m. peak due to the delays imposed to traffic along Alabama Street. Louisiana Street and 29th Street operate at LOS D, indicating marginal operating conditions in the p.m. peak hour. Boundary Street at I-805 is controlled by an all-way stop, so that delay is imposed to all movements at the intersection. As shown in Table 4-2, this intersection currently operates at LOS F in the p.m. peak hour.

Table 4-1
Existing Conditions
Signalized Study Intersection LOS

Study Intersection	AM Peak Hour Delay - LOS	PM Peak Hour Delay – LOS
University Avenue/Park Avenue	22.4 – C	127.6 – F
University Avenue/Florida Street	10.0 – A	18.9 – B
University Avenue/Mississippi Street	8.9 – A	9.0 – A
University Avenue/Texas Street	21.5 – C	28.5 – C
University Avenue/Utah Street	11.7 – B	15.6 – B
University Avenue/30th Street	13.9 – B	24.2 – C
University Avenue/Ohio Street	4.4 – A	7.5 – A
University Avenue/Grim Street	3.5 – A	4.6 – A
University Avenue/Illinois Street	3.6 – A	6.3 – A
University Avenue/32nd Street	23.0 – C	13.2 – B
University Avenue/Boundary Street	22.1 – C	35.8 – D
University Avenue/Wabash Street	21.9 – C	51.6 – D
Lincoln Avenue/Wabash Street	13.2 – B	12.7 – B

Note: Deficient intersection operation showed in bold.

Table 4-2
Existing Conditions
Unsignalized Study Intersection LOS

Study Intersection	AM Peak Hour		PM Peak Hour	
	Minor Approach Delay - LOS	Overall Delay	Minor Approach Delay - LOS	Overall Delay
University Avenue/Alabama Street (NB)	16.3 – C	1.6	67.7 – F	3.1
University Avenue/Alabama (SB)	13.4 – B	0.4	16.4 – C	0.6
University Avenue/Louisiana Street	16.8 – C	1.1	29.6 – D	1.2
University Avenue/Arizona Street (NB)	12.2 – B	0.6	17.4 – C	0.5
University Avenue/Arizona Street (SB)	12.7 – B	0.8	15.9 – C	0.7
University Avenue/Arnold Street	15.7 – C	1.2	23.9 – C	1.4
University Avenue/Hamilton Street	12.2 – B	0.6	17.9 – C	0.8
University Avenue/Oregon Street	16.0 – C	0.3	21.9 – C	1.0
University Avenue/Idaho Street	12.2 – B	0.6	18.8 – C	1.3
University Avenue/28th Street	12.4 – B	0.6	17.2 – C	0.3
University Avenue/Granada Street	10.4 – B	0.5	14.3 – B	1.1
University Avenue/Kansas Street	13.0 – B	0.9	21.7 – C	1.2
University Avenue/29th Street	11.3 – B	0.5	25.9 – D	1.5
University Avenue/31st Street	10.4 – B	0.4	14.1 – B	0.7
University Avenue/Iowa Street	18.0 – C	0.7	24.0 – C	1.0
University Avenue/Herman Avenue	10.2 – B	0.2	12.0 – B	0.1
University Avenue/Bancroft Street	12.4 – B	1.1	13.8 - B	1.1
Boundary/I-805 SB Ramps	-	20.4 - C	-	94.8 – F
Boundary Street/Lincoln Avenue	12.1 – B	2.3	10.7 - B	0.6

Note: Deficient intersection operation shown in bold.

VISSIM Delay Summary

In addition to the HCM analysis, the VISSIM software program was used to evaluate the existing travel time, delay and operating conditions along the corridor. By running the VISSIM model for multiple seeding scenarios, the average delay, travel time and other associated data can be reported. The basic measures of effectiveness reported by VISSIM are as follows:

- Intersections Delay
- Passenger Vehicle Travel Time
- Concurrent Intersection Delay
- Conflicting Intersection Delay
- Person Delay
- Stops per Vehicle

Table 4-3 summarizes the results of the a.m. and p.m. peak hour delay summary for the corridor as a whole and for the individual signalized intersections along the corridor. VISSIM is not an effective tool for reporting data at unsignalized intersections. Therefore, data is only reported for the twelve existing signalized intersections along the study corridor. The VISSIM data summarized in Table 4-3 was used as a basis of comparison for all future scenarios.

Roadway Segment Operational Analysis

The City of San Diego aims to maintain roadway segment operations LOS D or better. Roadway segment level of service is based on capacity thresholds that correspond to roadway classifications established in the North Park Community Plan. Average daily traffic volumes (ADT) collected for this project show that University Avenue, from Florida Street to 32nd Street, and east of Boundary Street, currently operates at LOS F. The remaining segments operate at LOS D. Study roadway segments parallel or intersecting University Avenue operate at LOS D or better on a daily level, with the exception of:

- North Park Way, from 32nd Street to Boundary Street
- 30th Street, from University Avenue to Lincoln Avenue
- 32nd Street, from University Avenue to North Park Way
- Boundary Street, from University Avenue to North Park Way

The segment of 30th Street, from University Avenue to Lincoln Avenue, operates at LOS E. The segments of North Park Way, from 32nd Street to Boundary Street; 32nd Street, from University Avenue to North Park Way; and Boundary Street, from University Avenue to North Park Way, operate at LOS F based on the estimated capacities of the roadways. The roadway segment level of service analysis for the study area is summarized in Table 4-4.

Table 4-3
Existing Conditions
VISSIM Measures of Effectiveness Summary

Study Intersection	Intersection Delay[1]		Concurrent Delay[2]		Conflicting Delay[3]		Person Delay[4]	
	AM	PM	AM	PM	AM	PM	AM	PM
University Avenue/Park Avenue	28.5	41.4	27.1	43.7	30.6	38.7	33.3	44.4
University Avenue/Florida Street	10.4	17.6	9.2	13.2	16.7	35.1	10.8	16.9
University Avenue/Mississippi Street	6.6	11.5	4.3	9.6	24.0	28.3	7.6	12.2
University Avenue/Texas Street	20.7	35.4	18.5	33.2	27.0	41.7	21.0	36.0
University Avenue/Utah Street	14.0	26.5	12.4	24.4	22.1	37.2	15.9	30.7
University Avenue/30th Street	15.2	25.6	12.5	22.3	20.2	31.0	16.7	26.4
University Avenue/Ohio Street	3.3	12.8	0.8	6.7	5.5	5.3	3.2	12.2
University Avenue/Grim Street	3.0	6.4	1.7	5.1	19.2	25.7	4.3	6.6
University Avenue/Illinois Street	5.0	8.6	4.3	7.3	17.8	25.5	5.7	8.9
University Avenue/32nd Street	15.0	18.1	14.2	17.7	17.3	20.1	15.5	19.6
University Avenue/Boundary Street	15.4	21.6	15.3	19.6	16.7	29.5	15.3	21.0
University Avenue/Wabash Street	25.0	45.7	23.7	54.7	26.9	28.6	27.1	49.0

Travel Direction	Travel Time[5]		Stops[6]	
	AM	PM	AM	PM
Eastbound	5.6	7.0	3.8	5.1
Westbound	5.9	7.1	4.0	5.9

1 Intersection Delay = Average delay for all movements at the intersection (sec/veh)
2 Concurrent Delay = Delay imposed to eastbound & westbound vehicles along University Avenue (sec/veh)
3 Conflicting Delay = Delay imposed to northbound & southbound vehicles entering or crossing University Avenue (sec/veh)
4 Seconds per person.
5 Minutes per vehicle.
6 Stops per vehicle.

Table 4-4
Existing Conditions
Roadway Segment Level of Service Analysis

Street	Limit	Class (Lanes)	Capacity	ADT	LOS	V/C
University Avenue	Centre to Park	C + LTL (4)	30,000	21,580	D	0.72
	Park to Florida	C + LTL (4)	30,000	20,040	D	0.67
	Florida to Texas	Collector (4)	15,000	**20,402**	**F**	**1.36**
	Texas to Utah	Collector (4)	15,000	**20,192**	**F**	**1.35**
	Utah to 30th	Collector (4)	15,000	**20,684**	**F**	**1.38**
	30th to 32nd	Collector (3)	12,000	**22,020**	**F**	**1.84**
	32nd to Boundary	C + LTL (4)	30,000	22,348	D	0.74
	Boundary to Wabash	Collector (4)	15,000	**23,962**	**F**	**1.60**
Lincoln Avenue	Louisiana to Texas	Collector (2)	8,000	2,740	B	0.34
	Texas to Utah	Collector (2)	8,000	2,341	A	0.29
	Utah to 30th	C + TWLTL (2)	15,000	4,790	A	0.32
	30th to Boundary	C + TWLTL (2)	15,000	5,288	B	0.35
	Boundary to Wabash	C + TWLTL (2)	15,000	4,290	A	0.29
North Park Way	Utah to 30th	Collector (2)	8,000	2,200	A	0.28
	30th to 32nd	Collector (2)	8,000	6,420	D	0.80
	32nd to Boundary	Collector (2)	8,000	**8,050**	**F**	**1.01**
Park Boulevard	Lincoln to University	Major (4)	40,000	14,690	A	0.37
	University to Essex	Major (4)	40,000	14,380	A	0.36
Texas Street	Lincoln to University	C + TWLTL (2)	15,000	8,830	C	0.59
	University to Wightman	Collector (2)	8,000	4,140	C	0.52
Utah Street	Lincoln to University	Collector (2)	8,000	2,830	B	0.35
	University to North Park	Collector (2)	8,000	3,600	C	0.45
30th Street	Lincoln to University	C + TWLTL (2)	15,000	**13,017**	**E**	**0.87**
	University to North Park	C + TWLTL (2)	15,000	12,960	D	0.86
32nd Street	Lincoln to University	Collector (2)	8,000	3,550	C	0.44
	University to North Park	Collector (2)	8,000	**8,660**	**F**	**1.08**
Boundary Street	Lincoln to University	Collector (2)	8,000	1,682	A	0.21
	University to North Park	Collector (2)	8,000	**13,110**	**F**	**1.64**

Note: C+TWLTL = Collector with Two-Way Left Turn Lane
C+LTL = Collector with Left Turn Lanes
ADT = Average Daily Traffic
LOS = Level of Service
V/C = Volume to Capacity Ratio

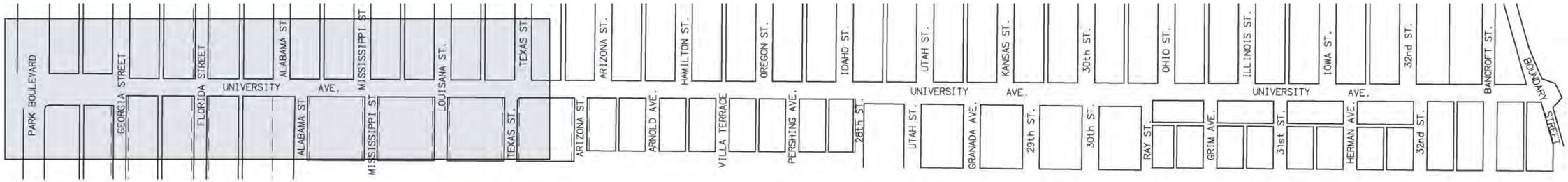
4.6 EXISTING PARKING

On-street parking is currently allowed through much of the study corridor along University Avenue and along the side streets. Between 28th Street and 30th Street diagonal parking spaces are provided on the south side of University Avenue. Approximately 28 diagonal parking spaces are provided. Exhibit 4-5 illustrates the location of all existing on-street parking along University Avenue. All side streets allow parking either diagonal or parallel. Table 4-5 summarizes the roadway width of each of the side streets and the type of parking, parallel (P) or diagonal (D), on either side of the street.

Table 4-5
Existing Conditions
Side Street Parking Configuration

Street	North of University Ave.			South of University Ave.		
	Parking		Street Width (Curb-to-Curb)	Parking		Street Width (Curb-to-Curb)
	East Side	West Side		East Side	West Side	
Florida Street	P	P	40’	P	P	38’
Alabama Street	D	P	60’	P	P	40’
Mississippi Street	D	P	52’	P	P	38’
Louisiana Street	P	P	42’	P	P	40’
Texas Street	P	P	52’	P	P	40’
Arizona Street	P	P	52’	P	P	40’
Arnold Avenue	--	--	--	P	P	45’
Hamilton Street	P	P	52’	--	--	--
Oregon Street	P	P	52’ *	--	--	--
Pershing Avenue	--	--	--	P	P	45’
Idaho/28th Street	P	D	51’	P	P	30’
Utah Street	P	P	52*	P	P	51’*
Granada Street	--	--	--	D	D	52’
Kansas Street	D	D	52’	--	--	--
29th Street	--	--	--	D	D	52’
30th Street	P	P	52’	P	P	52’
Ray Street (One-Way)	--	--	--	P	P	33’
Ohio Street	P	D	52’*	--	--	--
Grim Street	--	--	--	P	P	40’
Illinois Street	P	D	52’*	--	--	--
31st Street	--	--	--	P	P	45’
Iowa Street	D	P	52’*	--	--	--
Herman Street	--	--	--	P	P	40’
32nd Street	P	P	52’	P	P	45’

Note: P = Parallel, D = Diagonal or Angled. * = sidewalks greater than 10 feet wide.



KEY MAP
SCALE: 1"=500'

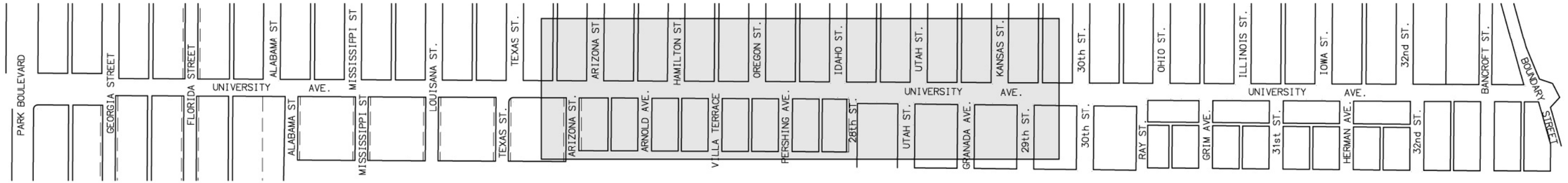
LEGEND

▨ Existing Parking

Not to Scale

EXISTING ON-STREET PARKING

EXHIBIT 4-5
SHEET 1 OF 3



KEY MAP
SCALE: 1"=500'

LEGEND
Existing Parking

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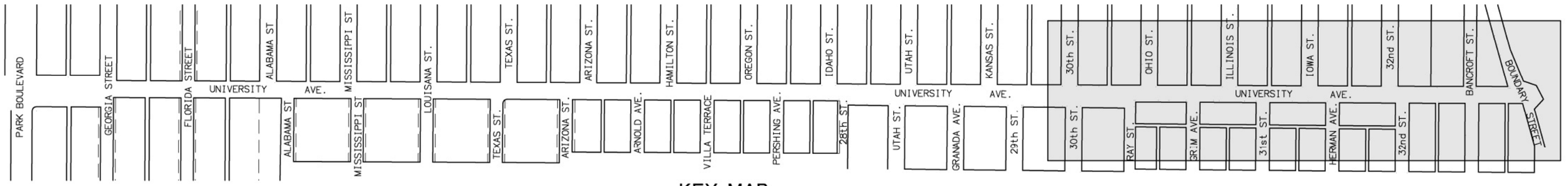
RBF

EXISTING ON-STREET PARKING
EXHIBIT 4-5
SHEET 2 OF 3



KEY MAP
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LEGEND

▨ Existing Parking

Not to Scale

RBF

EXISTING ON-STREET PARKING

EXHIBIT 4-5
SHEET 3 OF 3

4.7 EXISTING TRANSIT CONDITIONS

Two routes currently serve the community of North Park along University Avenue: Route 7 and Route 908. Both Routes 7 and 908 enter and exit the project study area at Interstate 805 and Park Boulevard. Also, both routes connect with multiple transfers of other routes at locations along University Avenue. The two (2) highest transfer locations in the study area are 30th Street and Park Boulevard.

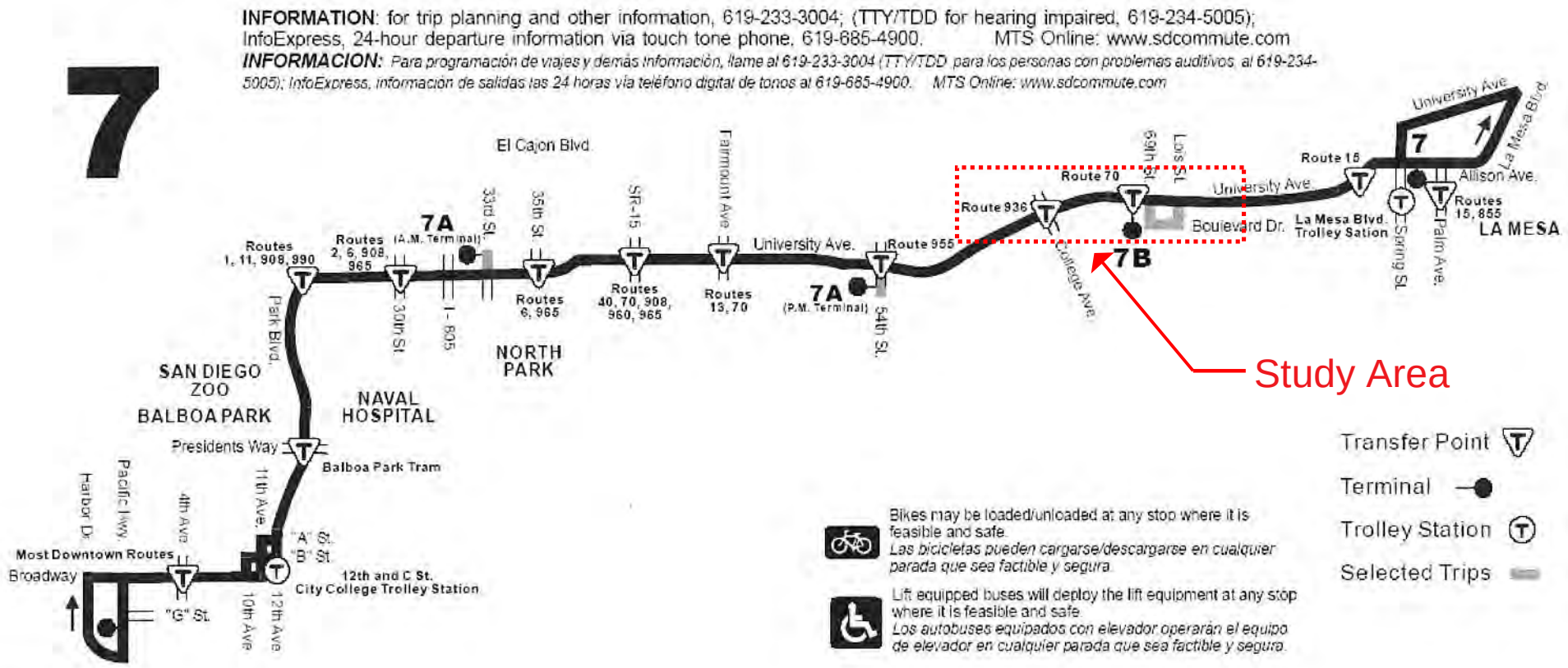
Route Description

Route 7: Currently Route 7 provides transit service along the University Avenue corridor. Route 7 begins in La Mesa and travels on University Avenue to Park Boulevard where it heads south into downtown San Diego, as illustrated in Exhibit 4-6. The overall route distance is 12.6 miles, with approximately 1.9-miles existing within the project study area. In addition to Route 7 there is also Route 7A, which operates as a limited stop service. The 7A service begins at 33rd Street and University Avenue and also ends in downtown San Diego. However, Route 7A only travels westbound and only operates during the a.m. peak periods at a 6- minute headway. Route 7 operates with a 6-minute headway during peak commute periods and a 10-minute headway during most other times. On the average weekday, 101 inbound and 101 outbound trips are operated. Standard 40-foot long transit coaches and 60-foot long articulated coaches are both employed for Route 7. The articulated coaches are used more frequently during the peak periods because of the heavy passenger loads during this time. Typically weekday-operating hours for Route 7 are from about 5 a.m. to 12 a.m.

Route 908: The 908 route begins in City Heights and travels on University Avenue to Old Town, as is shown in Exhibit 4-7. The overall route distance is 7.5 miles, with approximately 1.9 miles existing within the project study area. Route 908 operates on a 15-minute headway and after 8:30 p.m. headways increase to 30-minute headways. On the average weekday, 65 inbound and 62 outbound trips are operated. Similar to Route 7, standard and articulated coaches are both used for Route 908 during the course of the day. Route 908's weekday operating hours are from 6 a.m. to 11 p.m.

Ridership and Passenger Counts

To assess the operating conditions of transit along the corridor, boarding and alighting data, pedestrian access data, and on-time arrival data was collected for each of the transit routes. The ridership data was provided by SANDAG for use in this study. This ridership information was averaged from a span of three (3) years from 2001 to 2003.



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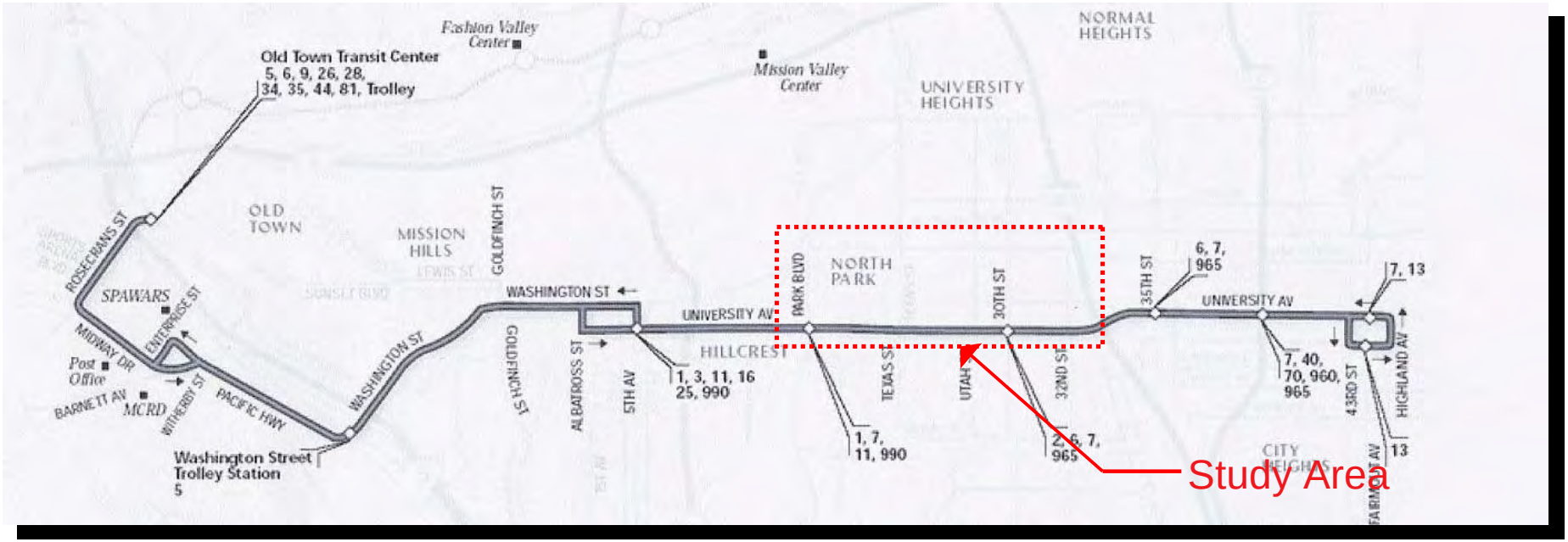
ROUTE 7 ALIGNMENT WITHIN STUDY AREA



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ROUTE 908 ALIGNMENT WITHIN STUDY AREA

RBF

CityWorks

cityworks

CityWorks: a joint venture of Collaborative Services & Warner Architecture + Design

The results of the ridership analysis show that both transit lines are well utilized, with Route 7 having one of the highest ridership rates in the city. The "Daily Ridership Boarding and Alighting" for both Routes 7 and 908 within the study area are illustrated in Table 4-6. This figure provides the daily passenger boarding and alighting for each of the transit stops located in the project study area. For both routes, approximately 7,800 boarding and alighting of passengers occur within just the study area. This is an extremely high volume of ridership.

The transit stops along the corridor with the highest ridership activity are at 30th Street and Park Boulevard, where daily boardings and alightings exceed 4,000 per day. This is the combined amount for the Route 7 and Route 908. These two (2) intersections also happen to have the highest transfer activity as well. The lowest boarding and alighting occurs at Bancroft Street and Florida Street (westbound) and Arnold Avenue and Florida Street (eastbound).

Transit Stop Locations

Currently 20 transit stops are located within the 1.9-mile study area. The general locations of the stops are illustrated in Exhibit 4-8. The study area has 10 stops serving westbound transit vehicles, and 10 stops serving eastbound transit vehicles. The average spacing between each of the stops is approximately 0.12 miles or 633-feet, with the shortest distance of approximately 370-feet between Louisiana Street and Arizona Street. The longest distance between stops is between Utah Street and 30th Street at 844-feet. SANDAG/MTS does not have standards for distances between transit stops for the city's urbanized areas. These distances are typically based on activity centers, needs, and requests. Nationally, typical spacing for similar type transit stops is from 750 to 800-feet in urban areas not associated with central downtowns. Thus, the transit stops along University Avenue are much closer than normal, especially the stops spacing less than 400 feet. Significant time delays can result from the closer than normal spacing of transit stops.

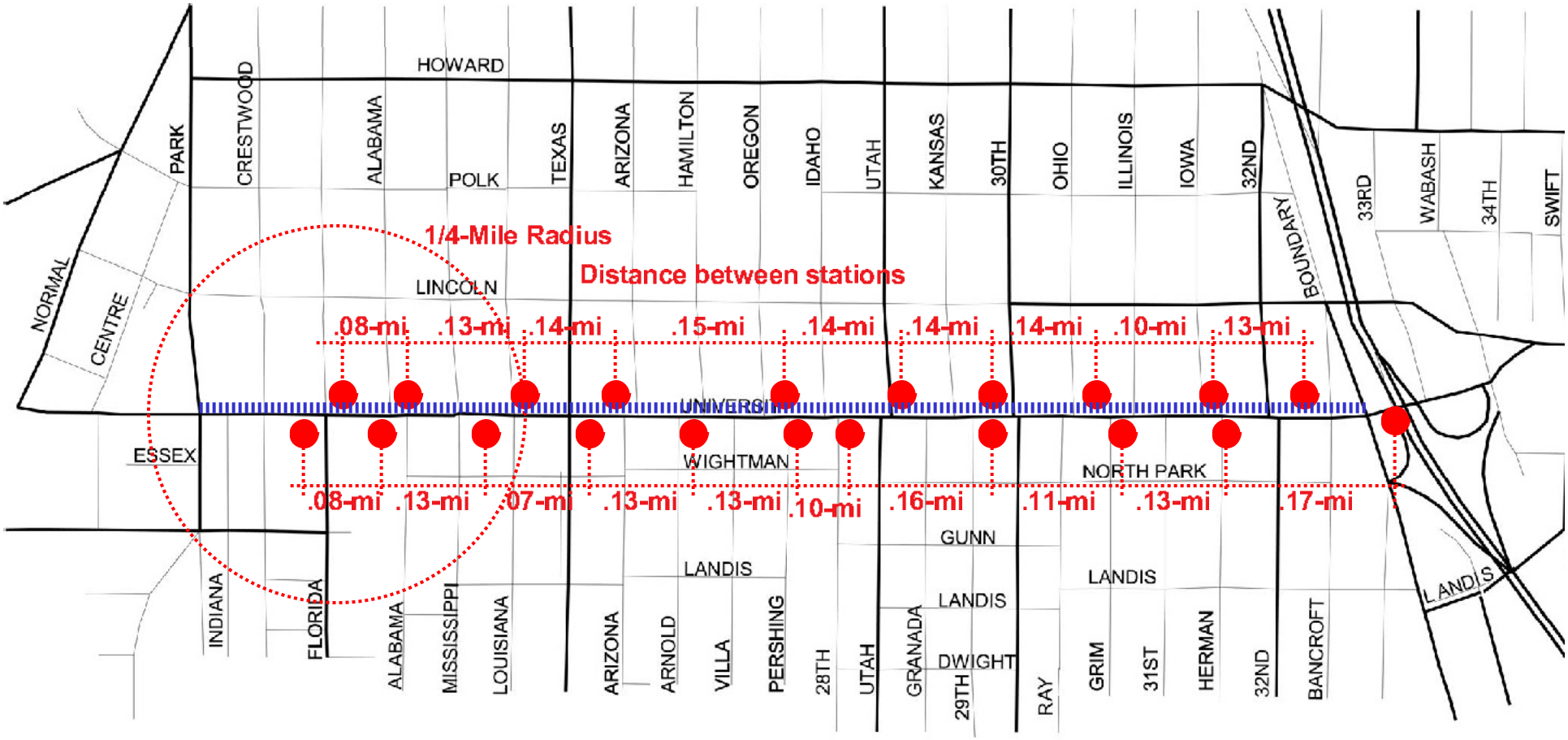
The existing transit stops are made up of both nearside and far side locations. At a near side transit stop, the transit vehicle stops prior to entering the intersection. At a far side transit stop, the transit vehicle passes through the intersection, then stops when it reaches the other side. Because of offset intersections, some of the stops could be considered mid-block. For the westbound route, there are 6-nearside locations and 4-farside locations including the Arizona Street stop, which could be considered a mid-block location.

For the eastbound transit route, there are also 6-nearside and 4-farside locations. It should be noted that from an operational standpoint, far side stops are the preferred locations by most transit authorities including SANDAG/MTS.

Table 4-6
Existing Conditions
Transit Ridership Data

Westbound Station Locations	Route 7	Route 908	Total	RANK
Bancroft Street	126	64	190	**10**
Iowa Street	149	43	192	**9**
Illinois Street	177	43	220	**7**
30th Street	758	383	1141	**1**
Utah Street	178	63	241	**4**
Oregon Street	141	69	210	**8**
Arizona Street	190	64	254	**3**
Louisiana Street	167	61	228	**6**
Alabama Street	153	87	240	**5**
Florida Street	74	40	114	**11**
Park Boulevard	805	224	1029	**2**
Eastbound Station Locations	**Route 7**	**Route 908**	**Total**	**RANK**
Park Boulevard	629	193	822	**2**
Florida Street	75	51	126	**10**
Alabama Street	117	47	164	**7**
Louisiana Street	191	76	267	**4**
Texas Street	122	49	171	**6**
Arnold Avenue	76	27	103	**11**
Pershing Avenue	96	43	139	**9**
Utah Street	179	42	221	**5**
30th Street	803	360	1163	**1**
Grim Street	104	57	161	**8**
Herman Avenue	228	79	307	**3**
Boundary Street	39	58	97	**12**

Note: Ridership based on total boardings and alightings at each transit stop



.12-mi **Average distance between existing transit stops**

Not to Scale

EXISTING TRANSIT STOPS

EXHIBIT 4-8

Dwell Time

The dwell time at each of the stops is a critical feature in defining the overall travel time for the transit service. The existing dwell times were used to assist in defining the current transit travel time within the project study area. Although both transit routes extend beyond the project study area, the existing dwell times at the stops were established from Park Boulevard to Interstate 805. The dwell time is determined by:

- Total passengers boarding and alighting, arrival and departure of the transit vehicle.
- Features at the transit stop.
- Width and number of the doors.
- Number of wheelchair and other mobility impaired riders.
- Passenger information needs.

It should be noted that it typically takes longer to board the first passenger than the other passengers due to the time required for passengers to reach the front door of the transit vehicles. Various features of the bus stop can also add to the dwell time. These include ability of the transit driver to maneuver into to the stop location, fare pre-payment, and mobility of the passengers (i.e., carrying groceries, accompanying small children, and physical or medical disabilities).

In this analysis the dwell time calculations are based on the number of passengers identified for each of the stops, as illustrated in Table 4-7. Dwell time was calculated using the VISSIM software program. Based on the model run. The longest dwell times were calculated at 30th Street and Park Boulevard. This is consistent with the existing high ridership at these locations.

Table 4-7
Existing Conditions
Dwell Time Summary – Route 908

Eastbound Route 908 Stop Locations	Existing					
	AM			PM		
	Boarding Pass./Hr	Alighting Trip %	Average Dwell Sec/Stop	Boarding Pass./Hr	Alighting Trip %	Average Dwell Sec/Stop
Park Boulevard	3	19%	10.4	13	13%	14.3
Florida Street	0	5%	8.6	1	2%	8.8
Alabama Street	0	11%	9.2	5	1%	10.5
Louisiana Street	3	0%	9.0	4	8%	11.0
Texas Street	3	0%	9.5	1	4%	9.5
Arnold Avenue	3	6%	9.0	1	6%	10.3
Pershing Avenue	4	3%	10.5	3	1%	9.3
Utah Street	0	3%	8.3	3	6%	9.9
30th Street	12	28%	14.0	20	34%	19.3
Grim Avenue	1	5%	8.6	3	3%	9.3
Herman Avenue	1	3%	8.5	7	6%	11.1
Boundary Street	1	5%	8.6	0	8%	10.3

Westbound Route 908 Stop Locations	Existing					
	AM			PM		
	Boarding Pass./Hr	Alighting Trip %	Average Dwell Sec/Stop	Boarding Pass./Hr	Alighting Trip %	Average Dwell Sec/Stop
Wabash Avenue	12	5%	12.5	3	0%	9.0
Bancroft Street	1	1%	8.5	11	4%	12.0
Iowa Street	1	0%	8.5	5	1%	10.5
Illinois Street	7	1%	11.5	0	2%	8.6
30th Street	27	14%	21.5	13	39%	17.3
Utah Street	4	3%	10.0	8	2%	11.0
Oregon Street	7	1%	11.5	3	6%	9.2
Arizona Street	1	0%	9.0	7	6%	10.5
Louisiana Street	4	3%	10.5	5	9%	10.5
Alabama Street	4	2%	10.0	9	4%	12.0
Florida Street	0	2%	8.9	4	0%	9.5
Park Boulevard	15	13%	14.0	12	13%	13.5

Table 4-7 (Continued)
Existing Conditions
Dwell Time Summary – Route 7

Eastbound Route 7 Stop Locations	Existing					
	AM			PM		
	Boarding Pass./Hr	Alighting Trip %	Average Dwell Sec/Stop	Boarding Pass./Hr	Alighting Trip %	Average Dwell Sec/Stop
Park Boulevard	14	16%	13.7	46	13%	18.8
Florida Street	3	1%	9.1	4	1%	9.1
Alabama Street	5	1%	10.2	6	3%	9.6
Louisiana Street	3	4%	9.3	12	6%	11.0
Texas Street	3	3%	9.4	6	3%	9.5
Arnold Avenue	4	2%	9.7	5	2%	9.1
Pershing Avenue	3	3%	9.3	4	3%	9.3
Utah Street	4	7%	10.1	9	9%	11.7
30th Street	16	12%	14.5	58	18%	22.6
Grim Avenue	6	3%	10.5	30	4%	15.9
Herman Avenue	5	3%	10.1	10	5%	10.6
Boundary Street	3	1%	9.3	2	1%	8.6
	5	3%	9.9	4	3%	9.4

Westbound Route 7 Stop Locations	Existing					
	AM			PM		
	Boarding Pass./Hr	Alighting Trip %	Average Dwell Sec/Stop	Boarding Pass./Hr	Alighting Trip %	Average Dwell Sec/Stop
Wabash Avenue	10	1%	12.2	6	3%	10.1
Bancroft Street	4	2%	9.7	3	3%	9.2
Iowa Street	8	2%	11.5	11	4%	11.8
Illinois Street	5	3%	9.9	6	9%	11.3
30th Street	16	16%	16.8	32	20%	19.5
Utah Street	9	4%	11.9	7	3%	10.5
Oregon Street	7	2%	11.1	2	3%	9.1
Arizona Street	17	1%	14.9	8	4%	10.7
Louisiana Street	6	1%	10.6	8	4%	10.7
Alabama Street	7	1%	11.1	1	3%	9.0
Florida Street	2	0%	8.7	4	3%	9.3
Park Boulevard	23	10%	17.4	31	16%	19.1

Existing Transit Travel Time

The existing transit travel time in the corridor was determined by combining the dwell times at the transit stops with the average travel times of the transit vehicles between the stops when traversing the project study area from Interstate 805 to Park Boulevard. The travel time for both routes at a.m. and p.m. peak periods are illustrated in Table 4-8.

Table 4-8
Existing Conditions
Transit Travel Times (I-805 to Park Boulevard)

Route 7	**AM**	**PM**
Westbound Interstate 805 to Park Boulevard	8.5 min.	9.2 min.
Eastbound Park Boulevard to Interstate 805	6.8 min.	9.3 min.
Route 908	**AM**	**PM**
Westbound Interstate 805 to Park Boulevard	7.3 min.	9.3 min.
Eastbound Park Boulevard to Interstate 805	6.6 min.	9.9 min.

Wait Time and On-Time Performance

As described earlier, the peak period headways for both Routes 7 and 908 are approximately 6-minutes. This means that during the highest ridership period a transit vehicle should arrive every 6-minues to pick up passengers. During non-peak periods, this wait time increases to approximately 10 minutes between transit vehicles.

However, headway expectation and on-time performance can vary. Wait time for existing on-time performance is based on figures provided by SANDAG dating back to 2003. The figures for Route 7 and 908 are shown in Tables 4-9 and 4-10. The tables demonstrate that both the 7 and 908 currently experience either a delay or early departure rate of approximately 30 percent. Therefore they have an average on-time percentage rate of 70 percent. However, the 908 eastbound p.m. period is the most inefficient, as it experiences a 65 percent late/early departure performance.

Table 4-9
Existing Conditions – Route 7 Weekdays
On-Time Performance by Time Period

Direction: Inbound (101 trips counted)				Direction: Outbound (101 trips counted)			
Peak	**Percent "Slow"**	**Percent "Hot"**	**Total**	**Peak**	**Percent "Slow"**	**Percent "Hot"**	**Total**
AM	16.3	17.3	33.7	AM	16.4	12.9	29.3
Mid-Day	20.1	15.0	35.2	Mid-Day	24.4	5.2	29.5
PM	23.1	3.7	26.9	PM	38.1	5.0	43.1
Other	10.0	13.7	23.7	Other	18.7	6.7	25.4
TOTAL	17.3	13.4	30.8	TOTAL	25.2	6.6	31.7

Note: "Hot" refers to transit vehicles that left the stop early.

Table 4-10
Existing Conditions – Route 908 Weekdays
On-Time Performance by Time Period

Direction: Inbound (59 trips counted)				Direction: Outbound (59 trips counted)			
Peak	**Percent "Slow"**	**Percent "Hot"**	**Total**	**Peak**	**Percent "Slow"**	**Percent "Hot"**	**Total**
AM	4.3	23.2	27.5	AM	4.9	13.4	18.3
Mid-Day	18.6	6.6	25.2	Mid-Day	12.4	16.6	29.0
PM	64.3	1.2	65.5	PM	41.0	10.8	51.8
Other	28.0	1.1	29.0	Other	1.3	8.9	10.1
Daily	27.6	7.0	34.6	Daily	14.5	13.3	27.8

It should also be noted that both Route 7 and 908 experience "bunching" in the University Avenue corridor. This "bunching" occurs when a transit vehicle catches up to an earlier bus and impacts their on-time arrival performance. The bunching occurs when traffic congestions or traffic conflicts occur, slowing down the previous bus and allowing for the later bus to catch up to it.

4.8 PEDESTRIAN AND BICYCLE ACTIVITY ON CORRIDOR

Pedestrian Activity

Marked pedestrian crossings along the corridor are provided at signalized intersections and at two unsignalized locations. These existing unsignalized locations have overhead flashing lights and signs indicating that a crosswalk is present. Through the public outreach efforts, it was determined that in general this design is unclear to the driver and is not effective in these locations. The average distance between crosswalks, either signalized or unsignalized is provided in Table 4-11.

Table 4-11
Existing Distance Between Marked
Crosswalks Across University Avenue (North-South)

From	To	Distance	Topography
Park Boulevard	Florida Street	705’	Steep Grade Under Georgia Bridge
Florida Street	Mississippi Street	685’	Steep Grade
Mississippi Street	Texas Street	510’	Steep Grade
Texas Street	Arnold Street	535’	Steep Grade
Arnold Street	Pershing Street	700’	Steep Grade
Pershing Street	Utah Street	485’	Level
Utah Street	30th Street	680’	Level
30th Street	Ohio Street	300’	Level
Ohio Street	Grim Street	200’	Level
Grim Street	Illinois Street	100’	Level
Illinois Street	32nd Street	690’	Level
32nd Street	Boundary Street	575’	Level

Pedestrian activity was monitored on three occasions:

- In December 2003 in conjunction with the intersection count data collection efforts
- In February 2004 in conjunction with the transit study analysis
- In April 2004 specifically relating to the analysis of pedestrian activity

Pedestrian activity at each of the study intersections is illustrated in Exhibit 4-9. Table 4-12, summarizes the total number of pedestrian crossings for two two-hour periods on a typical weekday.

Table 4-12
Existing Conditions
Peak Hour Pedestrian Activity by Intersection

Study Intersection	AM (7:00-9:00 a.m.)	PM (4:00-6:00 p.m.)	TOTAL
University Avenue/Park Avenue	151	233	**384**
University Avenue/Florida Street	28	39	67
University Avenue/Alabama Street	30	91	121
University Avenue/Mississippi Street	31	85	116
University Avenue/Louisiana Street	52	48	100
University Avenue/Texas Street	53	76	129
University Avenue/Arizona Street	6	4	10
University Avenue/Arnold Street	31	60	91
University Avenue/Hamilton Street	15	25	40
University Avenue/Villa Terrace	1	4	5
University Avenue/Oregon Street	48	42	90
University Avenue/Idaho Street	20	39	59
University Avenue/28th Street	25	43	68
University Avenue/Utah Street	53	178	**231**
University Avenue/Granada Street	9	43	52
University Avenue/Kansas Street	39	72	111
University Avenue/29th Street	21	54	75
University Avenue/30th Street	183	310	**493**
University Avenue/Ray Street	71	286	**357**
University Avenue/Ohio Street	37	84	121
University Avenue/Grim Street	53	149	**202**
University Avenue/Illinois Street	11	70	81
University Avenue/31st Street	29	87	116
University Avenue/Iowa Street	14	17	31
University Avenue/32nd Street	32	75	107
University Avenue/Boundary Street	17	52	69

Note: Total peak period pedestrian crossing volumes greater than 200 are shown in bold.

As shown, the highest pedestrian activity currently occurs at 30th Street, which is also the highest transit usage station along the corridor. Pedestrian activity is lowest east of Texas Street.

Sidewalk conditions along the corridor vary. Through the downtown core (Idaho Street to Iowa Street), sidewalks are typically wide (15 feet or wider), with existing street trees and bus stop shelters. However, to the west of Idaho Street, sidewalks narrow and are typically 5 to 8 feet wide.

Another key factor for pedestrians is the width of the streets that they cross. By minimizing the pedestrian exposure to vehicular traffic, the risk of pedestrian/vehicular accidents is minimized and the pedestrian comfort level is improved. Table 4-13 summarizes the walking distance for pedestrians at each crossing location.

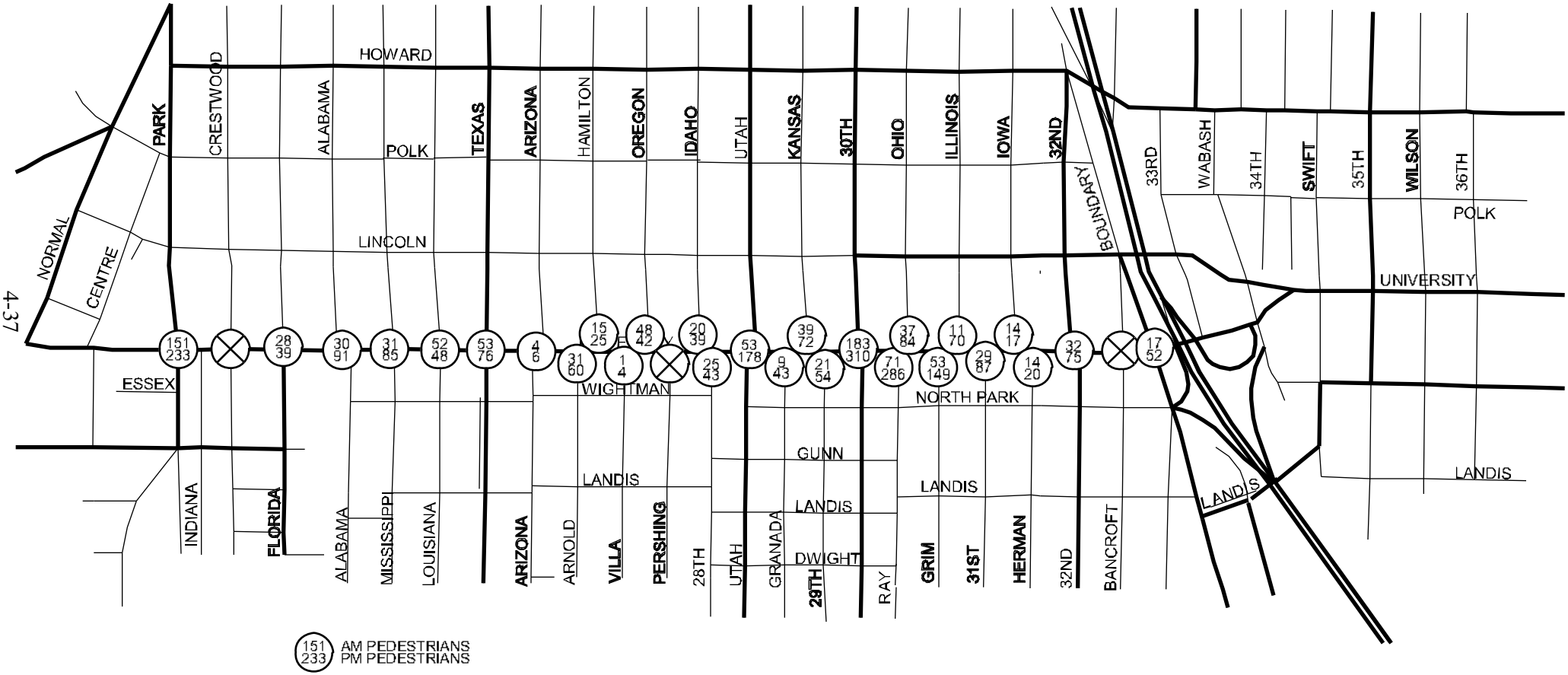
Bicycle Activity

Bicycle activity along the corridor is minimal, most likely due to the lack of bicycle lanes and high speeds and traffic volumes. In the a.m. peak hour, an average of seven bicycles were observed traveling along the corridor during a two hour period (between 7:00 a.m. and 9:00 a.m. when morning traffic volumes along the corridor are their highest). Similarly, during the p.m. peak period bicycle traffic averaged approximately 15 bicyclists between 4:00 to 6:00 p.m., when afternoon traffic volumes are the highest.

Bicycle lanes or bicycle routes are not designated along University Avenue. Therefore, bicycles are required to share the travel way with passenger vehicles and buses. The outside or curb lane along University Avenue is typically 11 feet wide. As discussed previously, parallel and diagonal parking is permitted along University Avenue along the corridor. This traps bicycles between passenger vehicles traveling along University and the vehicles parked along the curb.

Working with the bicycling community, the City of San Diego has established a Bicycle Master Plan. This plan includes goals and objectives to improve the overall bicycle safety and mobility throughout the City as well as recommendations to improve the bicycle circulation system. No existing or planned bicycle routes are identified along University Avenue, Lincoln Avenue or North Park Way. Recommended bicycle routes are proposed on 30th Street, Texas Street and Park Boulevard, as they cross University Avenue.

Although not designated in the Bicycle Master Plan, alternate routes for bicycles include Lincoln Way, North Park Way, and Wightman Avenue. However, Lincoln Avenue is the only continuous street that extends from Park Boulevard to Boundary Street. Wightman Avenue and North Park Way are discontinuous and require weaving through residential neighborhoods to traverse the length of the study area.



AM/PM PEAK HOUR PEDESTRIAN VOLUMES

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 4-9

Table 4-13
Existing Conditions
Curb-to-Curb Distances at Marked Crosswalks

Location	Crossing Distance (Curb to Curb)			
	North Leg	South Leg	East Leg	West Leg
University Avenue/Park Avenue	115’	90’	85’	70’
University Avenue/Florida Street	40’	40’	52’	50’
University Avenue/Alabama Street	52’	40’	--	--
University Avenue/Mississippi Street	52’	40’	52’	52’
University Avenue/Louisiana Street	52’	40’	--	--
University Avenue/Texas Street	52’	40’	52’	52’
University Avenue/Arizona Street	52’	40’	--	--
University Avenue/Arnold Street	--	45’	--	52’
University Avenue/Hamilton Street	45’	--	--	--
University Avenue/Villa Terrace	--	38’	--	--
University Avenue/Oregon Street	42’	--	--	--
University Avenue/Pershing Street	--	50’	52’	--
University Avenue/Idaho Street	52’	--	--	--
University Avenue/28th Street	--	30’	--	--
University Avenue/Utah Street	52’	52’	52’	70’
University Avenue/Granada Street	--	52’	--	--
University Avenue/Kansas Street	52’	--	--	--
University Avenue/29th Street	--	52’	--	--
University Avenue/30th Street	52’	52’	62’	76’
University Avenue/Ray Street	--	25’	--	--
University Avenue/Ohio Street	52’	--	52’	50’
University Avenue/Grim Street	--	40’	52’	52’
University Avenue/Illinois Street	52’	--	52’	52’
University Avenue/31st Street	--	45’	--	--
University Avenue/Iowa Street	52’	--	--	--
University Avenue/Herman Street	--	40’	--	--
University Avenue/32nd Street	45’	45’	52’	52’
University Avenue/Bancroft Street	38’	45’	--	--
University Avenue/Boundary Street	65’	40’	50’	--

4.9 SUMMARY OF EXISTING CONDITIONS

From an operational perspective, University Avenue operates within the City defined acceptable levels of service, with the exception of the following locations:

Intersections:

- University Avenue/Park Boulevard (signalized) ..... LOS F, p.m. peak
- University Avenue/Alabama Street Northbound (unsignalized) ..... LOS F, p.m. peak
- Boundary Street/I-805 Southbound Ramps (all-way stop) ..... LOS F, p.m. peak

Roadway Segments:

- University Avenue between 30th & 32nd Street ..... LOS E
- North Park Way, from 32nd Street to Boundary Street ..... LOS F
- 30th Street from, Lincoln Street to University Avenue ..... LOS E
- 32nd Street from, University Avenue to North Park Way ..... LOS F
- Boundary Street from, University Avenue to North Park Way ..... LOS F

Travel times along the 1.9-mile stretch of the corridor are currently at acceptable levels, with average speeds of ranging from 15 to 30 mph. Average passenger vehicle travel times along the corridor are approximately six minutes in the morning and approximately seven minutes in the afternoon based on the VISSIM simulation model established for the study corridor. Average transit vehicle travel times along the corridor are approximately seven minutes eastbound and nine minutes westbound in the a.m. peak hour. In the p.m. peak hour, average transit travel times are approximately nine minutes westbound and ten minutes eastbound.

The highest pedestrian activity currently occurs at the intersections of University Avenue/30th Street and University Avenue/Park Boulevard, which correspond with the highest transit transfer locations. A total of 20 transit stops are provided along University Avenue serving both Route 7 and Route 908. Marked pedestrian crossings are provided at all signalized intersections and at two unsignalized locations.

Chapter Five – No Build Conditions

5.0 INTRODUCTION

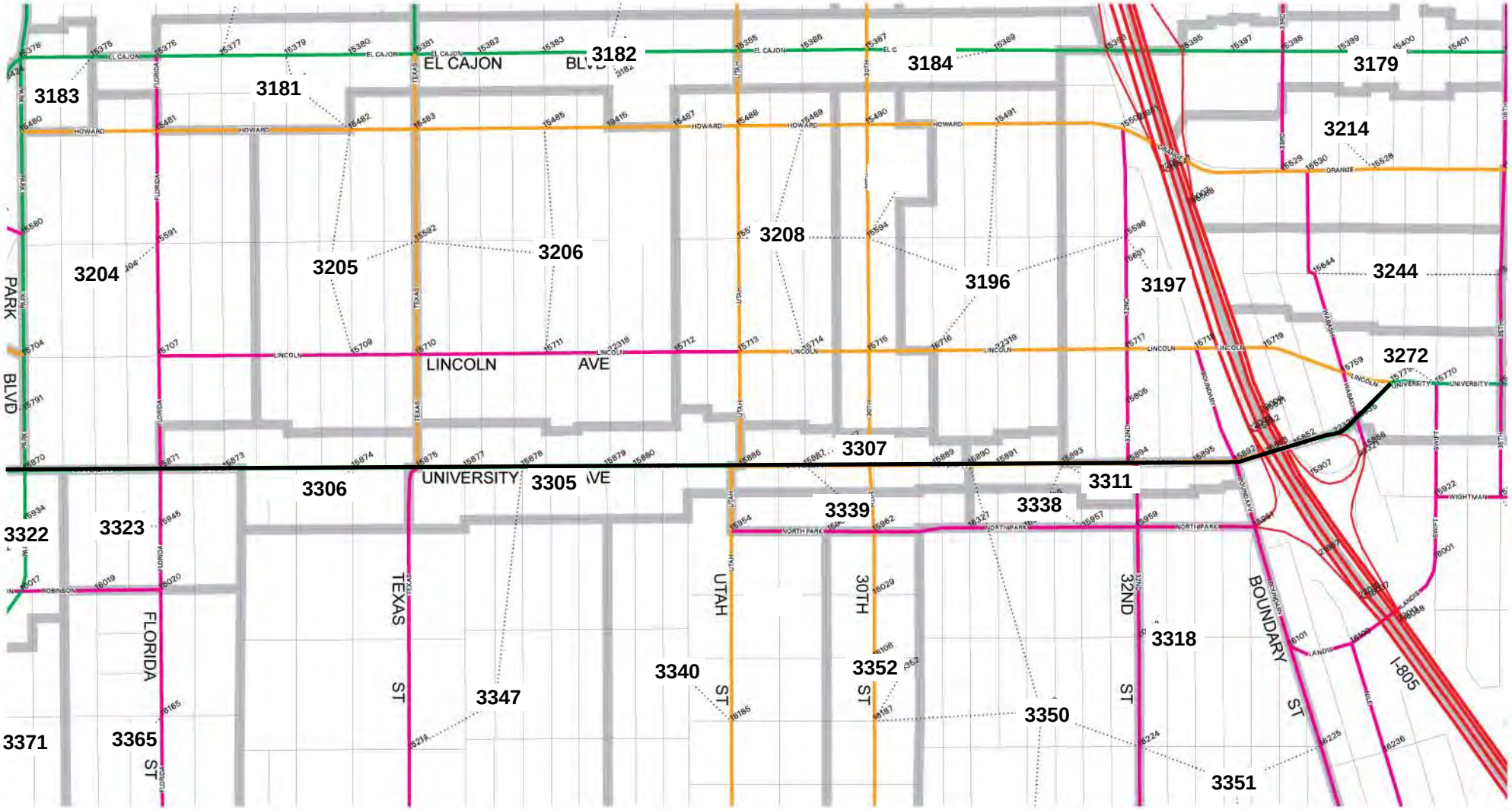
The University Avenue Mobility Plan is a vision for the future of University Avenue and the community of Greater North Park. It would be short sighted to consider only the immediate impacts of the Preferred Concept Plan as it relates to traffic, transit, pedestrians and bicycles. The land uses along University Avenue are diverse and changing. Projects such as the theater revitalization project and numerous mixed use and residential projects along the corridor will change the face of University Avenue and Greater North Park in the years to come. Therefore, this chapter focuses on the conditions in the study area assuming that no physical roadway modifications to University Avenue occur.

In conjunction with the City of San Diego, SANDAG recently updated the traffic model for the region. This traffic model uses existing and planned land uses as well as existing and planned roadway capacity and speeds to forecast the flow of traffic throughout the region. The traffic model integrates all modes of transportation including passenger vehicle and transit vehicle operations.

Although 2030 may seem like the distant future, a minimum of 20 years is the regional standard by which roads and highways are designed and is the basis for the traffic model. This chapter presents the methodology for forecasting the year 2030 traffic volumes. The traffic and transit operations for the year 2030 based on the 2030 planned land uses and street network (2030 No Build) will also be evaluated in this chapter. To look at the interim conditions, a 2010 analysis was conducted. These traffic volumes were derived based on a growth factor. The 2010 analysis is intended to represent the short-term with project conditions.

5.1 FUTURE LAND USE ALONG CORRIDOR

The San Diego Association of Governments (SANDAG) regional traffic model utilizes land use, demographic data, roadway capacity, speed limits and capacity constraints such as traffic signals and stop signs to forecast traffic volumes and transit ridership in year 2030. The model breaks the region into traffic analysis zones (TAZ). The TAZ's for North Park are illustrated in Exhibit 5-1. Each TAZ includes land use data for all the land included within the TAZ boundary. This land use data is then used to forecast future traffic volumes that are subsequently distributed onto the roadway network using the traffic model. The City recently provided SANDAG with detailed updated land use information for the entire City. For this project, the City further examined the street network and land uses in the study area to ensure that they were consistent with the relevant community plan land uses and planned roadway improvements. The exception to this is based on the proposed Transit First Showcase Project. The Showcase Project proposes to convert two of the six lanes on El Cajon Boulevard to transit only lanes.



LEGEND:

Series 10 Traffic Analysis Zone

3206 Traffic Analysis Zone (TAZ) Numbers

NOT TO SCALE

STUDY AREA TRAFFIC ANALYSIS ZONES

RBF

55-100140.001 - February 2004

EXHIBIT 5-1

A total of 24 TAZs are located in the study area, which extends from approximately El Cajon Boulevard to the north, Upas Street to the south, Park Boulevard to the west and Boundary Street to the east. A review of the TAZs directly adjacent to University Avenue in the study area indicates a significant increase in multi-family units is projected (approximately 3,263 units in 2030 versus 1,168 existing units). The number of single family homes and the acreage allocated to retail, restaurant, office, and church uses are expected to remain relatively consistent with existing conditions. The breakdown of land uses along University Avenue by the year 2030 include:

- 155 Single Family Homes
- 3,263 Multi-Family Units – Apartments and Condominiums Included
- 22.2 acres of Commercial Retail and/or Restaurant Uses
- 1.8 acres of Office
- 1.3 acres of Church or Religious Uses

A complete comparison of land uses for each TAZ in the study area is provided in the Appendix at the end of this report. Each TAZ summary compares the number of units and/or total acreage allocated for individual land use types for existing and 2030 conditions.

5.2 TRAFFIC FORECAST METHODOLOGY

The SANDAG 2030 traffic model was used as a basis for the future year technical analysis. The SANDAG traffic model provides forecast average daily traffic (ADT) volumes on regional roadways based on future land use and roadway classification assumptions contained in the various community and City plans, including the Greater North Park Community Plan.

To evaluate the shift in traffic volume along University Avenue as it relates to the Preferred Concept Plan, the City worked closely with SANDAG to conduct two 2030 model runs:

- A regional 2030 network including the Greater North Park Community Plan Circulation element and Transit First Showcase Project.
- A regional 2030 network including the Greater North Park Community Plan Circulation Element, Transit First Showcase Project and the Preferred Concept Plan.

In addition to the ADT volume reports for each model run, several select link model runs were conducted. A select link model run traces vehicles as they disperse themselves on the roadway network. This model run illustrates the vehicle destinations and routes from the selected link. For this project, the select link model run was used to compare the with and without Preferred Concept Plan to determine how vehicle routes change with the implementation of the Preferred Concept Plan.

5.3 TRANSIT FORECAST METHODOLOGY

Transit ridership forecasts were developed for the year 2030 by using transit ridership and person-trip data supplied by SANDAG. The transit ridership data was generated using the transit component of SANDAG Series 10 Regional Transportation Model. Person-trip data was generated using the trip generation component of that model. Based on this data, SANDAG anticipates an increase in the ridership for both Route 7 and Route 908.

5.4 FUTURE PEDESTRIAN AND BICYCLE ACTIVITY ON CORRIDOR

Pedestrian and bicycle future forecast volumes are based upon future forecast transit ridership and the planned changes in land use within Greater North Park. As the trend toward live/work and mixed-use development continues, pedestrian activity is also anticipated to increase. Increased pedestrian activity will result in more frequent pedestrian actuations at signalized intersections, the need for wider sidewalks, and the need for additional capacity and amenities at transit stops.

As the community of Greater North Park continues to age, wider sidewalks will be needed to accommodate wheelchairs and mobility scooters along the corridor. Pedestrian ramps at all intersections will be needed to help improve the walkability and accessibility of the corridor in the future.

Bicycle activity on the corridor will also be a function of how bicycle friendly the corridor becomes in the future. Under the existing conditions, bicycles are required to share the travel way with passenger vehicles, trucks and transit vehicles. With the forecast increase in traffic reported by the 2030 SANDAG model, it is unlikely that bicycle activity will change. However, if a transit lane is provided (without tracks to accommodate the Historic Streetcar), it is anticipated that bicycle activity will increase. It is anticipated that bicycle activity through the study area will increase over the next 30 years. However, whether the bicycles use University Avenue or parallel routes such as North Park Way or Lincoln Avenue will be determined by the lane designations along University Avenue.

5.5 PLANNED ROADWAY IMPROVEMENTS ALONG CORRIDOR

Signal Modifications

Signal operation improvements have recently been made at the intersection of University Avenue/30th Street. The signal operations have been upgraded to provide for protected/permitted left turn phasing on University Avenue. Previously, the University Avenue left turns were controlled by permitted operations.

New Traffic Signals

The intersection of Boundary Street/I-805 SB Ramps was assumed to be signalized in the 2030 SANDAG model. Since existing and future traffic volumes satisfy peak hour volume warrants and given that the

intersection currently operates at LOS F in the p.m. peak hour, the intersection was assumed to be signalized by the year 2010.

Roadway Improvements

At the time the University Avenue Mobility Plan project moved forward, El Cajon Boulevard was undergoing a similar analysis. El Cajon Boulevard is currently a six lane arterial with a raised center median and on-street parking. Along El Cajon Boulevard, a raised median and transit only lanes are planned through the study area (Park Boulevard to I-805). The traffic modeling efforts for the University Avenue Mobility Plan includes the reduction in capacity associated with the transit only lanes on El Cajon Boulevard.

University Avenue and Lincoln Avenue at one time were designed to operate as a couplet per the Greater North Park Community Plan. Lincoln Avenue was intended to have two westbound through lanes and one eastbound through lane. University Avenue was intended to have two eastbound through lanes and one westbound through lane. Currently University Avenue is constructed and striped for the proposed design. Lincoln Avenue, although widened, was not striped in the couplet configuration due to opposition from residents. For the analysis of the corridor, it is assumed that the couplet design will not be implemented. The configuration of Lincoln Avenue is assumed to remain the same as the existing condition for this analysis.

5.6 PLANNED CHANGES IN TRANSIT SERVICE ALONG CORRIDOR

Route 7 and 908 – 2030

SANDAG anticipates a nine percent increase in ridership by the year 2030 for Routes 7 and 908. Route 7 is currently the systems' most productive transit route and operates at six to ten minute headways during peak hours. However, the travel speeds are low and schedule reliability is poor, due to congestion along the corridor and the length of the route. Improvements to the travel speed that can be achieved by transit lanes, signal priority, and physical improvements to speed the boarding process would allow for better schedule reliability and higher ridership growth. Such improvements may also conserve resources that could then be applied to ether a higher route frequency or other service enhancements in the Mid-City area.

Transit First Showcase Route

The Transit First SDSU to Downtown-Showcase Project is intended to be operational by 2007. A portion of this route's alignment is on Park Boulevard. Although the proposed Showcase alignment is out of the current project study area, the Showcase Project does share the same alignment as Route 7 along Park Boulevard south of University Avenue. In the future, Route 7 could take advantage of the priority treatments being implemented for the Showcase Project along Park Boulevard south of University Avenue.

North Park Village Project

SANDAG is currently reviewing the possibility of express transit service on University Avenue. This study, The North Park Village Project, analyzes the existing and future transit needs of University Avenue residents and workers, and will present additional options for improving the speed and quality of service along this corridor. Chapter 11 provides this analysis.

5.7 PLANNED CHANGES IN PEDESTRIAN AND BICYCLE FACILITIES

University Avenue is not included in the City of San Diego Bicycle Master Plan. Therefore, this analysis assumes no planned improvements along University Avenue to accommodate bicycles in the 2030 No Build scenario.

Community Development Block Grant Allocations for Fiscal Year 2005 indicate that approximately $60,000 has been allocated to North Park Main Street for Pedestrian & Signage Improvements in the community of North Park.

A District 3 Sidewalk Study was initiated in 2003 that evaluated the need for sidewalk improvements within the communities located within this district. The results of this study, prepared by a consultant to the City, will prioritize improvements and develop plans for implementing the improvements.

North Park Main Street was granted funds to improve sidewalks through North Park west of 30th Street. The Streetscape project final design was completed in early 2003, however funding related issues have stalled the project. When constructed, the streetscape project would provide for additional curb extensions (bulb-outs) at intersections, sidewalk improvements and crosswalk improvements.

5.8 FUTURE FORECAST TRAFFIC VOLUMES

The future year traffic volumes were estimated based on the SANDAG 2030 traffic model. The 2030 daily traffic volumes reported by the SANDAG model were compared to existing ADT volumes collected specifically for this study. Where the 2030 traffic model volumes exhibit a growth in excess of 20 percent over existing traffic volumes, the model volumes were used directly from the model. For roadway segments exhibiting growth of less than 20 percent, model volumes were adjusted upward to reflect a 20 percent increase over existing conditions. This minimum growth (20 percent) equates to approximately 0.75 percent per year between existing and 2030 conditions.

Peak hour turning movement volumes for Horizon Year 2030 were developed by applying a growth factor to each approach based on the forecast increase in traffic volume from the existing ground count and the modeled 2030 conditions. The a.m. and p.m. peak hour volumes were then balanced between intersections along the entire corridor. Balancing was necessary in cases where adjacent intersection

volumes were found to vary due to the applied growth factor. The lower volume approach or departure was adjusted upward to balance with the higher adjacent approach or departure.

The Year 2010 analysis determined the near-term operating conditions along the corridor. Based on the Implementation Plan, presented in Chapter 9 of this document, it would be reasonable to assume that the University Avenue Mobility Plan would be implemented within 5 to 6 years. Therefore, the year 2010 was assumed as the project completion date. 2010 No Build traffic volumes were developed by interpolating the growth between existing and 2030 traffic volumes.

Year 2010 peak hour turning movement volumes were developed by applying a growth rate to all intersections determined by comparing overall corridor growth between existing and 2030 conditions and interpolating to 2010.

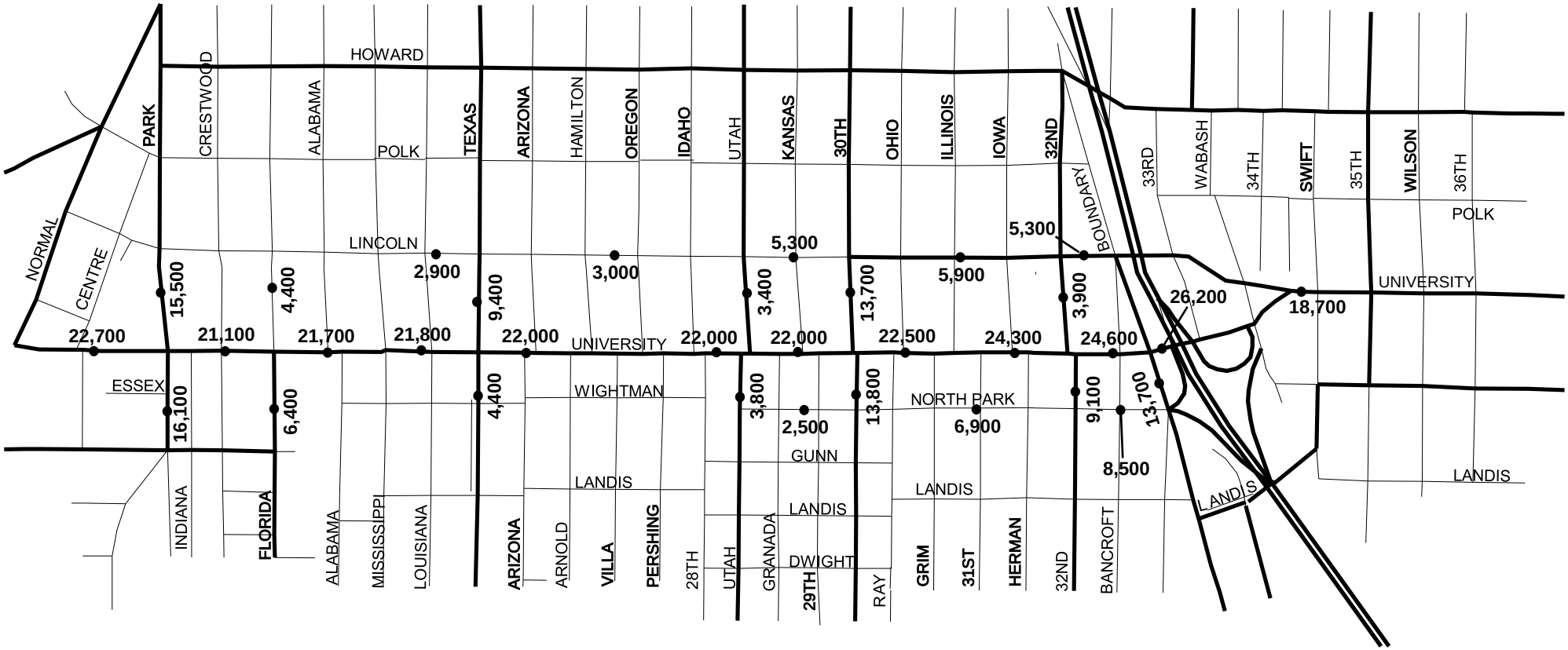
Year 2010 No Build daily traffic volumes and Horizon Year 2030 No Build daily traffic volumes are shown in Exhibits 5-2 and 5-3, respectively. Peak hour intersection volumes are provided in Exhibits 5-4 and 5-5 for 2010 and 2030 No Build conditions, respectively.

5.9 2010 No Build Operational Analysis

Roadway Segments

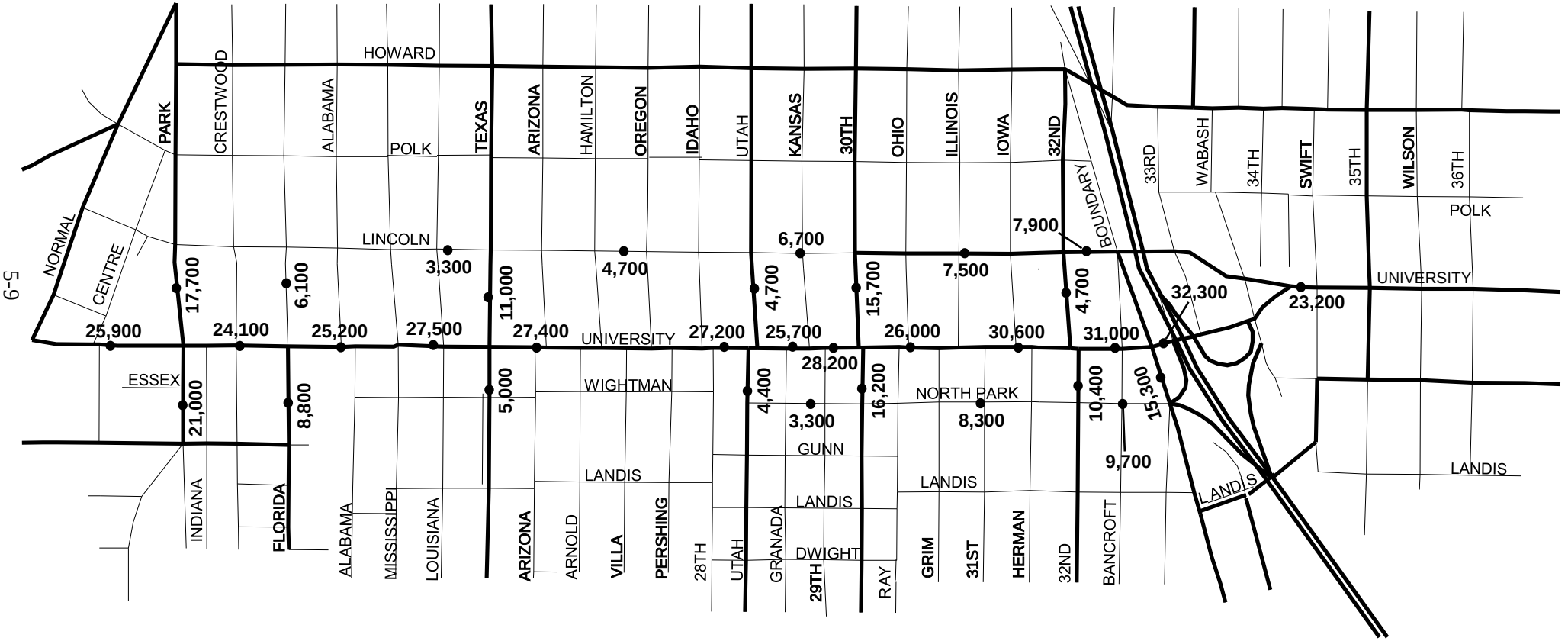
To evaluate the 2010 No Build operating conditions of the roadways within the study area, the forecast daily traffic volumes were compared to the capacity thresholds identified by the City of San Diego for the appropriate classification of roadway. A level of service was assigned to each roadway segment based on the capacity thresholds.

The 2010 No Build roadway segment level of service analysis for the study area is summarized in Table 5-1. As shown in the table, University Avenue is expected to operate at LOS F from Florida Street to 32nd Street and from Boundary Street to Wabash Avenue by the year 2010 if existing intersection and roadway geometry remain unchanged. University Avenue from Centre Street to Florida Street and 30th Street to 32nd Street is forecast to operate at LOS D. The City of San Diego defines LOS D as the threshold for acceptable operating conditions for roadway segments.

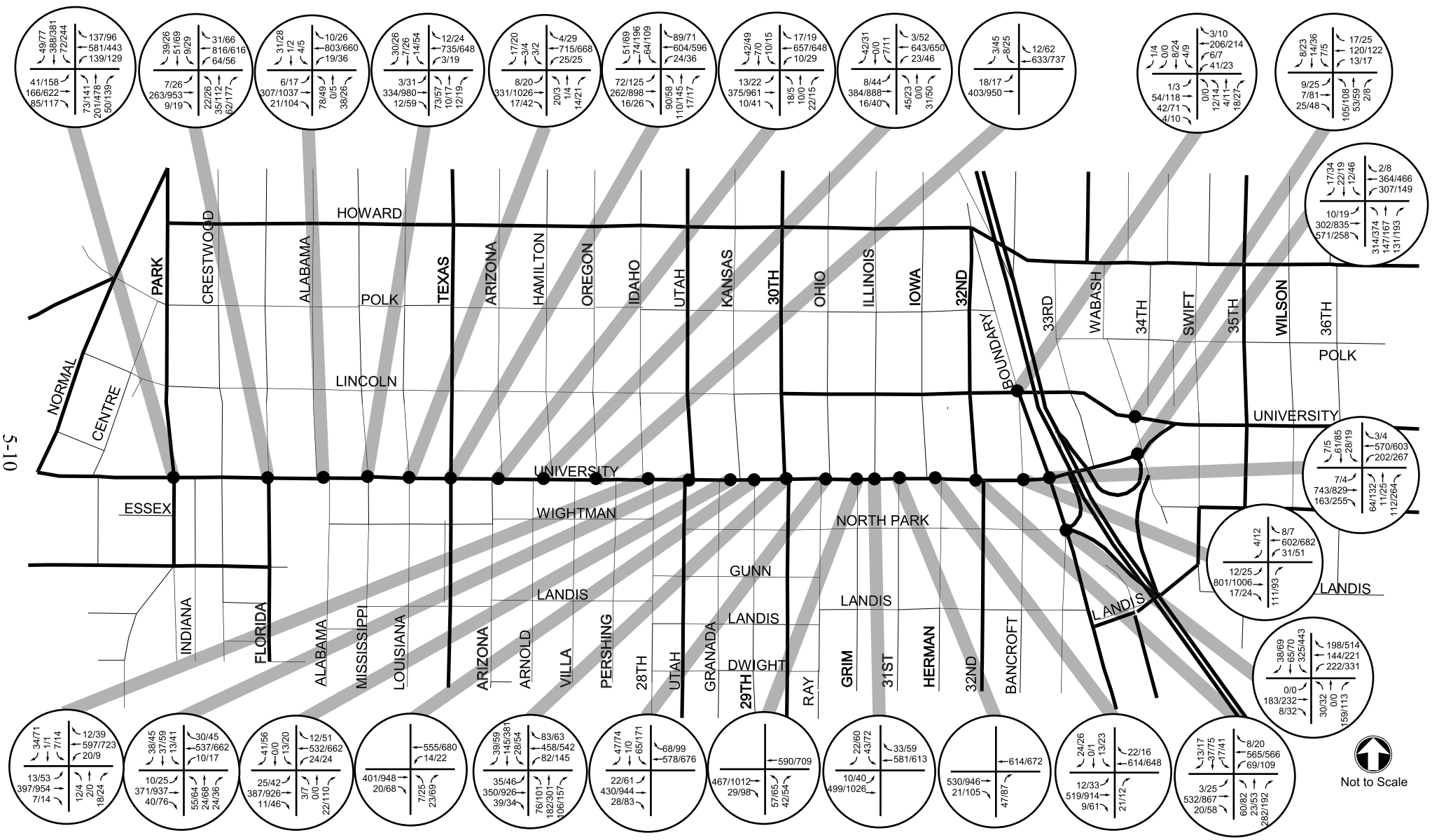


5-8

2010 NO BUILD DAILY TRAFFIC VOLUMES



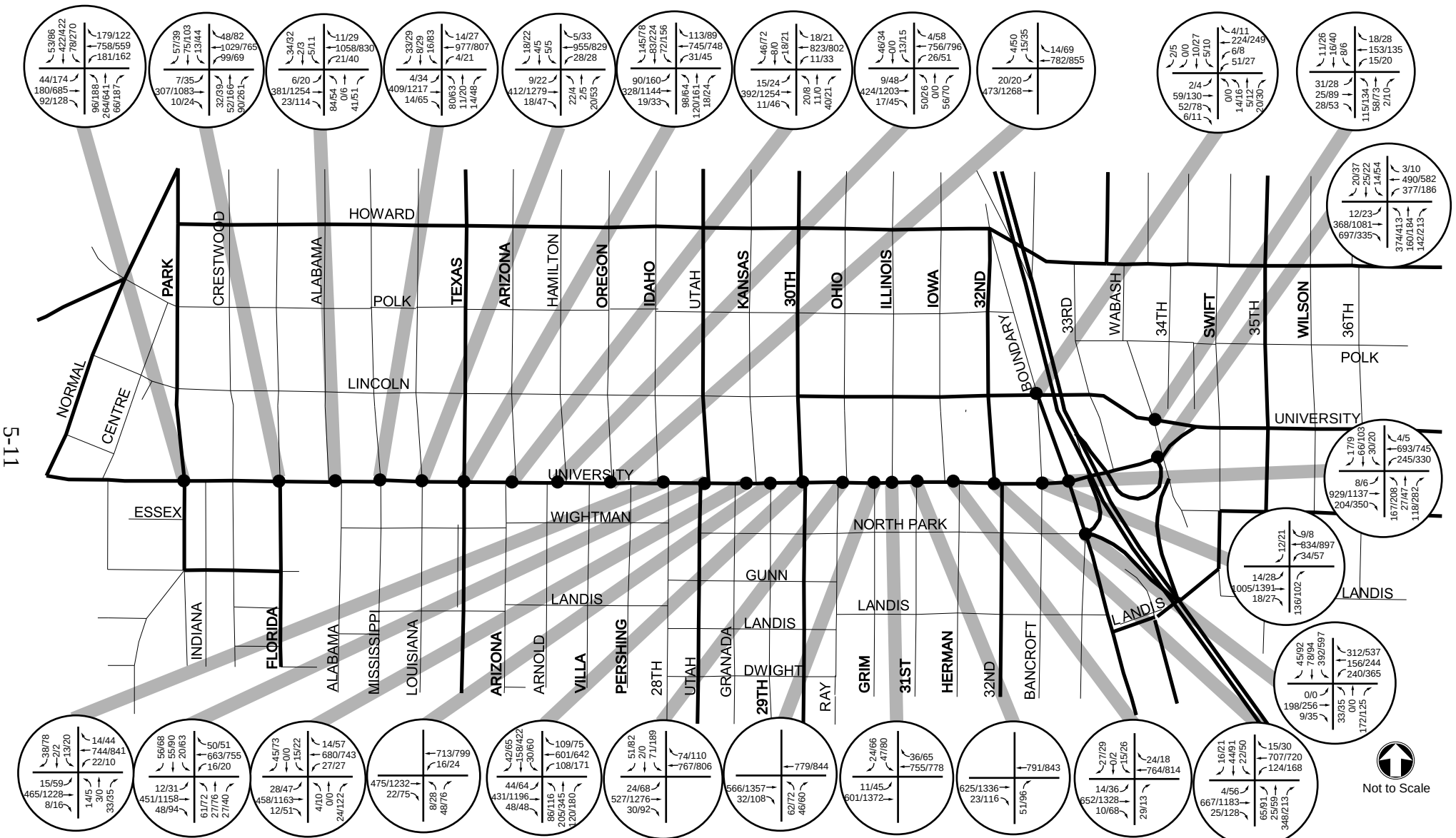
2030 NO BUILD DAILY TRAFFIC VOLUMES



2010 NO BUILD PEAK HOUR TURN MOVEMENTS

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 5-4



2030 NO BUILD PEAK HOUR TURN MOVEMENTS

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 5-5

Table 5-1
Horizon Year 2010 No Build Conditions
Roadway Segment Level of Service Analysis

Street	Limit	Class (Lanes)	Capacity	Existing			2010 No Build			Change in…	
				ADT	LOS	V/C	ADT	LOS	V/C	ADT	V/C
University Avenue	Centre to Park	C+LTL (4)	30,000	21,580	D	0.72	22,700	D	0.76	1,120	0.04
	Park to Florida	C+LTL (4)	30,000	20,040	D	0.67	21,100	D	0.70	1,060	0.03
	Florida to Texas	Collector (4)	15,000	**20,402**	**F**	**1.36**	**21,800**	**F**	**1.45**	1,398	**0.09**
	Texas to Utah	Collector (4)	15,000	**20,192**	**F**	**1.35**	**22,000**	**F**	**1.47**	1,808	**0.12**
	Utah to 30th	Collector (4)	15,000	**20,684**	**F**	**1.38**	**22,000**	**F**	**1.47**	1,316	**0.09**
	30th to 32nd	Collector (3)	12,000	**22,020**	**F**	**1.84**	**24,300**	**F**	**2.03**	2,280	**0.19**
	32nd to Boundary	C+LTL (4)	30,000	22,348	D	0.74	24,600	D	0.82	2,252	0.08
	Boundary to Wabash	Collector (4)	15,000	**23,962**	**F**	**1.60**	**26,200**	**F**	**1.75**	2,238	**0.15**
Lincoln Avenue	Louisiana to Texas	Collector (2)	8,000	2,740	B	0.34	2,900	B	0.36	160	0.02
	Texas to Utah	Collector (2)	8,000	2,341	A	0.29	3,000	B	0.38	659	0.09
	Utah to 30th	C + TWLTL (2)	15,000	4,790	A	0.32	5,300	B	0.35	510	0.03
	30th to Boundary	C + TWLTL (2)	15,000	5,288	B	0.35	5,900	B	0.39	612	0.04
	Boundary to Wabash	C + TWLTL (2)	15,000	4,290	A	0.29	5,300	B	0.35	1,010	0.06

Table 5-1 (continued)
Horizon Year 2010 No Build Conditions
Roadway Segment Level of Service Analysis

Street	Limit	Class (Lanes)	Capacity	Existing			2010 No Build			Change in…	
				ADT	LOS	V/C	ADT	LOS	V/C	ADT	V/C
North Park Way	Utah to 30th	Collector (2)	8,000	2,200	A	0.28	2,500	A	0.31	300	0.03
	30th to 32nd	Collector (2)	8,000	6,420	D	0.80	**6,900**	**E**	**0.86**	480	**0.06**
	32nd to Boundary	Collector (2)	8,000	**8,050**	**F**	**1.01**	**8,500**	**F**	**1.06**	450	**0.05**
Park Boulevard	Lincoln to University	Major (4)	40,000	14,690	A	0.37	15,500	B	0.39	810	0.02
	University to Essex	Major (4)	40,000	14,380	A	0.36	16,100	B	0.40	1,720	0.04
Texas Street	Lincoln to University	C + TWLTL (2)	15,000	8,830	C	0.59	9,400	C	0.63	570	0.04
	University to Wightman	Collector (2)	8,000	4,140	C	0.52	4,400	C	0.55	260	0.03
Utah Street	Lincoln to University	Collector (2)	8,000	2,830	B	0.35	3,400	B	0.43	570	0.08
	University to North Park	Collector (2)	8,000	3,600	C	0.45	3,800	C	0.48	200	0.03
30th Street	Lincoln to University	C + TWLTL (2)	15,000	**13,017**	**E**	**0.87**	**13,700**	**E**	**0.91**	683	**0.04**
	University to North Park	C + TWLTL (2)	15,000	12,960	D	0.86	**13,800**	**E**	**0.92**	840	**0.06**
32nd Street	Lincoln to University	Collector (2)	8,000	3,550	C	0.44	3,900	C	0.49	350	0.05
	University to North Park	Collector (2)	8,000	**8,660**	**F**	**1.08**	**9,100**	**F**	**1.14**	440	**0.06**
Boundary Street	Lincoln to University	Collector (2)	8,000	1,682	A	0.21	1,800	A	0.23	118	0.02
	University to North Park	Collector (2)	8,000	**13,110**	**F**	**1.64**	**13,700**	**F**	**1.71**	590	**0.07**

Note: C+TWLTL = Collector with Two-Way Left Turn Lane.
C+LTL = Collector with Left Turn Lanes.

The segment of North Park Way, between 30th Street and 32nd Street, is forecast to operate at LOS E conditions under 2010 No Build. From 32nd Street to Boundary Street, North Park Way currently operates at LOS F and is forecast to continue to operate at LOS F in the year 2010 No Build scenario.

30th Street would continue to operate unacceptably north of University Avenue. The segment currently operates at LOS E and is forecast to operate at LOS E in 2010. The segment of 30th Street, south of University Avenue, would also operate at LOS E in the 2010 No Build scenario. Additionally, the segments of 32nd Street, south of University Avenue, and Boundary Street, south of University Avenue, both currently operate and would continue to operate at LOS F conditions in the 2010 No Build scenario.

Intersections

Tables 5-2 and 5-3 summarize the results of the Year 2010 No Build HCM intersection level of service analysis for signalized and unsignalized intersections, respectively. HCM analysis worksheets are provided in the Appendix at the end of this report. As shown in Table 5-2, the intersection of University Avenue/Park Boulevard currently operates at LOS F in the p.m. peak hour. Based on the analysis, the intersection of Boundary Street/I-805 SB Ramps would operate acceptably with the addition of a traffic signal at that location.

Table 5-3 shows that three of the 18 stop-controlled approaches to University Avenue would operate unacceptably at either LOS E or F in the p.m. peak hour by the year 2010. Analysis of the 2010 No Build scenario indicate that the following approaches are forecast to experience significant delays (LOS E or F) in the p.m. peak hour:

- Alabama Street
- Louisiana Street
- 29th Street

The typical cause for failing operating conditions on the side streets under the 2010 No Build conditions is the delay imposed on the northbound or southbound left turning vehicles. These vehicles attempt to cross University Avenue and merge into the flow of traffic. Due to the forecast increase in through traffic along University Avenue by the year 2010, delays to vehicles on the side streets are forecast to exceed acceptable levels of delay.

Table 5-2
2010 No Build Signalized Study Intersection LOS

Study Intersection	Existing		2010 No Build		Change in Delay	
	AM Delay – LOS	PM Delay – LOS	AM Delay - LOS	PM Delay – LOS	AM	PM
University Avenue/Park Boulevard	22.4 – C	**127.6 – F**	27.3 – C	**156.2 – F**	4.9	**28.6**
University Avenue/Florida Street	10.0 – A	18.9 – B	8.5 – A	18.5 – B	-1.5	-0.4
University Avenue/Mississippi Street	8.9 – A	9.0 – A	8.9 – A	8.2 – A	0.0	-0.8
University Avenue/Texas Street	21.5 – C	28.5 – C	22.7 – C	35.3 – D	1.2	6.8
University Avenue/Utah Street	11.7 – B	15.6 – B	11.7 – B	16.3 – B	0.0	0.7
University Avenue/30th Street	13.9 – B	24.2 – C	17.0 – B	35.7 – D	3.1	11.5
University Avenue/Ohio Street	4.4 – A	7.5 – A	4.4 – A	8.1 – A	0.0	0.6
University Avenue/Grim Street	3.5 – A	4.6 – A	3.7 – A	3.7 – A	0.2	-0.9
University Avenue/Illinois Street	3.6 – A	6.3 – A	4.0 – A	5.1 – A	0.4	-1.2
University Avenue/32nd Street	23.0 – C	13.2 – B	14.0 – B	24.1 – C	-9.0	10.9
University Avenue/Boundary Street	22.1 – C	35.8 – D	19.9 – B	23.3 – C	-2.2	-12.5
University Avenue/Wabash Street	21.9 – C	51.6 – D	19.6 – B	39.1 – D	-2.3	-12.5
Lincoln Avenue/Wabash Street	13.2 – B	12.7 – B	12.9 – B	12.2 – B	-0.3	-0.5
Boundary Street/I-805 SB Ramps[1]	20.4 – C	**94.8 – F**	16.5 – B	17.1 – B	-3.9	-77.7

Note: Deficient intersection operations shown in bold.
[1] All-way stop control under existing conditions.

Table 5-3
2010 No Build Unsignalized Study Intersection LOS

Study Intersection	Minor Approach Delay – LOS (Overall Delay)					
	Existing		2010 No Build		Change in Delay	
	AM	PM	AM	PM	AM	PM
University Avenue/Alabama Street (NB)	16.3 – C (1.6)	**67.7 – F** (3.1)	17.1 – C (1.7)	**107.7 – F** (4.5)	0.8 (0.1)	40.0 (1.4)
University Avenue/Alabama Street (SB)	13.4 – B (0.4)	16.4 – C (0.6)	14.9 – B (0.5)	16.2 – C (0.4)	1.5 (0.1)	-0.2 (-0.2)
University Avenue/Louisiana Street	16.8 – C (1.1)	29.6 – D (1.2)	18.9 – C (1.2)	**35.5 – E** (1.4)	2.1 (0.1)	5.9 (0.2)
University Avenue/Arizona Street (NB)	12.2 – B (0.6)	17.4 – C (0.5)	13.9 – B (0.6)	21.5 – C (0.5)	1.7 (0.0)	4.1 (0.0)
University Avenue/Arizona Street (SB)	12.7 – B (0.8)	15.9 – C (0.7)	13.7 – C (0.7)	18.3 – C (0.8)	1.0 (-0.1)	2.4 (0.1)
University Avenue/Arnold Street	15.7 – C (1.2)	23.9 – C (1.4)	17.6 – C (1.3)	33.5 – D (1.8)	1.9 (0.1)	9.6 (0.4)
University Avenue/Hamilton Street	12.2 – B (0.6)	17.9 – C (0.8)	13.1 – B (0.6)	20.5 – C (0.9)	0.9 (0.0)	2.6 (0.1)
University Avenue/Oregon Street	16.0 – C (0.3)	21.9 – C (1.0)	17.9 – C (0.4)	26.3 – D (1.1)	1.9 (0.1)	4.4 (0.1)
University Avenue/Idaho Street	12.2 – B (0.6)	18.8 – C (1.3)	12.8 – B (0.6)	21.1 – C (1.4)	0.6 (0.0)	2.3 (0.1)
University Avenue/28th Street	12.4 – B (0.6)	17.2 – C (0.3)	13.3 – B (0.6)	18.7 – C (0.4)	0.9 (0.0)	1.5 (0.1)
University Avenue/Granada Street	10.4 – B (0.5)	14.3 – B (1.1)	10.8 – B (0.5)	28.5 – D (0.5)	0.4 (0.0)	14.2(-0.6)
University Avenue/Kansas Street	13.0 – B (0.9)	21.7 – C (1.2)	13.9 – B (1.0)	27.4 – D (1.5)	0.9 (0.1)	5.7 (0.3)
University Avenue/29th Street	11.3 – B (0.5)	25.9 – D (1.5)	11.9 – B (0.5)	**35.5 – E** (2.1)	0.6 (0.0)	9.6 (0.6)
University Avenue/31st Street	10.4 – B (0.4)	14.1 – B (0.7)	10.6 – B (0.4)	15.1 – C (0.7)	0.2 (0.0)	1.0 (0.0)
University Avenue/Iowa Street	18.0 – C (0.7)	24.0 – C (1.0)	21.0 – C (0.8)	28.1 – D (1.1)	3.0 (0.1)	4.1 (0.1)
University Avenue/Herman Avenue	10.2 – B (0.2)	12.0 – B (0.1)	10.4 – B (0.2)	12.3 – B (0.1)	0.2 (0.0)	0.3 (0.0)
University Avenue/Bancroft Street	12.4 – B (1.1)	13.8 – B (1.1)	13.3 – B (1.2)	14.9 – B (1.2)	0.9 (0.1)	1.1 (0.1)
Boundary Street/Lincoln Avenue	12.1 – B (2.3)	10.7 – B (0.6)	12.6 – B (2.4)	13.7 – B (2.6)	0.5 (0.1)	3.0 (2.0)

Note: Deficient intersection operation shown in bold.

5.10 2030 No Build Operational Analysis

Roadway Segments

The 2030 No Build roadway segment level of service analysis for the study area is summarized in Table 5-4. As shown in the table, University Avenue is expected to operate at LOS E from Centre Street to Park Boulevard and LOS F from Florida Street to Wabash Avenue by the year 2030 if existing intersection and roadway geometry remain unchanged. University Avenue from Park Boulevard to Florida Street is forecast to operate at LOS D. The City of San Diego defines LOS D as the threshold for acceptable operating conditions for roadway segments.

The segment of North Park Way, between 30th Street and 32nd Street, is forecast to operate at LOS F conditions under 2030 No Build. From 32nd Street to Boundary Street, North Park Way currently operates at LOS F and is forecast to continue to operate at LOS F in the year 2030 No Build scenario.

30th Street would continue to operate unacceptably north of University Avenue. The segment currently operates at LOS E and is forecast to operate at LOS F in 2030. The segment of 30th Street, south of University Avenue, would also operate at LOS F in the 2030 No Build scenario. Additionally, the segments of 32nd Street, south of University Avenue, and Boundary Street, south of University Avenue, both currently operate and would continue to operate at LOS F conditions in the 2030 No Build scenario.

Intersections

Tables 5-5 and 5-6 present the 2030 No Build scenario delays and levels of service at the signalized and unsignalized study intersections, respectively, based on the HCM methodology. HCM analysis worksheets are provided in the Appendix at the end of this report.

As shown in Table 5-5, the intersection of University Avenue/Park Boulevard currently operates and is forecast to continue to operate at LOS F in the p.m. peak hour. Additionally, the intersections of University Avenue/30th Street, University Avenue/Boundary Street, and University Avenue/Wabash Street are forecast to operate unacceptably at LOS E in the p.m. peak hour. Based on the analysis, the intersection of Boundary Street/I-805 SB Ramps would operate acceptably with the addition of a traffic signal at that location.

Table 5-4
Horizon Year 2030 No Build Conditions
Roadway Segment Level of Service Analysis

Street	Limit	Class (Lanes)	Capacity	Existing			2030 No Build			Change in…	
				ADT	LOS	V/C	ADT	LOS	V/C	ADT	V/C
University Avenue	Centre to Park	C+LTL (4)	30,000	21,580	D	0.72	**25,900**	**E**	**0.86**	4,320	0.14
	Park to Florida	C+LTL (4)	30,000	20,040	D	0.67	24,100	D	0.80	4,060	0.13
	Florida to Texas	Collector (4)	15,000	**20,402**	**F**	**1.36**	**27,500**	**F**	**1.83**	7,098	**0.47**
	Texas to Utah	Collector (4)	15,000	**20,192**	**F**	**1.35**	**27,400**	**F**	**1.83**	7,208	**0.48**
	Utah to 30th	Collector (4)	15,000	**20,684**	**F**	**1.38**	**28,200**	**F**	**1.88**	7,516	**0.50**
	30th to 32nd	Collector (3)	12,000	**22,020**	**F**	**1.84**	**30,600**	**F**	**2.55**	8,580	**0.71**
	32nd to Boundary	C+LTL (4)	30,000	22,348	D	0.74	**31,000**	**F**	**1.03**	8,652	**0.29**
	Boundary to Wabash	Collector (4)	15,000	**23,962**	**F**	**1.60**	**32,300**	**F**	**2.15**	8,338	**0.55**
Lincoln Avenue	Louisiana to Texas	Collector (2)	8,000	2,740	B	0.34	3,300	B	0.41	560	0.07
	Texas to Utah	Collector (2)	8,000	2,341	A	0.29	4,700	C	0.59	2,359	0.30
	Utah to 30th	C + TWLTL (2)	15,000	4,790	A	0.32	6,700	B	0.45	1,910	0.13
	30th to Boundary	C + TWLTL (2)	15,000	5,288	B	0.35	7,500	C	0.50	2,212	0.15
	Boundary to Wabash	C + TWLTL (2)	15,000	4,290	A	0.29	7,900	C	0.53	3,610	0.24
North Park Way	Utah to 30th	Collector (2)	8,000	2,200	A	0.28	3,300	B	0.41	1,100	0.13
	30th to 32nd	Collector (2)	8,000	6,420	D	0.80	**8,300**	**F**	**1.04**	1,880	**0.24**
	32nd to Boundary	Collector (2)	8,000	**8,050**	**F**	**1.01**	**9,700**	**F**	**1.21**	1,650	**0.20**

Table 5-4 (continued)
Horizon Year 2030 No Build Conditions
Roadway Segment Level of Service Analysis

Street	Limit	Class (Lanes)	Capacity	Existing			2030 No Build			Change in…	
				ADT	LOS	V/C	ADT	LOS	V/C	ADT	V/C
Park Boulevard	Lincoln to University	Major (4)	40,000	14,690	A	0.37	17,700	B	0.44	3,010	0.07
	University to Essex	Major (4)	40,000	14,380	A	0.36	21,000	B	0.53	6,620	0.17
Texas Street	Lincoln to University	C + TWLTL (2)	15,000	8,830	C	0.59	11,000	D	0.73	2,170	0.14
	University to Wightman	Collector (2)	8,000	4,140	C	0.52	5,000	C	0.63	860	0.11
Utah Street	Lincoln to University	Collector (2)	8,000	2,830	B	0.35	4,700	C	0.59	1,870	0.24
	University to North Park	Collector (2)	8,000	3,600	C	0.45	4,400	C	0.55	800	0.10
30th Street	Lincoln to University	C + TWLTL (2)	15,000	**13,017**	**E**	**0.87**	**15,700**	**F**	**1.05**	2,683	**0.18**
	University to North Park	C + TWLTL (2)	15,000	12,960	D	0.86	**16,200**	**F**	**1.08**	3,240	**0.22**
32nd Street	Lincoln to University	Collector (2)	8,000	3,550	C	0.44	4,700	C	0.59	1,150	0.15
	University to North Park	Collector (2)	8,000	**8,660**	**F**	**1.08**	**10,400**	**F**	**1.30**	1,740	**0.22**
Boundary Street	Lincoln to University	Collector (2)	8,000	1,682	A	0.21	2,100	A	0.26	418	0.05
	University to North Park	Collector (2)	8,000	**13,110**	**F**	**1.64**	**15,300**	**F**	**1.91**	2,190	**0.27**

Note: C+TWLTL = Collector with Two-Way Left Turn Lane HCM Intersection Level of Service
C+LTL = Collector with Left Turn Lanes
ADT = Average Daily Traffic
LOS = Level of Service
V/C = Volume to Capacity Ratio

Table 5-5
2030 No Build Signalized Study Intersection LOS

Study Intersection	Existing		2030 No Build		Change in Delay	
	AM Delay – LOS	PM Delay – LOS	AM Delay - LOS	PM Delay – LOS	AM	PM
University Avenue/Park Boulevard	22.4 – C	**127.6 – F**	33.4 – C	**223.7 – F**	11.0	**96.1**
University Avenue/Florida Street	10.0 – A	18.9 – B	10.0 – A	30.8 – C	0.0	11.9
University Avenue/Mississippi Street	8.9 – A	9.0 – A	9.2 – A	11.5 – B	0.3	2.5
University Avenue/Texas Street	21.5 – C	28.5 – C	30.1 – C	46.8 – D	8.6	18.3
University Avenue/Utah Street	11.7 – B	15.6 – B	13.0 – B	22.0 – C	1.3	6.4
University Avenue/30th Street	13.9 – B	24.2 – C	18.6 – B	**71.9 – E**	4.7	**47.7**
University Avenue/Ohio Street	4.4 – A	7.5 – A	5.0 – A	12.2 – B	0.6	4.7
University Avenue/Grim Street	3.5 – A	4.6 – A	3.9 – A	4.3 – A	0.4	-0.3
University Avenue/Illinois Street	3.6 – A	6.3 – A	4.8 – A	7.1 – A	1.2	0.8
University Avenue/32nd Street	23.0 – C	13.2 – B	15.4 – B	34.9 – C	-7.6	21.7
University Avenue/Boundary Street	22.1 – C	35.8 – D	24.9 – C	**61.7 – E**	2.8	**25.9**
University Avenue/Wabash Street	21.9 – C	51.6 – D	23.8 – C	**73.6 – E**	1.9	**22.0**
Lincoln Avenue/Wabash Street	13.2 – B	12.7 – B	12.1 – B	13.3 – B	-1.1	0.6
Boundary Street/I-805 SB Ramps[1]	20.4 – C	**94.8 – F**	16.6 – B	20.8 – C	-3.8	-74.0

Note: Deficient intersection operation shown in bold.
[1] All-way stop control under existing conditions.

Table 5-6
2030 No Build Unsignalized Study Intersection LOS

Study Intersection	Minor Approach Delay – LOS (Overall Delay)					
	Existing		2030 No Build		Change in Delay	
	AM	PM	AM	PM	AM	PM
University Avenue/Alabama Street (NB)	16.3 – C (1.6)	**67.7 – F** (3.1)	26.8 – D (2.2)	**>120.0 – F** (24.5)	**10.5 (0.6)**	52.3(21.4)
University Avenue/Alabama Street (SB)	13.4 – B (0.4)	16.4 – C (0.6)	19.0 – C (0.5)	33.1 – D (0.8)	5.6 (0.1)	16.7(0.2)
University Avenue/Louisiana Street	16.8 – C (1.1)	29.6 – D (1.2)	26.9 – D (1.6)	**90.6 – F** (3.9)	10.1 (0.5)	61.0(2.7)
University Avenue/Arizona Street (NB)	12.2 – B (0.6)	17.4 – C (0.5)	13.5 – B (0.8)	**58.8 – F** (1.2)	1.3 (0.2)	41.4(0.7)
University Avenue/Arizona Street (SB)	12.7 – B (0.8)	15.9 – C (0.7)	18.6 – C (1.2)	**36.7 – E** (1.7)	5.9 (0.4)	20.8(1.0)
University Avenue/Arnold Street	15.7 – C (1.2)	23.9 – C (1.4)	19.8 – C (1.7)	**>120.0 – F** (10.4)	4.1 (0.5)	96.1(9.0)
University Avenue/Hamilton Street	12.2 – B (0.6)	17.9 – C (0.8)	16.2 – C (0.8)	**49.4 – E** (1.5)	4.0 (0.2)	31.5(0.7)
University Avenue/Oregon Street	16.0 – C (0.3)	21.9 – C (1.0)	24.6 – C (0.5)	**88.9 – F** (3.5)	8.6 (0.2)	67.0(2.5)
University Avenue/Idaho Street	12.2 – B (0.6)	18.8 – C (1.3)	17.1 – C (0.8)	**40.9 – E** (2.3)	4.9 (0.2)	22.1(1.0)
University Avenue/28th Street	12.4 – B (0.6)	17.2 – C (0.3)	15.0 – C (0.8)	26.7 – D (0.6)	2.6 (0.2)	9.5(0.3)
University Avenue/Granada Street	10.4 – B (0.5)	14.3 – B (1.1)	11.4 – B (0.5)	31.3 – D (2.2)	10.0 (0.0)	17.0(1.1)
University Avenue/Kansas Street	13.0 – B (0.9)	21.7 – C (1.2)	16.9 – C (1.1)	**55.1 – F** (2.8)	3.9 (0.2)	33.4(1.6)
University Avenue/29th Street	11.3 – B (0.5)	25.9 – D (1.5)	12.4 – B (0.7)	**>120.0 – F** (7.7)	1.1 (0.2)	94.1(6.2)
University Avenue/31st Street	10.4 – B (0.4)	14.1 – B (0.7)	11.0 – B (0.4)	20.0 – C (0.8)	0.6 (0.0)	5.9(0.1)
University Avenue/Iowa Street	18.0 – C (0.7)	24.0 – C (1.0)	34.1 – D (1.1)	**49.1 – E** (1.6)	16.1 (0.4)	25.1(0.6)
University Avenue/Herman Avenue	10.2 – B (0.2)	12.0 – B (0.1)	11.2 – B (0.2)	14.2 – B (0.1)	1.0 (0.0)	2.2(0.0)
University Avenue/Bancroft Street	12.4 – B (1.1)	13.8 – B (1.1)	16.2 – C (1.4)	20.9 – C (1.4)	3.8 (0.3)	7.1(0.3)
Boundary Street/Lincoln Avenue	12.1 – B (2.3)	10.7 – B (0.6)	13.3 – B (2.6)	10.7 – B (0.6)	1.2 (0.3)	0.0(0.0)

Note: Deficient intersection operation shown in bold.

Table 5-6 shows that 11 of the 18 stop-controlled approaches to University Avenue would operate unacceptably at either LOS E or F in the p.m. peak hour by the year 2030. Analysis of the 2030 No Build scenario indicate that the following approaches are forecast to experience significant delays (LOS E or F) in the p.m. peak hour:

- Alabama Street
- Louisiana Street
- Arizona Street (North & South)
- Arnold Avenue
- Hamilton Street
- Oregon Street
- Idaho Street
- Kansas Street
- 29th Street
- Iowa Street

The typical cause for failing operating conditions on the side streets under the 2030 No Build conditions is the delay imposed on the northbound or southbound left turning vehicles. These vehicles attempt to cross University Avenue and merge into the flow of traffic. Due to the forecast increase in through traffic along University Avenue by the year 2030, delays to vehicles on the side streets are forecast to exceed acceptable levels of delay.

5.11 VISSIM DELAY SUMMARY

VISSIM was also used to evaluate the 2030 No Build scenario travel times, delays and operating conditions along the corridor. Table 5-7 summarizes the results of the a.m. and p.m. peak hour delay summary for the corridor as a whole and for the individual intersections along the corridor. Table 5-8 presents the travel time and stops per vehicle data calculated by VISSIM.

The results of the VISSIM analysis demonstrate an increase in delay for all signalized intersections over existing conditions. In the p.m. peak hour, the travel time along the study corridor in the eastbound direction is projected to increase from approximately 7.0 minutes under existing conditions to roughly 15.1 minutes under 2030 No Build conditions. A smaller increase is anticipated in the westbound direction, where travel time is estimated to increase from approximately 7.1 minutes to 9.7 minutes in the p.m. peak hour.

Table 5-7
2030 No Build Conditions
VISSIM Measures of Effectiveness Delay Summary

Study Intersection	Existing				2030				Change in Delay			
	Total Delay[1]		Concurrent Delay[2]		Total Delay[1]		Concurrent Delay[2]		Total Delay[1]		Concurrent Delay[2]	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
University Avenue/Park Avenue	28.5	41.4	27.1	43.7	33.0	113.5	32.5	111.4	4.5	72.1	5.4	67.7
University Avenue/Florida Street	10.4	17.6	9.2	13.2	15.0	93.6	12.0	89.1	4.6	76.0	2.8	75.9
University Avenue/Mississippi Street	6.6	11.5	4.3	9.6	9.2	68.9	7.1	70.8	2.6	57.4	2.8	61.2
University Avenue/Texas Street	20.7	35.4	18.5	33.2	28.4	77.1	26.3	77.3	7.7	41.7	7.8	44.1
University Avenue/Utah Street	14.0	26.5	12.4	24.4	16.5	43.1	14.6	40.9	2.5	16.6	2.2	16.5
University Avenue/30th Street	15.2	25.6	12.5	22.3	19.9	47.7	15.6	36.9	4.7	22.1	3.1	14.6
University Avenue/Ohio Street	3.3	12.8	0.8	6.7	4.9	21.0	1.7	3.9	1.6	8.2	0.9	-2.8
University Avenue/Grim Street	3.0	6.4	1.7	5.1	5.0	6.1	3.4	3.3	2.0	-0.3	1.7	-1.8
University Avenue/Illinois Street	5.0	8.6	4.3	7.3	5.5	12.1	4.5	9.9	0.5	3.5	0.2	2.6
University Avenue/32nd Street	15.0	18.1	14.2	17.7	28.2	35.8	29.0	37.0	13.2	17.7	14.8	19.3
University Avenue/Boundary Street	15.4	21.6	15.3	19.6	55.7	55.6	57.6	56.9	40.3	34.0	42.3	37.3
University Avenue/Wabash Street	25.0	45.7	23.7	54.7	37.2	35.6	33.5	33.3	12.2	-10.1	9.8	-21.4

1 Intersection Delay = Average delay for all movements at the intersection (sec/veh).
2 Concurrent Delay = Delay imposed to eastbound & westbound vehicles along University Avenue (sec/veh).

Table 5-7 (continued)
2030 No Build Conditions
VISSIM Measures of Effectiveness Delay Summary

Study Intersection	Existing				2030				Change in Delay			
	Conflicting Delay[3]		Person Delay[4]		Conflicting Delay[3]		Person Delay[4]		Conflicting Delay[3]		Person Delay[4]	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
University Avenue/Park Avenue	30.6	38.7	33.3	44.4	33.8	115.6	37.4	113.7	3.2	76.9	4.1	69.3
University Avenue/Florida Street	16.7	35.1	10.8	16.9	27.8	106.1	14.6	93.1	11.1	71.0	3.8	76.2
University Avenue/Mississippi Street	24.0	28.3	7.6	12.2	27.5	57.1	9.9	67.2	3.5	28.8	2.3	55.0
University Avenue/Texas Street	27.0	41.7	21.0	36.0	33.6	76.6	28.7	77.9	6.6	34.9	7.7	41.9
University Avenue/Utah Street	22.1	37.2	15.9	30.7	26.3	53.2	18.8	45.8	4.2	16.0	2.9	15.1
University Avenue/30th Street	20.2	31.0	16.7	26.4	29.4	65.0	21.8	49.5	9.2	34.0	5.1	23.1
University Avenue/Ohio Street	5.5	5.3	3.2	12.2	5.6	10.1	4.8	19.5	0.1	4.8	1.6	7.3
University Avenue/Grim Street	19.2	25.7	4.3	6.6	27.2	51.8	6.2	5.6	8.0	26.1	1.9	-1.0
University Avenue/Illinois Street	17.8	25.5	5.7	8.9	26.6	43.7	5.7	12.0	8.8	18.2	0.0	3.1
University Avenue/32nd Street	17.3	20.1	15.5	19.6	24.9	29.6	28.3	36.8	7.6	9.5	12.8	17.2
University Avenue/Boundary Street	16.7	29.5	15.3	21.0	45.6	49.7	52.6	55.4	28.9	20.2	37.3	34.4
University Avenue/Wabash Street	26.9	28.6	27.1	49.0	42.4	40.3	37.5	36.0	15.5	11.7	10.4	-13.0

3 Conflicting Delay = Delay imposed to northbound & southbound vehicles entering or crossing University Avenue (sec/veh)
4 Seconds per person.

Table 5-8
2030 No Build Conditions
Travel Time / Stops (I-805 to Park Boulevard)

Direction	Travel Time						Stops[1]					
	Existing		2030		Change		Existing		2030		Change	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Westbound Interstate 805 to Park Boulevard	5.9	7.1	6.5	9.7	0.6	2.6	4.0	5.9	4.8	7.9	0.8	2.0
Eastbound Park Boulevard to Interstate 805	5.6	7.0	7.1	15.1	1.5	8.1	3.8	5.1	5.8	13.1	2.0	8.0

1 Stops per vehicle.

5.12 FUTURE TRANSIT ACTIVITY AND OPERATIONS

Based on the Series 10 regional model, SANDAG has also estimated that by 2030 transit ridership will increase by nine percent (9%) over the 2003 figure. This would be an increase of approximately 700 daily passengers within the corridor. Current transit vehicles are running at less than capacity. Therefore, it is anticipated that this level of increase will not have a significant effect on the overall travel time or service needs for Route 7 or the 908. Existing capacity with the existing service will be sufficient to meet the forecast increase in demand. Table 5-9 summarizes the forecast transit ridership information provide by SANDAG for use in this analysis.

The 2030 No Build transit vehicle travel time along the corridor was determined by combining the dwell times at the transit stops with the average travel speed of the transit vehicles between the stops when exiting the project study area from Interstate 805 to Park Boulevard. The travel time, as reported by the VISSIM analysis, for both routes in the a.m. and p.m. peak hour is summarized in Table 5-10.

Table 5-9
2030 No Build Conditions
Transit Ridership Forecast

Westbound Station Locations	Existing Conditions			2030 No Build Conditions			
	Route 7	Route 908	Total	Route 7	Route 908	Total	RANK
Bancroft Street	126	64	190	137	70	207	**10**
Iowa Street	149	43	192	162	47	209	**9**
Illinois Street	177	43	220	193	47	240	**7**
30th Street	758	383	1141	826	416	1242	**1**
Utah Street	178	63	241	194	68	262	**4**
Oregon Street	141	69	210	154	75	229	**8**
Arizona Street	190	64	254	207	70	277	**3**
Louisiana Street	167	61	228	182	66	248	**6**
Alabama Street	153	87	240	167	95	262	**5**
Florida Street	74	40	114	81	43	124	**11**
Park Boulevard	805	224	1029	877	243	1120	**2**
Eastbound Station Locations	**Route 7**	**Route 908**	**Total**	**Route 7**	**Route 908**	**Total**	**RANK**
Park Boulevard	629	193	822	686	210	896	**2**
Florida Street	75	51	126	82	55	137	**11**
Alabama Street	117	47	164	128	51	179	**8**
Louisiana Street	191	76	267	208	83	291	**5**
Texas Street	122	49	171	133	53	186	**7**
Arnold Avenue	76	27	103	83	29	112	**10**
Pershing Avenue	96	43	139	105	47	152	**9**
Utah Street	179	42	221	195	46	241	**6**
30th Street	803	360	1163	875	391	1266	**1**
Grim Street	104	57	161	245	62	307	**4**
Herman Avenue	228	79	307	249	86	335	**3**
Boundary Street	39	58	97	43	63	106	**12**

Note: 2030 No Build assumes a 9% increase over existing ridership
Ridership measured in number of passengers on transit vehicle between stops.

Table 5-10
2030 No Build Conditions
Transit Travel Times (I-805 to Park Boulevard)

Route / Direction	Existing		2030		Change	
Route 7	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Westbound Interstate 805 to Park Boulevard	9.5	10.2	10.4	12.3	0.9	2.1
Eastbound Park Boulevard to Interstate 805	7.6	10.1	8.8	17.8	1.2	7.7
Route 908	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Westbound Interstate 805 to Park Boulevard	8.1	10.1	8.8	11.8	0.7	1.7
Eastbound Park Boulevard to Interstate 805	7.4	10.9	8.3	17.9	0.9	7.0

5.13 SUMMARY OF FUTURE NO BUILD CONDITIONS

The SANDAG traffic model was used to forecast the Horizon Year 2030 No Build Conditions for University Avenue and other roadways within the study area. Average daily traffic volumes and transit ridership data were calculated by the SANDAG model and post-processed to evaluate the operating conditions along the corridor if no physical conditions were changed on University Avenue by the year 2030. Improvements to El Cajon Boulevard, planned signal improvements along the corridor, and transit improvement projects in the study area were taken into consideration when the Horizon Year 2030 No Build ADT volumes were forecast using the traffic model. Since the City of San Diego does not maintain interim year traffic models, Year 2010 volumes were forecast by calculating a growth rate factor based on existing and 2030 ADT volumes. Year 2010 conditions reflect the project's opening year.

The No Build operational analysis shows that traffic volumes will continue to increase throughout the Greater North Park community. The majority of University Avenue is forecast to operate at deficient LOS based on roadway segment capacity thresholds established by the City of San Diego.

Under the No Build scenario, passenger vehicle travel times are anticipated to increase for both passenger vehicles and transit vehicles along the corridor when compared to the existing travel time. Due to the forecast increase in traffic along University Avenue based on the SANDAG traffic model, unsignalized intersection operations are forecast to experience the greatest increase in delay. Of the 18 unsignalized

intersections along the corridor, three are forecast to operate deficiently along the side streets in 2010. By 2030, the number of deficient unsignalized intersections increases to 11 intersections. This is typically due to the delay imposed to vehicles attempting to turn left or go through from the side streets onto or across University Avenue.

Due to the overall increase in traffic volumes along the corridor, transit travel times are projected to increase. Ridership is forecast to increase by approximately nine percent by 2030. No increase in service is currently programmed by SANDAG for the corridor. Existing capacity on the system is sufficient to meet the forecast demand by the year 2030.

As land uses along University Avenue intensify and integrate mixed-use type projects, pedestrian demands along the corridor will increase. Improvements to the sidewalks along University Avenue will be necessary to both accommodate and encourage pedestrian activity. The widths of sidewalks and amenities at the transit stops will need to be evaluated to ensure that adequate space is provided for existing and future transit users.

Bicycle traffic along University Avenue is currently very light, with less than 15 bicycles on the corridor during the peak hours. Bicycle ridership along University Avenue is not anticipated to significantly increase in the No Build scenarios due to the constrained capacity, and undesirable conditions along the corridor. Recreational bicyclists will continue to use parallel routes such as North Park Way and Lincoln Avenue unless bicycle facilities are provided along University Avenue in the future.

Chapter Six – Preferred Concept Plan Conditions

6.0 INTRODUCTION

The Preferred Concept Plan is made up of several traffic calming elements intended to slow traffic along University Avenue, making it a more pedestrian friendly and safer corridor to travel. This chapter focuses on the elements of the Preferred Concept Plan and how they affect each mode of transportation.

It also presents the results of the VISSIM microsimulation model operational analysis of the corridor. The measures of effectiveness that describe the operating conditions of the corridor with the elements of the Preferred Concept Plan in place are summarized at the end of this chapter.

6.1 ELEMENTS OF THE CONCEPT PLAN AFFECTING TRAFFIC

In this report, the term "traffic" refers to vehicles traversing the corridor that are not transit vehicles. This includes passenger vehicles, delivery trucks, school buses, semi-truck and trailer units, trash trucks, etc. These vehicles carry goods and people into and out of the study corridor. Currently four lanes are provided along most of University Avenue for traffic, with the exception of the segments between Idaho Street and Iowa Street where only one lane in the westbound direction is provided. Traffic shares the roadway with transit vehicles and bicycles.

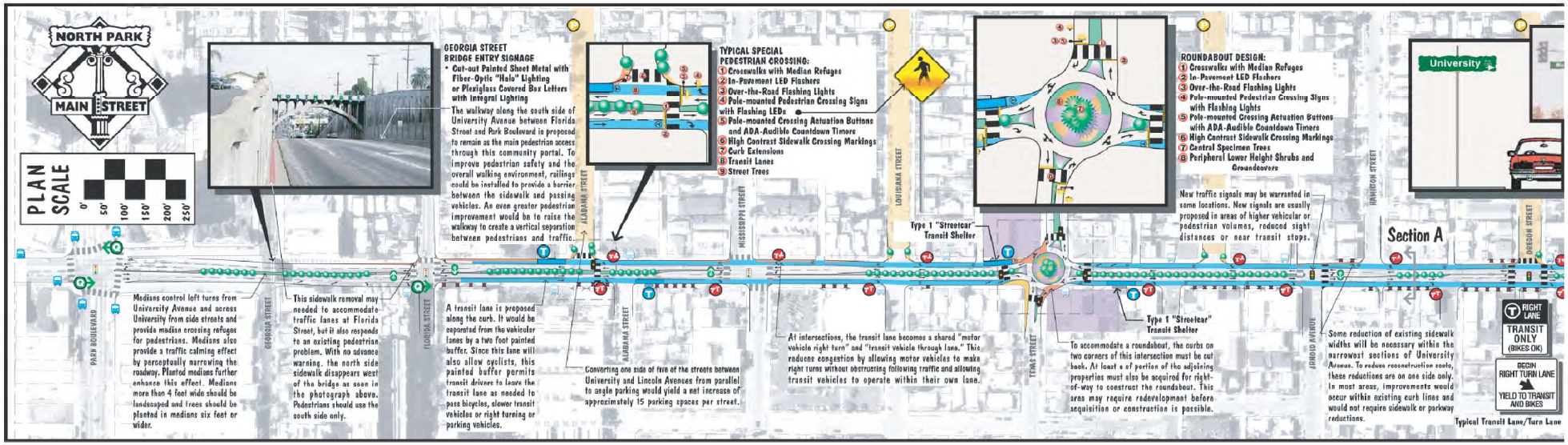
The Preferred Concept Plan, as drafted for the University Avenue Traffic Calming project by KTU+A, is provided in Exhibit 6-1. Elements of the Preferred Concept Plan that will affect the flow of traffic through the corridor are:

- Constrained Capacity due to Transit Only Lanes
- On-Street Parking between Idaho Street and Iowa Street
- Roundabout at Texas Street
- Raised Median
- Spacing of Traffic Signals

Transit Only Lanes

As proposed, the outside or curb lane along University Avenue would serve as a dedicated transit only lane through much of the corridor. The number of lanes on University Avenue available to traffic would therefore be reduced by 50 percent through most of the corridor to allow for this transit only lane.

Dedicated turn lanes and the raised median would improve the flow of traffic along the corridor; therefore the daily capacity of University Avenue would remain unchanged at 15,000 vehicles per day. The greatest impact to traffic would occur during the peak hours. Based on daily traffic volume counts collected along University Avenue, the a.m. peak hour traffic volumes account for approximately six



Source: "University Avenue Traffic Calming Conceptual Study, November 2002, KTU+A

PREFERRED ALTERNATIVE A

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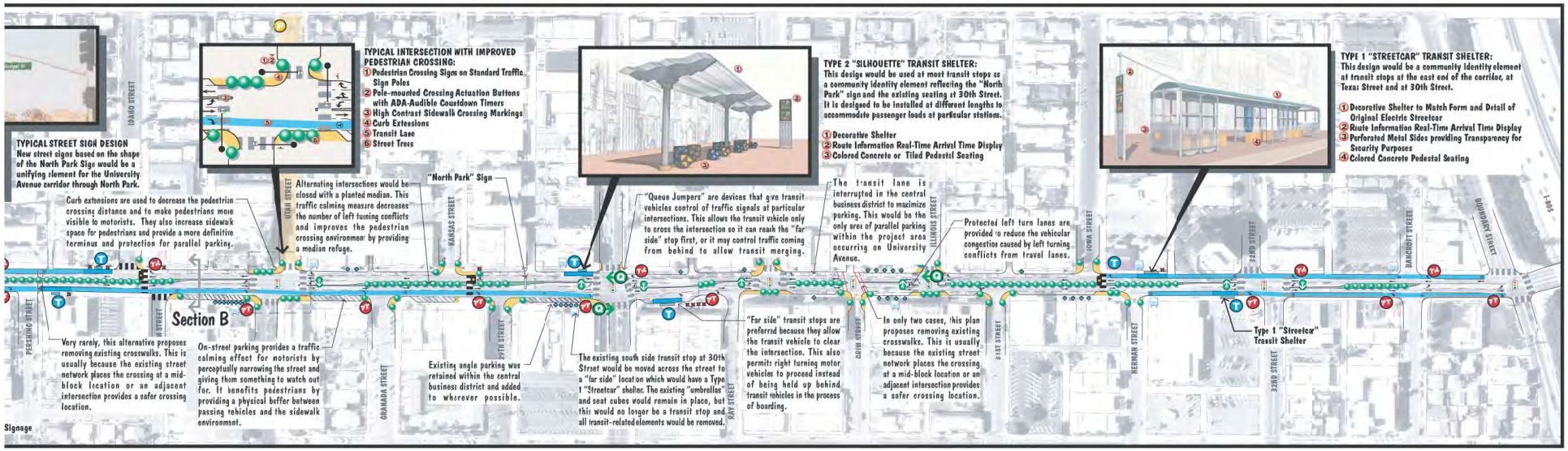
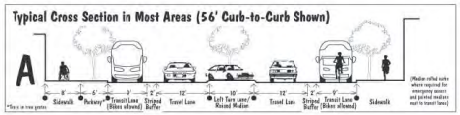
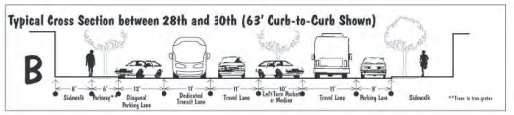


SUMMARY

5 Lane Option - 1 Unobstructed Vehicular Lane Each Way with Protected Left Turn Pockets and Medians for increased control of crossing traffic and elimination or unprotected and uncontrolled left turns from travel lanes, with Transit Lanes Each Way except within CBD: Install dedicated transit lanes striped separate from vehicular lanes throughout except for within CBD.

SECTIONS





Source: "University Avenue Traffic Calming Conceptual Study, November 2002, KTU+A

percent of the total daily traffic and the p.m. peak hour traffic volumes account for approximately nine percent of the total daily traffic.

During the peak hour, each lane along University Avenue carries approximately 530 vehicles per hour. Existing traffic volumes along the corridor show that on the average between Boundary Street and Park Boulevard:

- 400 vehicles travel eastbound in the a.m. peak hour
- 650 vehicles travel westbound in the a.m. peak hour
- 980 vehicles travel eastbound in the p.m. peak hour
- 660 vehicles travel westbound in the p.m. peak hour

Based on the peak hour capacity threshold of 850 vehicles per lane per hour, existing traffic volumes exceed the theoretical capacity of a single lane in the eastbound direction during the p.m. peak hour. The methodology for establishing this threshold is discussed in section 6.5. If the Preferred Concept Plan were constructed overnight, high delay and queues would result, as volumes would exceed capacity. Over time, traffic will divert to alternate routes until a stable condition is reached. By the year 2030, traffic volumes along University Avenue are forecast to increase due to the Community Plan density increases along the corridor. As a result of this growth and due to the constrained capacity through this 1.9-mile section of University Avenue, an increase in traffic volume will be diverted to parallel routes.

On-Street Parking

Parallel on-street parking was proposed to remain unchanged through much of the core section of University Avenue in the Preferred Concept Plan. This core section extends from Idaho Street to Iowa Street, with on-street parking on the north and south sides of University Avenue. Angled or diagonal parking spaces that are currently provided along University Avenue were also proposed to remain unchanged. All parallel parking would be lost to the west of Idaho Street due to the transit only lanes and raised median.

Between Idaho Street and Iowa Street, transit vehicles would merge with through traffic into a single lane to navigate around the parallel on-street parking. This would result in an increase in merge and weave maneuvers through the core of the corridor due to the transitioning of transit vehicles into the mixed flow or traffic lane. The maneuvering of the transit vehicles into the mixed flow lane will impose additional delays and stop time to vehicles traveling in the mixed flow inside lanes of University Avenue.

The forecast traffic volumes along the corridor during the peak hours under the Preferred Concept Plan would result in an underutilization of parking along University Avenue. Although parking spaces may be provided, the slow, steady flow of peak hour traffic in one lane would create an unfriendly environment

for vehicles to attempt to park. Drivers may be intimidated to back into or stop on-coming traffic to access a parking space.

If a driver chooses to use the parallel parking spaces along University Avenue, that vehicle would need to back up into oncoming traffic to parallel park in most parking spaces. Where parallel parking is preserved along University Avenue, lane widths are approximately 8 feet for parking and 10 to 11 feet for mixed flow traffic. The plan also includes a raised median. With the raised median, there would be no buffer for the mixed flow traffic. Therefore, queues will form behind any vehicle attempting to pull into a parallel parking space, and will continue to lengthen until the vehicle is out of the travel way.

Roundabout at Texas Street

As proposed in the Preferred Concept Plan, the roundabout at Texas Street would be a single lane roundabout. Approaching the roundabout from the east and from the west, transit vehicles and mixed traffic merge into a single lane to traverse the roundabout. Speeds through the roundabout are designed to be approximately 18 mph. Forecast traffic volumes for the intersection of Texas Street and University Avenue exceed the capacity of a single lane roundabout. Due to the inadequate capacity of the single lane roundabout, queues would develop that block upstream and downstream intersections, and block access from the side streets.

Raised Median

The Preferred Concept Plan includes a raised median planned for the length of the corridor. Median breaks were proposed only at the signalized intersections.

By introducing a raised median, left turn access to and from unsignalized side streets would be prohibited. Vehicles exiting these unsignalized side streets would be forced to make a right turn. U-turns would not be permitted along University Avenue. Therefore, vehicles that currently go through at or turn left off the side streets onto University Avenue would be required to find an alternate route. Similarly, vehicles wishing to turn left from University Avenue onto an unsignalized side street would be required to turn left at the previous signalized intersection or bypass their destination and turn left at the next signalized intersection. This would result in some re-routing of traffic along Lincoln Avenue, North Park Way, and Wightman Street, as well as on the side streets intersecting University Avenue at signalized intersections.

Spacing of Signalized Intersections

To maintain a smooth flow of traffic, the signalized intersections along the corridor will need to be coordinated. This is the process of setting the signal timing such that vehicles traveling along University Avenue receive the green indication at as many signalized intersections as possible. This will be necessary to help the forecast traffic volumes traverse the corridor and minimize delays, stops and driver frustration. The more closely spaced intersections are, the more critical coordination becomes. If the

signals for closely spaced intersections are not coordinated, queues will form that may affect the operations of the upstream intersections and the corridor as a whole.

6.2 ELEMENTS OF THE CONCEPT PLAN AFFECTING TRANSIT

Queue Jumper Lanes

The Preferred Concept Plan provides six queue jumper lanes. The purpose of the queue jumper lane is to help reduce traffic signal delay for transit vehicles in the corridor and improve overall transit travel time. Queue jumpers allow buses to bypass queuing cars waiting at traffic signals, allowing them to reach the transit stops faster, bypass intersection congestion, and help ensure transit vehicles don't miss the signal cycle.

Queue jumpers are only effective at signalized intersection where heavy queues are created or anticipated. Three (3) of the Preferred Concept Plan queue jumper lanes would be serving the westbound lanes. These lanes are located at:

- Illinois Street
- 30th Street
- Park Boulevard

The Preferred Concept Plan queue jumper lanes serving the eastbound lanes would be located at:

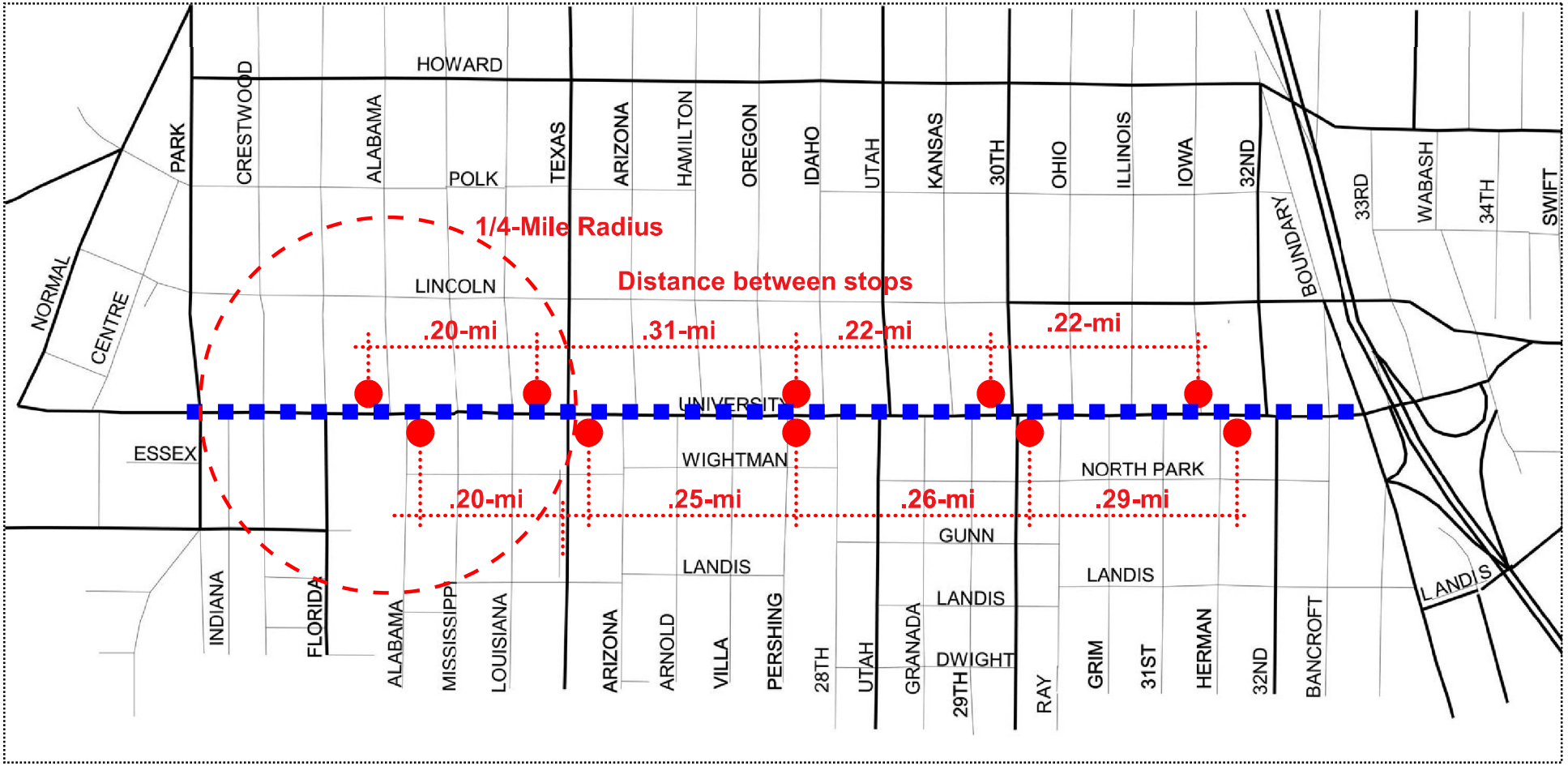
- Park Boulevard
- Florida Street
- 30th Street

In order for queue jumper lanes to provide significant benefit, intersection queues need to regularly extend more than four (4) cars per lane. When a queue jump lane is shared with a right turning vehicles and there are high volumes of right-turning vehicles (particularly at intersections with high pedestrian crossing activity), the effectiveness of these queue jumpers is reduced.

Reduction of Transit Stops

As stated earlier there are 20 existing transit stops serving the corridor from Interstate 805 to Park Boulevard. The existing stops are evenly divided with 10 stops serving the westbound routes and 10 serving the eastbound routes. Both Routes 7 and 908 utilize the same transit stops.

The Preferred Concept Plan would reduce the number of transit stops from 20 to 10 as illustrated in Exhibit 6-2. Again, the stops are evenly divided with five (5) serving the westbound routes and five (5)



● Route 7 and 908 Proposed Transit Stops

.20-mi Distance Between Stops

Not to Scale

LOCATION OF PROPOSED TRANSIT STOPS WITHIN STUDY AREA

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 6-2

RBF
CityWorks
cityworks
CityWorks: a joint venture of Collaborative Services & Warner Architecture + Design

serving the eastbound routes. This reduction is intended to consolidate the passengers boarding and alighting areas, allow for fewer stops, and provide faster transit service within the corridor.

Consolidation of stops would lead to a decrease in travel time within the corridor. SANDAG/MTS has found that transit stop consolidation can have a time savings of typically 15-seconds for each eliminated stop.

With the reduction of transit stops, the redistribution of passengers to the new transit stop locations would occur. As part of this analysis, a table was prepared showing the potential redistribution of the passengers based on the transit stop reductions. The redistribution is used to calculate dwell times and help define the overall transit travel time with the study area. Table 6-1 shows these redistributions of passengers. Table 6-2 summarizes the forecast dwell times for the 2030 with Preferred Concept Plan scenario based on the VISSIM model runs for the Preferred Concept Plan conditions.

Table 6-1
2030 With Preferred Concept Plan
Ridership Forecast – Route 7 & Route 908

Westbound Station Locations	Route 7	Route 908	Total	RANK
Iowa St.	395	140	535	**4**
30th St.	1019	473	1492	**1**
Idaho St.	251	109	360	**6**
Texas St.	640	136	776	**3**
Alabama St.	248	138	386	**5**
Park Blvd.	877	243	1120	**2**
Eastbound Station Locations	**Route 7**	**Route 908**	**Total**	**RANK**
Park Blvd.	686	210	896	**2**
Alabama St.	314	148	462	**4**
Texas St.	279	108	387	**6**
Pershing St.	341	108	449	**5**
30th St.	997	422	1419	**1**
32nd St.	394	149	543	**3**

Table 6-2
2030 with Preferred Concept Plan
Dwell Time Summary

Eastbound Route 908 Stop Locations	AM			PM		
	Boarding (Pass./Hr)	Alighting Trip %	Average Dwell (Sec/Stop)	Boarding (Pass./Hr)	Alighting Trip %	Average Dwell (Sec/Stop)
Alabama Street	2	17%	10.0	9	3%	11.4
Texas Street	6	0%	10.7	3.5	12%	12.9
Pershing Avenue	6	7%	11.8	6.5	7%	10.9
30th Street	14	27%	14.5	23.5	46%	22.3
Grim Avenue	2	12%	9.6	8.5	17%	12.9

Westbound Route 908 Stop Locations	AM			PM		
	Boarding (Pass./Hr)	Alighting Trip %	Average Dwell (Sec/Stop)	Boarding (Pass./Hr)	Alighting Trip %	Average Dwell (Sec/Stop)
Iowa Street	6	1%	9.1	18	5%	15.1
30th Street	35	13%	26.5	18.5	52%	18.8
Oregon Street	9	0%	0.0	7.5	0%	0.0
Louisiana Street	5	0%	0.0	13	0%	0.0
Alabama Street	4	18%	16.7	14	17%	20.0

Eastbound Route 7 Stop Locations	AM			PM		
	Boarding (Pass./Hr)	Alighting Trip %	Average Dwell (Sec/Stop)	Boarding (Pass./Hr)	Alighting Trip %	Average Dwell (Sec/Stop)
Alabama Street	11	2%	11.6	19	4%	11.0
Texas Street	8	7%	10.7	17	9%	12.9
Pershing Avenue	9	5%	11.2	17	5%	10.3
30th Street	21	18%	16.8	81	26%	25.9
Grim Avenue	10	6%	14.4	29	8%	20.0

Westbound Route 7 Stop Locations	AM			PM		
	Boarding (Pass./Hr)	Alighting Trip %	Average Dwell (Sec/Stop)	Boarding (Pass./Hr)	Alighting Trip %	Average Dwell (Sec/Stop)
Iowa Street	16	4%	13.6	19	7%	13.2
30th Street	25	22%	19.1	43	29%	23.1
Oregon Street	13	6%	15.6	7	6%	11.6
Louisiana Street	25	2%	18.4	16	8%	14.0
Alabama Street	10	1%	12.1	5	6%	10.2

Farside Transit Stops

All of the proposed transit stops have been established as far side locations. The purpose for placing the stops on the far side of intersections, as shown in the Preferred Concept Plan, is to provide for improved transit times. Far-side transit stop are a preferred location by most transit agencies including SANDAG and MTS. Far-side stops have the added benefit of:

- Minimizing conflicts with right turning vehicles.
- Minimizing sight distance safety conflicts for both pedestrians and motorists.
- Encouraging pedestrians to cross behind the bus rather that in front of it.
- Better facilitating bus reentry into mixed-flow traffic.
- Allowing the transit vehicle to pass the intersection before loading/unloading passengers thereby eliminating the potential need to wait through another signal cycle.

Impacts of Pedestrian Crossings on Transit Operations

In the Preferred Concept Plan the pedestrian crossings have been restricted to either signalized intersections or selected unsignalized marked crossings. The proposed unsignalized crossings are co-located with nearby transit stops at:

- Iowa Street
- Idaho Street
- Alabama Street

A high volume of pedestrians crossing at either the signalized intersections or unsignalized crossings may affect the transit vehicles travel times (particularly at peak travel periods). The pedestrian crossing could reduce the available cycle time for the transit signal priority thereby affecting the overall transit travel time through the corridor.

Transit Signal Priority

Transit signal priority provides preferential treatment for transit vehicles at traffic signals. This can be accomplished in several ways. The simplest strategy is to set basic timings for intersection approaches to favor approaches used by transit vehicles. Another strategy is to provide initial "signal preference" for transit vehicles stopped at the intersection. This method works in conjunction with queue jumping and dedicated transit lanes, whereby transit vehicles receive a short exclusive transit phase to get a head-start on the other traffic.

Roundabout at Texas Street

The Preferred Concept Plan includes a single lane roundabout at the intersection at Texas Street. The roundabout is intended to reduce turning conflicts, slow down through traffic, and maintain a steady flow of traffic through the intersection.

The roundabout would have an impact on transit vehicles by possibly changing the travel speed from that through a typical signalized intersection. The operational analysis helped determine whether the roundabout would help or hinder transit mobility within the corridor.

Transit Only Lane

Transit only lanes (both eastbound and westbound) are proposed to address and minimize the conflicts with general traffic. Obviously, the transit only lanes would have the greatest effect on transit mobility and travel time within the corridor. For westbound transit vehicles the transit only lanes extend from:

- Boundary Street to Illinois Street, and from
- Idaho Street to Florida Street

For eastbound transit vehicles the transit only lanes extend from:

- Florida Street to 30th Street, and from
- Herman Street to Boundary Street

Under the Preferred Concept Plan design, the main issue for the transit only lanes is potential problems where the transit vehicles would be required to merge from the transit only lanes into the mixed-flow lanes. These merge points occur at the transition into the mixed-flow lane due to on-street parking in the commercial core area, when entering the roundabout at Texas Street, and when leaving the project study area where the transit only lanes end.

Curb Extensions (Bulb-outs)

Curb extensions or pedestrian bulb-outs are extensions of the sidewalk into the street providing a wider waiting area for pedestrians or transit passengers at intersections and unsignalized crosswalks. Most curb extensions (bulb-outs) extend the sidewalk toward the traffic lane, reducing the curb-to-curb distance and pedestrian exposure time to moving vehicles.

The Preferred Concept Plan includes multiple locations for these curb extensions (bulb-outs) to occur. Typically the bulb-outs are associated with major intersections, unsignalized pedestrian crossings, transit stops and protective areas for on-street parking.

Curb extensions (bulb-outs) at bus stops can reduce delay for buses and provide an enhanced passenger-waiting environment. Bulb-outs at transit stops reduce travel times by eliminating the time normally lost after stopping to board passengers when buses wait for an acceptable gap to re-enter traffic because the bus stops in the parking or dedicated transit only lane.

On-Street Angled Parking

The Preferred Concept Plan maintained on-street angled parking on the south side of University Avenue from 28th Street to 30th Street. Although not as disruptive as parallel parking maneuvers, angled on-street parking can have an impact on traffic flow. Parked cars backing up into oncoming traffic can cause momentary delays. This is especially true during peak traffic periods.

In the Preferred Concept Plan the angled parking is adjacent to the eastbound transit only lane from 28th Street to 30th Street. Cars leaving the parking spaces would back into the transit only lane. This movement could create problems for transit vehicles and interrupt the bus progression through the corridor. However, given the headway times of 6-minutes (peak period) and 10-minutes (non-peak period) conflicts between the parked cars and transit vehicles should be minimal.

6.3 ELEMENTS OF THE PREFERRED CONCEPT PLAN AFFECTING PEDESTRIANS

Pedestrians stand to gain the most benefit from the Preferred Concept Plan. In addition to slower moving traffic, more frequent and improved warnings and markings will be provided for pedestrians to cross from one side of University Avenue to the other. Table 6-3 summarizes the distances between crossings along University Avenue with the Preferred Concept Plan.

New Enhanced Pedestrian Crossings

In the Preferred Concept Plan enhanced pedestrian crossings are proposed on University Avenue at four locations:

- Herman Avenue
- Kansas Street
- Idaho Street
- Alabama Street

In addition, enhanced pedestrian crossings are proposed on three side streets at University Avenue:

- 28th Street
- Idaho Street
- Alabama Street

At the locations crossing University Avenue, in pavement flashers would notify oncoming traffic of the presence of a pedestrian along side or within the crosswalk. At the enhanced pedestrian crossings across the side streets, bulb-outs and improved pavement markings are planned. Although the in-pavement flasher technology is currently available, the City of San Diego is in the process of selecting a preferred technology to be implemented Citywide. Typical operations require that a pedestrian press a button to activate the in pavement flashing devices. This will require a 4-foot post, pedestrian push button, and power source.

Table 6-3
Preferred Concept Plan Distance Between
Marked Crosswalks Across University Avenue (North-South)

From	To	Future Distance	Topography
Park Boulevard	Florida Street	705’	Steep Grade Under Georgia Bridge
Florida Street	Mississippi Street	685’	Steep Grade
Mississippi Street	Texas Street	510’	Steep Grade
Texas Street	Arnold Street	535’	Steep Grade
Arnold Street	Oregon Street	425’	Steep Grade
Oregon Street	Idaho Street	360’	Partial Grade
Idaho Street	Utah Street	250’	Level
Utah Street	Kansas Street	360’	Level
Kansas Street	30th Street	310’	Level
30th Street	Ohio Street	300’	Level
Ohio Street	Illinois Street	300’	Level
Illinois Street	Iowa Street	390’	Level
Iowa Street	32nd Street	280’	Level
32nd Street	Boundary Street	575’	Level

New Traffic Signals

In addition to the enhanced pedestrian crossings, two new traffic signals are proposed on University Avenue with the Preferred Concept Plan:

- Arnold Avenue
- Oregon Street

With the installation of the new traffic signals at these two locations, new crosswalks would be striped on all legs of the intersections. The existing overhead flashing lights and signs at Arnold Avenue and Pershing Avenue would be removed with the installation of these traffic signals.

Removal of Crosswalks

The Preferred Concept Plan would remove existing marked crosswalks at:

- Arnold Avenue (existing unsignalized crossing)
- Pershing Avenue (existing unsignalized crossing)
- Grim Street (existing signalized intersection)

The removal of the unsignalized crossing at Arnold Avenue would occur in conjunction with the installation of the traffic signal at that location. The overhead flashing light and sign associated with the existing unsignalized Arnold Avenue crossing would be removed when the traffic signal is installed. New crosswalks would be striped on all legs of the intersection with the new traffic signal.

Pershing Avenue is located between Oregon Street and the proposed enhanced pedestrian crossing at Idaho Street. The Pershing Avenue marked crosswalk, flashing beacon and sign would be removed with the installation of the traffic signal at Oregon Street.

The Preferred Concept Plan proposes to remove the crosswalk at Grim Street, an existing signalized intersection. Through this section of University Avenue, there are multiple signalized crossing opportunities for pedestrians. By removing the pedestrian crossings on University Avenue (not the traffic signal) at Grim Street, the distance between marked crossings can be maintained at 300 feet or less through the central business district and pedestrians would be encouraged to cross at a safer location.

Curb Extensions (Bulb-outs)

Curb extensions reduce the exposure time for pedestrians as they cross the street by reducing the distance from curb to curb. Bulb-outs can only be provided if on-street parking is provided, otherwise, the bulb-out would extend into a travel lane disrupting the flow of traffic. The Preferred Concept Plan includes bulb-outs on the side streets at the following locations:

- Alabama Street
- Louisiana Street
- Arizona Street
- Oregon Street
- Idaho Street
- Utah Street
- Granada Street
- Kansas Street
- 29th Street
- 30th Street
- Illinois Street
- Iowa Street

Table 6-4 provides a comparison of crossing distances at all locations where bulb-outs are proposed in the Preferred Concept Plan.

Table 6-4
Crossing Distances at Intersections with Proposed Bulb-outs
Preferred Concept Plan

Location	Scenario	Crossing Distance (Curb to Curb)			
		North Leg	South Leg	East Leg	West Leg
University Avenue/Alabama Street	Existing	52’	40’	--	--
	Preferred Concept Plan	30’			
University Avenue/Louisiana Street	Existing	52’	40’	--	--
	Preferred Concept Plan	25’			
University Avenue/Arizona Street	Existing	52’	40’	--	--
	Preferred Concept Plan	30’			
University Avenue/Oregon Street	Existing	42’	--	--	--
	Preferred Concept Plan	24’			
University Avenue/Idaho Street	Existing	52’	--	--	--
	Preferred Concept Plan	24’			
University Avenue/Utah Street	Existing	52’	52’	52’	70’
	Preferred Concept Plan	40’	44’	--	60’
University Avenue/Granada Street	Existing	--	52’	--	--
	Preferred Concept Plan	--	34’	--	--
University Avenue/Kansas Street	Existing	52’	--	--	--
	Preferred Concept Plan	24’			
University Avenue/29th Street	Existing	--	52’	--	--
	Preferred Concept Plan		24’		
University Avenue/30th Street	Existing	52’	52’	62’	76’
	Preferred Concept Plan	35’			
University Avenue/Illinois Street	Existing	52’	--	52’	52’
	Preferred Concept Plan	30’			
University Avenue/Iowa Street	Existing	52’	--	--	--
	Preferred Concept Plan	25’			

Note: Crossing distances affected by intersection pop-outs and the design of side-street parking in accordance with the City of San Diego Street Design Manual. Streets with parallel parking on both sides typically have a wider curb to curb distance at intersection pop-outs than streets with angled parking on both sides. Angled parking protrudes further into the travel way, which often doubles as a traffic calming measure.

Relocation of Transit Stops

Currently, transit stops are located approximately 0.12 miles apart (approximately 500 feet) on either side of University Avenue. A total of 20 transit stops, 10 eastbound and 10 westbound serve Route 7 and Route 908. The Preferred Concept Plan would result in the consolidation of these 20 transit stops to 10 stops, 5 eastbound and 5 westbound.

The consolidation of transit stops would result in an increase in walking distance for pedestrians along the corridor. Table 6-5 provides a comparison of walking distances between transit stops.

Table 6-5
Distance Between Transit Stops
Preferred Concept Plan

Eastbound		Westbound	
Stop Locations	**Distance to Between Stops**	**Stop Location**	**Distance Between Stops**
Park Blvd. to Alabama St.	1,000’	Iowa to 30th St.	1,230’
Alabama St. to Texas St.	1,000’	30th St to Idaho St.	1,360’
Texas St. to Idaho St.	1,520’	Idaho St. to Texas St.	1,100’
Idaho St. to 30th St.	1,070’	Texas St to Alabama St.	1,090’
30th St. to Iowa St.	1,290	Alabama St. to Park Blvd.	1,360’

6.4 ELEMENTS OF THE PREFERRED CONCEPT PLAN AFFECTING BICYCLES

Transit Only Lane

Bicycles currently share the travel way with passenger vehicles, trucks and buses. Under the Preferred Concept Plan, bicycles would be allowed to travel in the transit only lane. Transit vehicles travel at approximately 6 to 10 minute headways along University Avenue. With 11 feet of travel way, bicycles would be provided more capacity with the transit only lane as proposed in the Preferred Concept Plan than in existing or 2030 No Build conditions.

However, if the Historic Streetcar moves forward and is implemented (refer to Chapter 10), tracks would be installed in this transit only lane. Tracks in the transit only lane would preclude bicycles from sharing this lane due to safety issues associated with bike tires and light rail track.

Through the most populated portions of the corridor with the highest traffic volume (Idaho Street to Iowa Street), the transit lane would end and on-street, parallel parking would be permitted. The mixed flow

lane through this section is approximately 10 to 11 feet wide through this section and is sandwiched between the raised median and the parking lane. The potential for car doors opening into traffic and the elimination of buffer area created by the raised median would, create an unsafe environment through the core of the University Avenue corridor for bicycles. Bicycle activity along University Avenue through the core would be anticipated to decrease due to the constrained conditions with the Preferred Concept Plan.

New Traffic Signals & Enhanced Pedestrian Crossings

Many of the benefits identified for pedestrians also apply to recreational bicyclists. Although most bicyclists use parallel routes to University Avenue such as North Park Way and Lincoln Avenue, the enhanced crossings across University Avenue and the new traffic signals at Oregon Street and Arnold Street will improve access north and south of the corridor.

6.5 SANDAG Traffic Modeling Efforts

Chapter 5 discussed the details of the traffic modeling efforts for this project. As discussed in Chapter 5, the SANDAG Series 10 traffic model for the City of San Diego was used to forecast the future 2030 traffic volumes along the corridor. Capacity constraints were imposed along the corridor to reflect the Preferred Concept Plan including signals at Oregon Street and Arnold Avenue and the reduction in travel lanes from four to two. With and without Preferred Concept Plan conditions were modeled. In addition to the 2030 forecast traffic volumes for each scenario, several select link reports were produced for each scenario. The select link analysis was vital to the process of evaluating the redistribution of traffic due to the constrained capacity.

Through the modeling efforts, it was determined that a small portion (5 to 10 percent) of the traffic traveling through the corridor travels from one end to the other. Existing conditions data collected for the corridor confirms this model run data. Therefore, most trips entering and exiting University Avenue between Park Boulevard and I-805, from the east or from the west are destined for or are coming from locations within the study area.

The Preferred Concept Plan would reduce the capacity of University Avenue from two lanes in each direction to one lane in each direction plus a transit only lane in each direction for most of its length. The exception is the core of the corridor, between Idaho and Iowa Streets, where capacity is further constrained by eliminating the transit only lanes to accommodate the on-street parallel parking.

The traffic modeling efforts show that approximately ten percent of the traffic along University Avenue would find an alternate route north of the corridor (most probably Lincoln Avenue). Approximately five to ten percent of the traffic would divert to the south of University Avenue, most probably to North Park

Way. Approximately five percent of the traffic would avoid the corridor all together by taking routes such as El Cajon Boulevard and/or Upas Street to avoid University Avenue.

It is anticipated that the diversion of traffic would primarily occur during the peak hours, and when hourly traffic volume along the corridor exceeds the reasonable hourly per lane capacity of the corridor. To assess the amount of peak hour traffic that would be diverted, the peak hour capacity of the roadway was calculated.

In order to calculate the peak hour lane capacity on University Avenue, the peak hour lane capacities and saturation flow rates for the future two-lane roadway with the Preferred Concept Plan scenarios were examined. The HCM analysis conducted for the following signalized intersections internal to the study corridor was compared to determine the average per lane capacity:

- Florida Street
- Texas Street
- Utah Street
- 30th Street
- 32nd Street

The ideal saturation flow rate for a typical travel lane is 1,900 vehicles per hour per lane (vphpl). The "ideal saturation flow rate" is typically achieved when all forms of friction (parked vehicles, narrow lanes, etc) and the effects of traffic signals are minimized. On a corridor such as University Avenue, traffic signals are the main source of capacity reduction, particularly when they are closely spaced. To estimate the prevailing saturation flow rates in each direction along University Avenue where traffic signals control the flow of traffic in the peak hours, the respective "green to cycle" ratios (g/c ratios) were calculated. Then the g/c[1] ratio was multiplied by the ideal saturation flow rate (1,900 vphpl) to obtain the "prevailing saturation flow rate". The average of the saturation flow rates for the examined intersections was roughly 950 vehicles per hour. The calculation worksheet to establish this average saturation flow rate is provided in the Appendix at the end of this report.

In addition, the lane group capacities calculated by the HCM analysis were examined for the sample five intersections along the corridor. In this case, the University Avenue through movement lane group capacity[2] was compared. The average of the lane group capacities (when divided by two to account for a single through lane) was roughly 820 vehicles per hour.

[1] The g/c ratio is the amount of effective green time (green indication plus change interval minus vehicle start-up lost time) over the cycle length.

[2] The lane group capacity refers to the maximum number of vehicles that can be accommodated per lane group.

Based on the HCM and g/c ratio calculations, it was determined that a peak hour lane capacity of 850 vehicles per hour was appropriate for the corridor. As traffic volumes approach or exceed this value, diversion to alternate routes is expected to occur.

6.6 Measures of Effectiveness

Measures of Effectiveness, MOE's, are the criteria by which the operations of the corridor are evaluated and compared. MOE's were defined for each transportation mode for the corridor:

- Traffic: Intersection Delay, Travel Time, Stops
- Transit: Intersection Delay, Travel Time, On-Time Performance, Accessibility

The following two sections provide an overview of the MOE's calculated for the short-term (2010) and horizon year (2030) with Preferred Concept Plan scenarios.

6.7 Near–Term (Year 2010) With Preferred Concept Plan

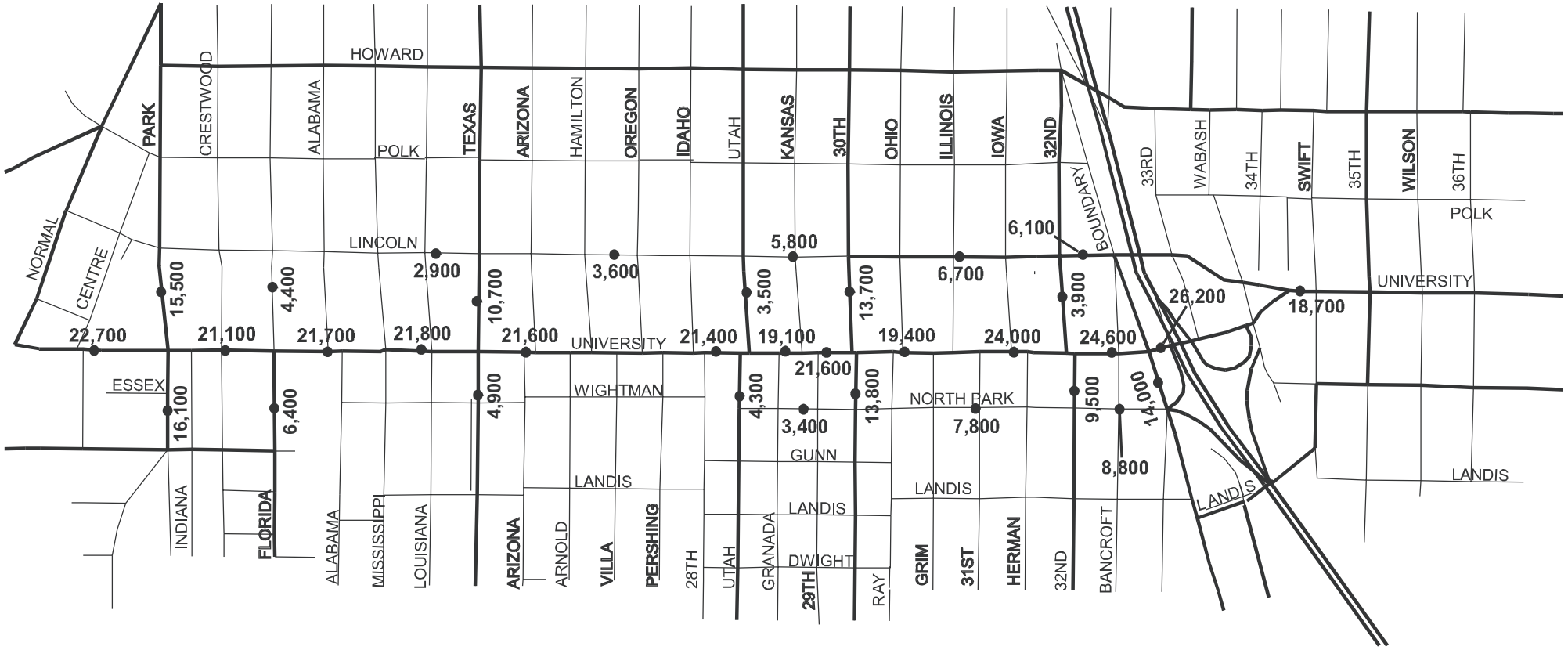
The Near-Term (Year 2010) analysis determined the operating conditions along the corridor in Year 2010 if Preferred Concept Plan were fully implemented. Based on the Implementation Plan, presented in Chapter 9 of this document, if funding were available it would be reasonable to assume that the University Avenue Mobility Plan would be implemented within 5 to 6 years. Therefore, the year 2010 was assumed as the project completion date.

Traffic

The 2030 traffic forecast volumes were compared to existing traffic volumes to derive an overall corridor growth rate factor for the corridor. In general, traffic volumes were assumed to grow at a constant rate over the 6-year period between 2004, when traffic data was collected, and 2010.

Evaluation of existing conditions shows that in the eastbound direction, existing peak hour volumes exceed the available peak hour lane capacity on a two-lane University Avenue. As traffic volume increases by year 2010, the corridor would continue to be constrained by the capacity of a single lane in each direction. Therefore, eastbound traffic along University Avenue in the p.m. peak hour remains relatively constant between 2004, 2010 and 2030. Diverted traffic volumes increase as density increases along University Avenue, in the Greater North Park community and the region as a whole.

Exhibit 6-3 illustrates the 2010 with Preferred Concept Plan scenario average daily traffic (ADT) volumes for the study corridor. Peak hour intersection volumes are illustrated in Exhibit 6-4.

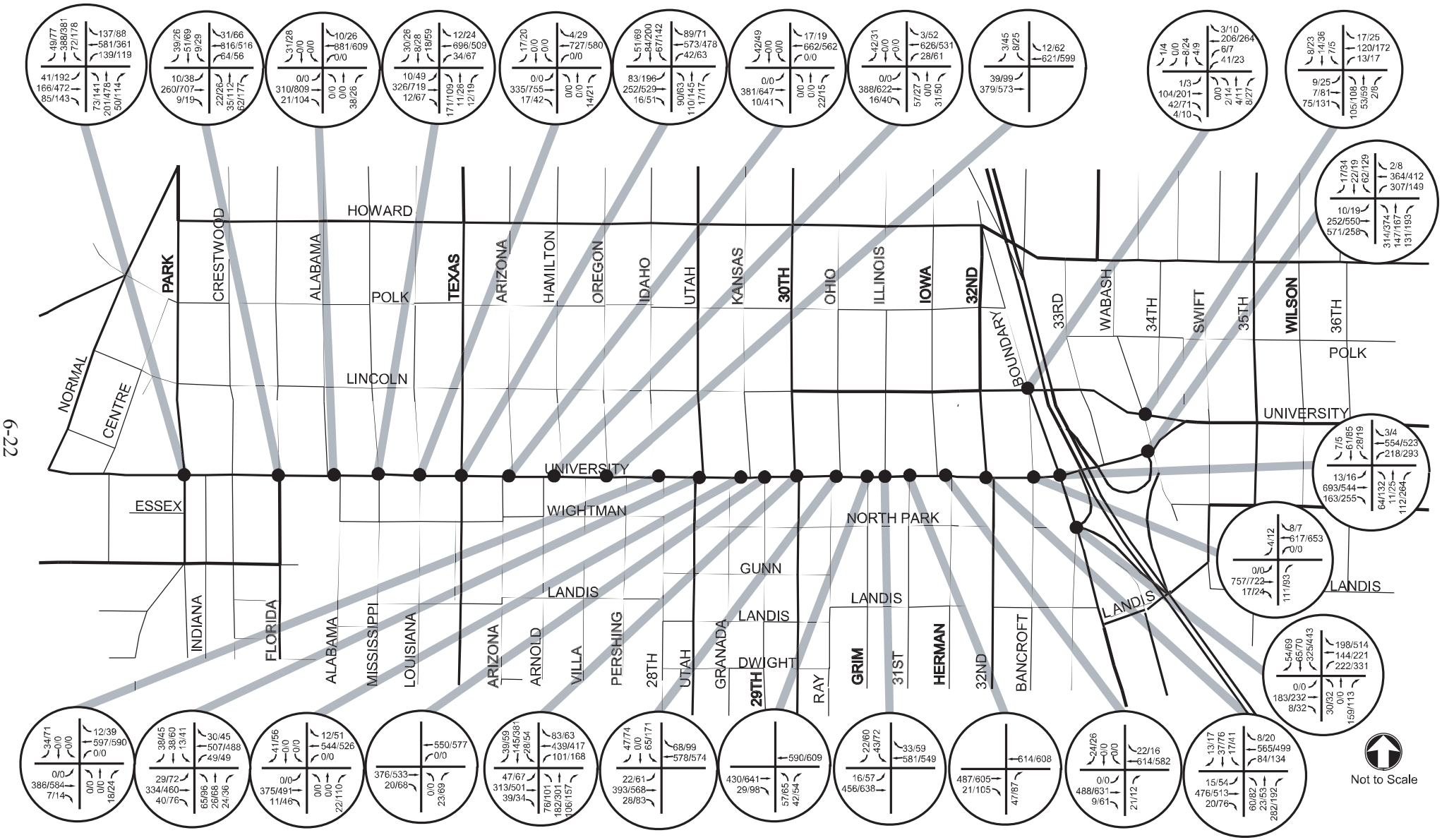


6-21

2010 WITH PREFERRED CONCEPT PLAN ADT

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 6-3



YEAR 2010 WITH PREFFERED CONCEPT PLAN PEAK HOUR VOLUME

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 6-4

Roadway Segment Analysis

The 2010 with Preferred Concept Plan scenario roadway segment level of service analysis for the study area is summarized in Table 6-6. As shown in the table, University Avenue would be expected to operate at LOS F from Park Boulevard to Wabash Avenue by the year 2010 due to the constrained capacity along University Avenue.

With the addition of diverted traffic to the segments of North Park Way, from 30th Street to Boundary Street; 32nd Street, from University Avenue to North Park Way; and Boundary Street, from University Avenue to North Park Way, the roadways would continue to operate at LOS E and F conditions as forecast under 2010 no build conditions.

HCM Intersection Level of Service

Tables 6-7 and 6-8 present the 2010 With Preferred Concept Plan scenario level of service at the signalized and unsignalized study intersections, respectively, based on the HCM methodology.

As shown in Table 6-7, the intersection of University Avenue/Park Boulevard would to operate at LOS F with the Preferred Concept Plan by year 2010. The single-lane roundabout at Texas Street would operate at LOS C in the p.m. peak hour. The analysis of the Preferred Concept Plan includes three new traffic signals: Arnold Avenue, Oregon Street and I-805/Boundary. All future signals would operate at LOS C or better.

Because of the prohibited left turn movement for the unsignalized side streets, the overall level of service for the side streets would generally improve based on the HCM level of service methodology, when compared to no build conditions. As shown in Table 6-8, all side streets would operate at LOS C or better based on the HCM methodology. However, the HCM analysis is not capable of evaluating the interaction between intersections, since HCM is an isolated intersection analysis methodology. Due to the high volume of traffic and the constrained capacity along the corridor, it is anticipated that queues will form along University Avenue that may affect the ability of vehicles on side streets to access University Avenue. Such constraints were observed to occur using the VISSIM software analysis.

Table 6-6
Horizon Year 2010 With Preferred Concept Plan
Roadway Segment Level of Service Analysis

Street	Limit	2010 with Preferred Concept Plan					2010 No Build*			Change in…	
		Class (Lanes)	Capacity	ADT	LOS	V/C	ADT	LOS	V/C	ADT	V/C
University Avenue	Centre to Park	C + LTL (4)	30,000	22,700	D	0.76	22,700	D	0.76	0	0.00
	Park to Florida	C + RM (2)	15,000	**21,100**	**F**	**1.41**	21,100	D	0.70	0	0.71
	Florida to Texas	C + RM (2)	15,000	**21,800**	**F**	**1.45**	**21,800**	**F**	**1.45**	0	0.00
	Texas to Utah	C + RM (2)	15,000	**21,600**	**F**	**1.44**	**22,000**	**F**	**1.47**	-400	-0.03
	Utah to 30th	C + RM (2)	15,000	**21,600**	**F**	**1.44**	**22,000**	**F**	**1.47**	-400	-0.03
	30th to 32nd	C + RM (2)	15,000	**24,000**	**F**	**1.60**	**24,300**	**F**	**2.03**	-300	-0.43
	32nd to Boundary	C + RM (2)	15,000	**24,600**	**F**	**1.64**	24,600	D	0.82	0	0.82
	Boundary to Wabash	Collector (4)	15,000	**26,200**	**F**	**1.75**	**26,200**	**F**	**1.75**	0	0.00
Lincoln Avenue	Louisiana to Texas	Collector (2)	8,000	2,900	B	0.36	2,900	B	0.36	0	0.00
	Texas to Utah	Collector (2)	8,000	3,600	C	0.45	3,000	B	0.38	600	0.07
	Utah to 30th	C + TWLTL (2)	15,000	5,800	B	0.39	5,300	B	0.35	500	0.04
	30th to Boundary	C + TWLTL (2)	15,000	6,700	B	0.45	5,900	B	0.39	800	0.06
	Boundary to Wabash	C + TWLTL (2)	15,000	6,100	B	0.41	5,300	B	0.35	800	0.06
North Park Way	Utah to 30th	Collector (2)	8,000	3,400	B	0.43	2,500	A	0.31	900	0.12
	30th to 32nd	Collector (2)	8,000	**7,800**	**E**	**0.98**	**6,900**	**E**	**0.86**	900	0.12
	32nd to Boundary	Collector (2)	8,000	**8,800**	**F**	**1.10**	**8,500**	**F**	**1.06**	300	0.04

Table 6-6 (continued)
Horizon Year 2010 With Preferred Concept Plan
Roadway Segment Level of Service Analysis

Street	Limit	2010 with Preferred Concept Plan					2010 No Build*			Change in…	
		Class (Lanes)	Capacity	ADT	LOS	V/C	ADT	LOS	V/C	ADT	V/C
Park Boulevard	Lincoln to University	Major (4)	40,000	15,500		0.39	15,500	B	0.39	0	0.00
	University to Essex	Major (4)	40,000	16,100	B	0.40	16,100	B	0.40	0	0.00
Texas Street	Lincoln to University	C + TWLTL (2)	15,000	10,700	D	0.71	9,400	C	0.63	1,300	0.08
	University to Wightman	Collector (2)	8,000	4,900	C	0.61	4,400	C	0.55	500	0.06
Utah Street	Lincoln to University	Collector (2)	8,000	3,500	B	0.44	3,400	B	0.43	100	0.01
	University to North Park	Collector (2)	8,000	4,300	C	0.54	3,800	C	0.48	500	0.06
30th Street	Lincoln to University	C + TWLTL (2)	15,000	**13,700**	**E**	**0.91**	**13,700**	**E**	**0.91**	0	0.00
	University to North Park	C + TWLTL (2)	15,000	**13,800**	**E**	**0.92**	**13,800**	**E**	**0.92**	0	0.00
32nd Street	Lincoln to University	Collector (2)	8,000	3,900	C	0.49	3,900	C	0.49	0	0.00
	University to North Park	Collector (2)	8,000	**9,500**	**F**	**1.19**	**9,100**	**F**	**1.14**	400	0.05
Boundary Street	Lincoln to University	Collector (2)	8,000	1,800	A	0.23	1,800	A	0.23	0	0.00
	University to North Park	Collector (2)	8,000	**14,000**	**F**	**1.75**	**13,700**	**F**	**1.71**	300	0.04

Note: Deficient roadway segment operation shown in bold.
C+TWLTL = Collector with Two-Way Left Turn Lane
C+LTL = Collector with Left Turn Lanes
C+RM = Collector with Raised Median
* 2010 No Build Street Classifications and Capacities are shown in Chapter 5, Table 5-1

Table 6-7
2010 With Preferred Concept Plan
Signalized Study Intersection LOS

Study Intersection	2010 No Build		2010 with Preferred Concept Plan		Change in Delay	
	AM Delay – LOS	PM Delay – LOS	AM Delay - LOS	PM Delay – LOS	AM	PM
University Avenue/Park Boulevard	27.3 – C	**156.2 – F**	27.3 – C	**100.5 – F**	0.0	-55.7
University Avenue/Florida Street	8.5 – A	18.5 – B	11.0 – B	25.4 – C	2.5	6.9
University Avenue/Mississippi Street	8.9 – A	8.2 – A	18.6 – B	16.3 – B	9.7	8.1
University Avenue/Texas Street[1]	22.7 – C	35.3 – D	10.7 – B	21.3 – C	-12.0	-14.0
University Avenue/Arnold Avenue[2]	15.7 – C	23.9 – C	7.2 – A	19.8 – B	-8.5	-4.1
University Avenue/Oregon Street[2]	16.0 – C	21.9 – C	17.5 – B	7.4 – A	1.5	-14.5
University Avenue/Utah Street	11.7 – B	16.3 – B	13.9 – B	19.7 – B	2.2	3.4
University Avenue/30th Street	17.0 – B	35.7 – D	24.6 – C	41.3 – D	7.6	5.6
University Avenue/Ohio Street	4.4 – A	8.1 – A	6.1 – A	9.9 – A	1.7	1.8
University Avenue/Grim Street	3.7 – A	3.7 – A	4.8 – A	5.2 – A	1.1	1.5
University Avenue/Illinois Street	4.0 – A	5.1 – A	3.3 – A	5.5 – A	-0.7	0.4
University Avenue/32nd Street	14.0 – B	24.1 – C	20.7 – C	24.7 – C	6.7	0.6
University Avenue/Boundary Street	19.9 – B	23.3 – C	43.2 – D	39.7 – D	23.3	16.4
University Avenue/Wabash Street	19.6 – B	39.1 – D	21.0 – C	31.0 – C	1.4	-8.1
Lincoln Avenue/Wabash Street	12.9 – B	12.2 – B	9.6 – A	12.6 – B	-3.3	0.4
Boundary Street/I-805 SB Ramps	16.5 – B	17.1 – B	19.0 – B	16.1 – B	2.5	-1.0

Note: Deficient intersection operation shown in bold.

[1] Roundabout under Preferred Concept Plan.

[2] Unsignalized under No Build.

Table 6-8
2010 With Preferred Concept Plan
Unsignalized Study Intersection LOS

Study Intersection	Minor Approach Delay – LOS (Overall Delay)					
	2010 No Build		2010 with Preferred Concept Plan		Change in Delay	
	AM	PM	AM	PM	AM	PM
University Avenue/Alabama Street (NB)	17.1 – C (1.7)	**107.7 – F** (4.5)	10.6 – B (0.3)	18.2 – C (0.3)	-6.5 (-1.4)	-89.5 (-4.2)
University Avenue/Alabama Street (SB)	14.9 – B (0.5)	16.2 – C (0.4)	18.5 – C (0.5)	14.0 – B (0.2)	3.6 (0.0)	-2.2 (-0.2)
University Avenue/Louisiana Street	18.9 – C (1.2)	**35.5 – E** (1.4)	15.4 – C (0.4)	15.9 – C (0.4)	-3.5 (-0.8)	-19.6 (-1.0)
University Avenue/Arizona Street (NB)	13.9 – B (0.6)	21.5 – C (0.5)	10.9 – B (0.2)	13.7 – B (0.2)	-3.0 (-0.4)	-7.8 (-0.3)
University Avenue/Arizona Street (SB)	13.7 – B (0.7)	18.3 – C (0.8)	16.4 – C (0.6)	14.4 – C (0.5)	2.7 (-0.1)	-3.9 (-0.3)
University Avenue/Arnold Street[1]	17.6 – C (1.3)	33.5 – D (1.8)	-	-	-	-
University Avenue/Hamilton Street	13.1 – B (0.6)	20.5 – C (0.9)	17.7 – C (0.7)	15.3 – C (0.4)	4.6 (0.1)	-5.2 (-0.5)
University Avenue/Oregon Street[1]	17.9 – C (0.4)	26.3 – D (1.1)	-	-	-	-
University Avenue/Idaho Street	12.8 – B (0.6)	21.1 – C (1.4)	13.7 – B (0.4)	14.9 – B (0.8)	0.9 (-0.2)	-6.2 (-0.6)
University Avenue/28th Street	13.3 – B (0.6)	18.7 – C (0.4)	11.3 – B (0.2)	15.2 – C (0.3)	-2.0 (-0.4)	-3.5 (-0.1)
University Avenue/Granada Street	10.8 – B (0.5)	28.5 – D (0.5)	11.0 – B (0.2)	15.7 – C (1.4)	0.2 (-0.3)	-12.8 (0.9)
University Avenue/Kansas Street	13.9 – B (1.0)	27.4 – D (1.5)	13.6 – B (0.6)	14.7 – B (0.7)	-0.3 (-0.4)	-12.7 (-0.8)
University Avenue/29th Street	11.9 – B (0.5)	**35.5 – E** (2.1)	11.2 – B (0.3)	15.5 – C (0.9)	-0.7 (-0.2)	-20.0 (-1.2)
University Avenue/31st Street	10.6 – B (0.4)	15.1 – C (0.7)	13.1 – B (0.5)	20.6 – C (1.3)	2.5 (0.1)	5.5 (0.6)
University Avenue/Iowa Street	21.0 – C (0.8)	28.1 – D (1.1)	15.0 – C (0.3)	14.4 – B (0.3)	-6.0 (-0.5)	-13.7 (-0.8)
University Avenue/Herman Avenue	10.4 – B (0.2)	12.3 – B (0.1)	12.2 – B (0.2)	14.8 – B (0.1)	1.8 (0.0)	2.5 (0.0)
University Avenue/Bancroft Street	13.3 – B (1.2)	14.9 – B (1.2)	19.7 – C (1.5)	17.7 – C (1.2)	6.4 (0.3)	2.8 (0.0)
Boundary Street/Lincoln Avenue	12.6 – B (2.4)	13.7 – B (2.6)	13.1 – B (1.8)	15.8 – C (2.4)	0.5 (-0.6)	2.1 (-0.2)

Note: Deficient intersection operation shown in bold.

[1] Signalized under Preferred Concept Plan conditions.

VISSIM Delay Summary

Table 6-9 summarizes the results of the a.m. and p.m. peak hour delay summary for the corridor as a whole and for the individual intersections along the corridor. Table 6-10 presents the travel time and stops per vehicle data calculated by VISSIM.

The results of the travel time analysis indicates the greatest increase in travel time over Existing conditions would occur in the p.m. peak hour. Westbound, the p.m. peak hour passenger vehicle travel time would be approximately 8.3 minutes from Park Boulevard to Boundary Street. Eastbound passenger vehicle travel time would be approximately 11.2 minutes to travel the corridor.

A review of the VISSIM simulation shows that the single-lane roundabout at Texas Street would cause significant queuing both west and east of the intersection.

An additional constraint observed in the VISSIM simulation affecting both directions of travel is the combined mixed-flow/transit lane portion of University Avenue between Idaho Street and Iowa Street. In this section, passenger and transit vehicles are required to merge at points where the transit-only lane ends and feeds into the mixed-flow lanes and at transit stops.

As stated previously in the HCM analysis section, the HCM methodology does not consider the effect of queuing at nearby adjacent intersections. Review of the simulation indicates that performing a right turn onto University Avenue out of a stop-controlled intersection would become difficult with a steady stream of traffic in the single mixed-flow lane and/or a built up queue on University Avenue.

Table 6-9
2010 With Preferred Concept Plan Conditions
VISSIM Measures of Effectiveness Delay Summary

Study Intersection	2010 with Preferred Concept Plan							
	Total Delay[1]		Concurrent Delay[2]		Conflicting Delay[3]		Person Delay[4]	
	AM	PM	AM	PM	AM	PM	AM	PM
University Avenue/Park Avenue	29.8	76.4	24.4	84.5	37.4	67.7	34.3	77.5
University Avenue/Florida Street	9.6	80.7	4.2	75.7	38.7	95.5	9.3	74.1
University Avenue/Mississippi Street	14.4	38.2	6.6	37.9	50.6	39.8	12.5	33.2
University Avenue/Texas Street	19.0	55.2	22.2	58.7	10.9	47.9	15.2	44.8
University Avenue/Arnold Avenue	8.7	22.6	5.8	22.5	41.2	23.7	6.2	17.0
University Avenue/Oregon Street	3.5	12.3	3.2	11.5	35.4	25.5	3.9	10.4
University Avenue/Utah Street	19.6	42.3	14.1	20.9	44.4	114.1	18.4	37.4
University Avenue/30th Street	25.0	48.1	12.6	19.4	44.2	83.0	26.8	47.6
University Avenue/Ohio Street	7.0	12.4	0.7	4.1	42.0	35.8	6.2	10.7
University Avenue/Grim Street	4.1	4.7	0.5	2.1	39.6	35.5	3.6	3.8
University Avenue/Illinois Street	4.8	6.6	2.4	4.4	24.1	22.8	4.3	5.5
University Avenue/32nd Street	23.3	22.8	14.4	20.4	45.0	29.9	20.5	21.0
University Avenue/Boundary Street	26.0	30.6	23.9	27.7	32.6	35.9	24.6	28.1
University Avenue/Wabash Street	35.5	26.5	32.1	25.8	40.1	27.3	38.1	27.7

1. Intersection Delay = Average vehicle delay for all movements at the intersection (sec/veh)
2. Concurrent Delay = Average vehicle delay imposed to eastbound & westbound through vehicles along University Avenue (sec/veh)
3. Conflicting Delay = Average vehicle delay imposed to northbound & southbound vehicles entering or crossing University Avenue (sec/veh)
4. Seconds per person.

Table 6-10
2010 With Preferred Concept Plan
Travel Time / Stops (I-805 to Park Boulevard)

Direction	Travel Time						Stops[1]					
	Existing		2010 with Preferred Concept Plan		Change		Existing		2010 with Preferred Concept Plan		Change	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Eastbound Park Boulevard to Interstate 805	5.9	7.1	6.7	11.2	0.8	4.1	4	5.9	4.7	11.1	0.7	5.2
Westbound Interstate 805 to Park Boulevard	5.6	7.0	5.7	8.3	0.1	1.3	3.8	5.1	3.2	8.4	-0.6	3.3

Transit

SANDAG has estimated that by year 2010, total transit ridership will increase by two percent (2%) over 2003 figures. This would be an increase of approximately 160 daily passengers within the corridor. It is anticipated that this level of increase would not have a significant effect on the overall travel time or service needs for Route 7 or 908. Transit service is not anticipated to change from existing conditions based on the projected 2010 ridership data because there is available capacity on the buses currently running in the corridor.

Table 6-11 provides a summary of 2010 transit vehicle travel times as evaluated using the VISSIM software program. As shown in the table, westbound transit travel times would improve by year 2010 over existing conditions with the implementation of the Preferred Concept Plan. Eastbound travel times on both the 908 and 7, would increase with the Preferred Concept Plan. This is primarily due to the delay imposed at the roundabout, and the constrained operations through the core of the corridor (Idaho Street to Iowa Street), where only one travel lane is provided in each direction for transit vehicles and all other traffic to accommodate on-street parking.

Table 6-11
2010 With Preferred Concept Plan
Transit Travel Times (I-805 to Park Boulevard)

Route / Direction	Existing Conditions		2010 With Preferred Concept Plan		Change in Travel Time	
Route 7	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Westbound Interstate 805 to Park	8.5 min.	9.2 min.	8.5 min.	8.5 min.	0.0 min.	-0.7 min.
Eastbound Park Boulevard to	6.8 min.	9.3 min.	7.6 min.	9.8 min.	0.8 min.	0.5 min.
Route 908	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Westbound Interstate 805 to Park	7.3 min.	9.3 min.	6.9 min.	8.0 min.	-0.4 min.	-1.3 min.
Eastbound Park Boulevard to	6.6 min.	9.9 min.	7.2 min.	10.4 min.	0.6 min.	0.5 min.

6.8 Long-term (2030) With Preferred Concept Plan

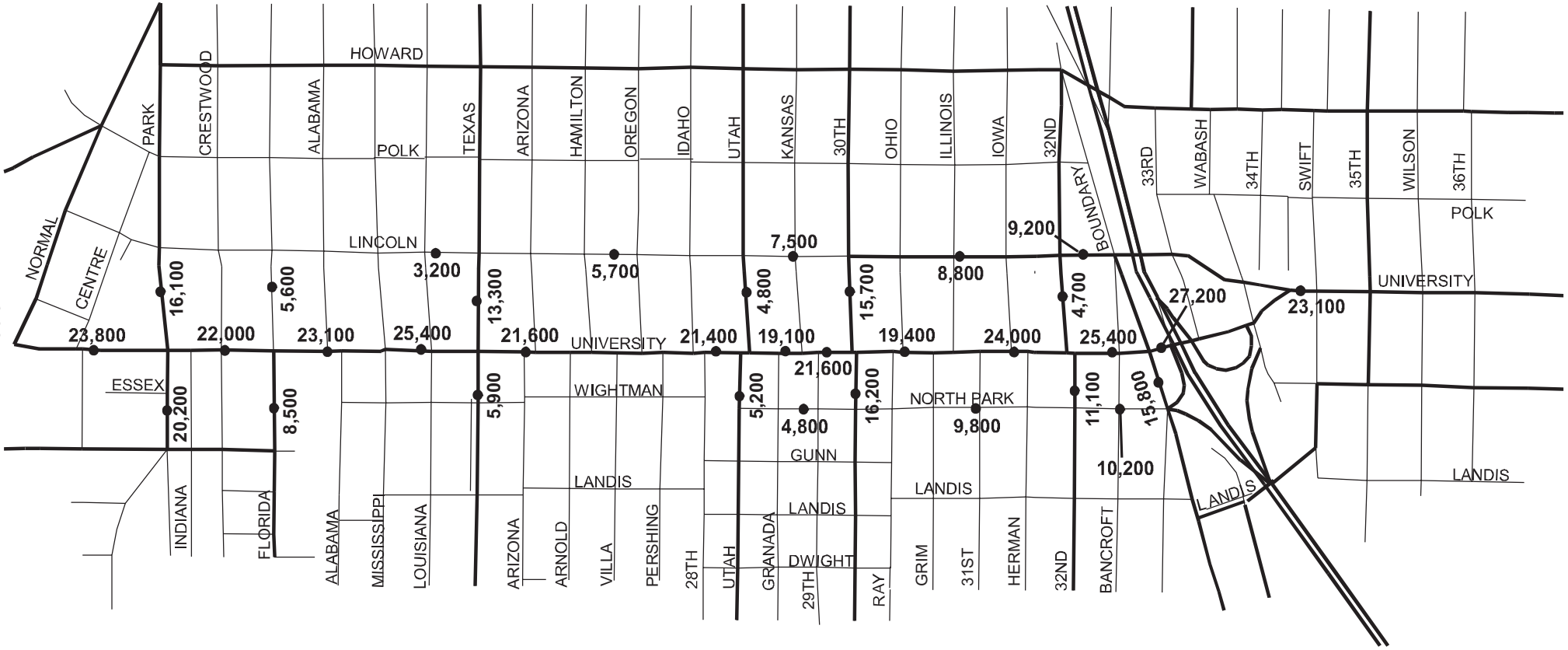
Horizon Year 2030 traffic and transit data was forecast using the SANDAG Series 10 traffic model. The changes made in the model to reflect the "With Preferred Concept Plan" scenarios are outlined herein.

Traffic

Roadway Segments

Horizon Year 2030 With Preferred Concept Plan daily traffic volumes are shown in Exhibit 6-5. To evaluate the 2030 With Preferred Concept Plan operating conditions of the roadway segments within the study area, the ADT volumes were compared to the City LOS thresholds for a two-lane Collector Roadway with a raised median and left turn pockets (Preferred Concept Plan geometry) for University Avenue from Park Boulevard to Boundary Street. No changes to capacity over existing or 2030 No Build conditions were applied to the side streets. A level of service was assigned to each roadway segment based on the level of service thresholds.

The 2030 Preferred Concept Plan roadway segment level of service analysis for the study area is summarized in Table 6-12. As shown in the table, University Avenue is expected to operate at LOS F from Park Boulevard to Wabash Avenue.



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55-100140.001 - February 2004

2030 WITH PREFERRED CONCEPT PLAN ADT

EXHIBIT 6-5

Table 6-12
Horizon Year 2030 With Preferred Concept Plan
Roadway Segment Level of Service Analysis

Street	Limit	2030 with Preferred Concept Plan					2030 No Build*			Change in…	
		Class (Lanes)	Capacity	ADT	LOS	V/C	ADT	LOS	V/C	ADT	V/C
University Avenue	Centre to Park	C + LTL (4)	30,000	23,800	D	0.79	**25,900**	**E**	**0.86**	-2,100	-0.07
	Park to Florida	C + RM (2)	15,000	**22,000**	**F**	**1.47**	24,100	D	0.80	-2,100	0.67
	Florida to Texas	C + RM (2)	15,000	**25,400**	**F**	**1.69**	**27,500**	**F**	**1.83**	-2,100	-0.14
	Texas to Utah	C + RM (2)	15,000	**21,600**	**F**	**1.44**	**27,400**	**F**	**1.83**	-5,800	-0.39
	Utah to 30th	C + RM (2)	15,000	**21,600**	**F**	**1.44**	**28,200**	**F**	**1.88**	-6,600	-0.44
	30th to 32nd	C + RM (2)	15,000	**24,000**	**F**	**1.60**	**30,600**	**F**	**2.55**	-6,600	-0.95
	32nd to Boundary	C + RM (2)	15,000	**25,400**	**F**	**1.69**	**31,000**	**F**	**1.03**	-5,600	0.66
	Boundary to Wabash	Collector (4)	15,000	**27,200**	**F**	**1.81**	**32,300**	**F**	**2.15**	-5,100	-0.34
Lincoln Avenue	Louisiana to Texas	Collector (2)	8,000	3,200	B	0.40	3,300	B	0.41	-100	-0.01
	Texas to Utah	Collector (2)	8,000	5,700	D	0.71	4,700	C	0.59	1,000	0.12
	Utah to 30th	C + TWLTL (2)	15,000	7,500	C	0.50	6,700	B	0.45	800	0.05
	30th to Boundary	C + TWLTL (2)	15,000	8,800	C	0.59	7,500	C	0.50	1,300	0.09
	Boundary to Wabash	C + TWLTL (2)	15,000	9,200	C	0.61	7,900	C	0.53	1,300	0.08
North Park Way	Utah to 30th	Collector (2)	8,000	4,800	C	0.60	3,300	B	0.41	1,500	0.19
	30th to 32nd	Collector (2)	8,000	**9,800**	**F**	**1.23**	**8,300**	**F**	**1.04**	1,500	0.19
	32nd to Boundary	Collector (2)	8,000	**10,200**	**F**	**1.28**	**9,700**	**F**	**1.21**	500	0.07
Park Boulevard	Lincoln to University	Major (4)	40,000	16,100	B	0.40	17,700	B	0.44	-1,600	-0.04
	University to Essex	Major (4)	40,000	20,200	B	0.51	21,000	B	0.53	-800	-0.02

Table 6-12 (continued)
Horizon Year 2030 With Preferred Concept Plan
Roadway Segment Level of Service Analysis

Street	Limit	2030 with Preferred Concept Plan					2030 No Build*			Change in…	
		Class (Lanes)	Capacity	ADT	LOS	V/C	ADT	LOS	V/C	ADT	V/C
Texas Street	Lincoln to University	C + TWLTL (2)	15,000	**13,300**	**E**	**0.89**	11,000	D	0.73	2,300	0.16
	University to Wightman	Collector (2)	8,000	5,900	D	0.74	5,000	C	0.63	900	0.11
Utah Street	Lincoln to University	Collector (2)	8,000	4,800	C	0.60	4,700	C	0.59	100	0.01
	University to North Park	Collector (2)	8,000	5,200	D	0.65	4,400	C	0.55	800	0.10
30th Street	Lincoln to University	C + TWLTL (2)	15,000	**15,700**	**F**	**1.05**	**15,700**	**F**	**1.05**	0	0.00
	University to North Park	C + TWLTL (2)	15,000	**16,200**	**F**	**1.08**	**16,200**	**F**	**1.08**	0	0.00
32nd Street	Lincoln to University	Collector (2)	8,000	4,700	C	0.59	4,700	C	0.59	0	0.00
	University to North Park	Collector (2)	8,000	**11,100**	**F**	**1.39**	**10,400**	**F**	**1.30**	700	0.09
Boundary Street	Lincoln to University	Collector (2)	8,000	2,100	A	0.26	2,100	A	0.26	0	0.00
	University to North Park	Collector (2)	8,000	**15,800**	**F**	**1.98**	**15,300**	**F**	**1.91**	500	0.07

Note: Deficient roadway segments are in bold. Bold items in 'Change in' column reflect a significant traffic impact.
C+TWLTL = Collector with Two-Way Left Turn Lane
C+LTL = Collector with Left Turn Lanes
C+RM = Collector with Raised Median
* 2030 No Build Street Classifications and Capacities are shown in Chapter 5, Table 5-4

The segment of North Park Way, from 30th Street to Boundary Street is forecast to operate at LOS F under the 2030 No Build scenario. This segment would continue to operate at LOS F with the implementation of the Preferred Concept Plan. The section of North Park Way, from Utah Street to 30th Street, is expected to go from LOS B to C under the Preferred Concept Plan.

30th Street, north and south of University Avenue, would continue to operate unacceptably with the Preferred Concept Plan. These segments would operate at LOS F in the future 2030 No Build condition and would remain at that service level. Additionally, the segments of 32nd Street, south of University Avenue, and Boundary Street, south of University Avenue, would both operate at LOS F conditions under the 2030 No Build and Preferred Concept Plan scenarios.

With the anticipated diversion of traffic off of University Avenue due to the implementation of the Concept Plan, the segment of Texas Street, north of University Avenue would expected to operate at LOS E. This segment would to operate at LOS D under the 2030 No Build scenario.

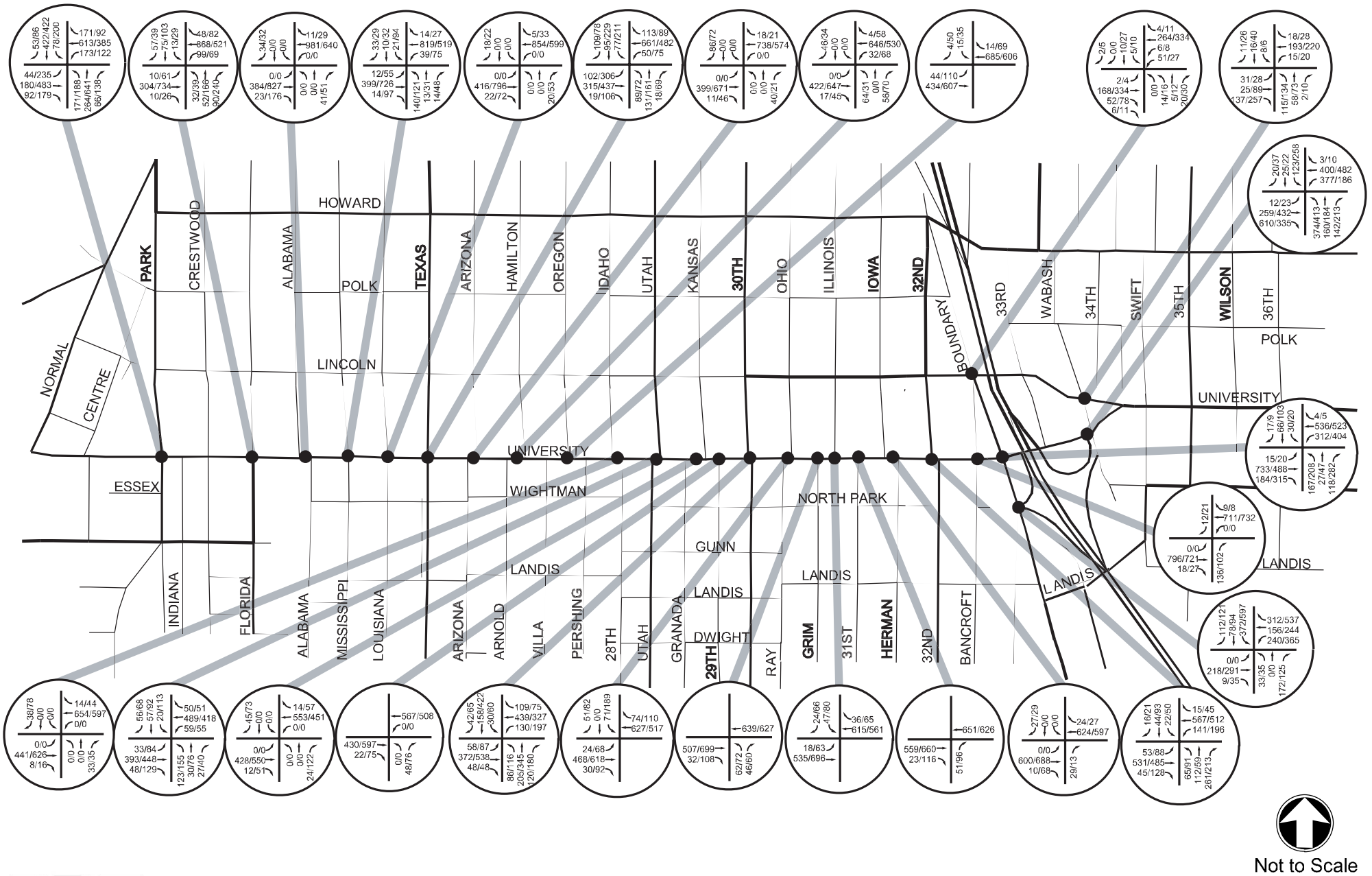
HCM Intersection Level of Service

Peak hour turning movement volumes for the Horizon Year 2030 with Preferred Concept Plan scenario were based upon the existing intersection volumes, the ADT volumes for the Preferred Concept Plan and redistribution of traffic volumes to account for the raised median along the corridor.

To begin, a growth factor was applied to each existing intersection approach volume based on the forecast increase in traffic from the existing ground count to the modeled 2030 with Preferred Concept Plan forecast. The peak hour volumes were then balanced between intersections along the entire corridor. Balancing was necessary in cases where adjacent intersection volumes were found to vary due to the applied growth factor. The lower volume approach or departure was adjusted upward to balance with the higher adjacent approach or departure.

After balancing was completed, turning movement volumes were redistributed to account for the restricted access at all unsignalized intersections due to the raised median in the Preferred Concept Plan. Peak hour traffic volumes that previously turned left from or to the unsignalized side street were reassigned to the nearest signalized intersection. U-turn movements are not currently allowed along University Avenue, nor will they be permitted in the future due to inadequate width. Therefore, it was assumed that traffic would reroute along streets parallel to University Avenue to reach their destination.

Peak hour a.m. and p.m. turning movement volumes for the Horizon Year 2030 With Preferred Concept Plan scenario are presented in Exhibit 6-6. Tables 6-13 and 6-14 present the 2030 With Preferred Concept Plan scenario levels of service at the signalized and unsignalized study intersections, respectively, based on the HCM methodology.



Not to Scale

2030 WITH PREFERRED CONCEPT PLAN PEAK HOUR VOLUME

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 6-6

Table 6-13
2030 With Preferred Concept Plan
Signalized Study Intersection LOS

Study Intersection	2030 No Build		2030 With Preferred Concept Plan		Change in Delay	
	AM Delay – LOS	PM Delay – LOS	AM Delay - LOS	PM Delay – LOS	AM	PM
University Avenue/Park Boulevard	33.4 – C	**223.7 – F**	48.2 – D	**148.5 – F**	14.8	-75.2
University Avenue/Florida Street	10.0 – A	30.8 – C	16.3 – B	40.2 – D	6.3	9.4
University Avenue/Mississippi Street	9.2 – A	11.5 – B	15.3 – B	22.4 – C	6.1	10.9
University Avenue/Texas Street[1]	30.1 – C	46.8 – D	20.5 – C	**45.0 – E**	-9.6	-1.8
University Avenue/Arnold Avenue[2]	19.8 – C	**>120.0 – F**	5.8 – A	17.9 – B	-14.0	-102.1
University Avenue/Oregon Street[2]	24.6 – C	**88.9 – F**	14.0 – B	7.7 – A	-10.6	-81.2
University Avenue/Utah Street	13.0 – B	22.0 – C	20.5 – C	23.2 – C	7.5	1.2
University Avenue/30th Street	18.6 – B	**71.9 – E**	25.3 – C	**59.6 – E**	6.7	-12.3
University Avenue/Ohio Street	5.0 – A	12.2 – B	7.9 – A	10.6 – B	2.9	-1.6
University Avenue/Grim Street	3.9 – A	4.3 – A	6.3 – A	5.9 – A	2.4	1.6
University Avenue/Illinois Street	4.8 – A	7.1 – A	4.2 – A	6.0 – A	-0.6	-1.1
University Avenue/32nd Street	15.4 – B	34.9 – C	22.7 – C	29.5 – C	7.3	-5.4
University Avenue/Boundary Street	24.9 – C	**61.7 – E**	**62.7 – E**	41.1 – D	**37.8**	-20.6
University Avenue/Wabash Street	23.8 – C	**73.6 – E**	25.9 – C	32.0 – C	2.1	-41.6
Lincoln Avenue/Wabash Street	12.1 – B	13.3 – B	12.9 – B	13.0 – B	0.8	-0.3
Boundary Street/I-805 SB Ramps	16.6 – B	20.8 – C	24.8 – C	20.4 – C	8.2	-0.4

Note: Deficient intersection operation shown in bold.

[1] Roundabout under Preferred Concept Plan.

[2] Unsignalized under No Build.

Table 6-14
2030 With Preferred Concept Plan
Unsignalized Study Intersection LOS

Study Intersection	Minor Approach Delay – LOS (Overall Intersection Delay)					
	2030 No Build		2030 With Preferred Concept Plan		Change in Delay	
	AM	PM	AM	PM	AM	PM
University Avenue/Alabama Street (NB)	26.8 – D (2.2)	**>120.0 – F** (24.5)	11.4 – B (0.3)	20.2 – C (0.6)	-15.4 (1.9)	-99.8 (23.9)
University Avenue/Alabama Street (SB)	19.0 – C (0.5)	33.1 – D (0.8)	21.2 – C (0.5)	14.6 – B (0.3)	2.2 (0.0)	-18.5 (0.5)
University Avenue/Louisiana Street	26.9 – D (1.6)	**90.6 – F** (3.9)	17.7 – C (0.4)	18.1 – C (0.8)	-9.2 (1.2)	-72.5 (3.1)
University Avenue/Arizona Street (NB)	13.5 – B (0.8)	**58.8 – F** (1.2)	11.5 – B (0.4)	13.5 – B (0.2)	-2.0 (0.4)	-45.3 (1.0)
University Avenue/Arizona Street (SB)	18.6 – C (1.2)	**36.7 – E** (1.7)	21.4 – C (1.4)	15.3 – C (0.8)	2.8 (0.2)	-21.4 (0.9)
University Avenue/Arnold Street[1]	19.8 – C (1.7)	**>120.0 – F** (10.4)	-	-	-	-
University Avenue/Hamilton Street	16.2 – C (0.8)	**49.4 – E** (1.5)	18.3 – C (0.7)	15.5 – C (0.4)	2.1 (0.1)	33.9 (1.1)
University Avenue/Oregon Street[1]	24.6 – C (0.5)	**88.9 – F** (3.5)	-	-	-	-
University Avenue/Idaho Street	17.1 – C (0.8)	**40.9 – E** (2.3)	14.6 – B (0.5)	15.3 – C (0.9)	2.5 (0.3)	25.6 (1.4)
University Avenue/28th Street	15.0 – C (0.8)	26.7 – D (0.6)	12.1 – B (0.3)	16.7 – C (0.4)	-2.9 (0.5)	-10.0 (0.2)
University Avenue/Granada Street	11.4 – B (0.5)	31.3 – D (2.2)	11.7 – B (0.3)	18.3 – C (1.8)	0.3 (0.2)	-13.0 (0.4)
University Avenue/Kansas Street	16.9 – C (1.1)	**55.1 – F** (2.8)	13.8 – B (0.6)	14.0 – B (0.8)	-3.1 (0.5)	-41.1(2.0)
University Avenue/29th Street	12.4 – B (0.7)	**>120.0 – F** (7.7)	12.3 – B (0.6)	17.7 – C (1.1)	-0.1 (0.1)	-102.3(6.6)
University Avenue/31st Street	11.0 – B (0.4)	20.0 – C (0.8)	14.4 – B (0.6)	25.0 – C (1.6)	3.4 (0.2)	5.0 (0.8)
University Avenue/Iowa Street	34.1 – D (1.1)	**49.1 – E** (1.6)	15.2 – C (0.3)	14.9 – B (0.3)	-18.9 (0.8)	-34.2 (1.3)
University Avenue/Herman Avenue	11.2 – B (0.2)	14.2 – B (0.1)	14.0 – B (0.3)	16.2 – C (0.2)	2.8 (0.1)	2.0 (0.1)
University Avenue/Bancroft Street	16.2 – C (1.4)	20.9 – C (1.4)	23.1 – C (2.0)	18.4 – C (1.4)	6.9 (0.6)	-2.5 (0.0)
Boundary Street/Lincoln Avenue	13.3 – B (2.6)	10.7 – B (0.6)	15.5 – C (2.2)	21.5 – C (2.6)	2.2 (0.4)	10.8 (2.0)

Note: Deficient intersection operation shown in bold.

1 Signalized under Preferred Concept Plan conditions.

As shown in Table 6-13, in the year 2030, the intersections of University Avenue/Park Boulevard, University Avenue/30th Street, and University Avenue/Boundary Street are expected to operate at LOS E or F during one peak hour with and without the Preferred Concept Plan in place. The single-lane roundabout at Texas Street would operate at LOS E in the p.m. peak hour. Under 2030 No Build Conditions, University Avenue/Texas Street would operate at LOS D in the p.m. peak hour as a signalized intersection. Under 2030 No Build conditions, the stop-controlled approaches at Arnold Avenue and Oregon Street would operate at LOS F. With the addition of traffic signals at those locations in the Preferred Concept Plan scenario, operations would improve to LOS B or better.

Table 6-14 shows that all side street stop-controlled approaches to University Avenue would operate at acceptable LOS by the year 2030 with the Preferred Concept Plan using the HCM methodology. Because of the constrained left turn operations along the side streets, the overall level of service for the side streets improve in the Preferred Concept Plan to LOS C or better when compared to the 2030 No Build condition, based on the HCM level of service methodology. However, the HCM analysis is not capable of evaluating the interaction between intersections, since HCM is an isolated intersection analysis methodology. Due to the forecast high volume of traffic on University Avenue and the constrained capacity along the corridor, it is anticipated that queues will form along University Avenue that would affect the ability of vehicles on the side streets to access University Avenue. Such constraints were observed to occur using the VISSIM software analysis.

VISSIM Delay Summary

VISSIM was used to evaluate the 2030 With Preferred Concept Plan conditions in two capacities:

- Provide detailed travel time and delay values for the signalized intersections and the corridor as a whole.
- Visually assess the impacts to the unsignalized intersections along the corridor

Table 6-15 summarizes the results of the a.m. and p.m. peak hour delay summary for the corridor as a whole and for the individual intersections along the corridor. Table 6-16 presents the travel time and stops per vehicle data calculated by VISSIM.

The results of the VISSIM analysis demonstrate that vehicles would experience significant delay and queues at Florida Street, particularly in the p.m. peak hour. Under the Preferred Concept Plan scenario, the eastbound through lanes for mixed traffic on University Avenue are reduced from two lanes to one lane west of Florida Street, (to accommodate the eastbound transit only lane), causing a bottleneck. Similarly, in the a.m. peak hour, delay is shown to increase on the eastern portion of the corridor near Wabash Street, Boundary Street, and 32nd Street. As on the western portion of the corridor, a bottleneck is located at Boundary Street, where two mixed-flow lanes on the east side of Boundary Street are reduced down to one lane on the west side of Boundary Street to accommodate the westbound transit only lane.

Table 6-15
2030 With Preferred Concept Plan Conditions
VISSIM Measures of Effectiveness Delay Summary

Study Intersection	2030 No Build				2030 With Preferred Concept Plan				Change in Delay			
	Total Delay[1]		Concurrent Delay[2]		Total Delay[1]		Concurrent Delay[2]		Total Delay[1]		Concurrent Delay[2]	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
University Avenue/Park Avenue	33.0	113.5	32.5	111.4	33.7	144.0	29.5	166.7	0.7	30.5	-3.0	55.3
University Avenue/Florida Street	15.0	93.6	12.0	89.1	18.0	153.3	4.4	160.9	3.0	59.7	-7.6	71.8
University Avenue/Mississippi Street	9.2	68.9	7.1	70.8	13.5	56.8	6.5	58.0	4.3	-12.1	-0.6	-12.8
University Avenue/Texas Street[3]	28.4	77.1	26.3	77.3	31.9	72.3	36.7	75.2	3.5	-4.8	10.4	-2.1
University Avenue/Arnold Avenue[4]	-	-	-	-	46.7	37.2	47.0	38.4	-	-	-	-
University Avenue/Oregon Street[4]	-	-	-	-	36.1	28.1	36.0	28.0	-	-	-	-
University Avenue/Utah Street	16.5	43.1	14.6	40.9	95.2	102.1	86.4	46.2	78.7	59.0	71.8	5.3
University Avenue/30th Street	19.9	47.7	15.6	36.9	57.9	53.1	56.9	25.3	38.0	5.4	41.3	-11.6
University Avenue/Ohio Street	4.9	21.0	1.7	3.9	27.2	17.7	20.6	5.0	22.3	-3.3	18.9	1.1
University Avenue/Grim Street	5.0	6.1	3.4	3.3	12.7	8.5	9.0	4.4	7.7	2.4	5.6	1.1
University Avenue/Illinois Street	5.5	12.1	4.5	9.9	30.5	9.2	28.7	6.7	25.0	-2.9	24.2	-3.2
University Avenue/32nd Street	28.2	35.8	29.0	37.0	53.4	35.9	47.6	34.5	25.2	0.1	18.6	-2.5
University Avenue/Boundary Street	55.7	55.6	57.6	56.9	66.9	52.2	64.3	46.3	11.2	-3.4	6.7	-10.6
University Avenue/Wabash Street	37.2	35.6	33.5	33.3	53.0	26.5	50.6	25.4	15.8	-9.1	17.1	-7.9

1 Intersection Delay = Average delay for all movements at the intersection (sec/veh)
2 Concurrent Delay = Delay imposed to eastbound & westbound vehicles along University Avenue (sec/veh)
3 Roundabout in the Preferred Concept Plan
4 Traffic signal in the Preferred Concept Plan

Table 6-15 (continued)
2030 With Preferred Concept Plan Conditions
VISSIM Measures of Effectiveness Delay Summary

Study Intersection	2030 No Build				2030 With Preferred Concept Plan				Change in Delay			
	Conflicting Delay[5]		Person Delay[6]		Conflicting Delay[5]		Person Delay[6]		Conflicting Delay[5]		Person Delay[6]	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
University Avenue/Park Avenue	33.8	115.6	37.4	113.7	38.6	126.1	38.1	141.7	4.8	10.5	0.7	28.0
University Avenue/Florida Street	27.8	106.1	14.6	93.1	70.2	138.6	15.6	154.3	42.4	32.5	1.0	61.2
University Avenue/Mississippi Street	27.5	57.1	9.9	67.2	48.7	53.1	12.3	47.3	21.2	-4.0	2.4	-19.9
University Avenue/Texas Street[3]	33.6	76.6	28.7	77.9	21.3	67.7	26.3	58.9	-12.3	-8.9	-2.4	-19.0
University Avenue/Arnold Avenue[4]	-	-	-	-	44.9	24.3	33.7	27.3	-	-	-	-
University Avenue/Oregon Street[4]	-	-	-	-	37.8	29.5	26.9	21.6	-	-	-	-
University Avenue/Utah Street	26.3	53.2	18.8	45.8	122.9	244.5	96.9	87.4	96.6	191.3	78.1	41.6
University Avenue/30th Street	29.4	65.0	21.8	49.5	59.2	84.4	57.2	51.8	29.8	19.4	35.4	2.3
University Avenue/Ohio Street	5.6	10.1	4.8	19.5	59.7	49.1	27.6	15.7	54.1	39.0	22.8	-3.8
University Avenue/Grim Street	27.2	51.8	6.2	5.6	49.8	52.4	13.2	7.2	22.6	0.6	7.0	1.6
University Avenue/Illinois Street	26.6	43.7	5.7	12.0	59.4	23.5	27.0	8.6	32.8	-20.2	21.3	-3.4
University Avenue/32nd Street	24.9	29.6	28.3	36.8	66.6	39.9	48.1	33.1	41.7	10.3	19.8	-3.7
University Avenue/Boundary Street	45.6	49.7	52.6	55.4	72.8	64.4	66.7	46.2	27.2	14.7	14.1	-9.2
University Avenue/Wabash Street	42.4	40.3	37.5	36.0	55.8	27.7	55.8	27.4	13.4	-12.6	18.3	-8.6

3 Roundabout in the Preferred Concept Plan

4 Traffic signal in the Preferred Concept Plan

5 Conflicting Delay = Delay imposed to northbound & southbound vehicles entering or crossing University Avenue (sec/veh)

6 Seconds per person.

Table 6-16
2030 With Preferred Concept Plan
Travel Time / Stops (I-805 to Park Boulevard)

Direction	Travel Time						Stops[1]					
	2030 No Build		2030 With Preferred Concept Plan		Change		2030 No Build		2030 With Preferred Concept Plan		Change	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Westbound Interstate 805 to Park Boulevard	6.5	9.7	14.3	11.2	7.8	1.5	4.8	7.9	18.6	14.6	13.8	6.7
Eastbound Park Boulevard to Interstate 805	7.1	15.1	7.4	21.4	0.3	6.3	5.8	13.1	5.7	22.6	-0.1	9.5

1 Average number of stops per vehicle.

The results of the travel time analysis indicate the peak direction of travel in each peak hour would be most significantly impacted by implementation of the Preferred Concept Plan. In the a.m. peak hour, westbound passenger vehicles would take approximately 14.3 minutes to travel from Park Boulevard to Boundary Street. This is roughly 8 minutes longer than in the 2030 No Build scenario. In the p.m. peak hour, eastbound passenger vehicle travel times would be approximately 21.4 minutes to travel the corridor with the Preferred Concept Plan. This is slightly more than a 6-minute increase over the 2030 No Build scenario.

A review of the VISSIM simulation shows that the single-lane roundabout at Texas Street causes significant queuing both west and east of the intersection. In the a.m. peak hour, queuing to the east caused by the roundabout was observed to affect traffic operations at the signalized intersection of Utah Street. In the p.m. peak hour, queuing to the west caused by the roundabout was observed to affect traffic operations up to and beyond Florida Street. This results in two consecutive constraints in the eastbound direction: the reduction from two to one of mixed-flow through lane(s) west of Florida Street followed by the Texas Street roundabout.

For both the a.m. and p.m. peak hours, the delay at the Utah Street intersection is shown to increase. This is likely a combination of vehicles queuing back from the Texas Street roundabout and the all-pedestrian phase at the Utah Street intersection.

An additional constraint observed in the VISSIM simulation affecting both directions of travel is the combined mixed-flow/transit lane portion of University Avenue between Idaho Street and Iowa Street. In this section, passenger and transit vehicles are required to merge from two lanes into one lane at points where the transit-only lane feeds into the mixed-flow lane and at transit stops. As stated previously in the HCM analysis section, the HCM methodology does not consider the effect of queuing at nearby adjacent intersections. Review of the simulation indicates that performing a right turn out of a stop-controlled

intersection would be difficult with a steady stream of traffic in the single mixed-flow lane and/or a standing queue.

Transit

Travel Time

Travel time is the greatest measure of transit effectiveness. One of the primary purposes of the Preferred Concept Plan was to provide an enhanced level of transit service within the project study area. Improving the travel time through the corridor makes transit a more viable and possibly preferred choice for mobility. Under the year 2030 Preferred Concept Plan scenario, the following is a summary of the transit travel times for the a.m. and p.m. peak periods for Routes 7 and 908, based on the travel time summary provided in Table 6-17:

- **P.M. Eastbound**: This time period and direction have typically been the most difficult for both the 7 and 908. For both Route 7 and 908 with the Preferred Concept Plan there would be approximately a two and a half (2.5) minute or a 15 percent improvement over the 2030 No Build scenario.

- **P.M. Westbound**: Both the 7 and 908 would experience approximately a five (5) minute or 60 percent savings over the 2030 No Build scenario

- **A.M. Eastbound**: Both the 7 and the 908 would experience an approximate four (4) minute improvement with the Preferred Concept. The time savings is in the realm of 40 percent.

- **A.M. Westbound**: The 7 and the 908 would experience an increase in travel time over the 2030 No Build scenario. The increase would be 1.5 minutes for Route 7 and 3.3 minutes for Route, primarily due to the on street parallel parking on University Avenue.

Table 6-17
2030 With Preferred Concept Plan
Transit Travel Times (I-805 to Park Boulevard)

Route / Direction	2030 No Build		2030 With Preferred Concept Plan		Change in Travel Time	
Route 7	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Westbound Interstate 805 to Park	10.4 min.	12.3 min.	11.9 min.	7.2 min.	1.5 min.	-5.1 min.
Eastbound Park Boulevard to Interstate 805	8.8 min.	17.8 min.	5.1 min.	15.3 min.	-3.7 min.	-2.5 min.
Route 908	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Westbound Interstate 805 to Park	8.8 min.	11.8 min.	12.1 min.	7.2 min.	3.3 min.	-4.6 min.
Eastbound Park Boulevard to Interstate 805	8.3 min.	17.9 min.	4.2 min.	15.3 min.	-3.9 min.	-2.6 min.

On-Time Performance

It is difficult to determine if a new improvement to a local service, not yet in operation, would be able to maintain a high level of on-time performance. Until the service has been in operation for a period of time it's not possible to determine the route's ability to maintain its on-time performance.

The best way to determine the value of a new service (with the Preferred Concept Plan's transit priority measures this really could be considered a "new" route) is to run a micro-simulation model, such as VISSIM, to determine if travel times can be improved. As stated above the Route 7 and Route 908 experience improvements in travel time except for the westbound AM which has an increase in travel time.

It would be fair to assume that if a decrease in travel time is possible, based on the Preferred Concept Plan, then future on-time performance will be improved as well. This, of course, is not the case for the a.m. westbound, which is demonstrating an increase of travel time for this period.

Transit Passenger Accessibility

Even with the reduced number of transit stops (from 20 to 10) passenger accessibility would continue to remaining very good. With current stops within approximately 350-feet of each other, there is no balance between access convenience, and speed of service. Reducing the stops from 20 to 10 would create an average spacing of approximately 1,300 linear feet. This would provide a halfway distance between stops of 650-feet. This consolidation of the stops begins to restore a balance between access and speed or

reliability for on time performance in the Preferred Concept Plan. Also, the new stop locations are placed near activity centers and continue to be at major transfer centers.

Transit Performance Based on Preferred Concept Plan

The transit performance in the Preferred Concept Plan scenario shows an improvement over the 2030 No Build scenario in three (3) of the four (4) time periods as shown in Table 6-17. Although the 7 to 23 percent savings in time performance is better than the "No Build" it would not be considered significant for the rate since it is experienced for a travel length of 1.9 miles out of a total of 12.6 miles. The vast majority of passengers boarding or alighting in the study area are traveling outside of the corridor. So, the overall travel time savings for these passengers would be, as a percentage of their overall travel time, even less.

The a.m. westbound increase in travel time is highly undesirable. SANDAG/MTS would not want to see improvements implemented that actually increased the transit travel time during peak periods. Even though there are dedicated transit lanes in the Preferred Concept Plan, the need to transition into the mixed flow travel lanes impacts the free flowing movement of transit vehicles. There would be no incentive for SANDAG/MTS to see these westbound improvements implemented. The improvements should be designed to improve service reliability and performance, not restrict it.

The transit travel time results demonstrate that the combined benefits of dedicated transit only lanes, queue jumping lanes, transit signal priority, and reducing stops led to a net travel time savings of 7 to 23 percent savings in three (3) of the four (4) time periods. If the fourth time period could show similar improvements of reduced running times there may be merit in implementing the Preferred Concept Plan measures. Additionally, it should be noted that if similar transit priority measures could be implemented in other segments of Routes 7 and 908 additional time savings, and therefore increased transit performance, could be achieved. If the transit performance could reach a 25 to 30 percent time savings over the "No Build" conditions for the entire length of either route it would be considered a substantial improvement.

Pedestrians and Transit

Pedestrian Movements on Transit Effectiveness

The purpose of this section is to document the transit passenger and pedestrian activity patterns along University Avenue and the perpendicular streets leading to the transit stops. This information will be used to reach the following objectives:

- To define the pedestrian movements to the existing transit stops and to confirm the streets that provide a logical access to the proposed transit stops identified in the Preferred Concept Plan.

- To provide recommendations of possible improvements to the environments along the major streets used to reach the future stops. (Chapter 8)

- To confirm the location of the mid-block unsignalized crossing and its relationship to the future transit stop locations.

- To confirm existing and future land use patterns along the study corridor.

- To determine if any delays to the transit operations might occur based on future pedestrian patterns or movements uncovered in this analysis.

- To make a final recommendation on the proposed stop locations, or relocations, based on the above information.

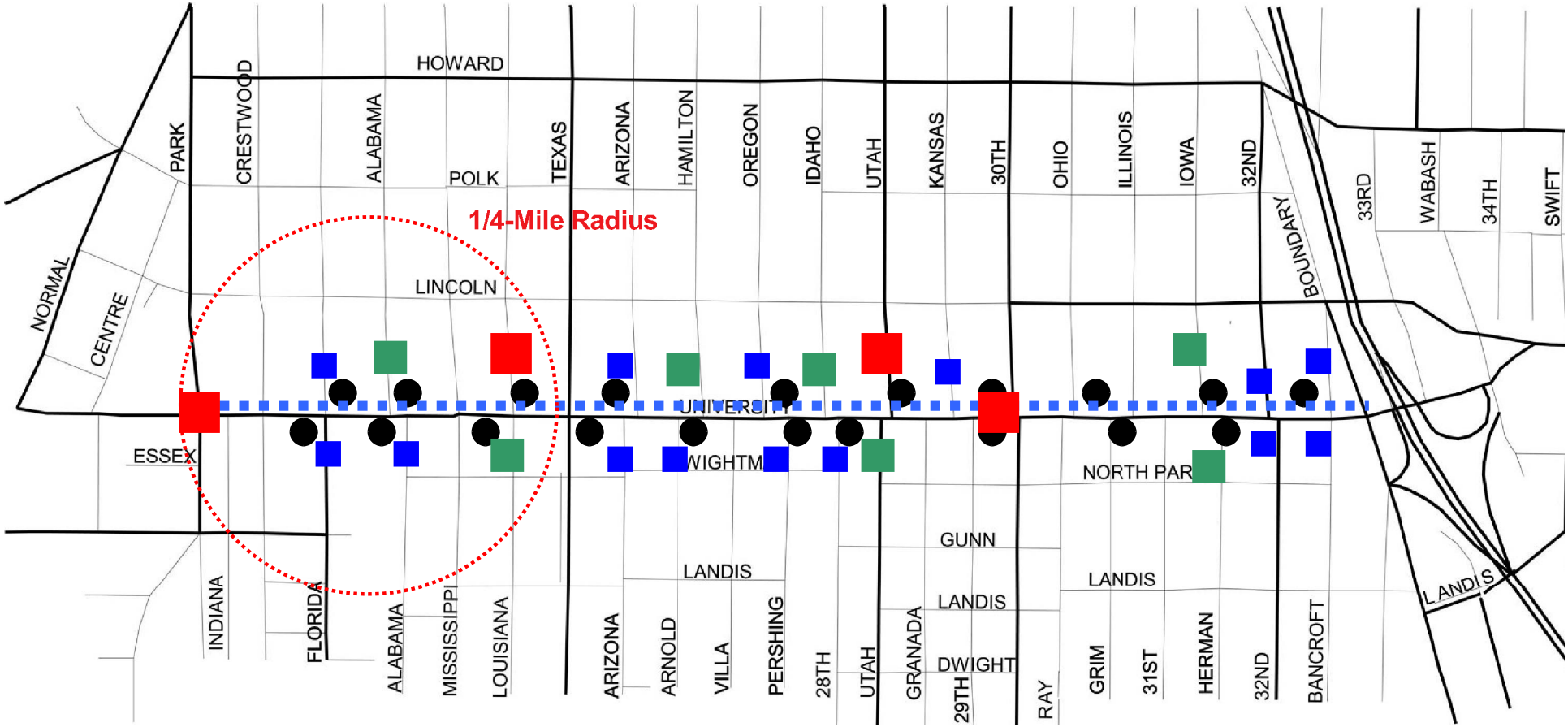
Pedestrian Movement at Existing Transit Stops

All transit patrons at some point in their journey are pedestrians. Therefore, as a general rule, transit stops should be connected to the surrounding neighborhoods with direct, safe, pleasant and convenient pedestrian access. Additionally, research has indicated that transit stops located near empty lots, vacated or dilapidated buildings, mid-block alleys, and certain types of land uses, tend to have higher incidents of crime. The relocation of the transit stops along University Avenue addresses this issue by placing stops away from such areas. Such planning is a good starting point for increasing the potential for additional transit passengers.

An analysis of the pedestrian movements from the surrounding neighborhoods and a determination of how they reached the existing transit stops on University Avenue was completed during peak transit periods. This involved on-site investigations into the current pedestrian movement to the transit stops, especially the stops with high boarding and alighting activity. The boarding and alighting figures were based on SANDAG's ridership model data for the Routes 7 and 908 transit lines.

This type of pedestrian movement was then related to the proposed transit stops, in the Preferred Concept Plan, to establish which streets should receive enhanced treatment for improved pedestrian experience and a potential increase in access from the surrounding neighborhoods under the Preferred Concept Plan. The existing stops on University Avenue are discussed below, with a diagrammatic summary provided in Exhibit 6-7.

- **Bancroft Street Stop.** The Bancroft Street Stop is one of the least used stops in the corridor. It was observed that passengers arrive at the stop primarily from the north side of University Avenue, from either Boundary or Bancroft Street.



● Route 7 and 908: 20-Transit Stops on University Avenue

■ Primary Pedestrian Path to Transit Stop

■ Secondary Pedestrian Path to Transit Stop

■ Minor Pedestrian Path to Transit

▪ ▪ ▪ ▪ Transit Route

Not to Scale

PEDESTRIAN CIRCULATION PATTERN TO EXISTING TRANSIT STOPS

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 6-7

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- **Iowa Street / Herman Street Stops.** The Iowa Street stop, serving westbound passengers, is also a less frequently used stop. While the Herman Street stop, which serves the eastbound passengers, has a higher passenger count. Many of the passengers using these stops appeared to be elderly and/or disabled. These passengers were coming from a senior housing project south of University on Herman Street and North Park Way. To reach the Iowa Street stop these pedestrians were crossing at mid-block and were not using the signalized intersection one block west at 32nd Street. Both stops remain in the Preferred Concept Plan.

  Transit passengers were also observed to arrive from Iowa Street to access the Iowa Street stop directly from the north. Other passengers were observed to arrive either north or south from 32nd street, using University Avenue to access the stop. However, these passengers were in the minority.

- **Illinois Street/ Grim Street Stops.** Transit passengers were noted to arrive at the stop primarily from University Avenue. Few of the transit passengers arrived directly from Illinois Street or Grim Street. These two stops are among the least used stops in the corridor.

  In the Preferred Concept Plan, both stops are eliminated. The next closest station would be located at Iowa Street serving westbound passengers, and at 30th Street serving eastbound passengers.

- **30th Street Stops.** This transit stop/intersection is extremely busy with very high boarding and alighting occurrences. The majority of the transit passengers at this stop are transfers from the northbound and southbound Routes 2 and 6. Most of the pedestrian activity occurs right at the intersection, and does not filter north or south on 30th Street. A few transit passengers arrived at the stop from 30th Street, Ray Street, and Kansas Street. However, most of the transit passengers stayed within the intersection. It was observed that very light pedestrian movement filtered into the surrounding neighborhoods.

  The Preferred Concept Plan would keep the 30th Street stops. The eastbound station would be relocated to the east side of 30th Street as a far side stop. Based on the high level of passengers at this location, it would be advisable to improve the pedestrian area wherever possible. A possible location for pedestrian improvements is the southeast corner of

University Avenue and 30th Street at the proposed eastbound stop location. The Preferred Concept Plan provides a transit pull-in for the stop. Creating a transit stop "in-street" would allow for the proposed transit pull-in area reverting to increased pedestrian space, improving this crowed area.

- **Utah Street Stops.** At Utah Street, the stops serve both the westbound and eastbound passengers and both are moderately high locations for boarding and alighting. The passengers arrive primarily from both north and south of University Avenue. The second highest number of passengers arrived from Kansas Street, with a very small percentage arriving from Granada Street. It was noted that a few of the passengers alighting were students/parents headed for Jefferson Elementary School.

  In the Preferred Concept Plan the Utah Street stops are eliminated. The closest stations would be located at Idaho Street. This location would serve both westbound and eastbound passengers.

- **Oregon Street / Pershing Avenue Stop.** The Oregon Street stop, serving westbound passengers, and the Pershing Avenue stop, serving eastbound passengers are both lightly used stops based on the boarding and alighting figures from SANDAG. The passengers were observed to be arriving primarily from Oregon Street, with a small percentage of passengers arriving from Pershing Avenue. The second largest number of passengers arrived from the west on University Avenue.

  In the Preferred Concept Plan, the Oregon Street stop is eliminated, while the Pershing Avenue stop remains, serving eastbound passengers. The next closest station for westbound passengers is located at Idaho Street.

- **Arizona Street / Arnold Avenue Stop.** The Arizona Street stop had few passengers. Most of the passengers were observed to arrive from Hamilton Street, while others were arriving from either east or west on University Avenue.

  In the Preferred Concept Plan, both the Arizona Street and Arnold Avenue stops are eliminated. The next closest station serving westbound passengers is located on the west side of Texas Street. The stop location serving the eastbound passengers is between Texas Street and Arizona Street. Both are located on the far side of the proposed roundabout at Texas Street.

- **Louisiana Street Stop.** In general, the transit stops at Louisiana Street have a high level of passenger activity. The majority of the passengers were observed either arriving or leaving

both north and south on Louisiana Street. Others arrived from east or west on University Avenue.

The Louisiana Street stops (both westbound and eastbound) are eliminated in the Preferred Concept Plan and transit passengers would use the new Texas Street locations. Based on the high level of passengers arriving from Louisiana Street and also going to the Albertson's grocery store it might be beneficial to reconsider maintaining the Louisiana Street eastbound station. However, for this study the stations should be eliminated to maintain SANDAG's stop distance recommendations and to allow this analysis to fully understand the impact of consolidating the existing stations to ten (10) as defined by the Preferred Concept Plan. As the project moves forward into the next phase the eastbound station should re-examine by the community and SANDAG to determine if it continues to warrant removal or if it should stay.

- **Alabama Street Stop.** The number of passengers using the Alabama Street stop was less than those using the Louisiana Street stop. During the peak period, most of the passengers arrived and departed to and from Alabama Street. Very few passengers arrived from University Avenue.

  The Preferred Concept Plan retains both the Alabama Street stops, but places the stops at far side locations.

- **Florida Street Stop.** The passengers arriving at the Florida Street stop arrive primarily from the north on Florida Street, while a very small percentage arrive from the south.

  The Preferred Concept Plan eliminates the Florida Street stop. The next closest stop would be at Alabama Street.

- **Park Boulevard Stop.** Park Boulevard is a major transit hub. Like 30th Street and University Avenue, this intersection has multiple transit lines coming into it. When reviewing the pedestrian patterns it was observed that the majority of the transit patrons were transferring to other buses. A small portion of the passengers arrived by either Park Boulevard or University Avenue. This stop/intersection is extremely busy with a very high boarding and alighting occurring at peak periods. However, most of the transit passengers moved within the intersection to close by stops, with very few of the pedestrians filtering into the surrounding neighborhoods.

To provide a safe, pedestrian friendly environment from the side streets to University Avenue, several improvement corridors along the side streets have been identified. The intent is to ensure improved pedestrian connectivity to the proposed transit stops noted in the Preferred Concept Plan. Not all

proposed improvements are located on streets that connect directly with a transit stop. Some locations provide connections with the nearest pedestrian crossing or signalized intersection. The goal is to provide pedestrian friendly connectivity to the transit corridor and to the transit stops.

Based on the above analysis, the following selected streets are recommended for pedestrian improvements.

North of University Avenue

- Iowa Street
- Utah Street
- Idaho Street
- Arizona Street
- Louisiana Street
- Alabama Street

South of University Avenue

- Herman Street
- 30th Street Utah Street
- Pershing Avenue
- Arizona Street
- Louisiana Street
- Alabama Street

Recommended improvements are outlined in Chapter 8.

Pedestrian Movement Analysis at Unsignalized Crosswalk Locations (LED Flashers)

An analysis was conducted on the pedestrian movement at key intersections and at the unsignalized locations identified in the Preferred Concept Plan. How these movements might affect transit ridership and service was considered important to the overall success of the transit mobility for the corridor.

This effort included reviewing the following pedestrian information: SANDAG transit boarding and alighting information, Counts Unlimited pedestrian counts, and on-site field observations. This information was provided for the traffic/transit modeling effort used to determine the travel time for all vehicles at peak periods for the project study area.

In general it should be noted that the Preferred Concept Plan design and subsequent modeling efforts showed that the unsignalized pedestrian crossings do not significantly impact the flow of traffic or transit. The unsignalized pedestrian crossing locations are:

- **Alabama Street.** The Preferred Concept Plan has identified Alabama Street as having two of the ten transit stops serving both westbound and eastbound transit vehicles. At this location the Preferred Concept Plan has a flashing light and lighted cross walk with in-pavement light emitting diode (LED) flashers. This is an appropriate treatment given the volume of transit passengers crossing at this intersection. The number of pedestrians crossing at this location during peak periods was noted as "High", indicating more than 200 pedestrian crossings per day. However, the number of pedestrians crossing would not affect peak period transit operations. Of those crossing University Avenue (approximately 20 during a.m. peak period and 57 during p.m. peak), the majority of the transit passenger crossings occurred prior to the arrival of the transit vehicles. Other pedestrian crossings at this location were considered very light.

  At peak periods with transit vehicles running every 6 minutes, the pedestrian activation of the signal crossing would not have a significant impact to operational headways. It should be noted that there are other issues hindering the operational efficiency in the corridor. Most notably, the merge movement required in the Preferred Concept Plan to transition to mixed-flow lanes for transit vehicles. Given the current lane configuration, the unsignalized pedestrian crossing at Alabama Street will have little or no impact on transit operations.

- **Texas Street.** Texas Street has two of the ten transit stops serving the corridor. Both occur as far side serving stops on University Avenue. At this location the Preferred Concept Plan has a flashing light and lighted cross walk or in pavement LED flashers for all crossings at the Roundabout. This would be an appropriate location given the volume of transit passengers that would be potentially crossing at this intersection. However, the crossings that would be of concern are those located on University Avenue. The number of pedestrians crossing University Avenue during a.m. peak period is 23, while the p.m. peak period was 26. This volume of crossings would not affect peak period transit operations.

  With transit vehicles running every 6 minutes, the pedestrian activation of the pedestrian crossing warning would not have a significant impact to operational headways at this location. The unsignalized pedestrian crossing would have no significant impact to the travel times within the corridor. There are larger issues hindering the operational efficiency at the Roundabout. This is primarily the merge movement required in the Preferred Concept Plan of transitioning to from two lanes to a single lane roundabout.

- **Idaho Street.** The Preferred Concept Plan has identified Idaho Street as one of the five transit stops serving the westbound transit vehicles. The eastbound transit stop is closer to Pershing Avenue and will benefit from the signalized intersection at Oregon Street. At the Idaho Street location there will be a flashing light and lighted cross walk or in pavement LED

flashers. This appears to be an appropriate treatment given that it is associated with the transit stop.

However, the existing pedestrian crossings are very light with only 30 crossings during both the AM and PM peak period. Again, the majority of the transit passenger crossings occurred well in advance of the arriving transit vehicles. Additionally, the transit patrons alighting at these locations cross University Avenue after the transit vehicles have departed. With transit vehicles running every 6 minutes, the pedestrian activation of the signal crossing does not have a significant impact to operational headways.

- **Kansas Street/ 29th Street.** Kansas Street is the first block to the west of the 30th Street transit stop and the Preferred Concept Plan has identified an unsignalized crossing at this location. The pedestrian crossing activity at this location on University Avenue was very light with only three crossings observed for both the AM and PM peak periods. But it should also be noted that the crossings at 29th Street were extremely high, with over a 120 crossings in the AM and PM peak periods. Pedestrian activation of the enhanced pedestrian crossing would have a very minor impact to transit vehicles operational headways with this current threshold. However, future conditions at this location may change with the opening of the North Park Theater and the proposed parking structure at 29th Street and North Park Way.

- **Iowa Street/Herman Street.** The Preferred Concept Plan has identified Iowa Street as one (1) of the five (5) transit stops serving the westbound transit vehicles. It was noted that the primary pedestrian crossings occurred on the west side of Iowa Street across University Avenue with 13 crossings occurring in the a.m. and p.m. peak periods. The east side of Iowa Street was noted to have only five (5) during the same time period. This low amount of pedestrian crossings at University Avenue would not have an impact on the transit operational modeling.

Proposed Transit Stop Locations and Passenger Redistribution

The Traffic Calming Conceptual Study determined that the number of stops along the University Avenue corridor between Park Boulevard and Boundary Street were extensive and could potentially cause slower operational times for both the 908 and 7 routes. The Preferred Concept Plan proposed fewer transit stop locations (10 vs. 20 existing) to improve transit's operational times. SANDAG typically realizes a 15 second gain in travel time for every stop that is consolidated.

The rationale used for locating these new stops was to:

- Increase the stop distances from 1-2 blocks to a minimum of every 3-blocks.

- Anchor new transit stops with major destinations or transfer locations such as 30th Street/University Avenue and Park Boulevard/University Avenue.

- Provide the consolidated stops with regard to existing senior facilities and in consideration of the existing topography.

Again, the primary reason for reducing the number of stops is to increase the time and efficiency of the transit service along this corridor. To determine if there would be a benefit in reducing the number of stops, a traffic/transit model was run. As part of the model's program a new assignment of the passengers allocated for each of the new stops was needed. This passenger allocation provided the estimated dwell time for each stop. The dwell time is an important component of the transit model as it provides the length of time the transit vehicle is stopped for the boarding and aligning of passengers. A redistribution of the passengers was prepared based on the new stop locations. This redistribution of the passengers basically shifted the passengers from a deleted stop to the closest stop to the east and to the west. Typically half of the passengers were shifted to the nearest eastern and western stop to account for the deleted station. The results of this passenger redistribution are illustrated in Table 6-1, provided previously in this chapter.

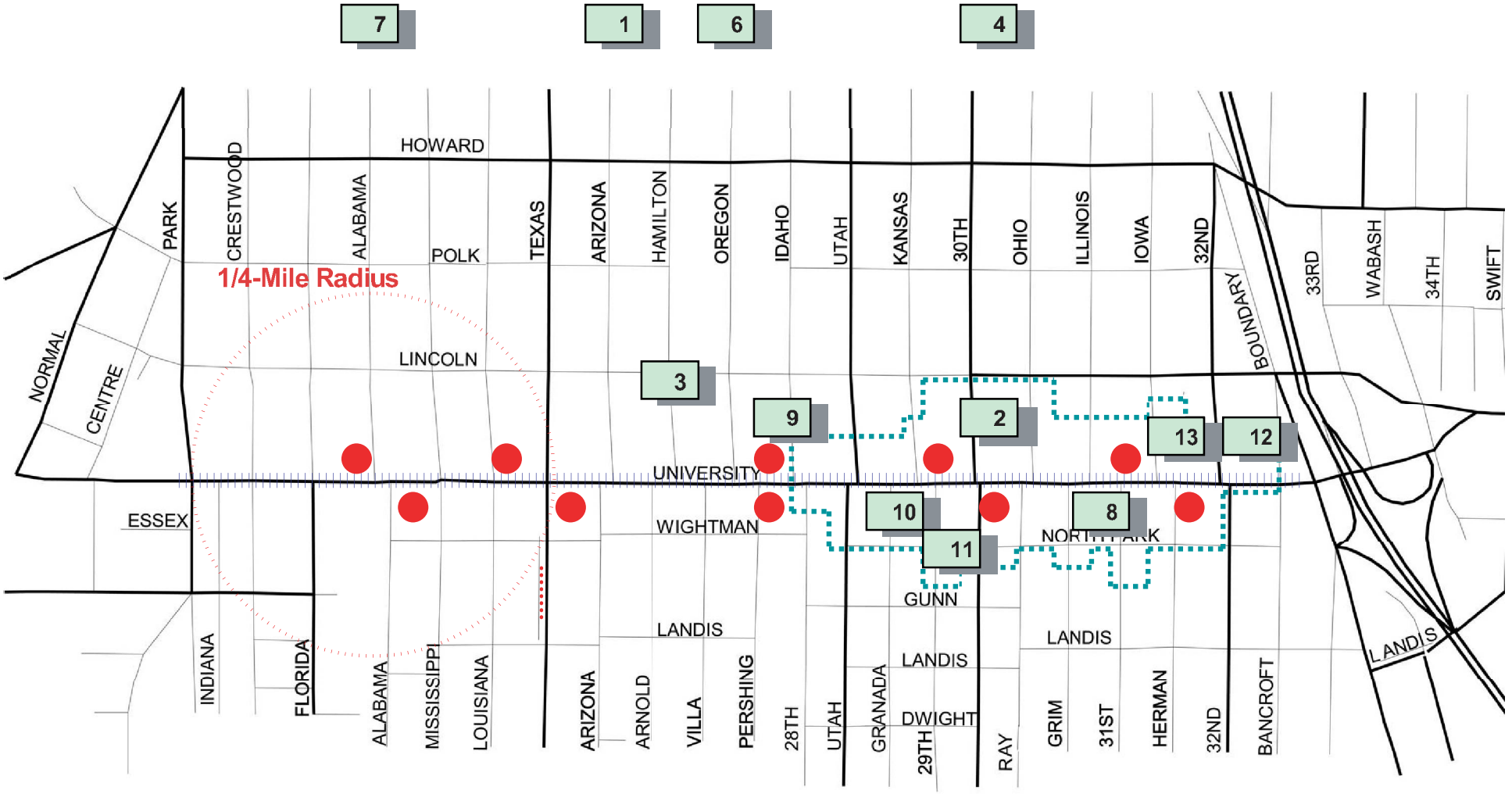
With this new passenger redistribution the dwell times were recalculated to account for the new passenger boarding and alighting times and are included in the new overall travel times for Route 7 and 908. The dwell times are noted in Table 6-2, provided previously in this chapter.

Review Land Use Patterns – Existing and Future

A review of the existing and proposed activity centers, as well as future development patterns (SANDAG's 2030 projections), within a 1/4-mile of the corridor was conducted. This land use study was used to help refine, if necessary, the locations of the transit stops. The intent is to pair the proposed transit stops with areas of increase densities and mix of land uses.

In discussions with the City of San Diego's Long Range Planning Division, numerous projects in North Park are currently approved or proposed within close proximity to University Avenue. A summary of these projects is listed in Table 6-18 and their locations are illustrated in Exhibit 6-8. These projects are all within close proximity to a proposed transit stop.

Additionally, North Park is one of the City of San Diego's "City of Villages" Pilot Villages. The "village" is located in the North Park redevelopment area centered on 30th and University Avenue. The purpose of the pilot project is to demonstrate how the "Villages" can revitalize existing neighborhoods while retaining their individual character. It is anticipated that additional projects will occur within the redevelopment area and rely on the transit system for part of their transportation needs. The Pilot Village Area is also outlined in Exhibit 6- 8.



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PROPOSED PROJECTS IN NORTH PARK

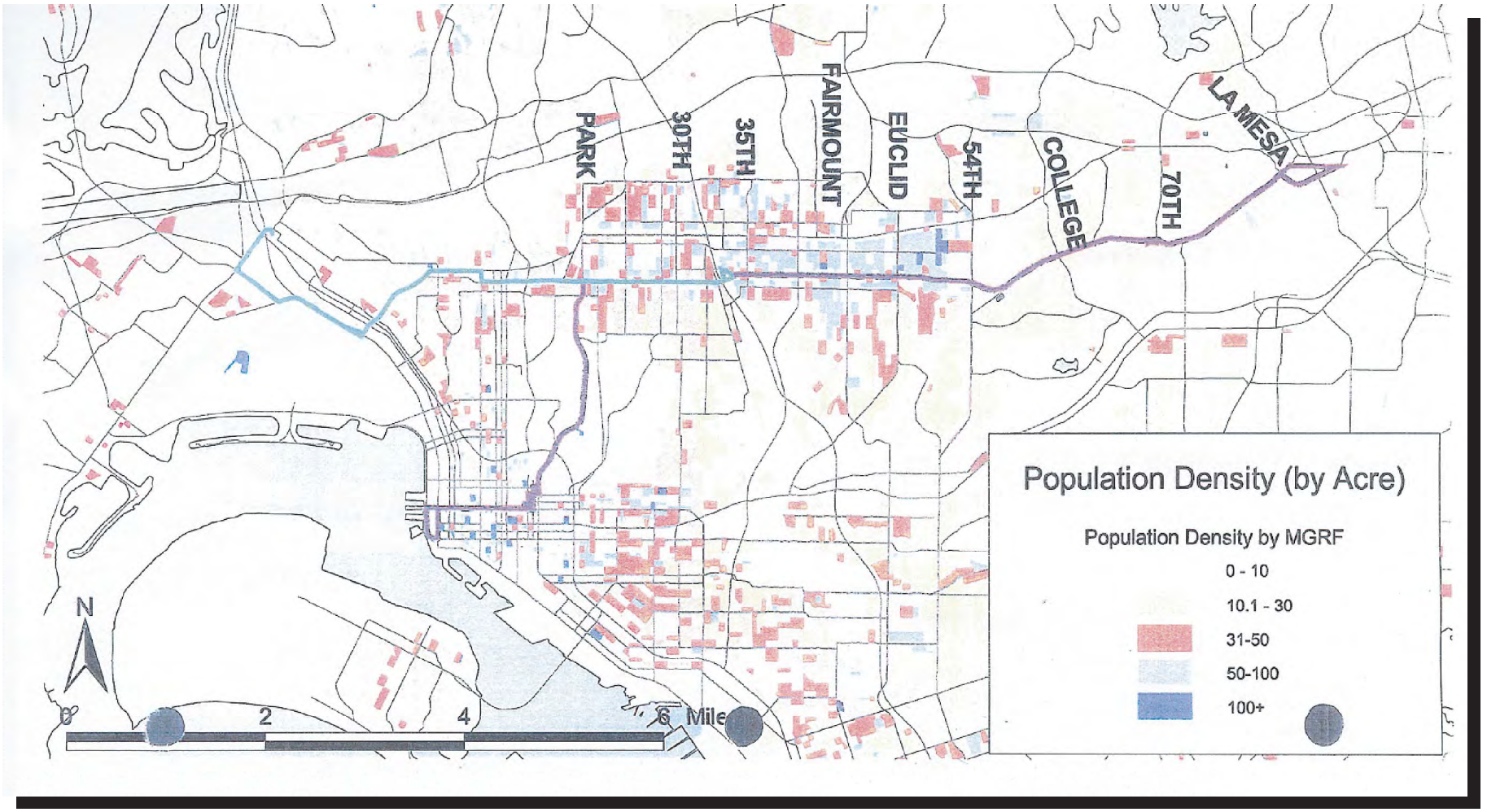
55-100140.001 - March 2004 (2004-0331)

EXHIBIT 6-8

Table 6-18
Land Use Summary Table

Project Name	# of Units	Location	Status	Mixed-Use
Hamilton Rowhomes	4	4566 Hamilton Street	Approved	No
North Park Condos	224	Lincoln Between Ohio/30th	Approved by Planning Commission	Yes
Hamilton Street Condos	16	Hamilton/Lincoln	Approved	No
Renaissance	134	30th/El Cajon Boulevard	In Construction	Yes
30th and Upas	TBD	3409 30th Street	Proposed	Yes
La Fayette Hotel	+/- 250	El Cajon Boulevard	Proposed	Yes
Alabama/ECB	94	Alabama/El Cajon	Proposed	Yes
Verso (Potential Library site)	150	31st/University	Proposed	Yes
Deaf Services/Library/ Residential	88	Idaho/University	Proposed	Yes
North Park Theater	-	29th/University Avenue	In Construction	No
North Park Theater Parking Structure	-	30th/North Park Way	Approved	Yes
Walgreen's	-	32nd /University	Approved	Yes
Walgreen's Parking Structure	-	32nd/University	Approved	No

SANDAG has determined that by 2030, the North Park area will see an increase in density. This is based on SANDAG's Series 10 socioeconomic forecast model and reflects preliminary assumptions concerning SANDAG's regional vision. In general, SANDAG's model illustrates that the majority of the growth within the North Park area will occur north of University Avenue and south of Adams Avenue. The area south of University Avenue is shown as not having any appreciable increase in growth. The difference in the population density from the year 2000 to 2030 can be seen in Exhibits 6-9 and 6-10. Additionally, the employment densities anticipated for the North Park community does not change significantly between 2000 and 2003. This can be seen in Exhibits 6-11 and 6-12. Based on this land use information, the location and placement of the proposed transit stops serving the University Avenue corridor still appear to be appropriate.



Not to Scale

2000 POPULATION DENSITY

EXHIBIT 6-9

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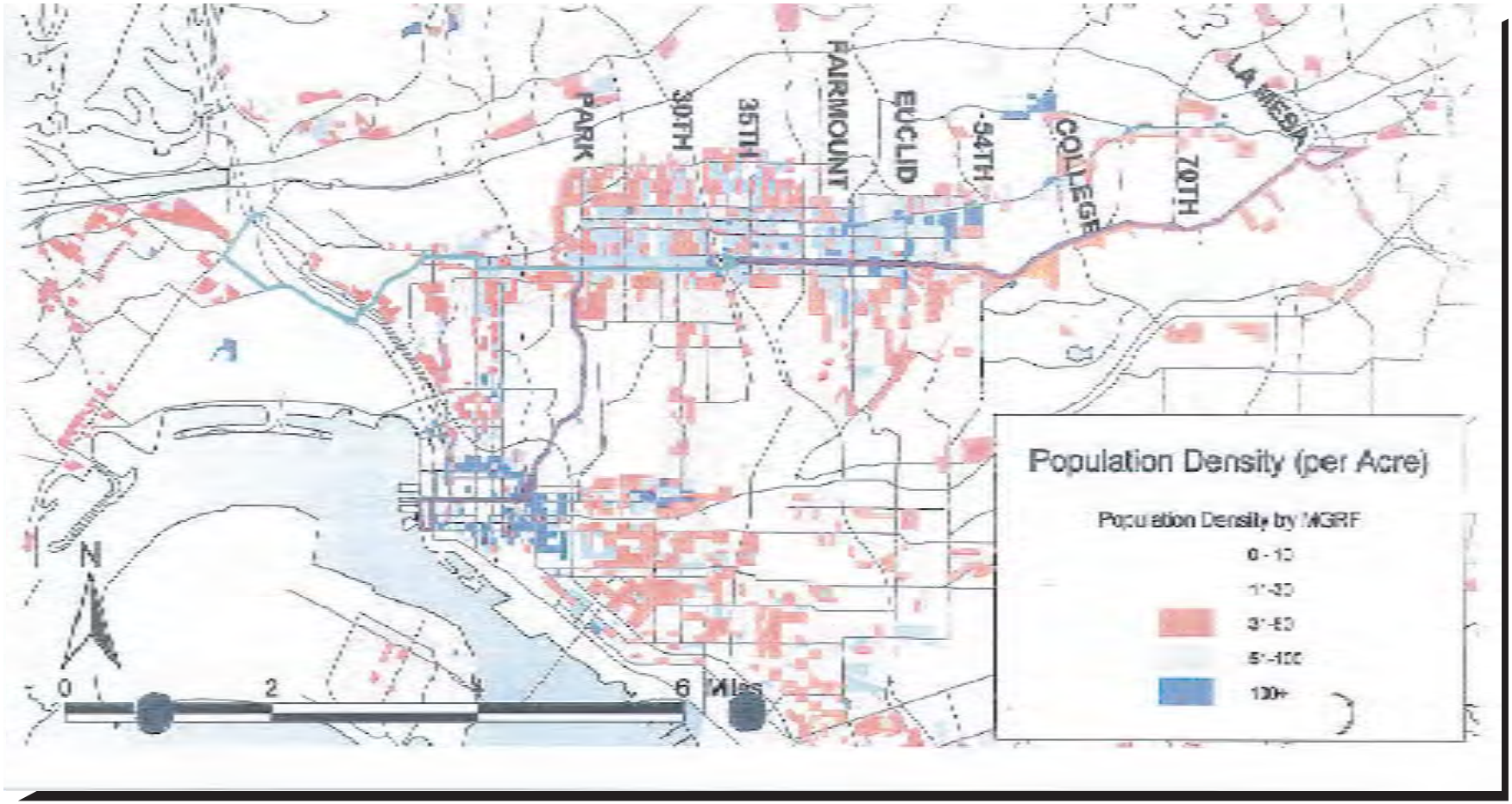

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2030 POPULATION DENSITY

EXHIBIT 6-10

55-100140.001 - March 2004 (2004-0331)

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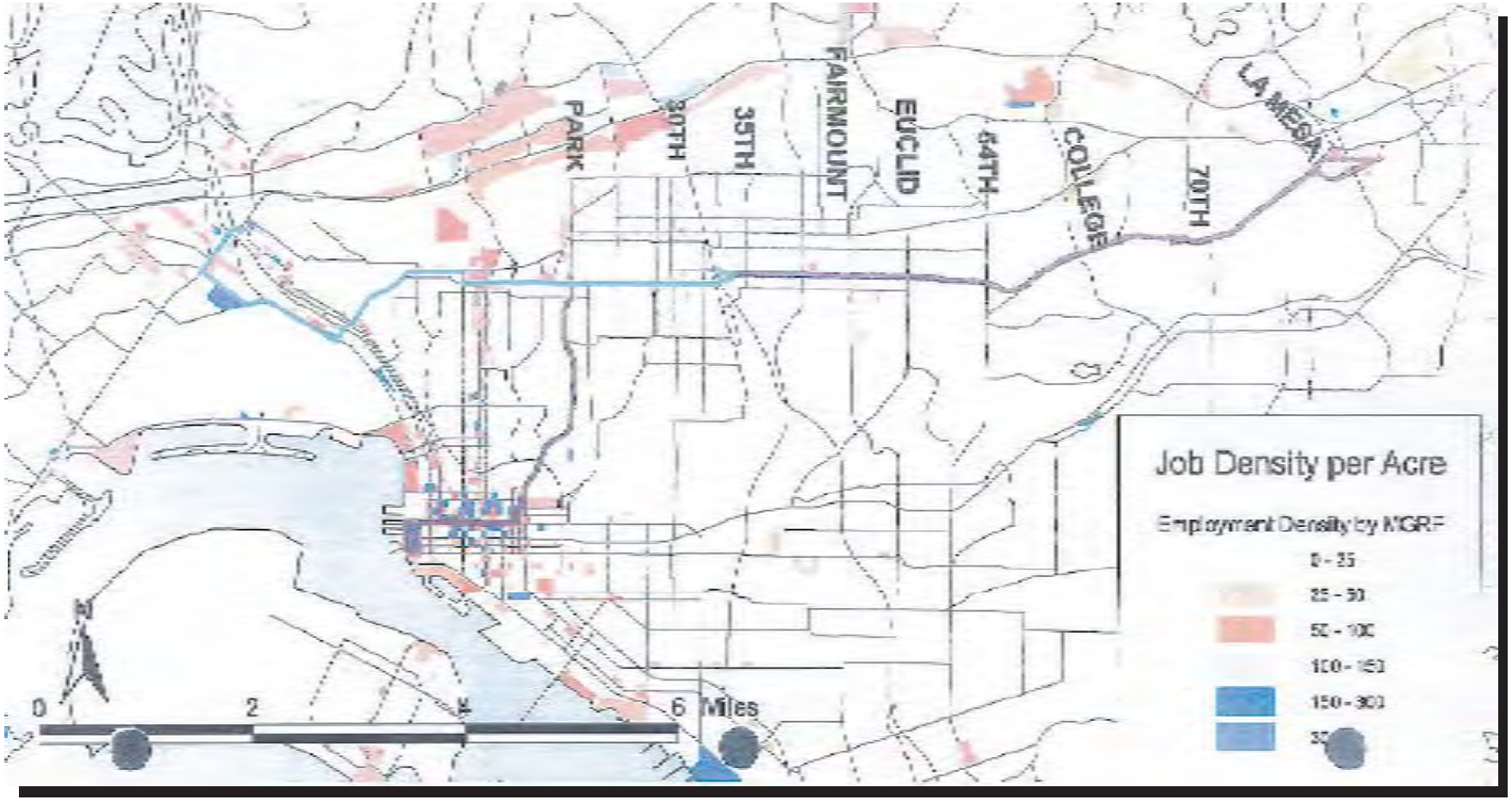

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2000 EMPLOYMENT DENSITY

EXHIBIT 6-11

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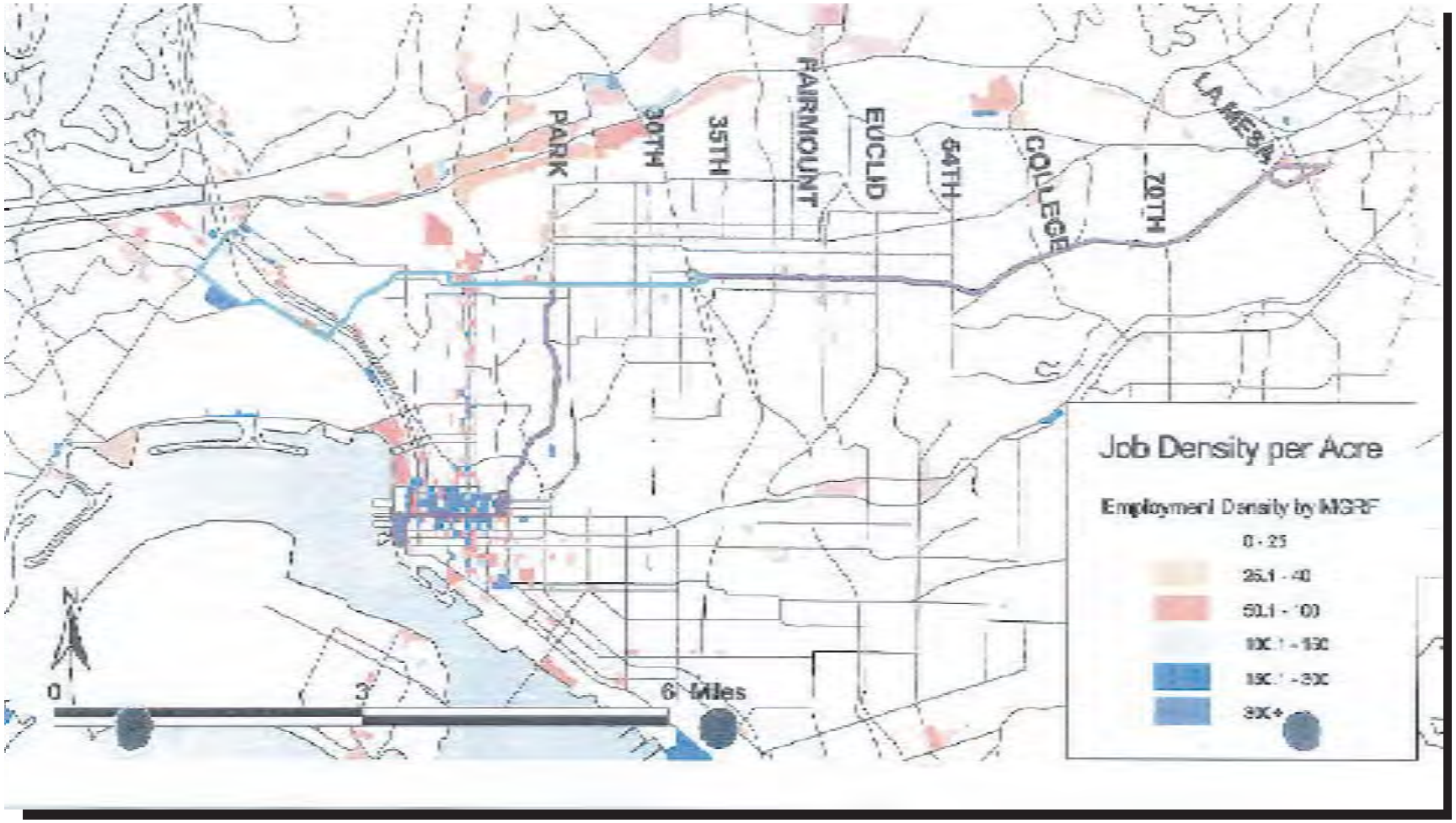

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2030 EMPLOYMENT DENSITY

EXHIBIT 6-12

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6.9 IDENTIFICATION OF CORRIDOR CONSTRAINTS WITH PREFERRED CONCEPT PLAN

Four main constraints to providing efficient operations along University Avenue were identified that are inherent to the Preferred Concept Plan:

- **Single Lane Roundabout at Texas Street** – The forecast traffic volumes at this intersection exceed the capacity of a single lane roundabout, which would lead to queues east and west of Texas Street that could affect upstream signalized and unsignalized intersections.

- **Discontinuous Transit Only Lane** – The transit only lane is discontinuous in several locations along the corridor. To meet the objective of providing efficient transit service along the corridor, it would be beneficial to reduce the number of merging maneuvers required by the transit vehicles. This could be achieved by maximizing the length of the transit only lane.

- **Parallel Parking** – The transit only lane is discontinuous due to the on-street parallel parking along University Avenue. This parallel parking aims to provide loading and unloading as well as storefront parking for many businesses fronting University Avenue. To maintain the on street parking, only one lane in each direction could be provided for traffic along University Avenue. This mixed flow lane would, of necessity, include passenger vehicles and transit vehicles. The merging and weaving required of transit vehicles and passenger vehicles through this portion of the corridor results in lengthy queues and delays.

- **Effectiveness of Queue Jumping Lanes** – Queue jumper lanes are intended to give buses a head start when they are stopped at a traffic light. However, the forecast queues along University Avenue between blocks observed with the VISSIM simulation program, show that the queue jumpers are not effective. Basically, buses would move from the stoplight to the end of the queue at the next adjacent intersection. Transit signal priority of a dedicated transit only lane would provide significantly better operations for transit vehicles.

These constraints were presented to the public at the March 20th Community Workshop held at the Claire de Lune Cafe. At that time, potential solutions for resolving these operational issues were also presented, which included:

- Maintain Signal Operations at Texas Street
- Relocate On-Street Parallel Parking
- Replace Queue Jump Technology with Transit Signal Priority

Chapter 7 discusses the alternatives evaluated to improve the overall operations of the corridor and to find a balance for vehicular, transit, bicycles, and pedestrian mobility through North Park.

Chapter Seven – Alternatives Analysis

7.0 INTRODUCTION

The operational analysis of the Preferred Concept Plan identified two key constraints: the one-lane roundabout at Texas Street and the parallel parking along University Avenue. These constraints would result in operational breakdown along the corridor and blocking of side-street access at signalized and unsignalized intersections. Excessive queues were observed on University Avenue at the Texas Street roundabout that extended as far as Florida Street to the west and Utah Street to the east. Preferred Concept Plan travel times for passenger vehicles exceeded the 2030 No Build conditions travel times and the delay at some intersections doubled and tripled when compared to the No Build conditions. In the a.m. peak, westbound transit time with the Preferred Concept Plan also exceeded the No Build conditions.

Therefore, several alternatives were identified that would return travel time along the corridor to a reasonable level. This is critical in maintaining the character of the corridor. To continue to stimulate commercial development along University Avenue, it is critical that visitors perceive University Avenue as accessible and a great place to shop, live and play. If the corridor is inaccessible, then it will be perceived as a place to avoid due to congestion. The goal of the Preferred Concept Plan is to slow traffic and create a pedestrian friendly environment that will work in conjunction with the revitalization of North Park. These goals can still be met while providing reasonable levels of delay and acceptable travel times to both passenger vehicles and transit vehicles.

The alternatives identified and evaluated in this chapter do not deviate widely from the Preferred Concept Plan. Each alternative varies one or more of the following five variables:

- Length of Transit Only Lane
- Traffic Control Method at Texas Street
- Alignment of Texas Street
- Traffic Control at Ohio Street
- Relocation of Parallel Parking away from University Avenue to accommodate continuation of the transit only lane through the business core.

All alternatives maintain the same pedestrian access, raised median design, and transit improvements.

Parking is a key issue in the community of North Park. Overall, there is a parking shortage, not only along University Avenue, but also along the side streets and parallel streets throughout the community. Much of the parking with 200 feet of University Avenue is restricted parking, limiting the duration of time that a vehicle may park in a designated space. Since the parallel on-street parking along University Avenue is one of the key constraints along the corridor in the Preferred Concept Plan scenario removing the parking would greatly reduce the forecast delays and queues entering the corridor from the east, primarily from I-805. However, the removal of parking would not come without some resistance from

local business owners. Therefore, five parking alternatives were identified to help maximize the available parking while providing for efficient mobility through the corridor.

The result of the Alternatives Analysis was the identification of the Refined Concept Plan, Alternative 5a, illustrated in Exhibit 7-1. The selection of the Refined Concept Plan was determined based on the best operational balance of traffic, transit, pedestrians and bicycles. The Refined Concept Plan was presented to City and SANDAG staff and the Steering Committee established for this project, as well as to the community at two public meetings.

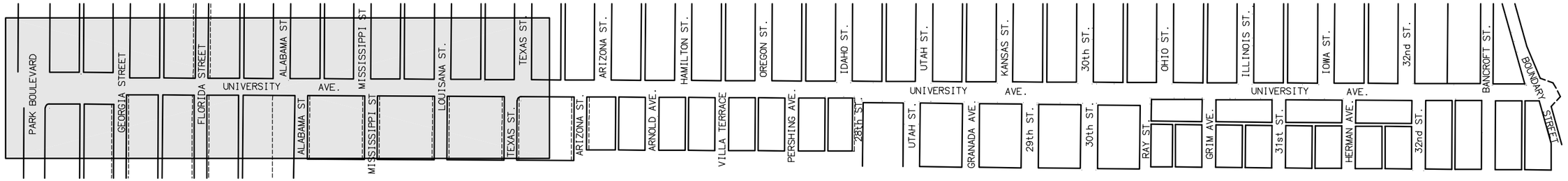
Based on the VISSIM and HCM operational analysis of the corridor, City of San Diego Transportation Planning staff support the selection of Alternative 5a. This alternative maximizes the capacity of University Avenue west of Utah Street for mixed flow traffic and provides the transit only lanes through the most dense core of the corridor where there are available alternative parallel routes for traffic to divert.

This alternative includes:

- Installation of Enhanced Unsignalized Pedestrian Crossings across University Avenue at Herman Street, Kansas Street & Alabama Street.
- Installation of New Traffic Signals at Oregon Street and Arnold Avenue.
- Transit Signal Priority at all Signalized Intersections[1].
- Removal of traffic signal at Ohio Street to reduce delays. Installation of Enhanced Pedestrian crossing at Ohio Street in place of traffic signal.
- Construction of raised median from Boundary Street to Park Boulevard to separate opposing traffic flow, limit the number of intersections with left turn access and help channelize left turning traffic out of the through lanes.
- Eastbound Transit Only Lane from Utah Street to Boundary Street. Peak hour only operations (7-9 a.m. and 4-6 p.m.) in the business core (Idaho Street to Iowa Street). Parking permitted in the Transit Only Lane during off-peak hours in the business core .

Exhibit 7-1

[1] Analysis of the alternatives included in the installation of Transit Signal Priority at all intersections. The purposed of this analysis was to determine which intersections benefited most from Transit Signal Priority.



KEY MAP

SCALE: 1"=500'

LEGEND

PEDESTRIAN IMPROVEMENTS

SYMBOL	DESCRIPTION
	RESTRIPE EXISTING CROSSWALK OR NEW CROSSWALK MODIFIED EXISTING CROSSWALK
	NEW ENHANCED SIDE STREET CROSSING
	NEW ENHANCED UNSIGNALIZED CROSSWALK
	REMOVE CROSSWALK

TRANSIT IMPROVEMENTS

SYMBOL	DESCRIPTION
	TRANSIT STOP
	TRANSIT ONLY LANE
	POTENTIAL TRANSIT ONLY LANE (ALT. 3)

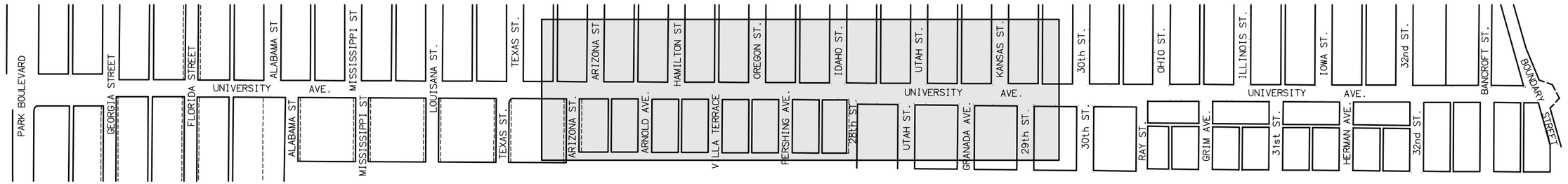
STREET IMPROVEMENTS

SYMBOL	DESCRIPTION
	PROPOSED CURB EXISTING CURB
	NEW "STOP" SIGN
	NEW "TRANSIT ONLY LANE AHEAD MERGE LEFT" SIGN
	NEW "RIGHT TURN ONLY LANE BUSES EXEMPT" SIGN
	RAISED MEDIAN WITH LANDSCAPE
	REPAINT EXISTING STOP BAR & SYMBOL
	STRIPE RIGHT TURN ARROW

SIGNAL IMPROVEMENTS

SYMBOL	DESCRIPTION
	STRIPE LEFT TURN ARROW & INSTALL NEW PROTECTED LEFT TURN ARROW
	NEW TRAFFIC SIGNAL
	REMOVE EXISTING TRAFFIC SIGNAL

Not to Scale



KEY MAP
SCALE: 1"=500'

LEGEND

PEDESTRIAN IMPROVEMENTS

SYMBOL	DESCRIPTION
	RESTRIPE EXISTING CROSSWALK OR NEW CROSSWALK MODIFIED EXISTING CROSSWALK
	NEW ENHANCED SIDE STREET CROSSING
	NEW ENHANCED UNSIGNALIZED CROSSWALK
	REMOVE CROSSWALK

TRANSIT IMPROVEMENTS

SYMBOL	DESCRIPTION
	TRANSIT STOP
	TRANSIT ONLY LANE
	POTENTIAL TRANSIT ONLY LANE (ALT. 3)

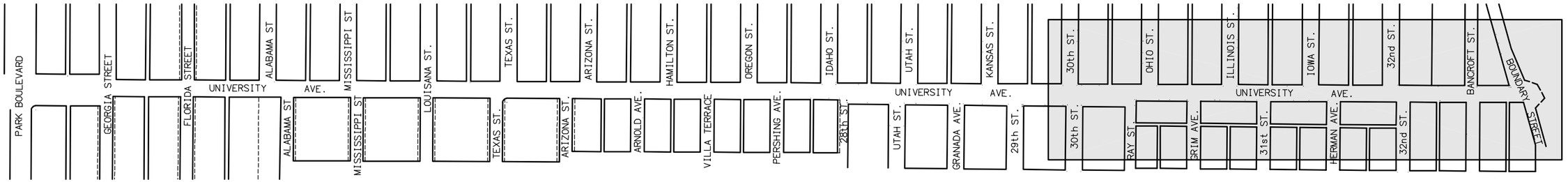
STREET IMPROVEMENTS

SYMBOL	DESCRIPTION
	PROPOSED CURB EXISTING CURB
	NEW "STOP" SIGN
	NEW "TRANSIT ONLY LANE AHEAD MERGE LEFT" SIGN
	NEW "RIGHT TURN ONLY LANE BUSES EXEMPT" SIGN
	RAISED MEDIAN WITH LANDSCAPE
	REPAINT EXISTING STOP BAR & SYMBOL
	STRIPE RIGHT TURN ARROW

SIGNAL IMPROVEMENTS

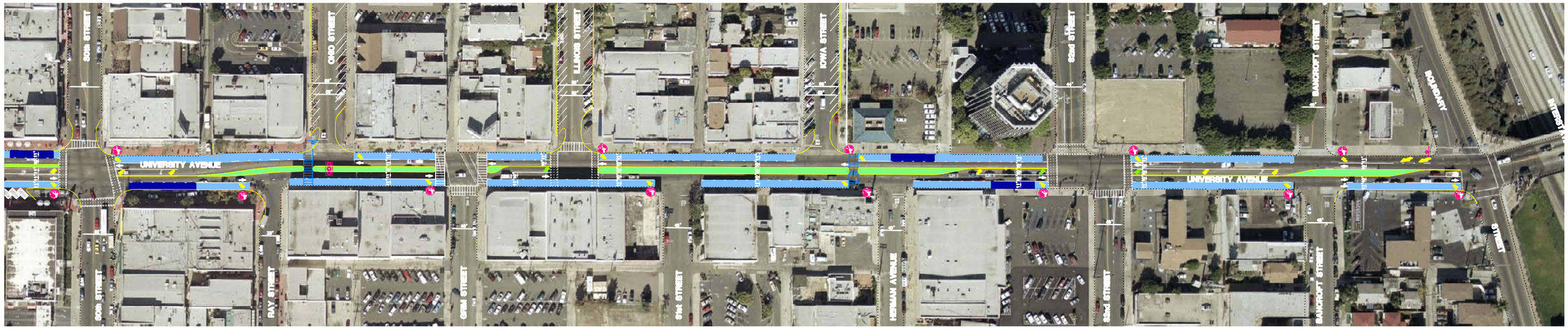
SYMBOL	DESCRIPTION
	STRIPE LEFT TURN ARROW & INSTALL NEW PROTECTED LEFT TURN ARROW
	NEW TRAFFIC SIGNAL
	REMOVE EXISTING TRAFFIC SIGNAL

Not to Scale



KEY MAP

SCALE: 1"=500'



LEGEND

PEDESTRIAN IMPROVEMENTS

SYMBOL	DESCRIPTION
	RESTRIPE EXISTING CROSSWALK OR NEW CROSSWALK MODIFIED EXISTING CROSSWALK
	NEW ENHANCED SIDE STREET CROSSING
	NEW ENHANCED UNSIGNALIZED CROSSWALK
	REMOVE CROSSWALK

TRANSIT IMPROVEMENTS

SYMBOL	DESCRIPTION
	TRANSIT STOP
	TRANSIT ONLY LANE
	POTENTIAL TRANSIT ONLY LANE (ALT. 3)

STREET IMPROVEMENTS

SYMBOL	DESCRIPTION
	PROPOSED CURB EXISTING CURB
	NEW "STOP" SIGN
	NEW "TRANSIT ONLY LANE AHEAD MERGE LEFT" SIGN
	NEW "RIGHT TURN ONLY LANE BUSES EXEMPT" SIGN
	RAISED MEDIAN WITH LANDSCAPE
	REPAINT EXISTING STOP BAR & SYMBOL
	STRIPE RIGHT TURN ARROW

SIGNAL IMPROVEMENTS

SYMBOL	DESCRIPTION
	STRIPE LEFT TURN ARROW & INSTALL NEW PROTECTED LEFT TURN ARROW
	NEW TRAFFIC SIGNAL
	REMOVE EXISTING TRAFFIC SIGNAL

Not to Scale

- Westbound Transit Only Lane from Boundary Street to Florida Street. Peak hour only operations (7-9 a.m. and 4-6 p.m.) in the business core (Idaho Street to Iowa Street). Parking permitted in the Transit Only Lane during off-peak hours in the business core.

- Maintain on-street parallel parking spaces (68) between Idaho Street and Iowa Street in the off peak. These spaces can be used for loading and unloading products to the businesses for 20 of the 24 hours on a typical weekday.

- Increase parking on the side streets by converting the existing parallel parking to diagonal parking on all streets where this is feasible.

- Provide for traffic calming measures on side streets and streets parallel to University Avenue to help slow traffic such as bulb-outs, increased on street parking and appropriate traffic controls at parallel street intersections.

SANDAG/MTS and the Steering Committee support the selection of Alternative 3, which is physically consistent with Alternative 5a. However, instead of from Utah Street to Boundary Street Alternative 3a would extend the eastbound transit only lanes from Park Boulevard to Boundary Street (shown in orange in Exhibit 7-1). In SANDAG/MTS opinion, this alternative would maximize the efficiency of the transit service along University Avenue. A straw poll vote of the Steering Committee indicated that the group favored the sense of community and the traffic slowing effects that occur with the implementation of the extended transit only lane. SANDAG/MTS and the Steering Committee also support the removal of all on-street parking along University Avenue at all times in order to make the transit lane operational at all times.

7.1 Analysis Methodology

To evaluate the operations of the study corridor, a set of Measures of Effectiveness were established. The Measures of Effectiveness defined for this analysis include both travel time and intersection delay. Travel time for the corridor was recorded separately for the transit vehicles and the passenger vehicles. Using the VISSIM model, travel time data was collected for a sample of vehicles traveling from Boundary Street to Park Boulevard in the eastbound and in the westbound directions. A total of 10 model runs were conducted for each scenario in order to achieve a representative sample size to evaluate the data.

The second Measure of Effectiveness recorded for each alternative is intersection delay, which was broken down into three categories:

- total intersection delay
- concurrent delay
- conflicting delay

Concurrent delay refers to the delay experienced by vehicles along University Avenue (left turning, through and right turning) and conflicting delay refers to delay specific to vehicles the side streets (left turning, through and right turning). Delay was recorded for each movement at each of the signalized intersections along the study corridor.

7.2 Description of Alternatives

A total of nine alternatives were evaluated. As stated previously, the nine alternatives toggle one or more of the following key elements of the Preferred Concept Plan:

- Length of Transit Only Lane
- Traffic Control Method at Texas Street
- Alignment of Texas Street
- Traffic Control at Ohio Street
- Relocation of Parallel Parking Along University Avenue

Table 7-1 provides a matrix of these key elements included in each of the nine alternatives evaluated.

Table 7-1
Summary of Alternatives

Alternative:	Relocate Parking	Transit Lanes Boundary to…		Traffic Control at Texas Street	Traffic Control at Ohio Street
		EB	WB		
Preferred Concept Plan	No	Florida	Florida	Roundabout (1 lane)	Signal
Alt. 1	Yes	Florida	Florida	Signal	Signal
Alt. 2	Yes	Park	Florida	Signal	Signal
Alt. 3	Yes	Park	Florida	Signal	Median, No Signal
Alt. 4	Yes	Park	Florida	Realigned Signal	Signal
Alt. 5	Yes	Utah	Florida	Signal	Signal
Alt. 6	Yes	Utah	Florida	Roundabout (2 lane)	Signal
Alt 3a	Yes	Park	Florida	Realigned Signal	Median, No Signal
Alt 5a	Yes	Utah	Florida	Signal	Median, No Signal
Alt 5b	Yes	Utah	Florida	Realigned Signal	Median, No Signal

The results of the VISSIM analysis are summarized in Tables 7-2 through 7-5. Based on the operational analysis of the alternatives, Alternative 3 and Alternative 5a were identified as the operationally superior alternatives of the nine analyzed. The following section provides a detailed description of each of the alternatives, brief discussion of the operational benefits and constraints of each alternative and why each alternative was accepted or rejected.

- Table 7-2: Travel Time Summary
- Table 7-3: Intersection Delay Summary
- Table 7-4: Conflicting Delay Summary
- Table 7-5: Concurrent Delay Summary

A complete summary of all data reported for the VISSIM analysis is provide in the Appendix at the end of this report.

Alternative 1

Description: Alternative 1 was the starting point for all of the alternatives evaluated. It removed the constraints identified in the Preferred Concept Plan. First, the single lane roundabout at Texas Street was removed and the existing traffic signal operations were coded into the VISSIM model. Second, the on-street parallel parking that remained in the business core along University Avenue in the Preferred Concept Plan was removed from the model. A continuous transit only lane from Florida Street to Boundary Street both eastbound and westbound replaced this parking. The removed parking would be shifted to the nearest side street by converting the existing parallel parking to diagonal parking. Refer to Section 7.4 of this chapter for more details regarding the parking alternatives evaluated.

Why Rejected: The analysis of Alternative 1 revealed that further improvement to the overall system, specifically significant passenger vehicle travel time savings, could be achieved if the extents of the transit only lanes were modified.

Alternative 2

Description: Alternative 2 extended the eastbound transit only lane from Florida Street to Park Boulevard. The intent with this scenario would be to provide a direct connection to the from the Showcase project planned for Park Boulevard. Alternative 2 built upon the Alternative 1 network, which removed all parallel parking along University Avenue and removed the one-lane roundabout at Texas Street.

Why Rejected: Alternative 2 would provide benefit to transit vehicles only, compared to the Preferred Concept Plan. Reviewing the VISSIM simulation of this scenario, it was clear that further refinements within the core of University Avenue (Idaho Street to Iowa Street) needed to be made.

Table 7-2a

Travel Time Summary (Minutes) - A.M. Peak Hour

Intersection	Direction	Existing	2030 No Build	2030 Preferred Concept Plan	2030 Alt 1	2030 Alt 2	2030 Alt 3	2030 Alt 4	2030 Alt 5	2030 Alt 6	2030 Alt 3a	2030 Alt 5a	2030 Alt 5b
Passenger Vehicle	WB	5.9	6.5	14.3	5.5	5.5	5.6	5.5	5.5	5.4	5.5	5.5	5.5
	EB	5.6	7.1	7.4	7.8	7.8	8.2	7.7	8.0	7.6	8.2	8.1	7.7
Route 7	WB	9.5	10.4	13.6	9.2	9.2	9.3	9.5	9.2	9.1	9.3	9.0	9.1
	EB	7.6	8.8	8.4	8.1	8.1	7.9	7.8	8.0	7.4	8.0	8.1	8.0
Route 908	WB	8.1	8.8	13.0	7.9	7.9	8.2	7.8	7.8	7.5	7.9	8.0	7.8
	EB	7.4	8.3	7.8	7.2	7.2	7.1	7.0	7.4	7.1	7.1	7.3	7.3

Table 7-2b

Travel Time Summary (Minutes) - P.M. Peak Hour

Intersection	Direction	Existing	2030 No Build	2030 Preferred Concept Plan	2030 Alt 1	2030 Alt 2	2030 Alt 3	2030 Alt 4	2030 Alt 5	2030 Alt 6	2030 Alt 3a	2030 Alt 5a	2030 Alt 5b
Passenger Vehicle	WB	7.1	9.7	11.2	8.4	8.7	8.8	7.1	8.2	7.1	6.9	8.6	7.1
	EB	7.0	15.1	21.4	13.5	12.5	13.4	9.8	9.9	9.5	11.9	11.6	11.7
Route 7	WB	10.2	12.3	9.8	9.7	9.8	9.6	9.7	9.3	9.7	9.8	9.6	9.6
	EB	10.1	17.8	15.1	10.3	9.3	9.3	9.1	10.2	9.6	9.1	10.5	10.8
Route 908	WB	10.1	11.8	9.1	8.9	9.4	9.1	9.1	9.1	9.1	9.0	9.2	8.9
	EB	10.9	17.9	16.7	10.5	9.3	9.5	8.5	10.1	9.8	8.4	10.4	10.7

Table 7-3a
Total Intersection Delay (Seconds)
A.M. Peak Hour

Intersection	Existing	2030 No Build	2030 Preferred Concept Plan	2030 Alt 1	2030 Alt 2	2030 Alt 3	2030 Alt 4	2030 Alt 5	2030 Alt 6	2030 Alt 3a	2030 Alt 5a	2030 Alt 5b
Park	28.5	33.0	33.7	35.8	35.8	34.7	35.1	34.4	35.9	36.1	34.5	34.6
Florida	10.4	15.0	18.0	18.0	18.0	17.1	18.6	16.9	17.6	18.2	19.5	18.8
Mississippi	6.6	9.2	13.5	10.6	10.6	10.8	12.1	11.3	14.5	11.9	11.4	12.3
Texas	20.7	28.4	31.9	39.8	39.8	40.4	26.2	40.4	7.7	26.4	40.0	26.5
Arnold	0.0	0.0	46.7	7.5	7.5	8.0	6.5	6.9	5.6	6.1	7.5	6.5
Oregon	0.0	0.0	36.1	3.8	3.8	4.0	3.8	3.9	3.4	3.8	3.9	3.7
Utah	14.0	16.5	95.2	24.8	24.8	24.5	24.2	24.7	23.7	23.9	24.4	24.3
30th	15.2	19.9	57.9	25.9	25.9	27.3	25.6	26.2	26.2	26.9	26.5	26.8
Ohio	3.3	4.9	27.2	6.1	6.1	1.0*	6.1	6.6	6.6	0.2*	0.2*	0.2*
Grim	3.0	5.0	12.7	5.3	5.3	6.2	5.0	6.2	5.6	6.8	6.1	5.4
Illinois	5.0	5.5	30.5	5.3	5.3	7.9	5.5	6.1	5.8	8.6	8.5	7.4
32nd	15.0	28.2	53.4	38.3	38.3	40.4	39.3	40.7	36.5	44.7	40.5	40.0
Boundary	15.4	55.7	66.9	37.6	37.6	36.4	35.2	35.5	37.7	35.9	36.7	36.4
Wabash	25.0	37.2	53.0	34.9	34.9	35.6	35.7	35.7	35.6	35.2	35.5	35.6

(*) = Intersection unsignalized under this alternative.

Table 7-3b
Total Intersection Delay (Seconds)
P.M. Peak Hour

Intersection	Existing	2030 No Build	2030 Preferred Concept Plan	2030 Alt 1	2030 Alt 2	2030 Alt 3	2030 Alt 4	2030 Alt 5	2030 Alt 6	2030 Alt 3a	2030 Alt 5a	2030 Alt 5b
Park	41.4	113.5	144.0	74.6	91.2	92.2	58.5	46.8	46.0	65.7	47.4	47.5
Florida	17.6	93.6	153.3	87.1	65.2	64.0	41.3	41.0	40.0	48.5	40.1	39.4
Mississippi	11.5	68.9	56.8	57.1	66.5	64.0	23.2	19.3	20.0	32.1	18.8	18.9
Texas	35.4	77.1	72.3	79.3	83.5	85.4	37.4	67.2	15.6	45.3	68.9	37.5
Arnold	0.0	0.0	37.2	15.5	17.9	23.6	6.9	10.3	3.7	14.2	18.5	13.6
Oregon	0.0	0.0	28.1	11.8	13.4	17.3	9.3	8.3	4.9	19.5	17.0	19.7
Utah	26.5	43.1	102.1	47.3	44.2	47.4	43.8	54.3	43.1	49.7	58.8	69.0
30th	25.6	47.7	53.1	57.5	57.7	63.1	57.0	61.5	58.6	63.4	67.3	68.1
Ohio	12.8	21.0	17.7	21.5	20.6	2.7*	19.9	22.2	20.1	1.5*	1.2*	1.3*
Grim	6.4	6.1	8.5	8.7	8.8	8.4	7.2	8.8	7.5	8.4	8.8	10.6
Illinois	8.6	12.1	9.2	8.2	8.1	12.0	7.4	8.3	7.6	12.5	12.4	13.6
32nd	18.1	35.8	35.9	28.6	30.3	31.3	27.9	30.6	29.3	34.1	34.4	37.7
Boundary	21.6	55.6	52.2	62.6	59.6	65.9	66.2	61.4	67.2	64.6	65.7	63.6
Wabash	45.7	35.6	26.5	35.1	30.8	33.9	36.6	30.5	40.1	33.3	34.3	34.0

(*) = Intersection unsignalized under this alternative.

Table 7-4a
Conflicting Intersection Delay (Seconds)
A.M. Peak Hour

Intersection	Existing	2030 No Build	2030 Preferred Concept Plan	2030 Alt 1	2030 Alt 2	2030 Alt 3	2030 Alt 4	2030 Alt 5	2030 Alt 6	2030 Alt 3a	2030 Alt 5a	2030 Alt 5b
Park	30.6	33.8	38.6	40.1	40.1	40.8	40.9	40.0	40.5	40.5	40.3	40.2
Florida	16.7	27.8	70.2	76.0	76.0	71.2	77.3	70.9	71.8	74.8	84.3	79.4
Mississippi	24.0	27.5	48.7	48.7	48.7	49.1	49.0	49.3	49.1	49.4	49.4	48.7
Texas	27.0	33.6	21.3	62.8	62.8	63.4	44.6	66.3	9.7	44.1	63.9	44.9
Arnold	6.8	7.3	44.9	39.6	39.6	39.9	41.1	37.5	38.9	38.5	39.7	38.9
Oregon	9.1	11.5	37.8	35.5	35.5	38.7	37.3	38.7	39.3	38.7	39.4	37.4
Utah	22.1	26.3	122.9	46.4	46.4	46.6	46.4	45.9	46.7	46.3	46.2	46.1
30th	20.2	29.4	59.2	44.5	44.5	44.6	44.5	44.9	46.0	46.4	45.0	44.8
Ohio	5.5	5.6	59.7	43.2	43.2	12.6*	43.2	46.2	46.3	11.7*	12.2*	11.9*
Grim	19.2	27.2	49.8	42.9	42.9	43.5	40.5	41.3	43.6	43.2	40.7	39.8
Illinois	17.8	26.6	59.4	36.6	36.6	49.8	41.1	40.7	40.1	53.0	53.3	47.7
32nd	17.3	24.9	66.6	52.0	52.0	57.7	53.3	56.9	53.1	58.2	53.2	53.0
Boundary	16.7	45.6	72.8	55.9	55.9	53.4	51.1	52.6	58.3	52.3	53.4	54.6
Wabash	26.9	42.4	55.8	37.6	37.6	39.4	38.8	38.9	39.3	38.8	39.2	38.9

(*) = Intersection unsignalized under this alternative.

Table 7-4b
Conflicting Intersection Delay (Seconds)
P.M. Peak Hour

Intersection	Existing	2030 No Build	2030 Preferred Concept Plan	2030 Alt 1	2030 Alt 2	2030 Alt 3	2030 Alt 4	2030 Alt 5	2030 Alt 6	2030 Alt 3a	2030 Alt 5a	2030 Alt 5b
Park	38.7	115.6	126.1	81.0	87.1	87.9	54.9	51.0	50.1	63.4	51.4	52.4
Florida	35.1	106.1	138.6	112.2	109.6	103.4	94.0	107.2	101.4	101.9	104.4	103.0
Mississippi	28.3	57.1	53.1	178.3	223.4	205.2	74.0	59.0	61.1	106.6	57.7	59.6
Texas	41.7	76.6	67.7	89.0	94.4	94.1	46.2	89.2	18.5	55.4	89.0	44.4
Arnold	7.0	39.1	24.3	37.4	39.5	50.8	29.5	32.5	23.7	40.6	34.5	30.3
Oregon	11.8	33.2	29.5	40.8	46.9	62.2	39.9	31.5	30.0	93.9	59.4	41.4
Utah	37.2	53.2	244.5	51.0	44.8	47.4	44.6	45.9	46.0	46.1	49.8	48.8
30th	31.0	65.0	84.4	81.1	79.7	80.9	79.8	81.7	80.3	80.2	84.9	83.9
Ohio	5.3	10.1	49.1	56.4	52.7	12.2*	51.8	58.0	52.6	13.3*	11.9*	11.9*
Grim	25.7	51.8	52.4	54.4	58.5	55.0	49.9	56.5	52.0	52.4	55.1	61.1
Illinois	25.5	43.7	23.5	36.4	36.1	43.5	34.6	36.6	35.9	43.2	43.3	44.3
32nd	20.1	29.6	39.9	33.4	33.2	33.1	32.9	33.1	31.9	34.1	34.0	34.9
Boundary	29.5	49.7	64.4	48.5	47.6	50.9	45.9	51.3	46.8	46.8	46.6	47.4
Wabash	28.6	40.3	27.7	40.1	33.4	40.0	43.6	33.3	48.0	37.7	37.6	38.9

(*) = Intersection unsignalized under this alternative.

Table 7-5a
Concurrent Intersection Delay (Seconds)
A.M. Peak Hour

Intersection	Existing	2030 No Build	2030 Preferred Concept Plan	2030 Alt 1	2030 Alt 2	2030 Alt 3	2030 Alt 4	2030 Alt 5	2030 Alt 6	2030 Alt 3a	2030 Alt 5a	2030 Alt 5b
Park	27.1	32.5	29.5	32.3	32.3	29.8	30.4	29.7	32.1	32.4	29.8	30.1
Florida	9.2	12.0	4.4	4.0	4.0	4.0	4.3	3.6	4.6	4.4	3.7	4.0
Mississippi	4.3	7.1	6.5	3.5	3.5	3.7	5.2	4.2	8.1	4.8	4.3	5.5
Texas	18.5	26.3	36.7	30.3	30.3	30.8	18.5	29.6	6.9	19.0	30.1	18.7
Arnold	0.0	0.0	47.0	4.0	4.0	4.5	2.8	3.7	2.0	2.7	4.0	3.0
Oregon	0.0	0.0	36.0	3.3	3.3	3.5	3.3	3.4	2.9	3.3	3.4	3.2
Utah	12.4	14.6	86.4	18.5	18.5	17.9	17.7	18.4	16.9	17.4	17.9	17.7
30th	12.5	15.6	56.9	14.8	14.8	16.1	14.3	15.0	14.5	14.5	14.8	15.4
Ohio	0.8	1.7	20.6	0.0	0.0	0.9*	0.0	0.0	0.1	0.0*	0.0*	0.0*
Grim	1.7	3.4	9.0	1.8	1.8	2.6	1.7	3.0	2.1	3.4	2.9	2.1
Illinois	4.3	4.5	28.7	3.4	3.4	4.2	3.4	4.0	3.6	4.7	4.6	3.8
32nd	14.2	29.0	47.6	32.7	32.7	33.4	33.5	34.1	29.6	39.2	35.3	34.8
Boundary	15.3	57.6	64.3	30.2	30.2	29.6	28.9	28.7	29.4	29.5	30.0	29.2
Wabash	23.7	33.5	50.6	32.8	32.8	32.6	33.2	33.1	32.7	32.2	32.6	33.0

(*****) = Intersection unsignalized under this alternative.

Table 7-5b
Concurrent Intersection Delay (Seconds)
P.M. Peak Hour

Intersection	Existing	2030 No Build	2030 Preferred Concept Plan	2030 Alt 1	2030 Alt 2	2030 Alt 3	2030 Alt 4	2030 Alt 5	2030 Alt 6	2030 Alt 3a	2030 Alt 5a	2030 Alt 5b
Park	43.7	111.4	166.7	66.9	96.3	97.6	62.6	41.9	41.2	68.5	42.6	41.9
Florida	13.2	89.1	160.9	75.8	44.5	45.2	18.3	12.2	13.5	25.3	12.1	12.3
Mississippi	9.6	70.8	58.0	28.1	28.2	29.2	10.4	9.3	9.8	14.0	9.1	8.7
Texas	33.2	77.3	75.2	74.2	77.7	80.6	32.8	55.4	14.1	40.0	58.2	33.7
Arnold	0.0	0.0	38.4	13.9	16.2	21.5	5.2	8.6	2.3	12.1	17.3	12.3
Oregon	0.0	0.0	28.0	10.0	11.2	14.4	7.5	6.8	3.4	15.0	14.3	18.4
Utah	24.4	40.9	46.2	45.5	44.0	47.3	43.5	58.4	41.8	51.5	63.2	78.8
30th	22.3	36.9	25.3	36.5	37.4	43.6	35.8	42.6	38.7	45.3	48.3	50.6
Ohio	6.7	3.9	5.0	7.8	8.2	2.3*	7.5	8.1	7.3	0.2*	0.1*	0.1*
Grim	5.1	3.3	4.4	4.3	4.2	3.9	3.3	4.4	3.4	4.2	4.3	5.6
Illinois	7.3	9.9	6.7	5.1	5.1	6.3	4.6	5.3	4.6	6.9	6.8	7.9
32nd	17.7	37.0	34.5	26.7	29.2	30.6	26.0	29.8	28.3	34.0	34.6	38.7
Boundary	19.6	56.9	46.3	69.8	65.7	73.6	76.5	66.5	77.4	73.6	75.4	71.8
Wabash	54.7	33.3	25.4	30.3	28.3	28.2	29.9	27.7	32.7	29.0	31.2	29.2

(*****) = Intersection unsignalized under this alternative.

Alternative 3

Description: Building upon the network for Alternative 2, Alternative 3 removed the traffic signal at Ohio Street, and replaced it with an enhanced unsignalized pedestrian crossing. Otherwise, east of 30th Street, left turns would be allowed at three consecutive intersections: 30th Street, Ohio Street and Illinois Street. The distance between 30th Street and Illinois Street is approximately 650 feet. With closely spaced intersections with turning movements, it can be difficult to maintain coordination, and prevent queues into adjacent intersections. Reviewing the VISSIM simulation runs and reviewing existing signal timing information for the corridor, it was determined that both passenger vehicles and transit vehicles would benefit from a reduction in traffic signals through this section. Therefore, Alternative 3 evaluated the operating conditions with the following:

- No Parallel Parking on University Avenue
- Continuous Eastbound Transit Only Lanes from Park Boulevard to Boundary Street
- Continuous Westbound Transit Only Lanes from Boundary Street to Florida Street
- Traffic Signal Removed at Ohio Street

Why Selected: Alternative 3 was identified as one of the top two operationally superior alternatives in this analysis. Overall transit travel time improves significantly over the Preferred Concept Plan. It allows for a continuous dedicated transit only lane from Park Boulevard to Boundary Street, which would also encourage bicycle traffic to re-enter University Avenue. The downsides to this alternative are the additional delay for passenger vehicles and lack of parallel routes for diverted traffic along some of the corridor.

Alternative 3a

Description: Alternative 3a evaluated the potential benefit of realigning Texas Street, in addition to the other modifications to the Preferred Concept Plan included in Alternative 3. Texas Street is currently an offset intersection. The north leg of the intersection is approximately 60 feet east of the south leg. This requires that the intersection operate with split phasing and an "all pedestrian" phase. These two elements result in the need for very long cycle lengths. As such Texas Street is not currently coordinated with the other signals along the corridor. Alternative 3a eliminates the split phasing and all pedestrian phase by aligning the north and south legs of the intersection, and coordinates Texas Street with the other signals along University Avenue.

Why Rejected: The realignment of Texas Street would require significant right-of-way acquisition and would impact single family homes, multi-family developments and businesses along both University Avenue and Texas Street. The impact of realigning Texas Street was not justified by the minimal

improvement in delay and in travel time along the corridor that it would provide. Therefore, the realignment of Texas Street is not recommended.

Alternative 4

Description: In addition to removing the parking along University Avenue, Alternative 4 evaluated the potential improvement to corridor operations with the realignment of Texas Street described in Alternative 3A. Alternative 4 does not include the removal of the traffic signal at Ohio Street.

Why Rejected: Similar to Alternative 3a, Alternative 4 was rejected because of the cost, impacts, and minimal benefit associated with the realignment of Texas Street.

Alternative 5

Description: Alternatives 1 through 4 evaluated extending the eastbound transit only lane to Park Boulevard. Alternative 5 evaluates the operations of the corridor with the eastbound transit only lane beginning at Utah Street. Utah Street was selected as the eastbound starting point for the transit only lane for two reasons:

- At Utah Street, two parallel alternative routes to University Avenue are available: Lincoln Avenue and North Park Way. This is the first point along the corridor where one contiguous route is provided on the north and one contiguous route is provided on the south. This would allow for sufficient capacity to meet the projected diverted traffic due to the constrained capacity along University Avenue.

- By providing two eastbound mixed flow lanes through Texas Street, a two-lane roundabout would be possible (refer to Alternative 6). Based on the operational analysis, a two-lane roundabout would operate as well as a signalized intersection.

Alternative 5 modified the Preferred Concept Plan by:

- Removing all parallel parking along University Avenue
- Removing the one-lane roundabout; maintaining the traffic signal at Texas Street
- Providing the Eastbound transit only lane from Utah Street to Boundary Street

The results of the analysis of Alternative 5 indicated that providing the transit only lane from Utah Street to Boundary Street improved traffic signal operations west of Utah Street. Traffic travel times significantly improved over the forecast travel times with the Preferred Concept Plan. Because of the

available parallel routes at Utah Street, queues would not impact side streets and/or signalized intersections west of Utah Street as they would west of Florida Street with the Preferred Concept Plan.

Why Rejected: Although Alternative 5 provided improved operating conditions over the Preferred Concept Plan, it was determined that further improvement to the overall system could be achieved if additional modifications were integrated into the Alternative 5 scenario (See Alternative 5a).

Alternative 5a

Description: In addition to the modifications included in Alternative 5, Alternative 5a evaluated the potential operational improvements associated with removing the traffic signal at Ohio Street.

Why Selected: Alternative 5a was identified as one of two operationally superior alternatives. Balancing travel time, delay and impacts to side streets, Alternative 5a provides the most efficient operations for passenger vehicles. As shown previously in Table 7-2, Alternative 5a would provide the most efficient travel time. Bicycles would be required to share the travel lane EB with transit and passenger vehicles west of Utah Street. Alternative 5a limits the bicycle access to the corridor.

Alternative 5b

Description: In addition to the modifications evaluated in Alternative 5a, Alternative 5b evaluated the potential operational improvements associated with realigning Texas Street.

Why Rejected: As described previously, the realignment of Texas Street requires significant right-of-way, impacting both University Avenue and Texas Street. By realigning Texas Street and shortening the transit only lane to begin at Utah Street, traffic operations would decline from Utah Street to the east. As an offset intersection with a high cycle length, Texas Street serves as a metering point for the constrained traffic operations along the eastern portion of the corridor. Realigning Texas Street, and coordinating signal operations along the corridor pushes too much traffic too quickly through the corridor resulting in poor operations further east. Therefore, this alternative was rejected due to the impact to the right-of-way, cost, and lack of operational benefits.

Alternative 6

Description: Alternative 6 is the only alternative that analyzed the operations of the corridor with a two-lane roundabout at Texas Street. In this scenario, the eastbound transit only lane begins at Utah Street, because it is necessary to have two lanes feeding into the two-lane roundabout in order for it to be functional. In this analysis, the Ohio Street traffic signal is maintained.

Why Rejected: The two lane roundabout would operate at acceptable levels of service, if the eastbound transit only lane began at Utah Street. However, the two-lane roundabout would require significant right of way that would impact all four corners of the intersection of Texas Street/University Avenue. Access to the businesses on all four corners of the intersection would be closed to accommodate the necessary right-of-way for a two-lane roundabout. Although the analysis does not preclude the implementation of a roundabout at Texas Street, it is not recommended due to the right-of-way impacts and cost to construct.

7.3 Recommended Refined Concept Plan

Two alternatives were identified as the operationally superior alternatives: Alternative 3 and Alternative 5a. Both alternatives are physically the same. In order to provide two lanes in each direction and a landscaped raised median throughout the corridor, all on-street parallel parking through this corridor would be relocated to the side streets. Diagonal parking on University Avenue would not be removed.

In the eastbound direction, Alternative 3 would provide a transit only lane from Park Boulevard to Boundary Street. Alternative 5a would provide an eastbound transit only lane from Utah Street to Boundary Street. Both Alternative 3 and Alternative 5a would provide for a westbound transit only lane from Florida Street to Boundary Street.

In comparing Alternative 5a to Alternative 3, it became clear that from an operational perspective the extension of the eastbound transit only lane to Park Avenue would not result in overall improved operations for transit vehicles. However, Alternative 3 results in much higher travel times for passenger vehicles due to the constrained capacity from Park Boulevard to Utah Street. Comparing the total intersection delay time, Alternative 5a is forecast to have lower intersection delay when compared to Alternative 3 for intersections located west of Utah Street.

Based on the operational analysis of the corridor, Alternative 5a is the recommended Refined Concept Plan, illustrated in Exhibit 7-1. It provides for efficient passenger vehicle mobility and transit vehicle mobility. At Utah Street, passenger vehicles are provided parallel routes to University Avenue: Lincoln Avenue to the north and North Park Way to the south. Because of the parallel routes, this section of University Avenue has the greatest amount of through capacity to meet the forecast travel demands.

Although not recommended, a two-lane roundabout could be constructed at Texas Street as a future modification to Alternative 5a. It was determined that the roundabout would not significantly improve travel conditions for the corridor. Based on this fact and due to the right-of-way needs of the roundabout and the overall impacts to the existing businesses and community surrounding the roundabout, it is not recommended as part of this plan.

As stated previously, there are no physical or geometric differences between Alternative 3 and Alternative 5a. Therefore, if it is determined in the future that major transit travel time benefits could be achieved by extending the eastbound transit only lane to Park Boulevard, and the operational impacts to traffic could be mitigated, the transit only lanes could be extended to Park Boulevard as a future phase of the project.

Maintaining the parallel parking and constraining the capacity to two lanes (one in each direction) along University Avenue through the core of the community would result in significant delays to both passenger vehicles and transit vehicles as illustrated in the analysis of the Preferred Concept Plan. The weaving that occurs at every block due to merging of transit vehicles from bus stops and merging of passanger vehicles into right turn lanes, and the queues that develop as a result of the constrained capacity would make accessing University Avenue difficult at best. Therefore, all of the alternatives would shift the parking along University Avenue to the side streets. This recommendation for shifting the parking involved an analysis of several parking alternatives that are summarized in the following section.

7.4 Parking Relocation Alternatives

A total of 68 parallel on-street parking spaces would be provided between Idaho Street and Iowa Street along University Avenue with the implementation of the Preferred Concept Plan. A total of 47 parallel on-street parking spaces would be located on the north side of University Avenue and 21 on the south side of University Avenue.

Currently, 30 diagonal parking spaces are provided on the south side of University Avenue between 28th Street and 30th Street. Because of the consolidation of the transit stops, the Preferred Concept Plan would increase the total diagonal parking from 30 spaces to 43 between 28th Street and 30th Street. The Refined Concept Plan (Alternative 5a) maintains all diagonal parking spaces included in the Preferred Concept Plan, with the exception of five proposed diagonal parking spaces that would block the existing driveway access to Kentucky Fried Chicken.

Five parking alternatives were identified to address the relocation of the on-street parallel parking between Idaho Street and Iowa Street:

- Alternative A - Shift Parking to Side Streets and Provide Corner Loading Zones on side streets
- Alternative B - Maintain On-Street Parking during Off Peak Periods
- Alternative C - Alternate Parking on North and South Side of University Avenue
- Alternative D - Provide Parallel Parking on North Side of University Avenue Only
- Alternative E - Maintain Preferred Concept Plan Parking

Each of the parking alternatives was reviewed to determine the operational impacts, enforcement concerns and overall equality to the businesses along University Avenue as summarized below:

Parking Alternative A: Shift Parking to Side Streets and Provide Corner Loading Zones.
Each of the blocks through the impacted section of University Avenue is approximately 300 feet long. Each block has an alley that divides the blocks into two 150 foot blocks. All businesses on the north side of University Avenue and some on the south side of University Avenue are confined to front access only. Rear access is not provided. Therefore, existing businesses use University Avenue to load and unload their products.

Alternative A would relocate all University Avenue parallel parking to the side streets. Loading zones would be provided at the corners on each side street, resulting in some loss of parking on the side streets. All loading zones would therefore be located within 150 feet of the businesses fronting University Avenue.

Many of the side streets intersecting University Avenue within the impacted section have sufficient cross-sectional widths (52 to 54 feet) to convert the existing parallel parking to diagonal parking, which would, result in an overall increase in parking on the side streets. However, the change in parking design from parallel to diagonal would require the support of the residents and the businesses fronting those side streets. It is recommended that the parking located closest to University Avenue be restricted parking (2 hours or less) during business hours to ensure that the businesses benefit from these additional side street parking spaces.

This alternative would provide for the maximum capacity for transit and passenger vehicles through the study corridor.

Parking Alternative B: Maintain On-Street Parallel Parking During Off-Peak Periods.
Alternative B would prohibit parallel parking along University Avenue during the highest traffic volume times of the day (7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.). This alternative would continue to improve the side street parking by converting parallel on-street parking to diagonal parking on as many side streets as possible. However, businesses would maintain their store-front access for loading and unloading for 20 of 24 hours in the day.

This alternative meets the peak hour transit and traffic needs along the corridor and minimizes the impacts to the businesses that are constrained by front access only conditions.

Parking Alternative C: Alternate Parking between North and South Side of University Avenue.
A parking plan was evaluated that would alternate the on-street parallel parking between the north and south sides of University Avenue. In doing so, loading zones would be provided approximately once per

block on either the north or south side of the street. This design would have preserved approximately 20 on-street parallel parking spaces along the corridor and two travel lanes in each direction. However, the median would have to be reduced to approximately four feet or less through most of the constrained portion of the corridor (Idaho Street to Iowa Street).

Although some on-street parking would be maintained with this alternative, it was rejected due to the loss of the landscaped median, operational concerns with multiple transitions for traffic along University Avenue, and the minor retention of parking and loading areas along University Avenue. Although loading and parking would be provided on University Avenue, many of the businesses along the corridor may find that the side streets provide for closer access.

Parking Alternative D: Provide Parallel Parking on North Side of University Avenue Only.

A total of 21 parking spaces are provided on the south side of University Avenue. Most businesses on the south side of University Avenue also benefit from parking lots behind their buildings or rear-access from alleys or drive isles. Therefore, a parking plan was designed to provide for parking on the north side of University Avenue only. Since the critical movement for the corridor (movement with the highest delay) the eastbound, the westbound traffic could operate at a reasonable flow in a single lane. Therefore, the raised median could be maintained, and two travel lanes eastbound and one travel lane westbound would be provided.

By maintaining parking on the north side of the street, westbound transit travel times are forecast to be approximately 14 minutes. Without the on-street parking the forecast transit travel time is approximately 9 minutes. Westbound traffic travel time would increase from 6 to 14 minutes in the a.m. peak hour if parking were permitted along University Avenue. Due to the impacts on travel time, this alternative was rejected. It also results in an unfair balance of impacts on the businesses on the north and south sides of the streets.

Parking Alternative E: Maintain Preferred Concept Plan Parking.

The Preferred Concept Plan would provide for a total of 68 on-street parallel parking spaces from Idaho Street to Iowa Street. However, this parking alternative was rejected due to the lengthy queues and traffic impacts associated with providing a single lane of traffic both eastbound and westbound along the corridor. If the Preferred Concept Plan parking were to be maintained, travel times along the corridor for transit vehicles are forecast to exceed 16 minutes and passenger vehicle travel times would exceed 21 minutes.

Parking Alternatives Summary

Parking Alternative B would provide more parking for the corridor by allowing on-street parking during the off-peak periods of the day, and would increase the side street parking by converting the existing parallel parking on the side streets to diagonal parking at all feasible locations. However, Parking

Alternative A, which would relocate all on-street parallel parking from University Avenue to the side streets is the operationally preferred alternative for both passenger vehicles and transit vehicles.

It is recommended that to meet the immediate need of the businesses on the corridor, Parking Alternative B be implemented. As businesses evolve along the corridor, it is recommended that Parking Alternative B, that allows for peak hour parking, be transitioned to Parking Alternative A, where parking is prohibited along University Avenue. North Park Main Street should continue its efforts to educate businesses, both new and old, of the plans for the corridor and encourage businesses that do not require heavy loading to locate on the north side of University Avenue where parking would be prohibited in the future.

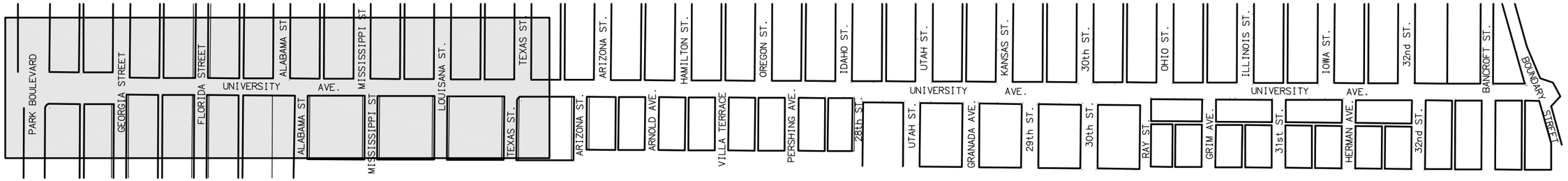
Parking Alternative B is illustrated in Exhibit 7-2. All parking spaces illustrated in blue are restricted parking spaces that would eventually be removed from University Avenue as part of the long-range plan for the corridor.

7.5 Review of Refined Concept Plan

The two operationally superior alternatives, Alternative 3 and 5a, were presented to City of San Diego, SANDAG staff, and the Project Steering Committee, as well as to the community as a whole at the April 13 and May 6 public meetings. City of San Diego transportation planning staff preferred Alternative 5a. City staff is concerned about queues and delays imposed along University Avenue that may occur due to the reduction in travel lanes from four-lanes to two-lanes. City staff is also concerned that diversion of traffic to parallel routes will impact residential communities along North Park Way and Lincoln Avenue. Providing two eastbound mixed flow lanes from Park Boulevard to Utah Street would provide for maximum capacity along the corridor until parallel, alternative routes are available both north and south of University Avenue.

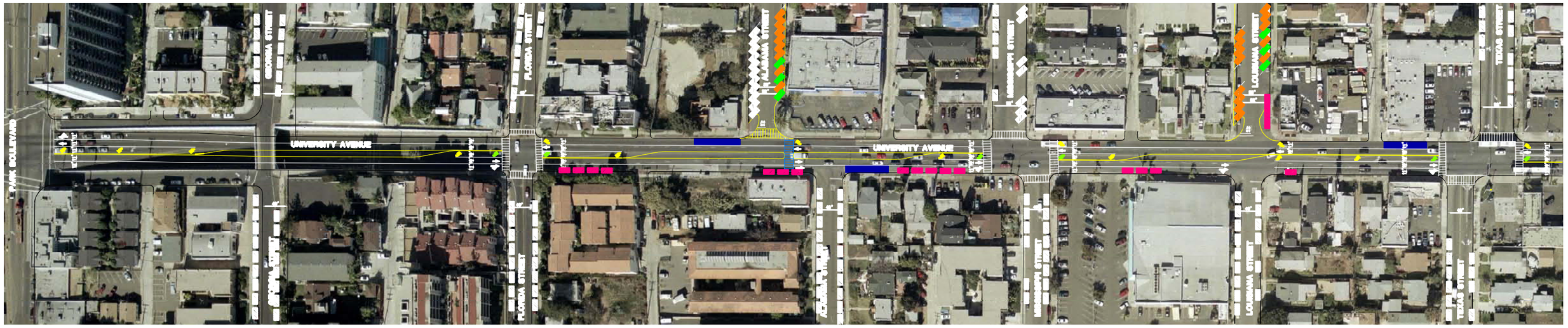
Transit planning and operations through the corridor are the responsibility of SANDAG and MTS, respectively. As such, SANDAG/MTS preferred Alternative 3, which would extend the transit only lanes from Park Boulevard to Boundary Street in the eastbound direction. This alternative would provide a direct linkage from the future Showcase project along Park Boulevard to the University Avenue corridor, following the alignment of Route 7.

The Steering Committee is a consortium of representatives from the business and residential community of North Park who met monthly to discuss the key elements of the University Avenue Mobility Plan. Many members of the Steering Committee for this project were also involved in the development of the Preferred Concept Plan during the University Avenue Traffic Calming Conceptual study, providing the team with key historical details. The overall concern of the Steering Committee is to maintain the character of the Preferred Concept Plan – slow traffic, provide for a pedestrian friendly environment, and create a sense of community along University Avenue. There was a concern that the Refined Concept



KEY MAP

SCALE: 1"=500'



LEGEND

EXISTING PARKING TO REMAIN (146)

EXISTING PARKING TO BE REMOVED (19)

NEW PARKING SPACE (6)

CONVERTED TO ANGLED PARKING (21)

RESTRICTED PARKING (NO PARKING 7–9 AM, 4–6 PM) (0)

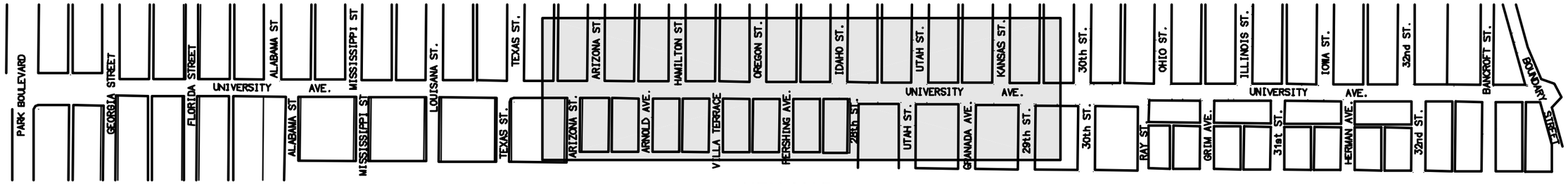
BUS STOP

Not to Scale

RBF

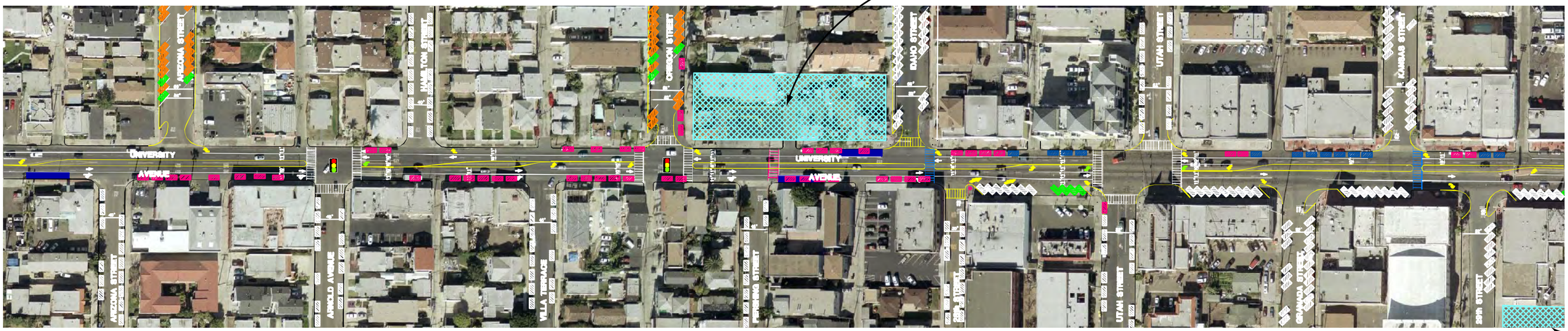
RECOMMENDED PARKING PLAN

EXHIBIT 7-2
SHEET 1 OF 3



KEY MAP
SCALE: 1"=500'

PROPOSED LIBRARY SITE (PUBLIC PARKING) = 125 SPACES



332 SPACE PARKING STRUCTURE

LEGEND

EXISTING PARKING TO REMAIN (202)	
EXISTING PARKING TO BE REMOVED (51)	
NEW PARKING SPACE (467)	
CONVERTED TO ANGLED PARKING (28)	
RESTRICTED PARKING (NO PARKING 7–9 AM, 4–6 PM) (13)	
BUS STOP	

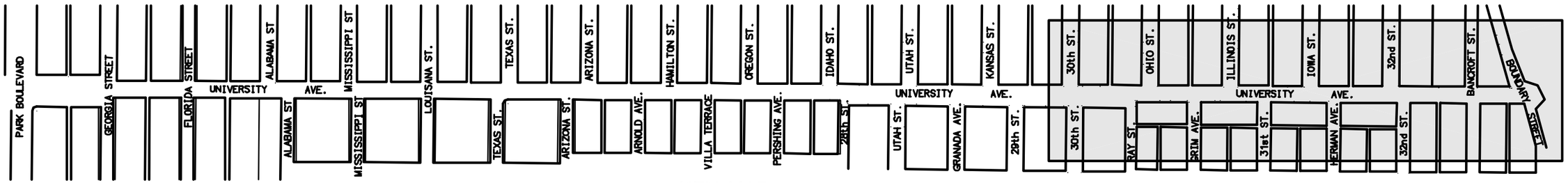
Not to Scale

RBF

55-100148.001 June 2004 (2004-0331)

RECOMMENDED PARKING PLAN

EXHIBIT 7-2
SHEET 2 OF 3



KEY MAP
SCALE: 1"=500'

332 SPACE PARKING STRUCTURE

LEGEND

EXISTING PARKING TO REMAIN (136)
EXISTING PARKING TO BE REMOVED (14)
NEW PARKING SPACE (14)
CONVERTED TO ANGLED PARKING (20)
RESTRICTED PARKING (NO PARKING 7–9 AM, 4–6 PM) (34)
BUS STOP

Not to Scale

RECOMMENDED PARKING PLAN

Plan focuses heavily on the passenger vehicles. A straw poll vote conducted by the Steering Committee indicated that the group prefers Alternative 3, which would provide transit only lanes from Park Boulevard to Boundary Street eastbound and from Boundary Street to Florida Street westbound.

As stated previously, there are no physical or geometric differences between Alternative 3 and Alternative 5a. Therefore, if it is determined in the future that major transit travel time benefits could be achieved by extending the eastbound transit only lane to Park Boulevard, and the operational impacts to traffic could be mitigated, the transit only lanes could be extended to Park Boulevard as a future phase of the project.

The operational analysis of the corridor shows that maintaining the parallel parking and constraining the capacity to two lanes (one in each direction) along University Avenue through the core of the community results in significant delays to both passenger vehicles. The weaving that occurs at every block due to merging of transit vehicles from bus stops and merging of passenger vehicles into right turn lanes, and the queues that develop as a result of the constrained capacity would make accessing University Avenue difficult at best. Therefore, all of the alternatives would shift the parking along University Avenue to the side streets. Responding to the concerns of business owners along University Avenue, a parking alternative was evaluated that allows parking on University Avenue during the off-peak hours. Between the hours of 7:00 and 9:00 a.m. and from 4:00 to 6:00 p.m., the parking lane would serve as a transit only lane. It is recommended that this serve as an interim condition to meet the immediate needs of the businesses that do not have rear access. However, to achieve the operational benefits of the transit only lane for the corridor, and to meet the goal of a transit oriented village, as outlined in the Community Plan for Greater North Park, it is recommended that ultimately the on-street parallel parking be removed from University Avenue. North Park Main Street should continue to share information regarding the University Avenue Mobility Plan and to work with businesses, both new and old, helping to locate businesses that do not have heavy loading requirements to storefronts with no rear access.

City of San Diego transportation planning staff supports this peak hour parking restriction and indicates that similar restrictions are currently being implemented in downtown San Diego. SANDAG/MTS and the Steering Committee supported the removal of the on street parking from University Avenue. Based on a straw pole conducted by the Steering Committee, the group felt that the community would be best served if off-peak parking were not permitted along University Avenue. The straw poll showed that the majority of the Steering Committee members preferred that parking on the side streets be improved to allow for angle parking on both sides with loading zones provided on every block to meet these businesses needs.

7.6 Conclusions and Recommendations

Alternative 5a is recommended as the operationally superior Refined Concept Plan with Parking Alternative B. Alternative 5a would provide for the following improvements to University Avenue:

- Installation of Enhanced Pedestrian Crossings across University Avenue at Herman Street, Kansas Street & Alabama Street.
- Installation of New Traffic Signals at Oregon Street and Arnold Avenue.
- Transit Signal Priority at key signalized intersections.
- Removal of traffic signal at Ohio Street to reduce delays. Installation of Enhanced Pedestrian crossing at Ohio in place of traffic signal.
- Construction of raised median from Boundary Street to Park Boulevard to separate opposing traffic flow, limit the number of intersections with left turn access and help channelize left turning traffic from through lanes.
- Eastbound Transit Only Lane from Utah Street to Boundary Street. Peak hour only operations (7-9 a.m. and 4-6 p.m.) in the business core (Idaho Street to Iowa Street). On-street parking permitted in the Transit Only Lane during the off-peak in business core.
- Westbound Transit Only Lane from Florida Street to Boundary Street. Peak hour only operations (7-9 a.m. and 4-6 p.m.) in the business core (Idaho Street to (Iowa Street). On-street parking permitted in the off-peak in the Transit Only Lane during the off peak in the business core.
- Maintain restricted on-street parallel parking spaces (68) between Idaho Street and Iowa Street in Transit Only lane that can be used for parking and loading/unloading products during the off-peak in the short-term. In the long-term, parking should be prohibited on University Avenue.
- Increase parking on the side streets by converting the existing parallel parking to diagonal parking on all feasible streets.
- Provide for traffic calming measures on side streets and University Avenue to help slow traffic such as bulb-outs, increased on street parking and appropriate traffic controls at parallel street intersections.

Parking Alternative B would only restrict parking along University Avenue during the peak traffic periods of the day (7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.). This alternative would meet the immediate needs of the businesses along the corridor. As businesses evolve along University Avenue, an effort should be made to educate new business owners about the removal of on-street parking along University Avenue. It should be the long-term goal of this project to remove the parallel on-street parking from University Avenue. This design is supported by City of San Diego staff, SANDAG/MTS, the project Steering Committee and members of the community surveyed at the June 12 Community Workshop.

Chapter Eight – Design Elements of Refined Concept Plan

8.0 INTRODUCTION

This chapter provides an overview of the design elements of the Refined Concept Plan, including roadway cross-sections, traffic signal phasing, turn pocket needs and traffic signal warrants for the proposed signalized intersections along the corridor.

Analyses of the Preferred Concept Plan and Refined Concept Plan show that traffic will be diverted from the corridor if the mixed flow capacity of University Avenue is reduced from four-lanes to two-lanes. In addition to the design elements of the Refined Concept Plan, this chapter also identifies potential traffic calming measures that should be considered for the surrounding community to help manage traffic along the alternate routes.

8.1 DESIGN ELEMENTS OF REFINED CONCEPT PLAN

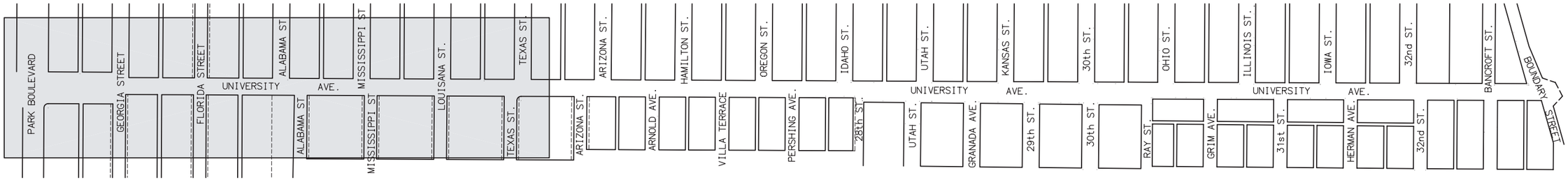
The Refined Concept Plan integrates many of the basic concepts of the Preferred Concept Plan. Exhibit 8-1 provides a plan view of the Refined Concept Plan. Each of the key elements of the Refined Concept Plan are described in detail below.

Roadway Improvements

Traffic Signals. Two new traffic signals are included in the Refined Concept Plan: University Avenue/Arnold Avenue and University Avenue/Oregon Street. Discussion of the traffic signal warrants conducted for these two intersections are provided in a later section of this chapter. One traffic signal will be removed at Ohio Street and replaced by an enhanced pedestrian crossing.

Traffic Signal Modifications. Signal modifications that involve adding a protected left turn phase are planned at several signalized intersections. Although left turn phases often lead to longer cycle lengths and delays to vehicles and pedestrians, the reduction in left turn access along the corridor would result in an increase in left turn traffic at the signalized intersections. To meet this increase in demand, new left turn phases will be necessary.

Raised Median. A raised median extends from Boundary Street to Park Boulevard. To allow the median to be planted, the minimum width of the raised median is 10 feet. This allows for 2 feet of paved surface area on each side of a six-foot plantable area. A sewer line runs down the centerline of University Avenue. Manhole access to the sewer line would need to be modified with the construction of the raised median to ensure that proper access is maintained.



KEY MAP
SCALE: 1"=500'

LEGEND

PEDESTRIAN IMPROVEMENTS

SYMBOL	DESCRIPTION
	RESTRIPE EXISTING CROSSWALK OR NEW CROSSWALK MODIFIED EXISTING CROSSWALK
	NEW ENHANCED SIDE STREET CROSSING
	NEW ENHANCED UNSIGNALIZED CROSSWALK
	REMOVE CROSSWALK

TRANSIT IMPROVEMENTS

SYMBOL	DESCRIPTION
	TRANSIT STOP
	TRANSIT ONLY LANE
	POTENTIAL TRANSIT ONLY LANE (ALT. 3)

STREET IMPROVEMENTS

SYMBOL	DESCRIPTION
	PROPOSED CURB EXISTING CURB
	NEW "STOP" SIGN
	NEW "TRANSIT ONLY LANE AHEAD MERGE LEFT" SIGN
	NEW "RIGHT TURN ONLY LANE BUSES EXEMPT" SIGN
	RAISED MEDIAN WITH LANDSCAPE
	REPAINT EXISTING STOP BAR & SYMBOL
	STRIPE RIGHT TURN ARROW

SIGNAL IMPROVEMENTS

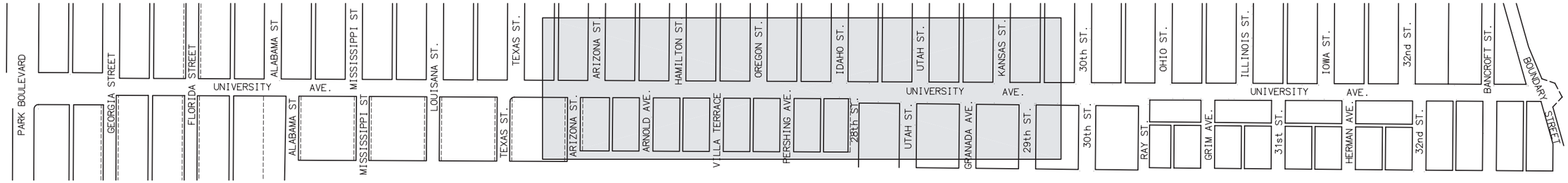
SYMBOL	DESCRIPTION
	STRIPE LEFT TURN ARROW & INSTALL NEW PROTECTED LEFT TURN ARROW
	NEW TRAFFIC SIGNAL
	REMOVE EXISTING TRAFFIC SIGNAL

Not to Scale

RBF

REFINED CONCEPT PLAN

EXHIBIT 8-1
SHEET 1 OF 3



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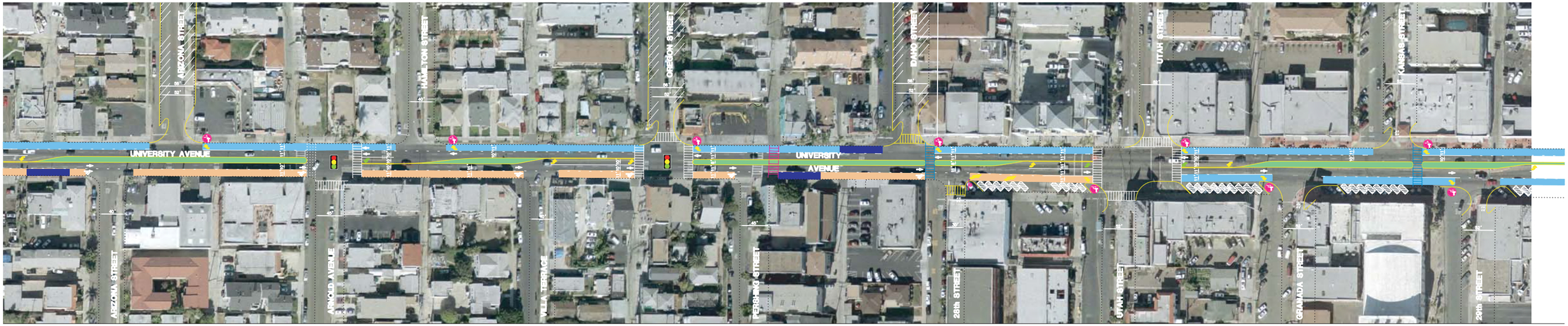


LEGEND

PEDESTRIAN IMPROVEMENTS 8-3

SYMBOL	DESCRIPTION
	RESTRIPE EXISTING CROSSWALK OR NEW CROSSWALK MODIFIED EXISTING CROSSWALK
	NEW ENHANCED SIDE STREET CROSSING
	NEW ENHANCED UNSIGNALIZED CROSSWALK
	REMOVE CROSSWALK

TRANSIT IMPROVEMENTS

SYMBOL	DESCRIPTION
	TRANSIT STOP
	TRANSIT ONLY LANE
	POTENTIAL TRANSIT ONLY LANE (ALT. 3)

STREET IMPROVEMENTS

SYMBOL	DESCRIPTION
	PROPOSED CURB EXISTING CURB
	NEW "STOP" SIGN
	NEW "TRANSIT ONLY LANE AHEAD MERGE LEFT" SIGN
	NEW "RIGHT TURN ONLY LANE BUSES EXEMPT" SIGN
	RAISED MEDIAN WITH LANDSCAPE
	REPAINT EXISTING STOP BAR & SYMBOL
	STRIPE RIGHT TURN ARROW

SIGNAL IMPROVEMENTS

SYMBOL	DESCRIPTION
	STRIPE LEFT TURN ARROW & INSTALL NEW PROTECTED LEFT TURN ARROW
	NEW TRAFFIC SIGNAL
	REMOVE EXISTING TRAFFIC SIGNAL

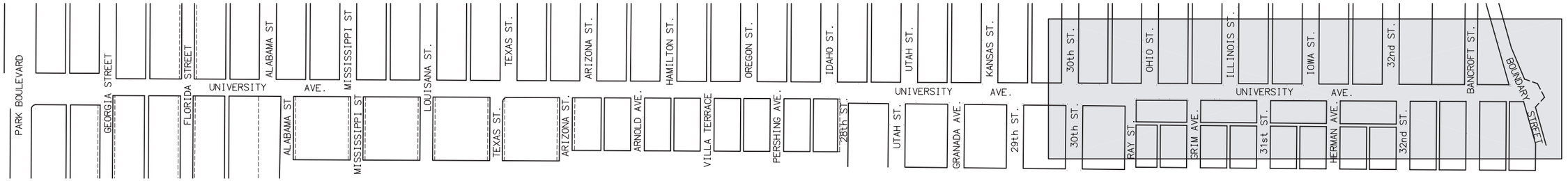
Not to Scale

RBF

55-100148.001 - June 2004

REFINED CONCEPT PLAN

EXHIBIT 8-1
SHEET 2 OF 3



KEY MAP
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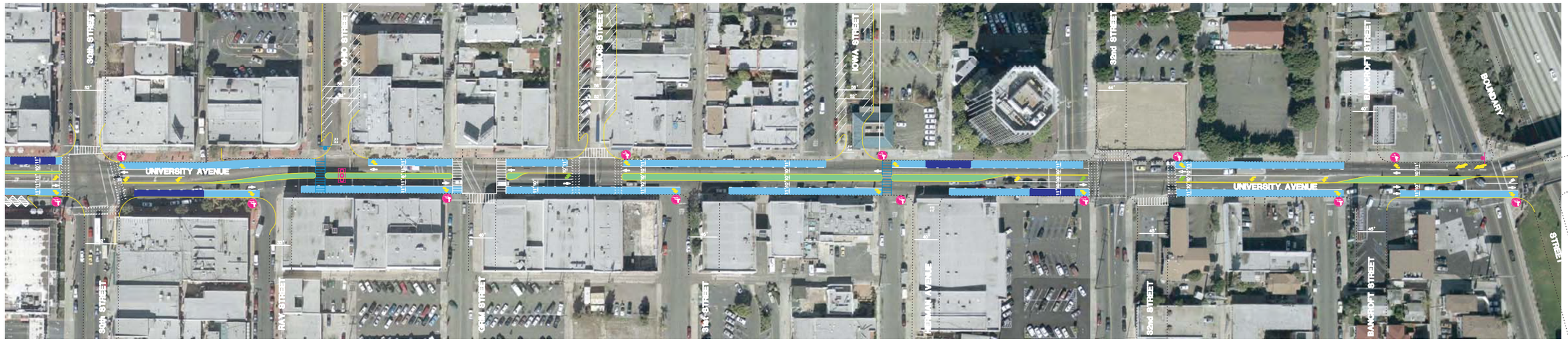


LEGEND

PEDESTRIAN IMPROVEMENTS

SYMBOL	DESCRIPTION
	RESTRIPE EXISTING CROSSWALK OR NEW CROSSWALK MODIFIED EXISTING CROSSWALK
	NEW ENHANCED SIDE STREET CROSSING
	NEW ENHANCED UNSIGNALIZED CROSSWALK
	REMOVE CROSSWALK

8-4

TRANSIT IMPROVEMENTS

SYMBOL	DESCRIPTION
	TRANSIT STOP
	TRANSIT ONLY LANE
	POTENTIAL TRANSIT ONLY LANE (ALT. 3)

STREET IMPROVEMENTS

SYMBOL	DESCRIPTION
	PROPOSED CURB EXISTING CURB
	NEW "STOP" SIGN
	NEW "TRANSIT ONLY LANE AHEAD MERGE LEFT" SIGN
	NEW "RIGHT TURN ONLY LANE BUSES EXEMPT" SIGN
	RAISED MEDIAN WITH LANDSCAPE
	REPAINT EXISTING STOP BAR & SYMBOL
	STRIPE RIGHT TURN ARROW

SIGNAL IMPROVEMENTS

SYMBOL	DESCRIPTION
	STRIPE LEFT TURN ARROW & INSTALL NEW PROTECTED LEFT TURN ARROW
	NEW TRAFFIC SIGNAL
	REMOVE EXISTING TRAFFIC SIGNAL

Not to Scale

RBF

55-100148.001 - June 2004

REFINED CONCEPT PLAN

EXHIBIT 8-1
SHEET 3 OF 3

City regulations strictly prohibit planting large trees over an existing utility line for several reasons. First, access to the utility is impaired when trees are planted on top of a utility line. Often, the tree must be removed if the utility line needs to be repaired. Second, roots of trees often grow around or through wet utilities, resulting in damage and failure of such facilities.

To repair the utility lines due to roots or other elements, the trees and other landscaping would need to be removed. Shallow rooted trees or trees in planters are allowed and should be considered in place of planted trees. A detailed assessment of the planting materials should be evaluated in the design phase of the project.

Left Turn Pockets. The construction of the raised median will provide for left turn pockets at the signalized intersections. The raised median will end prior to the transition into the left turn pocket. Each signalized intersection will be designed with eastbound and westbound left turn pockets. Turn pocket length calculations were conducted for each signalized intersection based on forecast 2030 traffic volumes. The methodology and recommended turn pocket lengths are discussed later in this chapter.

Road Repaving and Striping. With the construction of the raised median and proposed striping modifications, University Avenue will be resurfaced and restriped. Observations along the corridor show that the typical crossfall (difference between centerline and edge of pavement) is between 4 and 6 percent for much of University Avenue. Standard crossfall is approximately 2 percent on a typical street. It is likely that the centerline of the roadway is much higher than the edge of pavement due to the buried railroad tracks and years of overlay. Research by North Park Main Street indicates that the existing tracks are located approximately 10 inches below the surface of the road. To verify this assumption, it is recommended that borings be collected in the design phase of this project to evaluate the pavement cross-sections at various points along the corridor. If the findings of the pavement study show that University Avenue should be reconstructed, it is recommended that centerline of the roadway be brought down to a more standard crossfall. This would require the removal of the existing tracks and potentially abandoned utility lines in the roadway.

SANDAG/MTS has requested that all transit stop platforms be raised to street level to allow for level boardings. With the existing crossfall of the roadway, this may require the platform be raised by several inches. In turn, this will impact drainage along the sidewalk and along the curb and gutter at all proposed transit stops. Lowering University Avenue and reconstructing the sidewalks in the vicinity of the transit stops may eliminate potential drainage issues. However, a detailed drainage study will need to be conducted to evaluate the impacts associated with raising these platforms.

Pedestrian Improvements

Enhanced Pedestrian Crossings. A total of five unsignalized enhanced pedestrian crossings on University Avenue and four enhanced side street crossings are included in the Refined Concept Plan:

Crossing University Avenue:

- Alabama Street
- Idaho Street/28th Street
- Kansas Street
- Ohio Street
- Herman Avenue / Iowa Street

Side Street Crossings:

- Alabama Street (north leg)
- Alabama Street (south leg)
- Idaho Street
- 28th Street

Enhanced pedestrian crossings on University Avenue would include flashing in pavement devices and highly reflective pavement markings warning drivers of the presence of a pedestrian in the crosswalk. The technology available at the time this report was prepared would require that the pedestrian press a button to activate the crossing. The in- pavement devices would continue to flash for a pre-determined time.

Exhibit 8-2 illustrates a typical enhanced pedestrian crossing system. As shown, the system would require a power source, activation technology (either push button or automatic sensor), control unit and in-pavement flashers.

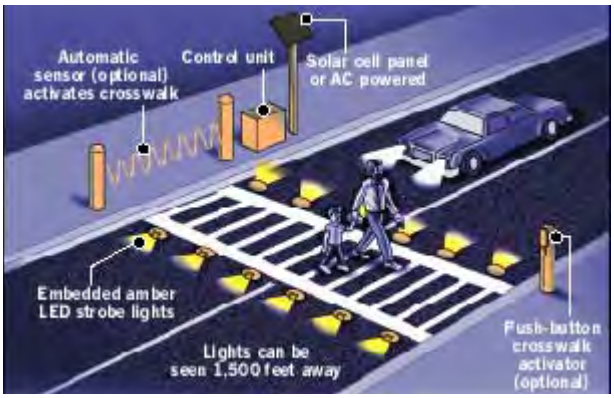


Exhibit 8-2 Enhanced Pedestrian Crossing Technology
Source: Lightguard Systems Inc.

Exhibit 8-3 illustrates some of the physical elements of the Enhanced Pedestrian Crossing System. At the time this report was prepared, the cost to construct a typical Enhanced Pedestrian Crossing was estimated to be $20,000 for a crossing across University Avenue. This includes installation of pedestrian push button, wiring of push button to control box, acquisition and installation of the control unit, connection to a power source, in pavement flashers and highly reflective pavement markings.

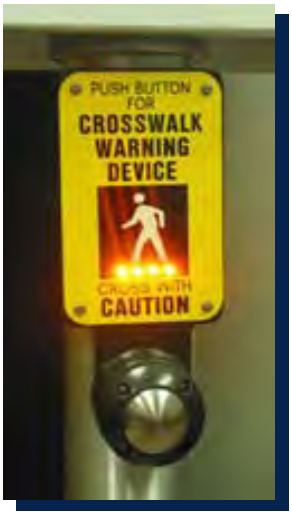


Exhibit 8-3 Enhanced Pedestrian Crossing Elements:
a) Pedestrian Push Button
b) Automated Sensor
c) In Pavement Flasher
Source: Lightguard Systems, Inc.

Curb Extensions (Bulb-outs or Pop-outs). Curb extensions, also called pop-outs or bulb-outs, will be provided at several intersections. Curb extensions reduce the exposure time for pedestrians as they cross the mixed flow lanes by reducing the distance from curb to curb. Curb extensions should only be provided on blocks where on-street parking is provided. As the Refined Concept Plan recommends that parking along University Avenue be removed or restricted, no curb extensions would be provided on University Avenue. Curb extensions are proposed on the side streets only.

Exhibit 8-4 illustrates the minimum design requirements for a curb extension according to the City of San Diego Street Design Manual. As shown, the minimum curb radius is 30 feet, which is consistent with the minimum turning radius for large (WB-50) trucks. Currently, the curb radius along University Avenue is between 15 and 25 feet. Therefore, the curb extensions will result in longer sweeping curbs.

The design manual recommends that the crosswalks be located at the narrowest point between the two curb extensions. Because the existing development is within 15 feet or less of the existing curb along University Avenue, existing buildings may block the view of a pedestrian in a crosswalk. Final design should evaluate the appropriate location of the crosswalk to meet minimum sight distance requirements.

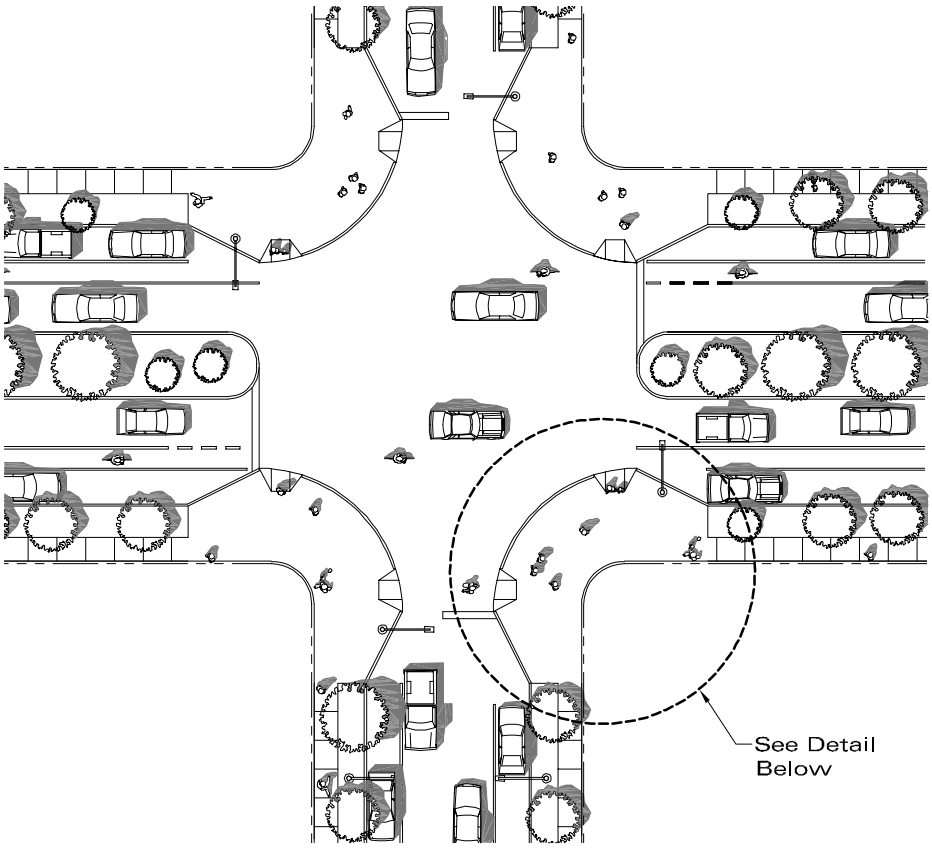
Transit Improvements

Consolidation of Transit Stops. A total of 20 transit stops are currently provided along University Avenue, serving Routes 7 and 908. The Refined Concept Plan will consolidate those transit stops to 10, providing 5 eastbound and 5 westbound, shown in Exhibit 8-5. The stops will be located at:

- Iowa Street/32nd Street
- 30th Street
- Pershing Street/Idaho Street
- Texas Street
- Alabama Street

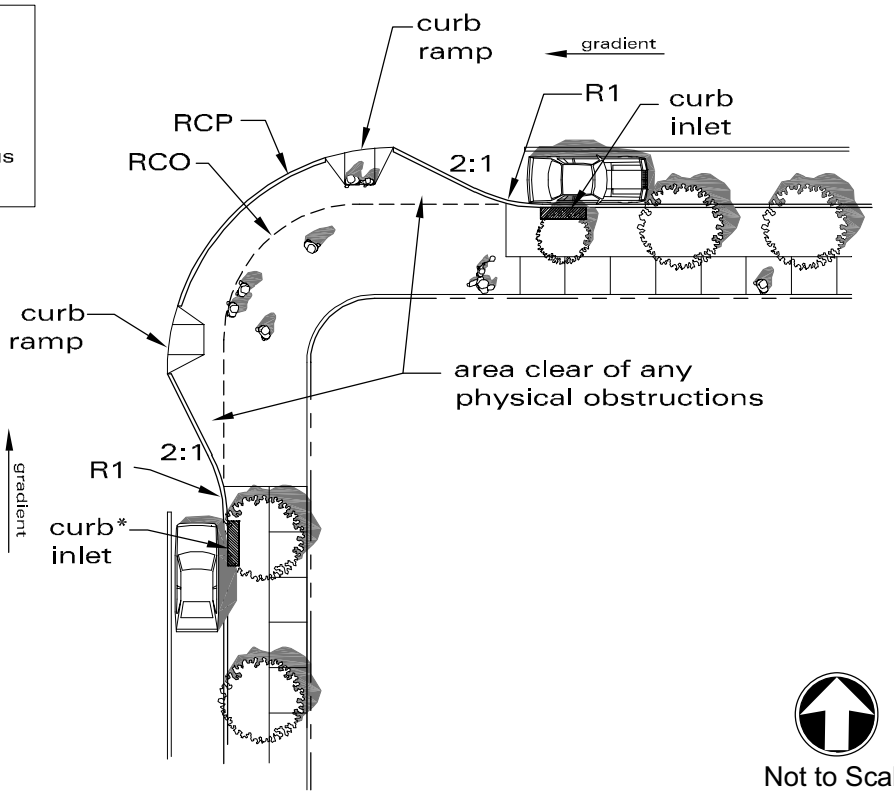
Each transit stop would be equipped with a minimum of seating, signage, concrete bus pad, raised sidewalk for at-grade boarding and trash receptacle. Of the 10 stops, 4 would also be equipped with a new Type 1 transit shelter: Texas Street (eastbound and westbound), Herman Street (eastbound) and Iowa Street (westbound). Type 1 transit shelters look like the historic streetcar and are intended to set the tone for streetscape along University Avenue. All other stops will be provided Type 2 transit shelters that are similar in design to those near 30th Street, with umbrella type canopies and tile covered square boxes for seating.

The current design of the transit shelters, as illustrated in the Concept Plan, should fit within the existing right-of-way. However it should be noted that no detailed plans for either of the shelters were provided to the consultant to determine if the shelters would fit into the intended station location. The Concept Plan notes that the "Type 2" shelter is to be located where sidewalk width is constrained. However, this will depend on the final opinion on whether the shelter designs were appropriate. As final designs for the shelters are created the locations and right-of-way width should be taken into consideration. This will ensure that there will be sufficient room for the transit shelter furniture, and for smooth pedestrian movement in the station area.



NOTE:
* Drainage requirements must be evaluated and addressed.

Legend
RCP - 30' (9.2 m) minimum
RCO - Retrofit installations- original curb radius
R1 - Curb radius 20' (6 m)



Source: City of San Diego
Street Design Manual, Nov. 2002,
Page 90.

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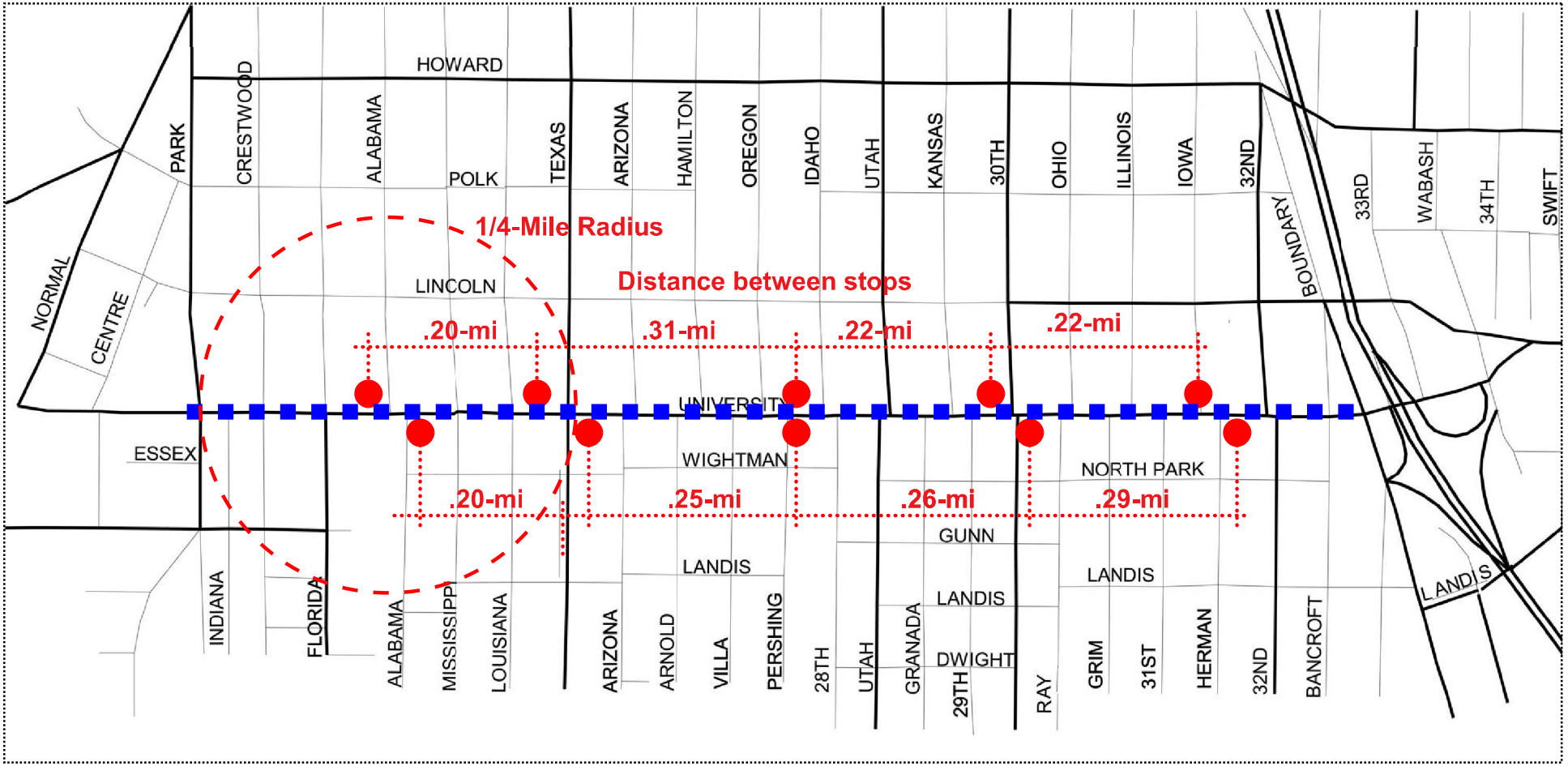


● Route 7 and 908 Proposed Transit Stops

.20-mi Distance Between Stops

Not to Scale

LOCATION OF PROPOSED TRANSIT STOPS WITHIN STUDY AREA

55-100148.001 - June 2004

EXHIBIT 8-5

RBF
CityWorks
cityworks
CityWorks: a joint venture of Collaborative Services & Warner Architecture + Design

Consistent with the Preferred Concept Plan, all of the transit stops proposed in the Refined Concept Plan are located on the farside of the intersection. Farside transit stops are a preferred location by most transit agencies including SANDAG/MTS. Farside stops have the added benefit of:

- Minimizing conflicts with right turning vehicles.
- Minimizing sight distance safety conflicts for both pedestrians and motorist.
- Encouraging pedestrians to cross behind the bus rather that in front of it.
- Better facilitating bus reentry into mixed-flow traffic.
- Allowing the transit vehicle to go through the intersection, thus eliminating the need to wait through another signal cycle.

Transit Only Lanes. The Refined Concept Plan includes transit only lanes in both the eastbound and westbound directions, as shown in blue in Exhibit 8-1. The eastbound transit only lane would extend from Utah Street to Boundary Street. Westbound, the transit only lane would extend from Boundary Street to Florida Street. At all intersections, a minimum 75' right turn pocket should be provided for mixed flow traffic. This is the only location where passenger vehicles should be allowed to enter the transit only lane (for right turns only).

Transit only lanes should be 11 feet wide throughout the corridor. The pavement should be color treated to clearly identify a difference in travel way. "Transit Only Lane" signs should be placed at 100-foot intervals along the corridor.

The Steering Committee and SANDAG prefer that the eastbound transit only lane extend from Park Boulevard to Boundary Street, as shown in orange in Exhibit 8-1. The Refined Concept Plan recommends the eastbound transit only lane from Utah Street to Boundary Street due to traffic operations along the corridor. The operational analysis of the corridor indicates that queues and delays would be significantly greater to passenger vehicles if the transit only lane begins at Park Boulevard, as there are no continuous alternative routes north and south of University Avenue. However, there are no physical differences in the roadway between the two alternatives. The only differences are the pavement markings and signage for the curbside lane. If future operations of the corridor show that traffic volumes along University Avenue are less than forecast and that University Avenue would operate acceptably with a single traffic lane, then the transit only lane could be extended to Park Boulevard.

In addition to the benefits of a transit only lane to transit vehicles, emergency vehicles may also benefit greatly from the proposed transit only lane design. Emergency service vehicles could either travel in the transit only lane or passenger vehicles would have the ability to move to the side of the road into the

transit only lane to allow emergency vehicles to pass. It should be noted that the City Fire-Rescue department has not had the opportunity to review the Refined Concept Plan.

Transit Signal Priority System. All queue jump technology recommended in the Preferred Concept Plan has been eliminated from the Refined Concept Plan. Instead, this study has included preliminary analysis of a Transit Signal Priority (TSP) system that would provide priority to transit vehicles, whether in a transit only lane or not. TSP provides preferential treatment for transit vehicles at traffic signals. This can be accomplished in several ways. The simplest passive-priority strategy is to set basic timings for intersection approaches to favor approaches used by transit vehicles. Other active-priority options are to provide green extensions and/or early green lights to transit vehicles running behind schedule at signalized intersections.

The latter TSP system involves the selection and implementation of on-vehicle technology, traffic signal controller modifications and central control technology. SANDAG/MTS and the City of San Diego are in the process of identifying an operating system through the Showcase project planned for El Cajon and Park Boulevards.

The VISSIM simulation model was used to estimate potential benefits of TSP along the University Avenue corridor. In the model, TSP was allowed at all signalized intersections, although it would not be necessary to implement TSP at all intersections. By assuming that TSP is installed at all signalized intersections, the determination could be made as to whether or not the TSP system: (1) improved transit operations at the individual intersections, and (2) impacted the side streets for those intersections.

In addition, the model assumed that all buses were eligible for, and received, TSP in the VISSIM simulation model. However not all buses would be granted TSP under actual operating conditions. In the VISSIM simulation model, buses were only granted a green extension when arriving at the end of the green phase. When granted, the green time was extended to allow the bus to pass through the intersection without stopping. In those instances when the green time could not be extended or the bus arrived during the red interval, the bus received an early green at the beginning of the next green phase.

Travel time values were obtained by running the VISSIM simulation model for each scenario 10 times and calculating the volume-weighted average travel times. The standard deviations of the average travel times in the runs for the refined concept plan with- and without-TSP scenarios were inconclusive due, in part, to the fact that all vehicles received priority. Transit vehicles ahead of schedule receiving priority contributed to the observed increases in standard deviation. The VISSIM simulation model runs indicated that some travel time reductions along the corridor associated with the implementation of TSP with the Refined Concept Plan, mainly during the evening peak period. Routes 7 and 908 experienced a range of average travel time changes from an increase in travel time of 16 seconds to a reduction in travel time of

57 seconds during the peak periods. Passenger vehicles on University Avenue also benefited from TSP due to reduced delay to through traffic when green time along the corridor is increased for transit vehicles.

The VISSIM simulation model run showed overall slightly reduced bus delay along the corridor, in particular:

	AM	PM
❖ Florida Street	1.2 seconds/ bus	4.3 seconds/bus
❖ Texas Street	4.3 seconds/bus	3.1 seconds/bus
❖ Arnold Avenue	0.5 seconds/bus	5.7 seconds/bus
❖ Oregon Street	0.4 seconds/bus	4.0 seconds/bus
❖ Utah Street	2.8 seconds/bus	4.6 seconds/bus
❖ 30th Street	0.9 seconds/bus	2.1 seconds/bus

These intersections demonstrated consistent delay benefits between time periods (a.m. and p.m.) and by direction (eastbound and westbound). The greatest benefit was achieved at Arnold Avenue in the p.m. peak hour when average bus delay through the intersection was reduced by more than 5.0 seconds. Similar results were achieved at Florida Street and Utah Street, each with forecast reduced bus delay time of more than 4.0 seconds in the p.m. peak hour.

When considering TSP, impacts to the side street should also be analyzed to determine if the priority timing significantly impacts side street operations and delay. The VISSIM model assumed in all cases that the extra green time allocated to the buses was taken from the side streets, although, it is possible to allow the green time to be taken from the left turn phases. In either case, as a result, queues may develop and operations may not recover until demand on the left turn or side street is reduced. Using the VISSIM simulation model, Texas Street was determined to be most significantly impacted on the side street by the implementation of TSP with nearly a 5 percent (21.4 seconds) increase in side street delay in the p.m. peak hour and an 8.5 percent (5.4 seconds) increase in side street delay in the p.m. peak hour.

Although the simulation model assumed that all intersections were equipped with TSP and all buses were provided TSP, actual operations in the field would be far more restrictive. For example, a bus traveling ahead of schedule does not need to be provided priority. If priority is provided to a bus traveling ahead of schedule, the bus will sit at the next stop until the schedule is once again achieved. A conditional priority system should be considered to allow TSP only when buses are running behind schedule.

The segment of University Avenue studied covers only a limited portion of the transit routes. The estimated potential benefits of TSP shown in this preliminary analysis were only incremental over those provided by the transit only lanes and the results are inconclusive due to the high standard deviation in the

travel time values between runs. A future study focused specifically on TSP operations should be conducted to evaluate the potential TSP benefits across the entire length of the transit corridor (Route 7 and Route 908). The focused study should integrate City of San Diego specific TSP operations, including conditional priority. TSP recommendations should be developed for the individual intersections along the entire length of the transit corridor. For more information on the TSP analysis conducted specifically for the University Avenue Mobility Plan, please see Appendix L.

Parking

Parking was one of the most controversial elements of the Refined Concept Plan. The Preferred Concept Plan recommended that on-street parking be maintained through the most congested segments of the University Avenue corridor. Analysis of the operations of the corridor shows that during the peak hours, this on-street parking would result in significant delays due to the merging maneuvers for both passenger vehicles (into right turn lanes) and transit vehicles (into and out of transit stops and right turn lanes). Travel time with the on-street parking was forecast to range from 15 to 21 minutes depending on the direction of travel in the peak hours. Current travel time along the corridor is approximately 7 to 8 minutes. Therefore, it is recommended that on-street parking be restricted, if not removed from University Avenue. By restricting the parking to off-peak hours or removing the on-street parking, a continuous transit only lane can be provided in each direction without the need for transit vehicles to merge into and share the mixed flow lanes resulting in optimal transit operations.

However, a few business owners on the north side of University Avenue expressed a concern that the removal of the on-street parking would pose loading problems for their businesses. Between Iowa Street and Idaho Street, buildings on the north side of University Avenue do not have rear access. Therefore all loading and unloading occur on University Avenue. To meet the needs of businesses on the north side of University Avenue, a short-term alternative was developed.

In the short-term, on-street parallel parking would be permitted in the off-peak period between Idaho Street and Iowa Street. Between the hours of 7:00 and 9:00 a.m. and between 4:00 and 6:00 p.m., on-street street parallel parking would be prohibited to allow for the continuous transit only lane along the corridor. Consideration was made to prohibit on-street parallel parking though the core but allow for commercial loading intermittently where rear access is not provided. This configuration may lead to increased merging by buses into and out of the mixed flow lane, and would be difficult to enforce.

The long-term parking goal would be to remove all on-street parallel parking along University Avenue. This would meet SANDAG's goal of improved transit service and the community goal of creating a transit oriented village. Surveys collected at the June 12th public workshop indicate that many

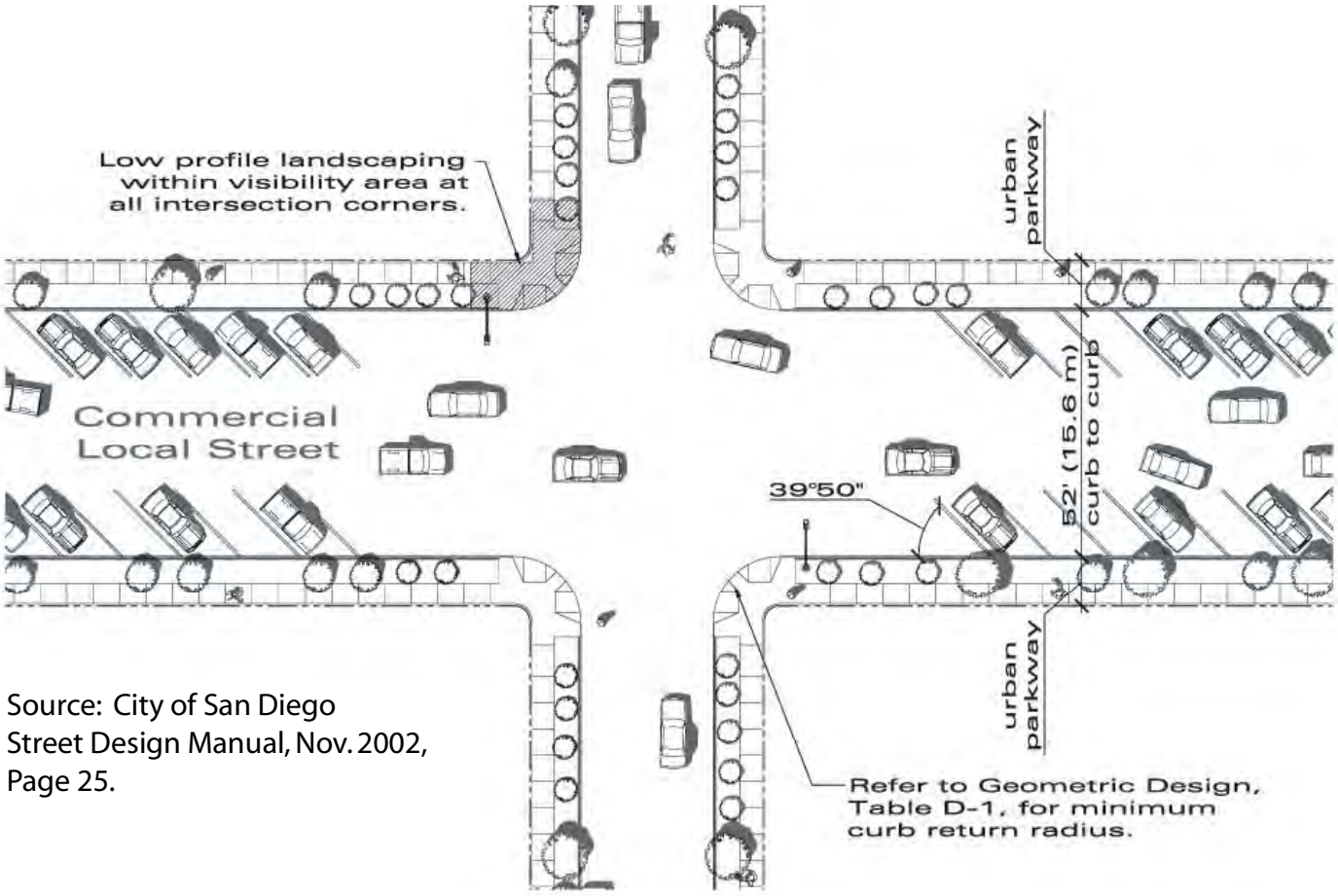
participants feel the restricted parking would be confusing and unnecessary. The Steering Committee and SANDAG support the proposal to remove parallel parking on University Avenue.

In addition to the parking modifications along University Avenue, side street improvements have been identified that convert parallel parking on side streets to diagonal parking. A total of seven streets on the north side of University Avenue were identified to have curb-to-curb widths of 52 feet or wider. Based on City standards for collector roadways, diagonal parking can be provided on both sides of the street within the 52 foot curb-to-curb width. The design of such roadways as provided in the November 2002 City of San Diego Street Design Manual is illustrated in Exhibit 8-6.

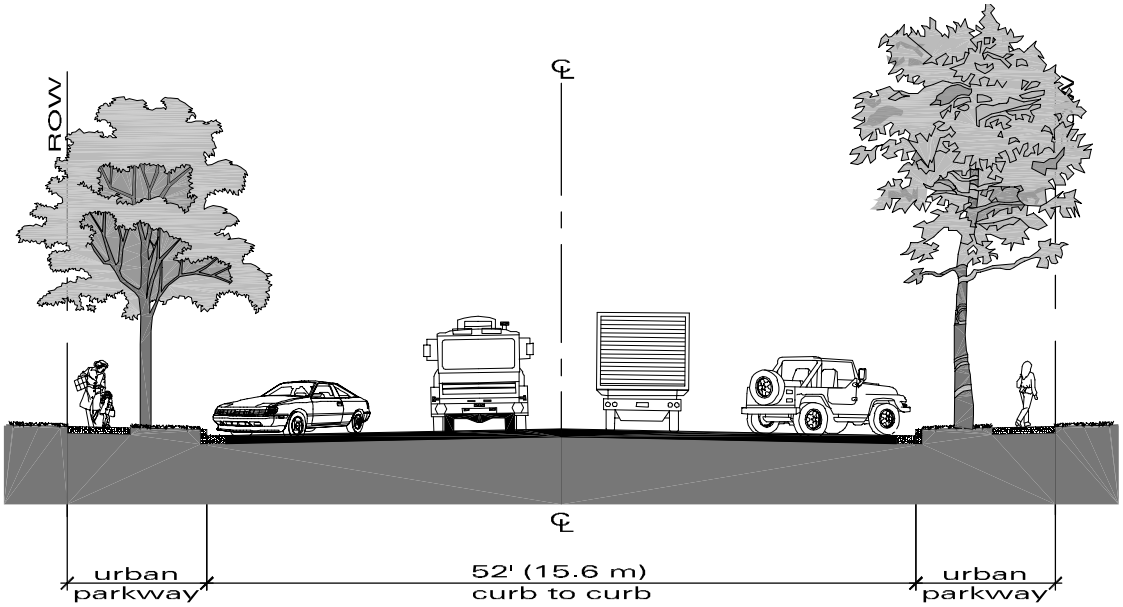
Allowing parking in the transit only lane will impact the ability for emergency vehicles to respond to incidents along the corridor. With the construction of the raised median, directional capacity for emergency vehicles will be constrained to a single 10 to 11 foot travel lane if on-street parallel parking is permitted along University Avenue. The minimum curb-to-curb width recommended by emergency services is approximately 22 feet to allow passenger vehicles to move to the side and for emergency vehicles to safely pass. If the minimum width is not provided, emergency vehicles will be required to wait through traffic to reach their destination. Due to the accelerated project schedule, the City Fire-Rescue department has not had the opportunity to review the Refined Concept Plan. This will need to take places as the project progresses. It is anticipated that emergency services will not support the proposed restricted parking alternative for University Avenue.

8.2 CROSS-SECTIONS

Cross-sections provide a street level view of the corridor that illustrate lane widths, lane utilization type and other key elements of the roadway that cannot be illustrated in a plan or overhead view. A total of four typical cross-sections illustrate the changes in design along University Avenue with the Refined Concept Plan. Exhibit 8-7 illustrates the locations of the cross-sections. Typical cross-sections are illustrated in Exhibits 8-8 through 8-11.



Source: City of San Diego Street Design Manual, Nov. 2002, Page 25.



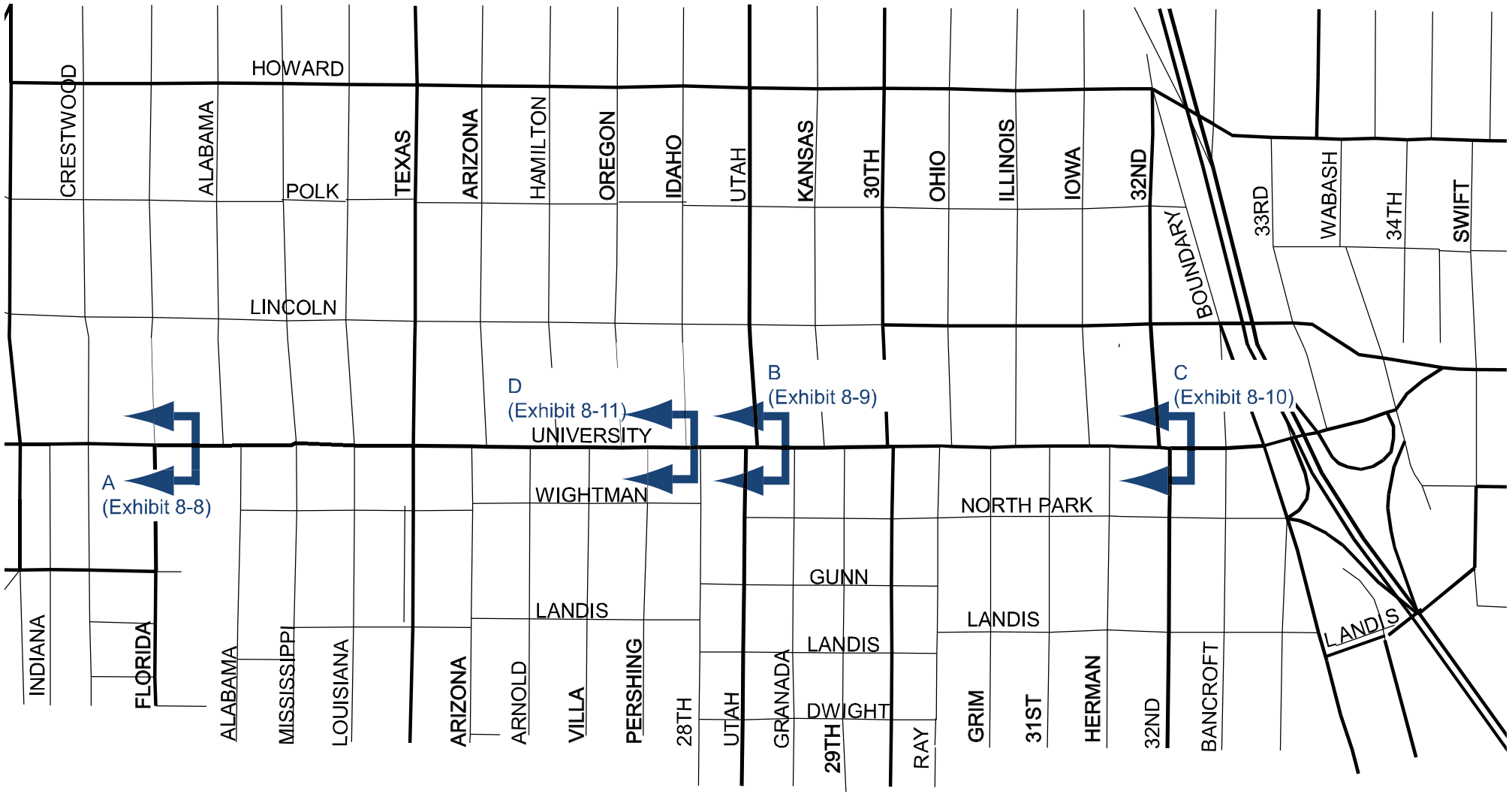
with diagonal parking on both sides

Not to Scale

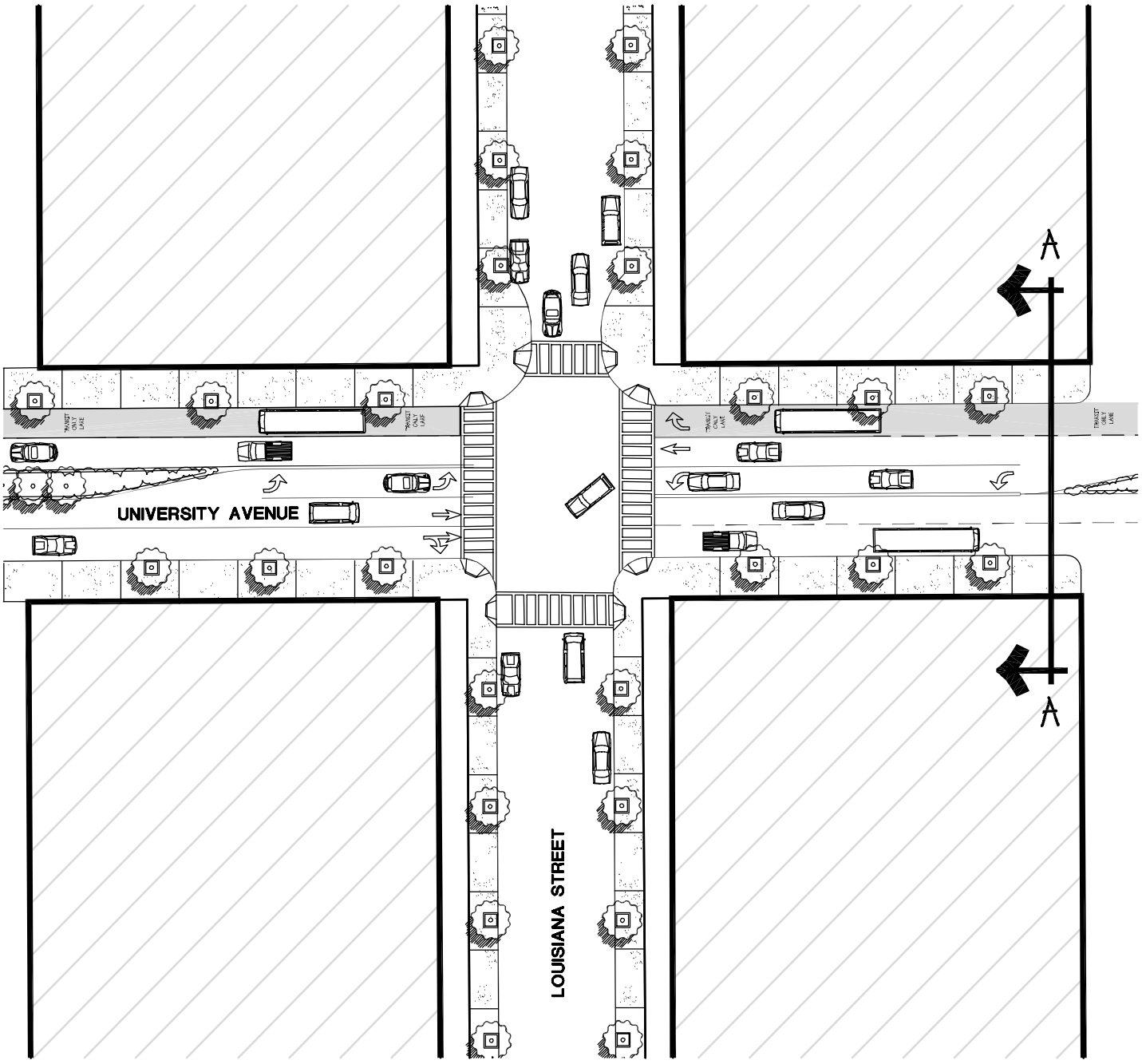
SIDE STREET DIAGONAL PARKING CROSS-SECTION

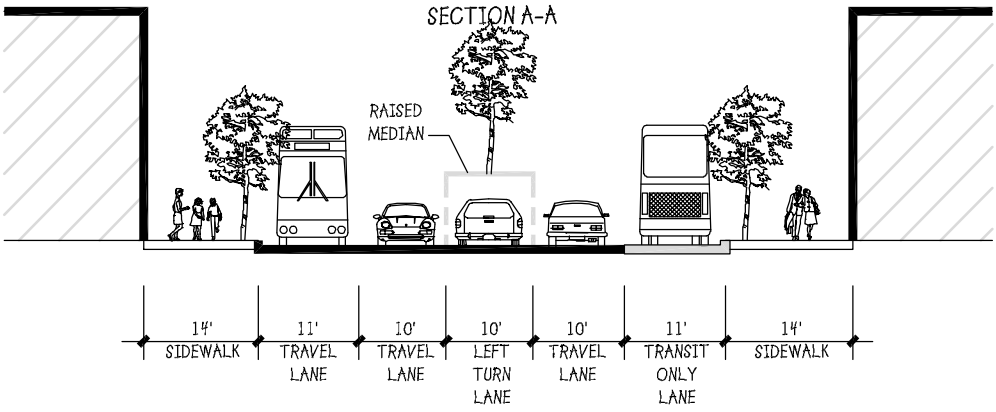
55-100148.001 - June 2004

EXHIBIT 8-6


HOWARD
CRESTWOOD
ALABAMA
POLK
TEXAS
ARIZONA
HAMILTON
OREGON
IDAHO
UTAH
KANSAS
30TH
OHIO
ILLINOIS
IOWA
32ND
BOUNDARY
33RD
WABASH
34TH
SWIFT
LINCOLN
A
(Exhibit 8-8)
D
(Exhibit 8-11)
B
(Exhibit 8-9)
C
(Exhibit 8-10)
UNIVERSITY
WIGHTMAN
NORTH PARK
GUNN
LANDIS
LANDIS
LANDIS
LANDIS
INDIANA
FLORIDA
ALABAMA
MISSISSIPPI
LOUISIANA
ARIZONA
ARNOLD
VILLA
PERSHING
28TH
UTAH
GRANADA
DWIGHT
29TH
RAY
GRIM
31ST
HERMAN
32ND
BANCROFT

8-15





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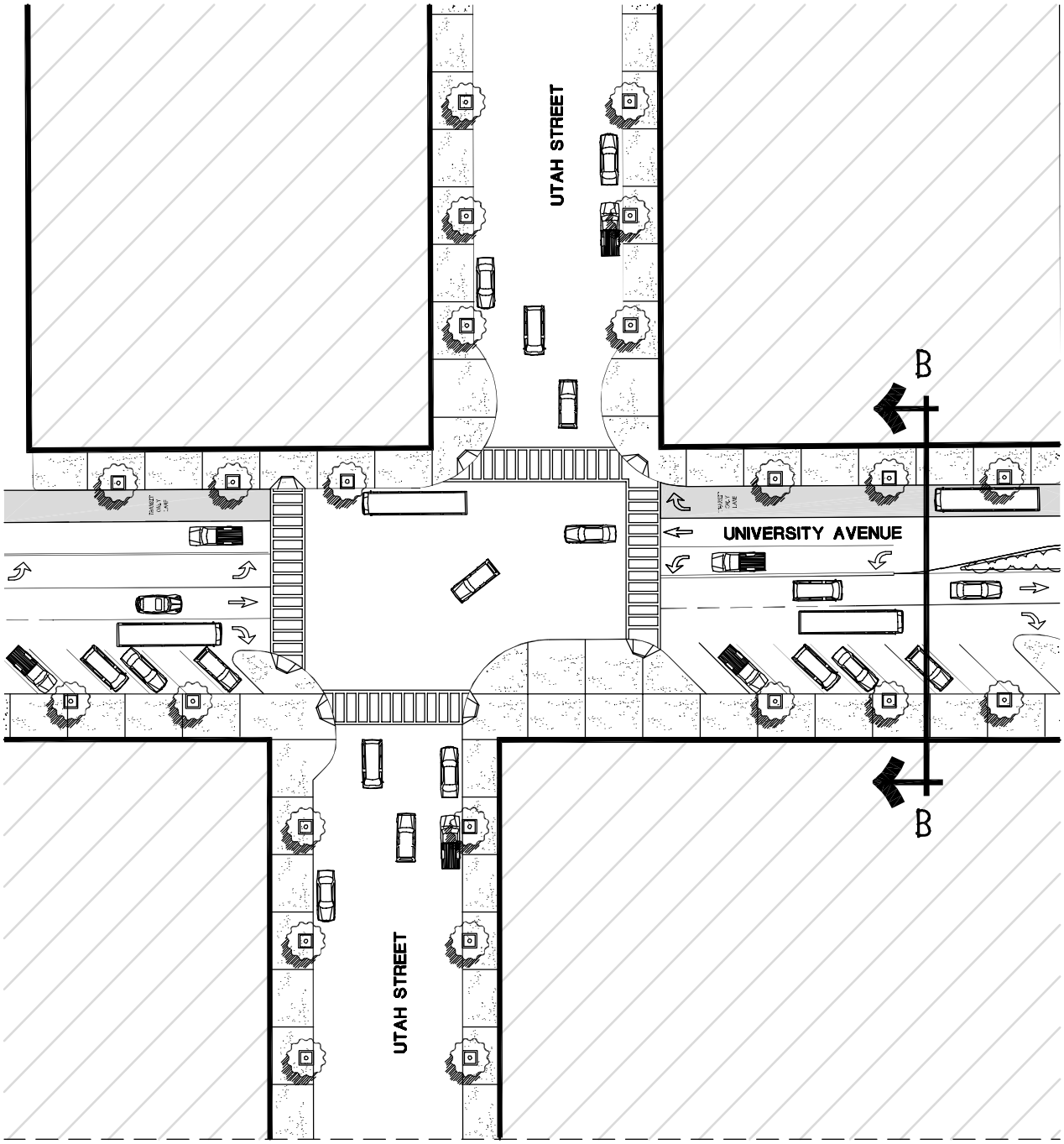
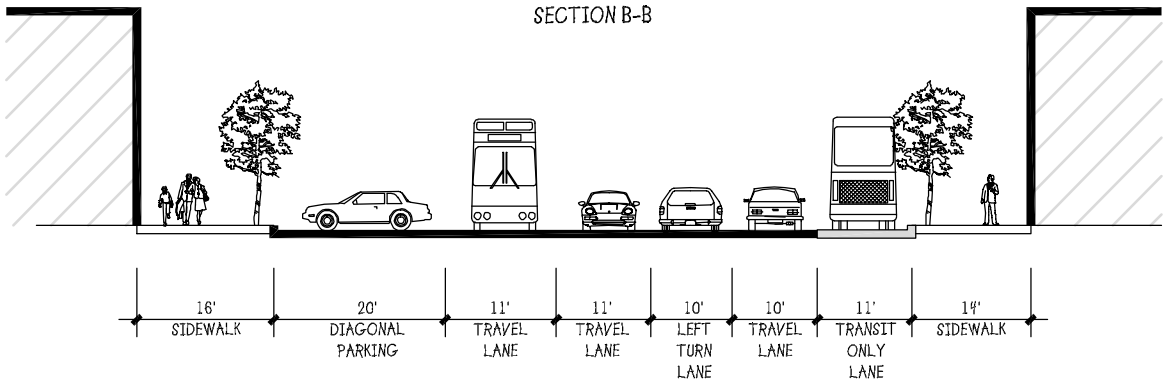
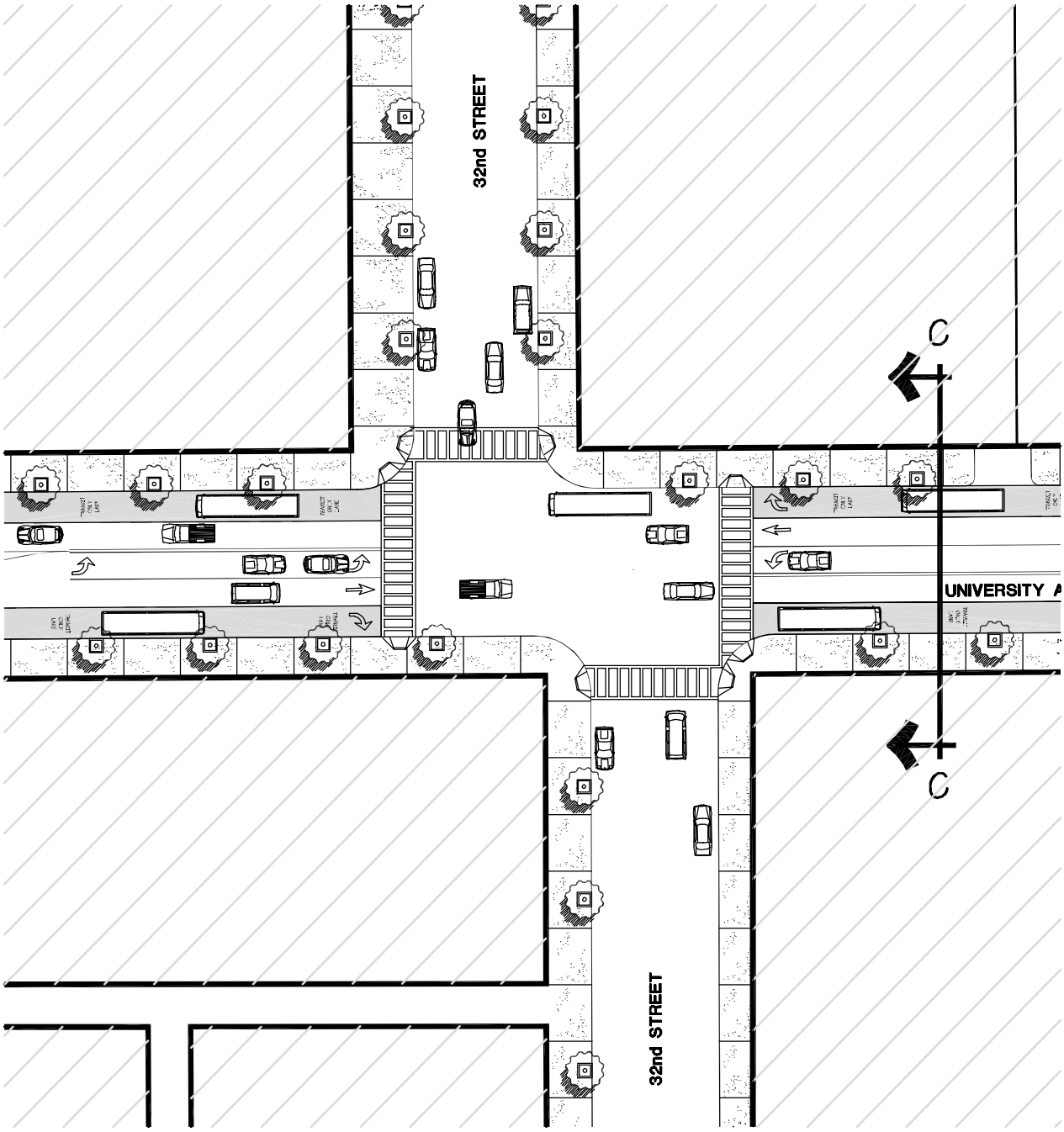
CROSS-SECTION A-A
Park Boulevard to Utah Street

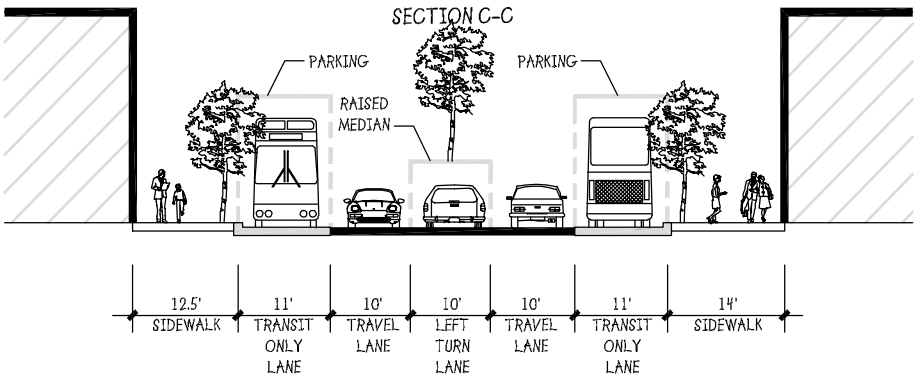




Not to Scale

CROSS-SECTION B-B
28th Street to 30th Street





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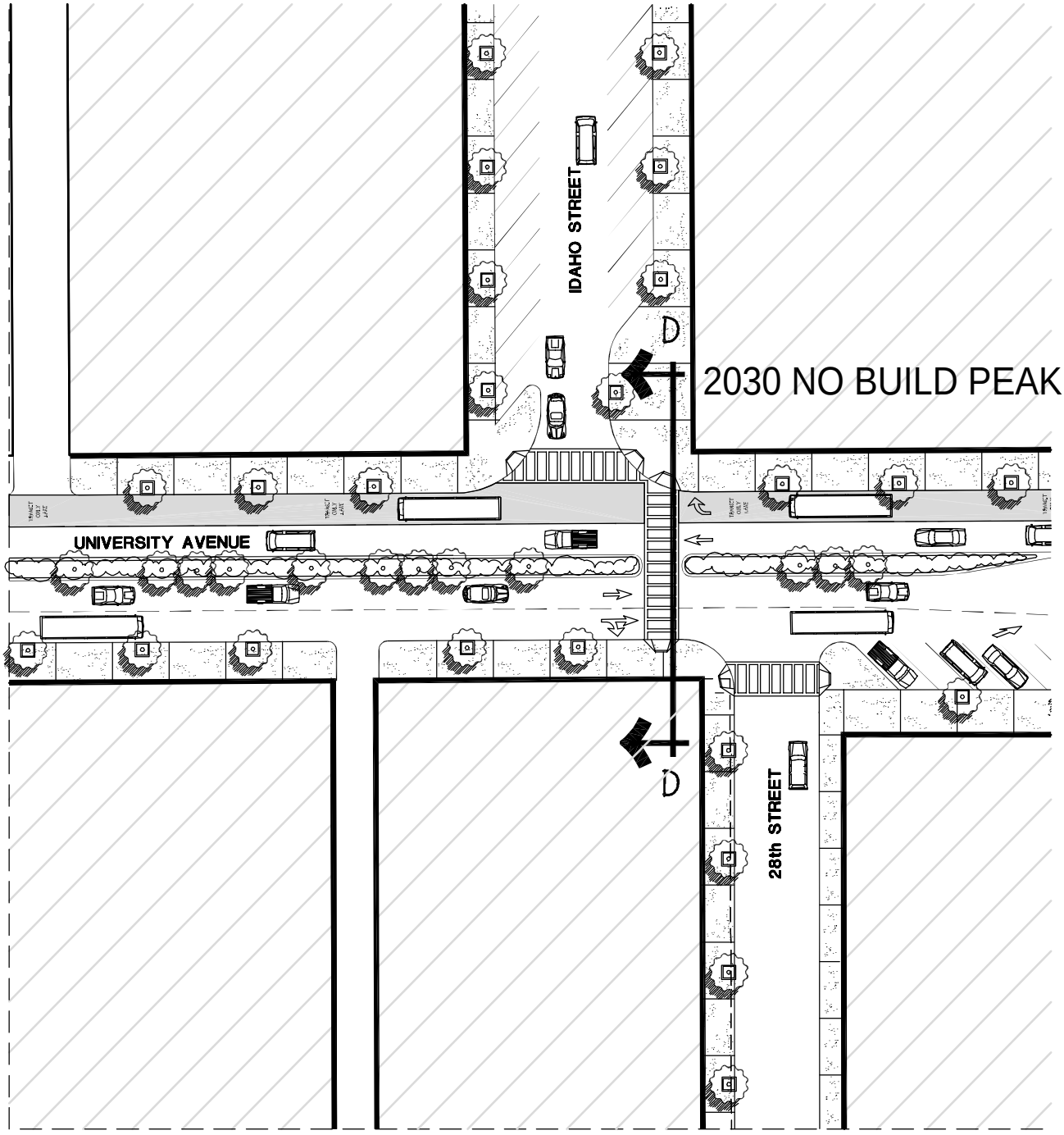
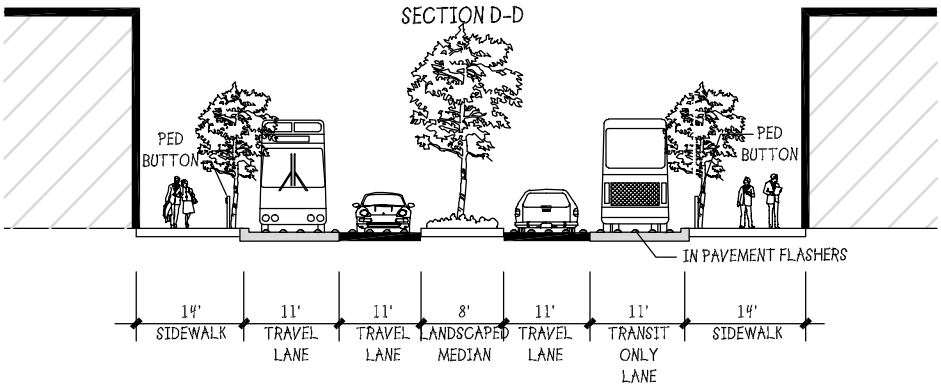
CROSS-SECTION C-C
28th Street to Boundary Street





Not to Scale

CROSS-SECTION D-D
Enhanced Pedestrian Crossing

Cross-section A, illustrated in Exhibit 8-8, provides an overview of the typical roadway segment from Park Boulevard to 28th Street. Through this section, two mixed flow travel lanes would be provided eastbound. Westbound, one mixed flow lane and one transit only lane would be provided. A ten-foot raised median would be provided which would become a ten-foot left turn lane at signalized intersections. On-street parking would be prohibited on both the north and south sides of the street through this section.

Cross-section B, illustrated in Exhibit 8-9, provides an overview of the typical roadway section from 28th Street to 30th Street, where on-street diagonal parking is provided on the south side of University Avenue. The existing on-street diagonal parking would be unaffected by the transit only lanes or the design of the Refined Concept Plan. West of Utah Street, two mixed flow lanes are provided. The outside or curb lane converts to a dedicated right turn lane at Utah Street, resulting in a single mixed flow through lane and a dedicated transit only lane east of Utah Street. Westbound, the transit only lane is provided from 28th Street to 30th Street. All on-street parallel parking along the north side of University Avenue, located within the transit only lane, would be prohibited during the peak hours only (7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.). Off-peak on-street parallel parking would be permitted on the north side of University Avenue through this section.

Cross-section C, illustrated in Exhibit 8-10, provides an overview of the typical roadway section from 30th Street to Boundary Street. Through this section, transit only lanes would be provided both eastbound and westbound. In the short-term parking would be allowed during the off-peak periods in the transit only lane both eastbound and westbound. In the long-term, this parking would be removed.

Cross-section D, illustrated in Exhibit 8-11, provides an overview of the typical unsignalized enhanced pedestrian crossing along the corridor.

8.3 TURN POCKET LENGTH CALCULATIONS

Under existing conditions, left turning and through vehicles share a common lane along University Avenue at many intersections. At most intersections, this left turn movement is an unprotected movement, such that left turning vehicles must wait for gaps in traffic to make their turn. The following intersections currently have left turn pockets:

- Park Boulevard
- Florida Street
- Texas Street
- 30th Street
- 32nd Street

The Refined Concept Plan will maintain these left turn pockets and add eastbound and westbound left turn pockets at the following intersections:

- Mississippi Street
- Arnold Avenue (westbound)
- Oregon Street (eastbound)
- Utah Street
- Illinois Street
- Boundary Street

The length of the left turn pocket is critical. If left turn pockets are not long enough, queued left turn vehicles will spill over into the through lane, thereby blocking and reducing the capacity of the through lane. Therefore, left turn pocket calculations were conducted for each leg of each signalized intersection where a left turn pocket is proposed. Table 8-1 summarizes the recommended minimum left turn pocket storage lengths, based on Horizon Year 2030 with Preferred Concept Plan peak hour volumes.

Table 8-1
Recommended Left Turn Pocket Lengths

Intersection	Existing Pocket Length				Proposed Pocket Length			
	EB	WB	NB	SB	EB	WB	NB	SB
Park Boulevard	150	135	90	160	270	220	220	230
Florida Street	60	40	--	--	70	130	--	--
Mississippi Street	--	--	--	--	70	90	--	--
Texas Street	100	100	100	150	350	90	120	250
Arnold Avenue	N/A	--	--	N/A	N/A	80	--	N/A
Oregon Street	--	N/A	N/A	--	130	N/A	N/A	--
Utah Street	--	--	70	120	100	80	180	130
30th Street	60	75	60	50	140	230	140	70
Grim Avenue	N/A	N/A	--	N/A	N/A	N/A	--	N/A
Illinois Street	--	N/A	N/A	--	110	N/A	N/A	--
32nd Street	60	80	100	80	100	230	250	60
Boundary Street	60	--	--	--	100	--	--	--

These recommended left turn pocket lengths were drafted into the raised median designed on the Refined Concept Plan. Each location was reviewed to ensure that the length of the left turn pocket did not result in an unsafe condition at an upstream location. It was determined that at Texas Street, the eastbound left turn pocket should be shortened so as to not extend past the intersection of University Avenue/Louisiana Street. It is critical that the raised median extend through the unsignalized intersections to control left turn access. If the eastbound left turn lane were allowed to extend through Louisiana Street, the raised median would not be able to extend through the intersection. Therefore, it is recommended that the Texas Street eastbound left turn lane be shorter than the calculated length. Traffic signal timing at this intersection will be critical to prevent overflow left-turn queues from impacting the through lane.

8.4 PROTECTED LEFT TURN PHASING

A left turn phase is warranted, based on the Caltrans Traffic Manual and City of San Diego Guideline, if on or more of the following exist:

- Accidents – 5 or more left turn accidents occurred at that location involving left turning vehicles in a 12-month period.

- Delay – Left turn vehicles experience LOS E or worse delay (waiting through one or more cycles).

- Volumes – 50 or more left turning vehicles per hour and the product of the left turn volume and the sum of the conflicting right turn and through volume is greater than 100,000 in the peak hour (50,000 for a 2-lane road).

- Miscellaneous – Consideration of other factors such as curvature of the roadway, heavy bus or truck activity, etc. should be made when determining a need for a protected left turn phase. This includes analysis of sight distance requirements associated with both the horizontal and vertical curvature of the roadway. Minimum stopping sight distances are a key criteria in evaluating the need for a left turn phase.

Protected left turn phasing or protected/permissive left turn phasing along University Avenue is currently provided at:

- Park Boulevard
- Florida Street
- Texas Street
- 30th Street

- Boundary Street (Split Phase)
- Wabash Avenue (Split Phase)

The Refined Concept Plan recommends the implementation of protected or protected-permissive left turn phasing along University Avenue at the following intersections:

- Mississippi Street
- Arnold Avenue
- Utah Street
- 30th Street
- Illinois Street
- 32nd Street

A protected left turn phase warrant analysis based on traffic volumes was conducted for all the signalized intersections that currently do not have protected left turn phasing. The warrant analysis is based on the forecast 2030 with Preferred Concept Plan traffic volumes. Intersections where the product of the through volume and opposing left turn volume is greater than 50,000 (2-lane road) were determined to be warranted. Table 8-2 summarizes the results of this analysis.

Table 8-2
Protected Left Turn Warrant Analysis

Intersection	Peak Hour	Eastbound			Westbound			Warranted?
		Left Turn Volume	Conflicting (WB) Thru + Right	Total	Left Turn Volume	Conflicting (EB) Thru + Right	Total	
Mississippi Street	A.M.	12	833	9,996	39	413	16,107	Yes
	P.M.	55	546	30,030	75	823	**61,725**	
Arnold Avenue	A.M.	--	--	--	32	439	14,048	No
	P.M.	--	--	--	68	692	47,056	
Oregon Street	A.M.	44	699	30,756	--	--	--	Yes
	P.M.	110	675	**74,250**	--	--	--	
Utah Street	A.M.	33	539	17,787	59	431	25,429	No
	P.M.	84	469	39,396	55	577	31,735	
Illinois Street	A.M.	18	651	11,718	--	--	--	No
	P.M.	63	616	38,808	--	--	--	
32nd Street	A.M.	53	682	36,146	141	576	**81,216**	Yes
	P.M.	88	557	49,016	196	513	**100,548**	

Note: Bold indicates movements that meet or exceed the minimum threshold for left turn phase (100,000 for 4-lane intersections and 50,000 for 2-lane street.).

As shown in Table 8-2, left turn phasing is warranted based on traffic volumes at Mississippi Street, Oregon Street and 32nd Street based on traffic volumes alone. However, special consideration should be made at the other signalized intersections that would lead to the need for protected left turn phasing.

- Arnold Avenue is a T-intersection. The volumes at the intersection do not support a left turn phase. Other factors that may affect the need for protected left turn phasing include stop sight distance and consistency. Although not warranted, this may be the only intersection along the corridor without phasing. To provide a consistent application of left turn phasing along the corridor, it should be considered at this location. Arnold Street is also located at the bottom of a vertical curve. Stopping sight distance should be evaluated in determining the need for a protected left turn phase.

- Utah Street is an offset intersection. As proposed, the eastbound transit only lane will begin on the east side of Utah Street. Merging for the lane drop will occur west of Utah Street. Left turn phasing in conjunction with the left turn pocket is recommended at this location to help minimize any left turn queues that may spill over into the through lane. Spill over would further complicate the operations at the intersection where the mixed flow traffic merges into a single lane (west of Utah Street). The left turn phase could be set such that the left turn demands are met and spill over does not occur. Therefore, protected left turn phases are recommended at Utah Street.

- Illinois Street is a T-intersection. Although not warranted based on traffic volume alone, protected left turn phasing is recommended at Illinois Street. This intersection is located in the most dense and heavily traveled portions of the corridor. With the removal of the Ohio Street traffic signal, it is anticipated that left turning traffic at Illinois Street will increase. To meet the future demands, it is recommended that a protected left turn phase be installed at Illinois Street.

Implementation of a left turn phase will require modification to the traffic signal timing, installation or modifications to in-pavement loop detectors, modification or replacement of the signal mast arms and signal heads, and construction of the dedicated left turn pockets. The operations of the protected or protected-permissive phasing will be dependant upon further study at each intersection during the design phase.

Because of the increase in traffic volumes along University Avenue and the reduction in the number of left turn access points to and from University Avenue, left turn phasing will become a critical element of signal operations. As traffic volumes increase along the corridor, the need for left turn phases should be monitored and they should be installed as necessary to meet the increasing demands.

8.5 TRAFFIC SIGNAL WARRANT ANALYSIS

Two new traffic signals are recommended along University Avenue at Arnold Avenue and Oregon Street. A traffic signal warrant analysis, based on the Caltrans Traffic Manual, was conducted for each intersection to validate the recommendation for these new traffic signals. The following traffic signal warrants were prepared:

- Planning Warrant (Minimum Traffic and Interruption of Continuous Traffic)
- Peak Hour Volumes
- Four Hour Volumes

The traffic signal warrant worksheets are summarized in the Appendix at the conclusion of this report. Table 8-3 summarizes the results of the traffic signal warrant analysis. Planning Warrants are based on forecast ADT traffic volumes (Horizon Year 2030 with Preferred Concept Plan), and are typically recommended for new intersections or locations where actual traffic count data cannot be collected. Since the Preferred Concept Plan will alter the traffic patterns along the corridor, and data reflecting these conditions cannot feasibly be measured, it is appropriate to evaluate the intersections using this warrant. As shown, the Interruption of Continuous Traffic portion of the Planning Warrant is satisfied for both Arnold Avenue and Oregon Street. The Planning Warrant Interruption of Continuous Traffic indicates that the flow of traffic on University Avenue will be so heavy that the traffic on the side street suffers excessive delay or hazard in entering or crossing University Avenue.

The Peak Hour and Four Hour Volume warrants are based on four hours of traffic count data. For these warrants, the forecast Horizon Year 2030 with Preferred Concept Plan peak hour intersection volume was used. As shown in Table 8-3, neither of the two warrants is satisfied at either intersection.

Table 8-3
Traffic Signal Warrant Analysis

	Arnold Avenue	**Oregon Street**
Planning Warrant	Interruption of Continuous Traffic Warrant Met	Interruption of Continuous Traffic Warrant Met
Peak Hour volumes	Warrant Not Met	Warrant Not Met
Four Hour Volumes	Warrant Not Met	Warrant Not Met

Although the Peak Hour Volumes and Four Hour Volumes traffic signal warrants are not met at these locations, it should be noted that the intersections are forecast to operate at unacceptable service levels in the peak hours without traffic signals. The failing levels of service indicate that side street traffic trying to access University Avenue would experience significant delays if traffic signals are not installed. Installing traffic signals at these locations would also allow left turn access to and from University Avenue at consistent three to four block intervals along the entire corridor. It would also provide a controlled north-south pedestrian crossing. Currently, there are no traffic signals that allow protected left turns or signalized pedestrian crossings between Texas Street and Utah Street.

8.6 RECOMMENDED TRANSIT & PEDESTRIAN LINKAGE IMPROVEMENTS

This section discusses how selected streets can provide logical pedestrian access to the proposed transit stops, based on the pedestrian movement analysis in Chapter 6. This section also defines improvements needed to the pedestrian environments for the transit passengers accessing the transit stops. In general, improvements to the side streets leading directly to the stops on University Avenue are recommended. These improvements will encourage new transit patrons, and provide a better walking environment. The following outlines general observations regarding the street's existing conditions:

Existing Conditions

In most cases the sidewalks in the affected area are in need of some level of improvement. North Park is an older urban community and its infrastructure, including sidewalks, is in need of repair or replacement. Most sidewalks for the area's side streets are five (5) feet in width, with an additional parkway for planting.

Most of the side streets connecting to University Avenue do not have canopy trees within the parkway. Palm trees are consistently the dominant street trees. This occurs on most of the side streets in the study area from Florida Street all the way to Bancroft Street. Although palm trees offer a great skyline effect, they offer very little shade or comfort for pedestrians using the sidewalks.

All of the streets in the area provide on-street parking, consisting of both parallel and angled parking. The majority of the angled on-street parking is on the streets nearest to the central commercial core of the study area. The exceptions to this are Alabama Street and Mississippi Street. These streets have angled on-street parking on the north side of University Avenue, typically in conjunction with higher density residential developments in that area.

The majority of the streets have no above grade utilities (electrical, phone, cable) within the parkways. In most cases, the utilities lines and associated poles are located in the adjacent alleys. This condition provides for less visual clutter and a better pedestrian environment along the street.

Proposed Improvements

The quality of the pedestrian environment varies from street to street. For the streets that provide logical access to the transit stops, streetscape enhancements would provide an improved walking environment for the transit patrons. What follows is a brief description of possible improvements applicable to some or all the selected streets.

As stated earlier, the majority of the sidewalks are in various states of disrepair. It is recommended that selected sidewalks be improved to allow for a safe and convenient walking environment to University Avenue. "Canopy" type trees should be installed along the parkways to provide shade to pedestrians using the sidewalks. The canopy trees can supplement the existing palm trees already planted in the parkways.

Where feasible, existing parkways should be retrofitted to allow for wider sidewalks, as well as provide additional landscape improvements for street tree plantings. These improvements are beneficial in encouraging and increasing pedestrian mobility to the transit stops on University Avenue. Increasing the parkway could be accomplished by reducing the curb-to-curb section of the street and including excess right-of-way into the parkway. Not all of the selected streets are able to accommodate this type of treatment, and in some cases it may only be possible on one side of the street. But, where feasible, an expanded parkway should be provided to increase the pedestrian connectivity to the transit stops.

In order to further improve the pedestrian environment, above ground utilities should be placed underground when located within the right-of-way of the selected streets. However, most of the above grade utilities are in alleys, so this would not be necessary for most of the selected streets.

Accessibility needs and requirements for the disabled are defined by both the federal and state (California Title 24) standards. The ADA was signed into law on July 26, 1990 to assure that disabled persons will have full access to all public facilities along public rights-of-way.

Typically, this involves removing barriers to wheelchairs and installing accessible wheelchair ramps. However, this also includes other classifications of disability, including sight and hearing impairments. Generally, all transit stops and surrounding pedestrian facilities must comply with ADA standards and California Title 24, and take into account the entire range of disabilities.

Table 8-4 summarizes the improvements by transit stop in the eastbound and westbound direction. In general, creating a more attractive and safe pedestrian environment should be a major consideration in the continuing pursuit to promote transit. Safe and direct sidewalk connections to transit stops are one of the keys to increasing ridership and promoting transit as an attractive and viable alternative to the automobile.

Table 8-4
Pedestrian Improvements for Streets Leading to Proposed Transit Stops

Streets Leading to Stops (Westbound)	Sidewalk Replacement	Canopy Trees	Expanded Parkway	Lighting	Underground Utilities	ADA
Iowa St. Stop						
Iowa Street	√	√	√**(E)**	√		√
30th St. Stop						
Utah Street	√	√		√		√
Idaho St. Stop						
Idaho Street	√	√		√		√
Texas St. Stop						
Arizona Street	√	√	√**(B)**	√		√
Louisiana Street	√	√	√**(E)**	√		√
Alabama St. Stop						
Alabama Street	√	√	√**(W)**	√		√
Streets Leading to Stops (Eastbound)	**Sidewalk Replacement**	**Canopy Trees**	**Expanded Parkway**	**Lighting**	**Underground Utilities**	**ADA**
Alabama St. Stop						
Alabama Street	√	√		√		√
Texas St. Stop						
Louisiana Street	√	√		√		√
Arizona Street	√	√		√		√
Pershing St. Stop						
Pershing Street		√	√**(E)**	√		√
Utah Street	√	√		√		√
30th St. Stop						
30th Street Intersection	√	√		√		√
32nd St. Stop						
Herman Street	√	√		√		√

√ = Improvement Needed (B) = Both sides of the street
(E) = East side of the street
(W) = West side of the street

8.7 TRAFFIC CALMING FOR SURROUNDING COMMUNITY

The SANDAG traffic model shows that if the capacity along University Avenue is reduced from four lanes to two lanes, traffic volumes will be diverted from University Avenue onto parallel or intersecting roadways. Exhibit 8-12 illustrates the general diversion patterns anticipated with the change in traffic roadway capacity.

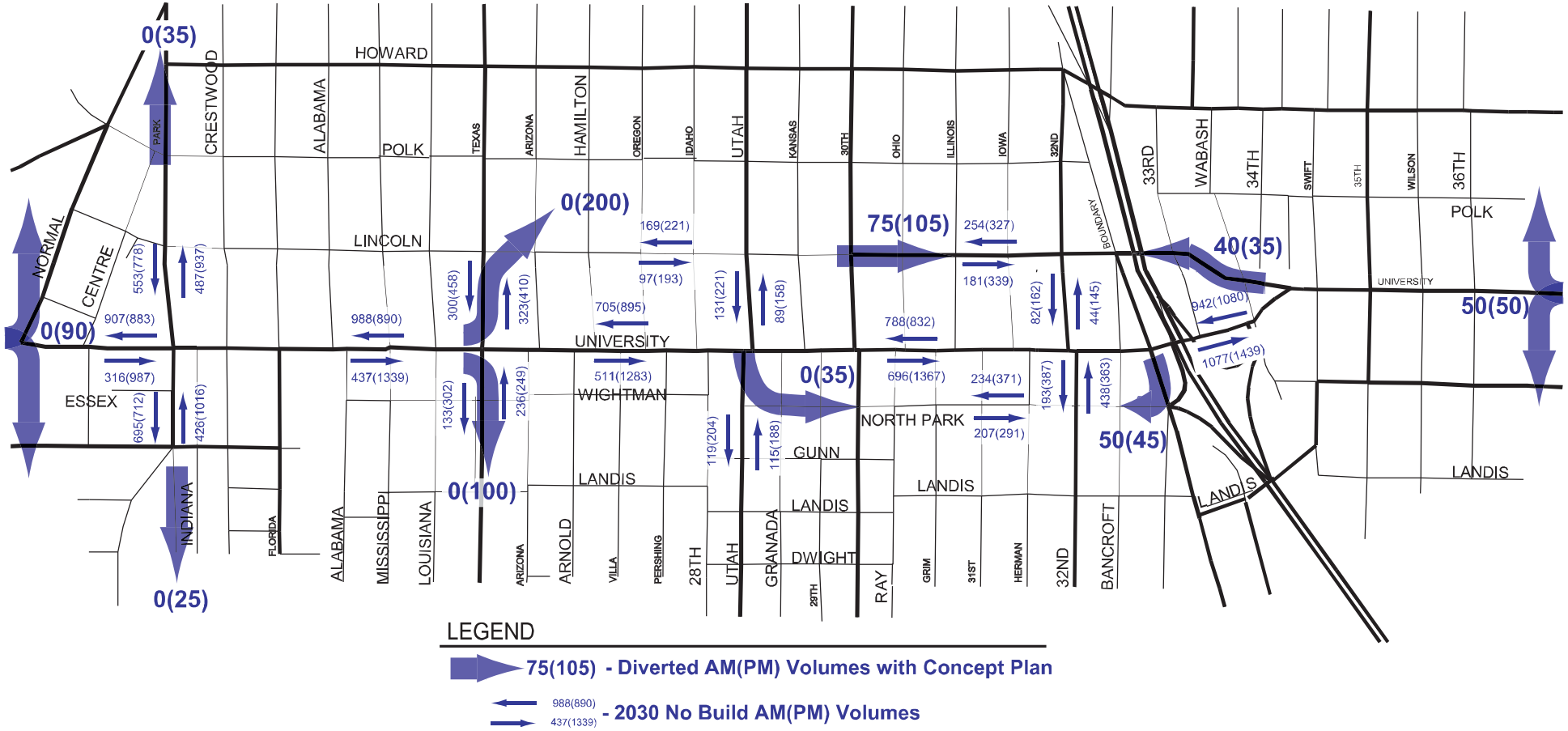
Diversion is anticipated to occur when the volume exceeds the lane capacity along University Avenue. This diversion results in an overall increase in traffic volumes along Lincoln Avenue, North Park Way, Texas Street and Utah Street. Roads that intersect with University Avenue at a signalized intersection are also anticipated to have an increase in traffic, as vehicles will use these routes to circulate off of University Avenue to get to their destination.

Most drivers will experience an increase in travel time with the Refined Concept Plan either due to delay associated with the constrained capacity or the restricted access imposed with the raised median. This can result in speeding on side streets when vehicles escape the congested conditions in order to make up for lost time.

Several existing features along North Park Way and Lincoln Avenue will serve as traffic calming devices. Along North Park Way, existing drainage swales exist – two at 32nd Street, two at Herman Avenue, one at 30th Street, one at 29th Street, and two at Granada Avenue – that require vehicles to slow down significantly. These drainage swales reduce speeds through the intersections and on the approaches to the intersection. Several intersections along North Park Way and Lincoln Avenue are controlled by all-way stops. In other words, traffic on all legs is required to stop before proceeding through the intersection. All-way stop controls interrupt the steady stream of traffic flow, thereby reducing a vehicles ability to speed along a corridor.

It may be desirable to implement additional traffic calming measures where appropriate to control the impacts associated with the diverted traffic on the surrounding community. The City of San Diego Street Design Manual includes potential traffic calming measures. Traffic calming measures are intended to slow traffic, but not divert traffic to parallel routes when applied appropriately. All roads within the project study considered for traffic calming implementation are classified as either commercial collector or local streets, both appropriate for traffic calming projects.

Traffic calming can provide for horizontal deflection, vertical deflection, and diversion of traffic or channelization of traffic. The installation of speed humps on collector streets or above are not recommended as a traffic calming measure due to increased response time impacts to emergency services. Reasonable applications of traffic calming measures within the community of North Park may include:



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55-100148.001 - June 2004

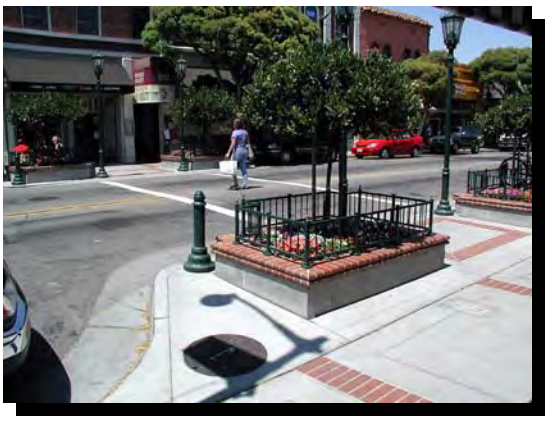
PEAK HOUR DIVERTED TRAFFIC

EXHIBIT 8-12

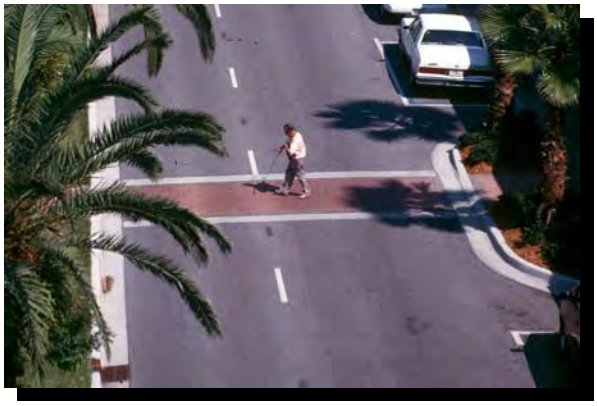
- **Modifications to Parking (angled parking on both sides of street)** – To increase parking along the University Avenue corridor, it is recommended that all through side streets that are 56 feet or wider with parallel parking on one or both sides be converted to angled parking on both sides wherever such conversion would result in a net increase in on-street parking.

  For streets where the curb-to-curb width is 42 to 52 feet, it is recommended that angled parking be provided on one side (42 foot curb-to-curb) or both sides (52 feet curb-to-curb) of the street wherever such conversion would result in a net increase in on-street parking. This will serve two purposes: increase overall parking and narrow the travel way to reduce speeds and calm traffic.

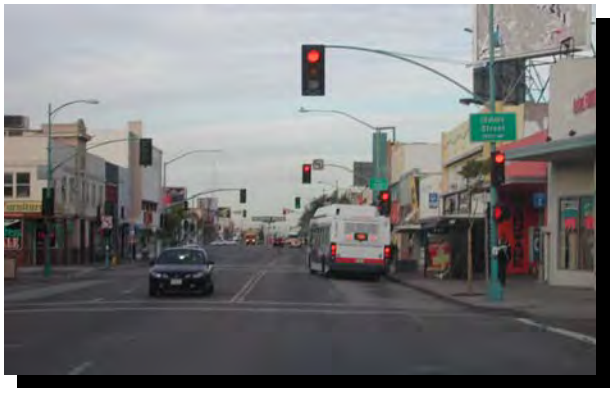
  An additional benefit for diagonal parking on the side streets is that it will also have a traffic calming effect. Where feasible, it is recommended that angled parking improvements be constructed from University Avenue to El Cajon Boulevard to the north and a minimum of one block south of University Avenue. This may require the consolidation of some driveways or reduction in driveway widths along the side streets.



Curb Extensions – Curb extensions reduce the exposure time for pedestrians along the travel way by extending the curb to the edge of the parking lane. The "neck" of the intersection is reduced from approximately 40 to 52 feet to approximately 24 feet, requiring vehicles to slow down significantly through the intersection.



Pavement Treatments – Raised crosswalks and road humps are typically not supported by emergency services because such vehicles must slow down significantly to avoid damage, which increases response times. Pavement treatments at unsignalized intersections or midblock locations, which can integrate raised pavement markers or stamped concrete, can effective replace raised pavement crossings and road humps. Pavement treatments result in vibrations within the vehicle and an audible Such treatments make drivers aware of a change in conditions.



All-Way Stops and Traffic Signals – Although not typically considered traffic calming devices, the installation of traffic signals and all-way stop control intersections can help to control speeds along roadways.

Traffic Controls

The streets and intersections most likely to be impacted in the study area by the diversion of traffic include:

- Texas Street/Lincoln Avenue (two-way stop)
- Texas Street/Wightman Avenue (two-way stop)
- Utah Street/Lincoln Avenue (signal)
- Utah Street/North Park Way (all-way stop)

- 30th Street/Lincoln Avenue (signal)
- 30th Street/ North Park Way (signal)
- 32nd Street/Lincoln Avenue (signal)
- 32nd Street/North Park Way (signal)
- Wabash Street/Lincoln Avenue (signal)

Of these nine intersections, six are currently signalized, one is an all-way stop controlled intersection and two are two-way stop controlled intersections. Preliminary traffic signal warrant analyses were conducted for all unsignalized intersections listed above, as provided in the Appendix and summarized in Table 8-5.

Table 8-5
Preliminary Traffic Signal Warrant Analysis
Potential Traffic Calming Locations

Intersection	Main Street ADT	Minor Street ADT[1]	Minimum Vehicular Flow Met?	Interruption Continuous Flow Met?	Warrant Satisfied?
Texas Street/Lincoln Avenue	13,300	3,420	Yes	Yes	Yes
Texas Street/Whitman Avenue	5,900	1,920	No	No	No
Utah Street/North Park Way	5,200	2,880	No	No	No

1 Higher Volume Approach, One Direction Only.

Texas Street

Because of the regional connectivity of Texas Street, a modification to on-street parking, from parallel to angled, is not recommended. Traffic control modifications at the intersection of Texas Street/Lincoln Avenue are recommended to eliminate the existing turn restriction devices installed. As shown, a traffic signal is warranted at this intersection by the year 2030. Additional improvements along Texas Street may include the integration of enhanced pedestrian crossings, streetscape improvements and curb extensions at intersections.

Utah Street

The Refined Concept Plan provides a transit only lane eastbound from Utah Street to Boundary Street. It is anticipated that traffic diversion will occur both north and south of University Avenue at Utah Street. The intersection of Utah Street/Lincoln Avenue is currently signalized. Utah Street/North Park Way is a T-intersection with stop control on all approaches. Although the preliminary traffic signal warrant analysis shows that a traffic signal is not warranted at this location, volumes and queuing should be monitored in the future to ensure efficient flow, particularly, the queuing resulting from heavy left turn movement anticipated to occur from southbound Utah Street to eastbound North Park Way. Enhanced

pavement treatments, marked pedestrian crossings and curb-extensions at the intersections of Utah Street/North Park Way and Utah Street/Lincoln Avenue should be considered for the Utah Street corridor.

30th Street

Thirtieth Street is also a regional serving arterial, with signalized intersections at both Lincoln Avenue and North Park Way. Curb extensions and pavement treatments are reasonable improvements that should be considered to help slow traffic along 30th Street north and south of the corridor. Modifications to parking should be considered where applicable. However, City traffic volume thresholds for angled parking may be exceeded by the year 2030.

32nd Street

Thirty-Second Street is the first signalized intersection on the eastern end of the corridor and is anticipated to carry an increase in traffic volume over existing conditions. Improvements at intersections with both Lincoln Avenue and North Park Way should be considered. Curb-to-curb width on 32nd Street south of University Avenue is not sufficient to modify parking. However curb extensions, enhanced pavement treatments and traffic control improvements are reasonable traffic calming measures that could be implemented along 32nd Street.

Wabash Street

Wabash Street connects northbound I-805 off-ramp traffic to Lincoln Avenue and will serve as a by-pass route for University Avenue. Improvements to the intersection of Wabash Street/Lincoln Avenue may need to be considered to meet the forecast traffic demands at this location.

Exhibit 8-13 depicts potential traffic calming measures for the surrounding community that may be pursued in the future if they are deemed appropriate after implementation of the Refined Concept Plan. These measures aim to slow traffic along those streets anticipated to be most heavily impacted by the diversion of traffic. Operational impacts were not addressed in this study. Implementation of any of these measures in the future will follow the City of San Diego established process for evaluating traffic calming measures. Table 8-6 provides general estimates of cost to implement these traffic calming devices per location.

POTENTIAL TRAFFIC CALMING MEASURES

ENHANCEMENT OF EXISTING MARKED CROSSWALK; OPTIONS INCLUDE:

- ENHANCED PAVEMENT MARKING
- PAVEMENT FLASHERS (UNCONTROLLED APPROACHES ONLY)
- PAVEMENT TREATMENT

NEW MARKED CROSSWALK; OPTIONS INCLUDE:

- ENHANCED PAVEMENT MARKING
- PAVEMENT FLASHERS (UNCONTROLLED APPROACHES ONLY)
- PAVEMENT TREATMENT

NEW CURB EXTENSION (POPOUT)

NEW "GATEWAY TO NORTH PARK" SIGNAGE

EXISTING TRAFFIC SIGNAL

EXISTING ALL-WAY STOP

EXISTING TWO-WAY STOP

NORTH
Not to Scale

RBF

POTENTIAL TRAFFIC CALMING LOCATIONS

EXHIBIT 8-13

Table 8-6
Traffic Calming Measures

Location	Types of Traffic Calming Measures				
	Curb Extensions	**Pavement Treatments**	**Enhanced Crosswalk Pavement Markings**	**Crosswalk with In-Pavement Flashers**	**Signage**
	$60K -$80K per corner	$5 –$10K per location	$1,500-$3,000 per location	$10-$15K per location	$250-$1,500 per location
Utah Street / Lincoln Avenue	Y		Y		
30th Street / Lincoln Avenue	Y		Y		
Ohio Street/Lincoln Avenue	Y		Y		
Illinois Street/Lincoln Avenue	Y		Y		
Iowa Street/Lincoln Avenue	Y		Y	Y	
32nd Street / Lincoln Avenue	Y		Y		
Boundary Street / Lincoln Avenue		Y			Y
Utah Street / North Park Way	Y		Y		
29th Street/North Park Way	Y		Y	Y	
30th Street / North Park Way	Y		Y		
Grim Avenue/North Park Way	Y		Y		
31st Street/North Park Way	Y		Y		
Herman Avenue/North Park Way	Y		Y		
32nd Street / North Park Way	Y		Y		
Boundary Street / North Park Way		Y			Y

Note: Cost estimates are Planning-level estimates based on year 2004 dollars.

8.8 RIGHT-OF-WAY NEEDS

Efforts were made at all locations to minimize the impacts to right-of-way along the corridor. In order to achieve this, traffic lanes are reduced to a substandard 10 or 11 feet. Although the standard width for a travel lane is 12 feet, existing lanes along University Avenue are 9 to 10 feet. Therefore, the Refined Concept Plan lane widths would be an improvement over the existing condition.

One location along University Avenue was identified wherethe Refined Concept Plan would modify the curb-to-curb width on University Avenue. East of 30th Street, the curb is carved out to provide for on-street parallel parking outside of the travel lane. The Refined Concept Plan would fill in the existing on-street parking with treated stamped concrete to match existing sidewalk patterns in this area. The transit stop would be located where the existing parking cut out currently exists. To provide a smooth transition along the corridor, the eastern end of the block may need to be shortened by approximately three feet. Overall this modification to the existing curb would result in a net increase in sidewalk area on this block.

8.9 UTILITY RELOCATION

With the construction of new curb extensions, existing utilities will need to be relocated. A number of storm water curb inlets would need to be rebuilt to accommodate the new construction. Sewer manholes and water valve cans located in the areas of the new medians will also need adjustment to ultimate finish grade. Most of the existing street lights would remain in their current location with the exception of a few that may need to be moved closer to the roadway as the curb is realigned on the south side of the street between 28th Street and Ray Street. The addition and/or modification to the traffic signals may provide enough light based on City standards so that the existing street light can remain in place. The ultimate location of street lighting should be evaluated in final design. Adjustments to dry utilities (SDG&E, SBC, Cable) will be affected with the reconstruction of University Avenue. Changes in the vertical elevation of the roadway will require the tops of the affected utility boxes to be adjusted.

Chapter Nine – Implementation Program

9.0 INTRODUCTION

The implementation of the Refined Concept Plan will be a multi-step process. At the time this report was completed, project funding had not been procured. This chapter will lay out the next steps in moving forward with the Refined Concept Plan, from continued public outreach to environmental documentation to final design and construction.

9.1 ESTIMATE OF PROBABLE COSTS

Proposed improvements along the corridor can be broken into six categories:

- Roadway Improvements
- Parking Improvements
- Pedestrian Improvements
- Traffic Signal Improvements
- Transit Improvements
- Streetscape Improvements

Each of these six categories incorporates several elements of the design included in the Refined Concept Plan. Table 9-1 summarizes the probable costs for the design, construction and administrative costs associated with the project, in year 2004 dollars. Overhead costs, including contingencies, mobilization, and project reserves are based on SANDAG guidelines for preparing cost estimates. As shown in the table, these overhead costs account for an 84% markup over the proposed construction costs.

Table 9-1
Estimate of Probable Costs
University Avenue Mobility Plan – Refined Concept Plan

Design Element	Probable Cost
Roadway Improvements	$1,513,394.00
Parking Improvements	$315,040.00
Pedestrian Crossing Improvements	$855,950.00
Traffic Signal Improvements	$583,000.00
Transit Improvements	$1,734,000.00
Streetscape Improvements(1)	$154,400.00
Subtotal	**$5,155,784.00**
Mobilization (4%)	$206,231.36
Engineering/Administration/Construction (30%)	$1,546,735.20
Project Reserve (30%)	$1,546,735.20
Contingency (15%)	$773,367.60
TOTAL	**$9,228,853.36**

Note: (1) Streetscape estimate based on KTU+A Study, November 2002.
(2) Actual costs will be available at the time of construction bid award.

Roadway Improvements

Roadway improvements include all physical modifications to University Avenue. Table 9-2 summarizes the individual costs associated with the proposed roadway improvements, such as the construction of bulb-outs and raised median, paving and striping, and utility relocation. It does not include pedestrian crosswalks at unsignalized locations. Those costs are outlined with the pedestrian improvements.

Table 9-2
Estimate of Probable Cost for Roadway Improvements

Description		Quantity	Units [1]	Unit Cost	Total Cost
Bulb-outs					
1	Remove Existing Curb & Gutter at Bulb-outs	3,000	LF	$ 5.00	$ 15,000.00
2	Construct Curb & Gutter for Bulb-outs	3,000	LF	$ 17.00	$ 51,000.00
3	Sidewalk improvements at Bulb-outs	32,300	SF	$ 5.00	$ 161,500.00
4	Reconstruction of Curb Inlets at Bulb-outs	11	EA	$ 3,890.00	$ 42,790.00
Raised Median					
5	Excavate for Raised Median	6,850	LF	$ 2.00	$ 13,700.00
6	Modify Sewer Manholes in Raised Median	22	EA	$ 1,100.00	$ 24,200.00
7	Construct Raised Median Curb & Gutter	6,850	LF	$ 20.00	$ 137,000.00
8	Landscaping for Median with Irrigation	32,000	SF	$ 5.00	$ 160,000.00
9	36" Box Trees with Planters for Median	200	EA	$ 950.00	$ 190,000.00
Roadway Paving & Striping					
10	2" Asphalt Overlay (Park to Boundary)	315,300	SF	$ 1.00	$ 315,300.00
11	Color Treatment to Asphalt in Transit Only Lane	62,676	SF	$ 4.00	$ 250,704.00
12	Refined Concept Plan Lane Striping & Pavement Markings	1	LS	$ 31,000.00	$ 31,000.00
Utilities Relocation					
13	Relocate Utilities	15	EA	$ 5,000.00	$ 75,000.00
14	Relocate Streetlight	11	EA	$ 4,200.00	$ 46,200.00
TOTAL					**$ 1,513,394.00**

Note: (1) LF = Linear Feet, SF = Square Feet, EA = each, LS = lump sum

Parking Improvements

The Refined Concept Plan recommends that parking be restricted along University Avenue in the transit only lane during the peak hours (7am –9am and 4pm –6pm). This will allow transit vehicles dedicated access to a transit only lane along the corridor when traffic congestion is the highest. This solution allows the community to maximize parking along the study corridor outside of the peak four hours of the day. The long-term goal would be to attract businesses to University Avenue storefronts that do not have a need for on-street loading/unloading. Such businesses would be encouraged to locate near corner loading zones or where adequate rear alley access is available. This would allow on-street parallel parking to ultimately be prohibited.

To make up for the loss of parking due to the transit only lane, side street improvements are recommended that would convert on-street parallel parking to diagonal parking. Such improvements are recommended on streets with a minimum cross-section width of 52 feet curb-to-curb. Road improvements include potential widening, curb and gutter replacement, striping and signs. Table 9-3 summarizes the costs associated with the proposed parking improvements.

Table 9-3
Estimate of Probable Cost for Parking Improvements

Description		Quantity	Units	Unit Cost	Total Cost
1	Remove Existing Striping (per Street)	7	EA	$ 5,000.00	$ 35,000.00
2	Remove Existing Curb & Gutter (7 streets @ 600')	5,780	LF	$ 5.00	$ 28,900.00
3	2' Street Widening (7 streets @ 600')	11,560	SF	$ 12.00	$ 138,720.00
4	Construct New Curb & Gutter (7 streets @ 600')	5,780	LF	$ 14.00	$ 80,920.00
5	Striping of New Parking Stalls (per Street)	7	EA	$ 4,500.00	$ 31,500.00
TOTAL					**$ 315,040.00**

Pedestrian Improvements

Five unsignalized enhanced pedestrian crossings are recommended along the University Avenue corridor. In addition, there are six side street enhanced pedestrian crossings. Enhanced pedestrian crossings include the following elements:

On University Avenue:

- In pavement flashing devices
- High contrast/highly reflective crosswalk marking
- Pedestrian activation button or automated detection
- Control assembly
- Wiring
- Side mounted pedestrian warning signs

On Side Street (controlled by stop sign):

- Pedestrian curb extensions (bulb-outs)
- High contrast/highly reflective paint crosswalk marking

In addition, new ADA pedestrian ramps with truncated domes would be constructed at all intersections where existing pedestrian ramps are not provided. This includes all unsignalized crossing locations. All existing pedestrian ramps should also be modified to the truncated dome design. Breaks in the median

would be provided at all unsignalized pedestrian crossings along University Avenue. Therefore, pedestrians would not be required to step up onto the median, but would cross at-grade.

To meet the needs of visually impaired residents and visitors to North Park, the cost estimate includes audible and countdown technology at each intersection. The estimate of probable cost includes the installation of these systems at all signalized intersections along the corridor. However, not all signalized intersections may be recommended for audible pedestrian signals. Determination of these locations would be done in consultation with the City's Disabilities Services section during the design phase of the project.

At the time this report was prepared, the City of San Diego has a pilot project underway to test the pedestrian countdown technology. Future city policy regarding the implementation of this technology will be applied with the Refined Concept Plan is constructed.

Table 9-4 summarizes the probable costs associated with the proposed pedestrian improvements.

Table 9-4
Estimate of Probable Cost for Pedestrian Improvements

Description		Quantity	Units	Unit Cost	Total Cost
1	Construct New ADA Pedestrian Ramps	47	EA	$ 2,500.00	$ 117,500.00
2	Retrofit Existing Pedestrian Ramps	27	EA	$ 350.00	$ 9,450.00
3	Restripe Existing Crosswalk with High Reflective Paint	36	EA	$ 250.00	$ 9,000.00
4	Install Unsignalized Enhanced Pedestrian Crossing With Overhead Sign	5	EA	$ 45,000.00	$ 225,000.00
5	Install Side Street Enhanced Pedestrian Crossing (No Overhead Sign)	6	EA	$ 45,000.00	$ 270,000.00
6	Sandblast Existing Pedestrian Crossing, Remove Overhead Sign & Flashing Lights, Sandblast crosswalks, Slurry Seal and Restripe	2	EA	$ 2,500.00	$ 5,000.00
7	ADA Audible Countdown with Actuator at Traffic Signals	11	EA	$ 20,000.00	$ 220,000.00
TOTAL					**$ 855,950.00**

Traffic Signal Improvements

Two new traffic signals are included in the Refined Concept Plan. Both Arnold Avenue and Oregon Street are 3-leg intersections. Left turn phasing is recommended at Arnold Avenue, but not at Oregon Street. The traffic signal at Ohio Street will be removed and replaced with an enhanced pedestrian crossing.

Traffic signal modifications are recommended at five intersections to convert existing permitted phasing to protected left turn phasing. Installation of a new left turn phase includes: installation of new traffic signal head on new mast arm, installation of new loop detectors and modifications to the traffic signal cabinet, and update of the traffic signal and system timing.

Table 9-5 summarizes the probable costs associated with the proposed traffic signal improvements.

Table 9-5
Estimate of Probable Cost for Traffic Signal Improvements

Description		Quantity	Units	Unit Cost	Total Cost
1	Install New Traffic Signal (Arnold & Oregon)	2	EA	$ 150,000.00	$ 300,000.00
2	Traffic Signal Modifications for Left Turn Phase	9	EA	$ 30,000.00	$ 270,000.00
3	Remove Traffic Signal at Ohio Street	1	EA	$ 13,000.00	$ 13,000.00
TOTAL					**$ 583,000.00**

Transit Improvements

The Refined Concept Plan focuses on several transit improvements:

- Transit Only Lane
- Consolidation of Transit Stops
- Implementation of Transit Signal Priority Technology (TSP)

At all proposed transit stops, a sign, seating, trash receptacle, concrete bus pad and paved waiting area will be provided. New transit shelters will be constructed at all locations. Design of these shelters will be determined based on the streetscape design for the corridor. Two types of shelters were identified in Phase I (University Avenue Traffic Calming project). Type 1 shelters integrated a streetcar-oriented design Texas Street, Herman Street and Idaho Street. Type 2 shelters, "Silhouette" design, are similar to those currently constructed at 30th Street. This cost estimate accounts for approximately $100,000 per transit stop for the construction of new Type 1 transit shelters and $50,000 for Type 2 transit shelters. Additional costs may be incurred based on changes to streetscape design for the corridor.

A major component of the transit design is the operation of the transit signal priority (TSP) system along the corridor. This system would give priority to transit vehicles at signalized intersections, when the transit vehicle is running behind schedule. A TSP system would require a central control system and transit operation system. The central control system links all the traffic signals to the traffic operations system. The traffic operations system tells the traffic signals what to do when a signal is received from the bus. Since the TSP affects the operations of the traffic signal, it should be located at and operated by the

City of San Diego. This would involve linking the communication system to a central computer located within a designated space (Traffic Control System Center) at the City of San Diego offices. A team of traffic engineers would also need to be trained to use the system. Cost for training staff or allocation of space for the system is not included in this cost. The system would not require a dedicated room, but would require a minimum of one designated computer and monitor for monitoring the system. In addition, each bus would require the necessary hardware to send a signal to the traffic signal controller. Typically, this involves mounting a device on the front of the transit vehicle that would most likely be automated, but could be activated by the transit operator, if a manual system is selected. Each traffic signal would be equipped with receiving devices, typically mounted on the mast arm that would receive the transmitted signal.

Table 9-6 summarizes the estimate of probable costs associated with the planned transit improvements along the corridor.

Table 9-6
Estimate of Probable Cost for Transit Improvements

Description		Quantity	Units	Unit Cost	Total Cost
1	Retain Existing Bus Stop with New Type 1 Shelter	2	EA	$ 100,000.00	$ 200,000.00
2	Install New Bus Stop with New Type 1 Shelter	3	EA	$ 175,000.00	$ 525,000.00
3	Install New Bus Stop with Type 2 Shelter	5	EA	$ 75,000.00	$ 375,000.00
4	Install (Transit Only Lane (Bikes OK)) Signs @ 100' intervals	90	EA	$ 500.00	$ 45,000.00
5	Install TSP Communication System	1	LS	$ 384,000.00	$ 384,000.00
6	Install Traffic Control System Center (TCS)	1	LS	$ 55,000.00	$ 55,000.00
7	Install Transit Operation System (TOS)	1	LS	$ 150,000.00	$ 150,000.00
TOTAL					**$ 1,734,000.00**

Streetscape Improvements

Although not studied as part of the University Avenue Mobility Plan, streetscape improvements were originally identified through the University Avenue Traffic Calming project. Table 9-7 summarizes the estimate of probable costs associated with the streetscape improvements identified in the first phase of this project.

The Georgia Street Bridge is the gateway to North Park at the western end of the corridor. The KTU+A study recommended that an illuminated "North Park" sign be installed on the bridge, which accounts for approximately $25,000 of the total streetscape improvement costs.

Table 9-7
Estimate of Probable Cost for Streetscape Improvements

Description		Quantity	Units	Unit Cost	Total Cost
1	Georgia Street Bridge Signage	1	LS	$ 10,000.00	$ 10,000.00
2	Georgia Street Lighting	1	LS	$ 15,000.00	$ 15,000.00
3	Over the road street signs	1	LS	$ 15,000.00	$ 15,000.00
4	Corner Street Signs	1	LS	$ 64,400.00	$ 64,400.00
5	Special Interpretive Signage at Transit Stops	1	LS	$ 50,000.00	$ 50,000.00
TOTAL					**$ 154,400.00**

In addition, the plan calls for over the road street signs. These signs would be located on the traffic signal mast arm and constructed in the same design as the existing North Park sign located near 30th Street. It was recommended in the KTU+A study that these signs be located at all signalized intersections. In addition to the over the road street name signs, signs at each of the corners are recommended, mounted on standard poles. These street name signs would be decorative, again in the shape of the existing North Park sign located near 30th Street. A preliminary cost of $79,000 was identified in the KTU+A study for these improvements. To date, North Park Main Street has identified $60,000 in funding to implement these signage improvements.

In conjunction with the transit stop improvements, the KTU+A plan integrates "special interpretive signage at transit stops". The cost for the electronic signage system at each transit stop has been estimated at $50,000, and would be dependant upon the communications system identified under the planned transit improvements and the operations of a transit signal priority system.

Other Costs

As shown previously in Table 9-1, the estimate of probable costs includes approximately $4.3 million dollars in overhead and/or contingency related costs. The percentages used in this analysis are consistent with SANDAG's requirements for estimating probable costs. A description of each of these items is provided below:

- **Mobilization** is a construction related cost. It is the fee the contractor will charge to the City to get the necessary equipment on-site to do the identified work. Four percent of the probable cost has been included in the estimate to account for mobilization.

- **Engineering/Administration/Construction** is estimated at 30 percent of the probable cost. It relates to costs associated with final design engineering, city administrative costs, and city construction inspections.

- **Project Reserve** is estimated at 30 percent of the probable cost of the project and provides funding for any additional analysis of the corridor. This may include city processing of the preliminary documents, environmental review, continued public outreach, changes to the preliminary design and other unforeseen costs associated with getting the project from preliminary design to construction.

- **Contingency** is included to account for any unforeseen final design or construction related events, changes to the design or change in construction costs and/or design due to delay to the project. A 20 percent contingency has been included in the estimate of probable costs for this project.

9.2 IMPLEMENTATION PROGRAM

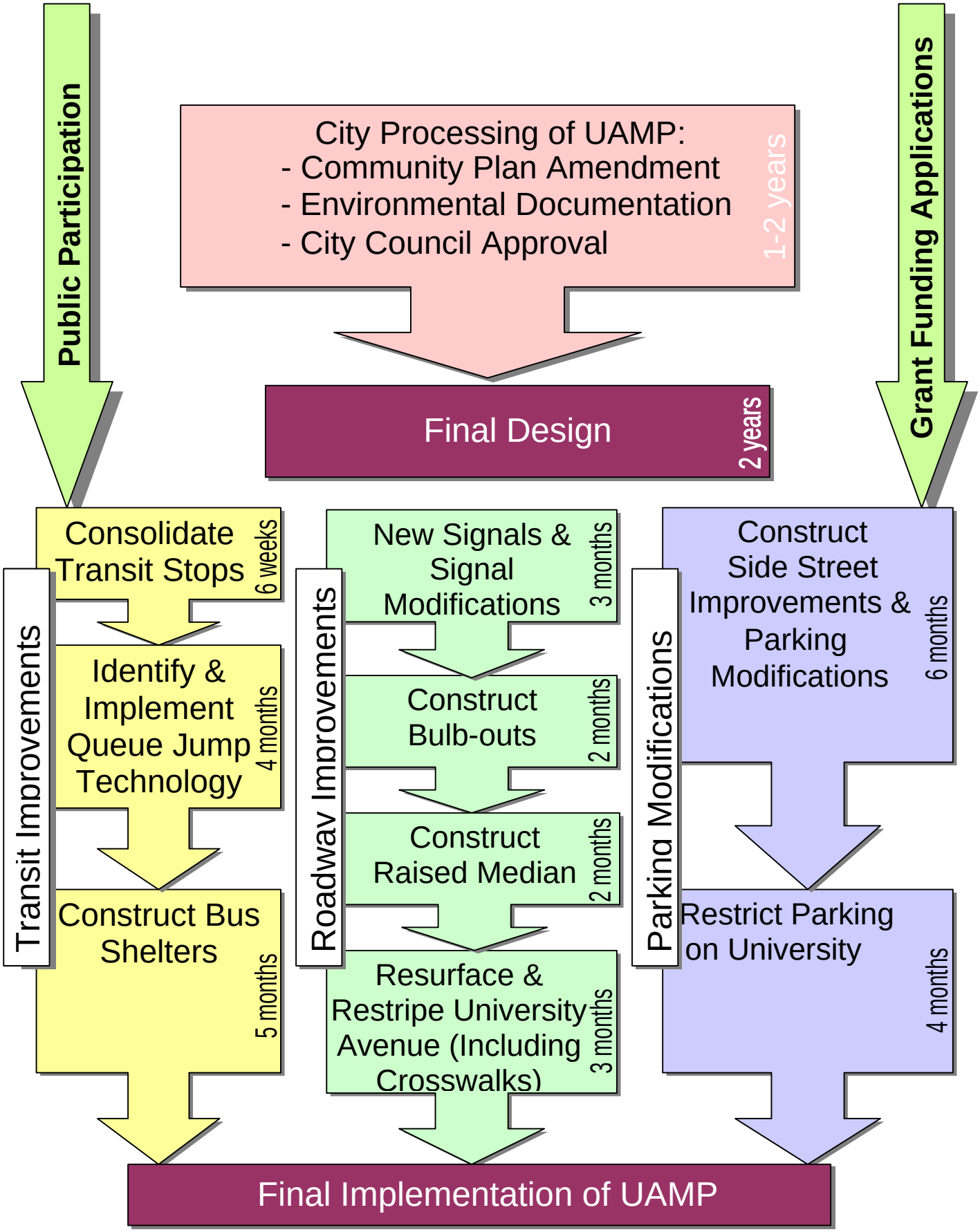
There are many paths that could be taken to implement the University Avenue Mobility Plan. To minimize costs and impacts to the community, a preferred implementation plan has been established. This plan, outlined in the following sections, assumes that the necessary funding for the completed construction of the project is available for each of the elements of the plan. Exhibit 9-1 summarizes the three key elements of the plan as they relate to implementation.

Public Participation

Public participation will be a key element to keeping this project on track. It will take the commitment of the members of the Steering Committee and ongoing dedication of City staff, SANDAG and North Park Main Street to move the project forward. Recommendations from the Project Area Committee, Greater North Park Community Planning Committee, the North Park Main Street Board and the North Park Community Association will be key in acquiring the necessary funding to move on to the next stages of the project.

Grant Applications and Funding

North Park Main Street, in partnership with City of San Diego, has been successful in acquiring several hundred thousand dollars in grant money for the University Avenue plans. This dedication to the project will be necessary to continue to fund this project in the future. A detailed discussion of potential funding opportunities is provided later in Section 9.4 of this chapter. Grant funding will be the critical path toward moving the project from paper to construction over the next five to six years. As a pilot village project, North Park will have priority in moving projects through the City of San Diego.


Public Participation
Grant Funding Applications
City Processing of UAMP:
- Community Plan Amendment
- Environmental Documentation
- City Council Approval
1-2 years
Final Design
2 years
Transit Improvements
Consolidate Transit Stops
6 weeks
Identify & Implement Queue Jump Technology
4 months
Construct Bus Shelters
5 months
Roadway Improvements
New Signals & Signal Modifications
3 months
Construct Bulb-outs
2 months
Construct Raised Median
2 months
Resurface & Restripe University Avenue (Including Crosswalks)
3 months
Parking Modifications
Construct Side Street Improvements & Parking Modifications
6 months
Restrict Parking on University
4 months
Final Implementation of UAMP

City Approval Process

A formal recommendation on the University Avenue Mobility Plan should be made by both the Greater North Park Community Planning Committee and the Greater North Park Redevelopment Project Area Committee. Letters describing their recommendations should be incorporated at the front of this report. Once funding for environmental analysis final design has been identified, the University Avenue Mobility Plan can be incorporated into the City's Capital Improvement Program and an environmental document can be prepared. Once the environmental document and design are completed it can be brought before the City Council's Land Use and Housing Committee for a recommendation to the City Council for approval. The City Council should also be asked to authorize application for any grant funding relating to environmental analysis final design and construction.

Once the project is in the Capital Improvement Program, the Greater North Park Community Plan (including the associated traffic studies) should be amended to incorporate the project. An environmental document will need to be prepared at this time as well. This must be done before final design can begin. The amendment must be approved by the Planning Commission and the City Council.

To complete this process, City staff and financial resources will need to be allocated. This should include a fully funded method for maintenance of all special features such as the median, landscaping, signage, etc. Once financial resources are allocated to continuing this project, it is anticipated that the environmental documentation and Community Plan amendment process will take 1 to 2 years to complete.

Environmental Analysis and Final Design

The concepts presented in this report must be reviewed by the City's Engineering and Capital Projects Department, Fire and Rescue Department and others for feasibility prior to implementation and formal recommendation by community groups. After an initial review, final design plans can be prepared. The final design process will use the Refined Concept Plan shown in this report to develop construction documents. A second environmental document may need to be prepared in conjunction with the final design work depending on whether all the project impacts can be identified at the time of the Community Plan amendment and how much time has elapsed between the amendment and final design. During the initial feasibility review, environmental document development and throughout the final design process, all project features shown in this report will be evaluated and be subject to change to meet design standards and address constructability needs. It is recommended that the project be designed as one complete project, with an established phasing plan, as outlined in this chapter. It is anticipated that final design, which includes City approval of all construction documents and selection of a contractor to complete the project, will take approximately 2 to 5 years to complete, depending on the level of additional design refinement required, complexity of the environmental document, amount of

coordination with outside agencies (including permitting), fund availability and significant other issues affecting the scope of the project.

Construction

Three independent paths have been established as part of the Implementation Program as illustrated in Exhibit 9-1: Transit Improvements, Roadway Improvements, and Parking Improvements. Roadway improvements will take the longest to complete and are the most disruptive to the traffic operations, residents and business owners along the corridor. It is anticipated that the roadway improvements along the corridor will take approximately 10 months to complete if funding is available to construct all the roadway improvements at on time. Transit improvements will be the least disruptive to the corridor, and should be conducted simultaneous to the construction of the roadway improvements included in the Refined Concept Plan.

9.3 FUNDING SOURCES

At the time this report was prepared, the University Avenue Mobility Plan was not included in the City Capital Improvement Program project list and funding had not been identified. North Park Main Street and the City have has been successful at acquiring grant funding through Caltrans for the first two stages of this project. In order to move the project forward, additional grant funding, and possible local match funds, will need to be awarded. This section of the report focuses on the potential funding sources available for the University Avenue Mobility Plan.

Local Funding Sources

TransNet

Local funding for projects maybe available through TransNet, a 20-year, $3.3 billion program managed by the San Diego Regional Transportation Commission. TransNet was initiated in 1987 and is a sales tax program that collects funds to improve the regional transportation system. Combined with federal and state funding, the TransNet program works to improve the regional transportation system in San Diego County. A proposition to extend TransNet beyond 2008 is expected to be on the November, 2004 ballot. If approved, the extension would provide funding for local street and road improvements including transportation related infrastructure improvements to support smart growth development. A portion of TransNet funds would also be set aside for smart growth incentives to fund enhancements to streets and public places and improved land use/transportation coordination. The University Avenue Mobility Plan would likely be eligible for these funds.

Redevelopment Funds

University Avenue is included in the North Park Redevelopment Area. As such, it is eligible for tax increment funds to assist in final design and construction implementation.

Development Impact Fees

Any new development that occurs along University Avenue is required to pay development impact fees. By law, these fees must be used to pay a proportionate cost for public facilities based on the impact that the development would have in generating demand for the facilities. Road improvements are an eligible cost.

State Funding - Caltrans

Caltrans Division of Transportation Planning awards transportation planning grants annually. In Fiscal Year 2004/2005 Caltrans awarded approximately $2.6 million for projects involving transportation and transit planning improvements throughout the state. Funding is allocated to the State of California through FHWA and FTA funding programs. These are one-time transportation planning grants. As this University Avenue Mobility Plan exits the planning stages and enters into design, this grant application process may not be applicable for this project. But this may be a source of funding for future traffic calming programs for the surrounding community.

Federal Funding Sources

Housing and Urban Development - Community Development Block Grant Funding & SuperNOFA

The Community Development Block Grant Funding (CDBG) program provides grant funding to develop viable urban communities. The goal is to provide decent housing and suitable living environments, and to expand economic opportunities primarily for low- and moderate-income persons. CDBG grants are awarded by the United States Department of Housing and Urban Development (HUD) through the Community Planning and Development office.

As of 2004, the HUD grant program was consolidated into one program called SuperNOFA (Notice of Funding Availability). Several grant funds are available through SuperNOFA, including Community Development Technical Assistance grants opportunities. In 2004, $1.5 million was allocated to CDBG technical assistance programs. Funding availability and programs vary from year to year and should be monitored to determine if streetscape or corridor beautification improvements for the corridor would be applicable under this grant.

TEA-21 – Transportation Equity Act for the 21st Century

The Transportation Equity Act for the 21st Century, or "TEA-21," refers to the massive federal transportation spending bill signed into law by President Clinton in June of 1998. It provided over $3 billion in annual federal funding over a six-year period (federal fiscal years 1998 through 2003) to assist California's state department of transportation (Caltrans), metropolitan regions, and local governments with everything from building freeways to installing curb cuts on sidewalks.

This program was originally passed by Congress in 1965 and has been re-enacted every 5 to 6 year since. Since the passage of TEA-21 California has experienced many successful transportation programs that span from highways to sidewalks. Some of these include the transportation enhancements program, the safe routes to school program, the bicycle transportation account and the congestion mitigation and air quality (CMAQ) program.

The TEA-21 program expired in 2003. The United States Congress and Senate are in the process of negotiating the future of TEA-21 around a document entitled “Stay the Course – How to make TEA-21 Even Better”. With the six-year extension of the TEA-21 program, funding will be come available for mobility projects such as the University Avenue project that demonstrate a balance between modes and the integration of smart growth principles in an urban core.

Federal Transit Administration – New Starts Program

Projects eligible for FTA Section 5309 New Starts funding include any fixed guideway system, which utilizes and occupies a separate right-of-way, or rail line, for the exclusive use of mass transportation and other high occupancy vehicles, or uses a fixed drop suspension system and a right of way usable by other forms of transportation. This includes, but is not limited to, rapid rail, light rail, commuter rail, automated guideway transit, people movers, and exclusive facilities for buses (such as bus rapid transit) and other high occupancy vehicles.

By implementing a dedicated transit only lane along University Avenue, both eastbound and westbound, this corridor may be eligible for New Starts funding. Application for this funding will require that parking along University Avenue be relocated to side streets.

The fiscal year 2005 New Starts budget was $1.5 billion, which included funding for 32 existing, pending and proposed Full Funding Grant Agreements (FFGA). These agreements are multi-year contractual agreements between the FTA and project sponsors that formally define the project scope, cost and schedule. They also establish the maximum level of federal financial assistance and outline the terms and conditions of federal financial participation.

New Starts projects must undergo evaluation by the FTA throughout the entire project development process. Projects are evaluated according to a variety of criteria. As required in Section 5309 (e), the FTA

assigns ratings of "highly recommended," "recommended" or "not recommended" throughout the project development process as information concerning costs, benefits and impacts is refined. Based on these evaluations, the FTA makes decisions about moving projects forward, from preliminary engineering to final design, to annual funding recommendations to Congress, and to the execution of a FFGA. In the Annual Report on New Starts, FTA applies these evaluations to recommend funding for projects anticipated to be ready for an FFGA before the end of the budget fiscal year, and to recommend funding for other meritorious projects.

FTA evaluates the project justification and the local financial commitment according to the following measures:

Project Justification

- **Mobility Improvements.** Measured by travel time benefits per project passenger mile, low-income households served and employment near stations
- **Environmental Benefits.** Measured by change in regional pollutant emissions, change in regional energy consumption and EPA Air Quality Designation.
- **Cost Effectiveness.** Measured as the cost per hour of travel time saved.
- **Operating Efficiencies.** Measured by system operating cost per passenger mile.
- **Transit Supportive Land Use & Future Patterns.** Measured by existing land use, transit supportive plans and policies and performance, and impacts of policies.
- **Other.** Number of optional factors, including the projected economic impact of project.

Local Financing

- The proposed share of total project costs from sources other than Section 5309 New Starts, including federal formula and flexible funds, the local match required by Federal law, and any additional capital funding.
- The stability and reliability of the proposed capital financing plan.
- The ability of the sponsoring agency to fund operational and maintenance of the entire transit system (including existing service) as planned, once the project is built.

To assign overall project ratings to each proposed New Starts project, FTA considers the individual ratings for each of the project justification and local financial commitment measures. FTA combines this information into summary "finance" and "project justification" ratings for each prospective New Starts project. Individual measures and summary ratings are designated as "High," "Medium-High," "Medium," "Low-Medium" or "Low."

Other Federal Transit Administration Funding Programs

Several other grant funding programs are available through the FTA for transit related projects. Grant programs are specific to the size of the urbanized area and the transit vehicle (rail vs. bus). Two grant programs defined by FTA that may be applicable to the University Avenue Mobility Plan are described below:

- **Bus and Bus-Related Projects.** Eligible purposes are acquisition of buses for fleet and service expansion, bus maintenance and administrative facilities, transfer facilities, bus malls, transportation centers, intermodal terminals, park-and-ride stations, acquisition of replacement vehicles, bus rebuilds, bus preventive maintenance, passenger amenities such as passenger shelters and bus stop signs, accessory and miscellaneous equipment such as mobile radio units, supervisory vehicles, fareboxes, computers, shop and garage equipment, and costs incurred in arranging innovative financing for eligible projects. Eligible recipients for capital investment funds are public bodies and agencies (transit authorities and other state and local public bodies and agencies thereof) including states, municipalities, other political subdivisions of states; public agencies and instrumentalities of one or more states; and certain public corporations, boards, and commissions established under state law. Funds are allocated on a discretionary basis.

- **Cities of over 50,000 Population.** Eligible purposes include planning, engineering design and evaluation of transit projects and other technical transportation-related studies; capital investments in bus and bus-related activities such as replacement of buses, overhaul of buses, rebuilding of buses, crime prevention and security equipment and construction of maintenance and passenger facilities; and capital investments in new and existing fixed guideway systems including rolling stock, overhaul and rebuilding of vehicles, track, signals, communications, and computer hardware and software. All preventive maintenance and some Americans with Disabilities Act complementary paratransit service costs are considered capital costs.

  For urbanized areas with 200,000 population and over, funds are apportioned and flow directly to a designated recipient selected locally to apply for and receive

Federal funds. For urbanized areas with populations of 200,000 or more, operating assistance is not an eligible expense. In these areas, at least one percent of the funding apportioned to each area must be used for transit enhancement activities such as historic preservation, landscaping, public art, pedestrian access, bicycle access, and enhanced access for persons with disabilities

Several other local, regional and federal grant programs develop annually depending upon the availability and need for projects. Walkable and livable community project rank high amongst organizations such as:

- The Funder's Network – A philanthropic organization aimed toward creating livable communities through smart growth.
- The Smart Communities Network – Sponsored through the Department of Energy, this organization regularly posts funding opportunities throughout the United States focused on creating energy efficient communities.
- The Surface Transportation Policy Project - This organization is a diverse, nationwide coalition working to ensure safer communities and smarter transportation choices that enhance the economy, improve public health, promote social equity, and protect the environment. Through this organization links to local and federal funding opportunities are regularly published.

Continuous monitoring of these and other local programs will be necessary to ensure that adequate funding is obtained for public outreach efforts, final design and construction of the elements of this plan.

9.4 FINAL DESIGN ISSUES AND CONSTRUCTION PLAN

The University Avenue Mobility Plan prepared 30 percent conceptual design plans for the study corridor. Several design elements are like to emerge as the project moves from preliminary design to final design. Discussions with North Park Main Street staff indicated there is a desire to get the ball rolling and make an immediate change to the corridor. One suggestion was to stripe the corridor with the proposed changes. Although it may be possible to move forward with some elements of the plan, it is possible that if implemented early, some elements of the plan would need to be redone as the project moves forward. However, without the raised median, there is a high potential for violations and the community would experience the restrictive aspects of the plan without the benefit of the safety enhancements and beautification elements. This may jeopardize full implementation.

This section focuses on some issues that should be considered when determining the phasing of the project and issues that may arise during final design.

Roadway Improvements

During construction of the proposed improvements, work areas will need to be dedicated along the corridor to allow heavy machinery and work crews to do their job. This will typically require a lane closure in one direction or in both directions. Because of this requirement, it is recommended that the raised median be the last element of the plan to be constructed. By waiting to construct the median, traffic lanes can be shifted from one side of the centerline to the other to maintain the maximum capacity for the motoring public during the construction of the improvements. During construction, parallel on-street parking will be removed. Therefore, it will be critical that side street improvements to maximize parking be conducted in conjunction with the physical improvements along University Avenue.

- **New Traffic Signals and Traffic Signal Modifications.** The first element of the plan that should be constructed is the new traffic signals and traffic signal modifications. These improvements will be typically isolated to the intersections. Lane closures may be necessary when the new traffic signals are installed at Arnold Avenue and Oregon Street. Temporary lane closures may occur when the new traffic signal heads are installed for the protected-permissive signal phase improvements. Otherwise, traffic signal improvements are typically constructed outside the travel way.

  Signal improvements do not include the installation of enhanced pedestrian crossings. The unsignalized pedestrian crossings should be constructed after the raised median and resurfacing of the roadway. If they are constructed prior to the resurfacing and/or reconstruction of the street, the in pavement flashers will need to be removed before the resurfacing occurs and replaced after the striping of the roadway is completed.

- **Construction of Curb Extensions (Bulb-outs).** Once signal modifications are completed, then bulb-outs should be constructed. Bulb-outs could be constructed simultaneous to signal improvements at any intersection where signal modifications or modifications to pedestrian access are not planned. Construction of the bulb-outs will require the closure of the outside lane and sidewalk adjacent to the construction. Therefore, it is recommended that bulb-outs be constructed on either the north or south side of University Avenue first, then switch to the other side of the street such that pedestrian access along the corridor is not hindered during construction. Pedestrian ramps should be constructed simultaneous to the construction of the bulb-outs at all locations.

- **Construction of Raised Median.** Although the exact depth of the historic streetcar tracks under University Avenue is unknown, it is believed that the depth is approximately 8 to 10 inches below the surface. This may pose construction related problems associated with the raised median. To install the raised median, the road will need to be excavated by approximately 10 inches to a foot to account for a six-inch curb above the surface and irrigation. If the historic streetcar tracks are located approximately 8 to 10 inches below the surface of the road, the tracks will need to be removed to properly construct the raised median. Visual observations along the road also show that the crown of the road in many areas is more than six percent grade above the edge of pavement at the gutter line. A typical crossfall of a road is approximately 2 percent. Crossfall is the difference in grade between the centerline of the roadway and the edge of pavement. By removing the tracks, University Avenue could also be leveled out and constructed to a more normal crossfall. Flattening out University Avenue may further improve overall traffic and transit operations through the corridor. The decision to reconstruct the road or to remove the tracks will control the duration of this phase of the project. During this construction period, it is possible that the capacity of University Avenue could be reduced to two lanes (one in each direction).

- Simultaneous to the construction of the raised median, the concrete pads at the transit stops should be constructed. This will require some excavation along the curb at the new transit stops.

- **Resurface and Restripe Corridor.** If funding cannot be acquired to reconstruct University Avenue, then it is recommended that the roadway be ground down by two inches and resurfaced. This will ensure that the crown of the road does not get any higher than it currently is and so that no existing striping seeps through the new pavement. All proposed striping changes and the color treatment to the transit only lane can be implemented. At this time it is recommended that the proposed enhanced pedestrian crossings be implemented.

Transit Improvements

If transit improvements are a priority along the corridor, simple steps could be taken to complete this effort at a relatively low cost and in a short time period. Relocation of the transit stops will involve noticing the public at each of the transit stops. In addition, all property owners near the new transit stops will be noticed. Upon the approval of all adjacent property owners and upon the completion of the removal noticing period, the necessary bus stops signs will be removed and new bus stop signs will be erected along the corridor.

To complete the relocation of transit stops, bus shelters, concrete bus pads, lighting, signage and seating will need to be provided. It is recommended that the transit stops be prioritized to determine the order for which improvements should be made once the transit stops are consolidated. A prioritization ranking based on ridership is provided in Table 9-8.

Table 9-8
Transit Stop Improvement Ranking

Transit Stop	Ridership Ranking	Existing to Remain	New Stop	Shelter Type	Prioritization Ranking	Improvement Cost
Westbound						
Iowa Street	6	Yes	No	Type 1	Medium	$100,000
30th Street	1	Yes	No	Type 2	High	$75,000
Idaho Street	12	No	Yes	Type 2	Low	$75,000
Texas Street	5	No	Yes	Type 1	Medium	$175,000
Alabama Street	11	No	Relocate to Farside	Type 2	Low	$75,000
Park Boulevard	3	Yes	No	Showcase Project		
Eastbound						
Park Boulevard	4	Yes	No	Showcase Project		
Alabama Street	8	No	Relocate to Farside	Type 2	Medium	$75,000
Texas Street	10	No	Yes	Type 1	Low	$175,000
Pershing Street	9	No	Yes	Type 2	Low	$75,000
30th Street	2	No	Relocate to Farside	Type 2	High	$75,000
32nd Street	7	No	Yes	Type 1	Medium	$175,000

Note: Prioritization Ranking based on ridership:
1 through 4 = High
5 through 8 = Medium
9 through 12 = Low

30th Street, both eastbound and westbound, has the highest ranking of all transit stops along the corridor. As the highest transfer intersection along the corridor, 30th Street has high visibility to transit riders. Therefore, it is recommended that improvements to this stop be implemented first. Construction of the Type 2 transit stops at 30th Street is estimated to cost approximately $150,000.

The **Iowa Street/32nd Street** pairing of transit stops are the only pair that received "Medium" priority ranking both eastbound and westbound. This pairing is also located at the eastern end of the corridor setting the tone for the corridor coming from the east. Therefore, it is recommended that this stop be implemented second. The estimated construction cost for the Iowa Street/32nd Street pairing is $350,000.

Texas Street is one of two Type 1 shelter locations along the corridor. With a mixed ranking of Medium and Low (westbound and eastbound, respectively), this stop is highly visible to both transit users and the

motoring public. It is recommended that Texas Street be implemented third. The cost to construct the transit stop improvements at Texas Street is $350,000.

Alabama Street also received a Medium/Low ranking on both the eastbound and westbound approach. It is recommended that this low volume transit stop be the fourth stop improved. The cost to construct the transit stop improvements at Alabama Street is approximately $150,000. It should be noted that improvements at this stop could increase in priority since the amenities at the existing stops in this portion of the corridor are limited and the stop is located on a steep slope resulting in a need for some transit passengers to sit down and rest upon arriving at the stop.

The lowest ranking of the ten transit stops were the **Idaho Street and Pershing Avenue**, resulting in the lowest priority for transit stop improvements. Improvements planned for this stop include the construction of Type 2 bus shelters. The estimated construction cost for improvements is approximately $150,000.

In addition to the transit stop improvements, SANDAG and City of San Diego must work together to select a transit signal priority system for this corridor consistent with the systems implemented on El Cajon Boulevard and as part of the Showcase project. Once the technology is identified, the process of implementation, training and test operations will begin. It is anticipated that this process could take up to 3 to 4 years.

Parking Improvements

Parking in North Park is at a premium. In the next three to five years over 500 new parking spaces will be added with the construction of the parking structure on 29th Street and the construction of the library between Idaho Street and Oregon Street. The operational analysis of the corridor shows that maintaining the on-street parking during the peak hours results in significant delays to both buses and passenger vehicles. However, businesses on the north side of the corridor require loading along University Avenue.

The long-range plan for this project would be to eliminate all on-street parallel parking spaces on University Avenue. To meet the immediate needs of the businesses along University Avenue, it is recommended that parking in the transit only lane be restricted from 7:00 to 9:00 a.m. and from 4:00 to 6:00 p.m. in the business core (Idaho Street to Iowa Street). North Park Main Street should continue to work with business owners, both new and existing, to educate them on the long-range plans for the corridor. As businesses along University Avenue evolve, a focus should be to encourage businesses that have a need for heavy loading to locate in storefronts with rear access.

To improve the overall parking along the corridor, it is recommended that side streets be modified from parallel parking to diagonal parking on all streets where the curb-to-curb width is 52 feet or wider, and where such modifications would result in a net increase in parking. City standards require 52 feet curb to

curb for diagonal parking on both sides of the street on non-through streets. For through streets, City standards require 54 feet curb-to-curb.

Construction along University Avenue will result in temporary parking losses. Therefore, it is recommended that side street parking improvements be constructed as the parking is lost along the corridor. The focus of parking improvements should be in the core of the corridor (Idaho Street to Iowa Street), which will be most impacted by construction.

9.5 CONCLUSIONS

The Refined Concept Plan identified in this report is estimated to cost approximately $8.7 million, which includes environmental clearance, City processing of the necessary Community Plan Amendments, final design and construction. Funding for this project was not identified at the time this study was completed. It is anticipated that the funding for the remaining planning and design stages will be acquired through local state, and federal grant programs such as TransNet, TEA-21, and FTA related programs. It is recommended that the North Park Main Street Program work together with City staff and SANDAG to continue to seek opportunities on an annual basis to fund this project.

It is recommended that the University Avenue Mobility Plan be designed and constructed as a single project in several phases. It is recommended that the roadway section be determined through the final design process to determine if University Avenue should be reconstructed and to determine if the buried streetcar tracks need to be removed. This determination will set both the cost and the schedule for construction of the project. Regardless of the road reconstruction, it is recommended that the raised median be constructed in the final stage of the project. This will allow maximum flexibility in traffic control as the other elements of the plan are constructed, such as the traffic signal modifications and curb-extensions.

Although the plan could be implemented initially as a striping project, several elements would not be integrated in the preliminary striping project including the curb extensions, enhanced pedestrian crossings and access control at the side streets. These three elements will require the installation of the raised median and any necessary roadwork along the corridor. The greatest benefit to initially striping the corridor, without the physical improvements, would be the implementation of the transit only lanes. However, if all phases are not implemented, forecast traffic operations may not be realized as presented in this report. For example, without the raised median, there is a high potential for violations. The community would experience the restrictive aspects of the plan without the benefit of the safety and beautification elements, which may jeopardize full implementation.

Chapter Ten – Feasibility of the Historic Streetcar

10.0 INTRODUCTION

The University Avenue "Traffic Calming Conceptual Study" prepared in November of 2002 proposed the reintroduction of streetcar service along University Avenue. The intent of implementing streetcar service is four-fold:

- Provide an enhanced form of transit that encourages people to ride transit and reduces traffic.
- Encourage economic revitalization along University Avenue.
- Provide a sense of historic preservation.
- Encourage and increase tourism in the North Park community.

The Community Workshop participants supporting the historic streetcar also suggested that streetcar service run along University Avenue and continue south on Park Boulevard connecting to downtown San Diego. The Park Boulevard terminus for the streetcar line is intended to be at or near the intersection of Park Boulevard (12th Avenue) and "C' Street.

This chapter provides a brief evaluation of the feasibility of providing an "historic" streetcar service in the defined study area of University Avenue from 32nd Street to Park Boulevard. This chapter addresses key issues pertaining to the relative feasibility and viability of streetcar service in North Park along the University Avenue corridor.

The streetcar analysis focused on the unique characteristics of the corridor, the streetcar, the design criteria set out in the Preferred Concept Plan from the University Avenue Traffic Calming Conceptual Study and the role the streetcar would play in providing transit options to this corridor of San Diego. The evaluation of the streetcar feasibility relies primarily on the physical requirements necessary to implement the streetcar system effectively within University Avenue. To support this effort the consultant team defined several study objectives:

- Define the route, or alignment, and confirm the station locations
- Define the streetcar or vehicle type (which would influence the design requirements)
- Establish the physical requirements and analysis
- Determine shared transit lanes feasibility
- Determine operations and maintenance responsibilities

10.1 ROUTE ALIGNMENTS, DESCRIPTION AND ASSUMPTIONS

This section describes the potential streetcar route's alignment, station locations, streetcar types, the study area and the necessary assumptions for operation of the historic type streetcar.

Alignment Descriptions

The streetcar alignment would begin at, or near, 32nd Street utilizing the dedicated curbside transit lanes or the mixed flow lanes as identified in the Conceptual Study and illustrated in Exhibit 10-1. The streetcar would continue along University Avenue to Park Boulevard. At Park Boulevard the alignment would leave the project study area by turning south on Park Boulevard. The streetcar would then be running in the proposed Bus Rapid Transit (BRT) lanes, which are currently in the planning stages as part of SANDAG's Transit First Showcase Project. The Showcase Project, which is currently planned to extend south of University Avenue on Park Boulevard, would provide either shared lanes (mixed-flow) or a side-running transitway.

Station Locations

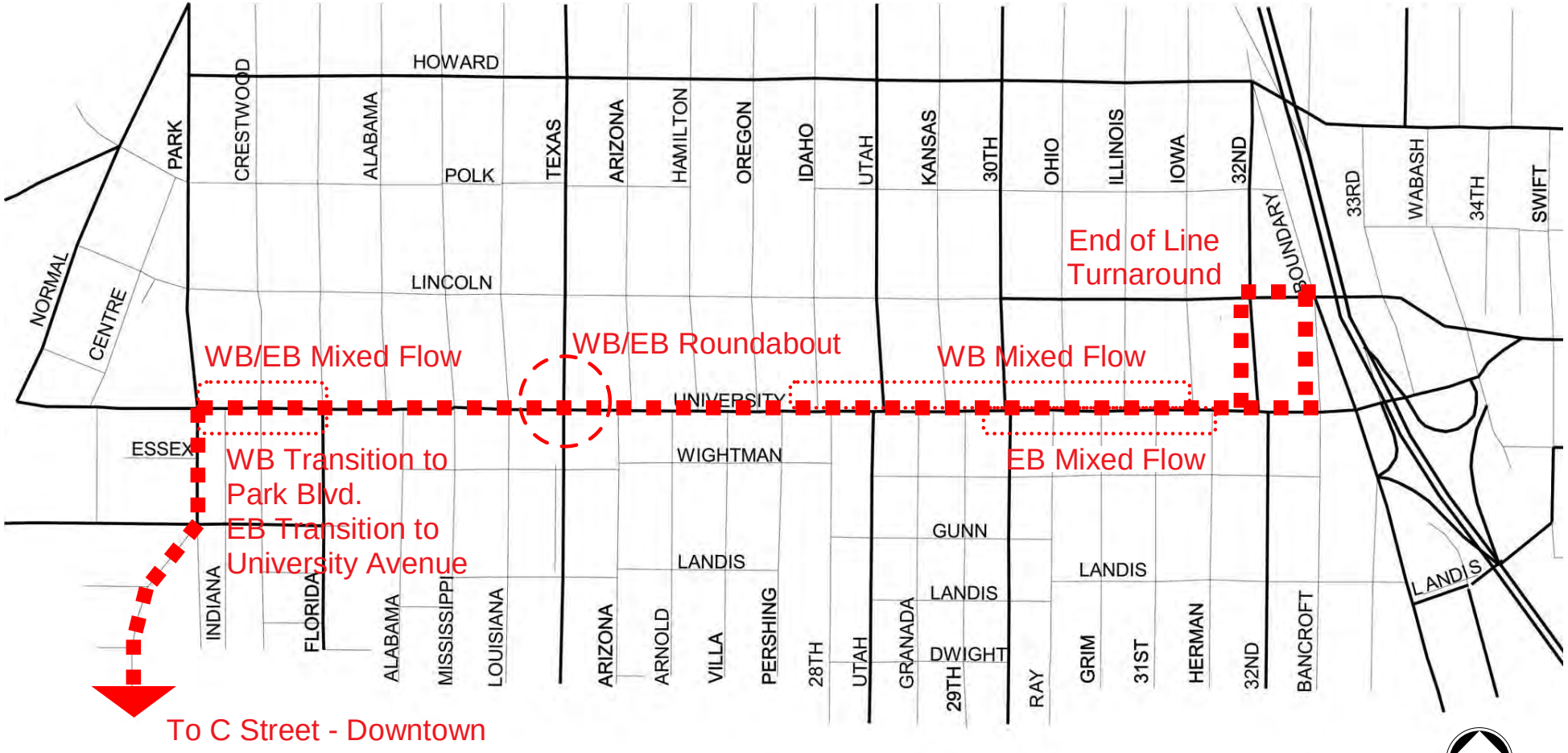
For this analysis the streetcar would utilize the same stations as the Metropolitan Transit System Route 7 and 908 on University Avenue as defined in the Preferred Concept Plan in the Traffic Calming Conceptual Study. These station locations, illustrated in Exhibit 10-2, include the following:

Westbound

- Iowa Street
- 30th Street
- Idaho Street
- Texas Street
- Alabama Street

Eastbound

- Alabama Street
- Texas Street
- Pershing Street
- 30th Street
- 32nd Street



Not to Scale

HISTORIC STREETCAR ALIGNMENT

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 10-1

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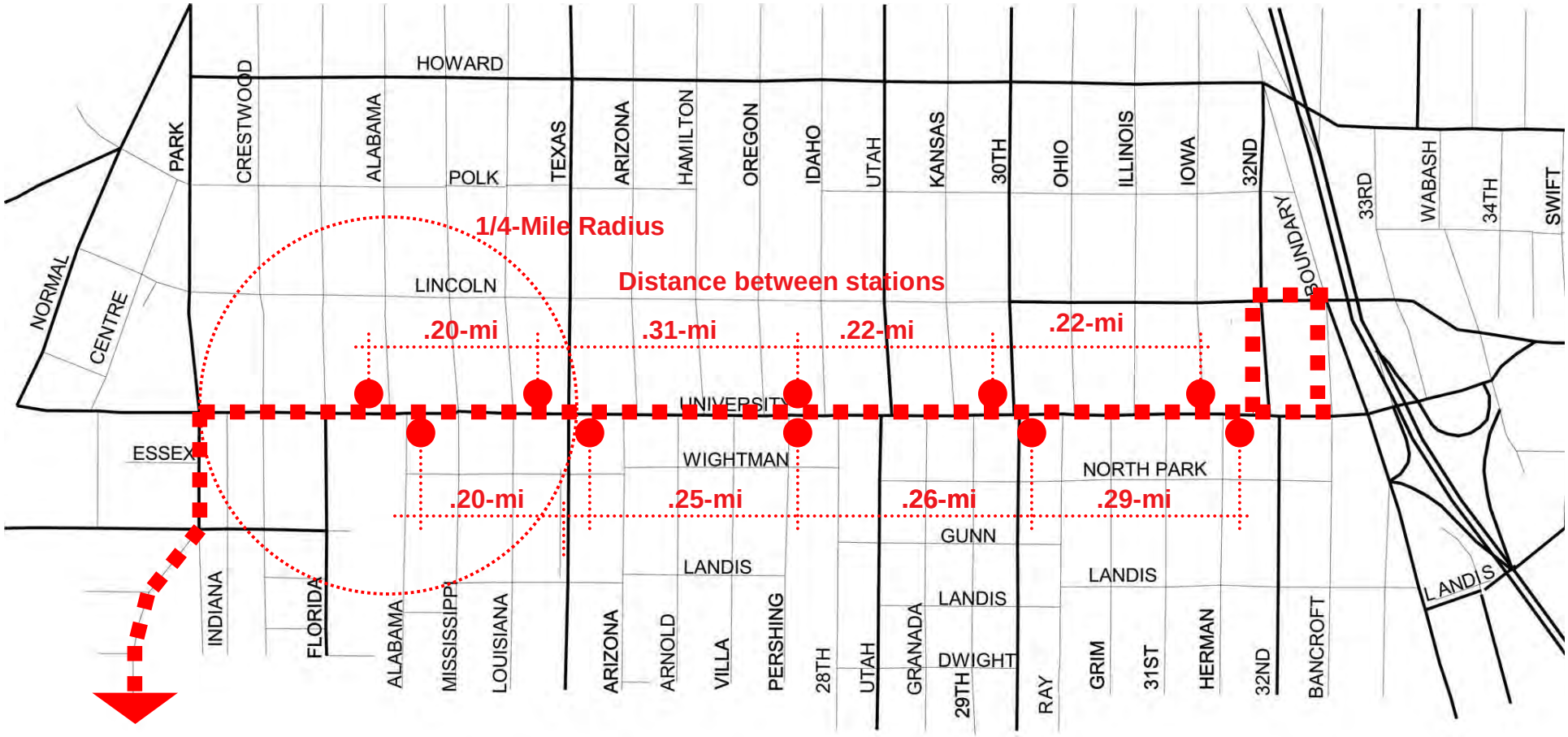

● **Proposed Streetcar Stops on University Avenue**

.25-mi Average distance between existing transit stops

Not to Scale

PROPOSED STREETCAR STOPS ON UNIVERSITY AVENUE

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Streetcar Type

The requirements or demands for the implementation of the streetcar service would greatly depend on the specific type of car selected. At this point in time, the design of the alignment should be as flexible as possible to allow for multiple boarding sides, driver location, and minimum track installation. Based on these suggested requirements, there are three (3) possible vehicles proposed for the corridor:

- The three San Diego Class 1 Streetcars, which are privately owned, are located in San Diego, and are in need of restoration.
- The PCC streetcars that were operated in San Diego, but are not currently located in San Diego (as shown in photo below).
- Replica streetcars, which would need to be acquired, to supplement the historic streetcars in order to meet ridership demands necessary for the alignment.

For the purpose of this analysis, following are specifications necessary for the technical requirements of an historic type streetcar. These requirements would allow for "tighter" operational characteristics that are better suited for a highly urbanized area such as North Park. However, designing the streetcar alignment to these standards would not allow for current Light Rail Vehicles (LRV) to utilize the corridor. It should be noted that the track gauge and voltage requirements would be the same as those used by the current trolley line. This would allow the historic streetcars to operate on the lines in other locations within the San Diego Trolley system. The general streetcar assumptions include the following:

- Car end types:

  Double-ended cars: A double end car is one with controls at both ends of the vehicle (similar to the existing trolley cars operating in San Diego). These cars, similar to San Diego Class 1 cars, effectively have two fronts with no back. At the end of the line, the driver changes ends while lowering one pantograph arm and raising the other. This saves the space and expense of track looping at the end of a line, or at intermediate points where it might be necessary to reverse directions.

  Single ended cars: A single ended car is one with the controls on one end of the car similar to certain types of PCC cars. This type of car requires a loop system to change direction, and therefore requires a greater length of track at the end of the alignment.

- Door configuration:

- Double-sided cars: This vehicle type has doors on both sides allowing passengers to board from either side. This is typical for double-ended type cars that simply reverse direction.

- Single sided cars: A single sided car is one with the door on one side of the car. Again, this is similar to certain types of PCC cars. This type of car would always require passenger loading to occur on one side. Typically this is on the right side of the vehicle. Because of this type of door configuration, the single-sided car requires a loop system to allow for boarding to occur on just one side. This type of feature typically requires a greater length of track at the end of the line to reverse direction.

- Passenger capacity: Passenger capacity varies depending on the car type. The Class 1 type car has a seating capacity of 40 and a standing capacity of 50, while PCC type cars have a seating capacity of 46 and standing capacity of 60. Some approaches to accommodating ADA requirements can reduce the number of seats, but most retrofits to streetcars for ADA requirements do not reduce seating. Please see pages 10-35 and 10-36 for options and solutions that will not reduce numbers of seats.

- Method of power: The cars are electric with a 650-volt requirement.

- Track Gauge: 4-feet 8.5 inches – This is measured between the inner sides of the rail heads. These measurements are the same as the existing trolley lines operating in San Diego by MTS.

- Turn-around requirements: Within the study area, only one turn-around would be neededat the east end of the proposed alignment. This study will illustrate how the streetcar would change directions at this point for both single-ended and double-ended vehicles.

- Lane width requirements: 12-feet - The "dynamic envelope" of the vehicle establishes the required width of the travel lane. The dynamic envelope consists of the streetcar width plus 1.5-feet on each side, or 66-inches from the centerline of the track gauge. In this case, the lane should be a minimum of 11-feet wide with 12-feet as the preferred width.

- Minimum Radii: 50-foot radius would be the minimum used within the corridor. This radius is used in San Francisco on the F Line on Market Street. The 50-foot radius would allow for the streetcar to make for tight turns but at a slow rate of speed. This radius would preclude San Diego's standard trolley cars from being used on this route. Although a tighter radius can be used for the historic streetcars (typically entering or exiting a storage area) it is not typically used for operational purposes. A tighter radius creates excessive track wear and has a higher noise level related to the wheels "squeaking" on the tracks.

It should be noted that the PCC cars operating in San Francisco had the undercarriage rebuilt to handle the tight radius associated with the F Line. This would also be required here if the PCC cars are intended to operate in University Avenue corridor given the minimum radius standards that would be employed.

Quantity of Streetcars Based on Schedule and Ridership Assumptions

- Schedule: The preferred schedule for the streetcar, based on initial community input, is to provide regular daily service that would be consistent with the existing Route 7. This would mean providing vehicles at 6-minute intervals, at peak periods, and 10-minute intervals at other times. The average one-way time to cover the proposed alignment from I-805 to Park Boulevard and C Street is approximately 22-25 minutes, with a maximum layover of 5-minutes at each end. This requires approximately 56-minutes per round trip.

- Number of Street Cars Needed: Based on the headway, or intervals assumptions, serving the corridor during peak period would require approximately 10 vehicles. Also, at least four (4) additional vehicles should be available for on-going maintenance or service during the course of standard operations. The total number of vehicles required to serve the proposed alignment would then be 14. More vehicles may be needed if the seating

capacity of the selected vehicle cannot meet the ridership requirements for the alignment when service begins.

- The number of vehicles would also have an influence on the spatial requirements for the storage and maintenance facility for the vehicles, as discussed in section 3.4. It should be noted that the 908 line would continue to use this corridor and the streetcar would not supplement or replace this service. Both the existing routes 7, 908 and the streetcar would share the proposed curbside transit-only lanes.

- Ridership Assumptions: The streetcar is intended to operate on University Avenue from
- 32nd Street to Park Boulevard, and then south on Park Boulevard to C Street. It has been discussed through the course of the project that the streetcar could play a role similar to Route 7A. The Route 7A supplements Route 7 starting at 33rd Street and University Avenue during peak periods. However, Route 7A extends beyond the proposed streetcar route of C Street and Park Boulevard and ends at Broadway and Harbor Drive near San Diego Bay. So, if a transit passenger on the streetcar wanted to travel past C Street and Park Boulevard into downtown San Diego (during peak periods) they would have to transfer to either another bus or trolley at that location.

- Other discussions involved replacing Route 7 altogether from 32nd Street with the streetcar. Again, this is not recommended as two (2) transfer points by transit passengers traveling from La Mesa to downtown San Diego would be needed. The first one would be at 32nd Street where the Route 7 passenger would transfer to the streetcar and then the other transfer would be at C Street and Park Boulevard where the streetcar service would end and passengers would need to take another bus or trolley to continue downtown. Transfers are not desirable as they add to the complexity and time of transit trips, thereby discouraging transit patrons.
-
- In both cases trying to emulate Route 7 or 7A with streetcar service requires the transfer of passengers. Assuming the transfer of passengers did occur, the streetcar capacity of 50-60 passengers would not be sufficient to accommodate the highest peak period ridership demand (97 passengers) for the corridor, which is illustrated in Table 10-1. Even without passenger transfers from the Route 7 eastbound of the proposed historic streetcar alignment, the morning peak period westbound passenger demand for the 7A (74 passengers) could not be accommodated by the streetcar due to its passenger capacity. In addition, SANDAG anticipates that by 2030, the ridership demands would increase by at least nine (9) percent. What this begins to identify is that the streetcar would not be able to replace Routes 7 or 7A during the peak periods.

- However, the high ridership counts and projections are only during the peak periods. Non-peak period passenger demand is not as strong. The streetcar could supplement Route 7 during non-peak times, but could not replace it, especially during the peak periods. Again the transfer of passengers would have to occur as stated above.

- As the implementation of historic streetcar service is explored, the issue of operational hours would need to be clearly defined with SANDAG and MTS. Determining if and how the streetcar can provide the level of service expected by the North Park community, while still handling the necessary volume of passengers, would require further dialog with SANDAG/MTS. Also, additional operational analysis is needed beyond the scope of this effort to determine how best to utilize the historic streetcar in the day to day operational needs of Route 7 and its passengers.

Table 10-2 outlines the requirements discussed in this section.

Table 10-1
Routes 7A and 7 - 2003 Passenger Count

Peak Period and Route Direction	Number of Passengers On-Board	
AM: Westbound	**Route 7A**	**Route 7**
Entering Study Area (Bancroft / University)	10	52
Leaving Study Area (Park Blvd. / University)	74	79
Mid-Route (Park Blvd./Zoo Drive)	24	97
End of Route (C Street)	4	21
AM: Eastbound		
Beginning of Route (C Street)	N/A	54
Mid-Route (Park Blvd./Zoo Pl.)	N/A	40
Entering Study Area (Park Blvd. / University)	N/A	10
Leaving Study Area (Boundary/University)	N/A	16
PM: Westbound		
Entering Study Area (Bancroft/ University)	N/A	62
Leaving Study Area (Park Blvd. / University)	N/A	49
Mid-Route (Park Blvd./Zoo Drive)	N/A	62
End of Route (C Street)	NA	24
Note: Highest passenger count at SDHS.		73
PM: Eastbound		
Beginning of Route (C Street)	N/A	65
Mid-Route (Park Blvd./Zoo Pl.)	NA	71
Entering Study Area (Park Blvd. / University)	N/A	57
Leaving Study Area (Boundary/University)	N/A	42

Note: Ridership indicates number of passengers between stops in the peak hour.

Table 10-2
Operational Requirements Summary

Car Type	San Diego Class 1	PCC	Replica Streetcar
End Type	Double Ended	Single Ended	Either Type
Door Type	Double Ended	Single Ended	Either Type
Passenger Capacity	40- seated + 10 standing	46-seated + 14 standing	TBD
Method of Mobility	Electric	Electric	Electric
Track Gauge	4'-8. 5"	4'-8. 5"	4'-8. 5"
Turn Around Location	32nd St and University Ave		
Lane Width	11'-12'		
Minimum Radius	50-feet	*50-feet	50-feet
Number of Vehicles	14 cars to meet headway and operational requirements		

10.2 PHYSICAL REQUIREMENTS AND ANALYSIS

Historic Street Car Alignment

As described earlier, the streetcar alignment would follow the transit only lanes and also use the mixed-flow lanes on University Avenue as defined in the Preferred Concept Plan. Analysis shows that the streetcar would run into operational problems trying to weave into and out of the transit-only lanes. Similar to the transit analysis provided for the project, the primary element affecting the streetcar would be the merge points with the mixed-flow lanes. In the concept plan, private vehicle traffic may utilize only one lane through most of the corridor. Providing only one mixed-flow lane creates significant queuing, making it difficult for the streetcar to transition into the mixed-flow lane. The Refined Concept Plan addresses this issue by removing on-street parallel parking and provides a continuous transit-only lane. The proposed short-term plan would allow parking in the transit only lane during the off-peak hours. This parking plan would pose operational problems for the streetcar. Therefore, on-street parallel parking would not be permitted if the streetcar were implemented.

Through the length of the corridor, this weave movement has its highest impact in the PM going eastbound. The travel time for the streetcar during this period in 2030, with the Conceptual Study implemented, could range from 16 to 18 minutes (similar to other transit vehicles) compared to 10 to 11

minutes today. Although this difference in time frame does not seem significant, it could require additional vehicles to meet the ridership demand for the corridor. This in turn increases the initial implementation cost.

Drop Suspension Support Poles

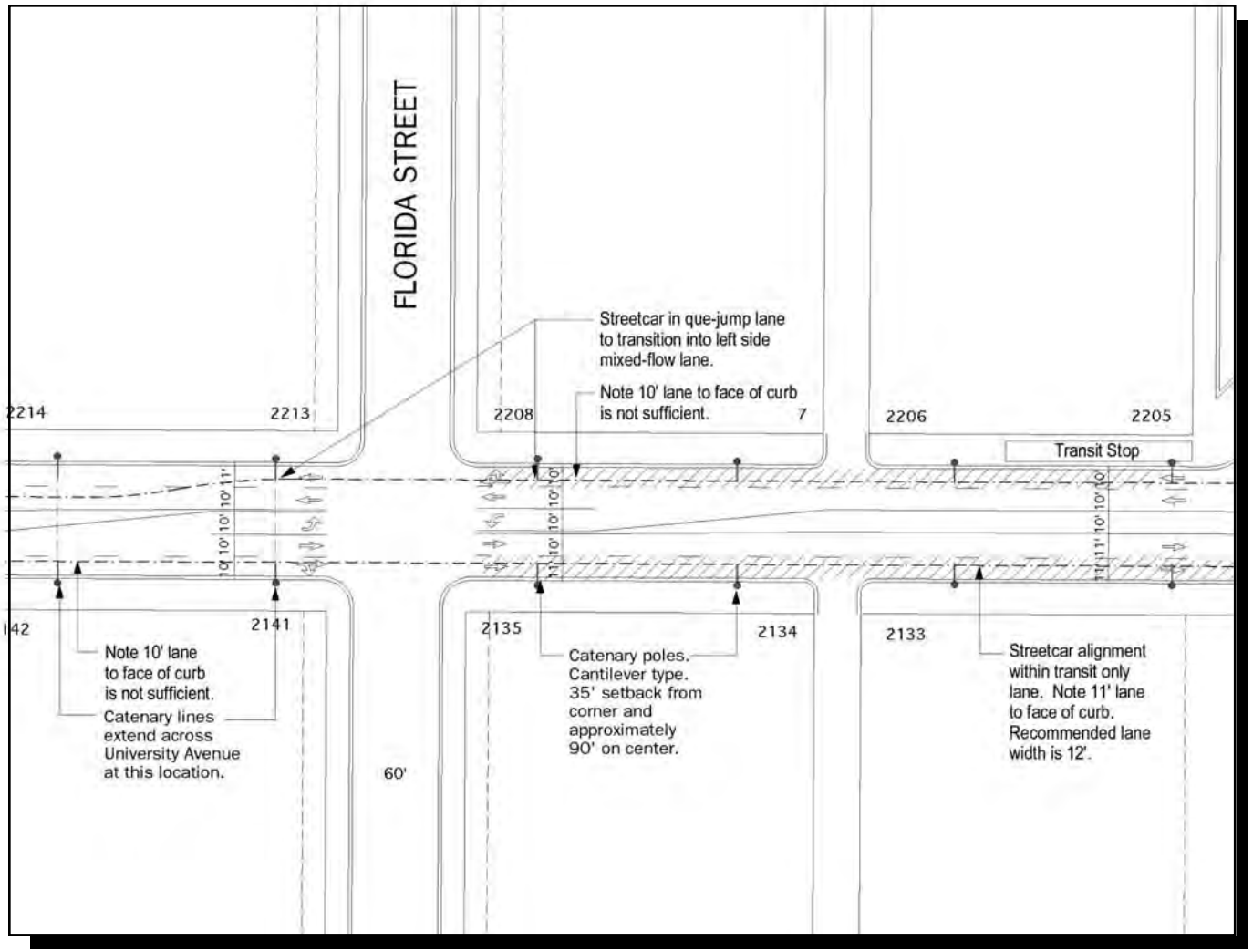
Drop suspension poles would provide the necessary power for the streetcar's electric service needs. Pole spacing and height is a critical project element when placing a new rail system into an existing urban environment. The existing infrastructure, underground utilities, overhead power lines, transformer boxes, street trees, and other public fixtures placed in the existing right-of-way all have an impact on where the poles can be located. Following are the minimum drop suspension pole requirements:

- Spacing: 4 – poles per block. The existing urban development blocks along University Avenue are typically 340-feet long, curb to curb. This includes a 300-feet building area, a 20-foot wide alley and another 20-feet for parkways. The recommended pole spacing is approximately 90-feet, or two per half-block as illustrated in Exhibit 10-3. In all cases it should be noted that drop suspension support poles could be outfitted with new street light fixtures. This would also alleviate a common concern identified during the community workshops regarding inadequate lighting in the corridor.

- The drop suspension lines do not have to reach across the entire width of University Avenue. Rather, cantilever poles could be used for the transit lane that runs curbside. Using the cantilevered poles allows the proposed median street trees to reach a greater height and canopy. Additionally, if the drop suspension lines span the entire width of University Avenue, the offsetting blocks could create a more complex spacing arrangement. In the areas where the streetcar would share the mixed-flow travel lanes, it would be necessary for the drop suspension lines to cross the entire width of the right-of-way.

- The typical minimum setback for drop suspension support poles from cross streets at street grade crossings is 35-feet. However, in highly urban areas, like downtown San Diego, the poles are setback 25-feet from the intersection cross street faces of curb.

- Due to the highly developed conditions along University Avenue, placement of the poles would have an impact on the existing above grade and below grade infrastructure. Most blocks contain utility boxes, street trees and other above grade structures. The impacts to below grade infrastructure include gas lines, sewer lines and waterlines. Future planning efforts would need to address specific locations for pole placement and the associated impacts to these utility features with the final placement.



Not to Scale

TYPICAL CATENARY POLE LOCATIONS

EXHIBIT 10-3

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- Height: 19-feet. The messenger wire or drop suspension lines need to be a minimum of 19-feet above the street. This is intended for alignments that are only being used by Light Rail Vehicles and not rail freight lines, for which the streetcar would qualify. Once the drop suspension lines are installed along University Avenue it would become a restricted corridor. Certain types of vehicles (such as large vehicles moving a house) would not be able to cross or traverse along this portion of University Avenue. It is recommended that coordination with emergency services be initiated prior to the design stage. This would be to ensure that the lines would not inhibit emergency responses or vehicles.

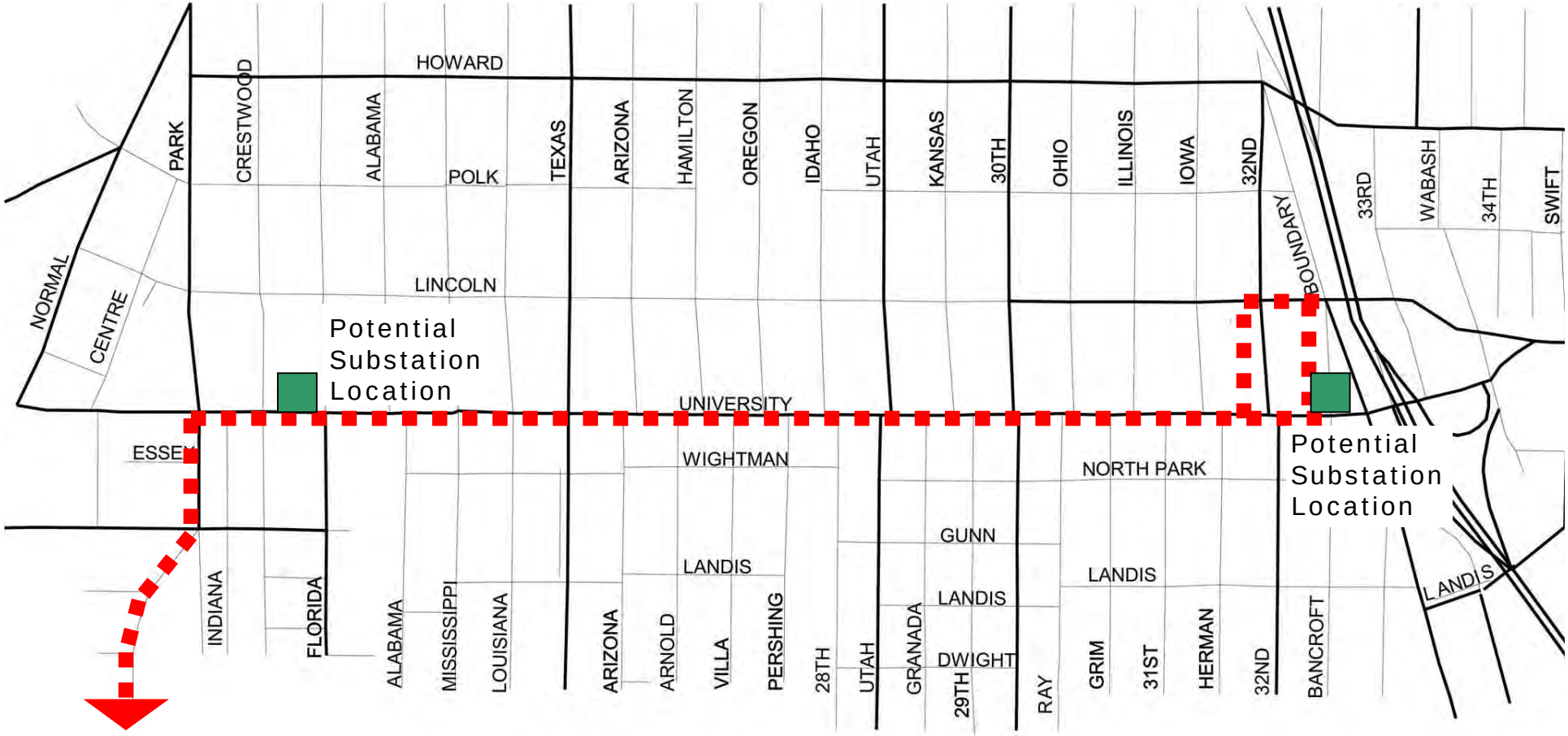
- Poles and Wires: It should also be noted that the drop suspension lines and support poles could create a negative impact on the corridor's visual quality. The webbing of lines and the number of poles needed to support the system could be perceived as a visual impact. The North Park community has spent considerable time and energy recently to remove overhead power lines in its neighborhood. Sensitive placing of the drop suspension poles would be necessary to minimize the visual impact.

  Although, if the streetcar implementation is in concert with other streetscape improvements, such as new sidewalks, lighting, street trees and more, the poles and overhead wires could be considered by the community as a minimal intrusion compared to the other improvements.

Substation Requirements

Substations would play an important role for the electrical streetcar by providing a constant flow of sustained power. Substations need to be located in close proximity to the corridor.

In normal trolley application, a substation is typically located approximately every 1.5-miles. The corridor along University Avenue being served by the streetcar is approximately 1.9-miles. This means that two (2) substations would be required to service the streetcar efficiently. Additional substations would be needed for the continuation of the streetcar line on Park Boulevard between University Avenue and C Street. Future study of this streetcar corridor is needed to determine the requirements for substations along this route and would need to be coordinated with those along the University streetcar line route. For University Avenue one, preliminary location should be near the beginning of the alignment at 32nd Street, and the other near Park Boulevard. These two locations are illustrated in Exhibit 10-4.



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POTENTIAL SUBSTATION LOCATIONS

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EXHIBIT 10-4

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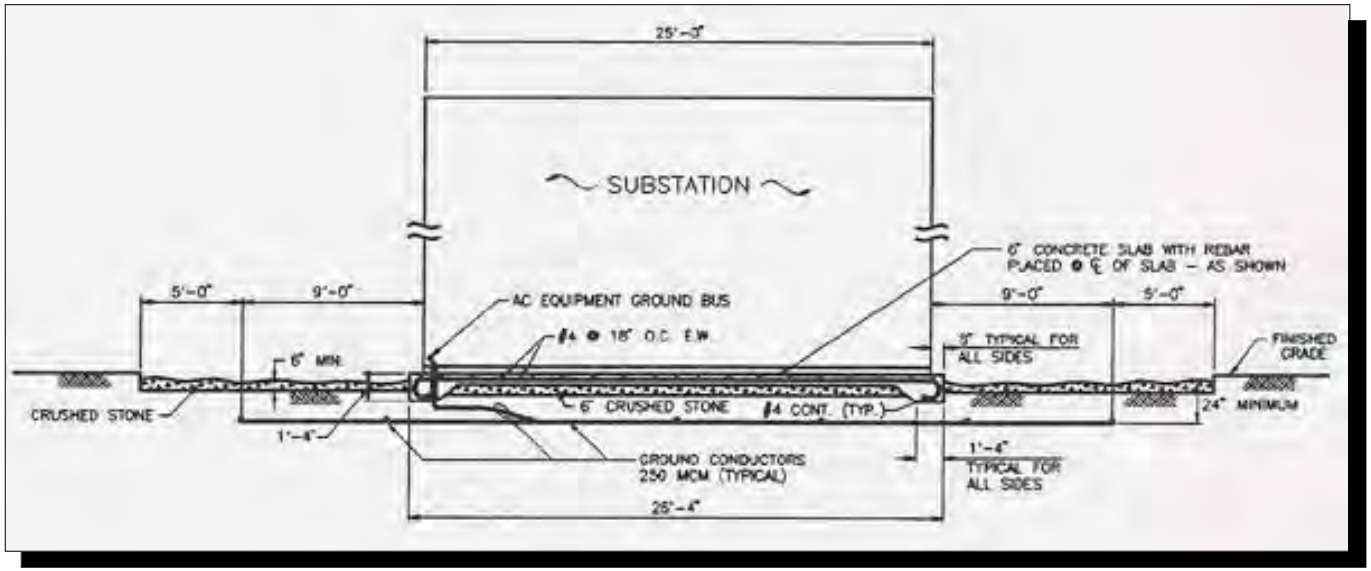
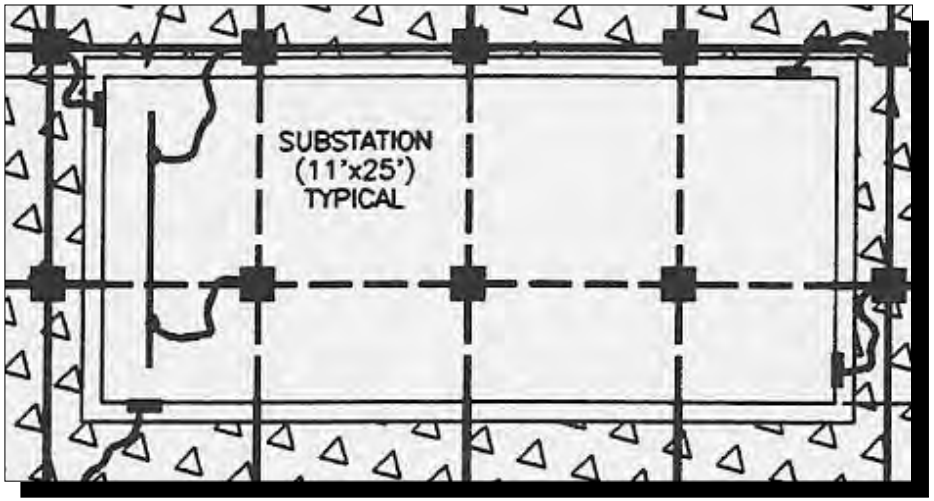


Section View



Plan View

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SUBSTATION SECTION AND PLAN VIEWS

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The size of a typical substation unit is 25-feet by 11 feet, and is 11-feet high. This size substation would require a pad of 37-feet by 53-feet (for a single station) and a fully secured base. A section and plan view are shown in Exhibit 10-5. Because of the highly urbanized nature of North Park, especially on University Avenue, the placement of these units would require significant study and community involvement. Any potential substation locations in the general vicinity of the streetcar alignment would require some type of property acquisition.

There are other types of rail-oriented electric streetcars that do not require the drop suspension lines necessary for mobility. These cars are created with technology based on battery powered, inductively charged steel wheel trolley. This type of vehicle/service has been employed successfully in other areas including the Farmers Market in Los Angeles. This technology could provide a more "urban friendly" appeal by eliminating the overhead drop suspension lines and the necessary support poles from the surrounding streetscape. This is an area that future studies should explore as the visual and aesthetic concerns of the overhead lines are discussed. The biggest drawback for this type of system is limited operational speed. As the technology is advanced, the speed of the vehicle could improve making it a candidate to operate in the University Avenue corridor.

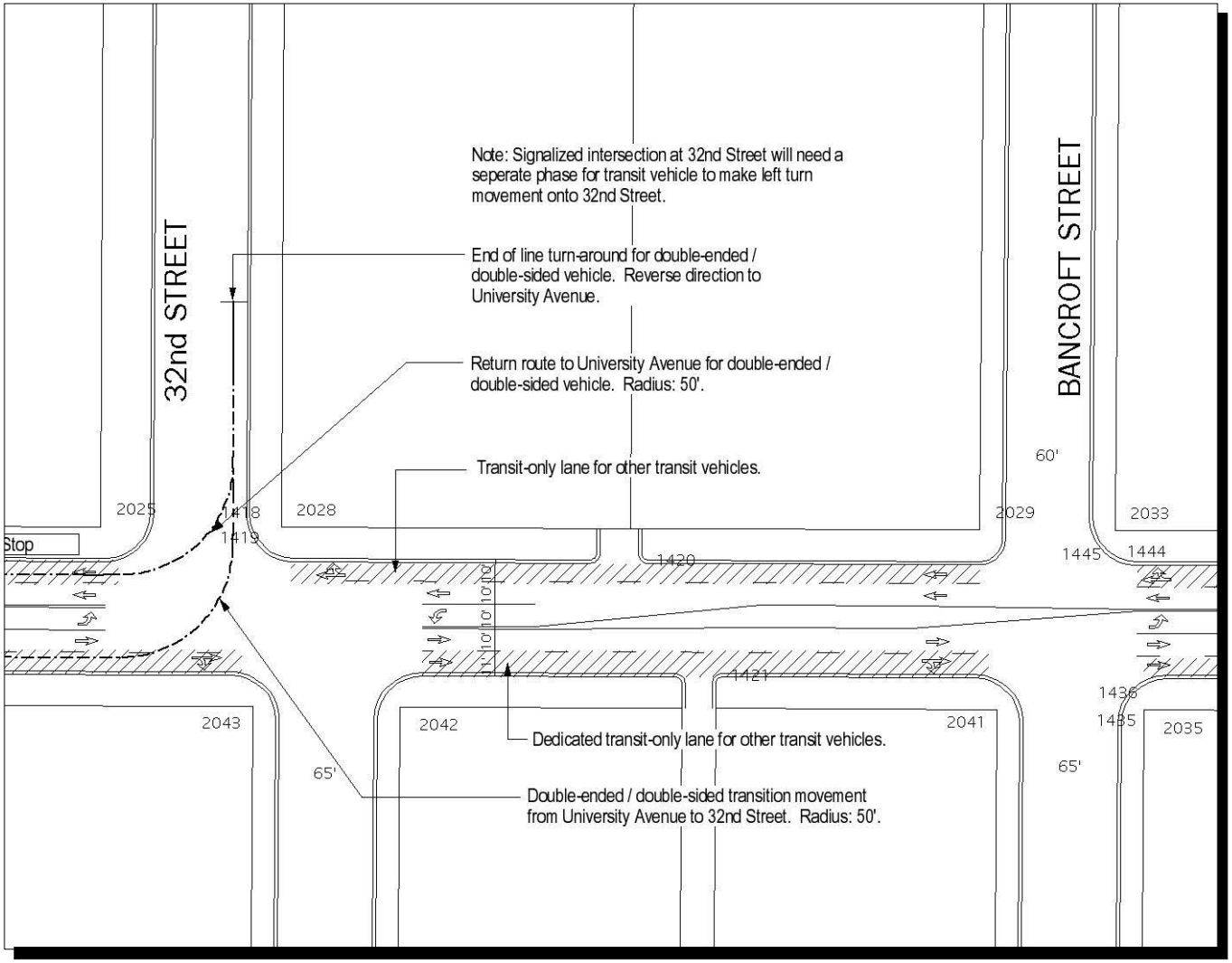
Turn-around Locations

The streetcar would need to turn around at the end of the alignment to make its return trip and proceed in the opposite direction. Within the study area there will only be one location needed for the turn-around – the intersection of the 32nd Street and University Avenue. The 32nd Street intersection is also the location of the last bus stop in the study area, and the intersection is signalized.

The 32nd Street intersection is also offset making it an extended or longer intersection than normal. This allows for an easier transition for the streetcar to enter 32nd Street to begin the turnaround process. There are two (2) ways of completing the end of line turnaround depending on the vehicle type selected for use. These include the following:

- Double-ended car: The eastbound vehicle would cross over the intersection into the far right lane on 32nd Street as illustrated in Exhibit 10-6. The vehicle would then proceed north of the intersection and stop. At this point the driver would proceed to the other end of the vehicle while lowering one pantograph arm and raising the other. The location for the streetcar would be a protected area on 32nd Street north of University Avenue, providing a better driver transfer.

- Also, the 32nd Street and University Avenue intersection would require a separate traffic signal phase to allow the streetcar the left turn movement off of University Avenue and the right- turn movement onto University Avenue. The streetcar phases would affect all intersection movements for the time it takes the streetcar to move through the intersection. This type of separate phasing for the streetcar would delay traffic and potentially cause longer vehicle queues on University Avenue.



Not to Scale

DOUBLE-ENDED CAR TURNAROUND

(OVERLAID ON THE PREFERRED CONCEPT PLAN)

Single-ended car: The eastbound vehicle would cross over the intersection into the middle lane on 32nd Street and continue to travel in the middle lane to Lincoln Avenue as illustrated in Exhibit 10-7. The vehicle would turn right on Lincoln into the far right travel lane, then continue to Bancroft and turn right into the middle lane. When the vehicle reaches University Avenue, it would turn right again and proceed in the westbound transit-only lane.

Also, each of the turning movements on the side streets (Lincoln and Bancroft Street) causes some impact to the adjacent property. This is the case even when using the minimum turning radius of 50-feet due to the curbside running track. Again, as with the double-sided cars, the 32nd Street and University Avenue intersection would require an additional separate traffic signal phase to allow for the historic streetcar's left turn movement off of University Avenue.

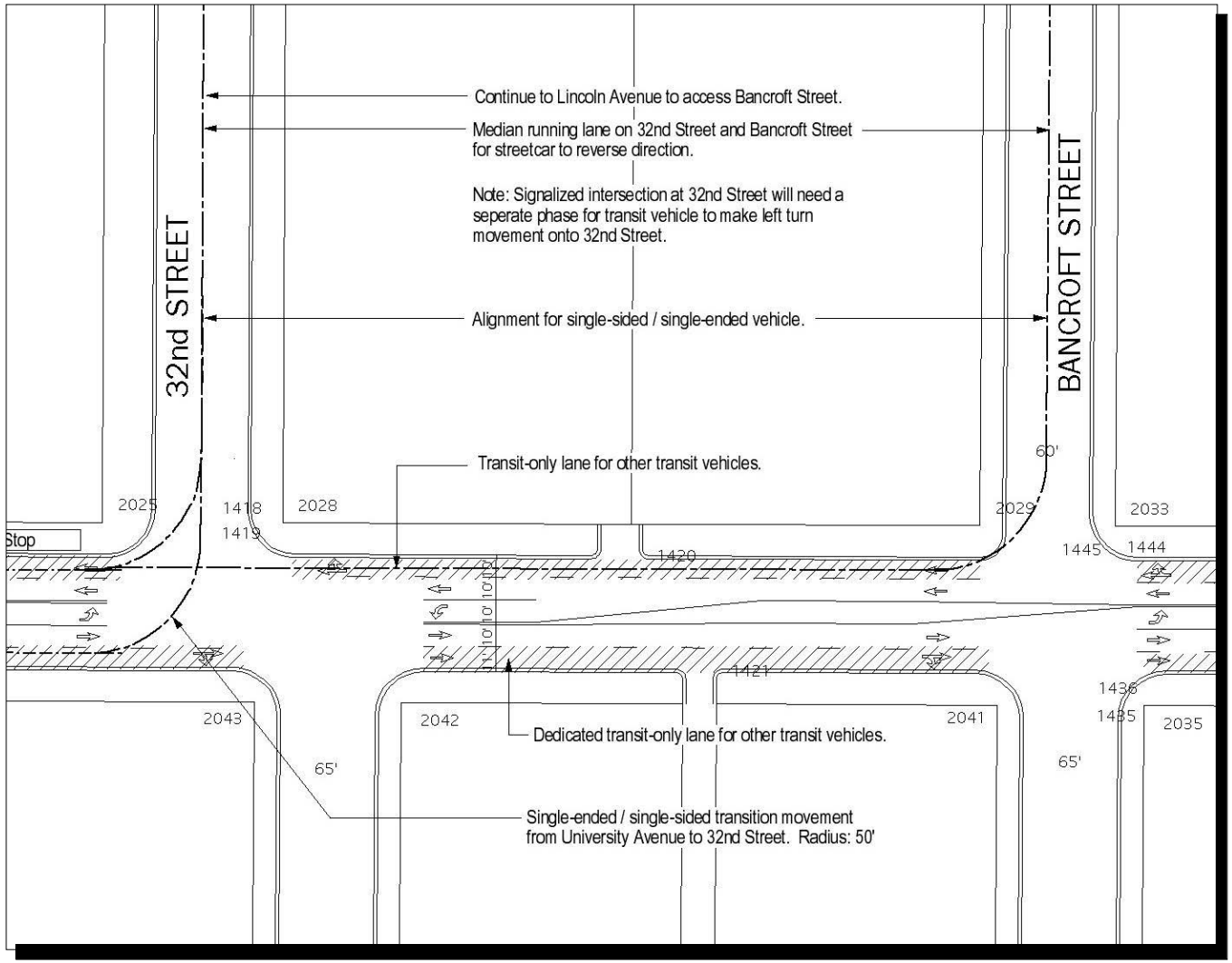
Streetcar Lane Width Requirements

The minimum lane width that provides sufficient safety is dependent upon the dynamic and static widths of the vehicle. The static width of the streetcar is approximately 8-feet 4-inches. The dynamic width of the streetcar (the area the streetcar moves from side to side while in motion) is 11 feet.

Based on the above information, the lane should be a minimum of 11-feet with 12-feet as the preferred width for a single curbside streetcar line. The Preferred Concept Plan shows three separate conditions for the operation of the streetcar. These conditions are:

- A 9-feet wide transit lane with a 2-foot painted or striped buffer as illustrated in Section A.
- A 12-foot wide transit lane as illustrated in Section B of the Conceptual Study.
- A mix-flow lane serving general traffic, transit, and streetcars of varying width from 10-feet to 11-feet.

The Refined Concept Plan minimizes the number of cross-sections along the corridor and provides for an 11-foot outside travel lane that would meet the minimum requirements for buses. The westbound transit only lane is proposed from Boundary Street to Florida Street to minimize the number of merge maneuvers required by transit vehicles. In the eastbound direction, the transit only lane is proposed from Utah Street to Boundary Street, with the potential for future extension of the eastbound transit only lane to Park Boulevard if traffic impacts could be mitigated.



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SINGLE-ENDED CAR TURNAROUND

(OVERLAID ON THE PREFERRED CONCEPT PLAN)

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To meet the parking and loading needs of businesses along the north side of University Avenue, a parking concept plan was developed as part of the Refined Concept Plan that would allow vehicles to park in the transit only lane during the off-peak hours.

In order to provide the safest streetcar service, it is recommended that all streetcar lanes be a minimum of 12-feet. This requires that certain areas within the corridor provide additional width than what is currently proposed in the Refined Concept Plan. All parking should also be eliminated from the transit only lane.

This additional lane width would have to come from the adjacent travel lanes, median, or encroachment into the existing sidewalk or parkway. This could require the relocation of existing curb/gutters and sidewalks depending upon from where the additional travel lane width would be extracted. Also, additional width to the typical 12-feet lane would be needed to compensate for vehicle overhang during turn movements. During these turn movements, vehicles have either in-swings or out-swings at the radius points requiring greater clearance at these locations.

Maintenance Yard and Storage Facility

An integral component for the streetcar system would be the overnight storage facility and maintenance yard. In the past, these were known as "Car Barns" or Trolley Barns." These facilities stored the cars and also allowed for normal daily maintenance. It is anticipated that the restored cars (and even the replica cars) would require significant maintenance if they were to be used on a daily basis, while being expected to provide for normal peak period transit service.

The size of the facility would depend on the number of vehicles needed to serve the alignment's length and schedule, while providing for a certain number of cars under maintenance. Given the overall alignment length (approximately 3-miles to C Street and Park Boulevard) and the preferred schedule of 6-minute headways at peak periods, it was determined that 14 cars would be needed to meet the peak period demand loads.

In order to minimize the laying of additional track, the maintenance / storage yard facility should be in close proximity to University Avenue. Below are the base requirements that would be needed to store and service the streetcars.

- Spatial Requirements: In order to meet the needs of 14 cars, the associated maintenance area of approximately 22,000 sq. feet would be needed. This would allow for two (2) to four (4) cars to be under maintenance at one time, while 10 cars remain fully operational for service. This area would also provide the transitional area needed to return the cars back to the operational lines on University Avenue.

- Possible Facility Location: As discussed earlier, the maintenance / storage yard facility should be located as close as possible to University Avenue. At this time, no site-specific location is being proposed within the study corridor. However, it may be in the best interest for the overall system to locate the storage yard in an area between 32nd Street / Boundary Street and north of University Avenue, south of Lincoln Avenue. This is in the general area for the streetcar's "end of the line," at the edge of the community and bordered on one side by the freeway as illustrated in Exhibit 10-8. Future efforts should consider this area and continue to explore where appropriate maintenance facilities would be feasible.

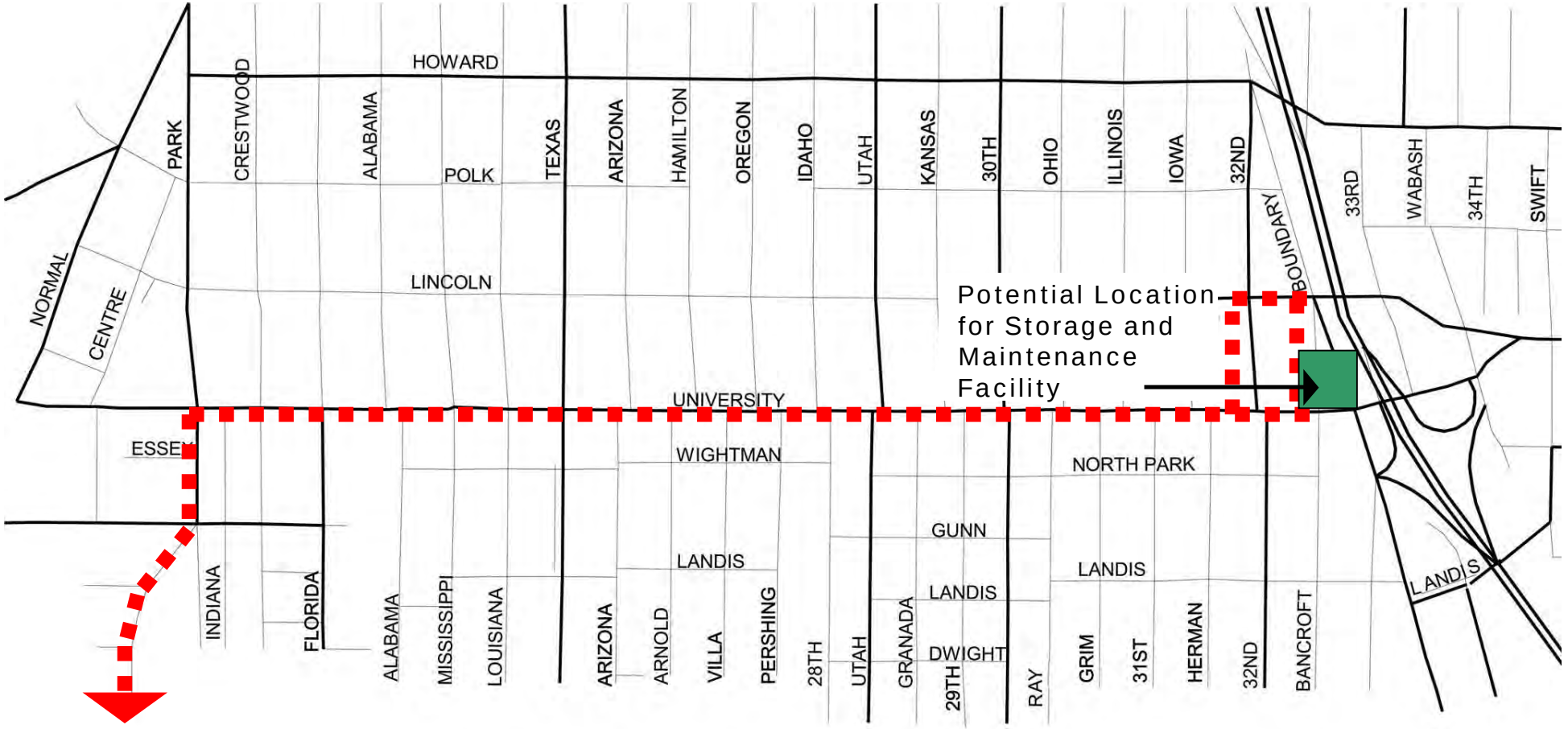
It has also been suggested that an alternative site might be the storage yard at Imperial Avenue and 12th Avenue. This existing storage yard currently houses the MTS trolley cars. If the streetcar alignment is extended to Park Boulevard and "C" Street, the streetcars could continue south on Park Boulevard (12th Avenue) to the Imperial Avenue storage yard. Coordination with SANDAG and MTS would be necessary to pursue this option to determine if sufficient room is available.

The storage yard is currently at capacity with the need requirements for SANDAG and MTS owned trolley cars. There is room to store perhaps 1 to 3 streetcars but no more. The use of this location today would not be possible. However, in the future as MTS operation and property assets change there may be storage capacity for the proposed streetcars. If the historic streetcar project moves forward, consideration for the Imperial Avenue site as a storage and maintenance facility site for the streetcars should be revisited.

Because of the historic nature of the vehicle, and the fine level of detail and materials used, historic streetcars are typically stored in buildings as opposed to outdoors. The storage/maintenance yard should be in a location that would allow building requirements necessary to house the streetcars.

Mid-Block Crossovers

Mid-block crossovers would be needed to provide a change of direction for streetcars that break down during the course of operations. The streetcars would need to return to the maintenance and operation yard without going in the opposite direction of the traffic flow. The typical recommendation for crossovers is one for each 1.25-miles of track. Along this length of the alignment on University Avenue of approximately 2-miles or 10,560-feet, a minimum of two (2) crossovers is recommended.



Not to Scale

POTENTIAL STORAGE/MAINTENANCE FACILITY

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 10-8

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The best coverage for this corridor would be to have the crossovers at approximately .66 miles apart. This provides a crossover no further than 3,500-feet from a potential breakdown location. The locations of crossovers should be in areas that divide the corridor as evenly as possible. However, because of the proposed medians identified in the Refined Concept Plan, the potential locations for these crossovers are limited. For the study area two (2) locations (see Exhibits 10-9 and 10-10) were noted as feasible and having the least impact to the Conceptual Plan as designed. These locations are:

- Illinois Street - At Illinois Street, the intersection is of sufficient length to allow for the crossover to occur. Also, both of the streetcar lanes would be in mixed-flow lanes creating a narrow track center for transition.

- Mississippi Street - At Mississippi Street, the crossover would need to transition from the westbound curbside lane to the eastbound curbside lane. This is a distance of approximately 37-feet to reach the opposite track center. The Mississippi Street intersection is offset significantly allowing for this wider crossover to occur.

The crossovers occurring at two (2) locations should span the proposed intersections to allow the crossover plates to be outside the intersection. This would allow for the crossover plates to avoid cross traffic impact. The crossover plates are extremely sensitive and subject to breaking if significant traffic crosses over the plates.

Transitions to Mixed-flow lanes

There are six (6) locations that require the streetcar to transition from one lane to another in the Preferred Concept Plan. The majority of the transitions occur when the streetcar leaves or returns to the transit only lanes from the mixed-flow lanes. Since the lanes vary in width, each of these locations would require slightly different design requirements to meet the streetcar needs. In each case the transitions could physically occur and are illustrated in Exhibits 10-11 through 10-14. The following are locations where the transitions are located.

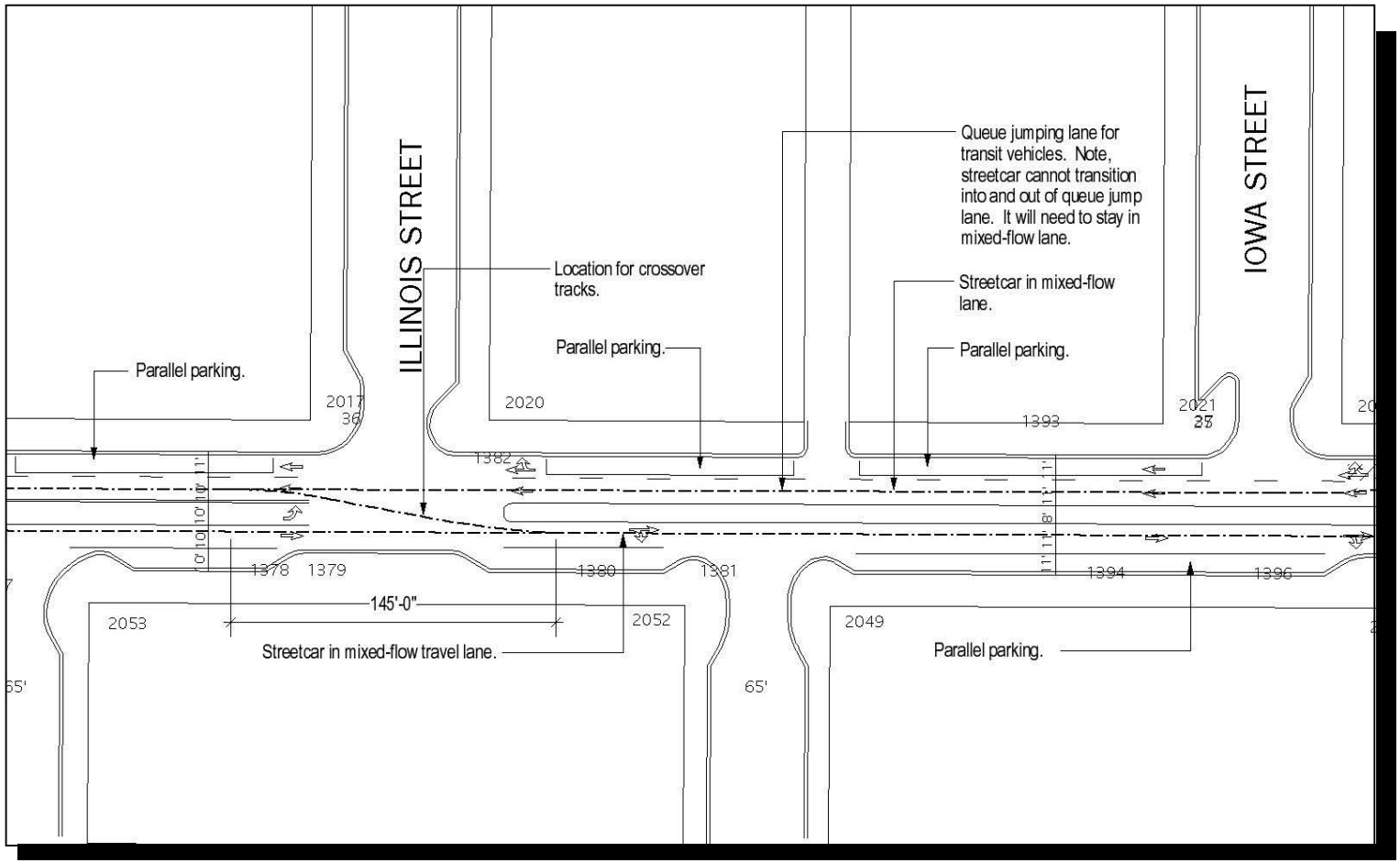
Westbound Lanes

- *Iowa Street – Exhibit 10-11*
- *Idaho Street – Exhibit 10-12*
- *Florida Street– Exhibit 10-13*

Eastbound Lanes.

- *Florida Street: – Exhibit 10-13*
- *30th Street: –Exhibit 10-12*
- *Herman Street: – Exhibit 10-11*

However, the number of transitions could have an effect on the streetcar's operational characteristics. Because there would be only one mixed-flow lane, heavy queuing would be expected during peak periods for major portions of the corridor. These long lines of traffic would have a negative impact on how smoothly the streetcar can transition from the transit only lane to the mixed flow lane and would also negatively impact traffic flow.



Not to Scale

ILLINOIS STREET - MID-BLOCK CROSSOVER

(OVERLAID ON THE PREFERRED CONCEPT PLAN)

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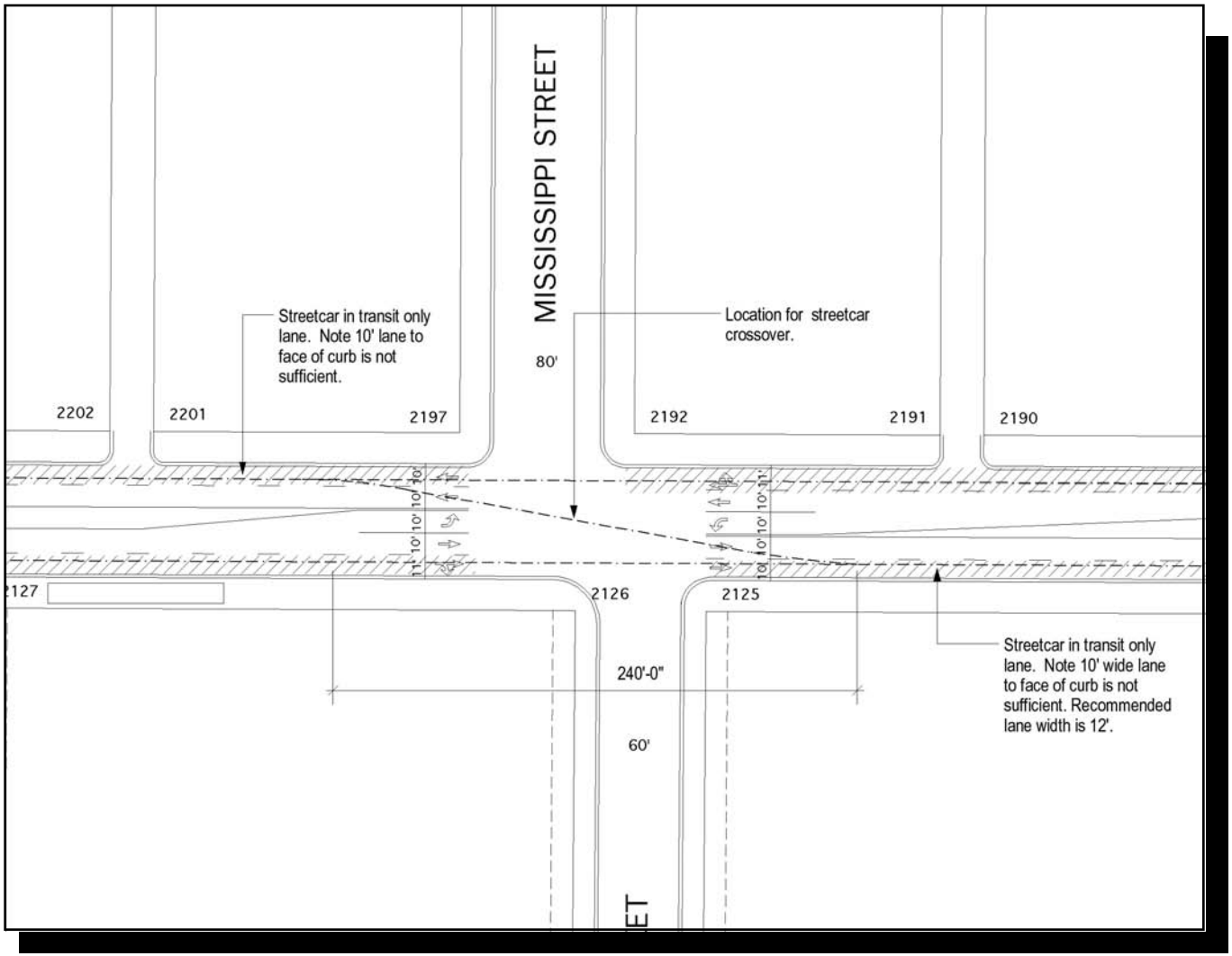

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MISSISSIPPI STREET - MID-BLOCK CROSSOVER

(OVERLAID ON THE PREFERRED CONCEPT PLAN)

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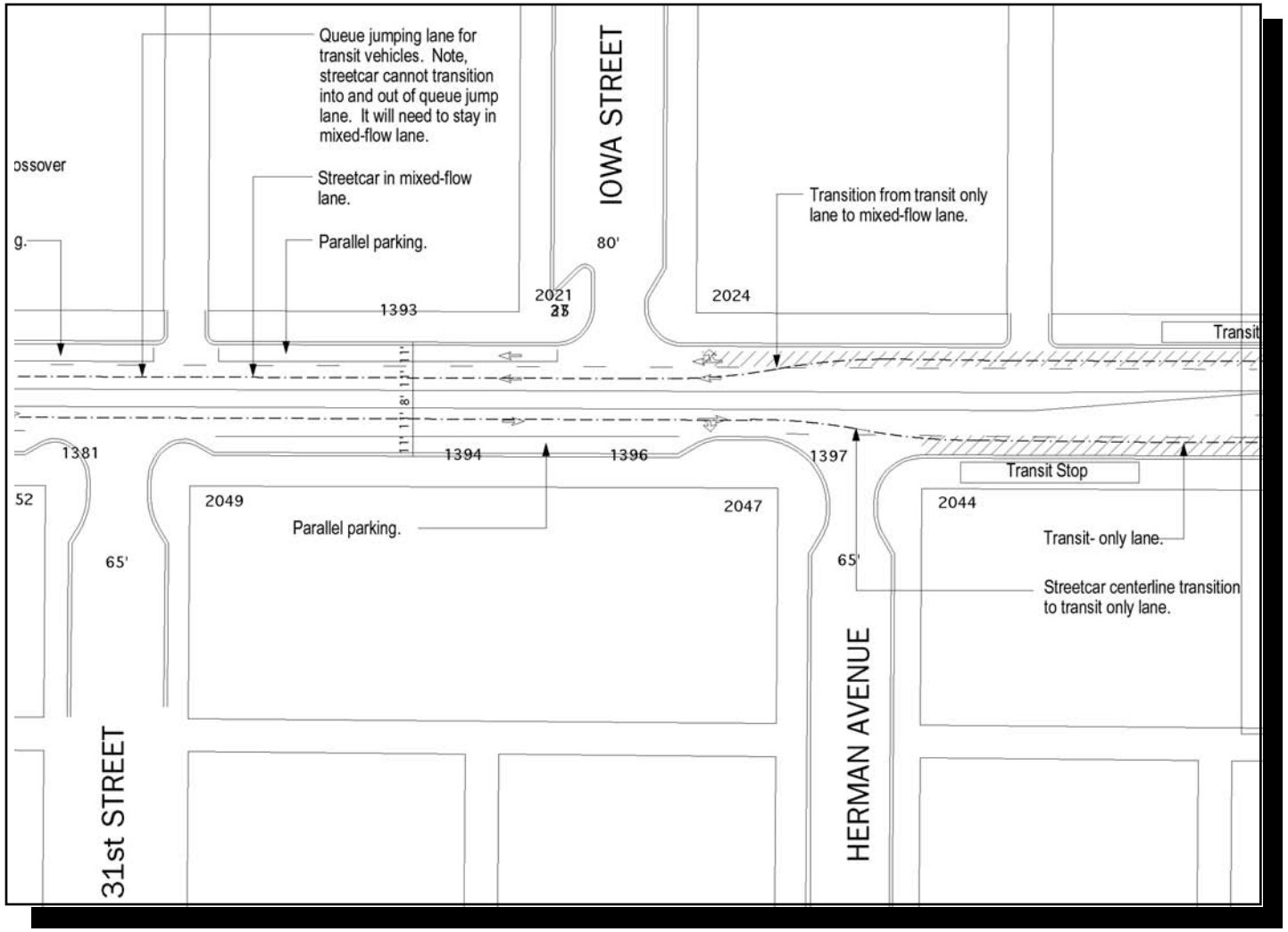

Not to Scale

IOWA STREET / HERMAN AVENUE - TRANSITION TO MIXED-FLOW

(OVERLAID ON THE PREFERRED CONCEPT PLAN)

EXHIBIT 10-11

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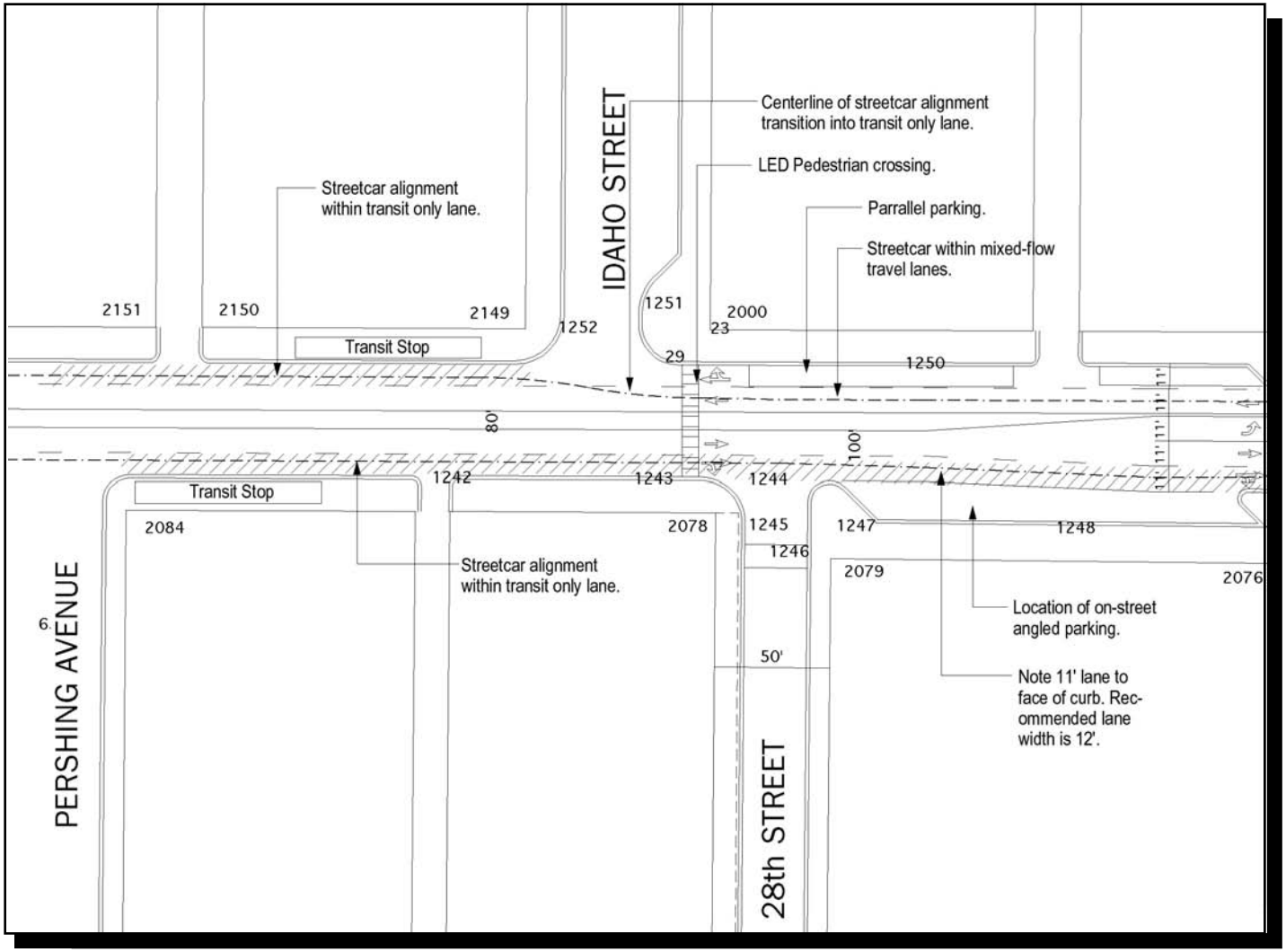

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IDAHO STREET TRANSITION TO TRANSIT-ONLY LANE

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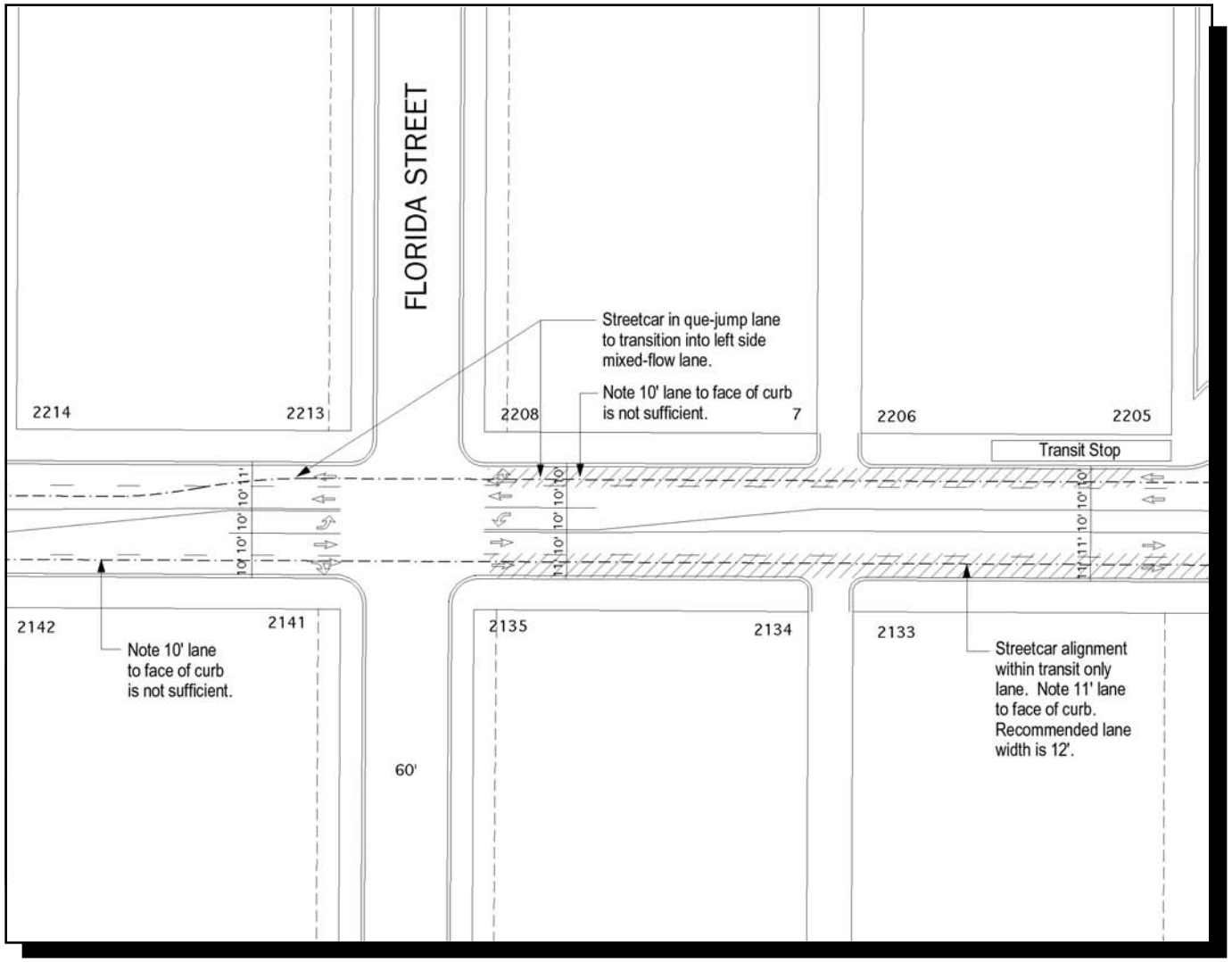

Not to Scale

FLORIDA STREET - TRANSITION TO MIXED-FLOW

55-100140.001 - March 2004 (2004-0331)

EXHIBIT 10-13

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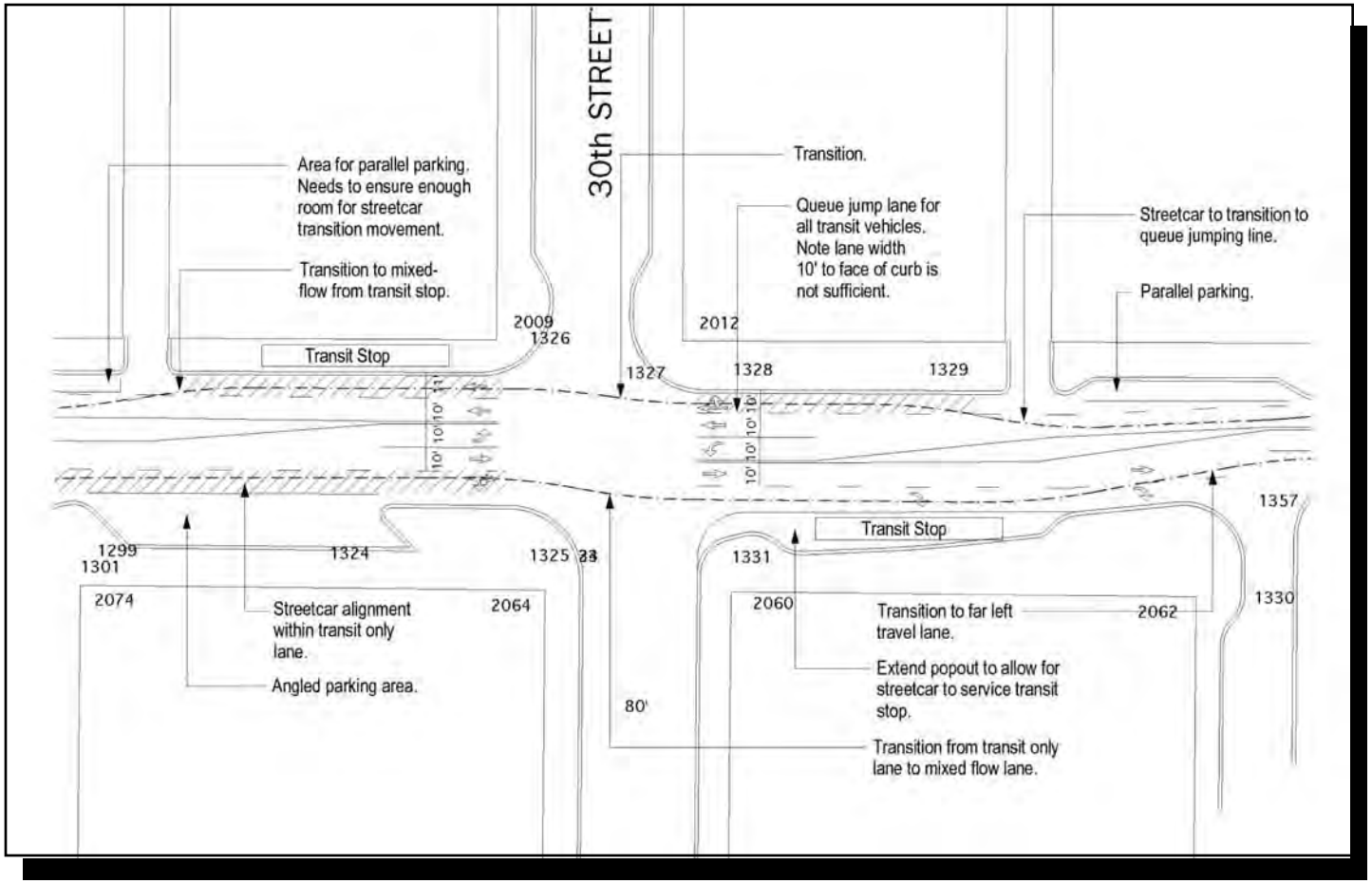

Not to Scale

30TH STREET - TRANSITION TO MIXED-FLOW

(OVERLAID ON THE PREFERRED CONCEPT PLAN)

EXHIBIT 10-14

55-100140.001 - March 2004 (2004-0331)

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The Refined Concept Plan recommends the relocation of parking to the side streets to provide for a continuous transit only lane. This would eliminate the need for the streetcar to merge into the mixed flow travel lanes.

Transition to Park Boulevard

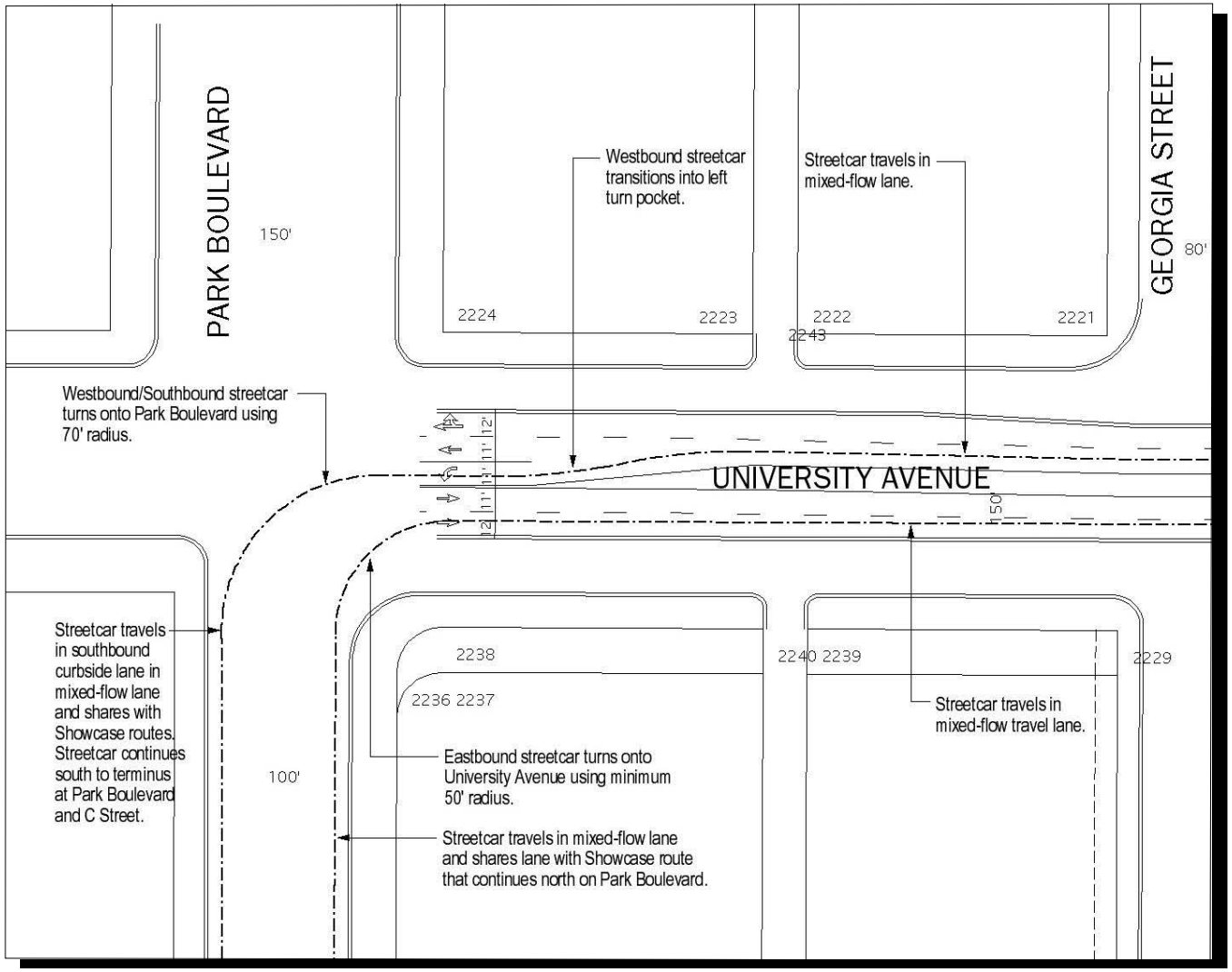
The streetcar would enter and exit the study area at Park Boulevard. Based on the direction the streetcar would be traveling, following is a description of how the streetcar would transition into and out of the corridor at Park Boulevard.

- Westbound Lane: The transition for the streetcar to Park Boulevard actually begins at Florida Street. At Florida Street the streetcar would receive a queue jump, allowing the streetcar to begin the transition to reach the left turn pocket at Park Boulevard. Once the streetcar is in the left turn pocket, it would turn onto curbside running tracks. The streetcar would share the curbside running lane with the proposed Showcase BRT vehicles. Although the Showcase BRT treatment in this area is in mixed- flow (can use either of the two southbound lanes), the streetcar would stay curbside at this location as illustrated in Exhibit 10-15. The radius used for this turn movement is 70-feet to allow for a smooth and easy transition.

- Eastbound Lane: The transition for the streetcar to University Avenue from the northbound lane of Park Boulevard would utilize a 50-foot radius. There should be no impact to the adjacent properties when making this turn movement. The streetcar would share the curbside running lane on the south side of University Avenue with other transit vehicles.

Texas Street Roundabout

The Preferred Concept Plan includes a single lane roundabout at Texas Street. The streetcar would not be able to negotiate the roundabout at Texas Street. The roundabout radius of 50-feet would too tight for the streetcar to maneuver properly. The width of the track would extend beyond the radius of the roundabout and would require two reverse curves with no tangent for transitioning as shown in Exhibit 10-16. This causes the streetcar to travel through the roundabout extremely slowly and would cause excessive track wear at this location. Additionally, the streetcar would be transitioning into the mixed flow lanes just prior to the roundabout. So at this location the streetcar would be required to negotiate multiple movements within a very limited distance.



Not to Scale

UNIVERSITY AVENUE TRANSITION TO/FROM PARK BOULEVARD

(OVERLAID ON THE PREFERRED CONCEPT PLAN)

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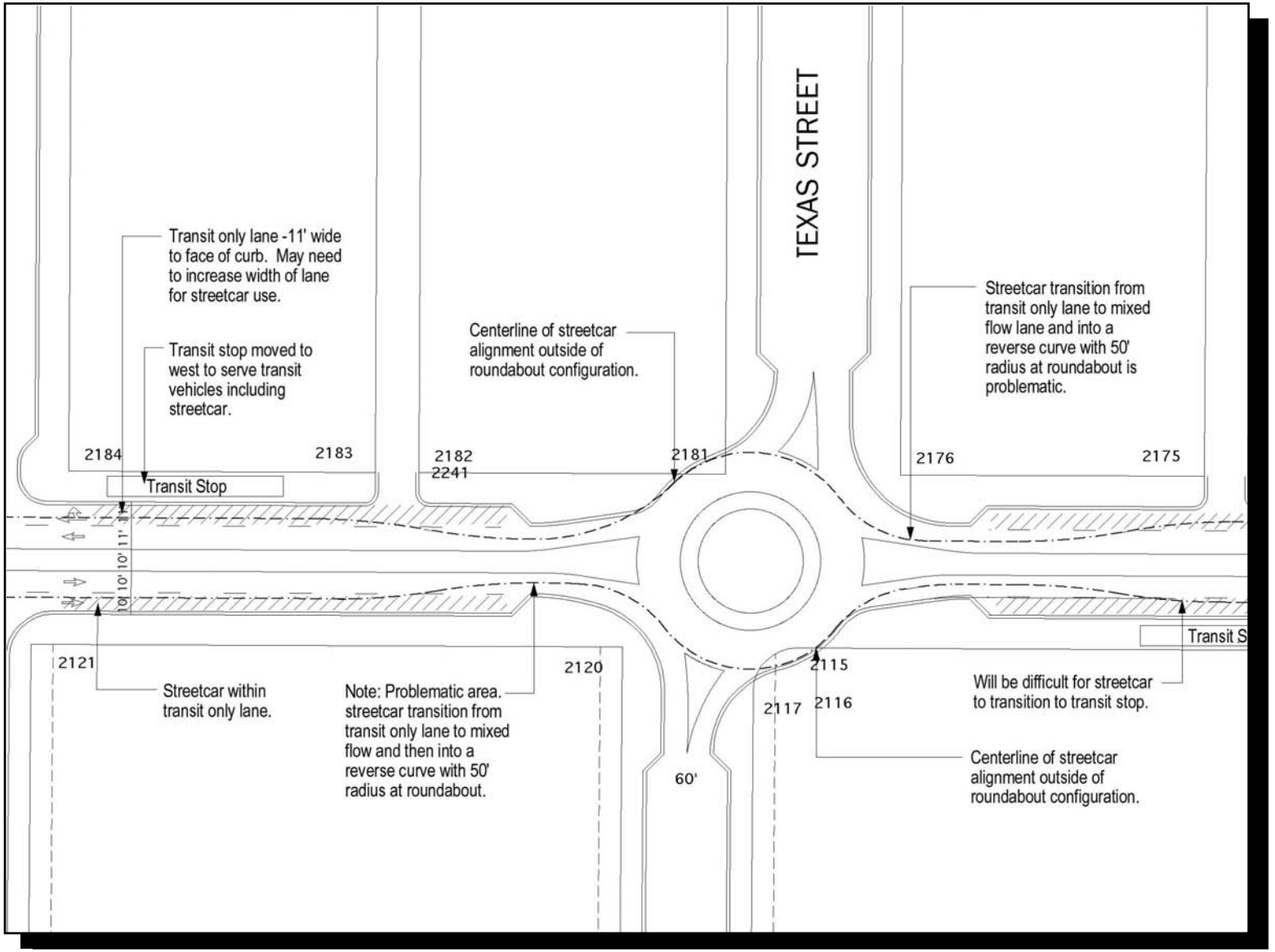

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TEXAS STREET ROUNDABOUT

(OVERLAID ON THE PREFERRED CONCEPT PLAN)

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There has been some discussion that the streetcars simply travel straight through the roundabout thereby avoiding all of the turn movements. However, this is not considered a safe operation. The traffic would be moving freely around the roundabout and the streetcar would be in conflict with the general flow of traffic creating an unsafe condition. A possible solution considered for this area was to increase the size of the roundabout by using a larger radius or even a two-lane roundabout.

Given all of these issues, the roundabout is very problematic for the streetcar. A different design is needed at this location for the streetcar to be able to traverse the corridor effectively and smoothly.

A single lane roundabout was determined to result in significant delays along the corridor to both passenger and transit vehicles. Therefore, the single lane roundabout was removed at Texas Street. The Refined Concept Plan recommends that Texas Street remain a signalized intersection.

Station Accommodations

Any of the proposed stations identified in the Preferred Concept Plan would accommodate the length of the streetcar. The Refined Concept Plan made no modifications to the recommended transit station configurations. Therefore, in the Refined Concept Plan, the typical transit station or stop would be 110-feet in length and the streetcars measure out at 46-feet. This allows for a significant amount of linear space for the streetcar to operate within. However, in some cases the station would have to be moved slightly from the location proposed in the Refined Concept Plan to accommodate the streetcar. This realignment is due to the streetcar transitioning from a mixed-flow lane to a transit only lane. In these locations, the stations would need to be moved over to allow for the streetcar to position itself parallel to the curb to allow for proper boarding.

Each station would have to accommodate those with disabilities, per the Americans with Disabilities Act (ADA). The ADA identifies numerous requirements that transit systems must meet to assure that transit is readily available to those individuals who have a disability. Many of the provisions associated with ADA requirements are related to signage and tactile surfaces, most of which can be provided relatively easily. However, the most difficult provision for a historic streetcar system to meet is easy access into cars for the mobility impaired. The design of historic streetcars requires climbing multiple steps when entering the car, and then frequently climbing another step from the vestibule to the main passenger compartment of the car. These types of cars are not accessible for people in wheelchairs, or individuals who have difficulty climbing stairs.

Choosing an accessibility solution would need to be considered during planning so that all new replica car systems, including those using unmodified or historic cars, meet ADA accessibility requirements. To meet these requirements historic streetcar systems have typically used one of the following three methods, each of which has its advantages and disadvantages. All options require space to accommodate

passengers in wheelchairs. Depending on the number of seats in a streetcar, 3 to 4 fold-up seats are needed to make room for passengers using a wheelchair. These seats can be used by the able bodied when not in use by passengers in a wheelchair.

- **On-car lifts.** Historic streetcars can be retrofitted with up to two wheelchair lifts per car, with one on each side. Some lift configurations can be intrusive, losing between three and four seats to accommodate the lift. But retrofitting a streetcar with a standard bus lift that retracts into the stairway will not eliminate any seating. Advantages of this approach are that no special equipment is needed on the station platforms and the same technicians and tools that maintain a city bus can be used to maintain the streetcar lift. Also, if a lift on one car malfunctions, the following car can pick up the disabled passenger. The disadvantage is that the cycle times for the wheelchair lift is one to fifteen minutes, which can be relatively long. Their use can disrupt operating schedules, particularly on a line with frequent service. This cycle time can be lengthened if the streetcar operator needs to enable the tie down to secure the wheelchair to the lift instead of the passenger in the wheelchair taking this action.

- **Platform elevators.** Another means of providing accessibility is to install elevators on station platforms to lift the passengers to the level of the car floor, and then to bridge the gap to the car by means of a folding plate mounted on either the lift or carried on the car. The advantage of this approach is that it does not require giving up interior space or changing the interior appearance other than equipping some seats to fold out of the way. The disadvantage is that the lifts require platforms large enough to accommodate them.

- **High blocks and ramps** The third accessibility approach is to place ramps leading to short raised platforms (often called “high blocks”) at car stops. The overall size for this configuration is eight feet wide by eight feet deep by two feet high for the “high block” or top landing plus the ADA ramp itself. Passengers waiting to board cars can go up the ramp before the car arrives, at which time a bridge plate can be used to reach the car, as with platform elevators. The advantages of this solution are that the car’s interior would not have to be changed, there is no mechanical system to malfunction, and the time required for a passenger to board or alight is the shortest of the three approaches.

- The primary disadvantage of this approach is that the space required on station platforms is relatively large, and the ramps and high blocks are visually intrusive. However, this approach is currently in use in San Francisco and is being constructed in Tampa.

In the case of either the platform lift or the high blocks and ramps, access is provided to the car's front platform or vestibule. If another step is required to enter the passenger compartment, then a conforming means must be identified to allow the passenger to pass this barrier as well.

Utilities Relocation

Currently the majority of utilities serving North Park have been under grounded within the curb-to-curb section of University Avenue. The dry utilities (electrical, telephone, cable) tend to be on the north side or under the westbound lanes, Of the wet utilities the sewer line runs down the centerline of the street, while the water line is on the south side or under the east bound lanes.

Utilities that are buried directly under the proposed historic streetcar alignment would have to be relocated when constructing the tracks/roadbed for the streetcar. This can be an extremely expensive component when implementing any type of rail service within an existing community. The dry utilities would be not be part of the cost equation as these facilities are required to be moved by the utility companies at no cost to the project. However, moving the wet utilities can carry a significant cost that would have an impact on the City of San Diego's fiscal budget and the ratepayers. This would be an important consideration if the project moves forward towards implementation.

Implementation and Construction Issues

One of the main considerations for the implementation of the streetcar improvements would be the impact to the corridor during construction. How the improvements would impact traffic and local businesses during the course of construction must be clearly outlined to the community. The implementation for such a project could certainly take 18-24 months. Another consideration is the location of staging areas necessary to support the construction effort.

One possible way to minimize the construction impacts to the surrounding business community is to schedule construction activities during the nighttime, although this may have some impact to residents due to noise. This method was used for the sewer and water pipeline construction project on El Cajon Boulevard. Although not all business would be impacted at the same time, constant construction in the corridor would have a definite impact on access to their local businesses. Disruption to businesses due to construction is a common occurrence when providing improvements in a developed business district. The level of disruption and impacts would need to be addressed as part of any mitigation measures. As with any large project, these construction issues should be taken into consideration early in the process and with extensive community involvement.

10.3 FEASIBILITY OF SHARED TRANSIT LANES

Operational Headway

One of the main issues with the shared transit lanes is operational headway. Would the streetcar impede other transit vehicles from meeting scheduled stops and time frames? The operating speeds of buses in the corridor are typically 15 to 25 miles an hour. The operation, or running speed, is based on transit station locations and the buses' acceleration rate prior to the next transit stop, as well as dwell time. This speed of 15 to 25 miles per hour is well within the operating capability for the streetcar. Also, since the transit only lanes are not physically divided, other buses could transition back into mixed flow lanes to by-pass any slower transit vehicles including the streetcar.

Another issue related to operational headway is the proposed Showcase BRT route along Park Boulevard. Although the Park Boulevard section is outside this study area, it should be noted that the proposed streetcar operation in this corridor is an issue requiring further exploration. The Showcase stations would be located further apart than typical local services, providing a higher level of speed for the transit vehicles. It is intended that the streetcar alignment would share the same curbside lanes as the BRT route on Park Boulevard. With the buses higher speed, the streetcar might become a hindrance. The Showcase route would be fully implemented prior to the proposed streetcar, so its operational requirements should be well known. If the streetcar moves forward towards implementation, the Park Boulevard corridor issues would need to be studied.

Mixed Traffic or Shared Travel Lanes with Rail Cars

It is fairly common to find rubber tire vehicles, whether private passenger cars or transit vehicles, sharing a travel lane with rail type cars in other cities, although not a preferred practice as it: adds more vehicles to the transit lane often slowing transit, creates traffic pattern confusion between fixed transit line use and non-fixed rubber tired vehicular use, and the streetcar tracks cause rubber wheeled vehicles to slide when it rains. It has been done for years in numerous other cities such as San Francisco and Portland. However, it should be noted that this configuration is most suitable when automobile traffic is not heavy. This is not the case with University Avenue, which carries and would continue to carry a high volume of automobile traffic.

Currently, SANDAG does not allow private vehicles or buses to share the existing trolley lanes where trolleys run on street rights-of-way. Maintaining this separation between vehicles is based primarily on safety issues. At this time SANDAG does not have an official position on the possibility of shared lanes for a streetcar type service and any proposal for joint use would have to address all safety and traffic engineering concerns identified by SANDAG, MTS, and the City of San Diego.

Based on the Refined Concept Plan, a significant portion of the streetcar alignment is in mixed flow traffic. The streetcar would be required to use mixed-flow travel lanes as it transitions from curbside running at Florida Street to the westbound left turn lane at Park Boulevard. As recommended in this report, the streetcar would be required to share the travel lanes with mixed-flow traffic eastbound from Park Boulevard to Utah Street.

Additionally, there are multiple locations where the streetcar merges from the transit only lanes to the mixed-flow lanes due primarily to on-street parallel parking. The number of transitions would have an effect on the streetcar's operational characteristics. Because there is only one mixed-flow travel lane, heavy queuing is expected for major portions of the corridor during peak periods. These long lines of traffic would have an impact on how smoothly the streetcar can transition from the transit only lane to the mixed flow lane. Minimizing the number of transitions occurring in the corridor would help to ensure that the streetcars (and other transit vehicles) move more freely along University Avenue. SANDAG would have to reconsider their current position on shared lanes if the streetcar is to be implemented.

Another consideration is that the curbside running streetcars would have to contend with illegally parked cars on the tracks or commercial trucks unloading merchandise at curbside. Because the streetcar is restricted to a fixed rail, the streetcar would not be able to avoid these types of impediments potentially causing delays. Enforcement and quick removal of these types of vehicles would be necessary and this would need to be part of the overall service and operational plan.

Since the Refined Concept Plan proposes non-peak period parking in transit lanes the streetcar could not work under this plan. Again, the parked vehicles would impede the progress of the streetcar basically rendering the streetcar fixed rail type service infeasible. Therefore, all parking would be removed from University Avenue with the operation of the streetcar.

Vehicle Breakdown Response

If MTS were the chosen operator, they would be responsible for responding to streetcars that are "down" in the system. Currently MTS operates the San Diego Trolley and has in place response vehicles that tend to the service needs when trolley vehicles experience operational problems. However, because the streetcars are unique vehicles, a separate team may be needed to respond to their service needs. Individuals could be trained to work on both types of vehicles. The main considerations would be a timely response and being able to get to the vehicle operational or provide another vehicle quickly.

10.4 OPERATIONS AND MAINTENANCE

Operations and Maintenance Responsibility

It has been suggested that the general planning of the streetcar system would be the responsibility of SANDAG, and the operation and maintenance of the streetcar system would be the responsibility of MTS. From a system planning and operations standpoint SANDAG and MTS do not have the financial resources to implement a duplicate service along the University Avenue corridor. Route 7 is able to serve the passenger needs with the current services of buses within its budgetary constraints. Diverting monies to provide a different mode type (streetcar) in a corridor that is already served takes away valuable financial resources from the overall transit system. Although community revitalization efforts could be enhanced by the streetcar, SANDAG could have a difficult time justifying the funding or the expense for the historic streetcar implementation when other areas in the region are not currently served or are underserved by transit. SANDAG would have to conduct a "Measures of Effectiveness" analysis and make a determination that the streetcar warrants implementation if it is to move forward in the future. These would include establishing the:

- Route Category
- Passengers per Revenue Hour
- Average for Route Category
- Operating Cost per Passenger
- Average for Route Category

The Route 7 and Route 908 have a performance for all of these measures, which is well above the average performance of like services within the current system. Replacing or duplicate this level of effectiveness with the streetcar may not be feasible.

Additionally, SANDAG/MTS does not currently employ staff with the training to plan, operate and maintain historic or "historic-type" streetcars. SANDAG/MTS would have to invest in hiring or training personnel to plan, maintain and operate these types of vehicles.

However, a key factor for most successful historic streetcar lines has been the collaboration of government, business, and nonprofit organizations in creating and operating the historic line. This wide level of involvement has helped convince funding sources to support and fund the streetcar line not only for implementation but also for continued ongoing maintenance and operations. So, if other funding sources became available and did not impact SANDAG's funds or budget there might be a greater willingness by SANDAG to review the merits of implementing the Historic Streetcar service along University Avenue.

Volunteers typically play an active role in regular operation and maintenance, or handle this function in its entirety. They perform all operation and maintenance functions in many historic streetcar service programs. In other cities, these groups share or supplement the staff of public agencies. A historic streetcar also typically requires a wide variety of skills from a diverse group of supporters to help accomplish the many tasks necessary to maintain the character and historic nature of the vehicles. Although it may not be possible to have an "all volunteer" group run this historic streetcar line due to the level of service expected, the presence of nonprofit groups with willing and skilled volunteers could help accomplish many tasks at greatly reduced cost. Almost every existing historic streetcar line benefits from the collaboration of these different groups.

10.5 CAPITAL COST

At this point in the analysis, a general "estimated order-of-magnitude capital cost" for the streetcar service cannot be provided. The streetcar layout and design is far from being done and numerous items and issues still need exploration before a more specific cost can be prepared. Additional research for the segment of University Avenue within the study area from Park Boulevard to 32nd Street would be needed. The capitals cost estimates given here are those costs that are typically incurred to design and construct similar facilities. This includes the placement of the rails, catenaries poles, and other improvements. Table 10-3 identifies the general estimates for those capital costs that are known.

Implementation of the historic streetcar within the University Avenue corridor from Park Boulevard to 32nd Street is estimated to have a capital cost of approximately **$25 million**, not including the maintenance and storage facility (both land and building cost), the utility relocations, the land acquisition for the substations, or the extension of the streetcar from Park Boulevard to downtown. It should be noted that the transit vehicles represent 45-percent of the known estimated capital costs. All of these vehicles would be needed for the entire length of the alignment (from Park Boulevard to C Street) and not just for the University Avenue corridor.

Table 10-3

Order of Magnitude Capital Cost Estimate (per Mile)

	Item Description	Unit	Unit Cost	Qty	Costs
1	At grade Transit Lane 12'-wide	LF	240	21,000	5,250,000
2	Misc. Roadway /Street Improvement (note 1)	LF	25	21,000	525,000
3	Construction Area Traffic Control Plans	EA	240,000	1	240,000
4	Boarding Platforms - ADA ramps/railings	EA	10	65,000	650,000
5	Sub Station Cost	EA	506,000	2	1,012,000
6	Utility Relocation	NA	NA	NA	NA
7	Drop Suspension Support Poles	EA	9,000	144	1,300,000
8	Crossovers	EA	120,000	2	240,000
	A: Subtotal Items Above				**9,217,000**
	Mobilization (4% of Sub total)				369,000
	Contingency (15% of Sub total)				1,383,000
	Admin/Eng/Const (30% of Sub total)				2,765,000
	B: Subtotal Items Above				**4,517,000**
	Preliminary Total Construction Cost				
	Associated Facilities Costs				
	Vehicle Cost (note 5)	EA	800,000	14	11,200,000
	Maintenance Facility & Equipment	NA	NA	NA	NA
	C: Subtotal Items Above				**11,200,000**
	Total Project Capital Cost for Items A, B and C				**24,934,000**
	Total Project Capital Cost per Mile				13,123,000

Assumptions:

1: At grade expanding existing curb-to-curb misc. roadway/street improvements. Item includes minor demolition of existing improvements and construction of base and asphalt pavement for street improvements.

2: Traffic control system (TCS) is in place

3: Transit operation system (TOS) is in place

4: Site Furnishings at transit stations in place

5: Price based on teleconference with Giomaco Trolley Company for newly constructed replica streetcars.

6. Does not include land or building cost for Storage and Maintenance Facility

7. Covers cost of constructing streetcar alignment from 32nd Street to Park Boulevard only. Does not include cost of constructing streetcar alignment on Park Boulevard from University Avenue to C Street in downtown.

10.6 CONCLUSIONS

In general, it is possible to physically implement and operate an historic streetcar system within University Avenue corridor as designed by the Refined Concept Plan. The feasibility of implementing and operating an historic streetcar system within the corridor is contingent upon addressing the following changes. Lane widths would need to be increased from 11 feet to 12 feet along the curb and all parking along University Avenue would need to be prohibited to accommodate the streetcar. The widening of the lane would result in a reduction in the width of the raised median and left turn lanes from 10 feet to 9 feet, or sidewalks would need to be reduced by one foot on either side of University Avenue to accommodate the minimum 12-foot width. Outside of the design of the Refined Concept Plan, there are several other challenges and issues that would need to be addressed if the planning and design of the facility moves forward.

Experience of other successful operating historic streetcar lines shows that a few critical factors must be in place for plans to be realized. In planning a new streetcar/rail system within University Avenue, considerable time should be devoted to ensuring that these factors, as summarized below, are addressed.

Define the car type: This would go a long way in determining the final design requirements of the alignment, the end-of-the-line turn-around, and of the stations, and determining impacts to intersections and surrounding properties.

Lane width: The lane width for the streetcar is important. For this type of alignment and the three potential vehicle types, a 12-foot lane width is preferred. The existing narrow right-of-way of University Avenue does not consistently accommodate this width throughout the corridor. The additional needed width could require the relocation of existing curb/gutters, sidewalks or the proposed medians. This relocation is dependent upon from where the needed travel lane width is extracted. Also, clearance beyond the typical 12-feet lane would be needed to compensate for vehicle overhang during turn movements. In general, a wider travel lane than what is currently designed in the Refined Concept Plan is needed for the streetcar implementation.

Maintenance facility: Define the location for the maintenance and storage facility. This study has determined that at least 14-vehicles would be needed to operate in the proposed alignment along University Avenue from 32nd Street to Park Boulevard and Park Boulevard from University to C Street if the streetcars are used during peak periods. The number of streetcars could be more or less depending on the final operational characteristics for the system. The maintenance facility should be within close proximity to the alignment to minimize the laying of additional track.

Transition to mixed-flow lanes: The Preferred Concept Plan had several locations where the streetcar would merge from the transit only lanes to the mixed-flow lanes. The number of transitions could have an effect on the streetcar's operational characteristics. Because there is only one mixed-flow lane, heavy queuing is expected for major portions of the corridor during peak periods. These long lines of traffic would have an impact on how smoothly the streetcar can transition from the transit only lane to the mixed flow lane. Minimizing the number of transitions occurring in the corridor would help to ensure that the streetcar (and other transit vehicles) move more freely along University Avenue. In the short-term, the Refined Concept Plan allows off-peak parallel parking in the transit only lane. All on-street parallel parking in the Transit Only Lane would need to be prohibited along University Avenue if the streetcar is operational.

Shared Travel Lane: It is fairly common to find rubber tire vehicles sharing the lane with rail type cars. A significant portion of the streetcar alignment is in mixed flow traffic. It is feasible to assume that the streetcar can operate in the mixed-flow travel lane and also share the transit only lanes with buses. At this time SANDAG does not have an official position on the possibility of shared lanes for a streetcar type service and any proposal for joint use would have to address all safety and traffic engineering concerns identified by SANDAG, MTS and the City of San Diego.

Operational Considerations: As the historic streetcar implementation continues to be explored, the issue of operational hours would need to be clearly defined with SANDAG/MTS with the understanding of the day-to-day operational needs of Route 7 and its passengers. If and how the streetcar could provide the level of service expected by the North Park Community, while still handling the necessary volume of passengers, requires further dialog with SANDAG /MTS. From an operations stand point SANDAG may not be able to prioritize or justify a duplicate service that utilizes both the streetcar and bus service along the University Avenue corridor over the service needs of other areas that are currently underserved.

Texas Street Roundabout: The roundabout as designed in the original Preferred Concept Plan is problematic for the historic streetcar. The roundabout would not allow for the streetcar to operate correctly due to the tight radii used for the roundabout design. However, the roundabout is no longer proposed in the Refined Concept Plan due to other operational considerations.

Operational Entity: Partnering with SANDAG and MTS as the planning and operational entities for the streetcar needs to be initiated. A partnership with SANDAG is necessary to work towards an implementation strategy that enables the streetcar to be a success. This includes defining the funding sources necessary for the initial implementation and operation of the streetcar service on University Avenue and ultimately on Park Boulevard.

Sources of Capital and Operating Funding: Creativity and persistence in finding funding for a historic streetcar project is crucial. At this time there is no dedicated source of funding to implement such a project. Historic streetcars do not generate sufficient direct revenues to cover their capital and operating costs. As there is great competition for governmental sources of funding. Successful projects have typically obtained funds from a variety of public and private sources, and have often been very innovative in finding or developing new sources of funding.

Partnerships between Government, Business, Community, and Non-Profit Groups: A key factor for most successful historic streetcar lines has been the collaboration of government, business, and nonprofit organizations in creating and operating the line. The wide level of support such collaboration demonstrates has helped convince funding sources to support the lines. In addition, the wide variety of skills from diverse groups of supporters has helped accomplish the many tasks necessary to maintain and operate this type of service. The presence of nonprofit groups with willing and skilled volunteers has helped accomplish many tasks at greatly reduced cost. Virtually all-historic streetcar lines have benefited from collaboration of different groups to make them successful.

Champion in Local Government: Perhaps the single most important factor contributing to successful implementation of previous historic streetcar lines is for a person well placed and well connected in the local government to function as a champion for the project. This person can fill the critical role of winning support from government, business, and community organizations. He or she can also continue to provide momentum to a project when the inevitable roadblocks, setbacks, or other obstacles arise. Without someone filling this role, it is unlikely the resources necessary to implement a project can be obtained, or that the labyrinth of governmental issues can be negotiated.

Perseverance: Experience shows that moving a historic streetcar idea from conception to operation can take as long as 10 (or even as long as 15) years, given the need to build support, win approvals, secure funding, and complete construction. Therefore, when launching an historic streetcar project, it is critical to have a realistic, long-term view and to have project supporters who would stay with the project for the duration.

Chapter Eleven – SANDAG Transit Study

11.0 INTRODUCTION

This report evaluates the potential for developing a transit operating plan for the University Avenue corridor that would enhance service to residents and employees of North Park and take advantage of the transit infrastructure (transit lanes, potential signal priority, and stop consolidation) proposed by the University Avenue Mobility Plan. This report evaluates transit demand and recommends route restructuring to better meet the demand, as well as physical improvements to speed transit travel along the route.

11.1 EXISTING SERVICE

University Avenue currently is served by two of Metropolitan Transit System's most productive transit services, Route 7 and Route 908. Route 7 runs along University Avenue from the City of La Mesa to downtown San Diego. Route 908 runs on University Avenue from Fairmount Avenue westward, and then terminates at the Old Town Transit Center. In addition, Route 70 serves University Avenue from La Mesa to Interstate 15 (east of the study area), connecting to downtown San Diego via I-15 and State Route 94 during peak periods. Each day, buses provide 325 trips along University Avenue (counting both directions), providing service for 16,000 passenger trips (with roughly 50 passenger trips per bus trip). Despite high ridership, changes in travel demand along the corridor, including changes in major destinations and trip lengths, warrant a fresh look at the transit service needed to better meet the needs of local residents, employees, and visitors. These changes in demand may partially explain a general decline in ridership on Routes 7 and 908, despite a general increase in density along that corridor over the last five years (Table 11-1).

Table 11-1
Routes 7 and 908 Performance Trends

	Passengers/Revenue Mile				
Route	**FY03**	**FY02**	**FY01**	**FY00**	**FY99**
7	5.72	6.10	6.63	6.97	7.14
908	4.34	4.11	4.44	4.77	4.77
Passengers/Revenue Hour					
Route	**FY03**	**FY02**	**FY01**	**FY00**	**FY99**
7	50.90	52.30	55.70	58.74	60.50
908	37.40	32.20	37.60	40.50	40.60

Notes: Revenue Miles are miles traveled when the vehicle is in revenue service (i.e., the vehicle is available for travel by the general public). Running time and layover/recovery time are included in this measure.
Revenue Hours are hours traveled when the vehicle is in revenue service (i.e., the vehicle is available for travel by the general public). Running time and layover/recovery time are included in this measure.
Source: Historical Short Range Transit Plans for the Metropolitan Transit Development Board (MTDB).

11.2 NEEDS OF CURRENT RIDERS

A 2003 household survey of San Diego residents found that 51 percent of respondents had used transit some time within the past 12 months. However, only nine percent of said users rode transit regularly (at least once per week). In fact, the survey found that nearly 60 percent of past riders stopped using transit as soon as they had access to a car for their trip. The primary reasons for this mode shift are lower speeds and less reliability of the transit trip compared to the car, lack of accessibility to desired destinations, and a sense of lack of safety, comfort, and cleanliness.

A 2001 onboard survey of passengers on Routes 7 and 908 generated comments similar to those noted above. Respondents stated that the greatest needs are for improved travel speed, reliability, and quality of service.

11.3 RIDERSHIP PATTERNS

Two sources of information were used to estimate future demand for transit services - travel forecasting, which estimates travel demand between activity centers based upon projected housing and employment densities, and the onboard surveys described above, which include information about passengers' starting and destination points.

Analysis of residential and employment density along the corridor shows which areas have the most promise for capturing transit ridership. In the Route 7 neighborhoods, the highest population density is within a quarter-mile of University Avenue, between Park Boulevard and 54th Street, and in Hillcrest. In the forecast for 2030, the greatest population increases are expected to occur within the already-dense communities between Park Boulevard and 54th Street (especially in North Park and City Heights), and in the Hillcrest and Uptown areas. The only area with significant employment density along the corridor is Hillcrest, and job density in this area is not expected to increase substantially by 2030.

SANDAG's 2000 base year transportation model was used to estimate travel within, into, and out of the University Avenue corridor. The model analyzed daily trip making between "University West," including Uptown, North Park, Normal Heights, and Kensington-Talmadge; and "University East," including the eastern area, College, La Mesa, and other regional destinations. The University Avenue corridor was split into two subareas because they exhibit different travel patterns and, potentially, a different market for transit services. The model reflects both total travel demand and work travel demand.

Total travel demand into and out of University West is significant, with nearly 1.5 million trips being made each day. About half these trips are regional (beginning or ending outside the area) and half are local. Travel out of University West to other areas in the region is greater than trips into the area (870,000 compared to 600,000 trips, respectively).

Major destinations (over 15,000 trips per day) for travelers from University West are Fashion Valley, Centre City, Southeast San Diego, Midway/Airport, College Area, Mid-City East, Kearny Mesa, Linda Vista, West Navajo, Sorrento/University area, and La Mesa. Travel into University West (over 10,000 trips per day) comes from Southeastern San Diego, Fashion/Mission Valley, College Area, Mid-City East, Centre City, Midway Airport, and Skyline-Paradise Hills.

Total travel demand into and out of University East is significant, with nearly 1.25 million trips being made each day. About half the trips are local and half are regional. The regional travel pattern shows strong activity centers, with 680,000 trips coming into University East, compared to 580,000 going out. Major regional destinations (over 10,000 trips per day) for travelers from University East include East Navajo, Mid-City, Lemon Grove, Santee, Spring Valley, El Cajon, Fashion/Mission Valley, Southeastern San Diego, and Centre City. Major regional origins (over 15,000 trips per day) going to University East include East Navajo, Mid-City, Spring Valley, Lemon Grove, Skyline-Paradise Hills, El Cajon, and Southeastern San Diego.

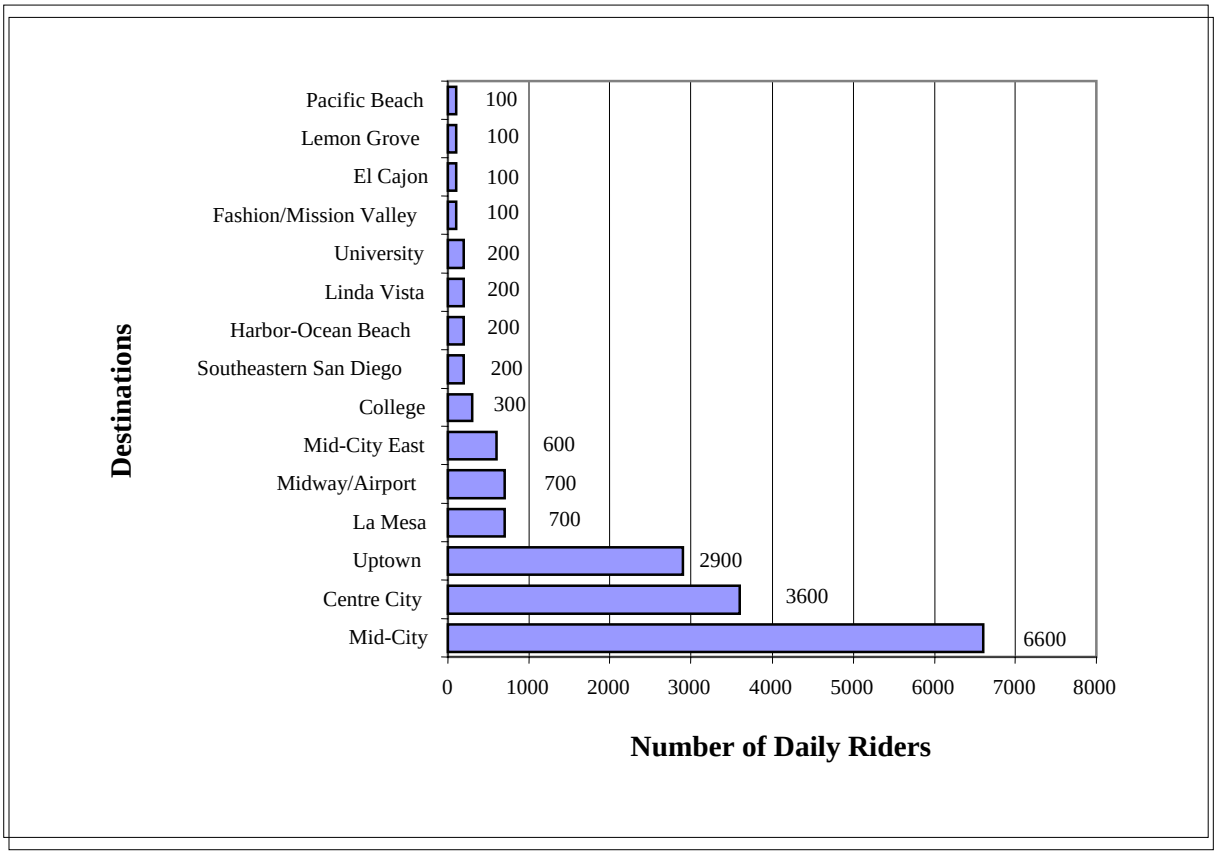
Work travel demand includes the Uptown area and La Mesa as the major attractors of work trips within the Route 7 corridor. Commuter travel out of University West and University East is much more prominent than commuter travel into the area.

Work travel from University West shows the University Towne Centre area as the highest attractor of trips, even though it is a significant distance away. Other major regional employment destinations (over 5,000 trips per day) from University West include Centre City, Fashion/Mission Valley, Kearny Mesa, Midway/Airport, and National City west. Work travel into University West is primarily from Southeastern San Diego and Skyline-Paradise Hills, each with over 2,000 trips per day.

Work travel from University East gravitates more to east county job centers such as La Mesa, Santee, and El Cajon. Other major regional employment destinations (over 3,000 trips per day) coming from University East include Centre City, University, and Kearny Mesa. Work travel into University East originates primarily in East Navajo, Mid-City, Spring Valley, and Skyline-Paradise Hills, each with over 3,000 trips per day.

SANDAG's 2001 onboard transit survey found that 60 percent of trip-ends on Route 7 and Route 908 lie within the University Avenue corridor itself, with the remainder of the trips being regional trips that are longer in nature and depend upon connections (transfers) to other regional services. The most significant destinations for transit riders of Routes 7 and 908 are shown in Figure 11-1.

Figure 11-1
University Avenue Study Routes



11.4 NEED FOR RAPID BUS SERVICE

The travel patterns of people coming from or going to University Avenue include a significant amount of regional travel. In addition, SANDAG's transportation forecasts show that work travel is getting lengthier throughout the region, primarily due to housing being located further away from employment. Surveys of existing riders show a great interest in faster travel linking the Mid-City area with work and other regional destinations. Providing a Rapid Bus service alternative to existing local service would greatly enhance transit service for existing riders, and hopefully attract new riders. Rapid Bus service is an express service that stops at fewer stations and provides a faster trip. It complements local routes which serve more stations, increasing accessibility at the cost of lower speeds.

The highest levels of transit activity are in the communities of City Heights (between Marlborough and 54th Street), North Park (between Park and I-805), and Hillcrest (west of Park). Ridership on Route 7 shows a dramatic drop east of College Avenue into La Mesa. Land use densities along the corridor show the areas with the greatest potential for attracting new riders. The first priority for Rapid Bus service

should be to improve the travel speed along the University Avenue corridor for service into downtown San Diego and La Mesa. Additional improvements are warranted to facilitate regional travel by enhancing service to key transfer locations to facilitate efficient network connections. These major regional destinations include the job centers of UTC/Sorrento Valley and Kearny Mesa. This report details a service strategy for Rapid Bus service along the University Avenue corridor with connections to La Mesa and downtown.

11.5 RAPID SERVICE CONCEPT

In reviewing Route 7 ridership by segment, it can be seen that only four percent of the ridership travels east of 69th Street, and only 21 percent of the ridership travels east of Fairmount Avenue. These numbers support the concept of higher service frequencies in the western portions of the corridor, especially North Park. Downtown-destined passengers (i.e., south of University Avenue) amount to 35-40 percent of total ridership. The high demand for the current route configuration and expected future growth in the corridor warrant continuation of the current basic route structure, with its focus principally on connecting North Park with Centre City via Park Boulevard (Route 7) and Old Town via Uptown (Route 908).

Opportunities to significantly improve the operating speed of the service (through delay reduction strategies) and to enhance the pedestrian experience should be aggressively pursued, as detailed by the University Avenue Mobility Plan. These actions would: (a) improve the neighborhood transit orientation, (b) increase transit service attractiveness to customers (faster and more predictable), and (c) reduce transit costs or allow more service to be operated for the same cost. This strategy will also further leverage the planned Bus Rapid Transit (BRT) lane investment along Park Boulevard (the "Showcase Project"). A phased approach would allow for future capital improvements (upgraded shelters and stations) to be made to achieve a service with all the components of BRT. BRT service along University Avenue is included in the Revenue Unconstrained scenario of the Regional Transportation Plan.
Two alternative operating strategies that include Rapid Bus service for the University Avenue corridor are as follows:

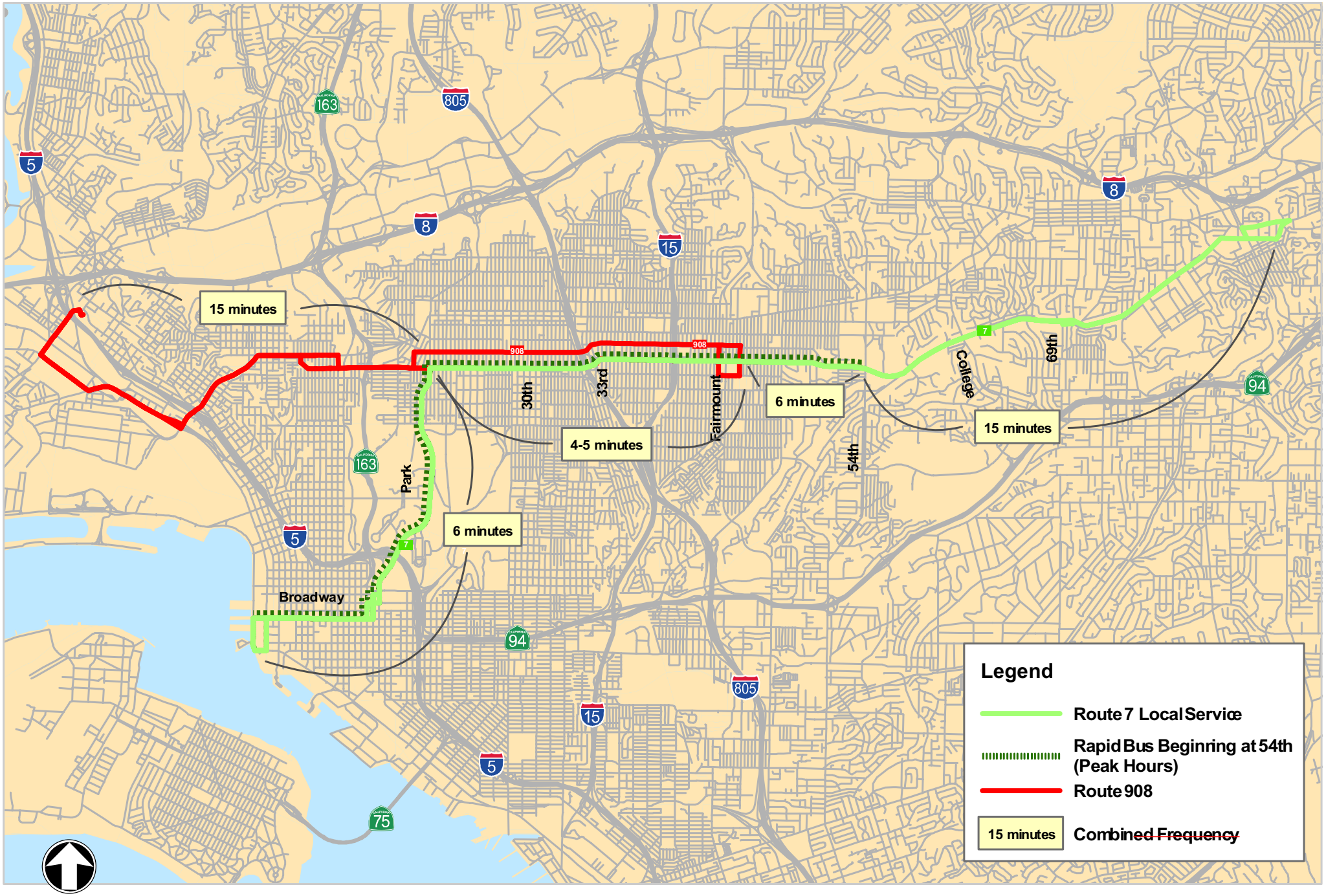
Option 1 (Figure 11-2)

- Route 7 operates as a local service from La Mesa to downtown (30-minute frequency) with additional frequency in the segment from 69th Street to downtown (additional 30-minute frequency, for a combined 15-minute frequency on this segment);
- A Rapid Bus service runs from 54th Street to downtown (10-minute frequency) during peak periods;
- Route 908 remains unchanged (15-minute frequency) from Fairmount to Old Town; and
- Express Route 70 is deleted in favor of the new Rapid Bus service.

Option 2 (Figure 11-3)

- A modified Route 7 operates as a local service from La Mesa to 54th Street (15-minute frequency), and continues as a Rapid Bus service from 54th Street to downtown;
- Additional Rapid Bus service operates between 54th Street and downtown during peak periods (additional 7 1/2-minute frequency, for a combined 5-minute frequency on this segment);
- Route 908 service operates locally within the corridor (15-minute frequency) and is extended east to terminate at 54th Street rather than Fairmount Avenue; and
- Express Route 70 is deleted in favor of the modified Route 7.

Both options include the consolidation of stops throughout the corridor, traffic signal improvements, and the introduction of a Rapid Bus service that focuses on the high ridership and important transfer stops between 54th Street and downtown. The Rapid Bus service will improve operating speeds and reduce delay for those passengers using the major stops and traveling to downtown. Experience elsewhere has found that offering limited stops will concentrate ridership and provide further efficiency benefits for passengers and transit operations. Transit-only lanes are proposed for the segment of University Avenue from Utah to Boundary Street eastbound and from Florida Street to Boundary Street westbound. The eastbound transit-only lane could be extended westward to Park Boulevard in the future, pending analysis of operating conditions in the corridor. A transit-only lane also is proposed along Park Boulevard through Balboa Park as part of the Transit First Showcase Project.

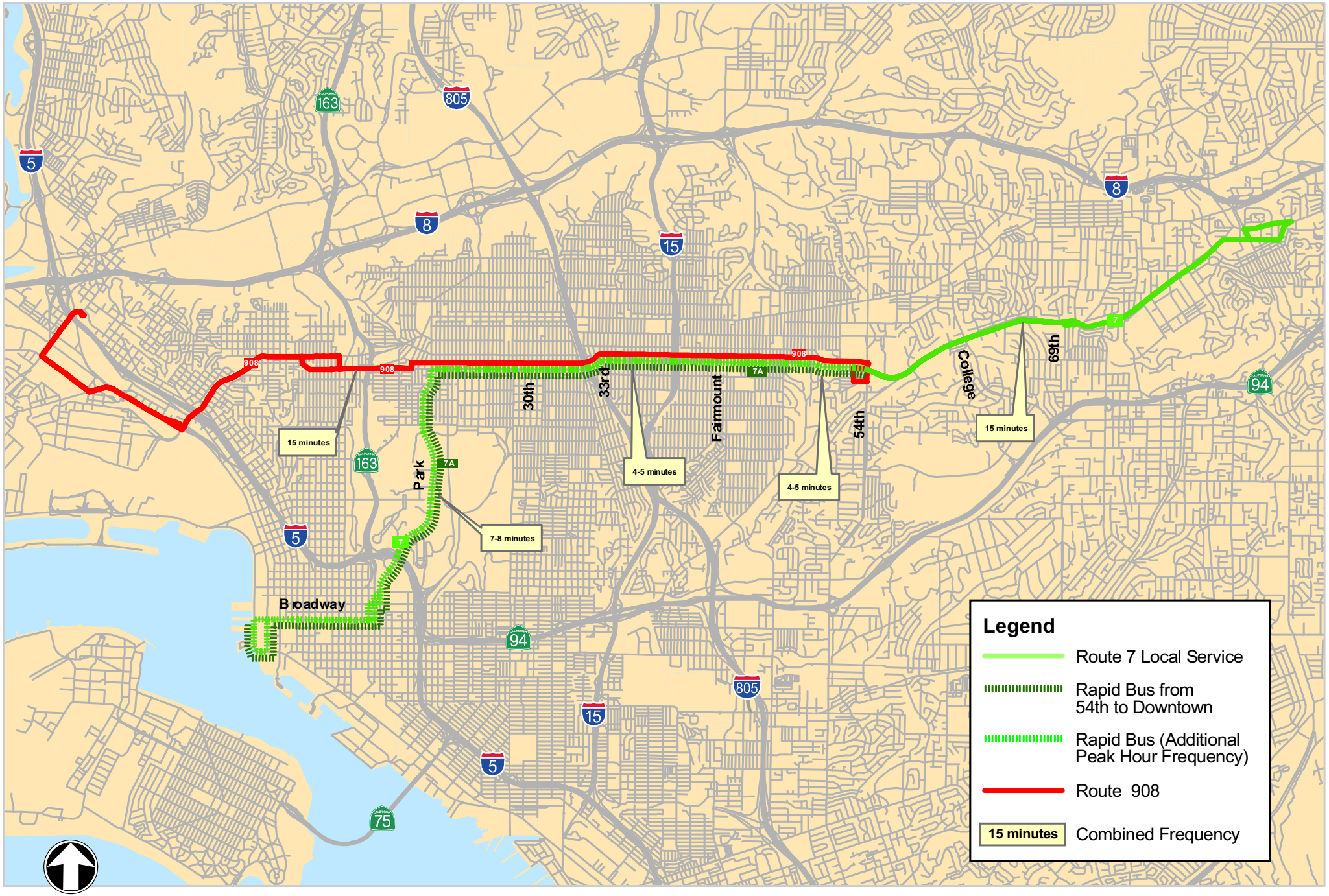


Not to Scale

RBF ITMD

OPTION 1 ROUTES IN UNIVERSITY AVENUE STUDY AREA

EXHIBIT 11-2



Not to Scale

RBF ITMD

PROPOSED OPTION 2 ROUTES IN UNIVERSITY AVENUE STUDY AREA

55-100140.001 - Novemeber 2004

EXHIBIT 11-3

Based upon a review of the effects on travel time of service improvement strategies observed in other Rapid Bus systems, these strategies are expected to have the following improvement to running times:

Table 11-2
Percent Improvement to Transit Running Times

Service Improvement Strategy	Estimated Impact	
	Peak	Off Peak
Stop Consolidation	8%	5%
Limited Stops	7%	5%
Signal Priority	10%	10%
Transit-Only Lanes	5-10%	5%
TOTAL	30-35%	25%

The service frequency would vary depending on the option selected. However, for both options, the improved running time frees up resources (including vehicles and drivers) that can be used for additional service frequency in the corridor or for other regional routes serving Mid-City. Table 11-3 shows potential headways between vehicles for the two options, assuming that the newly-freed resources would be applied to other regional routes serving Mid-City, rather than additional frequency on the University Avenue corridor.

Table 11-4 quantifies the number of vehicles/drivers needed to implement the two options, compared to the current route structure. Again, the vehicles/drivers freed up by the improved route efficiencies could be applied to additional service in the University Avenue corridor or to other services benefiting Mid-City.

Table 11-3
Service Frequency

University Corridor – Service Frequency						
Route	**A.M. (min.)**	**Midday (min.)**	**P.M. (min.)**	**Evening (min.)**	**Saturday (min.)**	**Sunday (min.)**
Existing						
La Mesa	24	24	20	20/3	24	24
Downtown	5	12	6-7	15	12	12
Corridor	4-5	6-7	4-5	7-8	8-9	8-9
Option 1						
La Mesa	15	24	15	15/30	15	15
Downtown	10	12	6	15	15	15
Corridor	4-5	6	4-5	10	10	10
Option 2						
La Mesa	15	20	15	15/30	24	24
Downtown	7-8	10	7-8	15	12	12
Corridor	4-5	6	5	10	8-9	8-9

Notes: The service headways shown represent the following:

La Mesa – service provided between downtown and La Mesa,

Downtown – combined service for all University corridor branches operating to/from downtown (i.e., Routes 7, 7A, 7B, 70, Options 1 and 2), and Corridor – maximum service provided by all services operated on any segment in the North Park portion of the University corridor, including Routes 7 and 908.

Table 11-4
Number of Vehicles Required

University Corridor – Vehicles Required						
Option	**A.M.**	**Midday**	**P.M.**	**Evening**	**Saturday**	**Sunday**
Existing	27	21	30	13/10	16	16
Option 1	25	19	27	9/6	14	14
Option 2	22	11	23	9/6	13	13

Table 11-5 estimates the average speeds that would be achieved by implementing the strategies employed by this report (stop consolidation, signal priority, transit-only lanes).

Table 11-5
Average Transit Vehicle Speeds

UNIVERSITY CORRIDOR – ESTIMATED AVERAGE SPEEDS							
Option	**Direction**	**AM (mph)**	**Midday (mph)**	**PM (mph)**	**Evening (mph)**	**Saturday (mph)**	**Sunday (mph)**
Existing	Inbound	10.6	9.0	9.0	13.4	9.7	9.7
	Outbound	11.8	9.6	9.6	13.5	10.7	10.7
With Strategies	Inbound	15.0	12.8	12.6	17.7	12.8	12.8
	Outbound	13.5	11.4	11.2	16.7	11.4	11.4

11.6 STOP CONSOLIDATION

Bus stops along the University Avenue corridor should be consolidated to better balance stop access with delay to create a faster transit trip. With the current Route 7 configuration, there are 79 stops outbound and 75 stops inbound. The number of stops should be reduced to 43 in each direction. These Route 7 stops also would be used by Route 908 on the overlapping portions of its route. Bus stop consolidations for Route 908 west of Park Boulevard also should occur, but are not analyzed here.

Within the North Park study area, bus stops would occur at the following locations:

- Alabama Street,
- Texas/Arizona Street,
- Oregon/Pershing,
- 30th Street, and
- Iowa/32nd Street.

Additional stops would occur just outside the study area, just east of I-805 and on Park Boulevard south of University Avenue.

Despite the 44 percent reduction in the number of bus stops, the majority of current riders will be within a short walking distance of the consolidated stops. Virtually all stops that are proposed for elimination are well within 1/4 mile walking distance of the remaining stops. It is expected that the additional time that some passengers incur by walking a greater distance to board the bus will be more than offset by the reduced travel time once on the bus (which will benefit all riders). With the consolidation, 235 of the current 26,921 boarding and alighting passengers would be subject to a walk exceeding 1/4 mile. This is equivalent to less than one percent of the boarding and alighting passengers.

Both service options include a Rapid Bus service connecting North Park to downtown. Within the study area, the Rapid Bus service would serve stations at 30th Street and Texas/Arizona.

11.7 CONCLUSIONS

The implementation of a variety of transit priority strategies in the University Avenue corridor will result in better transit service to North Park and other transit passengers, and a more efficient use of resources that will further improve the system. By implementing the strategies of stop consolidation, transit-only lanes, and Rapid Bus operation, as well as possible traffic signal priority, service to transit passengers can be improved significantly using the same level of investment as the current route structure. Additional operating funds that may be identified in the future would allow for further expansion of frequency or better service to other major regional destinations.

Each of the improvement strategies would improve running times throughout the corridor. The ability of the individual strategies to result in a savings in resources relates directly to service frequencies. The greater the savings in time and resources, the greater the attractiveness to current and potential customers. It will be more difficult to realize a savings if only one or two of the strategies are implemented. However, any savings could result in service improvements.

The difference between the two options relates to the degree of use of local versus Rapid Bus service. Option 1 provides a comparable level of local service along the length of the route to the existing level. The limited service from 54th Street to downtown provides a Rapid Bus service during peak periods only. To provide good local service, it is proposed that the timing of service from La Mesa be coordinated with the Route 908 service to provide a combined 7-8 minute service along University west of 54th Street. A ten minute Rapid Bus service would be overlaid at 54th Street to downtown.

For Option 2, more Rapid Bus service is provided, but local service is reduced. Local passengers would have a 15 minute service frequency while passengers using the major stops would have a 4-5 minute (peak) and 10 minute (mid-day) service frequency in the University Avenue corridor and enjoy significantly faster travel.

The option selected for implementation should be subject to a greater level of analysis to determine overall passenger impact. With the expected growth in the University Avenue corridor, it is imperative that an attractive service be provided for all users. The addition of connections to other major destinations in the area should be the subject of a comprehensive analysis to determine how best to use the resources provided by these service improvements.

Appendix A
Meeting Notification Flyers for UAMP

REDISCOVERING GREATER NORTH PARK

University Avenue Mobility Plan

Community Meeting Schedule

Community Workshop
Saturday, January 31st
9:00 am – Noon
Claire de Lune Café – 2906 University Avenue

◆

North Park Planning Group Workshop
Tuesday, February 17th
6:30 – 7:30pm.
North Park Christian Fellowship Church, 2901 North Park Way

◆

Community Workshop
Saturday, March 20th
9:00 am – Noon
Claire de Lune Café – 2906 University Avenue

◆

North Park Project Area Committee (PAC)
Tuesday, April 13th
7:00 pm
North Park Community Service Center, 3956 30th Street

◆

Joint Project Area Committee & Planning Group Workshop
Thursday, May 6th
7:00 – 9:00pm.
North Park Christian Fellowship Church, 2901 North Park Way

◆

Community Workshop
Saturday, June 12th
9:00 am – Noon
Claire de Lune Café – 2906 University Avenue

Please check the University Avenue Mobility Plan project website at ***http://www.rbfconsulting.com/us/northpark*** *for updated information regarding dates, times, locations and other news about the workshops.*

REDISCOVERING GREATER NORTH PARK

University Avenue Mobility Plan

Community Workshop

Saturday, January 31st
9 am - Noon
Location: Claire de Lune Café
2906 University Ave.

In 2002, the City of San Diego and community stakeholders, developed a series of innovative traffic calming concepts for University Avenue to help enhance and rediscover the corridor as a pedestrian and transit friendly environment. Now, the City invites you to participate in the second phase of this project. We will be taking a closer look at how, these traffic calming and transit-oriented concepts can work together along the University Avenue Corridor to meet the community goals. The project will include numerous opportunities for community review and input, as well as develop a variety of technical analyses to identify opportunities for improved automobile, pedestrian, bicycle, and mass transit mobility. The project will ultimately result in a preferred concept plan that will enhance University Avenue as a place where people want to live, work, shop and play.

You are invited to an interactive kick-off workshop!

At the workshop, you will:

- ***Learn more about the University Avenue Mobility Plan and meet the project team***
- ***Understand the traffic calming concepts that will be analyzed in this project***
- ***Identify what you feel is and is not currently working in the Corridor***
- ***Brainstorm your visions for the future of the Corridor***

PLEASE JOIN US!
YOUR PARTICIPATION MAKES A DIFFERENCE!

REDISCOVERING GREATER NORTH PARK

University Avenue Mobility Plan

BE PART OF THE FUTURE

Please join us for an interactive workshop to:

Review the preliminary traffic, transit, and pedestrian analysis

Talk about priorities and next steps in the process

Saturday, March 20th
9am - Noon
Claire de Lune Cafe
2906 University Avenue

REDISCOVERING GREATER NORTH PARK

University Avenue Mobility Plan

BE PART OF THE FUTURE

"modifications now under consideration include the removal of parking from University Avenue between Florida and Boundary."

WORKSHOP

Thursday, May 6th, 2004
7:00 p.m. to 9:00 p.m.
North Park Christian Fellowship Church
2901 North Park Way

The University Avenue Mobility Plan is the second phase of plans to make University Avenue in North Park a more pedestrian and transit friendly environment. The first phase, completed in 2002, resulted in an innovative traffic calming concept that have been undergoing more technical and detailed analyses during this second phase. Due to a variety of constraints that have been identified with the 2002 concept plan, several revised alternatives are being investigated. The various modifications now under consideration include the removal of on-street parking from University Ave between Florida and Boundary.

A joint workshop of the North Park Redevelopment Project Area Committee (PAC) and Greater North Park Planning Committee (GNPC) is scheduled for May 6th to hear a presentation on the revised alternatives to the original concept plan and to discuss them in more detail. It is important for business and property owners to attend this workshop to both learn more about the proposal for University Avenue and to provide your input.

For more information about the University Avenue Mobility Plan, please visit the project website at: www.rbfconsulting.com/us/northpark.

REDISCOVERING GREATER NORTH PARK

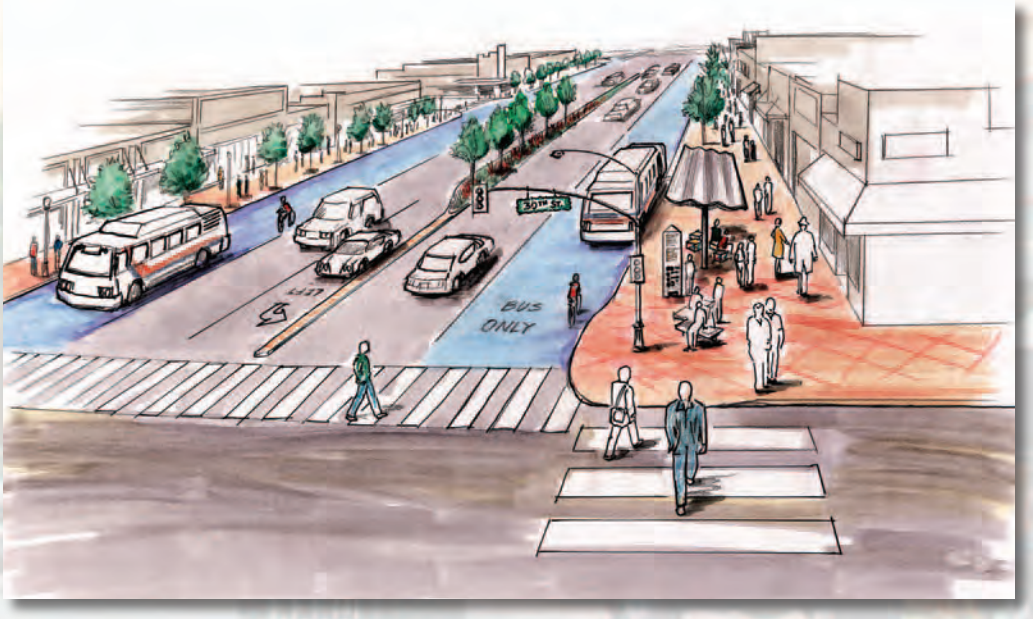
University Avenue Mobility Plan

Information Sheet

BE PART OF THE FUTURE

The University Avenue Mobility Plan is intended to revitalize and beautify the commercial district by promoting a pedestrian and transit oriented environment along University Avenue in North Park. A draft plan has been prepared for public review. The plan is designed to:

- Reduce speeding and associated traffic noise.
- Enhance pedestrian safety and comfort through corner bulb-outs, additional crosswalks and signals, and landscaped medians.
- Improve transit service by providing a transit only lane and consolidating bus stops.
- Improve traffic flow by providing separate left and right turn lanes and segregating busses from other vehicles.
- Shift existing parallel parking spaces on University to new diagonal spaces on adjacent side streets to improve traffic flow and eliminate crashes with parked or parking vehicles.
- Discourage neighborhood cut-through traffic with traffic calming measures (bulb-outs and diagonal parking).
- Provide additional traffic calming measures on Lincoln Ave. and North Park Way.



Join Us on Saturday, June 12th for More Information
9:00 a.m. to Noon
Claire de Lune Café, 2906 University Avenue
www.rbfconsulting.com/us/northpark

REDISCOVERING GREATER NORTH PARK

University Avenue Mobility Plan

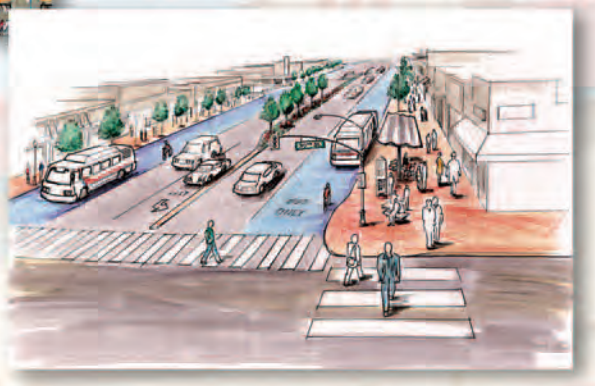
Please join us for an interactive workshop to:

Review the refined concept plan for University Avenue

Discuss potential parking and circulation impacts

❖

Talk about next steps in the process



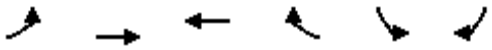
Saturday, June 12th
9am - Noon
Claire de Lune Cafe
2906 University Avenue

Appendix B
Existing Conditions HCM Analysis Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	281	20	17	733	70	34
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	312	22	19	814	78	38
Pedestrians	3			2	14	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	1	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)	452			320		
pX, platoon unblocked						
vC, conflicting volume			348		785	183
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			348		785	183
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		76	95
cM capacity (veh/h)			1207		324	823

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	208	126	290	543	116
Volume Left	0	0	19	0	78
Volume Right	0	22	0	0	38
cSH	1700	1700	1207	1700	481
Volume to Capacity	0.12	0.07	0.02	0.32	0.24
Queue Length (ft)	0	0	1	0	23
Control Delay (s)	0.0	0.0	0.7	0.0	16.3
Lane LOS			A		C
Approach Delay (s)	0.0		0.2		16.3
Approach LOS					C

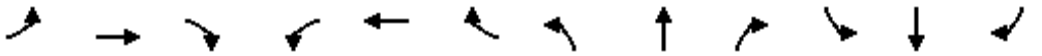
Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	38.3%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	5	296	794	9	5	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	6	329	882	10	6	31
Pedestrians		3	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)		372	400			
pX, platoon unblocked						
vC, conflicting volume	897				1070	454
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	897				1070	454
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				97	94
cM capacity (veh/h)	762				216	555

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	115	219	588	304	37
Volume Left	6	0	0	0	6
Volume Right	0	0	0	10	31
cSH	762	1700	1700	1700	654
Volume to Capacity	0.01	0.13	0.35	0.18	0.06
Queue Length (ft)	1	0	0	0	4
Control Delay (s)	0.5	0.0	0.0	0.0	13.4
Lane LOS	A				B
Approach Delay (s)	0.2		0.0		13.4
Approach LOS					B

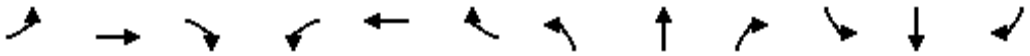
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	35.7%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	11	723	15	28	543	7	0	0	100	0	0	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	12	803	17	31	603	8	0	0	111	0	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		359			243							
pX, platoon unblocked	0.84						0.84	0.84		0.84	0.84	0.84
vC, conflicting volume	611			820			1204	1509	410	1207	1514	306
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	338			820			1048	1413	410	1051	1418	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			100	100	81	100	100	100
cM capacity (veh/h)	1030			818			148	111	596	120	110	912

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	12	536	284	31	402	209	111	4
Volume Left	12	0	0	31	0	0	0	0
Volume Right	0	0	17	0	0	8	111	4
cSH	1030	1700	1700	818	1700	1700	596	912
Volume to Capacity	0.01	0.32	0.17	0.04	0.24	0.12	0.19	0.00
Queue Length (ft)	1	0	0	3	0	0	17	0
Control Delay (s)	8.5	0.0	0.0	9.6	0.0	0.0	12.4	9.0
Lane LOS	A			A			B	A
Approach Delay (s)	0.1			0.5			12.4	9.0
Approach LOS							B	A

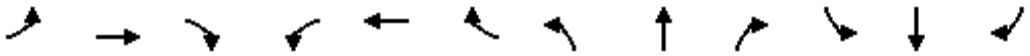
Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	36.3%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	1	49	42	42	186	3	11	4	16	4	7	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1	54	47	47	207	3	12	4	18	4	8	1
Pedestrians		1			5			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		393			875							
pX, platoon unblocked												
vC, conflicting volume	216			109			396	397	91	413	419	215
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	216			109			396	397	91	413	419	215
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			98	99	98	99	98	100
cM capacity (veh/h)	1347			1471			534	517	956	513	502	820

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	102	257	34	13
Volume Left	1	47	12	4
Volume Right	47	3	18	1
cSH	1347	1471	688	523
Volume to Capacity	0.00	0.03	0.05	0.03
Queue Length (ft)	0	2	4	2
Control Delay (s)	0.1	1.6	10.5	12.1
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	1.6	10.5	12.1
Approach LOS			B	B

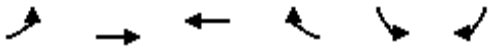
Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	7	299	15	23	645	4	18	1	13	3	3	15
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	8	332	17	26	717	4	20	1	14	3	3	17
Pedestrians		9			3			15			13	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			0			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		351			383							
pX, platoon unblocked												
vC, conflicting volume	734			364			808	1156	192	983	1162	383
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	734			364			808	1156	192	983	1162	383
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			92	99	98	98	98	97
cM capacity (veh/h)	871			1191			249	188	811	191	186	610

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	174	183	384	363	36	23
Volume Left	8	0	26	0	20	3
Volume Right	0	17	0	4	14	17
cSH	871	1700	1191	1700	342	372
Volume to Capacity	0.01	0.11	0.02	0.21	0.10	0.06
Queue Length (ft)	1	0	2	0	9	5
Control Delay (s)	0.5	0.0	0.7	0.0	16.8	15.3
Lane LOS	A		A		C	C
Approach Delay (s)	0.2		0.4		16.8	15.3
Approach LOS					C	C

Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	38.0%	ICU Level of Service	A	



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	12	358	602	15	9	44
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	13	398	669	17	10	49
Pedestrians		5			1	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		376				
pX, platoon unblocked						
vC, conflicting volume	687				904	349
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	687				904	349
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				96	92
cM capacity (veh/h)	916				276	650

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	146	265	446	240	59
Volume Left	13	0	0	0	10
Volume Right	0	0	0	17	49
cSH	916	1700	1700	1700	528
Volume to Capacity	0.01	0.16	0.26	0.14	0.11
Queue Length (ft)	1	0	0	0	9
Control Delay (s)	1.0	0.0	0.0	0.0	12.7
Lane LOS	A				B
Approach Delay (s)	0.3		0.0		12.7
Approach LOS					B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	350	9	9	631	16	29
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	389	10	10	701	18	32
Pedestrians	5					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	286					
pX, platoon unblocked			0.98		0.98	0.98
vC, conflicting volume			399		769	199
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			373		750	171
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		95	96
cM capacity (veh/h)			1177		342	836

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	259	140	244	467	50
Volume Left	0	0	10	0	18
Volume Right	0	10	0	0	32
cSH	1700	1700	1177	1700	552
Volume to Capacity	0.15	0.08	0.01	0.27	0.09
Queue Length (ft)	0	0	1	0	7
Control Delay (s)	0.0	0.0	0.4	0.0	12.2
Lane LOS			A		B
Approach Delay (s)	0.0		0.1		12.2
Approach LOS					B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	353	14	21	618	41	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	392	16	23	687	46	31
Pedestrians	9			2	9	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			0	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	616			1277		
pX, platoon unblocked						
vC, conflicting volume			417		808	215
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			417		808	215
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		85	96
cM capacity (veh/h)			1144		311	789

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	261	146	252	458	77
Volume Left	0	0	23	0	46
Volume Right	0	16	0	0	31
cSH	1700	1700	1144	1700	413
Volume to Capacity	0.15	0.09	0.02	0.27	0.19
Queue Length (ft)	0	0	2	0	17
Control Delay (s)	0.0	0.0	0.9	0.0	15.7
Lane LOS			A		C
Approach Delay (s)	0.0		0.3		15.7
Approach LOS					C

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	35.3%	ICU Level of Service	A

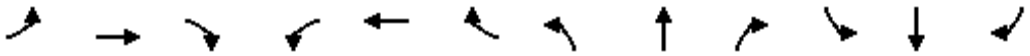
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95			1.00	0.95
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.95		1.00	0.97		1.00	0.97			1.00	0.98
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1770	3287		1770	3423		1770	3420			1770	3466
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.24	1.00
Satd. Flow (perm)	1770	3287		1770	3423		1770	3420			446	3466
Volume (vph)	37	150	77	125	524	124	66	181	45	9	56	350
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	41	167	86	139	582	138	73	201	50	10	62	389
Lane Group Flow (vph)	41	253	0	139	720	0	73	251	0	0	72	438
Confl. Peds. (#/hr)			87			19			14			
Turn Type	Prot			Prot			Prot			custom	Prot	
Protected Phases	5	2		1	6		3	8			7	4
Permitted Phases										7		
Actuated Green, G (s)	2.6	16.5		7.6	21.5		4.7	11.5			15.3	22.1
Effective Green, g (s)	4.0	18.4		9.0	23.4		6.1	13.4			16.7	24.0
Actuated g/C Ratio	0.06	0.26		0.13	0.34		0.09	0.19			0.24	0.35
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	4.9			4.4	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	3.3			2.0	2.9
Lane Grp Cap (vph)	102	870		229	1152		155	659			107	1197
v/s Ratio Prot	0.02	0.08		c0.08	c0.21		0.04	0.07				c0.13
v/s Ratio Perm											c0.16	
v/c Ratio	0.40	0.29		0.61	0.62		0.47	0.38			0.67	0.37
Uniform Delay, d1	31.6	20.4		28.6	19.4		30.2	24.4			23.9	17.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	2.6	0.1		4.5	0.8		2.3	0.4			12.3	0.2
Delay (s)	34.2	20.4		33.1	20.1		32.4	24.8			36.3	17.2
Level of Service	C	C		C	C		C	C			D	B
Approach Delay (s)		22.3			22.2			26.6				19.9
Approach LOS		C			C			C				B

Intersection Summary			
HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	69.5	Sum of lost time (s)	6.0
Intersection Capacity Utilization	72.1%	ICU Level of Service	C

c Critical Lane Group

Movement	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Volume (vph)	44
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	49
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	31
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

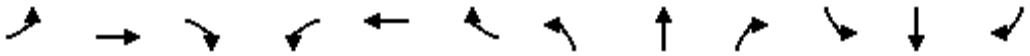
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.93			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1770	3519		1770	3516			1698			1739	
Flt Permitted	0.95	1.00		0.95	1.00			0.95			0.97	
Satd. Flow (perm)	1770	3519		1770	3516			1623			1700	
Volume (vph)	6	237	8	58	736	28	20	32	56	8	46	35
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	7	263	9	64	818	31	22	36	62	9	51	39
Lane Group Flow (vph)	7	272	0	64	849	0	0	120	0	0	99	0
Confl. Peds. (#/hr)			3			5			9			11
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	1.1	40.9		4.9	44.7			10.0			10.0	
Effective Green, g (s)	2.1	43.4		5.9	47.2			11.7			11.7	
Actuated g/C Ratio	0.03	0.62		0.08	0.67			0.17			0.17	
Clearance Time (s)	4.0	5.5		4.0	5.5			4.7			4.7	
Vehicle Extension (s)	2.0	2.5		2.0	2.5			2.0			2.0	
Lane Grp Cap (vph)	53	2182		149	2371			271			284	
v/s Ratio Prot	0.00	0.08		c0.04	c0.24							
v/s Ratio Perm								c0.07			0.06	
v/c Ratio	0.13	0.12		0.43	0.36			0.44			0.35	
Uniform Delay, d1	33.1	5.5		30.5	4.9			26.2			25.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.4	0.1		0.7	0.4			0.4			0.3	
Delay (s)	33.5	5.6		31.2	5.3			26.6			26.1	
Level of Service	C	A		C	A			C			C	
Approach Delay (s)		6.3			7.1			26.6			26.1	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	48.1%	ICU Level of Service	A

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0			3.0			3.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.98			0.92	
Flt Protected		1.00			1.00			0.96			0.99	
Satd. Flow (prot)		3517			3528			1757			1668	
Flt Permitted		0.95			0.95			0.96			0.99	
Satd. Flow (perm)		3346			3367			1757			1668	
Volume (vph)	3	301	11	3	663	11	66	9	11	13	6	27
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	3	334	12	3	737	12	73	10	12	14	7	30
Lane Group Flow (vph)	0	349	0	0	752	0	0	95	0	0	51	0
Confl. Peds. (#/hr)			1			8			12			10
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		44.7			44.7			8.2			5.9	
Effective Green, g (s)		47.1			47.1			10.1			7.8	
Actuated g/C Ratio		0.64			0.64			0.14			0.11	
Clearance Time (s)		5.4			5.4			4.9			4.9	
Vehicle Extension (s)		2.7			2.8			2.0			2.0	
Lane Grp Cap (vph)		2130			2143			240			176	
v/s Ratio Prot								c0.05			c0.03	
v/s Ratio Perm		0.10			c0.22							
v/c Ratio		0.16			0.35			0.40			0.29	
Uniform Delay, d1		5.5			6.3			29.2			30.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.1			0.4			0.3	
Delay (s)		5.6			6.4			29.6			30.9	
Level of Service		A			A			C			C	
Approach Delay (s)		5.6			6.4			29.6			30.9	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	41.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.98		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3494		1770	3459		1770	1814		1770	1727	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3494		1770	3459		1770	1814		1770	1727	
Volume (vph)	65	236	14	22	545	80	81	99	15	58	67	46
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	72	262	16	24	606	89	90	110	17	64	74	51
Lane Group Flow (vph)	72	278	0	24	695	0	90	127	0	64	125	0
Confl. Peds. (#/hr)			26			4			15			8
Turn Type	Prot			Prot			Split			Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	5.2	36.1		2.6	33.5		9.4	9.4		8.9	8.9	
Effective Green, g (s)	6.2	38.1		3.6	35.5		10.9	10.9		9.9	9.9	
Actuated g/C Ratio	0.08	0.47		0.04	0.44		0.14	0.14		0.12	0.12	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.5	4.5		4.0	4.0	
Vehicle Extension (s)	2.0	2.2		2.0	2.1		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	136	1654		79	1525		240	246		218	212	
v/s Ratio Prot	c0.04	c0.08		0.01	c0.20		0.05	c0.07		0.04	c0.07	
v/s Ratio Perm												
v/c Ratio	0.53	0.17		0.30	0.46		0.38	0.52		0.29	0.59	
Uniform Delay, d1	35.7	12.1		37.2	15.7		31.7	32.3		32.1	33.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	0.0		0.8	0.1		0.4	0.8		0.3	2.7	
Delay (s)	37.5	12.2		38.0	15.8		32.1	33.1		32.4	36.1	
Level of Service	D	B		D	B		C	C		C	D	
Approach Delay (s)		17.4			16.6			32.7			34.8	
Approach LOS		B			B			C			C	

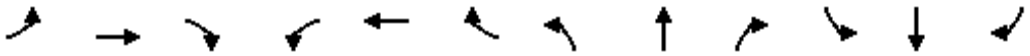
Intersection Summary			
HCM Average Control Delay	21.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	80.5	Sum of lost time (s)	21.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00		1.00	0.97		1.00	0.97	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.92		1.00	0.92	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3472			3501		1770	1663		1770	1674	
Flt Permitted		0.94			0.95		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3272			3321		1770	1663		1770	1674	
Volume (vph)	9	335	36	9	484	27	50	22	22	12	33	34
Peak-hour factor, PHF	0.90	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	10	353	40	10	538	30	56	24	24	13	37	38
Lane Group Flow (vph)	0	403	0	0	578	0	56	48	0	13	75	0
Confl. Peds. (#/hr)			6			13			20			14
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6								
Actuated Green, G (s)		41.6			41.6		5.5	5.5		5.2	5.2	
Effective Green, g (s)		44.1			44.1		7.7	7.7		7.4	7.4	
Actuated g/C Ratio		0.59			0.59		0.10	0.10		0.10	0.10	
Clearance Time (s)		5.5			5.5		5.2	5.2		5.2	5.2	
Vehicle Extension (s)		2.0			2.0		3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)		1916			1945		181	170		174	165	
v/s Ratio Prot							c0.03	0.03		0.01	c0.04	
v/s Ratio Perm		0.12			c0.17							
v/c Ratio		0.21			0.30		0.31	0.28		0.07	0.45	
Uniform Delay, d1		7.4			7.8		31.3	31.2		30.8	32.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			0.0		1.0	0.9		0.1	0.7	
Delay (s)		7.4			7.9		32.3	32.2		30.9	32.8	
Level of Service		A			A		C	C		C	C	
Approach Delay (s)		7.4			7.9			32.2			32.5	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	75.3	Sum of lost time (s)	16.1
Intersection Capacity Utilization	33.2%	ICU Level of Service	A

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.98		1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.98		1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3456		1770	3401		1770	1737		1770	1775	
Flt Permitted	0.41	1.00		0.50	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	764	3456		938	3401		1770	1737		1770	1775	
Volume (vph)	32	316	35	74	413	75	69	164	96	25	131	35
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	36	351	39	82	459	83	77	182	107	28	146	39
Lane Group Flow (vph)	36	390	0	82	542	0	77	289	0	28	185	0
Confl. Peds. (#/hr)			40			45			24			74
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	33.5	33.5		33.5	33.5		6.3	17.6		2.7	14.0	
Effective Green, g (s)	35.4	35.4		35.4	35.4		7.7	19.5		4.1	15.9	
Actuated g/C Ratio	0.52	0.52		0.52	0.52		0.11	0.29		0.06	0.23	
Clearance Time (s)	4.9	4.9		4.9	4.9		4.4	4.9		4.4	4.9	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	398	1799		488	1771		200	498		107	415	
v/s Ratio Prot		0.11			c0.16		c0.04	c0.17		0.02	0.10	
v/s Ratio Perm	0.05			0.09								
v/c Ratio	0.09	0.22		0.17	0.31		0.38	0.58		0.26	0.45	
Uniform Delay, d1	8.2	8.8		8.6	9.3		28.0	20.7		30.5	22.3	
Progression Factor	1.00	1.00		0.89	0.85		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.7	0.4		0.5	1.1		0.5	0.3	
Delay (s)	8.6	9.1		8.3	8.3		28.4	21.9		31.0	22.6	
Level of Service	A	A		A	A		C	C		C	C	
Approach Delay (s)		9.0			8.3			23.2			23.7	
Approach LOS		A			A			C			C	

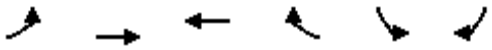
Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0			3.0	3.0	
Lane Util. Factor	0.95			1.00	1.00	
Frpb, ped/bikes	1.00			1.00	0.99	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	3501			1863	1683	
Flt Permitted	1.00			1.00	0.97	
Satd. Flow (perm)	3501			1863	1683	
Volume (vph)	421	26	0	532	51	38
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	468	29	0	591	57	42
Lane Group Flow (vph)	497	0	0	591	99	0
Confl. Peds. (#/hr)		8	8			20
Turn Type						
Protected Phases	2			2	4	
Permitted Phases						
Actuated Green, G (s)	51.9			51.9	7.6	
Effective Green, g (s)	53.4			53.4	8.6	
Actuated g/C Ratio	0.79			0.79	0.13	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	2.0			2.0	2.0	
Lane Grp Cap (vph)	2749			1463	213	
v/s Ratio Prot	0.14			c0.32	c0.06	
v/s Ratio Perm						
v/c Ratio	0.18			0.40	0.46	
Uniform Delay, d1	1.8			2.3	27.6	
Progression Factor	0.57			0.21	1.00	
Incremental Delay, d2	0.1			0.8	0.6	
Delay (s)	1.2			1.3	28.1	
Level of Service	A			A	C	
Approach Delay (s)	1.2			1.3	28.1	
Approach LOS	A			A	C	

Intersection Summary			
HCM Average Control Delay	3.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	48.8%	ICU Level of Service	A

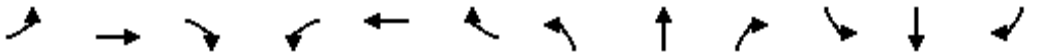
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.95	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3536	1847		1701	
Flt Permitted		0.95	1.00		0.97	
Satd. Flow (perm)		3345	1847		1701	
Volume (vph)	9	450	524	30	39	20
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	10	500	582	33	43	22
Lane Group Flow (vph)	0	510	615	0	65	0
Confl. Peds. (#/hr)	1			1		8
Turn Type	Perm					
Protected Phases		2	2		4	
Permitted Phases	2					
Actuated Green, G (s)		51.8	51.8		6.4	
Effective Green, g (s)		53.7	53.7		8.3	
Actuated g/C Ratio		0.79	0.79		0.12	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		1.0	1.0		2.0	
Lane Grp Cap (vph)		2642	1459		208	
v/s Ratio Prot			c0.33		c0.04	
v/s Ratio Perm		0.15				
v/c Ratio		0.19	0.42		0.31	
Uniform Delay, d1		1.8	2.3		27.2	
Progression Factor		0.38	1.09		1.00	
Incremental Delay, d2		0.2	0.9		0.3	
Delay (s)		0.8	3.3		27.6	
Level of Service		A	A		C	
Approach Delay (s)		0.8	3.3		27.6	
Approach LOS		A	A		C	

Intersection Summary			
HCM Average Control Delay	3.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	46.1%	ICU Level of Service	A

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.97		1.00	0.97
Flpb, ped/bikes	0.99	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.98	1.00
Satd. Flow (prot)	1758	3516		1761	3530			1798	1543		1834	1534
Flt Permitted	0.40	1.00		0.41	1.00			0.97	1.00		0.98	1.00
Satd. Flow (perm)	731	3516		755	3530			1798	1543		1834	1534
Volume (vph)	3	480	18	62	510	7	54	21	254	15	33	12
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	3	533	20	69	567	8	60	23	282	17	37	13
Lane Group Flow (vph)	3	553	0	69	575	0	0	83	282	0	54	13
Confl. Peds. (#/hr)	8		6	6		8			12			6
Turn Type	Perm			Perm			Split		Perm	Split		Perm
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6					3			4
Actuated Green, G (s)	34.5	34.5		34.5	34.5			10.4	10.4		8.4	8.4
Effective Green, g (s)	36.4	36.4		36.4	36.4			12.3	12.3		10.3	10.3
Actuated g/C Ratio	0.54	0.54		0.54	0.54			0.18	0.18		0.15	0.15
Clearance Time (s)	4.9	4.9		4.9	4.9			4.9	4.9		4.9	4.9
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	391	1882		404	1890			325	279		278	232
v/s Ratio Prot		0.16			c0.16			0.05			c0.03	
v/s Ratio Perm	0.00			0.09					c0.18			0.01
v/c Ratio	0.01	0.29		0.17	0.30			0.26	1.01		0.19	0.06
Uniform Delay, d1	7.4	8.7		8.1	8.8			23.9	27.8		25.2	24.7
Progression Factor	0.78	0.79		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.4		0.9	0.4			0.2	56.6		0.1	0.0
Delay (s)	5.8	7.3		9.0	9.2			24.1	84.5		25.3	24.7
Level of Service	A	A		A	A			C	F		C	C
Approach Delay (s)		7.3			9.2			70.8			25.2	
Approach LOS		A			A			E			C	

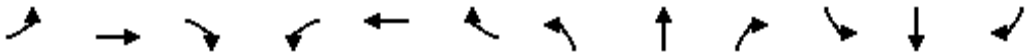
Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0	3.0		3.0	3.0
Lane Util. Factor		0.95	1.00		0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.96		1.00			1.00	0.98		1.00	0.99
Flpb, ped/bikes		1.00	1.00		1.00			1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00			1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00		0.99			0.96	1.00		0.98	1.00
Satd. Flow (prot)		3538	1520		3491			1784	1545		1828	1562
Flt Permitted		1.00	1.00		0.99			0.71	1.00		0.90	1.00
Satd. Flow (perm)		3538	1520		3491			1326	1545		1662	1562
Volume (vph)	6	670	147	182	514	3	58	10	101	25	55	6
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	7	744	163	202	571	3	64	11	112	28	61	7
Lane Group Flow (vph)	0	751	163	0	776	0	0	75	112	0	89	7
Confl. Peds. (#/hr)			7			2	1		8	8		1
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	2	2		1	1			8			4	
Permitted Phases			2				8		8	4		4
Actuated Green, G (s)		34.8	34.8		17.4			10.3	10.3		10.3	10.3
Effective Green, g (s)		36.3	36.3		18.9			11.8	11.8		11.8	11.8
Actuated g/C Ratio		0.48	0.48		0.25			0.16	0.16		0.16	0.16
Clearance Time (s)		4.5	4.5		4.5			4.5	4.5		4.5	4.5
Vehicle Extension (s)		2.0	2.0		2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		1690	726		868			206	240		258	243
v/s Ratio Prot		c0.21			c0.22							
v/s Ratio Perm			0.11					0.06	c0.07		0.05	0.00
v/c Ratio		0.44	0.22		0.89			0.36	0.47		0.34	0.03
Uniform Delay, d1		13.2	11.6		27.6			28.7	29.2		28.7	27.2
Progression Factor		1.00	1.00		0.70			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.8	0.7		10.2			0.4	0.5		0.3	0.0
Delay (s)		14.0	12.3		29.4			29.1	29.8		28.9	27.3
Level of Service		B	B		C			C	C		C	C
Approach Delay (s)		13.7			29.4			29.5			28.8	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	22.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B

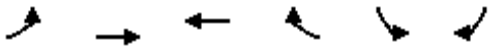
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0			3.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			1.00	
Frpb, ped/bikes		1.00	0.98		1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.97			0.96	
Flt Protected		1.00	1.00		0.98			0.97			0.99	
Satd. Flow (prot)		3534	1550		3458			3293			1746	
Flt Permitted		1.00	1.00		0.98			0.83			0.99	
Satd. Flow (perm)		3534	1550		3458			2801			1746	
Volume (vph)	9	272	515	277	328	2	283	133	118	11	20	15
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	10	302	572	308	364	2	314	148	131	12	22	17
Lane Group Flow (vph)	0	312	572	0	674	0	0	593	0	0	51	0
Confl. Peds. (#/hr)			2			5	7		7	7		7
Turn Type	Split		Free	Split			Perm			Perm		
Protected Phases	1	1		2	2			4			4	
Permitted Phases		1	Free		2		4			4	4	
Actuated Green, G (s)		11.8	76.0		33.3			17.4			17.4	
Effective Green, g (s)		13.3	76.0		34.8			18.9			18.9	
Actuated g/C Ratio		0.18	1.00		0.46			0.25			0.25	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		618	1550		1583			697			434	
v/s Ratio Prot		c0.09			c0.19						0.03	
v/s Ratio Perm			0.37					c0.21				
v/c Ratio		0.50	0.37		0.43			0.85			0.12	
Uniform Delay, d1		28.4	0.0		13.9			27.2			22.1	
Progression Factor		1.28	1.00		1.42			1.00			1.00	
Incremental Delay, d2		0.2	0.6		0.4			9.4			0.0	
Delay (s)		36.6	0.6		20.2			36.6			22.1	
Level of Service		D	A		C			D			C	
Approach Delay (s)		13.3			20.2			36.6			22.1	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM Average Control Delay	21.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	62.2%	ICU Level of Service	B

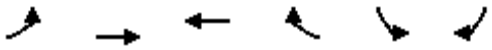
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	7	374	601	3	6	38
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	8	416	668	3	7	42
Pedestrians		9	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	0		0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		776	1117			
pX, platoon unblocked						
vC, conflicting volume	676				900	350
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	676				900	350
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	93
cM capacity (veh/h)	921				278	645

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	146	277	445	226	49
Volume Left	8	0	0	0	7
Volume Right	0	0	0	3	42
cSH	921	1700	1700	1700	547
Volume to Capacity	0.01	0.16	0.26	0.13	0.09
Queue Length (ft)	1	0	0	0	7
Control Delay (s)	0.6	0.0	0.0	0.0	12.2
Lane LOS	A				B
Approach Delay (s)	0.2		0.0		12.2
Approach LOS					B

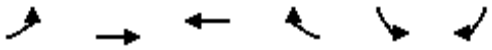
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	31.5%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	364	571	11	7	3
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	18	404	634	12	8	3
Pedestrians		1	11			
Lane Width (ft)		12.0	12.0			
Walking Speed (ft/s)		4.0	4.0			
Percent Blockage		0	1			
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		1136	757			
pX, platoon unblocked						
vC, conflicting volume	647				889	324
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	647				889	324
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	100
cM capacity (veh/h)	948				278	677

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	153	270	423	224	11
Volume Left	18	0	0	0	8
Volume Right	0	0	0	12	3
cSH	948	1700	1700	1700	338
Volume to Capacity	0.02	0.16	0.25	0.13	0.03
Queue Length (ft)	1	0	0	0	3
Control Delay (s)	1.2	0.0	0.0	0.0	16.0
Lane LOS	A				C
Approach Delay (s)	0.4		0.0		16.0
Approach LOS					C

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	28.3%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	12	364	550	11	7	31
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	13	404	611	12	8	34
Pedestrians		5	6		7	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			367			
pX, platoon unblocked						
vC, conflicting volume	630				859	324
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	630				859	324
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				97	95
cM capacity (veh/h)	956				292	671

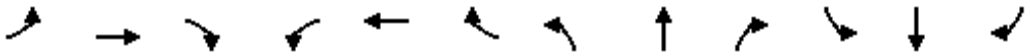
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	148	270	407	216	42
Volume Left	13	0	0	0	8
Volume Right	0	0	0	12	34
cSH	956	1700	1700	1700	542
Volume to Capacity	0.01	0.16	0.24	0.13	0.08
Queue Length (ft)	1	0	0	0	6
Control Delay (s)	0.9	0.0	0.0	0.0	12.2
Lane LOS	A				B
Approach Delay (s)	0.3		0.0		12.2
Approach LOS					B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	28.8%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	364	6	18	550	11	18
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	404	7	20	611	12	20
Pedestrians	5			6	7	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				297		
pX, platoon unblocked						
vC, conflicting volume			418		765	219
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			418		765	219
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		96	97
cM capacity (veh/h)			1145		334	783

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	270	141	224	407	32
Volume Left	0	0	20	0	12
Volume Right	0	7	0	0	20
cSH	1700	1700	1145	1700	519
Volume to Capacity	0.16	0.08	0.02	0.24	0.06
Queue Length (ft)	0	0	1	0	5
Control Delay (s)	0.0	0.0	0.9	0.0	12.4
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		12.4
Approach LOS					B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		0.95	0.95			1.00	
Frpb, ped/bikes		0.99			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			1.00	
Frt		0.92			0.98		1.00	1.00			0.96	
Flt Protected		0.99			1.00		0.95	0.98			0.99	
Satd. Flow (prot)		1665			1822		1681	1734			1758	
Flt Permitted		0.96			0.99		0.95	0.98			0.99	
Satd. Flow (perm)		1615			1803		1681	1734			1758	
Volume (vph)	8	6	23	12	108	15	95	48	2	6	13	7
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	9	7	26	13	120	17	106	53	2	7	14	8
Lane Group Flow (vph)	0	42	0	0	150	0	79	82	0	0	29	0
Confl. Peds. (#/hr)	1		2	2		1	7		1	1		7
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		32.4			32.2		9.0	9.0			3.2	
Effective Green, g (s)		34.0			34.0		10.0	10.0			4.4	
Actuated g/C Ratio		0.59			0.59		0.17	0.17			0.08	
Clearance Time (s)		4.6			4.8		4.0	4.0			4.2	
Vehicle Extension (s)		2.0			2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		957			1068		293	302			135	
v/s Ratio Prot							0.05	c0.05			c0.02	
v/s Ratio Perm		0.03			c0.08							
v/c Ratio		0.04			0.14		0.27	0.27			0.21	
Uniform Delay, d1		4.9			5.2		20.5	20.5			24.9	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.0			0.0		0.2	0.2			0.3	
Delay (s)		4.9			5.2		20.7	20.7			25.2	
Level of Service		A			A		C	C			C	
Approach Delay (s)		4.9			5.2			20.7			25.2	
Approach LOS		A			A			C			C	

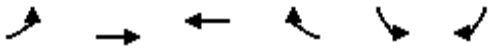
Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	57.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	27.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	372	10	22	517	3	20
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	413	11	24	574	3	22
Pedestrians				1	3	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	243			551		
pX, platoon unblocked			0.98		0.98	0.98
vC, conflicting volume			427		758	216
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			389		728	173
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		99	97
cM capacity (veh/h)			1149		346	824

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	276	149	216	383	26
Volume Left	0	0	24	0	3
Volume Right	0	11	0	0	22
cSH	1700	1700	1149	1700	698
Volume to Capacity	0.16	0.09	0.02	0.23	0.04
Queue Length (ft)	0	0	2	0	3
Control Delay (s)	0.0	0.0	1.1	0.0	10.4
Lane LOS			A		B
Approach Delay (s)	0.0		0.4		10.4
Approach LOS					B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	30.3%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	23	369	502	11	12	37
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	26	410	558	12	13	41
Pedestrians			1		32	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			4.0		4.0	
Percent Blockage			0		3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		393	401			
pX, platoon unblocked						
vC, conflicting volume	602				853	317
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	602				853	317
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				95	94
cM capacity (veh/h)	959				286	666

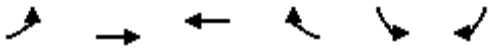
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	162	273	372	198	54
Volume Left	26	0	0	0	13
Volume Right	0	0	0	12	41
cSH	959	1700	1700	1700	503
Volume to Capacity	0.03	0.16	0.22	0.12	0.11
Queue Length (ft)	2	0	0	0	9
Control Delay (s)	1.6	0.0	0.0	0.0	13.0
Lane LOS	A				B
Approach Delay (s)	0.6		0.0		13.0
Approach LOS					B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	25.9%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	362	18	13	501	6	21
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	402	20	14	557	7	23
Pedestrians					19	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	523			271		
pX, platoon unblocked						
vC, conflicting volume			441		738	230
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			441		738	230
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	97
cM capacity (veh/h)			1112		347	766

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	268	154	200	371	30
Volume Left	0	0	14	0	7
Volume Right	0	20	0	0	23
cSH	1700	1700	1112	1700	604
Volume to Capacity	0.16	0.09	0.01	0.22	0.05
Queue Length (ft)	0	0	1	0	4
Control Delay (s)	0.0	0.0	0.7	0.0	11.3
Lane LOS			A		B
Approach Delay (s)	0.0		0.2		11.3
Approach LOS					B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	27.5%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	0.99		0.97	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.94	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3527	1820		1656	
Flt Permitted		0.92	1.00		0.97	
Satd. Flow (perm)		3253	1820		1656	
Volume (vph)	20	388	521	61	59	43
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	431	579	68	66	48
Lane Group Flow (vph)	0	453	647	0	114	0
Confl. Peds. (#/hr)	36			36	1	28
Turn Type	Perm					
Protected Phases		2	6		4	
Permitted Phases	2					
Actuated Green, G (s)		51.9	51.9		6.3	
Effective Green, g (s)		53.8	53.8		8.2	
Actuated g/C Ratio		0.79	0.79		0.12	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		2.0	2.0		2.0	
Lane Grp Cap (vph)		2574	1440		200	
v/s Ratio Prot			c0.36		c0.07	
v/s Ratio Perm		0.14				
v/c Ratio		0.18	0.45		0.57	
Uniform Delay, d1		1.7	2.3		28.2	
Progression Factor		0.80	0.36		1.00	
Incremental Delay, d2		0.1	1.0		2.2	
Delay (s)		1.5	1.8		30.5	
Level of Service		A	A		C	
Approach Delay (s)		1.5	1.8		30.5	
Approach LOS		A	A		C	

Intersection Summary			
HCM Average Control Delay	4.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	408	25	0	563	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	453	28	0	626	0	0
Pedestrians	28			1	43	
Lane Width (ft)	12.0			12.0	0.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	259			90		
pX, platoon unblocked			0.97		0.90	0.97
vC, conflicting volume			524		1164	285
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			485		1111	240
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1060		181	747

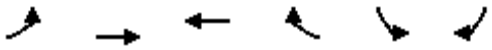
Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	302	179	626
Volume Left	0	0	0
Volume Right	0	28	0
cSH	1700	1700	1700
Volume to Capacity	0.18	0.11	0.37
Queue Length (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		0.0
Approach LOS			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	478	19	0	554	0	42
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	531	21	0	616	0	47
Pedestrians				11	11	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				1	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	150			636		
pX, platoon unblocked			0.98		0.85	0.98
vC, conflicting volume			563		1168	298
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			533		1137	262
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	93
cM capacity (veh/h)			1014		167	714

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	354	198	616	47
Volume Left	0	0	0	0
Volume Right	0	21	0	47
cSH	1700	1700	1700	714
Volume to Capacity	0.21	0.12	0.36	0.07
Queue Length (ft)	0	0	0	5
Control Delay (s)	0.0	0.0	0.0	10.4
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.4
Approach LOS				B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	45.5%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	11	476	554	20	12	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	12	529	616	22	13	24
Pedestrians		2			4	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		370	416			
pX, platoon unblocked	0.83				0.83	0.83
vC, conflicting volume	642				920	633
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	570				903	559
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				94	94
cM capacity (veh/h)	840				229	396

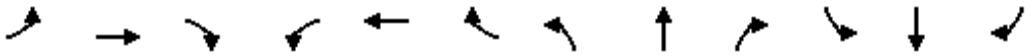
Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	189	353	638	38
Volume Left	12	0	0	13
Volume Right	0	0	22	24
cSH	840	1700	1700	315
Volume to Capacity	0.01	0.21	0.38	0.12
Queue Length (ft)	1	0	0	10
Control Delay (s)	0.7	0.0	0.0	18.0
Lane LOS	A			C
Approach Delay (s)	0.3		0.0	18.0
Approach LOS				C

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	480	8	2	574	0	19
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	533	9	2	638	0	21
Pedestrians	2			3	6	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	490			296		
pX, platoon unblocked					0.85	
vC, conflicting volume			548		1188	280
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			548		1222	280
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	97
cM capacity (veh/h)			1026		146	718

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	356	187	640	21
Volume Left	0	0	2	0
Volume Right	0	9	0	21
cSH	1700	1700	1026	718
Volume to Capacity	0.21	0.11	0.00	0.03
Queue Length (ft)	0	0	0	2
Control Delay (s)	0.0	0.0	0.1	10.2
Lane LOS			A	B
Approach Delay (s)	0.0		0.1	10.2
Approach LOS				B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	45.8%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	1	165	7	200	130	179	28	1	143	293	59	34
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1	183	8	222	144	199	31	1	159	326	66	38

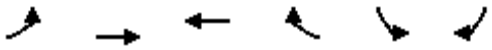
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	192	367	199	191	429
Volume Left (vph)	1	222	0	31	326
Volume Right (vph)	8	0	199	159	38
Hadj (s)	0.0	0.2	-0.6	-0.4	0.1
Departure Headway (s)	7.0	6.9	6.2	6.5	6.5
Degree Utilization, x	0.37	0.71	0.34	0.34	0.77
Capacity (veh/h)	467	505	559	502	542
Control Delay (s)	14.0	23.8	11.2	12.9	27.8
Approach Delay (s)	14.0	19.4		12.9	27.8
Approach LOS	B	C		B	D

Intersection Summary				
Delay	20.4			
HCM Level of Service	C			
Intersection Capacity Utilization	78.9%	ICU Level of Service	C	

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	957	97	33	630	50	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1063	108	37	700	56	27
Pedestrians	12			20	36	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			2	3	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)	452			320		
pX, platoon unblocked						
vC, conflicting volume			1207		1589	642
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1207		1589	642
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		38	93
cM capacity (veh/h)			568		90	402

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	709	462	270	467	82
Volume Left	0	0	37	0	56
Volume Right	0	108	0	0	27
cSH	1700	1700	568	1700	134
Volume to Capacity	0.42	0.27	0.06	0.27	0.62
Queue Length (ft)	0	0	5	0	80
Control Delay (s)	0.0	0.0	2.4	0.0	67.7
Lane LOS			A		F
Approach Delay (s)	0.0		0.9		67.7
Approach LOS					F

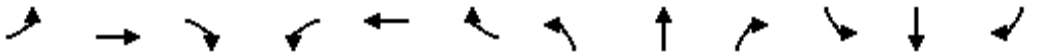
Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	48.1%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	1047	651	29	7	26
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	18	1163	723	32	8	29
Pedestrians		12	20		17	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	2		1	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)		372	400			
pX, platoon unblocked						
vC, conflicting volume	773				1394	407
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	773				1394	407
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				94	95
cM capacity (veh/h)	840				128	585

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	406	776	482	273	37
Volume Left	18	0	0	0	8
Volume Right	0	0	0	32	29
cSH	840	1700	1700	1700	604
Volume to Capacity	0.02	0.46	0.28	0.16	0.06
Queue Length (ft)	2	0	0	0	5
Control Delay (s)	0.7	0.0	0.0	0.0	16.4
Lane LOS	A				C
Approach Delay (s)	0.2		0.0		16.4
Approach LOS					C

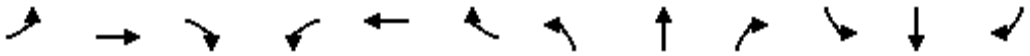
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	51.0%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	23	923	22	47	626	6	0	0	85	0	0	11
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	26	1026	24	52	696	7	0	0	94	0	0	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		359			243							
pX, platoon unblocked	0.82						0.82	0.82		0.82	0.82	0.82
vC, conflicting volume	702			1050			1553	1896	525	1462	1904	351
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	414			1050			1454	1872	525	1342	1883	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			92			100	100	81	100	100	99
cM capacity (veh/h)	946			671			69	53	502	69	53	893

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	26	684	366	52	464	239	94	12
Volume Left	26	0	0	52	0	0	0	0
Volume Right	0	0	24	0	0	7	94	12
cSH	946	1700	1700	671	1700	1700	502	893
Volume to Capacity	0.03	0.40	0.22	0.08	0.27	0.14	0.19	0.01
Queue Length (ft)	2	0	0	6	0	0	17	1
Control Delay (s)	8.9	0.0	0.0	10.8	0.0	0.0	13.8	9.1
Lane LOS	A			B			B	A
Approach Delay (s)	0.2			0.7			13.8	9.1
Approach LOS							B	A

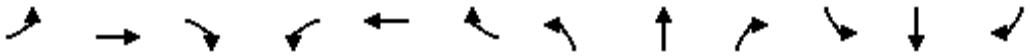
Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	41.6%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	3	108	9	6	196	9	0	0	0	8	0	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	3	120	10	7	218	10	0	0	0	9	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		393			875							
pX, platoon unblocked												
vC, conflicting volume	228			130			372	373	125	368	373	223
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	228			130			372	373	125	368	373	223
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	98	100	99
cM capacity (veh/h)	1340			1455			578	554	926	585	554	817

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	133	234	0	13
Volume Left	3	7	0	9
Volume Right	10	10	0	4
cSH	1340	1455	1700	646
Volume to Capacity	0.00	0.00	0.00	0.02
Queue Length (ft)	0	0	0	2
Control Delay (s)	0.2	0.3	0.0	10.7
Lane LOS	A	A	A	B
Approach Delay (s)	0.2	0.3	0.0	10.7
Approach LOS			A	B

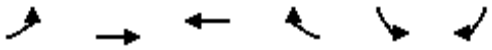
Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	23.6%	ICU Level of Service	A	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	18	942	39	23	613	27	3	4	19	2	4	18
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	20	1047	43	26	681	30	3	4	21	2	4	20
Pedestrians		6			1			17			16	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		351			383							
pX, platoon unblocked												
vC, conflicting volume	727			1107			1545	1904	563	1351	1910	378
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	727			1107			1545	1904	563	1351	1910	378
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			96			95	93	95	98	93	97
cM capacity (veh/h)	874			629			67	63	468	92	63	614

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	543	567	366	371	29	27
Volume Left	20	0	26	0	3	2
Volume Right	0	43	0	30	21	20
cSH	874	1700	629	1700	175	209
Volume to Capacity	0.02	0.33	0.04	0.22	0.17	0.13
Queue Length (ft)	2	0	3	0	14	11
Control Delay (s)	0.6	0.0	1.3	0.0	29.6	24.7
Lane LOS	A		A		D	C
Approach Delay (s)	0.3		0.6		29.6	24.7
Approach LOS					D	C

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	48.3%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	20	896	622	17	14	45
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	22	996	691	19	16	50
Pedestrians		2				
Lane Width (ft)		12.0				
Walking Speed (ft/s)		4.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		376				
pX, platoon unblocked					0.78	
vC, conflicting volume	710				1243	357
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	710				1026	357
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				91	92
cM capacity (veh/h)	899				177	644

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	354	664	461	249	66
Volume Left	22	0	0	0	16
Volume Right	0	0	0	19	50
cSH	899	1700	1700	1700	397
Volume to Capacity	0.02	0.39	0.27	0.15	0.17
Queue Length (ft)	2	0	0	0	15
Control Delay (s)	0.8	0.0	0.0	0.0	15.9
Lane LOS	A				C
Approach Delay (s)	0.3		0.0		15.9
Approach LOS					C

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	45.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	902	38	27	640	5	14
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1002	42	30	711	6	16
Pedestrians	2				2	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	0				0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	286					
pX, platoon unblocked			0.77		0.77	0.77
vC, conflicting volume			1046		1443	524
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			760		1275	81
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		95	98
cM capacity (veh/h)			661		118	744

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	668	376	267	474	21
Volume Left	0	0	30	0	6
Volume Right	0	42	0	0	16
cSH	1700	1700	661	1700	311
Volume to Capacity	0.39	0.22	0.05	0.28	0.07
Queue Length (ft)	0	0	4	0	5
Control Delay (s)	0.0	0.0	1.7	0.0	17.4
Lane LOS			A		C
Approach Delay (s)	0.0		0.6		17.4
Approach LOS					C

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	855	37	42	625	21	46
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	950	41	47	694	23	51
Pedestrians	21			13	10	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			1	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	616			1277		
pX, platoon unblocked			0.80		0.80	0.80
vC, conflicting volume			1001		1442	519
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			753		1304	151
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		79	93
cM capacity (veh/h)			688		113	687

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	633	358	278	463	74
Volume Left	0	0	47	0	23
Volume Right	0	41	0	0	51
cSH	1700	1700	688	1700	264
Volume to Capacity	0.37	0.21	0.07	0.27	0.28
Queue Length (ft)	0	0	5	0	28
Control Delay (s)	0.0	0.0	2.5	0.0	23.9
Lane LOS			A		C
Approach Delay (s)	0.0		0.9		23.9
Approach LOS					C

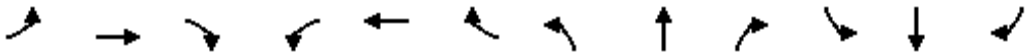
Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	46.2%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	0.95			1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			1.00
Frt	1.00	0.98		1.00	0.97			1.00	0.97			1.00
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95
Satd. Flow (prot)	1703	3288		1703	3280			1703	3254			1703
Flt Permitted	0.95	1.00		0.95	1.00			0.32	1.00			0.28
Satd. Flow (perm)	1703	3288		1703	3280			578	3254			494
Volume (vph)	144	571	107	118	407	88	2	127	439	128	7	217
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	160	634	119	131	452	98	2	141	488	142	8	241
Lane Group Flow (vph)	160	753	0	131	550	0	0	143	630	0	0	249
Confl. Peds. (#/hr)			79			67				52		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			custom	Prot			custom	Prot
Protected Phases	5	2		1	6			3	8			7
Permitted Phases							3				7	
Actuated Green, G (s)	10.0	26.9		8.0	24.9			11.0	22.1			13.1
Effective Green, g (s)	11.4	28.8		9.4	26.8			12.4	24.0			14.5
Actuated g/C Ratio	0.13	0.32		0.11	0.30			0.14	0.27			0.16
Clearance Time (s)	4.4	4.9		4.4	4.9			4.4	4.9			4.4
Vehicle Extension (s)	3.0	2.0		3.0	2.0			3.0	3.3			2.0
Lane Grp Cap (vph)	219	1068		180	991			81	880			81
v/s Ratio Prot	c0.09	c0.23		0.08	0.17				c0.19			
v/s Ratio Perm								0.25				c0.50
v/c Ratio	0.73	0.71		0.73	0.55			1.77	0.72			3.07
Uniform Delay, d1	37.2	26.2		38.4	26.0			38.2	29.3			37.1
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00
Incremental Delay, d2	11.8	1.7		13.7	0.4			389.7	2.9			965.2
Delay (s)	49.0	28.0		52.1	26.3			427.9	32.1			1002.3
Level of Service	D	C		D	C			F	C			F
Approach Delay (s)		31.7			31.3				105.3			
Approach LOS		C			C				F			

Intersection Summary			
HCM Average Control Delay	127.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	88.7	Sum of lost time (s)	9.0
Intersection Capacity Utilization	94.0%	ICU Level of Service	E
c Critical Lane Group			

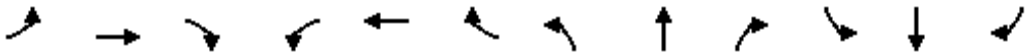
Movement	SBT	SBR
Lane Configurations		
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	3.0	
Lane Util. Factor	0.95	
Frpb, ped/bikes	0.99	
Flpb, ped/bikes	1.00	
Frt	0.97	
Flt Protected	1.00	
Satd. Flow (prot)	3294	
Flt Permitted	1.00	
Satd. Flow (perm)	3294	
Volume (vph)	350	71
Peak-hour factor, PHF	0.90	0.90
Adj. Flow (vph)	389	79
Lane Group Flow (vph)	468	0
Confl. Peds. (#/hr)		35
Heavy Vehicles (%)	6%	6%
Turn Type		
Protected Phases	4	
Permitted Phases		
Actuated Green, G (s)	24.2	
Effective Green, g (s)	26.1	
Actuated g/C Ratio	0.29	
Clearance Time (s)	4.9	
Vehicle Extension (s)	2.9	
Lane Grp Cap (vph)	969	
v/s Ratio Prot	0.14	
v/s Ratio Perm		
v/c Ratio	0.48	
Uniform Delay, d1	25.7	
Progression Factor	1.00	
Incremental Delay, d2	0.4	
Delay (s)	26.1	
Level of Service	C	
Approach Delay (s)	365.1	
Approach LOS	F	

Intersection Summary



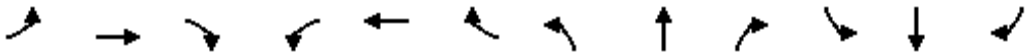
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			0.98			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.92			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1703	3394		1703	3339			1622			1715	
Flt Permitted	0.95	1.00		0.95	1.00			0.97			0.78	
Satd. Flow (perm)	1703	3394		1703	3339			1577			1356	
Volume (vph)	24	875	17	51	565	61	24	103	162	26	63	24
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	27	972	19	57	628	68	27	114	180	29	70	27
Lane Group Flow (vph)	27	991	0	57	696	0	0	321	0	0	126	0
Confl. Peds. (#/hr)			3			17			16			3
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	2.7	40.3		4.8	42.4			14.7			14.7	
Effective Green, g (s)	3.7	42.8		5.8	44.9			16.4			16.4	
Actuated g/C Ratio	0.05	0.58		0.08	0.61			0.22			0.22	
Clearance Time (s)	4.0	5.5		4.0	5.5			4.7			4.7	
Vehicle Extension (s)	2.0	2.5		2.0	2.5			2.0			2.0	
Lane Grp Cap (vph)	85	1963		133	2026			349			301	
v/s Ratio Prot	0.02	c0.29		c0.03	0.21							
v/s Ratio Perm								c0.20			0.09	
v/c Ratio	0.32	0.50		0.43	0.34			0.92			0.42	
Uniform Delay, d1	33.9	9.3		32.5	7.2			28.2			24.7	
Progression Factor	1.00	1.00		0.74	1.56			1.00			1.00	
Incremental Delay, d2	0.8	0.9		0.8	0.4			27.9			0.3	
Delay (s)	34.7	10.2		24.8	11.8			56.1			25.1	
Level of Service	C	B		C	B			E			C	
Approach Delay (s)		10.9			12.7			56.1			25.1	
Approach LOS		B			B			E			C	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0			3.0			3.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.97			0.97	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		3366			3377			1670			1678	
Flt Permitted		0.92			0.91			0.97			0.98	
Satd. Flow (perm)		3109			3094			1670			1678	
Volume (vph)	28	899	54	17	595	22	52	16	17	50	24	24
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	31	999	60	19	661	24	58	18	19	56	27	27
Lane Group Flow (vph)	0	1090	0	0	704	0	0	95	0	0	110	0
Confl. Peds. (#/hr)			7			18			46			14
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		42.2			42.2			8.2			8.4	
Effective Green, g (s)		44.6			44.6			10.1			10.3	
Actuated g/C Ratio		0.60			0.60			0.14			0.14	
Clearance Time (s)		5.4			5.4			4.9			4.9	
Vehicle Extension (s)		2.7			2.8			2.0			2.0	
Lane Grp Cap (vph)		1874			1865			228			234	
v/s Ratio Prot								c0.06			c0.07	
v/s Ratio Perm		c0.35			0.23							
v/c Ratio		0.58			0.38			0.42			0.47	
Uniform Delay, d1		9.0			7.6			29.3			29.3	
Progression Factor		0.53			1.00			1.00			1.00	
Incremental Delay, d2		1.2			0.1			0.5			0.5	
Delay (s)		5.9			7.7			29.7			29.9	
Level of Service		A			A			C			C	
Approach Delay (s)		5.9			7.7			29.7			29.9	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.98		1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3386		1703	3318		1703	1754		1703	1712	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1703	3386		1703	3318		1703	1754		1703	1712	
Volume (vph)	115	824	24	33	547	65	53	133	16	100	180	63
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	128	916	27	37	608	72	59	148	18	111	200	70
Lane Group Flow (vph)	128	943	0	37	680	0	59	166	0	111	270	0
Confl. Peds. (#/hr)			14			36			18			8
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			Split			Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	7.3	29.4		3.9	26.0		9.6	9.6		15.0	15.0	
Effective Green, g (s)	8.3	31.4		4.9	28.0		11.1	11.1		16.0	16.0	
Actuated g/C Ratio	0.10	0.39		0.06	0.34		0.14	0.14		0.20	0.20	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.5	4.5		4.0	4.0	
Vehicle Extension (s)	2.0	2.2		2.0	2.1		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	174	1306		103	1141		232	239		335	337	
v/s Ratio Prot	c0.08	c0.28		0.02	0.20		0.03	c0.09		0.07	c0.16	
v/s Ratio Perm												
v/c Ratio	0.74	0.72		0.36	0.60		0.25	0.69		0.33	0.80	
Uniform Delay, d1	35.5	21.3		36.7	22.0		31.4	33.5		28.1	31.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	13.0	1.8		0.8	0.6		0.2	6.9		0.2	12.1	
Delay (s)	48.5	23.1		37.5	22.6		31.7	40.4		28.3	43.3	
Level of Service	D	C		D	C		C	D		C	D	
Approach Delay (s)		26.1			23.4			38.1			38.9	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	28.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	81.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.99		1.00	0.95		1.00	0.95	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.95		1.00	0.93	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3343			3350		1703	1618		1703	1586	
Flt Permitted		0.93			0.92		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3100			3082		1703	1618		1703	1586	
Volume (vph)	23	860	70	16	608	41	59	62	33	38	54	41
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	26	956	78	18	676	46	66	69	37	42	60	46
Lane Group Flow (vph)	0	1060	0	0	740	0	66	106	0	42	106	0
Confl. Peds. (#/hr)			35			40			54			49
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6								
Actuated Green, G (s)		39.5			39.5		7.9	7.9		7.9	7.9	
Effective Green, g (s)		42.0			42.0		10.1	10.1		10.1	10.1	
Actuated g/C Ratio		0.54			0.54		0.13	0.13		0.13	0.13	
Clearance Time (s)		5.5			5.5		5.2	5.2		5.2	5.2	
Vehicle Extension (s)		2.0			2.0		3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)		1659			1649		219	208		219	204	
v/s Ratio Prot							0.04	c0.07		0.02	c0.07	
v/s Ratio Perm		c0.34			0.24							
v/c Ratio		0.64			0.45		0.30	0.51		0.19	0.52	
Uniform Delay, d1		12.9			11.2		31.0	31.9		30.6	31.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			0.1		0.8	2.0		0.2	0.9	
Delay (s)		13.5			11.2		31.8	33.9		30.7	32.9	
Level of Service		B			B		C	C		C	C	
Approach Delay (s)		13.5			11.2			33.1			32.3	
Approach LOS		B			B			C			C	

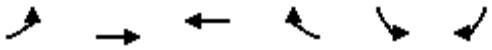
Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	16.3
Intersection Capacity Utilization	56.4%	ICU Level of Service	A
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.97		1.00	0.95		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3381		1703	3266		1703	1611		1703	1744	
Flt Permitted	0.34	1.00		0.18	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	618	3381		319	3266		1703	1611		1703	1744	
Volume (vph)	42	850	31	133	497	58	93	276	144	50	350	54
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	47	944	34	148	552	64	103	307	160	56	389	60
Lane Group Flow (vph)	47	978	0	148	616	0	103	467	0	56	449	0
Confl. Peds. (#/hr)			23			104			139			44
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	32.7	32.7		32.7	32.7		7.0	24.3		4.8	22.1	
Effective Green, g (s)	34.6	34.6		34.6	34.6		8.4	26.2		6.2	24.0	
Actuated g/C Ratio	0.46	0.46		0.46	0.46		0.11	0.34		0.08	0.32	
Clearance Time (s)	4.9	4.9		4.9	4.9		4.4	4.9		4.4	4.9	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	281	1539		145	1487		188	555		139	551	
v/s Ratio Prot		0.29			0.19		c0.06	c0.29		0.03	0.26	
v/s Ratio Perm	0.08			c0.46								
v/c Ratio	0.17	0.64		1.02	0.41		0.55	0.84		0.40	0.81	
Uniform Delay, d1	12.2	15.9		20.7	13.9		32.0	23.0		33.1	24.0	
Progression Factor	1.00	1.00		0.78	0.80		1.06	0.80		0.96	0.79	
Incremental Delay, d2	1.3	2.0		71.4	0.7		1.6	10.0		0.7	8.3	
Delay (s)	13.5	17.9		87.6	11.8		35.4	28.3		32.3	27.2	
Level of Service	B	B		F	B		D	C		C	C	
Approach Delay (s)		17.7			26.5			29.6			27.8	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	24.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	88.9%	ICU Level of Service	D
c Critical Lane Group			

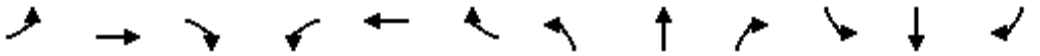
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0			3.0	3.0	
Lane Util. Factor	0.95			1.00	1.00	
Frpb, ped/bikes	0.98			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	3298			1792	1638	
Flt Permitted	1.00			1.00	0.97	
Satd. Flow (perm)	3298			1792	1638	
Volume (vph)	929	90	0	651	60	50
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1032	100	0	723	67	56
Lane Group Flow (vph)	1132	0	0	723	123	0
Confl. Peds. (#/hr)		98				
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type						
Protected Phases	2			2	4	
Permitted Phases						
Actuated Green, G (s)	59.2			59.2	8.3	
Effective Green, g (s)	60.7			60.7	9.3	
Actuated g/C Ratio	0.80			0.80	0.12	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	2.0			2.0	2.0	
Lane Grp Cap (vph)	2634			1431	200	
v/s Ratio Prot	0.34			c0.40	c0.08	
v/s Ratio Perm						
v/c Ratio	0.43			0.51	0.62	
Uniform Delay, d1	2.3			2.6	31.7	
Progression Factor	0.50			1.00	1.00	
Incremental Delay, d2	0.4			1.3	3.9	
Delay (s)	1.6			3.9	35.6	
Level of Service	A			A	D	
Approach Delay (s)	1.6			3.9	35.6	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	51.8%	ICU Level of Service	A
c Critical Lane Group			



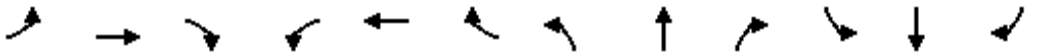
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.95	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.94	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3399	1763		1562	
Flt Permitted		0.91	1.00		0.97	
Satd. Flow (perm)		3104	1763		1562	
Volume (vph)	37	942	563	54	66	55
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	41	1047	626	60	73	61
Lane Group Flow (vph)	0	1088	686	0	134	0
Confl. Peds. (#/hr)				16		41
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type	Perm					
Protected Phases		2	2		4	
Permitted Phases	2					
Actuated Green, G (s)		56.6	56.6		10.5	
Effective Green, g (s)		58.5	58.5		12.4	
Actuated g/C Ratio		0.76	0.76		0.16	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		1.0	1.0		2.0	
Lane Grp Cap (vph)		2361	1341		252	
v/s Ratio Prot			c0.39		c0.09	
v/s Ratio Perm		0.35				
v/c Ratio		0.46	0.51		0.53	
Uniform Delay, d1		3.4	3.6		29.6	
Progression Factor		1.00	1.00		1.00	
Incremental Delay, d2		0.6	1.4		1.1	
Delay (s)		4.0	5.0		30.7	
Level of Service		A	A		C	
Approach Delay (s)		4.0	5.0		30.7	
Approach LOS		A	A		C	

Intersection Summary			
HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	76.9	Sum of lost time (s)	6.0
Intersection Capacity Utilization	64.9%	ICU Level of Service	B
c Critical Lane Group			



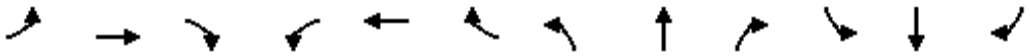
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.95		1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.98	1.00
Satd. Flow (prot)	1703	3359		1703	3383			1740	1452		1761	1462
Flt Permitted	0.38	1.00		0.23	1.00			0.97	1.00		0.98	1.00
Satd. Flow (perm)	680	3359		404	3383			1740	1452		1761	1462
Volume (vph)	23	796	53	100	519	18	75	49	176	38	69	16
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	26	884	59	111	577	20	83	54	196	42	77	18
Lane Group Flow (vph)	26	943	0	111	597	0	0	137	196	0	119	18
Confl. Peds. (#/hr)			23			14			28			10
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm			Perm			Split		Perm	Split		Perm
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6					3			4
Actuated Green, G (s)	38.8	38.8		38.8	38.8			12.0	12.0		10.5	10.5
Effective Green, g (s)	40.7	40.7		40.7	40.7			13.9	13.9		12.4	12.4
Actuated g/C Ratio	0.54	0.54		0.54	0.54			0.18	0.18		0.16	0.16
Clearance Time (s)	4.9	4.9		4.9	4.9			4.9	4.9		4.9	4.9
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	364	1799		216	1812			318	266		287	239
v/s Ratio Prot		c0.28			0.18			0.08			c0.07	
v/s Ratio Perm	0.04			0.27					c0.13			0.01
v/c Ratio	0.07	0.52		0.51	0.33			0.43	0.74		0.41	0.08
Uniform Delay, d1	8.5	11.4		11.3	10.0			27.5	29.3		28.5	26.9
Progression Factor	1.00	1.00		0.23	0.07			0.74	1.19		0.98	0.92
Incremental Delay, d2	0.4	1.1		2.7	0.2			0.3	8.6		0.4	0.0
Delay (s)	8.9	12.5		5.3	0.9			20.8	43.5		28.4	24.9
Level of Service	A	B		A	A			C	D		C	C
Approach Delay (s)		12.4			1.6			34.2			28.0	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
c Critical Lane Group			



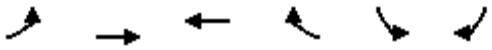
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0	3.0		3.0	3.0
Lane Util. Factor		0.95	1.00		0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00			1.00	0.94		1.00	0.96
Flpb, ped/bikes		1.00	1.00		1.00			1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00			1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00		0.98			0.96	1.00		0.99	1.00
Satd. Flow (prot)		3405	1524		3352			1731	1437		1846	1517
Flt Permitted		1.00	1.00		0.98			0.65	1.00		0.93	1.00
Satd. Flow (perm)		3405	1524		3352			1170	1437		1739	1517
Volume (vph)	4	761	234	245	553	4	121	23	242	17	78	5
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	846	260	272	614	4	134	26	269	19	87	6
Lane Group Flow (vph)	0	850	260	0	890	0	0	160	269	0	106	6
Confl. Peds. (#/hr)						2			30			20
Heavy Vehicles (%)	2%	6%	6%	6%	6%	2%	6%	2%	6%	2%	2%	2%
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	2	2		1	1			8			4	
Permitted Phases			2				8		8	4		4
Actuated Green, G (s)		32.0	32.0		17.5			13.0	13.0		13.0	13.0
Effective Green, g (s)		33.5	33.5		19.0			14.5	14.5		14.5	14.5
Actuated g/C Ratio		0.44	0.44		0.25			0.19	0.19		0.19	0.19
Clearance Time (s)		4.5	4.5		4.5			4.5	4.5		4.5	4.5
Vehicle Extension (s)		2.0	2.0		2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		1501	672		838			223	274		332	289
v/s Ratio Prot		c0.25			c0.27							
v/s Ratio Perm			0.17					0.14	c0.19		0.06	0.00
v/c Ratio		0.57	0.39		1.06			0.72	0.98		0.32	0.02
Uniform Delay, d1		15.8	14.3		28.5			28.8	30.6		26.5	25.0
Progression Factor		0.56	0.26		0.47			1.00	1.00		1.00	1.00
Incremental Delay, d2		1.4	1.5		43.5			8.8	48.9		0.2	0.0
Delay (s)		10.3	5.3		56.8			37.6	79.6		26.7	25.0
Level of Service		B	A		E			D	E		C	C
Approach Delay (s)		9.1			56.8			63.9			26.6	
Approach LOS		A			E			E			C	

Intersection Summary			
HCM Average Control Delay	35.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	C
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0			3.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			1.00	
Frpb, ped/bikes		1.00	1.00		1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.96			0.95	
Flt Protected		1.00	1.00		0.99			0.98			0.98	
Satd. Flow (prot)		3405	1524		3359			3180			1718	
Flt Permitted		1.00	1.00		0.99			0.77			0.98	
Satd. Flow (perm)		3405	1524		3359			2508			1718	
Volume (vph)	17	766	237	137	428	7	343	153	177	42	17	31
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	19	851	263	152	476	8	381	170	197	47	19	34
Lane Group Flow (vph)	0	870	263	0	636	0	0	748	0	0	100	0
Confl. Peds. (#/hr)						13			11			14
Heavy Vehicles (%)	2%	6%	6%	6%	6%	2%	6%	2%	6%	2%	2%	2%
Turn Type	Split		Free	Split			Perm			Perm		
Protected Phases	1	1		2	2			4			4	
Permitted Phases		1	Free		2		4			4	4	
Actuated Green, G (s)		18.5	76.0		24.5			19.5			19.5	
Effective Green, g (s)		20.0	76.0		26.0			21.0			21.0	
Actuated g/C Ratio		0.26	1.00		0.34			0.28			0.28	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		896	1524		1149			693			475	
v/s Ratio Prot		c0.26			c0.19						0.06	
v/s Ratio Perm			0.17					c0.30				
v/c Ratio		0.97	0.17		0.55			1.08			0.21	
Uniform Delay, d1		27.7	0.0		20.3			27.5			21.1	
Progression Factor		1.41	1.00		1.24			1.00			1.00	
Incremental Delay, d2		20.8	0.2		1.7			57.6			0.1	
Delay (s)		60.0	0.2		27.0			85.1			21.2	
Level of Service		E	A		C			F			C	
Approach Delay (s)		46.1			27.0			85.1			21.2	
Approach LOS		D			C			F			C	

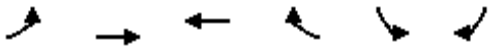
Intersection Summary			
HCM Average Control Delay	51.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	79.7%	ICU Level of Service	C
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	40	861	639	48	10	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	44	957	710	53	11	31
Pedestrians		21	13		7	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		2	1		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		776	1117			
pX, platoon unblocked					0.83	
vC, conflicting volume	770				1324	410
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	770				1186	410
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				92	95
cM capacity (veh/h)	848				143	583

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	363	638	473	290	42
Volume Left	44	0	0	0	11
Volume Right	0	0	0	53	31
cSH	848	1700	1700	1700	322
Volume to Capacity	0.05	0.38	0.28	0.17	0.13
Queue Length (ft)	4	0	0	0	11
Control Delay (s)	1.7	0.0	0.0	0.0	17.9
Lane LOS	A				C
Approach Delay (s)	0.6		0.0		17.9
Approach LOS					C

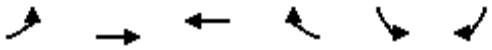
Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	57.4%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	872	676	57	23	41
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	18	969	751	63	26	46
Pedestrians		4	6		8	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		1136	757			
pX, platoon unblocked					0.90	
vC, conflicting volume	822				1317	419
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	822				1244	419
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				83	92
cM capacity (veh/h)	811				148	582

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	341	646	501	314	71
Volume Left	18	0	0	0	26
Volume Right	0	0	0	63	46
cSH	811	1700	1700	1700	283
Volume to Capacity	0.02	0.38	0.29	0.18	0.25
Queue Length (ft)	2	0	0	0	24
Control Delay (s)	0.7	0.0	0.0	0.0	21.9
Lane LOS	A				C
Approach Delay (s)	0.3		0.0		21.9
Approach LOS					C

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	49	889	668	36	14	65
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	54	988	742	40	16	72
Pedestrians		3	2		25	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			367			
pX, platoon unblocked						
vC, conflicting volume	807				1392	419
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	807				1392	419
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				87	87
cM capacity (veh/h)	809				123	575

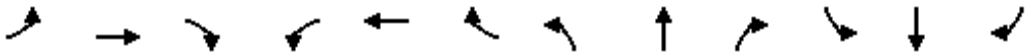
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	384	659	495	287	88
Volume Left	54	0	0	0	16
Volume Right	0	0	0	40	72
cSH	809	1700	1700	1700	349
Volume to Capacity	0.07	0.39	0.29	0.17	0.25
Queue Length (ft)	5	0	0	0	24
Control Delay (s)	2.1	0.0	0.0	0.0	18.8
Lane LOS	A				C
Approach Delay (s)	0.8		0.0		18.8
Approach LOS					C

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	63.0%	ICU Level of Service	B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	889	14	8	700	4	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	988	16	9	778	4	24
Pedestrians	3			2	40	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				297		
pX, platoon unblocked						
vC, conflicting volume			1043		1445	544
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1043		1445	544
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		96	95
cM capacity (veh/h)			652		119	472

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	659	345	268	519	29
Volume Left	0	0	9	0	4
Volume Right	0	16	0	0	24
cSH	1700	1700	652	1700	324
Volume to Capacity	0.39	0.20	0.01	0.31	0.09
Queue Length (ft)	0	0	1	0	7
Control Delay (s)	0.0	0.0	0.5	0.0	17.2
Lane LOS			A		C
Approach Delay (s)	0.0		0.2		17.2
Approach LOS					C

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		0.95	0.95			1.00	
Frpb, ped/bikes		0.99			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			1.00	
Frt		0.96			0.98		1.00	0.99			0.95	
Flt Protected		0.99			0.99		0.95	0.99			1.00	
Satd. Flow (prot)		1751			1807		1681	1721			1750	
Flt Permitted		0.95			0.97		0.95	0.99			1.00	
Satd. Flow (perm)		1678			1765		1681	1721			1750	
Volume (vph)	23	74	44	16	112	23	99	54	7	5	33	21
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	26	82	49	18	124	26	110	60	8	6	37	23
Lane Group Flow (vph)	0	157	0	0	168	0	87	91	0	0	66	0
Confl. Peds. (#/hr)			11			4			1			6
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		30.0			29.8		8.5	8.5			5.2	
Effective Green, g (s)		31.6			31.6		9.5	9.5			6.4	
Actuated g/C Ratio		0.56			0.56		0.17	0.17			0.11	
Clearance Time (s)		4.6			4.8		4.0	4.0			4.2	
Vehicle Extension (s)		2.0			2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		938			987		283	289			198	
v/s Ratio Prot							0.05	c0.05			c0.04	
v/s Ratio Perm		0.09			c0.10							
v/c Ratio		0.17			0.17		0.31	0.31			0.33	
Uniform Delay, d1		6.1			6.1		20.6	20.6			23.1	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.0			0.0		0.2	0.2			0.4	
Delay (s)		6.1			6.1		20.8	20.9			23.4	
Level of Service		A			A		C	C			C	
Approach Delay (s)		6.1			6.1			20.9			23.4	
Approach LOS		A			A			C			C	

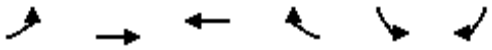
Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	56.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	33.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	889	42	22	659	6	101
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	988	47	24	732	7	112
Pedestrians					38	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	243			551		
pX, platoon unblocked			0.80		0.80	0.80
vC, conflicting volume			1072		1464	555
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			838		1328	189
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		94	82
cM capacity (veh/h)			622		111	639

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	659	376	269	488	119
Volume Left	0	0	24	0	7
Volume Right	0	47	0	0	112
cSH	1700	1700	622	1700	504
Volume to Capacity	0.39	0.22	0.04	0.29	0.24
Queue Length (ft)	0	0	3	0	23
Control Delay (s)	0.0	0.0	1.5	0.0	14.3
Lane LOS			A		B
Approach Delay (s)	0.0		0.5		14.3
Approach LOS					B

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	39	951	608	47	18	51
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	43	1057	676	52	20	57
Pedestrians					63	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					5	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		393	401			
pX, platoon unblocked					0.82	
vC, conflicting volume	791				1380	427
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	791				1240	427
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				84	90
cM capacity (veh/h)	794				124	551

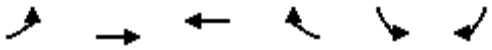
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	396	704	450	277	77
Volume Left	43	0	0	0	20
Volume Right	0	0	0	52	57
cSH	794	1700	1700	1700	291
Volume to Capacity	0.05	0.41	0.26	0.16	0.26
Queue Length (ft)	4	0	0	0	26
Control Delay (s)	1.7	0.0	0.0	0.0	21.7
Lane LOS	A				C
Approach Delay (s)	0.6		0.0		21.7
Approach LOS					C

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	57.0%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	870	62	20	624	23	63
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	967	69	22	693	26	70
Pedestrians				1	52	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	4	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	523			271		
pX, platoon unblocked			0.85		0.85	0.85
vC, conflicting volume			1088		1444	571
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			927		1347	320
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		78	87
cM capacity (veh/h)			607		114	554

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	644	391	253	462	96
Volume Left	0	0	22	0	26
Volume Right	0	69	0	0	70
cSH	1700	1700	607	1700	272
Volume to Capacity	0.38	0.23	0.04	0.27	0.35
Queue Length (ft)	0	0	3	0	38
Control Delay (s)	0.0	0.0	1.4	0.0	25.2
Lane LOS			A		D
Approach Delay (s)	0.0		0.5		25.2
Approach LOS					D

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	0.98		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.98		0.96	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3390	1730		1645	
Flt Permitted		0.86	1.00		0.97	
Satd. Flow (perm)		2939	1730		1645	
Volume (vph)	56	866	620	91	157	68
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	62	962	689	101	174	76
Lane Group Flow (vph)	0	1024	790	0	250	0
Confl. Peds. (#/hr)	58			58	13	6
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type	Perm					
Protected Phases		2	6		4	
Permitted Phases	2					
Actuated Green, G (s)		52.4	52.4		13.8	
Effective Green, g (s)		54.3	54.3		15.7	
Actuated g/C Ratio		0.71	0.71		0.21	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		2.0	2.0		2.0	
Lane Grp Cap (vph)		2100	1236		340	
v/s Ratio Prot			c0.46		c0.15	
v/s Ratio Perm		0.35				
v/c Ratio		0.49	0.64		0.74	
Uniform Delay, d1		4.8	5.7		28.2	
Progression Factor		0.26	0.64		1.00	
Incremental Delay, d2		0.6	2.3		6.9	
Delay (s)		1.9	5.9		35.2	
Level of Service		A	A		D	
Approach Delay (s)		1.9	5.9		35.2	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	7.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	95.9%	ICU Level of Service	E
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	922	76	0	688	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1024	84	0	764	0	0
Pedestrians					120	
Lane Width (ft)					0.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	259			90		
pX, platoon unblocked			0.79		0.87	0.79
vC, conflicting volume			1229		1951	674
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1025		1493	323
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			542		101	536

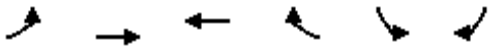
Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	683	426	764
Volume Left	0	0	0
Volume Right	0	84	0
cSH	1700	1700	1700
Volume to Capacity	0.40	0.25	0.45
Queue Length (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		0.0
Approach LOS			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	43.6%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	868	96	0	617	0	80
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	964	107	0	686	0	89
Pedestrians				4	63	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	5	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	150			636		
pX, platoon unblocked			0.89		0.87	0.89
vC, conflicting volume			1134		1766	603
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1031		1573	437
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	82
cM capacity (veh/h)			577		85	484

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	643	428	686	89
Volume Left	0	0	0	0
Volume Right	0	107	0	89
cSH	1700	1700	1700	484
Volume to Capacity	0.38	0.25	0.40	0.18
Queue Length (ft)	0	0	0	17
Control Delay (s)	0.0	0.0	0.0	14.1
Lane LOS				B
Approach Delay (s)	0.0		0.0	14.1
Approach LOS				B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	47.3%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	30	895	595	15	22	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	33	994	661	17	24	27
Pedestrians		2			6	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		370	416			
pX, platoon unblocked	0.83				0.86	0.83
vC, conflicting volume	684				1239	677
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	619				1090	611
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				86	93
cM capacity (veh/h)	802				175	364

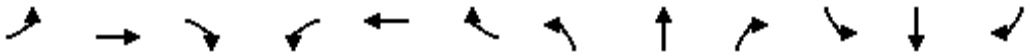
Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	365	663	678	51
Volume Left	33	0	0	24
Volume Right	0	0	17	27
cSH	802	1700	1700	240
Volume to Capacity	0.04	0.39	0.40	0.21
Queue Length (ft)	3	0	0	20
Control Delay (s)	1.3	0.0	0.0	24.0
Lane LOS	A			C
Approach Delay (s)	0.5		0.0	24.0
Approach LOS				C

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	48.7%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	860	56	0	610	0	11
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	956	62	0	678	0	12
Pedestrians	2				8	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	0				1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	490			296		
pX, platoon unblocked			0.97		0.86	0.97
vC, conflicting volume			1026		1674	517
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			993		1689	466
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	98
cM capacity (veh/h)			677		74	527

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	637	381	678	12
Volume Left	0	0	0	0
Volume Right	0	62	0	12
cSH	1700	1700	1700	527
Volume to Capacity	0.37	0.22	0.40	0.02
Queue Length (ft)	0	0	0	2
Control Delay (s)	0.0	0.0	0.0	12.0
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.0
Approach LOS				B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	39.0%	ICU Level of Service	A

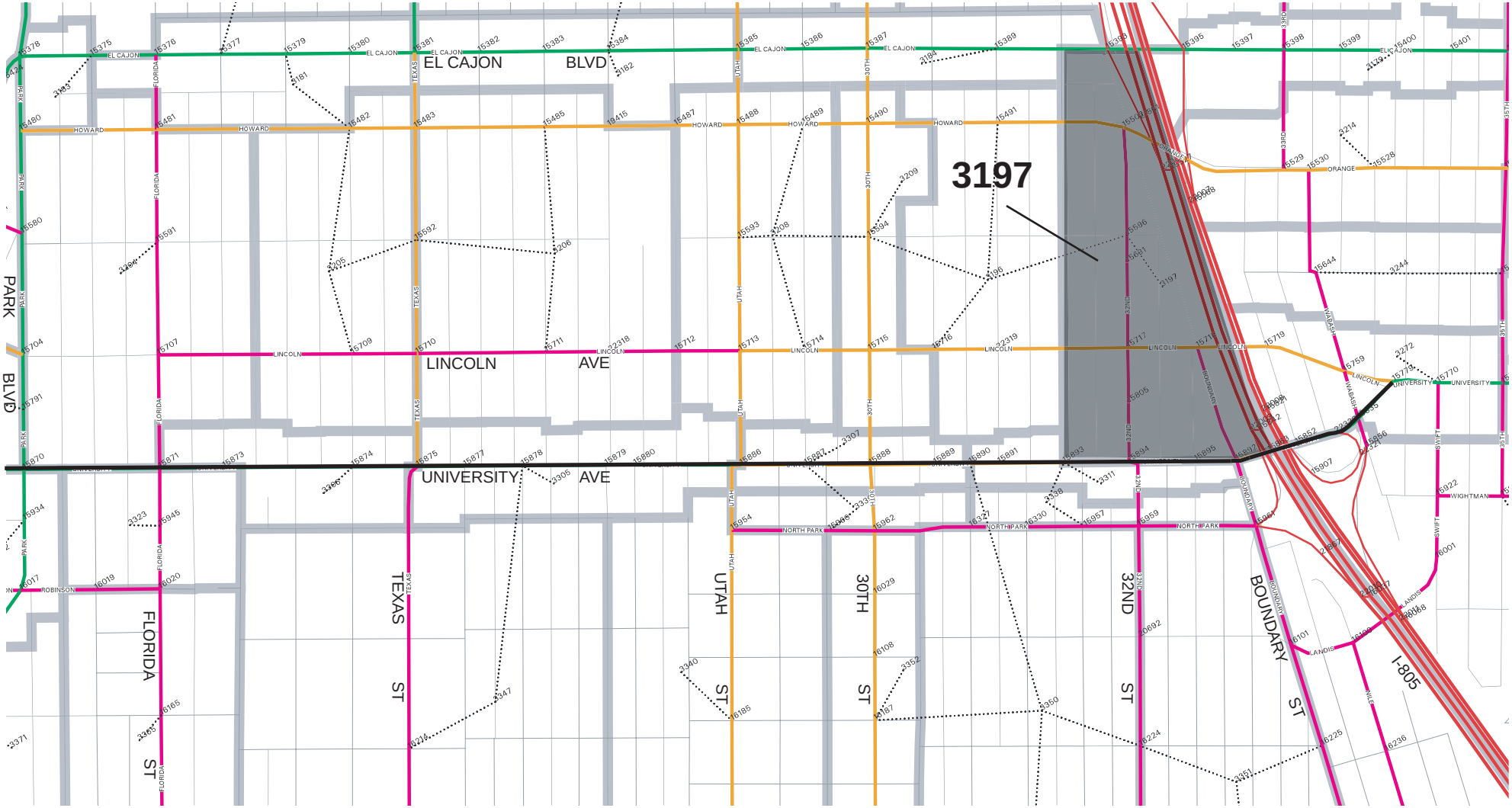


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	213	29	304	203	472	29	0	104	407	64	63
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	237	32	338	226	524	32	0	116	452	71	70

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	269	563	524	148	593
Volume Left (vph)	0	338	0	32	452
Volume Right (vph)	32	0	524	116	70
Hadj (s)	0.0	0.2	-0.6	-0.4	0.1
Departure Headway (s)	7.6	7.6	6.9	7.7	7.0
Degree Utilization, x	0.57	1.19	1.00	0.32	1.16
Capacity (veh/h)	457	470	524	446	502
Control Delay (s)	20.3	128.6	64.8	14.3	117.2
Approach Delay (s)	20.3	97.8		14.3	117.2
Approach LOS	C	F		B	F

Intersection Summary				
Delay		87.5		
HCM Level of Service		F		
Intersection Capacity Utilization	94.8%	ICU Level of Service		E

Appendix C
SANDAG Traffic Model Land Use Data



LEGEND:

- Existing Roadway
- Series 10 Traffic Analysis Zone

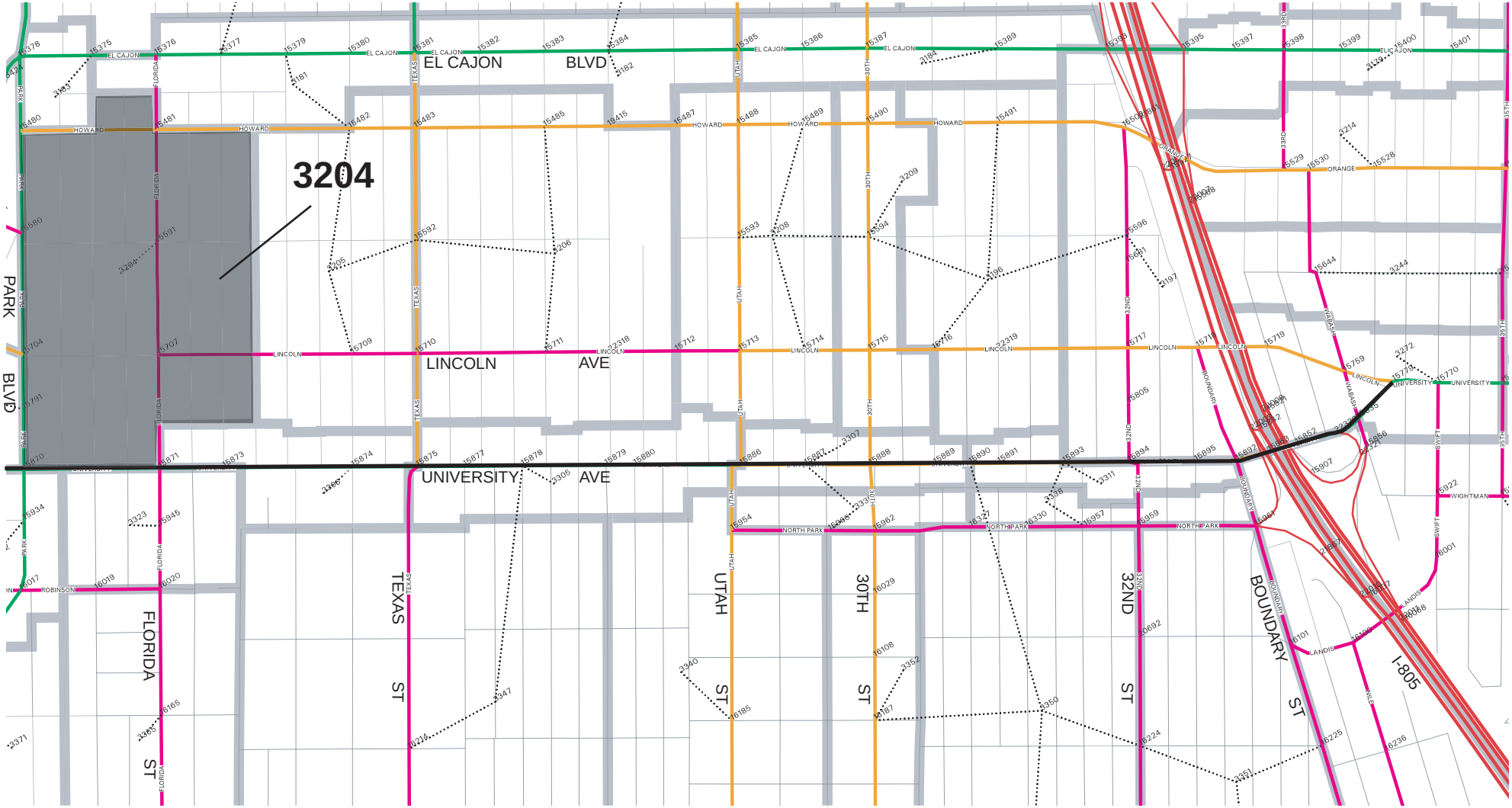
NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3197

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3197	101	SINGLE FAMILY	DU	98	1,208	801	83	1,070	710	**-15**	**-138**	**-91**
3197	102	MULTI-FAMILY	DU	510	4,309	2,904	979	8,638	5,796	**+469**	**+4,329**	**+2,892**
3197	4112	RIGHT-OF-WAY	ACRE	26.3	0	0	26.3	0	0	**+0.0**	**+0**	**+0**
3197	4113	COMMUNICATION OR UTILITY	ACRE	0.7	3	2	0.7	3	2	**+0.0**	**+0**	**+0**
3197	4114	PARKING	ACRE	1.2	0	0	0	0	0	**-1.2**	**+0**	**+0**
3197	5003	COMMUNITY COMMERCIAL	ACRE	0	0	0	0.5	578	401	**+0.5**	**+578**	**+401**
3197	5007	STREETFRONT COMMERCIAL	ACRE	1	1,328	955	1	1,446	1,033	**+0.0**	**+118**	**+78**
3197	6001	HIGH RISE OFFICE	ACRE	0.5	1,616	1,296	0.5	1,661	1,321	**+0.0**	**+45**	**+25**
3197	6105	FIRE OR POLICE STATION	SITE	1	361	267	1	391	286	**+0**	**+30**	**+19**
3197	6509	OTHER HEALTH CARE	ACRE	1.2	641	455	1.2	709	498	**+0.0**	**+68**	**+43**
3197 Total					**9,466**	**6,680**		**14,496**	**10,047**		**+5,030**	**+3,367**



LEGEND:

Existing Roadway

Series 10 Traffic Analysis Zone

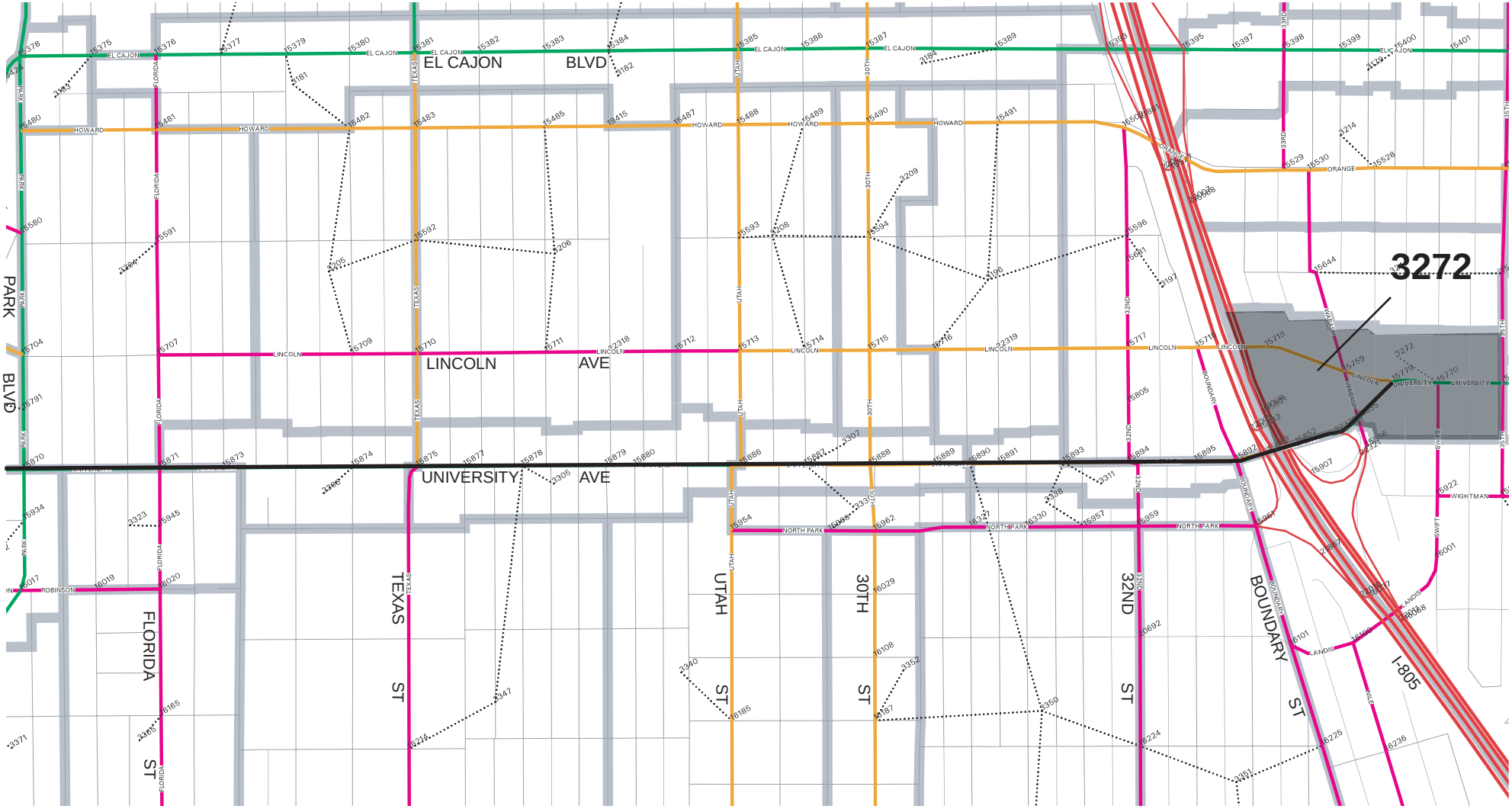
NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3204

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3204	101	SINGLE FAMILY	DU	241	2,970	1,970	210	2,708	1,797	**-31**	**-262**	**-173**
3204	102	MULTI-FAMILY	DU	1256	10,613	7,152	1769	15,607	10,473	**+513**	**+4,994**	**+3,321**
3204	103	MOBILE HOME PARK	DU	2	13	9	2	14	9	**+0**	**+1**	**+0**
3204	1409	OTHER GROUP QUARTERS	ACRE	1.2	6	5	1.2	7	5	**+0.0**	**+1**	**+0**
3204	4112	RIGHT-OF-WAY	ACRE	22.2	0	0	22.2	0	0	**+0.0**	**+0**	**+0**
3204	4114	PARKING	ACRE	0.9	0	0	0	0	0	**-0.9**	**+0**	**+0**
3204	5004	NEIGHBORHOOD COMMERCIAL	ACRE	0.8	1,272	885	1.5	2,467	1,711	**+0.7**	**+1,195**	**+826**
3204	5007	STREETFRONT COMMERCIAL	ACRE	0.6	841	605	0.6	916	655	**+0.0**	**+75**	**+50**
3204	6102	CHURCH	ACRE	1.1	58	40	1.1	65	45	**+0.0**	**+7**	**+5**
3204	6103	LIBRARY	ACRE	0.2	84	62	0.2	91	67	**+0.0**	**+7**	**+5**
3204	6509	OTHER HEALTH CARE	ACRE	0.4	222	158	0.4	245	172	**+0.0**	**+23**	**+14**
3204	6806	ELEMENTARY SCHOOL	SITE	1	1,708	746	1	1,763	804	**+0**	**+55**	**+58**
3204	9500	UNDER CONTRUCTION	ACRE	0.4	2	2	0	0	0	**-0.4**	**-2**	**-2**
3204 Total					**17,789**	**11,634**		**23,883**	**15,738**		**+6,094**	**+4,104**



LEGEND:

- Existing Roadway
- Series 10 Traffic Analysis Zone

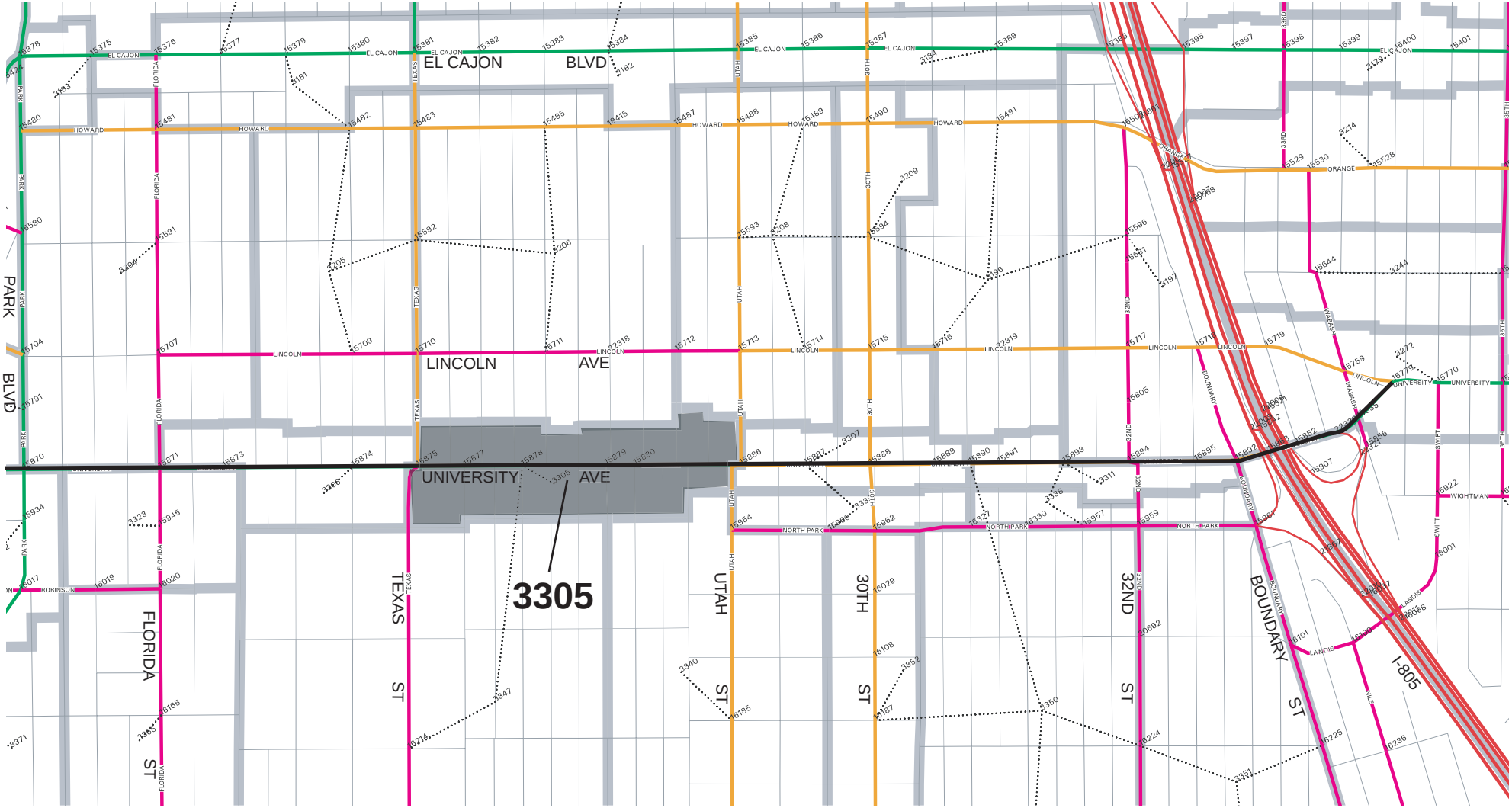
NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3272

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3272	101	SINGLE FAMILY	DU	55	678	450	49	632	419	**-6**	**-46**	**-31**
3272	102	MULTI-FAMILY	DU	225	1,901	1,281	412	3,635	2,440	**+187**	**+1,734**	**+1,159**
3272	4112	RIGHT-OF-WAY	ACRE	11.3	0	0	11.3	0	0	**+0.0**	**+0**	**+0**
3272	5007	STREETFRONT COMMERCIAL	ACRE	2.1	2,822	2,028	2.1	3,073	2,196	**+0.0**	**+251**	**+168**
3272	5009	OTHER COMMERCIAL	ACRE	1.5	207	149	1.5	226	162	**+0.0**	**+19**	**+13**
3272	9101	VACANT	ACRE	0.1	0	0	0.1	0	0	**+0.0**	**+0**	**+0**
3272 Total					**5,608**	**3,908**		**7,566**	**5,217**		**+1,958**	**+1,309**



LEGEND:

- Existing Roadway
- Series 10 Traffic Analysis Zone

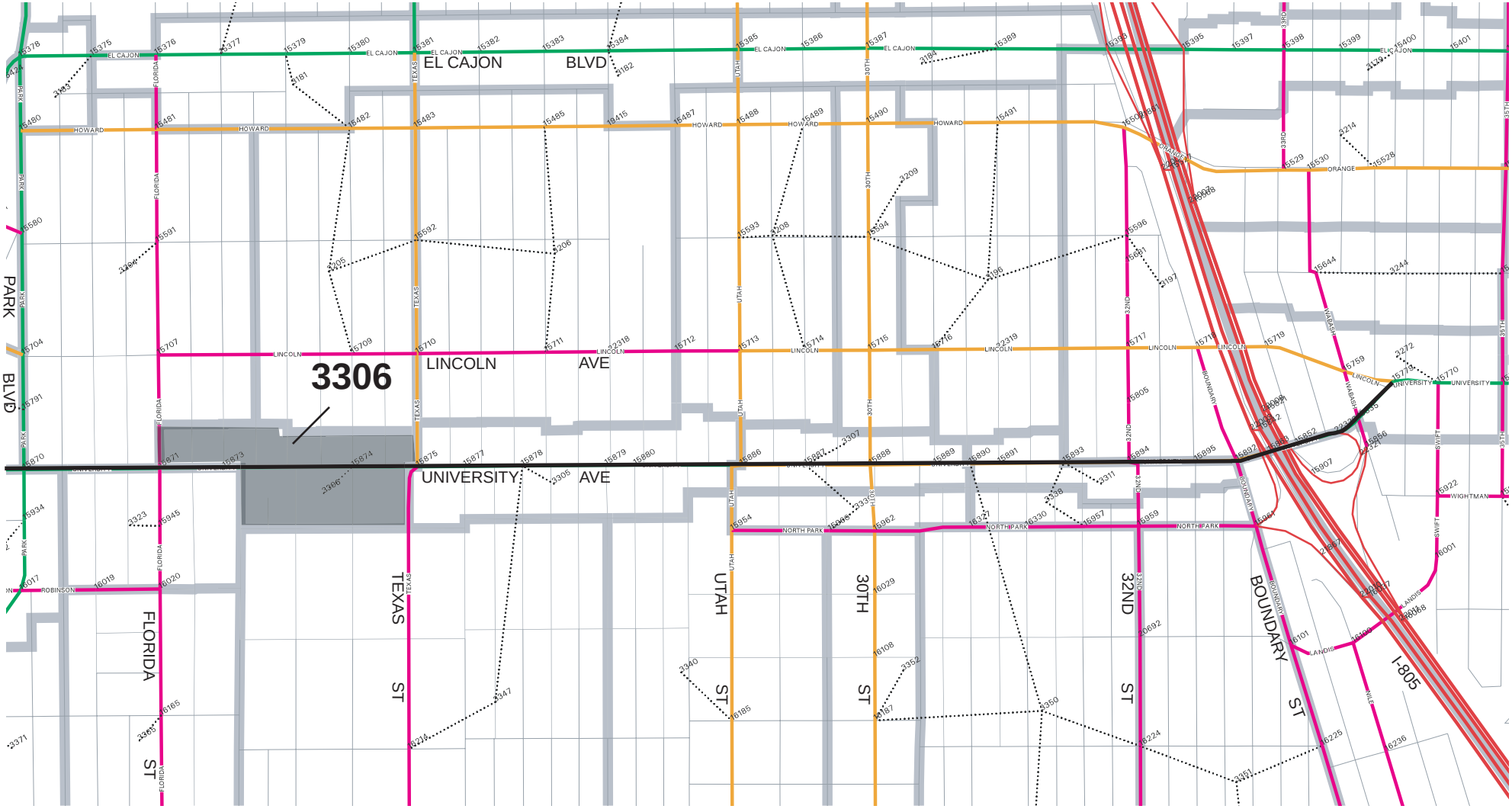
NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3305

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3305	101	SINGLE FAMILY	DU	59	727	482	54	695	461	**-5**	**-32**	**-21**
3305	102	MULTI-FAMILY	DU	277	2,341	1,578	753	6,643	4,458	**+476**	**+4,302**	**+2,880**
3305	103	MOBILE HOME PARK	DU	1	7	5	1	7	5	**+0**	**+0**	**+0**
3305	4112	RIGHT-OF-WAY	ACRE	9.7	0	0	9.7	0	0	**+0.0**	**+0**	**+0**
3305	4114	PARKING	ACRE	0.4	0	0	0	0	0	**-0.4**	**+0**	**+0**
3305	5004	NEIGHBORHOOD COMMERCIAL	ACRE	0	0	0	0.2	419	291	**+0.2**	**+419**	**+291**
3305	5007	STREETFRONT COMMERCIAL	ACRE	5.1	6,943	4,990	5.1	7,562	5,404	**+0.0**	**+619**	**+414**
3305	6001	HIGH RISE OFFICE	ACRE	0.5	1,586	1,272	0.5	1,630	1,296	**+0.0**	**+44**	**+24**
3305	6002	LOW RISE OFFICE	ACRE	0.2	45	35	0.2	47	36	**+0.0**	**+2**	**+1**
3305	6102	CHURCH	ACRE	0.4	22	15	0.4	25	17	**+0.0**	**+3**	**+2**
3305 Total					**11,671**	**8,377**		**17,028**	**11,968**		**+5,357**	**+3,591**



LEGEND:

- Existing Roadway
- Series 10 Traffic Analysis Zone

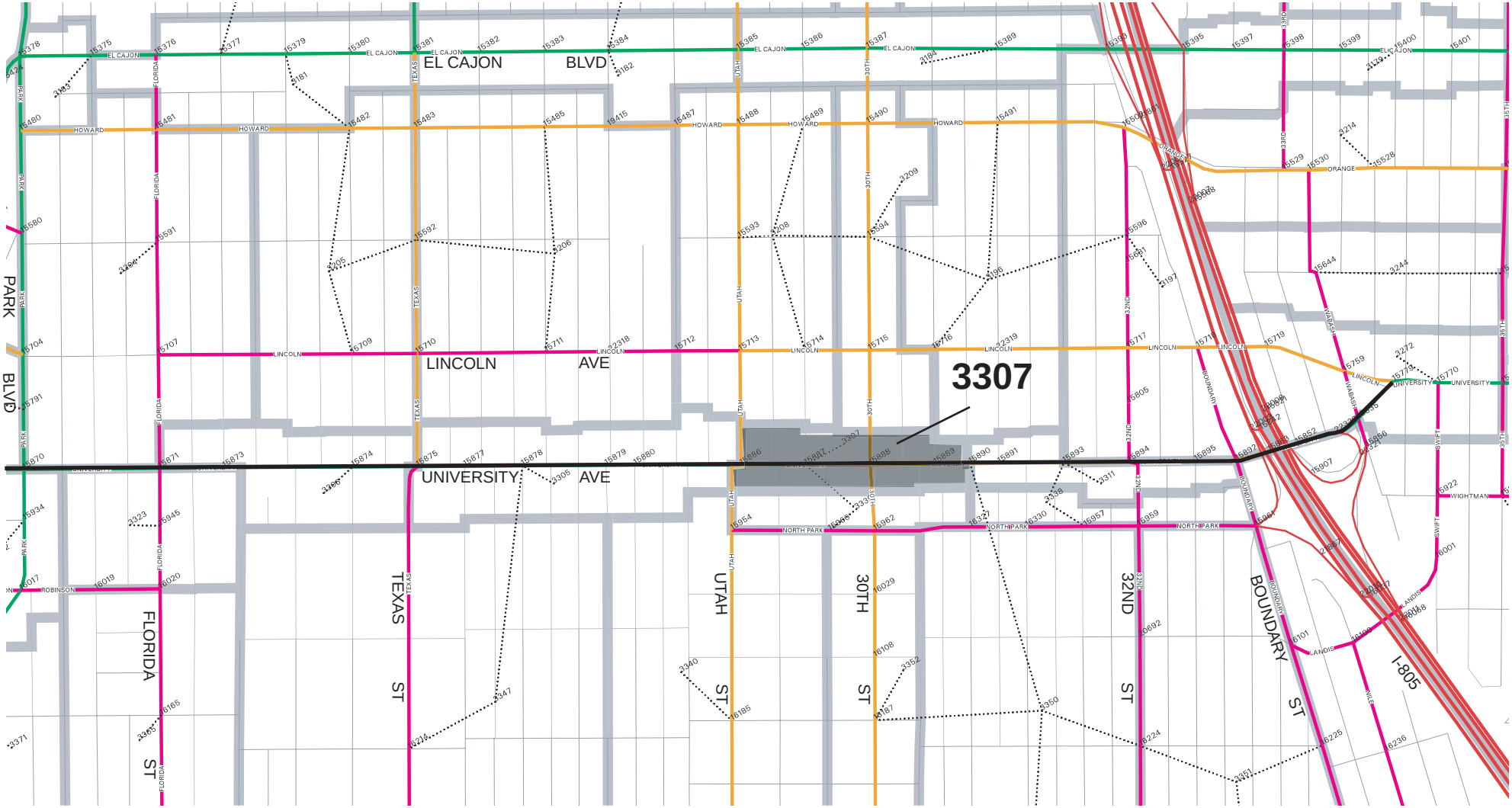
NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3306

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3306	101	SINGLE FAMILY	DU	39	480	318	33	425	282	**-6**	**-55**	**-36**
3306	102	MULTI-FAMILY	DU	133	1,124	758	488	4,306	2,890	**+355**	**+3,182**	**+2,132**
3306	4112	RIGHT-OF-WAY	ACRE	6	0	0	6	0	0	**+0.0**	**+0**	**+0**
3306	4114	PARKING	ACRE	0.2	0	0	0	0	0	**-0.2**	**+0**	**+0**
3306	5004	NEIGHBORHOOD COMMERCIAL	ACRE	1.9	2,871	1,998	2	3,443	2,387	**+0.1**	**+572**	**+389**
3306	5006	AUTO COMMERCIAL	ACRE	0.5	264	184	0.5	289	200	**+0.0**	**+25**	**+16**
3306	5007	STREETFRONT COMMERCIAL	ACRE	1.6	2,188	1,573	1.6	2,382	1,702	**+0.0**	**+194**	**+129**
3306	5009	OTHER COMMERCIAL	ACRE	0.2	20	15	0.2	22	16	**+0.0**	**+2**	**+1**
3306	7210	OTHER RECREATION	ACRE	0.2	1	1	0.2	1	1	**+0.0**	**+0**	**+0**
3306	9101	VACANT	ACRE	0.3	0	0	0	0	0	**-0.3**	**+0**	**+0**
3306 Total					**6,948**	**4,847**		**10,868**	**7,478**		**+3,920**	**+2,631**



LEGEND:

- Existing Roadway
- Series 10 Traffic Analysis Zone

NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3307

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3307	101	SINGLE FAMILY	DU	18	222	147	15	193	128	**-3**	**-29**	**-19**
3307	102	MULTI-FAMILY	DU	45	381	257	397	3,503	2,351	**+352**	**+3,122**	**+2,094**
3307	4112	RIGHT-OF-WAY	ACRE	5.3	0	0	5.3	0	0	**+0.0**	**+0**	**+0**
3307	4114	PARKING	ACRE	0.3	0	0	0	0	0	**-0.3**	**+0**	**+0**
3307	5003	COMMUNITY COMMERCIAL	ACRE	0	0	0	0.2	174	120	**+0.2**	**+174**	**+120**
3307	5007	STREETFRONT COMMERCIAL	ACRE	4.8	6,468	4,649	4.8	7,045	5,035	**+0.0**	**+577**	**+386**
3307	5009	OTHER COMMERCIAL	ACRE	0.2	21	15	0.2	23	17	**+0.0**	**+2**	**+2**
3307	6002	LOW RISE OFFICE	ACRE	0.3	94	74	0.3	98	76	**+0.0**	**+4**	**+2**
3307 Total					**7,186**	**5,142**		**11,036**	**7,727**		**+3,850**	**+2,585**

LEGEND:

Existing Roadway

Series 10 Traffic Analysis Zone

NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3311

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3311	101	SINGLE FAMILY	DU	1	12	8	1	13	8	**+0**	**+1**	**+0**
3311	102	MULTI-FAMILY	DU	19	161	108	370	3,265	2,191	**+351**	**+3,104**	**+2,083**
3311	4112	RIGHT-OF-WAY	ACRE	3.5	0	0	3.5	0	0	**+0.0**	**+0**	**+0**
3311	4113	COMMUNICATION OR UTILITY	ACRE	0.2	1	0	0.2	0	0	**+0.0**	**-1**	**+0**
3311	5004	NEIGHBORHOOD COMMERCIAL	ACRE	1.2	1,877	1,306	1.2	2,068	1,434	**+0.0**	**+191**	**+128**
3311	5007	STREETFRONT COMMERCIAL	ACRE	3.5	4,714	3,388	3.5	5,133	3,668	**+0.0**	**+419**	**+280**
3311	5009	OTHER COMMERCIAL	ACRE	0.1	17	12	0.1	19	14	**+0.0**	**+2**	**+2**
3311 Total					**6,782**	**4,822**		**10,498**	**7,315**		**+3,716**	**+2,493**

LEGEND:

Existing Roadway

Series 10 Traffic Analysis Zone

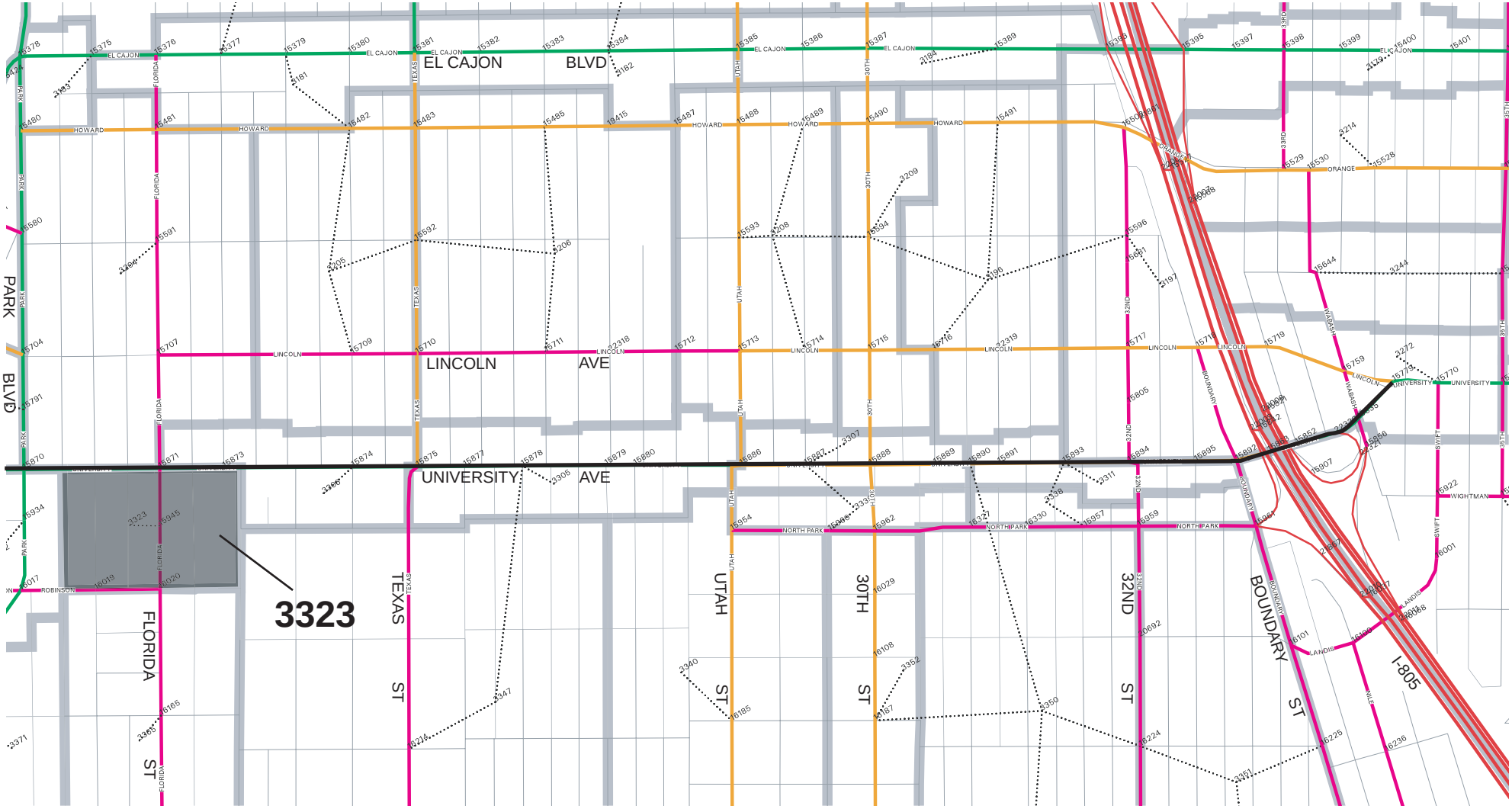
NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3322

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3322	101	SINGLE FAMILY	DU	30	370	245	30	387	257	**+0**	**+17**	**+12**
3322	102	MULTI-FAMILY	DU	154	1,301	876	338	2,982	2,001	**+184**	**+1,681**	**+1,125**
3322	4112	RIGHT-OF-WAY	ACRE	4.9	0	0	4.9	0	0	**+0.0**	**+0**	**+0**
3322	4114	PARKING	ACRE	0.3	0	0	0	0	0	**-0.3**	**+0**	**+0**
3322	5007	STREETFRONT COMMERCIAL	ACRE	3.8	5,234	3,762	4.3	6,426	4,592	**+0.5**	**+1,192**	**+830**
3322	5009	OTHER COMMERCIAL	ACRE	0.2	20	15	0.2	22	16	**+0.0**	**+2**	**+1**
3322	6002	LOW RISE OFFICE	ACRE	0.4	110	86	0.4	115	89	**+0.0**	**+5**	**+3**
3322	9101	VACANT	ACRE	0.2	0	0	0	0	0	**-0.2**	**+0**	**+0**
3322 Total					**7,035**	**4,984**		**9,932**	**6,955**		**+2,897**	**+1,971**



LEGEND:

- Existing Roadway
- Series 10 Traffic Analysis Zone

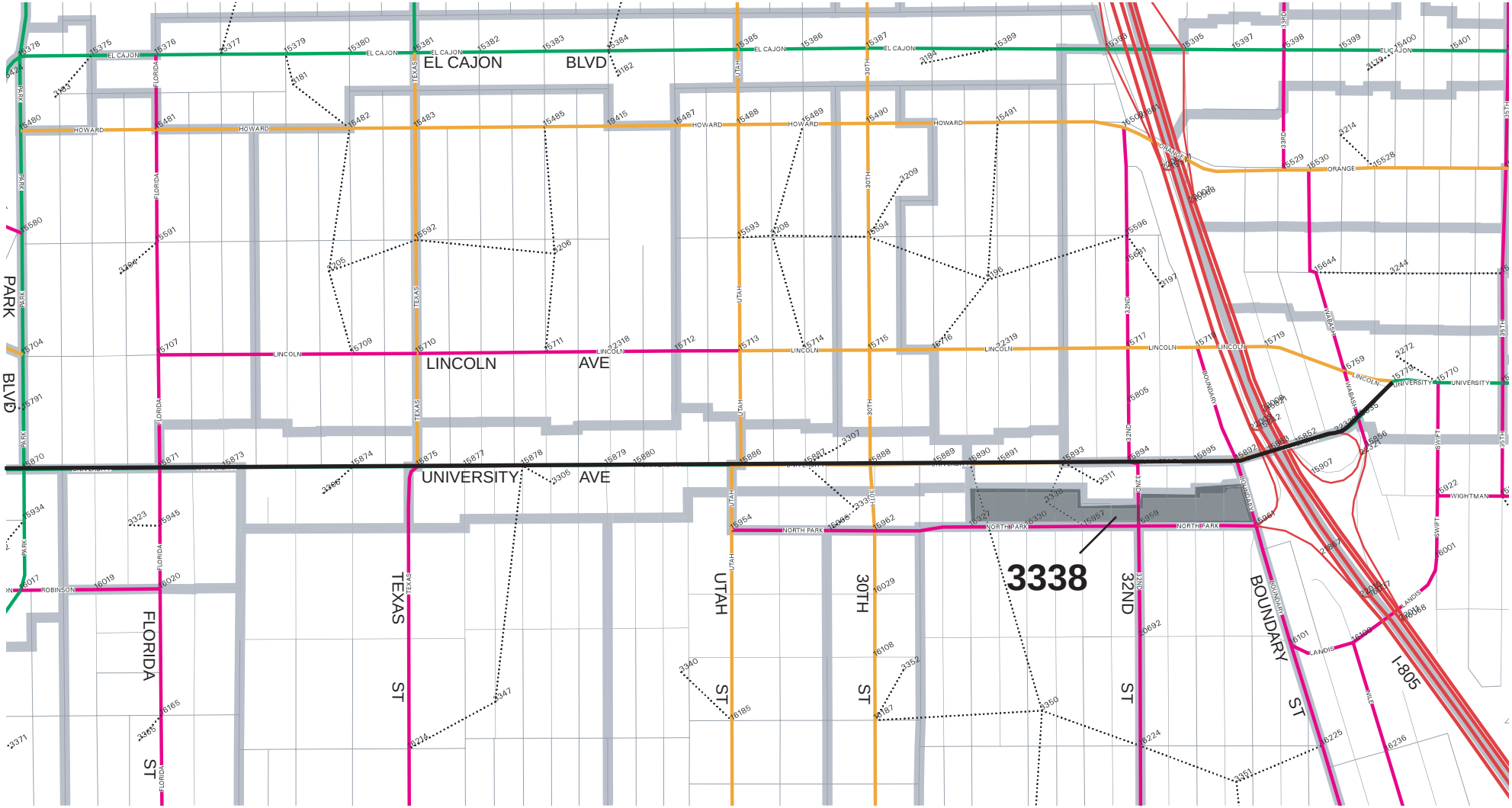
NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3323

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3323	101	SINGLE FAMILY	DU	35	431	287	35	451	299	**+0**	**+20**	**+12**
3323	102	MULTI-FAMILY	DU	659	5,568	3,752	687	6,062	4,068	**+28**	**+494**	**+316**
3323	2103	LIGHT INDUSTRY	ACRE	0.3	32	26	0.3	32	26	**+0.0**	**+0**	**+0**
3323	4112	RIGHT-OF-WAY	ACRE	4.8	0	0	4.8	0	0	**+0.0**	**+0**	**+0**
3323	5007	STREETFRONT COMMERCIAL	ACRE	0.3	358	258	0.3	391	279	**+0.0**	**+33**	**+21**
3323	6102	CHURCH	ACRE	0.4	23	16	0.4	26	18	**+0.0**	**+3**	**+2**
3323	9101	VACANT	ACRE	0.1	0	0	0	0	0	**-0.1**	**+0**	**+0**
3323 Total					**6,412**	**4,339**		**6,962**	**4,690**		**+550**	**+351**



LEGEND:

- Existing Roadway
- Series 10 Traffic Analysis Zone

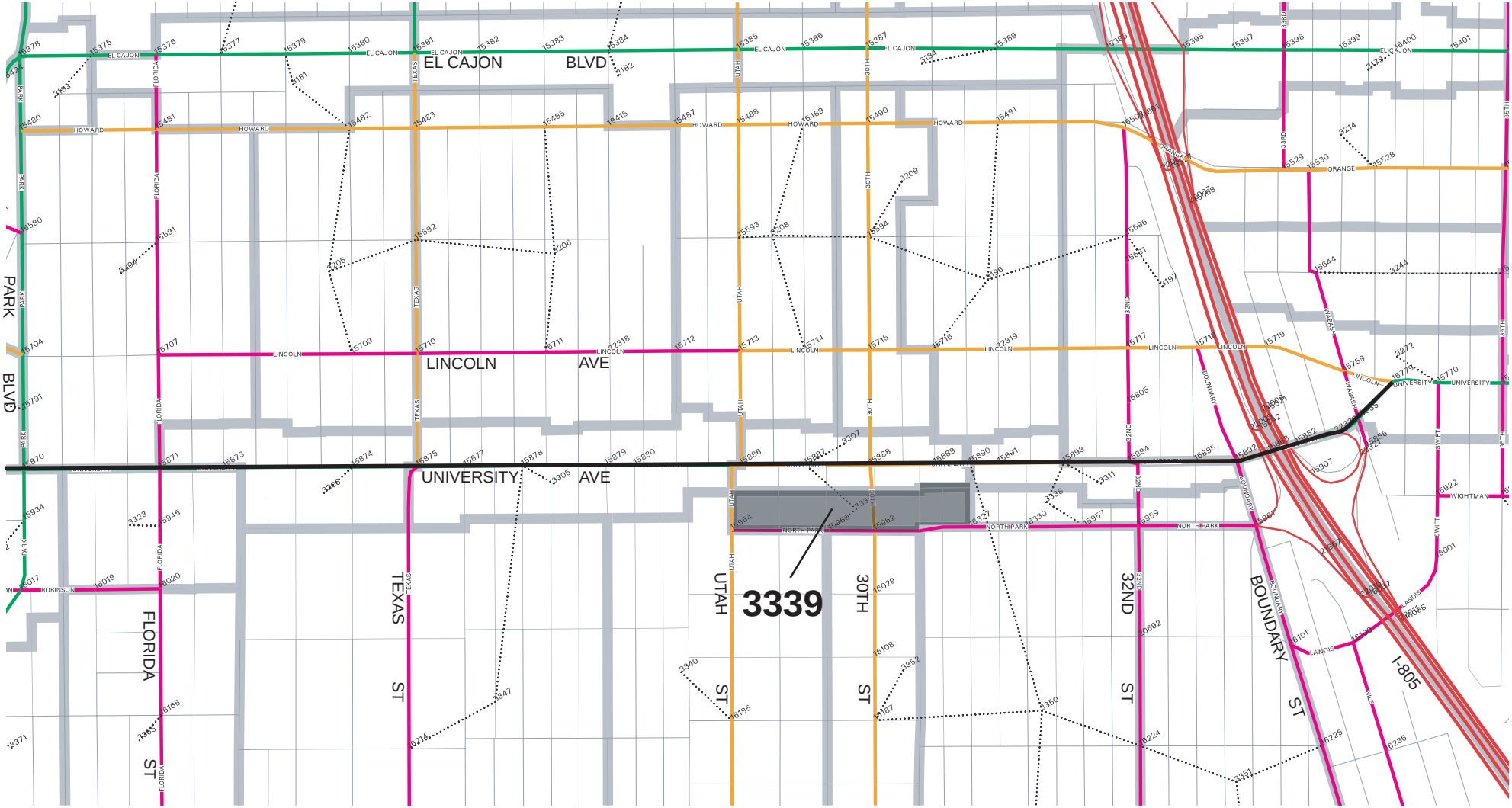
NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3338

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3338	101	SINGLE FAMILY	DU	8	99	66	7	90	60	**-1**	**-9**	**-6**
3338	102	MULTI-FAMILY	DU	28	236	159	259	2,285	1,534	**+231**	**+2,049**	**+1,375**
3338	2104	WAREHOUSING OR STORAGE	ACRE	0.4	0	0	0.4	0	0	**+0.0**	**+0**	**+0**
3338	4112	RIGHT-OF-WAY	ACRE	3	0	0	3	0	0	**+0.0**	**+0**	**+0**
3338	4114	PARKING	ACRE	0.9	0	0	0.6	601	417	**-0.3**	**+601**	**+417**
3338	5004	NEIGHBORHOOD COMMERCIAL	ACRE	0.6	836	582	0.6	922	639	**+0.0**	**+86**	**+57**
3338	5007	STREETFRONT COMMERCIAL	ACRE	0.7	908	652	0.7	989	707	**+0.0**	**+81**	**+55**
3338	6102	CHURCH	ACRE	0.5	25	18	0.5	28	19	**+0.0**	**+3**	**+1**
3338	9101	VACANT	ACRE	0.3	0	0	0	0	0	**-0.3**	**+0**	**+0**
3338 Total					**2,104**	**1,477**		**4,915**	**3,376**		**+2,811**	**+1,899**



LEGEND:

Existing Roadway

Series 10 Traffic Analysis Zone

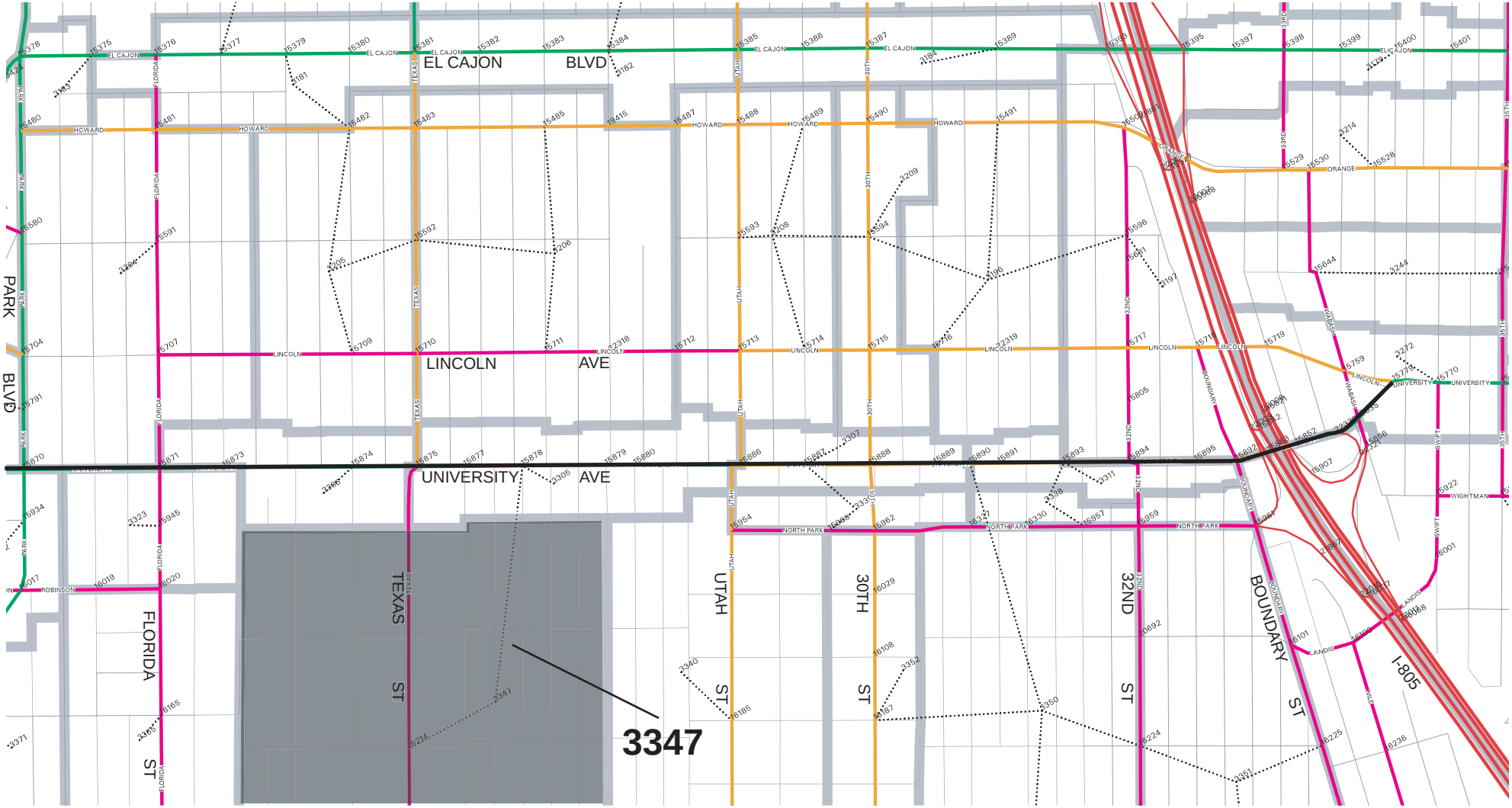
NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3339

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3339	101	SINGLE FAMILY	DU	15	185	123	10	129	85	**-5**	**-56**	**-38**
3339	102	MULTI-FAMILY	DU	7	59	40	309	2,726	1,829	**+302**	**+2,667**	**+1,789**
3339	4112	RIGHT-OF-WAY	ACRE	3	0	0	3	0	0	**+0.0**	**+0**	**+0**
3339	4114	PARKING	ACRE	1.1	0	0	0	0	0	**-1.1**	**+0**	**+0**
3339	5007	STREETFRONT COMMERCIAL	ACRE	2.2	3,007	2,161	2.2	3,275	2,341	**+0.0**	**+268**	**+180**
3339	6002	LOW RISE OFFICE	ACRE	0.8	215	168	0.8	224	174	**+0.0**	**+9**	**+6**
3339 Total					**3,466**	**2,492**		**6,354**	**4,429**		**+2,888**	**+1,937**



LEGEND:

Existing Roadway

Series 10 Traffic Analysis Zone

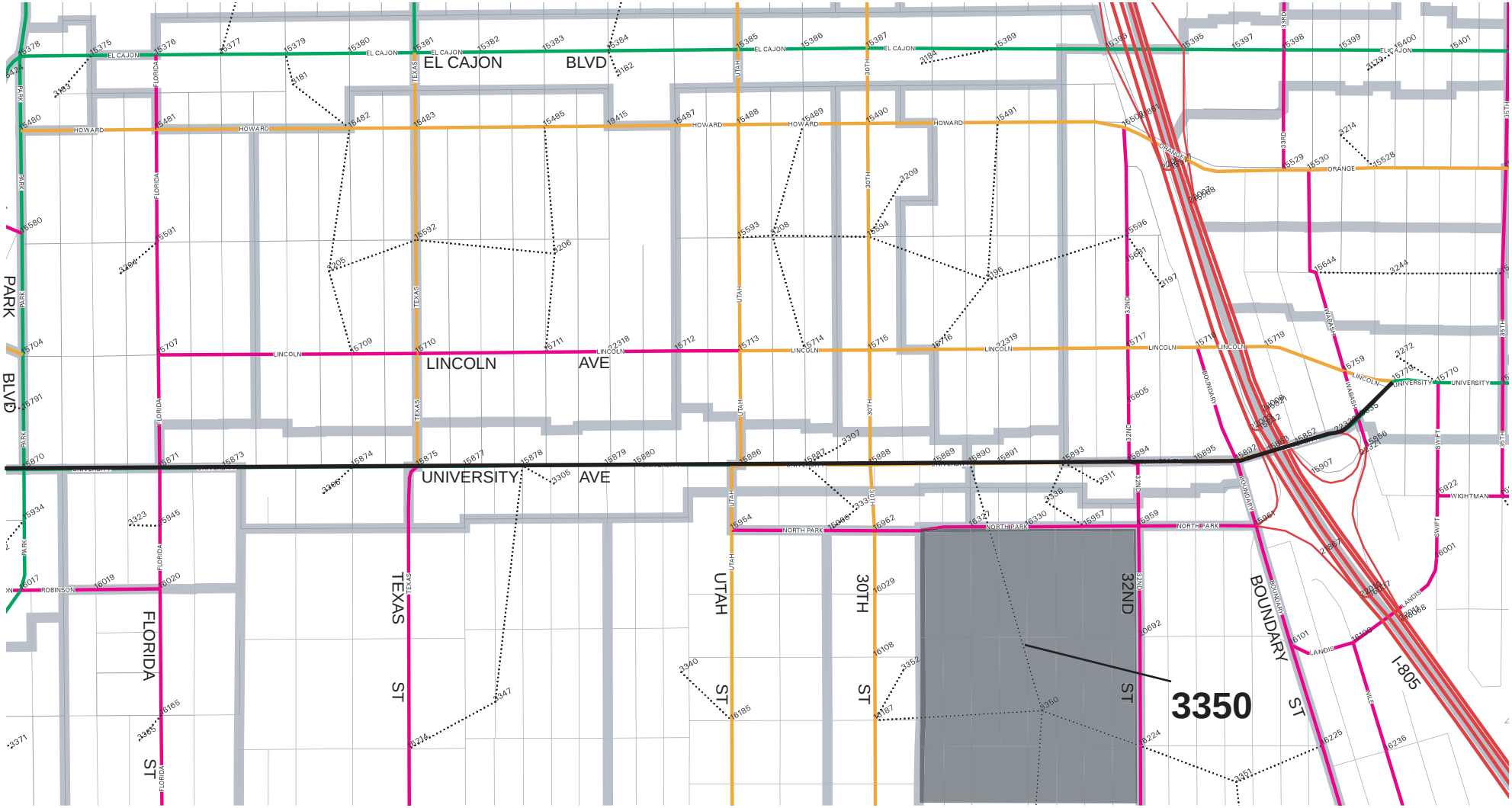
NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3347

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3347	101	SINGLE FAMILY	DU	780	9,612	6,377	781	10,066	6,677	**+1**	**+454**	**+300**
3347	102	MULTI-FAMILY	DU	499	4,217	2,841	502	4,429	2,972	**+3**	**+212**	**+131**
3347	4112	RIGHT-OF-WAY	ACRE	33.5	0	0	33.5	0	0	**+0.0**	**+0**	**+0**
3347	5007	STREETFRONT COMMERCIAL	ACRE	0.1	140	101	0.1	153	109	**+0.0**	**+13**	**+8**
3347	9101	VACANT	ACRE	0.4	0	0	0	0	0	**-0.4**	**+0**	**+0**
3347 Total					**13,969**	**9,319**		**14,648**	**9,758**		**+679**	**+439**



LEGEND:

- Existing Roadway
- Series 10 Traffic Analysis Zone

NOT TO SCALE

UNIVERSITY AVENUE MOBILITY PLAN
SERIES 10 - ZONE 3350

RBF

55-100140.001 - February 2004

				2003 LAND USE			2030 LAND USE			DIFFERENCE		
ZONE	CODE	NAME	TYPE	UNITS	PERSON TRIPS	VEHICLE TRIPS	UNITS	PERSON TRIPS	VEHICLE TRIPS	**UNITS**	**PERSON TRIPS**	**VEHICLE TRIPS**
3350	101	SINGLE FAMILY	DU	454	5,594	3,711	454	5,854	3,883	**+0**	**+260**	**+172**
3350	102	MULTI-FAMILY	DU	525	4,437	2,990	536	4,727	3,171	**+11**	**+290**	**+181**
3350	103	MOBILE HOME PARK	DU	6	39	26	6	41	28	**+0**	**+2**	**+2**
3350	4112	RIGHT-OF-WAY	ACRE	21.4	0	0	21.4	0	0	**+0.0**	**+0**	**+0**
3350	4114	PARKING	ACRE	0.6	0	0	0	0	0	**-0.6**	**+0**	**+0**
3350	5007	STREETFRONT COMMERCIAL	ACRE	0.2	205	147	0.2	223	159	**+0.0**	**+18**	**+12**
3350	6103	LIBRARY	ACRE	0.3	146	108	0.7	397	290	**+0.4**	**+251**	**+182**
3350	6104	POST OFFICE	ACRE	0.3	371	274	0.3	402	294	**+0.0**	**+31**	**+20**
3350 Total					**10,792**	**7,256**		**11,644**	**7,825**		**+852**	**+569**

NAME	TYPE	2003 UNITS	2003 LAND USE PERSON TRIPS	2003 VEHICLE TRIPS	2030 UNITS	2030 LAND USE PERSON TRIPS	2030 VEHICLE TRIPS	DIFFERENCE UNITS	DIFFERENCE PERSON TRIPS	DIFFERENCE VEHICLE TRIPS
SINGLE FAMILY	DU	7,827	96,450	63,986	7,531	97,072	64,378	**-296**	**+622**	**+392**
MULTI-FAMILY	DU	19,181	162,085	109,226	29,837	263,255	176,659	**+10,656**	**+101,170**	**+67,433**
MOBILE HOME PARK	DU	46	298	199	67	462	308	**+21**	**+164**	**+109**
OTHER GROUP QUARTERS	ACRE	1.4	7	6	1.4	8	6	**+0.0**	**+1**	**+0**
LOW-RISE HOTEL OR MOTEL	ACRE	3.2	1,094	654	3.2	1,160	693	**+0.0**	**+66**	**+39**
LIGHT INDUSTRY	ACRE	2.4	273	224	2.4	278	227	**+0.0**	**+5**	**+3**
WAREHOUSING OR STORAGE	ACRE	0.5	0	0	0.5	0	0	**+0.0**	**+0**	**+0**
RIGHT-OF-WAY	ACRE	721.8	0	0	721.8	0	0	**+0.0**	**+0**	**+0**
COMMUNICATION OR UTILITY	ACRE	2.6	10	7	2.6	9	7	**+0.0**	**-1**	**+0**
PARKING	ACRE	15.4	0	0	0.1	0	0	**-15.3**	**+0**	**+0**
COMMUNITY COMMERCIAL	ACRE	0.9	0	0	3.2	3,413	2,366	**+2.3**	**+3,413**	**+2,366**
NEIGHBORHOOD COMMERCIAL	ACRE	19.7	29,982	20,869	20.7	34,800	24,128	**+1.0**	**+4,818**	**+3,259**
AUTO COMMERCIAL	ACRE	4.9	2,672	1,862	4.9	2,928	2,027	**+0.0**	**+256**	**+165**
STREETFRONT COMMERCIAL	ACRE	95.5	130,222	93,597	96.8	143,771	102,743	**+1.3**	**+13,549**	**+9,146**
OTHER COMMERCIAL	ACRE	5.2	701	504	5.4	788	567	**+0.2**	**+87**	**+63**
HIGH RISE OFFICE	ACRE	1	3,202	2,568	1	3,291	2,617	**+0.0**	**+89**	**+49**
LOW RISE OFFICE	ACRE	5.8	1,589	1,243	7.4	2,133	1,651	**+1.6**	**+544**	**+408**
GOV'T OFFICE OR CENTER	ACRE	2.7	2,384	1,780	2.7	2,537	1,875	**+0.0**	**+153**	**+95**
CHURCH	ACRE	16.4	865	603	17.4	1,031	713	**+1.0**	**+166**	**+110**
LIBRARY	ACRE	0.5	230	170	0.9	488	357	**+0.4**	**+258**	**+187**
POST OFFICE	ACRE	1.3	1,623	1,200	1.3	1,758	1,287	**+0.0**	**+135**	**+87**
FIRE OR POLICE STATION	ACRE	1	361	267	1	391	286	**+0.0**	**+30**	**+19**
OTHER PUBLIC SERVICE	ACRE	1.5	544	371	1.5	612	413	**+0.0**	**+68**	**+42**
HOSPITAL	ACRE	3.4	1,159	852	3.4	1,265	918	**+0.0**	**+106**	**+66**
OTHER HEALTH CARE	ACRE	4	2,164	1,538	4	2,395	1,682	**+0.0**	**+231**	**+144**
JUNIOR HIGH OR MIDDLE SCHOOL	SITE	1	3,613	1,440	1	3,697	1,545	**+0**	**+84**	**+105**
ELEMENTARY SCHOOL	SITE	9	15,372	6,710	9	15,864	7,237	**+0**	**+492**	**+527**
SCHOOL DISTRICT OFFICE	ACRE	6.7	1,999	1,560	6.7	2,081	1,608	**+0.0**	**+82**	**+48**
OTHER SCHOOL	ACRE	4.1	751	583	4.1	755	583	**+0.0**	**+4**	**+0**
OTHER RECREATION	ACRE	2.8	19	13	2.8	22	15	**+0.0**	**+3**	**+2**
ACTIVE PARK	ACRE	10.2	760	492	10.2	875	562	**+0.0**	**+115**	**+70**
VACANT	ACRE	12.7	0	0	5.9	0	0	**-6.8**	**+0**	**+0**
UNDER CONTRUCTION	ACRE	0.4	2	2	0	0	0	**-0.4**	**-2**	**-2**
Grand Total			**460,431**	**312,526**		**587,139**	**397,458**		**+126,708**	**+84,932**
Dwelling Unit totals		**27,054**	**258,833**	**173,411**	**37,435**	**360,789**	**241,345**	**+10,381**	**+101,956**	**+67,934**

Appendix D
SANDAG Traffic Model & Select Link Plots

2030 No Build

University Avenue Mobility Study

2nd Stage
Full Forecast Assignment

Series 10 Year 2030

Legend

- Freeway
- Prime
- Major
- Collector
- Local Collector
- Rural Collector
- Rural Light Collector
- Local
- Ramp

Unadjusted Volumes (1000s)

Surface Street and Ramp Adjusted Volumes (1000s)

Freeway Adjusted Volumes (1000s)

Feet
0 350 700
0 42 126 210
Meters

N

February 23, 2004

The information contained on this map pertains to this project. Interpretation of the information should be made by someone appropriately qualified. The use of the City traffic model should not be interpreted as an approval of the project. This map may also contain information from SANDAG and/or SanGIS.

MBR

University Avenue Mobility Study

Select Link Assignment (1 of 3)

2030 Base Network

Series 10 Year 2030

Legend

- Freeway
- Prime
- Major
- Collector
- Local Collector
- Rural Collector
- Local
- Freeway to Freeway Ramp
- Freeway to Arterial Ramp

\# Freeway Full Forecast Daily Traffic Volumes (1000s)

\# Street, Ramp Full Forecast Daily Traffic Volumes (1000s)

\# Select Link Volumes
Lincoln Avenue -- Florida St. to Louisiana St.

\# Select Link Volumes
University Avenue -- Park Bl. to Florida St.

Feet
0 350 700
0 42 126 210
Meters

N

THE CITY OF SAN DIEGO • STATE OF CALIFORNIA • SEMPER VIGILANS •

TRANSPORTATION PLANNING • YOUR ROAD TO THE FUTURE •

February 27, 2004

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MBR

University Avenue Mobility Study

Select Link Assignment (2 of 3)

2030 Base Network

Series 10 Year 2030

Legend

- Freeway
- Prime
- Major
- Collector
- Local Collector
- Rural Collector
- Local
- Freeway to Freeway Ramp
- Freeway to Arterial Ramp

\# Freeway Full Forecast Daily Traffic Volumes (1000s)

\# Street, Ramp Full Forecast Daily Traffic Volumes (1000s)

\# Select Link Volumes
University Avenue -- Kansas St. to 30th St.

\# Select Link Volumes
University Avenue -- Bancroft St. to Boundary St.

Feet
0 350 700
0 42 126 210
Meters

N

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MBR

University Avenue Mobility Study

Select Link Assignment (3 of 3)

2030 Base Network

Series 10 Year 2030

Legend

- Freeway
- Prime
- Major
- Collector
- Local Collector
- Rural Collector
- Local
- Freeway to Freeway Ramp
- Freeway to Arterial Ramp

\# Freeway Full Forecast Daily Traffic Volumes (1000s)

\# Street, Ramp Full Forecast Daily Traffic Volumes (1000s)

\# Select Link Volumes
North Park Wy. -- Grim Av. to 31st St.

\# Select Link Volumes
Lincoln Avenue -- Illinois St. to 32nd St.

Feet
0 350 700
0 42 126 210
Meters

N

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February 27, 2004

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MBR

2030 With Preferred Concept Plan

University Avenue Mobility Study

2nd Stage
Full Forecast Assignment

2030 Preferred Alternative

Series 10 Year 2030

Legend

- Freeway
- Prime
- Major
- Collector
- Local Collector
- Rural Collector
- Rural Light Collector
- Local
- Ramp

Unadjusted Volumes (1000s)

Surface Street and Ramp Adjusted Volumes (1000s)

Freeway Adjusted Volumes (1000s)

Feet
0 350 700
0 42 126 210
Meters

N

February 23, 2004

The information contained on this map pertains to this project. Interpretation of the information should be made by someone appropriately qualified. The use of the City traffic model should not be interpreted as an approval of the project. This map may also contain information from SANDAG and/or SanGIS.

MBR

University Avenue Mobility Study

Select Link Assignment (1 of 3)

2030 Preferred Alternative

Series 10 Year 2030

Legend

- Freeway
- Prime
- Major
- Collector
- Local Collector
- Rural Collector
- Local
- Freeway to Freeway Ramp
- Freeway to Arterial Ramp

\# Freeway Full Forecast Daily Traffic Volumes (1000s)

\# Street, Ramp Full Forecast Daily Traffic Volumes (1000s)

\# Select Link Volumes
Lincoln Avenue -- Florida St. to Louisiana St.

\# Select Link Volumes
University Avenue -- Park Bl. to Florida St.

Feet
0 350 700
0 42 126 210
Meters

N

March 1, 2004

The information contained on this map pertains to this project. Interpretation of the information should be made by someone appropriately qualified. The use of the City traffic model should not be interpreted as an approval of the project. The map may also contain information from SANDAG and/or SanGIS.

MBR

University Avenue Mobility Study

Select Link Assignment (2 of 3)

2030 Preferred Alternative

Series 10 Year 2030

Legend

- Freeway
- Prime
- Major
- Collector
- Local Collector
- Rural Collector
- Local
- Freeway to Freeway Ramp
- Freeway to Arterial Ramp

\# Freeway Full Forecast Daily Traffic Volumes (1000s)

\# Street, Ramp Full Forecast Daily Traffic Volumes (1000s)

\# Select Link Volumes
University Avenue -- Kansas St. to 30th St.

\# Select Link Volumes
University Avenue -- Bancroft St. to Boundary St.

Feet
0 350 700
0 42 126 210
Meters

N

March 1, 2004

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MBR

University Avenue Mobility Study

Select Link Assignment (3 of 3)

2030 Preferred Alternative

Series 10 Year 2030

Legend

- Freeway
- Prime
- Major
- Collector
- Local Collector
- Rural Collector
- Local
- Freeway to Freeway Ramp
- Freeway to Arterial Ramp

\# Freeway Full Forecast Daily Traffic Volumes (1000s)

\# Street, Ramp Full Forecast Daily Traffic Volumes (1000s)

\# Select Link Volumes
North Park Wy. -- Grim Av. to 31st St.

\# Select Link Volumes
Lincoln Avenue -- Illinois St. to 32nd St.

Feet
0 350 700
0 42 126 210
Meters

N

March 1, 2004

The information contained on this map pertains to this project. Interpretation of the information should be made by someone appropriately qualified. The use of the City traffic model should not be interpreted as an approval of the project. The map may also contain information from SANDAG and/or SanGIS.

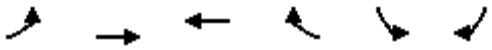
MBR

Appendix E
2010 No Build HCM Analysis Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	311	21	19	813	78	38
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	346	23	21	903	87	42
Pedestrians	3			2	14	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	1	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)	452			320		
pX, platoon unblocked						
vC, conflicting volume			383		868	200
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			383		868	200
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		70	95
cM capacity (veh/h)			1173		286	802

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	230	139	322	602	129
Volume Left	0	0	21	0	87
Volume Right	0	23	0	0	42
cSH	1700	1700	1173	1700	425
Volume to Capacity	0.14	0.08	0.02	0.35	0.30
Queue Length (ft)	0	0	1	0	32
Control Delay (s)	0.0	0.0	0.7	0.0	17.1
Lane LOS			A		C
Approach Delay (s)	0.0		0.2		17.1
Approach LOS					C

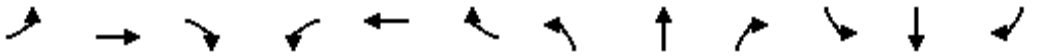
Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	47.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	6	328	881	10	7	31
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	7	364	979	11	8	34
Pedestrians		3	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)		372	400			
pX, platoon unblocked						
vC, conflicting volume	995				1187	503
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	995				1187	503
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				96	93
cM capacity (veh/h)	700				181	516

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	128	243	653	337	42
Volume Left	7	0	0	0	8
Volume Right	0	0	0	11	34
cSH	700	1700	1700	1700	632
Volume to Capacity	0.01	0.14	0.38	0.20	0.07
Queue Length (ft)	1	0	0	0	5
Control Delay (s)	0.6	0.0	0.0	0.0	14.9
Lane LOS	A				B
Approach Delay (s)	0.2		0.0		14.9
Approach LOS					B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	12	801	17	31	602	8	0	0	111	0	0	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	13	890	19	34	669	9	0	0	123	0	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		359			243							
pX, platoon unblocked	0.82						0.82	0.82		0.82	0.82	0.82
vC, conflicting volume	678			909			1334	1673	454	1337	1678	339
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	387			909			1188	1601	454	1192	1607	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			95			100	100	78	100	100	100
cM capacity (veh/h)	969			757			114	83	558	89	82	894

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	13	593	316	34	446	232	123	4
Volume Left	13	0	0	34	0	0	0	0
Volume Right	0	0	19	0	0	9	123	4
cSH	969	1700	1700	757	1700	1700	558	894
Volume to Capacity	0.01	0.35	0.19	0.05	0.26	0.14	0.22	0.00
Queue Length (ft)	1	0	0	4	0	0	21	0
Control Delay (s)	8.8	0.0	0.0	10.0	0.0	0.0	13.3	9.0
Lane LOS	A			A			B	A
Approach Delay (s)	0.1			0.5			13.3	9.0
Approach LOS							B	A

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	36.2%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	1	54	48	47	206	3	12	4	18	4	8	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1	60	53	52	229	3	13	4	20	4	9	1
Pedestrians		1			5			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		393			875							
pX, platoon unblocked												
vC, conflicting volume	238			121			438	440	100	457	465	238
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	238			121			438	440	100	457	465	238
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			97	99	98	99	98	100
cM capacity (veh/h)	1322			1456			498	487	946	477	471	797

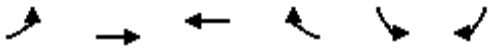
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	114	284	38	14
Volume Left	1	52	13	4
Volume Right	53	3	20	1
cSH	1322	1456	662	488
Volume to Capacity	0.00	0.04	0.06	0.03
Queue Length (ft)	0	3	5	2
Control Delay (s)	0.1	1.6	10.8	12.6
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	1.6	10.8	12.6
Approach LOS			B	B

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	8	331	17	25	715	4	20	1	14	3	3	17
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	9	368	19	28	794	4	22	1	16	3	3	19
Pedestrians		9			3			15			13	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			0			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		351			383							
pX, platoon unblocked												
vC, conflicting volume	812			402			892	1277	211	1086	1285	421
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	812			402			892	1277	211	1086	1285	421
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			90	99	98	98	98	97
cM capacity (veh/h)	814			1153			214	158	788	159	157	576

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	193	203	425	402	39	26
Volume Left	9	0	28	0	22	3
Volume Right	0	19	0	4	16	19
cSH	814	1700	1153	1700	298	341
Volume to Capacity	0.01	0.12	0.02	0.24	0.13	0.07
Queue Length (ft)	1	0	2	0	11	6
Control Delay (s)	0.5	0.0	0.8	0.0	18.9	16.4
Lane LOS	A		A		C	C
Approach Delay (s)	0.3		0.4		18.9	16.4
Approach LOS					C	C

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	13	397	667	17	10	42
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	14	441	741	19	11	47
Pedestrians		5			1	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		376				
pX, platoon unblocked						
vC, conflicting volume	761				1001	386
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	761				1001	386
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				95	92
cM capacity (veh/h)	859				239	615

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	161	294	494	266	58
Volume Left	14	0	0	0	11
Volume Right	0	0	0	19	47
cSH	859	1700	1700	1700	472
Volume to Capacity	0.02	0.17	0.29	0.16	0.12
Queue Length (ft)	1	0	0	0	10
Control Delay (s)	1.0	0.0	0.0	0.0	13.7
Lane LOS	A				B
Approach Delay (s)	0.3		0.0		13.7
Approach LOS					B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	388	10	13	699	18	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	431	11	14	777	20	24
Pedestrians	5					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	286					
pX, platoon unblocked						
vC, conflicting volume			442		859	221
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			442		859	221
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		93	97
cM capacity (veh/h)			1129		294	789

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	287	155	273	518	44
Volume Left	0	0	14	0	20
Volume Right	0	11	0	0	24
cSH	1700	1700	1129	1700	449
Volume to Capacity	0.17	0.09	0.01	0.30	0.10
Queue Length (ft)	0	0	1	0	8
Control Delay (s)	0.0	0.0	0.6	0.0	13.9
Lane LOS			A		B
Approach Delay (s)	0.0		0.2		13.9
Approach LOS					B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	392	16	23	685	45	31
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	436	18	26	761	50	34
Pedestrians	9			2	9	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			0	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	616			1277		
pX, platoon unblocked						
vC, conflicting volume			462		894	238
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			462		894	238
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		82	95
cM capacity (veh/h)			1101		274	763

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	290	163	279	507	84
Volume Left	0	0	26	0	50
Volume Right	0	18	0	0	34
cSH	1700	1700	1101	1700	371
Volume to Capacity	0.17	0.10	0.02	0.30	0.23
Queue Length (ft)	0	0	2	0	22
Control Delay (s)	0.0	0.0	1.0	0.0	17.6
Lane LOS			A		C
Approach Delay (s)	0.0		0.3		17.6
Approach LOS					C

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95			1.00	0.95
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.95		1.00	0.97		1.00	0.97			1.00	0.98
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1770	3283		1770	3423		1770	3419			1770	3465
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.26	1.00
Satd. Flow (perm)	1770	3283		1770	3423		1770	3419			481	3465
Volume (vph)	41	166	85	139	581	137	73	201	50	9	72	388
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	46	184	94	154	646	152	81	223	56	10	80	431
RTOR Reduction (vph)	0	61	0	0	18	0	0	22	0	0	0	8
Lane Group Flow (vph)	46	217	0	154	780	0	81	257	0	0	90	477
Confl. Peds. (#/hr)			87			19			14			
Turn Type	Prot			Prot			Prot			custom	Prot	
Protected Phases	5	2		1	6		3	8			7	4
Permitted Phases										7		
Actuated Green, G (s)	4.3	18.3		8.4	22.4		5.1	16.8			14.1	25.8
Effective Green, g (s)	5.7	20.2		9.8	24.3		6.5	18.7			15.5	27.7
Actuated g/C Ratio	0.07	0.27		0.13	0.32		0.09	0.25			0.20	0.36
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	4.9			4.4	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	3.3			2.0	2.9
Lane Grp Cap (vph)	132	870		228	1092		151	839			98	1260
v/s Ratio Prot	0.03	0.08		c0.09	c0.23		0.05	0.08				c0.14
v/s Ratio Perm											c0.19	
v/c Ratio	0.35	0.25		0.68	0.71		0.54	0.31			0.92	0.38
Uniform Delay, d1	33.5	22.0		31.7	22.9		33.4	23.5			29.7	17.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	1.6	0.1		7.7	1.9		3.6	0.2			63.5	0.2
Delay (s)	35.1	22.1		39.4	24.8		37.0	23.7			93.2	18.1
Level of Service	D	C		D	C		D	C			F	B
Approach Delay (s)		23.9			27.1			26.7				29.8
Approach LOS		C			C			C				C

Intersection Summary			
HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	76.2	Sum of lost time (s)	6.0
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Volume (vph)	49
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	54
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	31
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.93			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1770	3519		1770	3516			1695			1739	
Flt Permitted	0.95	1.00		0.95	1.00			0.95			0.97	
Satd. Flow (perm)	1770	3519		1770	3516			1621			1697	
Volume (vph)	7	263	9	64	816	31	22	35	62	9	51	39
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	8	292	10	71	907	34	24	39	69	10	57	43
RTOR Reduction (vph)	0	3	0	0	2	0	0	55	0	0	32	0
Lane Group Flow (vph)	8	299	0	71	939	0	0	77	0	0	78	0
Confl. Peds. (#/hr)			3			5			9			11
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	1.2	42.8		10.4	52.0			12.6			12.6	
Effective Green, g (s)	2.2	45.3		11.4	54.5			14.3			14.3	
Actuated g/C Ratio	0.03	0.57		0.14	0.68			0.18			0.18	
Clearance Time (s)	4.0	5.5		4.0	5.5			4.7			4.7	
Vehicle Extension (s)	2.0	2.5		2.0	2.5			2.0			2.0	
Lane Grp Cap (vph)	49	1993		252	2395			290			303	
v/s Ratio Prot	0.00	c0.09		0.04	c0.27							
v/s Ratio Perm								c0.08			0.06	
v/c Ratio	0.16	0.15		0.28	0.39			0.27			0.26	
Uniform Delay, d1	38.0	8.2		30.6	5.5			28.3			28.3	
Progression Factor	1.00	1.00		0.76	0.29			1.00			1.00	
Incremental Delay, d2	0.6	0.2		0.2	0.5			0.2			0.2	
Delay (s)	38.6	8.4		23.5	2.1			28.5			28.4	
Level of Service	D	A		C	A			C			C	
Approach Delay (s)		9.2			3.6			28.5			28.4	
Approach LOS		A			A			C			C	

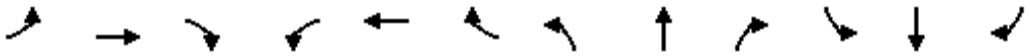
Intersection Summary			
HCM Average Control Delay	8.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0			3.0			3.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.98			0.92	
Flt Protected		1.00			1.00			0.96			0.99	
Satd. Flow (prot)		3517			3528			1758			1669	
Flt Permitted		0.95			0.95			0.96			0.99	
Satd. Flow (perm)		3347			3367			1758			1669	
Volume (vph)	3	334	12	3	735	12	73	10	12	14	7	30
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	3	371	13	3	817	13	81	11	13	16	8	33
RTOR Reduction (vph)	0	2	0	0	1	0	0	7	0	0	30	0
Lane Group Flow (vph)	0	385	0	0	832	0	0	98	0	0	27	0
Confl. Peds. (#/hr)			1			8			12			10
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		50.1			50.1			8.7			6.0	
Effective Green, g (s)		52.5			52.5			10.6			7.9	
Actuated g/C Ratio		0.66			0.66			0.13			0.10	
Clearance Time (s)		5.4			5.4			4.9			4.9	
Vehicle Extension (s)		2.7			2.8			2.0			2.0	
Lane Grp Cap (vph)		2196			2210			233			165	
v/s Ratio Prot								c0.06			c0.03	
v/s Ratio Perm		0.12			c0.25							
v/c Ratio		0.18			0.38			0.42			0.17	
Uniform Delay, d1		5.3			6.3			31.9			33.0	
Progression Factor		0.76			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.1			0.4			0.2	
Delay (s)		4.3			6.4			32.3			33.2	
Level of Service		A			A			C			C	
Approach Delay (s)		4.3			6.4			32.3			33.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

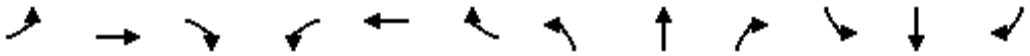
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.98		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3492		1770	3459		1770	1814		1770	1726	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3492		1770	3459		1770	1814		1770	1726	
Volume (vph)	72	262	16	24	604	89	90	110	17	64	74	51
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	291	18	27	671	99	100	122	19	71	82	57
RTOR Reduction (vph)	0	3	0	0	7	0	0	5	0	0	23	0
Lane Group Flow (vph)	80	306	0	27	763	0	100	136	0	71	116	0
Confl. Peds. (#/hr)			26			4			15			8
Turn Type	Prot			Prot			Split			Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	5.4	40.1		2.7	37.4		10.0	10.0		9.5	9.5	
Effective Green, g (s)	6.4	42.1		3.7	39.4		11.5	11.5		10.5	10.5	
Actuated g/C Ratio	0.07	0.49		0.04	0.46		0.13	0.13		0.12	0.12	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.5	4.5		4.0	4.0	
Vehicle Extension (s)	2.0	2.2		2.0	2.1		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	132	1711		76	1587		237	243		216	211	
v/s Ratio Prot	c0.05	c0.09		0.02	c0.22		0.06	c0.08		0.04	c0.08	
v/s Ratio Perm												
v/c Ratio	0.61	0.18		0.36	0.48		0.42	0.56		0.33	0.55	
Uniform Delay, d1	38.5	12.2		39.9	16.1		34.1	34.8		34.5	35.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.3	0.0		1.0	0.1		0.4	1.6		0.3	1.8	
Delay (s)	43.8	12.3		41.0	16.2		34.6	36.4		34.8	37.2	
Level of Service	D	B		D	B		C	D		C	D	
Approach Delay (s)		18.8			17.1			35.7			36.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	85.9	Sum of lost time (s)	21.1
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

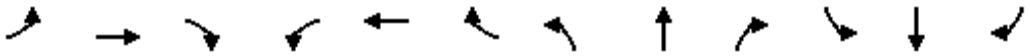
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00		1.00	0.97		1.00	0.97	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.92		1.00	0.92	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3472			3501		1770	1664		1770	1675	
Flt Permitted		0.94			0.95		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3265			3318		1770	1664		1770	1675	
Volume (vph)	10	371	40	10	537	30	55	24	24	13	37	38
Peak-hour factor, PHF	0.90	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	391	44	11	597	33	61	27	27	14	41	42
RTOR Reduction (vph)	0	5	0	0	2	0	0	24	0	0	38	0
Lane Group Flow (vph)	0	441	0	0	639	0	61	30	0	14	45	0
Confl. Peds. (#/hr)			6			13			20			14
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6								
Actuated Green, G (s)		40.8			40.8		5.5	5.5		5.2	5.2	
Effective Green, g (s)		43.3			43.3		7.7	7.7		7.4	7.4	
Actuated g/C Ratio		0.58			0.58		0.10	0.10		0.10	0.10	
Clearance Time (s)		5.5			5.5		5.2	5.2		5.2	5.2	
Vehicle Extension (s)		2.0			2.0		3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)		1900			1931		183	172		176	167	
v/s Ratio Prot							c0.03	0.03		0.01	c0.05	
v/s Ratio Perm		0.14			c0.19							
v/c Ratio		0.23			0.33		0.33	0.17		0.08	0.27	
Uniform Delay, d1		7.5			8.1		31.0	30.4		30.4	31.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			0.0		1.1	0.5		0.1	0.3	
Delay (s)		7.5			8.1		32.0	30.9		30.5	31.3	
Level of Service		A			A		C	C		C	C	
Approach Delay (s)		7.5			8.1			31.5			31.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	74.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	41.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.98		1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3452		1770	3392		1770	1735		1770	1771	
Flt Permitted	0.30	1.00		0.50	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	555	3452		933	3392		1770	1735		1770	1771	
Volume (vph)	35	350	39	82	458	83	76	182	106	28	145	39
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	39	389	43	91	509	92	84	202	118	31	161	43
RTOR Reduction (vph)	0	9	0	0	15	0	0	28	0	0	14	0
Lane Group Flow (vph)	39	423	0	91	586	0	84	292	0	31	190	0
Confl. Peds. (#/hr)			40			45			24			74
Turn Type	pm+pt			pm+pt			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	33.9	33.9		35.3	34.9		9.0	20.0		2.9	13.9	
Effective Green, g (s)	35.8	35.8		36.8	36.8		10.4	21.9		4.3	15.8	
Actuated g/C Ratio	0.45	0.45		0.46	0.46		0.13	0.27		0.05	0.20	
Clearance Time (s)	4.5	4.9		4.5	4.9		4.4	4.9		4.4	4.9	
Vehicle Extension (s)	3.0	2.0		3.0	2.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	324	1545		492	1560		230	475		95	350	
v/s Ratio Prot	0.01	c0.13		0.01	c0.18		0.05	c0.18		0.02	c0.12	
v/s Ratio Perm	0.05			0.07								
v/c Ratio	0.12	0.27		0.18	0.38		0.37	0.62		0.33	0.54	
Uniform Delay, d1	13.0	13.9		12.9	14.1		31.8	25.4		36.5	28.9	
Progression Factor	1.00	1.00		0.51	0.52		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.4		0.2	0.6		0.4	1.7		0.7	0.9	
Delay (s)	13.2	14.4		6.8	7.9		32.1	27.0		37.2	29.8	
Level of Service	B	B		A	A		C	C		D	C	
Approach Delay (s)		14.3			7.8			28.1			30.8	
Approach LOS		B			A			C			C	

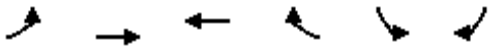
Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0			3.0	3.0	
Lane Util. Factor	0.95			1.00	1.00	
Frpb, ped/bikes	1.00			1.00	0.98	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	3501			1863	1680	
Flt Permitted	1.00			1.00	0.97	
Satd. Flow (perm)	3501			1863	1680	
Volume (vph)	467	29	0	590	57	42
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	519	32	0	656	63	47
RTOR Reduction (vph)	3	0	0	0	41	0
Lane Group Flow (vph)	548	0	0	656	69	0
Confl. Peds. (#/hr)		8	8			20
Turn Type						
Protected Phases	2			2	4	
Permitted Phases						
Actuated Green, G (s)	63.4			63.4	8.1	
Effective Green, g (s)	64.9			64.9	9.1	
Actuated g/C Ratio	0.81			0.81	0.11	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	2.0			2.0	2.0	
Lane Grp Cap (vph)	2840			1511	191	
v/s Ratio Prot	0.16			c0.35	c0.07	
v/s Ratio Perm						
v/c Ratio	0.19			0.43	0.36	
Uniform Delay, d1	1.7			2.2	32.8	
Progression Factor	0.42			0.10	1.00	
Incremental Delay, d2	0.1			0.8	0.4	
Delay (s)	0.9			1.0	33.2	
Level of Service	A			A	C	
Approach Delay (s)	0.9			1.0	33.2	
Approach LOS	A			A	C	

Intersection Summary			
HCM Average Control Delay	3.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		

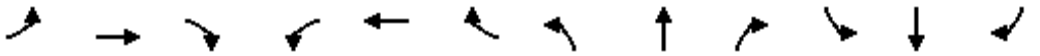
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.96	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3536	1847		1701	
Flt Permitted		0.94	1.00		0.97	
Satd. Flow (perm)		3338	1847		1701	
Volume (vph)	10	499	581	33	43	22
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	554	646	37	48	24
RTOR Reduction (vph)	0	0	2	0	20	0
Lane Group Flow (vph)	0	565	681	0	52	0
Confl. Peds. (#/hr)	1			1		8
Turn Type	Perm					
Protected Phases		2	2		4	
Permitted Phases	2					
Actuated Green, G (s)		60.3	60.3		9.9	
Effective Green, g (s)		62.2	62.2		11.8	
Actuated g/C Ratio		0.78	0.78		0.15	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		1.0	1.0		2.0	
Lane Grp Cap (vph)		2595	1436		251	
v/s Ratio Prot			c0.37		c0.04	
v/s Ratio Perm		0.17				
v/c Ratio		0.22	0.47		0.21	
Uniform Delay, d1		2.4	3.1		30.0	
Progression Factor		0.44	0.79		1.00	
Incremental Delay, d2		0.2	1.1		0.1	
Delay (s)		1.2	3.6		30.1	
Level of Service		A	A		C	
Approach Delay (s)		1.2	3.6		30.1	
Approach LOS		A	A		C	

Intersection Summary			
HCM Average Control Delay	4.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.98		1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.98	1.00
Satd. Flow (prot)	1766	3516		1767	3530			1798	1559		1834	1531
Flt Permitted	0.33	1.00		0.33	1.00			0.97	1.00		0.98	1.00
Satd. Flow (perm)	614	3516		613	3530			1798	1559		1834	1531
Volume (vph)	3	532	20	69	565	8	60	23	282	17	37	13
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	3	591	22	77	628	9	67	26	313	19	41	14
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	3	613	0	77	637	0	0	93	313	0	60	14
Confl. Peds. (#/hr)	8		6	6		8			12			6
Turn Type	pm+pt			pm+pt			Split		pm+ov	Split		Perm
Protected Phases	5	2		1	6		3	3	1	4	4	
Permitted Phases	2			6					3			4
Actuated Green, G (s)	30.8	30.0		43.5	37.8			10.2	18.8		12.0	12.0
Effective Green, g (s)	34.2	31.9		45.0	39.7			12.1	22.2		13.9	13.9
Actuated g/C Ratio	0.43	0.40		0.56	0.50			0.15	0.28		0.17	0.17
Clearance Time (s)	4.5	4.9		4.5	4.9			4.9	4.5		4.9	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0			2.0	3.0		2.0	2.0
Lane Grp Cap (vph)	296	1402		491	1752			272	491		319	266
v/s Ratio Prot	0.00	c0.17		0.02	0.18			0.05	c0.08		c0.03	
v/s Ratio Perm	0.00			0.07					0.12			0.01
v/c Ratio	0.01	0.44		0.16	0.36			0.34	0.64		0.19	0.05
Uniform Delay, d1	17.0	17.5		12.5	12.4			30.4	25.4		28.2	27.6
Progression Factor	0.88	0.81		0.32	0.21			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	1.0		0.1	0.4			0.3	2.7		0.1	0.0
Delay (s)	14.9	15.1		4.1	3.0			30.7	28.1		28.3	27.6
Level of Service	B	B		A	A			C	C		C	C
Approach Delay (s)		15.1			3.2			28.7			28.2	
Approach LOS		B			A			C			C	

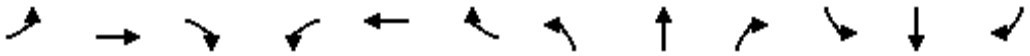
Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0	3.0		3.0	3.0
Lane Util. Factor		0.95	1.00		0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.98		1.00			1.00	0.98		1.00	0.99
Flpb, ped/bikes		1.00	1.00		1.00			1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00			1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00		0.99			0.96	1.00		0.98	1.00
Satd. Flow (prot)		3538	1544		3492			1784	1544		1828	1562
Flt Permitted		1.00	1.00		0.99			0.67	1.00		0.89	1.00
Satd. Flow (perm)		3538	1544		3492			1249	1544		1654	1562
Volume (vph)	7	743	163	202	570	3	64	11	112	28	61	7
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	8	826	181	224	633	3	71	12	124	31	68	8
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	834	181	0	860	0	0	83	124	0	99	8
Confl. Peds. (#/hr)			7			2	1		8	8		1
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	2	2		1	1			8			4	
Permitted Phases			2				8		8	4		4
Actuated Green, G (s)		32.9	32.9		22.8			10.8	10.8		10.8	10.8
Effective Green, g (s)		34.4	34.4		24.3			12.3	12.3		12.3	12.3
Actuated g/C Ratio		0.43	0.43		0.30			0.15	0.15		0.15	0.15
Clearance Time (s)		4.5	4.5		4.5			4.5	4.5		4.5	4.5
Vehicle Extension (s)		2.0	2.0		2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		1521	664		1061			192	237		254	240
v/s Ratio Prot		c0.24			c0.25							
v/s Ratio Perm			0.12					0.07	0.08		0.06	0.01
v/c Ratio		0.55	0.27		0.81			0.43	0.52		0.39	0.03
Uniform Delay, d1		17.0	14.7		25.7			30.7	31.2		30.5	28.8
Progression Factor		0.82	0.77		0.70			1.00	1.00		1.00	1.00
Incremental Delay, d2		1.3	0.9		3.9			0.6	1.0		0.4	0.0
Delay (s)		15.2	12.3		21.8			31.3	32.1		30.8	28.8
Level of Service		B	B		C			C	C		C	C
Approach Delay (s)		14.6			21.8			31.8			30.7	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

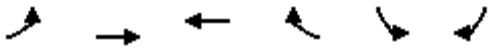
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0			3.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			1.00	
Frpb, ped/bikes		1.00	0.98		1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.97			0.95	
Flt Protected		1.00	1.00		0.98			0.97			0.99	
Satd. Flow (prot)		3534	1550		3459			3291			1742	
Flt Permitted		1.00	1.00		0.98			0.81			0.86	
Satd. Flow (perm)		3534	1550		3459			2745			1508	
Volume (vph)	10	302	571	307	364	2	314	147	131	12	22	17
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	336	634	341	404	2	349	163	146	13	24	19
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	347	634	0	747	0	0	658	0	0	56	0
Confl. Peds. (#/hr)			2			5	7		7	7		7
Turn Type	Split		Free	Split			Perm			Perm		
Protected Phases	1	1		2	2			4			4	
Permitted Phases		1	Free		2		4			4	4	
Actuated Green, G (s)		12.6	80.0		31.6			22.3			22.3	
Effective Green, g (s)		14.1	80.0		33.1			23.8			23.8	
Actuated g/C Ratio		0.18	1.00		0.41			0.30			0.30	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		623	1550		1431			817			449	
v/s Ratio Prot		c0.10			c0.22							
v/s Ratio Perm			0.41					c0.24			0.04	
v/c Ratio		0.56	0.41		0.52			0.81			0.12	
Uniform Delay, d1		30.1	0.0		17.5			26.0			20.5	
Progression Factor		1.09	1.00		1.00			1.00			1.00	
Incremental Delay, d2		0.5	0.7		1.4			5.5			0.0	
Delay (s)		33.3	0.7		18.9			31.5			20.5	
Level of Service		C	A		B			C			C	
Approach Delay (s)		12.2			18.9			31.5			20.5	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	19.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	62.2%	ICU Level of Service	B
Analysis Period (min)	15		

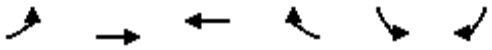
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	8	415	666	3	7	42
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	9	461	740	3	8	47
Pedestrians		9	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	0		0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		776	1117			
pX, platoon unblocked						
vC, conflicting volume	748				997	386
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	748				997	386
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				97	92
cM capacity (veh/h)	866				240	611

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	163	307	493	250	54
Volume Left	9	0	0	0	8
Volume Right	0	0	0	3	47
cSH	866	1700	1700	1700	501
Volume to Capacity	0.01	0.18	0.29	0.15	0.11
Queue Length (ft)	1	0	0	0	9
Control Delay (s)	0.6	0.0	0.0	0.0	13.1
Lane LOS	A				B
Approach Delay (s)	0.2		0.0		13.1
Approach LOS					B

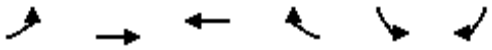
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	18	403	633	12	8	3
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	20	448	703	13	9	3
Pedestrians		1	11			
Lane Width (ft)		12.0	12.0			
Walking Speed (ft/s)		4.0	4.0			
Percent Blockage		0	1			
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		1136	757			
pX, platoon unblocked						
vC, conflicting volume	717				985	359
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	717				985	359
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				96	99
cM capacity (veh/h)	893				241	643

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	169	299	469	248	12
Volume Left	20	0	0	0	9
Volume Right	0	0	0	13	3
cSH	893	1700	1700	1700	290
Volume to Capacity	0.02	0.18	0.28	0.15	0.04
Queue Length (ft)	2	0	0	0	3
Control Delay (s)	1.3	0.0	0.0	0.0	17.9
Lane LOS	A				C
Approach Delay (s)	0.5		0.0		17.9
Approach LOS					C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	34.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	13	404	609	12	7	34
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	14	449	677	13	8	38
Pedestrians		5	6		7	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			367			
pX, platoon unblocked						
vC, conflicting volume	697				950	357
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	697				950	357
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	94
cM capacity (veh/h)	903				255	639

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	164	299	451	239	46
Volume Left	14	0	0	0	8
Volume Right	0	0	0	13	38
cSH	903	1700	1700	1700	508
Volume to Capacity	0.02	0.18	0.27	0.14	0.09
Queue Length (ft)	1	0	0	0	7
Control Delay (s)	0.9	0.0	0.0	0.0	12.8
Lane LOS	A				B
Approach Delay (s)	0.3		0.0		12.8
Approach LOS					B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	404	7	20	609	12	18
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	449	8	22	677	13	20
Pedestrians	5			6	7	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				297		
pX, platoon unblocked						
vC, conflicting volume			464		848	241
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			464		848	241
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		95	97
cM capacity (veh/h)			1102		295	757

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	299	157	248	451	33
Volume Left	0	0	22	0	13
Volume Right	0	8	0	0	20
cSH	1700	1700	1102	1700	466
Volume to Capacity	0.18	0.09	0.02	0.27	0.07
Queue Length (ft)	0	0	2	0	6
Control Delay (s)	0.0	0.0	0.9	0.0	13.3
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		13.3
Approach LOS					B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		0.95	0.95			1.00	
Frpb, ped/bikes		0.99			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			1.00	
Frt		0.92			0.98		1.00	1.00			0.96	
Flt Protected		0.99			1.00		0.95	0.98			0.99	
Satd. Flow (prot)		1668			1821		1681	1734			1759	
Flt Permitted		0.95			0.98		0.95	0.98			0.99	
Satd. Flow (perm)		1610			1801		1681	1734			1759	
Volume (vph)	9	7	25	13	120	17	105	53	2	7	14	8
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	10	8	28	14	133	19	117	59	2	8	16	9
RTOR Reduction (vph)	0	12	0	0	4	0	0	1	0	0	8	0
Lane Group Flow (vph)	0	34	0	0	162	0	87	90	0	0	25	0
Confl. Peds. (#/hr)	1		2	2		1	7		1	1		7
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		29.9			29.7		10.6	10.6			3.2	
Effective Green, g (s)		31.5			31.5		11.6	11.6			4.4	
Actuated g/C Ratio		0.56			0.56		0.21	0.21			0.08	
Clearance Time (s)		4.6			4.8		4.0	4.0			4.2	
Vehicle Extension (s)		2.0			2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		898			1004		345	356			137	
v/s Ratio Prot							0.05	c0.05			c0.02	
v/s Ratio Perm		0.03			c0.09							
v/c Ratio		0.04			0.16		0.25	0.25			0.18	
Uniform Delay, d1		5.6			6.1		18.8	18.8			24.4	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.0			0.0		0.1	0.1			0.2	
Delay (s)		5.7			6.1		19.0	19.0			24.6	
Level of Service		A			A		B	B			C	
Approach Delay (s)		5.7			6.1			19.0			24.6	
Approach LOS		A			A			B			C	

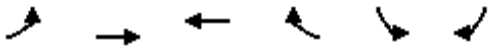
Intersection Summary			
HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	56.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	412	11	24	573	3	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	458	12	27	637	3	24
Pedestrians				1	3	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	243			551		
pX, platoon unblocked						
vC, conflicting volume			473		839	239
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			473		839	239
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		99	97
cM capacity (veh/h)			1097		300	766

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	305	165	239	424	28
Volume Left	0	0	27	0	3
Volume Right	0	12	0	0	24
cSH	1700	1700	1097	1700	646
Volume to Capacity	0.18	0.10	0.02	0.25	0.04
Queue Length (ft)	0	0	2	0	3
Control Delay (s)	0.0	0.0	1.1	0.0	10.8
Lane LOS			A		B
Approach Delay (s)	0.0		0.4		10.8
Approach LOS					B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	25	409	556	12	13	41
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	28	454	618	13	14	46
Pedestrians			1		32	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			4.0		4.0	
Percent Blockage			0		3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		393	401			
pX, platoon unblocked						
vC, conflicting volume	663				940	348
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	663				940	348
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				94	93
cM capacity (veh/h)	910				251	637

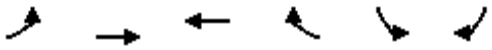
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	179	303	412	219	60
Volume Left	28	0	0	0	14
Volume Right	0	0	0	13	46
cSH	910	1700	1700	1700	464
Volume to Capacity	0.03	0.18	0.24	0.13	0.13
Queue Length (ft)	2	0	0	0	11
Control Delay (s)	1.7	0.0	0.0	0.0	13.9
Lane LOS	A				B
Approach Delay (s)	0.6		0.0		13.9
Approach LOS					B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	401	22	14	555	7	23
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	446	24	16	617	8	26
Pedestrians					19	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	523			271		
pX, platoon unblocked						
vC, conflicting volume			489		816	254
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			489		816	254
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	97
cM capacity (veh/h)			1067		309	740

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	297	173	221	411	33
Volume Left	0	0	16	0	8
Volume Right	0	24	0	0	26
cSH	1700	1700	1067	1700	558
Volume to Capacity	0.17	0.10	0.01	0.24	0.06
Queue Length (ft)	0	0	1	0	5
Control Delay (s)	0.0	0.0	0.7	0.0	11.9
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		11.9
Approach LOS					B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	0.99		0.97	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.94	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3527	1817		1650	
Flt Permitted		0.91	1.00		0.97	
Satd. Flow (perm)		3227	1817		1650	
Volume (vph)	22	430	578	68	65	47
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	24	478	642	76	72	52
RTOR Reduction (vph)	0	0	3	0	38	0
Lane Group Flow (vph)	0	502	715	0	86	0
Confl. Peds. (#/hr)	36			36	1	28
Turn Type	Perm					
Protected Phases		2	6		4	
Permitted Phases	2					
Actuated Green, G (s)		62.8	62.8		7.4	
Effective Green, g (s)		64.7	64.7		9.3	
Actuated g/C Ratio		0.81	0.81		0.12	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		2.0	2.0		2.0	
Lane Grp Cap (vph)		2610	1469		192	
v/s Ratio Prot			c0.40		c0.08	
v/s Ratio Perm		0.16				
v/c Ratio		0.19	0.49		0.45	
Uniform Delay, d1		1.7	2.4		33.0	
Progression Factor		0.62	0.23		1.00	
Incremental Delay, d2		0.2	1.1		0.6	
Delay (s)		1.2	1.6		33.6	
Level of Service		A	A		C	
Approach Delay (s)		1.2	1.6		33.6	
Approach LOS		A	A		C	

Intersection Summary			
HCM Average Control Delay	4.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	53.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	452	28	0	625	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	502	31	0	694	0	0
Pedestrians	28			1	43	
Lane Width (ft)	12.0			12.0	0.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	259			90		
pX, platoon unblocked						
vC, conflicting volume			576		1283	311
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			576		1283	311
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1007		156	691

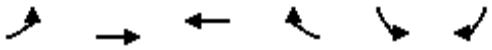
Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	335	199	694
Volume Left	0	0	0
Volume Right	0	31	0
cSH	1700	1700	1700
Volume to Capacity	0.20	0.12	0.41
Queue Length (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		0.0
Approach LOS			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	530	21	0	614	0	47
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	589	23	0	682	0	52
Pedestrians				11	11	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				1	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	150			636		
pX, platoon unblocked			0.97		0.82	0.97
vC, conflicting volume			623		1294	328
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			575		1255	269
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	93
cM capacity (veh/h)			965		135	697

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	393	220	682	52
Volume Left	0	0	0	0
Volume Right	0	23	0	52
cSH	1700	1700	1700	697
Volume to Capacity	0.23	0.13	0.40	0.07
Queue Length (ft)	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	10.6
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.6
Approach LOS				B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	12	528	614	22	13	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	13	587	682	24	14	27
Pedestrians		2			4	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		370	416			
pX, platoon unblocked	0.81				0.81	0.81
vC, conflicting volume	711				1018	700
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	642				1023	629
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				92	92
cM capacity (veh/h)	767				186	345

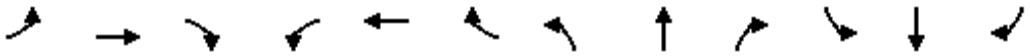
Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	209	391	707	41
Volume Left	13	0	0	14
Volume Right	0	0	24	27
cSH	767	1700	1700	266
Volume to Capacity	0.02	0.23	0.42	0.15
Queue Length (ft)	1	0	0	13
Control Delay (s)	0.8	0.0	0.0	21.0
Lane LOS	A			C
Approach Delay (s)	0.3		0.0	21.0
Approach LOS				C

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	532	9	0	636	0	21
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	591	10	0	707	0	23
Pedestrians	2			3	6	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	490			296		
pX, platoon unblocked					0.83	
vC, conflicting volume			607		1311	310
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			607		1377	310
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	97
cM capacity (veh/h)			976		114	687

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	394	207	707	23
Volume Left	0	0	0	0
Volume Right	0	10	0	23
cSH	1700	1700	1700	687
Volume to Capacity	0.23	0.12	0.42	0.03
Queue Length (ft)	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	10.4
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.4
Approach LOS				B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Util. Factor		1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00	0.98		0.98		1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frt		0.99		1.00	1.00	0.85		0.89		1.00	0.94	
Flt Protected		1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)		1852		1770	1863	1551		1607		1767	1760	
Flt Permitted		1.00		0.51	1.00	1.00		0.95		0.63	1.00	
Satd. Flow (perm)		1852		946	1863	1551		1544		1180	1760	
Volume (vph)	0	183	8	222	144	198	30	0	159	325	65	38
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	203	9	247	160	220	33	0	177	361	72	42
RTOR Reduction (vph)	0	2	0	0	0	0	0	66	0	0	16	0
Lane Group Flow (vph)	0	210	0	247	160	220	0	144	0	361	98	0
Confl. Peds. (#/hr)	1					1			1	1		
Turn Type				Perm		Free	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases				8		Free	2			6		
Actuated Green, G (s)		22.4		22.4	22.4	80.0		48.6		48.6	48.6	
Effective Green, g (s)		23.9		23.9	23.9	80.0		50.1		50.1	50.1	
Actuated g/C Ratio		0.30		0.30	0.30	1.00		0.63		0.63	0.63	
Clearance Time (s)		4.5		4.5	4.5			4.5		4.5	4.5	
Vehicle Extension (s)		3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		553		283	557	1551		967		739	1102	
v/s Ratio Prot		0.11			0.09						0.06	
v/s Ratio Perm				c0.26		0.14		0.14		c0.31		
v/c Ratio		0.38		0.87	0.29	0.14		0.15		0.49	0.09	
Uniform Delay, d1		22.2		26.6	21.5	0.0		6.2		8.1	5.9	
Progression Factor		1.00		1.00	1.00	1.00		1.00		0.61	0.63	
Incremental Delay, d2		0.4		24.3	0.3	0.2		0.3		2.0	0.1	
Delay (s)		22.6		50.9	21.8	0.2		6.5		6.9	3.9	
Level of Service		C		D	C	A		A		A	A	
Approach Delay (s)		22.6			25.7			6.5			6.2	
Approach LOS		C			C			A			A	

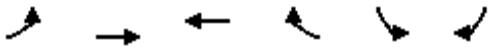
Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1042	104	36	686	49	26
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1158	116	40	762	54	29
Pedestrians	12			20	36	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			2	3	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)	452			320		
pX, platoon unblocked						
vC, conflicting volume			1309		1725	693
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1309		1725	693
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		25	92
cM capacity (veh/h)			519		72	373

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	772	501	294	508	83
Volume Left	0	0	40	0	54
Volume Right	0	116	0	0	29
cSH	1700	1700	519	1700	107
Volume to Capacity	0.45	0.29	0.08	0.30	0.78
Queue Length (ft)	0	0	6	0	107
Control Delay (s)	0.0	0.0	2.7	0.0	107.7
Lane LOS			A		F
Approach Delay (s)	0.0		1.0		107.7
Approach LOS					F

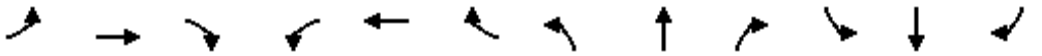
Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	17	1141	709	26	5	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	19	1268	788	29	6	31
Pedestrians		12	20		17	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	2		1	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)		372	400			
pX, platoon unblocked						
vC, conflicting volume	834				1511	437
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	834				1511	437
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				95	94
cM capacity (veh/h)	797				107	559

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	441	845	525	291	37
Volume Left	19	0	0	0	6
Volume Right	0	0	0	29	31
cSH	797	1700	1700	1700	659
Volume to Capacity	0.02	0.50	0.31	0.17	0.06
Queue Length (ft)	2	0	0	0	4
Control Delay (s)	0.7	0.0	0.0	0.0	16.2
Lane LOS	A				C
Approach Delay (s)	0.2		0.0		16.2
Approach LOS					C

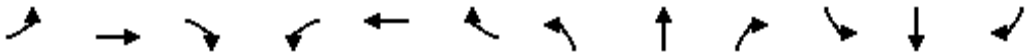
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	1006	24	51	682	7	0	0	93	0	0	12
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	28	1118	27	57	758	8	0	0	103	0	0	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		359			243							
pX, platoon unblocked	0.80						0.80	0.80		0.80	0.80	0.80
vC, conflicting volume	766			1144			1692	2066	572	1593	2075	383
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	450			1144			1613	2082	572	1489	2094	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			91			100	100	78	100	100	98
cM capacity (veh/h)	893			618			50	38	468	49	37	869

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	28	745	399	57	505	260	103	13
Volume Left	28	0	0	57	0	0	0	0
Volume Right	0	0	27	0	0	8	103	13
cSH	893	1700	1700	618	1700	1700	468	869
Volume to Capacity	0.03	0.44	0.23	0.09	0.30	0.15	0.22	0.02
Queue Length (ft)	2	0	0	8	0	0	21	1
Control Delay (s)	9.2	0.0	0.0	11.4	0.0	0.0	14.9	9.2
Lane LOS	A			B			B	A
Approach Delay (s)	0.2			0.8			14.9	9.2
Approach LOS							B	A

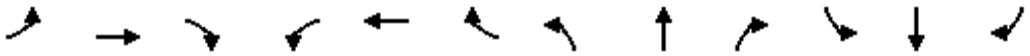
Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	41.0%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	3	118	81	30	214	10	14	11	27	9	24	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	3	131	90	33	238	11	16	12	30	10	27	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		393			875							
pX, platoon unblocked												
vC, conflicting volume	249			221			511	498	176	529	538	243
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	249			221			511	498	176	529	538	243
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			96	97	97	98	94	99
cM capacity (veh/h)	1317			1348			440	461	867	426	438	795

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	224	282	58	41
Volume Left	3	33	16	10
Volume Right	90	11	30	4
cSH	1317	1348	599	457
Volume to Capacity	0.00	0.02	0.10	0.09
Queue Length (ft)	0	2	8	7
Control Delay (s)	0.1	1.1	11.7	13.7
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	1.1	11.7	13.7
Approach LOS			B	B

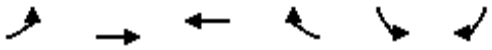
Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	20	1026	42	25	668	29	3	4	21	2	4	20
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	22	1140	47	28	742	32	3	4	23	2	4	22
Pedestrians		6			1			17			16	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		351			383							
pX, platoon unblocked												
vC, conflicting volume	790			1204			1682	2071	611	1471	2078	409
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	790			1204			1682	2071	611	1471	2078	409
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			95			93	91	95	97	91	96
cM capacity (veh/h)	827			579			51	49	435	73	49	586

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	592	617	399	403	31	29
Volume Left	22	0	28	0	3	2
Volume Right	0	47	0	32	23	22
cSH	827	1700	579	1700	149	181
Volume to Capacity	0.03	0.36	0.05	0.24	0.21	0.16
Queue Length (ft)	2	0	4	0	19	14
Control Delay (s)	0.7	0.0	1.5	0.0	35.5	28.6
Lane LOS	A		A		E	D
Approach Delay (s)	0.4		0.7		35.5	28.6
Approach LOS					E	D

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	22	976	677	19	15	49
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	24	1084	752	21	17	54
Pedestrians		2				
Lane Width (ft)		12.0				
Walking Speed (ft/s)		4.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		376				
pX, platoon unblocked						
vC, conflicting volume	773				1354	389
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	773				1354	389
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				88	91
cM capacity (veh/h)	851				139	615

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	386	723	501	272	71
Volume Left	24	0	0	0	17
Volume Right	0	0	0	21	54
cSH	851	1700	1700	1700	341
Volume to Capacity	0.03	0.43	0.29	0.16	0.21
Queue Length (ft)	2	0	0	0	19
Control Delay (s)	0.9	0.0	0.0	0.0	18.3
Lane LOS	A				C
Approach Delay (s)	0.3		0.0		18.3
Approach LOS					C

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	983	41	29	697	5	15
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1092	46	32	774	6	17
Pedestrians	2				2	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	0				0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	286					
pX, platoon unblocked						
vC, conflicting volume			1140		1571	571
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1140		1571	571
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		94	96
cM capacity (veh/h)			619		98	468

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	728	410	290	516	22
Volume Left	0	0	32	0	6
Volume Right	0	46	0	0	17
cSH	1700	1700	619	1700	240
Volume to Capacity	0.43	0.24	0.05	0.30	0.09
Queue Length (ft)	0	0	4	0	8
Control Delay (s)	0.0	0.0	1.8	0.0	21.5
Lane LOS			A		C
Approach Delay (s)	0.0		0.7		21.5
Approach LOS					C

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	932	40	46	681	23	50
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1036	44	51	757	26	56
Pedestrians	21			13	10	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			1	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	616			1277		
pX, platoon unblocked						
vC, conflicting volume			1090		1569	563
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1090		1569	563
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		72	88
cM capacity (veh/h)			642		93	466

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	690	390	303	504	81
Volume Left	0	0	51	0	26
Volume Right	0	44	0	0	56
cSH	1700	1700	642	1700	205
Volume to Capacity	0.41	0.23	0.08	0.30	0.39
Queue Length (ft)	0	0	6	0	44
Control Delay (s)	0.0	0.0	2.7	0.0	33.5
Lane LOS			A		D
Approach Delay (s)	0.0		1.0		33.5
Approach LOS					D

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	0.95			1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			1.00
Frt	1.00	0.98		1.00	0.97			1.00	0.97			1.00
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95
Satd. Flow (prot)	1703	3286		1703	3278			1703	3254			1703
Flt Permitted	0.95	1.00		0.95	1.00			0.32	1.00			0.30
Satd. Flow (perm)	1703	3286		1703	3278			578	3254			535
Volume (vph)	158	622	117	129	443	96	2	141	478	139	7	244
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	176	691	130	143	492	107	2	157	531	154	8	271
RTOR Reduction (vph)	0	14	0	0	17	0	0	0	25	0	0	0
Lane Group Flow (vph)	176	807	0	143	582	0	0	159	660	0	0	279
Confl. Peds. (#/hr)			79			67				52		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			custom	Prot			custom	Prot
Protected Phases	5	2		1	6			3	8			7
Permitted Phases							3				7	
Actuated Green, G (s)	10.0	26.3		10.6	26.9			11.0	24.0			12.0
Effective Green, g (s)	11.4	28.2		12.0	28.8			12.4	25.9			13.4
Actuated g/C Ratio	0.12	0.31		0.13	0.31			0.14	0.28			0.15
Clearance Time (s)	4.4	4.9		4.4	4.9			4.4	4.9			4.4
Vehicle Extension (s)	3.0	2.0		3.0	2.0			3.0	3.3			2.0
Lane Grp Cap (vph)	212	1013		223	1032			78	921			78
v/s Ratio Prot	c0.10	c0.25		0.08	0.18				c0.21			
v/s Ratio Perm								0.27				c0.52
v/c Ratio	0.83	0.80		0.64	0.56			2.04	0.72			3.58
Uniform Delay, d1	39.1	29.0		37.7	26.1			39.6	29.5			39.0
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00
Incremental Delay, d2	23.2	4.1		6.2	0.4			508.9	2.7			1190.8
Delay (s)	62.3	33.2		43.9	26.5			548.5	32.2			1229.9
Level of Service	E	C		D	C			F	C			F
Approach Delay (s)		38.3			29.9				129.5			
Approach LOS		D			C				F			

Intersection Summary			
HCM Average Control Delay	156.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	91.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	3.0	
Lane Util. Factor	0.95	
Frpb, ped/bikes	0.99	
Flpb, ped/bikes	1.00	
Frt	0.97	
Flt Protected	1.00	
Satd. Flow (prot)	3293	
Flt Permitted	1.00	
Satd. Flow (perm)	3293	
Volume (vph)	381	77
Peak-hour factor, PHF	0.90	0.90
Adj. Flow (vph)	423	86
RTOR Reduction (vph)	16	0
Lane Group Flow (vph)	493	0
Confl. Peds. (#/hr)		35
Heavy Vehicles (%)	6%	6%
Turn Type		
Protected Phases	4	
Permitted Phases		
Actuated Green, G (s)	25.0	
Effective Green, g (s)	26.9	
Actuated g/C Ratio	0.29	
Clearance Time (s)	4.9	
Vehicle Extension (s)	2.9	
Lane Grp Cap (vph)	968	
v/s Ratio Prot	0.15	
v/s Ratio Perm		
v/c Ratio	0.51	
Uniform Delay, d1	26.8	
Progression Factor	1.00	
Incremental Delay, d2	0.4	
Delay (s)	27.2	
Level of Service	C	
Approach Delay (s)	453.0	
Approach LOS	F	

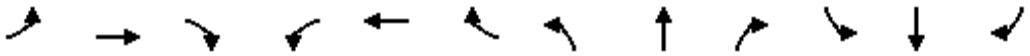
Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			0.98			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.92			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1703	3394		1703	3337			1618			1716	
Flt Permitted	0.95	1.00		0.95	1.00			0.97			0.75	
Satd. Flow (perm)	1703	3394		1703	3337			1572			1307	
Volume (vph)	26	953	19	56	616	66	26	112	177	29	69	26
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	29	1059	21	62	684	73	29	124	197	32	77	29
RTOR Reduction (vph)	0	1	0	0	6	0	0	61	0	0	13	0
Lane Group Flow (vph)	29	1079	0	62	751	0	0	289	0	0	125	0
Confl. Peds. (#/hr)			3			17			16			3
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	3.0	46.6		9.6	53.2			19.6			19.6	
Effective Green, g (s)	4.0	49.1		10.6	55.7			21.3			21.3	
Actuated g/C Ratio	0.04	0.55		0.12	0.62			0.24			0.24	
Clearance Time (s)	4.0	5.5		4.0	5.5			4.7			4.7	
Vehicle Extension (s)	2.0	2.5		2.0	2.5			2.0			2.0	
Lane Grp Cap (vph)	76	1852		201	2065			372			309	
v/s Ratio Prot	0.02	c0.32		0.04	c0.23							
v/s Ratio Perm								c0.22			0.11	
v/c Ratio	0.38	0.58		0.31	0.36			0.78			0.40	
Uniform Delay, d1	41.8	13.6		36.3	8.4			32.1			29.0	
Progression Factor	1.00	1.00		0.92	1.02			1.00			1.00	
Incremental Delay, d2	1.2	1.3		0.3	0.5			9.0			0.3	
Delay (s)	43.0	15.0		33.6	9.1			41.1			29.3	
Level of Service	D	B		C	A			D			C	
Approach Delay (s)		15.7			11.0			41.1			29.3	
Approach LOS		B			B			D			C	

Intersection Summary			
HCM Average Control Delay	18.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0			3.0			3.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.98			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.97			0.97	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		3365			3375			1664			1676	
Flt Permitted		0.91			0.90			0.97			0.98	
Satd. Flow (perm)		3082			3057			1664			1676	
Volume (vph)	31	980	59	19	648	24	57	17	19	54	26	26
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	34	1089	66	21	720	27	63	19	21	60	29	29
RTOR Reduction (vph)	0	3	0	0	2	0	0	11	0	0	15	0
Lane Group Flow (vph)	0	1186	0	0	766	0	0	92	0	0	103	0
Confl. Peds. (#/hr)			7			18			46			14
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		56.4			56.4			9.0			9.4	
Effective Green, g (s)		58.8			58.8			10.9			11.3	
Actuated g/C Ratio		0.65			0.65			0.12			0.13	
Clearance Time (s)		5.4			5.4			4.9			4.9	
Vehicle Extension (s)		2.7			2.8			2.0			2.0	
Lane Grp Cap (vph)		2014			1997			202			210	
v/s Ratio Prot								c0.06			c0.07	
v/s Ratio Perm		c0.39			0.25							
v/c Ratio		0.59			0.38			0.45			0.49	
Uniform Delay, d1		8.8			7.2			36.8			36.7	
Progression Factor		0.26			1.00			1.00			1.00	
Incremental Delay, d2		1.1			0.1			0.6			0.7	
Delay (s)		3.4			7.3			37.4			37.3	
Level of Service		A			A			D			D	
Approach Delay (s)		3.4			7.3			37.4			37.3	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM Average Control Delay	8.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.98		1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3385		1703	3311		1703	1755		1703	1713	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1703	3385		1703	3311		1703	1755		1703	1713	
Volume (vph)	125	898	26	36	596	71	58	145	17	109	196	69
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	139	998	29	40	662	79	64	161	19	121	218	77
RTOR Reduction (vph)	0	1	0	0	6	0	0	3	0	0	8	0
Lane Group Flow (vph)	139	1026	0	40	735	0	64	177	0	121	287	0
Confl. Peds. (#/hr)			14			36			18			8
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			Split			Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	9.5	34.7		4.1	29.3		13.4	13.4		23.7	23.7	
Effective Green, g (s)	10.5	36.7		5.1	31.3		14.9	14.9		24.7	24.7	
Actuated g/C Ratio	0.11	0.37		0.05	0.32		0.15	0.15		0.25	0.25	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.5	4.5		4.0	4.0	
Vehicle Extension (s)	2.0	2.2		2.0	2.1		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	180	1252		88	1045		256	264		424	427	
v/s Ratio Prot	c0.08	c0.30		0.02	0.22		0.04	c0.10		0.07	c0.17	
v/s Ratio Perm												
v/c Ratio	0.77	0.82		0.45	0.70		0.25	0.67		0.29	0.67	
Uniform Delay, d1	43.2	28.3		45.7	29.9		37.2	39.8		30.1	33.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	16.9	4.1		1.4	1.8		0.2	5.2		0.1	3.3	
Delay (s)	60.1	32.4		47.1	31.7		37.4	45.1		30.3	36.8	
Level of Service	E	C		D	C		D	D		C	D	
Approach Delay (s)		35.7			32.5			43.0			34.9	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM Average Control Delay	35.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	99.2	Sum of lost time (s)	14.8
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.99		1.00	0.96		1.00	0.95	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.95		1.00	0.94	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3343			3350		1703	1625		1703	1588	
Flt Permitted		0.92			0.91		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3086			3066		1703	1625		1703	1588	
Volume (vph)	25	937	76	17	662	45	64	68	36	41	59	45
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	1041	84	19	736	50	71	76	40	46	66	50
RTOR Reduction (vph)	0	4	0	0	3	0	0	14	0	0	22	0
Lane Group Flow (vph)	0	1149	0	0	802	0	71	102	0	46	94	0
Confl. Peds. (#/hr)			35			40			54			49
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6								
Actuated Green, G (s)		41.9			41.9		9.1	9.1		8.5	8.5	
Effective Green, g (s)		44.4			44.4		11.3	11.3		10.7	10.7	
Actuated g/C Ratio		0.54			0.54		0.14	0.14		0.13	0.13	
Clearance Time (s)		5.5			5.5		5.2	5.2		5.2	5.2	
Vehicle Extension (s)		2.0			2.0		3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)		1677			1666		236	225		223	208	
v/s Ratio Prot							0.04	c0.07		0.03	c0.07	
v/s Ratio Perm		c0.37			0.26							
v/c Ratio		0.69			0.48		0.30	0.45		0.21	0.45	
Uniform Delay, d1		13.6			11.5		31.6	32.4		31.7	32.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.9			0.1		0.7	1.5		0.2	0.6	
Delay (s)		14.5			11.6		32.4	33.8		31.9	33.4	
Level of Service		B			B		C	C		C	C	
Approach Delay (s)		14.5			11.6			33.3			32.9	
Approach LOS		B			B			C			C	

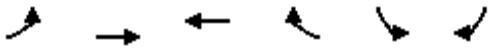
Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	81.7	Sum of lost time (s)	15.3
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.97		1.00	0.94		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3379		1703	3251		1703	1596		1703	1741	
Flt Permitted	0.20	1.00		0.14	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	367	3379		260	3251		1703	1596		1703	1741	
Volume (vph)	46	926	34	145	542	63	101	301	157	54	381	59
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	51	1029	38	161	602	70	112	334	174	60	423	66
RTOR Reduction (vph)	0	3	0	0	9	0	0	20	0	0	6	0
Lane Group Flow (vph)	51	1064	0	161	663	0	112	488	0	60	483	0
Confl. Peds. (#/hr)			23			104			139			44
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt			pm+pt			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	30.5	30.5		33.9	33.5		7.4	28.1		6.4	27.1	
Effective Green, g (s)	32.4	32.4		35.4	35.4		8.8	30.0		7.8	29.0	
Actuated g/C Ratio	0.36	0.36		0.39	0.39		0.10	0.33		0.09	0.32	
Clearance Time (s)	4.5	4.9		4.5	4.9		4.4	4.9		4.4	4.9	
Vehicle Extension (s)	3.0	2.0		3.0	2.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	203	1216		227	1279		167	532		148	561	
v/s Ratio Prot	0.01	c0.32		c0.06	0.21		c0.07	c0.32		0.04	0.28	
v/s Ratio Perm	0.08			0.22								
v/c Ratio	0.25	0.87		0.71	0.52		0.67	0.92		0.41	0.86	
Uniform Delay, d1	20.1	26.9		32.8	20.8		39.2	28.8		38.9	28.6	
Progression Factor	1.00	1.00		0.91	0.91		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	8.9		7.8	1.2		8.0	20.3		0.7	12.4	
Delay (s)	20.7	35.8		37.6	20.1		47.2	49.1		39.6	41.0	
Level of Service	C	D		D	C		D	D		D	D	
Approach Delay (s)		35.1			23.5			48.8			40.8	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM Average Control Delay	35.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

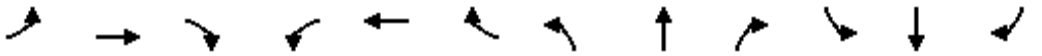
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0			3.0	3.0	
Lane Util. Factor	0.95			1.00	1.00	
Frpb, ped/bikes	0.98			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	3287			1792	1638	
Flt Permitted	1.00			1.00	0.97	
Satd. Flow (perm)	3287			1792	1638	
Volume (vph)	1012	98	0	709	65	54
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1124	109	0	788	72	60
RTOR Reduction (vph)	5	0	0	0	38	0
Lane Group Flow (vph)	1228	0	0	788	94	0
Confl. Peds. (#/hr)		98				
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type						
Protected Phases	2			2	4	
Permitted Phases						
Actuated Green, G (s)	71.3			71.3	10.2	
Effective Green, g (s)	72.8			72.8	11.2	
Actuated g/C Ratio	0.81			0.81	0.12	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	2.0			2.0	2.0	
Lane Grp Cap (vph)	2659			1450	204	
v/s Ratio Prot	0.38			c0.44	c0.08	
v/s Ratio Perm						
v/c Ratio	0.46			0.54	0.46	
Uniform Delay, d1	2.6			2.9	36.6	
Progression Factor	0.27			0.21	1.00	
Incremental Delay, d2	0.5			1.3	0.6	
Delay (s)	1.2			1.9	37.2	
Level of Service	A			A	D	
Approach Delay (s)	1.2			1.9	37.2	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	3.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



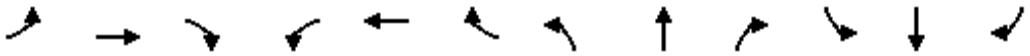
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	0.99		0.95	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.94	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3399	1762		1552	
Flt Permitted		0.90	1.00		0.97	
Satd. Flow (perm)		3074	1762		1552	
Volume (vph)	40	1026	613	59	72	60
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	44	1140	681	66	80	67
RTOR Reduction (vph)	0	0	3	0	37	0
Lane Group Flow (vph)	0	1184	744	0	110	0
Confl. Peds. (#/hr)				16		41
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type	Perm					
Protected Phases		2	2		4	
Permitted Phases	2					
Actuated Green, G (s)		68.0	68.0		12.2	
Effective Green, g (s)		69.9	69.9		14.1	
Actuated g/C Ratio		0.78	0.78		0.16	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		1.0	1.0		2.0	
Lane Grp Cap (vph)		2387	1368		243	
v/s Ratio Prot			c0.42		c0.09	
v/s Ratio Perm		0.39				
v/c Ratio		0.50	0.54		0.45	
Uniform Delay, d1		3.7	3.9		34.4	
Progression Factor		0.23	1.06		1.00	
Incremental Delay, d2		0.7	1.5		0.5	
Delay (s)		1.5	5.6		34.9	
Level of Service		A	A		C	
Approach Delay (s)		1.5	5.6		34.9	
Approach LOS		A	A		C	

Intersection Summary			
HCM Average Control Delay	5.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



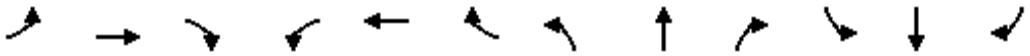
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.95		1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.98	1.00
Satd. Flow (prot)	1703	3358		1703	3382			1740	1443		1761	1456
Flt Permitted	0.40	1.00		0.11	1.00			0.97	1.00		0.98	1.00
Satd. Flow (perm)	725	3358		205	3382			1740	1443		1761	1456
Volume (vph)	25	867	58	109	566	20	82	53	192	41	75	17
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	963	64	121	629	22	91	59	213	46	83	19
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	28	1027	0	121	651	0	0	150	213	0	129	19
Confl. Peds. (#/hr)			23			14			28			10
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt			pm+pt			Split		Perm	Split		Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6					3			4
Actuated Green, G (s)	36.7	36.3		39.6	39.6			15.6	15.6		13.8	13.8
Effective Green, g (s)	38.2	38.2		41.5	41.5			17.5	17.5		15.7	15.7
Actuated g/C Ratio	0.42	0.42		0.46	0.46			0.19	0.19		0.17	0.17
Clearance Time (s)	4.5	4.9		4.5	4.9			4.9	4.9		4.9	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	344	1425		204	1559			338	281		307	254
v/s Ratio Prot	0.00	c0.31		c0.04	0.19			0.09			c0.07	
v/s Ratio Perm	0.03			0.23					0.15			0.01
v/c Ratio	0.08	0.72		0.59	0.42			0.44	0.76		0.42	0.07
Uniform Delay, d1	15.5	21.5		17.6	16.2			32.0	34.2		33.1	31.1
Progression Factor	1.36	1.30		0.33	0.36			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	2.9		2.4	0.4			0.3	9.9		0.3	0.0
Delay (s)	21.1	30.8		8.2	6.2			32.3	44.2		33.4	31.1
Level of Service	C	C		A	A			C	D		C	C
Approach Delay (s)		30.5			6.5			39.3			33.1	
Approach LOS		C			A			D			C	

Intersection Summary			
HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0	3.0		3.0	3.0
Lane Util. Factor		0.95	1.00		0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00			1.00	0.94		1.00	0.95
Flpb, ped/bikes		1.00	1.00		1.00			1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00			1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00		0.98			0.96	1.00		0.99	1.00
Satd. Flow (prot)		3405	1524		3352			1731	1425		1846	1508
Flt Permitted		1.00	1.00		0.98			0.62	1.00		0.93	1.00
Satd. Flow (perm)		3405	1524		3352			1124	1425		1738	1508
Volume (vph)	4	829	255	267	603	4	132	25	264	19	85	5
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	921	283	297	670	4	147	28	293	21	94	6
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	925	283	0	971	0	0	175	293	0	115	6
Confl. Peds. (#/hr)						2			30			20
Heavy Vehicles (%)	2%	6%	6%	6%	6%	2%	6%	2%	6%	2%	2%	2%
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	2	2		1	1			8			4	
Permitted Phases			2				8		8	4		4
Actuated Green, G (s)		30.8	30.8		26.9			18.8	18.8		18.8	18.8
Effective Green, g (s)		32.3	32.3		28.4			20.3	20.3		20.3	20.3
Actuated g/C Ratio		0.36	0.36		0.32			0.23	0.23		0.23	0.23
Clearance Time (s)		4.5	4.5		4.5			4.5	4.5		4.5	4.5
Vehicle Extension (s)		2.0	2.0		2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		1222	547		1058			254	321		392	340
v/s Ratio Prot		c0.27			c0.29							
v/s Ratio Perm			0.19					0.16	0.21		0.07	0.00
v/c Ratio		0.76	0.52		0.92			0.69	0.91		0.29	0.02
Uniform Delay, d1		25.4	22.7		29.7			32.0	34.0		28.9	27.1
Progression Factor		0.50	0.44		0.42			1.00	1.00		1.00	1.00
Incremental Delay, d2		3.4	2.7		5.9			5.8	27.4		0.2	0.0
Delay (s)		16.0	12.7		18.5			37.7	61.4		29.1	27.1
Level of Service		B	B		B			D	E		C	C
Approach Delay (s)		15.2			18.5			52.5			29.0	
Approach LOS		B			B			D			C	

Intersection Summary			
HCM Average Control Delay	23.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

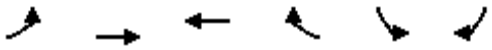


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0			3.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			1.00	
Frpb, ped/bikes		1.00	1.00		1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.96			0.95	
Flt Protected		1.00	1.00		0.99			0.98			0.98	
Satd. Flow (prot)		3405	1524		3358			3177			1715	
Flt Permitted		1.00	1.00		0.99			0.75			0.49	
Satd. Flow (perm)		3405	1524		3358			2458			851	
Volume (vph)	19	835	258	149	466	8	374	167	193	46	19	34
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	21	928	287	166	518	9	416	186	214	51	21	38
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	949	287	0	693	0	0	816	0	0	110	0
Confl. Peds. (#/hr)						13			11			14
Heavy Vehicles (%)	2%	6%	6%	6%	6%	2%	6%	2%	6%	2%	2%	2%
Turn Type	Split		Free	Split			Perm			Perm		
Protected Phases	1	1		2	2			4			4	
Permitted Phases		1	Free		2		4			4	4	
Actuated Green, G (s)		27.2	90.0		20.5			28.8			28.8	
Effective Green, g (s)		28.7	90.0		22.0			30.3			30.3	
Actuated g/C Ratio		0.32	1.00		0.24			0.34			0.34	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		1086	1524		821			828			287	
v/s Ratio Prot		c0.28			c0.21							
v/s Ratio Perm			0.19					c0.33			0.13	
v/c Ratio		0.87	0.19		0.84			1.01dl			0.38	
Uniform Delay, d1		28.9	0.0		32.4			29.6			22.7	
Progression Factor		1.04	1.00		1.00			1.00			0.91	
Incremental Delay, d2		4.9	0.2		10.3			27.4			0.3	
Delay (s)		34.9	0.2		42.7			57.0			21.0	
Level of Service		C	A		D			E			C	
Approach Delay (s)		26.8			42.7			57.0			21.0	
Approach LOS		C			D			E			C	

Intersection Summary			
HCM Average Control Delay	39.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

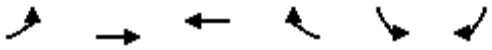
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	44	938	696	52	11	31
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	49	1042	773	58	12	34
Pedestrians		21	13		7	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		2	1		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		776	1117			
pX, platoon unblocked						
vC, conflicting volume	838				1441	444
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	838				1441	444
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				89	94
cM capacity (veh/h)	800				116	554

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	396	695	516	316	47
Volume Left	49	0	0	0	12
Volume Right	0	0	0	58	34
cSH	800	1700	1700	1700	279
Volume to Capacity	0.06	0.41	0.30	0.19	0.17
Queue Length (ft)	5	0	0	0	15
Control Delay (s)	1.9	0.0	0.0	0.0	20.5
Lane LOS	A				C
Approach Delay (s)	0.7		0.0		20.5
Approach LOS					C

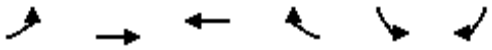
Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	17	950	737	62	25	45
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	19	1056	819	69	28	50
Pedestrians		4	6		8	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		1136	757			
pX, platoon unblocked						
vC, conflicting volume	896				1433	456
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	896				1433	456
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				77	91
cM capacity (veh/h)	761				123	551

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	371	704	546	342	78
Volume Left	19	0	0	0	28
Volume Right	0	0	0	69	50
cSH	761	1700	1700	1700	245
Volume to Capacity	0.02	0.41	0.32	0.20	0.32
Queue Length (ft)	2	0	0	0	33
Control Delay (s)	0.8	0.0	0.0	0.0	26.3
Lane LOS	A				D
Approach Delay (s)	0.3		0.0		26.3
Approach LOS					D

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	53	968	727	39	14	71
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	59	1076	808	43	16	79
Pedestrians		3	2		25	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			367			
pX, platoon unblocked						
vC, conflicting volume	876				1512	454
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	876				1512	454
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				85	86
cM capacity (veh/h)	763				102	546

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	417	717	539	313	94
Volume Left	59	0	0	0	16
Volume Right	0	0	0	43	79
cSH	763	1700	1700	1700	318
Volume to Capacity	0.08	0.42	0.32	0.18	0.30
Queue Length (ft)	6	0	0	0	30
Control Delay (s)	2.3	0.0	0.0	0.0	21.1
Lane LOS	A				C
Approach Delay (s)	0.8		0.0		21.1
Approach LOS					C

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	968	14	9	762	4	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1076	16	10	847	4	27
Pedestrians	3			2	40	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				297		
pX, platoon unblocked						
vC, conflicting volume			1131		1570	588
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1131		1570	588
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		95	94
cM capacity (veh/h)			604		98	442

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	717	374	292	564	31
Volume Left	0	0	10	0	4
Volume Right	0	16	0	0	27
cSH	1700	1700	604	1700	294
Volume to Capacity	0.42	0.22	0.02	0.33	0.11
Queue Length (ft)	0	0	1	0	9
Control Delay (s)	0.0	0.0	0.6	0.0	18.7
Lane LOS			A		C
Approach Delay (s)	0.0		0.2		18.7
Approach LOS					C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	38.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		0.95	0.95			1.00	
Frpb, ped/bikes		0.99			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			1.00	
Frt		0.96			0.98		1.00	0.99			0.95	
Flt Protected		0.99			0.99		0.95	0.99			1.00	
Satd. Flow (prot)		1747			1807		1681	1721			1745	
Flt Permitted		0.94			0.97		0.95	0.99			1.00	
Satd. Flow (perm)		1664			1761		1681	1721			1745	
Volume (vph)	25	81	48	17	122	25	108	59	8	5	36	23
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	90	53	19	136	28	120	66	9	6	40	26
RTOR Reduction (vph)	0	9	0	0	3	0	0	5	0	0	23	0
Lane Group Flow (vph)	0	163	0	0	180	0	96	94	0	0	49	0
Confl. Peds. (#/hr)			11			4			1			6
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		57.8			57.6		10.9	10.9			8.5	
Effective Green, g (s)		59.4			59.4		11.9	11.9			9.7	
Actuated g/C Ratio		0.66			0.66		0.13	0.13			0.11	
Clearance Time (s)		4.6			4.8		4.0	4.0			4.2	
Vehicle Extension (s)		2.0			2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		1098			1162		222	228			188	
v/s Ratio Prot							0.06	c0.06			c0.04	
v/s Ratio Perm		0.10			c0.10							
v/c Ratio		0.15			0.15		0.43	0.41			0.26	
Uniform Delay, d1		5.8			5.8		35.9	35.8			36.9	
Progression Factor		1.00			1.00		0.42	0.38			1.00	
Incremental Delay, d2		0.3			0.0		0.1	0.1			0.3	
Delay (s)		6.0			5.8		15.3	13.8			37.1	
Level of Service		A			A		B	B			D	
Approach Delay (s)		6.0			5.8			14.5			37.1	
Approach LOS		A			A			B			D	

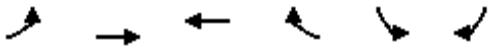
Intersection Summary			
HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	968	46	24	718	7	10
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1076	51	27	798	8	11
Pedestrians					38	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	243			551		
pX, platoon unblocked						
vC, conflicting volume			1165		1591	601
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1165		1591	601
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		92	97
cM capacity (veh/h)			588		93	434

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	717	410	293	532	19
Volume Left	0	0	27	0	8
Volume Right	0	51	0	0	11
cSH	1700	1700	588	1700	172
Volume to Capacity	0.42	0.24	0.05	0.31	0.11
Queue Length (ft)	0	0	4	0	9
Control Delay (s)	0.0	0.0	1.6	0.0	28.5
Lane LOS			A		D
Approach Delay (s)	0.0		0.6		28.5
Approach LOS					D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	42	1036	686	51	20	56
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	47	1151	762	57	22	62
Pedestrians					63	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					5	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		393	401			
pX, platoon unblocked						
vC, conflicting volume	882				1522	472
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	882				1522	472
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				77	88
cM capacity (veh/h)	735				99	515

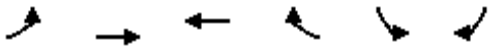
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	430	767	508	311	84
Volume Left	47	0	0	0	22
Volume Right	0	0	0	57	62
cSH	735	1700	1700	1700	244
Volume to Capacity	0.06	0.45	0.30	0.18	0.35
Queue Length (ft)	5	0	0	0	37
Control Delay (s)	1.9	0.0	0.0	0.0	27.4
Lane LOS	A				D
Approach Delay (s)	0.7		0.0		27.4
Approach LOS					D

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	948	68	22	680	25	69
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1053	76	24	756	28	77
Pedestrians				1	52	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	4	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	523			271		
pX, platoon unblocked						
vC, conflicting volume			1181		1570	617
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1181		1570	617
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		71	82
cM capacity (veh/h)			573		95	418

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	702	427	276	504	104
Volume Left	0	0	24	0	28
Volume Right	0	76	0	0	77
cSH	1700	1700	573	1700	219
Volume to Capacity	0.41	0.25	0.04	0.30	0.48
Queue Length (ft)	0	0	3	0	59
Control Delay (s)	0.0	0.0	1.6	0.0	35.5
Lane LOS			A		E
Approach Delay (s)	0.0		0.5		35.5
Approach LOS					E

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	0.98		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.98		0.96	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3395	1725		1644	
Flt Permitted		0.82	1.00		0.97	
Satd. Flow (perm)		2786	1725		1644	
Volume (vph)	61	944	676	99	171	74
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	68	1049	751	110	190	82
RTOR Reduction (vph)	0	0	5	0	18	0
Lane Group Flow (vph)	0	1117	856	0	254	0
Confl. Peds. (#/hr)	58			58	13	6
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type	Perm					
Protected Phases		2	6		4	
Permitted Phases	2					
Actuated Green, G (s)		64.1	64.1		16.1	
Effective Green, g (s)		66.0	66.0		18.0	
Actuated g/C Ratio		0.73	0.73		0.20	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		2.0	2.0		2.0	
Lane Grp Cap (vph)		2043	1265		329	
v/s Ratio Prot			c0.50		c0.17	
v/s Ratio Perm		0.40				
v/c Ratio		0.55	0.68		0.77	
Uniform Delay, d1		5.3	6.3		34.1	
Progression Factor		0.38	0.23		1.00	
Incremental Delay, d2		0.6	2.5		9.9	
Delay (s)		2.7	3.9		43.9	
Level of Service		A	A		D	
Approach Delay (s)		2.7	3.9		43.9	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	8.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1005	83	0	676	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1117	92	0	751	0	0
Pedestrians					120	
Lane Width (ft)					0.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	259			90		
pX, platoon unblocked						
vC, conflicting volume			1329		2034	724
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1329		2034	724
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			526		51	372

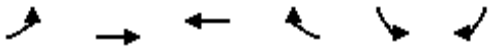
Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	744	464	751
Volume Left	0	0	0
Volume Right	0	92	0
cSH	1700	1700	1700
Volume to Capacity	0.44	0.27	0.44
Queue Length (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		0.0
Approach LOS			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	38.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	946	105	0	672	0	87
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1051	117	0	747	0	97
Pedestrians				4	63	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	5	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	150			636		
pX, platoon unblocked			0.88		0.84	0.88
vC, conflicting volume			1231		1919	651
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1131		1752	475
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	79
cM capacity (veh/h)			524		62	452

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	701	467	747	97
Volume Left	0	0	0	0
Volume Right	0	117	0	97
cSH	1700	1700	1700	452
Volume to Capacity	0.41	0.27	0.44	0.21
Queue Length (ft)	0	0	0	20
Control Delay (s)	0.0	0.0	0.0	15.1
Lane LOS				C
Approach Delay (s)	0.0		0.0	15.1
Approach LOS				C

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	33	975	648	16	23	26
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	37	1083	720	18	26	29
Pedestrians		2			6	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		370	416			
pX, platoon unblocked	0.80				0.84	0.80
vC, conflicting volume	744				1350	737
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	680				1170	671
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				83	91
cM capacity (veh/h)	734				150	321

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	398	722	738	54
Volume Left	37	0	0	26
Volume Right	0	0	18	29
cSH	734	1700	1700	209
Volume to Capacity	0.05	0.42	0.43	0.26
Queue Length (ft)	4	0	0	25
Control Delay (s)	1.5	0.0	0.0	28.1
Lane LOS	A			D
Approach Delay (s)	0.5		0.0	28.1
Approach LOS				D

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	937	61	0	664	0	12
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1041	68	0	738	0	13
Pedestrians	2				8	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	0				1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	490			296		
pX, platoon unblocked			0.94		0.85	0.94
vC, conflicting volume			1117		1823	562
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1062		1800	473
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	97
cM capacity (veh/h)			621		61	508

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	694	415	738	13
Volume Left	0	0	0	0
Volume Right	0	68	0	13
cSH	1700	1700	1700	508
Volume to Capacity	0.41	0.24	0.43	0.03
Queue Length (ft)	0	0	0	2
Control Delay (s)	0.0	0.0	0.0	12.3
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.3
Approach LOS				B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	38.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	
Lane Util. Factor		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00	0.98	1.00		1.00	1.00	0.99	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Frt		0.98		1.00	1.00	0.85	1.00		0.85	1.00	0.93	
Flt Protected		1.00		0.95	1.00	1.00	0.95		1.00	0.95	1.00	
Satd. Flow (prot)		1824		1769	1863	1547	1764		1583	1770	1703	
Flt Permitted		1.00		0.19	1.00	1.00	0.64		1.00	0.95	1.00	
Satd. Flow (perm)		1824		362	1863	1547	1187		1583	1770	1703	
Volume (vph)	0	232	32	331	221	514	32	0	113	443	70	69
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	258	36	368	246	571	36	0	126	492	78	77
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	64	0	38	0
Lane Group Flow (vph)	0	288	0	368	246	571	36	0	62	492	117	0
Confl. Peds. (#/hr)	3		6	3		6	4					4
Turn Type				pm+pt		Free	custom		custom	Perm		
Protected Phases		4		3	8						6	
Permitted Phases				8		Free	2		2	6		
Actuated Green, G (s)		16.1		38.2	38.2	90.0	42.8		42.8	42.8	42.8	
Effective Green, g (s)		17.6		39.7	39.7	90.0	44.3		44.3	44.3	44.3	
Actuated g/C Ratio		0.20		0.44	0.44	1.00	0.49		0.49	0.49	0.49	
Clearance Time (s)		4.5		4.5	4.5		4.5		4.5	4.5	4.5	
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		357		458	822	1547	584		779	871	838	
v/s Ratio Prot		0.16		c0.17	0.13						0.09	
v/s Ratio Perm				c0.18		0.37	0.03		0.08	0.28		
v/c Ratio		0.81		0.80	0.30	0.37	0.06		0.08	0.56	0.14	
Uniform Delay, d1		34.6		19.6	16.2	0.0	12.0		12.1	16.1	12.5	
Progression Factor		1.00		1.00	1.00	1.00	1.00		1.00	0.79	0.74	
Incremental Delay, d2		12.6		9.8	0.2	0.7	0.2		0.2	0.6	0.1	
Delay (s)		47.2		29.5	16.4	0.7	12.2		12.3	13.4	9.3	
Level of Service		D		C	B	A	B		B	B	A	
Approach Delay (s)		47.2			12.9			12.3			12.4	
Approach LOS		D			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

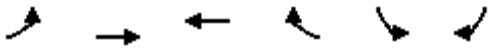
c Critical Lane Group

Appendix F
2030 No Build HCM Analysis Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	386	25	21	1069	84	41
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	429	28	23	1188	93	46
Pedestrians	3			2	14	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	1	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)	452			320		
pX, platoon unblocked						
vC, conflicting volume			471		1100	244
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			471		1100	244
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		54	94
cM capacity (veh/h)			1089		202	752

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	286	171	419	792	139
Volume Left	0	0	23	0	93
Volume Right	0	28	0	0	46
cSH	1700	1700	1089	1700	301
Volume to Capacity	0.17	0.10	0.02	0.47	0.46
Queue Length (ft)	0	0	2	0	58
Control Delay (s)	0.0	0.0	0.7	0.0	26.8
Lane LOS			A		D
Approach Delay (s)	0.0		0.2		26.8
Approach LOS					D

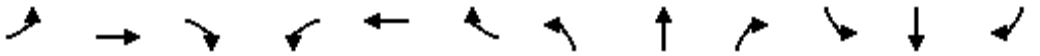
Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	53.1%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	6	404	1142	11	7	34
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	7	449	1269	12	8	38
Pedestrians		3	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)		372	400			
pX, platoon unblocked						
vC, conflicting volume	1286				1520	649
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1286				1520	649
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				93	91
cM capacity (veh/h)	544				110	415

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	156	299	846	435	46
Volume Left	7	0	0	0	8
Volume Right	0	0	0	12	38
cSH	544	1700	1700	1700	500
Volume to Capacity	0.01	0.18	0.50	0.26	0.09
Queue Length (ft)	1	0	0	0	7
Control Delay (s)	0.6	0.0	0.0	0.0	19.0
Lane LOS	A				C
Approach Delay (s)	0.2		0.0		19.0
Approach LOS					C

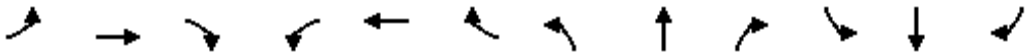
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	46.4%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	14	1005	18	34	834	9	0	0	136	0	0	12
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	16	1117	20	38	927	10	0	0	151	0	0	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		359			243							
pX, platoon unblocked	0.75						0.75	0.75		0.75	0.75	0.75
vC, conflicting volume	937			1137			1710	2170	568	1748	2175	468
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	591			1137			1616	2225	568	1666	2232	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			94			100	100	68	100	100	98
cM capacity (veh/h)	751			622			49	30	471	31	30	823

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	16	744	392	38	618	319	151	13
Volume Left	16	0	0	38	0	0	0	0
Volume Right	0	0	20	0	0	10	151	13
cSH	751	1700	1700	622	1700	1700	471	823
Volume to Capacity	0.02	0.44	0.23	0.06	0.36	0.19	0.32	0.02
Queue Length (ft)	2	0	0	5	0	0	34	1
Control Delay (s)	9.9	0.0	0.0	11.2	0.0	0.0	16.2	9.4
Lane LOS	A			B			C	A
Approach Delay (s)	0.1			0.4			16.2	9.4
Approach LOS							C	A

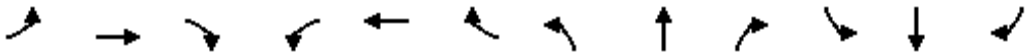
Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	2	59	58	57	224	4	14	5	20	5	10	2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	2	66	64	63	249	4	16	6	22	6	11	2
Pedestrians		1			5			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		393			875							
pX, platoon unblocked												
vC, conflicting volume	259			138			497	496	111	516	526	258
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	259			138			497	496	111	516	526	258
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			97	99	98	99	97	100
cM capacity (veh/h)	1299			1436			449	448	932	430	431	776

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	132	317	43	19
Volume Left	2	63	16	6
Volume Right	64	4	22	2
cSH	1299	1436	611	454
Volume to Capacity	0.00	0.04	0.07	0.04
Queue Length (ft)	0	3	6	3
Control Delay (s)	0.1	1.8	11.3	13.3
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	1.8	11.3	13.3
Approach LOS			B	B

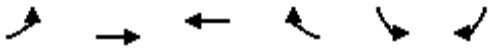
Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	40.9%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	9	412	18	28	955	5	22	2	20	5	4	18
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	10	458	20	31	1061	6	24	2	22	6	4	20
Pedestrians		9			3			15			13	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			0			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		351			383							
pX, platoon unblocked												
vC, conflicting volume	1080			493			1127	1645	257	1414	1652	555
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1080			493			1127	1645	257	1414	1652	555
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			97			82	98	97	94	95	96
cM capacity (veh/h)	646			1068			139	94	737	89	93	471

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	239	249	562	536	49	30
Volume Left	10	0	31	0	24	6
Volume Right	0	20	0	6	22	20
cSH	646	1700	1068	1700	213	196
Volume to Capacity	0.02	0.15	0.03	0.32	0.23	0.15
Queue Length (ft)	1	0	2	0	21	13
Control Delay (s)	0.6	0.0	0.8	0.0	26.9	26.6
Lane LOS	A		A		D	D
Approach Delay (s)	0.3		0.4		26.9	26.6
Approach LOS					D	D

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	52.4%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	26	432	834	18	18	54
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	29	480	927	20	20	60
Pedestrians		5			1	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		376				
pX, platoon unblocked					0.97	
vC, conflicting volume	948				1235	479
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	948				1209	479
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				88	89
cM capacity (veh/h)	732				165	535

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	189	320	618	329	80
Volume Left	29	0	0	0	20
Volume Right	0	0	0	20	60
cSH	732	1700	1700	1700	343
Volume to Capacity	0.04	0.19	0.36	0.19	0.23
Queue Length (ft)	3	0	0	0	22
Control Delay (s)	1.9	0.0	0.0	0.0	18.6
Lane LOS	A				C
Approach Delay (s)	0.7		0.0		18.6
Approach LOS					C

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	39.4%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	407	11	19	869	20	51
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	452	12	21	966	22	57
Pedestrians	5					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	286					
pX, platoon unblocked			0.95		0.95	0.95
vC, conflicting volume			464		988	232
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			387		938	143
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		91	93
cM capacity (veh/h)			1126		248	842

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	301	163	343	644	79
Volume Left	0	0	21	0	22
Volume Right	0	12	0	0	57
cSH	1700	1700	1126	1700	503
Volume to Capacity	0.18	0.10	0.02	0.38	0.16
Queue Length (ft)	0	0	1	0	14
Control Delay (s)	0.0	0.0	0.7	0.0	13.5
Lane LOS			A		B
Approach Delay (s)	0.0		0.2		13.5
Approach LOS					B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	43.8%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	433	17	26	802	50	56
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	481	19	29	891	56	62
Pedestrians	9			2	9	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			0	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	616			1277		
pX, platoon unblocked						
vC, conflicting volume			509		1012	261
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			509		1012	261
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		76	92
cM capacity (veh/h)			1058		229	737

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	321	179	326	594	118
Volume Left	0	0	29	0	56
Volume Right	0	19	0	0	62
cSH	1700	1700	1058	1700	360
Volume to Capacity	0.19	0.11	0.03	0.35	0.33
Queue Length (ft)	0	0	2	0	35
Control Delay (s)	0.0	0.0	1.0	0.0	19.8
Lane LOS			A		C
Approach Delay (s)	0.0		0.4		19.8
Approach LOS					C

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95			1.00	0.95
Frpb, ped/bikes	1.00	0.97		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.95		1.00	0.97		1.00	0.97			1.00	0.98
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1770	3275		1770	3421		1770	3419			1770	3464
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.27	1.00
Satd. Flow (perm)	1770	3275		1770	3421		1770	3419			497	3464
Volume (vph)	44	180	92	181	758	179	96	264	66	9	78	422
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	49	200	102	201	842	199	107	293	73	10	87	469
Lane Group Flow (vph)	49	302	0	201	1041	0	107	366	0	0	97	528
Confl. Peds. (#/hr)			87			19			14			
Turn Type	Prot			Prot			Prot			custom	Prot	
Protected Phases	5	2		1	6		3	8			7	4
Permitted Phases										7		
Actuated Green, G (s)	4.5	23.0		12.5	31.0		7.8	18.4			13.6	24.2
Effective Green, g (s)	5.9	24.9		13.9	32.9		9.2	20.3			15.0	26.1
Actuated g/C Ratio	0.07	0.29		0.16	0.38		0.11	0.24			0.17	0.30
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	4.9			4.4	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	3.3			2.0	2.9
Lane Grp Cap (vph)	121	947		286	1307		189	806			87	1050
v/s Ratio Prot	0.03	0.09		c0.11	c0.30		0.06	0.11				c0.15
v/s Ratio Perm											c0.20	
v/c Ratio	0.40	0.32		0.70	0.80		0.57	0.45			1.11	0.50
Uniform Delay, d1	38.4	24.0		34.1	23.6		36.6	28.2			35.6	24.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	2.2	0.1		7.6	3.2		3.9	0.5			131.0	0.4
Delay (s)	40.6	24.0		41.8	26.9		40.4	28.6			166.5	25.0
Level of Service	D	C		D	C		D	C			F	C
Approach Delay (s)		26.3			29.3			31.3				47.0
Approach LOS		C			C			C				D

Intersection Summary			
HCM Average Control Delay	33.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	86.1	Sum of lost time (s)	6.0
Intersection Capacity Utilization	78.4%	ICU Level of Service	C

c Critical Lane Group

Movement	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Volume (vph)	53
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	59
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	31
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.93			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1770	3520		1770	3511			1697			1738	
Flt Permitted	0.95	1.00		0.95	1.00			0.91			0.97	
Satd. Flow (perm)	1770	3520		1770	3511			1567			1696	
Volume (vph)	7	307	10	99	1029	48	32	52	90	13	75	57
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	8	341	11	110	1143	53	36	58	100	14	83	63
Lane Group Flow (vph)	8	352	0	110	1196	0	0	194	0	0	160	0
Confl. Peds. (#/hr)			3			5			9			11
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	1.2	41.4		10.4	50.6			14.0			14.0	
Effective Green, g (s)	2.2	43.9		11.4	53.1			15.7			15.7	
Actuated g/C Ratio	0.03	0.55		0.14	0.66			0.20			0.20	
Clearance Time (s)	4.0	5.5		4.0	5.5			4.7			4.7	
Vehicle Extension (s)	2.0	2.5		2.0	2.5			2.0			2.0	
Lane Grp Cap (vph)	49	1932		252	2330			308			333	
v/s Ratio Prot	0.00	c0.10		0.06	c0.34							
v/s Ratio Perm								c0.12			0.09	
v/c Ratio	0.16	0.18		0.44	0.51			0.63			0.48	
Uniform Delay, d1	38.0	9.0		31.4	6.9			29.5			28.5	
Progression Factor	1.00	1.00		0.73	0.27			1.00			1.00	
Incremental Delay, d2	0.6	0.2		0.4	0.8			2.9			0.4	
Delay (s)	38.6	9.3		23.2	2.6			32.4			28.9	
Level of Service	D	A		C	A			C			C	
Approach Delay (s)		9.9			4.3			32.4			28.9	
Approach LOS		A			A			C			C	

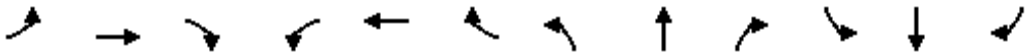
Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0			3.0			3.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.98			0.92	
Flt Protected		1.00			1.00			0.96			0.99	
Satd. Flow (prot)		3517			3529			1755			1669	
Flt Permitted		0.95			0.95			0.96			0.99	
Satd. Flow (perm)		3336			3367			1755			1669	
Volume (vph)	4	409	14	4	977	14	80	11	14	16	8	33
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	454	16	4	1086	16	89	12	16	18	9	37
Lane Group Flow (vph)	0	474	0	0	1106	0	0	117	0	0	64	0
Confl. Peds. (#/hr)			1			8			12			10
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		49.7			49.7			9.0			6.1	
Effective Green, g (s)		52.1			52.1			10.9			8.0	
Actuated g/C Ratio		0.65			0.65			0.14			0.10	
Clearance Time (s)		5.4			5.4			4.9			4.9	
Vehicle Extension (s)		2.7			2.8			2.0			2.0	
Lane Grp Cap (vph)		2173			2193			239			167	
v/s Ratio Prot								c0.07			c0.04	
v/s Ratio Perm		0.14			c0.33							
v/c Ratio		0.22			0.50			0.49			0.38	
Uniform Delay, d1		5.7			7.2			32.0			33.7	
Progression Factor		0.70			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.2			0.6			0.5	
Delay (s)		4.2			7.4			32.6			34.2	
Level of Service		A			A			C			C	
Approach Delay (s)		4.2			7.4			32.6			34.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	52.2%	ICU Level of Service	A

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.98		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3496		1770	3457		1770	1815		1770	1657	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3496		1770	3457		1770	1815		1770	1657	
Volume (vph)	90	328	19	31	745	113	98	120	18	72	83	145
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	100	364	21	34	828	126	109	133	20	80	92	161
Lane Group Flow (vph)	100	385	0	34	954	0	109	153	0	80	253	0
Confl. Peds. (#/hr)			26			4			15			8
Turn Type	Prot			Prot			Split			Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	6.6	35.3		2.6	31.3		9.0	9.0		12.4	12.4	
Effective Green, g (s)	7.6	37.3		3.6	33.3		10.5	10.5		13.4	13.4	
Actuated g/C Ratio	0.09	0.45		0.04	0.40		0.13	0.13		0.16	0.16	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.5	4.5		4.0	4.0	
Vehicle Extension (s)	2.0	2.2		2.0	2.1		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	163	1577		77	1392		225	230		287	268	
v/s Ratio Prot	c0.06	0.11		0.02	c0.28		0.06	c0.08		0.05	c0.15	
v/s Ratio Perm												
v/c Ratio	0.61	0.24		0.44	0.69		0.48	0.67		0.28	0.94	
Uniform Delay, d1	36.1	14.0		38.6	20.4		33.6	34.4		30.4	34.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.7	0.0		1.5	1.2		0.6	5.5		0.2	39.4	
Delay (s)	40.9	14.0		40.0	21.5		34.2	39.9		30.6	73.7	
Level of Service	D	B		D	C		C	D		C	E	
Approach Delay (s)		19.6			22.2			37.5			63.3	
Approach LOS		B			C			D			E	

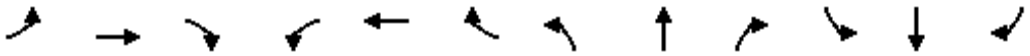
Intersection Summary			
HCM Average Control Delay	30.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	82.7	Sum of lost time (s)	17.9
Intersection Capacity Utilization	67.1%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00		1.00	0.97		1.00	0.98	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.92		1.00	0.92	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3473			3488		1770	1664		1770	1680	
Flt Permitted		0.93			0.94		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3246			3282		1770	1664		1770	1680	
Volume (vph)	12	451	48	16	663	50	61	27	27	20	55	56
Peak-hour factor, PHF	0.90	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	475	53	18	737	56	68	30	30	22	61	62
Lane Group Flow (vph)	0	541	0	0	811	0	68	60	0	22	123	0
Confl. Peds. (#/hr)			6			13			20			14
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6								
Actuated Green, G (s)		39.0			39.0		5.4	5.4		6.0	6.0	
Effective Green, g (s)		41.5			41.5		7.6	7.6		8.2	8.2	
Actuated g/C Ratio		0.57			0.57		0.10	0.10		0.11	0.11	
Clearance Time (s)		5.5			5.5		5.2	5.2		5.2	5.2	
Vehicle Extension (s)		2.0			2.0		3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)		1843			1863		184	173		199	188	
v/s Ratio Prot							c0.04	0.04		0.01	c0.07	
v/s Ratio Perm		0.17			c0.25							
v/c Ratio		0.29			0.44		0.37	0.35		0.11	0.65	
Uniform Delay, d1		8.2			9.1		30.5	30.4		29.2	31.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			0.1		1.3	1.2		0.1	6.1	
Delay (s)		8.2			9.1		31.8	31.7		29.3	37.2	
Level of Service		A			A		C	C		C	D	
Approach Delay (s)		8.2			9.1			31.7			36.0	
Approach LOS		A			A			C			D	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	73.1	Sum of lost time (s)	15.8
Intersection Capacity Utilization	50.9%	ICU Level of Service	A

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.98		1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3452		1770	3392		1770	1735		1770	1771	
Flt Permitted	0.20	1.00		0.45	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	378	3452		846	3392		1770	1735		1770	1771	
Volume (vph)	44	431	48	108	601	109	86	205	120	30	158	42
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	49	479	53	120	668	121	96	228	133	33	176	47
Lane Group Flow (vph)	49	532	0	120	789	0	96	361	0	33	223	0
Confl. Peds. (#/hr)			40			45			24			74
Turn Type	pm+pt			pm+pt			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	32.6	32.6		35.1	34.7		9.5	21.3		2.9	14.7	
Effective Green, g (s)	34.5	34.5		36.6	36.6		10.9	23.2		4.3	16.6	
Actuated g/C Ratio	0.43	0.43		0.46	0.46		0.14	0.29		0.05	0.21	
Clearance Time (s)	4.5	4.9		4.5	4.9		4.4	4.9		4.4	4.9	
Vehicle Extension (s)	3.0	2.0		3.0	2.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	231	1489		456	1552		241	503		95	367	
v/s Ratio Prot	0.01	c0.15		0.02	c0.23		0.05	c0.21		0.02	c0.13	
v/s Ratio Perm	0.08			0.10								
v/c Ratio	0.21	0.36		0.26	0.51		0.40	0.72		0.35	0.61	
Uniform Delay, d1	14.5	15.3		13.7	15.3		31.6	25.5		36.5	28.7	
Progression Factor	1.00	1.00		0.69	0.67		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.7		0.2	1.0		0.4	4.1		0.8	2.0	
Delay (s)	14.9	16.0		9.7	11.3		32.0	29.5		37.3	30.7	
Level of Service	B	B		A	B		C	C		D	C	
Approach Delay (s)		15.9			11.1			30.0			31.6	
Approach LOS		B			B			C			C	

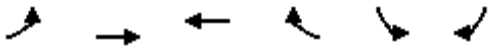
Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0			3.0	3.0	
Lane Util. Factor	0.95			1.00	1.00	
Frpb, ped/bikes	1.00			1.00	0.98	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	3504			1863	1680	
Flt Permitted	1.00			1.00	0.97	
Satd. Flow (perm)	3504			1863	1680	
Volume (vph)	566	32	0	779	62	46
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	629	36	0	866	69	51
Lane Group Flow (vph)	665	0	0	866	120	0
Confl. Peds. (#/hr)		8	8			20
Turn Type						
Protected Phases	2			2	4	
Permitted Phases						
Actuated Green, G (s)	63.1			63.1	8.4	
Effective Green, g (s)	64.6			64.6	9.4	
Actuated g/C Ratio	0.81			0.81	0.12	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	2.0			2.0	2.0	
Lane Grp Cap (vph)	2829			1504	197	
v/s Ratio Prot	0.19			c0.46	c0.07	
v/s Ratio Perm						
v/c Ratio	0.24			0.58	0.61	
Uniform Delay, d1	1.8			2.8	33.6	
Progression Factor	0.41			0.09	1.00	
Incremental Delay, d2	0.2			1.3	3.6	
Delay (s)	0.9			1.6	37.2	
Level of Service	A			A	D	
Approach Delay (s)	0.9			1.6	37.2	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	3.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.95	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3536	1849		1699	
Flt Permitted		0.94	1.00		0.97	
Satd. Flow (perm)		3327	1849		1699	
Volume (vph)	11	601	755	36	47	24
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	668	839	40	52	27
Lane Group Flow (vph)	0	680	879	0	79	0
Confl. Peds. (#/hr)	1			1		8
Turn Type	Perm					
Protected Phases		2	2		4	
Permitted Phases	2					
Actuated Green, G (s)		60.2	60.2		10.0	
Effective Green, g (s)		62.1	62.1		11.9	
Actuated g/C Ratio		0.78	0.78		0.15	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		1.0	1.0		2.0	
Lane Grp Cap (vph)		2583	1435		253	
v/s Ratio Prot			c0.48		c0.05	
v/s Ratio Perm		0.20				
v/c Ratio		0.26	0.61		0.31	
Uniform Delay, d1		2.5	3.8		30.4	
Progression Factor		0.44	0.86		1.00	
Incremental Delay, d2		0.2	1.9		0.3	
Delay (s)		1.4	5.1		30.7	
Level of Service		A	A		C	
Approach Delay (s)		1.4	5.1		30.7	
Approach LOS		A	A		C	

Intersection Summary			
HCM Average Control Delay	4.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.98		1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.98	1.00
Satd. Flow (prot)	1768	3516		1768	3525			1798	1559		1833	1531
Flt Permitted	0.25	1.00		0.25	1.00			0.97	1.00		0.98	1.00
Satd. Flow (perm)	457	3516		459	3525			1798	1559		1833	1531
Volume (vph)	4	667	25	124	707	15	65	25	348	22	44	16
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	741	28	138	786	17	72	28	387	24	49	18
Lane Group Flow (vph)	4	769	0	138	803	0	0	100	387	0	73	18
Confl. Peds. (#/hr)	8		6	6		8			12			6
Turn Type	pm+pt			pm+pt			Split		pm+ov	Split		Perm
Protected Phases	5	2		1	6		3	3	1	4	4	
Permitted Phases	2			6					3			4
Actuated Green, G (s)	30.7	29.9		43.4	37.7			10.3	18.9		12.0	12.0
Effective Green, g (s)	34.1	31.8		44.9	39.6			12.2	22.3		13.9	13.9
Actuated g/C Ratio	0.43	0.40		0.56	0.50			0.15	0.28		0.17	0.17
Clearance Time (s)	4.5	4.9		4.5	4.9			4.9	4.5		4.9	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0			2.0	3.0		2.0	2.0
Lane Grp Cap (vph)	232	1398		423	1745			274	493		318	266
v/s Ratio Prot	0.00	c0.22		0.04	0.23			0.06	c0.10		c0.04	
v/s Ratio Perm	0.01			0.14					0.15			0.01
v/c Ratio	0.02	0.55		0.33	0.46			0.36	0.78		0.23	0.07
Uniform Delay, d1	19.2	18.6		16.7	13.2			30.4	26.6		28.4	27.6
Progression Factor	0.87	0.77		0.45	0.25			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	1.5		0.2	0.4			0.3	8.0		0.1	0.0
Delay (s)	16.8	15.9		7.7	3.7			30.7	34.7		28.6	27.7
Level of Service	B	B		A	A			C	C		C	C
Approach Delay (s)		15.9			4.3			33.9			28.4	
Approach LOS		B			A			C			C	

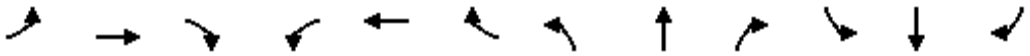
Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0	3.0		3.0	3.0
Lane Util. Factor		0.95	1.00		0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.98		1.00			1.00	0.98		1.00	0.99
Flpb, ped/bikes		1.00	1.00		1.00			1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00			1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00		0.99			0.96	1.00		0.98	1.00
Satd. Flow (prot)		3538	1544		3491			1784	1544		1830	1562
Flt Permitted		1.00	1.00		0.99			0.64	1.00		0.82	1.00
Satd. Flow (perm)		3538	1544		3491			1200	1544		1524	1562
Volume (vph)	8	929	204	245	693	4	167	27	118	30	66	17
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	9	1032	227	272	770	4	186	30	131	33	73	19
Lane Group Flow (vph)	0	1041	227	0	1046	0	0	216	131	0	106	19
Confl. Peds. (#/hr)			7			2	1		8	8		1
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	2	2		1	1			8			4	
Permitted Phases			2				8		8	4		4
Actuated Green, G (s)		26.7	26.7		24.3			15.5	15.5		15.5	15.5
Effective Green, g (s)		28.2	28.2		25.8			17.0	17.0		17.0	17.0
Actuated g/C Ratio		0.35	0.35		0.32			0.21	0.21		0.21	0.21
Clearance Time (s)		4.5	4.5		4.5			4.5	4.5		4.5	4.5
Vehicle Extension (s)		2.0	2.0		2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		1247	544		1126			255	328		324	332
v/s Ratio Prot		c0.29			c0.30							
v/s Ratio Perm			0.15					c0.18	0.08		0.07	0.01
v/c Ratio		0.83	0.42		0.93			0.85	0.40		0.33	0.06
Uniform Delay, d1		23.8	19.7		26.2			30.3	27.1		26.7	25.1
Progression Factor		0.61	0.33		0.68			1.00	1.00		1.00	1.00
Incremental Delay, d2		6.1	2.1		9.4			21.0	0.3		0.2	0.0
Delay (s)		20.6	8.6		27.2			51.3	27.4		26.9	25.1
Level of Service		C	A		C			D	C		C	C
Approach Delay (s)		18.5			27.2			42.3			26.6	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM Average Control Delay	25.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	86.6%	ICU Level of Service	D

c Critical Lane Group

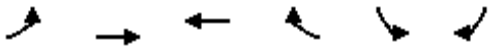


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0			3.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			1.00	
Frpb, ped/bikes		1.00	0.98		1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.97			0.96	
Flt Protected		1.00	1.00		0.98			0.97			0.99	
Satd. Flow (prot)		3534	1550		3462			3294			1745	
Flt Permitted		1.00	1.00		0.98			0.79			0.99	
Satd. Flow (perm)		3534	1550		3462			2684			1745	
Volume (vph)	12	368	697	377	490	3	374	160	142	14	25	20
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	409	774	419	544	3	416	178	158	16	28	22
Lane Group Flow (vph)	0	422	774	0	966	0	0	752	0	0	66	0
Confl. Peds. (#/hr)			2			5	7		7	7		7
Turn Type	Split		Free	Split			Perm			Perm		
Protected Phases	1	1		2	2			4			4	
Permitted Phases		1	Free		2		4			4	4	
Actuated Green, G (s)		13.9	80.0		30.0			22.6			22.6	
Effective Green, g (s)		15.4	80.0		31.5			24.1			24.1	
Actuated g/C Ratio		0.19	1.00		0.39			0.30			0.30	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		680	1550		1363			809			526	
v/s Ratio Prot		c0.12			c0.28						0.04	
v/s Ratio Perm			0.50					c0.28				
v/c Ratio		0.62	0.50		0.71			0.93dl			0.13	
Uniform Delay, d1		29.6	0.0		20.4			27.1			20.3	
Progression Factor		1.04	1.00		1.00			1.00			1.00	
Incremental Delay, d2		0.8	0.7		3.1			16.5			0.0	
Delay (s)		31.7	0.7		23.5			43.6			20.3	
Level of Service		C	A		C			D			C	
Approach Delay (s)		11.7			23.5			43.6			20.3	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM Average Control Delay	23.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	78.9%	ICU Level of Service	C

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

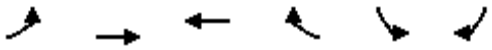
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	9	480	782	4	13	46
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	10	533	869	4	14	51
Pedestrians		9	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	0		0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		776	1117			
pX, platoon unblocked						
vC, conflicting volume	878				1165	451
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	878				1165	451
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	91
cM capacity (veh/h)	774				187	555

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	188	356	579	294	66
Volume Left	10	0	0	0	14
Volume Right	0	0	0	4	51
cSH	774	1700	1700	1700	387
Volume to Capacity	0.01	0.21	0.34	0.17	0.17
Queue Length (ft)	1	0	0	0	15
Control Delay (s)	0.6	0.0	0.0	0.0	16.2
Lane LOS	A				C
Approach Delay (s)	0.2		0.0		16.2
Approach LOS					C

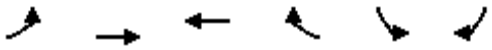
Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	37.8%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	20	473	782	14	15	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	22	526	869	16	17	4
Pedestrians		1	11			
Lane Width (ft)		12.0	12.0			
Walking Speed (ft/s)		4.0	4.0			
Percent Blockage		0	1			
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		1136	757			
pX, platoon unblocked						
vC, conflicting volume	884				1195	443
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	884				1195	443
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				90	99
cM capacity (veh/h)	774				175	567

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	197	350	579	305	21
Volume Left	22	0	0	0	17
Volume Right	0	0	0	16	4
cSH	774	1700	1700	1700	205
Volume to Capacity	0.03	0.21	0.34	0.18	0.10
Queue Length (ft)	2	0	0	0	8
Control Delay (s)	1.4	0.0	0.0	0.0	24.6
Lane LOS	A				C
Approach Delay (s)	0.5		0.0		24.6
Approach LOS					C

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	34.8%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	15	473	758	17	15	38
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	17	526	842	19	17	42
Pedestrians		5	6		7	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			367			
pX, platoon unblocked						
vC, conflicting volume	868				1161	443
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	868				1161	443
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				91	92
cM capacity (veh/h)	780				185	563

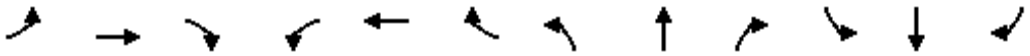
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	192	350	561	300	59
Volume Left	17	0	0	0	17
Volume Right	0	0	0	19	42
cSH	780	1700	1700	1700	357
Volume to Capacity	0.02	0.21	0.33	0.18	0.16
Queue Length (ft)	2	0	0	0	15
Control Delay (s)	1.1	0.0	0.0	0.0	17.1
Lane LOS	A				C
Approach Delay (s)	0.4		0.0		17.1
Approach LOS					C

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	478	10	22	758	17	33
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	531	11	24	842	19	37
Pedestrians	5			6	7	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				297		
pX, platoon unblocked						
vC, conflicting volume			549		1019	284
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			549		1019	284
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		92	95
cM capacity (veh/h)			1025		229	711

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	354	188	305	561	56
Volume Left	0	0	24	0	19
Volume Right	0	11	0	0	37
cSH	1700	1700	1025	1700	414
Volume to Capacity	0.21	0.11	0.02	0.33	0.13
Queue Length (ft)	0	0	2	0	12
Control Delay (s)	0.0	0.0	0.9	0.0	15.0
Lane LOS			A		C
Approach Delay (s)	0.0		0.3		15.0
Approach LOS					C

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		0.95	0.95			1.00	
Frpb, ped/bikes		0.99			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			1.00	
Frt		0.96			0.99		1.00	1.00			0.96	
Flt Protected		0.98			1.00		0.95	0.98			0.99	
Satd. Flow (prot)		1733			1827		1681	1735			1750	
Flt Permitted		0.88			0.98		0.95	0.98			0.99	
Satd. Flow (perm)		1559			1800		1681	1735			1750	
Volume (vph)	31	25	28	15	153	18	115	58	2	8	16	11
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	34	28	31	17	170	20	128	64	2	9	18	12
Lane Group Flow (vph)	0	93	0	0	207	0	95	99	0	0	39	0
Confl. Peds. (#/hr)	1		2	2		1	7		1	1		7
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		26.6			26.4		9.4	9.4			4.7	
Effective Green, g (s)		28.2			28.2		10.4	10.4			5.9	
Actuated g/C Ratio		0.53			0.53		0.19	0.19			0.11	
Clearance Time (s)		4.6			4.8		4.0	4.0			4.2	
Vehicle Extension (s)		2.0			2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		822			949		327	337			193	
v/s Ratio Prot							0.06	c0.06			c0.02	
v/s Ratio Perm		0.06			c0.11							
v/c Ratio		0.11			0.22		0.29	0.29			0.20	
Uniform Delay, d1		6.4			6.8		18.4	18.4			21.7	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.0			0.0		0.2	0.2			0.2	
Delay (s)		6.4			6.8		18.6	18.6			21.8	
Level of Service		A			A		B	B			C	
Approach Delay (s)		6.4			6.8			18.6			21.8	
Approach LOS		A			A			B			C	

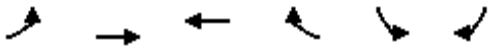
Intersection Summary			
HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	53.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	33.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	486	12	27	725	4	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	540	13	30	806	4	27
Pedestrians				1	3	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	243			551		
pX, platoon unblocked			0.95		0.95	0.95
vC, conflicting volume			556		1012	281
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			473		955	181
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		98	97
cM capacity (veh/h)			1037		238	788

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	360	193	299	537	31
Volume Left	0	0	30	0	4
Volume Right	0	13	0	0	27
cSH	1700	1700	1037	1700	593
Volume to Capacity	0.21	0.11	0.03	0.32	0.05
Queue Length (ft)	0	0	2	0	4
Control Delay (s)	0.0	0.0	1.1	0.0	11.4
Lane LOS			A		B
Approach Delay (s)	0.0		0.4		11.4
Approach LOS					B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	40.0%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	28	482	707	14	15	45
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	31	536	786	16	17	50
Pedestrians			1		32	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			4.0		4.0	
Percent Blockage			0		3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		393	401			
pX, platoon unblocked					0.97	
vC, conflicting volume	833				1156	433
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	833				1133	433
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				91	91
cM capacity (veh/h)	787				181	561

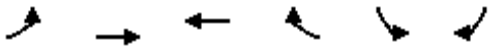
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	210	357	524	277	67
Volume Left	31	0	0	0	17
Volume Right	0	0	0	16	50
cSH	787	1700	1700	1700	369
Volume to Capacity	0.04	0.21	0.31	0.16	0.18
Queue Length (ft)	3	0	0	0	16
Control Delay (s)	1.8	0.0	0.0	0.0	16.9
Lane LOS	A				C
Approach Delay (s)	0.7		0.0		16.9
Approach LOS					C

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	32.9%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	475	22	16	713	8	48
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	528	24	18	792	9	53
Pedestrians					19	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	523			271		
pX, platoon unblocked						
vC, conflicting volume			571		991	295
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			571		991	295
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		96	92
cM capacity (veh/h)			995		238	696

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	352	200	282	528	62
Volume Left	0	0	18	0	9
Volume Right	0	24	0	0	53
cSH	1700	1700	995	1700	546
Volume to Capacity	0.21	0.12	0.02	0.31	0.11
Queue Length (ft)	0	0	1	0	10
Control Delay (s)	0.0	0.0	0.7	0.0	12.4
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		12.4
Approach LOS					B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	36.2%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	0.99		0.97	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.94	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3529	1825		1650	
Flt Permitted		0.90	1.00		0.97	
Satd. Flow (perm)		3183	1825		1650	
Volume (vph)	24	527	767	74	71	51
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	27	586	852	82	79	57
Lane Group Flow (vph)	0	613	934	0	136	0
Confl. Peds. (#/hr)	36			36	1	28
Turn Type	Perm					
Protected Phases		2	6		4	
Permitted Phases	2					
Actuated Green, G (s)		62.2	62.2		8.0	
Effective Green, g (s)		64.1	64.1		9.9	
Actuated g/C Ratio		0.80	0.80		0.12	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		2.0	2.0		2.0	
Lane Grp Cap (vph)		2550	1462		204	
v/s Ratio Prot			c0.51		c0.08	
v/s Ratio Perm		0.19				
v/c Ratio		0.24	0.64		0.67	
Uniform Delay, d1		2.0	3.2		33.5	
Progression Factor		0.53	0.17		1.00	
Incremental Delay, d2		0.2	1.8		6.2	
Delay (s)		1.2	2.4		39.7	
Level of Service		A	A		D	
Approach Delay (s)		1.2	2.4		39.7	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	5.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	69.4%	ICU Level of Service	B

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	551	30	0	818	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	612	33	0	909	0	0
Pedestrians	28			1	43	
Lane Width (ft)	12.0			12.0	0.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	259			90		
pX, platoon unblocked			0.92		0.82	0.92
vC, conflicting volume			689		1609	367
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			568		1485	217
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			929		94	727

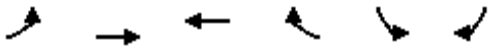
Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	408	237	909
Volume Left	0	0	0
Volume Right	0	33	0
cSH	1700	1700	1700
Volume to Capacity	0.24	0.14	0.53
Queue Length (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		0.0
Approach LOS			

Intersection Summary			
Average Delay		0.0	
Intersection Capacity Utilization		58.2%	ICU Level of Service A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	625	23	0	791	0	51
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	694	26	0	879	0	57
Pedestrians				11	11	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				1	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	150			636		
pX, platoon unblocked			0.95		0.73	0.95
vC, conflicting volume			731		1597	382
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			667		1652	301
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	91
cM capacity (veh/h)			879		66	656

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	463	257	879	57
Volume Left	0	0	0	0
Volume Right	0	26	0	57
cSH	1700	1700	1700	656
Volume to Capacity	0.27	0.15	0.52	0.09
Queue Length (ft)	0	0	0	7
Control Delay (s)	0.0	0.0	0.0	11.0
Lane LOS				B
Approach Delay (s)	0.0		0.0	11.0
Approach LOS				B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	59.3%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	14	662	764	24	15	27
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	16	736	849	27	17	30
Pedestrians		2			4	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		370	416			
pX, platoon unblocked	0.74				0.75	0.74
vC, conflicting volume	880				1265	868
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	837				1296	822
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				85	87
cM capacity (veh/h)	593				113	236

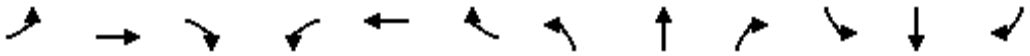
Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	261	490	876	47
Volume Left	16	0	0	17
Volume Right	0	0	27	30
cSH	593	1700	1700	170
Volume to Capacity	0.03	0.29	0.52	0.27
Queue Length (ft)	2	0	0	26
Control Delay (s)	1.0	0.0	0.0	33.9
Lane LOS	A			D
Approach Delay (s)	0.3		0.0	33.9
Approach LOS				D

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	57.0%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	667	10	0	788	0	29
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	741	11	0	876	0	32
Pedestrians	2			3	6	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	490			296		
pX, platoon unblocked					0.77	
vC, conflicting volume			758		1630	385
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			758		1823	385
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	95
cM capacity (veh/h)			858		53	614

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	494	258	876	32
Volume Left	0	0	0	0
Volume Right	0	11	0	32
cSH	1700	1700	1700	614
Volume to Capacity	0.29	0.15	0.52	0.05
Queue Length (ft)	0	0	0	4
Control Delay (s)	0.0	0.0	0.0	11.2
Lane LOS				B
Approach Delay (s)	0.0		0.0	11.2
Approach LOS				B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	57.0%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Util. Factor		1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00	0.98		0.98		1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frt		0.99		1.00	1.00	0.85		0.89		1.00	0.95	
Flt Protected		1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)		1852		1770	1863	1551		1608		1767	1761	
Flt Permitted		1.00		0.50	1.00	1.00		0.95		0.62	1.00	
Satd. Flow (perm)		1852		925	1863	1551		1535		1148	1761	
Volume (vph)	0	198	9	240	156	312	33	0	172	392	78	45
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	220	10	267	173	347	37	0	191	436	87	50
Lane Group Flow (vph)	0	230	0	267	173	347	0	228	0	436	137	0
Confl. Peds. (#/hr)	1					1			1	1		
Turn Type				Perm		Free	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases				8		Free	2			6		
Actuated Green, G (s)		24.2		24.2	24.2	80.0		46.8		46.8	46.8	
Effective Green, g (s)		25.7		25.7	25.7	80.0		48.3		48.3	48.3	
Actuated g/C Ratio		0.32		0.32	0.32	1.00		0.60		0.60	0.60	
Clearance Time (s)		4.5		4.5	4.5			4.5		4.5	4.5	
Vehicle Extension (s)		3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		595		297	598	1551		927		693	1063	
v/s Ratio Prot		0.12			0.09						0.08	
v/s Ratio Perm				c0.29		0.22		0.15		c0.38		
v/c Ratio		0.39		0.90	0.29	0.22		0.25		0.63	0.13	
Uniform Delay, d1		21.0		25.9	20.3	0.0		7.4		10.1	6.8	
Progression Factor		1.00		1.00	1.00	1.00		1.00		0.73	0.69	
Incremental Delay, d2		0.4		27.6	0.3	0.3		0.6		3.4	0.2	
Delay (s)		21.5		53.6	20.6	0.3		8.0		10.7	4.9	
Level of Service		C		D	C	A		A		B	A	
Approach Delay (s)		21.5			22.8			8.0			9.3	
Approach LOS		C			C			A			A	

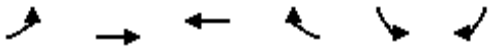
Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	C

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1265	117	40	859	60	51
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1406	130	44	954	67	57
Pedestrians	12			20	36	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			2	3	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)	452			320		
pX, platoon unblocked						
vC, conflicting volume			1572		2085	824
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1572		2085	824
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			89		0	81
cM capacity (veh/h)			412		40	306

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	937	599	363	636	123
Volume Left	0	0	44	0	67
Volume Right	0	130	0	0	57
cSH	1700	1700	412	1700	68
Volume to Capacity	0.55	0.35	0.11	0.37	1.81
Queue Length (ft)	0	0	9	0	277
Control Delay (s)	0.0	0.0	3.5	0.0	516.8
Lane LOS			A		F
Approach Delay (s)	0.0		1.3		516.8
Approach LOS					F

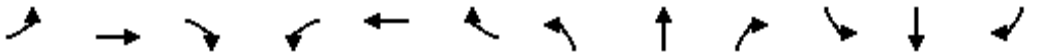
Intersection Summary			
Average Delay	24.5		
Intersection Capacity Utilization	59.2%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	20	1368	884	35	14	32
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	22	1520	982	39	16	36
Pedestrians		12	20		17	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	2		1	
Right turn flare (veh)						2
Median type					None	
Median storage veh)						
Upstream signal (ft)		372	400			
pX, platoon unblocked						
vC, conflicting volume	1038				1843	540
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1038				1843	540
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				76	93
cM capacity (veh/h)	668				64	480

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	529	1013	655	366	51
Volume Left	22	0	0	0	16
Volume Right	0	0	0	39	36
cSH	668	1700	1700	1700	210
Volume to Capacity	0.03	0.60	0.39	0.22	0.24
Queue Length (ft)	3	0	0	0	23
Control Delay (s)	0.9	0.0	0.0	0.0	33.1
Lane LOS	A				D
Approach Delay (s)	0.3		0.0		33.1
Approach LOS					D

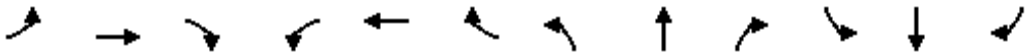
Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	64.9%	ICU Level of Service	B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	28	1391	27	57	897	8	0	0	102	0	0	21
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	31	1546	30	63	997	9	0	0	113	0	0	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		359			243							
pX, platoon unblocked	0.72						0.72	0.72		0.72	0.72	0.72
vC, conflicting volume	1006			1576			2271	2755	788	2076	2766	503
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	627			1576			2374	3043	788	2105	3057	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			85			100	100	67	100	100	97
cM capacity (veh/h)	699			424			11	8	338	12	7	790

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	31	1030	545	63	664	341	113	23
Volume Left	31	0	0	63	0	0	0	0
Volume Right	0	0	30	0	0	9	113	23
cSH	699	1700	1700	424	1700	1700	338	790
Volume to Capacity	0.04	0.61	0.32	0.15	0.39	0.20	0.33	0.03
Queue Length (ft)	3	0	0	13	0	0	36	2
Control Delay (s)	10.4	0.0	0.0	15.0	0.0	0.0	20.9	9.7
Lane LOS	B			B			C	A
Approach Delay (s)	0.2			0.9			20.9	9.7
Approach LOS							C	A

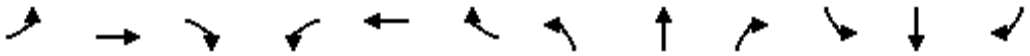
Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	57.4%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	3	108	9	6	196	9	0	0	0	8	0	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	3	120	10	7	218	10	0	0	0	9	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		393			875							
pX, platoon unblocked												
vC, conflicting volume	228			130			372	373	125	368	373	223
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	228			130			372	373	125	368	373	223
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	98	100	99
cM capacity (veh/h)	1340			1455			578	554	926	585	554	817

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	133	234	0	13
Volume Left	3	7	0	9
Volume Right	10	10	0	4
cSH	1340	1455	1700	646
Volume to Capacity	0.00	0.00	0.00	0.02
Queue Length (ft)	0	0	0	2
Control Delay (s)	0.2	0.3	0.0	10.7
Lane LOS	A	A	A	B
Approach Delay (s)	0.2	0.3	0.0	10.7
Approach LOS			A	B

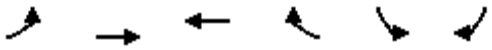
Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	23.6%	ICU Level of Service	A	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	22	1279	47	28	829	33	4	5	53	5	5	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	24	1421	52	31	921	37	4	6	59	6	6	24
Pedestrians		6			1			17			16	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		351			383							
pX, platoon unblocked												
vC, conflicting volume	974			1490			2069	2549	755	1840	2557	501
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	974			1490			2069	2549	755	1840	2557	501
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			93			80	77	83	81	76	95
cM capacity (veh/h)	707			450			22	24	350	29	23	511

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	735	763	492	497	69	36
Volume Left	24	0	31	0	4	6
Volume Right	0	52	0	37	59	24
cSH	707	1700	450	1700	114	75
Volume to Capacity	0.03	0.45	0.07	0.29	0.60	0.47
Queue Length (ft)	3	0	6	0	74	49
Control Delay (s)	0.9	0.0	2.1	0.0	75.5	90.6
Lane LOS	A		A		F	F
Approach Delay (s)	0.5		1.0		75.5	90.6
Approach LOS					F	F

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	63.3%	ICU Level of Service	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	24	1254	835	21	21	72
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	27	1393	928	23	23	80
Pedestrians		2				
Lane Width (ft)		12.0				
Walking Speed (ft/s)		4.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		376				
pX, platoon unblocked					0.65	
vC, conflicting volume	951				1689	478
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	951				1521	478
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				66	85
cM capacity (veh/h)	730				70	538

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	491	929	619	333	103
Volume Left	27	0	0	0	23
Volume Right	0	0	0	23	80
cSH	730	1700	1700	1700	213
Volume to Capacity	0.04	0.55	0.36	0.20	0.48
Queue Length (ft)	3	0	0	0	60
Control Delay (s)	1.0	0.0	0.0	0.0	36.7
Lane LOS	A				E
Approach Delay (s)	0.4		0.0		36.7
Approach LOS					E

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	63.0%	ICU Level of Service	B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1278	46	33	874	8	21
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1420	51	37	971	9	23
Pedestrians	2				2	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	0				0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	286					
pX, platoon unblocked			0.64		0.64	0.64
vC, conflicting volume			1473		2008	738
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1179		2013	32
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		71	97
cM capacity (veh/h)			384		30	667

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	947	524	360	647	32
Volume Left	0	0	37	0	9
Volume Right	0	51	0	0	23
cSH	1700	1700	384	1700	98
Volume to Capacity	0.56	0.31	0.10	0.38	0.33
Queue Length (ft)	0	0	8	0	32
Control Delay (s)	0.0	0.0	3.2	0.0	58.8
Lane LOS			A		F
Approach Delay (s)	0.0		1.1		58.8
Approach LOS					F

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	50.9%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1251	45	51	830	26	70
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1390	50	57	922	29	78
Pedestrians	21			13	10	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			1	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	616			1277		
pX, platoon unblocked			0.65		0.65	0.65
vC, conflicting volume			1450		2020	743
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1160		2031	80
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			86		0	88
cM capacity (veh/h)			396		28	623

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	927	513	364	615	107
Volume Left	0	0	57	0	29
Volume Right	0	50	0	0	78
cSH	1700	1700	396	1700	92
Volume to Capacity	0.55	0.30	0.14	0.36	1.16
Queue Length (ft)	0	0	12	0	183
Control Delay (s)	0.0	0.0	4.7	0.0	229.3
Lane LOS			A		F
Approach Delay (s)	0.0		1.8		229.3
Approach LOS					F

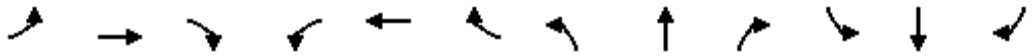
Intersection Summary			
Average Delay	10.4		
Intersection Capacity Utilization	64.4%	ICU Level of Service	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	0.95			1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			1.00
Frt	1.00	0.98		1.00	0.97			1.00	0.97			1.00
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95
Satd. Flow (prot)	1703	3282		1703	3273			1703	3249			1703
Flt Permitted	0.95	1.00		0.95	1.00			0.33	1.00			0.30
Satd. Flow (perm)	1703	3282		1703	3273			588	3249			543
Volume (vph)	174	685	128	162	559	122	2	188	641	187	7	270
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	193	761	142	180	621	136	2	209	712	208	8	300
Lane Group Flow (vph)	193	903	0	180	757	0	0	211	920	0	0	308
Confl. Peds. (#/hr)			79			67				52		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			custom	Prot			custom	Prot
Protected Phases	5	2		1	6			3	8			7
Permitted Phases							3				7	
Actuated Green, G (s)	9.7	31.5		11.8	33.6			10.8	32.6			11.8
Effective Green, g (s)	11.1	33.4		13.2	35.5			12.2	34.5			13.2
Actuated g/C Ratio	0.10	0.31		0.12	0.33			0.11	0.32			0.12
Clearance Time (s)	4.4	4.9		4.4	4.9			4.4	4.9			4.4
Vehicle Extension (s)	3.0	2.0		3.0	2.0			3.0	3.3			2.0
Lane Grp Cap (vph)	178	1031		211	1093			67	1054			67
v/s Ratio Prot	c0.11	c0.28		0.11	0.23				c0.28			
v/s Ratio Perm								0.36				c0.57
v/c Ratio	1.08	0.88		0.85	0.69			3.15	0.87			4.60
Uniform Delay, d1	47.6	34.5		45.6	30.7			47.0	33.8			46.6
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00
Incremental Delay, d2	91.7	8.2		26.8	1.5			1005.0	8.2			1652.3
Delay (s)	139.3	42.7		72.4	32.2			1052.1	42.1			1698.8
Level of Service	F	D		E	C			F	D			F
Approach Delay (s)		59.7			39.9				230.5			
Approach LOS		E			D				F			

Intersection Summary			
HCM Average Control Delay	223.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.37		
Actuated Cycle Length (s)	106.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.2%	ICU Level of Service	F
c Critical Lane Group			

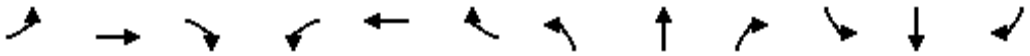
Movement	SBT	SBR
Lane Configurations		
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	3.0	
Lane Util. Factor	0.95	
Frpb, ped/bikes	0.99	
Flpb, ped/bikes	1.00	
Frt	0.97	
Flt Protected	1.00	
Satd. Flow (prot)	3289	
Flt Permitted	1.00	
Satd. Flow (perm)	3289	
Volume (vph)	422	86
Peak-hour factor, PHF	0.90	0.90
Adj. Flow (vph)	469	96
Lane Group Flow (vph)	565	0
Confl. Peds. (#/hr)		35
Heavy Vehicles (%)	6%	6%
Turn Type		
Protected Phases	4	
Permitted Phases		
Actuated Green, G (s)	33.6	
Effective Green, g (s)	35.5	
Actuated g/C Ratio	0.33	
Clearance Time (s)	4.9	
Vehicle Extension (s)	2.9	
Lane Grp Cap (vph)	1098	
v/s Ratio Prot	0.17	
v/s Ratio Perm		
v/c Ratio	0.51	
Uniform Delay, d1	28.5	
Progression Factor	1.00	
Incremental Delay, d2	0.4	
Delay (s)	28.9	
Level of Service	C	
Approach Delay (s)	618.0	
Approach LOS	F	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			0.98			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.92			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1703	3392		1703	3337			1618			1716	
Flt Permitted	0.95	1.00		0.95	1.00			0.96			0.71	
Satd. Flow (perm)	1703	3392		1703	3337			1561			1239	
Volume (vph)	35	1083	24	69	765	82	39	166	261	44	103	39
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	39	1203	27	77	850	91	43	184	290	49	114	43
Lane Group Flow (vph)	39	1230	0	77	941	0	0	517	0	0	206	0
Confl. Peds. (#/hr)			3			17			16			3
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.6	39.4		8.8	43.6			27.6			27.6	
Effective Green, g (s)	5.6	41.9		9.8	46.1			29.3			29.3	
Actuated g/C Ratio	0.06	0.47		0.11	0.51			0.33			0.33	
Clearance Time (s)	4.0	5.5		4.0	5.5			4.7			4.7	
Vehicle Extension (s)	2.0	2.5		2.0	2.5			2.0			2.0	
Lane Grp Cap (vph)	106	1579		185	1709			508			403	
v/s Ratio Prot	0.02	c0.36		0.05	c0.28							
v/s Ratio Perm								c0.33			0.17	
v/c Ratio	0.37	0.78		0.42	0.55			1.02			0.51	
Uniform Delay, d1	40.5	20.2		37.4	14.9			30.4			24.6	
Progression Factor	1.00	1.00		0.95	0.98			1.00			1.00	
Incremental Delay, d2	0.8	3.9		0.5	1.1			44.5			0.5	
Delay (s)	41.3	24.0		36.1	15.7			74.8			25.0	
Level of Service	D	C		D	B			E			C	
Approach Delay (s)		24.6			17.3			74.8			25.0	
Approach LOS		C			B			E			C	

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	94.3%	ICU Level of Service	E
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0			3.0			3.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.97			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.95			0.97	
Flt Protected		1.00			1.00			0.98			0.97	
Satd. Flow (prot)		3369			3379			1615			1682	
Flt Permitted		0.90			0.89			0.98			0.97	
Satd. Flow (perm)		3048			3013			1615			1682	
Volume (vph)	34	1213	65	21	807	27	63	20	48	83	29	29
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	38	1348	72	23	897	30	70	22	53	92	32	32
Lane Group Flow (vph)	0	1458	0	0	950	0	0	145	0	0	156	0
Confl. Peds. (#/hr)			7			18			46			14
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		51.8			51.8			11.0			12.0	
Effective Green, g (s)		54.2			54.2			12.9			13.9	
Actuated g/C Ratio		0.60			0.60			0.14			0.15	
Clearance Time (s)		5.4			5.4			4.9			4.9	
Vehicle Extension (s)		2.7			2.8			2.0			2.0	
Lane Grp Cap (vph)		1836			1814			231			260	
v/s Ratio Prot								c0.09			c0.09	
v/s Ratio Perm		c0.48			0.32							
v/c Ratio		0.79			0.52			0.63			0.60	
Uniform Delay, d1		13.6			10.4			36.3			35.5	
Progression Factor		0.28			1.00			1.00			1.00	
Incremental Delay, d2		2.5			0.2			3.8			2.7	
Delay (s)		6.3			10.6			40.1			38.1	
Level of Service		A			B			D			D	
Approach Delay (s)		6.3			10.6			40.1			38.1	
Approach LOS		A			B			D			D	

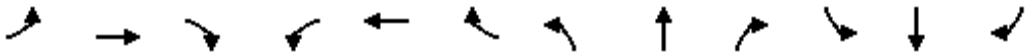
Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.98		1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3385		1703	3304		1703	1746		1703	1712	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1703	3385		1703	3304		1703	1746		1703	1712	
Volume (vph)	160	1144	33	45	748	89	64	161	24	156	224	78
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	178	1271	37	50	831	99	71	179	27	173	249	87
Lane Group Flow (vph)	178	1308	0	50	930	0	71	206	0	173	336	0
Confl. Peds. (#/hr)			14			36			18			8
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			Split			Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	14.6	50.3		6.4	42.1		16.5	16.5		23.4	23.4	
Effective Green, g (s)	15.6	52.3		7.4	44.1		18.0	18.0		24.4	24.4	
Actuated g/C Ratio	0.13	0.43		0.06	0.37		0.15	0.15		0.20	0.20	
Clearance Time (s)	4.0	5.0		4.0	5.0		4.5	4.5		4.0	4.0	
Vehicle Extension (s)	2.0	2.2		2.0	2.1		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	220	1469		105	1209		254	261		345	347	
v/s Ratio Prot	c0.10	c0.39		0.03	0.28		0.04	c0.12		0.10	c0.20	
v/s Ratio Perm												
v/c Ratio	0.81	0.89		0.48	0.77		0.28	0.79		0.50	0.97	
Uniform Delay, d1	51.0	31.5		54.7	33.7		45.5	49.4		42.7	47.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	18.3	7.1		1.2	2.7		0.2	13.6		0.4	39.2	
Delay (s)	69.3	38.5		55.9	36.5		45.7	63.0		43.1	86.9	
Level of Service	E	D		E	D		D	E		D	F	
Approach Delay (s)		42.2			37.4			58.6			72.0	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM Average Control Delay	46.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.5	Sum of lost time (s)	15.4
Intersection Capacity Utilization	75.5%	ICU Level of Service	C
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.99		1.00	0.95		1.00	0.95	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.95		1.00	0.94	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3339			3346		1703	1608		1703	1597	
Flt Permitted		0.91			0.89		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3040			2984		1703	1608		1703	1597	
Volume (vph)	31	1158	94	20	755	51	72	76	40	63	90	68
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	34	1287	104	22	839	57	80	84	44	70	100	76
Lane Group Flow (vph)	0	1425	0	0	918	0	80	128	0	70	176	0
Confl. Peds. (#/hr)			35			40			54			49
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6								
Actuated Green, G (s)		57.4			57.4		8.9	8.9		12.9	12.9	
Effective Green, g (s)		59.9			59.9		11.1	11.1		15.1	15.1	
Actuated g/C Ratio		0.59			0.59		0.11	0.11		0.15	0.15	
Clearance Time (s)		5.5			5.5		5.2	5.2		5.2	5.2	
Vehicle Extension (s)		2.0			2.0		3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)		1784			1751		185	175		252	236	
v/s Ratio Prot							0.05	c0.08		0.04	c0.11	
v/s Ratio Perm		c0.47			0.31							
v/c Ratio		0.80			0.52		0.43	0.73		0.28	0.75	
Uniform Delay, d1		16.4			12.6		42.6	44.1		38.7	41.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.4			0.1		1.6	14.6		0.2	10.6	
Delay (s)		18.8			12.7		44.2	58.6		38.9	52.3	
Level of Service		B			B		D	E		D	D	
Approach Delay (s)		18.8			12.7			53.1			48.5	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	102.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	D
c Critical Lane Group			

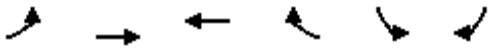


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.97		1.00	0.94		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3377		1703	3251		1703	1596		1703	1742	
Flt Permitted	0.15	1.00		0.15	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	276	3377		276	3251		1703	1596		1703	1742	
Volume (vph)	64	1196	48	171	642	75	116	345	180	60	422	65
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	71	1329	53	190	713	83	129	383	200	67	469	72
Lane Group Flow (vph)	71	1382	0	190	796	0	129	583	0	67	541	0
Confl. Peds. (#/hr)			23			104			139			44
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt			pm+pt			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	30.0	30.0		31.4	31.0		8.9	29.3		6.6	27.0	
Effective Green, g (s)	31.9	31.9		32.9	32.9		10.3	31.2		8.0	28.9	
Actuated g/C Ratio	0.35	0.35		0.37	0.37		0.11	0.35		0.09	0.32	
Clearance Time (s)	4.5	4.9		4.5	4.9		4.4	4.9		4.4	4.9	
Vehicle Extension (s)	3.0	2.0		3.0	2.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	191	1197		210	1188		195	553		151	559	
v/s Ratio Prot	0.02	c0.41		c0.07	0.24		c0.08	c0.37		0.04	0.31	
v/s Ratio Perm	0.11			0.26								
v/c Ratio	0.37	1.15		0.90	0.67		0.66	1.05		0.44	0.97	
Uniform Delay, d1	21.4	29.0		38.4	24.0		38.2	29.4		38.9	30.1	
Progression Factor	1.00	1.00		0.92	0.91		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	79.4		24.6	1.7		6.4	53.4		0.8	29.6	
Delay (s)	22.6	108.4		59.8	23.5		44.6	82.8		39.6	59.6	
Level of Service	C	F		E	C		D	F		D	E	
Approach Delay (s)		104.2			30.5			75.8			57.4	
Approach LOS		F			C			E			E	

Intersection Summary			
HCM Average Control Delay	71.9	HCM Level of Service	E
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	100.8%	ICU Level of Service	F
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0			3.0	3.0	
Lane Util. Factor	0.95			1.00	1.00	
Frpb, ped/bikes	0.98			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	3307			1792	1638	
Flt Permitted	1.00			1.00	0.97	
Satd. Flow (perm)	3307			1792	1638	
Volume (vph)	1357	108	0	844	72	60
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1508	120	0	938	80	67
Lane Group Flow (vph)	1628	0	0	938	147	0
Confl. Peds. (#/hr)		98				
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type						
Protected Phases	2			2	4	
Permitted Phases						
Actuated Green, G (s)	70.8			70.8	10.7	
Effective Green, g (s)	72.3			72.3	11.7	
Actuated g/C Ratio	0.80			0.80	0.13	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	2.0			2.0	2.0	
Lane Grp Cap (vph)	2657			1440	213	
v/s Ratio Prot	0.49			c0.52	c0.09	
v/s Ratio Perm						
v/c Ratio	0.61			0.65	0.69	
Uniform Delay, d1	3.4			3.7	37.4	
Progression Factor	0.39			0.14	1.00	
Incremental Delay, d2	0.6			1.7	7.5	
Delay (s)	1.9			2.2	45.0	
Level of Service	A			A	D	
Approach Delay (s)	1.9			2.2	45.0	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	4.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	B
c Critical Lane Group			

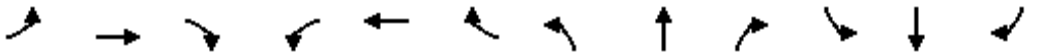


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.95	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.94	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3400	1766		1553	
Flt Permitted		0.89	1.00		0.97	
Satd. Flow (perm)		3037	1766		1553	
Volume (vph)	45	1372	778	65	80	66
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	50	1524	864	72	89	73
Lane Group Flow (vph)	0	1574	936	0	162	0
Confl. Peds. (#/hr)				16		41
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type	Perm					
Protected Phases		2	2		4	
Permitted Phases	2					
Actuated Green, G (s)		67.6	67.6		12.6	
Effective Green, g (s)		69.5	69.5		14.5	
Actuated g/C Ratio		0.77	0.77		0.16	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		1.0	1.0		2.0	
Lane Grp Cap (vph)		2345	1364		250	
v/s Ratio Prot			c0.53		c0.10	
v/s Ratio Perm		0.52				
v/c Ratio		0.67	0.69		0.65	
Uniform Delay, d1		4.8	5.0		35.4	
Progression Factor		0.42	1.08		1.00	
Incremental Delay, d2		1.2	2.5		4.3	
Delay (s)		3.3	7.9		39.6	
Level of Service		A	A		D	
Approach Delay (s)		3.3	7.9		39.6	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	E
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00	0.95		1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.98	1.00
Satd. Flow (prot)	1703	3331		1703	3378			1740	1443		1761	1456
Flt Permitted	0.30	1.00		0.11	1.00			0.97	1.00		0.98	1.00
Satd. Flow (perm)	545	3331		201	3378			1740	1443		1761	1456
Volume (vph)	56	1183	128	168	720	30	91	59	213	50	91	21
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	62	1314	142	187	800	33	101	66	237	56	101	23
Lane Group Flow (vph)	62	1456	0	187	833	0	0	167	237	0	157	23
Confl. Peds. (#/hr)			23			14			28			10
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt			pm+pt			Split		Perm	Split		Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6					3			4
Actuated Green, G (s)	39.2	38.8		39.7	39.7			13.3	13.3		14.2	14.2
Effective Green, g (s)	40.7	40.7		41.6	41.6			15.2	15.2		16.1	16.1
Actuated g/C Ratio	0.45	0.45		0.46	0.46			0.17	0.17		0.18	0.18
Clearance Time (s)	4.5	4.9		4.5	4.9			4.9	4.9		4.9	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	312	1506		193	1561			294	244		315	260
v/s Ratio Prot	0.01	c0.44		c0.06	0.25			0.10			c0.09	
v/s Ratio Perm	0.08			c0.38					c0.16			0.02
v/c Ratio	0.20	0.97		0.97	0.53			0.57	0.97		0.50	0.09
Uniform Delay, d1	17.3	24.0		44.0	17.3			34.4	37.2		33.3	30.8
Progression Factor	1.29	1.21		0.45	0.43			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	14.0		12.8	0.1			1.5	49.2		0.5	0.1
Delay (s)	22.6	43.0		32.7	7.6			35.9	86.3		33.8	30.9
Level of Service	C	D		C	A			D	F		C	C
Approach Delay (s)		42.2			12.2			65.5			33.4	
Approach LOS		D			B			E			C	

Intersection Summary			
HCM Average Control Delay	34.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	C
c Critical Lane Group			

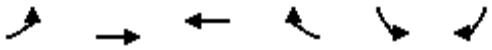


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0	3.0		3.0	3.0
Lane Util. Factor		0.95	1.00		0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00			1.00	0.94		1.00	0.95
Flpb, ped/bikes		1.00	1.00		1.00			1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00			1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00		0.98			0.96	1.00		0.99	1.00
Satd. Flow (prot)		3405	1524		3352			1734	1425		1848	1508
Flt Permitted		1.00	1.00		0.98			0.59	1.00		0.84	1.00
Satd. Flow (perm)		3405	1524		3352			1066	1425		1560	1508
Volume (vph)	6	1137	350	330	745	5	208	47	282	20	103	9
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	7	1263	389	367	828	6	231	52	313	22	114	10
Lane Group Flow (vph)	0	1270	389	0	1201	0	0	283	313	0	136	10
Confl. Peds. (#/hr)						2			30			20
Heavy Vehicles (%)	2%	6%	6%	6%	6%	2%	6%	2%	6%	2%	2%	2%
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	2	2		1	1			8			4	
Permitted Phases			2				8		8	4		4
Actuated Green, G (s)		29.5	29.5		27.5			19.5	19.5		19.5	19.5
Effective Green, g (s)		31.0	31.0		29.0			21.0	21.0		21.0	21.0
Actuated g/C Ratio		0.34	0.34		0.32			0.23	0.23		0.23	0.23
Clearance Time (s)		4.5	4.5		4.5			4.5	4.5		4.5	4.5
Vehicle Extension (s)		2.0	2.0		2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		1173	525		1080			249	333		364	352
v/s Ratio Prot		c0.37			c0.36							
v/s Ratio Perm			0.26					c0.27	0.22		0.09	0.01
v/c Ratio		1.08	0.74		1.11			1.14	0.94		0.37	0.03
Uniform Delay, d1		29.5	26.0		30.5			34.5	33.9		29.0	26.6
Progression Factor		0.46	0.16		0.42			1.00	1.00		1.00	1.00
Incremental Delay, d2		46.2	5.2		54.0			97.2	31.9		0.2	0.0
Delay (s)		59.9	9.5		66.8			131.7	65.8		29.2	26.6
Level of Service		E	A		E			F	E		C	C
Approach Delay (s)		48.1			66.8			97.1			29.0	
Approach LOS		D			E			F			C	

Intersection Summary			
HCM Average Control Delay	61.7	HCM Level of Service	E
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	101.0%	ICU Level of Service	F
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0			3.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			1.00	
Frpb, ped/bikes		1.00	1.00		1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.96			0.96	
Flt Protected		1.00	1.00		0.99			0.98			0.98	
Satd. Flow (prot)		3405	1524		3358			3176			1719	
Flt Permitted		1.00	1.00		0.99			0.74			0.98	
Satd. Flow (perm)		3405	1524		3358			2420			1719	
Volume (vph)	23	1081	335	186	582	10	413	184	213	54	22	37
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	26	1201	372	207	647	11	459	204	237	60	24	41
Lane Group Flow (vph)	0	1227	372	0	865	0	0	900	0	0	125	0
Confl. Peds. (#/hr)						13			11			14
Heavy Vehicles (%)	2%	6%	6%	6%	6%	2%	6%	2%	6%	2%	2%	2%
Turn Type	Split		Free	Split			Perm			Perm		
Protected Phases	1	1		2	2			4			4	
Permitted Phases		1	Free		2		4			4	4	
Actuated Green, G (s)		28.5	90.0		20.5			27.5			27.5	
Effective Green, g (s)		30.0	90.0		22.0			29.0			29.0	
Actuated g/C Ratio		0.33	1.00		0.24			0.32			0.32	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		1135	1524		821			780			554	
v/s Ratio Prot		c0.36			c0.26						0.07	
v/s Ratio Perm			0.24					c0.37				
v/c Ratio		1.08	0.24		1.05			1.15			0.23	
Uniform Delay, d1		30.0	0.0		34.0			30.5			22.3	
Progression Factor		0.87	1.00		1.00			1.00			0.83	
Incremental Delay, d2		41.0	0.1		46.5			83.6			0.1	
Delay (s)		67.0	0.1		80.5			114.1			18.5	
Level of Service		E	A		F			F			B	
Approach Delay (s)		51.4			80.5			114.1			18.5	
Approach LOS		D			F			F			B	

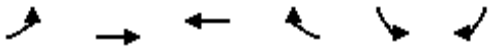
Intersection Summary			
HCM Average Control Delay	73.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	108.4%	ICU Level of Service	F
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	48	1273	847	58	15	34
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	53	1414	941	64	17	38
Pedestrians		21	13		7	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		2	1		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		776	1117			
pX, platoon unblocked					0.67	
vC, conflicting volume	1013				1807	531
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1013				1711	531
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				67	92
cM capacity (veh/h)	689				50	487

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	525	943	627	378	54
Volume Left	53	0	0	0	17
Volume Right	0	0	0	64	38
cSH	689	1700	1700	1700	133
Volume to Capacity	0.08	0.55	0.37	0.22	0.41
Queue Length (ft)	6	0	0	0	44
Control Delay (s)	2.1	0.0	0.0	0.0	49.4
Lane LOS	A				E
Approach Delay (s)	0.8		0.0		49.4
Approach LOS					E

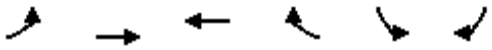
Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	86.1%	ICU Level of Service	D



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	20	1268	855	69	35	50
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	22	1409	950	77	39	56
Pedestrians		4	6		8	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		1136	757			
pX, platoon unblocked					0.70	
vC, conflicting volume	1035				1751	525
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1035				1642	525
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				37	89
cM capacity (veh/h)	675				62	497

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	492	939	633	393	94
Volume Left	22	0	0	0	39
Volume Right	0	0	0	77	56
cSH	675	1700	1700	1700	127
Volume to Capacity	0.03	0.55	0.37	0.23	0.74
Queue Length (ft)	3	0	0	0	106
Control Delay (s)	0.9	0.0	0.0	0.0	88.9
Lane LOS	A				F
Approach Delay (s)	0.3		0.0		88.9
Approach LOS					F

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	61.2%	ICU Level of Service	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	59	1244	812	44	22	78
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	66	1382	902	49	24	87
Pedestrians		3	2		25	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			367			
pX, platoon unblocked						
vC, conflicting volume	976				1776	504
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	976				1776	504
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				63	83
cM capacity (veh/h)	700				67	507

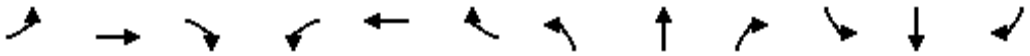
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	526	921	601	350	111
Volume Left	66	0	0	0	24
Volume Right	0	0	0	49	87
cSH	700	1700	1700	1700	207
Volume to Capacity	0.09	0.54	0.35	0.21	0.54
Queue Length (ft)	8	0	0	0	70
Control Delay (s)	2.5	0.0	0.0	0.0	40.9
Lane LOS	A				E
Approach Delay (s)	0.9		0.0		40.9
Approach LOS					E

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	84.3%	ICU Level of Service	D

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1248	18	10	851	5	35
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1387	20	11	946	6	39
Pedestrians	3			2	40	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				297		
pX, platoon unblocked						
vC, conflicting volume			1447		1935	745
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1447		1935	745
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		90	89
cM capacity (veh/h)			459		56	348

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	924	482	326	630	44
Volume Left	0	0	11	0	6
Volume Right	0	20	0	0	39
cSH	1700	1700	459	1700	210
Volume to Capacity	0.54	0.28	0.02	0.37	0.21
Queue Length (ft)	0	0	2	0	19
Control Delay (s)	0.0	0.0	0.8	0.0	26.7
Lane LOS			A		D
Approach Delay (s)	0.0		0.3		26.7
Approach LOS					D

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		0.95	0.95			1.00	
Frpb, ped/bikes		0.99			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			1.00	
Frt		0.96			0.98		1.00	0.99			0.95	
Flt Protected		0.99			0.99		0.95	0.99			1.00	
Satd. Flow (prot)		1746			1807		1681	1721			1744	
Flt Permitted		0.94			0.96		0.95	0.99			1.00	
Satd. Flow (perm)		1654			1753		1681	1721			1744	
Volume (vph)	28	89	53	20	135	28	134	73	10	6	40	26
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	31	99	59	22	150	31	149	81	11	7	44	29
Lane Group Flow (vph)	0	189	0	0	203	0	118	123	0	0	80	0
Confl. Peds. (#/hr)			11			4			1			6
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		56.9			56.7		11.6	11.6			8.7	
Effective Green, g (s)		58.5			58.5		12.6	12.6			9.9	
Actuated g/C Ratio		0.65			0.65		0.14	0.14			0.11	
Clearance Time (s)		4.6			4.8		4.0	4.0			4.2	
Vehicle Extension (s)		2.0			2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		1075			1139		235	241			192	
v/s Ratio Prot							0.07	c0.07			c0.05	
v/s Ratio Perm		0.11			c0.12							
v/c Ratio		0.18			0.18		0.50	0.51			0.42	
Uniform Delay, d1		6.2			6.2		35.8	35.8			37.4	
Progression Factor		1.00			1.00		0.47	0.44			1.00	
Incremental Delay, d2		0.4			0.0		0.1	0.1			0.5	
Delay (s)		6.6			6.3		16.8	15.9			37.9	
Level of Service		A			A		B	B			D	
Approach Delay (s)		6.6			6.3			16.3			37.9	
Approach LOS		A			A			B			D	

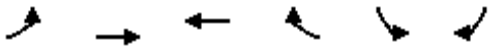
Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	38.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1210	51	27	816	10	122
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1344	57	30	907	11	136
Pedestrians					38	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	243			551		
pX, platoon unblocked			0.70		0.70	0.70
vC, conflicting volume			1439		1924	739
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1195		1891	190
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		72	76
cM capacity (veh/h)			399		39	557

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	896	505	332	604	147
Volume Left	0	0	30	0	11
Volume Right	0	57	0	0	136
cSH	1700	1700	399	1700	279
Volume to Capacity	0.53	0.30	0.08	0.36	0.52
Queue Length (ft)	0	0	6	0	71
Control Delay (s)	0.0	0.0	2.6	0.0	31.3
Lane LOS			A		D
Approach Delay (s)	0.0		0.9		31.3
Approach LOS					D

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	54.8%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	47	1285	770	57	22	73
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	52	1428	856	63	24	81
Pedestrians					63	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					5	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		393	401			
pX, platoon unblocked					0.71	
vC, conflicting volume	982				1769	522
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	982				1673	522
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				55	83
cM capacity (veh/h)	674				55	478

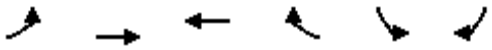
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	528	952	570	349	106
Volume Left	52	0	0	0	24
Volume Right	0	0	0	63	81
cSH	674	1700	1700	1700	171
Volume to Capacity	0.08	0.56	0.34	0.21	0.62
Queue Length (ft)	6	0	0	0	85
Control Delay (s)	2.1	0.0	0.0	0.0	55.1
Lane LOS	A				F
Approach Delay (s)	0.8		0.0		55.1
Approach LOS					F

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	82.9%	ICU Level of Service	D

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1232	75	24	799	28	76
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1369	83	27	888	31	84
Pedestrians				1	52	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	4	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	523			271		
pX, platoon unblocked			0.72		0.72	0.72
vC, conflicting volume			1504		1960	779
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1313		1944	308
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		17	82
cM capacity (veh/h)			368		37	479

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	913	540	323	592	116
Volume Left	0	0	27	0	31
Volume Right	0	83	0	0	84
cSH	1700	1700	368	1700	114
Volume to Capacity	0.54	0.32	0.07	0.35	1.01
Queue Length (ft)	0	0	6	0	167
Control Delay (s)	0.0	0.0	2.5	0.0	158.8
Lane LOS			A		F
Approach Delay (s)	0.0		0.9		158.8
Approach LOS					F

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	0.98		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.98		0.96	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3397	1729		1644	
Flt Permitted		0.74	1.00		0.97	
Satd. Flow (perm)		2511	1729		1644	
Volume (vph)	68	1276	806	110	189	82
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	76	1418	896	122	210	91
Lane Group Flow (vph)	0	1494	1018	0	301	0
Confl. Peds. (#/hr)	58			58	13	6
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type	Perm					
Protected Phases		2	6		4	
Permitted Phases	2					
Actuated Green, G (s)		63.4	63.4		16.8	
Effective Green, g (s)		65.3	65.3		18.7	
Actuated g/C Ratio		0.73	0.73		0.21	
Clearance Time (s)		4.9	4.9		4.9	
Vehicle Extension (s)		2.0	2.0		2.0	
Lane Grp Cap (vph)		1822	1254		342	
v/s Ratio Prot			0.59		c0.18	
v/s Ratio Perm		c0.59				
v/c Ratio		0.82	0.81		0.88	
Uniform Delay, d1		8.4	8.2		34.6	
Progression Factor		0.77	0.31		1.00	
Incremental Delay, d2		0.4	4.6		21.6	
Delay (s)		6.8	7.1		56.2	
Level of Service		A	A		E	
Approach Delay (s)		6.8	7.1		56.2	
Approach LOS		A	A		E	

Intersection Summary			
HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	123.9%	ICU Level of Service	H
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1344	92	0	888	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1493	102	0	987	0	0
Pedestrians					120	
Lane Width (ft)					0.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	259			90		
pX, platoon unblocked			0.66		0.77	0.66
vC, conflicting volume			1716		2651	918
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1567		2034	354
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			281		39	426

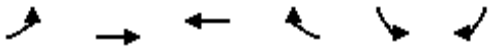
Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	996	600	987
Volume Left	0	0	0
Volume Right	0	102	0
cSH	1700	1700	1700
Volume to Capacity	0.59	0.35	0.58
Queue Length (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		0.0
Approach LOS			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	55.3%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1336	116	0	843	0	96
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1484	129	0	937	0	107
Pedestrians				4	63	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	5	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	150			636		
pX, platoon unblocked			0.80		0.79	0.80
vC, conflicting volume			1676		2549	874
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1593		2310	585
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	69
cM capacity (veh/h)			315		25	345

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	990	624	937	107
Volume Left	0	0	0	0
Volume Right	0	129	0	107
cSH	1700	1700	1700	345
Volume to Capacity	0.58	0.37	0.55	0.31
Queue Length (ft)	0	0	0	32
Control Delay (s)	0.0	0.0	0.0	20.0
Lane LOS				C
Approach Delay (s)	0.0		0.0	20.0
Approach LOS				C

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	60.5%	ICU Level of Service	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	36	1396	814	18	28	29
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	40	1551	904	20	31	32
Pedestrians		2			6	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		370	416			
pX, platoon unblocked	0.72				0.82	0.72
vC, conflicting volume	930				1776	922
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	904				1360	893
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				71	84
cM capacity (veh/h)	548				107	208

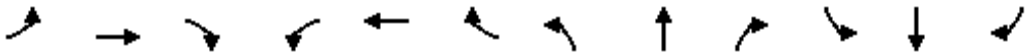
Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	557	1034	924	63
Volume Left	40	0	0	31
Volume Right	0	0	20	32
cSH	548	1700	1700	142
Volume to Capacity	0.07	0.61	0.54	0.44
Queue Length (ft)	6	0	0	50
Control Delay (s)	2.0	0.0	0.0	49.1
Lane LOS	A			E
Approach Delay (s)	0.7		0.0	49.1
Approach LOS				E

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	75.4%	ICU Level of Service	C

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1354	70	0	832	0	13
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1504	78	0	924	0	14
Pedestrians	2				8	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	0				1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	490			296		
pX, platoon unblocked			0.82		0.84	0.82
vC, conflicting volume			1590		2478	799
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1499		2219	532
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			368		32	404

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	1003	579	924	14
Volume Left	0	0	0	0
Volume Right	0	78	0	14
cSH	1700	1700	1700	404
Volume to Capacity	0.59	0.34	0.54	0.04
Queue Length (ft)	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	14.2
Lane LOS				B
Approach Delay (s)	0.0		0.0	14.2
Approach LOS				B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	
Lane Util. Factor		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00	0.98	1.00		1.00	1.00	0.99	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Frt		0.98		1.00	1.00	0.85	1.00		0.85	1.00	0.93	
Flt Protected		1.00		0.95	1.00	1.00	0.95		1.00	0.95	1.00	
Satd. Flow (prot)		1825		1769	1863	1547	1764		1583	1770	1704	
Flt Permitted		1.00		0.19	1.00	1.00	0.58		1.00	0.95	1.00	
Satd. Flow (perm)		1825		358	1863	1547	1086		1583	1770	1704	
Volume (vph)	0	256	35	365	244	537	35	0	125	597	94	92
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	284	39	406	271	597	39	0	139	663	104	102
Lane Group Flow (vph)	0	323	0	406	271	597	39	0	139	663	206	0
Confl. Peds. (#/hr)	3		6	3		6	4					4
Turn Type				pm+pt		Free	custom		custom	Perm		
Protected Phases		4		3	8						6	
Permitted Phases				8		Free	2		2	6		
Actuated Green, G (s)		16.3		39.2	39.2	90.0	41.8		41.8	41.8	41.8	
Effective Green, g (s)		17.8		40.7	40.7	90.0	43.3		43.3	43.3	43.3	
Actuated g/C Ratio		0.20		0.45	0.45	1.00	0.48		0.48	0.48	0.48	
Clearance Time (s)		4.5		4.5	4.5		4.5		4.5	4.5	4.5	
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		361		474	842	1547	522		762	852	820	
v/s Ratio Prot		0.18		c0.19	0.15						0.12	
v/s Ratio Perm				c0.20		0.39	0.04		0.09	c0.37		
v/c Ratio		0.89		0.86	0.32	0.39	0.07		0.18	0.78	0.25	
Uniform Delay, d1		35.2		21.2	15.8	0.0	12.6		13.3	19.4	13.8	
Progression Factor		1.00		1.00	1.00	1.00	1.00		1.00	0.82	0.81	
Incremental Delay, d2		23.4		14.1	0.2	0.7	0.3		0.5	2.6	0.1	
Delay (s)		58.6		35.3	16.0	0.7	12.8		13.8	18.6	11.3	
Level of Service		E		D	B	A	B		B	B	B	
Approach Delay (s)		58.6			15.0			13.6			16.8	
Approach LOS		E			B			B			B	

Intersection Summary			
HCM Average Control Delay	20.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	86.6%	ICU Level of Service	D

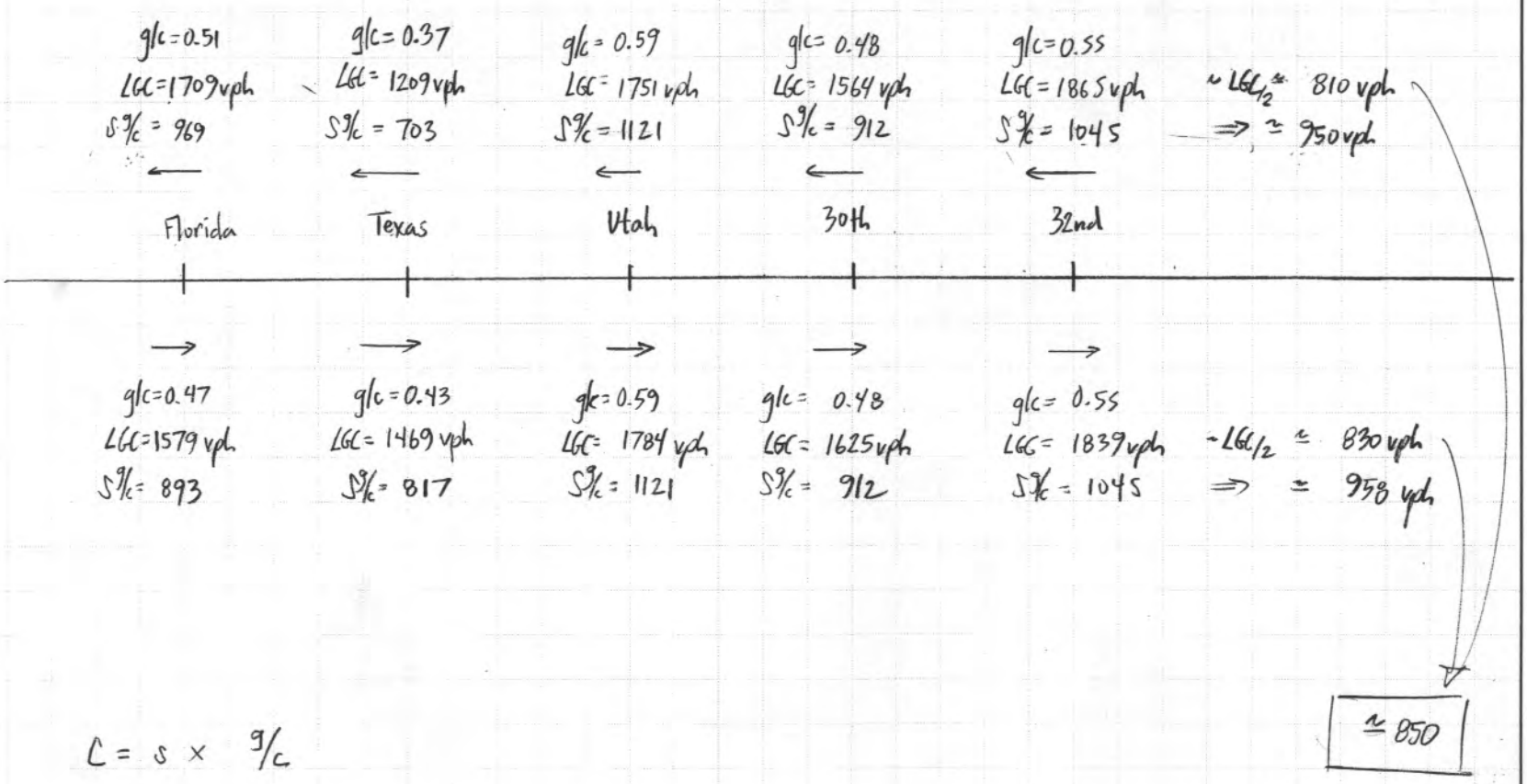
c Critical Lane Group

Appendix G
Saturation Flow Rate Calculation Worksheet

Based on 2030 NB

Ideal flow = 1900 vphpl (s)

LGC = Lane Group Capacity (vph)



$C = s \times g/c$

C = Approach Capacity
s = saturation flow
g = effective green (green + change interval - lost time)
c = cycle length

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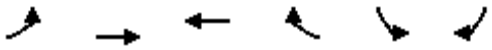
Appendix H
2010 with Preferred Concept Plan HCM Analysis Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	310	21	0	891	0	38
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	344	23	0	990	0	42
Pedestrians	3			2	14	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	452			320		
pX, platoon unblocked						
vC, conflicting volume			382		1351	360
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			382		1351	360
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	94
cM capacity (veh/h)			1174		165	679

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	344	23	990	42
Volume Left	0	0	0	0
Volume Right	0	23	0	42
cSH	1700	1700	1700	679
Volume to Capacity	0.20	0.01	0.58	0.06
Queue Length (ft)	0	0	0	5
Control Delay (s)	0.0	0.0	0.0	10.6
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.6
Approach LOS				B

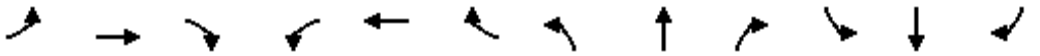
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	62.8%	ICU Level of Service	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	331	881	10	0	31
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	368	979	11	0	34
Pedestrians		3	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		372	400			
pX, platoon unblocked						
vC, conflicting volume	995				1354	987
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	995				1354	987
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	89
cM capacity (veh/h)	700				166	301

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	368	979	11	34
Volume Left	0	0	0	0
Volume Right	0	0	11	34
cSH	1700	1700	1700	301
Volume to Capacity	0.22	0.58	0.01	0.11
Queue Length (ft)	0	0	0	10
Control Delay (s)	0.0	0.0	0.0	18.5
Lane LOS				C
Approach Delay (s)	0.0	0.0		18.5
Approach LOS				C

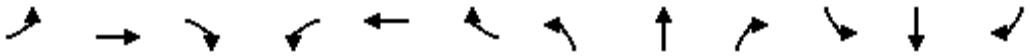
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	62.5%	ICU Level of Service	B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	757	17	0	617	8	0	0	111	0	0	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	841	19	0	686	9	0	0	123	0	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		359			243							
pX, platoon unblocked	0.69						0.69	0.69		0.69	0.69	0.69
vC, conflicting volume	694			860			1531	1536	841	1650	1546	686
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	559			860			1766	1772	841	1937	1787	547
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	66	100	100	99
cM capacity (veh/h)	709			790			45	58	368	23	57	375

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	841	19	686	9	123	4
Volume Left	0	0	0	0	0	0
Volume Right	0	19	0	9	123	4
cSH	1700	1700	1700	1700	368	375
Volume to Capacity	0.49	0.01	0.40	0.01	0.34	0.01
Queue Length (ft)	0	0	0	0	36	1
Control Delay (s)	0.0	0.0	0.0	0.0	19.7	14.7
Lane LOS					C	B
Approach Delay (s)	0.0		0.0		19.7	14.7
Approach LOS					C	B

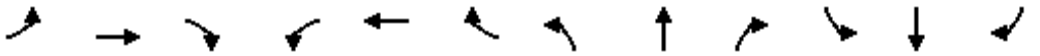
Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	58.6%	ICU Level of Service	A	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	1	104	46	47	206	3	2	4	8	4	8	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	1	116	51	52	229	3	2	4	9	4	9	1
Pedestrians		1			5			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		393			875							
pX, platoon unblocked												
vC, conflicting volume	238			175			493	494	154	500	518	238
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	238			175			493	494	154	500	518	238
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	99	99	99	98	100
cM capacity (veh/h)	1322			1392			457	453	882	450	439	797

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	168	284	16	14
Volume Left	1	52	2	4
Volume Right	51	3	9	1
cSH	1322	1392	628	458
Volume to Capacity	0.00	0.04	0.02	0.03
Queue Length (ft)	0	3	2	2
Control Delay (s)	0.1	1.7	10.9	13.1
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	1.7	10.9	13.1
Approach LOS			B	B

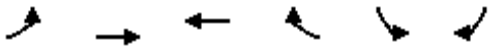
Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	40.4%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	335	17	0	727	4	0	0	14	0	0	17
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	372	19	0	808	4	0	0	16	0	0	19
Pedestrians		9			3			15			13	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			0			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		351										
pX, platoon unblocked												
vC, conflicting volume	825			406			1223	1212	390	1212	1227	830
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	825			406			1223	1212	390	1212	1227	830
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	98	100	100	95
cM capacity (veh/h)	805			1149			144	179	653	152	176	366

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	372	19	808	4	16	19
Volume Left	0	0	0	0	0	0
Volume Right	0	19	0	4	16	19
cSH	1700	1700	1700	1700	653	366
Volume to Capacity	0.22	0.01	0.48	0.00	0.02	0.05
Queue Length (ft)	0	0	0	0	2	4
Control Delay (s)	0.0	0.0	0.0	0.0	10.6	15.4
Lane LOS					B	C
Approach Delay (s)	0.0		0.0		10.6	15.4
Approach LOS					B	C

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	55.1%	ICU Level of Service	A	



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	403	662	17	0	42
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	448	736	19	0	47
Pedestrians		5			1	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			240			
pX, platoon unblocked	0.80				0.80	0.80
vC, conflicting volume	755				1184	742
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	694				1231	677
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	87
cM capacity (veh/h)	728				158	363

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	448	736	19	47
Volume Left	0	0	0	0
Volume Right	0	0	19	47
cSH	1700	1700	1700	363
Volume to Capacity	0.26	0.43	0.01	0.13
Queue Length (ft)	0	0	0	11
Control Delay (s)	0.0	0.0	0.0	16.4
Lane LOS				C
Approach Delay (s)	0.0	0.0		16.4
Approach LOS				C

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	50.3%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	381	10	0	704	0	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	423	11	0	782	0	24
Pedestrians	5					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				330		
pX, platoon unblocked					0.80	
vC, conflicting volume			434		1211	423
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			434		1264	423
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			1136		150	635

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	423	11	782	24
Volume Left	0	0	0	0
Volume Right	0	11	0	24
cSH	1700	1700	1700	635
Volume to Capacity	0.25	0.01	0.46	0.04
Queue Length (ft)	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	10.9
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.9
Approach LOS				B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	44.5%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	0.96	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.95	
Flt Protected	1.00	1.00	0.95	1.00	0.97	
Satd. Flow (prot)	1863	1543	1798	1863	1737	
Flt Permitted	1.00	1.00	0.41	1.00	0.97	
Satd. Flow (perm)	1863	1543	781	1863	1737	
Volume (vph)	388	16	28	668	57	31
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	431	18	31	742	63	34
Lane Group Flow (vph)	431	18	31	742	97	0
Confl. Peds. (#/hr)		9	9		9	2
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Turn Type		Perm	pm+pt			
Protected Phases	4		3	8	2	
Permitted Phases		4	8			
Actuated Green, G (s)	47.2	47.2	62.4	62.4	18.6	
Effective Green, g (s)	48.7	48.7	63.9	63.9	20.1	
Actuated g/C Ratio	0.54	0.54	0.71	0.71	0.22	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1008	835	692	1323	388	
v/s Ratio Prot	0.23		0.01	c0.40	c0.06	
v/s Ratio Perm		0.01	0.03			
v/c Ratio	0.43	0.02	0.04	0.56	0.25	
Uniform Delay, d1	12.3	9.6	7.5	6.3	28.7	
Progression Factor	1.00	1.00	0.20	0.11	1.00	
Incremental Delay, d2	0.3	0.0	0.0	0.5	1.5	
Delay (s)	12.6	9.6	1.5	1.2	30.3	
Level of Service	B	A	A	A	C	
Approach Delay (s)	12.5			1.2	30.3	
Approach LOS	B			A	C	

Intersection Summary			
HCM Average Control Delay	7.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	A
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95			1.00	0.95
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.95		1.00	0.97		1.00	0.97			1.00	0.98
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1770	3283		1770	3423		1770	3419			1770	3466
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.26	1.00
Satd. Flow (perm)	1770	3283		1770	3423		1770	3419			484	3466
Volume (vph)	41	166	85	139	581	137	73	201	50	9	72	388
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	46	184	94	154	646	152	81	223	56	10	80	431
Lane Group Flow (vph)	46	278	0	154	798	0	81	279	0	0	90	485
Confl. Peds. (#/hr)			87			19			14			
Turn Type	Prot			Prot			Prot			custom	Prot	
Protected Phases	5	2		1	6		3	8			7	4
Permitted Phases										7		
Actuated Green, G (s)	4.3	13.3		13.3	22.3		6.4	16.6			14.0	24.2
Effective Green, g (s)	5.7	15.2		14.7	24.2		7.8	18.5			15.4	26.1
Actuated g/C Ratio	0.08	0.20		0.19	0.32		0.10	0.24			0.20	0.34
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	4.9			4.4	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	3.3			2.0	2.9
Lane Grp Cap (vph)	133	658		343	1093		182	834			98	1193
v/s Ratio Prot	0.03	0.08		c0.09	c0.23		c0.05	0.08				c0.14
v/s Ratio Perm											c0.19	
v/c Ratio	0.35	0.42		0.45	0.73		0.45	0.33			0.92	0.41
Uniform Delay, d1	33.3	26.5		27.0	22.9		32.0	23.6			29.6	18.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	1.6	0.2		0.9	2.2		1.7	0.3			63.5	0.2
Delay (s)	34.8	26.6		27.9	25.1		33.7	23.8			93.1	19.2
Level of Service	C	C		C	C		C	C			F	B
Approach Delay (s)		27.8			25.5			26.1				30.7
Approach LOS		C			C			C				C

Intersection Summary			
HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	75.8	Sum of lost time (s)	9.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	C

c Critical Lane Group

Movement	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Volume (vph)	49
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	54
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	31
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97		0.98			0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.93			0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99			1.00	
Satd. Flow (prot)	1770	1863	1542	1770	1863	1533		1679			1738	
Flt Permitted	0.22	1.00	1.00	0.53	1.00	1.00		0.95			0.98	
Satd. Flow (perm)	404	1863	1542	990	1863	1533		1607			1703	
Volume (vph)	10	260	9	64	816	31	22	35	62	9	51	39
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	289	10	71	907	34	24	39	69	10	57	43
Lane Group Flow (vph)	11	289	10	71	907	34	0	132	0	0	110	0
Confl. Peds. (#/hr)			3			5			9			11
Turn Type	pm+pt		Perm	pm+pt		Perm	Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	59.1	58.1	58.1	65.3	61.2	61.2		13.6			13.6	
Effective Green, g (s)	62.6	60.6	60.6	68.7	63.7	63.7		15.3			15.3	
Actuated g/C Ratio	0.70	0.67	0.67	0.76	0.71	0.71		0.17			0.17	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5		4.7			4.7	
Vehicle Extension (s)	2.0	2.5	2.5	2.0	2.5	2.5		2.0			2.0	
Lane Grp Cap (vph)	311	1254	1038	800	1319	1085		273			290	
v/s Ratio Prot	0.00	0.16		c0.01	c0.49							
v/s Ratio Perm	0.02		0.01	0.06		0.02		c0.08			0.06	
v/c Ratio	0.04	0.23	0.01	0.09	0.69	0.03		0.48			0.38	
Uniform Delay, d1	6.6	5.7	4.8	2.8	7.5	3.9		33.8			33.1	
Progression Factor	1.00	1.00	1.00	0.71	0.70	0.38		1.00			1.00	
Incremental Delay, d2	0.0	0.4	0.0	0.0	2.3	0.0		0.5			0.3	
Delay (s)	6.6	6.1	4.9	2.0	7.6	1.5		34.3			33.4	
Level of Service	A	A	A	A	A	A		C			C	
Approach Delay (s)		6.1			7.0			34.3			33.4	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	73.4%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.96		1.00			0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.99			0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96			0.98	
Satd. Flow (prot)	1770	1863	1547	1770	1863	1521		1766			1661	
Flt Permitted	0.19	1.00	1.00	0.49	1.00	1.00		0.96			0.98	
Satd. Flow (perm)	349	1863	1547	903	1863	1521		1766			1661	
Volume (vph)	10	326	12	34	696	12	171	11	12	18	8	30
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	362	13	38	773	13	190	12	13	20	9	33
Lane Group Flow (vph)	11	362	13	38	773	13	0	215	0	0	62	0
Confl. Peds. (#/hr)			1			8			12			10
Turn Type	pm+pt		Perm	Perm		Perm	Split			Split		
Protected Phases	5	2			6		8	8		7	7	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	54.3	53.5	53.5	48.2	48.2	48.2		14.2			7.1	
Effective Green, g (s)	55.9	55.9	55.9	50.6	50.6	50.6		16.1			9.0	
Actuated g/C Ratio	0.62	0.62	0.62	0.56	0.56	0.56		0.18			0.10	
Clearance Time (s)	4.5	5.4	5.4	5.4	5.4	5.4		4.9			4.9	
Vehicle Extension (s)	3.0	2.7	2.7	2.8	2.8	2.8		2.0			2.0	
Lane Grp Cap (vph)	253	1157	961	508	1047	855		316			166	
v/s Ratio Prot	0.00	c0.19			c0.41			c0.12			c0.04	
v/s Ratio Perm	0.03		0.01	0.04		0.01						
v/c Ratio	0.04	0.31	0.01	0.07	0.74	0.02		0.68			0.37	
Uniform Delay, d1	20.8	8.0	6.5	9.0	14.7	8.7		34.5			37.9	
Progression Factor	0.84	0.82	0.81	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	0.7	0.0	0.1	2.7	0.0		4.7			0.5	
Delay (s)	17.6	7.2	5.3	9.1	17.4	8.7		39.3			38.4	
Level of Service	B	A	A	A	B	A		D			D	
Approach Delay (s)		7.5			16.9			39.3			38.4	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	B

c Critical Lane Group

Level Of Service Computation Report
FHWA Roundabout Method (Base Volume Alternative)

Intersection #6 University/Texas [2010 1-Lane Alt (AM)]

Average Delay (sec/veh): 10.7 Level Of Service: B

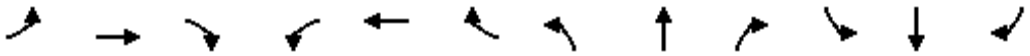
Street Name:	Texas						University					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Yield Sign			Yield Sign			Yield Sign			Yield Sign		
Lanes:	1			1			1			1		
Volume Module:												
Base Vol:	90	110	17	67	84	51	83	252	16	42	573	89
Growth 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
Initial Bse:	90	110	17	67	84	51	83	252	16	42	573	89
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	100	122	19	74	93	57	92	280	18	47	637	99
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	100	122	19	74	93	57	92	280	18	47	637	99
PCE 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
MLF 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
Final Vol.:	100	122	19	74	93	57	92	280	18	47	637	99
PCE Module:												
AutoPCE:	92	112	17	68	86	52	85	258	16	43	586	91
TruckPCE:	9	11	2	7	8	5	8	25	2	4	57	9
ComboPCE:	4	5	1	3	4	2	4	11	1	2	25	4
BicyclePCE:	0	0	0	0	0	0	0	0	0	0	0	0
AdjVolume:	105	128	20	78	98	60	97	294	19	49	669	104

Delay Module: >> Time Period: 0.25 hours <<				
CircVolume:	469	823	225	330
MaxVolume:	947	756	1078	1022
PedVolume:	0	0	0	0
AdjMaxVol:	947	756	1078	1022
ApproachVol:	253	236	410	821
ApproachDel:	5.2	6.9	5.4	16.2
Queue:	1.1	1.3	1.8	9.0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96	1.00	0.96		1.00	0.95	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1534	1770	1863	1513	1770	1666		1770	1639	
Flt Permitted	0.41	1.00	1.00	0.44	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	768	1863	1534	822	1863	1513	1770	1666		1770	1639	
Volume (vph)	29	334	40	49	507	30	65	26	24	13	38	38
Peak-hour factor, PHF	0.90	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	32	352	44	54	563	33	72	29	27	14	42	42
Lane Group Flow (vph)	32	352	44	54	563	33	72	56	0	14	84	0
Confl. Peds. (#/hr)			6			13			20			14
Turn Type	Perm		Perm	pm+pt		Perm	Split			Split		
Protected Phases		2		1	6		3	3		4	4	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	40.4	40.4	40.4	47.4	47.4	47.4	5.3	5.3		4.9	4.9	
Effective Green, g (s)	42.9	42.9	42.9	49.9	49.9	49.9	7.5	7.5		7.1	7.1	
Actuated g/C Ratio	0.53	0.53	0.53	0.62	0.62	0.62	0.09	0.09		0.09	0.09	
Clearance Time (s)	5.5	5.5	5.5	4.5	5.5	5.5	5.2	5.2		5.2	5.2	
Vehicle Extension (s)	2.0	2.0	2.0	3.0	2.0	2.0	3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)	410	995	820	558	1158	940	165	156		157	145	
v/s Ratio Prot		0.19		0.00	c0.30		c0.04	0.03		0.01	c0.05	
v/s Ratio Perm	0.04		0.03	0.06		0.02						
v/c Ratio	0.08	0.35	0.05	0.10	0.49	0.04	0.44	0.36		0.09	0.58	
Uniform Delay, d1	9.1	10.7	9.0	6.5	8.2	5.9	34.4	34.1		33.6	35.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.1	0.0	0.1	0.1	0.0	1.8	1.4		0.1	3.5	
Delay (s)	9.1	10.8	9.0	6.6	8.4	5.9	36.2	35.6		33.7	38.6	
Level of Service	A	B	A	A	A	A	D	D		C	D	
Approach Delay (s)		10.5			8.1			35.9			37.9	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	80.3	Sum of lost time (s)	15.8
Intersection Capacity Utilization	54.1%	ICU Level of Service	A

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.89	1.00	1.00	0.86	1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1412	1770	1863	1367	1770	1733		1770	1742	
Flt Permitted	0.34	1.00	1.00	0.46	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	641	1863	1412	856	1863	1367	1770	1733		1770	1742	
Volume (vph)	47	313	39	101	439	83	76	182	106	28	145	39
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	52	348	43	112	488	92	84	202	118	31	161	43
Lane Group Flow (vph)	52	348	43	112	488	92	84	320	0	31	204	0
Confl. Peds. (#/hr)			40			45			24			74
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	45.3	42.9	42.9	49.3	44.9	44.9	7.0	19.8		4.2	17.0	
Effective Green, g (s)	48.7	44.8	44.8	52.7	46.8	46.8	8.4	21.7		5.6	18.9	
Actuated g/C Ratio	0.54	0.50	0.50	0.59	0.52	0.52	0.09	0.24		0.06	0.21	
Clearance Time (s)	4.5	4.9	4.9	4.5	4.9	4.9	4.4	4.9		4.4	4.9	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	396	927	703	561	969	711	165	418		110	366	
v/s Ratio Prot	0.01	0.19		c0.01	c0.26		c0.05	c0.18		0.02	0.12	
v/s Ratio Perm	0.07		0.03	0.10		0.07						
v/c Ratio	0.13	0.38	0.06	0.20	0.50	0.13	0.51	0.77		0.28	0.56	
Uniform Delay, d1	17.4	14.0	11.7	12.7	14.0	11.1	38.8	31.8		40.3	31.8	
Progression Factor	1.00	1.00	1.00	1.08	1.22	2.30	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	1.2	0.2	0.2	1.7	0.3	0.9	7.4		0.5	1.0	
Delay (s)	17.6	15.1	11.9	13.9	18.8	25.9	39.7	39.1		40.8	32.9	
Level of Service	B	B	B	B	B	C	D	D		D	C	
Approach Delay (s)		15.1			19.0			39.3			33.9	
Approach LOS		B			B			D			C	

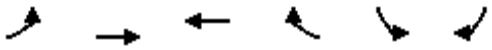
Intersection Summary			
HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.6%	ICU Level of Service	B

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0			3.0	3.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	1.00			1.00	0.98	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1842			1863	1677	
Flt Permitted	1.00			1.00	0.97	
Satd. Flow (perm)	1842			1863	1677	
Volume (vph)	430	29	0	590	57	42
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	478	32	0	656	63	47
Lane Group Flow (vph)	510	0	0	656	110	0
Confl. Peds. (#/hr)		8	8			20
Turn Type						
Protected Phases	2			2	4	
Permitted Phases						
Actuated Green, G (s)	73.2			73.2	8.3	
Effective Green, g (s)	74.7			74.7	9.3	
Actuated g/C Ratio	0.83			0.83	0.10	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	2.0			2.0	2.0	
Lane Grp Cap (vph)	1529			1546	173	
v/s Ratio Prot	0.28			c0.35	c0.07	
v/s Ratio Perm						
v/c Ratio	0.33			0.42	0.64	
Uniform Delay, d1	1.8			2.0	38.7	
Progression Factor	0.29			0.18	1.00	
Incremental Delay, d2	0.6			0.8	5.5	
Delay (s)	1.1			1.2	44.2	
Level of Service	A			A	D	
Approach Delay (s)	1.1			1.2	44.2	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	4.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.98	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.96	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1768	1863	1863	1548	1699	
Flt Permitted	0.38	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	705	1863	1863	1548	1699	
Volume (vph)	16	456	581	33	43	22
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	18	507	646	37	48	24
Lane Group Flow (vph)	18	507	646	37	72	0
Confl. Peds. (#/hr)	1			1		8
Turn Type	Perm			Perm		
Protected Phases		2	2		4	
Permitted Phases	2			2		
Actuated Green, G (s)	70.2	70.2	70.2	70.2	10.0	
Effective Green, g (s)	72.1	72.1	72.1	72.1	11.9	
Actuated g/C Ratio	0.80	0.80	0.80	0.80	0.13	
Clearance Time (s)	4.9	4.9	4.9	4.9	4.9	
Vehicle Extension (s)	1.0	1.0	1.0	1.0	2.0	
Lane Grp Cap (vph)	565	1492	1492	1240	225	
v/s Ratio Prot		0.27	c0.35		c0.04	
v/s Ratio Perm	0.03			0.02		
v/c Ratio	0.03	0.34	0.43	0.03	0.32	
Uniform Delay, d1	1.8	2.4	2.7	1.8	35.4	
Progression Factor	0.46	0.41	0.15	0.00	1.00	
Incremental Delay, d2	0.1	0.6	0.8	0.0	0.3	
Delay (s)	0.9	1.6	1.2	0.0	35.7	
Level of Service	A	A	A	A	D	
Approach Delay (s)		1.6	1.2		35.7	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	3.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	47.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96		1.00	0.98		1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00		0.98	1.00
Satd. Flow (prot)	1767	1863	1528	1770	1863	1519		1798	1551		1834	1528
Flt Permitted	0.32	1.00	1.00	0.27	1.00	1.00		0.97	1.00		0.98	1.00
Satd. Flow (perm)	598	1863	1528	504	1863	1519		1798	1551		1834	1528
Volume (vph)	15	476	20	84	565	8	60	23	282	17	37	13
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	529	22	93	628	9	67	26	313	19	41	14
Lane Group Flow (vph)	17	529	22	93	628	9	0	93	313	0	60	14
Confl. Peds. (#/hr)	8		6	6		8			12			6
Turn Type	pm+pt		Perm	pm+pt		Perm	Split		pm+ov	Split		Perm
Protected Phases	5	2		1	6		3	3	1	4	4	
Permitted Phases	2		2	6		6			3			4
Actuated Green, G (s)	44.8	44.4	44.4	46.8	46.8	46.8		10.4	14.4		12.0	12.0
Effective Green, g (s)	46.3	46.3	46.3	48.7	48.7	48.7		12.3	17.8		13.9	13.9
Actuated g/C Ratio	0.51	0.51	0.51	0.54	0.54	0.54		0.14	0.20		0.15	0.15
Clearance Time (s)	4.5	4.9	4.9	4.5	4.9	4.9		4.9	4.5		4.9	4.9
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0		2.0	3.0		2.0	2.0
Lane Grp Cap (vph)	348	958	786	350	1008	822		246	358		283	236
v/s Ratio Prot	0.00	c0.28		0.02	c0.34			0.05	c0.05		c0.03	
v/s Ratio Perm	0.02		0.01	0.13		0.01			0.15			0.01
v/c Ratio	0.05	0.55	0.03	0.27	0.62	0.01		0.38	0.87		0.21	0.06
Uniform Delay, d1	16.8	14.8	10.8	12.1	14.3	9.5		35.4	35.0		33.3	32.5
Progression Factor	1.06	1.05	1.28	0.29	0.29	0.08		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	2.2	0.1	0.2	1.1	0.0		0.4	20.4		0.1	0.0
Delay (s)	17.8	17.8	13.8	3.6	5.2	0.8		35.7	55.4		33.4	32.5
Level of Service	B	B	B	A	A	A		D	E		C	C
Approach Delay (s)		17.7			5.0			50.9			33.2	
Approach LOS		B			A			D			C	

Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	65.3%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00			1.00	0.97		1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	1.00
Satd. Flow (prot)	1770	1863	1542	1770	1861			1784	1542		1827	1562
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.64	1.00		0.89	1.00
Satd. Flow (perm)	1770	1863	1542	1770	1861			1191	1542		1653	1562
Volume (vph)	13	693	163	218	554	3	64	11	112	28	61	7
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	14	770	181	242	616	3	71	12	124	31	68	8
Lane Group Flow (vph)	14	770	181	242	619	0	0	83	124	0	99	8
Confl. Peds. (#/hr)			7			2	1		8	8		1
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	2	2		1	1			8			4	
Permitted Phases			2				8		8	4		4
Actuated Green, G (s)	38.4	38.4	38.4	26.5	26.5			11.6	11.6		11.6	11.6
Effective Green, g (s)	39.9	39.9	39.9	28.0	28.0			13.1	13.1		13.1	13.1
Actuated g/C Ratio	0.44	0.44	0.44	0.31	0.31			0.15	0.15		0.15	0.15
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5			4.5	4.5		4.5	4.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	785	826	684	551	579			173	224		241	227
v/s Ratio Prot	0.01	c0.41		0.14	c0.33							
v/s Ratio Perm			0.12					0.07	c0.08		0.06	0.01
v/c Ratio	0.02	0.93	0.26	0.44	1.07			0.48	0.55		0.41	0.04
Uniform Delay, d1	14.1	23.8	15.8	24.7	31.0			35.3	35.7		34.9	33.0
Progression Factor	0.53	0.69	0.40	0.71	0.81			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	17.2	0.8	0.2	54.8			0.8	1.7		0.4	0.0
Delay (s)	7.5	33.6	7.2	17.8	80.0			36.1	37.4		35.4	33.0
Level of Service	A	C	A	B	F			D	D		D	C
Approach Delay (s)		28.3			62.5			36.9			35.2	
Approach LOS		C			E			D			D	

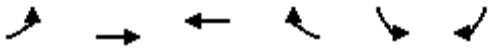
Intersection Summary			
HCM Average Control Delay	43.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0			3.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			1.00	
Frpb, ped/bikes		1.00	0.98		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.97			0.98	
Flt Protected		1.00	1.00		0.98			0.97			0.97	
Satd. Flow (prot)		3533	1550		3459			3290			1759	
Flt Permitted		1.00	1.00		0.98			0.75			0.97	
Satd. Flow (perm)		3533	1550		3459			2541			1759	
Volume (vph)	10	252	571	307	364	2	314	147	131	62	22	17
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	280	634	341	404	2	349	163	146	69	24	19
Lane Group Flow (vph)	0	291	634	0	747	0	0	658	0	0	112	0
Confl. Peds. (#/hr)			2			5	7		7	7		7
Turn Type	Split		Free	Split			Perm			Perm		
Protected Phases	1	1		2	2			4			4	
Permitted Phases		1	Free		2		4			4	4	
Actuated Green, G (s)		12.3	90.0		39.0			25.2			25.2	
Effective Green, g (s)		13.8	90.0		40.5			26.7			26.7	
Actuated g/C Ratio		0.15	1.00		0.45			0.30			0.30	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		542	1550		1557			754			522	
v/s Ratio Prot		c0.08			c0.22						0.06	
v/s Ratio Perm			0.41					c0.26				
v/c Ratio		0.54	0.41		0.48			0.87			0.21	
Uniform Delay, d1		35.2	0.0		17.4			30.0			23.8	
Progression Factor		0.76	1.00		1.00			1.00			1.00	
Incremental Delay, d2		0.3	0.4		1.1			10.6			0.1	
Delay (s)		27.1	0.4		18.4			40.6			23.8	
Level of Service		C	A		B			D			C	
Approach Delay (s)		8.8			18.4			40.6			23.8	
Approach LOS		A			B			D			C	

Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C

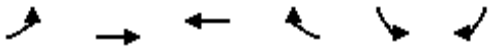
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	419	654	3	0	42
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	466	727	3	0	47
Pedestrians		9	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	0		0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		160	360			
pX, platoon unblocked	0.67				0.74	0.67
vC, conflicting volume	735				1199	741
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	605				982	614
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	86
cM capacity (veh/h)	657				205	329

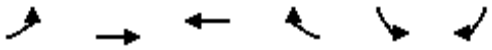
Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	466	727	3	47
Volume Left	0	0	0	0
Volume Right	0	0	3	47
cSH	1700	1700	1700	329
Volume to Capacity	0.27	0.43	0.00	0.14
Queue Length (ft)	0	0	0	12
Control Delay (s)	0.0	0.0	0.0	17.7
Lane LOS				C
Approach Delay (s)	0.0	0.0		17.7
Approach LOS				C

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	51.2%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.97	
Flt Protected	0.95	1.00	1.00	1.00	0.96	
Satd. Flow (prot)	1805	1863	1863	1615	1763	
Flt Permitted	0.16	1.00	1.00	1.00	0.96	
Satd. Flow (perm)	307	1863	1863	1615	1763	
Volume (vph)	39	379	621	12	8	3
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	43	421	690	13	9	3
Lane Group Flow (vph)	43	421	690	13	12	0
Confl. Peds. (#/hr)					11	1
Heavy Vehicles (%)	0%	2%	2%	0%	0%	0%
Turn Type	Perm			Perm		
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	41.9	41.9	41.9	41.9	39.1	
Effective Green, g (s)	43.4	43.4	43.4	43.4	40.6	
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.45	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	148	898	898	779	795	
v/s Ratio Prot		0.23	c0.37		c0.01	
v/s Ratio Perm	0.14			0.01		
v/c Ratio	0.29	0.47	0.77	0.02	0.02	
Uniform Delay, d1	14.0	15.6	19.2	12.2	13.7	
Progression Factor	0.38	0.59	1.00	1.00	1.00	
Incremental Delay, d2	1.0	0.4	4.0	0.0	0.0	
Delay (s)	6.4	9.5	23.2	12.2	13.7	
Level of Service	A	A	C	B	B	
Approach Delay (s)		9.2	23.0		13.7	
Approach LOS		A	C		B	

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	56.3%	ICU Level of Service	A
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	393	597	12	0	34
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	437	663	13	0	38
Pedestrians		5	6		7	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		390	367			
pX, platoon unblocked					0.84	
vC, conflicting volume	684				1113	675
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	684				1134	675
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	92
cM capacity (veh/h)	914				189	453

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	437	663	13	38
Volume Left	0	0	0	0
Volume Right	0	0	13	38
cSH	1700	1700	1700	453
Volume to Capacity	0.26	0.39	0.01	0.08
Queue Length (ft)	0	0	0	7
Control Delay (s)	0.0	0.0	0.0	13.7
Lane LOS				B
Approach Delay (s)	0.0	0.0		13.7
Approach LOS				B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	46.4%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	386	7	0	609	0	18
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	429	8	0	677	0	20
Pedestrians	5			6	7	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	460			297		
pX, platoon unblocked			0.85		0.85	0.85
vC, conflicting volume			444		1118	442
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			344		1139	342
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	97
cM capacity (veh/h)			1034		189	592

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	429	8	677	20
Volume Left	0	0	0	0
Volume Right	0	8	0	20
cSH	1700	1700	1700	592
Volume to Capacity	0.25	0.00	0.40	0.03
Queue Length (ft)	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	11.3
Lane LOS				B
Approach Delay (s)	0.0		0.0	11.3
Approach LOS				B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		0.95	0.95			1.00	
Frpb, ped/bikes		0.98			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			1.00	
Frt		0.89			0.98		1.00	1.00			0.96	
Flt Protected		1.00			1.00		0.95	0.98			0.99	
Satd. Flow (prot)		1615			1821		1681	1734			1757	
Flt Permitted		0.98			0.98		0.95	0.98			0.99	
Satd. Flow (perm)		1588			1796		1681	1734			1757	
Volume (vph)	9	7	75	13	120	17	105	53	2	7	14	8
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	10	8	83	14	133	19	117	59	2	8	16	9
Lane Group Flow (vph)	0	101	0	0	166	0	87	91	0	0	33	0
Confl. Peds. (#/hr)	1		2	2		1	7		1	1		7
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		61.7			61.5		9.6	9.6			5.9	
Effective Green, g (s)		63.3			63.3		10.6	10.6			7.1	
Actuated g/C Ratio		0.70			0.70		0.12	0.12			0.08	
Clearance Time (s)		4.6			4.8		4.0	4.0			4.2	
Vehicle Extension (s)		2.0			2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		1117			1263		198	204			139	
v/s Ratio Prot							0.05	c0.05			c0.02	
v/s Ratio Perm		0.06			c0.09							
v/c Ratio		0.09			0.13		0.44	0.45			0.24	
Uniform Delay, d1		4.2			4.4		36.9	37.0			38.9	
Progression Factor		1.00			1.00		0.31	0.31			1.00	
Incremental Delay, d2		0.2			0.0		0.4	0.4			0.3	
Delay (s)		4.4			4.4		12.0	11.7			39.2	
Level of Service		A			A		B	B			D	
Approach Delay (s)		4.4			4.4			11.8			39.2	
Approach LOS		A			A			B			D	

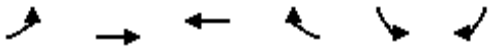
Intersection Summary			
HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	36.8%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	375	11	0	585	0	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	417	12	0	650	0	24
Pedestrians				1	3	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	243			551		
pX, platoon unblocked			0.89		0.89	0.89
vC, conflicting volume			432		1070	421
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			364		1078	352
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			1074		218	620

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	417	12	650	24
Volume Left	0	0	0	0
Volume Right	0	12	0	24
cSH	1700	1700	1700	620
Volume to Capacity	0.25	0.01	0.38	0.04
Queue Length (ft)	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	11.0
Lane LOS				B
Approach Delay (s)	0.0		0.0	11.0
Approach LOS				B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	44.5%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	397	544	12	0	41
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	441	604	13	0	46
Pedestrians			1		32	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			4.0		4.0	
Percent Blockage			0		3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		393	401			
pX, platoon unblocked					0.90	
vC, conflicting volume	650				1085	643
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	650				1095	643
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	90
cM capacity (veh/h)	921				209	464

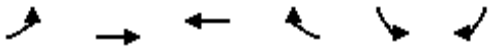
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	441	618	46
Volume Left	0	0	0
Volume Right	0	13	46
cSH	1700	1700	464
Volume to Capacity	0.26	0.36	0.10
Queue Length (ft)	0	0	8
Control Delay (s)	0.0	0.0	13.6
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.6
Approach LOS			B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	42.7%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	376	20	0	550	0	23
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	418	22	0	611	0	26
Pedestrians					19	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	523			271		
pX, platoon unblocked			0.92		0.92	0.92
vC, conflicting volume			459		1048	437
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			413		1052	389
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			1050		230	602

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	418	22	611	26
Volume Left	0	0	0	0
Volume Right	0	22	0	26
cSH	1700	1700	1700	602
Volume to Capacity	0.25	0.01	0.36	0.04
Queue Length (ft)	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	11.2
Lane LOS				B
Approach Delay (s)	0.0		0.0	11.2
Approach LOS				B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	35.5%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.89	0.96	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.94	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1756	1863	1863	1412	1644	
Flt Permitted	0.35	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	639	1863	1863	1412	1644	
Volume (vph)	22	393	578	68	65	47
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	24	437	642	76	72	52
Lane Group Flow (vph)	24	437	642	76	124	0
Confl. Peds. (#/hr)	36			36	1	28
Turn Type	pm+pt			Perm		
Protected Phases	5	2	6		4	
Permitted Phases	2			6		
Actuated Green, G (s)	72.2	72.2	65.4	65.4	8.0	
Effective Green, g (s)	74.1	74.1	67.3	67.3	9.9	
Actuated g/C Ratio	0.82	0.82	0.75	0.75	0.11	
Clearance Time (s)	4.5	4.9	4.9	4.9	4.9	
Vehicle Extension (s)	3.0	2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	573	1534	1393	1056	181	
v/s Ratio Prot	0.00	c0.23	c0.34		c0.08	
v/s Ratio Perm	0.03			0.05		
v/c Ratio	0.04	0.28	0.46	0.07	0.69	
Uniform Delay, d1	2.3	1.8	4.4	3.0	38.5	
Progression Factor	0.51	0.55	0.28	0.11	1.00	
Incremental Delay, d2	0.0	0.4	1.0	0.1	8.3	
Delay (s)	1.2	1.4	2.3	0.5	46.8	
Level of Service	A	A	A	A	D	
Approach Delay (s)		1.4	2.1		46.8	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	6.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	52.8%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	415	28	0	625	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	461	31	0	694	0	0
Pedestrians	28			1	43	
Lane Width (ft)	12.0			12.0	0.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	259			90		
pX, platoon unblocked			0.89		0.92	0.89
vC, conflicting volume			535		1227	505
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			478		1068	444
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			975		221	550

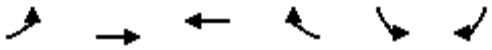
Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	461	31	694
Volume Left	0	0	0
Volume Right	0	31	0
cSH	1700	1700	1700
Volume to Capacity	0.27	0.02	0.41
Queue Length (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		0.0
Approach LOS			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	46.9%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	487	21	0	614	0	47
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	541	23	0	682	0	52
Pedestrians				11	11	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				1	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	150			636		
pX, platoon unblocked			0.92		0.80	0.92
vC, conflicting volume			575		1246	575
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			539		1160	539
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	89
cM capacity (veh/h)			949		173	495

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	564	682	52
Volume Left	0	0	0
Volume Right	23	0	52
cSH	1700	1700	495
Volume to Capacity	0.33	0.40	0.11
Queue Length (ft)	0	0	9
Control Delay (s)	0.0	0.0	13.1
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.1
Approach LOS			B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	49.0%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	497	614	22	0	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	552	682	24	0	27
Pedestrians		2			4	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		370	416			
pX, platoon unblocked	0.75				0.78	0.75
vC, conflicting volume	711				1238	688
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	616				1200	586
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	93
cM capacity (veh/h)	731				161	385

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	552	682	24	27
Volume Left	0	0	0	0
Volume Right	0	0	24	27
cSH	1700	1700	1700	385
Volume to Capacity	0.32	0.40	0.01	0.07
Queue Length (ft)	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	15.0
Lane LOS				C
Approach Delay (s)	0.0	0.0		15.0
Approach LOS				C

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	488	9	0	636	0	21
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	542	10	0	707	0	23
Pedestrians	2			3	6	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	490			296		
pX, platoon unblocked			0.96		0.77	0.96
vC, conflicting volume			558		1262	556
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			540		1264	538
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			993		145	522

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	552	707	23
Volume Left	0	0	0
Volume Right	10	0	23
cSH	1700	1700	522
Volume to Capacity	0.32	0.42	0.04
Queue Length (ft)	0	0	4
Control Delay (s)	0.0	0.0	12.2
Lane LOS			B
Approach Delay (s)	0.0	0.0	12.2
Approach LOS			B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	48.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Util. Factor		1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00	0.98		0.98		1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frt		0.99		1.00	1.00	0.85		0.89		1.00	0.93	
Flt Protected		1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)		1852		1770	1863	1551		1607		1766	1736	
Flt Permitted		1.00		0.50	1.00	1.00		0.95		0.63	1.00	
Satd. Flow (perm)		1852		927	1863	1551		1538		1172	1736	
Volume (vph)	0	183	8	222	144	198	30	0	159	325	65	54
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	203	9	247	160	220	33	0	177	361	72	60
Lane Group Flow (vph)	0	212	0	247	160	220	0	210	0	361	132	0
Confl. Peds. (#/hr)	1					1			1	1		
Turn Type				Perm		Free	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases				8		Free	2			6		
Actuated Green, G (s)		25.2		25.2	25.2	90.0		55.8		55.8	55.8	
Effective Green, g (s)		26.7		26.7	26.7	90.0		57.3		57.3	57.3	
Actuated g/C Ratio		0.30		0.30	0.30	1.00		0.64		0.64	0.64	
Clearance Time (s)		4.5		4.5	4.5			4.5		4.5	4.5	
Vehicle Extension (s)		3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		549		275	553	1551		979		746	1105	
v/s Ratio Prot		0.11			0.09						0.08	
v/s Ratio Perm				c0.27		0.14		0.14		c0.31		
v/c Ratio		0.39		0.90	0.29	0.14		0.21		0.48	0.12	
Uniform Delay, d1		25.1		30.3	24.4	0.0		6.9		8.6	6.4	
Progression Factor		1.00		1.00	1.00	1.00		1.00		0.71	0.67	
Incremental Delay, d2		0.5		29.1	0.3	0.2		0.5		2.1	0.2	
Delay (s)		25.6		59.4	24.6	0.2		7.4		8.3	4.5	
Level of Service		C		E	C	A		A		A	A	
Approach Delay (s)		25.6			29.8			7.4			7.3	
Approach LOS		C			C			A			A	

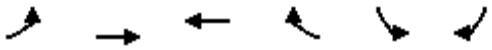
Intersection Summary			
HCM Average Control Delay	19.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	71.6%	ICU Level of Service	C

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	809	104	0	635	0	26
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	899	116	0	706	0	29
Pedestrians	12			20	36	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			2	3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	452			320		
pX, platoon unblocked						
vC, conflicting volume			1050		1652	955
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1050		1652	955
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	90
cM capacity (veh/h)			650		105	302

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	899	116	706	29
Volume Left	0	0	0	0
Volume Right	0	116	0	29
cSH	1700	1700	1700	302
Volume to Capacity	0.53	0.07	0.42	0.10
Queue Length (ft)	0	0	0	8
Control Delay (s)	0.0	0.0	0.0	18.2
Lane LOS				C
Approach Delay (s)	0.0		0.0	18.2
Approach LOS				C

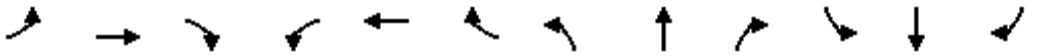
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	62.4%	ICU Level of Service	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	913	609	26	0	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	1014	677	29	0	31
Pedestrians		12	20		17	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	2		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		372	400			
pX, platoon unblocked						
vC, conflicting volume	723				1728	706
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	723				1728	706
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	93
cM capacity (veh/h)	876				95	429

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	1014	677	29	31
Volume Left	0	0	0	0
Volume Right	0	0	29	31
cSH	1700	1700	1700	429
Volume to Capacity	0.60	0.40	0.02	0.07
Queue Length (ft)	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	14.0
Lane LOS				B
Approach Delay (s)	0.0	0.0		14.0
Approach LOS				B

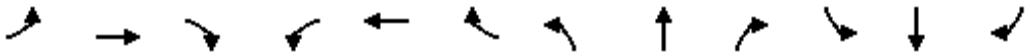
Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	66.7%	ICU Level of Service	B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	722	24	0	653	7	0	0	93	0	0	12
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	802	27	0	726	8	0	0	103	0	0	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		359			243							
pX, platoon unblocked	0.69						0.69	0.69		0.69	0.69	0.69
vC, conflicting volume	733			829			1541	1536	802	1631	1554	726
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	611			829			1789	1781	802	1921	1809	600
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	73	100	100	96
cM capacity (veh/h)	670			811			42	57	387	26	55	346

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	802	27	726	8	103	13
Volume Left	0	0	0	0	0	0
Volume Right	0	27	0	8	103	13
cSH	1700	1700	1700	1700	387	346
Volume to Capacity	0.47	0.02	0.43	0.00	0.27	0.04
Queue Length (ft)	0	0	0	0	27	3
Control Delay (s)	0.0	0.0	0.0	0.0	17.7	15.8
Lane LOS					C	C
Approach Delay (s)	0.0		0.0		17.7	15.8
Approach LOS					C	C

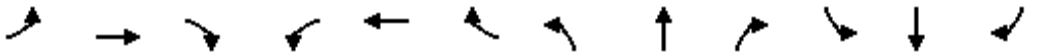
Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	55.3%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	3	201	81	30	264	10	14	11	27	9	24	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	3	223	90	33	293	11	16	12	30	10	27	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		393			875							
pX, platoon unblocked												
vC, conflicting volume	304			313			658	646	268	677	686	299
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	304			313			658	646	268	677	686	299
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			96	97	96	97	93	99
cM capacity (veh/h)	1256			1247			346	379	770	336	360	741

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	317	338	58	41
Volume Left	3	33	16	10
Volume Right	90	11	30	4
cSH	1256	1247	497	374
Volume to Capacity	0.00	0.03	0.12	0.11
Queue Length (ft)	0	2	10	9
Control Delay (s)	0.1	1.0	13.2	15.8
Lane LOS	A	A	B	C
Approach Delay (s)	0.1	1.0	13.2	15.8
Approach LOS			B	C

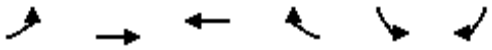
Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	755	42	0	580	29	0	0	21	0	0	20
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	839	47	0	644	32	0	0	23	0	0	22
Pedestrians		6			1			17			16	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		351										
pX, platoon unblocked												
vC, conflicting volume	693			903			1529	1549	857	1524	1563	666
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	693			903			1529	1549	857	1524	1563	666
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	93	100	100	95
cM capacity (veh/h)	900			751			89	112	355	88	110	454

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	839	47	644	32	23	22
Volume Left	0	0	0	0	0	0
Volume Right	0	47	0	32	23	22
cSH	1700	1700	1700	1700	355	454
Volume to Capacity	0.49	0.03	0.38	0.02	0.07	0.05
Queue Length (ft)	0	0	0	0	5	4
Control Delay (s)	0.0	0.0	0.0	0.0	15.9	13.3
Lane LOS					C	B
Approach Delay (s)	0.0		0.0		15.9	13.3
Approach LOS					C	B

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	54.5%	ICU Level of Service	A	



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	662	562	19	0	49
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	736	624	21	0	54
Pedestrians		2				
Lane Width (ft)		12.0				
Walking Speed (ft/s)		4.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			240			
pX, platoon unblocked	0.79				0.79	0.79
vC, conflicting volume	646				1360	626
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	553				1454	529
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	88
cM capacity (veh/h)	815				115	438

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	736	624	21	54
Volume Left	0	0	0	0
Volume Right	0	0	21	54
cSH	1700	1700	1700	438
Volume to Capacity	0.43	0.37	0.01	0.12
Queue Length (ft)	0	0	0	11
Control Delay (s)	0.0	0.0	0.0	14.4
Lane LOS				B
Approach Delay (s)	0.0	0.0		14.4
Approach LOS				B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	49.4%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	647	41	0	611	0	15
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	719	46	0	679	0	17
Pedestrians	2				2	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	0				0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				330		
pX, platoon unblocked					0.79	
vC, conflicting volume			766		1402	721
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			766		1507	721
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			855		106	430

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	719	46	679	17
Volume Left	0	0	0	0
Volume Right	0	46	0	17
cSH	1700	1700	1700	430
Volume to Capacity	0.42	0.03	0.40	0.04
Queue Length (ft)	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	13.7
Lane LOS				B
Approach Delay (s)	0.0		0.0	13.7
Approach LOS				B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	47.8%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	0.95	1.00	1.00	0.96	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.91	
Flt Protected	1.00	1.00	0.95	1.00	0.98	
Satd. Flow (prot)	1863	1538	1805	1863	1641	
Flt Permitted	1.00	1.00	0.13	1.00	0.98	
Satd. Flow (perm)	1863	1538	254	1863	1641	
Volume (vph)	622	40	61	531	27	50
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	691	44	68	590	30	56
Lane Group Flow (vph)	691	44	68	590	86	0
Confl. Peds. (#/hr)		10	10		21	13
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Turn Type		Perm	pm+pt			
Protected Phases	4		3	8	2	
Permitted Phases		4	8			
Actuated Green, G (s)	40.4	40.4	49.9	49.9	31.1	
Effective Green, g (s)	41.9	41.9	51.4	51.4	32.6	
Actuated g/C Ratio	0.47	0.47	0.57	0.57	0.36	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	867	716	257	1064	594	
v/s Ratio Prot	c0.37		0.02	c0.32	c0.05	
v/s Ratio Perm		0.03	0.13			
v/c Ratio	0.80	0.06	0.26	0.55	0.14	
Uniform Delay, d1	20.4	13.2	14.1	12.1	19.3	
Progression Factor	1.00	1.00	0.95	1.14	1.00	
Incremental Delay, d2	5.1	0.0	0.5	0.5	0.5	
Delay (s)	25.6	13.3	13.8	14.3	19.8	
Level of Service	C	B	B	B	B	
Approach Delay (s)	24.8			14.3	19.8	
Approach LOS	C			B	B	

Intersection Summary			
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	0.95			1.00
Frpb, ped/bikes	1.00	0.98		1.00	0.99			1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			1.00
Frt	1.00	0.97		1.00	0.97			1.00	0.97			1.00
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95
Satd. Flow (prot)	1703	3234		1703	3268			1703	3277			1703
Flt Permitted	0.95	1.00		0.95	1.00			0.30	1.00			0.30
Satd. Flow (perm)	1703	3234		1703	3268			531	3277			531
Volume (vph)	192	472	143	119	361	88	2	141	478	114	7	178
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	213	524	159	132	401	98	2	157	531	127	8	198
Lane Group Flow (vph)	213	683	0	132	499	0	0	159	658	0	0	206
Confl. Peds. (#/hr)			79			67				52		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			custom	Prot			custom	Prot
Protected Phases	5	2		1	6			3	8			7
Permitted Phases							3				7	
Actuated Green, G (s)	14.8	24.8		8.0	18.0			12.1	22.1			12.1
Effective Green, g (s)	16.2	26.7		9.4	19.9			13.5	24.0			13.5
Actuated g/C Ratio	0.19	0.31		0.11	0.23			0.16	0.28			0.16
Clearance Time (s)	4.4	4.9		4.4	4.9			4.4	4.9			4.4
Vehicle Extension (s)	3.0	2.0		3.0	2.0			3.0	3.3			2.0
Lane Grp Cap (vph)	322	1009		187	760			84	919			84
v/s Ratio Prot	0.13	c0.21		c0.08	c0.15				c0.20			
v/s Ratio Perm								0.30				c0.39
v/c Ratio	0.66	0.68		0.71	0.66			1.89	0.72			2.45
Uniform Delay, d1	32.2	25.7		36.8	29.8			36.0	27.7			36.0
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00
Incremental Delay, d2	5.0	1.4		11.5	1.6			443.0	2.7			687.9
Delay (s)	37.2	27.1		48.2	31.3			479.0	30.5			724.0
Level of Service	D	C		D	C			F	C			F
Approach Delay (s)		29.5			34.9				117.8			
Approach LOS		C			C				F			

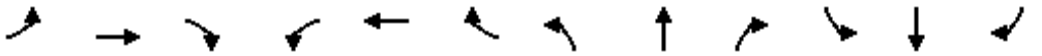
Intersection Summary			
HCM Average Control Delay	100.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	85.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	E
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	3.0	
Lane Util. Factor	0.95	
Frpb, ped/bikes	0.99	
Flpb, ped/bikes	1.00	
Frt	0.97	
Flt Protected	1.00	
Satd. Flow (prot)	3294	
Flt Permitted	1.00	
Satd. Flow (perm)	3294	
Volume (vph)	381	77
Peak-hour factor, PHF	0.90	0.90
Adj. Flow (vph)	423	86
Lane Group Flow (vph)	509	0
Confl. Peds. (#/hr)		35
Heavy Vehicles (%)	6%	6%
Turn Type		
Protected Phases	4	
Permitted Phases		
Actuated Green, G (s)	22.1	
Effective Green, g (s)	24.0	
Actuated g/C Ratio	0.28	
Clearance Time (s)	4.9	
Vehicle Extension (s)	2.9	
Lane Grp Cap (vph)	924	
v/s Ratio Prot	0.15	
v/s Ratio Perm		
v/c Ratio	0.55	
Uniform Delay, d1	26.2	
Progression Factor	1.00	
Incremental Delay, d2	0.7	
Delay (s)	26.9	
Level of Service	C	
Approach Delay (s)	227.7	
Approach LOS	F	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.94		0.97			1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.92			0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		1.00			0.99	
Satd. Flow (prot)	1703	1792	1484	1703	1792	1433		1596			1716	
Flt Permitted	0.29	1.00	1.00	0.20	1.00	1.00		0.97			0.75	
Satd. Flow (perm)	514	1792	1484	365	1792	1433		1552			1302	
Volume (vph)	38	707	19	56	516	66	26	112	177	29	69	26
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	42	786	21	62	573	73	29	124	197	32	77	29
Lane Group Flow (vph)	42	786	21	62	573	73	0	350	0	0	138	0
Confl. Peds. (#/hr)			3			17			16			3
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt		Perm	pm+pt		Perm	Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	47.5	47.5	47.5	54.0	52.5	52.5		19.5			19.5	
Effective Green, g (s)	50.0	50.0	50.0	55.0	55.0	55.0		21.2			21.2	
Actuated g/C Ratio	0.56	0.56	0.56	0.61	0.61	0.61		0.24			0.24	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5		4.7			4.7	
Vehicle Extension (s)	2.0	2.5	2.5	2.0	2.5	2.5		2.0			2.0	
Lane Grp Cap (vph)	349	996	824	369	1095	876		366			307	
v/s Ratio Prot	0.01	c0.44		0.02	c0.32							
v/s Ratio Perm	0.06		0.01	0.08		0.05		c0.23			0.11	
v/c Ratio	0.12	0.79	0.03	0.17	0.52	0.08		0.96			0.45	
Uniform Delay, d1	10.7	15.8	9.0	18.7	10.0	7.2		33.9			29.4	
Progression Factor	1.00	1.00	1.00	0.66	0.61	0.98		1.00			1.00	
Incremental Delay, d2	0.1	6.3	0.1	0.1	1.5	0.2		35.1			0.4	
Delay (s)	10.7	22.2	9.1	12.5	7.6	7.2		69.1			29.8	
Level of Service	B	C	A	B	A	A		E			C	
Approach Delay (s)		21.3			8.0			69.1			29.8	
Approach LOS		C			A			E			C	

Intersection Summary			
HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	D
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.94		0.99			0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.98			0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.97			0.97	
Satd. Flow (prot)	1703	1792	1462	1703	1792	1426		1686			1671	
Flt Permitted	0.29	1.00	1.00	0.16	1.00	1.00		0.97			0.97	
Satd. Flow (perm)	526	1792	1462	284	1792	1426		1686			1671	
Volume (vph)	49	719	67	67	509	24	109	26	19	59	28	26
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	54	799	74	74	566	27	121	29	21	66	31	29
Lane Group Flow (vph)	54	799	74	74	566	27	0	171	0	0	126	0
Confl. Peds. (#/hr)			7			18			46			14
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt		Perm	Perm		Perm	Split			Split		
Protected Phases	5	2			6		8	8		7	7	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	52.2	51.3	51.3	43.6	43.6	43.6		12.7			10.8	
Effective Green, g (s)	53.7	53.7	53.7	46.0	46.0	46.0		14.6			12.7	
Actuated g/C Ratio	0.60	0.60	0.60	0.51	0.51	0.51		0.16			0.14	
Clearance Time (s)	4.5	5.4	5.4	5.4	5.4	5.4		4.9			4.9	
Vehicle Extension (s)	3.0	2.7	2.7	2.8	2.8	2.8		2.0			2.0	
Lane Grp Cap (vph)	375	1069	872	145	916	729		274			236	
v/s Ratio Prot	0.01	c0.45			0.32			c0.10			c0.08	
v/s Ratio Perm	0.08		0.05	0.26		0.02						
v/c Ratio	0.14	0.75	0.08	0.51	0.62	0.04		0.62			0.53	
Uniform Delay, d1	17.0	13.2	7.7	14.6	15.7	11.0		35.1			35.9	
Progression Factor	0.52	0.49	0.26	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	3.3	0.1	2.7	1.2	0.0		3.2			1.2	
Delay (s)	9.0	9.8	2.2	17.3	16.9	11.0		38.3			37.1	
Level of Service	A	A	A	B	B	B		D			D	
Approach Delay (s)		9.1			16.7			38.3			37.1	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	77.0%	ICU Level of Service	C
c Critical Lane Group			

Level Of Service Computation Report
FHWA Roundabout Method (Base Volume Alternative)

Intersection #5 University/Texas [2010 1-Lane Alt (PM)]

Average Delay (sec/veh): 21.3 Level Of Service: C

Street Name:	Texas						University					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Yield Sign			Yield Sign			Yield Sign			Yield Sign		
Lanes:	1			1			1			1		
Volume Module:												
Base Vol:	63	145	17	142	200	69	196	529	51	63	478	71
Growth 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
Initial Bse:	63	145	17	142	200	69	196	529	51	63	478	71
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	70	161	19	158	222	77	218	588	57	70	531	79
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	70	161	19	158	222	77	218	588	57	70	531	79
PCE 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
MLF 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
Final Vol.:	70	161	19	158	222	77	218	588	57	70	531	79
PCE Module:												
AutoPCE:	64	148	17	145	204	71	200	541	52	64	489	73
TruckPCE:	6	14	2	14	20	7	20	53	5	6	48	7
ComboPCE:	3	6	1	6	9	3	9	24	2	3	21	3
BicyclePCE:	0	0	0	0	0	0	0	0	0	0	0	0
AdjVolume:	74	169	20	166	233	81	229	617	60	74	558	83
Delay Module: >> Time Period: 0.25 hours <<												
CircVolume:	1012			705			472			471		
MaxVolume:	654			819			945			945		
PedVolume:	0			0			0			0		
AdjMaxVol:	654			819			945			945		
ApproachVol:	263			480			905			714		
ApproachDel:	9.2			10.4			36.0			14.5		
Queue:	1.9			3.9			16.1			7.4		

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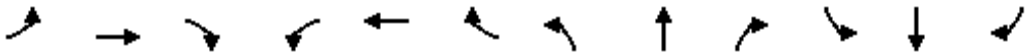
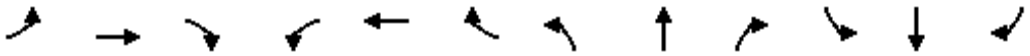


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.91	1.00	1.00	0.90	1.00	0.95		1.00	0.91	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	1792	1382	1703	1792	1367	1703	1611		1703	1523	
Flt Permitted	0.33	1.00	1.00	0.33	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	587	1792	1382	592	1792	1367	1703	1611		1703	1523	
Volume (vph)	72	460	76	49	488	45	96	68	36	41	60	45
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	511	84	54	542	50	107	76	40	46	67	50
Lane Group Flow (vph)	80	511	84	54	542	50	107	116	0	46	117	0
Confl. Peds. (#/hr)			35			40			54			49
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm		Perm	pm+pt		Perm	Split			Split		
Protected Phases		2		1	6		3	3		4	4	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	42.2	42.2	42.2	50.3	49.3	49.3	7.9	7.9		8.7	8.7	
Effective Green, g (s)	44.7	44.7	44.7	51.8	51.8	51.8	10.1	10.1		10.9	10.9	
Actuated g/C Ratio	0.50	0.50	0.50	0.58	0.58	0.58	0.11	0.11		0.12	0.12	
Clearance Time (s)	5.5	5.5	5.5	4.5	5.5	5.5	5.2	5.2		5.2	5.2	
Vehicle Extension (s)	2.0	2.0	2.0	3.0	2.0	2.0	3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)	295	900	694	396	1043	796	193	183		209	187	
v/s Ratio Prot		c0.29		0.01	c0.30		0.06	c0.07		0.03	c0.08	
v/s Ratio Perm	0.14		0.06	0.07		0.04						
v/c Ratio	0.27	0.57	0.12	0.14	0.52	0.06	0.55	0.63		0.22	0.63	
Uniform Delay, d1	12.8	15.4	11.7	16.1	11.1	8.1	37.3	37.7		35.2	37.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.5	0.0	0.2	0.2	0.0	3.4	7.0		0.2	4.6	
Delay (s)	12.9	15.9	11.8	16.2	11.3	8.1	40.7	44.7		35.4	41.7	
Level of Service	B	B	B	B	B	A	D	D		D	D	
Approach Delay (s)		15.0			11.5			42.8			40.0	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	19.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	89.0	Sum of lost time (s)	16.2
Intersection Capacity Utilization	69.2%	ICU Level of Service	B
c Critical Lane Group			

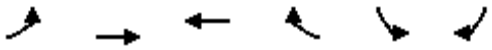


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.93	1.00	1.00	0.71	1.00	0.90		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	1792	1416	1703	1792	1082	1703	1526		1703	1731	
Flt Permitted	0.15	1.00	1.00	0.18	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	272	1792	1416	331	1792	1082	1703	1526		1703	1731	
Volume (vph)	67	501	34	168	417	63	101	301	157	54	381	59
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	74	557	38	187	463	70	112	334	174	60	423	66
Lane Group Flow (vph)	74	557	38	187	463	70	112	508	0	60	489	0
Confl. Peds. (#/hr)			23			104			139			44
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	29.2	29.2	29.2	33.5	33.1	33.1	7.5	28.0		7.0	27.5	
Effective Green, g (s)	31.1	31.1	31.1	35.0	35.0	35.0	8.9	29.9		8.4	29.4	
Actuated g/C Ratio	0.35	0.35	0.35	0.39	0.39	0.39	0.10	0.33		0.09	0.33	
Clearance Time (s)	4.5	4.9	4.9	4.5	4.9	4.9	4.4	4.9		4.4	4.9	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	169	619	489	260	697	421	168	507		159	565	
v/s Ratio Prot	0.02	c0.31		0.07	c0.26		c0.07	c0.33		0.04	0.28	
v/s Ratio Perm	0.13		0.03	0.21		0.06						
v/c Ratio	0.44	0.90	0.08	0.72	0.66	0.17	0.67	1.00		0.38	0.87	
Uniform Delay, d1	22.3	28.0	19.8	32.9	22.7	18.0	39.1	30.1		38.3	28.4	
Progression Factor	1.00	1.00	1.00	0.66	0.57	0.24	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	18.5	0.3	7.7	4.1	0.7	7.5	40.5		0.5	12.7	
Delay (s)	24.1	46.5	20.1	29.4	17.0	5.0	46.6	70.5		38.9	41.1	
Level of Service	C	D	C	C	B	A	D	E		D	D	
Approach Delay (s)		42.5			19.1			66.2			40.9	
Approach LOS		D			B			E			D	

Intersection Summary			
HCM Average Control Delay	41.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	D
c Critical Lane Group			

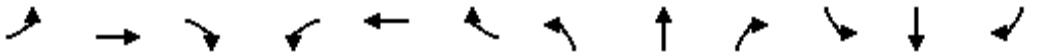
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0			3.0	3.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.97			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.98			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1702			1792	1638	
Flt Permitted	1.00			1.00	0.97	
Satd. Flow (perm)	1702			1792	1638	
Volume (vph)	641	98	0	609	65	54
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	712	109	0	677	72	60
Lane Group Flow (vph)	821	0	0	677	132	0
Confl. Peds. (#/hr)		98				
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type						
Protected Phases	2			2	4	
Permitted Phases						
Actuated Green, G (s)	71.3			71.3	10.2	
Effective Green, g (s)	72.8			72.8	11.2	
Actuated g/C Ratio	0.81			0.81	0.12	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	2.0			2.0	2.0	
Lane Grp Cap (vph)	1377			1450	204	
v/s Ratio Prot	c0.48			0.38	c0.08	
v/s Ratio Perm						
v/c Ratio	0.60			0.47	0.65	
Uniform Delay, d1	3.2			2.6	37.5	
Progression Factor	0.19			0.13	1.00	
Incremental Delay, d2	1.7			1.0	5.2	
Delay (s)	2.3			1.3	42.7	
Level of Service	A			A	D	
Approach Delay (s)	2.3			1.3	42.7	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	5.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	A
c Critical Lane Group			



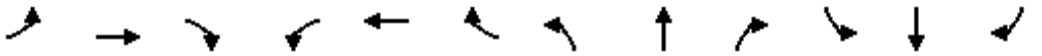
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.94	0.95	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.94	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1703	1792	1792	1437	1552	
Flt Permitted	0.39	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	698	1792	1792	1437	1552	
Volume (vph)	57	638	549	59	72	60
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	63	709	610	66	80	67
Lane Group Flow (vph)	63	709	610	66	147	0
Confl. Peds. (#/hr)				16		41
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type	Perm			Perm		
Protected Phases		2	2		4	
Permitted Phases	2			2		
Actuated Green, G (s)	68.2	68.2	68.2	68.2	12.0	
Effective Green, g (s)	70.1	70.1	70.1	70.1	13.9	
Actuated g/C Ratio	0.78	0.78	0.78	0.78	0.15	
Clearance Time (s)	4.9	4.9	4.9	4.9	4.9	
Vehicle Extension (s)	1.0	1.0	1.0	1.0	2.0	
Lane Grp Cap (vph)	544	1396	1396	1119	240	
v/s Ratio Prot		c0.40	0.34		c0.09	
v/s Ratio Perm	0.09			0.05		
v/c Ratio	0.12	0.51	0.44	0.06	0.61	
Uniform Delay, d1	2.4	3.6	3.3	2.3	35.5	
Progression Factor	0.40	0.36	0.34	0.34	1.00	
Incremental Delay, d2	0.4	1.1	0.9	0.1	3.2	
Delay (s)	1.3	2.4	2.0	0.9	38.8	
Level of Service	A	A	A	A	D	
Approach Delay (s)		2.3	1.9		38.8	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	B
c Critical Lane Group			



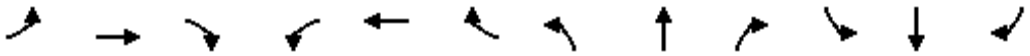
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.92	1.00	1.00	0.94		1.00	0.95		1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00		0.99	1.00
Satd. Flow (prot)	1703	1792	1407	1703	1792	1438		1740	1443		1778	1456
Flt Permitted	0.38	1.00	1.00	0.17	1.00	1.00		0.97	1.00		0.99	1.00
Satd. Flow (perm)	680	1792	1407	297	1792	1438		1740	1443		1778	1456
Volume (vph)	54	513	76	134	499	20	82	53	192	14	76	17
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	60	570	84	149	554	22	91	59	213	16	84	19
Lane Group Flow (vph)	60	570	84	149	554	22	0	150	213	0	100	19
Confl. Peds. (#/hr)			23			14			28			10
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt		Perm	pm+pt		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6		6			3			4
Actuated Green, G (s)	39.3	38.9	38.9	42.4	42.4	42.4		12.9	12.9		12.3	12.3
Effective Green, g (s)	40.8	40.8	40.8	44.3	44.3	44.3		14.8	14.8		14.2	14.2
Actuated g/C Ratio	0.45	0.45	0.45	0.49	0.49	0.49		0.16	0.16		0.16	0.16
Clearance Time (s)	4.5	4.9	4.9	4.5	4.9	4.9		4.9	4.9		4.9	4.9
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0		2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	362	812	638	274	882	708		286	237		281	230
v/s Ratio Prot	0.01	c0.32		0.05	c0.31			0.09			c0.06	
v/s Ratio Perm	0.07		0.06	0.22		0.02			c0.15			0.01
v/c Ratio	0.17	0.70	0.13	0.54	0.63	0.03		0.52	0.90		0.36	0.08
Uniform Delay, d1	18.3	19.7	14.3	16.3	16.8	11.8		34.4	36.9		33.8	32.3
Progression Factor	1.14	1.10	1.62	0.31	0.39	0.23		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	4.7	0.4	0.9	1.4	0.0		0.8	31.8		0.3	0.1
Delay (s)	21.2	26.3	23.6	5.9	8.0	2.7		35.2	68.7		34.1	32.4
Level of Service	C	C	C	A	A	A		D	E		C	C
Approach Delay (s)		25.6			7.4			54.8			33.8	
Approach LOS		C			A			D			C	

Intersection Summary			
HCM Average Control Delay	24.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
c Critical Lane Group			



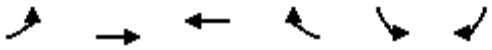
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	0.94		1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.99	1.00
Satd. Flow (prot)	1770	1792	1524	1703	1791			1731	1425		1846	1508
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.61	1.00		0.93	1.00
Satd. Flow (perm)	1770	1792	1524	1703	1791			1102	1425		1734	1508
Volume (vph)	16	544	255	293	523	4	132	25	264	19	85	5
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	18	604	283	326	581	4	147	28	293	21	94	6
Lane Group Flow (vph)	18	604	283	326	585	0	0	175	293	0	115	6
Confl. Peds. (#/hr)						2			30			20
Heavy Vehicles (%)	2%	6%	6%	6%	6%	2%	6%	2%	6%	2%	2%	2%
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	2	2		1	1			8			4	
Permitted Phases			2				8		8	4		4
Actuated Green, G (s)	32.3	32.3	32.3	27.5	27.5			16.7	16.7		16.7	16.7
Effective Green, g (s)	33.8	33.8	33.8	29.0	29.0			18.2	18.2		18.2	18.2
Actuated g/C Ratio	0.38	0.38	0.38	0.32	0.32			0.20	0.20		0.20	0.20
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5			4.5	4.5		4.5	4.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	665	673	572	549	577			223	288		351	305
v/s Ratio Prot	0.01	c0.34		0.19	c0.33							
v/s Ratio Perm			0.19					0.16	c0.21		0.07	0.00
v/c Ratio	0.03	0.90	0.49	0.59	1.01			0.78	1.02		0.33	0.02
Uniform Delay, d1	17.7	26.5	21.6	25.6	30.5			34.0	35.9		30.7	28.8
Progression Factor	0.45	0.54	0.25	0.52	0.60			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	15.2	2.6	0.8	35.4			14.5	56.1		0.2	0.0
Delay (s)	8.1	29.4	7.9	14.1	53.8			48.6	92.0		30.9	28.8
Level of Service	A	C	A	B	D			D	F		C	C
Approach Delay (s)		22.3			39.6			75.8			30.8	
Approach LOS		C			D			E			C	

Intersection Summary			
HCM Average Control Delay	39.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	C
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0			3.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			1.00	
Frpb, ped/bikes		1.00	1.00		1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.96			0.97	
Flt Protected		1.00	1.00		0.99			0.98			0.97	
Satd. Flow (prot)		3404	1524		3354			3177			1742	
Flt Permitted		1.00	1.00		0.99			0.72			0.97	
Satd. Flow (perm)		3404	1524		3354			2360			1742	
Volume (vph)	19	550	258	149	412	8	374	167	193	129	19	34
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	21	611	287	166	458	9	416	186	214	143	21	38
Lane Group Flow (vph)	0	632	287	0	633	0	0	816	0	0	202	0
Confl. Peds. (#/hr)						13			11			14
Heavy Vehicles (%)	2%	6%	6%	6%	6%	2%	6%	2%	6%	2%	2%	2%
Turn Type	Split		Free	Split			Perm			Perm		
Protected Phases	1	1		2	2			4			4	
Permitted Phases		1	Free		2		4			4	4	
Actuated Green, G (s)		18.0	90.0		27.1			31.4			31.4	
Effective Green, g (s)		19.5	90.0		28.6			32.9			32.9	
Actuated g/C Ratio		0.22	1.00		0.32			0.37			0.37	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		738	1524		1066			863			637	
v/s Ratio Prot		c0.19			c0.19						0.12	
v/s Ratio Perm			0.19					c0.35				
v/c Ratio		0.86	0.19		0.59			0.95			0.32	
Uniform Delay, d1		33.9	0.0		25.8			27.7			20.5	
Progression Factor		0.79	1.00		1.00			1.00			0.78	
Incremental Delay, d2		6.1	0.2		2.4			18.4			0.1	
Delay (s)		33.0	0.2		28.3			46.1			16.0	
Level of Service		C	A		C			D			B	
Approach Delay (s)		22.8			28.3			46.1			16.0	
Approach LOS		C			C			D			B	

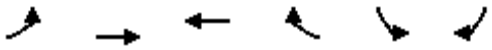
Intersection Summary			
HCM Average Control Delay	31.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	85.6%	ICU Level of Service	D
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	672	592	52	0	31
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	747	658	58	0	34
Pedestrians		21	13		7	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		2	1		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		160	360			
pX, platoon unblocked	0.78				0.78	0.78
vC, conflicting volume	723				1424	686
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	643				1115	596
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	91
cM capacity (veh/h)	735				179	385

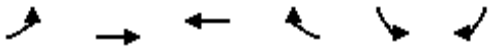
Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	747	658	58	34
Volume Left	0	0	0	0
Volume Right	0	0	58	34
cSH	1700	1700	1700	385
Volume to Capacity	0.44	0.39	0.03	0.09
Queue Length (ft)	0	0	0	7
Control Delay (s)	0.0	0.0	0.0	15.3
Lane LOS				C
Approach Delay (s)	0.0	0.0		15.3
Approach LOS				C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	54.7%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.96	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.91	
Flt Protected	0.95	1.00	1.00	1.00	0.98	
Satd. Flow (prot)	1805	1792	1792	1547	1685	
Flt Permitted	0.29	1.00	1.00	1.00	0.98	
Satd. Flow (perm)	549	1792	1792	1547	1685	
Volume (vph)	99	573	599	62	25	45
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	110	637	666	69	28	50
Lane Group Flow (vph)	110	637	666	69	78	0
Confl. Peds. (#/hr)	8			8	6	4
Heavy Vehicles (%)	0%	6%	6%	0%	0%	0%
Turn Type	Perm			Perm		
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	54.8	54.8	54.8	54.8	26.2	
Effective Green, g (s)	56.3	56.3	56.3	56.3	27.7	
Actuated g/C Ratio	0.63	0.63	0.63	0.63	0.31	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	343	1121	1121	968	519	
v/s Ratio Prot		0.36	c0.37		c0.05	
v/s Ratio Perm	0.20			0.04		
v/c Ratio	0.32	0.57	0.59	0.07	0.15	
Uniform Delay, d1	7.9	9.8	10.0	6.6	22.6	
Progression Factor	0.31	0.21	1.00	1.00	1.00	
Incremental Delay, d2	0.4	0.5	0.9	0.0	0.6	
Delay (s)	2.9	2.6	10.9	6.6	23.2	
Level of Service	A	A	B	A	C	
Approach Delay (s)		2.7	10.5		23.2	
Approach LOS		A	B		C	

Intersection Summary			
HCM Average Control Delay	7.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	B
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	598	590	39	0	71
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	664	656	43	0	79
Pedestrians		3	2		25	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		390	367			
pX, platoon unblocked					0.78	
vC, conflicting volume	724				1347	684
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	724				1446	684
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	82
cM capacity (veh/h)	869				112	442

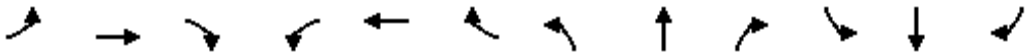
Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	664	656	43	79
Volume Left	0	0	0	0
Volume Right	0	0	43	79
cSH	1700	1700	1700	442
Volume to Capacity	0.39	0.39	0.03	0.18
Queue Length (ft)	0	0	0	16
Control Delay (s)	0.0	0.0	0.0	14.9
Lane LOS				B
Approach Delay (s)	0.0	0.0		14.9
Approach LOS				B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	47.2%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	584	14	0	629	0	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	649	16	0	699	0	27
Pedestrians	3			2	40	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	460			297		
pX, platoon unblocked			0.78		0.78	0.78
vC, conflicting volume			704		1391	691
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			622		1499	605
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	93
cM capacity (veh/h)			732		103	379

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	649	16	699	27
Volume Left	0	0	0	0
Volume Right	0	16	0	27
cSH	1700	1700	1700	379
Volume to Capacity	0.38	0.01	0.41	0.07
Queue Length (ft)	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	15.2
Lane LOS				C
Approach Delay (s)	0.0		0.0	15.2
Approach LOS				C

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		0.95	0.95			1.00	
Frpb, ped/bikes		0.98			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			1.00	
Frt		0.93			0.98		1.00	0.99			0.95	
Flt Protected		0.99			1.00		0.95	0.99			1.00	
Satd. Flow (prot)		1675			1820		1681	1721			1745	
Flt Permitted		0.96			0.97		0.95	0.99			1.00	
Satd. Flow (perm)		1613			1773		1681	1721			1745	
Volume (vph)	25	81	131	17	172	25	108	59	8	5	36	23
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	90	146	19	191	28	120	66	9	6	40	26
Lane Group Flow (vph)	0	264	0	0	238	0	96	99	0	0	72	0
Confl. Peds. (#/hr)			11			4			1			6
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		57.5			57.3		11.1	11.1			8.6	
Effective Green, g (s)		59.1			59.1		12.1	12.1			9.8	
Actuated g/C Ratio		0.66			0.66		0.13	0.13			0.11	
Clearance Time (s)		4.6			4.8		4.0	4.0			4.2	
Vehicle Extension (s)		2.0			2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		1059			1164		226	231			190	
v/s Ratio Prot							0.06	c0.06			c0.04	
v/s Ratio Perm		c0.16			0.13							
v/c Ratio		0.25			0.20		0.42	0.43			0.38	
Uniform Delay, d1		6.3			6.1		35.8	35.8			37.3	
Progression Factor		1.00			1.00		0.53	0.50			1.00	
Incremental Delay, d2		0.6			0.0		0.3	0.3			0.5	
Delay (s)		6.9			6.2		19.2	18.2			37.7	
Level of Service		A			A		B	B			D	
Approach Delay (s)		6.9			6.2			18.7			37.7	
Approach LOS		A			A			B			D	

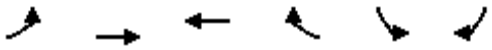
Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	45.0%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	491	46	0	582	0	110
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	546	51	0	647	0	122
Pedestrians					38	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	243			551		
pX, platoon unblocked			0.81		0.81	0.81
vC, conflicting volume			635		1230	584
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			547		1285	484
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	73
cM capacity (veh/h)			806		143	459

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	546	51	647	122
Volume Left	0	0	0	0
Volume Right	0	51	0	122
cSH	1700	1700	1700	459
Volume to Capacity	0.32	0.03	0.38	0.27
Queue Length (ft)	0	0	0	27
Control Delay (s)	0.0	0.0	0.0	15.7
Lane LOS				C
Approach Delay (s)	0.0		0.0	15.7
Approach LOS				C

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	601	526	51	0	56
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	668	584	57	0	62
Pedestrians					63	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					5	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		393	401			
pX, platoon unblocked					0.81	
vC, conflicting volume	704				1344	676
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	704				1424	676
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	86
cM capacity (veh/h)	856				116	433

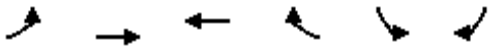
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	668	641	62
Volume Left	0	0	0
Volume Right	0	57	62
cSH	1700	1700	433
Volume to Capacity	0.39	0.38	0.14
Queue Length (ft)	0	0	12
Control Delay (s)	0.0	0.0	14.7
Lane LOS			B
Approach Delay (s)	0.0	0.0	14.7
Approach LOS			B

Intersection Summary			
Average Delay		0.7	
Intersection Capacity Utilization		45.1%	ICU Level of Service A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	533	68	0	577	0	69
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	592	76	0	641	0	77
Pedestrians				1	52	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	4	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	523			271		
pX, platoon unblocked			0.84		0.84	0.84
vC, conflicting volume			720		1285	645
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			667		1339	579
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	82
cM capacity (veh/h)			751		137	418

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	592	76	641	77
Volume Left	0	0	0	0
Volume Right	0	76	0	77
cSH	1700	1700	1700	418
Volume to Capacity	0.35	0.04	0.38	0.18
Queue Length (ft)	0	0	0	17
Control Delay (s)	0.0	0.0	0.0	15.5
Lane LOS				C
Approach Delay (s)	0.0		0.0	15.5
Approach LOS				C

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.84	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.96	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1688	1792	1792	1277	1644	
Flt Permitted	0.30	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	533	1792	1792	1277	1644	
Volume (vph)	61	568	574	99	171	74
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	68	631	638	110	190	82
Lane Group Flow (vph)	68	631	638	110	272	0
Confl. Peds. (#/hr)	58			58	13	6
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt			Perm		
Protected Phases	5	2	6		4	
Permitted Phases	2			6		
Actuated Green, G (s)	63.3	62.9	52.4	52.4	17.3	
Effective Green, g (s)	64.8	64.8	54.3	54.3	19.2	
Actuated g/C Ratio	0.72	0.72	0.60	0.60	0.21	
Clearance Time (s)	4.5	4.9	4.9	4.9	4.9	
Vehicle Extension (s)	3.0	2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	480	1290	1081	770	351	
v/s Ratio Prot	0.01	c0.35	c0.36		c0.17	
v/s Ratio Perm	0.09			0.09		
v/c Ratio	0.14	0.49	0.59	0.14	0.77	
Uniform Delay, d1	10.7	5.4	11.0	7.7	33.4	
Progression Factor	0.48	0.47	0.23	0.09	1.00	
Incremental Delay, d2	0.1	0.7	2.1	0.4	9.4	
Delay (s)	5.2	3.2	4.7	1.0	42.7	
Level of Service	A	A	A	A	D	
Approach Delay (s)		3.4	4.1		42.7	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	629	83	0	648	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	699	92	0	720	0	0
Pedestrians					120	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					10	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	259			90		
pX, platoon unblocked			0.70		0.81	0.70
vC, conflicting volume			911		1585	865
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			873		1307	807
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			491		130	242

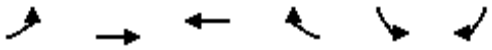
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	791	720	0
Volume Left	0	0	0
Volume Right	92	0	0
cSH	1700	1700	1700
Volume to Capacity	0.47	0.42	0.00
Queue Length (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	605	105	0	608	0	87
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	672	117	0	676	0	97
Pedestrians				4	63	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	5	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	150			636		
pX, platoon unblocked			0.84		0.85	0.84
vC, conflicting volume			852		1469	798
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			825		1279	760
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	70
cM capacity (veh/h)			652		149	326

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	789	676	97
Volume Left	0	0	0
Volume Right	117	0	97
cSH	1700	1700	326
Volume to Capacity	0.46	0.40	0.30
Queue Length (ft)	0	0	30
Control Delay (s)	0.0	0.0	20.6
Lane LOS			C
Approach Delay (s)	0.0	0.0	20.6
Approach LOS			C

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	57.1%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	692	582	16	0	26
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	769	647	18	0	29
Pedestrians		2			6	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		370	416			
pX, platoon unblocked	0.77				0.83	0.77
vC, conflicting volume	670				1422	655
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	571				1269	550
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	93
cM capacity (veh/h)	773				156	411

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	769	647	18	29
Volume Left	0	0	0	0
Volume Right	0	0	18	29
cSH	1700	1700	1700	411
Volume to Capacity	0.45	0.38	0.01	0.07
Queue Length (ft)	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	14.4
Lane LOS				B
Approach Delay (s)	0.0	0.0		14.4
Approach LOS				B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	51.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	631	61	0	598	0	12
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	701	68	0	664	0	13
Pedestrians	2				8	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	0				1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	490			296		
pX, platoon unblocked			0.88		0.83	0.88
vC, conflicting volume			777		1409	743
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			745		1271	707
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	97
cM capacity (veh/h)			759		153	382

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	769	664	13
Volume Left	0	0	0
Volume Right	68	0	13
cSH	1700	1700	382
Volume to Capacity	0.45	0.39	0.03
Queue Length (ft)	0	0	3
Control Delay (s)	0.0	0.0	14.8
Lane LOS			B
Approach Delay (s)	0.0	0.0	14.8
Approach LOS			B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	51.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	
Lane Util. Factor		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00	0.98	1.00		1.00	1.00	0.99	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Frt		0.98		1.00	1.00	0.85	1.00		0.85	1.00	0.93	
Flt Protected		1.00		0.95	1.00	1.00	0.95		1.00	0.95	1.00	
Satd. Flow (prot)		1824		1769	1863	1547	1764		1583	1770	1703	
Flt Permitted		1.00		0.21	1.00	1.00	0.64		1.00	0.95	1.00	
Satd. Flow (perm)		1824		392	1863	1547	1185		1583	1770	1703	
Volume (vph)	0	232	32	331	221	514	32	0	113	443	70	69
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	258	36	368	246	571	36	0	126	492	78	77
Lane Group Flow (vph)	0	294	0	368	246	571	36	0	126	492	155	0
Confl. Peds. (#/hr)	3		6	3		6	4					4
Turn Type				pm+pt		Free	custom		custom	Perm		
Protected Phases		4		3	8						6	
Permitted Phases				8		Free	2		2	6		
Actuated Green, G (s)		17.3		38.8	38.8	90.0	42.2		42.2	42.2	42.2	
Effective Green, g (s)		18.8		40.3	40.3	90.0	43.7		43.7	43.7	43.7	
Actuated g/C Ratio		0.21		0.45	0.45	1.00	0.49		0.49	0.49	0.49	
Clearance Time (s)		4.5		4.5	4.5		4.5		4.5	4.5	4.5	
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		381		459	834	1547	575		769	859	827	
v/s Ratio Prot		0.16		c0.16	0.13						0.09	
v/s Ratio Perm				c0.19		0.37	0.03		0.08	c0.28		
v/c Ratio		0.77		0.80	0.29	0.37	0.06		0.16	0.57	0.19	
Uniform Delay, d1		33.6		19.0	15.8	0.0	12.3		12.9	16.5	13.1	
Progression Factor		1.00		1.00	1.00	1.00	1.00		1.00	0.70	0.61	
Incremental Delay, d2		9.3		9.7	0.2	0.7	0.2		0.5	0.8	0.1	
Delay (s)		42.9		28.7	16.0	0.7	12.5		13.4	12.3	8.0	
Level of Service		D		C	B	A	B		B	B	A	
Approach Delay (s)		42.9			12.6			13.2			11.3	
Approach LOS		D			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	73.4%	ICU Level of Service	C

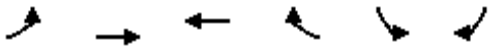
c Critical Lane Group

Appendix I
2030 with Preferred Concept Plan HCM Analysis Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	384	23	0	992	0	41
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	427	26	0	1102	0	46
Pedestrians	3			2	14	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	452			320		
pX, platoon unblocked						
vC, conflicting volume			466		1546	443
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			466		1546	443
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	93
cM capacity (veh/h)			1093		126	611

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	427	26	1102	46
Volume Left	0	0	0	0
Volume Right	0	26	0	46
cSH	1700	1700	1700	611
Volume to Capacity	0.25	0.02	0.65	0.07
Queue Length (ft)	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	11.4
Lane LOS				B
Approach Delay (s)	0.0		0.0	11.4
Approach LOS				B

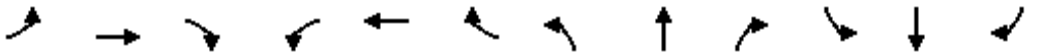
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	68.7%	ICU Level of Service	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	407	981	11	0	34
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	452	1090	12	0	38
Pedestrians		3	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		372	400			
pX, platoon unblocked						
vC, conflicting volume	1107				1549	1098
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1107				1549	1098
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	85
cM capacity (veh/h)	635				126	259

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	452	1090	12	38
Volume Left	0	0	0	0
Volume Right	0	0	12	38
cSH	1700	1700	1700	259
Volume to Capacity	0.27	0.64	0.01	0.15
Queue Length (ft)	0	0	0	13
Control Delay (s)	0.0	0.0	0.0	21.2
Lane LOS				C
Approach Delay (s)	0.0	0.0		21.2
Approach LOS				C

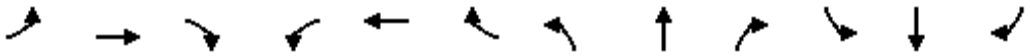
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	68.3%	ICU Level of Service	B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	796	18	0	711	9	0	0	136	0	0	12
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	884	20	0	790	10	0	0	151	0	0	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		359			243							
pX, platoon unblocked	0.70						0.70	0.70		0.70	0.70	0.70
vC, conflicting volume	800			904			1688	1684	884	1826	1694	790
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	712			904			1989	1985	884	2188	1999	698
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	56	100	100	96
cM capacity (veh/h)	623			760			31	43	347	13	42	309

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	884	20	790	10	151	13
Volume Left	0	0	0	0	0	0
Volume Right	0	20	0	10	151	13
cSH	1700	1700	1700	1700	347	309
Volume to Capacity	0.52	0.01	0.46	0.01	0.44	0.04
Queue Length (ft)	0	0	0	0	53	3
Control Delay (s)	0.0	0.0	0.0	0.0	23.1	17.2
Lane LOS					C	C
Approach Delay (s)	0.0		0.0		23.1	17.2
Approach LOS					C	C

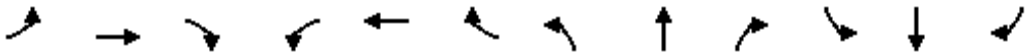
Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	62.6%	ICU Level of Service	B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	2	168	58	57	264	4	14	5	20	5	10	2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	2	187	64	63	293	4	16	6	22	6	11	2
Pedestrians		1			5			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		393			875							
pX, platoon unblocked												
vC, conflicting volume	304			259			662	662	232	682	692	303
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	304			259			662	662	232	682	692	303
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			95	98	97	98	97	100
cM capacity (veh/h)	1251			1297			345	359	799	330	345	733

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	253	361	43	19
Volume Left	2	63	16	6
Volume Right	64	4	22	2
cSH	1251	1297	490	363
Volume to Capacity	0.00	0.05	0.09	0.05
Queue Length (ft)	0	4	7	4
Control Delay (s)	0.1	1.8	13.1	15.5
Lane LOS	A	A	B	C
Approach Delay (s)	0.1	1.8	13.1	15.5
Approach LOS			B	C

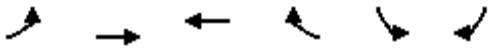
Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	48.2%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	416	22	0	854	5	0	0	20	0	0	18
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	462	24	0	949	6	0	0	22	0	0	20
Pedestrians		9			3			15			13	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			0			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		351			383							
pX, platoon unblocked												
vC, conflicting volume	967			502			1455	1445	480	1449	1464	971
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	967			502			1455	1445	480	1449	1464	971
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	96	100	100	93
cM capacity (veh/h)	712			1060			98	130	581	103	127	304

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	462	24	949	6	22	20
Volume Left	0	0	0	0	0	0
Volume Right	0	24	0	6	22	20
cSH	1700	1700	1700	1700	581	304
Volume to Capacity	0.27	0.01	0.56	0.00	0.04	0.07
Queue Length (ft)	0	0	0	0	3	5
Control Delay (s)	0.0	0.0	0.0	0.0	11.4	17.7
Lane LOS					B	C
Approach Delay (s)	0.0		0.0		11.4	17.7
Approach LOS					B	C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	62.5%	ICU Level of Service	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	439	738	18	0	86
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	488	820	20	0	96
Pedestrians		5			1	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		376	240			
pX, platoon unblocked	0.79				0.85	0.79
vC, conflicting volume	841				1309	826
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	799				1148	780
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	70
cM capacity (veh/h)	658				189	314

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	488	820	20	96
Volume Left	0	0	0	0
Volume Right	0	0	20	96
cSH	1700	1700	1700	314
Volume to Capacity	0.29	0.48	0.01	0.30
Queue Length (ft)	0	0	0	31
Control Delay (s)	0.0	0.0	0.0	21.4
Lane LOS				C
Approach Delay (s)	0.0	0.0		21.4
Approach LOS				C

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	57.3%	ICU Level of Service	A

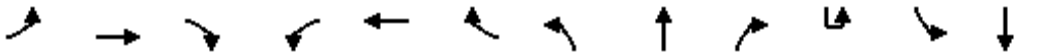
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	399	11	0	824	0	40
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	443	12	0	916	0	44
Pedestrians	5					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	286			330		
pX, platoon unblocked			0.88		0.85	0.88
vC, conflicting volume			456		1364	443
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			379		1210	365
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	93
cM capacity (veh/h)			1043		172	600

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	443	12	916	44
Volume Left	0	0	0	0
Volume Right	0	12	0	44
cSH	1700	1700	1700	600
Volume to Capacity	0.26	0.01	0.54	0.07
Queue Length (ft)	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	11.5
Lane LOS				B
Approach Delay (s)	0.0		0.0	11.5
Approach LOS				B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	51.5%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	0.95	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.94	
Flt Protected	1.00	1.00	0.95	1.00	0.97	
Satd. Flow (prot)	1863	1529	1798	1863	1712	
Flt Permitted	1.00	1.00	0.41	1.00	0.97	
Satd. Flow (perm)	1863	1529	771	1863	1712	
Volume (vph)	422	17	32	692	64	56
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	469	19	36	769	71	62
Lane Group Flow (vph)	469	19	36	769	133	0
Confl. Peds. (#/hr)		9	9		9	2
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Turn Type		Perm	pm+pt			
Protected Phases	4		3	8	2	
Permitted Phases		4	8			
Actuated Green, G (s)	77.6	77.6	85.4	85.4	25.6	
Effective Green, g (s)	79.1	79.1	86.9	86.9	27.1	
Actuated g/C Ratio	0.66	0.66	0.72	0.72	0.23	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1228	1008	599	1349	387	
v/s Ratio Prot	0.25		0.00	c0.41	c0.08	
v/s Ratio Perm		0.01	0.04			
v/c Ratio	0.38	0.02	0.06	0.57	0.34	
Uniform Delay, d1	9.3	7.1	5.6	7.8	39.0	
Progression Factor	0.44	0.29	0.10	0.06	1.00	
Incremental Delay, d2	0.2	0.0	0.0	0.5	2.4	
Delay (s)	4.3	2.0	0.6	0.9	41.4	
Level of Service	A	A	A	A	D	
Approach Delay (s)	4.2			0.9	41.4	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	5.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95			1.00	0.95
Frpb, ped/bikes	1.00	0.97		1.00	0.99		1.00	0.99			1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.95		1.00	0.97		1.00	0.97			1.00	0.98
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1770	3247		1770	3401		1770	3416			1770	3459
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.21	1.00
Satd. Flow (perm)	1770	3247		1770	3401		1770	3416			392	3459
Volume (vph)	44	180	92	173	613	171	171	264	66	9	78	422
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	49	200	102	192	681	190	190	293	73	10	87	469
Lane Group Flow (vph)	49	302	0	192	871	0	190	366	0	0	97	528
Confl. Peds. (#/hr)			87			19			14			
Turn Type	Prot			Prot			Prot			custom	Prot	
Protected Phases	5	2		1	6		3	8			7	4
Permitted Phases										7		
Actuated Green, G (s)	7.7	48.4		12.5	53.2		18.5	22.9			17.6	22.0
Effective Green, g (s)	9.1	50.3		13.9	55.1		19.9	24.8			19.0	23.9
Actuated g/C Ratio	0.08	0.42		0.12	0.46		0.17	0.21			0.16	0.20
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	4.9			4.4	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	3.3			2.0	2.9
Lane Grp Cap (vph)	134	1361		205	1562		294	706			62	689
v/s Ratio Prot	0.03	0.09		c0.11	c0.26		c0.11	0.11				c0.15
v/s Ratio Perm											c0.25	
v/c Ratio	0.37	0.22		0.94	0.56		0.65	0.52			1.56	0.77
Uniform Delay, d1	52.7	22.3		52.6	23.6		46.8	42.3			50.5	45.4
Progression Factor	1.00	1.00		0.87	0.59		0.95	0.94			1.00	1.00
Incremental Delay, d2	1.7	0.4		37.4	1.1		4.6	0.7			318.3	5.1
Delay (s)	54.4	22.7		83.1	15.1		49.0	40.5			368.8	50.5
Level of Service	D	C		F	B		D	D			F	D
Approach Delay (s)		27.1			27.3			43.4				99.9
Approach LOS		C			C			D				F

Intersection Summary			
HCM Average Control Delay	48.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	83.6%	ICU Level of Service	D

c Critical Lane Group

Movement	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Volume (vph)	53
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	59
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	31
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96		0.98			0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.93			0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99			1.00	
Satd. Flow (prot)	1770	1863	1538	1770	1863	1527		1675			1734	
Flt Permitted	0.19	1.00	1.00	0.52	1.00	1.00		0.83			0.94	
Satd. Flow (perm)	359	1863	1538	971	1863	1527		1396			1635	
Volume (vph)	10	304	10	99	868	48	32	52	90	13	75	57
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	338	11	110	964	53	36	58	100	14	83	63
Lane Group Flow (vph)	11	338	11	110	964	53	0	194	0	0	160	0
Confl. Peds. (#/hr)			3			5			9			11
Turn Type	pm+pt		Perm	pm+pt		Perm	Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	81.5	80.6	80.6	93.8	87.4	87.4		17.5			17.5	
Effective Green, g (s)	85.0	83.1	83.1	94.8	89.9	89.9		19.2			19.2	
Actuated g/C Ratio	0.71	0.69	0.69	0.79	0.75	0.75		0.16			0.16	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5		4.7			4.7	
Vehicle Extension (s)	2.0	2.5	2.5	2.0	2.5	2.5		2.0			2.0	
Lane Grp Cap (vph)	277	1290	1065	825	1396	1144		223			262	
v/s Ratio Prot	0.00	0.18		c0.01	c0.52							
v/s Ratio Perm	0.03		0.01	0.10		0.03		c0.14			0.10	
v/c Ratio	0.04	0.26	0.01	0.13	0.69	0.05		0.87			0.61	
Uniform Delay, d1	18.9	6.9	5.7	4.4	7.8	3.9		49.2			46.9	
Progression Factor	0.45	0.47	0.21	0.50	0.45	0.24		1.00			1.00	
Incremental Delay, d2	0.0	0.4	0.0	0.0	2.1	0.1		27.5			2.9	
Delay (s)	8.6	3.7	1.2	2.2	5.7	1.0		76.7			49.9	
Level of Service	A	A	A	A	A	A		E			D	
Approach Delay (s)		3.7			5.1			76.7			49.9	
Approach LOS		A			A			E			D	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	87.1%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.95		1.00			0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.99			0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96			0.98	
Satd. Flow (prot)	1770	1863	1545	1770	1863	1510		1762			1657	
Flt Permitted	0.15	1.00	1.00	0.49	1.00	1.00		0.96			0.98	
Satd. Flow (perm)	288	1863	1545	911	1863	1510		1762			1657	
Volume (vph)	12	399	14	39	819	14	140	13	14	21	10	33
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	443	16	43	910	16	156	14	16	23	11	37
Lane Group Flow (vph)	13	443	16	43	910	16	0	186	0	0	71	0
Confl. Peds. (#/hr)			1			8			12			10
Turn Type	pm+pt		Perm	Perm		Perm	Split			Split		
Protected Phases	5	2			6		8	8		7	7	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	81.8	81.8	81.8	75.7	75.7	75.7		15.3			7.7	
Effective Green, g (s)	84.2	84.2	84.2	78.1	78.1	78.1		17.2			9.6	
Actuated g/C Ratio	0.70	0.70	0.70	0.65	0.65	0.65		0.14			0.08	
Clearance Time (s)	4.5	5.4	5.4	5.4	5.4	5.4		4.9			4.9	
Vehicle Extension (s)	3.0	2.7	2.7	2.8	2.8	2.8		2.0			2.0	
Lane Grp Cap (vph)	240	1307	1084	593	1213	983		253			133	
v/s Ratio Prot	0.00	c0.24			c0.49			c0.11			c0.04	
v/s Ratio Perm	0.04		0.01	0.05		0.01						
v/c Ratio	0.05	0.34	0.01	0.07	0.75	0.02		0.74			0.53	
Uniform Delay, d1	13.2	7.0	5.4	7.7	14.3	7.4		49.2			53.0	
Progression Factor	0.76	0.78	0.68	0.33	0.53	0.19		1.00			1.00	
Incremental Delay, d2	0.1	0.7	0.0	0.0	1.4	0.0		9.2			2.1	
Delay (s)	10.1	6.2	3.7	2.5	8.9	1.4		58.4			55.1	
Level of Service	B	A	A	A	A	A		E			E	
Approach Delay (s)		6.2			8.5			58.4			55.1	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C

c Critical Lane Group

Level Of Service Computation Report
FHWA Roundabout Method (Base Volume Alternative)

Intersection #3 University/Texas [1-Lane Alt (AM)]

Average Delay (sec/veh): 20.5 Level Of Service: C

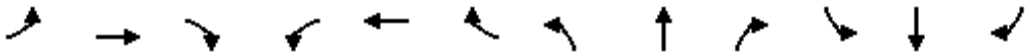
Street Name:	Texas						University					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Yield Sign			Yield Sign			Yield Sign			Yield Sign		
Lanes:	1			1			1			1		
Volume Module:												
Base Vol:	89	131	18	77	95	109	102	315	19	50	661	113
Growth 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
Initial Bse:	89	131	18	77	95	109	102	315	19	50	661	113
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	99	146	20	86	106	121	113	350	21	56	734	126
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	99	146	20	86	106	121	113	350	21	56	734	126
PCE 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
MLF 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
Final Vol.:	99	146	20	86	106	121	113	350	21	56	734	126
PCE Module:												
AutoPCE:	91	134	18	79	97	111	104	322	19	51	676	116
TruckPCE:	9	13	2	8	10	11	10	32	2	5	66	11
ComboPCE:	4	6	1	3	4	5	5	14	1	2	29	5
BicyclePCE:	0	0	0	0	0	0	0	0	0	0	0	0
AdjVolume:	104	153	21	90	111	127	119	368	22	58	771	132

Delay Module: >> Time Period: 0.25 hours <<				
CircVolume:	576	933	259	376
MaxVolume:	889	696	1060	997
PedVolume:	0	0	0	0
AdjMaxVol:	889	696	1060	997
ApproachVol:	278	328	509	961
ApproachDel:	5.9	9.7	6.5	35.9
Queue:	1.3	2.5	2.7	16.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.94	1.00	0.97		1.00	0.96	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1525	1770	1863	1494	1770	1677		1770	1653	
Flt Permitted	0.41	1.00	1.00	0.41	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	756	1863	1525	760	1863	1494	1770	1677		1770	1653	
Volume (vph)	33	393	48	59	489	50	123	30	27	20	57	56
Peak-hour factor, PHF	0.90	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	37	414	53	66	543	56	137	33	30	22	63	62
Lane Group Flow (vph)	37	414	53	66	543	56	137	63	0	22	125	0
Confl. Peds. (#/hr)			6			13			20			14
Turn Type	Perm		Perm	pm+pt		Perm	Split			Split		
Protected Phases		2		1	6		3	3		4	4	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	66.0	66.0	66.0	73.7	73.7	73.7	11.3	11.3		10.9	10.9	
Effective Green, g (s)	68.5	68.5	68.5	76.2	76.2	76.2	13.5	13.5		13.1	13.1	
Actuated g/C Ratio	0.57	0.57	0.57	0.64	0.64	0.64	0.11	0.11		0.11	0.11	
Clearance Time (s)	5.5	5.5	5.5	4.5	5.5	5.5	5.2	5.2		5.2	5.2	
Vehicle Extension (s)	2.0	2.0	2.0	3.0	2.0	2.0	3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)	432	1063	871	522	1183	949	199	189		193	180	
v/s Ratio Prot		0.22		0.00	c0.29		c0.08	0.04		0.01	c0.08	
v/s Ratio Perm	0.05		0.03	0.08		0.04						
v/c Ratio	0.09	0.39	0.06	0.13	0.46	0.06	0.69	0.33		0.11	0.69	
Uniform Delay, d1	11.6	14.2	11.4	9.4	11.3	8.3	51.2	49.1		48.2	51.5	
Progression Factor	0.65	0.61	0.43	0.57	0.81	0.75	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	1.0	0.1	0.1	1.2	0.1	9.5	1.0		0.1	9.0	
Delay (s)	7.9	9.7	5.0	5.5	10.3	6.3	60.7	50.1		48.3	60.5	
Level of Service	A	A	A	A	B	A	E	D		D	E	
Approach Delay (s)		9.1			9.5			57.4			58.7	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	76.9%	ICU Level of Service	C

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.86	1.00	1.00	0.82	1.00	0.98		1.00	0.96	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1365	1770	1863	1305	1770	1727		1770	1724	
Flt Permitted	0.28	1.00	1.00	0.48	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	524	1863	1365	891	1863	1305	1770	1727		1770	1724	
Volume (vph)	58	372	48	130	439	109	86	205	120	30	158	42
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	64	413	53	144	488	121	96	228	133	33	176	47
Lane Group Flow (vph)	64	413	53	144	488	121	96	361	0	33	223	0
Confl. Peds. (#/hr)			40			45			24			74
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	56.7	56.7	56.7	61.5	61.1	61.1	10.4	28.8		4.7	23.1	
Effective Green, g (s)	58.6	58.6	58.6	63.0	63.0	63.0	11.8	30.7		6.1	25.0	
Actuated g/C Ratio	0.49	0.49	0.49	0.52	0.52	0.52	0.10	0.26		0.05	0.21	
Clearance Time (s)	4.5	4.9	4.9	4.5	4.9	4.9	4.4	4.9		4.4	4.9	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	341	910	667	560	978	685	174	442		90	359	
v/s Ratio Prot	0.01	c0.22		0.03	c0.26		0.05	c0.21		0.02	c0.13	
v/s Ratio Perm	0.08		0.04	0.11		0.09						
v/c Ratio	0.19	0.45	0.08	0.26	0.50	0.18	0.55	0.82		0.37	0.62	
Uniform Delay, d1	18.3	20.2	16.3	18.3	18.3	14.9	51.6	42.0		55.1	43.2	
Progression Factor	0.64	0.73	0.75	0.44	0.44	0.06	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	1.6	0.2	0.2	1.6	0.5	2.1	10.6		0.9	2.4	
Delay (s)	12.0	16.4	12.4	8.2	9.7	1.4	53.7	52.6		56.0	45.6	
Level of Service	B	B	B	A	A	A	D	D		E	D	
Approach Delay (s)		15.4			8.1			52.8			46.9	
Approach LOS		B			A			D			D	

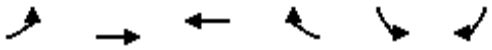
Intersection Summary			
HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	B

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0			3.0	3.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	1.00			1.00	0.98	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1843			1863	1671	
Flt Permitted	1.00			1.00	0.97	
Satd. Flow (perm)	1843			1863	1671	
Volume (vph)	507	32	0	639	62	46
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	563	36	0	710	69	51
Lane Group Flow (vph)	599	0	0	710	120	0
Confl. Peds. (#/hr)		8	8			20
Turn Type						
Protected Phases	2			2	4	
Permitted Phases						
Actuated Green, G (s)	100.6			100.6	10.9	
Effective Green, g (s)	102.1			102.1	11.9	
Actuated g/C Ratio	0.85			0.85	0.10	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	2.0			2.0	2.0	
Lane Grp Cap (vph)	1568			1585	166	
v/s Ratio Prot	0.33			c0.38	c0.07	
v/s Ratio Perm						
v/c Ratio	0.38			0.45	0.72	
Uniform Delay, d1	2.0			2.2	52.5	
Progression Factor	0.16			0.06	1.00	
Incremental Delay, d2	0.7			0.8	12.4	
Delay (s)	1.0			1.0	64.8	
Level of Service	A			A	E	
Approach Delay (s)	1.0			1.0	64.8	
Approach LOS	A			A	E	

Intersection Summary			
HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	55.7%	ICU Level of Service	A

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.98	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.95	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1768	1863	1863	1547	1694	
Flt Permitted	0.37	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	681	1863	1863	1547	1694	
Volume (vph)	18	535	615	36	47	24
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	20	594	683	40	52	27
Lane Group Flow (vph)	20	594	683	40	79	0
Confl. Peds. (#/hr)	1			1		8
Turn Type	Perm			Perm		
Protected Phases		2	2		4	
Permitted Phases	2			2		
Actuated Green, G (s)	97.5	97.5	97.5	97.5	12.7	
Effective Green, g (s)	99.4	99.4	99.4	99.4	14.6	
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.12	
Clearance Time (s)	4.9	4.9	4.9	4.9	4.9	
Vehicle Extension (s)	1.0	1.0	1.0	1.0	2.0	
Lane Grp Cap (vph)	564	1543	1543	1281	206	
v/s Ratio Prot		0.32	c0.37		c0.05	
v/s Ratio Perm	0.03			0.03		
v/c Ratio	0.04	0.38	0.44	0.03	0.38	
Uniform Delay, d1	1.8	2.6	2.8	1.8	48.6	
Progression Factor	0.61	0.53	0.14	0.05	1.00	
Incremental Delay, d2	0.1	0.7	0.8	0.0	0.4	
Delay (s)	1.2	2.1	1.2	0.1	49.0	
Level of Service	A	A	A	A	D	
Approach Delay (s)		2.0	1.1		49.0	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	4.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	50.0%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.95		1.00	0.98		1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98	1.00		0.98	1.00
Satd. Flow (prot)	1765	1863	1521	1770	1863	1508		1829	1548		1833	1521
Flt Permitted	0.35	1.00	1.00	0.23	1.00	1.00		0.98	1.00		0.98	1.00
Satd. Flow (perm)	642	1863	1521	432	1863	1508		1829	1548		1833	1521
Volume (vph)	53	531	45	141	567	15	65	112	261	22	44	16
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	59	590	50	157	630	17	72	124	290	24	49	18
Lane Group Flow (vph)	59	590	50	157	630	17	0	196	290	0	73	18
Confl. Peds. (#/hr)	8		6	6		8			12			6
Turn Type	pm+pt		Perm	pm+pt		Perm	Split		pm+ov	Split		Perm
Protected Phases	5	2		1	6		3	3	1	4	4	
Permitted Phases	2		2	6		6			3			4
Actuated Green, G (s)	61.6	61.2	61.2	67.0	67.0	67.0		16.2	25.2		14.4	14.4
Effective Green, g (s)	63.1	63.1	63.1	68.9	68.9	68.9		18.1	28.6		16.3	16.3
Actuated g/C Ratio	0.53	0.53	0.53	0.57	0.57	0.57		0.15	0.24		0.14	0.14
Clearance Time (s)	4.5	4.9	4.9	4.5	4.9	4.9		4.9	4.5		4.9	4.9
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0		2.0	3.0		2.0	2.0
Lane Grp Cap (vph)	382	980	800	365	1070	866		276	408		249	207
v/s Ratio Prot	0.01	c0.32		0.04	c0.34			0.11	c0.06		c0.04	
v/s Ratio Perm	0.08		0.03	0.21		0.01			0.13			0.01
v/c Ratio	0.15	0.60	0.06	0.43	0.59	0.02		0.71	0.71		0.29	0.09
Uniform Delay, d1	20.8	19.7	13.9	15.9	16.4	11.0		48.5	41.9		46.7	45.3
Progression Factor	0.95	0.82	1.31	1.26	0.14	0.11		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	2.6	0.1	0.2	0.5	0.0		7.0	5.8		0.2	0.1
Delay (s)	19.8	18.9	18.4	20.3	2.9	1.2		55.4	47.7		46.9	45.4
Level of Service	B	B	B	C	A	A		E	D		D	D
Approach Delay (s)		18.9			6.2			50.8			46.6	
Approach LOS		B			A			D			D	

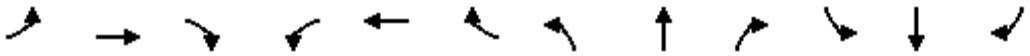
Intersection Summary			
HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	67.0%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00			1.00	0.97		1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	1.00
Satd. Flow (prot)	1770	1863	1534	1770	1861			1783	1535		1829	1561
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.59	1.00		0.70	1.00
Satd. Flow (perm)	1770	1863	1534	1770	1861			1100	1535		1296	1561
Volume (vph)	15	733	184	312	536	4	167	27	118	30	66	17
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	814	204	347	596	4	186	30	131	33	73	19
Lane Group Flow (vph)	17	814	204	347	600	0	0	216	131	0	106	19
Confl. Peds. (#/hr)			7			2	1		8	8		1
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	2	2		1	1			8			4	
Permitted Phases			2				8		8	4		4
Actuated Green, G (s)	49.5	49.5	49.5	35.5	35.5			21.5	21.5		21.5	21.5
Effective Green, g (s)	51.0	51.0	51.0	37.0	37.0			23.0	23.0		23.0	23.0
Actuated g/C Ratio	0.42	0.42	0.42	0.31	0.31			0.19	0.19		0.19	0.19
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5			4.5	4.5		4.5	4.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	752	792	652	546	574			211	294		248	299
v/s Ratio Prot	0.01	c0.44		0.20	c0.32							
v/s Ratio Perm			0.13					c0.20	0.09		0.08	0.01
v/c Ratio	0.02	1.03	0.31	0.64	1.05			1.02	0.45		0.43	0.06
Uniform Delay, d1	20.0	34.5	22.9	35.7	41.5			48.5	42.9		42.7	39.7
Progression Factor	0.56	0.70	0.48	1.00	0.97			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	37.6	1.1	1.4	46.1			67.8	0.4		0.4	0.0
Delay (s)	11.3	61.7	12.1	37.2	86.5			116.3	43.3		43.1	39.7
Level of Service	B	E	B	D	F			F	D		D	D
Approach Delay (s)		51.1			68.4			88.7			42.6	
Approach LOS		D			E			F			D	

Intersection Summary			
HCM Average Control Delay	62.7	HCM Level of Service	E
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	90.6%	ICU Level of Service	E

c Critical Lane Group

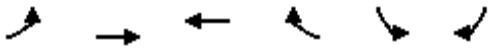


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0			3.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			1.00	
Frpb, ped/bikes		1.00	0.98		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.97			0.98	
Flt Protected		1.00	1.00		0.98			0.97			0.96	
Satd. Flow (prot)		3532	1550		3453			3289			1763	
Flt Permitted		1.00	1.00		0.98			0.72			0.96	
Satd. Flow (perm)		3532	1550		3453			2425			1763	
Volume (vph)	12	259	610	377	400	3	374	160	142	123	25	20
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	288	678	419	444	3	416	178	158	137	28	22
Lane Group Flow (vph)	0	301	678	0	866	0	0	752	0	0	187	0
Confl. Peds. (#/hr)			2			5	7		7	7		7
Turn Type	Split		Free	Split			Perm			Perm		
Protected Phases	1	1		2	2			4			4	
Permitted Phases		1	Free		2		4			4	4	
Actuated Green, G (s)		13.8	120.0		52.2			40.5			40.5	
Effective Green, g (s)		15.3	120.0		53.7			42.0			42.0	
Actuated g/C Ratio		0.13	1.00		0.45			0.35			0.35	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		450	1550		1545			849			617	
v/s Ratio Prot		c0.09			c0.25						0.11	
v/s Ratio Perm			0.44					c0.31				
v/c Ratio		0.67	0.44		0.56			0.93dl			0.30	
Uniform Delay, d1		49.9	0.0		24.4			36.7			28.4	
Progression Factor		0.56	1.00		1.00			1.00			0.95	
Incremental Delay, d2		1.1	0.3		1.5			10.7			0.1	
Delay (s)		28.9	0.3		25.9			47.4			27.0	
Level of Service		C	A		C			D			C	
Approach Delay (s)		9.1			25.9			47.4			27.0	
Approach LOS		A			C			D			C	

Intersection Summary			
HCM Average Control Delay	25.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	80.9%	ICU Level of Service	D

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

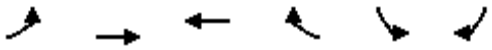
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	478	678	4	0	46
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	531	753	4	0	51
Pedestrians		9	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	0		0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		160	360			
pX, platoon unblocked	0.71				0.77	0.71
vC, conflicting volume	763				1291	767
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	664				1150	671
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	84
cM capacity (veh/h)	657				168	321

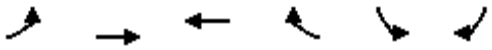
Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	531	753	4	51
Volume Left	0	0	0	0
Volume Right	0	0	4	51
cSH	1700	1700	1700	321
Volume to Capacity	0.31	0.44	0.00	0.16
Queue Length (ft)	0	0	0	14
Control Delay (s)	0.0	0.0	0.0	18.3
Lane LOS				C
Approach Delay (s)	0.0	0.0		18.3
Approach LOS				C

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	52.8%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.97	
Flt Protected	0.95	1.00	1.00	1.00	0.96	
Satd. Flow (prot)	1805	1863	1863	1615	1774	
Flt Permitted	0.21	1.00	1.00	1.00	0.96	
Satd. Flow (perm)	407	1863	1863	1615	1774	
Volume (vph)	44	434	685	14	15	4
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	49	482	761	16	17	4
Lane Group Flow (vph)	49	482	761	16	21	0
Confl. Peds. (#/hr)					11	1
Heavy Vehicles (%)	0%	2%	2%	0%	0%	0%
Turn Type	Perm			Perm		
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	71.4	71.4	71.4	71.4	39.6	
Effective Green, g (s)	72.9	72.9	72.9	72.9	41.1	
Actuated g/C Ratio	0.61	0.61	0.61	0.61	0.34	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	247	1132	1132	981	608	
v/s Ratio Prot		0.26	c0.41		c0.01	
v/s Ratio Perm	0.12			0.01		
v/c Ratio	0.20	0.43	0.67	0.02	0.03	
Uniform Delay, d1	10.5	12.5	15.6	9.3	26.2	
Progression Factor	1.59	1.14	0.75	1.22	1.00	
Incremental Delay, d2	0.4	0.2	1.4	0.0	0.1	
Delay (s)	17.1	14.5	13.1	11.4	26.4	
Level of Service	B	B	B	B	C	
Approach Delay (s)		14.7	13.1		26.4	
Approach LOS		B	B		C	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	449	654	14	0	38
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	499	727	16	0	42
Pedestrians		5	6		7	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		390	367			
pX, platoon unblocked					0.86	
vC, conflicting volume	749				1239	739
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	749				1279	739
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	90
cM capacity (veh/h)	864				157	417

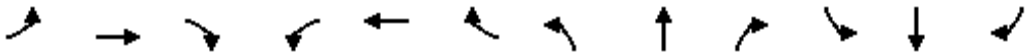
Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	499	727	16	42
Volume Left	0	0	0	0
Volume Right	0	0	16	42
cSH	1700	1700	1700	417
Volume to Capacity	0.29	0.43	0.01	0.10
Queue Length (ft)	0	0	0	8
Control Delay (s)	0.0	0.0	0.0	14.6
Lane LOS				B
Approach Delay (s)	0.0	0.0		14.6
Approach LOS				B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	49.8%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	441	8	0	668	0	33
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	490	9	0	742	0	37
Pedestrians	5			6	7	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	460			297		
pX, platoon unblocked			0.86		0.86	0.86
vC, conflicting volume			506		1244	503
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			425		1284	421
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	93
cM capacity (veh/h)			978		156	541

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	490	9	742	37
Volume Left	0	0	0	0
Volume Right	0	9	0	37
cSH	1700	1700	1700	541
Volume to Capacity	0.29	0.01	0.44	0.07
Queue Length (ft)	0	0	0	5
Control Delay (s)	0.0	0.0	0.0	12.1
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.1
Approach LOS				B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	50.9%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		0.95	0.95			1.00	
Frpb, ped/bikes		0.98			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			1.00	
Frt		0.90			0.99		1.00	1.00			0.96	
Flt Protected		0.99			1.00		0.95	0.98			0.99	
Satd. Flow (prot)		1640			1833		1681	1735			1744	
Flt Permitted		0.93			0.98		0.95	0.98			0.99	
Satd. Flow (perm)		1534			1796		1681	1735			1744	
Volume (vph)	31	25	137	15	193	18	115	58	2	8	16	11
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	34	28	152	17	214	20	128	64	2	9	18	12
Lane Group Flow (vph)	0	214	0	0	251	0	95	99	0	0	39	0
Confl. Peds. (#/hr)	1		2	2		1	7		1	1		7
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		87.9			87.7		12.1	12.1			7.2	
Effective Green, g (s)		89.5			89.5		13.1	13.1			8.4	
Actuated g/C Ratio		0.75			0.75		0.11	0.11			0.07	
Clearance Time (s)		4.6			4.8		4.0	4.0			4.2	
Vehicle Extension (s)		2.0			2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		1144			1340		184	189			122	
v/s Ratio Prot							0.06	c0.06			c0.02	
v/s Ratio Perm		0.14			c0.14							
v/c Ratio		0.19			0.19		0.52	0.52			0.32	
Uniform Delay, d1		4.5			4.5		50.5	50.5			53.1	
Progression Factor		1.00			1.00		0.47	0.47			1.00	
Incremental Delay, d2		0.4			0.0		0.7	0.8			0.6	
Delay (s)		4.9			4.5		24.6	24.4			53.6	
Level of Service		A			A		C	C			D	
Approach Delay (s)		4.9			4.5			24.5			53.6	
Approach LOS		A			A			C			D	

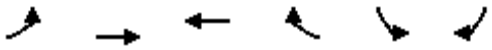
Intersection Summary			
HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	44.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	428	12	0	598	0	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	476	13	0	664	0	27
Pedestrians				1	3	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	243			551		
pX, platoon unblocked			0.88		0.88	0.88
vC, conflicting volume			492		1143	480
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			420		1163	406
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	95
cM capacity (veh/h)			1005		190	567

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	476	13	664	27
Volume Left	0	0	0	0
Volume Right	0	13	0	27
cSH	1700	1700	1700	567
Volume to Capacity	0.28	0.01	0.39	0.05
Queue Length (ft)	0	0	0	4
Control Delay (s)	0.0	0.0	0.0	11.7
Lane LOS				B
Approach Delay (s)	0.0		0.0	11.7
Approach LOS				B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	45.3%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	452	553	14	0	45
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	502	614	16	0	50
Pedestrians			1		32	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			4.0		4.0	
Percent Blockage			0		3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		393	401			
pX, platoon unblocked					0.88	
vC, conflicting volume	662				1157	654
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	662				1180	654
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	89
cM capacity (veh/h)	911				181	458

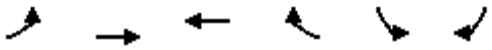
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	502	630	50
Volume Left	0	0	0
Volume Right	0	16	50
cSH	1700	1700	458
Volume to Capacity	0.30	0.37	0.11
Queue Length (ft)	0	0	9
Control Delay (s)	0.0	0.0	13.8
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.8
Approach LOS			B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	43.4%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	430	22	0	567	0	48
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	478	24	0	630	0	53
Pedestrians					19	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	523			271		
pX, platoon unblocked			0.89		0.89	0.89
vC, conflicting volume			521		1127	497
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			460		1143	432
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	90
cM capacity (veh/h)			970		195	547

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	478	24	630	53
Volume Left	0	0	0	0
Volume Right	0	24	0	53
cSH	1700	1700	1700	547
Volume to Capacity	0.28	0.01	0.37	0.10
Queue Length (ft)	0	0	0	8
Control Delay (s)	0.0	0.0	0.0	12.3
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.3
Approach LOS				B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.86	0.95	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.94	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1757	1863	1863	1365	1628	
Flt Permitted	0.33	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	603	1863	1863	1365	1628	
Volume (vph)	24	468	627	74	71	51
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	27	520	697	82	79	57
Lane Group Flow (vph)	27	520	697	82	136	0
Confl. Peds. (#/hr)	36			36	1	28
Turn Type	pm+pt			Perm		
Protected Phases	5	2	6		4	
Permitted Phases	2			6		
Actuated Green, G (s)	98.6	98.2	86.5	86.5	12.0	
Effective Green, g (s)	100.1	100.1	88.4	88.4	13.9	
Actuated g/C Ratio	0.83	0.83	0.74	0.74	0.12	
Clearance Time (s)	4.5	4.9	4.9	4.9	4.9	
Vehicle Extension (s)	3.0	2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	587	1554	1372	1006	189	
v/s Ratio Prot	0.00	c0.28	c0.37		c0.08	
v/s Ratio Perm	0.04			0.06		
v/c Ratio	0.05	0.33	0.51	0.08	0.72	
Uniform Delay, d1	5.9	2.3	6.6	4.4	51.2	
Progression Factor	0.61	0.88	0.17	0.03	1.00	
Incremental Delay, d2	0.0	0.5	1.2	0.1	10.4	
Delay (s)	3.6	2.5	2.4	0.3	61.6	
Level of Service	A	A	A	A	E	
Approach Delay (s)		2.6	2.2		61.6	
Approach LOS		A	A		E	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	55.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	492	30	0	678	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	547	33	0	753	0	0
Pedestrians	28			1	43	
Lane Width (ft)	12.0			12.0	0.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	259			90		
pX, platoon unblocked			0.86		0.91	0.86
vC, conflicting volume			623		1371	591
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			559		1169	521
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			874		191	478

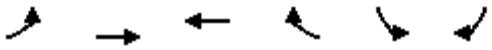
Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	547	33	753
Volume Left	0	0	0
Volume Right	0	33	0
cSH	1700	1700	1700
Volume to Capacity	0.32	0.02	0.44
Queue Length (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		0.0
Approach LOS			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	50.0%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	559	23	0	651	0	51
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	621	26	0	723	0	57
Pedestrians				11	11	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				1	1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	150			636		
pX, platoon unblocked			0.91		0.81	0.91
vC, conflicting volume			658		1368	656
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			625		1295	623
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	87
cM capacity (veh/h)			875		145	439

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	647	723	57
Volume Left	0	0	0
Volume Right	26	0	57
cSH	1700	1700	439
Volume to Capacity	0.38	0.43	0.13
Queue Length (ft)	0	0	11
Control Delay (s)	0.0	0.0	14.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	14.4
Approach LOS			B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	51.1%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	610	624	24	0	27
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	678	693	27	0	30
Pedestrians		2			4	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		370	416			
pX, platoon unblocked	0.77				0.81	0.77
vC, conflicting volume	724				1375	699
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	642				1308	610
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	92
cM capacity (veh/h)	732				144	382

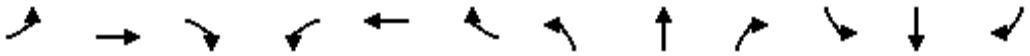
Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	678	693	27	30
Volume Left	0	0	0	0
Volume Right	0	0	27	30
cSH	1700	1700	1700	382
Volume to Capacity	0.40	0.41	0.02	0.08
Queue Length (ft)	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	15.2
Lane LOS				C
Approach Delay (s)	0.0	0.0		15.2
Approach LOS				C

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	47.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	600	10	0	648	0	29
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	667	11	0	720	0	32
Pedestrians	2			3	6	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	490			296		
pX, platoon unblocked			0.92		0.81	0.92
vC, conflicting volume			684		1400	681
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			657		1349	654
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	93
cM capacity (veh/h)			862		135	430

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	678	720	32
Volume Left	0	0	0
Volume Right	11	0	32
cSH	1700	1700	430
Volume to Capacity	0.40	0.42	0.07
Queue Length (ft)	0	0	6
Control Delay (s)	0.0	0.0	14.0
Lane LOS			B
Approach Delay (s)	0.0	0.0	14.0
Approach LOS			B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	48.8%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Util. Factor		1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00	0.98		0.98		1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frt		0.99		1.00	1.00	0.85		0.89		1.00	0.91	
Flt Protected		1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)		1853		1770	1863	1551		1606		1766	1699	
Flt Permitted		1.00		0.44	1.00	1.00		0.93		0.61	1.00	
Satd. Flow (perm)		1853		822	1863	1551		1506		1124	1699	
Volume (vph)	0	218	9	240	156	312	33	0	172	372	78	112
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	242	10	267	173	347	37	0	191	413	87	124
Lane Group Flow (vph)	0	252	0	267	173	347	0	228	0	413	211	0
Confl. Peds. (#/hr)	1					1			1	1		
Turn Type				Perm		Free	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases				8		Free	2			6		
Actuated Green, G (s)		36.9		36.9	36.9	120.0		74.1		74.1	74.1	
Effective Green, g (s)		38.4		38.4	38.4	120.0		75.6		75.6	75.6	
Actuated g/C Ratio		0.32		0.32	0.32	1.00		0.63		0.63	0.63	
Clearance Time (s)		4.5		4.5	4.5			4.5		4.5	4.5	
Vehicle Extension (s)		3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		593		263	596	1551		949		708	1070	
v/s Ratio Prot		0.14			0.09						0.12	
v/s Ratio Perm				c0.32		0.22		0.15		c0.37		
v/c Ratio		0.42		1.02	0.29	0.22		0.24		0.58	0.20	
Uniform Delay, d1		32.1		40.8	30.6	0.0		9.7		13.0	9.4	
Progression Factor		1.00		1.00	1.00	1.00		1.00		0.43	0.24	
Incremental Delay, d2		0.5		59.4	0.3	0.3		0.6		3.1	0.4	
Delay (s)		32.6		100.2	30.9	0.3		10.3		8.6	2.6	
Level of Service		C		F	C	A		B		A	A	
Approach Delay (s)		32.6			40.9			10.3			6.6	
Approach LOS		C			D			B			A	

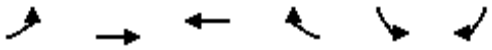
Intersection Summary			
HCM Average Control Delay	24.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	C

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	827	176	0	669	0	51
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	919	196	0	743	0	57
Pedestrians	12			20	36	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			2	3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	452			320		
pX, platoon unblocked						
vC, conflicting volume			1150		1710	975
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1150		1710	975
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	81
cM capacity (veh/h)			596		97	294

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	919	196	743	57
Volume Left	0	0	0	0
Volume Right	0	196	0	57
cSH	1700	1700	1700	294
Volume to Capacity	0.54	0.12	0.44	0.19
Queue Length (ft)	0	0	0	18
Control Delay (s)	0.0	0.0	0.0	20.2
Lane LOS				C
Approach Delay (s)	0.0		0.0	20.2
Approach LOS				C

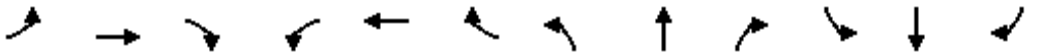
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	64.3%	ICU Level of Service	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	1003	640	29	0	32
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	1114	711	32	0	36
Pedestrians		12	20		17	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	2		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		372	400			
pX, platoon unblocked						
vC, conflicting volume	760				1863	740
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	760				1863	740
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	91
cM capacity (veh/h)	848				79	410

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	1114	711	32	36
Volume Left	0	0	0	0
Volume Right	0	0	32	36
cSH	1700	1700	1700	410
Volume to Capacity	0.66	0.42	0.02	0.09
Queue Length (ft)	0	0	0	7
Control Delay (s)	0.0	0.0	0.0	14.6
Lane LOS				B
Approach Delay (s)	0.0	0.0		14.6
Approach LOS				B

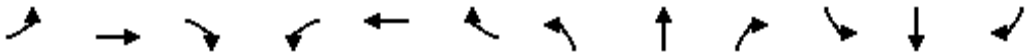
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	72.0%	ICU Level of Service	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	721	27	0	732	8	0	0	102	0	0	21
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	801	30	0	813	9	0	0	113	0	0	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		359			243							
pX, platoon unblocked	0.69						0.69	0.69		0.69	0.69	0.69
vC, conflicting volume	822			831			1638	1623	801	1728	1644	813
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	741			831			1931	1909	801	2062	1940	728
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	71	100	100	92
cM capacity (veh/h)	600			810			32	47	388	20	45	293

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	801	30	813	9	113	23
Volume Left	0	0	0	0	0	0
Volume Right	0	30	0	9	113	23
cSH	1700	1700	1700	1700	388	293
Volume to Capacity	0.47	0.02	0.48	0.01	0.29	0.08
Queue Length (ft)	0	0	0	0	30	6
Control Delay (s)	0.0	0.0	0.0	0.0	18.1	18.4
Lane LOS					C	C
Approach Delay (s)	0.0		0.0		18.1	18.4
Approach LOS					C	C

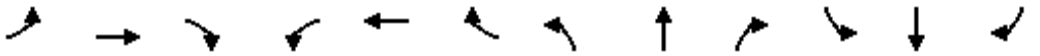
Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	55.8%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	4	334	89	35	334	11	16	12	30	10	27	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	4	371	99	39	371	12	18	13	33	11	30	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		393			875							
pX, platoon unblocked												
vC, conflicting volume	383			470			905	891	421	924	934	377
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	383			470			905	891	421	924	934	377
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			92	95	95	95	88	99
cM capacity (veh/h)	1175			1092			225	271	633	221	255	669

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	474	422	64	47
Volume Left	4	39	18	11
Volume Right	99	12	33	6
cSH	1175	1092	357	265
Volume to Capacity	0.00	0.04	0.18	0.18
Queue Length (ft)	0	3	16	16
Control Delay (s)	0.1	1.1	17.3	21.5
Lane LOS	A	A	C	C
Approach Delay (s)	0.1	1.1	17.3	21.5
Approach LOS			C	C

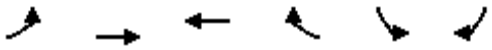
Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	62.1%	ICU Level of Service	B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	796	72	0	599	33	0	0	53	0	0	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	884	80	0	666	37	0	0	59	0	0	24
Pedestrians		6			1			17			16	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		351										
pX, platoon unblocked												
vC, conflicting volume	718			981			1597	1620	902	1626	1663	688
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	718			981			1597	1620	902	1626	1663	688
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	82	100	100	94
cM capacity (veh/h)	880			701			79	101	334	66	95	442

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	884	80	666	37	59	24
Volume Left	0	0	0	0	0	0
Volume Right	0	80	0	37	59	24
cSH	1700	1700	1700	1700	334	442
Volume to Capacity	0.52	0.05	0.39	0.02	0.18	0.06
Queue Length (ft)	0	0	0	0	16	4
Control Delay (s)	0.0	0.0	0.0	0.0	18.1	13.6
Lane LOS					C	B
Approach Delay (s)	0.0		0.0		18.1	13.6
Approach LOS					C	B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	57.3%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	692	574	21	0	72
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	769	638	23	0	80
Pedestrians		2				
Lane Width (ft)		12.0				
Walking Speed (ft/s)		4.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			240			
pX, platoon unblocked	0.79				0.79	0.79
vC, conflicting volume	661				1407	640
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	570				1516	543
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	81
cM capacity (veh/h)	798				105	428

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	769	638	23	80
Volume Left	0	0	0	0
Volume Right	0	0	23	80
cSH	1700	1700	1700	428
Volume to Capacity	0.45	0.38	0.01	0.19
Queue Length (ft)	0	0	0	17
Control Delay (s)	0.0	0.0	0.0	15.3
Lane LOS				C
Approach Delay (s)	0.0	0.0		15.3
Approach LOS				C

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	51.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	617	46	0	646	0	21
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	686	51	0	718	0	23
Pedestrians	2				2	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	0				0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				330		
pX, platoon unblocked					0.79	
vC, conflicting volume			739		1407	688
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			739		1518	688
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	95
cM capacity (veh/h)			875		104	449

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	686	51	718	23
Volume Left	0	0	0	0
Volume Right	0	51	0	23
cSH	1700	1700	1700	449
Volume to Capacity	0.40	0.03	0.42	0.05
Queue Length (ft)	0	0	0	4
Control Delay (s)	0.0	0.0	0.0	13.5
Lane LOS				B
Approach Delay (s)	0.0		0.0	13.5
Approach LOS				B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	46.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	0.95	1.00	1.00	0.96	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.91	
Flt Protected	1.00	1.00	0.95	1.00	0.99	
Satd. Flow (prot)	1863	1538	1805	1863	1630	
Flt Permitted	1.00	1.00	0.14	1.00	0.99	
Satd. Flow (perm)	1863	1538	272	1863	1630	
Volume (vph)	647	45	68	564	31	70
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	719	50	76	627	34	78
Lane Group Flow (vph)	719	50	76	627	112	0
Confl. Peds. (#/hr)		10	10		21	13
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Turn Type		Perm	pm+pt			
Protected Phases	4		3	8	2	
Permitted Phases		4	8			
Actuated Green, G (s)	43.1	43.1	52.6	52.6	28.4	
Effective Green, g (s)	44.6	44.6	54.1	54.1	29.9	
Actuated g/C Ratio	0.50	0.50	0.60	0.60	0.33	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	923	762	274	1120	542	
v/s Ratio Prot	c0.39		0.02	c0.34	c0.07	
v/s Ratio Perm		0.03	0.15			
v/c Ratio	0.78	0.07	0.28	0.56	0.21	
Uniform Delay, d1	18.7	11.8	13.1	10.8	21.5	
Progression Factor	1.00	1.00	0.97	1.10	1.00	
Incremental Delay, d2	4.2	0.0	0.5	0.5	0.9	
Delay (s)	22.9	11.9	13.2	12.4	22.4	
Level of Service	C	B	B	B	C	
Approach Delay (s)	22.1			12.5	22.4	
Approach LOS	C			B	C	

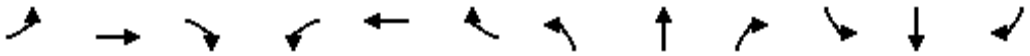
Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	B
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	0.95			1.00
Frpb, ped/bikes	1.00	0.98		1.00	0.99			1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			1.00
Frt	1.00	0.96		1.00	0.97			1.00	0.97			1.00
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95
Satd. Flow (prot)	1703	3201		1703	3268			1703	3285			1703
Flt Permitted	0.95	1.00		0.95	1.00			0.30	1.00			0.30
Satd. Flow (perm)	1703	3201		1703	3268			535	3285			535
Volume (vph)	235	483	179	122	385	92	2	188	641	138	7	200
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	261	537	199	136	428	102	2	209	712	153	8	222
Lane Group Flow (vph)	261	736	0	136	530	0	0	211	865	0	0	230
Confl. Peds. (#/hr)			79			67				52		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Prot			Prot			custom	Prot			custom	Prot
Protected Phases	5	2		1	6			3	8			7
Permitted Phases							3				7	
Actuated Green, G (s)	14.8	25.1		10.1	20.4			12.0	28.8			12.0
Effective Green, g (s)	16.2	27.0		11.5	22.3			13.4	30.7			13.4
Actuated g/C Ratio	0.17	0.29		0.12	0.24			0.14	0.32			0.14
Clearance Time (s)	4.4	4.9		4.4	4.9			4.4	4.9			4.4
Vehicle Extension (s)	3.0	2.0		3.0	2.0			3.0	3.3			2.0
Lane Grp Cap (vph)	292	914		207	770			76	1066			76
v/s Ratio Prot	0.15	c0.23		0.08	c0.16				c0.26			
v/s Ratio Perm								0.39				c0.43
v/c Ratio	0.89	0.81		0.66	0.69			2.78	0.81			3.03
Uniform Delay, d1	38.4	31.4		39.7	33.0			40.6	29.3			40.6
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00
Incremental Delay, d2	27.2	4.9		7.3	2.1			834.8	4.9			945.9
Delay (s)	65.6	36.3		47.0	35.0			875.4	34.2			986.5
Level of Service	E	D		D	D			F	C			F
Approach Delay (s)		44.0			37.5				199.1			
Approach LOS		D			D				F			

Intersection Summary			
HCM Average Control Delay	148.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	94.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	99.6%	ICU Level of Service	E
c Critical Lane Group			

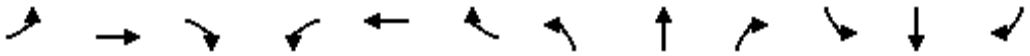
Movement	SBT	SBR
Lane Configurations		
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	3.0	
Lane Util. Factor	0.95	
Frpb, ped/bikes	0.99	
Flpb, ped/bikes	1.00	
Frt	0.97	
Flt Protected	1.00	
Satd. Flow (prot)	3292	
Flt Permitted	1.00	
Satd. Flow (perm)	3292	
Volume (vph)	422	86
Peak-hour factor, PHF	0.90	0.90
Adj. Flow (vph)	469	96
Lane Group Flow (vph)	565	0
Confl. Peds. (#/hr)		35
Heavy Vehicles (%)	6%	6%
Turn Type		
Protected Phases	4	
Permitted Phases		
Actuated Green, G (s)	28.8	
Effective Green, g (s)	30.7	
Actuated g/C Ratio	0.32	
Clearance Time (s)	4.9	
Vehicle Extension (s)	2.9	
Lane Grp Cap (vph)	1068	
v/s Ratio Prot	0.17	
v/s Ratio Perm		
v/c Ratio	0.53	
Uniform Delay, d1	26.1	
Progression Factor	1.00	
Incremental Delay, d2	0.5	
Delay (s)	26.5	
Level of Service	C	
Approach Delay (s)	304.3	
Approach LOS	F	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.94		0.97			1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.93			0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		1.00			0.99	
Satd. Flow (prot)	1703	1792	1484	1703	1792	1433		1603			1716	
Flt Permitted	0.22	1.00	1.00	0.14	1.00	1.00		0.96			0.78	
Satd. Flow (perm)	401	1792	1484	252	1792	1433		1551			1355	
Volume (vph)	61	734	26	69	521	82	39	166	240	29	103	39
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	68	816	29	77	579	91	43	184	267	32	114	43
Lane Group Flow (vph)	68	816	29	77	579	91	0	494	0	0	189	0
Confl. Peds. (#/hr)			3			17			16			3
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt		Perm	pm+pt		Perm	Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	43.5	43.5	43.5	47.5	46.0	46.0		24.3			24.3	
Effective Green, g (s)	46.0	46.0	46.0	48.5	48.5	48.5		26.0			26.0	
Actuated g/C Ratio	0.51	0.51	0.51	0.54	0.54	0.54		0.29			0.29	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5		4.7			4.7	
Vehicle Extension (s)	2.0	2.5	2.5	2.0	2.5	2.5		2.0			2.0	
Lane Grp Cap (vph)	299	916	758	281	966	772		448			391	
v/s Ratio Prot	0.02	c0.46		0.03	c0.32							
v/s Ratio Perm	0.10		0.02	0.12		0.06		c0.32			0.14	
v/c Ratio	0.23	0.89	0.04	0.27	0.60	0.12		1.10			0.48	
Uniform Delay, d1	13.6	19.7	11.0	27.1	14.1	10.2		32.0			26.4	
Progression Factor	1.00	1.00	1.00	0.68	0.66	1.15		1.00			1.00	
Incremental Delay, d2	0.1	12.7	0.1	0.2	2.2	0.2		73.4			0.3	
Delay (s)	13.7	32.5	11.1	18.6	11.5	12.0		105.4			26.8	
Level of Service	B	C	B	B	B	B		F			C	
Approach Delay (s)		30.4			12.3			105.4			26.8	
Approach LOS		C			B			F			C	

Intersection Summary			
HCM Average Control Delay	40.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	100.8%	ICU Level of Service	F
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.94		0.98			0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.97			0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.97			0.97	
Satd. Flow (prot)	1703	1792	1462	1703	1792	1426		1651			1679	
Flt Permitted	0.26	1.00	1.00	0.11	1.00	1.00		0.97			0.97	
Satd. Flow (perm)	458	1792	1462	198	1792	1426		1651			1679	
Volume (vph)	55	726	97	75	519	27	121	31	48	94	32	29
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	61	807	108	83	577	30	134	34	53	104	36	32
Lane Group Flow (vph)	61	807	108	83	577	30	0	221	0	0	172	0
Confl. Peds. (#/hr)			7			18			46			14
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt		Perm	Perm		Perm	Split			Split		
Protected Phases	5	2			6		8	8		7	7	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	48.6	47.7	47.7	40.0	40.0	40.0		14.5			12.6	
Effective Green, g (s)	50.1	50.1	50.1	42.4	42.4	42.4		16.4			14.5	
Actuated g/C Ratio	0.56	0.56	0.56	0.47	0.47	0.47		0.18			0.16	
Clearance Time (s)	4.5	5.4	5.4	5.4	5.4	5.4		4.9			4.9	
Vehicle Extension (s)	3.0	2.7	2.7	2.8	2.8	2.8		2.0			2.0	
Lane Grp Cap (vph)	320	998	814	93	844	672		301			271	
v/s Ratio Prot	0.01	c0.45			0.32			c0.13			c0.10	
v/s Ratio Perm	0.10		0.07	c0.42		0.02						
v/c Ratio	0.19	0.81	0.13	0.89	0.68	0.04		0.73			0.63	
Uniform Delay, d1	21.2	16.1	9.5	21.7	18.6	12.9		34.7			35.3	
Progression Factor	0.57	0.53	0.27	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	3.7	0.2	59.4	2.2	0.0		7.8			3.5	
Delay (s)	12.1	12.3	2.8	81.1	20.8	12.9		42.5			38.8	
Level of Service	B	B	A	F	C	B		D			D	
Approach Delay (s)		11.3			27.7			42.5			38.8	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	80.9%	ICU Level of Service	D
c Critical Lane Group			

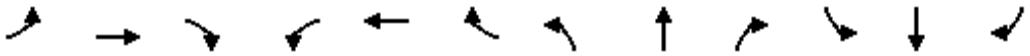
Level Of Service Computation Report
FHWA Roundabout Method (Base Volume Alternative)

Intersection #1 University/Texas [1-Lane Alt (PM)]

Average Delay (sec/veh): 45.0 Level Of Service: E

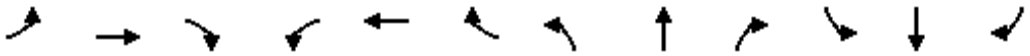
Street Name:	Texas						University					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Yield Sign			Yield Sign			Yield Sign			Yield Sign		
Lanes:	1			1			1			1		
Volume Module:												
Base Vol:	72	161	69	211	229	78	306	437	106	75	482	89
Growth 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
Initial Bse:	72	161	69	211	229	78	306	437	106	75	482	89
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	80	179	77	234	254	87	340	486	118	83	536	99
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	80	179	77	234	254	87	340	486	118	83	536	99
PCE 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
MLF 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
Final Vol.:	80	179	77	234	254	87	340	486	118	83	536	99
PCE Module:												
AutoPCE:	74	165	71	216	234	80	313	447	108	77	493	91
TruckPCE:	7	16	7	21	23	8	31	44	11	7	48	9
ComboPCE:	3	7	3	9	10	3	14	19	5	3	21	4
BicyclePCE:	0	0	0	0	0	0	0	0	0	0	0	0
AdjVolume:	84	188	81	246	267	91	357	510	124	87	562	104

Delay Module: >> Time Period: 0.25 hours <<				
CircVolume:	1113	734	601	629
MaxVolume:	599	804	876	860
PedVolume:	0	0	0	0
AdjMaxVol:	599	804	876	860
ApproachVol:	352	604	991	754
ApproachDel:	14.2	16.7	88.1	25.5
Queue:	3.8	7.1	27.8	11.4



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.92	1.00	1.00	0.91	1.00	0.96		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	1792	1395	1703	1792	1381	1703	1629		1703	1562	
Flt Permitted	0.32	1.00	1.00	0.27	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	580	1792	1395	489	1792	1381	1703	1629		1703	1562	
Volume (vph)	84	448	129	55	418	51	155	76	40	113	92	68
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	93	498	143	61	464	57	172	84	44	126	102	76
Lane Group Flow (vph)	93	498	143	61	464	57	172	128	0	126	178	0
Confl. Peds. (#/hr)			35			40			54			49
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm		Perm	pm+pt		Perm	Split			Split		
Protected Phases		2		1	6		3	3		4	4	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	29.2	29.2	29.2	36.9	35.9	35.9	9.2	9.2		11.2	11.2	
Effective Green, g (s)	31.7	31.7	31.7	38.4	38.4	38.4	11.4	11.4		13.4	13.4	
Actuated g/C Ratio	0.40	0.40	0.40	0.49	0.49	0.49	0.14	0.14		0.17	0.17	
Clearance Time (s)	5.5	5.5	5.5	4.5	5.5	5.5	5.2	5.2		5.2	5.2	
Vehicle Extension (s)	2.0	2.0	2.0	3.0	2.0	2.0	3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)	233	721	561	295	873	673	246	236		290	266	
v/s Ratio Prot		c0.28		0.01	c0.26		c0.10	0.08		0.07	c0.11	
v/s Ratio Perm	0.16		0.10	0.09		0.04						
v/c Ratio	0.40	0.69	0.25	0.21	0.53	0.08	0.70	0.54		0.43	0.67	
Uniform Delay, d1	16.8	19.5	15.7	21.0	14.0	10.8	32.1	31.3		29.3	30.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	2.3	0.1	0.3	0.3	0.0	8.4	2.5		0.4	4.9	
Delay (s)	17.2	21.8	15.8	21.3	14.3	10.8	40.5	33.8		29.7	35.5	
Level of Service	B	C	B	C	B	B	D	C		C	D	
Approach Delay (s)		20.0			14.7			37.6			33.1	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM Average Control Delay	23.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	78.8	Sum of lost time (s)	15.6
Intersection Capacity Utilization	77.8%	ICU Level of Service	C
c Critical Lane Group			

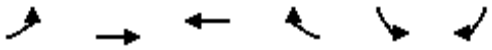


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.93	1.00	1.00	0.71	1.00	0.90		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	1792	1416	1703	1792	1082	1703	1526		1703	1732	
Flt Permitted	0.22	1.00	1.00	0.17	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	390	1792	1416	298	1792	1082	1703	1526		1703	1732	
Volume (vph)	87	538	48	197	327	75	116	345	180	60	422	65
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	97	598	53	219	363	83	129	383	200	67	469	72
Lane Group Flow (vph)	97	598	53	219	363	83	129	583	0	67	541	0
Confl. Peds. (#/hr)			23			104			139			44
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6						
Actuated Green, G (s)	26.9	26.9	26.9	31.2	30.8	30.8	9.8	29.7		7.6	27.5	
Effective Green, g (s)	28.8	28.8	28.8	32.7	32.7	32.7	11.2	31.6		9.0	29.4	
Actuated g/C Ratio	0.32	0.32	0.32	0.36	0.36	0.36	0.12	0.35		0.10	0.33	
Clearance Time (s)	4.5	4.9	4.9	4.5	4.9	4.9	4.4	4.9		4.4	4.9	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	193	573	453	243	651	393	212	536		170	566	
v/s Ratio Prot	0.03	c0.33		c0.09	0.20		c0.08	c0.38		0.04	0.31	
v/s Ratio Perm	0.13		0.04	0.24		0.08						
v/c Ratio	0.50	1.04	0.12	0.90	0.56	0.21	0.61	1.09		0.39	0.96	
Uniform Delay, d1	23.4	30.6	21.6	36.8	22.9	19.8	37.3	29.2		37.9	29.7	
Progression Factor	1.00	1.00	1.00	0.69	0.56	0.24	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	49.5	0.5	29.2	2.9	1.0	3.4	64.8		0.5	26.7	
Delay (s)	25.4	80.1	22.1	54.5	15.7	5.7	40.7	94.0		38.5	56.4	
Level of Service	C	F	C	D	B	A	D	F		D	E	
Approach Delay (s)		68.9			27.2			84.4			54.4	
Approach LOS		E			C			F			D	

Intersection Summary			
HCM Average Control Delay	59.6	HCM Level of Service	E
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	95.3%	ICU Level of Service	E
c Critical Lane Group			

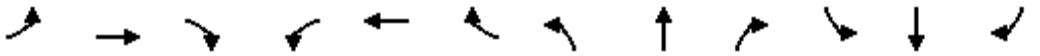
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0			3.0	3.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.97			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.98			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1702			1792	1638	
Flt Permitted	1.00			1.00	0.97	
Satd. Flow (perm)	1702			1792	1638	
Volume (vph)	699	108	0	627	72	60
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	777	120	0	697	80	67
Lane Group Flow (vph)	897	0	0	697	147	0
Confl. Peds. (#/hr)		98				
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type						
Protected Phases	2			2	4	
Permitted Phases						
Actuated Green, G (s)	70.8			70.8	10.7	
Effective Green, g (s)	72.3			72.3	11.7	
Actuated g/C Ratio	0.80			0.80	0.13	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	2.0			2.0	2.0	
Lane Grp Cap (vph)	1367			1440	213	
v/s Ratio Prot	c0.53			0.39	c0.09	
v/s Ratio Perm						
v/c Ratio	0.66			0.48	0.69	
Uniform Delay, d1	3.7			2.8	37.4	
Progression Factor	0.22			0.14	1.00	
Incremental Delay, d2	2.1			1.1	7.5	
Delay (s)	2.9			1.5	45.0	
Level of Service	A			A	D	
Approach Delay (s)	2.9			1.5	45.0	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	5.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	B
c Critical Lane Group			



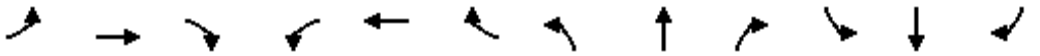
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.94	0.95	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.94	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1703	1792	1792	1437	1553	
Flt Permitted	0.38	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	683	1792	1792	1437	1553	
Volume (vph)	63	696	561	65	80	66
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	70	773	623	72	89	73
Lane Group Flow (vph)	70	773	623	72	162	0
Confl. Peds. (#/hr)				16		41
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type	Perm			Perm		
Protected Phases		2	2		4	
Permitted Phases	2			2		
Actuated Green, G (s)	67.8	67.8	67.8	67.8	12.4	
Effective Green, g (s)	69.7	69.7	69.7	69.7	14.3	
Actuated g/C Ratio	0.77	0.77	0.77	0.77	0.16	
Clearance Time (s)	4.9	4.9	4.9	4.9	4.9	
Vehicle Extension (s)	1.0	1.0	1.0	1.0	2.0	
Lane Grp Cap (vph)	529	1388	1388	1113	247	
v/s Ratio Prot		c0.43	0.35		c0.10	
v/s Ratio Perm	0.10			0.05		
v/c Ratio	0.13	0.56	0.45	0.06	0.66	
Uniform Delay, d1	2.6	4.0	3.5	2.4	35.5	
Progression Factor	0.39	0.34	0.40	0.35	1.00	
Incremental Delay, d2	0.4	1.3	0.9	0.1	4.7	
Delay (s)	1.4	2.6	2.2	0.9	40.3	
Level of Service	A	A	A	A	D	
Approach Delay (s)		2.5	2.1		40.3	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	6.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.92	1.00	1.00	0.94		1.00	0.95		1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00		0.98	1.00
Satd. Flow (prot)	1703	1792	1407	1703	1792	1438		1740	1443		1761	1456
Flt Permitted	0.35	1.00	1.00	0.15	1.00	1.00		0.97	1.00		0.98	1.00
Satd. Flow (perm)	632	1792	1407	268	1792	1438		1740	1443		1761	1456
Volume (vph)	88	485	128	196	512	45	91	59	213	50	93	21
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	98	539	142	218	569	50	101	66	237	56	103	23
Lane Group Flow (vph)	98	539	142	218	569	50	0	167	237	0	159	23
Confl. Peds. (#/hr)			23			14			28			10
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt		Perm	pm+pt		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6		6			3			4
Actuated Green, G (s)	36.2	35.8	35.8	40.1	40.1	40.1		13.3	13.3		14.2	14.2
Effective Green, g (s)	37.7	37.7	37.7	42.0	42.0	42.0		15.2	15.2		16.1	16.1
Actuated g/C Ratio	0.42	0.42	0.42	0.47	0.47	0.47		0.17	0.17		0.18	0.18
Clearance Time (s)	4.5	4.9	4.9	4.5	4.9	4.9		4.9	4.9		4.9	4.9
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0		2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	321	751	589	269	836	671		294	244		315	260
v/s Ratio Prot	0.02	c0.30		c0.08	0.32			0.10			c0.09	
v/s Ratio Perm	0.11		0.10	c0.30		0.03			c0.16			0.02
v/c Ratio	0.31	0.72	0.24	0.81	0.68	0.07		0.57	0.97		0.50	0.09
Uniform Delay, d1	22.4	21.7	16.9	18.4	18.8	13.3		34.4	37.2		33.4	30.8
Progression Factor	1.12	1.10	1.81	0.55	0.52	0.29		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.5	5.3	0.9	5.1	1.2	0.1		1.5	49.2		0.5	0.1
Delay (s)	25.6	29.1	31.4	15.3	11.0	3.9		35.9	86.3		33.8	30.9
Level of Service	C	C	C	B	B	A		D	F		C	C
Approach Delay (s)		29.1			11.7			65.5			33.4	
Approach LOS		C			B			E			C	

Intersection Summary			
HCM Average Control Delay	29.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	B
c Critical Lane Group			

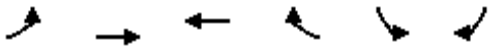


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	0.94		1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.99	1.00
Satd. Flow (prot)	1770	1792	1524	1703	1790			1734	1425		1848	1508
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.60	1.00		0.90	1.00
Satd. Flow (perm)	1770	1792	1524	1703	1790			1088	1425		1683	1508
Volume (vph)	20	488	315	404	523	5	208	47	282	20	103	9
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	542	350	449	581	6	231	52	313	22	114	10
Lane Group Flow (vph)	22	542	350	449	587	0	0	283	313	0	136	10
Confl. Peds. (#/hr)						2			30			20
Heavy Vehicles (%)	2%	6%	6%	6%	6%	2%	6%	2%	6%	2%	2%	2%
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	2	2		1	1			8			4	
Permitted Phases			2				8		8	4		4
Actuated Green, G (s)	27.5	27.5	27.5	27.5	27.5			21.5	21.5		21.5	21.5
Effective Green, g (s)	29.0	29.0	29.0	29.0	29.0			23.0	23.0		23.0	23.0
Actuated g/C Ratio	0.32	0.32	0.32	0.32	0.32			0.26	0.26		0.26	0.26
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5			4.5	4.5		4.5	4.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	570	577	491	549	577			278	364		430	385
v/s Ratio Prot	0.01	c0.30		0.26	c0.33							
v/s Ratio Perm			0.23					c0.26	0.22		0.08	0.01
v/c Ratio	0.04	0.94	0.71	0.82	1.02			1.02	0.86		0.32	0.03
Uniform Delay, d1	20.9	29.6	26.8	28.1	30.5			33.5	32.0		27.1	25.1
Progression Factor	0.54	0.62	0.36	0.52	0.55			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	22.4	7.3	5.1	32.3			57.0	16.5		0.2	0.0
Delay (s)	11.5	40.8	17.0	19.5	49.1			90.5	48.5		27.3	25.1
Level of Service	B	D	B	B	D			F	D		C	C
Approach Delay (s)		31.0			36.3			68.4			27.1	
Approach LOS		C			D			E			C	

Intersection Summary			
HCM Average Control Delay	41.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	85.6%	ICU Level of Service	D
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0			3.0			3.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			1.00	
Frpb, ped/bikes		1.00	1.00		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.96			0.98	
Flt Protected		1.00	1.00		0.99			0.98			0.96	
Satd. Flow (prot)		3404	1524		3352			3176			1755	
Flt Permitted		1.00	1.00		0.99			0.71			0.96	
Satd. Flow (perm)		3404	1524		3352			2297			1755	
Volume (vph)	23	432	335	186	482	10	413	184	213	258	22	37
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	26	480	372	207	536	11	459	204	237	287	24	41
Lane Group Flow (vph)	0	506	372	0	754	0	0	900	0	0	352	0
Confl. Peds. (#/hr)						13			11			14
Heavy Vehicles (%)	2%	6%	6%	6%	6%	2%	6%	2%	6%	2%	2%	2%
Turn Type	Split		Free	Split			Perm			Perm		
Protected Phases	1	1		2	2			4			4	
Permitted Phases		1	Free		2		4			4	4	
Actuated Green, G (s)		16.7	90.0		25.5			34.3			34.3	
Effective Green, g (s)		18.2	90.0		27.0			35.8			35.8	
Actuated g/C Ratio		0.20	1.00		0.30			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		688	1524		1006			914			698	
v/s Ratio Prot		c0.15			c0.22						0.20	
v/s Ratio Perm			0.24					c0.39				
v/c Ratio		0.74	0.24		0.75			0.98			0.50	
Uniform Delay, d1		33.6	0.0		28.4			26.8			20.4	
Progression Factor		0.78	1.00		1.00			1.00			0.74	
Incremental Delay, d2		2.0	0.2		5.1			25.8			0.2	
Delay (s)		28.3	0.2		33.6			52.6			15.2	
Level of Service		C	A		C			D			B	
Approach Delay (s)		16.4			33.6			52.6			15.2	
Approach LOS		B			C			D			B	

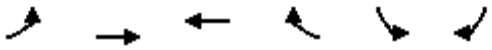
Intersection Summary			
HCM Average Control Delay	32.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	95.2%	ICU Level of Service	E
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	717	598	58	0	34
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	797	664	64	0	38
Pedestrians		21	13		7	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		2	1		1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		160	360			
pX, platoon unblocked	0.78				0.78	0.78
vC, conflicting volume	736				1481	692
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	661				1191	605
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	90
cM capacity (veh/h)	725				160	381

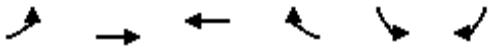
Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	797	664	64	38
Volume Left	0	0	0	0
Volume Right	0	0	64	38
cSH	1700	1700	1700	381
Volume to Capacity	0.47	0.39	0.04	0.10
Queue Length (ft)	0	0	0	8
Control Delay (s)	0.0	0.0	0.0	15.5
Lane LOS				C
Approach Delay (s)	0.0	0.0		15.5
Approach LOS				C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	57.5%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.96	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.92	
Flt Protected	0.95	1.00	1.00	1.00	0.98	
Satd. Flow (prot)	1805	1792	1792	1547	1695	
Flt Permitted	0.29	1.00	1.00	1.00	0.98	
Satd. Flow (perm)	548	1792	1792	1547	1695	
Volume (vph)	110	607	606	69	35	50
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	122	674	673	77	39	56
Lane Group Flow (vph)	122	674	673	77	95	0
Confl. Peds. (#/hr)	8			8	6	4
Heavy Vehicles (%)	0%	6%	6%	0%	0%	0%
Turn Type	Perm			Perm		
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	55.4	55.4	55.4	55.4	25.6	
Effective Green, g (s)	56.9	56.9	56.9	56.9	27.1	
Actuated g/C Ratio	0.63	0.63	0.63	0.63	0.30	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	346	1133	1133	978	510	
v/s Ratio Prot		c0.38	0.38		c0.06	
v/s Ratio Perm	0.22			0.05		
v/c Ratio	0.35	0.59	0.59	0.08	0.19	
Uniform Delay, d1	7.8	9.8	9.7	6.4	23.3	
Progression Factor	0.37	0.28	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.7	0.8	0.0	0.8	
Delay (s)	3.4	3.4	10.6	6.4	24.1	
Level of Service	A	A	B	A	C	
Approach Delay (s)		3.4	10.2		24.1	
Approach LOS		A	B		C	

Intersection Summary			
HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	65.5%	ICU Level of Service	B
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	642	597	44	0	78
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	713	663	49	0	87
Pedestrians		3	2		25	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		390	367			
pX, platoon unblocked					0.76	
vC, conflicting volume	737				1404	691
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	737				1532	691
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	80
cM capacity (veh/h)	860				96	437

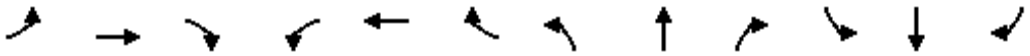
Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	713	663	49	87
Volume Left	0	0	0	0
Volume Right	0	0	49	87
cSH	1700	1700	1700	437
Volume to Capacity	0.42	0.39	0.03	0.20
Queue Length (ft)	0	0	0	18
Control Delay (s)	0.0	0.0	0.0	15.3
Lane LOS				C
Approach Delay (s)	0.0	0.0		15.3
Approach LOS				C

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	48.5%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	626	16	0	641	0	35
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	696	18	0	712	0	39
Pedestrians	3			2	40	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			0	3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	460			297		
pX, platoon unblocked			0.76		0.76	0.76
vC, conflicting volume			753		1451	738
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			677		1591	656
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	89
cM capacity (veh/h)			682		88	345

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	696	18	712	39
Volume Left	0	0	0	0
Volume Right	0	18	0	39
cSH	1700	1700	1700	345
Volume to Capacity	0.41	0.01	0.42	0.11
Queue Length (ft)	0	0	0	9
Control Delay (s)	0.0	0.0	0.0	16.7
Lane LOS				C
Approach Delay (s)	0.0		0.0	16.7
Approach LOS				C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	48.1%	ICU Level of Service	A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0			3.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		0.95	0.95			1.00	
Frpb, ped/bikes		0.97			1.00		1.00	1.00			0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00			1.00	
Frt		0.91			0.99		1.00	0.99			0.95	
Flt Protected		1.00			1.00		0.95	0.99			1.00	
Satd. Flow (prot)		1635			1824		1681	1721			1744	
Flt Permitted		0.96			0.96		0.95	0.99			1.00	
Satd. Flow (perm)		1582			1759		1681	1721			1744	
Volume (vph)	28	89	257	20	220	28	134	73	10	6	40	26
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	31	99	286	22	244	31	149	81	11	7	44	29
Lane Group Flow (vph)	0	416	0	0	297	0	118	123	0	0	80	0
Confl. Peds. (#/hr)			11			4			1			6
Turn Type	Perm			Perm			Split			Split		
Protected Phases		2			6		8	8		7	7	
Permitted Phases	2			6								
Actuated Green, G (s)		56.7			56.5		11.8	11.8			8.7	
Effective Green, g (s)		58.3			58.3		12.8	12.8			9.9	
Actuated g/C Ratio		0.65			0.65		0.14	0.14			0.11	
Clearance Time (s)		4.6			4.8		4.0	4.0			4.2	
Vehicle Extension (s)		2.0			2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		1025			1139		239	245			192	
v/s Ratio Prot							0.07	c0.07			c0.05	
v/s Ratio Perm		c0.26			0.17							
v/c Ratio		0.41			0.26		0.49	0.50			0.42	
Uniform Delay, d1		7.6			6.7		35.6	35.7			37.4	
Progression Factor		1.00			1.00		0.56	0.54			1.00	
Incremental Delay, d2		1.2			0.0		0.3	0.3			0.5	
Delay (s)		8.8			6.8		20.2	19.5			37.9	
Level of Service		A			A		C	B			D	
Approach Delay (s)		8.8			6.8			19.8			37.9	
Approach LOS		A			A			B			D	

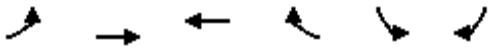
Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	B

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	550	51	0	524	0	122
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	611	57	0	582	0	136
Pedestrians					38	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					3	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	243			551		
pX, platoon unblocked			0.78		0.78	0.78
vC, conflicting volume			706		1231	649
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			621		1298	548
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	67
cM capacity (veh/h)			729		135	406

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	611	57	582	136
Volume Left	0	0	0	0
Volume Right	0	57	0	136
cSH	1700	1700	1700	406
Volume to Capacity	0.36	0.03	0.34	0.33
Queue Length (ft)	0	0	0	36
Control Delay (s)	0.0	0.0	0.0	18.3
Lane LOS				C
Approach Delay (s)	0.0		0.0	18.3
Approach LOS				C

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	47.2%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	672	451	57	0	73
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	747	501	63	0	81
Pedestrians					63	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					5	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		393	401			
pX, platoon unblocked					0.78	
vC, conflicting volume	627				1342	596
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	627				1439	596
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	83
cM capacity (veh/h)	914				109	481

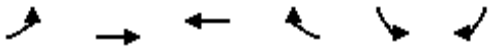
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	747	564	81
Volume Left	0	0	0
Volume Right	0	63	81
cSH	1700	1700	481
Volume to Capacity	0.44	0.33	0.17
Queue Length (ft)	0	0	15
Control Delay (s)	0.0	0.0	14.0
Lane LOS			B
Approach Delay (s)	0.0	0.0	14.0
Approach LOS			B

Intersection Summary			
Average Delay		0.8	
Intersection Capacity Utilization		42.6%	ICU Level of Service A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	597	75	0	508	0	76
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	663	83	0	564	0	84
Pedestrians				1	52	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	4	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	523			271		
pX, platoon unblocked			0.82		0.82	0.82
vC, conflicting volume			799		1280	716
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			753		1343	652
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	77
cM capacity (veh/h)			676		132	367

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	663	83	564	84
Volume Left	0	0	0	0
Volume Right	0	83	0	84
cSH	1700	1700	1700	367
Volume to Capacity	0.39	0.05	0.33	0.23
Queue Length (ft)	0	0	0	22
Control Delay (s)	0.0	0.0	0.0	17.7
Lane LOS				C
Approach Delay (s)	0.0		0.0	17.7
Approach LOS				C

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	47.2%	ICU Level of Service	A



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.84	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.96	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1683	1792	1792	1277	1644	
Flt Permitted	0.33	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	587	1792	1792	1277	1644	
Volume (vph)	68	618	517	110	189	82
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	76	687	574	122	210	91
Lane Group Flow (vph)	76	687	574	122	301	0
Confl. Peds. (#/hr)	58			58	13	6
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%
Turn Type	pm+pt			Perm		
Protected Phases	5	2	6		4	
Permitted Phases	2			6		
Actuated Green, G (s)	61.6	61.2	50.7	50.7	19.0	
Effective Green, g (s)	63.1	63.1	52.6	52.6	20.9	
Actuated g/C Ratio	0.70	0.70	0.58	0.58	0.23	
Clearance Time (s)	4.5	4.9	4.9	4.9	4.9	
Vehicle Extension (s)	3.0	2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	503	1256	1047	746	382	
v/s Ratio Prot	0.01	c0.38	0.32		c0.18	
v/s Ratio Perm	0.09			0.10		
v/c Ratio	0.15	0.55	0.55	0.16	0.79	
Uniform Delay, d1	10.5	6.5	11.4	8.6	32.5	
Progression Factor	0.51	0.48	0.27	0.10	1.00	
Incremental Delay, d2	0.0	0.6	1.9	0.4	9.6	
Delay (s)	5.4	3.7	5.0	1.3	42.0	
Level of Service	A	A	A	A	D	
Approach Delay (s)		3.9	4.3		42.0	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	686	92	0	599	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	762	102	0	666	0	0
Pedestrians					120	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					10	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	259			90		
pX, platoon unblocked			0.69		0.79	0.69
vC, conflicting volume			984		1599	933
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			977		1381	903
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			442		114	210

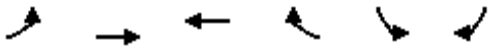
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	864	666	0
Volume Left	0	0	0
Volume Right	102	0	0
cSH	1700	1700	1700
Volume to Capacity	0.51	0.39	0.00
Queue Length (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	50.4%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	660	116	0	626	0	96
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	733	129	0	696	0	107
Pedestrians				4	63	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				0	5	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	150			636		
pX, platoon unblocked			0.81		0.84	0.81
vC, conflicting volume			925		1556	865
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			908		1329	834
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	63
cM capacity (veh/h)			585		138	285

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	862	696	107
Volume Left	0	0	0
Volume Right	129	0	107
cSH	1700	1700	285
Volume to Capacity	0.51	0.41	0.37
Queue Length (ft)	0	0	42
Control Delay (s)	0.0	0.0	25.0
Lane LOS			C
Approach Delay (s)	0.0	0.0	25.0
Approach LOS			C

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	61.6%	ICU Level of Service	B



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	756	597	27	0	29
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	0	840	663	30	0	32
Pedestrians		2			6	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		4.0			4.0	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		370	416			
pX, platoon unblocked	0.75				0.83	0.75
vC, conflicting volume	699				1509	671
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	599				1319	561
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	92
cM capacity (veh/h)	736				145	395

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	840	663	30	32
Volume Left	0	0	0	0
Volume Right	0	0	30	32
cSH	1700	1700	1700	395
Volume to Capacity	0.49	0.39	0.02	0.08
Queue Length (ft)	0	0	0	7
Control Delay (s)	0.0	0.0	0.0	14.9
Lane LOS				B
Approach Delay (s)	0.0	0.0		14.9
Approach LOS				B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	54.9%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	688	68	0	624	0	13
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (veh/h)	764	76	0	693	0	14
Pedestrians	2				8	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	0				1	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	490			296		
pX, platoon unblocked			0.84		0.82	0.84
vC, conflicting volume			848		1506	810
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			820		1328	775
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			685		141	336

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	840	693	14
Volume Left	0	0	0
Volume Right	76	0	14
cSH	1700	1700	336
Volume to Capacity	0.49	0.41	0.04
Queue Length (ft)	0	0	3
Control Delay (s)	0.0	0.0	16.2
Lane LOS			C
Approach Delay (s)	0.0	0.0	16.2
Approach LOS			C

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	54.9%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	
Lane Util. Factor		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00	0.98	1.00		1.00	1.00	0.99	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Frt		0.99		1.00	1.00	0.85	1.00		0.85	1.00	0.92	
Flt Protected		1.00		0.95	1.00	1.00	0.95		1.00	0.95	1.00	
Satd. Flow (prot)		1829		1769	1863	1547	1764		1583	1770	1682	
Flt Permitted		1.00		0.17	1.00	1.00	0.55		1.00	0.95	1.00	
Satd. Flow (perm)		1829		320	1863	1547	1013		1583	1770	1682	
Volume (vph)	0	291	35	365	244	537	35	0	125	597	94	121
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	323	39	406	271	597	39	0	139	663	104	134
Lane Group Flow (vph)	0	362	0	406	271	597	39	0	139	663	238	0
Confl. Peds. (#/hr)	3		6	3		6	4					4
Turn Type				pm+pt		Free	custom		custom	Perm		
Protected Phases		4		3	8						6	
Permitted Phases				8		Free	2		2	6		
Actuated Green, G (s)		18.8		41.2	41.2	90.0	39.8		39.8	39.8	39.8	
Effective Green, g (s)		20.3		42.7	42.7	90.0	41.3		41.3	41.3	41.3	
Actuated g/C Ratio		0.23		0.47	0.47	1.00	0.46		0.46	0.46	0.46	
Clearance Time (s)		4.5		4.5	4.5		4.5		4.5	4.5	4.5	
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		413		464	884	1547	465		726	812	772	
v/s Ratio Prot		0.20		c0.19	0.15						0.14	
v/s Ratio Perm				c0.23		0.39	0.04		0.09	c0.37		
v/c Ratio		0.88		0.88	0.31	0.39	0.08		0.19	0.82	0.31	
Uniform Delay, d1		33.6		22.0	14.5	0.0	13.7		14.4	21.1	15.3	
Progression Factor		1.00		1.00	1.00	1.00	1.00		1.00	0.63	0.53	
Incremental Delay, d2		18.4		16.6	0.2	0.7	0.4		0.6	4.7	0.2	
Delay (s)		52.0		38.6	14.7	0.7	14.1		15.0	18.0	8.3	
Level of Service		D		D	B	A	B		B	B	A	
Approach Delay (s)		52.0			15.8			14.8			15.4	
Approach LOS		D			B			B			B	

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	88.7%	ICU Level of Service	D

c Critical Lane Group

Appendix J
VISSIM Reports

PM System Summary

MOE / SCENARIO	Intersection Delay (sec/veh)	Conflicting Delay (sec/veh)	Travel Time (minutes)						Delay (sec/veh)						Stops (#/veh)					
			EB			WB			EB			WB			EB			WB		
			Rt 7	Rt 908	PrT	Rt 7	Rt 908	PrT	Rt 7	Rt 908	PrT	Rt 7	Rt 908	PrT	Rt 7	Rt 908	PrT	Rt 7	Rt 908	PrT
2004 NO BUILD	24.0	32.1	10.1	10.9	7.0	10.2	10.1	7.1	214.5	255.1	179.4	256.5	265.1	181.4	6.5	6.2	5.1	6.2	6.3	5.9
2030 NO BUILD	52.7	70.8	17.8	17.9	15.1	12.3	11.8	9.7	603.7	579.7	609.3	346.9	358.3	318.8	14.3	12.4	13.1	7.7	7.6	7.9
2030 BUILD	61.8	86.3	15.1	16.7	21.4	9.8	9.1	11.2	484.3	539.6	934.5	241.2	242.0	405.4	15.3	14.0	22.6	7.2	7.0	14.6
2030 BUILD PLUS 1	46.9	70.8	10.3	10.5	13.5	9.7	8.9	8.4	250.7	286.2	530.3	240.8	233.9	246.6	6.6	6.0	11.9	5.5	5.9	6.2
2030 BUILD PLUS 2	47.8	73.3	9.3	9.3	12.5	9.8	9.4	8.7	187.6	220.1	463.6	239.3	259.2	268.8	5.6	5.2	9.7	5.3	6.1	6.5
2030 BUILD PLUS 3	48.5	74.1	9.3	9.5	13.4	9.6	9.1	8.8	182.4	227.3	484.2	236.5	245.0	272.0	5.7	5.2	10.0	5.4	6.3	6.4
2030 BUILD PLUS 4	35.4	55.9	9.1	8.5	9.8	9.7	9.1	7.1	182.8	186.7	330.5	236.9	247.7	174.9	5.6	4.7	7.6	5.3	6.3	4.9
2030 BUILD PLUS 5	37.2	59.3	10.2	10.1	9.9	9.3	9.1	8.2	240.6	262.9	316.6	216.7	243.8	237.6	6.3	6.2	7.2	4.9	6.0	5.8
2030 BUILD PLUS 6	31.9	52.8	9.6	9.8	9.5	9.7	9.1	7.1	186.0	221.8	316.3	232.3	240.7	172.5	5.2	5.3	7.4	5.5	6.1	4.8
2030 BUILD PLUS 3A	40.1	60.7	9.1	8.4	11.9	9.8	9.0	6.9	179.5	175.2	442.6	231.6	238.0	170.2	5.4	4.8	9.7	5.4	5.8	4.8
2030 BUILD PLUS 5A	35.9	58.9	9.7	9.4	8.9	9.5	9.0	9.0	212.8	226.7	282.6	222.5	240.3	280.6	5.2	5.5	6.3	5.2	5.9	6.6
2030 BUILD PLUS 5B	37.8	56.1	10.8	10.7	11.7	9.6	8.9	7.1	298.6	312.4	470.0	241.7	240.9	176.8	7.5	7.0	10.5	5.3	5.8	4.8

AM System Summary

MOE / SCENARIO	Intersection Delay (sec/veh)	Conflicting Delay (sec/veh)	Travel Time (minutes)						Delay (sec/veh)						Stops (#/veh)					
			EB			WB			EB			WB			EB			WB		
			Rt 7	Rt 908	PrT	Rt 7	Rt 908	PrT	Rt 7	Rt 908	PrT	Rt 7	Rt 908	PrT	Rt 7	Rt 908	PrT	Rt 7	Rt 908	PrT
2004 NO BUILD	14.7	23.0	7.6	7.4	5.6	9.5	8.1	5.9	130.1	152.2	100.7	198.0	177.8	109.9	4.5	4.9	3.8	5.2	5.4	4.0
2030 NO BUILD	22.9	32.0	8.8	8.3	7.1	10.4	8.8	6.5	187.9	186.7	178.5	226.6	216.0	155.2	5.6	5.3	5.8	5.9	6.5	4.8
2030 BUILD	40.6	59.7	8.4	7.8	7.4	13.6	13.0	14.3	156.5	147.0	192.1	437.0	472.2	577.5	5.1	4.2	5.7	11.9	12.1	18.6
2030 BUILD PLUS 1	23.6	47.9	8.1	7.2	7.8	9.2	7.9	5.5	143.6	122.5	216.7	207.9	163.8	88.6	5.0	3.5	6.6	4.1	2.9	2.7
2030 BUILD PLUS 2	23.6	47.9	8.1	7.2	7.8	9.2	7.9	5.5	143.6	122.5	216.7	207.9	163.8	88.6	5.0	3.5	6.6	4.1	2.9	2.7
2030 BUILD PLUS 3	23.3	48.5	7.9	7.1	8.2	9.3	8.2	5.6	133.2	115.5	237.6	213.7	179.7	91.1	4.4	3.3	6.9	4.0	3.1	2.8
2030 BUILD PLUS 4	22.3	46.4	7.8	7.0	7.7	9.5	7.8	5.5	128.1	118.2	205.6	223.2	156.2	90.7	4.7	3.7	6.2	4.4	2.7	2.9
2030 BUILD PLUS 5	23.6	48.5	8.0	7.4	8.0	9.2	7.8	5.5	125.9	129.4	227.3	208.0	158.7	88.7	4.2	3.7	6.7	3.9	2.8	2.7
2030 BUILD PLUS 6	20.9	43.5	7.4	7.1	7.6	9.1	7.5	5.4	111.9	109.5	202.3	204.2	139.3	78.8	4.1	3.1	6.0	3.6	2.7	2.7
2030 BUILD PLUS 3A	23.1	46.9	8.0	7.1	8.2	9.3	7.9	5.5	135.5	129.0	233.5	211.0	165.5	88.3	4.4	4.1	7.1	4.2	2.9	2.7
2030 BUILD PLUS 5A	23.9	48.8	8.1	7.3	8.1	9.0	8.0	5.5	133.2	125.5	231.1	196.0	168.4	90.0	4.7	3.7	6.7	3.8	3.1	2.8
2030 BUILD PLUS 5B	22.6	46.4	8.0	7.3	7.7	9.1	7.8	5.5	134.5	130.3	210.6	203.9	158.7	86.3	4.6	3.7	6.2	4.0	3.1	2.8

MOE - 2010 AM BUILD

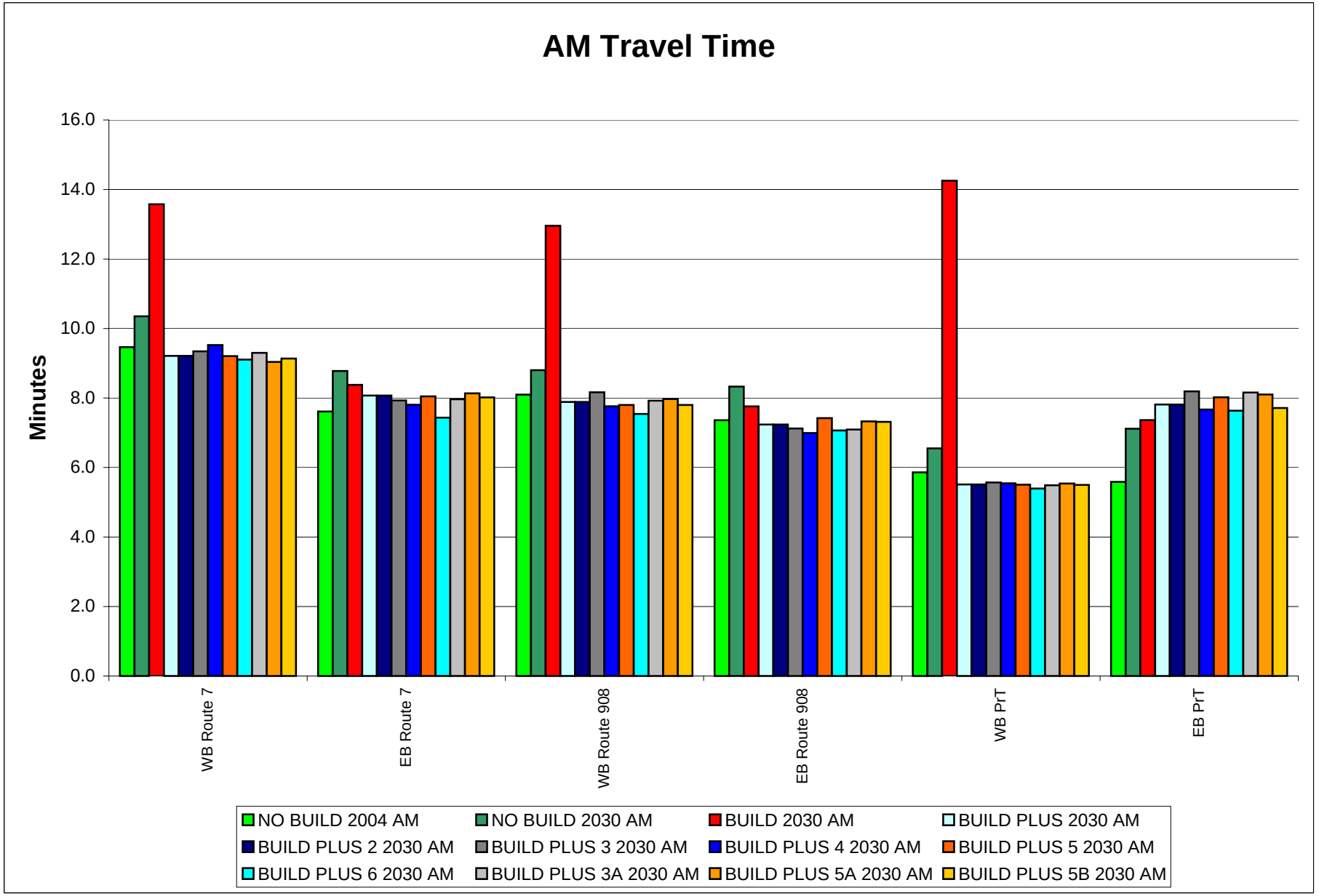
#	Intersection	Intersection Delay (sec/veh)	Intersection LOS	Bus Delay (sec/bus)	Concurrent Delay (sec/veh)	Conflicting Delay (sec/veh)	Person Delay (sec/veh)	Stops (#/veh)
University								
78	Park	29.8	C	43.6	24.4	37.4	34.3	0.7
79	Florida	9.6	A	8.2	4.2	38.7	9.3	0.4
80	Mississippi	14.4	B	8.2	6.6	50.6	12.5	0.5
81	Texas	19.0	B	4.8	22.2	10.9	15.2	0.7
77	Arnold	8.7	A	0.9	5.8	41.2	6.2	0.4
108	Oregon	3.5	A	4.4	3.2	35.4	3.9	0.2
82	Utah	19.6	B	15.0	14.1	44.4	18.4	0.6
83	30th	25.0	C	28.0	12.6	44.2	26.8	0.6
174	Ohio	7.0	A	7.0	0.7	42.0	6.2	0.2
84	Grim	4.1	A	4.1	0.5	39.6	3.6	0.1
85	Illinois	4.8	A	4.8	2.4	24.1	4.3	0.2
86	32nd	23.3	C	23.3	14.4	45.0	20.5	0.8
87	Boundary	26.0	C	26.0	23.9	32.6	24.6	0.8
88	Wabash	35.5	D	35.5	32.1	40.1	38.1	0.8

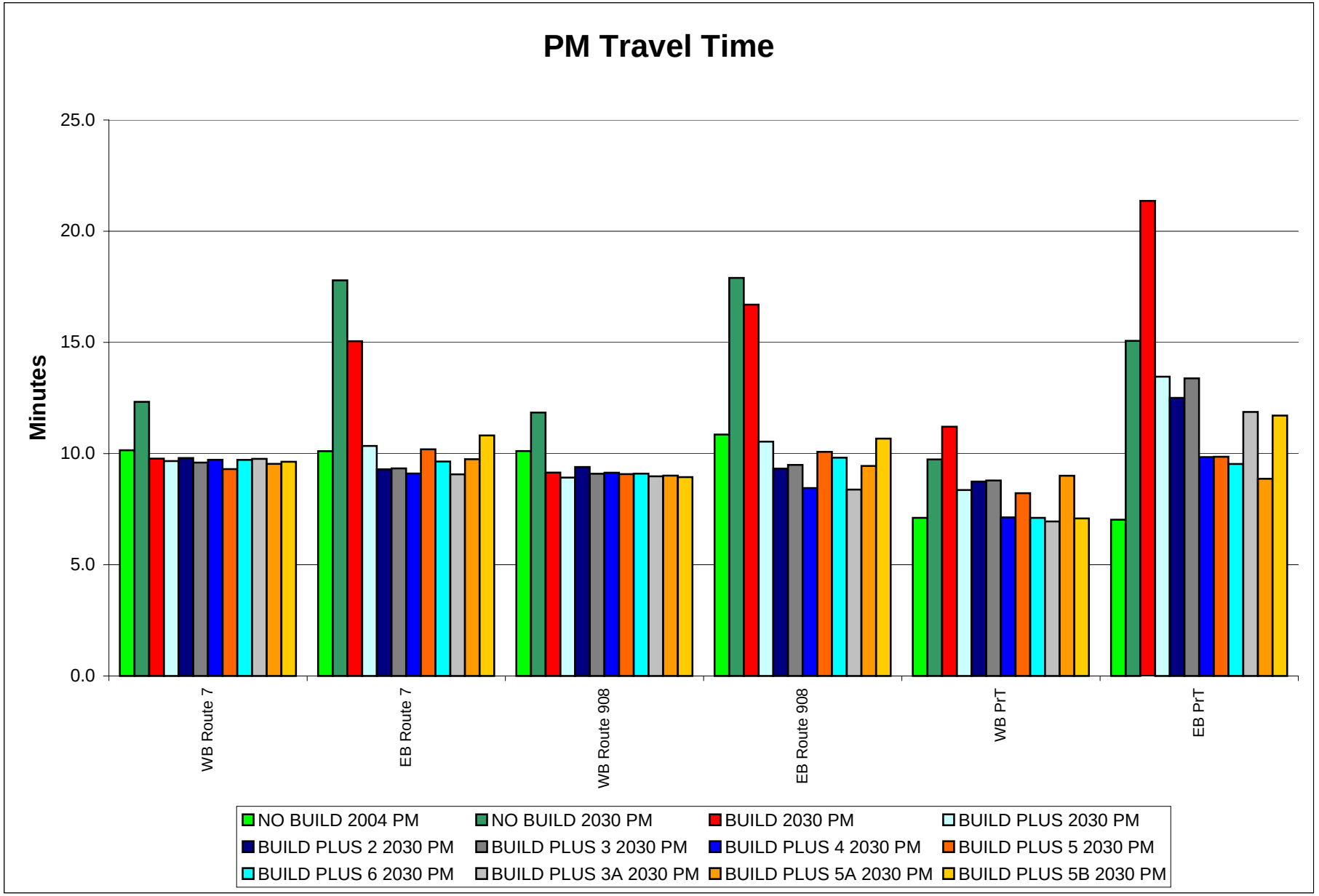
System

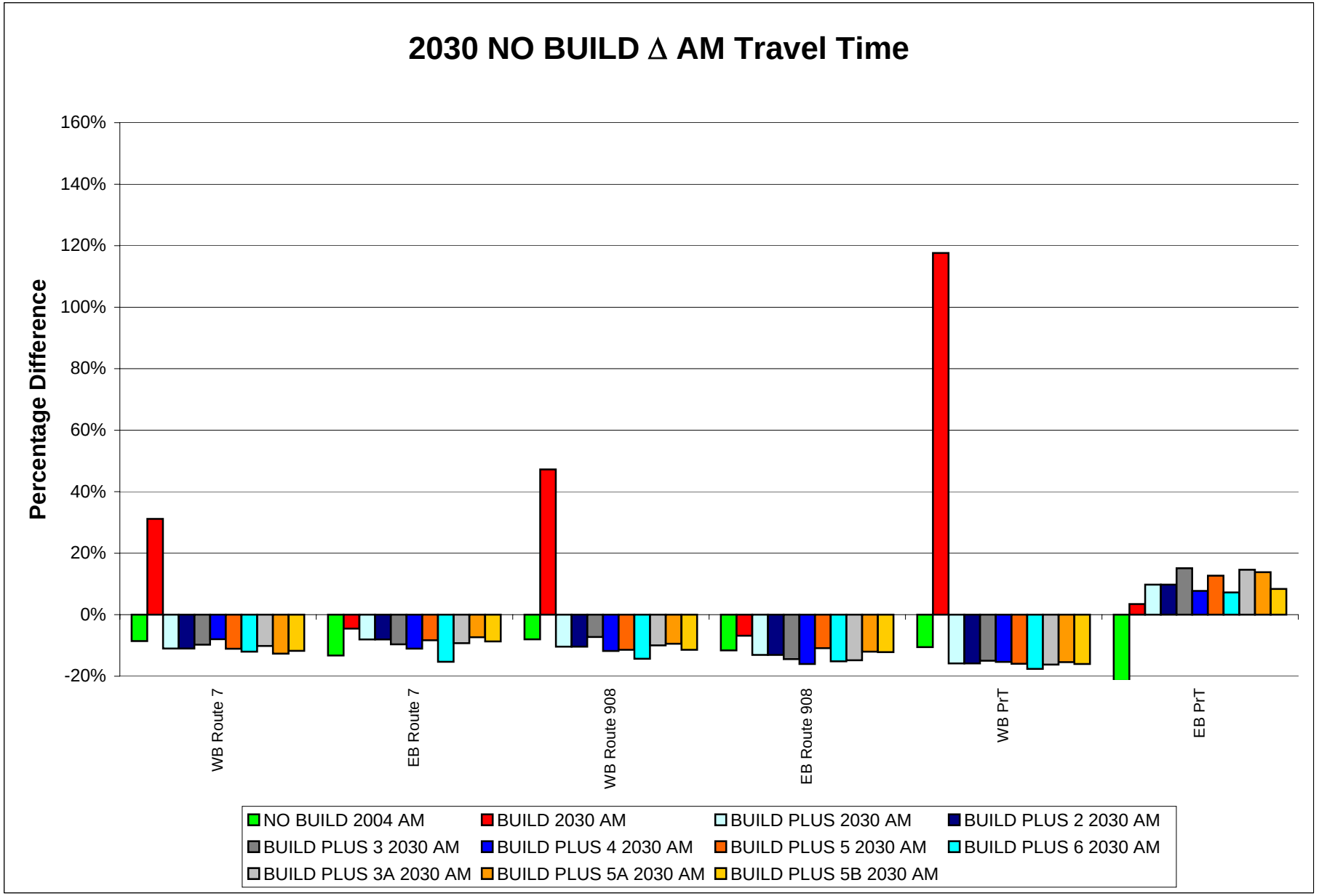
		Travel Time - sec	Travel Time - min	Delay, sec/veh	Stops, #/veh
WB	Bus - Route 7	511.6	8.5	160.4	4.0
EB	Bus - Route 7	455.2	7.6	109.1	4.1
WB	Bus - Route 908	411.5	6.9	116.2	2.6
EB	Bus - Route 908	431.2	7.2	113.0	3.4
WB	PrT	341.9	5.7	96.5	3.2
EB	PrT	403.1	6.7	152.3	4.7
	Average Intersection Delay			19.6	
	Average Conflicting Delay			40.9	

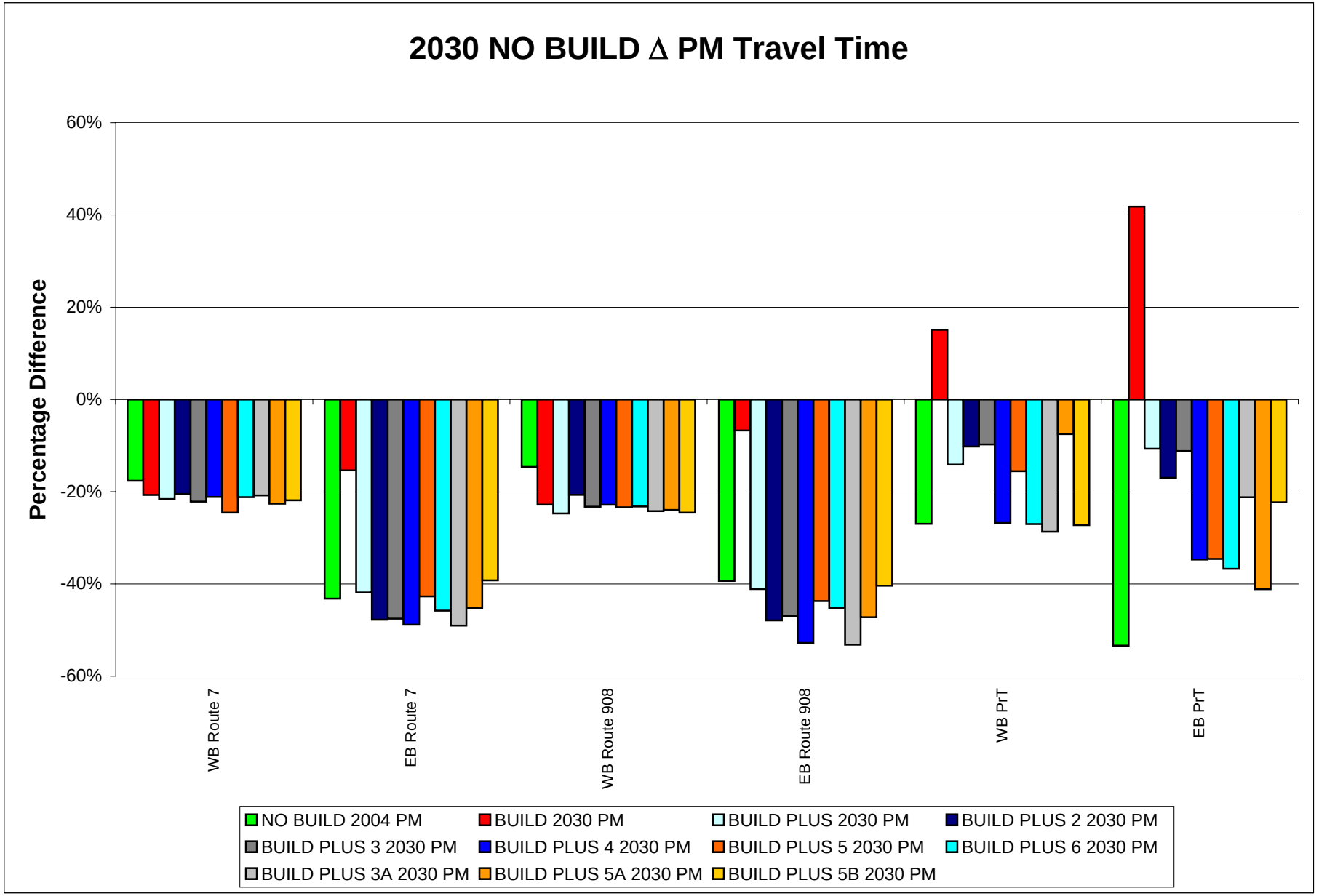
MOE - 2010 PM BUILD

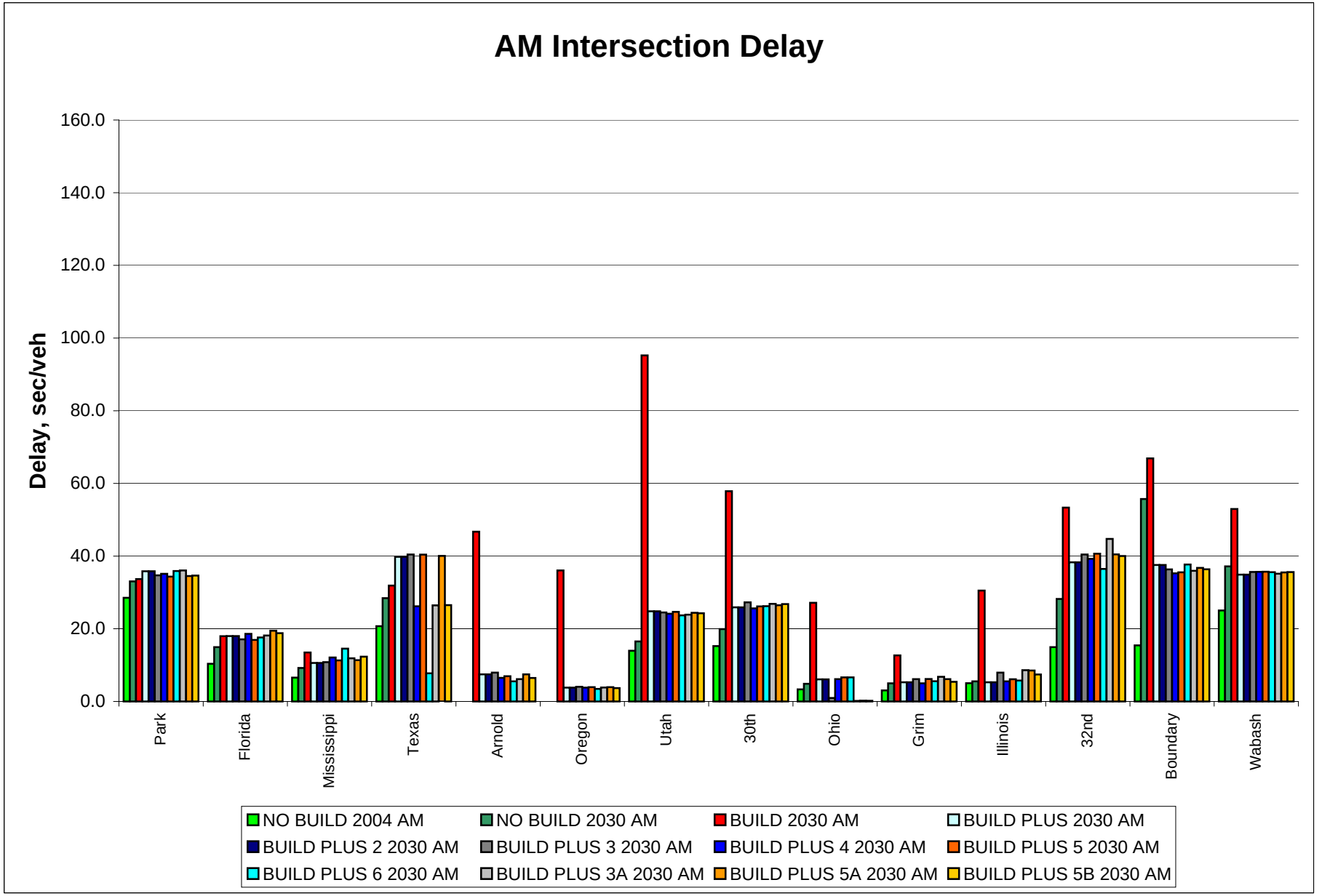
#	Intersection	Intersection Delay (sec/veh)	Intersection LOS	Bus Delay (sec/bus)	Concurrent Delay (sec/veh)	Conflicting Delay (sec/veh)	Person Delay (sec/veh)	Stops (#/veh)
University								
78	Park	76.4	E	84.1	84.5	67.7	77.5	1.4
79	Florida	80.7	F	47.3	75.7	95.5	74.1	2.5
80	Mississippi	38.2	D	17.9	37.9	39.8	33.2	1.2
81	Texas	55.2	E	7.4	58.7	47.9	44.8	1.8
77	Arnold	22.6	C	3.4	22.5	23.7	17.0	1.1
108	Oregon	12.3	B	5.7	11.5	25.5	10.4	0.6
82	Utah	42.3	D	23.4	20.9	114.1	37.4	0.8
83	30th	48.1	D	48.0	19.4	83.0	47.6	1.2
174	Ohio	12.4	B	12.4	4.1	35.8	10.7	0.4
84	Grim	4.7	A	4.7	2.1	35.5	3.8	0.2
85	Illinois	6.6	A	6.6	4.4	22.8	5.5	0.3
86	32nd	22.8	C	22.8	20.4	29.9	21.0	0.8
87	Boundary	30.6	C	30.6	27.7	35.9	28.1	1.1
88	Wabash	26.5	C	26.5	25.8	27.3	27.7	0.8
System								
		Travel Time - sec	Travel Time - min	Delay, sec/veh	Stops, #/veh			
WB	Bus - Route 7	512.4	8.5	169.2	4.4			
EB	Bus - Route 7	588.9	9.8	215.5	7.7			
WB	Bus - Route 908	482.1	8.0	174.4	5.1			
EB	Bus - Route 908	624.5	10.4	275.9	8.2			
WB	PrT	497.1	8.3	238.2	8.4			
EB	PrT	671.1	11.2	399.5	11.1			
	Average Intersection Delay			39.5				
	Average Conflicting Delay			57.8				

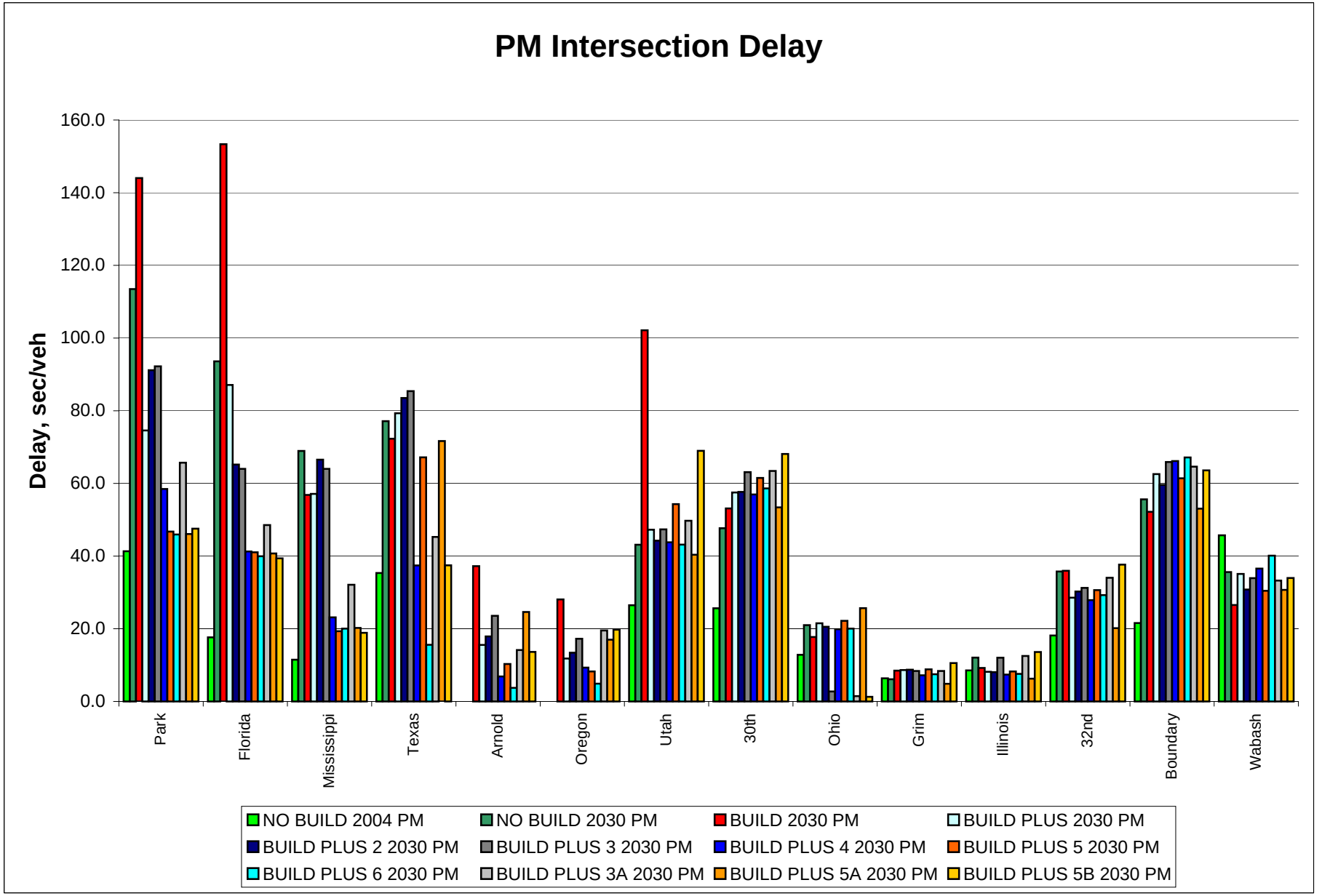

AM Travel Time
Minutes
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
WB Route 7
EB Route 7
WB Route 908
EB Route 908
WB PrT
EB PrT
NO BUILD 2004 AM
NO BUILD 2030 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM

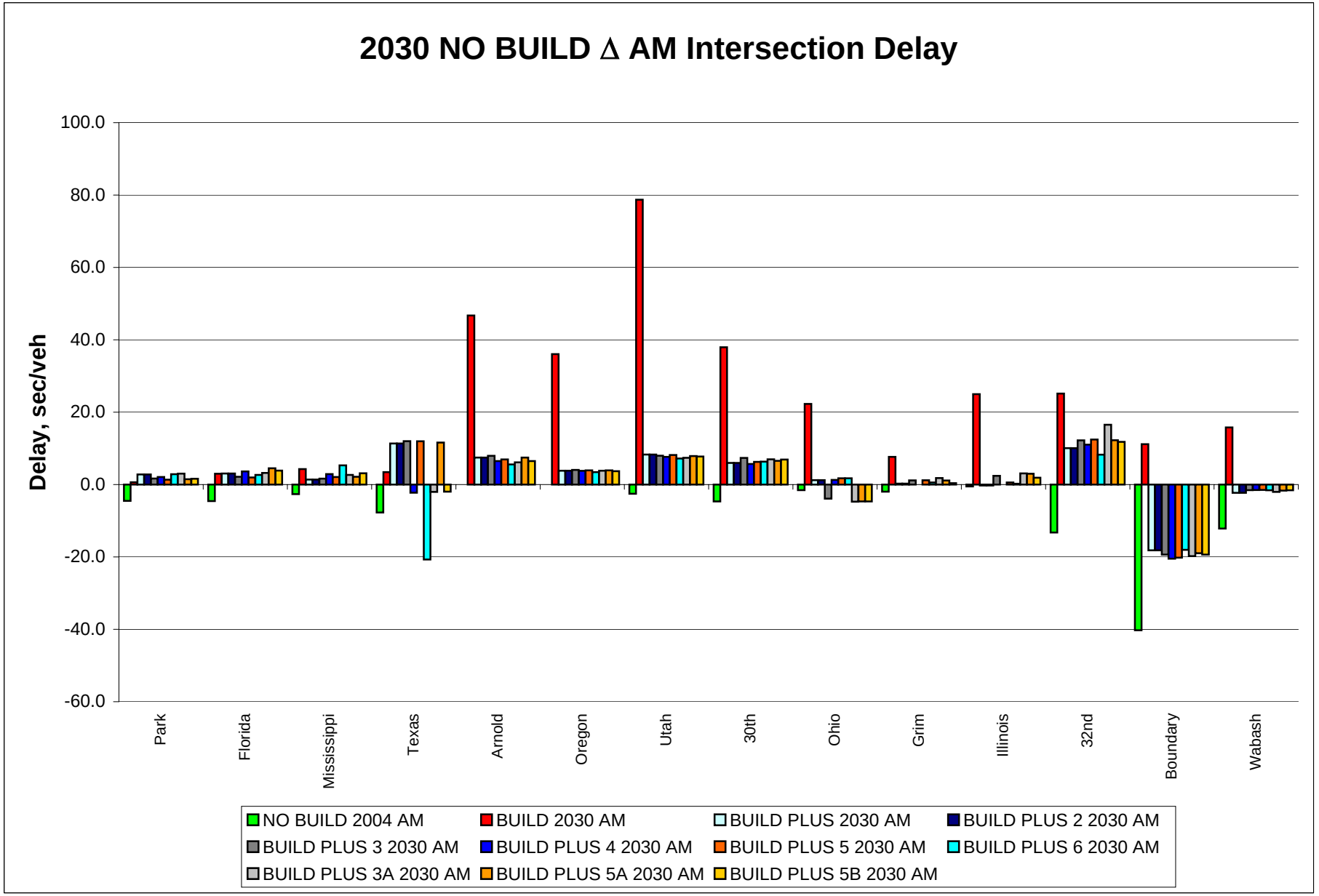

PM Travel Time
Minutes
25.0
20.0
15.0
10.0
5.0
0.0
WB Route 7
EB Route 7
WB Route 908
EB Route 908
WB PrT
EB PrT
NO BUILD 2004 PM
NO BUILD 2030 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM

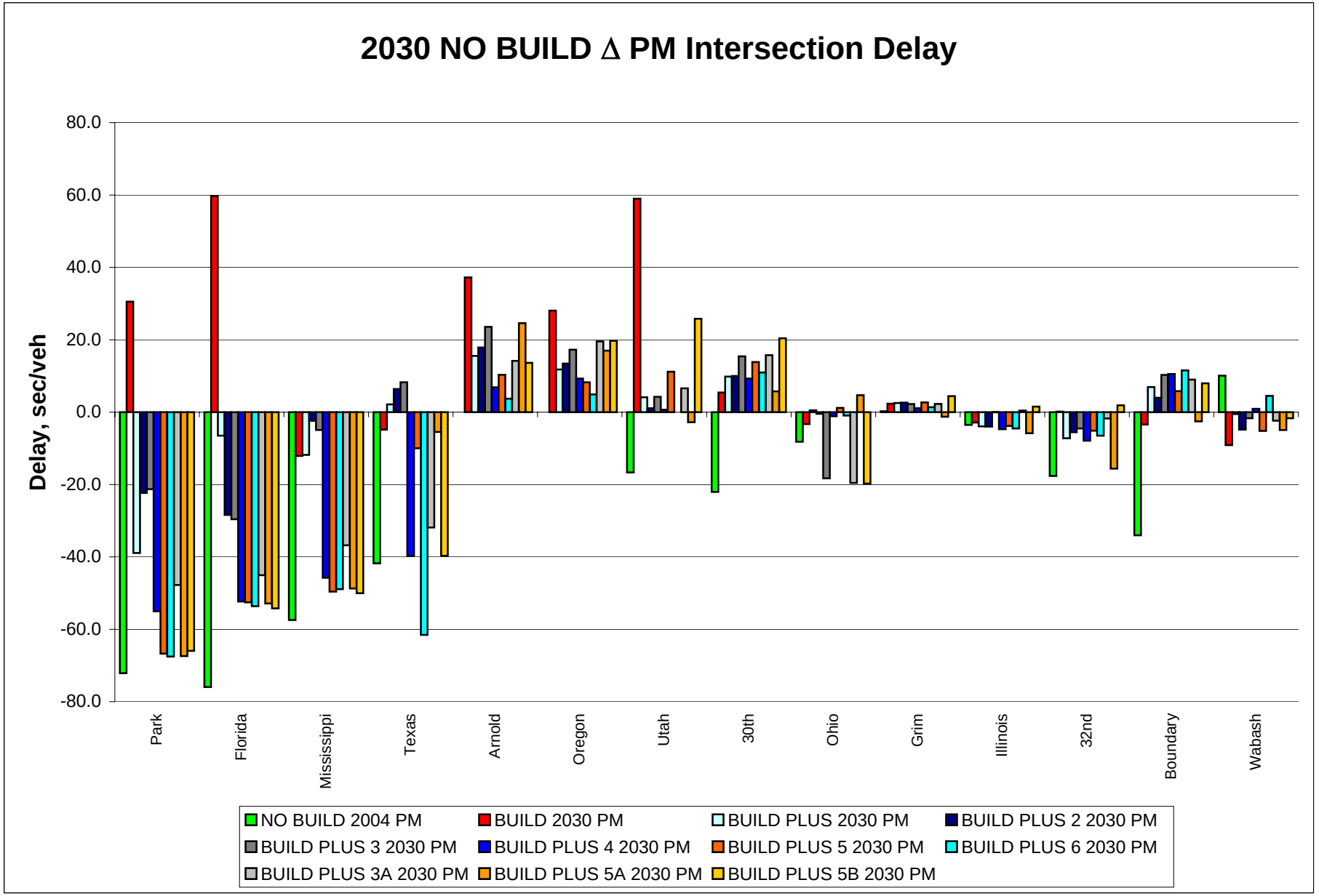

2030 NO BUILD Δ AM Travel Time
Percentage Difference
160%
140%
120%
100%
80%
60%
40%
20%
0%
-20%
WB Route 7
EB Route 7
WB Route 908
EB Route 908
WB PrT
EB PrT
NO BUILD 2004 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM

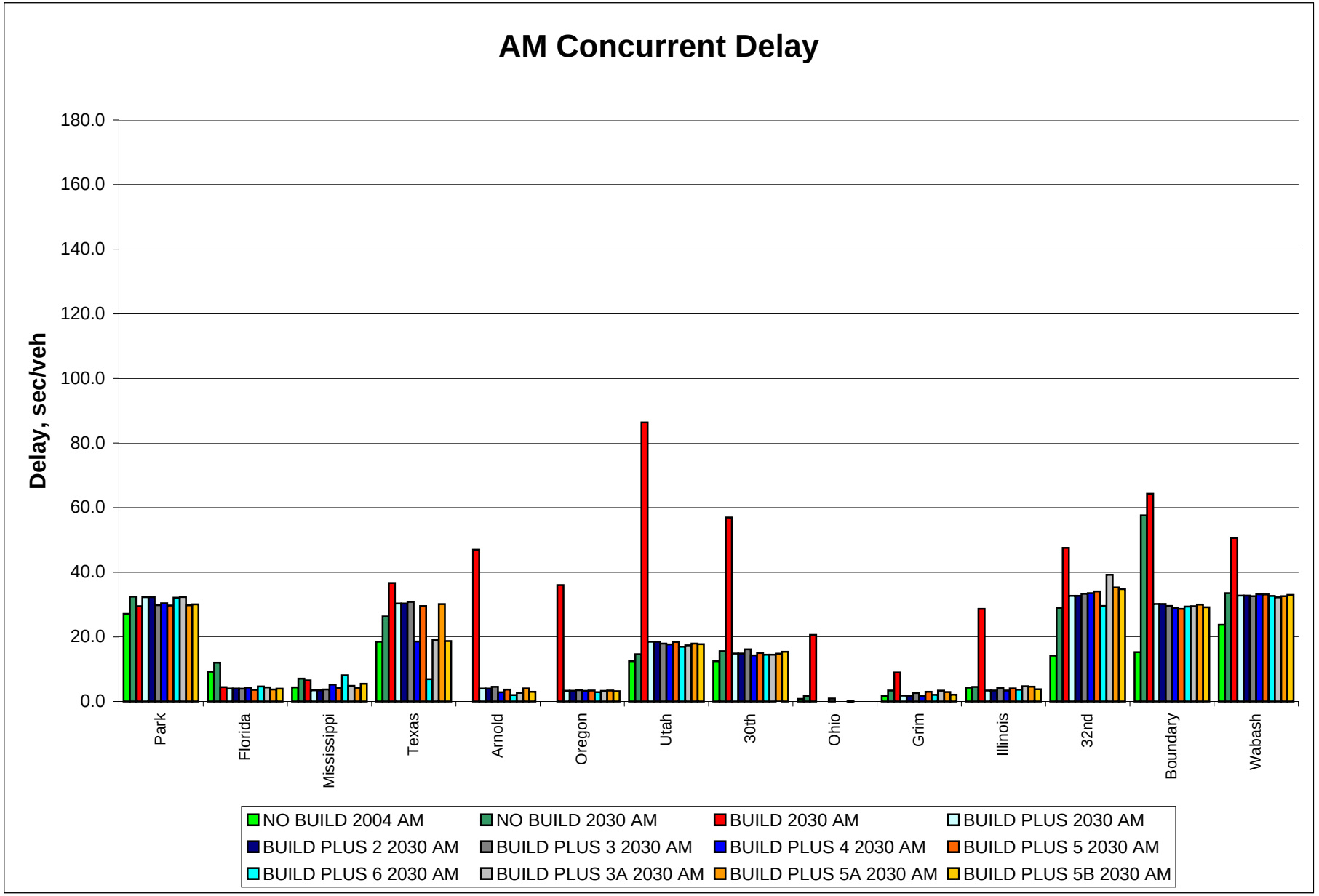

2030 NO BUILD Δ PM Travel Time
Percentage Difference
60%
40%
20%
0%
-20%
-40%
-60%
WB Route 7
EB Route 7
WB Route 908
EB Route 908
WB PrT
EB PrT
NO BUILD 2004 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM

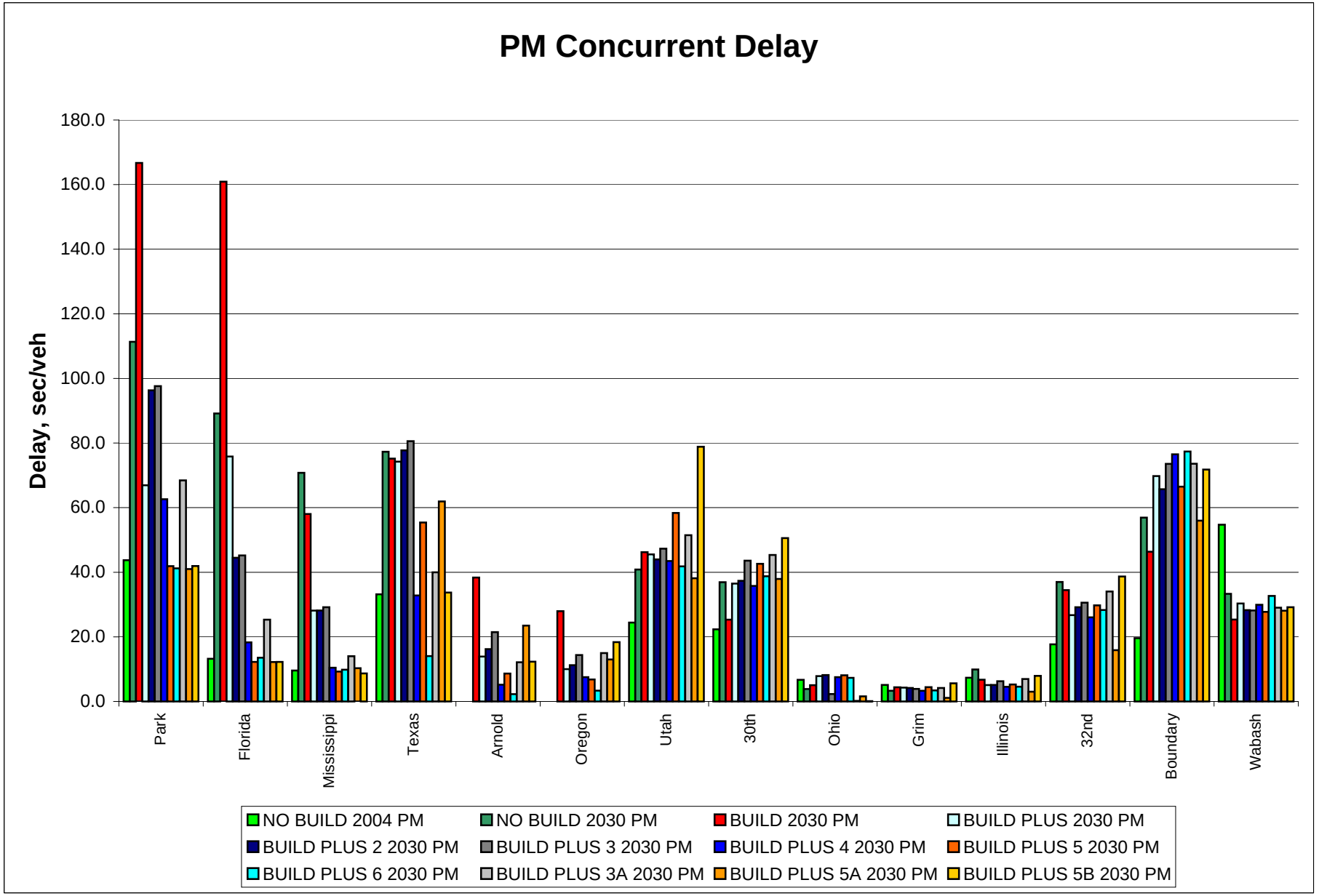

AM Intersection Delay
Delay, sec/veh
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 AM
NO BUILD 2030 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM

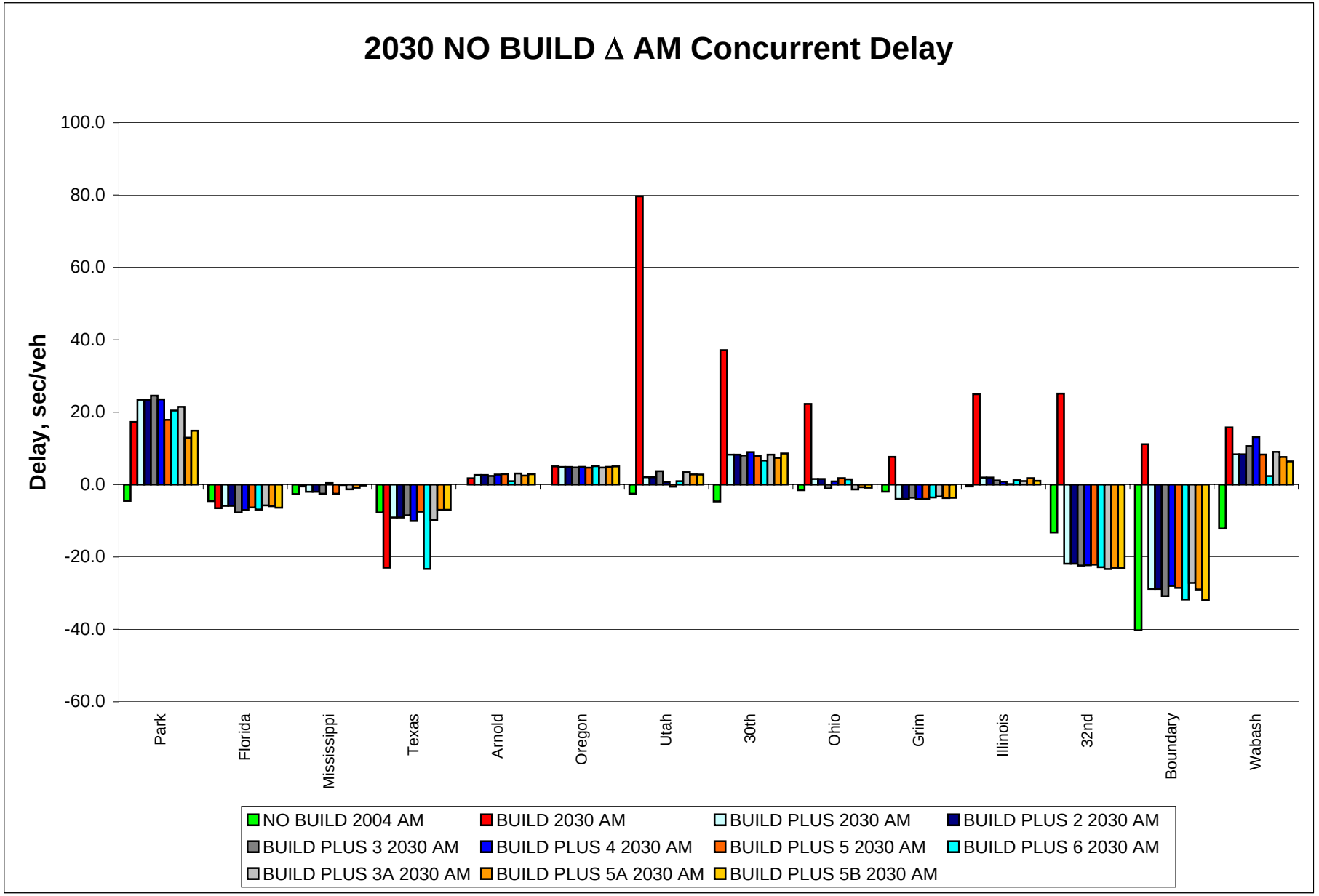

PM Intersection Delay
Delay, sec/veh
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 PM
NO BUILD 2030 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM


2030 NO BUILD Δ AM Intersection Delay
Delay, sec/veh
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM

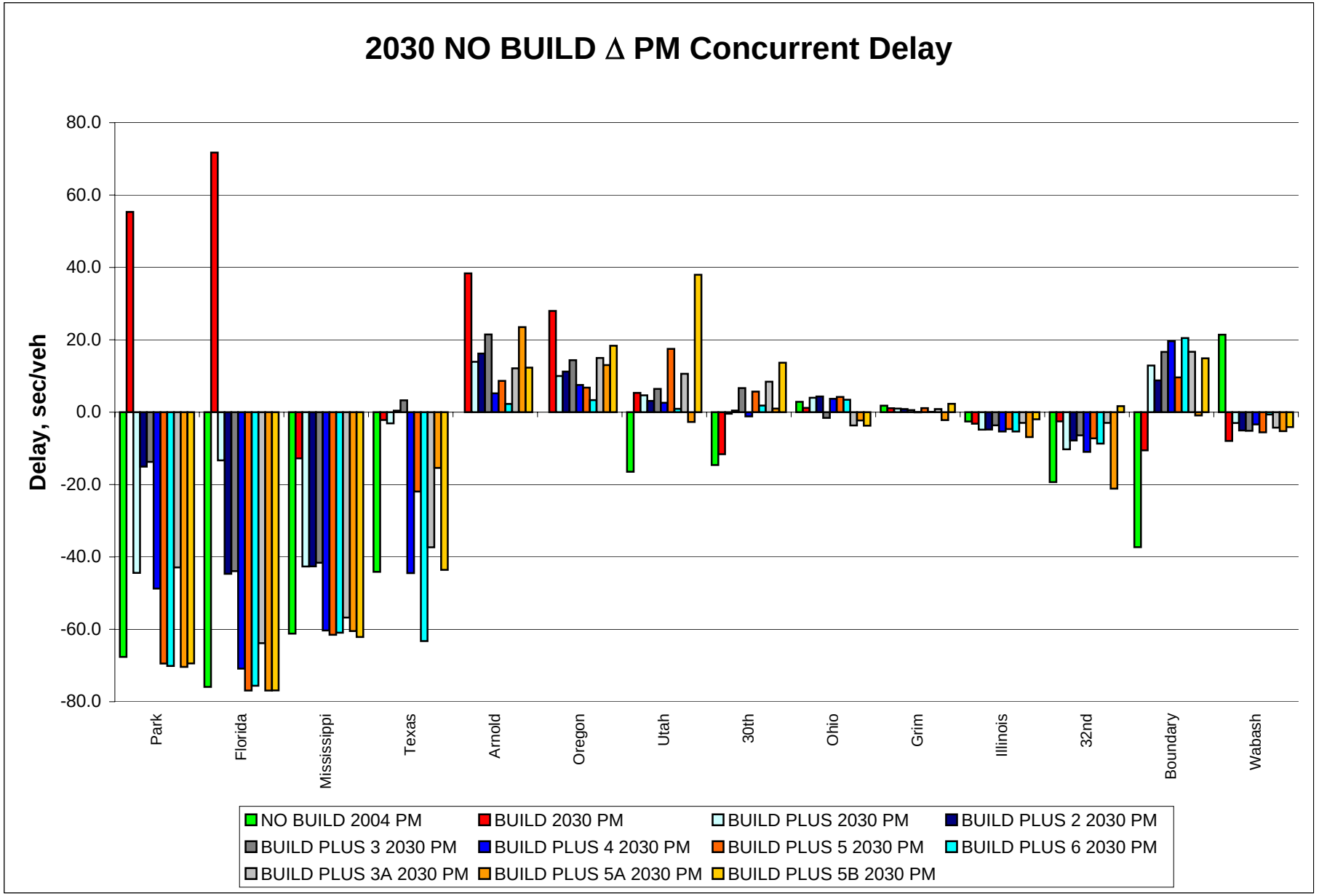

2030 NO BUILD Δ PM Intersection Delay
Delay, sec/veh
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM

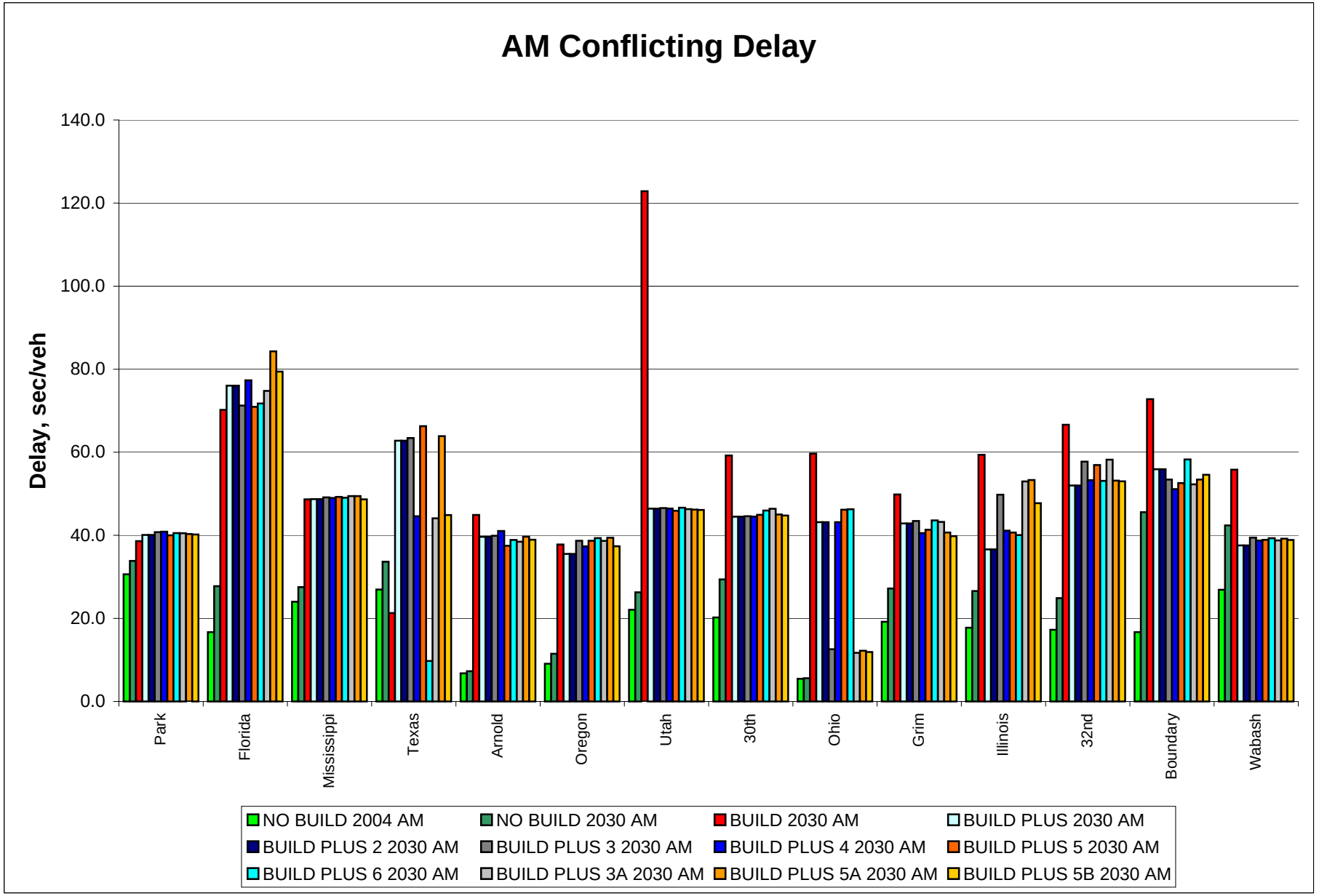

AM Concurrent Delay
Delay, sec/veh
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 AM
NO BUILD 2030 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM

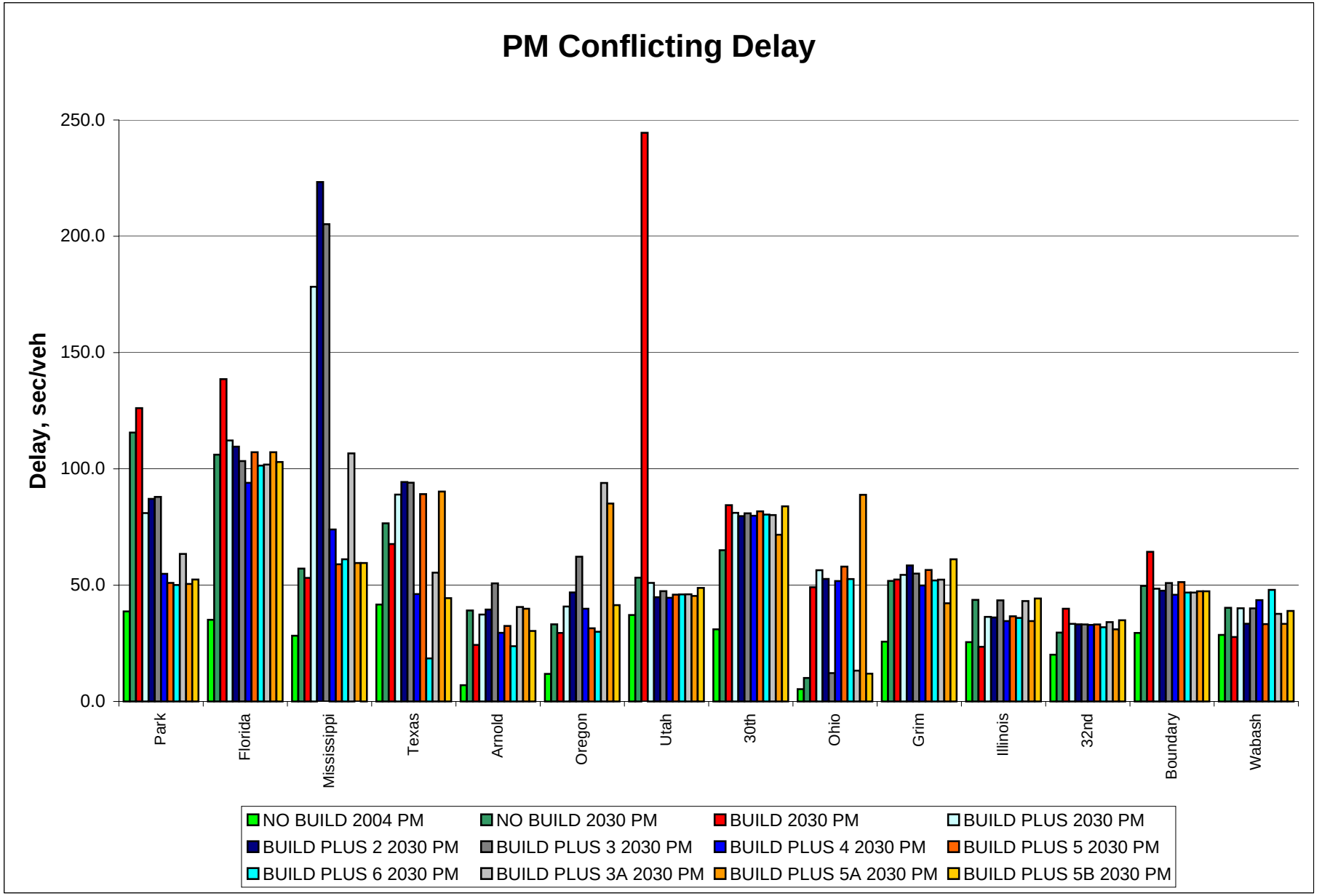

PM Concurrent Delay
Delay, sec/veh
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 PM
NO BUILD 2030 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM

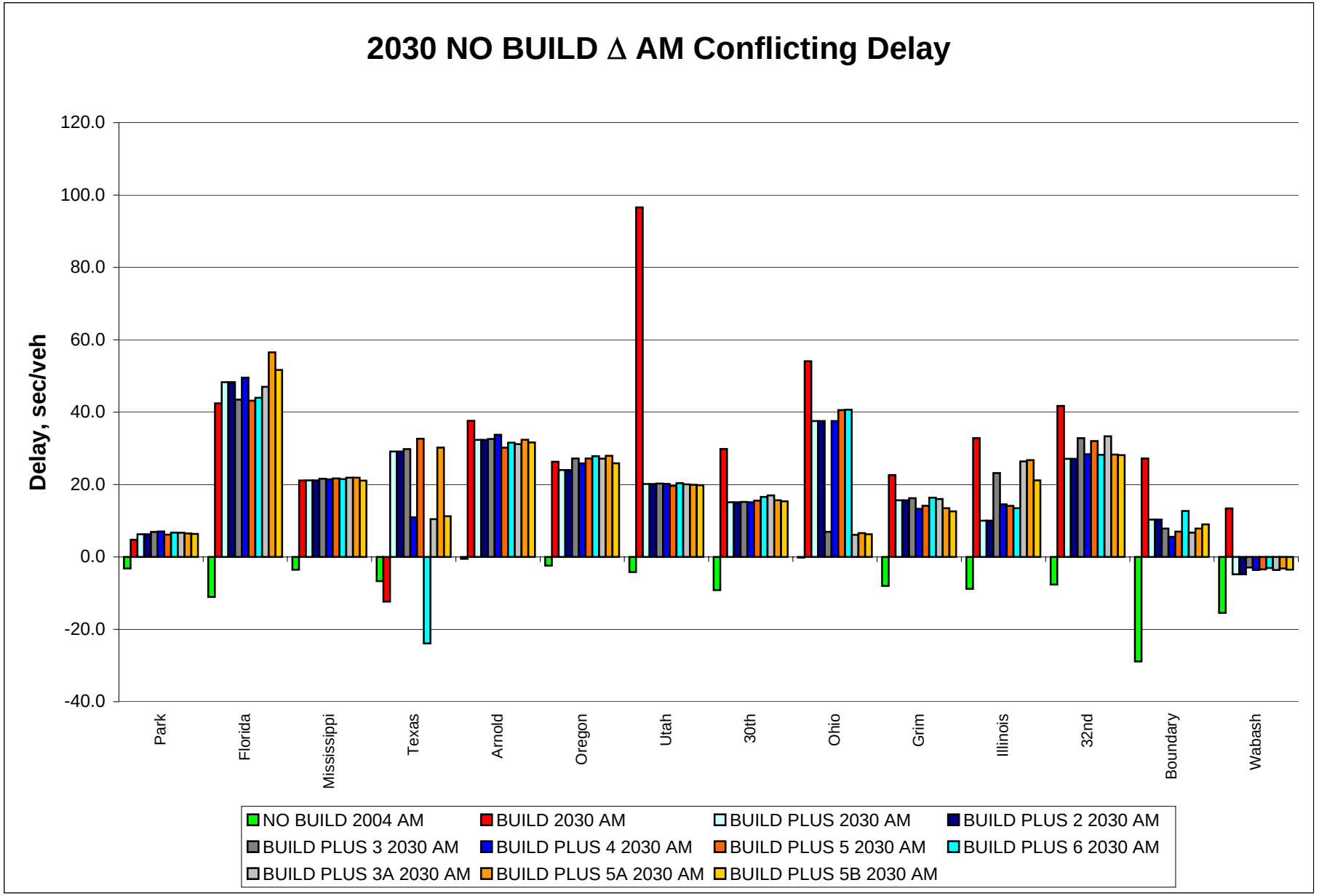

2030 NO BUILD Δ AM Concurrent Delay
Delay, sec/veh
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM

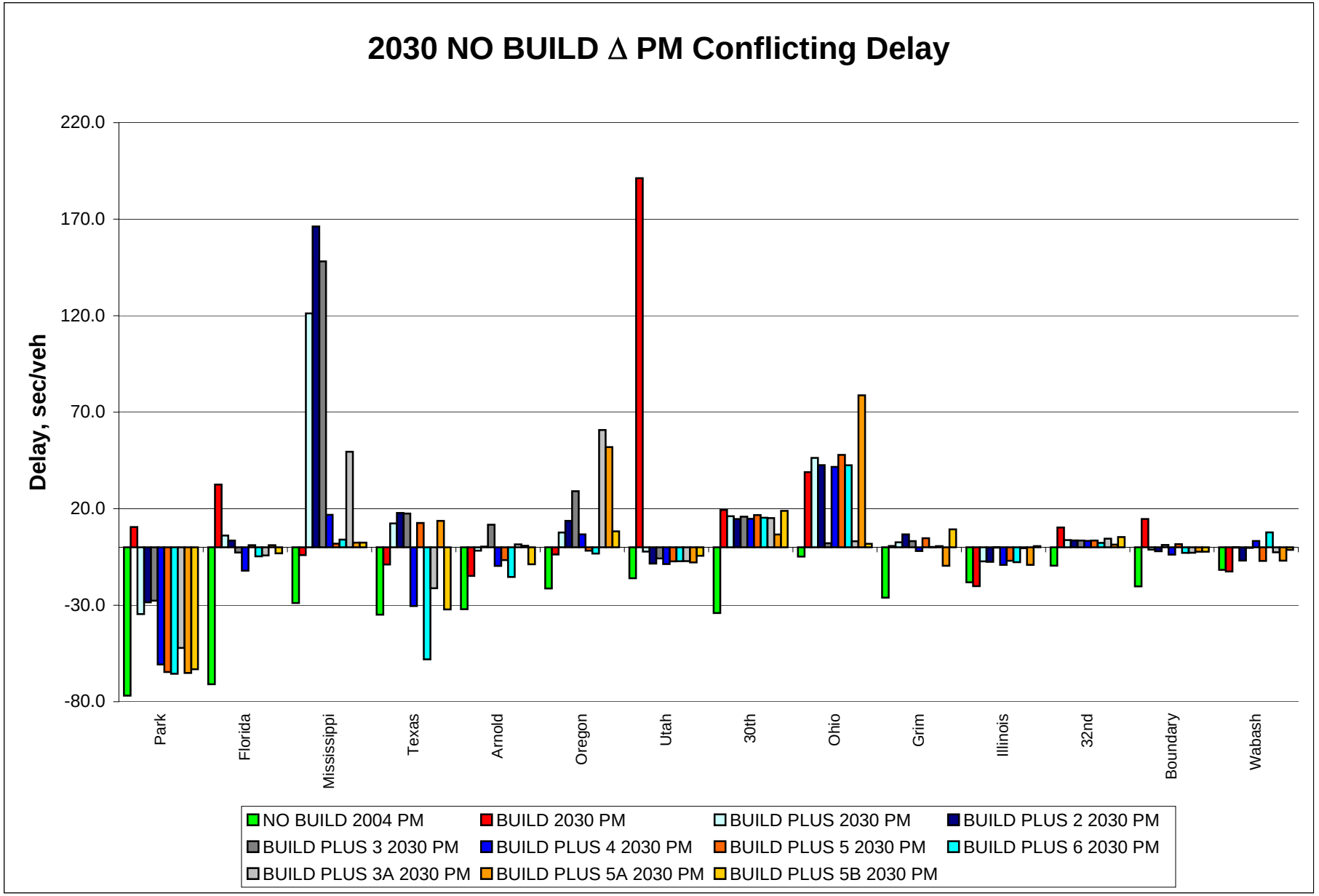
2030 NO BUILD Δ PM Concurrent Delay

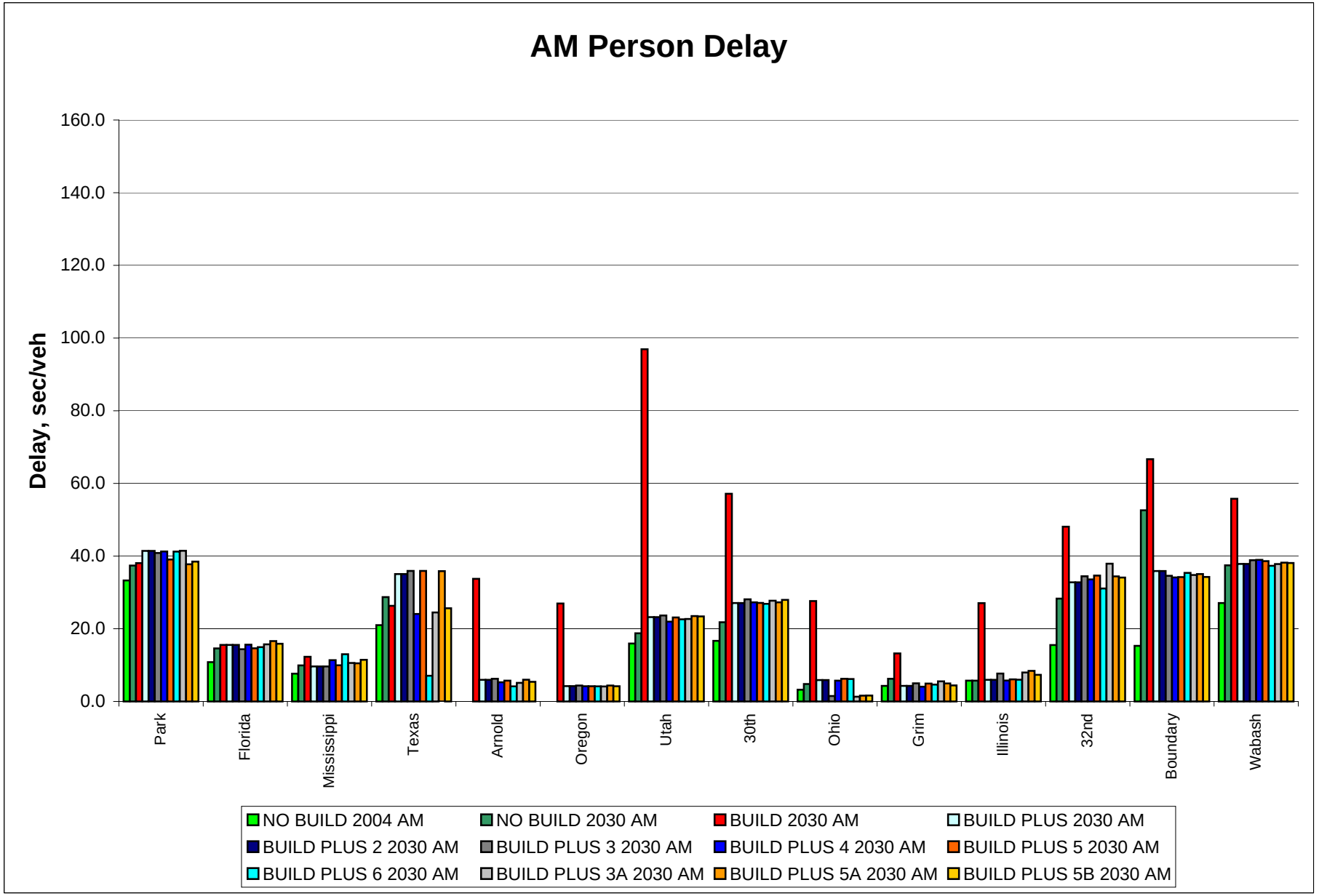


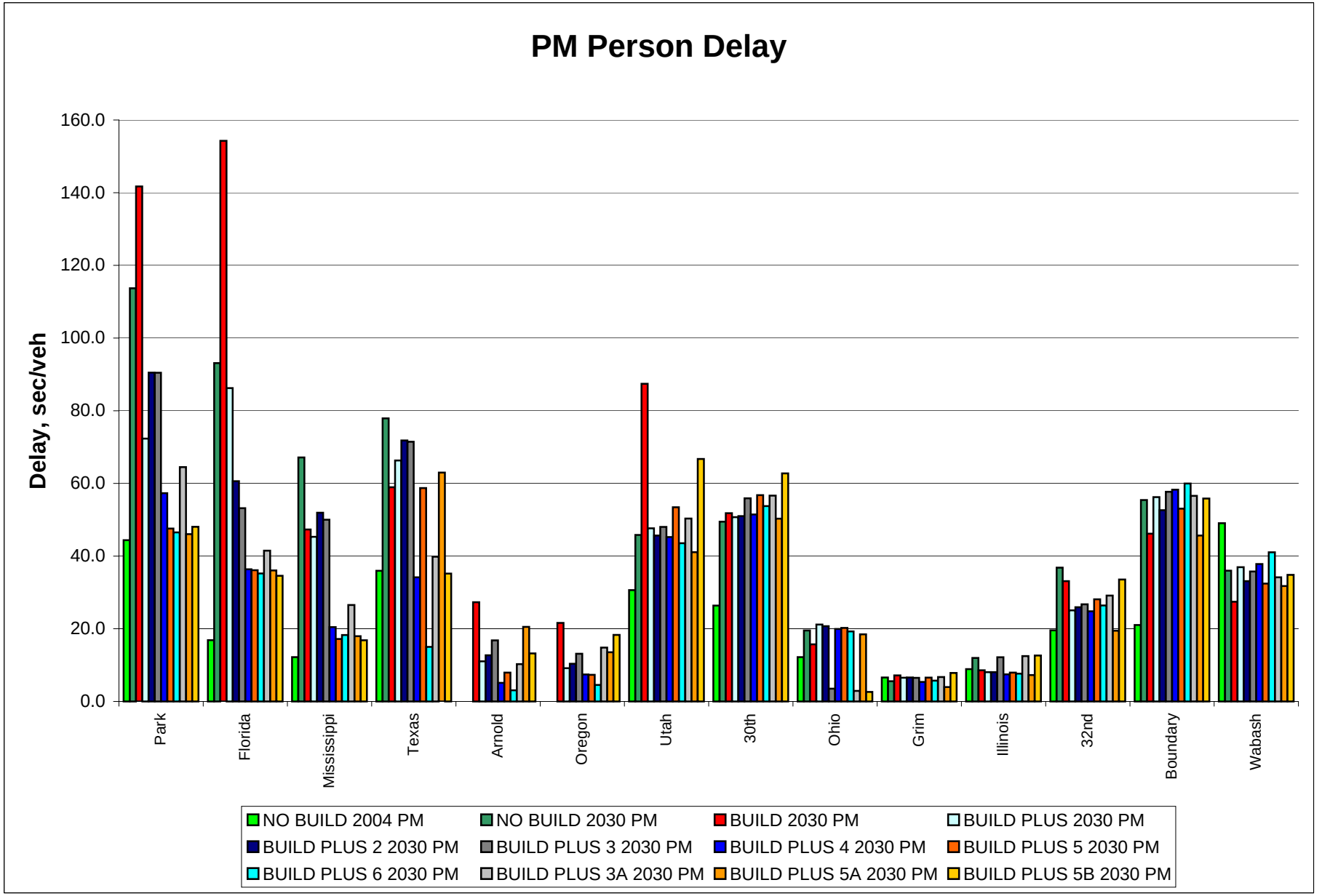

AM Conflicting Delay
Delay, sec/veh
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 AM
NO BUILD 2030 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM

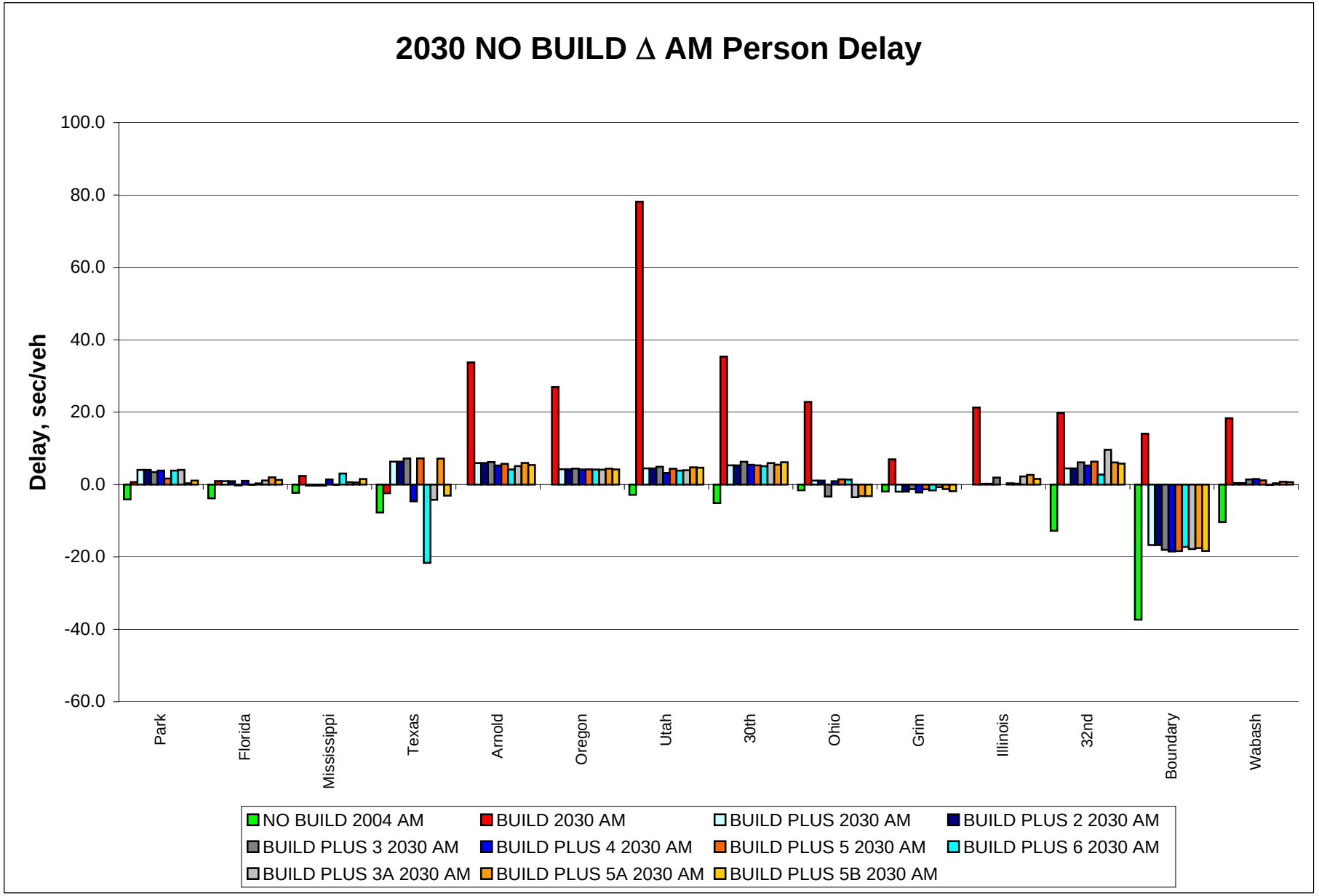

PM Conflicting Delay
Delay, sec/veh
250.0
200.0
150.0
100.0
50.0
0.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 PM
NO BUILD 2030 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM

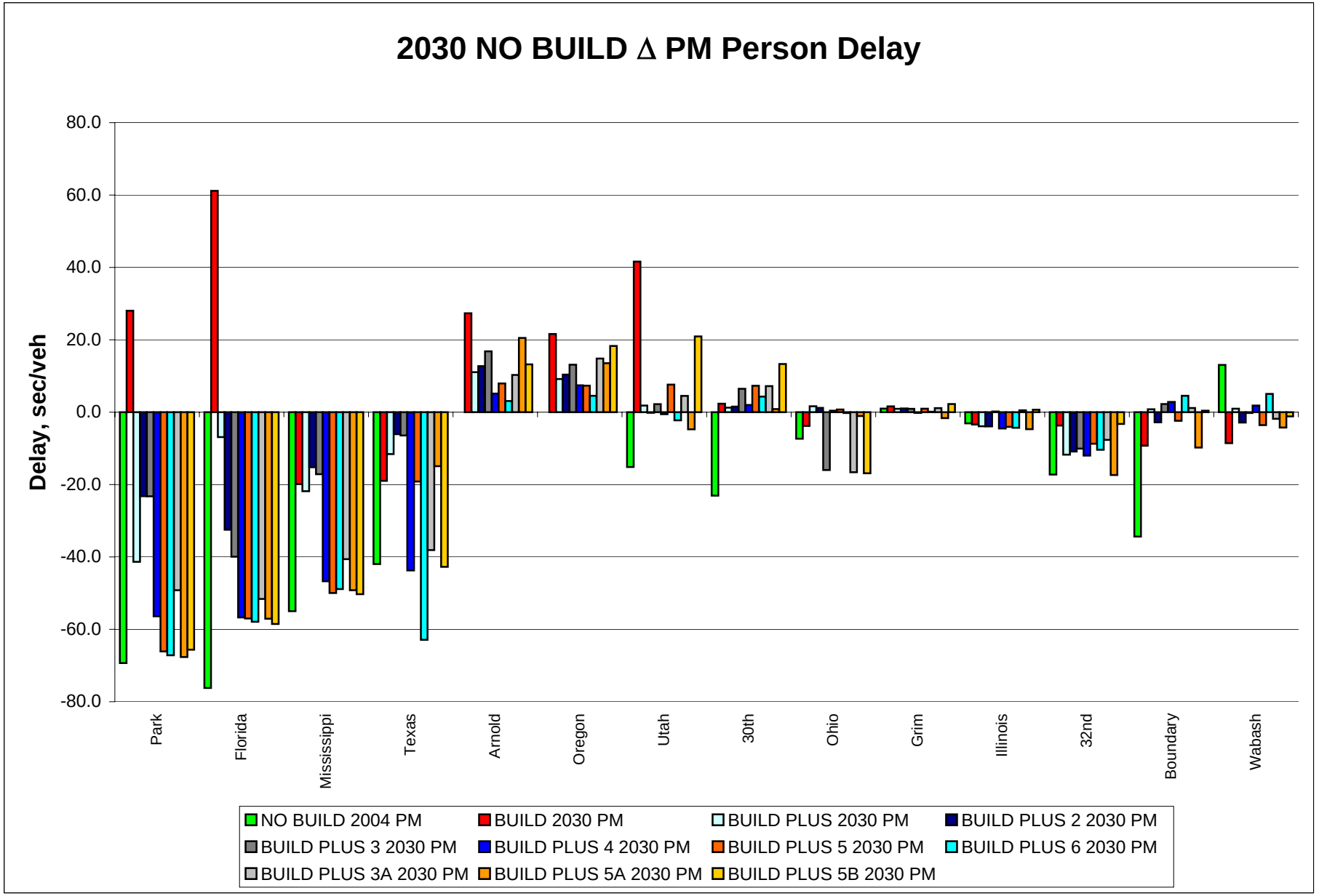

2030 NO BUILD Δ AM Conflicting Delay
Delay, sec/veh
120.0
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM

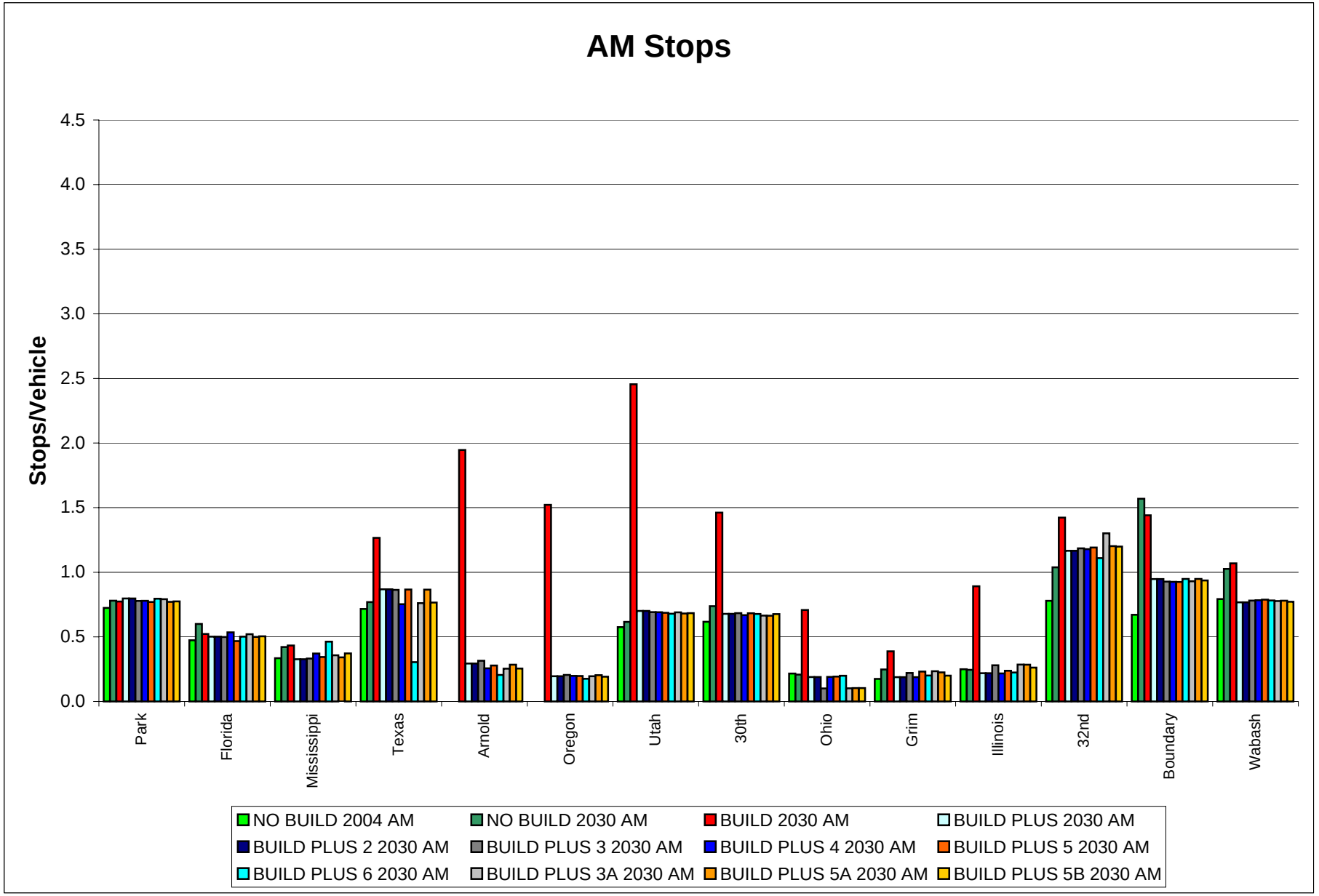

2030 NO BUILD Δ PM Conflicting Delay
Delay, sec/veh
220.0
170.0
120.0
70.0
20.0
-30.0
-80.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM

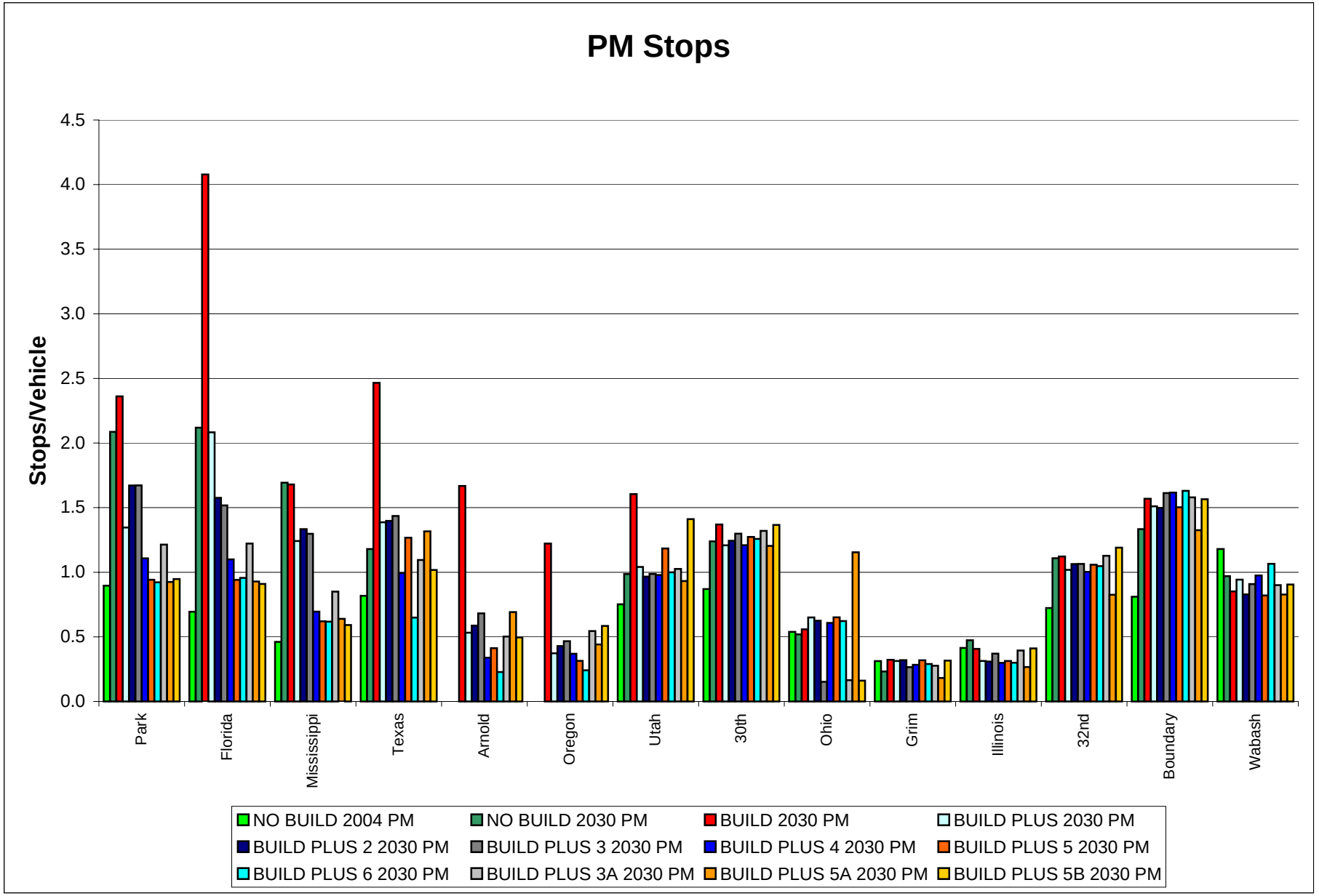

AM Person Delay
Delay, sec/veh
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 AM
NO BUILD 2030 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM

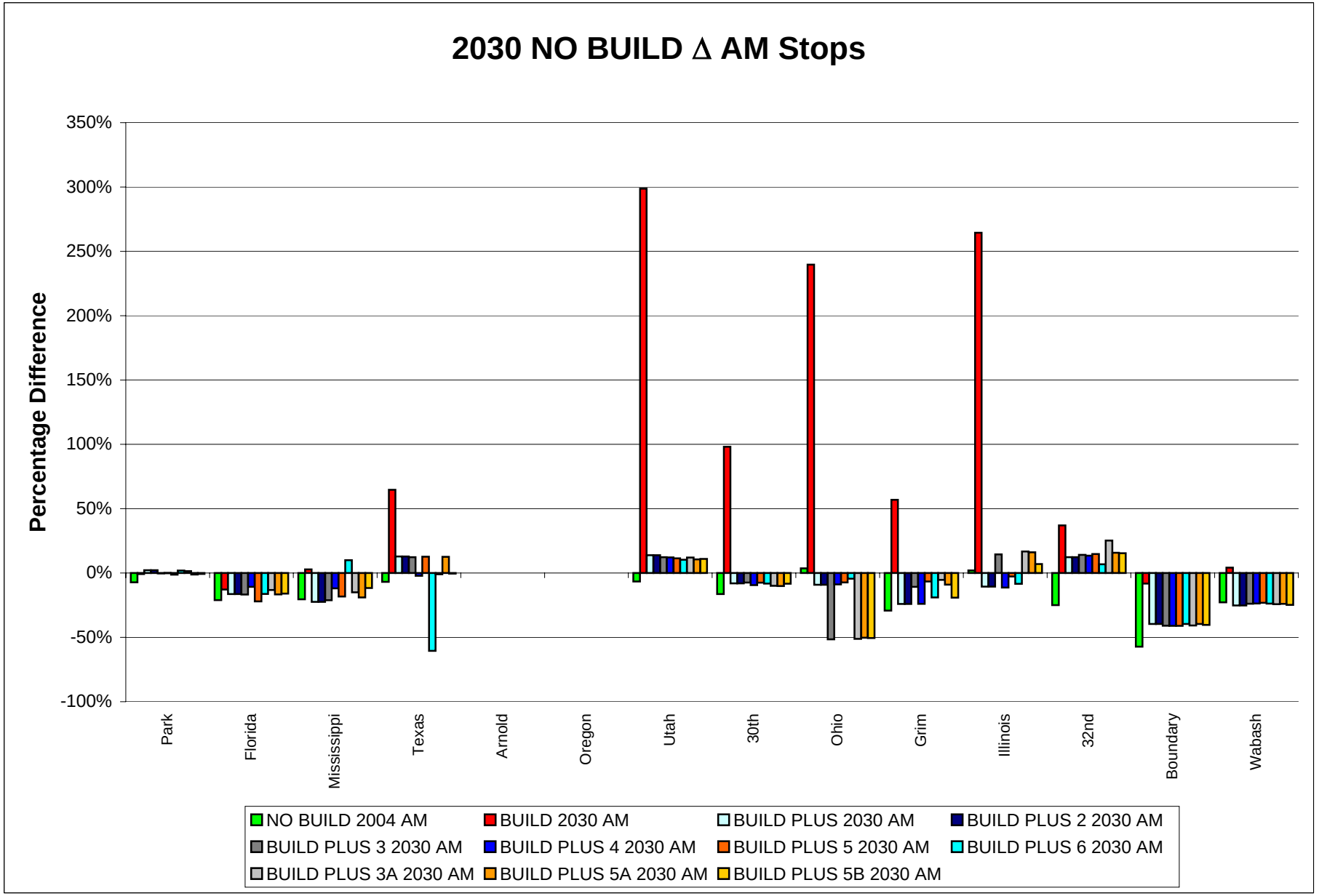

PM Person Delay
Delay, sec/veh
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 PM
NO BUILD 2030 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM

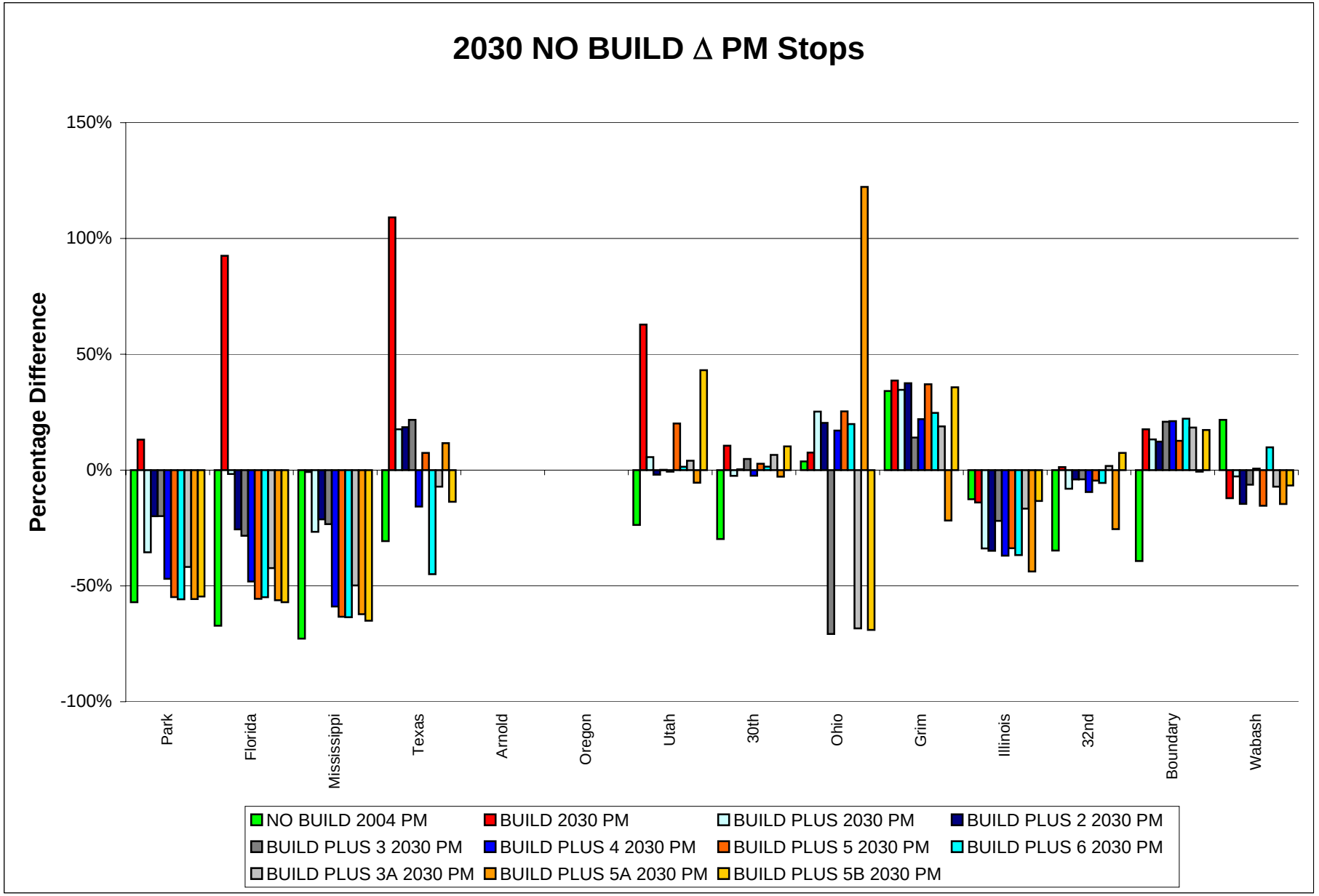

2030 NO BUILD Δ AM Person Delay
Delay, sec/veh
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM


2030 NO BUILD Δ PM Person Delay
Delay, sec/veh
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM


AM Stops
Stops/Vehicle
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 AM
NO BUILD 2030 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM


PM Stops
Stops/Vehicle
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 PM
NO BUILD 2030 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM


2030 NO BUILD Δ AM Stops
Percentage Difference
350%
300%
250%
200%
150%
100%
50%
0%
-50%
-100%
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 AM
BUILD 2030 AM
BUILD PLUS 2030 AM
BUILD PLUS 2 2030 AM
BUILD PLUS 3 2030 AM
BUILD PLUS 4 2030 AM
BUILD PLUS 5 2030 AM
BUILD PLUS 6 2030 AM
BUILD PLUS 3A 2030 AM
BUILD PLUS 5A 2030 AM
BUILD PLUS 5B 2030 AM


2030 NO BUILD Δ PM Stops
Percentage Difference
150%
100%
50%
0%
-50%
-100%
Park
Florida
Mississippi
Texas
Arnold
Oregon
Utah
30th
Ohio
Grim
Illinois
32nd
Boundary
Wabash
NO BUILD 2004 PM
BUILD 2030 PM
BUILD PLUS 2030 PM
BUILD PLUS 2 2030 PM
BUILD PLUS 3 2030 PM
BUILD PLUS 4 2030 PM
BUILD PLUS 5 2030 PM
BUILD PLUS 6 2030 PM
BUILD PLUS 3A 2030 PM
BUILD PLUS 5A 2030 PM
BUILD PLUS 5B 2030 PM

Appendix K
Arnold Avenue & Oregon Street Traffic Signal Warrant Worksheets

UNIVERSITY & ARNOLD

Figure 9-4
TRAFFIC SIGNAL WARRANTS

(Based on Estimated Average Daily Traffic - See Note)

URBAN ✓ RURAL	Minimum Requirements EADT	
1. Minimum Vehicular Satisfied _____ Not Satisfied ✓	Vehicles per day on major street (total of both approaches)	Vehicles per day on higher-volume minor street approach (one direction only)
Number of lanes for moving traffic on each approach Major Street — Minor Street (64+56)	Urban / Rural	Urban / Rural
1 (21,600) — 1 (1,200) (0-10)	8,000 / 5,600	2,400 / 1,680
2 or more — 1	9,600 / 6,720	2,400 / 1,680
2 or more — 2 or more	9,600 / 6,720	3,200 / 2,240
1 — 2 or more	8,000 / 5,600	3,200 / 2,240
2. Interuption of Continuous Traffic Satisfied ✓ Not Satisfied _____	Vehicles per day on major street (total of both approaches)	Vehicles per day on higher-volume minor street approach (one direction only)
Number of lanes for moving traffic on each approach Major Street — Minor Street	Urban / Rural	Urban / Rural
1 (21,600) — 1 (1,200)	12,000 / 8,400	1,200 / 850
2 or more — 1	14,400 / 10,080	1,200 / 850
2 or more — 2 or more	14,400 / 10,080	1,600 / 1,120
1 — 2 or more	12,000 / 8,400	1,600 / 1,120
3. Combination Satisfied _____ Not Satisfied ✓ No one warrant satisfied, but following warrants fulfilled 80% or more ..... NO (1) YES (2)	2 Warrants	2 Warrants

NOTE: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

UNIVERSITY & ARNOLD

Figure 9-3
TRAFFIC SIGNAL WARRANTS

WARRANT 8 - Combination of Warrants **SATISFIED YES ☐ NO ☐**

REQUIREMENT	WARRANT	✓	FULFILLED
TWO WARRANTS SATISFIED 80%	1. MINIMUM VEHICULAR VOLUME		
	2. INTERRUPTION OF CONTINUOUS TRAFFIC		YES ☐ NO ☐

WARRANT 9 - Four Hour Volume **SATISFIED* YES ☐ NO ☑**

Approach Lanes	One	2 or more	2010 AM	2010 PM	2020 AM	2020 PM Hour
Both Approaches - Major Street	✓		1058	1254	1117	1290
Highest Approaches - Minor Street	✓		88	77	120	101

* Refer to Figure 9-6 (URBAN AREAS) or Figure 9-7 (RURAL AREAS) to determine if this warrant is satisfied.

WARRANT 10 - Peak Hour Delay **SATISFIED YES ☐ NO ☐**

(ALL PARTS MUST BE SATISFIED)

1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND

   YES ☐ NO ☐

2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND

   YES ☐ NO ☐

3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.

   YES ☐ NO ☐

WARRANT 11 - Peak Hour Volume **SATISFIED* YES ☐ NO ☑**

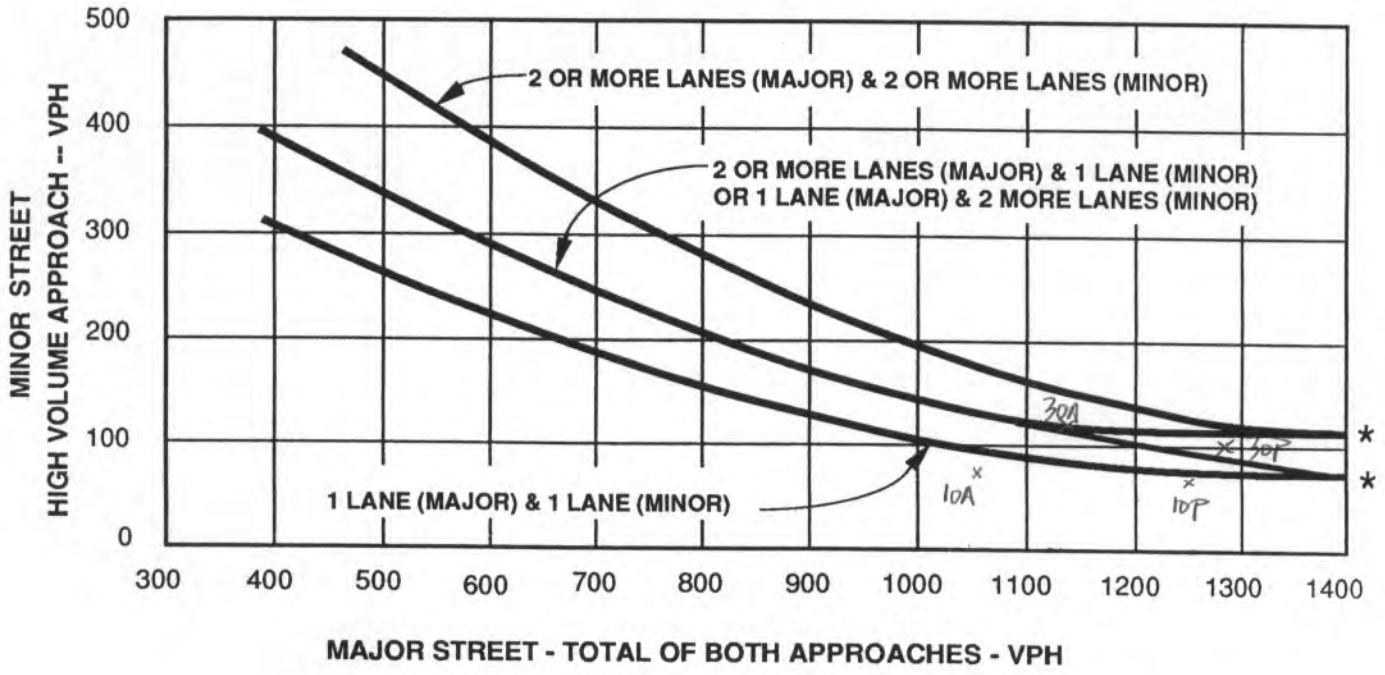
Approach Lanes	One	2 or more	2010 AM	2010 PM	2020 AM	2020 PM Hour
Both Approaches - Major Street	✓		1058	1254	1117	1290
Highest Approaches - Minor Street	✓		88	77	120	101

* Refer to Figure 9-8 (URBAN AREAS) or Figure 9-9 (RURAL AREAS) to determine if this warrant is satisfied.

The satisfaction of a warrant is not necessarily justification for a signal. Delay, congestion, confusion or other evidence of the need for right-of-way assignment must be shown.

UNIVERSITY & ARNOLD

Figure 9-6
FOUR HOUR VOLUME WARRANT
(Urban Areas)



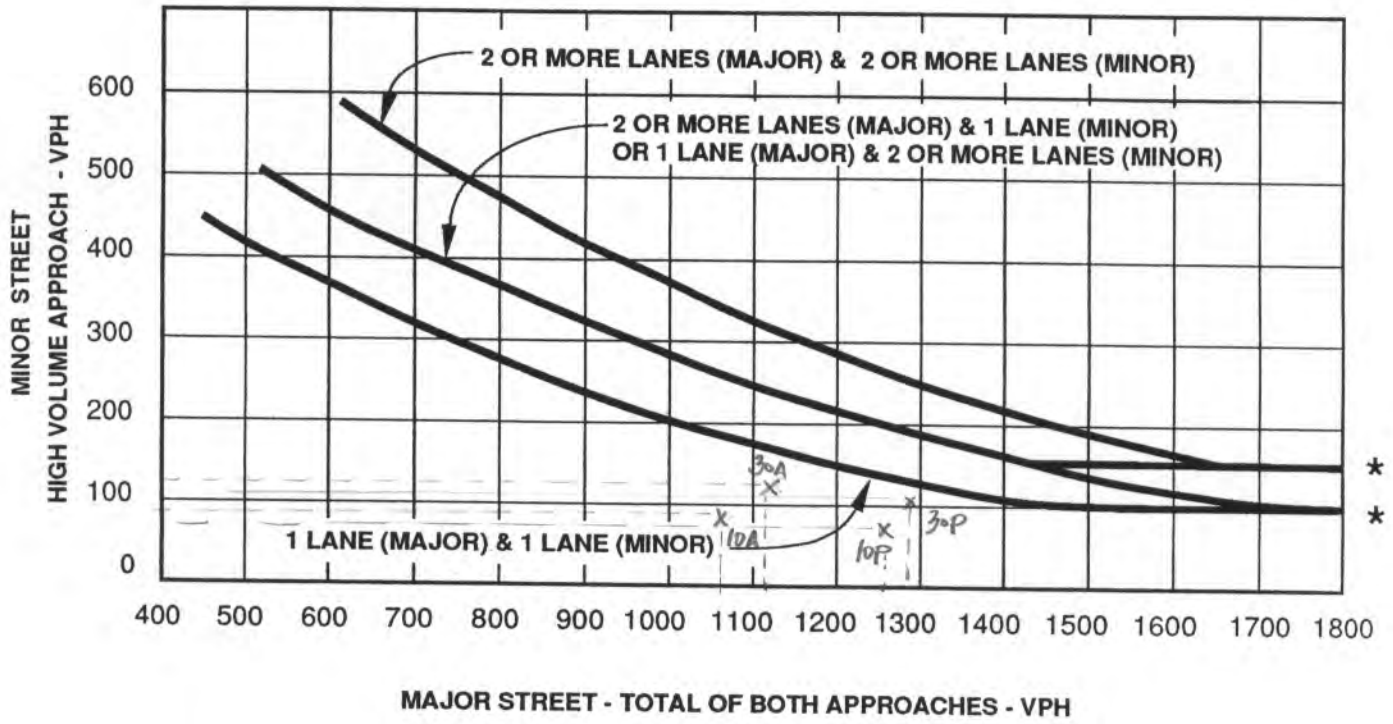
* **NOTE:**

115 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

	2010 AM	2010 PM	2030 AM	2030 PM
UNIVERSITY (BOTH)	1058	1254	1117	1290
ARNOLD (SINGLE)	88	77	120	103

UNIVERSITY & ARNOLD

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



* NOTE:

150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

	2010 AM	2010 PM	2030 AM	2030 PM
UNIVERSITY (BOTH)	1058	1254	1117	1290
ARNOLD (SINGLE)	88	77	120	101

UNIVERSITY of OREGON

Figure 9-4
TRAFFIC SIGNAL WARRANTS

(Based on Estimated Average Daily Traffic - See Note)

URBAN ✓ RURAL

1. Minimum Vehicular

Satisfied _____ Not Satisfied ✓

Number of lanes for moving traffic on each approach

Major Street	Minor Street	Minimum Requirements EADT: Vehicles per day on major street (total of both approaches)		Vehicles per day on higher-volume minor street approach (one direction only)	
		Urban	Rural	Urban	Rural
1 21,400	1 1,790 (110+69 −10)	8,000	5,600	2,400	1,680
2 or more	1	9,600	6,720	2,400	1,680
2 or more	2 or more	9,600	6,720	3,200	2,240
1	2 or more	8,000	5,600	3,200	2,240

2. Interuption of Continuous Traffic

Satisfied ✓ Not Satisfied _____

Number of lanes for moving traffic on each approach

Major Street	Minor Street	Vehicles per day on major street (total of both approaches)		Vehicles per day on higher-volume minor street approach (one direction only)	
		Urban	Rural	Urban	Rural
1 21,400	1 1,790	12,000	8,400	1,200	850
2 or more	1	14,400	10,080	1,200	850
2 or more	2 or more	14,400	10,080	1,600	1,120
1	2 or more	12,000	8,400	1,600	1,120

3. Combination

Satisfied _____ Not Satisfied ✓

2 Warrants | 2 Warrants

No one warrant satisfied, but following warrants fulfilled 80% or more ..... NO (1) YES (2)

NOTE: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

UNIVERSITY of OREGON

Figure 9-3
TRAFFIC SIGNAL WARRANTS

WARRANT 8 - Combination of Warrants **SATISFIED YES ☐ NO ☐**

REQUIREMENT	WARRANT	✓	FULFILLED
TWO WARRANTS SATISFIED 80%	1. MINIMUM VEHICULAR VOLUME		
	2. INTERRUPTION OF CONTINUOUS TRAFFIC		YES ☐ NO ☐

WARRANT 9 - Four Hour Volume **SATISFIED* YES ☐ NO ☑**

Approach Lanes	One	2 or more	2010 AM	2010 PM	2030 AM	2030 PM Hour
Both Approaches - Major Street	✓		1051	1333	1177	1392
Highest Approaches - Minor Street	✓		11	70	19	85

* Refer to Figure 9-6 (URBAN AREAS) or Figure 9-7 (RURAL AREAS) to determine if this warrant is satisfied.

WARRANT 10 - Peak Hour Delay **SATISFIED YES ☐ NO ☐**
(ALL PARTS MUST BE SATISFIED)

1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND
   YES ☐ NO ☐
2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND
   YES ☐ NO ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.
   YES ☐ NO ☐

WARRANT 11 - Peak Hour Volume **SATISFIED* YES ☐ NO ☑**

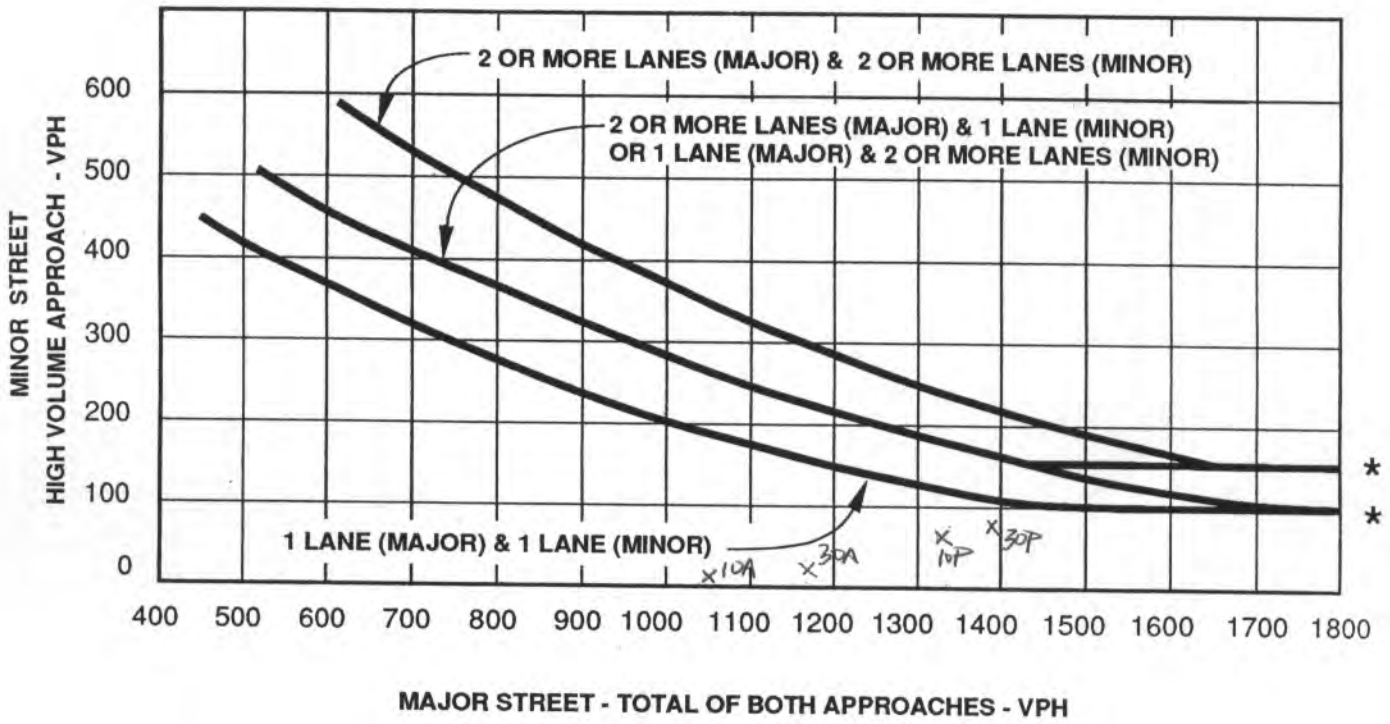
Approach Lanes	One	2 or more	2010 AM	2010 PM	2030 AM	2030 PM Hour
Both Approaches - Major Street	✓		1051	1333	1177	1392
Highest Approaches - Minor Street	✓		11	70	19	85

* Refer to Figure 9-8 (URBAN AREAS) or Figure 9-9 (RURAL AREAS) to determine if this warrant is satisfied.

The satisfaction of a warrant is not necessarily justification for a signal. Delay, congestion, confusion or other evidence of the need for right-of-way assignment must be shown.

UNIVERSITY & OREGON

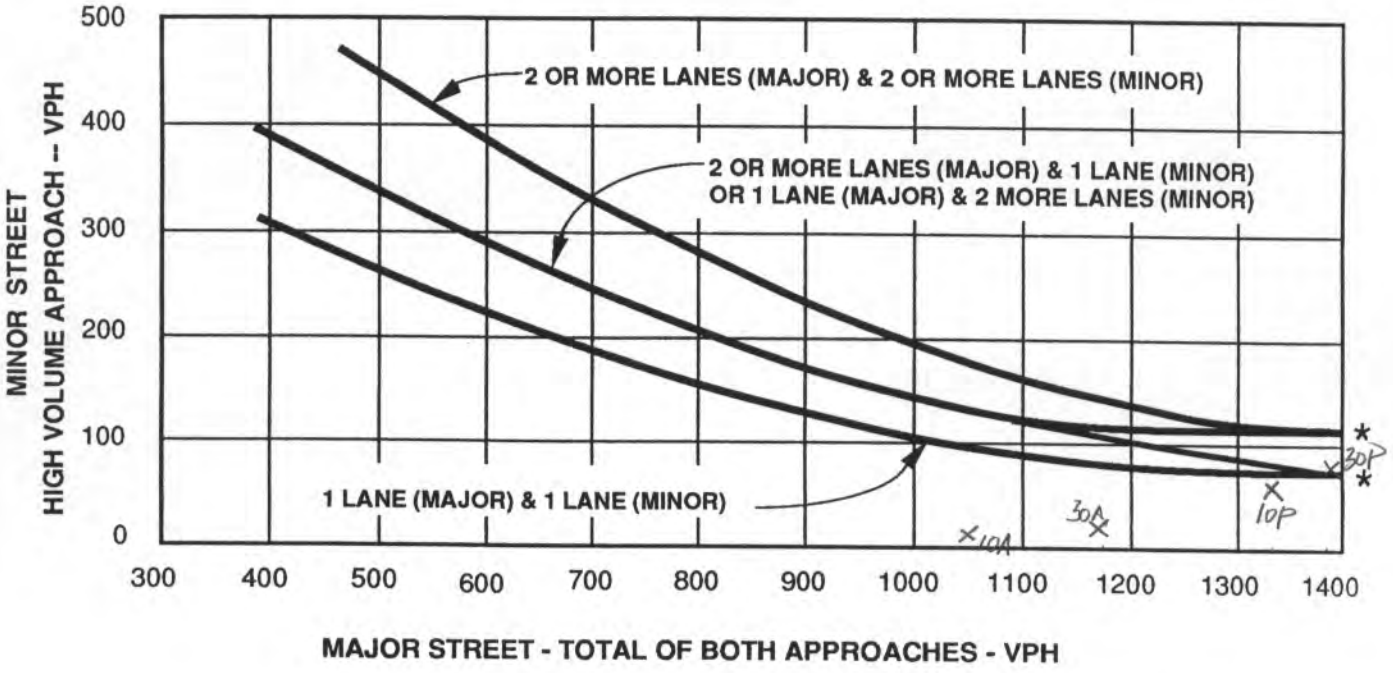
Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



	2010 AM	2010 PM	2030 AM	2030 PM
UNIVERSITY (BOTH)	1051	1333	1177	1392
OREGON (SINGLE)	11	70	19	85

UNIVERSITY OF OREGON

Figure 9-6
FOUR HOUR VOLUME WARRANT
(Urban Areas)



* **NOTE:**

115 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

	2010 AM	2010 PM	2030 AM	2030 PM
UNIVERSITY (BOTH)	1051	1333	1177	1392
OREGON (SINGLE)	11	70	19	85

Appendix L
Traffic Calming Signal Warrant Analysis

TEXAS & LINCOLN

Figure 9-4
TRAFFIC SIGNAL WARRANTS

(Based on Estimated Average Daily Traffic - See Note)

URBAN ✓ RURAL	Minimum Requirements EADT	
1. Minimum Vehicular Satisfied ✓ Not Satisfied	Vehicles per day on major street (total of both approaches)	Vehicles per day on higher-volume minor street approach (one direction only)
Number of lanes for moving traffic on each approach Major Street / Minor Street	Urban / Rural	Urban / Rural
1 (13,300) / 1 (3,420)	8,000 ✓ / 5,600	2,400 ✓ / 1,680
2 or more / 1	9,600 / 6,720	2,400 / 1,680
2 or more / 2 or more	9,600 / 6,720	3,200 / 2,240
1 / 2 or more	8,000 / 5,600	3,200 / 2,240
2. Interuption of Continuous Traffic Satisfied ✓ Not Satisfied	Vehicles per day on major street (total of both approaches)	Vehicles per day on higher-volume minor street approach (one direction only)
Number of lanes for moving traffic on each approach Major Street / Minor Street	Urban / Rural	Urban / Rural
1 (13,300) / 1 (3,420)	12,000 ✓ / 8,400	1,200 ✓ / 850
2 or more / 1	14,400 / 10,080	1,200 / 850
2 or more / 2 or more	14,400 / 10,080	1,600 / 1,120
1 / 2 or more	12,000 / 8,400	1,600 / 1,120
3. Combination Satisfied ____ Not Satisfied ____ No one warrant satisfied, but following warrants fulfilled 80% or more ..... 1 ____ 2 ____	2 Warrants	2 Warrants

NOTE: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

TEXAS & WHITMAN

Figure 9-4
TRAFFIC SIGNAL WARRANTS

(Based on Estimated Average Daily Traffic - See Note)

URBAN ✓ RURAL	Minimum Requirements EADT	
1. Minimum Vehicular Satisfied _____ Not Satisfied ✓	Vehicles per day on major street (total of both approaches)	Vehicles per day on higher-volume minor street approach (one direction only)
Number of lanes for moving traffic on each approach		
Major Street / Minor Street	Urban / Rural	Urban / Rural
1 (5,900) / 1 (1,920)	8,000 × / 5,600	2,400 × / 1,680
2 or more / 1	9,600 / 6,720	2,400 / 1,680
2 or more / 2 or more	9,600 / 6,720	3,200 / 2,240
1 / 2 or more	8,000 / 5,600	3,200 / 2,240
2. Interuption of Continuous Traffic Satisfied _____ Not Satisfied ✓	Vehicles per day on major street (total of both approaches)	Vehicles per day on higher-volume minor street approach (one direction only)
Number of lanes for moving traffic on each approach		
Major Street / Minor Street	Urban / Rural	Urban / Rural
1 (5,900) / 1 (1,920)	12,000 × / 8,400	1,200 ✓ / 850
2 or more / 1	14,400 / 10,080	1,200 / 850
2 or more / 2 or more	14,400 / 10,080	1,600 / 1,120
1 / 2 or more	12,000 / 8,400	1,600 / 1,120
3. Combination Satisfied _____ Not Satisfied ✓ No one warrant satisfied, but following warrants fulfilled 80% or more ..... _____ (1) _____ (2)	2 Warrants	2 Warrants

NOTE: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

UTAH & NORTH PARK

Figure 9-4
TRAFFIC SIGNAL WARRANTS

(Based on Estimated Average Daily Traffic - See Note)

URBAN ✓ RURAL	Minimum Requirements EADT	
1. Minimum Vehicular Satisfied _____ Not Satisfied ✓	Vehicles per day on major street (total of both approaches)	Vehicles per day on higher-volume minor street approach (one direction only)
Number of lanes for moving traffic on each approach Major Street / Minor Street	Urban / Rural	Urban / Rural
1 (5,200) / 1 (2,880)	8,000 × / 5,600	2,400 ✓ / 1,680
2 or more / 1	9,600 / 6,720	2,400 / 1,680
2 or more / 2 or more	9,600 / 6,720	3,200 / 2,240
1 / 2 or more	8,000 / 5,600	3,200 / 2,240
2. Interuption of Continuous Traffic Satisfied _____ Not Satisfied ✓	Vehicles per day on major street (total of both approaches)	Vehicles per day on higher-volume minor street approach (one direction only)
Number of lanes for moving traffic on each approach Major Street / Minor Street	Urban / Rural	Urban / Rural
1 (5,200) / 1 (2,880)	12,000 × / 8,400	1,200 ✓ / 850
2 or more / 1	14,400 / 10,080	1,200 / 850
2 or more / 2 or more	14,400 / 10,080	1,600 / 1,120
1 / 2 or more	12,000 / 8,400	1,600 / 1,120
3. Combination Satisfied _____ Not Satisfied ✓ No one warrant satisfied, but following warrants fulfilled 80% or more ..... _____ (1) _____ (2)	2 Warrants	2 Warrants

NOTE: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.