



2401 West Side Dr

OUTLINE PLAN BRIEF

NEW WAY GROUP

FINAL ISSUE (VERION 5) ADOPTED BY MUNICIPAL PLANNING COMMISSION
OCT 9, 2018

PROJECT NO.:171-15591-00

OCTOBER 2018

WSP CANADA INC.



CITY OF
Lethbridge



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October 15, 2018

The City of Lethbridge
910 4th Avenue South
Lethbridge, AB
T1J 0P6

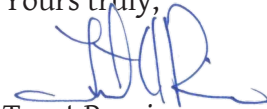
Attention: Jason Price, Senior Subdivision Planner
Subject: 2401 & 2501 West Side Drive – Outline Plan Brief

Dear Sir:

WSP Canada Group Limited has prepared an Outline Plan Brief pertaining to 2401 & 2501 West Side Drive. This submission will be processed concurrently with an application for ASP Amendment and an application to redesignate the land from a Future Urban Development (FUD) zone to a Direct Control zone. All submissions speak to a common development goal, and work together to support the development of a commercial centre which will align with the City's long-term goals within the area.

Please contact the undersigned at trent.purvis@wsp.com or at 403-359-5699 should you have any questions regarding the submission or if you require additional information.

Yours truly,



Trent Purvis

Southern Region Manager



INTRODUCTION

1 INTRODUCTION

WSP Canada Inc. has prepared an Outline Plan to support the development of 2401 West Side Drive and a portion of 2501 West Side Drive, legally described as Plan 9710982 Block 2 & Plan 9710982 Block 1. This submission is provided in support of an application for an ASP Amendment and an application to redesignate the land to accommodate commercial development.

This Document summarizes an Engineering and Land Use Planning analysis that has been completed by WSP Canada Inc. in support of an Area Structure Plan (ASP) and Land Use Amendment.

1.1 PROPOSED DEVELOPMENT

WSP Canada Inc. (the consultant) has been engaged by New Way Irrigation Group (the Developer), to complete this Outline Plan Brief and a series of technical studies which will meet City of Lethbridge municipal development standards in preparation to proceed with a Development Permit.

The intent of the ASP amendment is to remove the subject parcel from the Plan Area in order to facilitate its development independent to other areas of the ASP. All submissions speak to a common development goal, and work together to support the development of a commercial centre which will align with the City's goals.

The subject parcel (Block 2 Plan 9710982) is currently included within the Plan Area of the West Lethbridge Employment Center Area Structure Plan (WLEC). The intended land use for this parcel as identified by the WLEC is large format commercial. The ASP amendment will be submitted to the City and processed concurrently -- the scope of the ASP amendment will involve removing the subject parcel from the West Lethbridge Employment Centre ASP area.

The current land use as identified by the land use bylaw is Future Urban Development (FUD). The Outline Plan submission will be supported by a land use redesignation to a Direct Control (DC) zone to allow for the proposed commercial uses.

1 INTRODUCTION

1.2 BACKGROUND

This parcel has been subdivided from a larger parcel and has a municipal address (2401 West Side Drive). The 2.72 Ha (6.72Ac) parcel was created in its current form as a part of the University Drive re-alignment that was completed in 1995. This project involved re-aligning University Drive and West Side Drive, and prompted the creation of Walsh Drive. This parcel was created through the road closure of the former West Side Drive Alignment and the establishment of the University Drive and Walsh Drive right-of-ways. The site was provided services and access points as a part of that project but remains undeveloped and is currently farmed as a hay crop.

The property Owner wishes to develop this property for commercial use, generating commerce and employment in West Lethbridge and servicing the commercial needs of the greater community. The parcel is currently zoned Future Urban Development (FUD). The purpose of designating land in this district is to provide “for the control of subdivision and development until the required municipal services are available, area structure or area redevelopment plans are approved, and more appropriate alternative districts are applied.”

It is intended that the land use will be revised to a Direct Control zone based off of the typical CH-Highway Commercial, providing for commercial development with a specific set of regulations pertaining to urban design guidelines that align with the intent of the University Drive corridor. (See appendix C for Draft DC Bylaw)

1.3 SCOPE OF TECHNICAL ANALYSIS

The City of Lethbridge has requested that the developer address the following technical concerns in order to support the ASP amendment and Land Use redesignation:

Provide a Traffic Impact Assessment and Traffic Safety Review;

- Assess the design requirement and size for a Road Right-of-Way Widening on Walsh Drive to be acquired from this site to accommodate Transportation and Utilities;
- Determine stormwater storage requirements, release rate and location of connection to the storm system; and,
- Determine water and sewer connection point(s) and on-site hydrant spacing.

These items have been addressed in the supporting technical studies and are summarized in this brief.



SITE DESCRIPTION

2 SITE DESCRIPTION

2.1 LOCATION AREA

The subject parcel is located is 2.72 ha (6.72 ac) in size and is located in west Lethbridge.

The subject land is bordered by:

- Canadian Pacific Rail ROW (North), agricultural land
- Westside Dr W (West), BURNCO Landscape Centre - FUD (Future Urban Development)
- University Dr W (East), box commercial (Heritage Heights Plaza) – C-N (Neighbourhood Commercial)
- Walsh Drive W (South), box commercial (West Highlands Towne Centre) C-H (Highway Commercial)



FIGURE 1 - CONTEXT PLAN

2 SITE DESCRIPTION

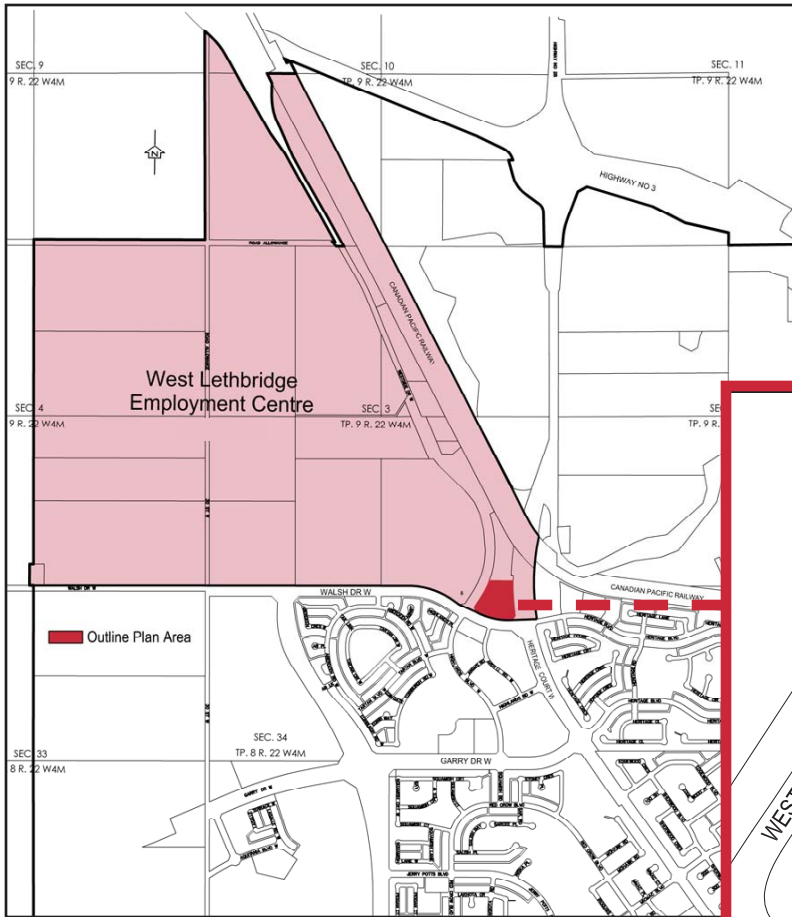


FIGURE 2 - CONTEXT WITHIN WEST LETHBRIDGE
EMPLOYMENT CENTRE

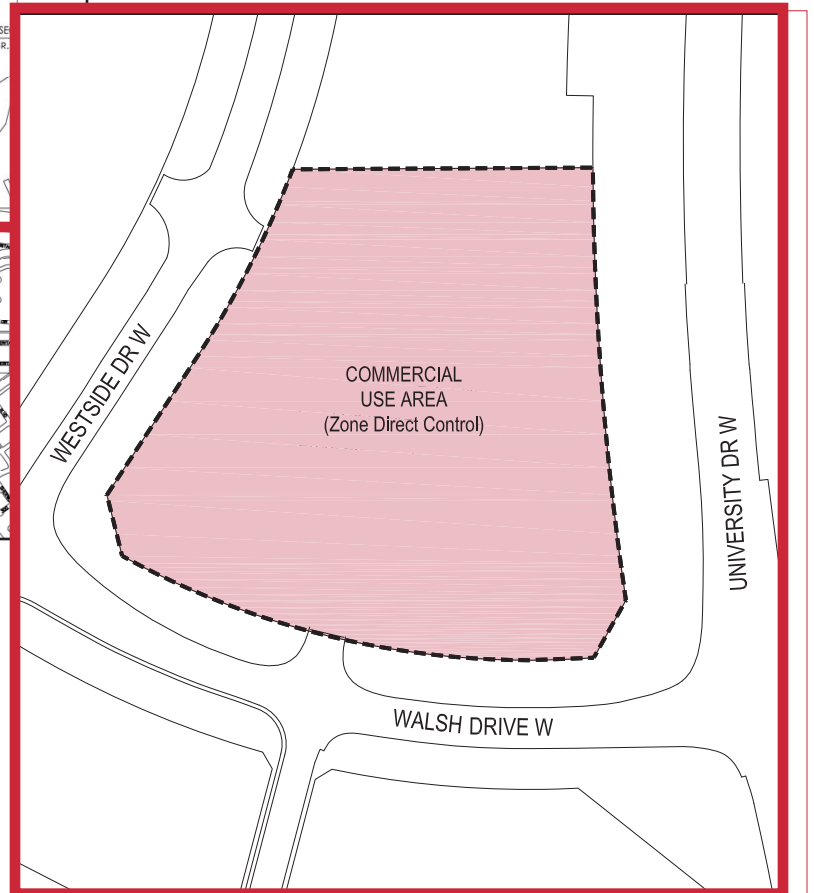


FIGURE 3 - OUTLINE PLAN AREA

2 SITE DESCRIPTION

2.2 SITE PHOTOS

The following collection of photos were taken during a site visit on December 11, 2017.



IMAGE 1 - SW CORNER - VIEW OF SITE LOOKING EAST/NE



IMAGE 2 - SW CORNER - VIEW OF SITE LOOKING NORTH



IMAGE 3 - VIEW OF SITE LOOKING SOUTH



IMAGE 4 - VIEW OF SITE LOOKING SW

2 SITE DESCRIPTION

2.2 SITE PHOTOS



IMAGE 5 - VIEW LOOKING WEST



IMAGE 6 - SOUTH SITE ACCESS - VIEW LOOKING EAST



IMAGE 7 - WEST SITE ACCESS - VIEW LOOKING WEST

2 SITE DESCRIPTION

2.3 TOPOGRAPHY + VEGETATION

The topography of the subject land is relatively flat as the land has been graded. The site generally falls from southwest to northeast. Vegetation consists of a hay crop that is farmed.

2.4 EXISTING LAND USE

The subject parcel is zoned Future Urban Development (FUD) zoning. The intent of this district is *“For the control of subdivision and development until the required municipal services are available, area structure or area redevelopment plans are approved, and more appropriate alternative districts are applied.”*

2.5 LAND OWNERSHIP

The land is owned by a single land owner (Plan 9710982 Lot 2). A current Certificate of Title is included in Appendix A.

2.6 LAND USE BYLAW/AREA STRUCTURE PLAN AMENDMENTS

An amendment to the West Lethbridge Employment Centre Areas Structure Plan (WLEC ASP) to exclude this site from the Plan Area is required. This will allow the development of this site at this time, prior to the implementation of a broader Outline Plan as shown in the WLEC ASP. Despite the site’s removal from the WLEC ASP, it will still reflect the intent for large format commercial land use, goals for site design and functionality that are associated with the gateway corridor (as originally presented in the WLEC ASP).

A subsequent Land Use Bylaw Amendment to Amend the Land Use district from FUD to DC is also required. Due to the similar nature of the intended development, the proposed DC district will largely be based off of the Highway Commercial District in the Land Use Bylaw in terms of allowable uses. However, to fulfill the goals of the WLEC ASP, this district will also include regulations to ensure that a high degree of attention is paid towards landscaping, the built form of the buildings and overall site design.

A summary of proposed changes to the West Lethbridge Employment Center ASP are summarized in Appendix D and have been provided to the City in a document with changes tracked.

2 SITE DESCRIPTION

2.7 LAND USE COMPATIBILITY

As outlined in the land use concept, the development of a large-format commercial centre is in-line with adjacent commercial land uses to the south and east of the site. Intended commercial uses on site will achieve compatibility with the existing developments.

2.8 ADHERENCE TO STATUTORY PLANS

The following tables outline the manner in which the proposed Outline Plan adheres to statutory plans applicable to the City of Lethbridge.

A. INTEGRATED COMMUNITY SUSTAINABILITY PLAN \ MUNICIPAL DEVELOPMENT PLAN BYLAW #5650 (JULY, 2010)

Policy Section	Outline Adherence to Policy
Figure 7 - Existing Development Pattern: June 2010, identifies the area as Future Development	The development of the outline plan area provides development in-line with the existing commercial uses south of the site.
5.3 Plan Your City Goals <ul style="list-style-type: none"> To enhance economic and housing opportunities throughout Lethbridge 	The development of the site as a commercial centre will enhance economic opportunities throughout Lethbridge, including creating employment opportunities in West Lethbridge. Development of this site allows for employment in West Lethbridge where a large labour force is available.
6.1.1 Lethbridge is a Good Place to Open and Operate a Business 1) Develop a diverse and stable economy by: <ul style="list-style-type: none"> Encouraging the creation of new businesses Supporting the growth and expansion of existing businesses 	A diverse and stable economy will be sustained through the provision of the future commercial centre. New businesses and/or existing businesses in Lethbridge may choose to open additional locations within this commercial centre and provide diversified opportunities for services within the community.
6.3 A Well Designed City The Mix and Density of Land Uses Increasing residential densities and the mix of mutually supportive activities in close proximity is part of the formula for an exciting, safe and vital city.	The commercial centre will provide a mix of uses within close proximity to residential development.

2 SITE DESCRIPTION

A. MUNICIPAL DEVELOPMENT PLAN BYLAW #5650 (JULY, 2010) (CONT'D)

Policy Section	Outline Adherence to Policy
6.4.3 Lethbridge is a Walkable, Bicycle Friendly City	The adjacent regional pathway construction will facilitate walking and cycling to and from the site. In addition, an internal network will ensure that the area is accessible and walkable, aligning with the MDP policy. Residents and customers within the areas adjacent will find that they are able to easily access the site and beyond when development proceeds.
Figure 10 – Future Land Use Map	The subject land is not identified with the marker identifying an intended future land use, however given the adjacent (south and north) commercial, and industrial (west) future land uses, the commercial usage within the plan area is compatible.
6.4.4 Lethbridge is Expanding in a Responsible Manner 6) Support a range of choice of new expansion areas for residential, commercial and industrial development	New commercial opportunities will be available to residents within the immediate area, and will also provide commercial attractions for residents from outside the immediate area.
6.4.5 Lethbridge is a Planned City that Exhibits Quality Urban Design 1) Encourage and promote the design of live, work, shop and play land uses in proximity to one another	Commercial development will allow residents residing in close proximity to access commercial services within their immediate area. Pedestrian-centric design will be employed to ensure that the site design supports a live-work-shop-play model.

2 SITE DESCRIPTION

B. INTERMUNICIPAL DEVELOPMENT PLAN #5242 (2004)

Policy Section	Outline Adherence to Policy
Site proximity to IDP Policy Area 1 and IDP Policy Area 2	The commercial site will provide services within IDP Policy Area 1 and Policy Area 2

C. SOUTH SASKATCHEWAN REGIONAL PLAN (2014-2024)

Policy Section	Outline Adherence to Policy
<p>Municipalities are expected to establish land-use patterns which:</p> <p>8.11 Provide an appropriate mix of agricultural, residential, commercial, industrial, institutional, public and recreational land uses; developed in an orderly, efficient, compatible, safe and economical manner.</p>	<p>The provision of commercial land uses within the outline plan area will provide services to residential land uses within close proximity and acts to expand on the commercial area within the community in a compatible, orderly, efficient safe and economical manner.</p>

D. WEST LETHBRIDGE EMPLOYMENT CENTRE AREA STRUCTURE PLAN

Policy Section	Outline Adherence to Policy
5.3.2 Policies	<p>a) Parking areas shall be situated on-site so that they are hidden as much as possible from the arterial roadway. In order to accomplish this parking areas shall be concentrated on the middle of a site or to the side or rear of buildings.</p> <p>b) Buildings shall be located on the perimeter of the site, wherever possible and shall be orientated towards the street. Building entrances and windows that face towards the nearest street shall be provided wherever possible.</p> <p>c) Buildings in the gateway corridor must incorporate distinct and attractive architectural elements into their design and are to avoid blank walls wherever possible. Building designs that are commonplace and simple are to be avoided. This is particularly important in regards to building elevations that front onto a major roadway.</p>

2 SITE DESCRIPTION

Policy Section	Outline Adherence to Policy
5.3.2 Policies (cont'd)	<p>d) Loading and service areas shall be situated at the back or side of buildings where they are least visible from major roadways.</p> <p>e) Sites that are developed in the area shall have a significant amount of on-site landscaping. Such landscaping must be designed to complement the buildings that are located on site. Further landscaping details and policies shall be identified at the zoning and development permit stage.</p> <p>f) Sufficient landscaping or fencing shall be provided to effectively screen on-site service, loading and parking areas that are visible from University Dr.</p> <p>g) Driveway access shall be shared amongst multiple properties, wherever possible.</p> <p>h) Direct pedestrian access from the pathway/sidewalk and bus stops along University Dr. to the site that is separated from vehicle access must be provided. This is in addition to any pedestrian access that is provided alongside vehicle access.</p> <p>i) Sites in the gateway corridor must also maintain pedestrian access internally, to provide effective pedestrian circulation within the site. Pedestrians should be able to navigate from the public pathway to any particular building as conveniently and with as little impedance as possible.</p> <p>j) Development in the gateway corridor shall incorporate on-site lifestyle features such as landscaping, monuments, benches or plazas amongst other such features. Outdoor display or patio areas that are accessory to the primary uses on-site shall also be developed where feasible.</p> <p>k) Billboards shall not be permitted within the University Drive Gateway Corridor.</p> <p>l) Signs for businesses within the gateway corridor shall be permitted, in accordance with existing City bylaws, provided that such signs mirror the architectural features of the property they are associated with.</p> <p>m) New technologies that are inventive or environmentally friendly (i.e. LED lights etc.) shall be implemented in the design and construction of the gateway corridor's private lands.</p>

2 SITE DESCRIPTION

2.9 ADHERENCE TO NON-STATUTORY PLANS

A. PARKS MASTER PLAN (2007)

The parks master plan does not identify parks or open space within the subject parcel. There is a future linear park planned for the east side of University Drive adjacent to the site as identified within the Parks Master Plan. The multi-use pathways connections will provide a link to this future park.

B. RECREATION AND CULTURE MASTER PLAN (2013)

The proposed development does not fall within any of the provisions as identified within the Lethbridge Recreation and Culture Master Plan.

C. TRANSPORTATION MASTER PLAN (2013)

The 2013 Transportation Master Plan shows a planned arterial road (Walsh Drive) along the south of the parcel. An existing arterial road (University Dr) runs along the east side of the parcel. Bus route 33 services the parcel with a stop located along the south side of the parcel (on Walsh Drive) headed west.

D. CYCLING MASTER PLAN (2017)

The Cycling Master Plan shows a Proposed Multi-Use Pathway located along Walsh Dr (south border of the parcel), and an existing Multi-Use Pathway which is located along University Dr W.

E. TRANSIT MASTER PLAN (IN PROGRESS)

Bus route 33 currently services the parcel with a stop located along the south side of the parcel (on Walsh Drive) headed west. Although the 2017 Transit Master Plan has not yet been adopted by Council, planning considerations for this application were based off of the Transit Master Plan presentation. In the long term plan this site is located on a frequent transit service route, utilizing Walsh Drive and University Drive. It will also be serviced by two community transit service routes, 103 and 101.

2 SITE DESCRIPTION

2.9 ADHERENCE TO NON-STATUTORY PLANS CONT'D

F. BIKEWAYS AND PATHWAYS MASTER PLAN (2007)

The Plan Area is located west of an existing Regional Multi-Use pathway which runs along the east side of University Drive as per the Bikeways and Pathways Master Plan. A multi-use pathway has been planned along the south border of the Outline Plan Area.

2 SITE DESCRIPTION

2.10 LAND USE AND SITE DESIGN

This site is intended for the establishment of large format commercial land uses that serve the City and the broader region.

A few rows of on-site parking may exist between the perimeter of the site and the buildings, however the majority of parking on this site will be primarily situated so that it is located in the middle of the site or to the side or rear of a building where it is hidden from adjacent roadways/pathways. Buildings will be primarily located at the perimeter of the site and oriented to the adjacent roadway, further increasing the attractiveness of this site from adjacent roadways/pathways. Loading and service areas of buildings will be located at the back or side of buildings where they are least visible and will be screened by landscaping or other features when they are visible from a major roadway.

Previous examples of large format commercial development are associated with large tracts of surface parking that is underutilized and discourages the use of forms of transportation other than the automobile. In 2017, the City of Lethbridge's Land Use Bylaw was amended to include maximum required parking that is a maximum of 25% over the required parking minimum. Bicycle parking is also a feature that was not often considered in previous large format commercial developments, but requirements for bicycle parking were added to the Land Use Bylaw in 2017 as well. The parking requirements that are currently listed in the Land Use Bylaw for both automobiles and bicycles will be utilized for this site.

As buildings will be located near the perimeter of the site building entrances shall also be orientated towards adjacent roadways/pathways. This makes the site accessible for people who wish to use other modes of transportation (i.e. biking, walking, public transit etc.) as there is less of a hard surface (i.e. parking lot) to cross. To further improve site accessibility direct pedestrian connections from the adjacent public pathway/sidewalk will be provided and will continue to circulate throughout the site, offering an unobstructed path from the public pathway or transit stop in the road right-of-way to the doorway of any particular establishment. Building walls facing the surrounding roadways will incorporate entrances, windows and other attractive architectural features into their design to increase the visual appeal of the site from major roadways.

Landscaping will be utilized both within the site and on its perimeter to break up the expanse of concrete and enhance outdoor areas. In addition to being visually enticing, features such as benches, planters and other such distinct features will be used to help encourage people to stay and enjoy the other amenities of the site beyond shopping. Outdoor patios or display areas that are an accessory to primary uses (i.e. cafes or restaurants) are encouraged. Signage will mirror the architectural features of the associated property and will follow existing City of Lethbridge regulations.

A Land Use Bylaw amendment to rezone the site from Future Urban Development (FUD) to Direct Control (DC) is required prior to development. The proposed DC district will include land uses that are similar to those currently found in the Land Use Bylaw's existing Highway Commercial (C-H) district. In addition, this DC district will also include regulations to ensure that a high degree of attention is paid towards landscaping, the built form of buildings and overall site design that further define what is stated in this section of the Outline Plan Brief.



TRANSPORTATION

3 TRANSPORTATION

3.1 TRANSPORTATION ANALYSIS

A traffic Impact Study has been prepared as is included as Appendix B. This study analyzed the operating conditions of the studied intersections for the future background and post development scenarios. This study has assessed potential intersection upgrades to support future traffic demands.

The analysis was carried out at three horizon years:

- 2018 horizon year: Existing;
- 2020 horizon year: full build out of the proposed development; and
- 2028 horizon year: 10-year horizon year as per the City’s direction.

The results of the study led to the following conclusions:

BACKGROUND OPERATING CONDITIONS

2018 (Existing) Horizon Year

All studied intersections are operating at an acceptable level of service. Also, the volume to capacity (v/c) ratios and queues are all within acceptable limits; therefore, no improvements are required by 2018 at the studied intersections.

2020 (Opening Day) Horizon Year

The studied intersections will continue to operate at an acceptable level of service. No improvements are required at this stage.

2028 (10-Year) Horizon Year

To improve the operating conditions at the intersection of University Drive / Walsh Drive, an additional through lane is required on the southbound approach within the functional area of the intersection due to the increase in the background traffic volumes. A six lane cross-section on University Drive is included in the West Lethbridge Employment Centre Area Structure Plan as a long-term infrastructure improvement.

3 TRANSPORTATION

POST DEVELOPMENT OPERATING CONDITIONS

2020 (Opening Day) Horizon Year

The additional traffic generated by the proposed development warrants improvements on the southbound approach at the University Drive / Walsh Drive intersection at this earlier horizon year. A six lane cross-section on University Drive is included in the West Lethbridge Employment Centre Area Structure Plan as a long term infrastructure improvement. This study has incorporated this infrastructure as an analysis assumption facilitating many developments on this corridor in addition to through traffic.

It has been identified that a separate left turn lane will need to be provided on the southbound approach at the Walsh Drive / Westside Drive intersection with a length of 85 metres.

2028 (10-Year) Horizon Year

A 30-metre separate right turn lane is required at the northbound approach at the Walsh Drive/Westside Drive intersection.

TRANSIT

According to the Lethbridge Transit Master Plan, some changes are expected to occur within the medium term planning horizon in West Lethbridge. The future transit plans are expected to provide a good level of connection to the study area and will provide connections from the subject site to the main attractors and/or transit terminals within the City. Transit will serve some of the trip demand resulting from this development, taking pressure off the road infrastructure improvements.

ACTIVE MODES

As indicated in the City of Lethbridge Cycling Master Plan, a new multi-use pathway will be established on Walsh Drive between University Drive and 30 Street W with connections to Westside Drive and Highlands Boulevard. It is recommended that a multi-use pathway along Westside Drive and a multi-use pathway along Walsh Drive be provided, and crosswalks on the access points are installed to reinforce the pedestrian and cyclist network connectivity throughout the study area. The site design is intended to support pedestrian connections on site.

3 TRANSPORTATION

SAFETY REVIEW

Sight Distance Assessment

As indicated in TAC Geometric Design Guide the required intersection sight distance for design speed of 60 km/h is 130 metres for left turns and 110 metres for right turns. These criteria are met at the subject site access points (West Access and South Access) and no concerns regarding the sight lines are expected at these locations.

Weaving Analysis

According to the HCM2010 Weaving analysis methodology the weaving segment between University Drive and the south site access is expected to operate at a LOS C with a v/c ratio of 0.65 in the 2028 Post Development PM Peak conditions which has the highest weaving volumes between the different scenarios.

Drawing F05 (Appendix D) provides the location of existing access points which will be utilized for access to the commercial development. Further Accesses along West Side drive may be requested at the time of development, as this road will have a Major Collector Classification, which allows for direct commercial access.

Access and pedestrian linkages to the site are shown on Figure F05 (Appendix D)

Site Access

The Developer recognizes that the City of Lethbridge can close any private access in the future if it becomes a safety concern. The proposed right-in right-out access between the site and Walsh Drive may require closure as traffic volumes on Walsh Drive increase over the long term. If the proposed right-in right-out access becomes unsafe in the future and the City deems closure of the access as appropriate, the developer requests appropriate notice of the closure in advance.

3 TRANSPORTATION

3.2 DEVELOPMENT CONCEPT

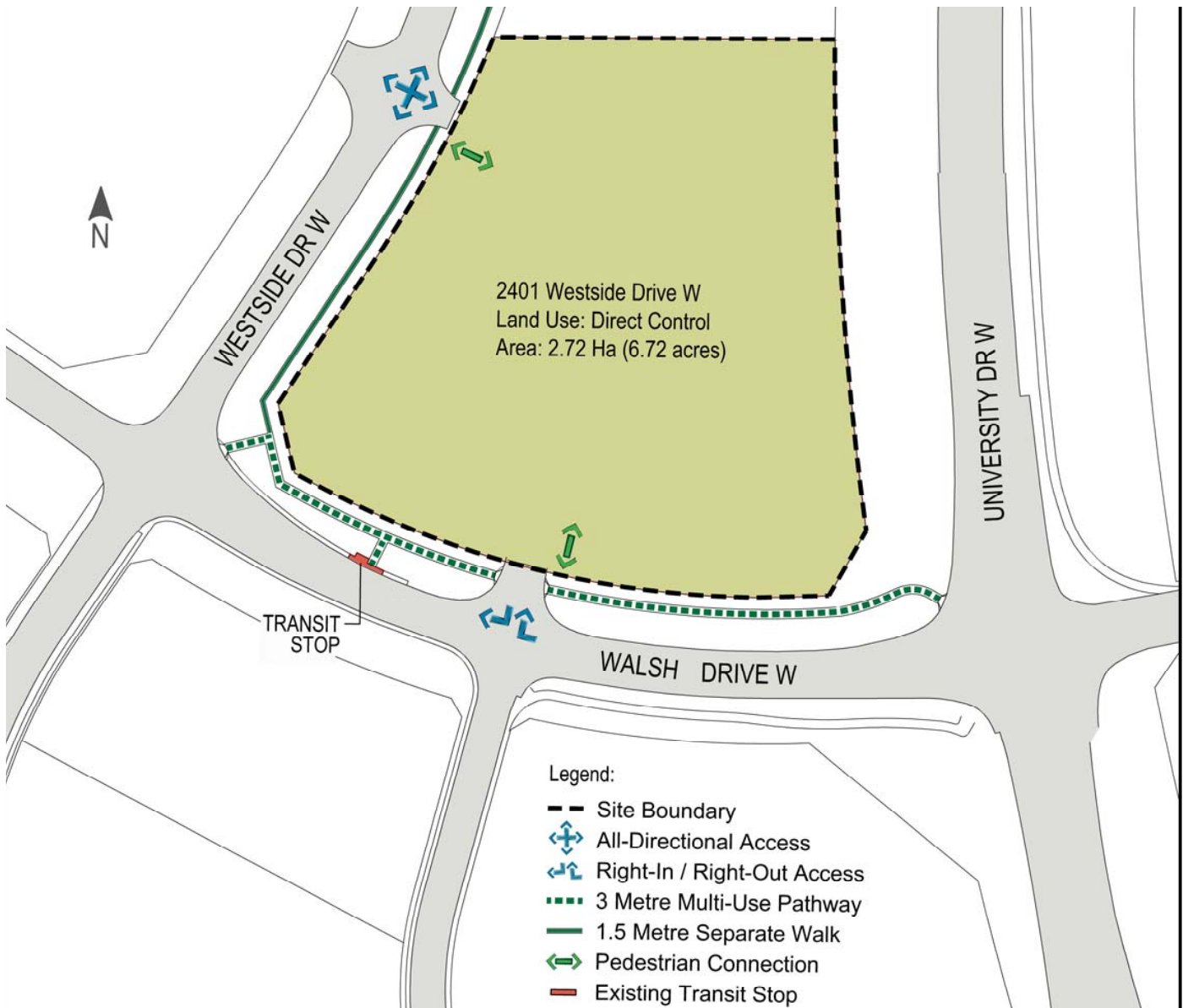


FIGURE 4 - DEVELOPMENT CONCEPT

4

SERVICING

4 SERVICING

4.1 SANITARY SEWER

Figure F01 (Appendix D) shows the location of the existing sanitary sewer service for this site. Sewage generation rates were estimated using the following standards outlined in the latest edition of the City of Lethbridge Design Standards for a Commercial land use designation.

Dry Weather Flow Rate = 20 m³/ha/day

Wet Weather Flow Rate = 7.5 m³/ha/day

Infiltration Allowance = 2.25 m³/ha/day

Total Generation Rate = 29.75 m³/ha/day

This Generation Rate applied across the 2.72 hectare site equates to 80.92 m³/day or a rounded total of 81 m³/day. This sanitary flow will be conveyed within 200mm service mains within the subject site and connecting to the service stub that exists currently and is shown on Figure F01 (Appendix D). The City of Lethbridge has confirmed that capacity is available to service this site.

The site is adjacent to Walsh Drive which contains a major sanitary sewer trunk that services all of West Lethbridge, west of Metis Trail. In order to accommodate this trunk main, a 6.0 m widening of the Walsh Drive ROW is required.

4.2 WATER

An existing water service has been provided to service this site from the watermain in Walsh Drive. This is shown on Figure F03 (Appendix D). Estimated water demands are based on the following standards outlined in the latest edition of the City of Lethbridge Design Standards for a Highway Commercial Land Use designation.

Average Day Demand = 415 L/cap/day

Highway Commercial zoning population density = 300 people/ha

These rates applied across the 2.72 hectare site equates to a corresponding Average Day Demand (ADD) of 338.64 m³/day, or a rounded total of 339 m³/day. Rounded Maximum Day Demand would then be (2.2 x ADD) 746 m³/day, and Peak Hour Demand (3.5 x ADD) of 1187 m³/day.

This estimated water demand will be distributed on site with 200mm diameter water mains. An alternate service to provide looping on the site may be requested at the time of development depending on the use. Double Check valve assemblies may be required at property line to prevent backflow from the private site to the municipal water mains. Hydrant spacing on the site will be finalized at the time of application for a building permit on the site, once building type and size, and site layout are confirmed. The City of Lethbridge has confirmed that capacity is available to service this site.

4 SERVICING

4.3 STORMWATER

Figure F02 (Appendix D) shows the existing topography and ditches on the perimeter of this site. It also shows the location of the existing storm service for this site. The City of Lethbridge has determined the following preliminary information about the stormwater drainage design for the site.

Site Area = 2.72Ha

Storage Volume Required = 181m³

Maximum Release Rate = 90 L/s

It is intended that stormwater storage will be provided in trapped low areas in the site parking lots, roof storage on flat roof commercial buildings or in landscaped dry pond areas, or a combination thereof.

The above is to be confirmed at the time of Development Permit application submission.

The City of Lethbridge has confirmed that capacity is available to service this site.

4.4 SHALLOW UTILITIES

Franchise Utilities including electricity, natural gas, and fibre optic communication cables are available for extension adjacent to the site along the Walsh Drive road Right of Way. All utilities on site will be located within the road Right of Way. Existing shallow utility lines and encroachments are shown on figure F04 (Appendix D).

Existing primary power and communications cables run along the south and west boundaries of the site. Two utility lines encroach the site on the south west corner. This is to be addressed by the utilities at the time of servicing of this site.

City Electric has indicated that power for this site will likely be provided from across either Walsh Drive or West Side Drive.

In initial discussions, there have been no concerns raised from shallow utility companies about the servicing of this site.

4 SERVICING

4.5 SERVICE AGREEMENT

The following items must be addressed in a service agreement which will be required as a condition of Development Permit:

- 1) The 6m road widening required for Walsh Dr. is required to be given to the City and will be completed through a service agreement. Under the service agreement the developer will be eligible for an arterial credit for the road widening evaluated following the process as described in the Offsite Levy Bylaw.
- 2) Offsite Levies for the site are due and will become payable with the service agreement. These will be calculated based on the Offsite Levy Bylaw and rates effective at the time the service agreement is signed.
- 3) The service agreement will include a requirement for the developer to share 50% of the cost of urbanizing West Side Drive Adjacent to their site from the edge of the Walsh Drive right of way to the north boundary of the property. This can be accomplished either by the developer urbanizing the roadway and the City will create a boundary condition to collect 50% of the cost back from the adjacent developer on the other side of West Side Dr., or the developer can pay the value of 50% of the roadway cost plus an appropriate contingency factor to the City of Lethbridge who will hold it in trust as a contribution for the future urbanization of West Side Dr.

APPENDIX



TITLE



LAND TITLE CERTIFICATE

S
LINC SHORT LEGAL TITLE NUMBER
0027 062 611 9710982;2 171 194 325

LEGAL DESCRIPTION

PLAN 9710982

BLOCK 2

EXCEPTING THEREOUT ALL MINES AND MINERALS

AREA: 2.477 HECTARES (6.12 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE

ATS REFERENCE: 4;22;9;3;SE

ATS REFERENCE: 4;22;8;34;NE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 161 055 048

REGISTERED OWNER(S)				
REGISTRATION	DATE (DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
171 194 325	31/08/2017	TRANSFER OF LAND	\$3,366,000	SEE INSTRUMENT

OWNERS

1603267 ALBERTA LTD.
OF P.O.BOX 1956,STN.MAIN
LETHBRIDGE
ALBERTA T1J 4K5

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION	DATE (D/M/Y)	PARTICULARS
NUMBER		
568DP .		RESTRICTIVE COVENANT "SUBJECT TO THE RIGHTS AND RESERVATIONS CONTAINED IN TRANSFER"
1084EJ .	31/07/1931	CAVEAT RE : EASEMENT CAVEATOR - LETHBRIDGE NORTHERN IRRIGATION DISTRICT.
6572FS .	29/01/1948	CAVEAT

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

PAGE 2
171 194 325

REGISTRATION

NUMBER DATE (D/M/Y) PARTICULARS

CAVEATOR - LETHBRIDGE COLLIERIES LTD.

1222FU . 03/06/1948 EASEMENT
"IN FAVOUR OF CERTIFICATE OF TITLE 70Z72"

1223FU . 03/06/1948 EASEMENT
"EXTENDED BY CERTIFICATE OF TITLE 70Z72"

741 091 031 27/09/1974 IRRIGATION ORDER/NOTICE
THIS PROPERTY IS INCLUDED IN THE LETHBRIDGE
NORTHERN IRRIGATION DISTRICT

911 068 939 08/04/1991 UTILITY RIGHT OF WAY
GRANTEE - ALBERTA GOVERNMENT TELEPHONES.
AS TO PORTION OR PLAN:9110217
"TAKES PRIORITY OF CAVEAT 891256910 REGISTERED
05/12/1989"

171 194 326 31/08/2017 MORTGAGE
MORTGAGEE - ALBERTA TREASURY BRANCHES.
601 MAYOR MAGRATH DRIVE SOUTH
LETHBRIDGE
ALBERTA T1J4M5
ORIGINAL PRINCIPAL AMOUNT: \$10,000,000

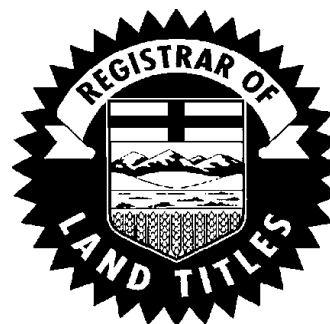
171 194 327 31/08/2017 CAVEAT
RE : ASSIGNMENT OF RENTS AND LEASES
CAVEATOR - ALBERTA TREASURY BRANCHES.
601 MAYOR MAGRATH DRIVE SOUTH
LETHBRIDGE
ALBERTA T1J4M5
AGENT - SPENCER L ASH

TOTAL INSTRUMENTS: 009

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APPENDIX

B

B

TIA / TRAFFIC
SAFETY REVIEW

NEW WAY GROUP

2401 WESTSIDE DRIVE TRANSPORTATION IMPACT ASSESSMENT

MARCH 27, 2018

CONFIDENTIAL



2401 WESTSIDE DRIVE TRANSPORTATION IMPACT ASSESSMENT

NEW WAY GROUP

CONFIDENTIAL

PROJECT NO.: 171-15591-00
DATE: MARCH 27, 2018

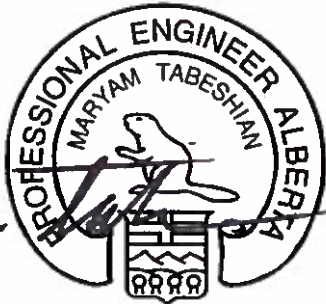
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237 4 AVENUE SW
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SIGNATURES

PREPARED BY

M.



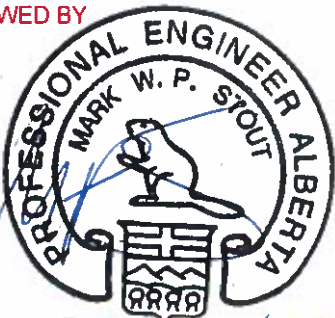
The seal is circular with the text "PROFESSIONAL ENGINEER ALBERTA" around the perimeter. Inside the circle, the name "MARYAM TABESHIAN" is written. The seal features a central emblem of a bird perched on a shield with wavy lines below it.

27 March 2018

Maryam Tabeshian, M.Sc., P.Eng
Transportation Engineer

REVIEWED BY

M.



The seal is circular with the text "PROFESSIONAL ENGINEER ALBERTA" around the perimeter. Inside the circle, the name "MARK W. P. STOUT" is written. The seal features a central emblem of a bird perched on a shield with wavy lines below it.

27 March 2018

Mark Stout, MES, P.Eng., RPP, MCIP
Senior Transportation Engineer

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1 INTRODUCTION

1.1 STUDY BACKGROUND

WSP was retained by New Way Group to provide transportation engineering consulting services in support of the proposed mixed use development located in the City of Lethbridge (the City) in Alberta. The subject site is situated in West Lethbridge and is bounded to the south by Walsh Drive, to the east by University Drive and to the west by Westside Drive.

This study has considered the potential impact of the traffic generated by the proposed development on the surrounding road network. This is to ensure that the function and the integrity of the adjacent roadways and key intersections are maintained, and that safe and efficient access capabilities are provided. The primary objectives of this study include:

- Assess the impacts of the development on the surrounding road network; and
- Determine what, if any, infrastructure improvements are required in order to support background and development traffic within the study horizons.

The location of the site and the surrounding road network are shown in Figure 1-1.



Figure 1-1: Site Context

1.2 SCOPE OF WORK

In order to achieve the study objectives, the scope and the requirements of this study were developed in consultation with the City of Lethbridge (the City). The agreed upon scope of work contains the following main requirements:

- Confirm the scope of work with the City of Lethbridge.
- Forecast background traffic volumes for 2018 (Existing), 2020 (opening day), and 2028 (10-year) horizon years at the following intersections:
 - Walsh Drive / Westside Drive
 - Walsh Drive / Argyll Road
 - Walsh Drive / University Drive
- Review background operating conditions at the above intersections for AM and PM peak hours.
- Estimate trip generation and distribution associated with the proposed land use and density.
- Determine future post development traffic demands for 2020 (opening day) and 2028 (10-year) horizon years for AM and PM peak hours at the following intersections:
 - Walsh Drive / Westside Drive
 - Walsh Drive / Argyll Road
 - Walsh Drive / University Drive
 - Westside Drive / Site Access
- Review post development operating conditions at the above mentioned intersections. Provide recommendations for intersection form and control and any mitigation measures required.
- Determine suitability of proposed access locations and the most appropriate form, from a traffic operation and safety standpoint, taking into account:
 - existing and future traffic conditions;
 - projected traffic demands; and
 - proximity to adjacent intersections.
- Perform sight lines analysis at site access points.
- Perform weaving analysis at Walsh Drive / Argyll Drive.
- Estimate future daily traffic volumes and determine road classification on the surrounding major road network.
- Provide recommendations for future road environment (number of lanes, urban or rural) for Westside Drive.
- Identify design vehicles and provide swept path analyses at the site access points.
- Provide pedestrians and cyclists statement.

2 EXISTING INFRASTRUCTURE & CONDITIONS

2.1 TRANSPORTATION ROAD NETWORK

A brief description of the major roads that comprise the adjacent transportation network surrounding the site, as shown in Figure 2-1, is provided below:

- **University Drive** is a 4-lane divided arterial with a posted speed limit of 60 km/h in the study area. The speed limit increases to 80 km/h north of the Walsh Drive intersection. This roadway is a major arterial that runs in the north-south direction in West Lethbridge and provides connection to Highway 3 and Highway 25 and Whoop Up Drive that connects West Lethbridge to the rest of the City on the east side of Old Man River.
- **Walsh Drive** is currently a 2-lane undivided road with a posted speed limit of 50 km/h in the study area. This roadway runs in the east-west direction and provides connection to University Drive on the east and to the future Metis Trail on the west.
- **Westside Drive** is a 2-lane roadway that runs in the north-south direction and has a posted speed limit of 50 km/h. The speed limit increases to 60 km/h north of the intersection of Walsh Drive. Westside drive stretches between Walsh Drive on the south and Highway 3 on the north. The connection from Westside Drive to Highway 3 is via a half interchange. Long term plans in this area indicate that the future Metis Trail connection to Highway 3 will replace the existing connection at Westside Drive / Highway 3. Westside Drive will then form a bend at Township Road 91.
- **Argyll Road** is a 2-lane undivided road that provides connection from Walsh Drive to West Highlands Community. Currently all turns are allowed at the intersection of Walsh Drive / Argyll Road; however, the configuration at this intersection will change into a right-in/right-out only in the future. The posted speed limit on this roadway is 50 km/h.

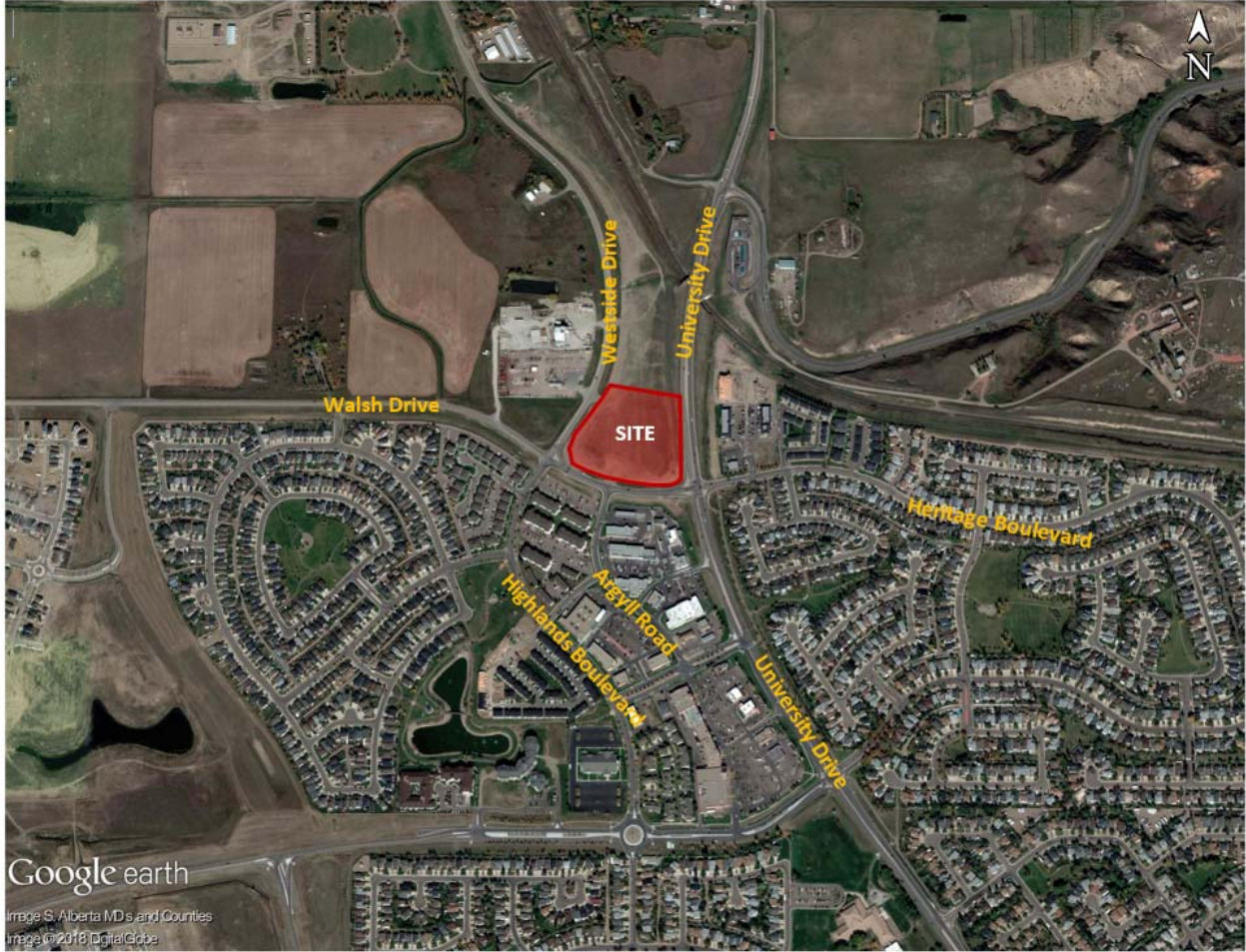


Figure 2-1: Existing Transportation Road Network

3 FUTURE BACKGROUND OPERATING CONDITIONS

3.1 ROAD NETWORK ASSUMPTIONS

The analysis in this study was conducted for 3 horizon years including 2018 (Existing), 2020 (opening day), and 2028 (10-year). As part of the discussions with the City, a number of assumptions were made regarding the improvements to the intersection configuration, traffic controls and road network within the study area. The specific improvements and upgrades that were assumed to be in place for the above mentioned horizon years include:

- 1 Metis Trail north-south connection between Walsh Drive and Whoop-Up Drive will be completed.
 - 2 The intersection of Walsh Drive / University Drive will be upgraded to include the following:
 - a A dual left turn lane on the eastbound approach;
 - b A separate right turn lane on the eastbound approach;
 - c A merge lane for the southbound to westbound right turning vehicles;
 - d A merge lane for the westbound to northbound right turning vehicles;
 - e Channelized right turn on the westbound approach; and
 - f A dedicated left turn lane on the westbound approach.
 - 3 Argyll Road will be converted into a right-in/right-out access only.
 - 4 The intersection of Walsh Drive / Westside Drive will be upgraded from a 4-way stop to a traffic signal.
-

3.2 FUTURE BACKGROUND TRAFFIC VOLUMES

The 2017 adjusted traffic volumes were provided to this study by the City. The 2017 traffic volumes were based on turning movement counts completed by the City of Lethbridge in 2017 and were adjusted by the City to account for the conversion of Argyll Road in to a right-in-right-out and the anticipated redistribution of traffic to Walsh Drive resulting from the opening of Métis Trail W. The redistributed volumes were calculated based on through traffic volume information from the City of Lethbridge traffic model Full Build Out scenario. As advised by the City an annual growth rate of 1.5% was used to estimate the background traffic volumes for 2018, 2020, and 2028 horizon years.

The 2017 adjusted volumes received from the City are included in Appendix A. The estimated 2018, 2020 and 2028 background traffic volumes for the AM and PM peak hours are shown in Figure 3-1 through Figure 3-6.

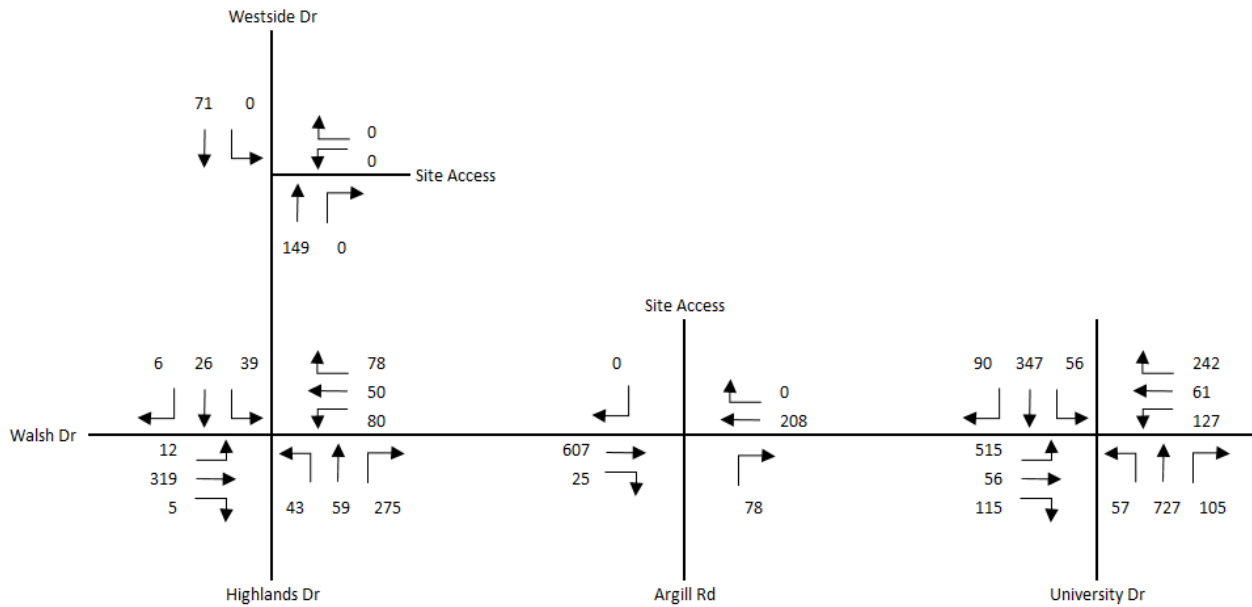


Figure 3-1: 2018 Background Traffic Volumes – AM Peak Hour

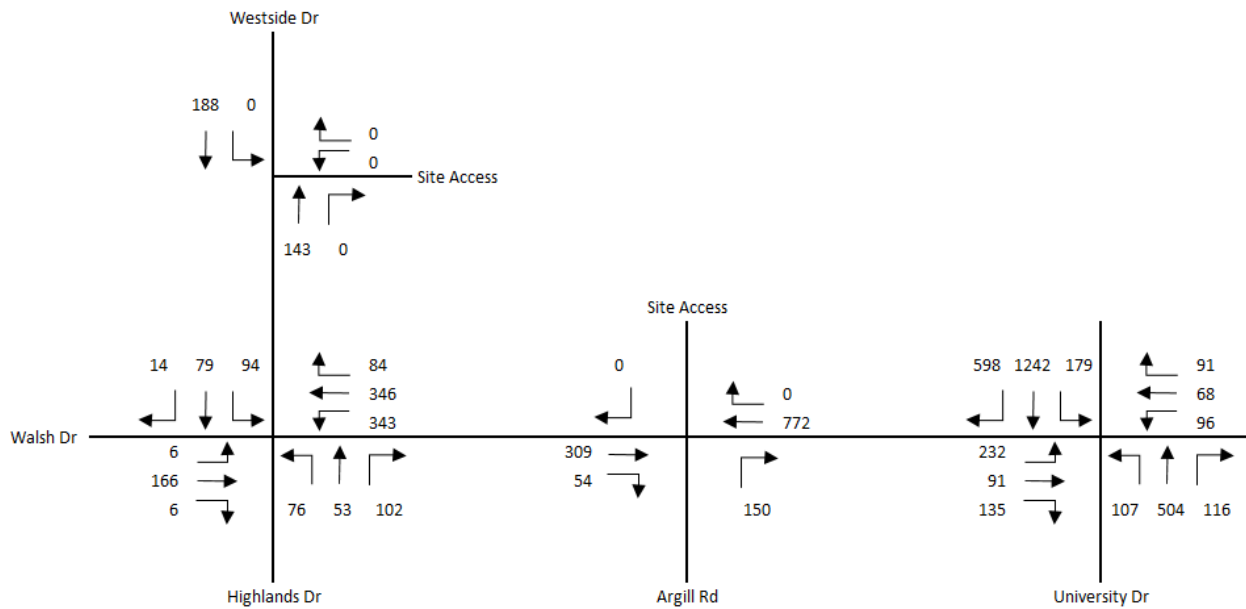


Figure 3-2: 2018 Background Traffic Volumes – PM Peak Hour

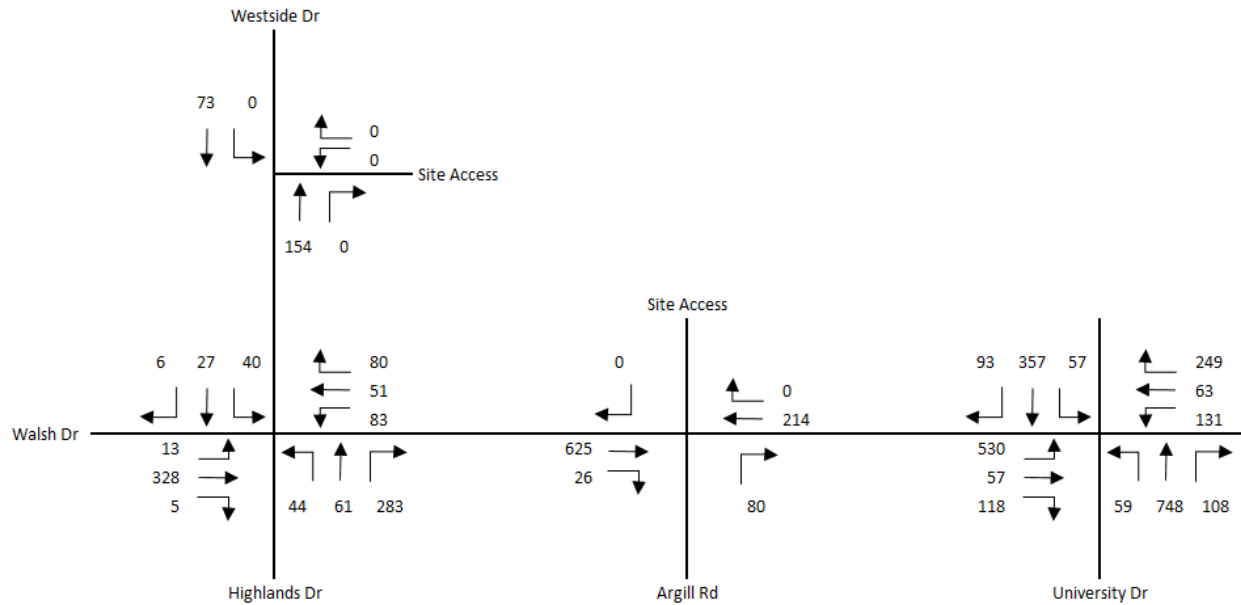


Figure 3-3: 2020 Background Traffic Volumes – AM Peak Hour

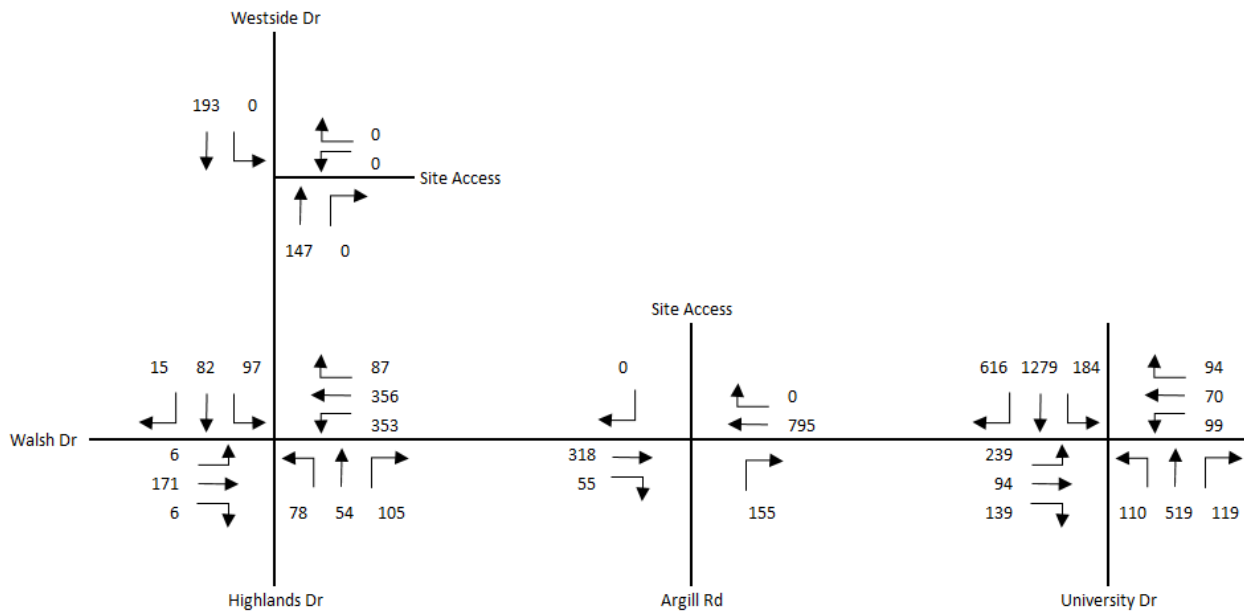


Figure 3-4: 2020 Background Traffic Volumes – PM Peak Hour

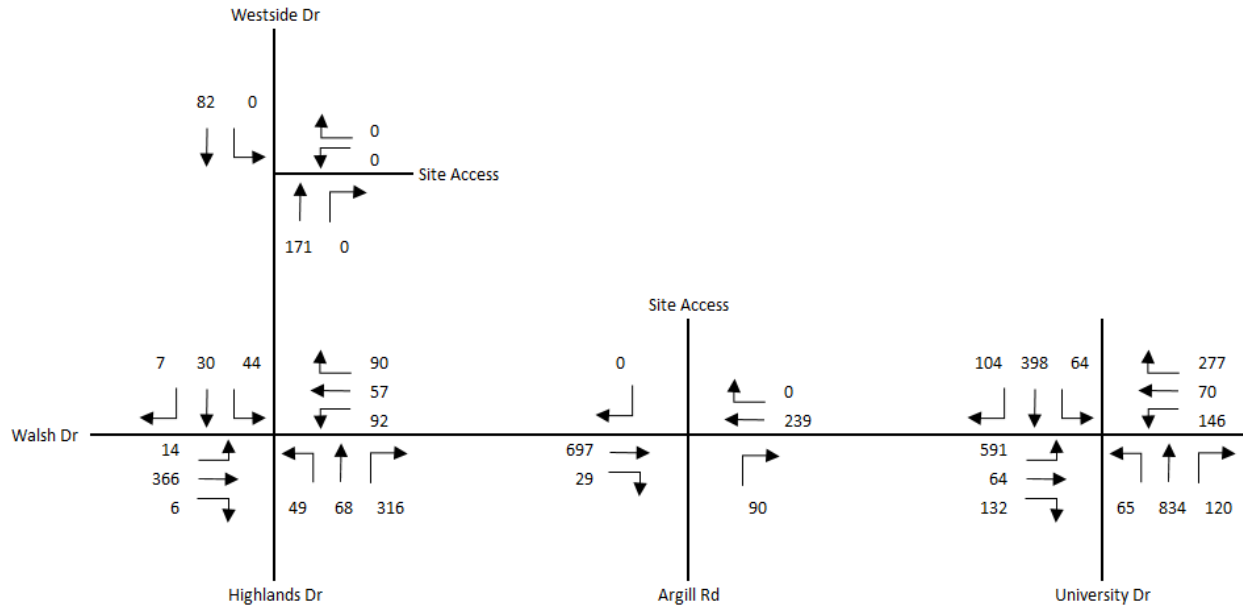


Figure 3-5: 2028 Background Traffic Volumes – AM Peak Hour

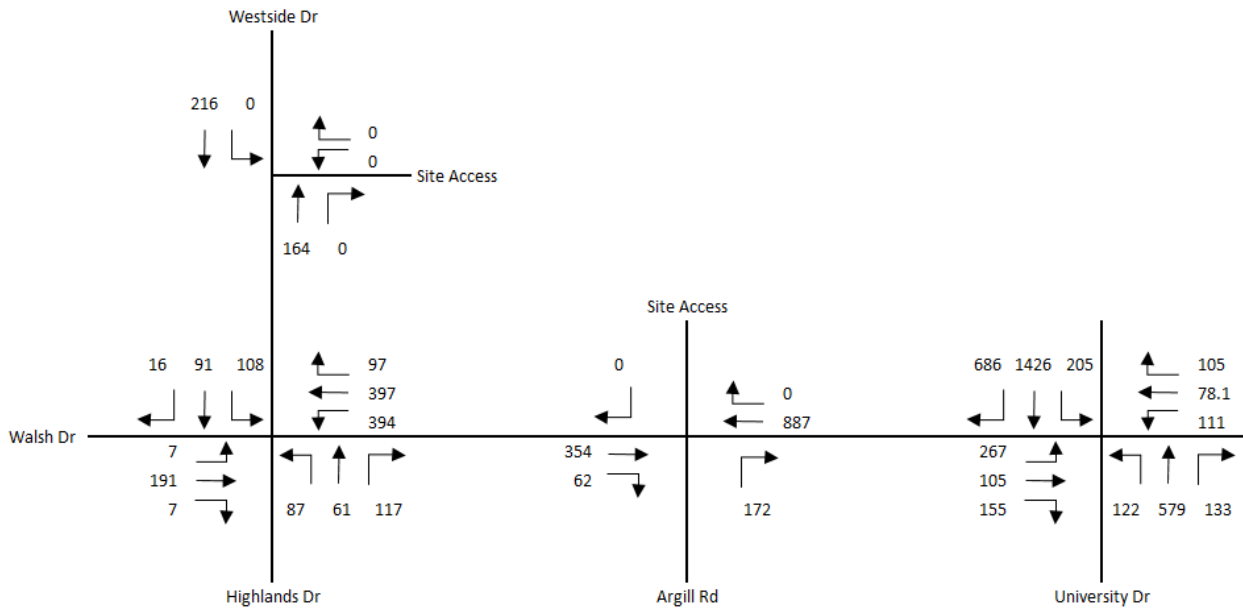


Figure 3-6: 2028 Background Traffic Volumes – PM Peak Hour

3.3 INTERSECTION PERFORMANCE EVALUATION CRITERIA

The intersection capacity analysis was carried out at the studied intersections during the morning and afternoon peak hours using Synchro 9 software package which is based on the methodology outlined in the Highway Capacity Manual (HCM). The HCM methodology considers the intersection geometry, the traffic volumes, the type of intersection controls, and also the pedestrian and cyclist volumes. The methodology then defines the level of service (LOS) based on the average delay per vehicle.

The LOS criteria for signalized and unsignalized (stop-controlled) intersections, as outlined in the Highway Capacity Manual is presented in Table 3-1. LOS A indicates good traffic flow with minimal delay, and LOS F indicates congested traffic operation with considerable delay. The operating conditions can also be expressed in terms of volume-to-capacity (v/c) ratio.

Table 3-1: Level of Service Criteria

LOS	Signalized Intersection (seconds)	Unsignalized Intersection (seconds)
A	≤ 10	≤ 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

Source: Highway Capacity Manual

3.4 FUTURE BACKGROUND CAPACITY ANALYSIS

The future background operating conditions were evaluated for the AM and PM peak hours for 2018, 2020, and 2028 horizon years. The intersections of Walsh Drive / University Drive, Walsh Drive / Argyll Drive, and Walsh Drive / Westside Drive were analyzed using the improved lane configurations and traffic controls as explained in Section 3.1. The lane configurations and traffic controls at the studied intersections are shown in Figure 3-7 and Figure 3-8. The detailed Synchro output results for the background conditions are included in Appendix B.



Figure 3-7: Walsh Drive / Westside Drive & Walsh Drive / Argyll Road Lane Configurations



Figure 3-8: Walsh Drive / University Drive Lane Configurations

3.4.1 2018 HORIZON YEAR (EXISTING)

The resulting 2018 background operating conditions at the studied intersections are summarized in Table 3-2.

Table 3-2: 2018 Background Operating Conditions

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
University Drive / Walsh Drive (Signalized)	EB	Left	0.63	C	27	78	0.57	D	49	56
		Through	0.13	B	19	16	0.40	D	45	38
		Right	0.26	A	6	11	0.45	B	11	17
	WB	Left	0.34	B	15	23	0.36	C	32	33
		Through	0.21	C	28	20	0.35	D	47	30
		Right	0.19	A	0	0	0.07	A	0	0
	NB	Left	0.19	B	18	16	0.60	C	29	35
		Through	0.66	C	21	82	0.38	B	18	59
		Right	0.20	A	5	10	0.19	A	6	14
	SB	Left	0.41	C	28	21	0.42	B	11	30
		Through	0.31	B	17	36	0.89	C	31	180
		Right	0.07	A	0	0	0.48	A	1	0
Intersection Summary				B	18		C	22		
Walsh Drive / Westside Drive (Signalized)	EB	Left/Through/Right	0.49	B	13	52	0.36	B	19	37
	WB	Left	0.21	B	11	15	0.55	B	11	44
		Through/Right	0.19	A	5	13	0.51	B	11	61
	NB	Left/Through/Right	0.72	B	14	36	0.69	C	26	42
	SB	Left/Through/Right	0.24	B	13	13	0.70	C	33	41
Intersection Summary				B	12		B	18		
Walsh Drive / Argyll Drive (Unsignalized)	EB	Through/Right	0.42	A	0	0	0.24	A	0	0
	WB	Through	0.14	A	0	0	0.52	A	0	0
	NB	Right	0.21	C	16	6	0.26	B	12	8
	Intersection Summary				A	1		A	1	

Based on the results of the analysis all studied intersections are expected to operate at an acceptable LOS C or better with all individual movements experiencing LOS D or better with a maximum v/c ratio of 0.89 during the morning and evening peak hours. The LOS, v/c ratios and queues are all within acceptable limits; therefore, no improvements are required by 2018 at these intersections.

3.4.2 2020 HORIZON YEAR (OPENING YEAR)

The resulting 2020 background operating conditions at the studied intersections are summarized in Table 3-3.

Table 3-3: 2020 Background Operating Conditions

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR				
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)	
University Drive / Walsh Drive (Signalized)	EB	Left	0.73	C	32	78	0.61	D	52	59	
		Through	0.12	B	19	16	0.42	D	47	39	
		Right	0.25	A	5	11	0.46	B	11	17	
	WB	Left	0.33	B	14	23	0.38	C	34	34	
		Through	0.23	C	30	21	0.37	D	49	32	
		Right	0.19	A	0	0	0.07	A	0	0	
	NB	Left	0.20	B	19	18	0.63	C	32	39	
		Through	0.69	C	23	87	0.38	B	18	61	
		Right	0.20	A	5	10	0.19	A	6	15	
	SB	Left	0.45	C	31	22	0.43	B	11	31	
		Through	0.33	B	18	38	0.89	C	31	189	
		Right	0.08	A	0	0	0.50	A	1	0	
	Intersection Summary				B	19			C	23	
	Walsh Drive / Westside Drive (Signalized)	EB	Left/Through/Right	0.51	B	13	56	0.38	B	20	38
		WB	Left	0.22	B	11	16	0.57	B	11	44
Through/Right			0.20	A	6	13	0.53	B	11	61	
NB		Left/Through/Right	0.73	B	14	39	0.70	C	28	45	
SB		Left/Through/Right	0.24	B	13	13	0.73	D	35	44	
Intersection Summary				B	12			B	18		
Walsh Drive / Argyll Drive (Unsignalized)	EB	Through/Right	0.44	A	0	0	0.25	A	0	0	
	WB	Through	0.14	A	0	0	0.53	A	0	0	
	NB	Right	0.22	C	16	7	0.27	B	13	9	
					A	1			A	2	

Based on the results of the analysis all studied intersections are expected to operate at an acceptable LOS C or better with all individual movements experiencing LOS D or better with a maximum v/c ratio of 0.89 during the morning and evening peak hours. The LOS, v/c ratios and queues are all within acceptable limits; therefore, no improvements are required by 2020 at these intersections.

3.4.3 2028 HORIZON YEAR (10-YEAR)

The resulting 2028 background operating conditions at the studied intersections are summarized in Table 3-4.

Table 3-4: 2028 Background Operating Conditions

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR				
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)	
University Drive / Walsh Drive (Signalized)	EB	Left	0.86	D	45	103	0.76	E	62	68	
		Through	0.17	C	24	19	0.50	D	52	42	
		Right	0.32	A	6	12	0.51	B	12	18	
	WB	Left	0.42	B	19	27	0.45	D	38	38	
		Through	0.29	C	33	23	0.44	D	53	34	
		Right	0.22	A	0	0	0.08	A	0	0	
	NB	Left	0.18	B	14	16	0.77	D	50	54	
		Through	0.88	D	38	132	0.40	B	18	72	
		Right	0.24	A	4	9	0.20	A	7	19	
	SB	Left	0.28	B	16	16	0.49	B	11	35	
		Through	0.42	C	23	49	0.92	C	34	248	
		Right	0.08	A	0	0	0.55	A	2	0	
	Intersection Summary				C	27		C	26		
	Walsh Drive / Westside Drive (Signalized)	EB	Left/Through/Right	0.58	B	16	73	0.44	C	22	43
		WB	Left	0.28	B	14	20	0.67	B	14	52
Through/Right			0.23	A	6	16	0.60	B	13	74	
NB		Left/Through/Right	0.77	B	16	51	0.77	C	31	54	
SB		Left/Through/Right	0.25	B	13	15	0.79	D	41	57	
Intersection Summary				B	14		C	21			
Walsh Drive / Argyll Drive (Unsignalized)	EB	Through/Right	0.49	A	0	0	0.28	A	0	0	
	WB	Through	0.16	A	0	0	0.59	A	0	0	
	NB	Right	0.28	C	19	9	0.32	B	14	11	
	Intersection Summary				A	2		A	2		

Based on the results of the analysis all studied intersections are expected to operate at an acceptable LOS C or better with all individual movements experiencing LOS D or better with a maximum v/c ratio of 0.88 during the morning and evening peak hours except the eastbound left turn and the southbound through movements at the intersection of University Drive / Walsh Drive. The eastbound left turn movement is expected to operate at LOS E with 62 seconds of delay and the southbound through movement is expected to operate close to capacity with v/c ratio of 0.92.

PROPOSED IMPROVEMENTS:

According to the Lethbridge Traffic Impact Study Guidelines¹, the analysis should include improvements where v/c ratios for the critical movements are increased to 0.90 or above. In order to improve the operating conditions at the intersection of University Drive / Walsh Drive, an additional through lane was introduced on the southbound approach within the functional area of the intersection. A six lane cross-section on University Drive is included in the West Lethbridge Employment Centre Area Structure Plan as a long term infrastructure improvement.

The improved operating conditions at the intersection of University Drive / Walsh Drive for the AM and PM peak hours are included in Table 3-5.

Table 3-5: 2028 Background Operating Conditions - Improved

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
University Drive / Walsh Drive (Signalized)	EB	Left	0.86	D	45	103	0.73	D	47	48
		Through	0.17	C	24	19	0.39	C	33	31
		Right	0.32	A	6	12	0.44	A	9	14
	WB	Left	0.42	B	19	27	0.33	C	21	25
		Through	0.29	C	33	23	0.33	C	34	25
		Right	0.22	A	0	0	0.08	A	0	0
	NB	Left	0.17	B	14	16	0.54	C	20	30
		Through	0.88	D	38	132	0.52	C	22	69
		Right	0.24	A	4	9	0.25	A	8	18
	SB	Left	0.28	B	16	16	0.53	B	14	37
		Through	0.29	C	21	32	0.84	C	27	133
		Right	0.08	A	0	0	0.55	A	2	0
	Intersection Summary				C	27		C	21	

As shown, the additional through lane on the southbound approach of the intersection will increase the capacity and will reduce the v/c ratios and the delays at the intersection of University Drive / Walsh Drive. The analysis results indicate that the intersection is expected to operate at LOS C during the AM and PM peak hours with all individual movements experiencing LOS D or better with a maximum v/c ratio of 0.88.

¹ "Traffic Impact Study Guidelines", March 2008, City of Lethbridge.

4 PROPOSED DEVELOPMENT

The proposed development is situated in West Lethbridge and is bounded to the south by Walsh Drive, to the east by University Drive and to the west by Westside Drive. There are two accesses to the site. The main access to the subject site is located on Westside Drive, north of the Walsh Drive intersection, and provides all-turn access to the site. The second access is located on Walsh Drive and is a right-in/right-out only access.

The subject site is 6.12 acres (2.48 ha) with different commercial uses. For the purpose of this study, a 50% land coverage and a FAR of 1.0 was assumed to estimate the Gross Floor Area (GFA) of the commercial uses which is 133,000 sqft.

4.1 TRIP GENERATION

To estimate the trip generation potential of the proposed development, ITE fitted curve equations for Shopping Centre (ITE Code: 820) for AM and PM peak hours were used². Total generated trips by the proposed development are included in Table 4-1.

Pass-by trips are attracted by commercial uses within the proposed development from traffic passing the site on adjacent streets. This study considers pass by trips from Walsh Drive and Westside Drive. The pass-by trip rates for shopping centre were obtained from ITE Trip Generation Manual. The estimated pass-by trips for the PM peak hour are included in Table 4-1. During the morning peak hour, retail use has significantly smaller trip generation, the bulk of which is typically employees. As such, no pass-by trips were assumed in the morning peak hour.

Table 4-1: Trip Generation

Land Use	Area (sqft)	Unit	AM Peak			PM Peak		
			Total	In	Out	Total	In	Out
Commercial	133	1,000 sqft	186	115	71	726	349	378
Pass-by	36%		0	0	0	261	130	130
Total			186	115	71	465	218	247

4.2 TRIP DISTRIBUTION AND ASSIGNMENT

The trip distribution patterns for this study were defined based on the existing traffic patterns, the existing and future land uses in the vicinity of the subject site, and the accessibility of the development. The defined trip distribution pattern is shown in Figure 4-1.

² ITE Trip Generation Manual – 9th Edition



Figure 4-1: Trip Distribution

The projected trip generation for the proposed development was assigned to the external road network based on the defined trip distribution. The site generated turning movement volumes by the proposed development at the studied intersections are included in Figure 4-2 and Figure 4-3.

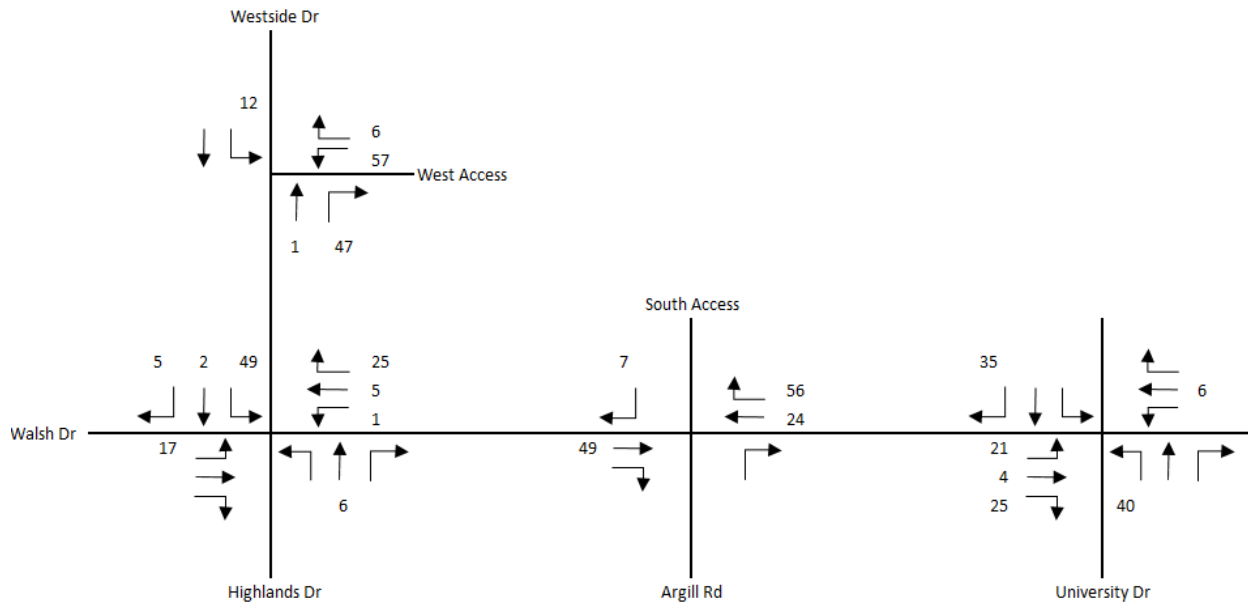


Figure 4-2: Site Generated Traffic Volumes – AM Peak Hour

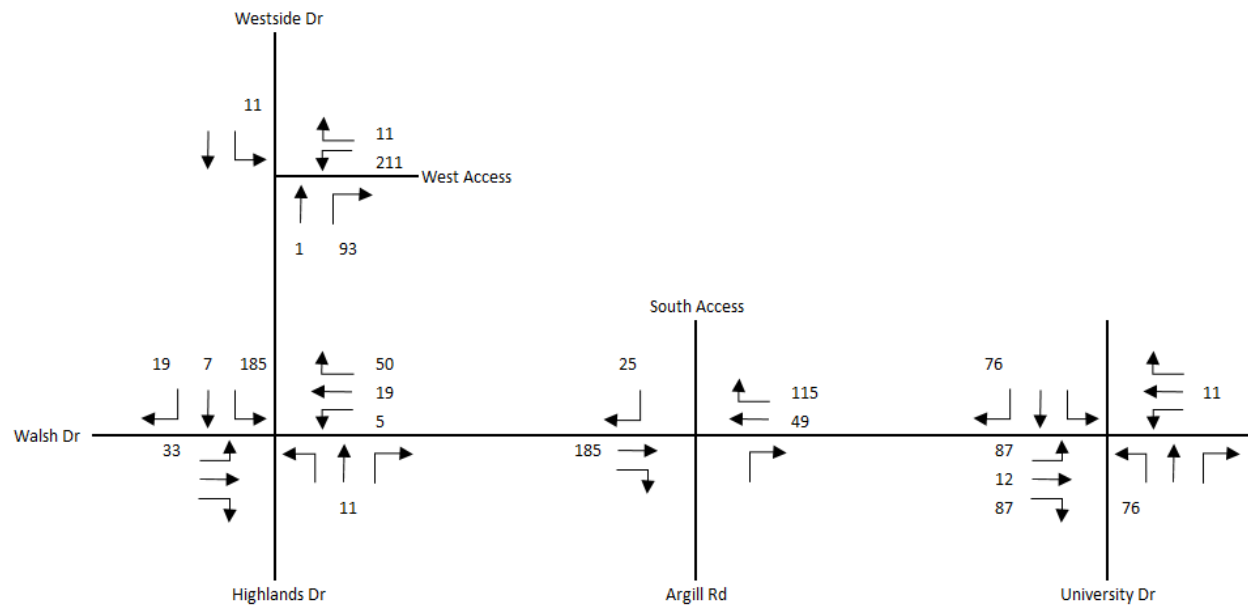


Figure 4-3: Site Generated Traffic Volumes – PM Peak Hour

5 POST DEVELOPMENT OPERATING CONDITIONS

5.1 POST DEVELOPMENT TRAFFIC VOLUMES

Traffic generated by the proposed development was added to the estimated future background traffic volumes to obtain the 2020 and 2028 post development volumes at the study intersections during the weekday AM and PM peak hours. Estimated post development traffic volumes for 2020 and 2028 horizon years are shown in Figure 5-1 through Figure 5-4.

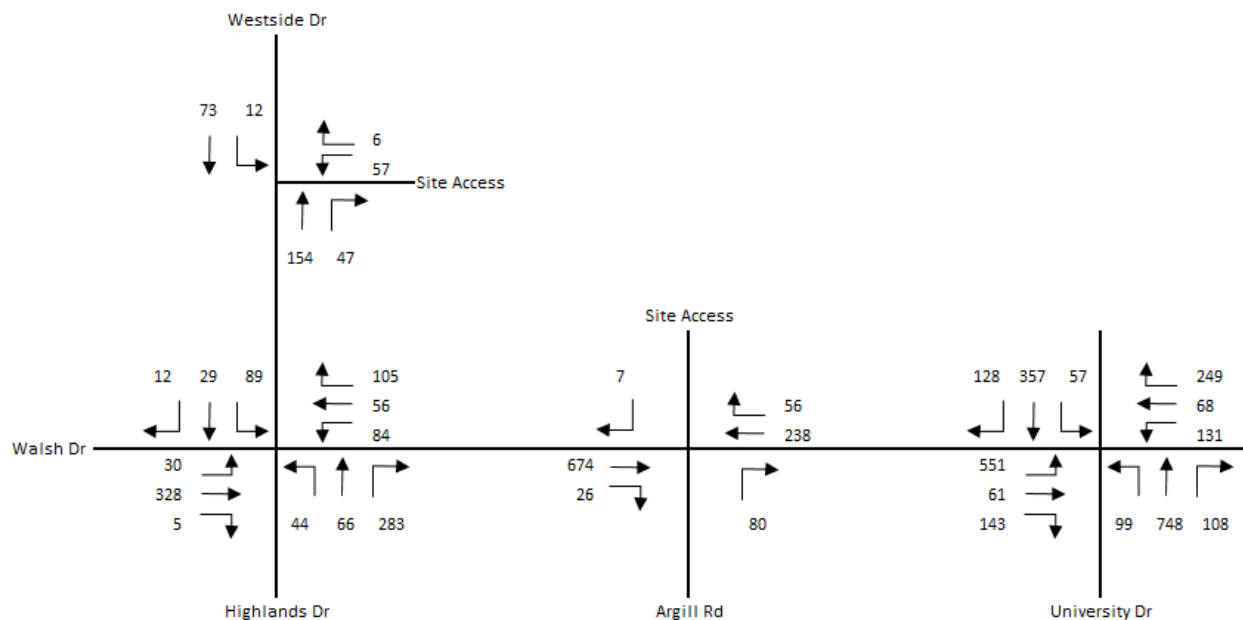


Figure 5-1: 2020 Post Development Traffic Volumes – AM Peak Hour

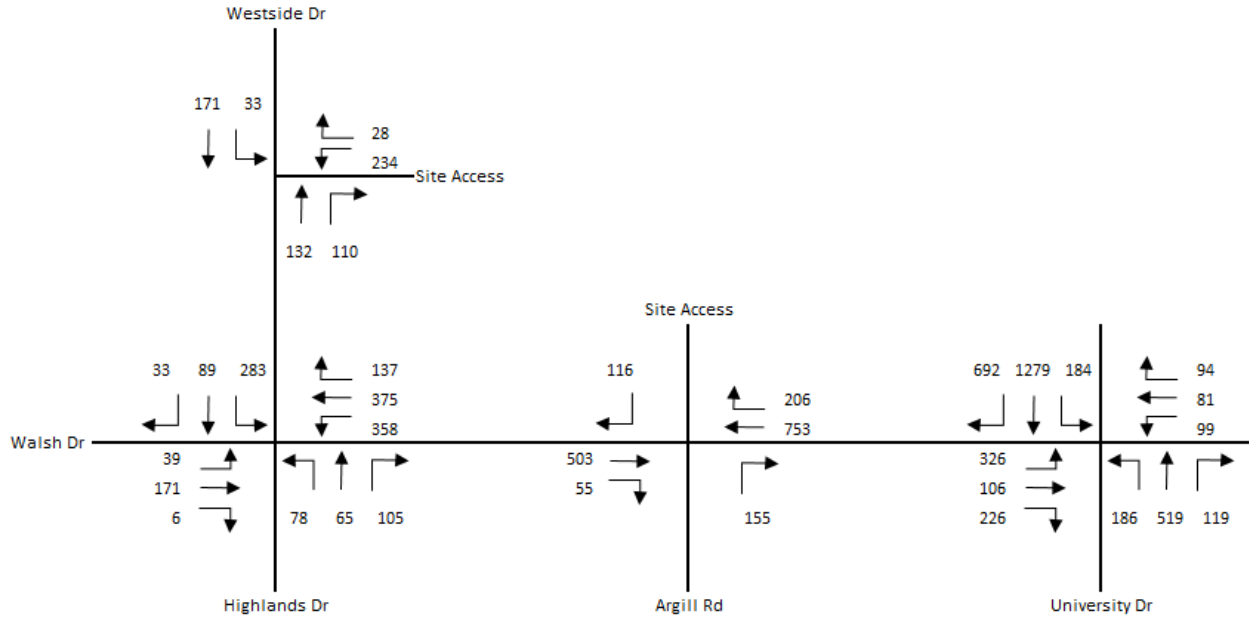


Figure 5-2: 2020 Post Development Traffic Volumes – PM Peak Hour

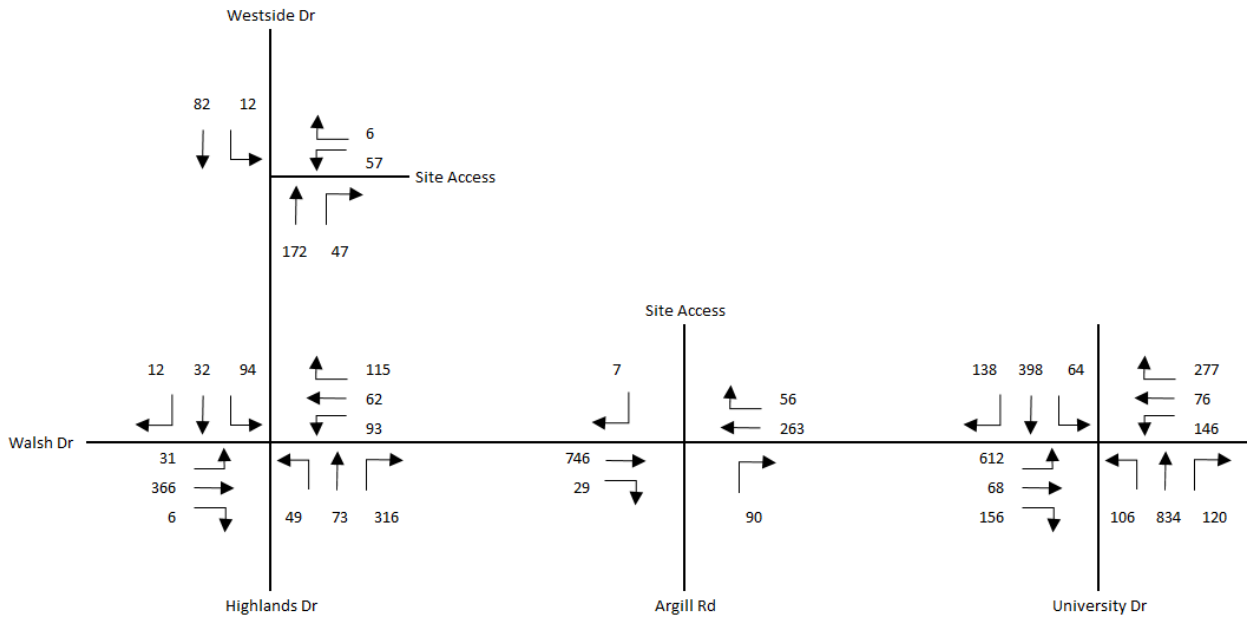


Figure 5-3: 2028 Post Development Traffic Volumes – AM Peak Hour

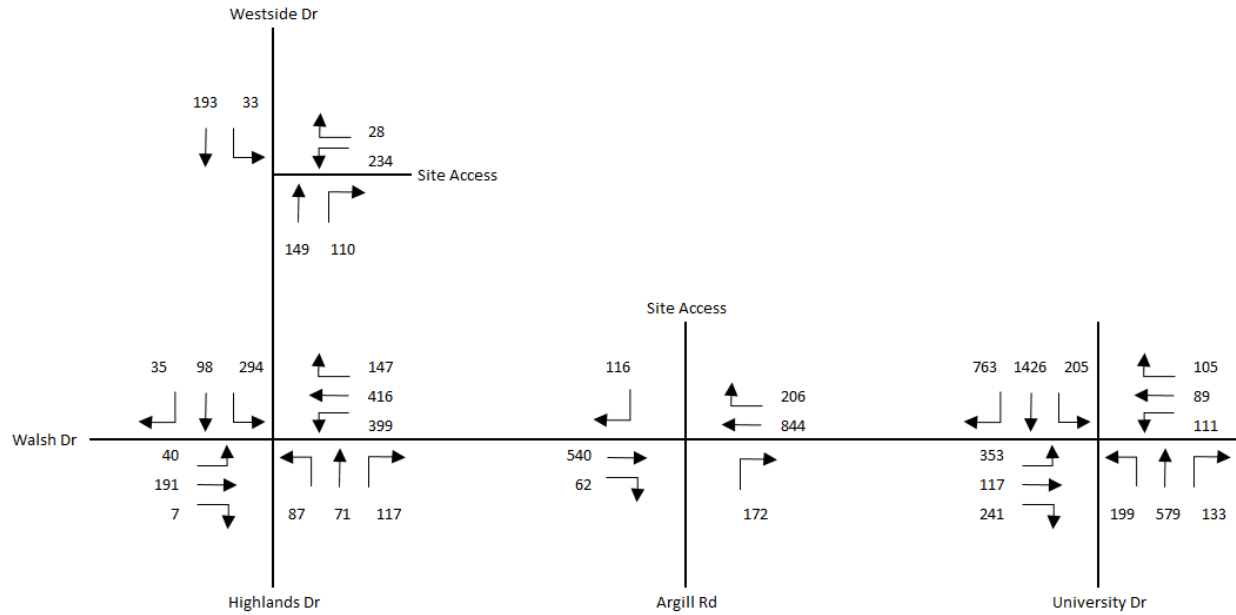


Figure 5-4: 2028 Post Development Traffic Volumes – PM Peak Hour

5.2 POST DEVELOPMENT CAPACITY ANALYSIS

Intersection capacity analyses were completed for the studied intersections to determine the 2020 and 2028 post development operating conditions during the roadway AM and PM peak hours. All intersections were modeled in Synchro using the improved lane configurations and traffic controls as explained in different background horizon years.

The West Access (main access) was modeled in Synchro with a shared left turn and right turn lane. The South Access was modeled as a right-in/right-out only.

The detailed Synchro output results for 2020 and 2028 post development operating conditions are included in Appendix C.

5.2.1 2020 HORIZON YEAR (OPENING YEAR)

The resulting 2020 post development operating conditions at the studied intersections are summarized in Table 5-1.

Table 5-1: 2020 Post Development Operating Conditions

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
University Drive / Walsh Drive (Signalized)	EB	Left	0.74	C	32	83	0.89	E	73	84
		Through	0.13	B	19	17	0.43	D	46	42
		Right	0.29	A	5	12	0.62	B	15	29
	WB	Left	0.33	B	14	23	0.45	D	38	34
		Through	0.25	C	30	22	0.45	D	53	35
		Right	0.19	A	0	0	0.07	A	0	0
	NB	Left	0.35	C	22	28	0.87	E	61	83
		Through	0.69	C	23	87	0.36	B	18	62
		Right	0.21	A	5	10	0.18	A	5	13
	SB	Left	0.45	C	32	22	0.42	B	11	32
		Through	0.33	B	18	38	0.91	C	35	221
		Right	0.10	A	0	0	0.56	A	2	0
	Intersection Summary				B	19		C	28	
Walsh Drive / Westside Drive (Signalized)	EB	Left/Through/Right	0.54	B	14	63	0.73	D	45	70
	WB	Left	0.23	B	12	17	0.89	D	44	101
		Through/Right	0.24	A	5	15	0.83	C	35	142
	NB	Left/Through/Right	0.74	B	15	45	0.47	B	16	47
	SB	Left/Through/Right	0.58	C	23	27	0.96	E	56	136
Intersection Summary				B	14		D	40		
Walsh Drive / Argyll Drive / South Access (Unsignalized)	EB	Through/Right	0.47	A	0	0	0.37	A	0	0
	WB	Through/Right	0.20	A	0	0	0.64	A	0	0
	NB	Right	0.24	C	18	7	0.36	C	17	13
	SB	Right	0.01	A	10	0	0.45	D	27	18
Intersection Summary				A	1		A	3		
Westside Drive / West Access (Unsignalized)	WB	Left/Right	0.10	B	10.9	2.8	0.54	C	19.1	25.6
	NB	Through/Right	0.13	A	0.0	0.0	0.16	A	0.0	0.0
	SB	Left/Through	0.01	A	1.2	0.3	0.03	A	1.5	0.7
Intersection Summary				A	2		A	8		

The results of the analysis indicate that:

- The intersection of University Drive / Walsh Drive is expected to operate at LOS B during the AM peak hour and LOS C during the PM peak hour. During the PM peak hour, a couple of movements are expected to operate at LOS E including the eastbound left turn and the northbound left turn movements. Also, the southbound through movement is anticipated to experience v/c ratio of 0.91 during the PM peak hour.
- The intersection of Walsh Drive / Westside Drive is expected to operate at LOS B during the AM peak hour and LOS D during the PM peak hour. All individual movements are expected to operate at LOS D or better with a maximum v/c ratio of 0.89 except the southbound movement which is expected to experience LOS E with v/c ratio of 0.96.
- Both site access points are expected to operate at LOS A during the AM and PM peak hours.

PROPOSED IMPROVEMENTS:

To improve the operating conditions at the intersection of University Drive / Walsh Drive and Walsh Drive / Westside Drive the following improvements were proposed:

- University Drive / Walsh Drive: An additional through lane was introduced on the southbound approach within the functional area of the intersection. A six lane cross-section on University Drive is included in the West Lethbridge Employment Centre Area Structure Plan as a long term infrastructure improvement.
- Walsh Drive / Westside Drive: A separate left turn lane was provided on the southbound approach with a length of 85 metres.

The improved operating conditions at these intersections for the AM and PM peak hours are included in Table 5-2.

Table 5-2: 2020 Post Development Operating Conditions - Improved

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
University Drive / Walsh Drive (Signalized)	EB	Left	0.74	C	32	83	0.77	D	47	60
		Through	0.13	B	19	17	0.32	C	29	30
		Right	0.29	A	5	12	0.50	A	7	16
	WB	Left	0.33	B	14	23	0.32	B	20	22
		Through	0.25	C	30	22	0.33	C	34	26
		Right	0.19	A	0	0	0.07	A	0	0
	NB	Left	0.35	C	22	29	0.78	D	37	62
		Through	0.69	C	23	87	0.52	C	23	63
		Right	0.21	A	5	10	0.24	A	6	12
	SB	Left	0.45	C	32	22	0.47	B	14	34
		Through	0.23	B	17	25	0.83	C	27	108
		Right	0.10	A	0	0	0.56	A	2	0
	Intersection Summary				B	19		C	21	
Walsh Drive / Westside Drive (Signalized)	EB	Left/Through/Right	0.54	B	14	63	0.58	C	27	49
	WB	Left	0.23	B	12	17	0.79	C	27	69
		Through/Right	0.24	A	5	15	0.75	C	23	97
	NB	Left/Through/Right	0.74	B	15	44	0.85	D	46	66
	SB	Left	0.47	C	21	20	0.76	C	29	57
		Through/Right	0.09	A	9	8	0.22	B	12	20
Intersection Summary				B	13		C	28		

As shown, the proposed changes improve the operating conditions at both intersections. The intersections are expected to operate at LOS B during the AM peak hour and LOS C during the PM peak hour with all individual movements experiencing LOS D or better with a maximum v/c ratio of 0.85.

5.2.2 2028 HORIZON YEAR (10-YEAR)

The resulting 2028 post development operating conditions at the studied intersections are summarized in Table 5-3.

Table 5-3: 2028 Post Development Operating Conditions

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
University Drive / Walsh Drive (Signalized)	EB	Left	0.75	C	34	97	0.75	D	47	68
		Through	0.15	C	21	18	0.38	C	32	34
		Right	0.33	A	5	12	0.54	A	8	17
	WB	Left	0.41	B	16	25	0.40	C	24	26
		Through	0.30	C	33	24	0.40	D	38	30
		Right	0.22	A	0	0	0.08	A	0	0
	NB	Left	0.39	C	23	31	0.88	D	54	74
		Through	0.77	C	26	100	0.54	C	24	72
		Right	0.23	A	6	13	0.25	A	5	13
	SB	Left	0.66	D	52	34	0.56	B	16	38
		Through	0.25	B	17	28	0.88	C	31	139
		Right	0.11	A	0	0	0.61	A	2	0
Intersection Summary				C	21			C	24	
Walsh Drive / Westside Drive (Signalized)	EB	Left/Through/Right	0.62	B	17	76	0.68	C	35	61
	WB	Left	0.29	B	14	20	0.86	C	33	88
		Through/Right	0.27	A	6	17	0.80	C	26	118
	NB	Left/Through/Right	0.79	B	18	56	0.89	D	53	84
	SB	Left	0.50	C	23	22	0.83	D	38	76
		Through/Right	0.09	A	9	8	0.23	B	15	25
Intersection Summary				B	16			C	34	
Walsh Drive / Argyll Drive / South Access (Unsignalized)	EB	Through/Right	0.52	A	0	0	0.40	A	0	0
	WB	Through/Right	0.21	A	0	0	0.70	A	0	0
	NB	Right	0.31	C	21	10	0.41	C	18	15
	SB	Right	0.01	B	10	0	0.53	D	34	22
	Intersection Summary				A	2			A	4
Westside Drive / West Access (Unsignalized)	WB	Left/Right	0.12	B	11.6	3.1	0.58	C	20.9	28.4
	NB	Through/Right	0.22	A	0.0	0.0	0.17	A	0.0	0.0
	SB	Left/Through	0.01	A	1.1	0.3	0.03	A	1.4	0.7
	Intersection Summary				A	2			A	8

The results of the analysis indicate that:

- The intersection of University Drive / Walsh Drive is expected to operate at LOS C during the AM and PM peak hours with all individual movements operating at LOS D or better with a maximum v/c ratio of 0.88.
- The intersection of Walsh Drive / Westside Drive is expected to operate at LOS B during the AM peak hour and LOS C during the PM peak hour with all individual movements operating at LOS D or better with a maximum v/c ratio of 0.89. The only concern at this intersection is that the queue length at the westbound left turn movement is approximately 18 metres longer than the provided turn bay and may spill over to the through lane during the PM peak hour.
- Both site access points are expected to operate well at LOS A during both the AM and PM peak hours. No improvements are required at the access points.

PROPOSED IMPROVEMENTS:

As mentioned, during the PM peak hour, the westbound left turn queue length at the intersection of Walsh Drive / Westside Drive is longer than the turn bay. Increasing the turn bay length may cause additional problems for the vehicles exiting the South Access and trying to get to the left turn since the end of the turn bay would be very close to the site access. Therefore, it is suggested to add a 30-metre separate right turn lane to the northbound approach and increase the capacity on this approach so that more green time can be allocated to the east-west direction. This upgrade will fix the capacity issue on the northbound approach as well as the queue problem on the westbound approach. The additional right turn lane on the south leg can be accommodated on the existing pavement width which is around 14 metres by modifying the pavement markings on this leg.

The improved operating conditions at the intersection of Walsh Drive / Westside Drive for the AM and PM peak hours are included in Table 5-4.

Table 5-4: 2028 Post Development Operating Conditions - Improved

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
Walsh Drive / Westside Drive (Signalized)	EB	Left/Through/Right	0.57	B	12	50	0.71	D	39	72
	WB	Left	0.25	A	9	13	0.75	B	20	63
		Through/Right	0.25	A	4	12	0.73	B	20	108
	NB	Left/Through	0.37	B	17	21	0.74	D	49	52
		Right	0.58	A	7	15	0.35	A	8	13
	SB	Left	0.36	B	17	18	0.86	D	44	81
		Through/Right	0.11	B	11	8	0.27	B	17	27
	Intersection Summary				A	10		C	28	

As shown, the additional improvements at the intersection are expected to improve the operating conditions. The westbound left turn queue is approximately 15 metres during the AM peak hour and 65 metres during the PM peak hour which can be accommodated within the 70-metre turn bay. In addition, the v/c ratio on the northbound approach decreases from 0.89 to 0.74.

6 DAILY TRAFFIC VOLUMES & ROAD CLASSIFICATION

The daily traffic volumes on the studied road network surrounding the proposed development were estimated for the year 2020 and 2028 using the following equations as per the City's direction:

- Arterial roads: $ADT = 5.8 * (AM\ Peak + PM\ Peak)$
- All other roads: $ADT = 5.6 * (AM\ Peak + PM\ Peak)$

According to the City of Lethbridge Road Classification Map (Appendix D) Walsh Drive and University Drive are classified as Arterial Roads and Westside Drive, Highlands Boulevard and Argyll Road are Collector Roads. Therefore, the corresponding ADT formula was used for each roadway accordingly.

The resulting daily traffic volumes for 2020 and 2028 horizon years are shown in Figure 6-1 and Figure 6-2, respectively.



Figure 6-1: Daily Traffic Volumes – 2020 Post Development



Figure 6-2: Daily Traffic Volumes – 2028 Post Development

The City of Lethbridge Design Standards³ provides information related to acceptable traffic volumes for various road classifications. Based on this information a recommended road classification scheme was prepared and is provided in Figure 6-3. A summary of the design standard for each classification is included in Table 6-1 and in Appendix E.

Table 6-1: Selected Road Classifications and Characteristics

Classification	Daily Volumes	ROW	Number of Lanes	Note
Arterial	Over 15,000	45 m to 75 m	2 to 6	Divided
Major Collector	2,000 to 8,000	25 m	2	Undivided
Minor Collector	up to 4,000	21 m to 23 m	2	Undivided

It should be note that the Traffic Volumes on Walsh Drive east of University Drive is a bit higher than the maximum allowed for a major collector road; however, the existing right-of-way does not allow a higher classification to be applied to this roadway.

³ "City of Lethbridge Design Standards", Edition 2016.

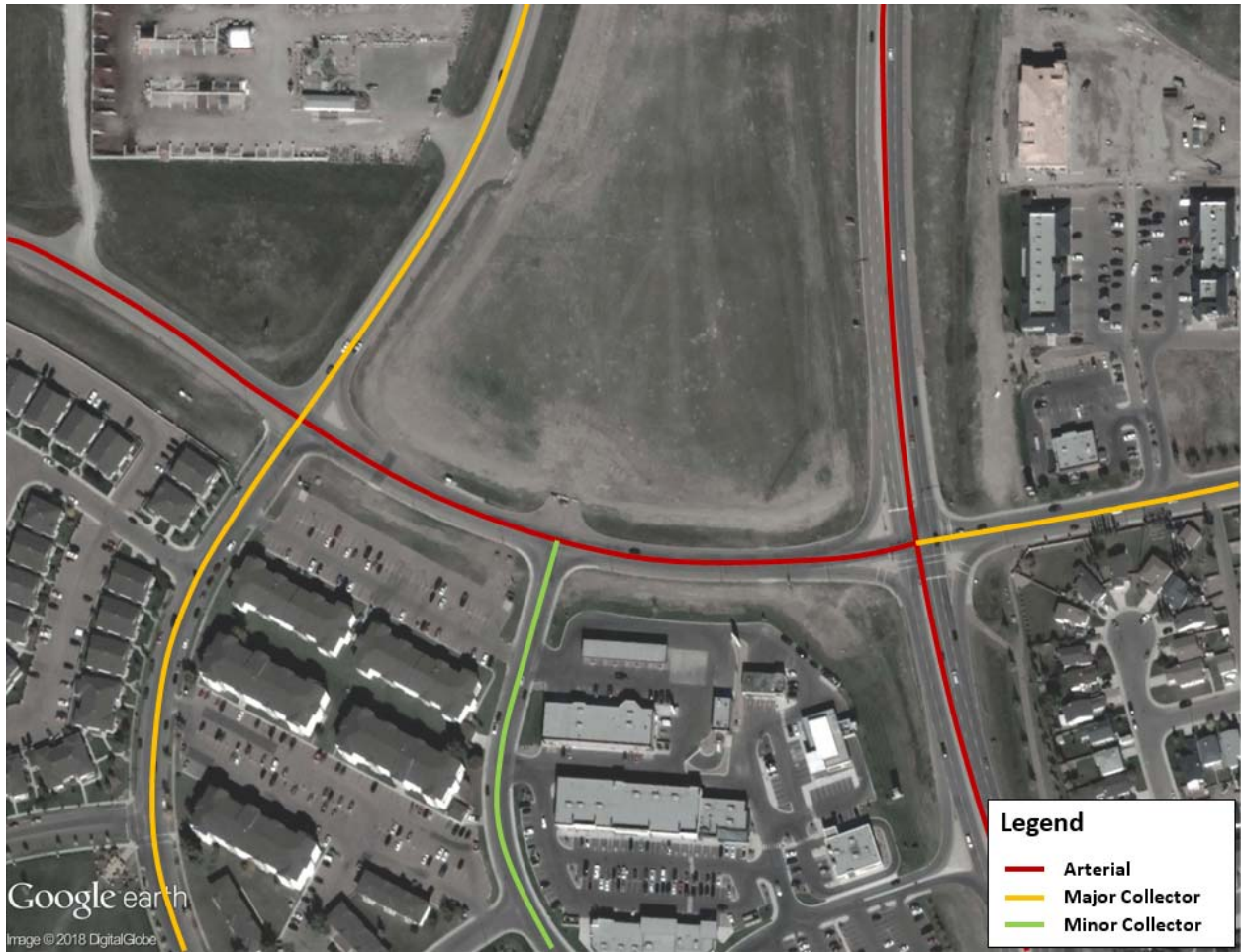


Figure 6-3: 2028 Recommended Road Classification

7 TRANSIT & ACTIVE MODES STATEMENT

7.1 TRANSIT REVIEW

7.1.1 EXISTING TRANSIT SERVICES

The closest bus stop to the subject site is located on westbound Walsh Drive between Westside Drive and Argyll Road and is equipped with a shelter and a bench. The bus stop is connected to the residential community on the south side of Walsh Drive through a sidewalk along north side of Walsh Drive and a crosswalk at Walsh Drive / Westside Drive intersection. Route 33 provides service to this bus stop. Figure 7-1 shows a photo of the bus stop that was taken during the site visit on November 3, 2017.



Figure 7-1: Bus Stop (Route 33) on Walsh Drive – Looking West

Route 33 runs counter clockwise between the University Terminal and Heritage Heights and West Highlands communities. This Route operates 7 days a week from 6:00 am to 12:00 am during weekdays, from 7:00 am to 12:00 am on Saturdays and from 8:00 am to 7:00 pm on Sundays and Holidays. A map of Route 33 is included in Figure 7-2. This figure also shows the location of the bus stops and the terminals.

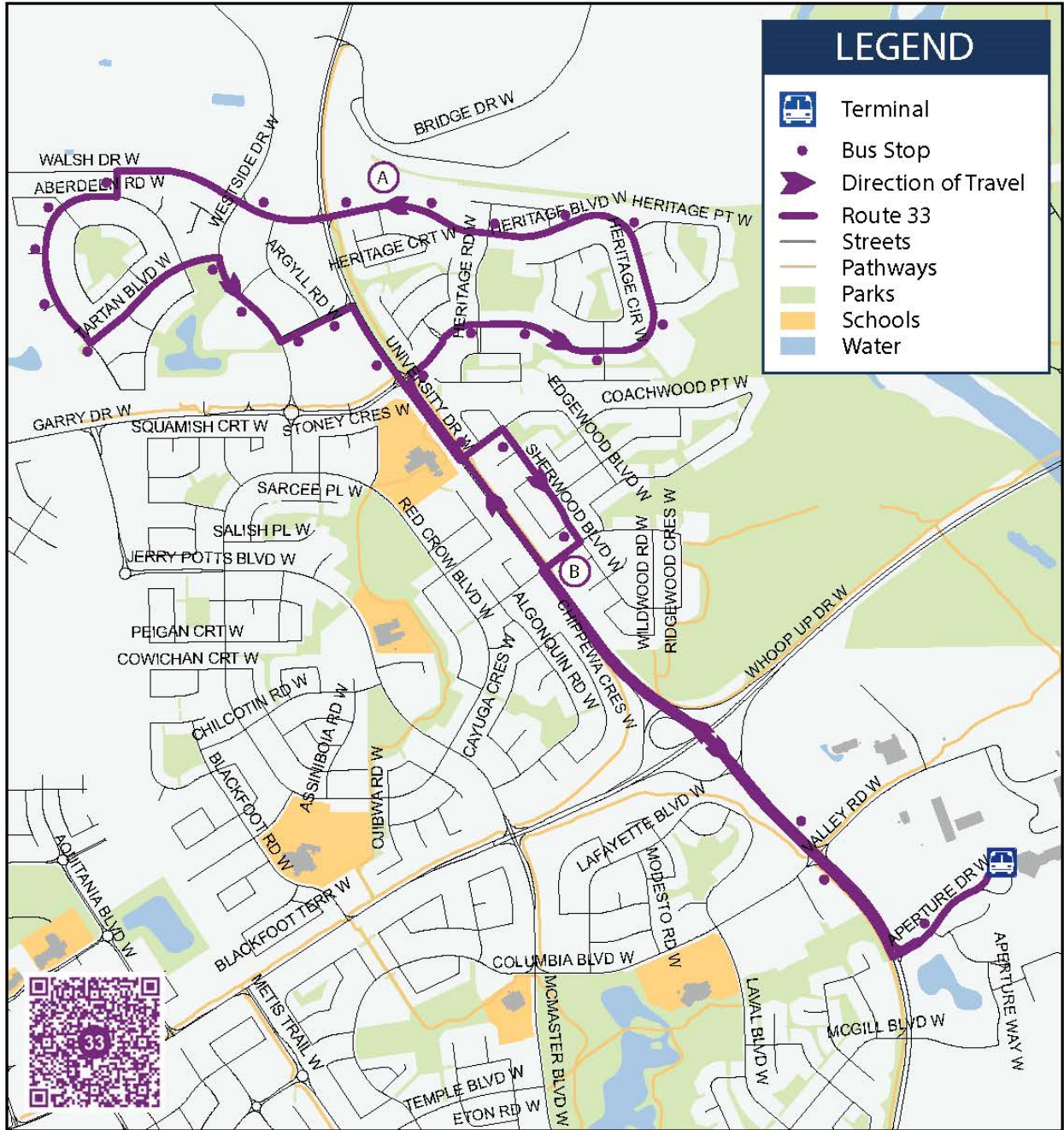


Figure 7-2: Route 33 Map (Source: www.lethbridge.ca)

7.1.2 FUTURE TRANSIT SERVICE

According to the Lethbridge Transit Master Plan⁴, some changes are expected to occur within the medium term planning horizon in West Lethbridge. The changes are as follow:

- All existing routes in West Lethbridge will be replaced including Route 33.
- New frequent transit routes, local routes, and community routes will be established in the City. New routes which will be servicing the study area include (see Figure 7-3):
 - **Route 3** will be a frequent transit route and will circulate between North-West Lethbridge Terminal and South-West Lethbridge Terminal.
 - **Route 13** will be a local route and will circulate between North-West terminal and Metis Trail terminal along Jerry Potts Boulevard and McMaster Boulevard.
 - **Route 101** will be a community route and will service West Terminal, Indian Battle Heights, and West Highlands neighbourhoods.
 - **Route 103** will be a community route and will service Garry Station, Heritage Heights, and West Lethbridge Employment Center neighbourhoods.
- A terminal in the north end of West Lethbridge will be established to allow for connections in West Lethbridge, terminal facilities for operators and an ability to turn buses around efficiently. The exact location is subject to review based on developments in the northern parts of West Lethbridge.
- Metis Trail Terminal at the south end of West Lethbridge will be established to allow for the new routes to connect, buses to turn around and the provision of operator facilities. This will also be established near a key crossroad location in West Lethbridge.

The future transit plans are expected to provide a good level of connection to the study area and will provide connections from the subject site to the main attractors or terminals within the City. Transit will serve some of the trip demand resulting from this development, taking pressure off the road infrastructure improvements.

Medium term transit network is shown in Figure 7-3.

⁴ "Lethbridge Transit Master Plan", July 2017, Stantec Consulting Ltd.

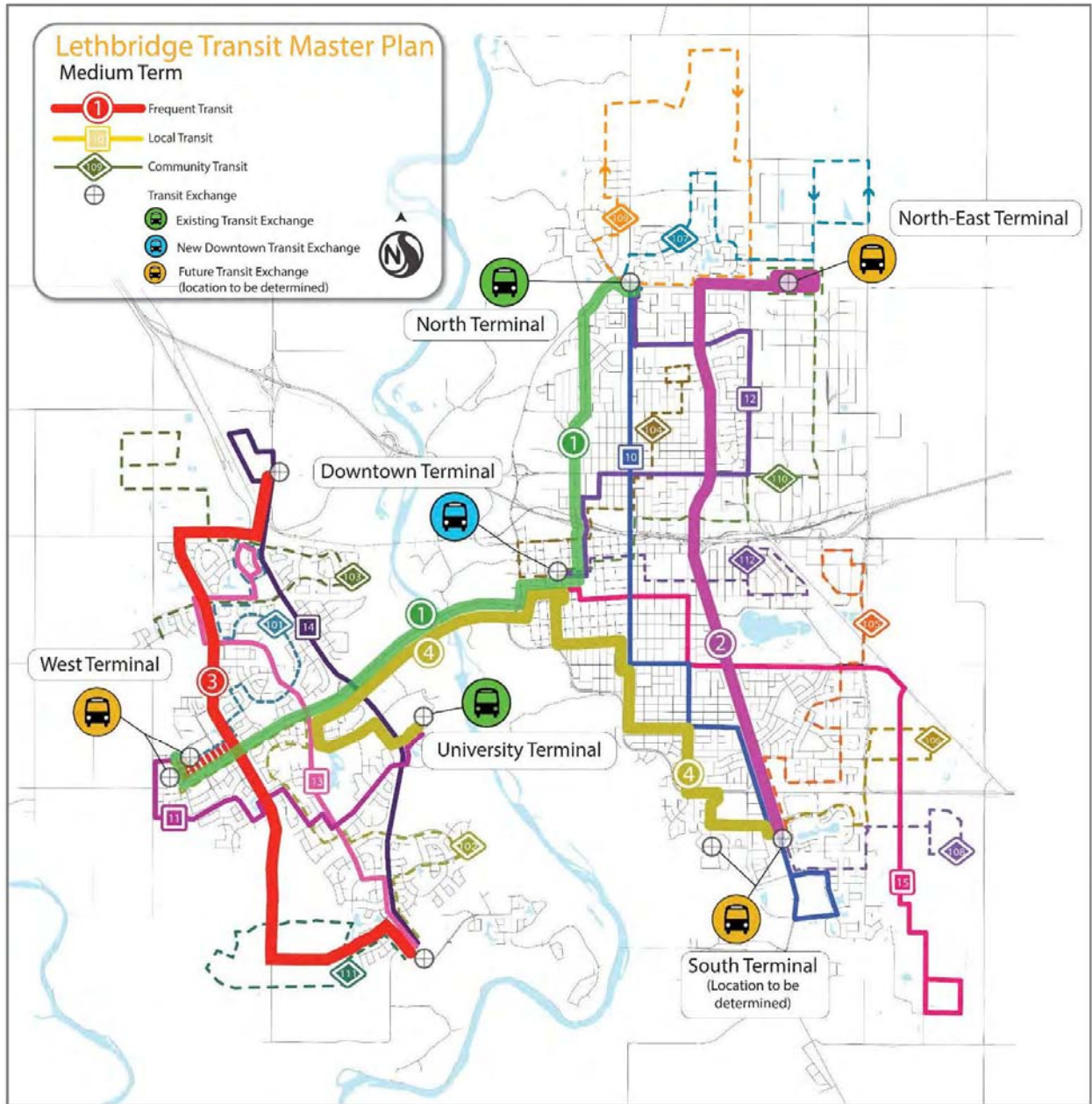


Figure 7-3: Medium-Term Transit Network (Source: Lethbridge Transit Master Plan)

7.2 PEDESTRIAN & CYCLIST REVIEW

A review of the existing pedestrian and cycling connections to the area was undertaken. There are sidewalks on both sides of Highlands Boulevard and Walsh Drive in the section between Westside Drive. There are only sidewalks on south side of Walsh Drive in the section between Argyll Road and University Drive. No sidewalks are provided along Westside Drive. The sidewalk network within the study area provides connection between the subject site and the multi-use pathway that runs along University Drive and can be used by both pedestrians and cyclists.

The intersection of University Drive / Walsh Drive is equipped with crosswalks on all legs, pedestrian activated signals, and wheelchair ramps. The intersection of Walsh Drive / Westside Drive is currently all-way stop controlled and provides crosswalks on all approaches.

The existing pathway and cycling network in the City of Lethbridge is shown in Figure 7-4.

As indicated in the City of Lethbridge Cycling Master Plan⁵, a new multi-use pathway will be established on Walsh Drive between University Drive and 30 Street W with connections to Westside Drive and Highlands Boulevard. The proposed pathway and cycling network in the City of Lethbridge is shown in Figure 7-5.

The proposed cycling network throughout the City is expected to be completed in two phases. The proposed multi-use pathways along Walsh Drive, Highlands Boulevard and 30 Street W are planned to be completed during the Phase 1 of the implementation plan.

To keep the pedestrian and cyclist network connectivity throughout the study area it is recommended to provide sidewalks along the site boundaries on Walsh Drive and Westside Drive and to install crosswalks on the access points.

⁵ "City of Lethbridge Cycling Master Plan", May 2017, Stantec Consulting Ltd. & Alta Planning + Design.

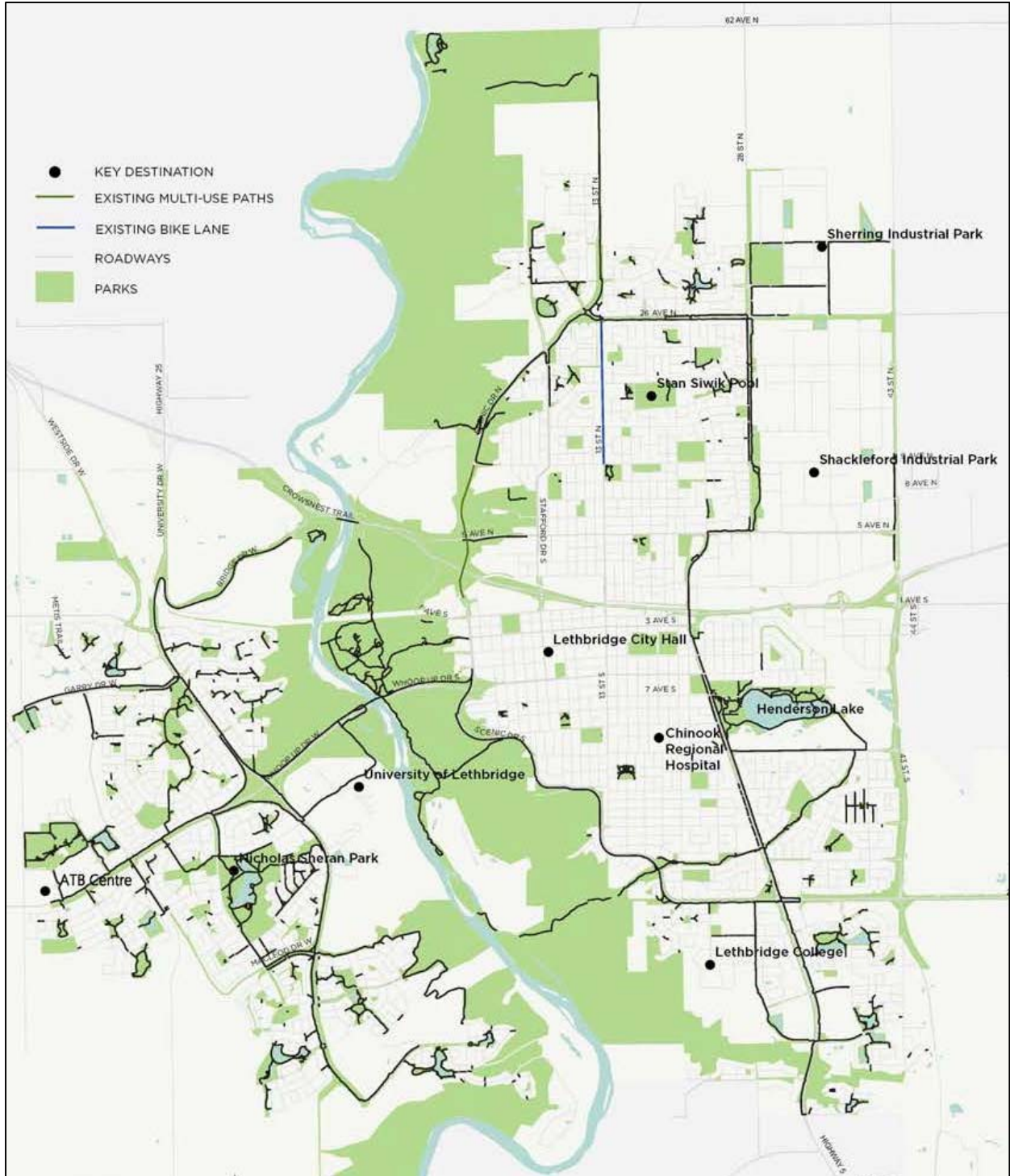


Figure 7-4: Existing Pathway & Cycling Network (Source: City of Lethbridge Cycling Master Plan)

Cycling Network and Infrastructure Types

- Shared Lane
- Bike Boulevard
- Proposed Multi-use Pathway
- Existing Multi-use Pathway
- Bike Lane / Buffered Bike Lane
- Protected Bike Lane
- - - Future Neighbourhoods
- ★ Further Investigation of Rail Crossing Needed

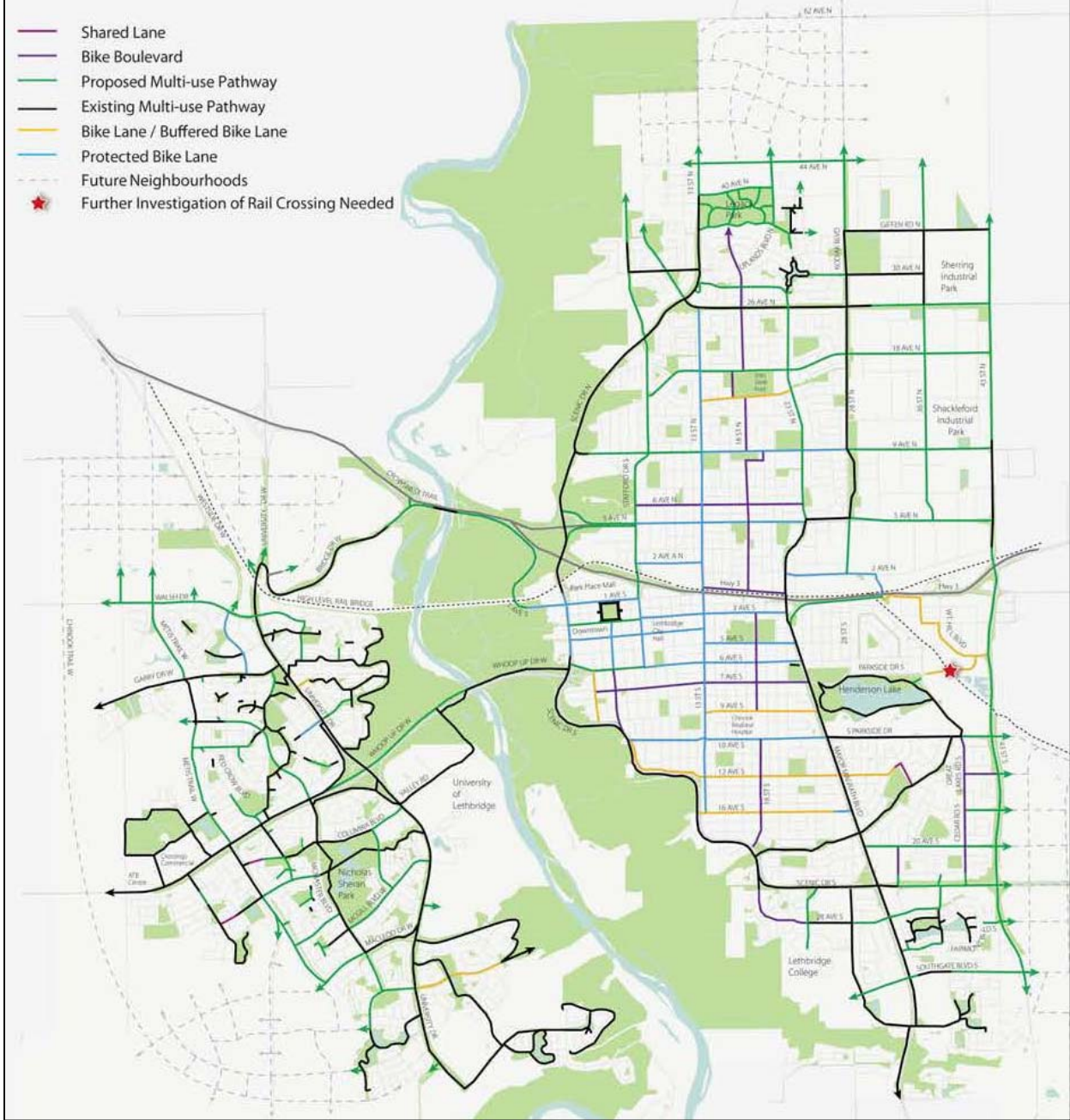


Figure 7-5: Proposed Pathway & Cycling Network (Source: City of Lethbridge Cycling Master Plan)

8 SAFETY REVIEW

As requested by the City, a high level safety review was conducted at the site access points to make sure that introducing new driveways along Walsh Drive and Westside Drive will not result in any safety concerns.

8.1 SIGHT DISTANCE ASSESSMENT

To assess the sight distance at the site access points the existing sight distances measured during a site visit at the site were compared to TAC sight distance requirements.

The site visit was conducted on Thursday, 23 November 2017 between the hours of 10 am and 12 pm to examine the site lines at the access points. The environmental conditions during the inspection were clear and dry.

8.1.1 EXISTING SIGHT DISTANCE

The main access to the subject site is an all-turn access and is located on Westside Drive north of Walsh Drive intersection. At this access point the sight lines to the south towards Walsh Drive intersection is sufficient and the intersection of Walsh Drive / Westside Drive is completely visible, as shown in Figure 8-1. The distance between the two intersections is around 145 metres.



Figure 8-1: Main Access – Looking South towards Walsh Drive

The site line at the main access towards the north is also sufficient and clear despite a slight bend on Westside Drive. This sight line is around 300 metres and is shown in Figure 8-2.



Figure 8-2: Main Access – Looking North

The second access to the subject site is located on Walsh Drive between Westside Drive and University Drive and is a right-in/right-out only access. The signalized intersection of University Drive / Walsh Drive is fully visible from this access point (Figure 8-3). The distance between this intersection and the access point is around 150 metres.



Figure 8-3: RI/RO Access on Walsh Drive – Looking East towards University Drive

The sight line from the right-in/right-out access to the west towards the west is clear and the Westside Drive / Walsh Drive intersection is completely visible. The sight distance is even past the Westside Drive intersection and is measured to be more than 200 metres (Figure 8-4).



Figure 8-4: RI/RO Access on Walsh Drive – Looking West towards Westside Drive

8.1.2 TAC INTERSECTION SIGHT DISTANCE REQUIREMENT

According to TAC Geometric Design Guide for Canadian Roads⁶, Chapter 9: Intersections, Section 9.9, sight distance criteria for intersections with stop control on the minor road should be considered for three situations:

- 1** Left turns from the minor road
- 2** Right turns from the minor road
- 3** Crossing the major road from a minor road approach

The main access (West Access) to the subject site is a T-intersection and exiting vehicles from the site can only turn left or right. Therefore, left turn and right turn sight distance requirements were examined at this location. The second access (South Access) to the site is a right-in/right-out. As a result, only the right turn sight distance requirements are applicable at this location.

The intersection sight distance for left turns and right turns are shown in Figure 8-5 and Figure 8-6.

As indicated in these tables for design speed of 60 km/h (posted speed limit of 50 km/h), the required intersection sight distance is 130 metres for left turns and 110 metres for right turns. These criteria are met at the subject site access points as explained in Section 8.1.1.

⁶ "TAC Geometric Design Guide", June 2017.

Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn From Stop

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	41.7	45
30	35	62.6	65
40	50	83.4	85
50	65	104.3	105
60	85	125.1	130
70	105	146.0	150
80	130	166.8	170
90	160	187.7	190
100	185	208.5	210
110	220	229.4	230
120	250	250.2	255
130	285	271.1	275

Note: Intersection sight distance shown is for a stopped passenger car to turn left onto a two-lane highway with no median and grades 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

Figure 8-5: Design Intersection Sight Distance – Left Turn from Stop

Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	36.1	40
30	35	54.2	55
40	50	72.3	75
50	65	90.4	95
60	85	108.4	110
70	105	126.5	130
80	130	144.6	145
90	160	162.6	165
100	185	180.7	185
110	220	198.8	200
120	250	216.8	220
130	285	234.9	235

Note: Intersection sight distance shown is for a stopped passenger car to turn right onto or to cross a two-lane highway with no median and with grades of 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

Figure 8-6: Design Intersection Sight Distance – Right Turn from Stop

8.2 WEAVING ANALYSIS

A weaving analysis was conducted using the methodology from the HCM2010 Chapter 12, outlined in Figure 8-7. A number of assumptions for interchange density (ID), and percentage of heavy vehicles and RV's were made using conservative and best practice values in order to complete the analysis. A final lane configuration of one westbound through lane for Walsh Drive and one continuous channelized right turn between University Drive and the south site access was also assumed.

The Results of the analysis indicated that the weaving segment is expected to operate at a LOS C with a v/c ratio of 0.65 in the 2028 Post Development PM Peak conditions which has the highest weaving volumes between the different scenarios. The calculations regarding the weaving analysis is included in Appendix F.

It should be noted that as indicated in HCM2010, the weaving analysis methodology is not reflective of arterial weaving movements as they are greatly affected by proximity and timing of signals along the arterial. However, since there is no generally accepted methodology for analyzing weaving movements on arterials at this time, this methodology was used in this study as requested by the City of Lethbridge.

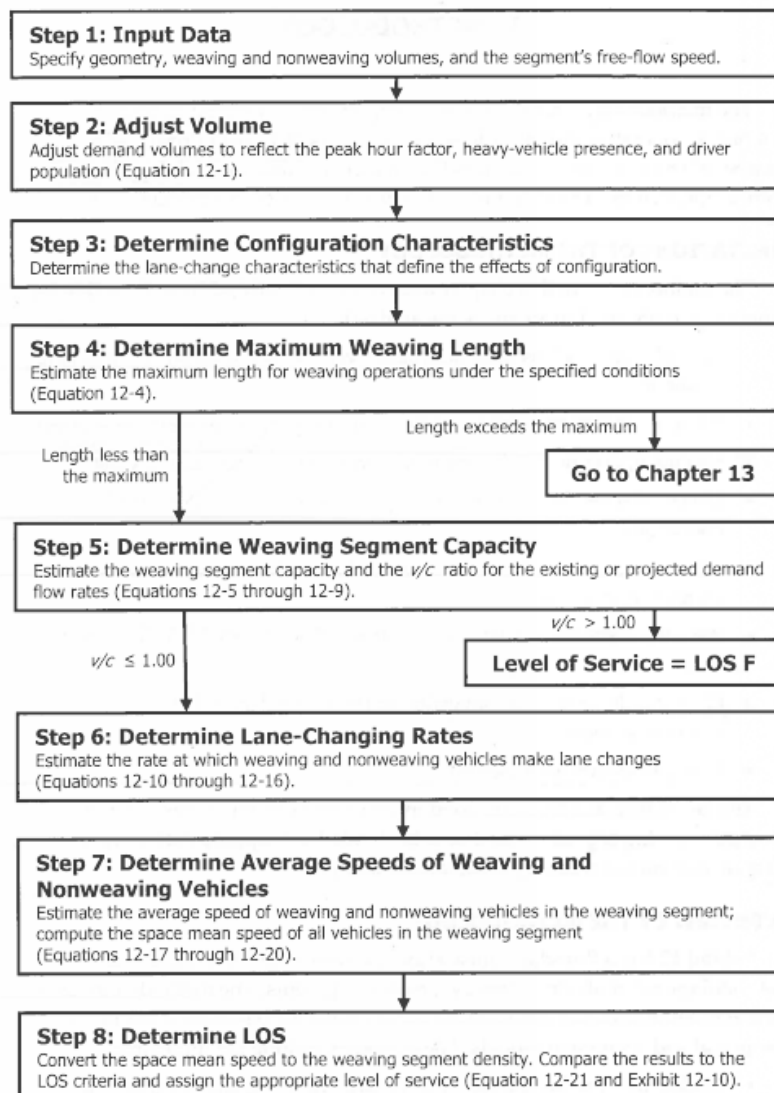


Figure 8-7: HCM2010 Weaving Analysis Methodology

9 CONCLUSIONS & RECOMMENDATIONS

This study analyzed the operating conditions of the studied intersections for the future background and post development scenarios. This study has assessed potential intersection upgrades to support future traffic demands.

The analysis was carried out at three horizon years:

- 2018 horizon year: Existing;
- 2020 horizon year: full build out of the proposed development; and
- 2028 horizon year: 10-year horizon year as per the City's direction.

The results of the study led to the following conclusions:

Background Operating Conditions:

→ 2018 (Existing) Horizon Year

All studied intersections are operating at an acceptable level of service. Also, the v/c ratios and queues are all within acceptable limits; therefore, no improvements are required by 2018 at the studied intersections.

→ 2020 (Opening Day) Horizon Year

The studied intersections will continue to operate at an acceptable level of service. No improvements are required at this stage.

→ 2028 (10-Year) Horizon Year

To improve the operating conditions at the intersection of University Drive / Walsh Drive, an additional through lane was introduced on the southbound approach within the functional area of the intersection due to the increase in the background traffic volumes. A six lane cross-section on University Drive is included in the West Lethbridge Employment Centre Area Structure Plan as a long term infrastructure improvement.

Post Development Operating Conditions:

→ 2020 (Opening Day) Horizon Year

The additional traffic generated by the proposed development warrants improvements on the southbound approach at the University Drive / Walsh Drive intersection at this earlier horizon year. A six lane cross-section on University Drive is included in the West Lethbridge Employment Centre Area Structure Plan as a long term infrastructure improvement. This study has incorporated this infrastructure as an analysis assumption facilitating many developments on this corridor in addition to through traffic.

Also, a separate left turn lane needs to be provided on the southbound approach at the Walsh Drive / Westside Drive intersection with a length of 85 metres.

→ 2028 (10-Year) Horizon Year

A 30-metre separate right turn lane is required at the northbound approach at the Walsh Drive / Westside Drive intersection.

Transit

According to the Lethbridge Transit Master Plan, some changes are expected to occur within the medium term planning horizon in West Lethbridge.

The future transit plans are expected to provide a good level of connection to the study area and will provide connections from the subject site to the main attractors and/or transit terminals within the City. Transit will serve some of the trip demand resulting from this development, taking pressure off the road infrastructure improvements.

Active Modes

As indicated in the City of Lethbridge Cycling Master Plan, a new multi-use pathway will be established on Walsh Drive between University Drive and 30 Street W with connections to Westside Drive and Highlands Boulevard.

It is recommended to provide sidewalks along the site boundaries on Walsh Drive and Westside Drive and to install crosswalks on the access points to keep the pedestrian and cyclist network connectivity throughout the study area

Safety Review

→ Sight Distance Assessment

As indicated in TAC Geometric Design Guide the required intersection sight distance for design speed of 60 km/h is 130 metres for left turns and 110 metres for right turns. These criteria are met at the subject site access points (West Access and South Access) and no concerns regarding the sight lines are expected at these locations.

→ Weaving Analysis

According to the HCM2010 Weaving analysis methodology the weaving segment between University Drive and the south site access is expected to operate at a LOS C with a v/c ratio of 0.65 in the 2028 Post Development PM Peak conditions which has the highest weaving volumes between the different scenarios.

APPENDIX A

2017 TRAFFIC VOLUMES



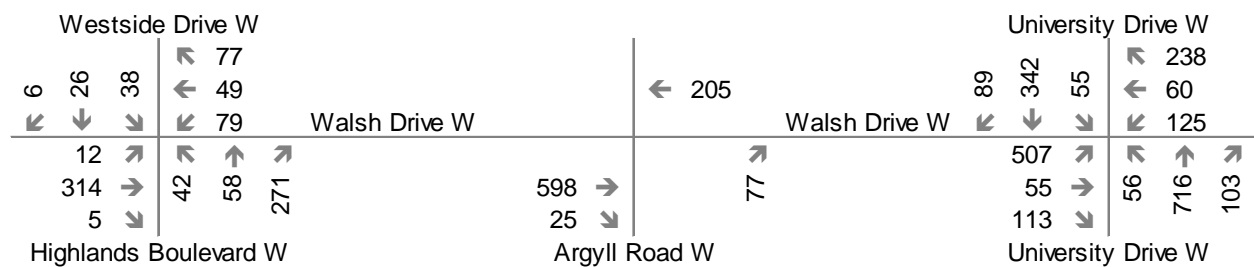


Traffic Volumes

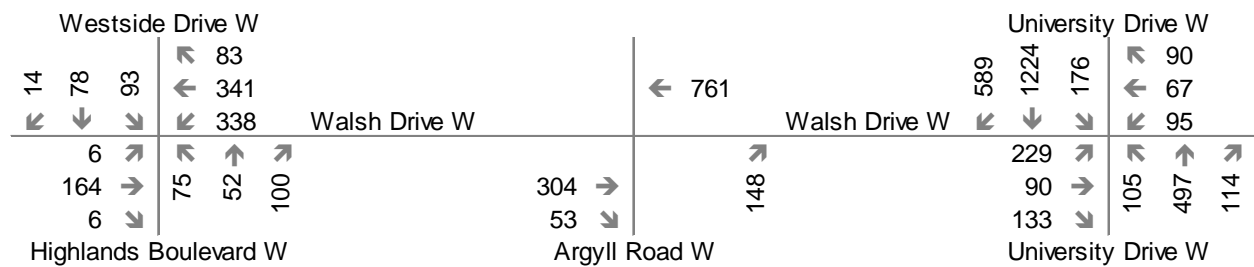
Traffic volumes are based on turning movement counts completed by the City of Lethbridge in 2017. Volumes were adjusted to account for the conversion of Argyll Road in to a right-in-right-out and the anticipated redistribution of traffic to Walsh Drive W resulting from the opening of Métis Trail W. The redistributed volumes were calculated based on through traffic volume information from the City of Lethbridge traffic model Full Build Out scenario. The through volumes were reduced at a rate of 1.5%/year for 45 years to estimate redistributed through traffic on Walsh Drive.

Traffic volumes provided below are to be grown by 1.5% per year to each of the planning horizons.

AM Peak Hour Volumes:



PM Peak Hour Volumes:



APPENDIX B

BACKGROUND SYNCHRO OUTPUTS



Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

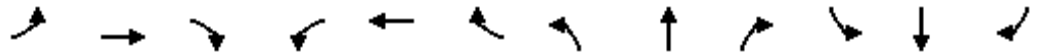
2018 Background
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑	↖	↖	↑	↖	↖	↑↑	↖	↖	↑↑	↖
Traffic Volume (vph)	515	56	115	127	61	242	57	727	105	56	347	90
Future Volume (vph)	515	56	115	127	61	242	57	727	105	56	347	90
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98	0.99		0.99	0.99		0.95	0.99		0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	3202	1432
Fl _t Permitted	0.950			0.715			0.519			0.239		
Satd. Flow (perm)	3160	1735	1438	1226	1735	1453	867	3202	1367	401	3202	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			131			275			121			188
Link Speed (k/h)		50			50			60				60
Link Distance (m)		88.6			185.2			219.5				151.3
Travel Time (s)		6.4			13.3			13.2				9.1
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	585	64	131	144	69	275	65	826	119	64	394	102
Shared Lane Traffic (%)												
Lane Group Flow (vph)	585	64	131	144	69	275	65	826	119	64	394	102
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		4.8			4.8			4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	Perm	NA	Perm	Perm	NA	Free
Protected Phases	7	4		3	8			2				6
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		2	2	2	6		6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		20.0	20.0	20.0	20.0		20.0
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		25.5	25.5	25.5	25.5		25.5
Total Split (s)	24.0	37.0	37.0	13.0	26.0		40.0	40.0	40.0	40.0		40.0
Total Split (%)	26.7%	41.1%	41.1%	14.4%	28.9%		44.4%	44.4%	44.4%	44.4%		44.4%
Maximum Green (s)	19.0	32.0	32.0	10.0	21.0		34.5	34.5	34.5	34.5		34.5
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.5	3.5	3.5	3.5		3.5
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		2.0	2.0	2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		5.5	5.5	5.5	5.5		5.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2018 Background
AM Peak

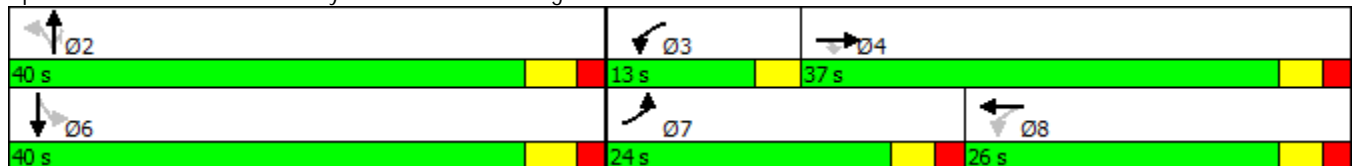


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Walk Time (s)		6.0	6.0		6.0		6.0	6.0	6.0	6.0	6.0	
Flash Dont Walk (s)		15.0	15.0		15.0		11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)		5	5		5		5	5	5	5	5	
Act Effect Green (s)	18.8	18.3	18.3	18.5	12.3	64.9	25.5	25.5	25.5	25.5	25.5	64.9
Actuated g/C Ratio	0.29	0.28	0.28	0.29	0.19	1.00	0.39	0.39	0.39	0.39	0.39	1.00
v/c Ratio	0.63	0.13	0.26	0.34	0.21	0.19	0.19	0.66	0.20	0.41	0.31	0.07
Control Delay	27.4	19.4	5.6	15.1	28.3	0.3	18.3	21.2	4.6	27.9	16.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.4	19.4	5.6	15.1	28.3	0.3	18.3	21.2	4.6	27.9	16.6	0.1
LOS	C	B	A	B	C	A	B	C	A	C	B	A
Approach Delay		23.1			8.6			19.1			14.9	
Approach LOS		C			A			B			B	
Queue Length 50th (m)	35.1	6.0	0.0	9.1	8.3	0.0	6.0	49.4	0.0	6.4	20.0	0.0
Queue Length 95th (m)	#77.7	15.9	10.8	22.5	20.4	0.0	16.8	81.9	9.6	20.7	36.2	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	1049	915	820	418	600	1453	493	1821	829	228	1821	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.07	0.16	0.34	0.12	0.19	0.13	0.45	0.14	0.28	0.22	0.07

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 64.9
 Natural Cycle: 75
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.66
 Intersection Signal Delay: 17.5
 Intersection LOS: B
 Intersection Capacity Utilization 74.4%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2018 Background
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	12	319	5	80	50	78	43	59	275	39	26	6
Future Volume (vph)	12	319	5	80	50	78	43	59	275	39	26	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.97			0.97			0.99	
Frt		0.998			0.909			0.902			0.988	
Flt Protected		0.998		0.950				0.994			0.974	
Satd. Flow (prot)	0	1727	0	1648	1537	0	0	1508	0	0	1663	0
Flt Permitted		0.989		0.552				0.953			0.670	
Satd. Flow (perm)	0	1710	0	948	1537	0	0	1443	0	0	1139	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			89			240			7	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			212.3	
Travel Time (s)		10.8			9.6			21.0			15.3	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	14	363	6	91	57	89	49	67	313	44	30	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	383	0	91	146	0	0	429	0	0	81	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	25.5	25.5		25.5	25.5		22.5	22.5		22.5	22.5	
Total Split (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	29.5	29.5		29.5	29.5		29.5	29.5		29.5	29.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2018 Background
AM Peak

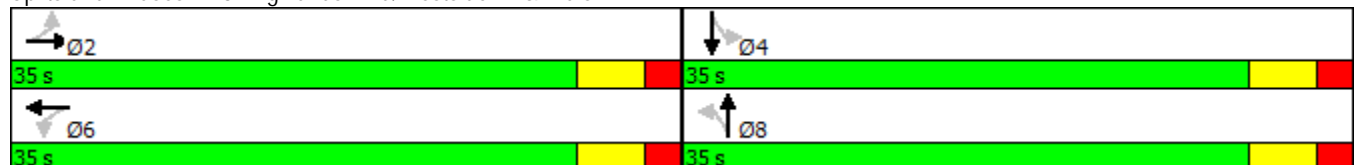


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	5	5		5	5		5	5		5	5	
Act Effect Green (s)		21.0		21.0	21.0			13.7			13.7	
Actuated g/C Ratio		0.46		0.46	0.46			0.30			0.30	
v/c Ratio		0.49		0.21	0.19			0.72			0.24	
Control Delay		12.5		10.7	5.3			13.8			12.8	
Queue Delay		0.0		0.0	0.0			0.0			0.0	
Total Delay		12.5		10.7	5.3			13.8			12.8	
LOS		B		B	A			B			B	
Approach Delay		12.5			7.4			13.8			12.8	
Approach LOS		B			A			B			B	
Queue Length 50th (m)		18.0		3.7	2.2			11.9			4.4	
Queue Length 95th (m)		52.0		14.7	12.5			36.1			12.5	
Internal Link Dist (m)		125.6			109.7			267.6			188.3	
Turn Bay Length (m)				70.0								
Base Capacity (vph)		1118		620	1036			1027			747	
Starvation Cap Reductn		0		0	0			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.34		0.15	0.14			0.42			0.11	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 45.9
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.72
 Intersection Signal Delay: 11.9
 Intersection Capacity Utilization 74.8%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service D

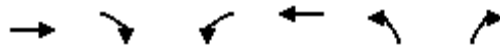
Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



HCM Unsignalized Intersection Capacity Analysis

2: Argyll Road & Walsh Dr

2018 Background
AM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻		↻
Traffic Volume (veh/h)	607	25	0	208	0	78
Future Volume (Veh/h)	607	25	0	208	0	78
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	690	28	0	236	0	89
Pedestrians	10			10	10	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	134			169		
pX, platoon unblocked	0.87			0.87	0.87	
vC, conflicting volume	728			960	724	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	617			883	613	
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	79	
cM capacity (veh/h)	835			272	424	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	718	236	89			
Volume Left	0	0	0			
Volume Right	28	0	89			
cSH	1700	1700	424			
Volume to Capacity	0.42	0.14	0.21			
Queue Length 95th (m)	0.0	0.0	6.2			
Control Delay (s)	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	1.3					
Intersection Capacity Utilization	51.3%			ICU Level of Service	A	
Analysis Period (min)	15					

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2018 Background
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↖	↑	↗	↖	↑	↗	↖	↑↑	↗	↖	↑↑	↗
Traffic Volume (vph)	232	91	135	96	68	91	107	504	116	179	1242	598
Future Volume (vph)	232	91	135	96	68	91	107	504	116	179	1242	598
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.98		0.97	0.99		0.99			0.95	0.99		0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	3202	1432
Fl _t Permitted	0.950			0.690			0.087			0.369		
Satd. Flow (perm)	3148	1735	1432	1179	1735	1453	147	3202	1354	615	3202	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			153			150			103			340
Link Speed (k/h)		50			50			60				60
Link Distance (m)		88.6			185.2			219.5				151.3
Travel Time (s)		6.4			13.3			13.2				9.1
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	264	103	153	109	77	103	122	573	132	203	1411	680
Shared Lane Traffic (%)												
Lane Group Flow (vph)	264	103	153	109	77	103	122	573	132	203	1411	680
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		4.8			4.8			4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	20.0	20.0	5.0	20.0	
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		10.5	25.5	25.5	10.5	25.5	
Total Split (s)	16.0	29.0	29.0	13.0	26.0		11.0	62.0	62.0	16.0	67.0	
Total Split (%)	13.3%	24.2%	24.2%	10.8%	21.7%		9.2%	51.7%	51.7%	13.3%	55.8%	
Maximum Green (s)	11.0	24.0	24.0	10.0	21.0		8.0	56.5	56.5	13.0	61.5	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		3.0	5.5	5.5	3.0	5.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2018 Background
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	None	Min	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		15.0	15.0		15.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effect Green (s)	14.3	14.7	14.7	21.6	12.4	98.3	56.7	46.2	46.2	61.0	48.6	98.3
Actuated g/C Ratio	0.15	0.15	0.15	0.22	0.13	1.00	0.58	0.47	0.47	0.62	0.49	1.00
v/c Ratio	0.57	0.40	0.45	0.36	0.35	0.07	0.60	0.38	0.19	0.42	0.89	0.48
Control Delay	49.4	44.9	11.1	31.8	47.2	0.1	28.9	18.0	5.8	10.7	30.9	1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.4	44.9	11.1	31.8	47.2	0.1	28.9	18.0	5.8	10.7	30.9	1.2
LOS	D	D	B	C	D	A	C	B	A	B	C	A
Approach Delay		37.2			24.6			17.7			20.3	
Approach LOS		D			C			B			C	
Queue Length 50th (m)	26.0	18.8	0.0	16.2	14.3	0.0	8.1	35.3	2.9	14.3	121.0	0.0
Queue Length 95th (m)	#56.2	37.5	16.5	33.1	30.4	0.0	#34.8	58.8	14.4	30.4	179.7	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	464	432	472	307	378	1453	206	1880	837	522	2047	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.24	0.32	0.36	0.20	0.07	0.59	0.30	0.16	0.39	0.69	0.48

Intersection Summary

Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 98.3
 Natural Cycle: 100
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 22.3 Intersection LOS: C
 Intersection Capacity Utilization 70.7% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2018 Background
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	6	166	6	343	346	84	76	53	102	94	79	14
Future Volume (vph)	6	166	6	343	346	84	76	53	102	94	79	14
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.99			0.98			0.99	
Frt		0.995			0.971			0.940			0.990	
Flt Protected		0.998		0.950				0.984			0.975	
Satd. Flow (prot)	0	1720	0	1648	1671	0	0	1575	0	0	1669	0
Flt Permitted		0.980		0.562				0.821			0.688	
Satd. Flow (perm)	0	1688	0	962	1671	0	0	1308	0	0	1171	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			27			59			6	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			212.3	
Travel Time (s)		10.8			9.6			21.0			15.3	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	7	189	7	390	393	95	86	60	116	107	90	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	203	0	390	488	0	0	262	0	0	213	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		10.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	25.5	25.5		13.0	25.5		21.5	21.5		21.5	21.5	
Total Split (s)	28.0	28.0		15.0	43.0		27.0	27.0		27.0	27.0	
Total Split (%)	40.0%	40.0%		21.4%	61.4%		38.6%	38.6%		38.6%	38.6%	
Maximum Green (s)	22.5	22.5		12.0	37.5		21.5	21.5		21.5	21.5	
Yellow Time (s)	3.5	3.5		3.0	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		0.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		3.0	5.5			5.5			5.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2018 Background
PM Peak

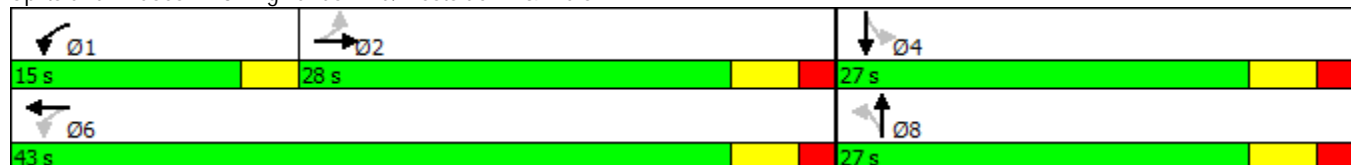


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	6.0	6.0			6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	10.0	10.0			10.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	5	5			5		5	5		5	5	
Act Effect Green (s)		20.1		37.0	34.5			15.7			15.7	
Actuated g/C Ratio		0.33		0.60	0.56			0.26			0.26	
v/c Ratio		0.36		0.55	0.51			0.69			0.70	
Control Delay		19.2		10.7	11.0			26.0			33.1	
Queue Delay		0.0		0.0	0.0			0.0			0.0	
Total Delay		19.2		10.7	11.0			26.0			33.1	
LOS		B		B	B			C			C	
Approach Delay		19.2			10.9			26.0			33.1	
Approach LOS		B			B			C			C	
Queue Length 50th (m)		17.9		20.7	29.4			21.3			22.1	
Queue Length 95th (m)		36.8		43.8	60.9			42.2			41.4	
Internal Link Dist (m)		125.6			109.7			267.6			188.3	
Turn Bay Length (m)				70.0								
Base Capacity (vph)		626		716	1040			500			417	
Starvation Cap Reductn		0		0	0			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.32		0.54	0.47			0.52			0.51	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 61.2
 Natural Cycle: 60
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.70
 Intersection Signal Delay: 17.6
 Intersection LOS: B
 Intersection Capacity Utilization 73.7%
 ICU Level of Service D
 Analysis Period (min) 15

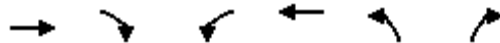
Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



HCM Unsignalized Intersection Capacity Analysis

2: Argyll Road & Walsh Dr

2018 Background
PM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻		↻
Traffic Volume (veh/h)	309	54	0	772	0	150
Future Volume (Veh/h)	309	54	0	772	0	150
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	351	61	0	877	0	170
Pedestrians	10			10	10	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	134			169		
pX, platoon unblocked	0.94			0.95	0.94	
vC, conflicting volume	422			1278	402	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	359			1221	337	
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	74	
cM capacity (veh/h)	1124			187	655	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	412	877	170			
Volume Left	0	0	0			
Volume Right	61	0	170			
cSH	1700	1700	655			
Volume to Capacity	0.24	0.52	0.26			
Queue Length 95th (m)	0.0	0.0	8.2			
Control Delay (s)	0.0	0.0	12.4			
Lane LOS				B		
Approach Delay (s)	0.0	0.0	12.4			
Approach LOS				B		
Intersection Summary						
Average Delay	1.4					
Intersection Capacity Utilization	56.9%			ICU Level of Service	B	
Analysis Period (min)	15					

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2020 Background
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	530	57	118	131	63	249	59	748	108	57	357	93
Future Volume (vph)	530	57	118	131	63	249	59	748	108	57	357	93
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98	0.99		0.99	0.99		0.95	1.00		0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	3202	1432
Flt Permitted	0.950			0.715			0.510			0.226		
Satd. Flow (perm)	3160	1735	1438	1226	1735	1453	852	3202	1367	379	3202	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			134			283			121			188
Link Speed (k/h)		50			50			60				60
Link Distance (m)		88.6			185.2			219.5				151.3
Travel Time (s)		6.4			13.3			13.2				9.1
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	602	65	134	149	72	283	67	850	123	65	406	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	602	65	134	149	72	283	67	850	123	65	406	106
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		4.8			4.8			4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	Perm	NA	Perm	Perm	NA	Free
Protected Phases	7	4		3	8			2				6
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		2	2	2	6		6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		20.0	20.0	20.0	20.0		20.0
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		25.5	25.5	25.5	25.5		25.5
Total Split (s)	25.0	38.0	38.0	13.0	26.0		39.0	39.0	39.0	39.0		39.0
Total Split (%)	27.8%	42.2%	42.2%	14.4%	28.9%		43.3%	43.3%	43.3%	43.3%		43.3%
Maximum Green (s)	20.0	33.0	33.0	10.0	21.0		33.5	33.5	33.5	33.5		33.5
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.5	3.5	3.5	3.5		3.5
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		2.0	2.0	2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		5.5	5.5	5.5	5.5		5.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2020 Background
AM Peak

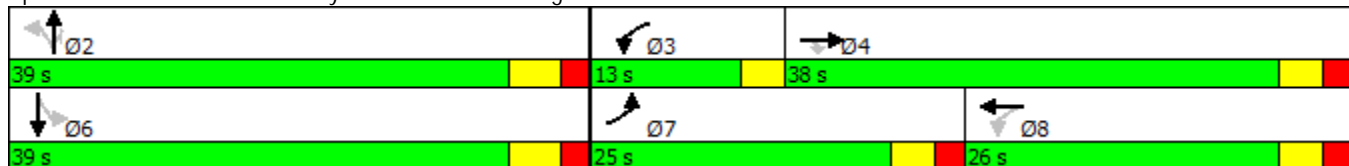


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Walk Time (s)		6.0	6.0		6.0		6.0	6.0	6.0	6.0	6.0	
Flash Dont Walk (s)		15.0	15.0		15.0		11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)		5	5		5		5	5	5	5	5	
Act Effect Green (s)	17.5	20.7	20.7	21.2	12.3	67.7	26.2	26.2	26.2	26.2	26.2	67.7
Actuated g/C Ratio	0.26	0.31	0.31	0.31	0.18	1.00	0.39	0.39	0.39	0.39	0.39	1.00
v/c Ratio	0.73	0.12	0.25	0.33	0.23	0.19	0.20	0.69	0.20	0.45	0.33	0.08
Control Delay	31.5	19.2	5.3	13.6	29.6	0.3	19.1	22.9	4.9	30.9	17.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.5	19.2	5.3	13.6	29.6	0.3	19.1	22.9	4.9	30.9	17.6	0.1
LOS	C	B	A	B	C	A	B	C	A	C	B	A
Approach Delay		26.1			8.4			20.5			15.9	
Approach LOS		C			A			C			B	
Queue Length 50th (m)	37.1	6.3	0.0	9.8	8.9	0.0	6.2	52.1	0.2	6.7	20.8	0.0
Queue Length 95th (m)	#77.6	15.9	10.8	22.5	21.3	0.0	17.6	86.8	10.4	22.2	38.1	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	1009	903	813	451	575	1453	450	1693	779	200	1693	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.07	0.16	0.33	0.13	0.19	0.15	0.50	0.16	0.33	0.24	0.08

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 67.7
 Natural Cycle: 75
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.73
 Intersection Signal Delay: 19.0
 Intersection LOS: B
 Intersection Capacity Utilization 75.5%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2020 Background
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	13	328	5	83	51	80	44	61	283	40	27	6
Future Volume (vph)	13	328	5	83	51	80	44	61	283	40	27	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.97			0.97			0.99	
Frt		0.998			0.908			0.901			0.989	
Flt Protected		0.998		0.950				0.994			0.974	
Satd. Flow (prot)	0	1727	0	1648	1535	0	0	1507	0	0	1665	0
Flt Permitted		0.988		0.540				0.953			0.666	
Satd. Flow (perm)	0	1708	0	928	1535	0	0	1441	0	0	1133	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			91			241			7	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			212.3	
Travel Time (s)		10.8			9.6			21.0			15.3	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	15	373	6	94	58	91	50	69	322	45	31	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	394	0	94	149	0	0	441	0	0	83	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	25.5	25.5		25.5	25.5		22.5	22.5		22.5	22.5	
Total Split (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	29.5	29.5		29.5	29.5		29.5	29.5		29.5	29.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2020 Background
AM Peak

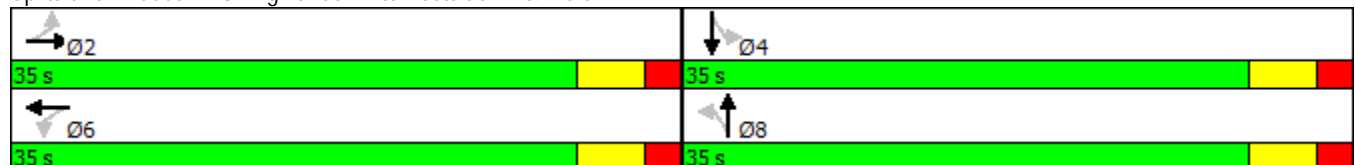


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	5	5		5	5		5	5		5	5	
Act Effect Green (s)		21.3		21.3	21.3			14.2			14.2	
Actuated g/C Ratio		0.46		0.46	0.46			0.30			0.30	
v/c Ratio		0.51		0.22	0.20			0.73			0.24	
Control Delay		13.1		11.2	5.5			14.4			12.9	
Queue Delay		0.0		0.0	0.0			0.0			0.0	
Total Delay		13.1		11.2	5.5			14.4			12.9	
LOS		B		B	A			B			B	
Approach Delay		13.1			7.7			14.4			12.9	
Approach LOS		B			A			B			B	
Queue Length 50th (m)		19.2		3.9	2.3			12.8			4.5	
Queue Length 95th (m)		55.8		15.8	13.1			39.1			13.1	
Internal Link Dist (m)		125.6			109.7			267.6			188.3	
Turn Bay Length (m)				70.0								
Base Capacity (vph)		1103		599	1023			1016			734	
Starvation Cap Reductn		0		0	0			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.36		0.16	0.15			0.43			0.11	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 46.8
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.73
 Intersection Signal Delay: 12.4
 Intersection LOS: B
 Intersection Capacity Utilization 76.1%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



HCM Unsignalized Intersection Capacity Analysis

2: Argyll Road & Walsh Dr

2020 Background
AM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔		↔
Traffic Volume (veh/h)	625	26	0	214	0	80
Future Volume (Veh/h)	625	26	0	214	0	80
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	710	30	0	243	0	91
Pedestrians	10			10	10	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	134			169		
pX, platoon unblocked	0.87			0.87	0.87	
vC, conflicting volume	750			988	745	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	634			909	628	
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	78	
cM capacity (veh/h)	815			260	411	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	740	243	91			
Volume Left	0	0	0			
Volume Right	30	0	91			
cSH	1700	1700	411			
Volume to Capacity	0.44	0.14	0.22			
Queue Length 95th (m)	0.0	0.0	6.6			
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	1.4					
Intersection Capacity Utilization	52.5%			ICU Level of Service	A	
Analysis Period (min)	15					

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2020 Background
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	239	94	139	99	70	94	110	519	119	184	1279	616
Future Volume (vph)	239	94	139	99	70	94	110	519	119	184	1279	616
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.98		0.97	0.99		0.99			0.95	0.99		0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	3202	1432
Fl _t Permitted	0.950			0.688			0.082			0.363		
Satd. Flow (perm)	3148	1735	1432	1176	1735	1453	138	3202	1354	605	3202	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			158			150			102			340
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		88.6			185.2			219.5			151.3	
Travel Time (s)		6.4			13.3			13.2			9.1	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	272	107	158	113	80	107	125	590	135	209	1453	700
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	107	158	113	80	107	125	590	135	209	1453	700
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	20.0	20.0	5.0	20.0	
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		10.5	25.5	25.5	10.5	25.5	
Total Split (s)	16.0	29.0	29.0	13.0	26.0		11.0	62.0	62.0	16.0	67.0	
Total Split (%)	13.3%	24.2%	24.2%	10.8%	21.7%		9.2%	51.7%	51.7%	13.3%	55.8%	
Maximum Green (s)	11.0	24.0	24.0	10.0	21.0		8.0	56.5	56.5	13.0	61.5	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		3.0	5.5	5.5	3.0	5.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2020 Background
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	None	Min	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		15.0	15.0		15.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effect Green (s)	14.2	14.8	14.8	21.7	12.5	101.3	59.6	49.0	49.0	63.9	51.4	101.3
Actuated g/C Ratio	0.14	0.15	0.15	0.21	0.12	1.00	0.59	0.48	0.48	0.63	0.51	1.00
v/c Ratio	0.61	0.42	0.46	0.38	0.37	0.07	0.63	0.38	0.19	0.43	0.89	0.50
Control Delay	51.8	46.6	11.2	33.5	48.7	0.1	32.4	17.8	5.9	10.7	31.1	1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.8	46.6	11.2	33.5	48.7	0.1	32.4	17.8	5.9	10.7	31.1	1.2
LOS	D	D	B	C	D	A	C	B	A	B	C	A
Approach Delay		38.9			25.7			18.1			20.4	
Approach LOS		D			C			B			C	
Queue Length 50th (m)	28.1	20.3	0.0	17.7	15.5	0.0	8.5	37.2	3.3	15.0	128.7	0.0
Queue Length 95th (m)	#58.6	38.7	16.8	34.1	31.6	0.0	#39.3	60.8	15.0	31.4	189.1	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	448	418	465	299	366	1453	198	1824	815	518	1981	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.26	0.34	0.38	0.22	0.07	0.63	0.32	0.17	0.40	0.73	0.50

Intersection Summary

Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 101.3
 Natural Cycle: 100
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 22.8
 Intersection LOS: C
 Intersection Capacity Utilization 72.1%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2020 Background
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	6	171	6	353	356	87	78	54	105	97	82	15
Future Volume (vph)	6	171	6	353	356	87	78	54	105	97	82	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.99			0.98			0.99	
Frt		0.995			0.971			0.940			0.990	
Flt Protected		0.998		0.950				0.984			0.976	
Satd. Flow (prot)	0	1720	0	1648	1671	0	0	1575	0	0	1671	0
Flt Permitted		0.980		0.550				0.815			0.681	
Satd. Flow (perm)	0	1689	0	942	1671	0	0	1299	0	0	1159	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			28			58			6	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			212.3	
Travel Time (s)		10.8			9.6			21.0			15.3	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	7	194	7	401	405	99	89	61	119	110	93	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	208	0	401	504	0	0	269	0	0	220	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		10.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	25.5	25.5		13.0	25.5		21.5	21.5		21.5	21.5	
Total Split (s)	28.0	28.0		16.0	44.0		26.0	26.0		26.0	26.0	
Total Split (%)	40.0%	40.0%		22.9%	62.9%		37.1%	37.1%		37.1%	37.1%	
Maximum Green (s)	22.5	22.5		13.0	38.5		20.5	20.5		20.5	20.5	
Yellow Time (s)	3.5	3.5		3.0	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		0.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		3.0	5.5			5.5			5.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2020 Background
PM Peak

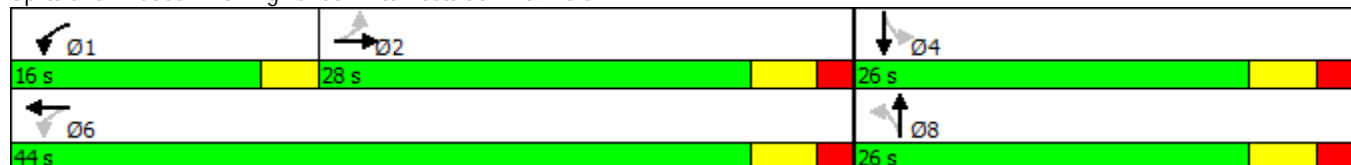


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	6.0	6.0			6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	10.0	10.0			10.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	5	5			5		5	5		5	5	
Act Effect Green (s)		20.2		37.7	35.2			16.1			16.1	
Actuated g/C Ratio		0.32		0.61	0.57			0.26			0.26	
v/c Ratio		0.38		0.57	0.53			0.71			0.73	
Control Delay		20.0		10.9	11.2			27.7			35.3	
Queue Delay		0.0		0.0	0.0			0.0			0.0	
Total Delay		20.0		10.9	11.2			27.7			35.3	
LOS		C		B	B			C			D	
Approach Delay		20.0			11.1			27.7			35.3	
Approach LOS		C			B			C			D	
Queue Length 50th (m)		19.5		22.7	32.4			23.0			23.7	
Queue Length 95th (m)		37.7		43.5	61.1			45.3			44.3	
Internal Link Dist (m)		125.6			109.7			267.6			188.3	
Turn Bay Length (m)				70.0								
Base Capacity (vph)		616		718	1051			469			388	
Starvation Cap Reductn		0		0	0			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.34		0.56	0.48			0.57			0.57	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 62.3
 Natural Cycle: 60
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.73
 Intersection Signal Delay: 18.4
 Intersection Capacity Utilization 75.1%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service D

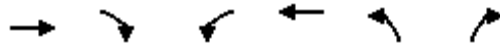
Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



HCM Unsignalized Intersection Capacity Analysis

2: Argyll Road & Walsh Dr

2020 Background
PM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↶		↷
Traffic Volume (veh/h)	318	55	0	795	0	155
Future Volume (Veh/h)	318	55	0	795	0	155
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	361	63	0	903	0	176
Pedestrians	10			10	10	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	134			169		
pX, platoon unblocked	0.94			0.95	0.94	
vC, conflicting volume	434			1316	412	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	365			1244	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	73	
cM capacity (veh/h)	1111			180	647	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	424	903	176			
Volume Left	0	0	0			
Volume Right	63	0	176			
cSH	1700	1700	647			
Volume to Capacity	0.25	0.53	0.27			
Queue Length 95th (m)	0.0	0.0	8.7			
Control Delay (s)	0.0	0.0	12.6			
Lane LOS	B					
Approach Delay (s)	0.0	0.0	12.6			
Approach LOS	B					
Intersection Summary						
Average Delay	1.5					
Intersection Capacity Utilization	58.3%			ICU Level of Service	B	
Analysis Period (min)	15					

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Background
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↖	↑	↗	↖	↑	↗	↖	↑↑	↗	↖	↑↑	↗
Traffic Volume (vph)	591	64	132	146	70	277	65	834	120	64	398	104
Future Volume (vph)	591	64	132	146	70	277	65	834	120	64	398	104
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98	0.99		0.99	0.99		0.95			0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	3202	1432
Fl _t Permitted	0.950			0.709			0.442			0.154		
Satd. Flow (perm)	3160	1735	1438	1216	1735	1453	739	3202	1367	260	3202	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			150			315			158			224
Link Speed (k/h)		50			50			60				60
Link Distance (m)		88.6			185.2			219.5				151.3
Travel Time (s)		6.4			13.3			13.2				9.1
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	672	73	150	166	80	315	74	948	136	73	452	118
Shared Lane Traffic (%)												
Lane Group Flow (vph)	672	73	150	166	80	315	74	948	136	73	452	118
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		4.8			4.8			4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		8.0	20.0	20.0	8.0	20.0	
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		11.0	25.5	25.5	11.0	25.5	
Total Split (s)	22.0	35.0	35.0	13.0	26.0		11.0	31.0	31.0	11.0	31.0	
Total Split (%)	24.4%	38.9%	38.9%	14.4%	28.9%		12.2%	34.4%	34.4%	12.2%	34.4%	
Maximum Green (s)	17.0	30.0	30.0	10.0	21.0		8.0	25.5	25.5	8.0	25.5	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		3.0	5.5	5.5	3.0	5.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Background
AM Peak

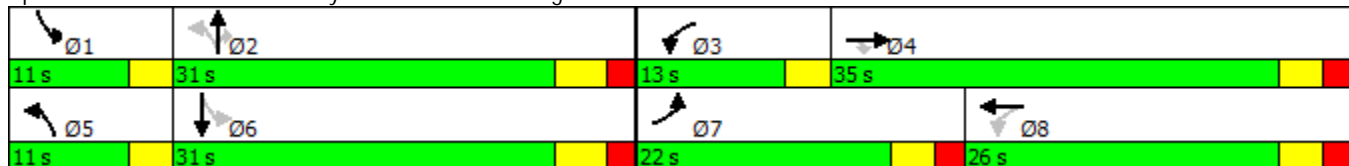


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	Min	Min	None	Min	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		15.0	15.0		15.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effect Green (s)	18.9	19.0	19.0	21.2	12.1	77.3	34.6	26.0	26.0	34.6	26.0	77.3
Actuated g/C Ratio	0.24	0.25	0.25	0.27	0.16	1.00	0.45	0.34	0.34	0.45	0.34	1.00
v/c Ratio	0.86	0.17	0.32	0.42	0.29	0.22	0.18	0.88	0.24	0.28	0.42	0.08
Control Delay	44.5	23.9	6.2	18.7	33.4	0.3	13.7	37.8	4.3	15.6	23.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.5	23.9	6.2	18.7	33.4	0.3	13.7	37.8	4.3	15.6	23.3	0.1
LOS	D	C	A	B	C	A	B	D	A	B	C	A
Approach Delay		36.4			10.5			32.3				18.2
Approach LOS		D			B			C				B
Queue Length 50th (m)	53.9	9.0	0.0	15.8	11.6	0.0	5.8	73.9	0.0	5.7	28.8	0.0
Queue Length 95th (m)	#102.6	18.5	12.0	26.9	23.0	0.0	15.5	#131.6	9.2	15.5	49.1	0.0
Internal Link Dist (m)		64.6			161.2			195.5				127.3
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	782	686	660	391	480	1453	422	1077	564	258	1077	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.11	0.23	0.42	0.17	0.22	0.18	0.88	0.24	0.28	0.42	0.08

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 77.3
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 26.9 Intersection LOS: C
 Intersection Capacity Utilization 68.8% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2028 Background
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	14	366	6	92	57	90	49	68	316	44	30	7
Future Volume (vph)	14	366	6	92	57	90	49	68	316	44	30	7
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.97			0.97			0.99	
Frt		0.998			0.908			0.901			0.988	
Flt Protected		0.998		0.950				0.994			0.974	
Satd. Flow (prot)	0	1727	0	1648	1535	0	0	1507	0	0	1663	0
Flt Permitted		0.988		0.489				0.952			0.645	
Satd. Flow (perm)	0	1708	0	841	1535	0	0	1440	0	0	1097	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			102			246			8	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			212.3	
Travel Time (s)		10.8			9.6			21.0			15.3	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	16	416	7	105	65	102	56	77	359	50	34	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	439	0	105	167	0	0	492	0	0	92	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	25.5	25.5		25.5	25.5		22.5	22.5		22.5	22.5	
Total Split (s)	34.0	34.0		34.0	34.0		36.0	36.0		36.0	36.0	
Total Split (%)	48.6%	48.6%		48.6%	48.6%		51.4%	51.4%		51.4%	51.4%	
Maximum Green (s)	28.5	28.5		28.5	28.5		30.5	30.5		30.5	30.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2028 Background
AM Peak

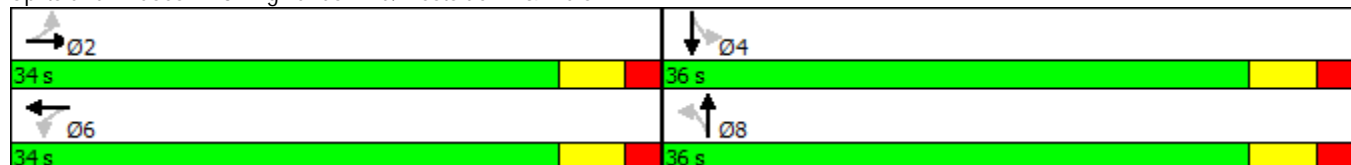


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	5	5		5	5		5	5		5	5	
Act Effect Green (s)		22.1		22.1	22.1			16.3			16.3	
Actuated g/C Ratio		0.44		0.44	0.44			0.33			0.33	
v/c Ratio		0.58		0.28	0.23			0.77			0.25	
Control Delay		15.9		13.8	6.2			16.3			12.9	
Queue Delay		0.0		0.0	0.0			0.0			0.0	
Total Delay		15.9		13.8	6.2			16.3			12.9	
LOS		B		B	A			B			B	
Approach Delay		15.9			9.1			16.3			12.9	
Approach LOS		B			A			B			B	
Queue Length 50th (m)		24.9		5.1	2.9			16.3			5.0	
Queue Length 95th (m)		72.8		20.3	15.8			51.0			15.0	
Internal Link Dist (m)		125.6			109.7			267.6			188.3	
Turn Bay Length (m)				70.0								
Base Capacity (vph)		1014		499	953			1005			700	
Starvation Cap Reductn		0		0	0			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.43		0.21	0.18			0.49			0.13	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 49.9
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.77
 Intersection Signal Delay: 14.4
 Intersection Capacity Utilization 81.3%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service D

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



HCM Unsignalized Intersection Capacity Analysis

2: Argyll Road & Walsh Dr

2028 Background
AM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻		↻
Traffic Volume (veh/h)	697	29	0	239	0	90
Future Volume (Veh/h)	697	29	0	239	0	90
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	792	33	0	272	0	102
Pedestrians	10			10	10	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	134			169		
pX, platoon unblocked	0.83			0.83	0.83	
vC, conflicting volume	835			1100	828	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	699			1019	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	72	
cM capacity (veh/h)	739			214	363	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	825	272	102			
Volume Left	0	0	0			
Volume Right	33	0	102			
cSH	1700	1700	363			
Volume to Capacity	0.49	0.16	0.28			
Queue Length 95th (m)	0.0	0.0	9.0			
Control Delay (s)	0.0	0.0	18.8			
Lane LOS	C					
Approach Delay (s)	0.0	0.0	18.8			
Approach LOS	C					
Intersection Summary						
Average Delay	1.6					
Intersection Capacity Utilization	57.3%			ICU Level of Service	B	
Analysis Period (min)	15					

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Background
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	267	105	155	111	78	105	122	579	133	205	1426	686
Future Volume (vph)	267	105	155	111	78	105	122	579	133	205	1426	686
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.98		0.97	0.99		0.99			0.95	0.99		0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	3202	1432
Flt Permitted	0.950			0.681			0.071			0.331		
Satd. Flow (perm)	3149	1735	1432	1164	1735	1453	120	3202	1354	553	3202	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			174			150			100			340
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		88.6			185.2			219.5			151.3	
Travel Time (s)		6.4			13.3			13.2			9.1	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	303	119	176	126	89	119	139	658	151	233	1620	780
Shared Lane Traffic (%)												
Lane Group Flow (vph)	303	119	176	126	89	119	139	658	151	233	1620	780
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		8.0	20.0	20.0	8.0	20.0	
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		11.0	25.5	25.5	11.0	25.5	
Total Split (s)	16.0	29.0	29.0	13.0	26.0		11.0	59.0	59.0	19.0	67.0	
Total Split (%)	13.3%	24.2%	24.2%	10.8%	21.7%		9.2%	49.2%	49.2%	15.8%	55.8%	
Maximum Green (s)	11.0	24.0	24.0	10.0	21.0		8.0	53.5	53.5	16.0	61.5	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		3.0	5.5	5.5	3.0	5.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Background
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	None	Min	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		15.0	15.0		15.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effect Green (s)	13.7	15.1	15.1	22.2	12.8	110.0	67.2	56.7	56.7	73.0	60.3	110.0
Actuated g/C Ratio	0.12	0.14	0.14	0.20	0.12	1.00	0.61	0.52	0.52	0.66	0.55	1.00
v/c Ratio	0.76	0.50	0.51	0.45	0.44	0.08	0.77	0.40	0.20	0.49	0.92	0.55
Control Delay	62.4	51.5	11.9	38.1	52.9	0.1	50.1	18.3	7.2	11.3	33.6	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.4	51.5	11.9	38.1	52.9	0.1	50.1	18.3	7.2	11.3	33.6	1.6
LOS	E	D	B	D	D	A	D	B	A	B	C	A
Approach Delay		45.4			28.5			21.2			22.1	
Approach LOS		D			C			C			C	
Queue Length 50th (m)	35.2	25.3	0.4	22.5	19.2	0.0	14.6	43.7	5.3	17.3	160.6	0.0
Queue Length 95th (m)	#67.8	42.4	18.1	37.5	34.2	0.0	#54.3	72.3	19.4	35.1	#247.8	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	397	379	449	278	332	1453	181	1649	746	524	1796	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.31	0.39	0.45	0.27	0.08	0.77	0.40	0.20	0.44	0.90	0.55

Intersection Summary

Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 110
 Natural Cycle: 120
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.92
 Intersection Signal Delay: 25.5
 Intersection LOS: C
 Intersection Capacity Utilization 77.9%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2028 Background
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	7	191	7	394	397	97	87	61	117	108	91	16
Future Volume (vph)	7	191	7	394	397	97	87	61	117	108	91	16
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.99			0.98			0.99	
Frt		0.995			0.971			0.940			0.990	
Flt Protected		0.998		0.950				0.984			0.975	
Satd. Flow (prot)	0	1720	0	1648	1671	0	0	1575	0	0	1669	0
Flt Permitted		0.977		0.512				0.803			0.655	
Satd. Flow (perm)	0	1683	0	878	1671	0	0	1280	0	0	1115	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			27			59			6	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			212.3	
Travel Time (s)		10.8			9.6			21.0			15.3	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	8	217	8	448	451	110	99	69	133	123	103	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	233	0	448	561	0	0	301	0	0	244	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		10.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	25.5	25.5		13.0	25.5		21.5	21.5		21.5	21.5	
Total Split (s)	27.0	27.0		16.0	43.0		27.0	27.0		27.0	27.0	
Total Split (%)	38.6%	38.6%		22.9%	61.4%		38.6%	38.6%		38.6%	38.6%	
Maximum Green (s)	21.5	21.5		13.0	37.5		21.5	21.5		21.5	21.5	
Yellow Time (s)	3.5	3.5		3.0	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		0.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		3.0	5.5			5.5			5.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2028 Background
PM Peak

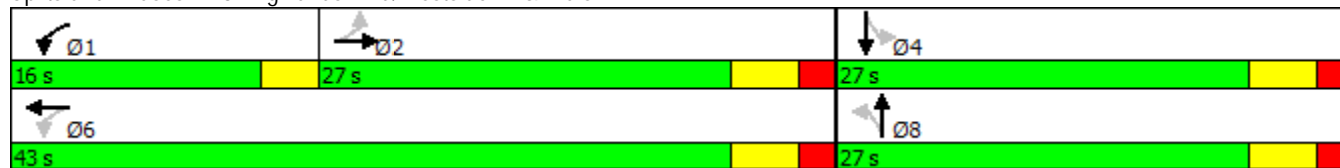


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	6.0	6.0			6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	10.0	10.0			10.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	5	5			5		5	5		5	5	
Act Effect Green (s)		20.2		38.0	35.5			17.5			17.5	
Actuated g/C Ratio		0.32		0.59	0.55			0.27			0.27	
v/c Ratio		0.44		0.67	0.60			0.77			0.79	
Control Delay		21.9		14.3	13.3			31.2			40.7	
Queue Delay		0.0		0.0	0.0			0.0			0.0	
Total Delay		21.9		14.3	13.3			31.2			40.7	
LOS		C		B	B			C			D	
Approach Delay		21.9			13.7			31.2			40.7	
Approach LOS		C			B			C			D	
Queue Length 50th (m)		23.9		30.0	43.1			27.5			27.3	
Queue Length 95th (m)		43.1		52.0	74.2			#53.6			#56.5	
Internal Link Dist (m)		125.6			109.7			267.6			188.3	
Turn Bay Length (m)				70.0								
Base Capacity (vph)		570		677	996			471			380	
Starvation Cap Reductn		0		0	0			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.41		0.66	0.56			0.64			0.64	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 64.1
 Natural Cycle: 60
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.79
 Intersection Signal Delay: 21.4
 Intersection LOS: C
 Intersection Capacity Utilization 80.1%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



HCM Unsignalized Intersection Capacity Analysis

2: Argyll Road & Walsh Dr

2028 Background
PM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻		↻
Traffic Volume (veh/h)	354	62	0	887	0	172
Future Volume (Veh/h)	354	62	0	887	0	172
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	402	70	0	1008	0	195
Pedestrians	10			10	10	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	134			169		
pX, platoon unblocked	0.92			0.94	0.92	
vC, conflicting volume	482			1465	457	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	395			1353	368	
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	68	
cM capacity (veh/h)	1063			153	614	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	472	1008	195			
Volume Left	0	0	0			
Volume Right	70	0	195			
cSH	1700	1700	614			
Volume to Capacity	0.28	0.59	0.32			
Queue Length 95th (m)	0.0	0.0	10.8			
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				1.6		
Intersection Capacity Utilization	63.5%			ICU Level of Service		B
Analysis Period (min)	15					

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Background Improved
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑	↖	↖	↑	↖	↖	↑↑	↖	↖	↑↑↑	↖
Traffic Volume (vph)	591	64	132	146	70	277	65	834	120	64	398	104
Future Volume (vph)	591	64	132	146	70	277	65	834	120	64	398	104
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Ped Bike Factor	0.99		0.98	0.99		0.99	0.99		0.95			0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	4601	1432
Fl _t Permitted	0.950			0.709			0.482			0.154		
Satd. Flow (perm)	3160	1735	1438	1216	1735	1453	806	3202	1367	260	4601	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			150			315			158			224
Link Speed (k/h)		50			50			60				60
Link Distance (m)		88.6			185.2			219.5				151.3
Travel Time (s)		6.4			13.3			13.2				9.1
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	672	73	150	166	80	315	74	948	136	73	452	118
Shared Lane Traffic (%)												
Lane Group Flow (vph)	672	73	150	166	80	315	74	948	136	73	452	118
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		4.8			4.8			4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		8.0	20.0	20.0	8.0	20.0	
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		11.0	25.5	25.5	11.0	25.5	
Total Split (s)	22.0	35.0	35.0	13.0	26.0		11.0	31.0	31.0	11.0	31.0	
Total Split (%)	24.4%	38.9%	38.9%	14.4%	28.9%		12.2%	34.4%	34.4%	12.2%	34.4%	
Maximum Green (s)	17.0	30.0	30.0	10.0	21.0		8.0	25.5	25.5	8.0	25.5	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		3.0	5.5	5.5	3.0	5.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Background Improved
AM Peak

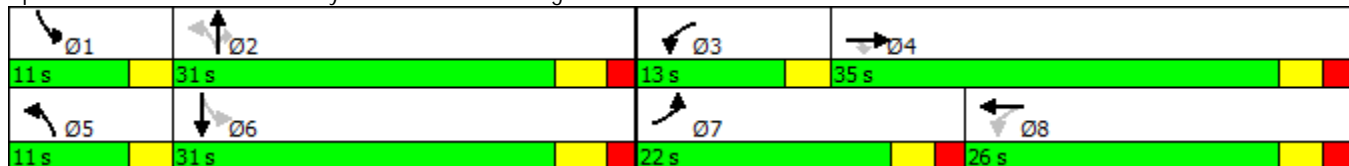


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	Min	Min	None	Min	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		15.0	15.0		15.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effect Green (s)	18.9	19.0	19.0	21.2	12.1	77.3	34.6	26.0	26.0	34.6	26.0	77.3
Actuated g/C Ratio	0.24	0.25	0.25	0.27	0.16	1.00	0.45	0.34	0.34	0.45	0.34	1.00
v/c Ratio	0.86	0.17	0.32	0.42	0.29	0.22	0.17	0.88	0.24	0.28	0.29	0.08
Control Delay	44.5	23.9	6.2	18.7	33.4	0.3	13.6	37.8	4.3	15.6	21.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.5	23.9	6.2	18.7	33.4	0.3	13.6	37.8	4.3	15.6	21.4	0.1
LOS	D	C	A	B	C	A	B	D	A	B	C	A
Approach Delay		36.4			10.5			32.3				16.8
Approach LOS		D			B			C				B
Queue Length 50th (m)	53.9	9.0	0.0	15.8	11.6	0.0	5.8	73.9	0.0	5.7	19.1	0.0
Queue Length 95th (m)	#102.6	18.5	12.0	26.9	23.0	0.0	15.5	#131.6	9.2	15.5	31.9	0.0
Internal Link Dist (m)		64.6			161.2			195.5				127.3
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	782	686	660	391	480	1453	445	1077	564	258	1548	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.11	0.23	0.42	0.17	0.22	0.17	0.88	0.24	0.28	0.29	0.08

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 77.3
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 26.6
 Intersection LOS: C
 Intersection Capacity Utilization 68.8%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Background Improved
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑	↖	↖	↑	↖	↖	↑↑	↖	↖	↑↑↑	↖
Traffic Volume (vph)	267	105	155	111	78	105	122	579	133	205	1426	686
Future Volume (vph)	267	105	155	111	78	105	122	579	133	205	1426	686
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Ped Bike Factor	0.99		0.98	0.99		0.99			0.95	0.99		0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	4601	1432
Fl _t Permitted	0.950			0.681			0.130			0.303		
Satd. Flow (perm)	3161	1735	1438	1168	1735	1453	219	3202	1367	507	4601	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			176			164			108			652
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		88.6			185.2			219.5			151.3	
Travel Time (s)		6.4			13.3			13.2			9.1	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	303	119	176	126	89	119	139	658	151	233	1620	780
Shared Lane Traffic (%)												
Lane Group Flow (vph)	303	119	176	126	89	119	139	658	151	233	1620	780
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		8.0	20.0	20.0	8.0	20.0	
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		11.0	25.5	25.5	11.0	25.5	
Total Split (s)	15.0	28.0	28.0	13.0	26.0		11.0	35.0	35.0	14.0	38.0	
Total Split (%)	16.7%	31.1%	31.1%	14.4%	28.9%		12.2%	38.9%	38.9%	15.6%	42.2%	
Maximum Green (s)	10.0	23.0	23.0	10.0	21.0		8.0	29.5	29.5	11.0	32.5	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		3.0	5.5	5.5	3.0	5.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Background Improved
PM Peak

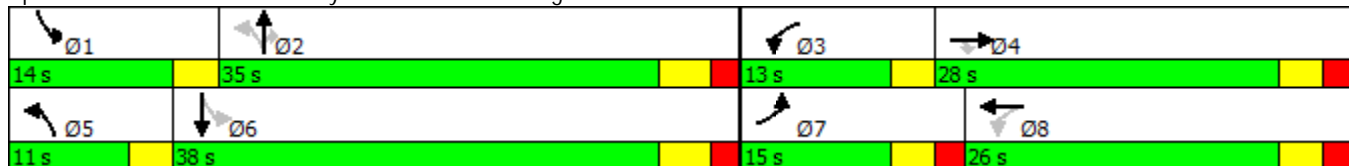


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	None	Min	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		15.0	15.0		15.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effect Green (s)	10.1	13.7	13.7	21.4	12.2	78.1	41.3	30.6	30.6	45.3	32.7	78.1
Actuated g/C Ratio	0.13	0.18	0.18	0.27	0.16	1.00	0.53	0.39	0.39	0.58	0.42	1.00
v/c Ratio	0.73	0.39	0.44	0.33	0.33	0.08	0.54	0.52	0.25	0.53	0.84	0.55
Control Delay	46.6	33.3	8.6	20.7	34.0	0.1	20.4	22.0	8.4	14.4	27.3	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.6	33.3	8.6	20.7	34.0	0.1	20.4	22.0	8.4	14.4	27.3	1.6
LOS	D	C	A	C	C	A	C	C	A	B	C	A
Approach Delay		32.8			16.9			19.6			18.6	
Approach LOS		C			B			B			B	
Queue Length 50th (m)	23.8	17.1	0.0	13.8	13.0	0.0	9.0	41.6	4.2	16.2	81.4	0.0
Queue Length 95th (m)	#48.3	31.0	14.4	24.8	25.2	0.0	#30.4	68.7	18.4	36.7	#133.2	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	414	517	552	382	472	1453	259	1255	601	456	1939	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.23	0.32	0.33	0.19	0.08	0.54	0.52	0.25	0.51	0.84	0.55

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 78.1
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.84
 Intersection Signal Delay: 20.5 Intersection LOS: C
 Intersection Capacity Utilization 65.0% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



APPENDIX C

POST DEVELOPMENT SYNCHRO OUTPUTS



Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2020 Post Development
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑	↖	↖	↑	↖	↖	↑↑	↖	↖	↑↑	↖
Traffic Volume (vph)	551	61	143	131	68	249	99	748	108	57	357	128
Future Volume (vph)	551	61	143	131	68	249	99	748	108	57	357	128
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98	0.99		0.99	0.99		0.95	1.00		0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	3202	1432
Fl _t Permitted	0.950			0.712			0.508			0.223		
Satd. Flow (perm)	3160	1735	1438	1221	1735	1453	849	3202	1367	374	3202	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			163			283			121			188
Link Speed (k/h)		50			50			60				60
Link Distance (m)		88.6			185.2			219.5				151.3
Travel Time (s)		6.4			13.3			13.2				9.1
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	626	69	163	149	77	283	113	850	123	65	406	145
Shared Lane Traffic (%)												
Lane Group Flow (vph)	626	69	163	149	77	283	113	850	123	65	406	145
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		4.8			4.8			4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	Perm	NA	Perm	Perm	NA	Free
Protected Phases	7	4		3	8			2				6
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		2	2	2	6		6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		20.0	20.0	20.0	20.0		20.0
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		25.5	25.5	25.5	25.5		25.5
Total Split (s)	25.0	38.0	38.0	13.0	26.0		39.0	39.0	39.0	39.0		39.0
Total Split (%)	27.8%	42.2%	42.2%	14.4%	28.9%		43.3%	43.3%	43.3%	43.3%		43.3%
Maximum Green (s)	20.0	33.0	33.0	10.0	21.0		33.5	33.5	33.5	33.5		33.5
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.5	3.5	3.5	3.5		3.5
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		2.0	2.0	2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		5.5	5.5	5.5	5.5		5.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2020 Post Development
AM Peak

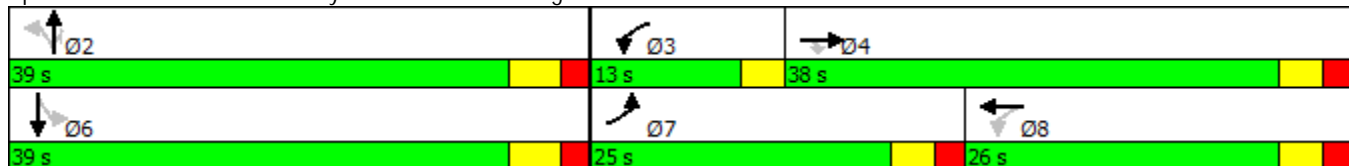


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Walk Time (s)		6.0	6.0		6.0		6.0	6.0	6.0	6.0	6.0	
Flash Dont Walk (s)		15.0	15.0		15.0		11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)		5	5		5		5	5	5	5	5	
Act Effect Green (s)	18.1	21.3	21.3	21.2	12.3	68.2	26.1	26.1	26.1	26.1	26.1	68.2
Actuated g/C Ratio	0.27	0.31	0.31	0.31	0.18	1.00	0.38	0.38	0.38	0.38	0.38	1.00
v/c Ratio	0.74	0.13	0.29	0.33	0.25	0.19	0.35	0.69	0.21	0.45	0.33	0.10
Control Delay	31.8	19.1	5.1	13.7	29.9	0.3	22.1	23.2	5.0	31.8	17.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.8	19.1	5.1	13.7	29.9	0.3	22.1	23.2	5.0	31.8	17.8	0.1
LOS	C	B	A	B	C	A	C	C	A	C	B	A
Approach Delay		25.7			8.7			21.0			15.1	
Approach LOS		C			A			C			B	
Queue Length 50th (m)	38.9	6.7	0.0	9.8	9.6	0.0	11.3	52.8	0.2	6.8	21.2	0.0
Queue Length 95th (m)	#82.6	16.5	11.6	22.5	22.4	0.0	28.4	86.8	10.4	22.4	38.1	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	997	893	819	446	568	1453	444	1673	772	195	1673	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.08	0.20	0.33	0.14	0.19	0.25	0.51	0.16	0.33	0.24	0.10

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 68.2
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 19.1
 Intersection LOS: B
 Intersection Capacity Utilization 76.2%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2020 Post Development
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	30	328	5	84	56	105	44	66	283	89	29	12
Future Volume (vph)	30	328	5	84	56	105	44	66	283	89	29	12
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.97			0.97			0.99	
Frt		0.998			0.902			0.903			0.987	
Flt Protected		0.996		0.950				0.994			0.967	
Satd. Flow (prot)	0	1723	0	1648	1523	0	0	1511	0	0	1649	0
Flt Permitted		0.966		0.521				0.946			0.479	
Satd. Flow (perm)	0	1669	0	895	1523	0	0	1435	0	0	812	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			119			229			9	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			147.7	
Travel Time (s)		10.8			9.6			21.0			10.6	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	34	373	6	95	64	119	50	75	322	101	33	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	413	0	95	183	0	0	447	0	0	148	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	25.5	25.5		25.5	25.5		22.5	22.5		22.5	22.5	
Total Split (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	29.5	29.5		29.5	29.5		29.5	29.5		29.5	29.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2020 Post Development
AM Peak

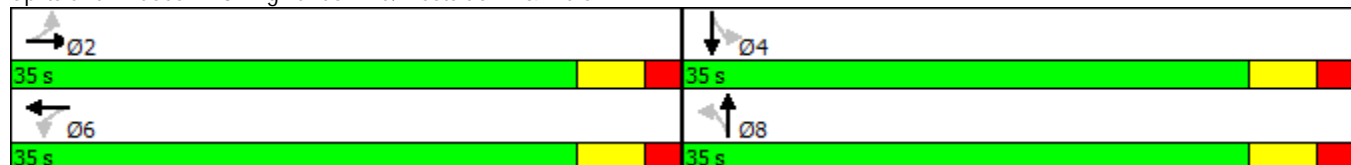


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	5	5		5	5		5	5		5	5	
Act Effect Green (s)		21.9		21.9	21.9			14.9			14.9	
Actuated g/C Ratio		0.45		0.45	0.45			0.31			0.31	
v/c Ratio		0.54		0.23	0.24			0.74			0.58	
Control Delay		14.3		11.9	5.4			15.4			22.8	
Queue Delay		0.0		0.0	0.0			0.0			0.0	
Total Delay		14.3		11.9	5.4			15.4			22.8	
LOS		B		B	A			B			C	
Approach Delay		14.3			7.6			15.4			22.8	
Approach LOS		B			A			B			C	
Queue Length 50th (m)		21.5		4.2	2.6			14.1			9.2	
Queue Length 95th (m)		63.3		16.8	15.0			45.1			27.0	
Internal Link Dist (m)		125.6			109.7			267.6			123.7	
Turn Bay Length (m)				70.0								
Base Capacity (vph)		1056		565	1007			991			516	
Starvation Cap Reductn		0		0	0			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.39		0.17	0.18			0.45			0.29	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 48.2
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 14.2
 Intersection LOS: B
 Intersection Capacity Utilization 82.7%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



HCM Unsignalized Intersection Capacity Analysis

2: Argyll Road & Walsh Dr

2020 Post Development
AM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻			↻				↻			↻
Traffic Volume (veh/h)	0	674	26	0	238	56	0	0	80	0	0	7
Future Volume (Veh/h)	0	674	26	0	238	56	0	0	80	0	0	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	766	30	0	270	64	0	0	91	0	0	8
Pedestrians		10			10			10				
Lane Width (m)		3.7			3.7			3.7				
Walking Speed (m/s)		1.2			1.2			1.2				
Percent Blockage		1			1			1				
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		134			169							
pX, platoon unblocked				0.86			0.86	0.86	0.86	0.86	0.86	
vC, conflicting volume	334			806			1111	1125	801	1184	1108	312
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	334			695			1049	1065	690	1134	1046	312
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	76	100	100	99
cM capacity (veh/h)	1225			770			171	190	378	116	195	722
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	796	334	91	8								
Volume Left	0	0	0	0								
Volume Right	30	64	91	8								
cSH	1700	1700	378	722								
Volume to Capacity	0.47	0.20	0.24	0.01								
Queue Length 95th (m)	0.0	0.0	7.3	0.3								
Control Delay (s)	0.0	0.0	17.5	10.0								
Lane LOS			C	B								
Approach Delay (s)	0.0	0.0	17.5	10.0								
Approach LOS			C	B								
Intersection Summary												
Average Delay			1.4									
Intersection Capacity Utilization			55.3%		ICU Level of Service				B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Westside Dr

2020 Post Development
AM Peak



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	57	6	154	47	12	73
Future Volume (Veh/h)	57	6	154	47	12	73
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	65	7	175	53	14	83
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	312	202			228	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	312	202			228	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	99			99	
cM capacity (veh/h)	673	839			1340	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	72	228	97			
Volume Left	65	0	14			
Volume Right	7	53	0			
cSH	686	1700	1340			
Volume to Capacity	0.10	0.13	0.01			
Queue Length 95th (m)	2.8	0.0	0.3			
Control Delay (s)	10.9	0.0	1.2			
Lane LOS	B		A			
Approach Delay (s)	10.9	0.0	1.2			
Approach LOS	B					
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			25.7%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2020 Post Development
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	326	106	226	99	81	94	186	519	119	184	1279	692
Future Volume (vph)	326	106	226	99	81	94	186	519	119	184	1279	692
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.98		0.97	0.99		0.99			0.95	0.99		0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	3202	1432
Fl _t Permitted	0.950			0.680			0.072			0.395		
Satd. Flow (perm)	3149	1735	1432	1163	1735	1453	121	3202	1354	658	3202	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			222			168			118			382
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		88.6			185.2			219.5			151.3	
Travel Time (s)		6.4			13.3			13.2			9.1	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	370	120	257	113	92	107	211	590	135	209	1453	786
Shared Lane Traffic (%)												
Lane Group Flow (vph)	370	120	257	113	92	107	211	590	135	209	1453	786
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	8.0	10.0		8.0	20.0	20.0	8.0	20.0	
Minimum Split (s)	15.0	26.0	26.0	11.0	26.0		11.0	25.5	25.5	11.0	25.5	
Total Split (s)	17.0	32.0	32.0	11.0	26.0		15.0	61.0	61.0	16.0	62.0	
Total Split (%)	14.2%	26.7%	26.7%	9.2%	21.7%		12.5%	50.8%	50.8%	13.3%	51.7%	
Maximum Green (s)	12.0	27.0	27.0	8.0	21.0		12.0	55.5	55.5	13.0	56.5	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		3.0	5.5	5.5	3.0	5.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2020 Post Development
PM Peak

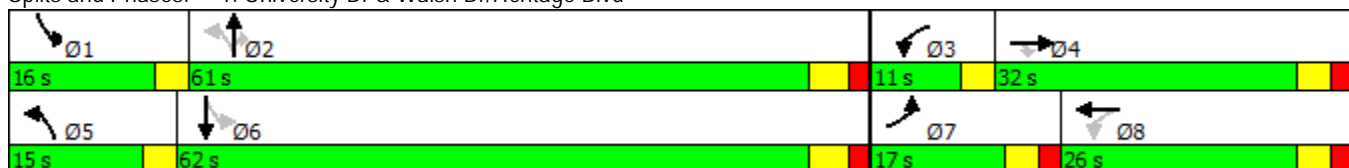


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	None	Min	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		15.0	15.0		15.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effect Green (s)	14.2	17.5	17.5	20.1	12.9	108.7	70.2	55.8	55.8	67.7	54.5	108.7
Actuated g/C Ratio	0.13	0.16	0.16	0.18	0.12	1.00	0.65	0.51	0.51	0.62	0.50	1.00
v/c Ratio	0.89	0.43	0.62	0.45	0.45	0.07	0.87	0.36	0.18	0.42	0.91	0.56
Control Delay	72.8	46.1	15.3	37.9	52.8	0.1	60.9	17.5	4.8	10.6	34.9	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.8	46.1	15.3	37.9	52.8	0.1	60.9	17.5	4.8	10.6	34.9	1.6
LOS	E	D	B	D	D	A	E	B	A	B	C	A
Approach Delay		48.7			29.3			25.5			22.1	
Approach LOS		D			C			C			C	
Queue Length 50th (m)	-47.0	24.6	6.9	19.7	19.8	0.0	30.7	38.8	1.8	15.9	146.4	0.0
Queue Length 95th (m)	#83.5	41.5	29.3	33.7	35.2	0.0	#83.0	61.8	12.8	32.1	#221.4	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	416	433	524	251	337	1453	242	1673	764	537	1675	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.89	0.28	0.49	0.45	0.27	0.07	0.87	0.35	0.18	0.39	0.87	0.56

Intersection Summary

Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 108.7
 Natural Cycle: 120
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 27.8
 Intersection LOS: C
 Intersection Capacity Utilization 78.6%
 ICU Level of Service D
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2020 Post Development
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	39	171	6	358	375	137	78	65	105	283	89	33
Future Volume (vph)	39	171	6	358	375	137	78	65	105	283	89	33
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.99			0.98			0.99	
Frt		0.996			0.960			0.943			0.989	
Flt Protected		0.991		0.950				0.984			0.966	
Satd. Flow (prot)	0	1710	0	1648	1644	0	0	1577	0	0	1651	0
Flt Permitted		0.799		0.440				0.780			0.620	
Satd. Flow (perm)	0	1376	0	754	1644	0	0	1247	0	0	1048	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			25			54			7	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			147.7	
Travel Time (s)		10.8			9.6			21.0			10.6	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	44	194	7	407	426	156	89	74	119	322	101	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	245	0	407	582	0	0	282	0	0	461	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		8.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	25.5	25.5		11.0	25.5		21.5	21.5		21.5	21.5	
Total Split (s)	28.0	28.0		15.0	43.0		47.0	47.0		47.0	47.0	
Total Split (%)	31.1%	31.1%		16.7%	47.8%		52.2%	52.2%		52.2%	52.2%	
Maximum Green (s)	22.5	22.5		12.0	37.5		41.5	41.5		41.5	41.5	
Yellow Time (s)	3.5	3.5		3.0	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		0.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		5.5		3.0	5.5			5.5			5.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2020 Post Development
PM Peak

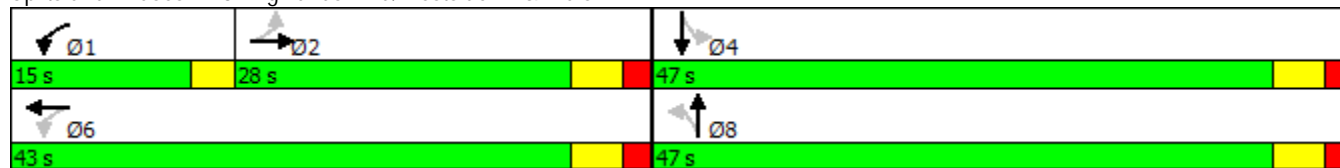


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	6.0	6.0			6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	10.0	10.0			10.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	5	5			5		5	5		5	5	
Act Effect Green (s)		21.3		38.9	36.3			39.8			39.8	
Actuated g/C Ratio		0.24		0.45	0.42			0.46			0.46	
v/c Ratio		0.73		0.89	0.83			0.47			0.96	
Control Delay		44.5		43.7	34.5			16.1			56.4	
Queue Delay		0.0		0.0	0.0			0.0			0.0	
Total Delay		44.5		43.7	34.5			16.1			56.4	
LOS		D		D	C			B			E	
Approach Delay		44.5			38.3			16.1			56.4	
Approach LOS		D			D			B			E	
Queue Length 50th (m)		39.9		52.2	87.5			26.0			73.7	
Queue Length 95th (m)		#70.2		#101.2	#142.1			46.9			#135.7	
Internal Link Dist (m)		125.6			109.7			267.6			123.7	
Turn Bay Length (m)				70.0								
Base Capacity (vph)		357		459	722			623			503	
Starvation Cap Reductn		0		0	0			0			0	
Spillback Cap Reductn		0		0	0			0			0	
Storage Cap Reductn		0		0	0			0			0	
Reduced v/c Ratio		0.69		0.89	0.81			0.45			0.92	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 87.2
 Natural Cycle: 75
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.96
 Intersection Signal Delay: 40.1
 Intersection LOS: D
 Intersection Capacity Utilization 105.9%
 ICU Level of Service G
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



HCM Unsignalized Intersection Capacity Analysis

2: Argyll Road & Walsh Dr

2020 Post Development
PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗			↖			↑	↘		↓	↙
Traffic Volume (veh/h)	0	503	55	0	753	206	0	0	155	0	0	116
Future Volume (Veh/h)	0	503	55	0	753	206	0	0	155	0	0	116
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	572	63	0	856	234	0	0	176	0	0	132
Pedestrians		10			10			10				
Lane Width (m)		3.7			3.7			3.7				
Walking Speed (m/s)		1.2			1.2			1.2				
Percent Blockage		1			1			1				
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		134			169							
pX, platoon unblocked	0.92			0.91			0.95	0.95	0.91	0.95	0.95	0.92
vC, conflicting volume	1090			645			1728	1704	624	1762	1618	983
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1052			562			1541	1515	538	1577	1425	936
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	64	100	100	55
cM capacity (veh/h)	606			912			48	113	486	53	128	292
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	635	1090	176	132								
Volume Left	0	0	0	0								
Volume Right	63	234	176	132								
cSH	1700	1700	486	292								
Volume to Capacity	0.37	0.64	0.36	0.45								
Queue Length 95th (m)	0.0	0.0	12.9	17.6								
Control Delay (s)	0.0	0.0	16.5	27.1								
Lane LOS			C	D								
Approach Delay (s)	0.0	0.0	16.5	27.1								
Approach LOS			C	D								
Intersection Summary												
Average Delay			3.2									
Intersection Capacity Utilization			71.1%		ICU Level of Service				C			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Westside Dr

2020 Post Development
PM Peak



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	234	28	132	110	33	171
Future Volume (Veh/h)	234	28	132	110	33	171
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	266	32	150	125	38	194
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage veh						
Upstream signal (m)			148			
pX, platoon unblocked						
vC, conflicting volume	482	212			275	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	482	212			275	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	50	96			97	
cM capacity (veh/h)	527	828			1288	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	298	275	232			
Volume Left	266	0	38			
Volume Right	32	125	0			
cSH	548	1700	1288			
Volume to Capacity	0.54	0.16	0.03			
Queue Length 95th (m)	25.6	0.0	0.7			
Control Delay (s)	19.1	0.0	1.5			
Lane LOS	C		A			
Approach Delay (s)	19.1	0.0	1.5			
Approach LOS	C					
Intersection Summary						
Average Delay			7.5			
Intersection Capacity Utilization			52.5%	ICU Level of Service		A
Analysis Period (min)	15					

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2020 PD Improved
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑	↔	↔	↑	↔	↔	↑↑	↔	↔	↑↑↑	↔
Traffic Volume (vph)	551	61	143	131	68	249	99	748	108	57	357	128
Future Volume (vph)	551	61	143	131	68	249	99	748	108	57	357	128
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Ped Bike Factor	0.99		0.98	0.99		0.99	0.99		0.95	1.00		0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	4601	1432
Fl _t Permitted	0.950			0.712			0.505			0.223		
Satd. Flow (perm)	3160	1735	1438	1221	1735	1453	843	3202	1367	374	4601	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			163			283			121			188
Link Speed (k/h)		50			50			60				60
Link Distance (m)		88.6			185.2			219.5				151.3
Travel Time (s)		6.4			13.3			13.2				9.1
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	626	69	163	149	77	283	113	850	123	65	406	145
Shared Lane Traffic (%)												
Lane Group Flow (vph)	626	69	163	149	77	283	113	850	123	65	406	145
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		4.8			4.8			4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	Perm	NA	Perm	Perm	NA	Free
Protected Phases	7	4		3	8			2				6
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		2	2	2	6		6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		20.0	20.0	20.0	20.0		20.0
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		25.5	25.5	25.5	25.5		25.5
Total Split (s)	25.0	38.0	38.0	13.0	26.0		39.0	39.0	39.0	39.0		39.0
Total Split (%)	27.8%	42.2%	42.2%	14.4%	28.9%		43.3%	43.3%	43.3%	43.3%		43.3%
Maximum Green (s)	20.0	33.0	33.0	10.0	21.0		33.5	33.5	33.5	33.5		33.5
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.5	3.5	3.5	3.5		3.5
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		2.0	2.0	2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		5.5	5.5	5.5	5.5		5.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												

Lanes, Volumes, Timings
 1: University Dr & Walsh Dr/Heritage Blvd

2020 PD Improved
 AM Peak

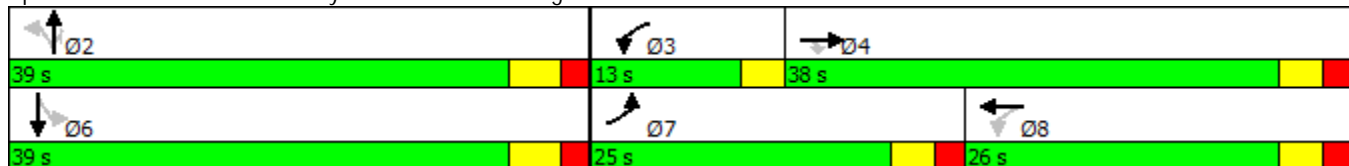


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Walk Time (s)		6.0	6.0		6.0		6.0	6.0	6.0	6.0	6.0	
Flash Dont Walk (s)		15.0	15.0		15.0		11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)		5	5		5		5	5	5	5	5	
Act Effect Green (s)	18.1	21.3	21.3	21.2	12.3	68.2	26.1	26.1	26.1	26.1	26.1	68.2
Actuated g/C Ratio	0.27	0.31	0.31	0.31	0.18	1.00	0.38	0.38	0.38	0.38	0.38	1.00
v/c Ratio	0.74	0.13	0.29	0.33	0.25	0.19	0.35	0.69	0.21	0.45	0.23	0.10
Control Delay	31.8	19.1	5.1	13.7	29.9	0.3	22.2	23.2	5.0	31.8	16.5	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.8	19.1	5.1	13.7	29.9	0.3	22.2	23.2	5.0	31.8	16.5	0.1
LOS	C	B	A	B	C	A	C	C	A	C	B	A
Approach Delay		25.7			8.7			21.0			14.3	
Approach LOS		C			A			C			B	
Queue Length 50th (m)	38.9	6.7	0.0	9.8	9.6	0.0	11.3	52.8	0.2	6.8	14.1	0.0
Queue Length 95th (m)	#82.6	16.5	11.6	22.5	22.4	0.0	28.5	86.8	10.4	22.4	24.9	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	997	893	819	446	568	1453	440	1673	772	195	2405	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.08	0.20	0.33	0.14	0.19	0.26	0.51	0.16	0.33	0.17	0.10

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 68.2
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 18.9
 Intersection LOS: B
 Intersection Capacity Utilization 76.2%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2020 PD Improved
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕		↖	↗	
Traffic Volume (vph)	30	328	5	84	56	105	44	66	283	89	29	12
Future Volume (vph)	30	328	5	84	56	105	44	66	283	89	29	12
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	60.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.97			0.97		0.99	0.99	
Frt		0.998			0.902			0.903			0.955	
Flt Protected		0.996		0.950				0.994		0.950		
Satd. Flow (prot)	0	1723	0	1648	1523	0	0	1511	0	1648	1636	0
Flt Permitted		0.966		0.522				0.959		0.410		
Satd. Flow (perm)	0	1669	0	897	1523	0	0	1454	0	705	1636	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			119			229			14	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			147.7	
Travel Time (s)		10.8			9.6			21.0			10.6	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	34	373	6	95	64	119	50	75	322	101	33	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	413	0	95	183	0	0	447	0	101	47	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	25.5	25.5		25.5	25.5		22.5	22.5		22.5	22.5	
Total Split (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	29.5	29.5		29.5	29.5		29.5	29.5		29.5	29.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5		5.5	5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
 3: Highlands Blvd/Westside Dr & Walsh Dr

2020 PD Improved
 AM Peak

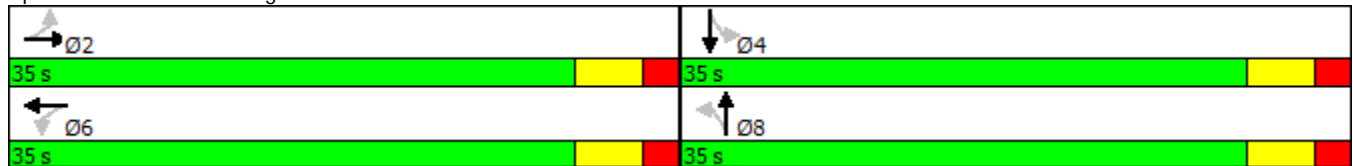


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	5	5		5	5		5	5		5	5	
Act Effect Green (s)		21.8		21.8	21.8			14.8		14.8	14.8	
Actuated g/C Ratio		0.45		0.45	0.45			0.31		0.31	0.31	
v/c Ratio		0.54		0.23	0.24			0.74		0.47	0.09	
Control Delay		14.2		11.8	5.3			15.2		21.1	9.3	
Queue Delay		0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay		14.2		11.8	5.3			15.2		21.1	9.3	
LOS		B		B	A			B		C	A	
Approach Delay		14.2			7.5			15.2			17.3	
Approach LOS		B			A			B			B	
Queue Length 50th (m)		21.2		4.1	2.6			14.1		6.5	1.9	
Queue Length 95th (m)		62.5		16.6	14.9			44.4		19.8	7.8	
Internal Link Dist (m)		125.6			109.7			267.6			123.7	
Turn Bay Length (m)				70.0						60.0		
Base Capacity (vph)		1059		569	1010			1006		447	1043	
Starvation Cap Reductn		0		0	0			0		0	0	
Spillback Cap Reductn		0		0	0			0		0	0	
Storage Cap Reductn		0		0	0			0		0	0	
Reduced v/c Ratio		0.39		0.17	0.18			0.44		0.23	0.05	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 48
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 13.4
 Intersection Capacity Utilization 84.0%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service E

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2020 PD Improved
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	326	106	226	99	81	94	186	519	119	184	1279	692
Future Volume (vph)	326	106	226	99	81	94	186	519	119	184	1279	692
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Ped Bike Factor	0.99		0.98	0.99		0.99	1.00		0.95	0.99		0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	4601	1432
Fl _t Permitted	0.950			0.680			0.149			0.324		
Satd. Flow (perm)	3161	1735	1438	1167	1735	1453	251	3202	1367	542	4601	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			257			200			133			692
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		88.6			185.2			219.5			151.3	
Travel Time (s)		6.4			13.3			13.2			9.1	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	370	120	257	113	92	107	211	590	135	209	1453	786
Shared Lane Traffic (%)												
Lane Group Flow (vph)	370	120	257	113	92	107	211	590	135	209	1453	786
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	8.0	10.0		8.0	20.0	20.0	8.0	20.0	
Minimum Split (s)	15.0	26.0	26.0	11.0	26.0		11.0	25.5	25.5	11.0	25.5	
Total Split (s)	16.0	31.0	31.0	11.0	26.0		11.0	33.0	33.0	15.0	37.0	
Total Split (%)	17.8%	34.4%	34.4%	12.2%	28.9%		12.2%	36.7%	36.7%	16.7%	41.1%	
Maximum Green (s)	11.0	26.0	26.0	8.0	21.0		8.0	27.5	27.5	12.0	31.5	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		3.0	5.5	5.5	3.0	5.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												

Lanes, Volumes, Timings
 1: University Dr & Walsh Dr/Heritage Blvd

2020 PD Improved
 PM Peak

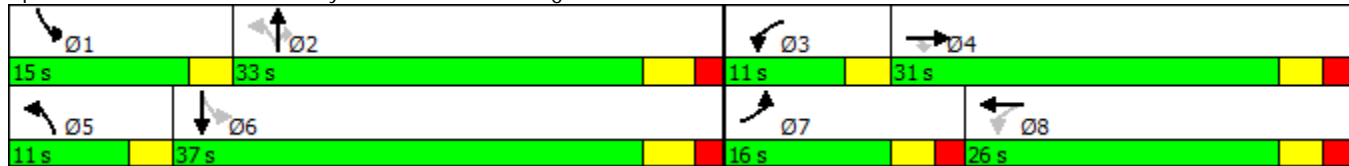


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	None	Min	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		15.0	15.0		15.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effect Green (s)	11.4	16.4	16.4	19.3	12.4	75.8	37.6	26.8	26.8	41.6	29.0	75.8
Actuated g/C Ratio	0.15	0.22	0.22	0.25	0.16	1.00	0.50	0.35	0.35	0.55	0.38	1.00
v/c Ratio	0.77	0.32	0.50	0.32	0.33	0.07	0.78	0.52	0.24	0.47	0.83	0.56
Control Delay	46.5	29.1	7.4	20.0	33.8	0.1	37.3	23.1	5.7	13.7	27.3	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.5	29.1	7.4	20.0	33.8	0.1	37.3	23.1	5.7	13.7	27.3	1.6
LOS	D	C	A	B	C	A	D	C	A	B	C	A
Approach Delay		30.3			17.2			23.8			17.9	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	29.3	16.4	0.0	12.0	13.4	0.0	14.9	36.8	0.2	14.8	70.9	0.0
Queue Length 95th (m)	#59.6	29.8	16.1	22.1	25.9	0.0	#62.1	63.0	12.3	33.7	#108.2	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	479	615	675	349	497	1453	271	1221	603	480	1977	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.20	0.38	0.32	0.19	0.07	0.78	0.48	0.22	0.44	0.73	0.56

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 75.8
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.83
 Intersection Signal Delay: 21.2
 Intersection LOS: C
 Intersection Capacity Utilization 67.1%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2020 PD Improved
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕		↖	↗	
Traffic Volume (vph)	39	171	6	358	375	137	78	65	105	283	89	33
Future Volume (vph)	39	171	6	358	375	137	78	65	105	283	89	33
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	60.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.99			0.98		0.99	0.99	
Frt		0.996			0.960			0.943			0.959	
Flt Protected		0.991		0.950				0.984		0.950		
Satd. Flow (prot)	0	1710	0	1648	1647	0	0	1582	0	1648	1645	0
Flt Permitted		0.829		0.501				0.842		0.446		
Satd. Flow (perm)	0	1428	0	859	1647	0	0	1346	0	766	1645	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			34			49			32	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			147.7	
Travel Time (s)		10.8			9.6			21.0			10.6	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	44	194	7	407	426	156	89	74	119	322	101	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	245	0	407	582	0	0	282	0	322	139	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		1	6		8	8		7	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		8.0	20.0		10.0	10.0		8.0	10.0	
Minimum Split (s)	25.5	25.5		11.0	25.5		21.5	21.5		11.0	21.5	
Total Split (s)	26.0	26.0		11.0	37.0		22.0	22.0		11.0	33.0	
Total Split (%)	37.1%	37.1%		15.7%	52.9%		31.4%	31.4%		15.7%	47.1%	
Maximum Green (s)	20.5	20.5		8.0	31.5		16.5	16.5		8.0	27.5	
Yellow Time (s)	3.5	3.5		3.0	3.5		3.5	3.5		3.0	3.5	
All-Red Time (s)	2.0	2.0		0.0	2.0		2.0	2.0		0.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5		3.0	5.5			5.5		3.0	5.5	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
 3: Highlands Blvd/Westside Dr & Walsh Dr

2020 PD Improved
 PM Peak

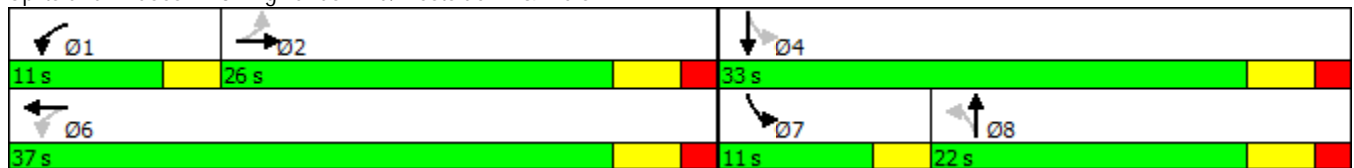


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	6.0	6.0			6.0		6.0	6.0				6.0
Flash Dont Walk (s)	10.0	10.0			10.0		10.0	10.0				10.0
Pedestrian Calls (#/hr)	5	5			5		5	5				5
Act Effect Green (s)		20.2		33.7	31.2			15.0		28.5	26.0	
Actuated g/C Ratio		0.30		0.49	0.46			0.22		0.42	0.38	
v/c Ratio		0.58		0.79	0.75			0.85		0.76	0.22	
Control Delay		27.2		26.8	22.7			45.6		29.1	11.8	
Queue Delay		0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay		27.2		26.8	22.7			45.6		29.1	11.8	
LOS		C		C	C			D		C	B	
Approach Delay		27.2			24.4			45.6			23.9	
Approach LOS		C			C			D			C	
Queue Length 50th (m)		28.0		35.7	59.9			29.6		29.4	9.0	
Queue Length 95th (m)		48.9		#68.9	#97.2			#65.8		#56.6	19.6	
Internal Link Dist (m)		125.6			109.7			267.6			123.7	
Turn Bay Length (m)				70.0						60.0		
Base Capacity (vph)		431		517	779			362		423	682	
Starvation Cap Reductn		0		0	0			0		0	0	
Spillback Cap Reductn		0		0	0			0		0	0	
Storage Cap Reductn		0		0	0			0		0	0	
Reduced v/c Ratio		0.57		0.79	0.75			0.78		0.76	0.20	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 68.2
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.85
 Intersection Signal Delay: 27.7
 Intersection LOS: C
 Intersection Capacity Utilization 98.6%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Post Development
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	612	68	156	146	76	277	106	834	120	64	398	138
Future Volume (vph)	612	68	156	146	76	277	106	834	120	64	398	138
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Ped Bike Factor	0.99		0.98	0.99		0.99	0.99		0.95	1.00		0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	4601	1432
Fl _t Permitted	0.950			0.707			0.482			0.172		
Satd. Flow (perm)	3161	1735	1438	1212	1735	1453	805	3202	1367	289	4601	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			177			315			121			188
Link Speed (k/h)		50			50			60				60
Link Distance (m)		88.6			185.2			219.5				151.3
Travel Time (s)		6.4			13.3			13.2				9.1
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	695	77	177	166	86	315	120	948	136	73	452	157
Shared Lane Traffic (%)												
Lane Group Flow (vph)	695	77	177	166	86	315	120	948	136	73	452	157
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		4.8			4.8			4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	Perm	NA	Perm	Perm	NA	Free
Protected Phases	7	4		3	8			2				6
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		2	2	2	6		6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		20.0	20.0	20.0	20.0		20.0
Minimum Split (s)	15.0	26.0	26.0	13.0	26.0		25.5	25.5	25.5	25.5		25.5
Total Split (s)	25.0	38.0	38.0	13.0	26.0		39.0	39.0	39.0	39.0		39.0
Total Split (%)	27.8%	42.2%	42.2%	14.4%	28.9%		43.3%	43.3%	43.3%	43.3%		43.3%
Maximum Green (s)	20.0	33.0	33.0	10.0	21.0		33.5	33.5	33.5	33.5		33.5
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.5	3.5	3.5	3.5		3.5
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		2.0	2.0	2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		5.5	5.5	5.5	5.5		5.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Post Development
AM Peak

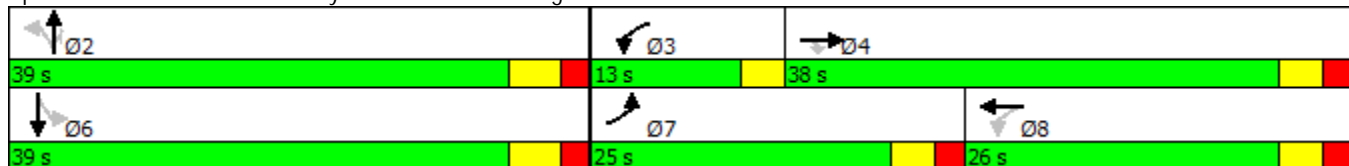


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Walk Time (s)		6.0	6.0		6.0		6.0	6.0	6.0	6.0	6.0	
Flash Dont Walk (s)		15.0	15.0		15.0		11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)		5	5		5		5	5	5	5	5	
Act Effect Green (s)	21.4	21.3	21.3	21.3	12.2	74.1	28.6	28.6	28.6	28.6	28.6	74.1
Actuated g/C Ratio	0.29	0.29	0.29	0.29	0.16	1.00	0.39	0.39	0.39	0.39	0.39	1.00
v/c Ratio	0.75	0.15	0.33	0.41	0.30	0.22	0.39	0.77	0.23	0.66	0.25	0.11
Control Delay	33.9	20.8	5.3	16.3	32.7	0.3	22.6	25.6	5.7	52.4	16.6	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.9	20.8	5.3	16.3	32.7	0.3	22.6	25.6	5.7	52.4	16.6	0.2
LOS	C	C	A	B	C	A	C	C	A	D	B	A
Approach Delay		27.5			9.9			23.0			16.7	
Approach LOS		C			A			C			B	
Queue Length 50th (m)	51.5	8.7	0.0	13.9	12.2	0.0	12.2	61.4	1.3	8.5	15.9	0.0
Queue Length 95th (m)	#96.9	18.1	12.0	24.9	24.4	0.0	30.7	99.9	12.6	#33.7	27.5	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	925	796	755	408	506	1453	374	1491	701	134	2143	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.10	0.23	0.41	0.17	0.22	0.32	0.64	0.19	0.54	0.21	0.11

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 74.1
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.77
 Intersection Signal Delay: 20.8 Intersection LOS: C
 Intersection Capacity Utilization 80.7% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2028 Post Development
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕		↖	↗	
Traffic Volume (vph)	31	366	6	93	62	115	49	73	316	94	32	12
Future Volume (vph)	31	366	6	93	62	115	49	73	316	94	32	12
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	60.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.97			0.97		0.99	0.99	
Frt		0.998			0.902			0.903			0.958	
Flt Protected		0.996		0.950				0.994		0.950		
Satd. Flow (prot)	0	1723	0	1648	1522	0	0	1511	0	1648	1643	0
Flt Permitted		0.966		0.476				0.959		0.377		
Satd. Flow (perm)	0	1669	0	819	1522	0	0	1454	0	649	1643	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			131			230			14	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			147.7	
Travel Time (s)		10.8			9.6			21.0			10.6	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	35	416	7	106	70	131	56	83	359	107	36	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	458	0	106	201	0	0	498	0	107	50	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	25.5	25.5		25.5	25.5		22.5	22.5		22.5	22.5	
Total Split (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	29.5	29.5		29.5	29.5		29.5	29.5		29.5	29.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5		5.5	5.5			5.5		5.5	5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2028 Post Development
AM Peak

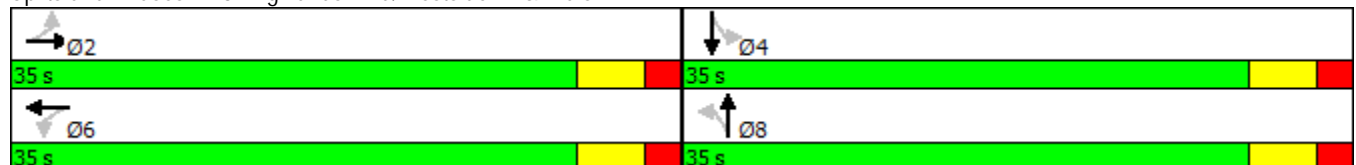


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	5	5		5	5		5	5		5	5	
Act Effct Green (s)		22.7		22.7	22.7			16.8		16.8	16.8	
Actuated g/C Ratio		0.45		0.45	0.45			0.33		0.33	0.33	
v/c Ratio		0.62		0.29	0.27			0.79		0.50	0.09	
Control Delay		16.8		13.9	5.7			17.8		22.7	9.4	
Queue Delay		0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay		16.8		13.9	5.7			17.8		22.7	9.4	
LOS		B		B	A			B		C	A	
Approach Delay		16.8			8.6			17.8			18.4	
Approach LOS		B			A			B			B	
Queue Length 50th (m)		28.1		5.4	3.3			18.0		7.0	2.0	
Queue Length 95th (m)		75.6		20.0	16.8			56.2		22.2	8.3	
Internal Link Dist (m)		125.6			109.7			267.6			123.7	
Turn Bay Length (m)				70.0						60.0		
Base Capacity (vph)		1005		493	969			967		390	995	
Starvation Cap Reductn		0		0	0			0		0	0	
Spillback Cap Reductn		0		0	0			0		0	0	
Storage Cap Reductn		0		0	0			0		0	0	
Reduced v/c Ratio		0.46		0.22	0.21			0.51		0.27	0.05	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 50.9
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.79
 Intersection Signal Delay: 15.6
 Intersection Capacity Utilization 89.2%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service E

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



HCM Unsignalized Intersection Capacity Analysis

2: Argyll Road & Walsh Dr

2028 Post Development
AM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗			↖			↑	↘		↓	↙
Traffic Volume (veh/h)	0	746	29	0	263	56	0	0	90	0	0	7
Future Volume (Veh/h)	0	746	29	0	263	56	0	0	90	0	0	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	848	33	0	299	64	0	0	102	0	0	8
Pedestrians		10			10			10				
Lane Width (m)		3.7			3.7			3.7				
Walking Speed (m/s)		1.2			1.2			1.2				
Percent Blockage		1			1			1				
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		134			169							
pX, platoon unblocked	1.00			0.83			0.83	0.83	0.83	0.83	0.83	1.00
vC, conflicting volume	363			891			1224	1238	884	1308	1222	341
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	363			763			1165	1181	755	1266	1163	341
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	69	100	100	99
cM capacity (veh/h)	1196			696			137	156	332	82	160	696
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	881	363	102	8								
Volume Left	0	0	0	0								
Volume Right	33	64	102	8								
cSH	1700	1700	332	696								
Volume to Capacity	0.52	0.21	0.31	0.01								
Queue Length 95th (m)	0.0	0.0	10.1	0.3								
Control Delay (s)	0.0	0.0	20.6	10.2								
Lane LOS			C	B								
Approach Delay (s)	0.0	0.0	20.6	10.2								
Approach LOS			C	B								
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization			60.1%		ICU Level of Service				B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Westside Dr

2028 Post Development
AM Peak



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	57	6	154	172	12	82
Future Volume (Veh/h)	57	6	154	172	12	82
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	65	7	175	195	14	93
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	394	272			370	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	394	272			370	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	99			99	
cM capacity (veh/h)	604	766			1189	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	72	370	107			
Volume Left	65	0	14			
Volume Right	7	195	0			
cSH	617	1700	1189			
Volume to Capacity	0.12	0.22	0.01			
Queue Length 95th (m)	3.1	0.0	0.3			
Control Delay (s)	11.6	0.0	1.1			
Lane LOS	B		A			
Approach Delay (s)	11.6	0.0	1.1			
Approach LOS	B					
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization			30.7%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Post Development
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑	↖	↖	↑	↖	↖	↑↑	↖	↖	↑↑↑	↖
Traffic Volume (vph)	353	117	241	111	89	105	199	579	133	205	1426	763
Future Volume (vph)	353	117	241	111	89	105	199	579	133	205	1426	763
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	25.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Ped Bike Factor	0.99		0.97	0.99		0.99			0.95	0.99		0.99
Fr _t			0.850			0.850			0.850			0.850
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3197	1735	1475	1648	1735	1475	1601	3202	1432	1601	4601	1432
Fl _t Permitted	0.950			0.672			0.123			0.299		
Satd. Flow (perm)	3159	1735	1437	1153	1735	1453	207	3202	1365	500	4601	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			273			212			149			687
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		88.6			185.2			219.5			151.3	
Travel Time (s)		6.4			13.3			13.2			9.1	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	401	133	274	126	101	119	226	658	151	233	1620	867
Shared Lane Traffic (%)												
Lane Group Flow (vph)	401	133	274	126	101	119	226	658	151	233	1620	867
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.4			7.4			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Prot	NA	Perm	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4	8		Free	2		2	6		Free
Detector Phase	7	4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	8.0	10.0		8.0	20.0	20.0	8.0	20.0	
Minimum Split (s)	15.0	26.0	26.0	11.0	26.0		11.0	25.5	25.5	11.0	25.5	
Total Split (s)	17.0	32.0	32.0	11.0	26.0		12.0	37.0	37.0	15.0	40.0	
Total Split (%)	17.9%	33.7%	33.7%	11.6%	27.4%		12.6%	38.9%	38.9%	15.8%	42.1%	
Maximum Green (s)	12.0	27.0	27.0	8.0	21.0		9.0	31.5	31.5	12.0	34.5	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.5	3.5	3.0	3.5	
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0		0.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0		3.0	5.5	5.5	3.0	5.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												

Lanes, Volumes, Timings
1: University Dr & Walsh Dr/Heritage Blvd

2028 Post Development
PM Peak

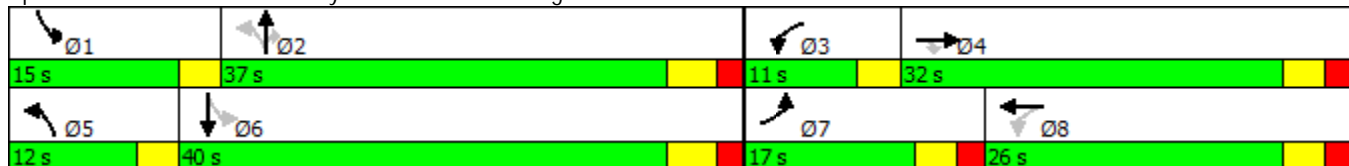


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	None	Min	
Walk Time (s)		6.0	6.0		6.0			6.0	6.0		6.0	
Flash Dont Walk (s)		15.0	15.0		15.0			11.0	11.0		11.0	
Pedestrian Calls (#/hr)		5	5		5			5	5		5	
Act Effect Green (s)	14.1	17.1	17.1	19.8	12.4	84.7	43.9	32.3	32.3	47.1	33.9	84.7
Actuated g/C Ratio	0.17	0.20	0.20	0.23	0.15	1.00	0.52	0.38	0.38	0.56	0.40	1.00
v/c Ratio	0.75	0.38	0.54	0.40	0.40	0.08	0.88	0.54	0.25	0.56	0.88	0.61
Control Delay	46.8	32.1	8.0	23.8	38.0	0.1	54.3	23.6	5.1	15.8	31.3	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.8	32.1	8.0	23.8	38.0	0.1	54.3	23.6	5.1	15.8	31.3	2.0
LOS	D	C	A	C	D	A	D	C	A	B	C	A
Approach Delay		31.2			19.8			27.6			20.6	
Approach LOS		C			B			C			C	
Queue Length 50th (m)	34.3	19.6	0.1	14.7	16.0	0.0	21.7	44.1	0.2	17.5	87.9	0.0
Queue Length 95th (m)	#67.9	34.3	17.2	26.1	29.8	0.0	#73.5	71.7	12.6	38.1	#139.0	0.0
Internal Link Dist (m)		64.6			161.2			195.5			127.3	
Turn Bay Length (m)	60.0		50.0	40.0		30.0	95.0		25.0	110.0		90.0
Base Capacity (vph)	533	556	646	315	432	1453	256	1221	612	442	1885	1411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.24	0.42	0.40	0.23	0.08	0.88	0.54	0.25	0.53	0.86	0.61

Intersection Summary

Area Type: Other
 Cycle Length: 95
 Actuated Cycle Length: 84.7
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 23.8
 Intersection LOS: C
 Intersection Capacity Utilization 71.6%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: University Dr & Walsh Dr/Heritage Blvd



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2028 Post Development
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕		↖	↗	
Traffic Volume (vph)	40	191	7	399	416	147	87	71	117	294	98	35
Future Volume (vph)	40	191	7	399	416	147	87	71	117	294	98	35
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		0.0	60.0		0.0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.99			0.97		0.99	0.99	
Frt		0.996			0.961			0.943			0.960	
Flt Protected		0.992		0.950				0.984		0.950		
Satd. Flow (prot)	0	1712	0	1648	1648	0	0	1579	0	1648	1646	0
Flt Permitted		0.823		0.449				0.837		0.431		
Satd. Flow (perm)	0	1418	0	770	1648	0	0	1335	0	741	1646	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			31			44			26	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		149.6			133.7			291.6			147.7	
Travel Time (s)		10.8			9.6			21.0			10.6	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	45	217	8	453	473	167	99	81	133	334	111	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	270	0	453	640	0	0	313	0	334	151	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		1	6		8	8		7	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		8.0	20.0		10.0	10.0		8.0	10.0	
Minimum Split (s)	25.5	25.5		11.0	25.5		21.5	21.5		11.0	21.5	
Total Split (s)	29.0	29.0		15.0	44.0		25.0	25.0		11.0	36.0	
Total Split (%)	36.3%	36.3%		18.8%	55.0%		31.3%	31.3%		13.8%	45.0%	
Maximum Green (s)	23.5	23.5		12.0	38.5		19.5	19.5		8.0	30.5	
Yellow Time (s)	3.5	3.5		3.0	3.5		3.5	3.5		3.0	3.5	
All-Red Time (s)	2.0	2.0		0.0	2.0		2.0	2.0		0.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5		3.0	5.5			5.5		3.0	5.5	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lanes, Volumes, Timings
 3: Highlands Blvd/Westside Dr & Walsh Dr

2028 Post Development
 PM Peak

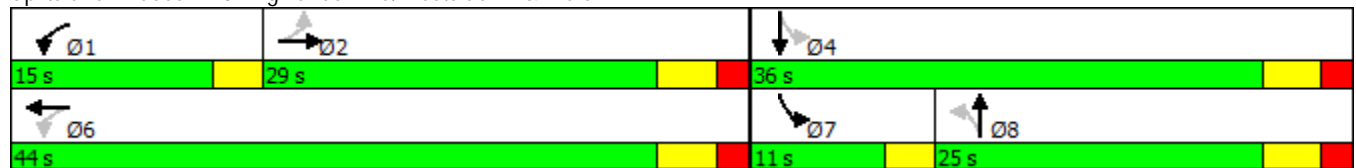


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	6.0	6.0			6.0		6.0	6.0				6.0
Flash Dont Walk (s)	10.0	10.0			10.0		10.0	10.0				10.0
Pedestrian Calls (#/hr)	5	5			5		5	5				5
Act Effect Green (s)		21.4		38.9	36.4			18.4		31.9	29.4	
Actuated g/C Ratio		0.28		0.51	0.47			0.24		0.42	0.38	
v/c Ratio		0.68		0.86	0.80			0.89		0.83	0.23	
Control Delay		34.8		33.0	26.1			53.2		38.3	14.5	
Queue Delay		0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay		34.8		33.0	26.1			53.2		38.3	14.5	
LOS		C		C	C			D		D	B	
Approach Delay		34.8			29.0			53.2			30.9	
Approach LOS		C			C			D			C	
Queue Length 50th (m)		36.6		45.3	76.9			38.6		34.5	11.9	
Queue Length 95th (m)		60.8		#87.7	118.4			#84.3		#75.9	25.2	
Internal Link Dist (m)		125.6			109.7			267.6			123.7	
Turn Bay Length (m)				70.0						60.0		
Base Capacity (vph)		435		527	842			372		402	669	
Starvation Cap Reductn		0		0	0			0		0	0	
Spillback Cap Reductn		0		0	0			0		0	0	
Storage Cap Reductn		0		0	0			0		0	0	
Reduced v/c Ratio		0.62		0.86	0.76			0.84		0.83	0.23	

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 76.8
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 33.6
 Intersection LOS: C
 Intersection Capacity Utilization 103.9%
 ICU Level of Service G
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



HCM Unsignalized Intersection Capacity Analysis

2: Argyll Road & Walsh Dr

2028 Post Development
PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻			↻				↻			↻
Traffic Volume (veh/h)	0	540	62	0	844	206	0	0	172	0	0	116
Future Volume (Veh/h)	0	540	62	0	844	206	0	0	172	0	0	116
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	614	70	0	959	234	0	0	195	0	0	132
Pedestrians		10			10			10				
Lane Width (m)		3.7			3.7			3.7				
Walking Speed (m/s)		1.2			1.2			1.2				
Percent Blockage		1			1			1				
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		134			169							
pX, platoon unblocked	0.90			0.76			0.81	0.81	0.76	0.81	0.81	0.90
vC, conflicting volume	1193			694			1877	1852	669	1930	1770	1086
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1158			439			1684	1654	406	1750	1552	1039
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	59	100	100	47
cM capacity (veh/h)	542			844			28	79	481	32	91	249
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	684	1193	195	132								
Volume Left	0	0	0	0								
Volume Right	70	234	195	132								
cSH	1700	1700	481	249								
Volume to Capacity	0.40	0.70	0.41	0.53								
Queue Length 95th (m)	0.0	0.0	15.3	22.3								
Control Delay (s)	0.0	0.0	17.5	34.6								
Lane LOS			C	D								
Approach Delay (s)	0.0	0.0	17.5	34.6								
Approach LOS			C	D								
Intersection Summary												
Average Delay			3.6									
Intersection Capacity Utilization			76.3%		ICU Level of Service				D			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Westside Dr

2028 Post Development
PM Peak



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	234	28	149	110	33	193
Future Volume (Veh/h)	234	28	149	110	33	193
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	266	32	169	125	38	219
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	526	232			294	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	526	232			294	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	46	96			97	
cM capacity (veh/h)	497	808			1268	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	298	294	257			
Volume Left	266	0	38			
Volume Right	32	125	0			
cSH	518	1700	1268			
Volume to Capacity	0.58	0.17	0.03			
Queue Length 95th (m)	28.4	0.0	0.7			
Control Delay (s)	20.9	0.0	1.4			
Lane LOS	C		A			
Approach Delay (s)	20.9	0.0	1.4			
Approach LOS	C					
Intersection Summary						
Average Delay			7.8			
Intersection Capacity Utilization		54.7%		ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2028 PD Improved
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	366	6	93	62	115	49	73	316	94	32	12
Future Volume (vph)	31	366	6	93	62	115	49	73	316	94	32	12
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		30.0	60.0		0.0
Storage Lanes	0		0	1		0	0		1	1		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.97			0.99	0.96	0.98	0.99	
Frt		0.998			0.902				0.850		0.958	
Flt Protected		0.996		0.950				0.980		0.950		
Satd. Flow (prot)	0	1723	0	1648	1522	0	0	1700	1475	1648	1643	0
Flt Permitted		0.967		0.515				0.850		0.668		
Satd. Flow (perm)	0	1671	0	885	1522	0	0	1462	1413	1138	1643	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			131				347			14
Link Speed (k/h)		50			50			50				50
Link Distance (m)		149.6			133.7			291.6				147.7
Travel Time (s)		10.8			9.6			21.0				10.6
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	35	416	7	106	70	131	56	83	359	107	36	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	458	0	106	201	0	0	139	359	107	50	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		4.8			4.8			4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm		NA
Protected Phases		2			6			8				4
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		6	6		8	8	8	4		4
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		10.0	10.0	10.0	10.0		10.0
Minimum Split (s)	25.5	25.5		25.5	25.5		22.5	22.5	22.5	22.5		22.5
Total Split (s)	40.0	40.0		40.0	40.0		30.0	30.0	30.0	30.0		30.0
Total Split (%)	57.1%	57.1%		57.1%	57.1%		42.9%	42.9%	42.9%	42.9%		42.9%
Maximum Green (s)	34.5	34.5		34.5	34.5		24.5	24.5	24.5	24.5		24.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5		3.5
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0		2.0
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0	0.0		0.0
Total Lost Time (s)		5.5		5.5	5.5			5.5	5.5	5.5		5.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0		3.0

Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2028 PD Improved
AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		Min	Min		None	None	None	None	None	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Pedestrian Calls (#/hr)	5	5		5	5		5	5	5	5	5	
Act Effect Green (s)		21.0		21.0	21.0			11.3	11.3	11.3	11.3	
Actuated g/C Ratio		0.48		0.48	0.48			0.26	0.26	0.26	0.26	
v/c Ratio		0.57		0.25	0.25			0.37	0.58	0.36	0.11	
Control Delay		11.7		9.0	3.9			16.5	6.5	17.3	10.6	
Queue Delay		0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay		11.7		9.0	3.9			16.5	6.5	17.3	10.6	
LOS		B		A	A			B	A	B	B	
Approach Delay		11.7			5.7			9.3			15.2	
Approach LOS		B			A			A			B	
Queue Length 50th (m)		20.7		4.0	2.4			8.4	0.7	6.5	2.0	
Queue Length 95th (m)		50.3		13.3	11.7			21.2	15.1	17.8	8.1	
Internal Link Dist (m)		125.6			109.7			267.6			123.7	
Turn Bay Length (m)				70.0					30.0	60.0		
Base Capacity (vph)		1341		710	1247			833	955	649	942	
Starvation Cap Reductn		0		0	0			0	0	0	0	
Spillback Cap Reductn		0		0	0			0	0	0	0	
Storage Cap Reductn		0		0	0			0	0	0	0	
Reduced v/c Ratio		0.34		0.15	0.16			0.17	0.38	0.16	0.05	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 43.3
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.58
 Intersection Signal Delay: 9.9
 Intersection Capacity Utilization 69.0%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service C

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



Lanes, Volumes, Timings
3: Highlands Blvd/Westside Dr & Walsh Dr

2028 PD Improved
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↖	↗	↖	↗	
Traffic Volume (vph)	40	191	7	399	416	147	87	71	117	294	98	35
Future Volume (vph)	40	191	7	399	416	147	87	71	117	294	98	35
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		0.0	70.0		0.0	0.0		30.0	60.0		0.0
Storage Lanes	0		0	1		0	0		1	1		0
Taper Length (m)	7.5			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.99	0.99			0.99	0.96	0.98	0.99	
Frt		0.996			0.961				0.850		0.960	
Flt Protected		0.992		0.950				0.973		0.950		
Satd. Flow (prot)	0	1712	0	1648	1648	0	0	1688	1475	1648	1646	0
Flt Permitted		0.821		0.440				0.748		0.484		
Satd. Flow (perm)	0	1414	0	755	1648	0	0	1283	1409	826	1646	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			33				133			25
Link Speed (k/h)		50			50			50				50
Link Distance (m)		149.6			133.7			291.6				147.7
Travel Time (s)		10.8			9.6			21.0				10.6
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	45	217	8	453	473	167	99	81	133	334	111	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	270	0	453	640	0	0	180	133	334	151	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		4.8			4.8			4.8				4.8
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	26		14	26		14	26		14	26		14
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		1	6		8	8	8	7	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		8.0	20.0		10.0	10.0	10.0	8.0	10.0	
Minimum Split (s)	25.5	25.5		11.0	25.5		21.5	21.5	21.5	11.0	21.5	
Total Split (s)	26.0	26.0		21.0	47.0		22.0	22.0	22.0	11.0	33.0	
Total Split (%)	32.5%	32.5%		26.3%	58.8%		27.5%	27.5%	27.5%	13.8%	41.3%	
Maximum Green (s)	20.5	20.5		18.0	41.5		16.5	16.5	16.5	8.0	27.5	
Yellow Time (s)	3.5	3.5		3.0	3.5		3.5	3.5	3.5	3.0	3.5	
All-Red Time (s)	2.0	2.0		0.0	2.0		2.0	2.0	2.0	0.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.5		3.0	5.5			5.5	5.5	3.0	5.5	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	

Lanes, Volumes, Timings
 3: Highlands Blvd/Westside Dr & Walsh Dr

2028 PD Improved
 PM Peak

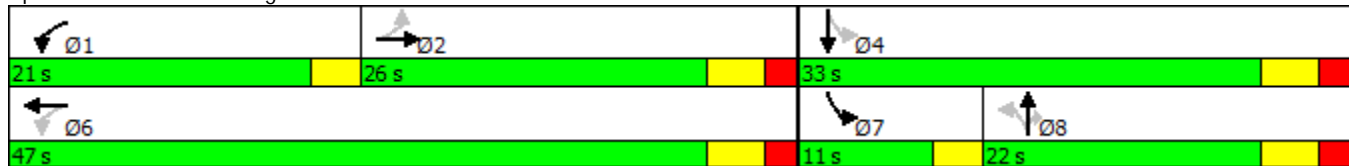


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	Min	Min		None	Min		None	None	None	None	None	
Walk Time (s)	6.0	6.0			6.0		6.0	6.0	6.0			6.0
Flash Dont Walk (s)	10.0	10.0			10.0		10.0	10.0	10.0			10.0
Pedestrian Calls (#/hr)	5	5			5		5	5	5			5
Act Effect Green (s)		20.4		42.1	39.5			14.5	14.5	28.0		25.5
Actuated g/C Ratio		0.27		0.55	0.52			0.19	0.19	0.37		0.34
v/c Ratio		0.71		0.75	0.73			0.74	0.35	0.86		0.27
Control Delay		38.6		20.0	19.9			49.2	8.4	43.9		17.1
Queue Delay		0.0		0.0	0.0			0.0	0.0	0.0		0.0
Total Delay		38.6		20.0	19.9			49.2	8.4	43.9		17.1
LOS		D		B	B			D	A	D		B
Approach Delay		38.6			20.0			31.8				35.6
Approach LOS		D			B			C				D
Queue Length 50th (m)		38.9		41.2	70.0			26.4	0.0	40.5		13.9
Queue Length 95th (m)		#71.8		63.1	108.1			#52.3	13.0	#81.3		27.1
Internal Link Dist (m)		125.6			109.7			267.6				123.7
Turn Bay Length (m)				70.0					30.0	60.0		
Base Capacity (vph)		383		629	917			279	411	390		613
Starvation Cap Reductn		0		0	0			0	0	0		0
Spillback Cap Reductn		0		0	0			0	0	0		0
Storage Cap Reductn		0		0	0			0	0	0		0
Reduced v/c Ratio		0.70		0.72	0.70			0.65	0.32	0.86		0.25

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 76.1
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 27.5
 Intersection LOS: C
 Intersection Capacity Utilization 96.9%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Highlands Blvd/Westside Dr & Walsh Dr



APPENDIX D

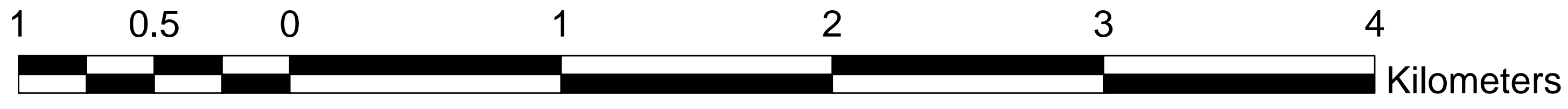
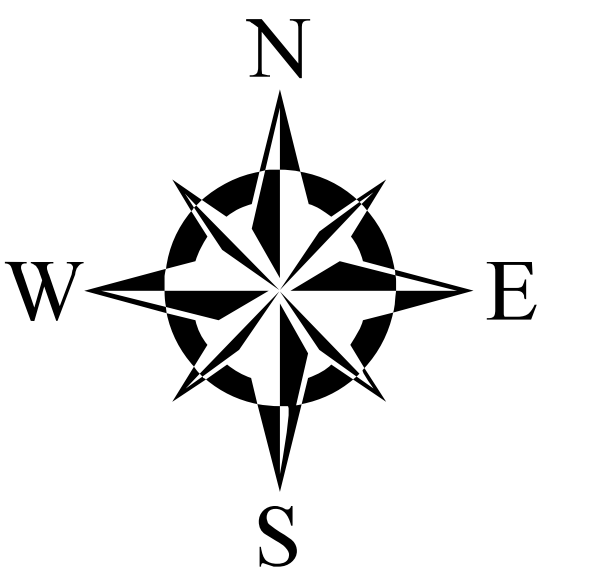
ROAD CLASSIFICATION MAP



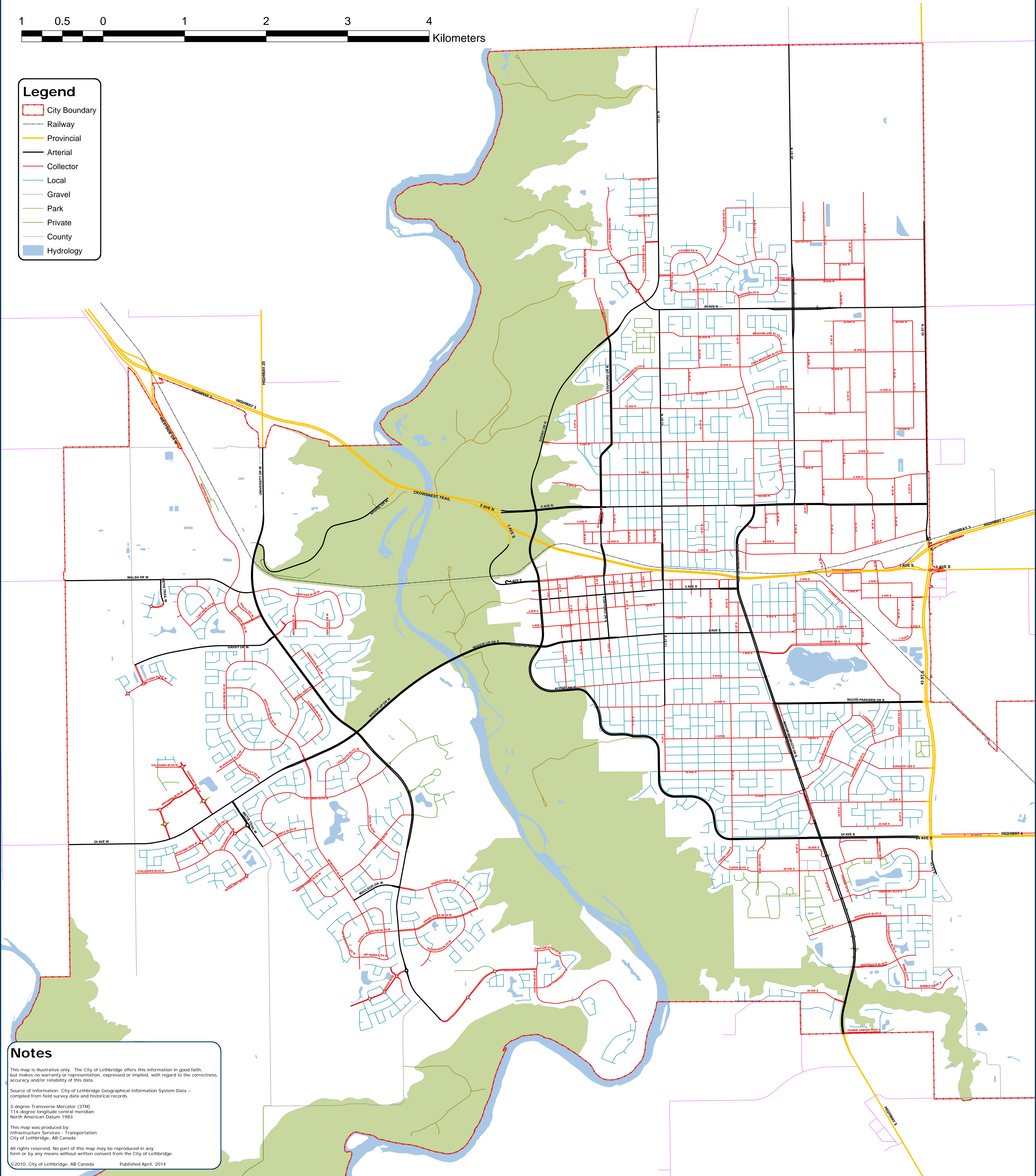


CITY OF Lethbridge

Road Classifications



- Legend**
- City Boundary
 - Railway
 - Provincial
 - Arterial
 - Collector
 - Local
 - Gravel
 - Park
 - Private
 - County
 - Hydrology



Notes

This map is illustrative only. The City of Lethbridge offers this information in good faith, but makes no warranty or representation, expressed or implied, with regard to the correctness, accuracy and/or reliability of this data.

Source of Information: City of Lethbridge Geographical Information System Data – compiled from field survey data and historical records.

3-degree Transverse Mercator (3TM)
114-degree longitude central meridian
North American Datum 1983

This map was produced by:
Infrastructure Services - Transportation
City of Lethbridge, AB Canada

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APPENDIX E

ROAD CLASSIFICATION DESIGN STANDARD





6.3 ARTERIAL

6.3.1 ARTERIAL

Design

TRAFFIC VOLUME (vehicles per day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING (Property Lines)
Over 15,000	2 to 6	45.0 m to 75.0 m	400 m
FUNCTION			
<ul style="list-style-type: none"> To allow movement between sections and subdivisions within the City of Lethbridge Arterial roadways are generally laid out on 1.6 km intervals along the boundaries of neighbourhoods To function as part of the Truck Route system 			
CONDITIONS			
<ul style="list-style-type: none"> Intersections may be grade separated when warranted An ultimate arterial is a divided roadway with full access control Arterials may intersect with Arterial, Super Collector or Community Entrance roadways Right in right out access to adjacent property will be considered by the Transportation Business Unit pending completion of a Traffic Impact Assessment by the applicant No direct vehicular access is allowed to adjacent residential property Intersection spacing on an Arterial shall be no closer than 400 m property line to property line unless agreed to in writing by the Transportation Business Unit. The minimum acceptable distance between the termination of an interchange ramp and the centreline of the first intersection is 400 m Where intersections are at grade, channelization may be required to control turning movements All transit stops shall be accommodated in pull outs WB-20 design vehicle with 1.0 m buffer for all arterial access points to commercial land uses 			
FEATURES		NOTES	
Posted Speed (kph)	50 to 80	<ol style="list-style-type: none"> Basic right of way requirement is 45.0 m. An additional 15.0 m shall be added to each side adjacent to residential development Design and construction shall be undertaken by the City of Lethbridge when necessary and as funding becomes available ROW shall be purchased from the developer by the City at the time of subdivision at the current market rate for raw land Developers adjacent to Arterial roadways shall make provision for storm water management for the Arterial road adjacent to their development 	
Parking	No		
Sidewalk	Regional pathway on one side or, if warranted, both sides		
Traffic Signals	As Warranted		



Pedestrian Crossing	At Grade Ramps required	5. Subdivision design shall aim for back of lot grades to be 600mm above the shoulder curb elevation of the arterial road 6. All intersections shall be as near as possible to 90 degrees 7. Modification of the Arterial roadway standard will be considered by the Transportation Business Unit on a case-by-case basis 8. Arterial roadway construction may be staged to meet traffic volume requirements 9. Play grounds shall be placed a sufficient distance from an arterial roadway to eliminate the need for a playground zone 10. Manholes shall not be placed in pathways	
Bikeway	Regional Pathway		
Transit Route	Yes		
Truck Route	Yes		
Sound Attenuation	15 m in ROW adjacent to residential areas		
Pavement Markings	Yes	Reference Drawings	SLA_06

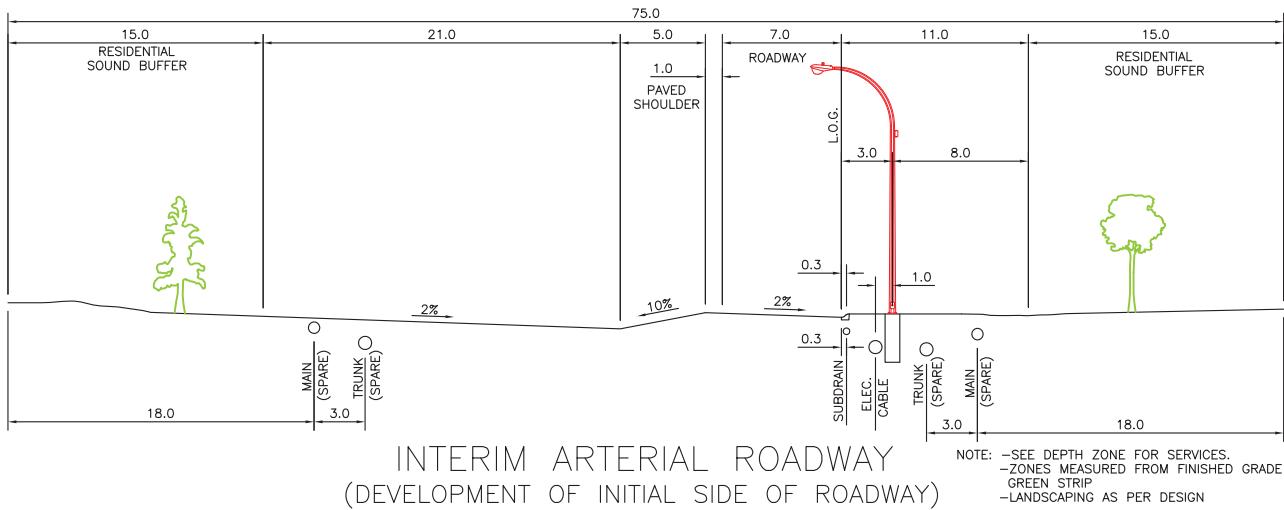
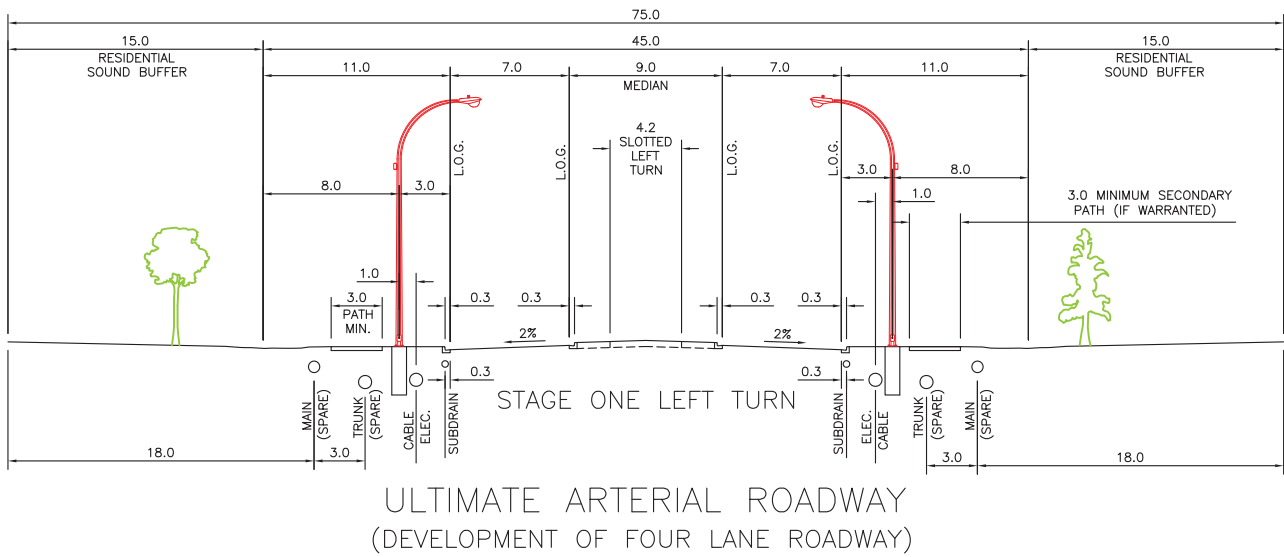
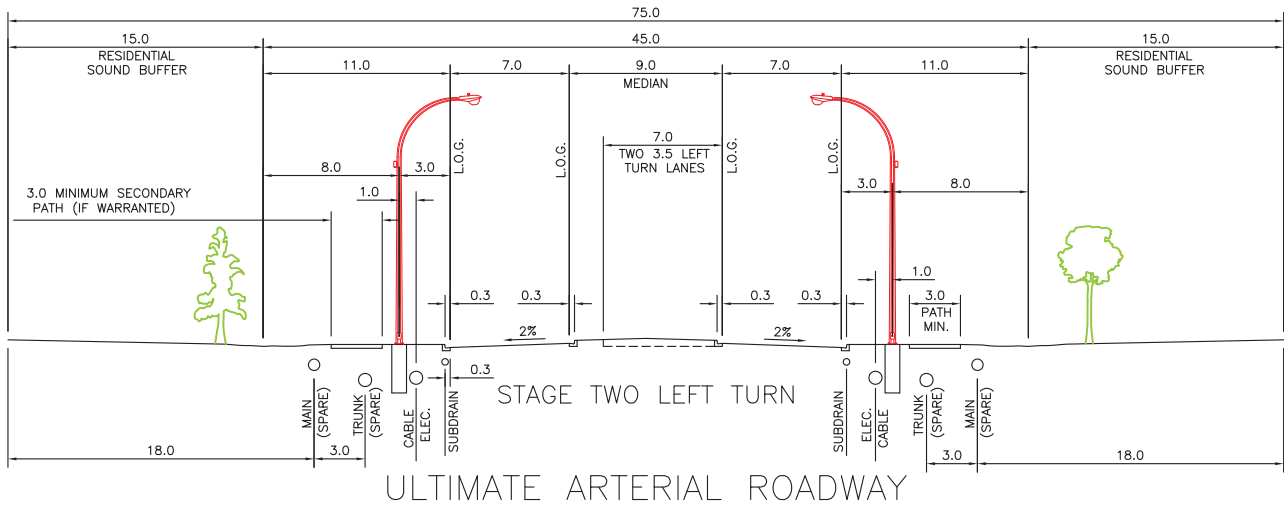
6.3.2 ARTERIAL

Geometric

CLASSIFICATION	DESIGN SPEED	DESIGN VEHICLE
Urban Arterial Divided (UAD 60)	60-90 kph	WB-20 (1.0 m buffer with a minimum of 0.3 m each side of vehicle)
Urban Arterial Divided (UAD 70)		
Urban Arterial Divided (UAD 80)		
Urban Arterial Divided (UAD 90)		
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance		Minimum Radius of Curvature
(As per current TAC GDGCR)		(As per current TAC GDGCR)
Median Left Turn Bay		
All arterial intersections to allow: <ul style="list-style-type: none"> • Stage 1 – single slotted left turn bays with opposing left turns capable of operating simultaneously • Stage 2 – dual parallel left turn bays with opposing left turns capable of operating simultaneously • Left turn bay storage lengths as per 6.12.1 Intersection Design • (As per current TAC GDGCR) 		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		



<ul style="list-style-type: none">• Max 6%, Min 0.6%	
Grade at Intersections	
<ul style="list-style-type: none">• (As per current TAC GDGCR)	
Vertical Curves & Super Elevation	
<ul style="list-style-type: none">• Vertical curve lengths in meters should not be less than speed in kilometers per hour• Use 0.04 or 0.06 superelevation tables	
PAVEMENT STRUCTURE	REFERENCE DRAWINGS
STR 18a	City of Lethbridge Engineering Standards;



DATE	REVISION	BY
11/06	BUFFERED UTILITIES	R.J.K.
01/13	PATHWAYS ADDED	R.J.K.
02/16	TREES ADDED	R.J.K.
FILE:	TRAN_6.3.dwg	



CITY OF
Lethbridge

INFRASTRUCTURE SERVICES

75m ARTERIAL ROAD

DRAWN:	R.J.K.
DESIGN:	R.J.K.
CHECKED:	R.A.B.
APPROVED:	D.L.J.
SCALE:	N.T.S.
DATE:	10/05/1999
DWG NO:	TRAN_6.3



6.6 MAJOR COLLECTOR

6.6.1 MAJOR COLLECTOR

Design

TRAFFIC VOLUME (vehicles per day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING (Property Lines)
2,000 to 8,000	2	25.0 m	120 m
FUNCTION			
<ul style="list-style-type: none"> To collect and distribute traffic within residential communities To provide access to the adjacent residential lots within the subdivision To serve secondary traffic generators such as neighbourhood commercial centres, recreational facilities, schools and traffic from neighbourhood to neighbourhood within the community To serve as a transit route 			
CONDITIONS			
<ul style="list-style-type: none"> Direct access shall be permitted to abutting residential and commercial properties Major Collectors shall intersect with Local roadways, Minor Collectors, other Major Collectors, Community Entrance Roads or Super Collectors Lane intersections with Major Collector roadways are not preferred. (All efforts should be taken to eliminate the intersection) Adequate emergency services access shall be provided to all abutting properties Lane connections to Major Collector roadways will be treated as driveways until the lane generates more than 250 vehicles per day. (No less than 30m from the nearest intersection measured from property line to property line) Intersection spacing on Major Collector roadways shall not be less than 120 m property line to property line unless agreed to in writing by the Transportation Business Unit 			
FEATURES		NOTES	
Posted Speed (kph)	50	<ol style="list-style-type: none"> Undivided roadway All intersections shall be as near as possible to 90 degrees Intersection control by yield signs, stop signs, or a roundabout as warranted Parking permitted on both sides of roadway, but may be restricted on higher volume sections by the Transportation Business Unit on a case by case basis Major Collector roadways shall not end in a cul-de-sac 	
Parking	Yes (see Note 4)		
Sidewalk	Separate sidewalk, curb and gutter on both sides		
Traffic Signals	As Warranted		



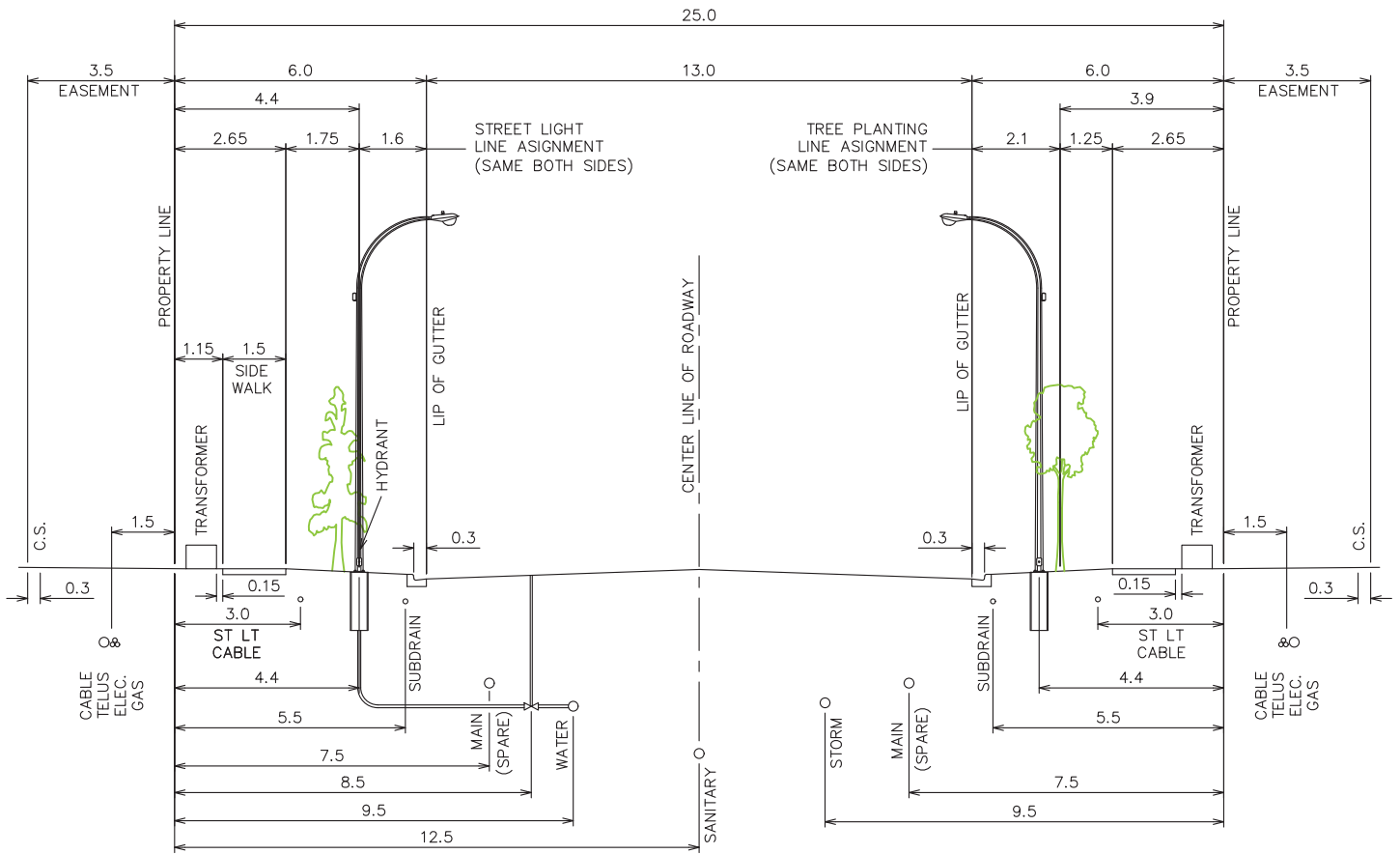
Pedestrian Crossing	At Grade Ramps required	6. Major Collector roadways shall be configured in loops and/or intersect with other Collector or Arterial roadways at a minimum of two locations	
Bikeway	TBD	7. All Major Collector roadways shall have yellow centerline pavement markings.	
Transit Route	Yes	8. No front residential driveway access on Major Collectors with projected volumes exceeding 7000 vehicles per day	
Truck Route	No	9. Major Collector roadways shall be configured to discourage transient traffic through residential neighbourhoods	
Sound Attenuation	No	10. Modification of the Major Collector standard shall be considered by the Transportation Business Unit on a case-by-case basis	
		11. Playground and School zones shall be minimized on Major Collector roadways	
		12. Traffic calming shall be considered on Major Collectors with potential for transient traffic	
Pavement Markings	Yes	Reference Drawings	SLA_05



6.6.2 MAJOR COLLECTOR

Geometric

CLASSIFICATION	DESIGN SPEED	DESIGN VEHICLE
Urban Collector Undivided (UCU 50) Urban Collector Undivided (UCU 60)	50 - 60 kph	Residential - WB-17 Commercial - WB-20 (1.0 m buffer with a minimum of 0.3 m each side of vehicle)
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
(As per current TAC GDGCR)	(As per current TAC GDGCR)	
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
<ul style="list-style-type: none"> Max 6%, Min 0.6% 		
Grade at Intersections		
<ul style="list-style-type: none"> (As per current TAC GDGCR) 		
Vertical Curves & Super Elevation		
<ul style="list-style-type: none"> Vertical curve lengths in meters should not be less than speed in kilometers per hour Use 0.04 or 0.06 superelevation tables 		
PAVEMENT STRUCTURE	REFERENCE DRAWINGS	
STR 18a	City of Lethbridge Engineering Standards;	



NOTE: -SEE DEPTH ZONES OF SERVICES. HYDRANT, TRANSFORMERS AND STREET LIGHTS ARE CENTERED ON LOT LINE EXTENSIONS

-WIRE FOR ELECTRIC/TELUSS/SHAW AND GAS CABLE 1.5m BACK FROM PROPERTY LINE

-TRANSFORMERS & PEDESTALS 0.15m BACK OF SIDEWALK

-SHALLOW UTILITY EASEMENT 3.5m 4 PARTY TRENCHING (RESIDENTIAL)

DATE	REVISION	BY
01/01	REVISED	A.D.
01/04	REVISED	W.G.C.
02/04	REVISED	W.G.C.
11/06	UPDATE	R.J.K.
11/07	UPDATE	R.J.K.
03/14	UTIL. SPACING	R.J.K.
04/16	1.5m SIDEWALK	R.J.K.
FILE:	TRAN_6.6b.dwg	



CITY OF
Lethbridge

INFRASTRUCTURE SERVICES

25m MAJOR COLLECTOR

DRAWN:	R.J.K.
DESIGN:	R.J.K.
CHECKED:	R.A.B.
APPROVED:	D.L.J.
SCALE:	N.T.S.
DATE:	30/01/1997
DWG NO:	TRAN_6.6b



6.7 MINOR COLLECTOR

6.7.1 MINOR COLLECTOR

Design

TRAFFIC VOLUME (vehicles per day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING (Property Lines)
up to 4000	2	21 or 23 m	60 m
FUNCTION			
<ul style="list-style-type: none"> To collect and distribute traffic within residential communities To provide access to the adjacent residential lots within the subdivision To serve secondary traffic generators such as recreational facilities and schools To serve as a transit route 			
CONDITIONS			
<ul style="list-style-type: none"> Direct access shall be permitted to abutting residential properties, schools and recreational facilities Minor Collectors shall intersect with Lanes, Local roadways, other Minor Collectors, Major Collectors, Community Entrance Roads or Super Collectors Adequate emergency services access shall be provided to all abutting properties Intersection spacing on Minor Collector roadways shall not be less than 60 m unless agreed to in writing by the Transportation Business Unit Lane connections to Minor Collector roadways will be treated as driveways until the lane generates more than 250 vehicles per day. (No less than 30 m from the nearest intersection measured from property line to property line) 			
FEATURES		NOTES	
Posted Speed (kph)	50	<ol style="list-style-type: none"> Undivided roadway All intersections shall be as near as possible to 90 degrees Intersection control by yield signs or stop signs as warranted Parking permitted on both sides of roadway, but may be restricted under special circumstances Minor Collector roadways shall not end in a cul-de-sac Minor Collector roadways shall be configured in loops and/or intersect with other Collector roadways at a minimum of two locations Minor Collector roadways shall be configured to discourage transient traffic through residential neighbourhoods Modification of the Minor Collector standard shall be considered by the Transportation Business Unit on a case-by-case basis 	
Parking	Yes (Both Sides)		
Sidewalk	Combined or separate sidewalk, curb and gutter on both sides		
Traffic Signals	As Warranted		
Pedestrian Crossing	At Grade Ramps required		
Bikeway	TBD		

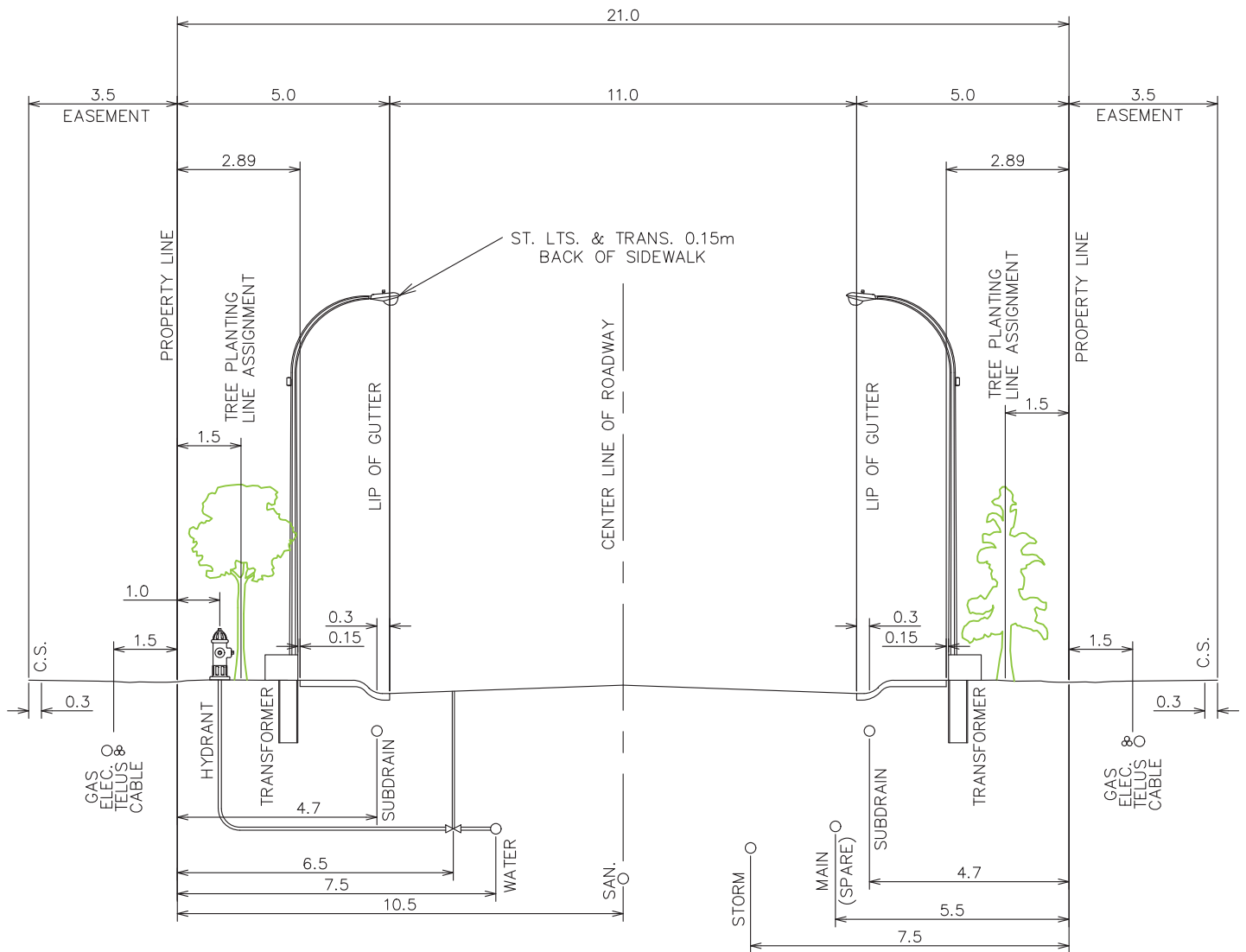


Transit Route	Yes	9. Use of a Minor Collector requires written approval of the Transportation Business Unit 10. Traffic calming shall be considered on Minor Collectors with potential for transient traffic	
Truck Route	No		
Sound Attenuation	No		
Pavement Markings	No	Reference Drawings	SLA_04

6.7.2 MINOR COLLECTOR

Geometric

CLASSIFICATION	DESIGN SPEED	DESIGN VEHICLE
Urban Collector Undivided (UAU 50)	50 kph	WB-17 (1.0 m buffer with a minimum of 0.3 m each side of vehicle)
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
(As per current TAC GDGCR)	(As per current TAC GDGCR)	
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
<ul style="list-style-type: none"> Max 6%, Min 0.6% 		
Grade at Intersections		
<ul style="list-style-type: none"> (As per current TAC GDGCR) 		
Vertical Curves & Super Elevation		
<ul style="list-style-type: none"> Vertical curve lengths in meters should not be less than speed in kilometers per hour Use 0.04 or 0.06 superelevation tables 		
PAVEMENT STRUCTURE	REFERENCE DRAWINGS	
STR 18a	City of Lethbridge Engineering Standards;	



NOTE: -SEE DEPTH ZONES OF SERVICES. HYDRANT, TRANSFORMERS AND STREET LIGHTS ARE CENTERED ON LOT LINE EXTENSIONS

-TRANSFORMERS & PEDESTALS 0.15m BACK OF SIDEWALK,

-WIRE FOR ELECTRIC/TELUS/SHAW AND GAS CABLE 1.50m BACK FROM PROPERTY LINE

-SHALLOW UTILITY EASEMENT 3.5m 4 PARTY TRENCHING (RESIDENTIAL)

DATE	REVISION	BY
01/00	REVISED	K.A.
01/01	REVISED	A.D.
01/05	REVISED	W.G.C.
11/06	UPDATE	R.J.K.
01/11	R.O.W. WIDTH	R.J.K.
03/14	UTIL. SPACING	R.J.K.
04/16	1.5m SIDEWALK	R.J.K.
FILE:	TRAN_6.7.dwg	

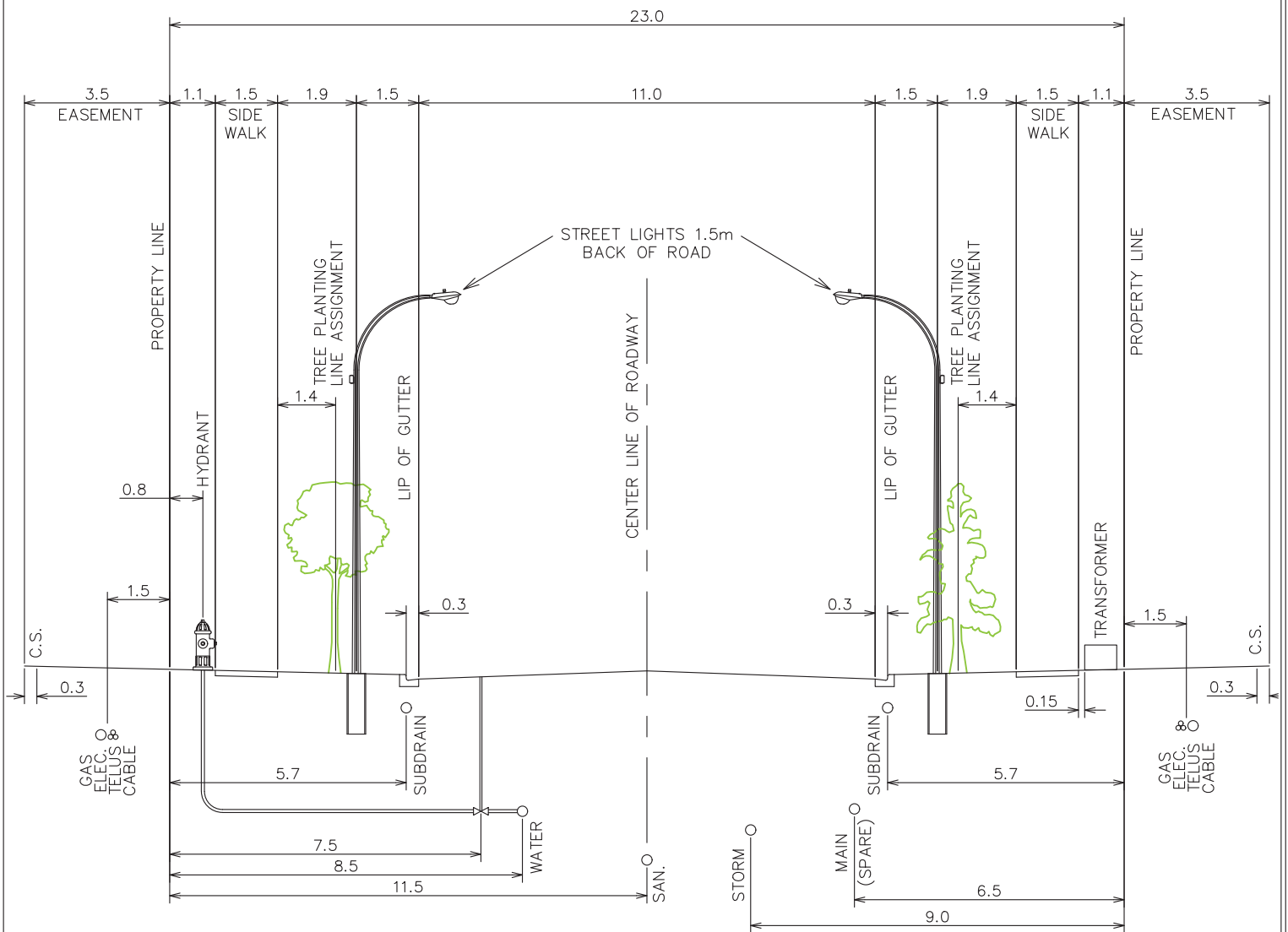


CITY OF
Lethbridge

INFRASTRUCTURE SERVICES

21m R.O.W. MINOR COLLECTOR
(MONO SIDEWALK WITH TREES)

DRAWN:	R.J.K.
DESIGN:	R.J.K.
CHECKED:	R.A.B.
APPROVED:	D.L.J.
SCALE:	N.T.S.
DATE:	30/01/1997
DWG NO:	TRAN_6.7



NOTE: -SEE DEPTH ZONES OF SERVICES. HYDRANT, TRANSFORMERS AND STREET LIGHTS ARE CENTERED ON LOT LINE EXTENSIONS

-WIRE FOR ELECTRIC/TELUS/SHAW AND GAS CABLE 1.50m BACK FROM PROPERTY LINE

-SHALLOW UTILITY EASEMENT 3.5m 4 PARTY TRENCHING (RESIDENTIAL)

DATE	REVISION	BY
04/16	1.5m SIDEWALK	BY



CITY OF
Lethbridge

INFRASTRUCTURE SERVICES

23m R.O.W. MINOR COLLECTOR
SEPARATE SIDEWALK WITH TREES

DRAWN:	R.J.K.
DESIGN:	R.J.K.
CHECKED:	R.A.B.
APPROVED:	D.L.J.
SCALE:	N.T.S.
DATE:	14/02/2011
DWG NO:	TRAN_6.7a

FILE: TRAN_6.7a.dwg

APPENDIX F

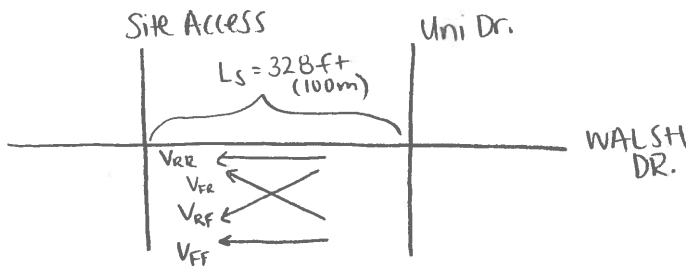
WEAVING ANALYSIS



HCM 2010 - Weaving Analysis

2028 Post Development

WB lane configuration (Post-Dev)
 1 channelized right turn lane
 1 through lane



$$LCRF = 1, LCFR = 1$$

STEP 1: Determine Volumes

$$V_{RF} = (35\% \times 30\% \times 218) + 686 = 709 \text{ pc/hr}$$

(TRIP GEN) (BG)

$$V_{FR} = (35\% \times 70\% \times 218) + (5\% \times 70\% \times 218) + (91 \times 9\%) + (91 \times 14\%) = 82 \text{ pc/hr}$$

(TRIP GEN) (PASS-BY)

$$V_{RR} = (35\% \times 70\% \times 218) + (77\% \times 91) = 123 \text{ pc/hr}$$

(TRIP GEN) (PASS-BY)

$$V_{FF} = 78.1 + 122 + (35 \times 30\% \times 218) + (5\% \times 30\% \times 218) = 226 \text{ pc/hr}$$

(BG) (TRIP GEN)

STEP 2: Adjust Volumes

$f_p = 1.00$ for regular commuters

$$v_i = \frac{V_i}{PHF \times f_{HV} \times f_p}$$

$$f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)}$$

$$PHF = 0.88 \text{ (Leithbridge TIA guidelines)} \quad f_{HV} = \frac{1}{1 + 0.02(1.5 - 1) + 0.02(1.2 - 1)} = 0.99$$

$$\begin{aligned} v_{RF} &= 814 \text{ pc/hr} \\ v_{FR} &= 94 \text{ pc/hr} \\ v_{RR} &= 141 \text{ pc/hr} \\ v_{FF} &= 259 \text{ pc/hr} \end{aligned}$$

$$v_W = v_{RF} + v_{FR} = 908 \text{ pc/hr}$$

$$v_{NW} = v_{RR} + v_{FF} = 400 \text{ pc/hr}$$

$$v = v_W + v_{NW} = 1308 \text{ pc/hr}$$

$$VR = v_W / v = 0.69$$

STEP 3: Determine min. lane changes

$$LC_{RF} = 1, \quad LC_{FR} = 1$$

$$LC_{min} = (LC_{RF} \times v_{RF}) + (LC_{FR} \times v_{FR}) = 908 \text{ lc/hr}$$

STEP 4: Determine max weaving length

$$L_{max} = [5,728(1+VR)^{1.6}] - [1,566 N_{WL}]$$

↗ $N_{WL} = 2 \text{ lanes}$

$$= [5,728(1+0.69)^{1.6}] - [1,566(2)]$$

$$L_{max} = 10,130 \text{ ft.}$$

$$L_s = 328 \text{ ft}$$

$L_s < L_{max} \therefore$ continue to step 5.

STEP 5: Weaving segment capacity

* use lower of capacity calculated b/w methods ① and ②

$$\textcircled{1} C_{IW} = \frac{2400}{VR} = \frac{2400}{0.69} = 3,478 \text{ pc/hr}$$

$$C_W = C_{IW} \times f_{HV} \times f_p = (3478)(0.99)(1) = 3,443 \text{ pc/hr}$$

$$\textcircled{2} C_{IWL} = C_{IFL} - [438.2(1+VR)^{1.6}] + [0.0765 L_s] + [119.8 N_{WL}]$$

$$= 1,750 - [438.2(1+0.69)^{1.6}] - [0.0765(328)] + [119.8(2)]$$

$$C_{IWL} = 1,000 \text{ pc/hr/ln}$$

$$C_W = C_{IWL} N f_{HV} f_p = (1,000)(2)(0.99)(1) = \boxed{1,980 \text{ pc/hr}}$$

$$v/c = \frac{v f_{HV} f_p}{C_W} = \frac{(1308 \text{ pc/hr})(0.99)(1)}{(1980 \text{ pc/hr})} = \boxed{0.65}$$

↓
method ② yields smaller capacity

STEP 6: lane change rates

$$LCW = LC_{min} + 0.39 [(L_s - 300)^{0.5} N^2 (1 + ID)^{0.8}]$$

ID = interchange density = 1 (to be conservative)

$$= 908 + 0.39 [(328 - 300)^{0.5} N^2 (2)^2 (1 + 1)^{0.8}]$$

$$\boxed{LCW = 922 \text{ lc/hr}}$$

$$I_{NW} = \frac{L_s \times ID \times v_{NW}}{10,000} = \frac{328 \times 1 \times 400}{10,000} = 13.12$$

$$I_{NW} < 1,300 \quad \therefore L_{NW} = LC_{NW1} \text{ (from HCM2010 methodology)}$$

$$LC_{NW} = (0.206 v_{NW}) + (0.542 L_s) - (192.6 N) = -125.02$$

$$\therefore \boxed{LC_{NW} = \emptyset}$$

extraneous value

$$LC_{all} = LCW + LC_{NW} = \boxed{922 \text{ lc/hr}}$$

STEP 7: Determining average speed

$$S_W = S_{min} + \left(\frac{S_{max} - S_{min}}{1 + W} \right)$$

$$S_{min} = 15 \text{ mph (HCM2010 req.)}$$

$$S_{max} = 31 \text{ mph (50 km/hr zone)}$$

$$W = 0.226 \left(\frac{LC_{all}}{L_s} \right)^{0.789} = 0.51$$

$$S_W = 15 + \left(\frac{31 - 15}{1 + 0.51} \right) = 25.6 \text{ mph}$$

$$S_{NW} = FFS - (0.0072 LC_{min}) - \left(0.0048 \frac{v}{N} \right)$$

$$S_{NW} = 31 \text{ mph} - (0.0072 \times 908) - \left(0.0048 \times \left(\frac{1308}{2} \right) \right) = 21.3 \text{ mph}$$

$$S_{avg} = \frac{v_W + v_{NW}}{\left(\frac{v_W}{S_W} \right) + \left(\frac{v_{NW}}{S_{NW}} \right)} = \frac{1308}{\left(\frac{908}{25.6} \right) + \left(\frac{400}{21.3} \right)} = 24.1 \text{ mph}$$

STEP 8: Determine LOS

$$D = \frac{(v/N)}{S_{avg}} = \frac{(1308/2)}{24.1 \text{ mph}} = 27.14$$

→ Compare to exhibit 12-10 for C-D roadways

↓
 $\boxed{\text{LOS C}}$

APPENDIX



PROPOSED ASP
CHANGES

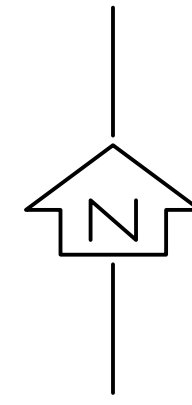
SUMMARY OF ASP AMENDMENTS

Page #	Details of Amendment
3	Updated 592.5 ha (1,464 ac) to reflect removal of 2.72 hectares (6.72 acres) = 590.0 ha (1,457 ac)
3	Changed 36 to 35 land owners as we have removed one land owner from the ASP area
23	Table 1.0 – City of Lethbridge to Update Retail Commercial to read 90.28 ha (lower) and 183.52 ha (upper) assuming the commercial site falls within the retail commercial land use category.
29	The removal of the parcel from sub-area 1 will reduce the total area to 362.3
86	Table 2 Updated WS catchment area from 270 to 267.28 = 267, total updated from 593 to 590
87	Table 3 – Stormwater Management Facilities -- updated area to read 267 ha. Total volume has been updated to 723 m ³ /ha
90	Table 4 updated to reflect sub area 1 sewer shed as 220.5-2.72 = 218.0 Total updated to 349
All Maps	All maps within the ASP must be updated to remove the parcel area from the Area Structure Plan Area.

APPENDIX

A large, stylized white letter 'D' is positioned on the left side of the page, partially overlapping the text. The 'D' is composed of a white outline and a light blue fill.

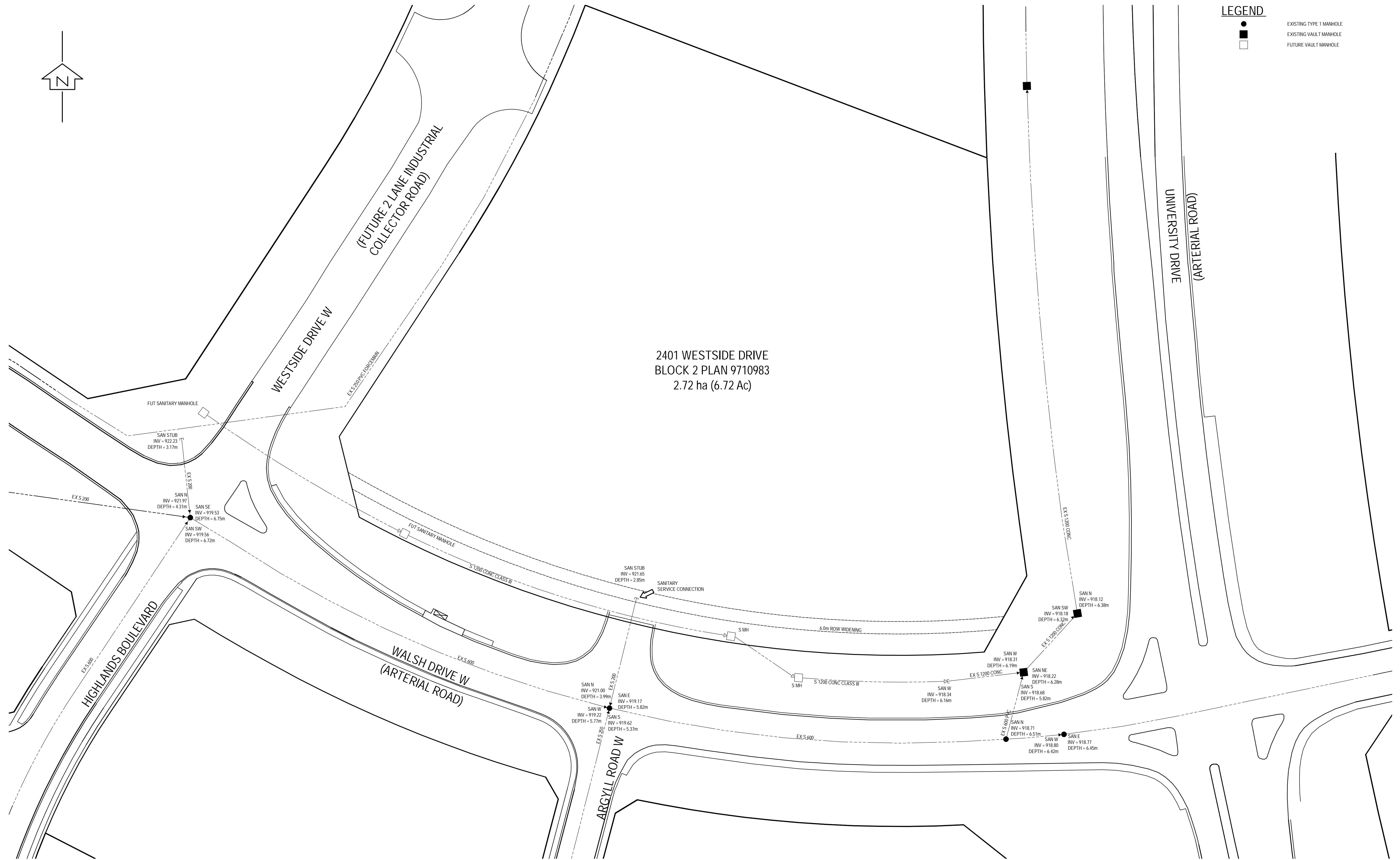
SERVICING
FIGURES



LEGEND

- EXISTING TYPE 1 MANHOLE
- EXISTING VAULT MANHOLE
- FUTURE VAULT MANHOLE

2401 WESTSIDE DRIVE
BLOCK 2 PLAN 9710983
2.72 ha (6.72 Ac)



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COPYRIGHT:

ISS/REV	DATE	DESCRIPTION	DES	CHK	PM

SEAL:

CLIENT:

NEW WAY GROUP

CLIENT REF NO:

PROJECT:

WEST SIDE DRIVE COMMERCIAL

PROJECT NO:
171-15591-00

ORIGINAL SCALE:
1:500

DESIGNED BY:

DISCIPLINE:
CIVIL

3509 6th AVENUE NORTH
LETHBRIDGE, ALBERTA T1J 5C1
TEL: 403-327-7746 | FAX: 403-380-2825 | WWW.WSPGROUP.COM

TITLE:

2401 WEST SIDE DRIVE
SANITARY SEWER

DRAWING NO:
F01

SHEET NO:
OF

ISSUE:

ISSREV:

DATE:

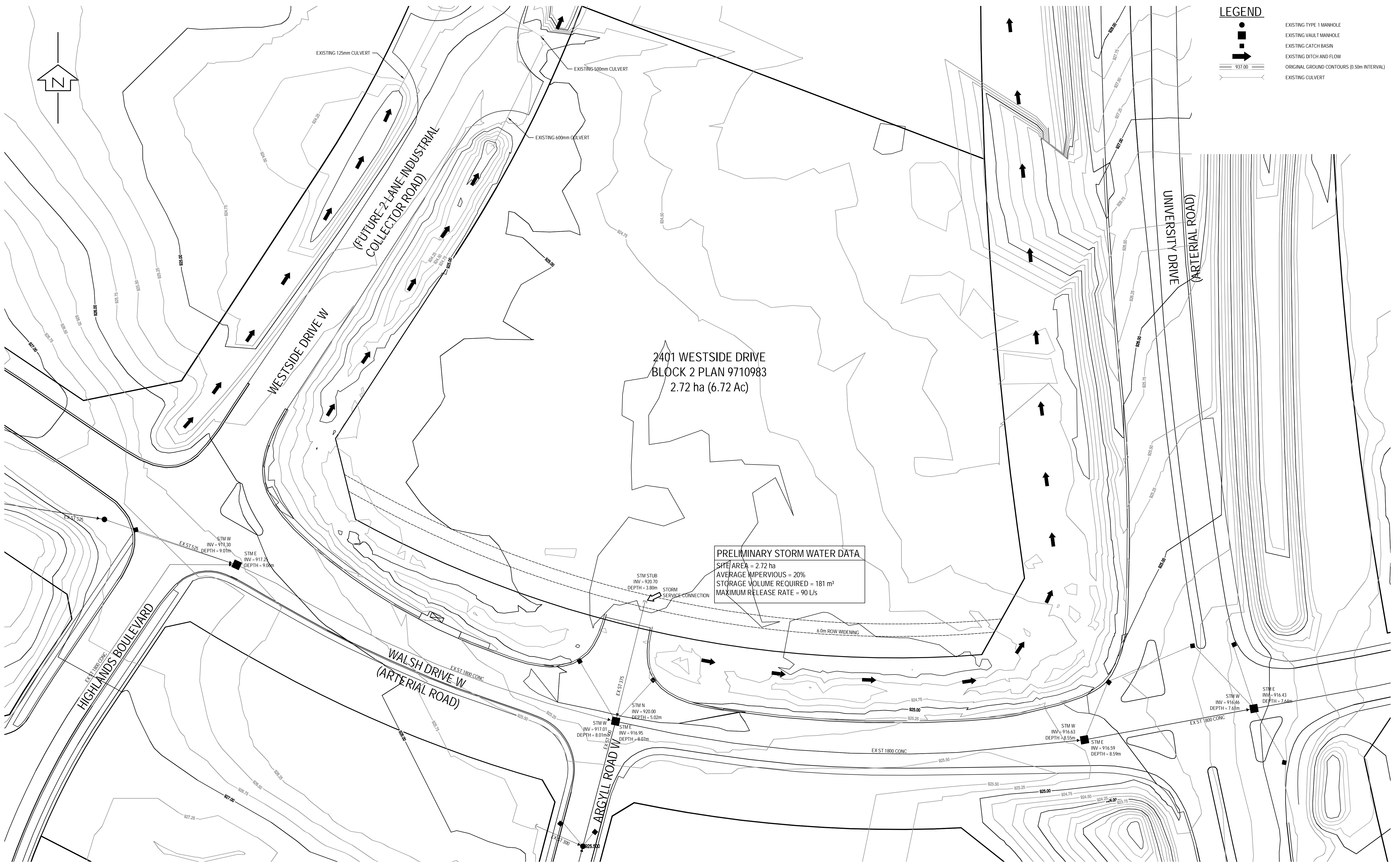
DATE:

DRAWN BY:

DISCIPLINE:

ISSUE:

ISSREV:



LEGEND

- EXISTING TYPE 1 MANHOLE
- EXISTING VAULT MANHOLE
- EXISTING CATCH BASIN
- EXISTING DITCH AND FLOW
- ORIGINAL GROUND CONTOURS (0.50m INTERVAL)
- EXISTING CULVERT

2401 WESTSIDE DRIVE
BLOCK 2 PLAN 9710983
2.72 ha (6.72 Ac)

PRELIMINARY STORM WATER DATA
 SITE AREA = 2.72 ha
 AVERAGE IMPERVIOUS = 20%
 STORAGE VOLUME REQUIRED = 181 m³
 MAXIMUM RELEASE RATE = 90 L/S

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3509 6th AVENUE NORTH
LETHBRIDGE, ALBERTA T1J 5C1
TEL: 403-327-7746 | FAX: 403-380-2825 | WWW.WSPGROUP.COM

PROJECT: WEST SIDE DRIVE COMMERCIAL

PROJECT NO: 171-15591-00

ORIGINAL SCALE: 1:500

DESIGNED BY: _____ DATE: _____

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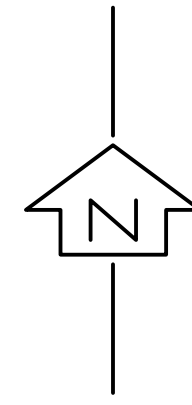
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DRAWING NO: F02 OF

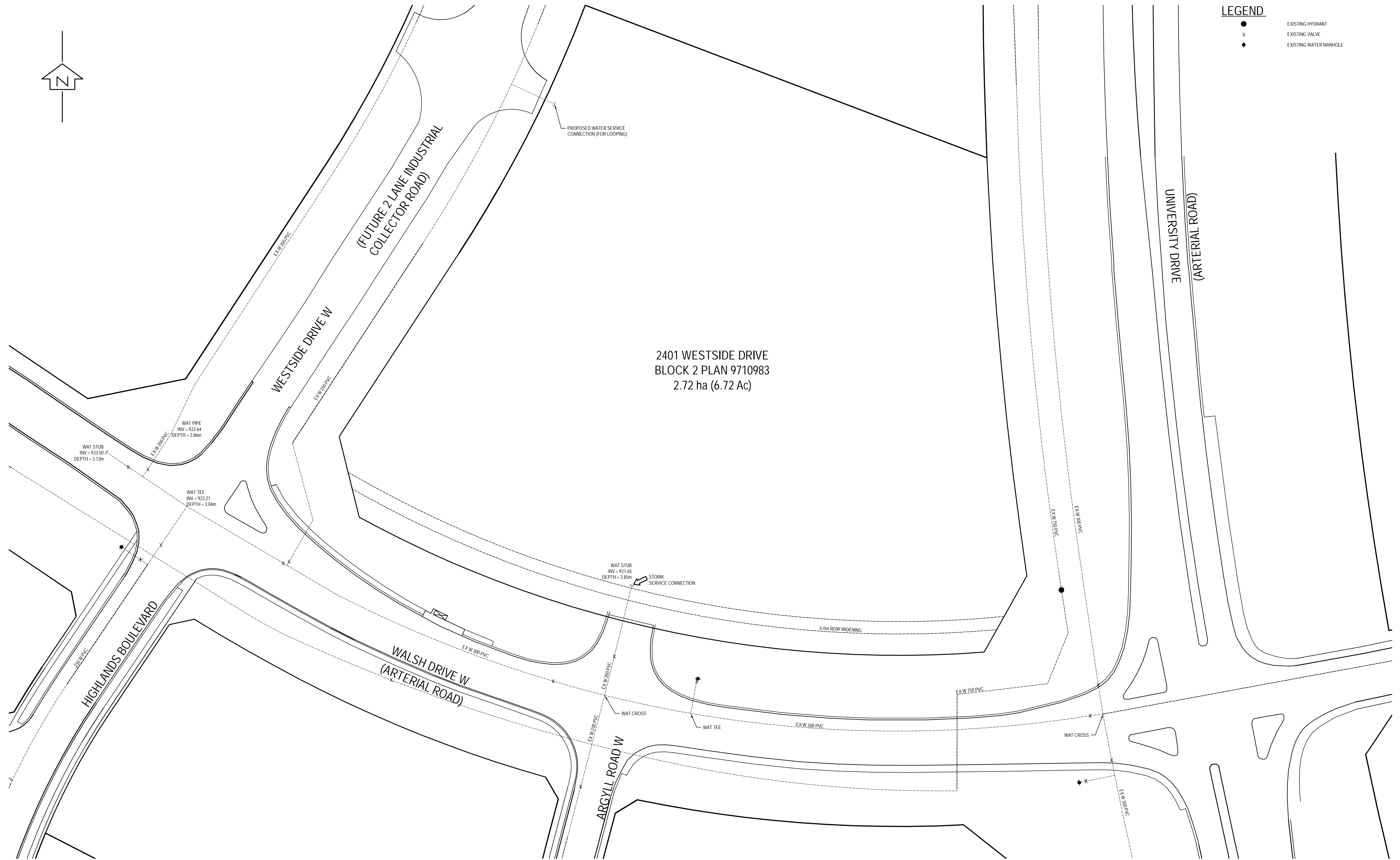
SHEET NO: _____

ISSUE: _____

ISS/REV: _____



- LEGEND**
- EXISTING HYDRANT
 - x EXISTING VALVE
 - EXISTING WATER MANHOLE



2401 WESTSIDE DRIVE
BLOCK 2 PLAN 9710983
2.72 ha (6.72 Ac)

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PROJECT NO:
171-15591-00

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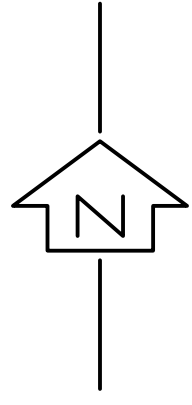
TITLE:
2401 WEST SIDE DRIVE WATER MAINS

DRAWING NO:
F03

SHEET NO:
OF

ISSUE:
DATE

ISSREV:
DATE



LEGEND

FO	EXISTING FIBRE OPTIC
UG	EXISTING UNDERGROUND POWER
S	EXISTING SHAW
T	EXISTING TELLUS
GAS	EXISTING GAS MAIN
BL	EXISTING BELL
□	EXISTING SHALLOW UTILITY VAULT
●	EXISTING SHALLOW UTILITY TUB



2401 WESTSIDE DRIVE
BLOCK 2 PLAN 9710983
2.72 ha (6.72 Ac)

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ISS/REV	DATE	DESCRIPTION	DES	CHK	PM
0					

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PROJECT:
WEST SIDE DRIVE COMMERCIAL

PROJECT NO:
171-15591-00

ORIGINAL SCALE:
1:500

DESIGNED BY:

DISCIPLINE:
CIVIL

TITLE:
**2401 WEST SIDE DRIVE
EXISTING SHALLOW UTILITY**

DRAWING NO:
F04

SHEET NO:
OF

ISSUE:
DATE

ISSREV:
DATE