Lethbridge Land

wsp

WATERMARK

COMMUNITY OUTLINE PLAN – TECHNICAL ELEMENTS

WATERMARK COMMUNITY OUTLINE PLAN APPENDICIES

May 2023

Opportunity Lethbridge
5th Floor, City Hall

910 4th Avenue South
Lethbridge, AB T1J 0P6

APPENDICES

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APPENDIX A: LAND OWNERSHIP

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0022 111 843	4;22;8;14;NW	751 130 428 D

LEGAL DESCRIPTION
MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH WEST
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 64.7 HECTARES (160 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
751 130 428	19/11/1975		$160,000	

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT 20 FT. STRIP BY INSTRUMENT 761071193, 04 06 1976"

TOTAL INSTRUMENTS: 001

(CONTINUED)

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2015 AT 09:31 A.M.

ORDER NUMBER: 28478760

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 844 712	4;22;8;14;NE	111 153 619 +3

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70
SUBDIVISION	0911396	0.280	0.69
ROAD	1010289	1.57	3.88
SUBDIVISION	1010942	4.13	10.21
SUBDIVISION	1012954	4.912	12.1
ROAD	1013789	4.569	11.3
SUBDIVISION	1112039	3.048	7.53

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 101 303 743 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION

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111 153 619 20/06/2011 SUBDIVISION PLAN

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS

NO REGISTRATIONS

TOTAL INSTRUMENTS: 000

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2015 AT 09:31 A.M.

ORDER NUMBER: 28478760

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 878 066	4;22;8;23;SW	111 186 538 +1

LEGAL DESCRIPTION

THE SOUTH WEST QUARTER OF SECTION TWENTY THREE (23)
TOWNSHIP EIGHT (8)
RANGE TWENTY TWO (22)
WEST OF THE FOURTH MERIDIAN
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	7.99	19.74
SUBDIVISION	7911317	5.26	12.99
SUBDIVISION	8910881	0.702	1.74
SUBDIVISION	1012889	0.182	0.45
ROAD	1112320	0.164	0.41

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 101 218 536 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
111 186 538	22/07/2011	ROAD PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
891 124 106	30/06/1989	CAVEAT

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS

RE : DEFERRED RESERVE
CAVEATOR - THE CITY OF LETHBRIDGE.
CITY HALL
910 4 AVENUE SOUTH
LETHBRIDGE
ALBERTA

TOTAL INSTRUMENTS: 001

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2015 AT 09:31 A.M.

ORDER NUMBER: 28478760

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0035 575 341	4;22;8;23;NW	131 029 851 +1

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER NORTH WEST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES	MORE OR LESS
SUBDIVISION	7710684		52.32	
REPLOTTING SCHEME	7710705		0.06	
REPLOTTING SCHEME	7710882		71.57	
REPLOTTTNG SCHEME	7810431		9.01	
SUBDIVISION	0814827	0.101	0.25	
ROAD	1112320	3.477	8.59	
SUBDIVISION	1310320	1.341	3.31	

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 111 186 538

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
131 029 851	01/02/2013	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 003 252	10/01/1974	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
771 055 709	04/05/1977	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2015 AT 09:31 A.M.

ORDER NUMBER: 28478760

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

APPENDIX B: POLICY AND LEGISLATIVE REVIEW

WATERMARK COMMUNITY OUTLINE PLAN
POLICY & LEGISLATIVE REVIEW

Lethbridge Land
2nd Floor, City Hall

910 4th Avenue South
Lethbridge, AB T1J 0P6

WATERMARK COMMUNITY OUTLINE PLAN

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1. INTRODUCTION

The City of Lethbridge has decided to undertake the preparation of the Watermark Community Outline Plan Update. The community of Watermark is located in west Lethbridge and is approximately 140.8 hectares in size. The site is bounded by 25th Street West (the future extension of Metis Trail) along its west side, the residential communities of Sunridge and Mountain Heights along its east side, and the future extension of Chinook Trail along its south side. The residential community of Copperwood is located northwest of the site, and the residential community of Varsity Village is located northeast of the site, see **Figure 1**.

Currently, the entire area is compromised of undeveloped agricultural lands. It is intended for the Watermark Community Outline Plan Update to support additional residential growth within west Lethbridge.

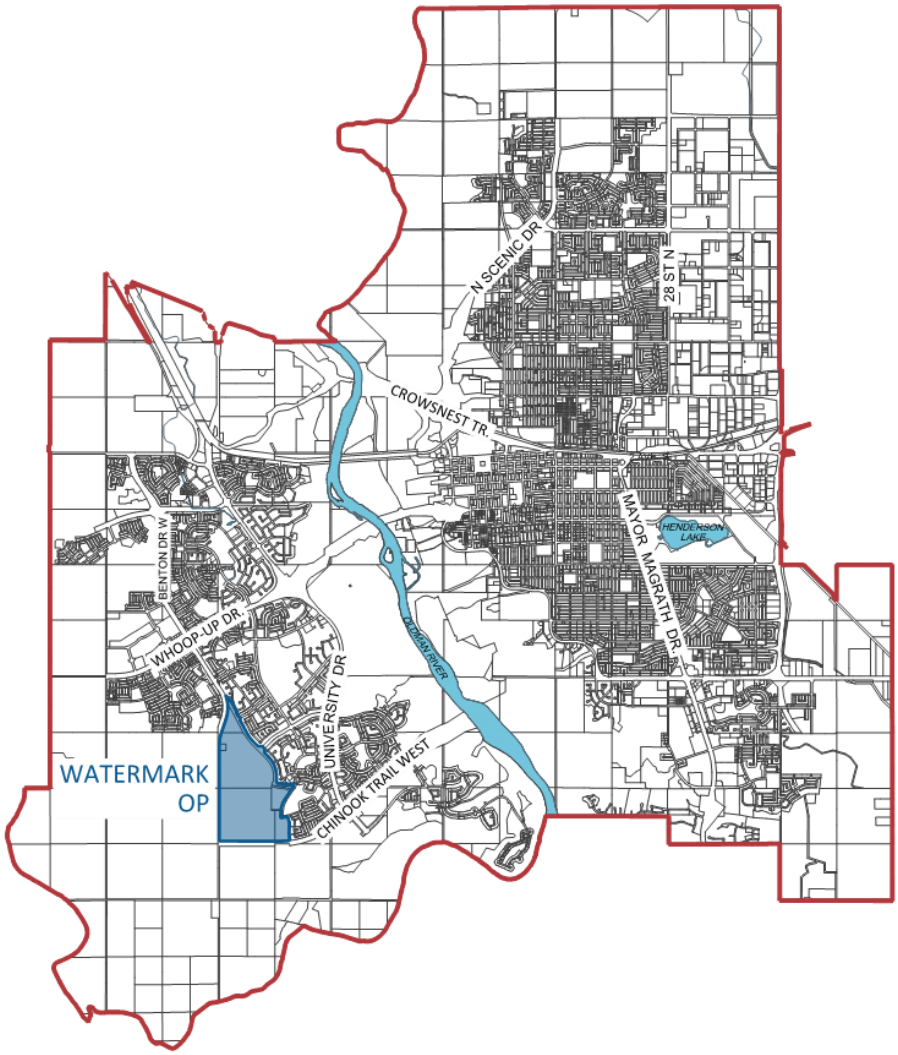

Figure 1 – Watermark Outline Plan Site

This Outline Plan will be written in consistency with the Waterbridge Area Structure Plan (2014), which was written in consistency with the City of Lethbridge's Integrated Community Sustainability Plan | Municipal Development Plan, as well as the variety of the City's other Master Plan documents.

The following review provides a description of the various plans prepared to date that support the preparation of the Watermark Community Outline Plan update (the Plan). This review outlines the connection between these plans prior to drafting the Plan in order to ensure that it will remain consistent with planning policy as well as the City's long-term planning priorities.

2. POLICY REVIEW

2.1 MUNICIPAL GOVERNMENT ACT

Planning policies and procedures are governed by the Municipal Government Act (MGA) which dictates the authority of each municipality to develop plans, issue permits and states what information is to be included in each type of approval. In particular, Part 17, Planning and Development, of the MGA outlines a variety of components for land use at the municipal level, including the establishment of planning authorities, statutory planning documents, general land use provisions, development levies, subdivision of land, the use of reserve land, and appeal processes.

A key component of the MGA is the establishment of statutory plans that a municipality may adopt to direct land use opportunities within its boundaries. Statutory plans include Intermunicipal Development Plans, Municipal Development Plans, Area Structure Plans, and Area Redevelopment Plans, and are all considered and adopted by by-law through a formal public hearing process of a municipal council.

Section 633 of the MGA sets the requirements and content for the development of Area Structure Plans. The *Waterbridge Area Structure Plan*, which guides the development of the Watermark Outline Plan, follows the prescriptive structure of the MGA.

The MGA does not set the requirements for drafting Outline Plans; however, Outline Plans must be consistent with what is dictated in their superior Area Structure Plan.

2.2 SOUTH SASKATCHEWAN REGIONAL PLAN

The purpose of the South Saskatchewan Regional Plan (SSRP) is to set the stage for robust growth, vibrant communities, and a healthy environment within the region over the next 50 years. The SSRP identifies strategic directions for the region to the year 2024.

The Plan applies to the South Saskatchewan Region of southern Alberta, as illustrated in the **Figure 2**.

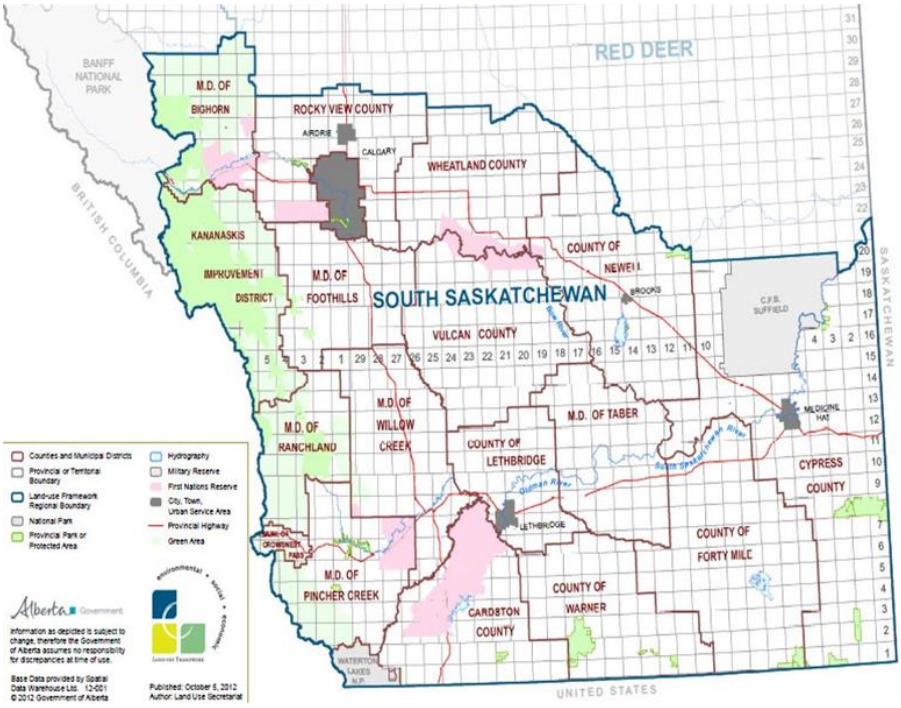

Figure 2 – South Saskatchewan Region

Certain portions of the SSRP are used to guide and inform land-use planning, while other portions are legally binding for the Provincial government, local governments, and other decision makers.

Part 5 of the SSRP is its Implementation Plan which establishes the objectives and the strategies that will be implemented to achieve the vision and outcomes for the region.

- Strategic Direction: Promoting efficient use of land
    - Objective: the *amount of land that is required for development of the built environment is minimized over time.*
        - Policy 5.1.4 Plan, design and locate new development in a manner that best utilizes existing infrastructure and minimizes the need for new or expanded infrastructure.
        - Policy 5.1.6 Provide decision-makers, land users and individuals the information they need to make decisions and choices that support efficient land use.
            - *Applicability to Plan – the Plan will be designed in a way to promote the efficient use of land when designing the road, neighbourhood and servicing layouts.*
- Strategic Direction: Providing recreation and nature-based tourism opportunities and preserving and promoting the region's unique cultural and natural heritage
    - Objective: A wider range of recreation experiences and tourism opportunities that meet the preferences of regional, residents and visitors will be provided.

- Policy 6.6 Develop comprehensive and integrated recreation management plans for lands in the Green Area working with communities, industry, other stakeholders and Aboriginal peoples
- Policy 6.8 In concert with developers, ensure that land-based development activities are assessed to identify and protect historic resources
    - *Applicability to Plan – A review of the City's Parks, Cycling and Recreation Master Plans will be completed in order to ensure the Plan incorporates their principles and future plans.*

- Strategic Direction: inclusion of aboriginal peoples in land-use planning
    - Objective: To encourage Aboriginal peoples' participation in land-use planning and input to decision-making in recognition of the cultural and economic importance of land use to those Aboriginal communities with constitutionally protected rights. This will provide both Aboriginal communities and the Government of Alberta with a basis for better addressing current and potential land-use conflicts, in a manner supportive of Aboriginal transitional uses, such as the exercise of treaty rights.
        - Policy 7.1 In accordance with applicable government policy as it may be from time to time, the Government of Alberta will continue to consult with Aboriginal peoples in a meaningful way when government decisions may adversely affect the continued exercise of their connotationally protected rights and the input from such consultations continues to be considered prior to the decision
            - *Applicability to Plan – the project team will include First Nations consultation in the Plan's engagement strategy, and ensure that the information collected from these groups will be considered and implemented into the Plan components where appropriate.*

- Strategic Direction: strengthening communities
    - Objective: Cooperation and coordination are fostered among all land-use planners and decision-makers involved in preparing and implementing land plans and strategies
        - Policy 8.2 Address common planning issues, especially where valued natural features and historic resources are of interests to more than one stakeholder and where the possible effect of development transcends jurisdictional boundaries
        - Policy 8.8 Coordinate land-use planning activities with First Nations, irrigation districts, school boards, health authorities and other agencies on areas of mutual interest
            - *Applicability to Plan – the Plan will include a robust engagement strategy to ensure that the proper technical experts, stakeholder groups, and the community are all engaged when developing the Plan.*

2.3 LETHBRIDGE INTEGRATED GROWTH MANAGEMENT STRATEGY (2013)

The Lethbridge Integrated Growth Management Strategy (IGMS) articulates a detailed spatial logic for land use planning, environmental and resources protection, and investments in public infrastructure. The primary goal of the

IGMS is to identity how the vision-based outcomes of existing planning policy manifest from current development patterns into future development opportunities and patterns over the next 100 years. As such, the IGMS identifies for local jurisdictions a preferred sequence and suitable locations to undertake planning of urban development and infrastructure in a manner that will lay a strong foundation for growth for the next 100 years.

The Watermark Outline Plan area is included within the IGMS Phase 1 Land Use and Planning Cells Map (Map 18) – see **Figure 3**. Phase 1, which illustrates growth from 2012 to 2032, indicates the first phase of the Growth Scenario that focuses on accommodating demand within areas already planned whenever practical. Specifically, this map illustrates conceptual planning cells that are recommended as priorities for planning within the next 20 years.

The IGMS also notes that the City's growth is primarily allocated to areas in West Lethbridge, where existing ASPs currently exist; the Waterbridge ASP is considered within this statement.

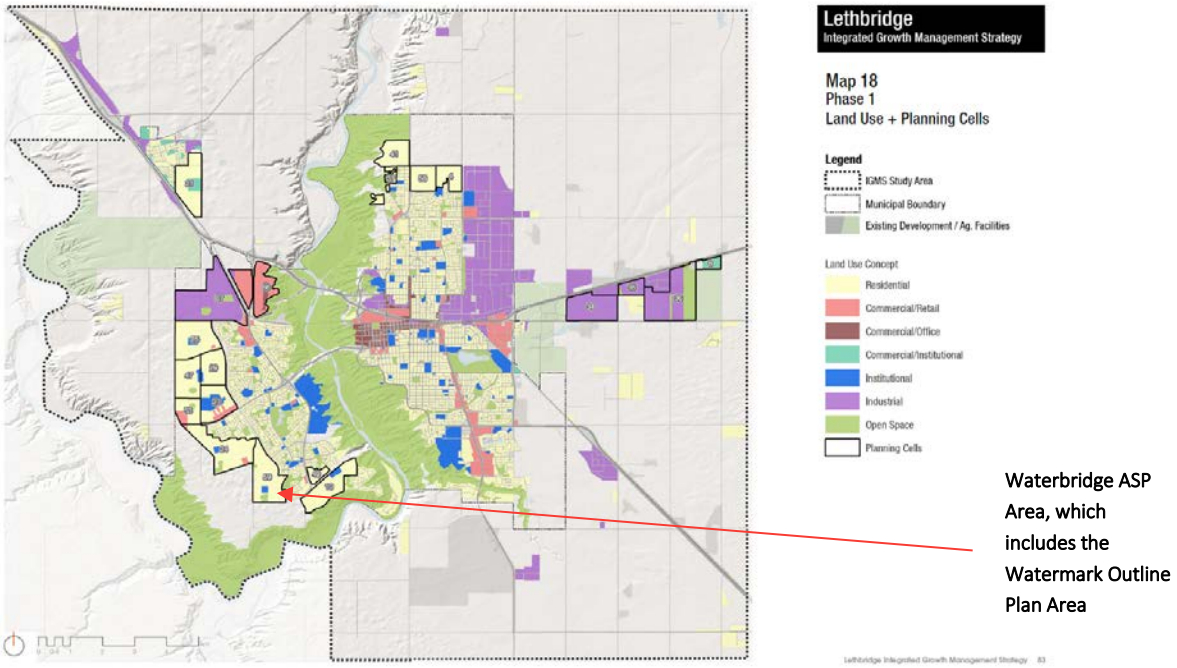

Figure 3- Map 18 Phase 1 Land Use & Planning Cells, Lethbridge Integrated Growth Management Strategy

2.4 CITY OF LETHBRIDGE INTEGRATED COMMUNITY SUSTAINABILITY PLAN | MUNICIPAL DEVELOPMENT PLAN (2010)

The Integrated Community Sustainability Plan / Municipal Development Plan (ICSP / MDP) was developed to provide Council and the community with a framework that will guide future development within Lethbridge over the next 40 years. Specifically, the ICSP / MDP was created to:

- Encourage and promote long-term sustainability into the year 2050 through the adoption of policies that safeguard the sustainable integrity of the community;

- Guide future policy regarding land use, transportation and infrastructure investment decisions within the community in a way that respects the Plan Your City Vision section of the ICSP / MDP;
- Define a clear description of the City's preferred direction with respect to infrastructure, service provision, and future development, and;
- Coordinate municipal bylaws, policies, programs, and investments.

The ICSP / MDP contains a number of goals / policies / objectives that will specifically impact the development of the Watermark Outline Plan, as follows:

- Section 4, 4.4: Accommodating Growth:
    - *"As Lethbridge's population increases and new units are developed to house these residents, it is important to explore where future growth will occur in the City. It is anticipated that a portion of future growth will occur in existing areas of Lethbridge while at the same time new development will expand into currently undeveloped municipal areas….. Several factors will influence future residential development: first and foremost is the type of housing that an increasingly aging population will demand (generally higher density, smaller units). As well, a general shift towards smaller families will influence the demand for different types of housing units in the future."*
- *Section 6, 6.2, Plan Your City Policies: A Healthy and Diverse City*
    - *6.2.1 Lethbridge has a Range of Housing that Meets Everyone's Needs:*
        - *3) Encourage and facilitate the adequate supple of housing for all income groups.*
        - *4) Develop accessible housing units in areas where ancillary neighbourhood facilities are currently available (e.g. schools, parks, transit routes, groceries) or will be developed in the future.*
    - *6.2.4 Lethbridge is a Safe City:*
        - *2) Encourage urban design that promotes public safety and reduces opportunities for crime in parks, roadways and other public spaces.*
        - *3) Encourage public safety and the reduction in opportunities for crime by:*
            - *Implementing CPTED principles.*
- *Section 6, 6.3, Plan Your City Policies: A Culturally Vibrant City*
    - *6.3.3 Lethbridge Supports Active Living:*
        - *1) Provide opportunities for passive recreation such as walking, biking, hiking, and gardening.*
- *Section 6, 6.4, Plan Your City Policies: A Well-Designed City*
    - *6.4.1 Lethbridge is a Compact City:*
        - *1) Increase residential densities in future neighbourhoods in relation to existing built-up areas.*
    - *6.4.2 Lethbridge has an Efficient and Effective Integrated Transportation Network:*
        - *1) Transportation priorities for community planning purposes are:*
            - *i. Pedestrians and personal mobility devices;*
            - *ii. Cyclists and recreational mobility devices;*
            - *iii. Public & private transit;*
            - *iv. Commercial vehicles;*
            - *v. Multiple occupancy automobiles;*
            - *vi. Single occupancy automobiles.*
        - *2) Integrate transit with community planning and design.*
        - *3) Provide accessible, affordable and effective public transportation.*
        - *4) Develop an integrated multimodal transportation system.*

- *6.4.3 Lethbridge is a Walkable, Bicycle Friendly City:*
  - *3) Design new neighbourhoods, and retrofit existing neighbourhoods, to improve pedestrian and cyclist access to destinations within and outside of neighbourhoods.*
- *6.4.4 Lethbridge is Expanding in a Responsible Manner:*
  - *3) Require the completion of Area Structure Plans and Outline Plans prior to the development of new areas.*
- *6.4.5 Lethbridge is a Planned City that Exhibits Quality Urban Design:*
  - *6) Encourage and promote a diverse range of housing that is incorporated in all new neighbourhoods.*
  - *7) Encourage and promote mixed-use development in residential neighbourhoods.*
  - *10) Encourage and promote neighbourhood design in a manner that encourages interaction between all age groups;*
  - *11) Encourage and promote neighbourhood design and public spaces to mitigate the impact of climatic extremes (temperature, wind, drifting snow).*
- *6.4.6 Lethbridge has a Diverse Parks and Open Space System*
  - *1) Parks and open space priorities for community planning purposes are:*
    - *Connectivity*
    - *Accessibility*
    - *Functionality*
    - *Diversity & Adaptability*
    - *Identity & Character*
    - *Sustainability*
  - *2) Incorporate a range of active and passive recreational opportunities into the open space system.*

2.5 CITY OF LETHBRIDGE MUNICIPAL DEVELOPMENT PLAN BYLAW 6265 (ANTICIPATED ADOPTION 2021)

The City of Lethbridge Municipal Development Plan (Byla 6265) carries forward the vision statement and outcomes established in the existing Integrated Community Sustainability Plan/Municipal Development plan (2010), and includes more detailed adn measurable policy directions and a more robust framework for implementation and performance measurement. First reading was health Feburary 9th, with public hearing on March 29th. The MDP is under revision and is anticipated for adoption at by the end of 2021.

The Watermark Outline Plan is well aligned with the new MDP, manifesting the intention of many policies, and following the guidance for Outline Plans. Relevant policies are as follows:

Policy 42. ENSURE opportunities for healthy living in the city, by providing: • Opportunities for people to connect with nature through equitable access to parks. • Opportunities for passive recreation such as, but not limited to, walking, biking, hiking, and gardening. • Opportunities for organised and unstructured recreation and sports. • Opportunities for arts and culture programs, performances and displays.

61. PROMOTE options for ageing-in-place by encouraging the provision of small-scale seniors housing (defined as seniors housing of a density below 37 dwelling units per hectare) in all neighbourhoods, in locations: • within 100 m.

of an arterial road, and/or • within 750 m. of a range of land uses and services considered likely to meet most residents' daily needs.

64. ENSURE new neighbourhoods make efficient use of land, by: • Requiring all Outline Plans adopted after the adoption of this MDP to achieve a minimum average density of 27.5 dwelling units per net residential hectare (du/nrha) across the Plan Area • Disallowing amendments to Outline Plans which lower the net residential density across the Plan Area

68. ENSURE a choice of housing is integrated throughout the city in future Area Structure Plans, Outline Plans and Area Redevelopment Plans, by: • Requiring future Area Structure Plans, Outline Plans, and Area Redevelopment Plans to include a variety of residential land use districts to ensure various housing types can occur, such as: secondary suites, duplexes, multi-family housing, market housing, single room occupancy, shared housing with supports, and shared ownership arrangements. • Requiring any proposed higher density residential developments to be located with good access to services (e.g. commercial uses, schools, parks) and transportation links (including but not limited to transit).

69. ENSURE a choice of housing is integrated in future large residential developments on a single site, by requiring diversity in terms of dwelling unit sizes and numbers of bedrooms.

73. PROMOTE an active and easily accessed community by including opportunities for unstructured recreation in park and open space design.

82. ENSURE an integrated parks and open space system that responds to the needs of current and future generations by requiring parks and open space priorities for community planning purposes to be: • Connectivity • Accessibility • Functionality • Diversity and adaptability • Identity, character and culture • Sustainability

83. ENSURE opportunities for healthy living by incorporating a range of active and passive recreational opportunities into the open space system.

84. PROMOTE social interaction and cohesion by encouraging opportunities for community gathering in parks.

85. ENSURE potable water needs are minimised by requiring the open space system to be planned and designed to efficiently manage water.

90. ENSURE commercial land use opportunities are available throughout the city for a wide range of commercial uses (including, but not limited to, agricultural-related enterprises of different types and scales, and accommodations for sport, business and leisure travellers) by: • Preparing and maintaining a regular inventory and market analysis of commercial land • Creating flexible opportunities in suitable locations during the preparation of Area Structure Plans, Outline Plans, and Area Redevelopment Plans

93. ENSURE increased activity in commercial areas by: • Creating opportunities for residential land uses (including, but not limited to, mixed residential/commercial developments) in commercial areas • Incorporating public gathering spaces in commercial areas, including but not limited to: sidewalk patio space, parklets, squares and plazas, and temporary road closures for events

94. ENSURE commercial areas are accessible via active transportation, by: • Requiring new commercial developments to provide safe, barrier-free access for people walking, rolling or cycling • Reviewing regulations and relevant statutory plans to ensure they encourage (or require) new commercial buildings to provide building frontage on, and main building entrances directly from, the sidewalk

99. PROMOTE walkable neighbourhoods by encouraging: • A greater mix of appropriate land uses and infill development through policies in Area Redevelopment Plans • Growth areas to provide for a greater mix of land uses in Area Structure Plans and Outline Plans • Development of accessible housing units in areas where ancillary

neighbourhood facilities are currently available (e.g. schools, parks, transit routes, groceries) or will be developed in the future, through land use plan preparation or consideration of applications for a change of land use • Area Redevelopment Plans for areas with inadequate green space to identify how the supply can be increased and how this can be paid for • Street-fronting and neighbourhood-oriented commercial development in new or existing neighbourhoods with a grid or modified grid street layout, through supporting appropriate land use amendments and identifying appropriate locations in Area Redevelopment Plans and Outline Plans • Commercial development around higher density residential areas, in Area Redevelopment Plan and Area Structure Plan preparation, and Land Use Bylaw amendments

102. ENSURE reconciliation is an integral part of neighbourhood planning by requiring: • All new Area Structure Plans to conduct a Traditional Knowledge and Land Use Study (or similar) at the outset of the project • All new Area Redevelopment Plans with plan boundaries that include or border undeveloped top-of bank lands to conduct a Traditional Knowledge and Land Use Study (or similar) • All statutory plans (adopted after the adoption of this MDP) to include an acknowledgement of Blackfoot Traditional Territory • That all new Outline Plans under Area Structure Plans for which there was no Traditional Knowledge and Land Use Study (or similar), be encouraged to prepare such a study • That the Municipal Naming Committee engage with appropriate Indigenous partners to create an inventory of appropriate names

104. ENSURE Lethbridge is expanding in a responsible manner by: • Protecting agricultural land from premature subdivision and development to prevent fragmentation • Requiring the completion of Area Structure Plans and Outline Plans prior to the development of new areas • Requiring that development in new areas not already addressed in an existing Area Structure Plan or Outline Plan, is to occur only as financing and infrastructure is available • Requiring that development in unplanned or orphaned residential growth areas complete an Outline Plan to determine infrastructure requirements before rezoning and development is allowed to occur. • Committing to maintain the current city limits - except in the case of the Lethbridge Airport annexation - until the following criteria are considered by City Council to warrant further annexation: • there is no longer at least 25 years of predicted urban area expansion capacity for planned residential development within existing city limits, or • specific opportunities which may arise to annex lands for strategic infrastructure provision, or commercial, industrial or community benefit purposes

117. ENSURE commercial areas are designed to be pedestrian-friendly by implementing relevant actions from the Mobility/Accessibility Master Plan through Area Structure Plans, Outline Plans, Area Redevelopment Plans, the Land Use Bylaw and development approvals.

120. PROMOTE transportation that encourages physical activity and is more environmentally friendly, efficient and safe, by including multiple modes of transportation in future projects and plans.

127. ENSURE the implementation of a grid or modified grid street layout for new neighbourhoods by requiring their incorporation in Area Structure Plans and Outline Plans.

131. ENSURE that public transit is integrated with community planning and design by requiring it be addressed in all new Area Structure Plans, Area Redevelopment Plans, and Outline Plans.

133. ENSURE the improvement of pedestrian and cyclist access to destinations both within and outside of neighbourhoods, by incorporating appropriate infrastructure in planning for new and existing neighbourhoods.

134. SUPPORT barrier-free accessibility throughout the city by considering the application of Universal Design principles and backing the recommendations of the Mobility/Accessibility Master Plan.

137. ENSURE safe, reliable and efficient service delivery by: • Requiring the developer to pay for their proportionate share of the cost of infrastructure to facilitate their development. • Requiring the approximate location, size, and capacity of future infrastructure and infrastructure assets, including arterial roadways, electrical transmission lines and substations, major water lines and sanitary sewers and shallow utilities, be identified during the drafting of new or amended Area Structure Plans and Outline Plans.

138. PROMOTE efficient land use and efficient and coordinated service delivery by encouraging transportation and utility corridors as multi-use corridors to accommodate transportation, municipal utilities, electrical transmission lines, communications infrastructure, wildlife corridors, and/ or active transportation infrastructure, where appropriate.

144. PROMOTE improved water quality in wet pond stormwater management facilities by encouraging future facilities' design to further consider reuse potential and aesthetics (including elements such as water clarity, colour and odour prevention).

2.6 CITY OF LETHBRIDGE WATERBRIDGE AREA STRUCTURE PLAN (2014)

The Waterbridge Area Structure Plan (ASP) creates a structure to accommodate future new community growth in a defined area of West Lethbridge. It contains land use and development guidance for the general public, developers, landowners, Municipal Planning Commission members and City Council. The Waterbridge ASP links the City's ICSP / MSP to the Land Use Redesignation and Subdivision process, and articulates the range of land uses, residential densities, community facilities, open spaces, transportation networks, and municipal servicing, which are necessary for a new and complete community for the residents of Lethbridge.

The Watermark Outline Plan area is located within the Waterbridge Area Structure Plan boundary (see **Figure 4**).

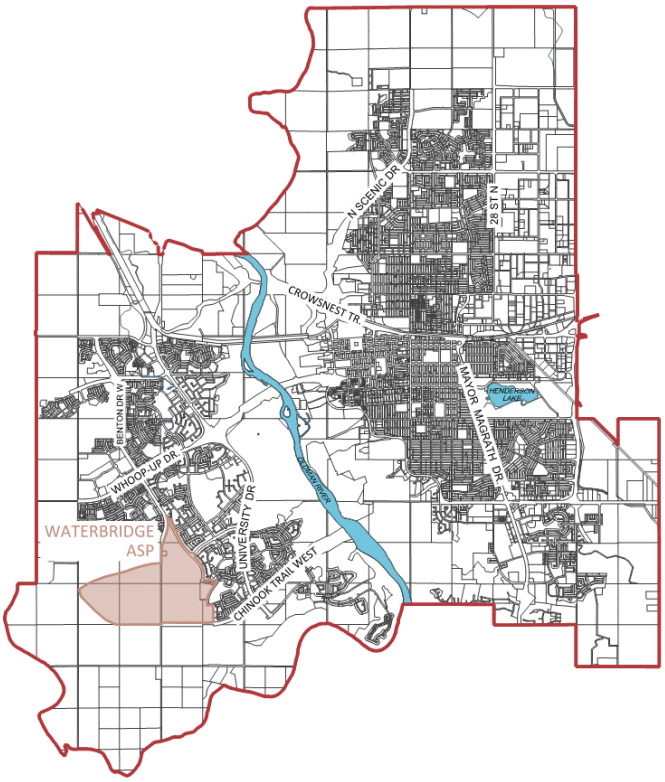

Figure 4 – Waterbridge Area Structure Plan Boundary

The Watermark Outline Plan must be written in consistency with the goals and policies set forth by the Waterbridge ASP.

The following is a list of the most relevant goals and policies of the ASP must be referenced when developing the Watermark Outline Plan:

- Section 2, Existing Conditions, 2.1 Physical Characteristics:
  - *2.1.1 At the At the Outline Plan stage of development existing gas wells and pipelines shall be incorporated into design for the new community.*
  - *2.1.3 At the Outline Plan stage of development additional biophysical and geotechnical work shall be performed to further assess the wetlands.*
- Section 2, Existing Conditions, 2.2 Physical Characteristics:
  - *2.2.1 Electrical sub-station 674S – Bowron shall be relocated out of the Waterbridge Plan area, and shall be located within the Chinook Trail utility corridor, to allow for electrical system improvements within West Lethbridge.*
  - *2.2.2 Electrical distribution service required within the plan area shall be located underground within transportation right-of-ways. During early stages of development, it may be necessary to build electrical distribution overhead on a temporary basis until final grades become known.*
- Section 4, Vision and Principles, 4.2 Plan Goals & Objectives:
  - *Goal 1: Provide for a variety of housing, neighbourhood amenities or services by incorporating a mix of land uses,including: residential, local commercial, recreational and institutional uses.*
  - *Goal 2: Make various transportation options convenient and efficient for residents, and encourage active transportation modes by enhancing the permeability and connectivity within the subdivision.*
  - *Goal 3: Provide a safe, convenient and diverse network of pathways and open spaces in the subdivision.*
  - *Goal 4: Incorporate natural environmental aspects of the stormwater management system into the open space plan.*
  - *Goal 5: Foster a sense of connectivity between subdivisions through the creation of spaces and places which promote social activities and interaction.*
- Section 5, Land Use Concept and Policies, 5.1 Land Use Concept & Residential Density:
  - *5.1.1 Secondary suite opportunities and their potential locations will be considered at the Outline Plan stage.*
- Section 5, Land Use Concept and Policies, 5.2 Residential:
  - *5.2.1 A variety of low and higher density residential forms shall be allowed in the Plan Area.*
  - *5.2.2 Locating higher density residential, commercial, institutional and /or recreational development will take into consideration transit stops according to Lethbridge Transit service levels.*
- Section 5, Land Use Concept and Policies, 5.4 Open Space System:
  - *5.4.1 The open space system shall include 10% dedication for Municipal Reserve and School Reserve lands within the Plan Area. This may include: pocket parks, neighbourhood parks, community core parks, school grounds, linear parks, and special use parks.*
  - *5.4.2 The open space system shall provide a range of active and passive recreational opportunities.*
  - *5.4.3 Park nodes shall be distributed throughout the subdivision to ensure accessibility for residents. Residents shall have the opportunity to be within walking distance to one or more park nodes.*
  - *5.4.6 Natural areas, bioretention and stormwater facilities are encouraged to be designed into the open space system to enhance the quality of stormwater while offering passive recreational and educational amenity.*
  - *5.4.7 Natural wetlands shall be incorporated into the stormwater management system. At the Outline Plan Stage, further work shall be undertaken to determine the classification of the wetlands.*

- *5.4.9 A combination of local pathways and sidewalks shall provide safe and comfortable access for pedestrians and cyclists to park nodes and neighbourhood nodes as well as connections out of the subdivision.*

- Section 5, Land Use Concept and Policies, 5.5 Schools:
  - *5.5.2 The school sites shall be bound by a collector road on at least one side.*
  - *5.5.3 Further details for each school site will be determined at the Outline Plan stage in conjunction with the appropriate school district.*
- Section 6, Transportation, 6.2 Internal Road Network:
  - *6.2.1 The internal road network shall connect to existing roads to the east.*
  - *6.2.2 The internal collector road network shall be designed as a modified grid pattern.*
- Section 6, Transportation, 6.5 Window Street:
  - *6.5.1 Macleod Drive, in the eastern portion of Waterbridge, will function as a window street. Details of the window street design will be determined at the Outline Plan Stage.*

2.7 CITY OF LETHBRIDGE LAND USE BY-LAW NO. 5700 (2011)

The City of Lethbridge Land Use By-law No. 5700 (LUB) regulates the use of land and buildings, classifies land use districts, determines the minimum standards for each of those districts, and determines the appropriate permitted and discretionary uses for each land use district.

The Watermark Outline Plan area is currently zoned as Future Urban Development (FUD). The purpose 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.

It is intended that the Outline Plan area will be re-zoned to be consistent with the Outline Plan, following its approval and adoption.

As per Lethbridge Land, the density target for the Outline Plan area is to be > 7.0 units per hectare (which *includes* public roadways, utility parcels and parks). The Outline Plan will include a number of different residential zones within the plan area; the LUB dictates density for residential zone density calculations as follows, which should be considered in the development of the Outline Plan, see **Table 1**.

Table 1 - City of Lethbridge Land Use By-law, Residential Zone Density Requirements

Residential Zone	**Density Requirement (*excludes public roadways, utility parcels and parks)***
R-CL Comprehensively Planned Low Density Residential	37 dwelling units / hectare
R-CM-20 Comprehensively Planned Medium Density Residential	20 dwelling units / hectare
R-CM Comprehensively Planned Medium Density Residential	37 dwelling units / hectare
R-L Low Density Residential	25 dwelling units / hectare

R-M Mixed Density Residential	No requirement included
R-MH Manufactured Home District	No requirement included
R-RL Restricted Low Density Residential	No requirement included
R-SL Small Parcel Low Density Residential	25 dwelling units / hectare
R-37 Medium Density Residential	26 dwelling units / hectare (minimum) 37 dwelling units / hectare (maximum)
R-50 Medium Density Residential	26 dwelling units / hectare (minimum) 50 dwelling units / hectare (maximum)
R-60 Medium Density Residential	26 dwelling units / hectare (minimum) 60 dwelling units / hectare (maximum)
R-75 Medium Density Residential	26 dwelling units / hectare (minimum) 75 dwelling units / hectare (maximum)
R-100 High Density Residential	76 dwelling units / hectare (minimum) 100 dwelling units / hectare (maximum)
R-150 High Density Residential	76 dwelling units / hectare (minimum) 150 dwelling units / hectare (maximum)
R-200 High Density Residential	76 dwelling units / hectare (minimum) 200 dwelling units / hectare (maximum)
R-LF Low Density Flexible Residential	To be set out in the Outline Plan

3. MASTER PLAN REVIEW

3.1 CITY OF LETHBRIDGE RECREATION AND CULTURE MASTER PLAN (2013)

The City of Lethbridge's Recreation and Culture Master Plan intent is to provide an accurate depiction of the present and future needs for recreation and culture facilities and services in the City of Lethbridge, and outline strategies as to how to meet identified needs for a ten-year period.

The Vision for the Plan is as follows:

> *The Recreation and Cultural Master Plan is a living document that guides the Recreation and Cultural Services Department's relationships with organizations that deliver recreation and cultural services in the city. It establishes the City's leadership role in directing the provision of those services and the management of the facilities in which they are housed. Finally, the Master Plan ensures that all city residents and visitors have access to affordable and high-quality opportunities, thereby encouraging them to pursue healthy, active and engaged lifestyles.*

The Plan identifies the existing and cultural facilities throughout the city of Lethbridge; a number of ball diamonds, a basketball court, and a sports field are located adjacent to the Watermark Outline Plan area (see **Figure 5**).

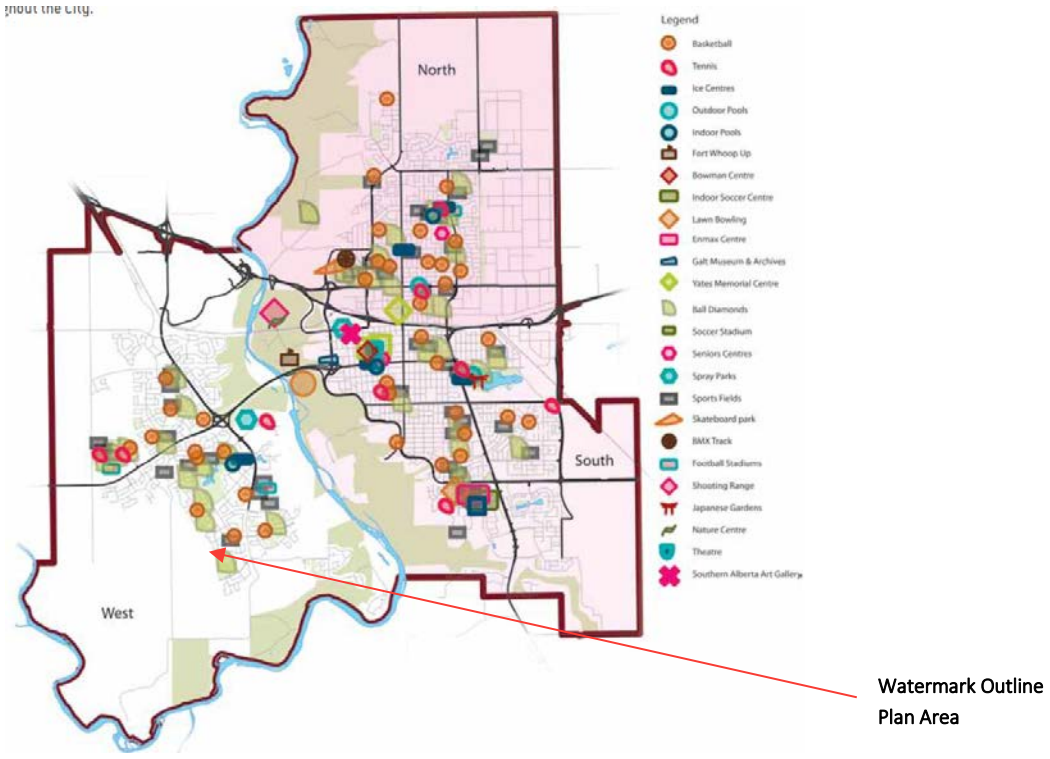

Figure 5 - Recreation and Culture Master Plan, Location of Existing Facilities

The Plan includes a *Recreation and Culture Infrastructure Prioritization Framework* (Section 5.8) and a project prioritization tool (Section 5.10) to help assess the viability of recreation and culture resource development in the community. This tool was used to prioritize the investment into new facilities throughout the city, as well as where investment in upgrades to existing facilities should be dedicated to. The top ten projects on this list include:

- New fitness areas in existing facilities
- New leisure and program (diving), aquatics and fitness centre
- Henderson Outdoor Pool renovation
- New indoor field / multipurpose gymnasium facility with indoor track
- New ice arena
- Replacing Civic Ice Centre
- New outdoor festival space
- Yates Memorial Theatre and Sterndale Bennett renovation
- New water spray park
- New performing arts centre

The Plan does not specifically identify areas in the city where these new facilities should be directed to. Although the Watermark Outline Plan area will include recreational spaces for passive and active recreation, Lethbridge Land has not expressed a requirement for a large indoor recreation / culture facility in the Plan area.

3.2 LETHBRIDGE RIVER VALLEY PARKS MASTER PLAN (2017)

The Lethbridge River Valley Parks Master Plan provides an overview of the current uses and future demands placed on the River Valley, while addressing gaps in accessibility, facilities, infrastructure, resource protection, and sustainable management practices. The Plan provides a long-term strategy for the River Valley in order to ensure that its natural character can be maintained, that use and development is guided in a sustainable manner, and to realize the recreation and conservation potential of this resource.

The Watermark Outline Plan area is not contained within this Plan's study area.

3.3 CITY OF LETHBRIDGE TRANSPORTATION MASTER PLAN (2013)

The City of Lethbridge's Transportation Master Plan (TMP) provides a comprehensive long-range plan that aligns the land use policies with the transportation infrastructure requirements for the 100,000 to 130,000 population horizons. The TMP provides the City with a blueprint on which to plan and implement specific transportation network improvement projects over the next 20 years, in 8-year (100,000 population – to 2021) and 30-year (130,000 population – to 2043) planning horizons.

The goals of the TMP are as follows:

- Effective access and mobility for people and goods.
- A safe, secure and integrated transportation system.
- Effective public involvement in the TMP development process.

- Recently updated ICSP/MDP driven TMP development process.
- Sustainable transportation initiatives.
- Transportation infrastructure investment rationale.

The TMP's Long Term Road Network Plan (see **Figure 6**) identifies road upgrades and connections through and adjacent to the Watermark Outline Plan area. Although this map identifies the future collectors through the Outline Plan area (in yellow), the Outline Plan will not necessary comply to the exact roadway locations as per the map.

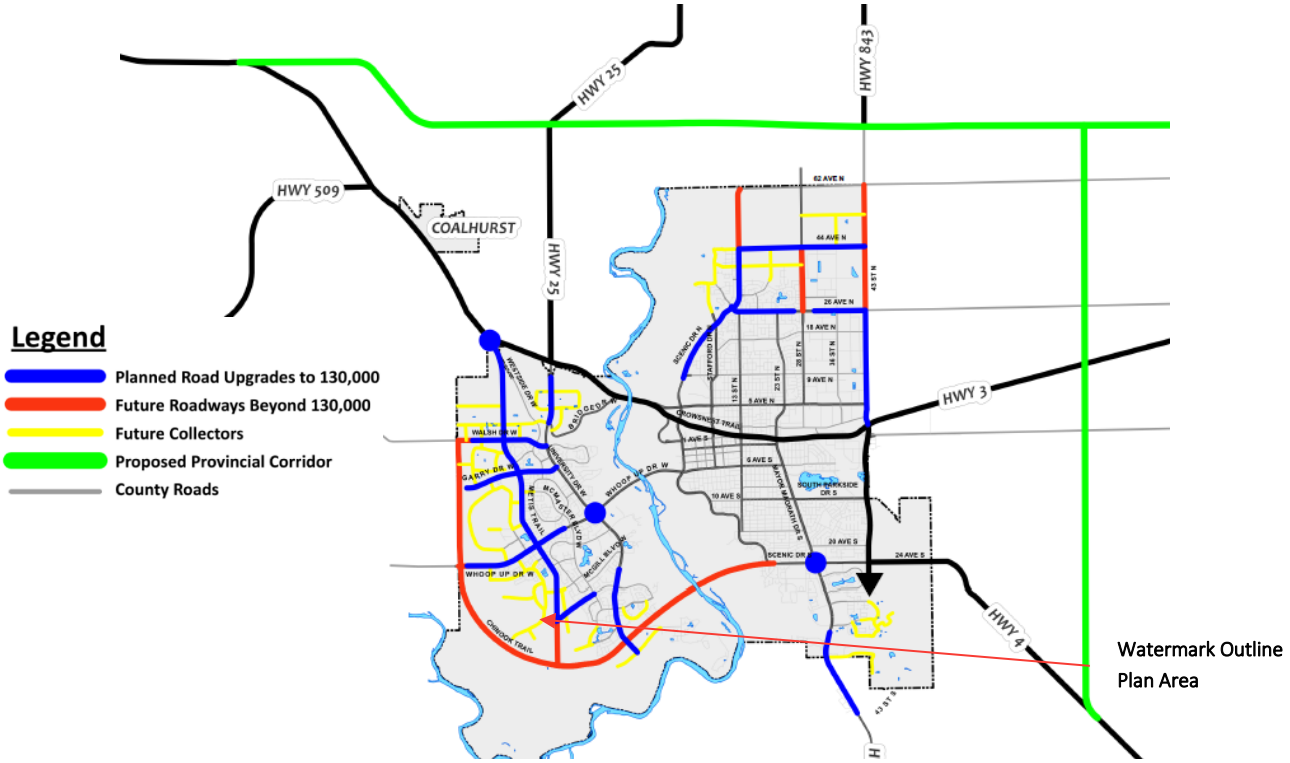

Figure 6 - Transportation Master Plan, Lethbridge Long Term Road Network Plan

3.4 CITY OF LETHBRIDGE CYCLING MASTER PLAN (2017)

The City of Lethbridge's Cycling Master Plan builds on the goals and objectives developed in the Transportation Master Plan and the ICSP / MDP to provide better design options to facilitate an increase in cycling through safe, well designed, and well-located infrastructure. The goal of this Plan is to help Lethbridge become a friendlier place for people walking and biking.

The Vision of the Plan is as follows:

> *Lethbridge commits to make cycling a realistic transportation option for all ages and abilities, contributing to our sustainable future.*

The Plan does not specifically identify any cycling routes within the Watermark Outline Plan, however identifies that *proposed multi-use pathways* shall be connected to the Outline Plan area, see **Figure 7**.

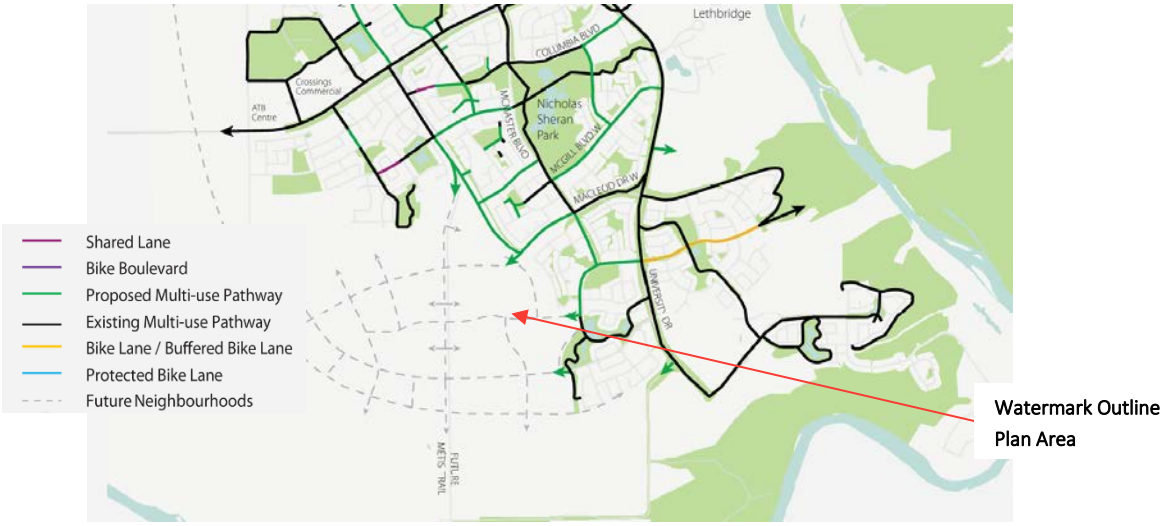

Figure 7 - Cycling Master Plan, Cycling Network and Infrastructure Types Map

3.5 CITY OF LETHBRIDGE MUNICIPAL HOUSING STRATEGY 2019 – 2025 (2019)

The City of Lethbridge prepared a *Housing Needs Assessment* (2019) to advise the creation of the *Municipal Housing Strategy* document.

The purpose of the Municipal Housing Strategy is to address the need for housing along the entire housing continuum within Lethbridge, which will allow the City to leverage and allocate resources to projects that meet the needs or priority groups while aligning itself with the National and Provincial Housing Strategies.

Housing demand was examined through the development of the Strategy, and it was found that:

- The population in Lethbridge is increasing at a faster rate compared to the Province of Alberta.
- Lethbridge had a higher proportion of seniors than the Province of Alberta and comparator municipalities, and the number of seniors is expected to increase in the near future.
- The homeless population is increasing rapidly and a large proportion of them are Indigenous peoples.
- Household sizes in Lethbridge are smaller compared to Alberta and comparator municipalities and the majority are made up of couples without children and persons living alone, suggesting a need for housing options for smaller households.
- Lethbridge had a higher proportion of households with a member with a disability compared to Alberta and comparator municipalities, suggesting a need for housing with accessibility features and support services.
- The average household income in Lethbridge is lower than that in Alberta and comparator municipalities and certain population groups were more likely to have low incomes.

Housing supply was also examined through the development of the Strategy, and it was found that:

- The housing stock is becoming more diverse but the majority of dwellings in Lethbridge are single detached and this is expected to continue in the near future.

- The emergency shelter system has not been able to absorb the increase of the homeless population in Lethbridge.
- There are a range of supportive and transitional housing in Lethbridge but the analysis shows there is a need for more housing options with accessibility features and support services.
- There are a number of non-market subsidized rental housing units in Lethbridge, but wait list data and shelter occupancy rates indicate a need to increase the supply of subsidized and affordable rental housing units for households with low incomes.
- The number of renter households is increasing faster than households as a whole but the number of primary rental dwellings have decreased, indicating a need to ensure the existing primary rental stock is well maintained and protected from further decreases in the future.

Gaps were also identified through the development of the Strategy, and it was found that:

- There is a need for more subsidized rental housing options for households with low incomes.
- The aging population, number of people with disabilities and mental health issues, and the increasing number of homeless people who require permanent supportive housing indicate a need for more housing units which are program specific and which meet the need for support services and/or accessibility. Having an adequate supply of supportive housing options as well as support services will allow individuals and families with special needs to remain in Lethbridge and as independently as possible.
- There is a need to ensure the existing purpose-built rental housing stock is in good condition to create a viable alternative to the secondary rental market for households who cannot afford home ownership or who choose to rent.
- There is a need to further diversify the housing supply as is shown by the shift to smaller households, the higher proportion of households with a physical disability, and the aging population.
- There is need for smaller housing units which will likely continue in the near future.

From the supply, demand, and analysis of housing gaps, the following goals were developed for the Strategy:

- *Goal 1: Increase the supply of rental housing which is affordable to households with low incomes to decrease the number of people who are homeless or at risk of homelessness.*
- *Goal 2: Expand the supply of supportive housing units and units with barrier-free features throughout Lethbridge to help address homelessness and increase housing stability.*
- *Goal 3: Ensure units in the primary rental market are in good condition and meet the needs of current and future residents.*
- *Goal 4: Encourage and support the development of a diverse housing stock, including medium and high-density options in appropriate locations.*

The Watermark Outline Plan will explore various types, tenures, and densities of housing to support some of the goals of the Strategy. It is the intent to explore policies for the development of visitable / accessible housing which will allow more people to age-in-place.

4. VISITABLE HOUSING INFORMATION

4.1 VISITABLE HOUSING INTRODUCTION

Lethbridge Land / the City of Lethbridge has expressed the desire to explore, and include policies encouraging the development of 'visitable homes' within the Watermark Outline Plan Area.

Visitable homes are considered homes that include the three following features:

- A one-level, no step entrance (at the front, back, or side of the house);
- Wider doorways and clear passageways; and
- A wheelchair-accessible bathroom on the main floor.[1]

The advantages of vistable homes are that they can allow people to age-in-place, there is less of a chance for falls, they provide easy access for everyone, and they provide the convenience of not having stairs on the main floor (for those that are disabled, with small children, etc.). A vistiable home does not mean it is entirely accessible, however, the main floors of these homes are completely accessible; many visitble homes have a second storey.

When planned prior to construction, the costs for these homes can be kept low. Not only do the exterior and interior of the homes must be designed as 'visitable', the lots for the homes also must be designed / graded in a way to permit a one-level, no step entrance and the potential feature of a walk-out basement.

Policies to encourage visitable homes (and the development of visitable lots) can be included in ASPs and Outline Plans, however, more specific lot design detail must be addressed during project design / construction phases, and the interior details of the homes should be guided by a supplementary Architectural Guidelines document.

There are a number of types of visitable homes, some of these include:

- A walkout design, which permits entering / exiting through the basement into the backyard, along with the front door access of the home.
- A lookout design, which incorporates large windows in the basement, rather than exit doors.

Visitable lots must be pre-engineered to accommodate a no-step entrance and drain to a pathway at the rear yard. Contributing factors that increase the development costs of a visitable lot include the build-up of the roadway, the rear pathway, drainage, and deeper service lines for water and sewer.

Manitoba Housing (see **Section 4.2** for more information), had a consultant complete a cost estimate for the creation of a visitable lot in the Bridgwater neighbourhoods in Winnipeg, and concluded that the additional cost was approximately $2,700.00 per lot (please note that this estimate is approximately 10 years old, and was completed for conditions in southwest Winnipeg).

[1] CMHC. Visitable Homes. Canadian Mortgage Housing Corporation, 2016, https://assets.cmhc-schl.gc.ca/sf/project/cmhc/pubsandreports/pdf/68677.pdf?rev=bd8af369-6014-499f-aedf-bf77fbe7009a. Accessed July 16, 2020.

4.2 BRIDGWATER NEIGHBOURHOODS – WINNIPEG, MB

The Bridgewater Neighbourhoods in Winnipeg are four neighbourhoods, located in the city's southwest, that were developed in partnership with Manitoba Housing. These were the first new neighbourhoods in Winnipeg that emphasized the planning and development of visitable homes.

The Bridgwater neighbourhoods are part of the City of Winnipeg's Waverley West Area Structure Plan (2006) (which includes seven neighbourhoods in total) – see **Figure 8**. The four Bridgwater neighbourhoods include (see **Figure 9**):

- Bridgewater Forest (2006) - Neighbourhood Plan Area A (as per **Figure 8**) - Waverley West NE Area Structure Plan – 340 acres / 138 ha;
- Bridgwater Town Centre (2010) - Town Centre Plan Area (as per **Figure 8**) – Waverley West Town Centre Area Structure Plan – 170 acres / 69 ha;
- Bridgewater Lakes (2010) - Neighbourhood Plan Area F (as per **Figure 8**) – Waverley West NW Area Structure Plan – 325 acres / 132 ha; and
- Bridgewater Trails (2012) - Neighbourhood Plan Area E (as per **Figure 8**) – Waverley West West Neighbourhood Area Structure Plan – 340 acres / 138 ha.

Following the adoption of the Waverley West Area Structure Plan, and the Neighbourhood Plan Area A (for Bridgwater Forest) in 2006, but prior to construction of this neighbourhood, Manitoba Housing determined that over 1,000 visitable homes and hundreds of multi-family units with visitable features should be included in the Bridgwater neighbourhoods.

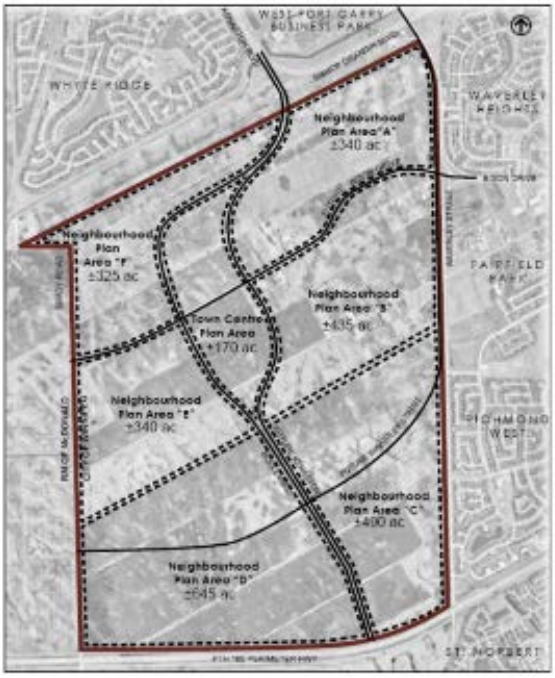

Figure 8 - Waverley West Area Structure Plan Area

As a result, Manitoba Housing completed an in-depth due diligence process to ensure the development of visitable homes within the Bridgwater neighbourhoods was realistic, cost effective, and suitable for the existing and future market conditions in southwest Winnipeg.

Manitoba Housing completed extensive consultations with building and development professionals, hired a consultant to research the costs of visitable housing, conducted focus groups to examine consumer responses to visitable housing, and developed an extensive marketing campaign to inform the public about visitable housing and its benefits. The results of this due diligence process were positive, and Manitoba Housing released an RFP for a 'Visitable Design Show' for the Bridgwater Forest neighbourhood in 2008 (the first of the four neighbourhoods to be developed).

By 2010, three builders constructed visitable show homes in Bridgwater Forest; fourteen (14) lots in the neighbourhood were dedicated for visitable housing in order to test and monitor the building and marketing of these types of homes. The homes we accepted positively by the public and seemed to fill a market demand, thus, later in 2010, it was decided that the Area Structure Plans for Bridgwater Lakes and Bridgwater Trails (see **Figure 9**), would include a target to encourage that 50% of all lots in these neighbourhoods would be developed as visitable.

Figure 9 - Bridgewater Forest Neighbourhoods

The Area Structure Plans (which function similarly to an Outline Plan) for Bridgwater Lakes and Bridggwater Trails include the mention of visitable homes is their Vision sections and land drainage policy sections.

Part of the Vision for the Bridgwater Lakes neighbourhood is as follows:

> *"....to develop a community will be highly visitable, with a minimum of **50% visitable housing**. Visitability refers to housing that is designed in such a way that everyone, regardless of mobility, will be able to at least visit someone's house, use a washroom and exit the home. A house that is visitable includes a zerostep entrance and doors with 32 inches of clear passage space on the main floor. The goal is to develop the*

majority of the neighbourhood using the visitable model, subject to addressing the engineering considerations related to drainage.

Adoption of these guidelines at the construction phase of a home suggests better integration of design elements, reduction in costs as fewer renovation would be required, fewer stair induced injuries and more access to the built environment for all.

- *Visitability increases opportunities for social interaction and inclusive, liveable communities.*
- *Visitability response to the increasing seniors population and the desire to age in place.*
- *Visitability promotes sustainable design in regards to housing needs over ones lifetime (lifecycle costs) and reduced in environmental and monetary costs due to home renovations when mobility changes.*
- *Vistiability reduced stair related injuries and can reduce length of hospital visits as patients can go home because of accessibility features.*
- *Visitability allows more flexibility in moving furniture, carrying groceries into the home, transporting a stroller or wagon among other items.*
- *Visitability provides value added and can be incorporated with other building innovation such as affordable design, energy efficient housing, and green design."*

The land drainage policy to encourage the development of visitable lots is as follows:

- *Rear-yard walkway areas may be incorporated into the stormwater management facilities associated with visitable lots.*

In summary, **Table 2** provides a snapshot of the number of visitable lots and homes projected to be included in four Bridgwater neighbourhoods during their planning stages:

Table 2 - Vistable Home / Lot Summary for Bridgwater Neighbourhoods

Neighbourhood	Visitable Lots	Visitable Homes	Total Number of All Single-Family Lots	Ratio
Bridgwater Forest	- 35 single family visitable lots - 300 multi-family visitable units	- Close to 40 single fam visitable homes - Over 200 units of multi family visitable units	1,100 single family lots / homes	4%
Bridgwater Centre (Town Centre)		- 650 multi-family visitable units - Residential land uses within the Town Centre will be developed to incorporate visitable housing standards,	- No single family lots in this neighbourhood	

		there is a strong desire to develop the area as fully accessible		
Bridgwater Lakes	- 630 single family visitable lots	- Approximately 595 visitable lots	- 1,190 single family lots / homes	50%
Bridgwater Trail	- 400 single fam visitable lots	- Approximately 580 - 260 multi fam visitable units	- 1,160	50%

By 2013, 300 visitable single-family homes had already been built and occupied in the Bridgwater Lakes and Bridgwater Forest neighbourhoods.

APPENDIX C: GEOTECHNICAL EVALUATION

TETRA TECH EBA

GEOTECHNICAL EVALUATION
WATERBRIDGE SUBDIVISION OUTLINE PLAN
LETHBRIDGE, ALBERTA

PRESENTED TO
City of Lethbridge

APRIL 2015
ISSUED FOR REVIEW
FILE: ENVIND03703-01.007

This "Issued for Review" report is provided solely for the purpose of client review and presents our findings and recommendations to date. Our findings and recommendations are provided only through an "Issued for Use" report, which will be issued subsequent to this review. You should not rely on the interim recommendations made herein. Once our report is issued for use, the "Issued for Review" document should be either returned to Tetra Tech EBA or destroyed.

Tetra Tech EBA Inc.
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Tel 403.329.9009 Fax 403.328.8817

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LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the City of Lethbridge and their agents. Tetra Tech EBA Inc. (Tetra Tech EBA) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the City of Lethbridge, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in the Subconsultant Agreement. Tetra Tech EBA's General Conditions are provided in Appendix A of this report.

1.0 INTRODUCTION

This report presents the results of a geotechnical evaluation conducted by Tetra Tech EBA Inc. (Tetra Tech EBA) for the parcel of land for the proposed Waterbridge Residential Subdivision (Waterbridge) development located in west Lethbridge, Alberta.

The scope of work for this evaluation was outlined in a proposal issued to Mr. Don Bartel, of the City of Lethbridge (City), on December 18, 2014. The objective of this work was to determine the general subsurface conditions in the area of the proposed development and to develop recommendations for the geotechnical aspects of design and construction for the project.

Prior to conducting this evaluation, Tetra Tech EBA completed a geotechnical desktop study of the proposed site for the Area Structure Plan stage of the project (File Reference No. L12102064). This evaluation was conducted as part of the Outline Plan/Preliminary Design stage for the proposed land parcel.

Tetra Tech EBA has also conducted a preliminary biophysical impact assessment (BIA) and a Phase I environmental site assessment (ESA) for the subdivision development. It is understood that Tetra Tech EBA will conduct a final BIA and Phase I ESA, based on final design considerations and the project configuration, which will be submitted under separate cover. Environmental issues are beyond the scope of this report and are not discussed herein.

Authorization to proceed with the work was provided by Mr. Michael Kelly, of the City, in a Subconsultant Agreement (COL-15-045) dated March 3, 2015.

2.0 PROJECT DETAILS AND SCOPE OF WORK

Based on the information provided by the City, the proposed parcel encompasses 126 hectares (ha.) in SW ¼ 23-08-22 W4M and NW ¼ 14-08-22 W4M in west Lethbridge. It is understood that the development will include residential lots, an educational facility (school) and commercial lots, utility and street infrastructures with parking areas, as well as stormwater management facilities. The foundation system for the residential lot structures will likely be shallow spread footings with a grade-supported lower level floor slab, typical of other residential developments in the area. Shallow foundation system recommendations, as well as deep foundation alternatives for larger commercial building developments are provided in this report.

It is understood that the proposed street developments will be designed and constructed to City of Lethbridge Standards. The majority of the roadways may consist of designated 'local' pavement structures, with some arterial or collector pavement structures, as required.

The scope of work for this evaluation comprised the installation of 25 boreholes, a laboratory program to assist in classification of the subsurface soils, and a report providing the following foundation design and construction recommendations:

- Recommendations for shallow foundation systems and below-grade structures.
- Recommendations for deep foundation systems.
- Recommendations for the design and installation of slabs-on-grade.
- Recommendations for design and construction of stormwater facilities.
- Recommendations for site grading.

- Recommendations for special considerations for deep fill.
- Recommendations for trench excavation and backfill.
- Recommendations for volumetric changes of soil due to changes in moisture content and/or frost.
- Recommendations for mitigation for high water table, if encountered.
- Recommendations for construction of subgrades, backfill materials, and compaction.
- Recommendations for pavement structures.
- Recommendations for concrete type for structured elements in contact with soil.
- Classification of site for seismic design purposes to Table 4.1.8.4A of the Alberta Building Code 2006.

3.0 GEOTECHNICAL FIELD AND LABORATORY WORK

The fieldwork for this evaluation was carried out on March 31, 2015, using a truck-mounted drill rig, contracted from Chilako Drilling Services Ltd. of Coaldale, Alberta. The rig was equipped with 150 mm diameter solid stem continuous flight augers. Tetra Tech EBA's field representative was Mr. Stuart Smith.

Twenty-five boreholes (referenced as 15BH001 through 15BH025) were installed across the site to depths ranging between 6.6 m and 9.6 m below existing ground surface. The approximate borehole locations are shown on Figure 1.

From the boreholes, disturbed grab samples were obtained at approximate 600 mm intervals. In addition, Standard Penetration Tests (SPTs) were generally performed at depth intervals of 1.5 m. All soil samples were visually classified in the field and the individual soil strata and the interfaces between them were noted. The borehole logs are presented in Appendix B. An explanation of the terms and symbols used on the borehole logs is also included in Appendix B.

Slotted 25 mm diameter PVC standpipes were installed in the boreholes to monitor groundwater levels. Auger cuttings were backfilled around the standpipes and they were sealed at ground surface with sand overlain with bentonite chips.

The locations of the boreholes were laid out on site by Tetra Tech EBA. The geodetic ground elevations at the borehole locations were surveyed by Associated Engineering Alberta Ltd. and are shown on the borehole logs.

Classification tests, including natural moisture content determination, grain size analysis, soluble sulphate content, and Atterberg Limits, were performed in a laboratory on samples collected from the boreholes to aid in the determination of engineering properties. The results of the laboratory tests are presented on the borehole logs.

4.0 SITE AND SOIL CONDITIONS

4.1 Site Condition

The proposed site configuration is triangular in shape and bounded between the existing Mountain Heights Subdivision to the east and 25 Street West to the west. The majority of the property was noted to be undeveloped cropland at the time of field drilling. During the fieldwork it was noted that a power substation exists in the northwestern area of the property.

The ground cover of the property, at the time of fieldwork, consisted generally of stubble crop. The ground surface topography was noted to be undulating. Site drainage generally appeared to be towards low-lying areas, with marginal off-site drainage noted, resulting in seasonal surface water ponding in some areas.

4.2 Historical Aerial Photographic Review

Based on Tetra Tech EBA's knowledge of this property's history taken from an aerial photograph review from the 1950s to the present day, the property appears to have been used primarily for agricultural purposes. Within the property, historical aerial photographs indicate a number of low-lying areas, in some cases, containing ponded surface water. These areas were evident as depressions in older aerial photographs, and were still visible during the recent fieldwork conducted by Tetra Tech EBA.

4.3 Mining Activity

Research was conducted to review the possible existence of mine workings within the boundary of the proposed development area, using a publication by the Energy Resource Conservation Board (Coal Mine Atlas, 1988) and other literature in Tetra Tech EBA's library. The review indicated that no mine workings exist within the development limits.

4.4 Soil Stratigraphy

The general subsurface stratigraphy for the property comprised a surficial topsoil layer, underlain by clay fill, in turn, underlain by native clay and clay till deposits. The following subsections provide a summary of the stratigraphic units encountered at the project site at the specific borehole locations. A more detailed description is provided on the borehole logs provided in Appendix B.

4.4.1 Topsoil

A surficial layer of topsoil was encountered with thicknesses generally ranging between 200 mm and 500 mm. Due to previous grading activities of the site (agricultural practices) and depositional processes (i.e., wind), the topsoil layer is expected to vary in thickness. This fact and the method of stripping should therefore be taken into account when determining stripping volumes.

4.4.2 Clay Fill

Clay fill was encountered at most borehole locations, extending to depths ranging between 0.4 m and 3.5 m below ground surface. The clay fill was generally described as silty, some sand, trace to no gravel, moist to wet, soft to stiff, medium plastic, and brown or dark brown with oxide specks and organics. Moisture contents taken from clay fill samples ranged between 16% and 39%. Atterberg Limits testing conducted on a clay fill sample indicated a Plastic Limit of 16% and a Liquid Limit of 31%, indicative of medium plasticity.

In 15BH002, a layer of sand and gravel fill was encountered below the clay fill extending to 4.6 m below ground level. The origin of the sand and gravel layer or pocket is unknown but may have been placed during grading or for some other reason during historical operation of the farm. The sand and gravel was generally described as silty with trace clay, well graded, sizes up to 25 mm, wet, compact, and brown

4.4.3 Clay

Native clay was encountered at some borehole locations (nine boreholes in total) underlying the topsoil or clay fill layers, extending to depths ranging between 1.4 m and 3.8 m below ground surface. The clay was generally described as silty, trace to some sand, moist to very moist, firm to stiff, low to high plastic, and light brown or brown to brownish grey. Moisture contents taken from clay samples ranged between 16% and 35%. Atterberg Limits testing conducted on clay samples (two samples) indicated Plastic Limits of 14% and 20%; and Liquid Limits of 29% and 57%; indicative of low to medium plasticity. One hydrometer test result indicated grain-size fractions by weight with 29% clay, 56% silt, and 15% sand particles.

4.4.4 Clay Till

Underlying the clay fill and/or native clay layers, clay till was encountered at the borehole locations, extending to the maximum borehole termination depths. The clay till was generally described as silty, trace sand to some sand (occasional sandy), trace gravel, moist to very moist, stiff to hard, medium to high plastic (occasional low plastic), and brown to brownish grey with coal and oxide specks. Sand pockets, silt lenses, and high plastic clay inclusions were also noted within the clay till. Moisture contents taken from clay till samples ranged between 14% and 31%. Atterberg Limits testing conducted on clay samples (three samples) indicated Plastic Limits of 11%, 13%, and 18%; and Liquid Limits of 27%, 32%, and 60%; indicative of low to high plasticity. One hydrometer test result indicated grain-size fractions by weight with 35% clay, 35% silt, and 30% sand particles.

4.5 Groundwater Conditions

At the time of drilling, seepage and sloughing was encountered at some borehole locations (refer to the individual borehole logs). The groundwater level at the borehole locations was measured on April 6, 2015. Table A summarizes the groundwater monitoring data collected to date.

Table A: Groundwater Monitoring Data

Borehole Number	Depth of Standpipe (m)	Geodetic Borehole Elevation at Ground Surface (m)	Groundwater Monitoring Data April 6, 2015	
			Depth to Groundwater (m)	Elevation of Groundwater (m)
15BH001	9.6	929.78	2.48	927.30
15BH002	6.1	929.28	1.62	927.66
15BH003	8.8	930.00	1.25	928.75
15BH004	6.1	932.44	1.08	931.36
15BH005	9.6	930.44	2.29	928.15
15BH006	6.6	929.75	1.11	928.64
15BH007	9.6	931.33	6.31	925.02
15BH008	6.6	932.84	Dry	-
15BH009	6.6	934.62	Dry	-
15BH010	9.6	935.47	Dry	-

Table A: Groundwater Monitoring Data

Borehole Number	Depth of Standpipe (m)	Geodetic Borehole Elevation at Ground Surface (m)	Groundwater Monitoring Data April 6, 2015	
			Depth to Groundwater (m)	Elevation of Groundwater (m)
15BH011	9.6	933.52	8.46	925.06
15BH012	6.6	933.43	3.10	930.33
15BH013	6.6	934.66	Dry	-
15BH014	9.6	934.59	1.28	933.31
15BH015	9.6	934.53	2.92	931.61
15BH016	6.6	938.30	Dry	-
15BH017	9.6	936.69	6.46	930.23
15BH018	6.1	935.52	0.75	934.77
15BH019	9.6	940.31	9.02	931.29
15BH020	6.6	933.86	1.00	932.86
15BH021	9.6	934.58	Dry	-
15BH022	9.6	936.59	Dry	-
15BH023	6.6	933.49	1.85	931.64
15BH024	9.6	933.39	8.10	925.29
15BH025	6.6	935.41	Dry	-

The groundwater is considered to be perched water within the silt and sand layers within the clay soils, and may fluctuate seasonally and in response to climatic conditions. Further comments regarding groundwater issues are provided in the subsequent sections.

5.0 GEOTECHNICAL RECOMMENDATIONS

The recommendations that follow offer varying options intended to aid in the development of project concepts and specifications. The recommendations are provided on the understanding and condition that Tetra Tech EBA will be retained to review the relevant aspects of the final design (drawings and specifications) and to conduct such field reviews as are necessary to ensure compliance with City of Lethbridge Standards (2014), this report, and the final plans and specifications. Tetra Tech EBA accepts no liability for any use of this report in the event that Tetra Tech EBA is not retained to provide these review services.

Specific recommendations that apply to this project are provided for site development, foundation alternatives and floor slab systems for residence and/or facility structures, pavement structures, and stormwater management facilities.

5.1 Site Development

5.1.1 Topsoil Depth

The initial topsoil stripping depth should be considered as being of particular importance with regard to site subgrade grading design elevations. Based on the findings of the field drilling program, the surficial topsoil (A Horizon) layer thickness is varied between 200 mm and 500 mm and maybe somewhat variable in thickness due to historical cultivation of the land surface and/or depositional processes (i.e., wind). Consideration can be given however, to incorporating the underlying B Horizon layer (organic content <5%) into the fill mass during general site grading. Full-time monitoring by experienced personnel is recommended in order to avoid over-stripping and to ensure appropriate material mixing and placement. To accurately estimate the topsoil stripping volume (if required), it is recommended that a site-specific field drilling program be conducted.

5.1.2 Lot Grading

The lot grading requirements for the various development aspects of the subdivision should be generally designed and carried out to the current City of Lethbridge Standards.

All lots should be graded for drainage at a minimum gradient of 2.0%. Deleterious materials encountered should be removed from the site. These materials are not suitable for use as general engineered fill for this development. Any organics, soft, and wet soils, where encountered, must be removed to expose the underlying competent clay soil. The excavated areas must be backfilled with general engineered fill as defined in Appendix C.

5.1.3 Subgrade Preparation

Subgrade preparation, to City of Lethbridge Standards, is required in all subdivision development areas, including lot grading, as well as all paved areas. Vegetation, topsoil, organic silt/clay, and other identified deleterious or unsuitable materials shall be excavated from under proposed fill areas during grading operations. Any existing fill not meeting the compaction standards or containing organics shall also be removed.

The native clay and clay till soils should be acceptable for site grading purposes in all areas. The near surface clay soil appears to be variable across the site and moisture conditioning will be required to reduce the swelling potential of this soil and to achieve the compaction standards recommended. Proof-rolling within roadways to detect soft areas is also recommended. Specific subgrade preparation recommendations for slabs-on-grade and paved areas are discussed in subsequent sections of this report.

5.1.4 Deep Fill

5.1.4.1 Fill Depths

Based on the site grading plan provided by Associated Engineering Alberta Ltd., it is understood that engineered fill, required to meet design grades, will be placed on the existing ground surface following stripping and subgrade preparation to a maximum thickness of approximately 4.0 m. The maximum design subcut for the development site is understood to be approximately 9.0 m from the existing ground surface.

5.1.4.2 Fill Placement

Following subgrade preparation to the requirements of the City of Lethbridge Standards, and prior to placement of deep fills, all existing natural and cutslopes shall be graded to a minimum of five horizontal to one vertical (5H:1V). If natural and cutslopes steeper than 5H:1V are to remain, it is recommended that benching of sideslopes of the native soils be performed prior to fill placement. The notching will greatly improve bonding between the deep fill

and the native soil, reducing the risk of slope failure at the underlying slope interface and differential settlement over the length of the fill zone. Benching should consist of a series of maximum 1.5 m vertical cuts into slopes exceeding 15%. All fill should be placed to meet the specification of general engineered fill.

5.1.4.3 Minimum Time Lag for Development

If the recommendations presented in this report are followed, it is estimated that approximately one-third of the fill-induced consolidation settlement should occur during and shortly after the fill placement. The estimated remaining consolidation settlement may be too great for typical residential development if constructed too soon after the grading work is completed. Tetra Tech EBA recommends that a minimum three month time lag prior to construction of residential structures in areas with a fill thickness less than 4.0 m. Longer time lag may be needed where fill is to be placed more than 4.0 m in thickness.

5.1.5 Backfill Materials

The native low to high plastic clay soils including clay fill, native clay, and clay till soils are considered acceptable for site grading purposes in all areas. The near surface clay soil appears to be variable in moisture content across the site and therefore, moisture conditioning will be required for proper backfill placement. The earthwork contractor should make his/her own estimate of the requirements for moisture conditioning to the recommended standards, and should consider such factors as weather and construction procedures.

Further recommendations regarding backfill materials and compaction are contained in Appendix C

5.1.6 Groundwater Issues

In accordance with the groundwater monitoring conducted to date (one occasion), the groundwater levels in this area vary between approximately 1.1 m to 9.1 m below ground surface. The above-noted groundwater levels are considered to be localized perched or trapped groundwater within zones of sandier material within the clay or clay till deposits. Based on Tetra Tech EBA's local experience and groundwater monitoring results, significant groundwater problems are not expected for the majority of excavations expected for this development and relatively minimal dewatering may be necessary in isolated areas.

5.1.7 Construction Excavations

The construction methodology for installation of the utility services is anticipated to be an open trench excavation. As excavation proceeds, following stripping, the excavated soil will generally be comprised of a mixture of clay fill, native clay, and clay till soils. Generally, variable soil moisture conditions should be expected in all areas.

Excavations should be carried out in accordance with the Alberta Occupational Health and Safety Regulations. For this project, the depth for the trench excavations could possibly vary between 2 m and 9 m below existing ground surface. The following recommendations notwithstanding, the responsibility of trench and all excavation cutslopes resides with the Contractor who should take into consideration site-specific conditions concerning soil stratigraphy and groundwater. All excavations should be reviewed by a geotechnical engineer prior to personnel working within the base of the excavation.

A sloped excavation may be considered in areas where the maximum excavation depths are less than 6.0 m and room is available for a sloped excavation. For depths greater than 6.0 m, temporary shoring may be considered more suitable for this development.

Excavation within very stiff clay soils should be cut back no steeper than 0.75H:1.0V; excavation within stiff clay soils should be cut back no steeper than 1.0H:1.0V; excavation within soft to firm clay soils should be cut back no steeper than 1.5H:1.0V. Excavations to be open for more than one month should be cut back flatter than the sideslopes recommended above, as deemed necessary on site, based on local conditions.

Flatter sideslopes may be required in areas where groundwater is encountered, which may cause local sloughing and instability of the excavation sidewalls. As required in these instances, it is recommended that the excavation configuration design be reviewed by experienced personnel, prior to allowing personnel to enter the base of the excavation.

Any encountered groundwater seepage should be directed towards sumps for removal from the excavation. Conventional construction sump pumps should be capable of providing groundwater control.

Based on the composition and consistencies of the soils encountered across the site, conventional hydraulic excavators should be able to remove these materials. It should be noted that there is a risk of encountering cobbles and boulders within the clay till deposit.

Consideration should be given to separation of the varying soil materials encountered during excavations as far as practical and where economically viable. For example, clay soils approaching the optimum moisture content (OMC) for the materials should be stockpiled separately from clay soils in wet condition, which will require moisture conditioning or removal.

Spill piles or temporary surcharge loads should not be allowed within a distance equal to the depth of the excavation from an unsupported excavation face while mobile equipment should be kept back at least 3.0 m. All excavations should be checked regularly for signs of sloughing, especially after rainfall periods. Small earth falls from the sideslopes are a potential danger to workers and must be guarded against.

5.1.8 Trench Backfill and Compaction

The existing site soils comprising clay fill (not including deleterious materials), clay, and clay till, are considered adequate for use as ‘general engineered fill’ within the trenches above the bedding zone. Requirements for ‘general engineered fill’ are defined in Appendix C.

The moisture content of the existing clay soils are estimated to be variable with respect to their OMC. As such, moisture conditioning should be anticipated for this project. The earthwork contractor should; however, make his own estimate of the requirements and should consider such factors as weather and construction procedures.

The level of compaction of the backfill must be suitable to limit post-construction trench settlement both for the road embankment as well as to maintain the design surface drainage (stormwater control) profile of the rights-of-way. A minimum compaction level of 95% of Standard Proctor Density (SPD) is recommended for backfill within the pipe zone of the trench (to 300 mm above the top of pipe). For the remainder of the trench backfill, a minimum compaction standard of 98% of SPD should be utilized in all areas. The compacted thickness of each lift of backfill shall not exceed 250 mm. Moisture conditioning to minus 1% of optimum and 2% over OMC of the soils should be specified for general trench backfill. During placement of the backfill materials it is recommended that ‘notching’ of the excavation sidewalls (1.0H:1.0V) every 1 m height occur to develop a bond between the native soils and backfill materials, resulting in less potential for long-term settlement or consolidation.

Localized sand and/or silt pockets or gravels which may be encountered within the clay till should be ‘wasted’ or incorporated into the approved backfill materials, as specified by qualified personnel, ensuring the design intent of the backfill work is maintained.

It should be noted that the ultimate performance of the trench backfill is directly related to the uniformity of the backfill compaction. In order to achieve the uniformity, the lift thickness and compaction criteria should be strictly enforced. General recommendations regarding backfill materials and compaction are contained in Appendix C.

For frost protection, pipes buried with less than 2.0 m of soil cover (above top of pipe) should be protected with insulation to avoid frost damage or breakage of the pipes. Rigid insulation placed under areas subject to vehicular wheel loadings should be provided with a minimum thickness of 600 mm of compacted granular base.

General recommendations regarding construction excavation and backfill materials and compaction are contained in Appendix C.

5.2 Foundations

5.2.1 General

All foundation design recommendations presented in this report are based on the assumption that an adequate level of monitoring by Tetra Tech EBA will be provided during construction and that all construction will be carried out by suitably qualified contractors, experienced in foundation and earthworks construction. An adequate level of monitoring is considered to be:

- For shallow foundations, inspection of bearing surfaces prior to placement of concrete or mudslab, and design review during construction.
- For deep foundations; full-time monitoring and design review during construction.
- For earthworks; full-time monitoring and compaction testing.

Suitably qualified persons, independent of the contractor, should carry out all such monitoring. One of the purposes of providing an adequate level of monitoring is to check that recommendations, based on data obtained at discrete borehole locations, are relevant to other areas of the site.

5.2.2 Limit States Design [LSD]

The design parameters provided in the following sections may be used to calculate the ultimate foundation capacity in each case. For the Limit States Design (LSD) methodology, in order to calculate the factored load capacity, the appropriate Soil Resistance Factors must be applied to each loading condition as follows:

Factored Capacity = Ultimate Capacity x Soil Resistance Factors

In general, the following soil resistance factors must be incorporated into the foundation design. These factors are considered to be in accordance with the Canadian Foundation Engineering Manual (CFEM) (2006) as well as the National Building Code (2010).

Table B: Soil Resistance Factors

Item	Soil Resistance Factor
Shallow Foundations	
Bearing Resistance	0.5
Deep Foundations - Piles	
Static Axial Compressive Pile Capacity	0.4
Static Axial Uplift Pile Capacity	0.3
Lateral Pile Capacity	0.5

Under LSD methodology, foundations should be designed on the basis of factored Ultimate Limit State (ULS) parameters. In order to determine the applicable working capacity, Serviceability Limit States (SLS) must also be considered. Further comments are provided in the following sections.

5.2.3 Shallow Foundations

Shallow foundations, which are generally considered feasible for residential and other relatively light loaded structures, should be constructed approximately 1.4 m below the final design exterior ground surface (frost protection requirement for heated structures). All footings should be founded on native stiff to very stiff cohesive soils only. All fill (except for the general engineered fill) and deleterious materials must be removed from the building footprint areas to expose native subgrade soils.

It is understood that future site grading designs may require footings to be placed within areas of general engineered fill. To be competent as footing base soils, the engineered fill requires full-time quality assurance monitoring by geotechnical personnel during fill placement and needs a period of at least three months for self-weight settlement prior to placement of footings. It is noted that placement of foundations on engineered cohesive fill thicknesses greater than 1.5 m require special consideration regarding long-term consolidation of the fill and subsequent performance issues with the foundations/floor slabs-on-grade.

The ultimate static bearing pressure for the design of strip and spread footings for residential construction may be taken as 250 kPa on native stiff clay soils or approved general engineered fill, and should be confirmed through filed bearing inspection. If weak soils including soft or firm clay with relatively high moisture contents are encountered during specific site excavations, the ultimate bearing capacity should be reduced and determined by qualified geotechnical engineers. Footing dimensions should be in accordance with the minimum requirements of the Alberta Building Code 2006 (Section 9.15.3 Footings). Bearing certification is recommended to ensure that the footings are placed on competent native clay soils.

It is recommended to use a smooth edge-trimming bucket or Grade-All for final excavation to the foundation subgrade elevation to minimize disturbance of the founding soils. The foundation concrete should be placed immediately following excavation to ensure the bearing clay soil does not dry out to below the plastic limit.

Settlement of footings designed and constructed in accordance with the above recommendations should be well within the normally tolerated values of 25 mm total and 20 mm differential.

Recommendations for minimum depth of cover for footings are presented under the heading ‘Frost Protection’ below. Further recommendations regarding shallow foundations are given in Appendix C.

5.2.4 Deep Foundation Systems

Deep foundation systems, including bored cast-in-place (CIP) concrete piles and dynamic CIP piles (compacto) may be considered for structures with relatively high structural loads and restricted settlement for which shallow foundations may not be suitable. Helical piles may also be considered for the project but should be limited to use for lightly loaded structures only.

All piles should be founded in native competent clay till soils and may be designed to resist axial compressive loads on the basis of the ultimate skin friction and end-bearing parameters. Preliminary soil resistance parameters are provided in Table C. However, it should be noted that geological conditions are innately variable with glacial deposits. Glacial deposits, generally encountered in the Lethbridge area, are seldom spatially uniform. It is recommended that a detailed geotechnical evaluation be conducted for each development if deep foundations are under consideration, to determine suitable pile types, accurate design parameters, and predict constructability of piling and/or belling.

Table C: Bored Cast-in-Place Concrete Pile Design Parameters

Depth Below Ground Surface (m)	Ultimate Shaft Resistance (kPa)	Ultimate Base Resistance (kPa)
0.0 to 2.0	0	N/A
2.0 to 6.0 (Clay or Clay Till)*	35	N/A
Below 6.0 (Bedrock)	45	600

*No positive shaft resistance should be considered for any fill if encountered below 2.0 m.

5.2.5 Foundation Perimeter Drainage Requirements

It is recommended that a weeping tile and sump system be constructed around the outside perimeter of the buildings (at the base of the footings, if selected) to maintain a relatively consistent moisture profile of the subgrade soils. The weeping tile system should comprise a perforated weeping tile, in turn surrounded with a minimum of 150 mm thick blanket of washed rock (maximum size 20 mm) with the granular layer wrapped in non-woven geotextile. The weeping tile should have a minimum 0.5% slope leading to a sump.

5.2.6 Floor Slab System

5.2.6.1 Floor Slabs-on-Grade

Construction of slabs-on-grade (outside of basements) must consider the following precautions and construction recommendations.

In native soil areas, following removal of topsoil, the subgrade should be scarified to a minimum depth of 300 mm, and moisture conditioned to a range of optimum to 2% over OMC. Within areas of clay fill, the exposed subgrade should be scarified to a minimum depth of 600 mm, considering the clay fill soils (not containing deleterious materials) and moisture conditioned as noted above. The minimum compaction in each case should be 98% of SPD. The prepared subgrade should be proof-rolled and any soft or loose pockets detected should be reconditioned as recommended above or over-excavated and replaced with general engineered fill.

A levelling course of clean well-graded crushed gravel, at least 150 mm in compacted thickness, is recommended directly beneath the slabs-on-grade, unless a thicker course is required for structural purposes. The subgrade beneath slabs-on-grade should be protected at all times from moisture or exposure which may cause softening or

disturbance of the subgrade soils. This applies during and after the construction period (and before and after replacement of the required general engineered fill). Should the exposed surface become saturated or disturbed, it should be reworked to achieve the above standards.

If the subgrade is properly prepared as noted above, floor slab movements should be limited to less than approximately 25 mm. Slabs-on-grade should be separated from bearing members to allow some differential movement. If this range of differential movement is unacceptable, the owner should consider a structurally supported floor.

Recommended procedures for proof-rolling, backfill materials, and further recommendations for slabs-on-grade construction are included in Appendix C.

5.2.6.2 Structural Slabs

A structurally supported floor slab, with a crawlspace beneath, may be used if differential movements from a slabs-on-grade system are not tolerable. The crawlspace floor should be graded toward a sump to collect water that may enter. The crawlspace floor should also be covered with a vapour barrier and concrete. If a concrete floor is selected for the crawlspace, bond breaks should be provided at the foundation walls and columns to allow it to move independently of the structure.

It is important that the crawlspace be properly insulated and vented according to applicable building codes, as it has been Tetra Tech EBA's experience that in some cases, crawlspaces may develop a moisture/humidity problem. The use of a crawlspace with any other floor covering is not recommended for this development.

Alternatively, the slab may be totally structurally supported with no crawlspace. However, with this type of structurally supported floor slab system, there is a risk of ground movement relative to the slab. This relative movement can lead to problems if piping and other utilities that are connected to the slab are embedded within the ground beneath the slab. Utilities beneath the structurally supported floor slabs should be protected from differential movement by placing utilities within boxes suspended from the structural slab. In addition, a void form is recommended below the floor slab in order to prevent transfer of uplift pressures due to swelling clay soil.

5.2.6.3 Basement Floor Slabs

Slabs-on-grade construction for basements is considered feasible providing certain precautions are undertaken. All excavation should be carried out remotely using a smooth-mouth bucket or Grade-All at final grade in order to minimize disturbance of the base. Basement floor slabs should be supported by a minimum of 150 mm compacted, clean, free-draining granular material.

In areas where floor slabs bear on a clay subgrade, the clay at this site may swell following completion of the floor slabs. Therefore, some movement should be anticipated. Any light columns in the basement designed to support the main floor should be of the adjustable "telepost" type. If partitions are constructed in the basement, provision must be made so that, if the basement floor slab heaves, the partitions do not raise the main floor. A minimum allowance of 25 mm should be left between the top plates of basement partitions and the floor above them to accommodate heaving of the floor slab. This heaving allowance is less applicable for interior columns founded on spread footings.

The slab subgrade should be sloped to provide positive drainage to the edge of the slab. A minimum drainage gradient of 0.5% is recommended.

General recommendations regarding floor slabs-on-grade construction are also presented in Appendix C.

5.2.7 Below-Grade Walls

All below-grade walls including basement walls and rigid retaining walls should be designed to resist lateral earth pressures in an "at-rest" condition. The coefficient K_o of lateral earth pressure "at-rest" condition is recommended to use 0.5 for cohesive backfill and 0.45 for sand and gravel backfill. Bulk unit weight of backfill soil may use 19 kN/m³ or 21 kN/m³ for cohesive or granular backfill, respectively. In addition, hydrostatic pressures should be considered in the design if no drainage is provided for all below-grade walls. Through the installation of the weeping tile, hydrostatic pressures will not be a factor in design.

5.3 Pavement Structures

5.3.1 Subgrade Preparation

Subgrade preparation should be undertaken prior to pavement construction. The recommended standard for subgrade preparation is a minimum of 98% of SPD. Cohesive soils should be compacted at optimum to 2% over the OMC. Granular soils (granular base and sub-base layers) should be compacted with moisture content ±1% of the OMC. A minimum depth of subgrade preparation of 600 mm within clay fill (subject to a proof-roll) or 300 mm within the native clay is recommended for all paved areas.

Caution may be required to ensure the clay fill does not contain deleterious materials. Where soft subgrade conditions exist below the design subgrade elevation, these materials should be subexcavated and replaced with general engineered fill.

Depending on the construction scheduling for placement of the granular sub-base and base layers, and the asphalt concrete pavement surface, further subgrade preparation may be required if the placed subgrade materials dry out or weather. This should be determined prior to the placement of the pavement structure. Should the subgrade materials be shown to deteriorate from construction completion, a minimum 300 mm of subgrade preparation is recommended prior to pavement structure placement.

It is recommended to include a contingency for woven geotextile, should localized areas of subgrade instability be encountered. Use of a woven geotextile should not be considered as an alternate for subgrade preparation as recommended, but an alternative, should subgrade instability exist after subgrade preparation. The woven geotextile should have a minimum grab tensile strength of 890 N.

The subgrade should be prepared and graded to allow drainage towards stormwater facilities. It is imperative that positive surface drainage be provided to prevent ponding of water within the pavement structure and subsequent softening and loss of strength of the subgrade materials. Surrounding landscaping should be such that runoff water is prevented from ponding beside paved areas in order to avoid softening and premature failure of the pavement surface.

5.3.2 Pavement Design and Construction

The minimum materials required for the pavement structures of roadways for this project should meet current City of Lethbridge Standards. Specific roadway pavement structures should be reviewed by the Transportation Business Unit based on roadway use, traffic volumes, heavy vehicles, and equivalent single axle loads.

All asphalt paving lifts should be compacted to a minimum of Marshall Design density, as per current City of Lethbridge Standards. Additional recommended guidelines for design and construction of pavement structure are presented in Appendix C of this report.

The pavement design should include provisions for subsurface drainage of the pavement granular layers. For urban sections it is considered appropriate to provide subsurface drainage in the form of longitudinal subdrains along the edge of the pavement structure. Subdrains will provide a means of evacuating water that infiltrates the pavement structure, either through cracks and vertical details (i.e., face of gutter), or from peripheral surface runoff. The subdrain should comprise a perforated flexible plastic drainpipe (100 mm diameter), complete with filter sock. The drain should be placed along the edge of the pavement section in a recessed area of the prepared subgrade. Positive outfall of the drains should be provided at catchbasin locations or other stormwater outfalls.

5.4 Concrete

5.4.1 Concrete Type

For this development, based on test results conducted on soil samples retrieved from the boreholes, Tetra Tech EBA's local experience, and the Canadian Standards Association (CSA) A23.2-14, the recommended concrete exposure classification for general usage (where concrete is in contact with soil or groundwater) should be Class S-2 (CSA A23.1-14). For this exposure classification, alternatives include the usage of Type HS (Sulphate Resistant) Portland cement, or blends of cement and supplementary cementing materials, conforming to Type MSb and/or Type HSb cements (CSA A3001-03).

For all cement exposed to soil and/or groundwater (e.g., including all building foundation concrete, all below-grade concrete, and surface works concrete), a maximum water/cementing materials (W/CM) ratio 0.45 is recommended. Based on Tetra Tech EBA's experience with Alberta aggregates, a W/CM ratio of 0.45 normally corresponds to a 56-day compressive strength of 32 MPa.

Air entrainment of 4% to 7% volume is recommended for all concrete exposed to freezing temperatures, native soils, and/or groundwater. This should be increased to 5% to 8% for exterior flatwork.

5.4.2 Concrete Surface Works

With respect to surface works concrete (i.e., specifically concrete curbs and sidewalks), the recommendations provided in this report for subgrade preparation, including moisture conditioning and compaction, are intended to provide relative uniformity in the subgrade. The intention of uniformity, with respect to material type and moisture content, is to reduce the risk of differential concrete movements due to soil volume changes as a result of fluctuating moisture content. A gradual increase in soil moisture content over time is likely to occur (due to precipitation, reduced evaporation, and irrigation), and some differential movement and subsequent cracking of concrete surface works should be anticipated; typical for the Lethbridge area.

With respect to providing a layer of granular material beneath surface works concrete, there are both positive and negative consequences. In the positive sense, it must be assumed that the subgrade will be uniformly graded properly such that any moisture gaining access beneath the concrete within the granular layer would be drained away quickly to an area designed to accommodate excess moisture (i.e., roadway weeping tile tied into the storm system). If well drained, the provision of granular material also serves to reduce some differential distortions, when washed materials are used, and has been documented as helping to reduce longitudinal cracking.

On the negative side, if free drainage of the granular layer is not designed, constructed, and maintained, granular materials provide easy access for excess moisture to pond below the concrete, causing swelling of the medium to high plastic subgrade soils and/or consolidation of fill soils. There is also a risk of softening of the adjacent roadway pavement edges.

The risk of differential movement of the subgrade soils and the economic consequence for either option should be given due consideration by the municipal engineer

5.5 Frost Protection

For protection against frost-action, perimeter footings in heated structures should be extended to such depths as to provide a minimum soil cover of 1.4 m. Isolated or exterior footings in unheated structures should have a minimum soil cover of 2.1 m unless provided with equivalent insulation.

For a deep foundation system, all piles in unheated areas should have full depth steel reinforcement and should be drilled to a minimum depth of 6.0 m. Grade beams spanning concrete piles should have a minimum 100 mm void space on the underside of the grade beam and around the pile caps to reduce the risk of interaction with the underlying soil associated with frost heaving and/or swelling soils.

Pipes buried with less than 2.0 m of soil cover should be protected with insulation to avoid frost effects that might cause damage to or breakage of the pipes. Rigid insulation placed under areas subject to vehicular wheel loadings should be provided with a minimum thickness of 600 mm of compacted granular base.

5.6 Seismic Design

The Site Classification recommended for Seismic Site Response is Classification D, as noted in Table 4.1.8.4.a of National Building Code of Canada.

5.7 Stormwater Pond Development

5.7.1 General

In the preparation of the recommendations provided in this report for the geotechnical aspects of design and construction of the stormwater management facility (facility), Tetra Tech EBA reviewed pertinent sections of the "Stormwater Management Guidelines for the Province of Alberta", dated March 2013 and prepared by the Municipal Program Development Branch of Alberta Environmental Protection. Detailed recommendations for the design and construction of this facility are provided in subsequent sections.

Stormwater ponds, including dry ponds and wet ponds (typical stormwater management methods used in Lethbridge urban area), are understood for this development. Such facilities are normally constructed as an excavation below ground surface to provide overland stormwater storage, in accordance with municipal regulations.

5.7.2 Availability of Suitable Clay Liner Materials

As discussed in the previous sections, the subsurface stratigraphy of the site generally comprises lacustrine clay overlying glacial clay till. Based on Tetra Tech EBA's experience in the Lethbridge area, medium to high plastic clay till expected at shallow depths in this area should be suitable as clay liner materials for pond construction. Based on previous permeability (K) test results, the medium to high plastic clay till is well below the minimum K value required by Alberta Environment and Sustainable Resource Development (ESRD). It is recommended that prior to design and construction of the proposed facility, permeability testing of on-site soil samples taken from the proposed excavation of the facility or borrow source, should be conducted to verify the site-specific permeability coefficient. The design permeability (K) should be one order of magnitude larger than the average laboratory K values as measured on typical samples.

Alternate liner types, such as geosynthetics, may be used but are substantially more expensive.

5.7.3 Stormwater Management Facility Concept Design

Based on Tetra Tech EBA's understanding of a typical stormwater management facility design, a dry pond typically has a base elevation of approximately 2 m to 3 m below final surrounding ground surface. A typical wet pond might have a base elevation ranging between 3 m and 5 m below final ground surface.

Once the operational water level elevation of the wet pond is designed, it is recommended that the proposed interior sideslopes be between 5.0H:1.0V to 7.0H:1.0V for the pond in the active storage zone and 4.0H:1.0V to 5.0H:1.0V for above the active storage zone. The maximum exterior sideslopes are 3.0H:1.0V.

It is recommended that the maximum interior sideslopes for a dry pond be 4.0H:1.0V to 5.0H:1.0V, with a minimum slope in the bottom of the pond of 1% (2% is preferred). The maximum exterior sideslopes should be no greater than 3.0H:1.0V.

Based on the site soil conditions and Tetra Tech EBA's experience with the potential permeability of local clay till soils, it is recommended that a preliminary thickness for the remoulded clay liner be 0.6 m along the base of the wet pond and 1.0 m along the sidewalls up to design operation water elevation (minimum recommended).

Assuming the embankment (wet pond) between the normal water level and high water level (HWL) is constructed with an engineered clay liner, the potential for erosion from wave action should be considered. Slope protection comprising rip-rap designed for potential wave erosion or other means should be given consideration. The use of a filter fabric median between the native soils and rip-rap is also recommended. Design recommendations for this type of protection are beyond the scope of this report.

A liner thickness of 0.3 m may be given consideration for base liners in other areas of the proposed developed (dry pond), which will only occasionally be below water. This thickness accounts for the potential of desiccation of the upper 0.2 m during the initial periods when the dry pond is empty. It also accounts for potential disturbance during storm events and to facilitate access during periods of maintenance.

Consideration should always be given to local municipal jurisdictional requirements for these types of facilities.

6.0 DESIGN AND CONSTRUCTION GUIDELINES

General design and construction guidelines are provided in Appendix C, under the following supplemental headings:

- Shallow Foundations
- Floor Slabs-on-Grade
- Construction Excavations
- Backfill Materials and Compaction
- Proof-rolling
- Pavements

These guidelines are intended to present standards of good practice. Although supplemental to the main text of this report, they should be interpreted as part of the report. Design recommendations presented herein are based on the premise that these guidelines will be followed. The design and construction guidelines are not intended to represent detailed specifications for the works although they may prove useful in the preparation of such specifications. In the event of any discrepancy between the main text of this report and Appendix C, the main text should govern.

7.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech EBA Inc.

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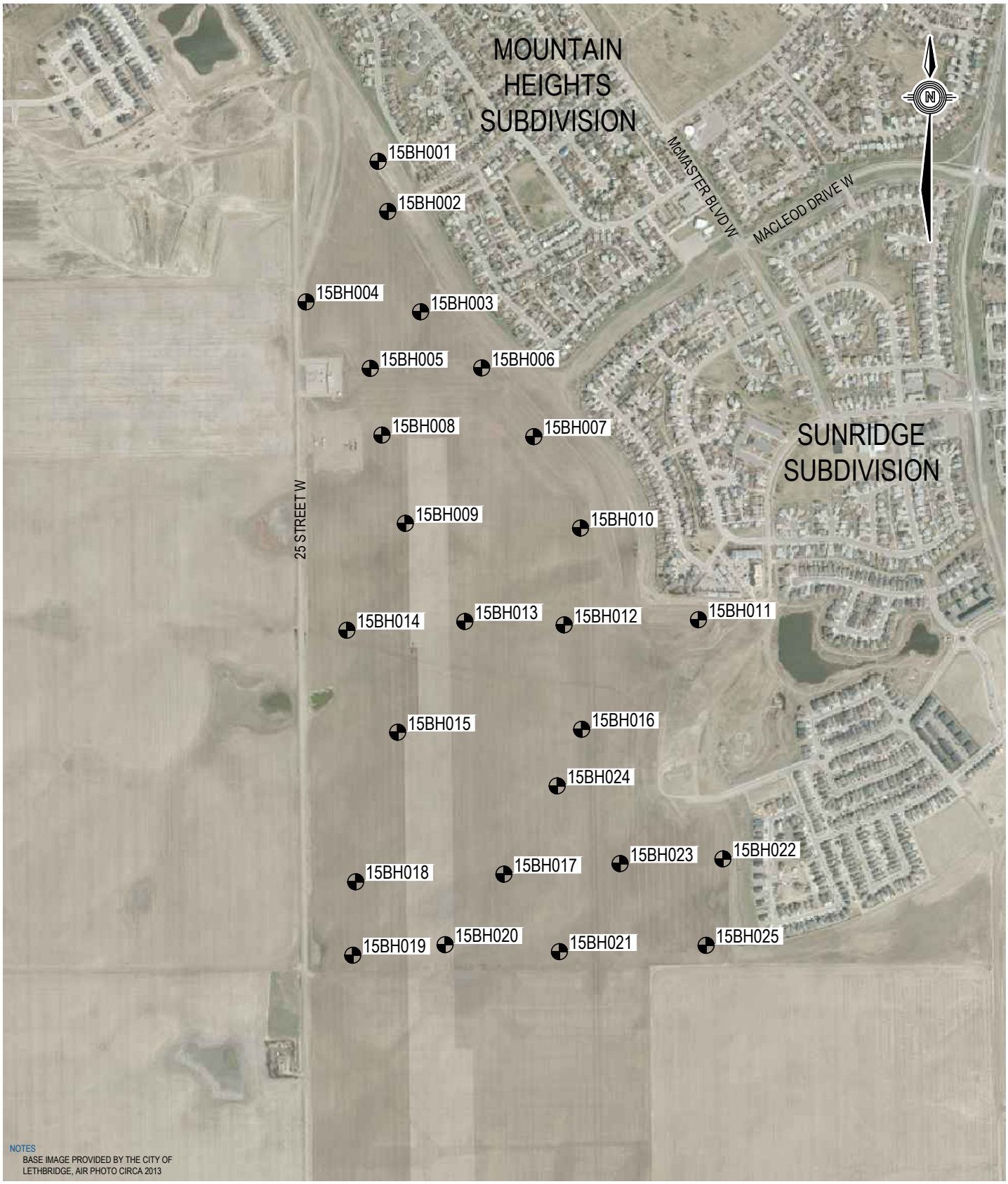
/tlp

FIGURES



NOTES
BASE IMAGE PROVIDED BY THE CITY OF LETHBRIDGE, AIR PHOTO CIRCA 2013

LEGEND

BOREHOLE LOCATION

0 500m

Scale: 1:12,500 @ 8.5"x11"

CLIENT

City of Lethbridge

GEOTECHNICAL EVALUATION
WATERBRIDGE SUBDIVISION OUTLINE PLAN

BOREHOLE LOCATION PLAN

TETRA TECH EBA

PROJECT NO.	DWN	CKD	REV
ENVIND03703-01-007	LCH	SS	0

OFFICE	DATE
LETHBRIDGE	April 2015

Figure 1

C:\Riverbend\Drafting\ENVIND\ENVIND03703\ENVIND03703-01 Figure 1.dwg [FIGURE 1] April 27, 2015 - 12:14:18 pm (BY: HUGHES, LEANNE)

APPENDIX A
GEOTECHNICAL REPORT - GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of Tetra Tech EBA’s Client. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Tetra Tech EBA’s Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

2.0 ALTERNATE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. Tetra Tech EBA’s instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, Tetra Tech EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. Tetra Tech EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of testholes and/or soil/rock exposures. Stratigraphy is known only at the locations of the testhole or exposure. Actual geology and stratigraphy between testholes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. Tetra Tech EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

8.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

9.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

10.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

11.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

12.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

13.0 SAMPLES

Tetra Tech EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

14.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B
BOREHOLE LOGS

TERMS USED ON BOREHOLE LOGS

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on 0.075mm sieve): Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as inferred from laboratory or in situ tests.

DESCRIPTIVE TERM	RELATIVE DENSITY	N (blows per 0.3m)
Very Loose	0 TO 20%	0 to 4
Loose	20 TO 40%	4 to 10
Compact	40 TO 75%	10 to 30
Dense	75 TO 90%	30 to 50
Very Dense	90 TO 100%	greater than 50

The number of blows, N, on a 51mm O.D. split spoon sampler of a 63.5kg weight falling 0.76m, required to drive the sampler a distance of 0.3m from 0.15m to 0.45m.

FINE GRAINED SOILS (major portion passing 0.075mm sieve): Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as estimated from laboratory or in situ tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH (KPA)
Very Soft	Less than 25
Soft	25 to 50
Firm	50 to 100
Stiff	100 to 200
Very Stiff	200 to 400
Hard	Greater than 400

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil.

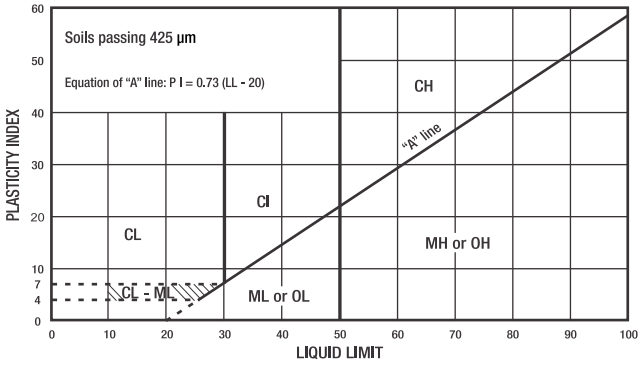
GENERAL DESCRIPTIVE TERMS

Slickensided - having inclined planes of weakness that are slick and glossy in appearance.
Fissured - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
Laminated - composed of thin layers of varying colour and texture.
Interbedded - composed of alternate layers of different soil types.
Calcareous - containing appreciable quantities of calcium carbonate.;
Well graded - having wide range in grain sizes and substantial amounts of intermediate particle sizes.
Poorly graded - predominantly of one grain size, or having a range of sizes with some intermediate size missing.

MODIFIED UNIFIED SOIL CLASSIFICATION

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA		
COARSE-GRAINED SOILS More than 50% retained on 75 µm sieve*	GRAVELS 50% or more of coarse fraction retained on 4.75 mm sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines. Less than 5% Pass 75 µm sieve; More than 12% Pass 75 µm sieve; 5% to 12% Pass 75 µm sieve. GW, GP, SW, SP GM, GC, SM, SC Borderline Classification requiring use of dual symbols	$C_U = D_{60} / D_{10}$ Greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW	
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits plot above "A" line or plasticity index greater than 7	
	SANDS More than 50% of coarse fraction passes 4.75 mm sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines		$C_U = D_{60}/D_{10}$ Greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW	
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above "A" line or plasticity index greater than 7	
FINE-GRAINED SOILS (by behavior) 50% or more passes 75 µm sieve*	SILTS Liquid limit <50		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands of slight plasticity	For classification of fine-grained soils and fine fraction of coarse-grained soils.		
	SILTS Liquid limit >50		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts			
	CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit <30		CL	Inorganic clays of low plasticity, gravelly clays, sandy clays, silty clays, lean clays			
	CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit 30-50		CI	Inorganic clays of medium plasticity, silty clays			
	CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit >50		CH	Inorganic clays of high plasticity, fat clays			
	ORGANIC SILTS AND CLAYS Liquid limit <50		OL	Organic silts and organic silty clays of low plasticity			
	ORGANIC SILTS AND CLAYS Liquid limit >50		OH	Organic clays of medium to high plasticity			
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils			

PLASTICITY CHART



*Based on the material passing the 75 mm sieve
Reference: ASTM Designation D2487, for identification procedure see D2488. USC as modified by PFRA

SOIL COMPONENTS

FRACTION	SIEVE SIZE PASSING	SIEVE SIZE RETAINED	DEFINING RANGES OF PERCENTAGE BY MASS OF MINOR COMPONENTS PERCENTAGE	DESCRIPTOR
GRAVEL			>35 %	"and"
coarse	75 mm	19 mm		
fine	19 mm	4.75 mm	21 to 35 %	"y-adjective"
SAND				
coarse	4.75 mm	2.00 mm	10 to 20 %	"some"
medium	2.00 mm	425 µm		
fine	425 µm	75 µm	>0 to 10 %	"trace"
SILT (non plastic) or CLAY (plastic)	75 µm		as above but by behavior	

OVERSIZE MATERIAL

Rounded or subrounded

COBBLES	75 mm to 300 mm
BOULDERS	> 300 mm

Not rounded

ROCK FRAGMENTS	>75 mm
ROCKS	> 0.76 cubic metre in volume

Tt_Modified Unified Soil Classification.cdr

TETRA TECH

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH001
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5503684, E - 80149	ELEVATION: 929.78 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					
	CLAY (FILL) - silty, some sand to sandy, moist, stiff, medium plastic, brown with dark brown mottling, oxide specks, roots and organics		B1		21.1	929.0
1	... very moist to wet, firm to stiff		B2		24.6	
			D1	8		928.0
2	... heavy organic staining		B3		22.1	
	... soft to firm, light brown with dark brown mottling, roots		B4		21.5	
3	4/6/2015		D2	4		927.0
	CLAY (TILL) - silty, sandy, trace gravel, very moist, stiff, medium plastic, brownish grey with grey mottling, coal and oxide specks		B5		20.1	926.0
4	... moist, trace gypsum crystals		B6		17	
			D3	10		925.0
5	... very stiff		B7			
			B8		17.5	924.0
6			D4	16		
			B9			923.0
7			B10		17.7	
			D5	24		922.0
8			B11			
	... oxide staining		B12		16.7	
9			D6	23		921.0
	End of Borehole @ 9.6 m					920.0
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Indicated Water Level Measured on April 6, 2015					919.0
11						
12						918.0

PLASTIC M.C. LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

4/6/2015

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH002
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5503453, E - 80212	ELEVATION: 929.28 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					929.0
	CLAY (FILL) - silty, sandy, very moist, firm to stiff, low to medium plastic, brown with dark brown mottling, oxide specks, roots and organics		B1		23.5	
1	... brown with grey mottling, trace oxide specks		B2		23.7	928.0
			D1	6	22.9	
2	4/6/2015		B3			927.0
	... trace gravel, medium grained sand pockets to 25 mm		B4		20.6	
	... coarse grained sand lenses to 50 mm					
3	SAND and GRAVEL (FILL) - silty, trace clay, well graded, sub angular, sizes to 25 mm, wet, compact, clay layers to 40 mm, trace free water		D2	19		926.0
			B5		13	
4			B6		16.1	925.0
	CLAY (TILL) - silty, sandy, some gravel to gravelly, moist, stiff, low plastic, brown, coal and oxide specks		D3	11		
5	... 200 mm sand lens		B7			924.0
	... trace gravel, coal chunks, brownish grey		B8		17.2	
	... soluble sulfate Content = 0.9% @ 5.5 m					
6						923.0
	... saturated sand lenses to 25 mm		D4	14		
	End of Borehole @ 6.6 m					
7	Seepage from 2.9 m, Minor Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.1 m Indicated Water Level Measured on April 6, 2015					922.0
8						921.0
9						920.0
10						919.0
11						918.0
12						

PLASTIC — M.C. — LIQUID (20 40 60 80)

STANDARD PENETRATION (N) ■ (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) ◆ (50 100 150 200)

POCKET PEN. (kPa) ▲ (100 200 300 400)

4/6/2015

TETRA TECH EBA

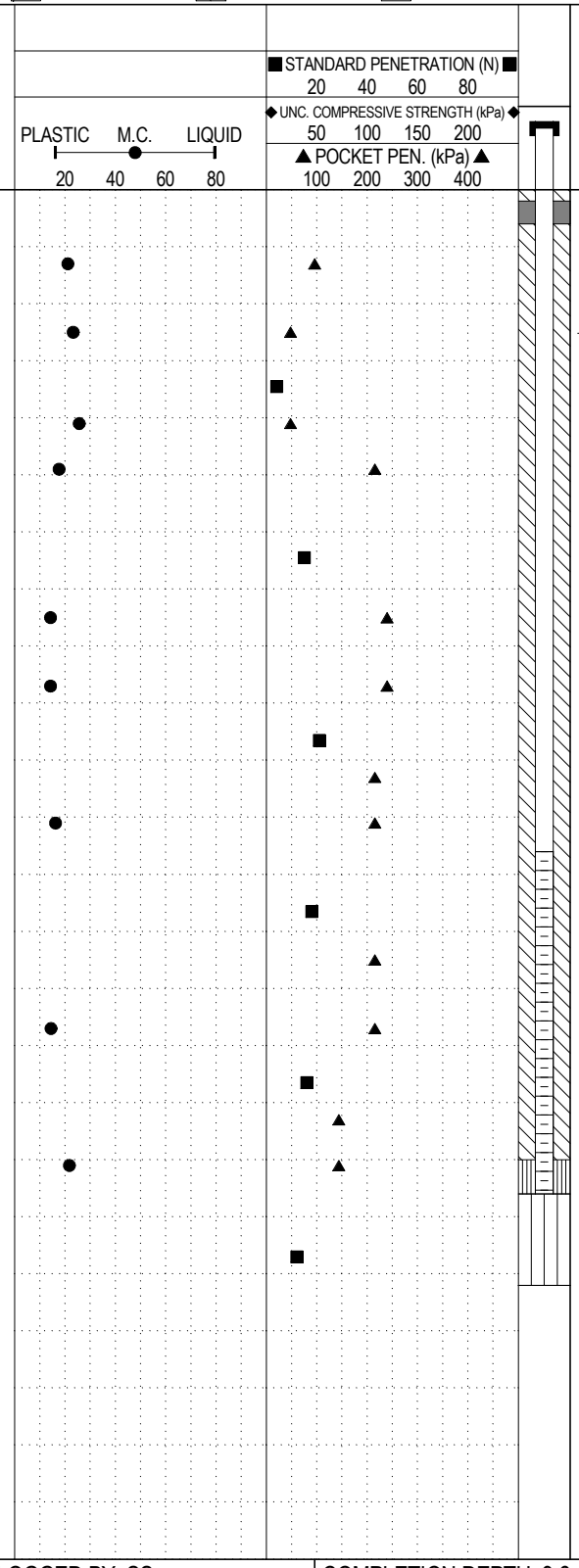
LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH003
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5503299, E - 80255	ELEVATION: 930 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					930.0
	CLAY (FILL) - silty, some sand to sandy, very moist, firm to stiff, low to medium plastic, dark brown, roots and organics		B1		21.1	
1	... soft to firm, brown with dark brown staining		B2		23.2	929.0
	4/6/2015		D1	4		4/6/2015
2	... 300 mm heavy organic and root layers, dark brown to black		B3		25.6	928.0
	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown with brownish grey mottling, coal and oxide specks, trace thin sand lenses, gypsum crystals		B4		17.6	
3			D2	15		927.0
	... sand and silt pockets, trace high plastic clay inclusions		B5		14.2	
4			B6		14.2	926.0
			D3	21		
5			B7			925.0
			B8		16.2	
6			D4	18		924.0
	... oxide staining		B9			
7			B10		14.4	923.0
			D5	16		
8	... trace sand, stiff, high plastic		B11			922.0
			B12		21.7	
9			D6	12		921.0
	End of Borehole @ 9.6 m					
10	No Seepage, Sloughing to 8.5 m Upon Completion Slotted PVC Standpipe Installed to 8.8 m Indicated Water Levels Measured on April 6, 2015					920.0
11						919.0
12						918.0



TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH004
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5503269, E - 80016	ELEVATION: 932.44 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					932.0
	CLAY (FILL) - silty, some sand, trace gravel, moist to very moist, firm to stiff, medium plastic, brown with dark brown mottling, oxide specks, roots and organics		B1		22	
1	CLAY - silty, some sand, very moist, firm, medium plastic, brown		B2		19.7	931.0
	CLAY (TILL) - silty, some sand, trace gravel, moist to very moist, stiff, medium plastic, brown, coal fragments, oxide specks, sand lenses with trace free water		D1	14		
2	... moist, very stiff, brown with grey mottling		B3		23.1	930.0
			B4		19.2	
3			D2	16		929.0
			B5		17.8	
4	... trace thin sand lenses					
	... trace to some sand, stiff, medium to high plastic		B6		21.2	928.0
5			D3	13		
			B7			927.0
			B8		21	
6	... some sand, very stiff, medium plastic					
			D4	19		926.0
	End of Borehole @ 6.6 m					
7	Seepage from 1.4 m, Minor Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.1 m Indicated Water Level Measured on April 6, 2015					925.0
8						924.0
9						923.0
10						922.0
11						921.0
12						

PLASTIC — M.C. — LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

4/6/2015

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH005
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5503068, E - 80201	ELEVATION: 930.44 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics				
	CLAY (FILL) - silty, some sand, trace gravel, very moist, stiff, medium plastic, dark brown with light brown mottling, roots and organics		B1		21
1	CLAY (TILL) - silty, some sand, trace gravel, moist to very moist, stiff, brown with brownish grey mottling, coal and oxide specks, trace silt and sand pockets		B2		18.5
	... precipitates		D1	14	
2	... trace to some sand, very stiff, medium to high plastic		B3		18.8
	... gypsum crystals		B4		22.2
3			D2	18	
	... trace sand, stiff to very stiff, high plastic		B5		24.4
4			B6		19.1
			D3	15	
5	... oxide staining		B7		
			B8		22.6
6	... some sand, moist, very stiff, medium plastic		D4	18	
			B9		
7			B10		15.7
			D5	19	
8			B11		
			B12		17.7
9			D6	16	
	End of Borehole @ 9.6 m				
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Indicated Water Level Measured on April 6, 2015				
11					
12					

PLASTIC M.C. LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

4/6/2015

Elevation (m)
930.0
929.0
928.0
927.0
926.0
925.0
924.0
923.0
922.0
921.0
920.0
919.0

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH006
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5503078, E - 80463	ELEVATION: 929.75 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					
	CLAY (FILL) - silty, some sand, very moist, firm to stiff, medium plastic, brown with dark brown mottling, oxide specks, roots and organics, trace silt lenses		B1		22.8	929.0
1	... firm, light brown with dark brown mottling		B2		23.6	
	4/6/2015		D1	12		928.0
2	CLAY (TILL) - silty, some sand, trace gravel, moist to very moist, stiff, medium plastic, brownish grey with brown mottling, coal and oxide specks, trace high plastic clay inclusions		B3		16	
	... moist, very stiff		B4		17.7	
3						927.0
	... gypsum crystals		D2	19		
			B5		15.6	926.0
4						
			B6		14.2	
			D3	20		925.0
5	... trace thin sand lenses		B7			
	... greyish brown, oxide staining		B8		14.3	924.0
6						
			D4	31		
	End of Borehole @ 6.6 m					923.0
7	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.6 m Indicated Water Level Measured on April 6, 2015					
8						922.0
9						921.0
10						920.0
11						919.0
12						918.0

PLASTIC — M.C. — LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

4/6/2015

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH007
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502941, E - 80578	ELEVATION: 931.33 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					931.0
	CLAY (TILL) - silty, some sand, trace gravel, moist to very moist, stiff, medium plastic, brown with greyish brown mottling, coal fragments, oxide specks, trace sand pockets		B1		19.7	
1			B2		19.9	930.0
			D1	10		
2	... moist, very stiff, greyish brown, oxide staining		B3		16.5	929.0
			B4		17.5	
3			D2	12		928.0
			B5		17.3	
4			B6		16.7	927.0
			D3	15		
5			B7			926.0
	... stiff to very stiff, brown with greyish brown mottling		B8		17.5	
6			D4	14		925.0
7	4/6/2015		B9			4/6/2015
			B10		15.4	924.0
	... very stiff		D5	16		
8			B11			923.0
			B12		16.8	
9			D6	18		922.0
	End of Borehole @ 9.6 m					
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Indicated Water Level Measured on April 6, 2015					921.0
11						920.0
12						

PLASTIC | M.C. | LIQUID (20 40 60 80)

STANDARD PENETRATION (N) ■ (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) ◆ (50 100 150 200)

POCKET PEN. (kPa) ▲ (100 200 300 400)

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH008
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502835, E - 80216	ELEVATION: 932.84 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					932.84
	CLAY (FILL) - silty, some sand, trace gravel, very moist, stiff, medium plastic, brown with dark brown mottling, coal and oxide specks, trace roots, trace organics		B1		26.2	
1	CLAY - silty, trace sand, moist, stiff, high plastic, brown with dark brown mottling		B2		20.4	932.0
			D1	10	34.7	
2	... trace coal and oxide specks		B3			931.0
	... gypsum crystals		B4		26.8	
3			D2	10		930.0
			B5		25.1	
4	CLAY (TILL) - silty, trace to some sand, trace gravel, moist, very stiff, medium to high plastic, brown with brownish grey mottling, coal and oxide specks, trace high plastic clay inclusions		B6		23.3	929.0
	... some sand, medium plastic		D3	15		928.0
5	... trace sand, high plastic		B7			
			B8		28	927.0
6			D4	16		
	End of Borehole @ 6.6 m					926.0
7	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.6 m Borehole Measured Dry on April 6, 2015					
8						925.0
9						924.0
10						923.0
11						922.0
12						921.0

PLASTIC M.C. LIQUID (20 40 60 80)

STANDARD PENETRATION (N) ■ (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) ◆ (50 100 150 200)

POCKET PEN. (kPa) ▲ (100 200 300 400)

TETRA TECH EBA

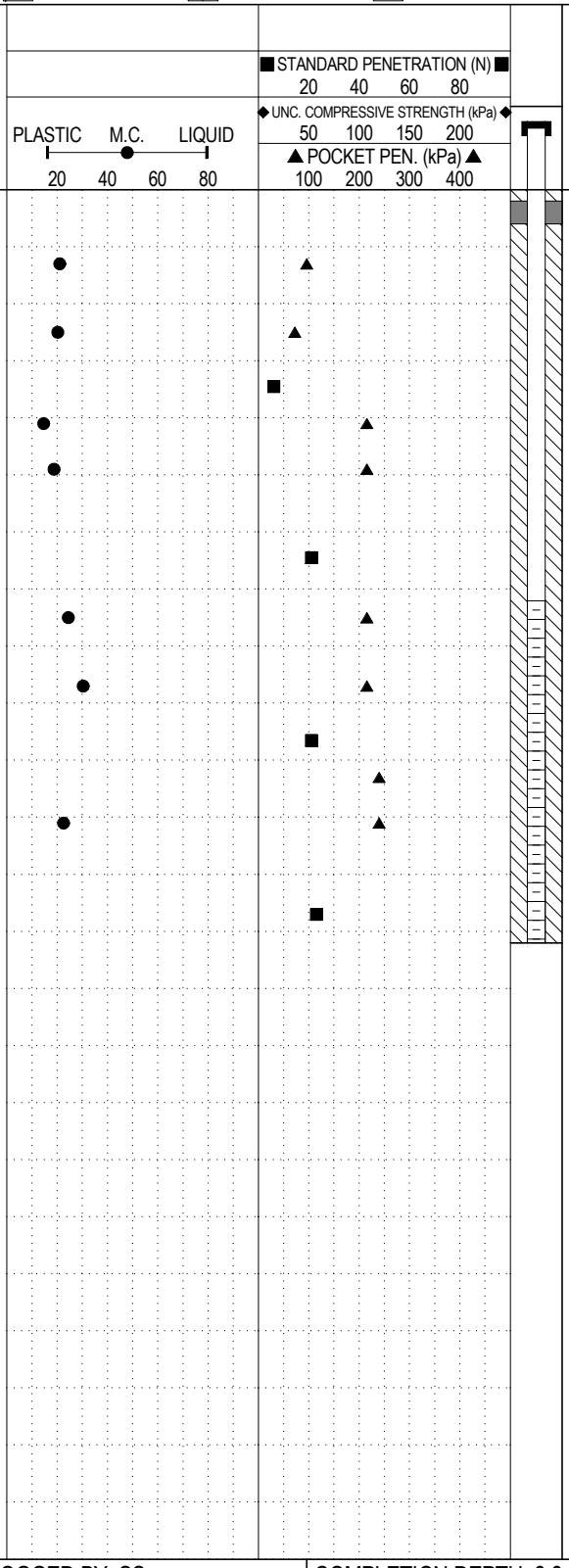
LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH009
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502744, E - 80160	ELEVATION: 934.62 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					934.0
	CLAY (FILL) - silty, some sand, moist to very moist, firm to stiff, medium plastic, brown with dark brown mottling, trace roots, trace organics		B1		21	
1	CLAY - silty, some sand, very moist, firm, medium plastic, brown with grey mottling, trace oxide specks		B2		20.2	933.0
	... trace coal specks		D1	6		
2	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown with grey mottling, coal and oxide specks, gypsum crystals, trace high plastic clay inclusions		B3		14.6	932.0
			B4		18.7	
3			D2	21		931.0
	... trace sand, high plastic inclusions		B5		24.4	
4			B6		30.3	930.0
			D3	21		
5			B7			
			B8		22.5	929.0
6			D4	23		
	End of Borehole @ 6.6 m					928.0
7	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.6 m Borehole Measured Dry on April 6, 2015					927.0
8						926.0
9						925.0
10						924.0
11						923.0
12						



TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH010
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502747, E - 80475	ELEVATION: 935.47 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					935.0
	CLAY (FILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brownish grey, trace roots, organics		B1		19.5	
1	CLAY - silty, some sand, moist, stiff, medium plastic, brownish grey		B2		16	934.0
			D1	14		
2	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brownish grey, coal and oxide specks, thin sand lenses, sand pockets		B3		13.4	
			B4		14.9	933.0
3			D2	20		
			B5		18.3	932.0
4			B6		16.5	
			D3	24		931.0
5			B7			
			B8		16.1	930.0
6			D4	24		
			B9			929.0
7			B10		16.5	
			D5	24		928.0
8	... silt pockets		B11			
			B12		16.6	927.0
9			D6	24		
	End of Borehole @ 9.6 m					926.0
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Borehole Measured Dry on April 6, 2015					925.0
11						
						924.0
12						

STANDARD PENETRATION (N) ■ 20 40 60 80

◆ UNC. COMPRESSIVE STRENGTH (kPa) ◆ 50 100 150 200

▲ POCKET PEN. (kPa) ▲ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH011
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502528, E - 80957	ELEVATION: 933.52 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	CLAY (FILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown with grey mottling, coal and oxide specks, trace organics					933.0
	CLAY (TILL) - silty, some sand, trace gravel, moist, medium plastic, greyish brown, coal and oxide specks, sand pockets		B1		19.1	
1	... trace precipitates		B2		17.8	932.0
			D1	14		
2	... gypsum crystals		B3		18	
			B4		16.6	931.0
3	... small coal fragments, oxide staining		D2	14		
			B5		17.4	930.0
4			B6		19	
			D3	12		929.0
5	... high plastic clay inclusions		B7			
			B8		15.3	928.0
6			D4	14		
			B9			927.0
7	... very stiff, brownish grey, oxide staining		B10		17.2	
			D5	18		926.0
8			B11			
			B12		17.7	925.0
9	... Soluble Sulfate Content = 0.1% @ 8.5 m					
			D6	22		924.0
	End of Borehole @ 9.6 m					
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Indicated Water Level Measured on April 6, 2015					923.0
11						922.0
12						

PLASTIC M.C. LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

4/6/2015

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH012
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502526, E - 80666	ELEVATION: 933.43 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					933.0
	CLAY - silty, some sand, moist, stiff, medium plastic, brown, trace roots		B1		19.1	
1			B2		22	932.0
	... trace sand, high plastic		D1	10		
2			B3		23.6	931.0
	CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown, coal and oxide specks, sand lenses		B4		16	
3			D2	11		930.0
			B5		17.3	
4			B6		17.6	929.0
			D3	13		
5	... very stiff		B7			928.0
			B8		17.7	
6			D4	18		927.0
	End of Borehole @ 6.6 m					
7	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.6 m Indicated Water Level Measured on April 6, 2015					926.0
8						925.0
9						924.0
10						923.0
11						922.0
12						

4/6/2015

PLASTIC — M.C. — LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH013
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502523, E - 80317	ELEVATION: 934.66 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					934.0
	CLAY (FILL) - silty, trace to some sand, trace gravel, moist, stiff, medium plastic, brown with dark brown mottling, roots, trace organics, coal and oxide specks		B1		18.9	
1	... white precipitates		B2		13.9	933.0
	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown with brownish grey mottling, coal and oxide specks, sand pockets, white precipitates		D1	18		
2			B3		17.5	932.0
			B4		20.8	
3	... trace sand, stiff, high plastic		D2	14		931.0
			B5		22.7	
4			B6		22.7	930.0
			D3	10		
5			B7			929.0
			B8		25	
6			D4	12		928.0
	End of Borehole @ 6.6 m					
7	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.6 m Borehole Measured Dry on April 6, 2015					927.0
8						
9						926.0
10						925.0
11						924.0
12						923.0

PLASTIC M.C. LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH014
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502521, E - 80033	ELEVATION: 934.59 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					934.0
1	CLAY (FILL) - silty, some sand, very moist to wet, firm to stiff, medium plastic, brown with dark brown mottling, roots, organics		B1		23.7	
	... wet, soft to firm, medium plastic, dark brown to black, organics		B2		38.5	
2	4/6/2015		D1	5		933.0
			B3		26.9	
	CLAY - silty, some sand,wet, firm to stiff, medium plastic, light brownish grey with brown mottling		B4		29.5	932.0
3			D2	9		
	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brownish grey, coal and oxide specks, trace sand pockets		B5		14.9	931.0
4			B6		14.6	
			D3	16		930.0
5	... trace to some sand, medium to high plastic		B7			
			B8		13.5	929.0
6			D4	23		
	... some sand, medium plastic		B9			928.0
7			B10		27.9	
	... trace sand, high plastic		D5	18		927.0
8			B11			
			B12		20.8	926.0
9			D6	20		
	End of Borehole @ 9.6 m					925.0
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Indicated Water Levels Measured on April 6, 2015					924.0
11						923.0
12						

PLASTIC M.C. LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

4/6/2015

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH015
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502265, E - 80060	ELEVATION: 934.53 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					934.0
	CLAY (FILL) - silty, some sand, trace gravel, moist, stiff to very stiff, medium plastic, brown with dark brown, coal and oxide specks, roots, trace organics		B1		16.6	
1	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown with greyish brown mottling, coal and oxide specks		B2		16.5	933.0
	... precipitates		D1	24		
2	... Soluble Sulfate Content = 1.5% @ 2.0 m		B3		14.8	
	... trace high plastic clay inclusions		B4		16.3	932.0
3	▼ 4/6/2015					
	... gypsum crystals		D2	26		931.0
	... trace to some sand, medium to high plastic		B5		19.3	
4						
	... some sand, medium plastic, sand lenses		B6		19	930.0
	... trace sand, moist to very moist, high plastic, stiff		D3	12		
5			B7			
	... some sand, moist, medium plastic, very stiff, brownish grey with grey mottling, oxide staining		B8		16.3	929.0
6			D4	23		928.0
			B9			
7			B10			927.0
	... very stiff to hard, brownish grey		D5	30	14.3	
8			B11			
	... hard		B12		14	926.0
9			D6	34		925.0
	End of Borehole @ 9.6 m					
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Indicated Water Level Measured on April 6, 2015					924.0
11						923.0
12						

PLASTIC — M.C. — LIQUID (20 40 60 80)

STANDARD PENETRATION (N) ■ (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) ◆ (50 100 150 200)

POCKET PEN. (kPa) ▲ (100 200 300 400)

▼ 4/6/2015

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH016
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502274, E - 80349	ELEVATION: 938.3 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					938.0
	CLAY (FILL) - silty, trace to some sand, trace gravel, moist, stiff, medium to high plastic, brown with dark brown mottling, trace roots and organics		B1		17.2	
1	CLAY (TILL) - silty, trace to some sand, trace gravel, moist, very stiff, medium to high plastic, brown with brownish grey mottling, coal and oxide specks, silt and sand pockets		B2		22.9	937.0
			D1	18		
2			B3		21.8	936.0
	... trace sand, high plastic		B4		23.8	
3			D2	18		935.0
			B5		23	
4			B6		25.4	934.0
	... moist to very moist, stiff		D3	12		
5			B7			933.0
			B8		23.5	
6			D4	14		932.0
	End of Borehole @ 6.6 m					
7	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.6 m Borehole Measured Dry on April 6, 2015					931.0
8						930.0
9						929.0
10						928.0
11						927.0
12						

PLASTIC — M.C. — LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH017
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5501978, E - 80373	ELEVATION: 936.69 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					
	CLAY (FILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown with dark brown mottling, oxide specks, trace roots and organics		B1		17.8	936.0
1	CLAY (TILL) - silty, some sand, trace gravel, moist, stiff to very stiff, medium plastic, brown with greyish brown mottling, coal and oxide specks, sand pockets		B2		15.6	
			D1	16		935.0
2	... very stiff, gypsum crystals		B3		16.4	
	... high plastic clay inclusions to 50 mm		B4		23.8	934.0
3			D2	18		
			B5		24.5	933.0
4			B6		15	
	... trace sand, stiff to very stiff, high plastic		D3	16		932.0
5			B7			
			B8		16.5	931.0
6			D4	17		
	... some sand, very stiff, medium plastic, interbedded high plastic clay layers to 100 mm		B9			930.0
7			B10		18.9	
	... greyish brown, oxide staining		D5	22		929.0
8			B11			
			B12		17.8	928.0
9			D6	22		
	End of Borehole @ 9.6					927.0
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Indicated Water Level Measured on April 6, 2015					926.0
11						925.0
12						

4/6/2015

PLASTIC M.C. LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH018
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5501977, E - 80128	ELEVATION: 935.52 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	PLASTIC / M.C. / LIQUID (20 40 60 80)	STANDARD PENETRATION (N) 20 40 60 80 / UNC. COMPRESSIVE STRENGTH (kPa) 50 100 150 200 / POCKET PEN. (kPa) 100 200 300 400	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics							935.0
1	CLAY (FILL) - silty, some sand, very moist, firm to stiff, medium plastic, brown with dark brown mottling, trace roots and organics		B1		24.4			
	... soft to firm, light brownish grey with dark brown mottling, heavy organic staining		B2		23			934.0
2			D1	5				
			B3		25.9			
	CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brownish grey, coal and oxide specks		B4		15.3			933.0
3			D2	13				
			B5		16.8			932.0
4			B6		16.7			
	... stiff to very stiff		D3	15				931.0
5			B7					
	... very stiff		B8		15.8			930.0
6			D4	17				929.0
	End of Borehole @ 6.6 m							
7	Seepage from 1.1 m, Minor Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.1 m Indicated Water Levels Measured on April 6, 2015							928.0
8								927.0
9								926.0
10								925.0
11								924.0
12								

4/6/2015

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH019
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5501712, E - 80147	ELEVATION: 940.31 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					940.0
	CLAY (FILL) - silty, some sand, very moist, stiff, medium plastic, brown with dark brown mottling, trace roots, organics, precipitates, trace oxide specks		B1		23.5	
1	CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown with brownish grey mottling, coal and oxide specks, sand pockets		B2		16.2	939.0
	... white precipitates		D1	14		
2	... stiff to very stiff, silt pockets, gypsum crystals		B3		20.8	938.0
			B4		18.4	
3			D2	15		937.0
			B5		16.8	
4	... trace to some sand, very stiff, medium to high plastic		B6		23.8	936.0
			D3	17		
5			B7			935.0
			B8		23.1	
6			D4	24		934.0
	... some sand, medium plastic		B9			
7			B10		16.7	933.0
			D5	26		
8	... coal staining		B11			932.0
			B12		16.9	
9 ▼ 4/6/2015			D6	25		▼ 4/6/2015 931.0
	End of Borehole @ 9.6 m					
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Indicated Water Levels Measured on April 6, 2015					930.0
11						929.0
12						

PLASTIC M.C. LIQUID (20 40 60 80)

STANDARD PENETRATION (N) ■ (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) ◆ (50 100 150 200)

POCKET PEN. (kPa) ▲ (100 200 300 400)

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH020
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5501716, E - 80306	ELEVATION: 933.86 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					933.0
	CLAY (FILL) - silty, some sand, very moist, stiff, medium plastic, brown with light brownish grey mottling, trace roots and organics		B1		26	
1 ▼ 4/6/2015	CLAY (TILL) - silty, some sand, trace gravel, very moist, stiff, medium plastic, brown with dark brownish grey mottling, coal and oxide specks, sand pockets		B2		20.6	932.0
			D1	18		
2	... moist, very stiff		B3		16.2	
	... high plastic clay inclusions		B4		14	931.0
3			D2	29		
			B5		17.3	930.0
4	... very moist		B6		15	
			D3	17		929.0
5			B7			
			B8		16.9	928.0
6			D4	19		
	End of Borehole @ 6.6 m					927.0
7	No Seepage or Sloughing Upon Completion Slotted 25 mm VC Standpipe Installed to 6.6 m Indicated Water Levels Measured on April 6, 2015					
8						926.0
9						925.0
10						924.0
11						923.0
12						922.0

PLASTIC M.C. LIQUID: 20 40 60 80

STANDARD PENETRATION (N): 20 40 60 80

UNC. COMPRESSIVE STRENGTH (kPa): 50 100 150 200

POCKET PEN. (kPa): 100 200 300 400

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH021
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5501737, E - 80563	ELEVATION: 934.58 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					934.0
	CLAY (FILL) - silty, some sand, very moist, firm to stiff, medium platic, light brownish grey with dark brown mottling		B1		27	
1	CLAY - silty, some sand, very moist, firm to stiff, medium plastic, light brownish grey		B2		24.3	933.0
			D1	8		
2	CLAY (TILL) - silty, some sand, trace gravel, moist to very moist, very stiff, medium plastic, greyish brown, coal and oxide specks, gypsum crystals, trace small and pockets		B3		16.1	932.0
			B4		15.6	
3			D2	19		931.0
			B5		15.8	
4	... trace to some sand, medium to high plastic,		B6		16.9	930.0
			D3	20		
5			B7			
			B8		20.1	929.0
6			D4	18		
			B9			928.0
7			B10		26.3	
	... hard		D5	44		927.0
8			B11			
			B12		24.2	926.0
9			D6	31		
	End of Borehole @ 9.6					925.0
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Borehole Measured Dry on April 6, 2015					924.0
11						923.0
12						

PLASTIC M.C. LIQUID (20 40 60 80)

STANDARD PENETRATION (N) (20 40 60 80)

UNC. COMPRESSIVE STRENGTH (kPa) (50 100 150 200)

POCKET PEN. (kPa) (100 200 300 400)

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH022
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502002, E - 80987	ELEVATION: 936.59 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					
	CLAY (FILL) - silty, some sand, moist, firm to stiff, medium plastic, brown with dark brown mottling, trace roots, trace organics, trace oxide specks		B1		19.8	936.0
1	CLAY - silty, some sand, moist to very moist, firm, greyish brown		B2		20.2	
			D1	6		935.0
2	CLAY (TILL) - silty, some sand, trace gravel, moist to very moist, stiff, medium plastic, brown with grey mottling, coal and oxide specks, thin sand lenses and pockets		B3		21.9	
			B4		15.4	934.0
3			D2	10		
	... high plastic clay inclusions		B5		21.9	933.0
4						
	... very stiff, brownish grey, oxide staining		B6		14	932.0
			D3	16		
5	... trace sand, high plastic		B7			
			B8		27	931.0
6						
			D4	18		930.0
7			B9			
			B10		25.3	929.0
8			D5	20		
			B11			
	... some sand, stiff, medium plastic		B12		22.8	928.0
9						
			D6	13		927.0
	End of Borehole @ 9.6 m					
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Borehole Measured Dry on April 6, 2015					926.0
11						
						925.0
12						

STANDARD PENETRATION (N) ■ 20 40 60 80

◆ UNC. COMPRESSIVE STRENGTH (kPa) ◆ 50 100 150 200

▲ POCKET PEN. (kPa) ▲ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH023
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5501990, E - 80692	ELEVATION: 933.49 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					933.0
	CLAY (FILL) - silty, some sand, moist, stiff, medium plastic, brown with dark brown, trace roots, trace organics, trace oxide specks		B1		20.3	
1	... very moist, soft to firm, light brown with dark brown mottling, heavy organic staining, roots		B2		23.3	932.0
			D1	4		
2	4/6/2015		B3		25.2	4/6/2015
			B4		20.8	931.0
	CLAY (TILL) - silty, some sand, trace gravel, moist, stiff to very stiff, medium plastic, brown with brownish grey mottling, coal and oxide specks					
3			D2	16		930.0
	... stiff		B5		15.6	
4			B6		16.4	929.0
			D3	11		
5			B7			
	... stiff to very stiff		B8		15	928.0
6			D4	15		927.0
	End of Borehole @ 6.6					
7	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.6 m Indicated Water Levels Measured on April 6, 2015					926.0
8						925.0
9						924.0
10						923.0
11						922.0
12						

STANDARD PENETRATION (N) ■ 20 40 60 80

◆ UNC. COMPRESSIVE STRENGTH (kPa) ◆ 50 100 150 200

▲ POCKET PEN. (kPa) ▲ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH024
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5502188, E - 80729	ELEVATION: 933.39 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	CLAY (FILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown with dark brown mottling, trace roots and organics					933.0
			B1		16.5	
1	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown with dark brownish grey mottling, coal and oxide specks, sand pockets		B2		13.6	932.0
	... trace sand, stiff, high plastic		D1	11		
2			B3		27.2	
	... trace to some sand, very stiff, medium to high plastic		B4		20.5	931.0
3			D2	18		
			B5		26.8	930.0
4			B6		22.9	
	... stiff to very stiff		D3	15		929.0
5			B7			
	... very stiff		B8		25.9	928.0
6			D4	17		
			B9			927.0
7	... trace sand, stiff, high plastic		B10		25.3	
			D5	12		926.0
8			B11			
			B12		27.1	925.0
9			D6	13		
	End of Borehole @ 9.6 m					924.0
10	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 9.6 m Indicated Water Levels Measured on April 6, 2015					923.0
11						922.0
12						

PLASTIC M.C. LIQUID (20 40 60 80)

STANDARD PENETRATION (N) ■ (20 40 60 80)

◆ UNC. COMPRESSIVE STRENGTH (kPa) ◆ (50 100 150 200)

▲ POCKET PEN. (kPa) ▲ (100 200 300 400)

4/6/2015

4/6/2015

TETRA TECH EBA

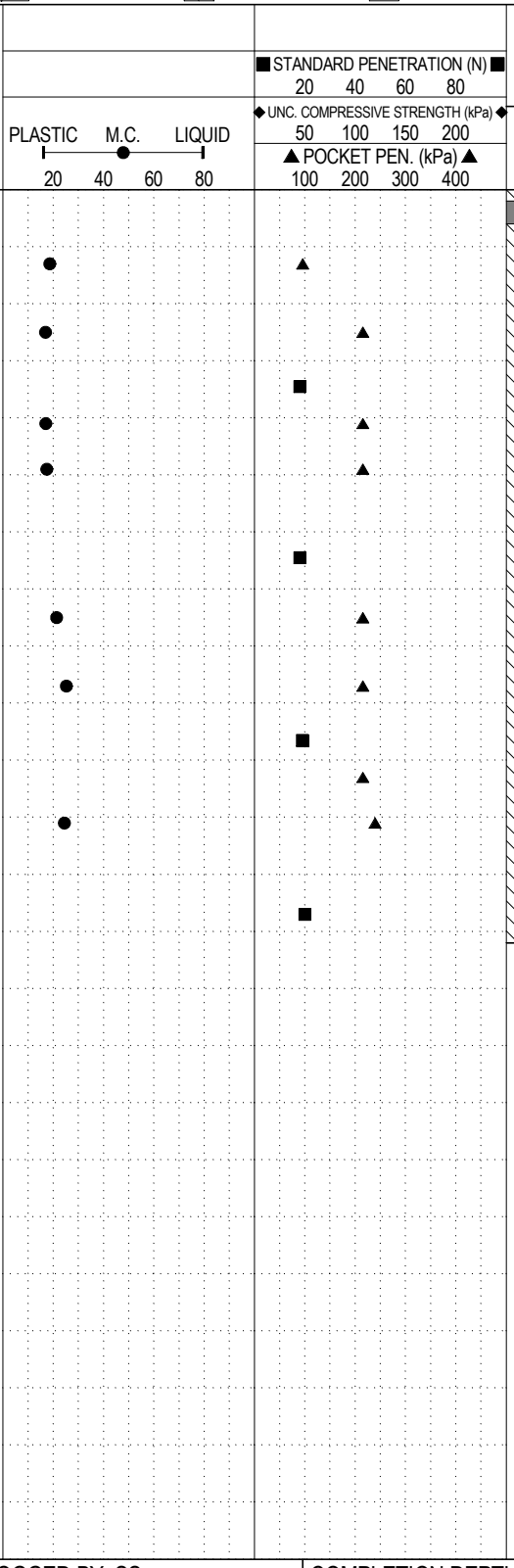
LOGGED BY: SS	COMPLETION DEPTH: 9.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

PROJECT: WATERBRIDGE SUBDIVISION	CLIENT: CITY OF LETHBRIDGE	BOREHOLE NO: 15BH025
LOCATION: 23-08-22-W4 & 14-08-22-W4	DRILL METHOD: 150mm SOLID STEM AUGER	PROJECT: ENVIND03703-01
CITY: LETHBRIDGE, AB	N - 5501715, E - 80993	ELEVATION: 935.41 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SPT (N)	MOISTURE CONTENT	Elevation (m)
0	TOPSOIL - clay, sandy, silty, moist, dark brown, roots, organics					935.0
	CLAY (FILL) - silty, some sand, moist, firm to stiff, medium plastic, brown with dark brown, trace roots, trace organics		B1		18.6	
1			B2		16.9	934.0
	CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brownish grey, coal and oxide specks, sand pockets		D1	18		
2	... gypsum crystals		B3		17	933.0
	... silt pockets, coal staining		B4		17.4	
3	... trace sand, high plastic, brown with dark brownish grey mottling		D2	18		932.0
			B5		21.3	
4			B6		25.2	931.0
			D3	19		
5	... greyish brown with brown mottling, oxide staining		B7			930.0
			B8		24.4	
6			D4	20		929.0
	End of Borehole @ 6.6 m					
7	No Seepage or Sloughing Upon Completion Slotted PVC Standpipe Installed to 6.6 m Borehole Measured Dry on April 6, 2015					928.0
8						927.0
9						926.0
10						925.0
11						924.0
12						



TETRA TECH EBA

LOGGED BY: SS	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JZ	COMPLETE: 3/31/2015
DRAWING NO: B1	Page 1 of 1

APPENDIX C

RECOMMENDED GENERAL DESIGN AND CONSTRUCTION GUIDELINES

SHALLOW FOUNDATIONS

Design and construction of shallow foundations should comply with relevant Building Code requirements.

The term ‘shallow foundations’ includes strip and spread footings, mat slab and raft foundations.

Minimum footing dimensions in plan should be 0.45 m and 0.9 m for strip and square footings respectively.

No loose, disturbed or sloughed material should be allowed to remain in open foundation excavations. Hand cleaning should be undertaken to prepare an acceptable bearing surface. Recompaction of disturbed or loosened bearing surface may be required.

Foundation excavations and bearing surfaces should be protected from rain, snow, freezing temperatures, excessive drying and the ingress of free water before, during and after footing construction.

Footing excavations should be carried down into the designated bearing stratum.

After the bearing surface is approved, a mud slab should be poured to protect the soil and provide a working surface for construction, should immediate foundation construction not be intended.

All constructed foundations should be placed on unfrozen soils, which should be at all times protected from frost penetration.

All foundation excavations and bearing surfaces should be inspected by a qualified geotechnical engineer to check that the recommendations contained in this report have been followed.

Where over-excavation has been carried out through a weak or unsuitable stratum to reach into a suitable bearing stratum or where a foundation pad is to be placed above stripped natural ground surface such over-excavation may be backfilled to subgrade elevation utilizing either structural fill or lean-mix concrete. These materials are defined under the separate heading ‘Backfill Materials and Compaction’.

FLOOR SLABS-ON-GRADE

All soft, loose or organic material should be removed from beneath slab areas. If any local 'hard spots' such as old basement walls are revealed beneath the slab area, these should be over-excavated and removed to not less than 0.9 m below underside of slab level. The exposed soil should be proof-rolled and the final grade restored by general engineered fill placement. If proof-rolling reveals any soft or loose spots, these should be excavated and the desired grade restored by general engineered fill placement. Proof-rolling should be carried out in accordance with the recommendations given elsewhere in this Appendix. The subgrade should be compacted to a depth of not less than 0.3 m to a density of not less than 98 percent Standard Proctor Maximum Dry Density (ASTM Test Method D698).

If, for economic reasons, it is considered desirable to leave low quality material in-place beneath a slab-on-grade, special ground treatment procedures may be considered, Tetra Tech EBA could provide additional advice on this aspect if required.

A levelling course of 20 mm crushed gravel at least 150 mm in compacted thickness, is recommended directly beneath all slabs-on-grade. Alternatively a minimum thickness of 150 mm of pit-run gravel overlain by a minimum thickness of 50 mm of 20 mm crushed gravel may be used. Very coarse material (larger than 25 mm diameter) should be avoided directly beneath the slab-on-grade to limit potential stress concentrations within the slab. All levelling courses directly under floor slabs should be compacted to 100 percent of Standard Proctor maximum dry density.

General engineered fill, pit-run gravel and crushed gravel are defined under the heading 'Backfill Materials and Compaction' elsewhere in this Appendix.

The slab should be structurally independent from walls and columns supported on foundations. This is to reduce any structural distress that may occur as a result of differential soil movements. If it is intended to place any internal non-load bearing partition walls directly on a slab-on-grade, such walls should also be structurally independent from other elements of the building founded on a conventional foundation system so that some relative vertical movement of the walls can occur freely.

The excavated subgrade beneath slabs-on-grade should be protected at all times from rain, snow, freezing temperatures, excessive drying and the ingress of free water. This applies during and after the construction period.

A minimum slab concrete thickness of 100 mm is recommended. Control joints should be provided in all slabs. Typically for a 125 mm slab thickness; control joints should be placed on a 3 m square grid, should be sawn to a depth of one-quarter the slab thickness and have a width of approximately 3 mm.

Wire mesh reinforcement, 150 mm square grid, should be provided to reduce the possibility of uncontrolled slab cracking. The mesh should be adequately supported and should be located at mid-height of the slab with adequate cover.

CONSTRUCTION EXCAVATIONS

Construction should be in accordance with good practice and comply with the requirements of the responsible regulatory agencies.

All excavations greater than 1.5 m deep should be sloped or shored for worker protection.

Shallow excavations up to about 3 m depth may use temporary sideslopes of 1H:1V. A flatter slope of 2H:1V should be used if groundwater is encountered. Localized sloughing can be expected from these slopes.

Deep excavations or trenches may require temporary support if space limitations or economic considerations preclude the use of sloped excavations.

For excavations greater than 3 m depth, temporary support should be designed by a qualified geotechnical engineer. The design and proposed installation and construction procedures should be submitted to Tetra Tech EBA for review.

The construction of a temporary support system should be monitored. Detailed records should be taken of installation methods, materials, in situ conditions and the movement of the system. If anchors are used, they should be load tested. Tetra Tech EBA can provide further information on monitoring and testing procedures if required.

Attention should be paid to structures or buried service lines close to the excavation. For structures, a general guideline is that if a line projected down, at 45 degrees from the horizontal from the base of foundations of adjacent structures intersects the extent of the proposed excavation, these structures may require underpinning or special shoring techniques to avoid damaging earth movements. The need for any underpinning or special shoring techniques and the scope of monitoring required can be determined when details of the service ducts and vaults, foundation configuration of existing buildings and final design excavation levels are known.

No surface surcharges should be placed closer to the edge of the excavation than a distance equal to the depth of the excavation, unless the excavation support system has been designed to accommodate such surcharge.

BACKFILL MATERIALS AND COMPACTION (ALBERTA)

1.0 DEFINITIONS

“Landscape fill” is typically used in areas such as berms and grassed areas where settlement of the fill and noticeable surface subsidence can be tolerated. “Landscape fill” may comprise soils without regard to engineering quality.

“General engineered fill” is typically used in areas where a moderate potential for subgrade movement is tolerable, such as asphalt (i.e., flexible) pavement areas. “General engineered fill” should comprise clean, inorganic granular or clay soils.

“Select engineered fill” is typically used below slabs-on-grade or where high volumetric stability is desired, such as within the footprint of a building. “Select engineered fill” should comprise clean, well-graded granular soils or inorganic low to medium plastic clay soils.

“Structural engineered fill” is used for supporting structural loads in conjunction with shallow foundations. “Structural engineered fill” should comprise clean, well-graded inorganic granular soils.

“Lean-mix concrete” is typically used to protect a subgrade from weather effects including excessive drying or wetting. “Lean-mix concrete” can also be used to provide a stable working platform over weak subgrades. “Lean-mix concrete” should be low strength concrete having a minimum 28-day compressive strength of 3.5 MPa.

Standard Proctor Density (SPD) as used herein means Standard Proctor Maximum Dry Density (ASTM Test Method D698). Optimum moisture content is defined in ASTM Test Method D698.

2.0 GENERAL BACKFILL AND COMPACTION RECOMMENDATIONS

Backfill adjacent to and above footings, abutment walls, basement walls, grade beams and pile caps or below highway, street or parking lot pavement sections should comprise “general engineered fill” materials as defined above.

Exterior backfill adjacent to footings, foundation walls, grade beams and pile caps and within 600 mm of final grade should comprise inorganic, cohesive “general engineered fill”. Such backfill should provide a relatively impervious surface layer to reduce seepage into the subsoil.

Backfill should not be placed against a foundation structure until the structure has sufficient strength to withstand the earth pressures resulting from placement and compaction. During compaction, careful observation of the foundation wall for deflection should be carried out continuously. Where deflections are apparent, the compactive effort should be reduced accordingly.

In order to reduce potential compaction induced stresses, only hand held compaction equipment should be used in the compaction of fill within 1 m of retaining walls or basement walls.

All lumps of materials should be broken down during placement. Backfill materials should not be placed in a frozen state, or placed on a frozen subgrade.

Where the maximum-sized particles in any backfill material exceed 50 percent of the minimum dimension of the cross-section to be backfilled (e.g., lift thickness), such particles should be removed and placed at other more suitable locations on-site or screened off prior to delivery to site.

Bonding should be provided between backfill lifts, if the previous lift has become desiccated. For fine-grained materials the previous lift should be scarified to the base of the desiccated layer, moisture-conditioned and recompacted and bonded thoroughly to the succeeding lift. For granular materials, the surface of the previous lift should be scarified to about a 75 mm depth followed by proper moisture-conditioning and recompaction.

3.0 COMPACTION AND MOISTURE CONDITIONING

“Landscape fill” material should be placed in compacted lifts not exceeding 300 mm and compacted to a density of not less than 90 percent of SPD.

“General engineered fill” and “select engineered fill” materials should be placed in layers of 150 mm compacted thickness and should be compacted to not less than 98 percent of SPD. Note that higher compaction levels may be specified within 300 mm of the design elevation. Cohesive materials placed as “general engineered fill” or “select engineered fill” should be compacted at 0 to 2 percent above the optimum moisture content. Granular materials placed as “general engineered fill” or “select engineered fill” should be compacted at slightly below the optimum moisture content.

“Structural engineered fill” material should be placed in compacted lifts not exceeding 150 mm in thickness and compacted to not less than 100 percent of SPD at slightly below the optimum moisture content.

4.0 “GENERAL ENGINEERED FILL” SPECIFICATIONS

Low to high plastic clay is considered acceptable for use as “general engineered fill,” assuming this material is inorganic and free of deleterious materials.

Materials meeting the specifications for “select engineered fill” or “structural engineered fill” as described below would also be acceptable for use as “general engineered fill.”

5.0 “SELECT ENGINEERED FILL” SPECIFICATIONS

Low to medium plastic clay with the following range of plasticity properties is generally considered suitable for use as “select engineered fill”:

Liquid Limit	= 20 to 40%
Plastic Limit	= 10 to 20%
Plasticity Index	= 10 to 30%

"Pit-run gravel" and "fill sand" that meet the following specifications are generally considered acceptable for use as "select engineered fill."

Granular "Select Engineered Fill" – Percent Passing by Weight

Sieve Size	Pit-run Gravel (AT D6-C80)	Fill Sand
80 mm	100	--
50 mm	55 – 100	--
25 mm	38 – 100	100
16 mm	32 – 85	--
5.0 mm	20 – 65	75 – 100
630 μm	--	45 – 80
315 μm	6 – 30	--
80 μm	2 – 10	2 – 10

The "pit-run gravel" should be free of any form of coating and any gravel or sand containing clay, loam or other deleterious materials should be rejected. No oversize material should be tolerated.

The materials above are also suitable for use as "general engineered fill."

6.0 "STRUCTURAL ENGINEERED FILL" SPECIFICATIONS

Crushed gravel used as "structural engineered fill" should be hard, clean, well graded, crushed aggregate, free of organics, coal, clay lumps, coatings of clay, silt and other deleterious materials. The aggregates should conform to the following gradation requirement when tested in accordance with ASTM C136:

"Structural Engineered Fill" – Percent Passing by Weight

Sieve Size	20 mm Crush (AT D2-C20)	40 mm Crush (AT D2-C40)
40 mm		100
25 mm		70 – 94
20 mm	100	--
16 mm	84 – 94	55 – 85
10 mm	63 – 86	44 – 74
5.0 mm	40 – 67	32 – 62
1.25 mm	20 – 43	17 – 43
630 μm	14 – 34	12 – 34
315 μm	9 – 26	8 – 26
160 μm	5 – 18	5 – 18
80 μm	2 – 10	2 – 10

In addition to the above grading limits, the following criteria should be met:

"Structural Engineered Fill" – Additional Material Properties

Material Type	Percentage of Material Retained on 5 mm Sieve having Two or More Fractured Faces	Plasticity Index (<400 μm)	L.A. Abrasion Loss (percent Mass)
20 mm Crush	60 min	6 max	50 max
40 mm Crush	50 min	6 max	50 max

Materials that meet the above grading limits and material property criteria are also suitable for use as "select engineered fill."

7.0 DRAINAGE MATERIALS

"Coarse gravel" for drainage or weeping tile bedding should conform to the following grading:

"Coarse Gravel" Drainage Material – Percent Passing by Weight

Sieve Size	25 mm Gravel (AT D8-C25)	20 mm Gravel
40 mm	--	--
28 mm	--	100
25 mm	100	--
20 mm	--	85 – 100
16 mm	90 – 100	--
14 mm	--	60 – 90
10 mm	45 – 75	--
5 mm	0 – 15	0 – 10
2.5 mm	--	0 – 5
1.25 mm	0 – 5	--

"Coarse sand" for drainage should conform to the following grading limits:

"Coarse Sand" Drainage Material – Percent Passing by Weight

Sieve Size	Coarse Sand*
10 mm	100
5 mm	95 – 100
2.5 mm	80 – 100
1.25 mm	50 – 90
630 μm	25 – 65
315 μm	10 – 35
160 μm	2 – 10
80 μm	0 – 3

* From CSA A23.1-09, Table 10, "Grading Limits for Fine Aggregate", Class FA1

Note that the "coarse sand" above is also suitable for use as pipe bedding material.

8.0 BEDDING MATERIALS

The “fill sand” gradation presented above in Section 5.0 is suitable for use as pipe bedding and as backfill within the pipe embedment zone. If drainage is also a consideration, “coarse sand” presented in Section 7.0 above should be used.

PROOF-ROLLING

Proof-rolling is a method of detecting soft areas in an 'as-excavated' subgrade for fill, pavement, floor or foundations or detecting non-uniformity of compacted embankment. The intent is to detect soft areas or areas of low shear strength not otherwise revealed by means of testholes, density testing, or visual examination of the site surface and to check that any fill placed or subgrade meets the necessary design strength requirements.

Proof-rolling should be observed by qualified geotechnical personnel.

Proof-rolling is generally accomplished by the use of a heavy (15 to 60 tonne) rubber-tired roller having four wheels abreast on independent axles with high contact wheel pressures (inflation pressures ranging from 550 kPa (80 psi) up to 1030 kPa (150 psi).

A heavily loaded tandem axle gravel truck may be used in lieu of the equipment described in the paragraph above. The truck should be loaded to approximately 10 tonnes per axle and a minimum tire pressure of 550 kPa (80 psi).

Ground speed - maximum 8 km/hr recommended 4 km/hr.

The recommended procedure is two complete coverages with the proof-rolling equipment in one direction and a second series of two coverages made at right angles to the first series; one 'coverage' means that every point of the proof-rolled surface has been subjected to the tire pressure of a loaded wheel. Less rigorous procedures may be acceptable under certain conditions subject to the approval of an engineer.

Any areas of soft, rutted, or displaced materials detected should either be recompacted with additional fill or the existing material removed and replaced with general engineered fill, or properly moisture conditioned as necessary.

The surface of the grade under the action of the proof-roller should be observed, noting; visible deflection and rebound of the surface, formation of a crack pattern in the compacted surface or shear failure in the surface of granular soils as ridging between wheel tracks.

If any part of an area indicates significantly more distress than other parts, the cause should be investigated, by, for example, shallow auger holes.

In the case of granular subgrades, distress will generally consist of either compression due to insufficient compaction or shearing under the tires. In the first case, rolling should be continued until no further compression occurs. In the second case, the tire pressure should be reduced to a point where the subgrade can carry the load without significant deflection and subsequently gradually increased to its specified pressure as the subgrade increases in shear strength under this compaction.

PAVEMENTS

The following recommended procedures for pavements have been based on the use of the area generally by cars with some light truck traffic, as is normal for parking lot areas and access roadways. Recommendations for occasional heavy truck access areas are also presented. These recommendations are intended as minimums only for subgrades having a California Bearing Ratio (CBR) value of two or higher, under saturated conditions.

Maximum density as used in this section means Standard Proctor Maximum Dry Density (ASTM Test Method D698) unless specifically noted otherwise.

The subgrade should be graded to drain towards catch basin locations. All loose, soft or organic material should be removed from beneath pavement areas. The subgrade should be scarified to a depth of not less than 150 mm below the surface and recompacted. In areas where general engineered fill is placed to achieve design grades, the subgrade should be compacted to 98 percent of maximum density and proof-rolled prior to placing fill. The upper 150 mm of subgrade (and/or general engineered fill) under pavement sections should be compacted to not less than 100 percent of maximum density.

Proof-rolling of the entire surface area under pavement sections should be carried out to detect any local soft spots. Soft spots detected as a result of proof-rolling should be excavated and backfilled with 'general engineered fill'. Recommended procedures for proof-rolling are presented under a separate section in Appendix C. General engineered fill is defined under the section entitled "Backfill Materials and Compaction" in Appendix C.

The parking area and roadways base course should comprise a layer of compacted cement stabilized aggregate or crushed gravel of nominal size equal to 20 mm placed on top of the compacted subgrade. The base course should have a compacted thickness of not less than 100 mm. The base course should be compacted to not less than 100 percent of maximum density.

The surface of the final lift of base course must have an asphalt prime coat of SS-1, or its equivalent, applied prior to the placement of asphaltic concrete.

The asphalt thickness is dependent on asphalt mix specifications and should be reviewed when details of the mix are available. Minimum surface lift thickness in multiple-lift construction should be not less than 50 mm.

Preparation of the subgrade should be carried out within restricted areas. This is to avoid loosening of the prepared areas by site traffic before compaction of the subgrade and placement of the granular material has been completed. Protection of the prepared subgrade against precipitation and frost should be undertaken.

Observation of compaction and asphalt laying operations should be carried out by staff of Tetra Tech EBA.

Where there is risk of gasoline or diesel oil spillage, such as in the vicinity of pump islands, concrete pavements are preferred to asphalt.

APPENDIX D: TOPSOIL SITE ASSESSMENT

TETRA TECH EBA

May 27, 2015

ISSUED FOR USE
FILE: ENVIND03703-01

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

Attention: Mr. Don Bartel

Subject: Topsoil Survey Pre-Disturbance Site Assessment
Waterbridge Subdivision
Lethbridge, Alberta

Client:	City of Lethbridge
Size of Proposed Disturbance:	126.5 ha (SW¼ 23-08-22 W4M and NW¼ 14-08-22 W4M)
Date of Inspection:	April 29,30 and May 1, 4, 2015
Inspector:	Brad Calder

1.0 INTRODUCTION

Tetra Tech EBA Inc. (Tetra Tech EBA) was retained by the City of Lethbridge (City) to conduct a topsoil survey and assessment for a portion of the proposed Waterbridge Subdivision which encompasses an area of 126.5 ha in SW¼ 23-08-22 W4M and NW¼ 14-08-22 W4M located in west Lethbridge, Alberta, hereinafter referred to as the "site".

The scope of work for this soil survey and assessment is required as part of the Waterbridge Outline Plan (OLP). A biophysical impact assessment (BIA)[1] and Phase I Environmental Site Assessment (ESA)[2] were previously prepared for this portion of the proposed Waterbridge Subdivision.

The objective of the assessment is to document and characterize soil conditions within the proposed development area to assist in in the identification of appropriate soil handling best management practices (BMPs) during construction.

2.0 PURPOSE AND SCOPE OF REPORT

The purpose of this report is to document topsoil depths and conditions for a proposed residential subdivision and recommendations for soil handling are provided. The objective of the recommendations is to assist the on-site construction supervisor in carrying out construction operations in a manner that minimizes negative impacts on the land and assists in the future reclamation of the affected area.

[1] Tetra Tech EBA. February 2012. Biophysical Impact Assessment Waterbridge Residential Subdivision N1/2 15-008-22 W4M and S1/2 22-008-22 W4M Lethbridge, Alberta Tetra Tech EBA File No. L22101485.

[2] Tetra Tech EBA. January 2012. Phase I Environmental Site Assessment Waterbridge Expansion 4020 & 3800 – 25 Street West and 4025 & 3505 – 30 Street West Lethbridge, Alberta Tetra Tech EBA File No. L22101486.

Tetra Tech EBA Inc.
442 - 10 Street N.
Lethbridge, AB T1H 2C7 CANADA
Tel 403.329.9009 Fax 403.328.8817

The scope of this report is restricted to a visual inspection of the site. This report is based solely on the conditions that existed on site at the time of Tetra Tech EBA's assessment. No responsibility is assumed for reporting any previous practices or processes that would not be readily observable within the limited scope of this report and provide a record of pre-disturbance conditions at the site.

3.0 METHODS

In accordance with the recommendations provided as part of the BIA prepared by Tetra Tech EBA in 2012 for an adjacent portion of the Waterbridge Subdivision, the topsoil survey was conducted to accurately characterize soil conditions within the proposed development area for the purpose of identifying appropriate soil handling BMPs to be employed during construction. For the purpose of this assessment, soils depths were inspected at a ratio of one inspection location per 1.6 ha (80 soil inspection locations). Thirty soil assessment locations were completed for a description of soil characteristics. Each soil assessment location was excavated with a shovel through the topsoil into the subsoil. All soils assessment locations were described according to the Canadian System of Soil Classification[3] (CSSC), with soil colour described by visual observation. An abbreviation key for the CSSC system is attached in Appendix A. Soil characteristics documented during the top soil survey includes:

- Depth of organic layers on the soil surface (LFH), if present;
- Topsoil horizon identification (Ap, Ah, Ahe, Ae);
- Topsoil depth;
- Colour of topsoil and underlying subsoil; and
- Identification of areas with potential topsoil handling problems, such as areas with poor colour differentiation between topsoil and subsoil, surface stones etc.

Full soil classification was not completed during this topsoil assessment.

4.0 RESULTS

4.1 SUMMARY

The site is currently vacant, cultivated, agricultural land and several ephemeral wetlands were observed at the site at the time of the topsoil survey. No buildings are located on the site with the exception of a well shed belonging to Bonavista located at 4025 – 30 Street West in NW 15-08-22 W4M. Several associated pipelines belonging to Bonavista are also located in the same quarter. An abandoned well site belonging to a numbered company is located on the southeast side of the site within 4020 – 25 Street West or NE 15-08-22 W4M. The nearest waterbody; the Sunridge Stormwater Pond is approximately 150 meters to the east of the eastern site boundary. A soil survey was previously completed as part of the AGRASID Program [4]. The dominant mapped soils within the project area are comprised mainly of Orthic Dark Brown Chernozems developed in moderately fine textured (loam and clay loam) till; the Readymade, Whitney, Lethbridge, and Chokio soil series are mapped at the site. Most

[3] Soil Classification Working Group. 1998. The Canadian System of Soil Classification. Agric. and Agri-food Can. Publ. 1646 (Revised). 187 pp.

4 Alberta Soil Information Centre. 2001. AGRASID 3.0 Agricultural Region of Alberta Soil Inventory Database (Version 3.0). Edited by J.A. Brierley, T.C. Martin, and D.J. Spiess. Agriculture and Agri-Food Canada, Research Branch, Alberta Agriculture, Food and Rural Development, Conservation and Development Branch. Available: Alberta Soil Information Centre http://www4.agric.gov.ab.ca/agrasidviewer/.

of the areas and soils within the project area have been disturbed by road and pipeline construction and agriculture activities.

Field investigations of the project area indicated that the topography of the site is undulating. The site is currently seeded with a cereal crop, and canola. Several wetlands are located within the project area that collect surface runoff. The topsoil encountered on agricultural lands consisted of predominantly Ap horizons with occasional Ae horizons. The subsoil encountered consisted of Bm horizons. Color change between topsoil and subsoil was good. Predominant topsoil color was brown over subsoil color of light brown. Table 1 shows topsoil depths, color and soil horizons designations. Figure 1 shows the location of all of the soil assessment locations.

5.0 SITE DESCRIPTION

Table A. Site Description

General	Cultivated agricultural cropland
Land use	Agricultural
Site drainage	Moderately well to poor
Topography and slopes	Undulating
Surface stoniness	S1-S3
Erosion and stability	No observations of surficial soil erosion observed
Surface debris	Cereal stubble, litter
Vegetation	Cereal and canola

6.0 SOIL DESCRIPTION

Table B. Soil Description

Parent Material	Glaciolacustrine
Surface Texture	Silt loam
Average Topsoil Depth	14 cm
Topsoil Quality	Fine textured
Topsoil / Subsoil Colour Contrast	Topsoil brown, Subsoil light brown
Upper Subsoil Quality (B horizon)	Fine textured
Depth from surface to Lower Subsoil (C horizon)	30-40 cm

7.0 SOIL SALVAGE RECOMMENDATIONS

Table C. Soil Salvage Recommendations

Borrow Excavation Site		Comments
Topsoil lift	15 cm	Silt loam fine textured, fine granular.
Subsoil lift	25 cm	Silt clay loam, fine textured, medium subangular blocky.

Soil salvage will utilize a two-lift strip method:

- The first soil lift will remove any remaining low lying surface vegetation and A-horizon material (including LFH horizons) to the colour change (B-horizon), to a maximum 15 cm depth.
- The second lift will remove up to a 25 cm thickness of the B-horizon (subsoil).
- Both A and B-horizon materials will be stockpiled in distinct stockpiles during construction.
- Due to the undulating terrain, soil salvage depths to color change will have to be monitored closely in areas of changing elevation as reduced topsoil depths were recorded on side slopes, as well as increased topsoil depths were recorded in low lying areas.
- Effects of wind erosion were observed at the time of the soil assessment which will continue to be a concern during construction activities due to the proximity of residential subdivisions. Dust control mitigation options such as use of tackifiers or watering of soil piles are recommended during windy and dry conditions due to the fine soil texture.

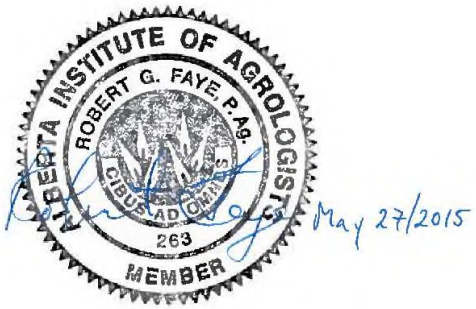
8.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of City of Lethbridge and their agents. Tetra Tech EBA Inc. (Tetra Tech EBA) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than City of Lethbridge, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are provided in Appendix B of this report.

9.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech EBA Inc.



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Attachments: Tables (1)
Figures (1)
Appendix A: Canadian System of Soil Classification Abbreviation Key
Appendix B: Tetra Tech EBA's General Conditions

TABLES

Table 1: Mineral Soil Survey Assessment Locations

Assessment Location	Latitude Degrees North	Longitude Degrees West	Surface Stoniness	A Horizon Type	A Depth (cm)	A Colour	A Texture	A Structure	B Horizon Type	B Depth (cm)	B Colour	B Texture	B Structure	C Horizon Type	C Horizon Depth (cm)	C Horizon Colour	C Horizon Texture
15S01	49.66360111	-112.88935137	S1	Ap	0-13	10YR3/2m	Silt loam	fine granular	Bm	13-30	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	30-40	2.5Y5/1m	Clay loam
15S05	49.66204661	-112.88786947	S1	Ap/Bm	0-14	10YR2/2m	Silt loam	fine granular	Bm	14-40	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	40-45	2.5Y5/4m	Clay loam
15S07	49.66198664	-112.89077405	S1	Ap/Bm	0-16	10YR3/2m	Silt loam	fine granular	Bm	16-31	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	31-45	2.5Y5/4m	Clay loam
15S09	49.66072681	-112.88924817	S1	Ap/Bm	0-14	10YR3/4m	Silty clay loam	fine granular	Bm	14-35	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	35-45	2.5Y5/3m	Clay loam
15S16	49.65974655	-112.88514622	S1	Ap	0-14	10YR3/2m	Silt loam	fine granular	Bm	14-39	10YR4/3m	Silty clay loam	medium subangular blocky	Ck	39-45	2.5Y5/4m	Clay
15S20	49.65838509	-112.88652873	S1	Ap	0-13	10YR3/2m	Silt loam	fine granular	Bm	14-36	10YR4/3m	Silty clay loam	medium subangular blocky	Ck	36-45	2.5Y5/3m	Clay
15S24	49.65719782	-112.88420337	S1	Ap	0-13	10YR3/2m	Silt loam	fine granular	Bm	13-24	10YR4/3m	Silty clay loam	medium subangular blocky	Ck	24-40	2.5Y5/3m	Clay
15S27	49.65641005	-112.88873857	S2	Ap	0-14	10YR2/2m	Silt loam	fine granular	Bm	14-29	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	29-45	2.5Y5/3m	Clay
15S31	49.65616902	-112.88173108	S1	Ap	0-17	10YR3/2m	Silt loam	fine granular	Bm	17-38	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	38-45	2.5Y5/3m	Clay
15S33	49.65506076	-112.88335106	S1	Ap	0-14	10YR3/2m	Silt loam	fine granular	Bm	14-35	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	35-40	2.5Y5/3m	Clay loam
15S35	49.65520962	-112.88698462	S1	Ap	0-14	10YR3/2m	Silt loam	fine granular	Bm	14-32	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	32-40	2.5Y5/4m	Clay
15S39	49.65408914	-112.88541318	S1	Ap	0-16	10YR3/2m	Silt loam	fine granular	Bm	16-35	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	32-45	2.5Y5/3m	Clay loam
15S42	49.65392856	-112.88016736	S1	Ap	0-15	10YR3/2m	Silt loam	fine granular	Bm	36-42	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	36-45	2.5Y5/3m	Clay loam
15S45	49.65270258	-112.88390836	S1	Ap	0-14	10YR3/2m	Silt loam	fine granular	Bm	14-32	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	32-45	2.5Y5/1m	Clay loam
15S47	49.65288053	-112.88749218	S1	Ap	0-16	10YR3/2m	Silt loam	fine granular	Bm	16-38	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	38-45	2.5Y5/3m	Clay loam
15S51	49.65168214	112.88581438	S1	Ap	0-15	10YR3/2m	Silt loam	fine granular	Bm	15-36	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	36-40	2.5Y5/4m	Clay loam
15S53	49.65151877	112.88235295	S1	Ap	0-16	10YR3/2m	Silt loam	fine granular	Bm	16-32	10YR4/4m	Silty clay loam	medium subangular blocky	Cca	36-45	2.5Y5/3m	Clay loam
15S58	49.65037333	112.87881847	S1	Ap	0-15	10YR3/2m	Silt loam	fine granular	Bm	15-36	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	36-42	2.5Y5/3m	Clay loam
15S61	49.64928017	112.88230014	S1	Ap	0-21	10YR3/2m	Silty clay loam	fine granular	Bm	21-45	10YR4/4m	Silty clay loam	medium subangular blocky	Cca	45-50	2.5Y5/4m	Clay loam
15S67	49.64960319	112.89100757	S1	Ap	0-16	10YR2/2m	Silt loam	fine granular	Bm	16-38	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	38-45	2.5Y5/3m	Clay
15S69	49.64819478	112.89101715	S1	Ap	0-13	10YR2/2m	Silt loam	fine granular	Btj	13-35	10YR3/2m	Silty clay loam	medium platy	Cca	35-45	2.5Y5/4m	Clay loam
15S70	49.64845280	112.88931262	S2	Ap	0-16	10YR3/2m	Silt loam	fine granular	Bm	16-34	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	34-45	2.5Y5/3m	Clay loam
15S72	49.64947151	112.88755435	S2	Ap	0-15	10YR3/2m	Silt loam	fine granular	Bm	15-38	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	38-45	2.5Y5/4m	Clay loam
15S74	49.64770558	112.88755057	S1	Ap	0-14	10YR3/4m	Silt loam	fine granular	Bm	14-38	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	38-40	2.5Y5/3m	Clay
15S78	49.64867364	112.88590874	S1	Ap	0-14	10YR3/2m	Silt loam	fine granular	Bm	14-39	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	39-45	2.5Y5/3m	Clay loam
15S83	49.64763596	112.88245239	S1	Ap	0-9	10YR3/3m	Silt loam	fine granular	Bm	9-26	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	26-40	2.5Y5/3m	Clay
15S88	49.64850743	112.87862420	S1	Ap/Bm	0-24	10YR3/2m	Silt loam	fine granular	Bm	24-39	10YR4/4m	Silty clay loam	medium subangular blocky	Cca	39-45	2.5Y5/3m	Clay
15S89	49.65184236	112.89092501	S1	Ap	0-12	10YR3/3m	Silt loam	fine granular	Bm	12-38	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	38-45	2.5Y5/4m	Clay
15S93	49.65536604	112.89042531	S1	Ap	0-14	10YR3/2m	Silt loam	fine granular	Bm	14-37	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	37-45	2.5Y5/4m	Clay
15S96	49.65757976	112.89051028	S3	Ap/Bm	0-13	10YR3/2m	Silt loam	fine granular	Bm	13-29	10YR4/3m	Silty clay loam	medium subangular blocky	Cca	29-40	2.5Y5/4m	Clay

FIGURES

LEGEND

- Soil Assessment Location
- Soil Inspection Location
- Road
- Study Area

NOTES
Imagery Source: ESRI Imagery Service (July 15, 2012)

STATUS
ISSUED FOR REVIEW

WATERBRIDGE TOPSOIL SURVEY

Site Plan Showing Soil Assessment Locations

PROJECTION	DATUM	CLIENT
UTM Zone 12	NAD83	City of Lethbridge

Scale: 1:12,000
200 100 0 200
Meters

TETRA TECH EBA

FILE NO.				
ENVIND03703-01_FIG1.mxd				
PROJECT NO.	**DWN**	**CKD**	**APVD**	**REV**
ENVIND03703-002	BB	MS	BV	0
OFFICE	**DATE**			
Tt EBA-CAL	May 21, 2015			

Figure 1

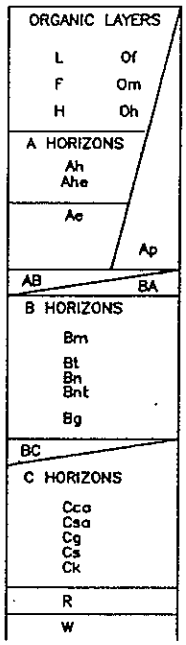
M:\ENVIRONMENTAL\IND\ENVIND03703\Maps\002\ENVIND03703-01_FIG1.mxd modified 5/21/2015 by Brittney.Bietz

APPENDIX A

CANADIAN SYSTEM OF SOIL CLASSIFICATION ABBREVIATION KEY

CANADIAN SYSTEM OF SOIL CLASSIFICATION

HORIZONS



NOTE: The lower case letters shown above and below are sometimes combined to expressed combinations of characteristics in horizons (eg. Ahk, Ahksa, Bnjtj) Other lower case letters not listed above are:

f – a significant accumulation of Fe + Al combined with organic matter – in B horizon
b – a buried soil horizon
j – a modifier of suffixes e, f, g, n and t to denote expression of, but failure to meet, the specified limits of the suffix it modifies.

L–F–H Well drained decomposing plant litter, primarily leaves, twigs, woody materials.
L – slightly decomposed,
F – partly decomposed,
H – well decomposed.

O Poorly drained decomposing peat, mainly mosses, rushes, woody materials.
Of – fibric – least decomposed;
Om – mesic – moderately decomposed;
Oh – humic – most highly decomposed.

A Organo – mineral horizons at or near the surface.
Ah – dark colored, humus–rich horizon.
Ae – light colored, eluviated horizon, characterized by removal of clay, iron, aluminum or organic matter, light color and platy structure.
Ahe – some eluviation evident – salt and pepper appearance or platy structure.
Ap – horizons disturbed by agricultural (cultivation or pasturing).

AB,BA Horizons transitional to A and B.

B Weathered subsurface – can have the following characteristics:
Bm – slightly altered by hydrolysis, oxidation, or solution or all three, to give a change in color, or structure or both.
Bt – a significant accumulation of silicate clay.
Bn – a columnar or prismatic structure, hard consistence when dry and significantly high exchangeable sodium.
g – a significant expression of gleying[2].

BC A horizon transitional to B and C.

C Parent material – a horizon comparatively unaffected by soil forming processes, except for:
ca – an accumulation of lime.
sa – an accumulation of water–soluble salts.
g – a significant expression of gleying[2].
s – denotes the presence of salts, including gypsum ($CaSO_4$).
k – denotes the presence of lime.

R A consolidated bedrock layer.

W A layer of water.

[1] Diagram modified from the National Atlas of Canada Energy, Mines and Resources, 1973).

[2] "Gleying" refers to a soil forming process operation under poor drainage conditions, which results in the reduction of iron and other elements indicated by dull gray soil colors. If the soil is re–oxygenated the iron then forms reddish brown "mottles".

% COARSE FRAGMENTS

g – gravel < 7.5cm diameter
c – cobbles 7.5 – 25cm diameter
s – stones > 25cm diameter

CONSISTENCE

Dry:

L ..... Loose
Sf ..... Soft
SH ..... Slightly hard
H ..... Hard
VH ..... Very hard
EH ..... Extremely hard
R ..... Rigid

Moist:

L ..... Loose
VF ..... Very friable
F ..... Friable
Fi ..... Firm
VFi ..... Very firm

Wet:

NS ..... Nonsticky
SS ..... Slightly sticky
S ..... Sticky
VS ..... Very sticky

Plasticity:

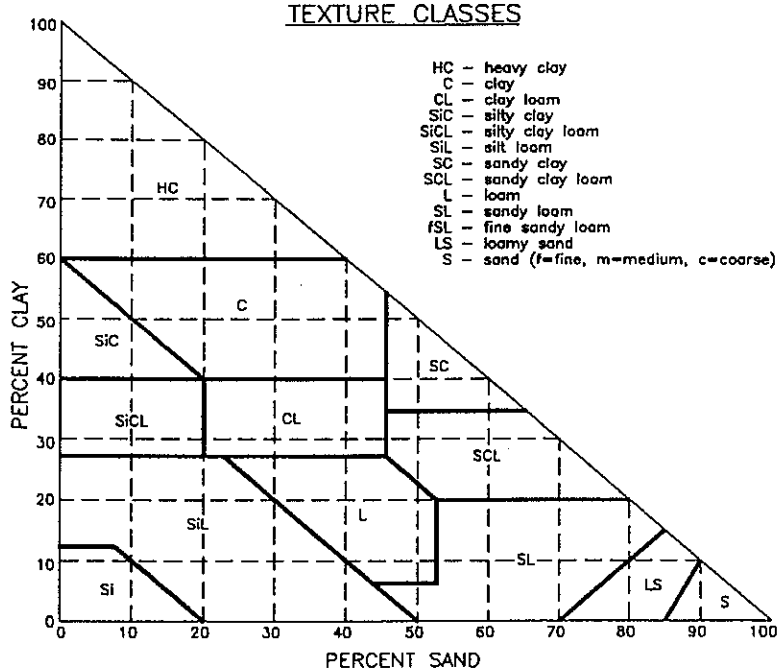
NP ..... Non plastic
SP ..... Slightly plastic
P ..... Plastic
VP ..... Very plastic

EFFERVESCENCE

(with 10% HCl)

VW – a few bubbles
W – bubbles readily form
M – bubbles form a low foam
S – bubbles form a thick foam

TEXTURE CLASSES



HC – heavy clay
C – clay
CL – clay loam
SiC – silty clay
SiCL – silty clay loam
SiL – silt loam
SC – sandy clay
SCL – sandy clay loam
L – loam
SL – sandy loam
fSL – fine sandy loam
LS – loamy sand
S – sand (f=fine, m=medium, c=coarse)

LANDFORM

Parent Material:

C ..... Colluvial
D ..... Disturbed
E ..... Eolian
F ..... Fluvial
GF ..... Glaciofluvial
GL ..... Glaciolacustrine
L ..... Lacustrine
O ..... Organic
R ..... Bedrock
T ..... Till

Surface Expression:

h ..... Hummocky
l ..... Level
m ..... Rolling
r ..... Ridged
s ..... Steep
t ..... Terraced
u ..... Undulating
v ..... Veneer

eba

STRUCTURE

eg. w.c.sbk

Grade:

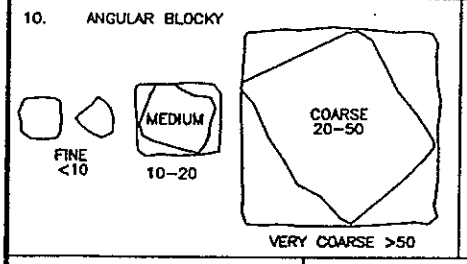
- w ..... Weak
- wm ..... Weak to moderate
- m ..... Moderate
- ms ..... Moderate to strong
- s ..... Strong

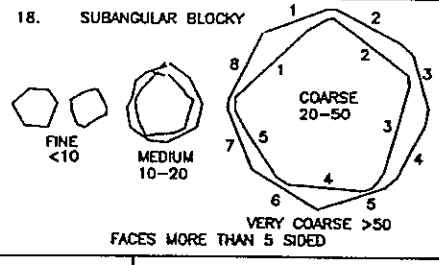
Class:

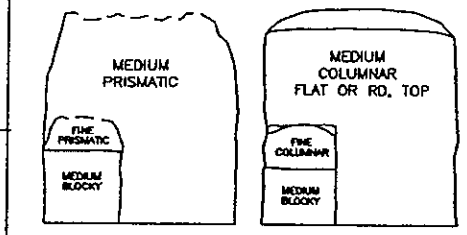
- vf ..... Very fine
- f ..... Fine
- m ..... Medium
- c ..... Coarse
- vc ..... Very coarse

Kind:

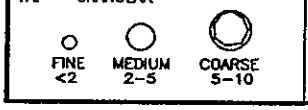
- sg ..... Single grained
- ma ..... Massive
- bk ..... Angular blocky
- sbk ..... Subangular blocky
- gr ..... Granular
- pl ..... Platy
- pr ..... Prismatic
- col ..... Columnar

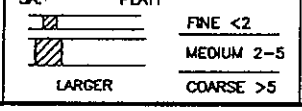


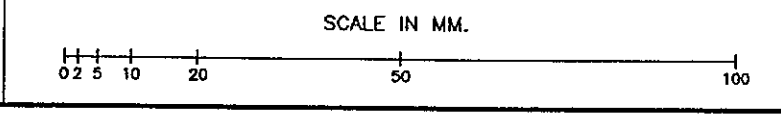




FINE <20
MEDIUM 20-50
COARSE 50-100
VERY COARSE >100







SLOPE CLASSES OF LOCAL LANDFORMS

Slope Class	Percent Slope	Approximate Degrees	Description
1	0–0.5	0	level
2	0.5–2.5	0.3–1.5	nearly level
3	2–5	1–3	very gentle slopes
4	6–9	3.5–5	gentle slopes
5	10–15	6–8.5	moderate slopes
6	16–30	9–17	strong slopes
7	31–45	17–24	very strong slopes
8	46–70	25–35	extreme slopes
9	71–100	35–45	steep slopes
10	>100	>45	very steep slopes

SURFACE STONINESS

		Surface Area	Distance Apart (cm)
S0	non-stony	<0.01%	>30
S1	slightly stony	0.01–0.1%	10–30
S2	moderately stony	0.1–3%	2–10
S3	very stony	3–15%	1–2
S4	exceedingly stony	15–50%	0.1–5
S5	excessively stony	50%	0.1

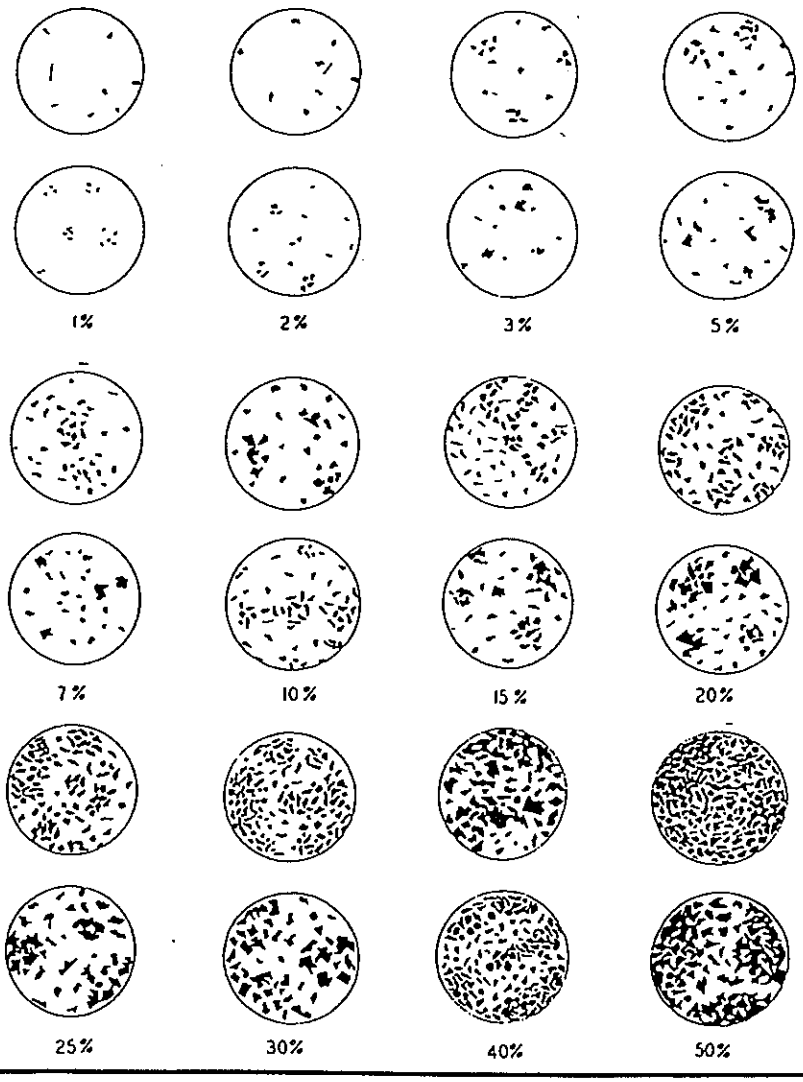
SLOPE POSITION

- c – crest
- u – upper slope
- m – mid slope
- l – lower slope
- t – toe
- d – depression
- l – level

DRAINAGE

- R – rapidly
- W – well
- M – moderately well
- I – imperfectly
- P – poorly
- VP – very poorly

PERCENT AREAS



APPENDIX B

TETRA TECH EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Tetra Tech EBA’s client. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Tetra Tech EBA’s Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

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2.0 ALTERNATE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. The Client warrants that Tetra Tech EBA’s instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by Tetra Tech EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

TETRA TECH EBA

TECHNICAL MEMO

ISSUED FOR REVIEW

To:	The City of Lethbridge	**Date:**	July 8, 2015
c:		**Memo No.:**	
From:	Tetra Tech EBA Inc.	**File:**	704-ENVIND03703-01
Subject:	Waterbridge Wildlife Surveys		

This 'Issued for Review' document is provided solely for the purpose of client review and presents our interim findings and recommendations to date. Our usable findings and recommendations are provided only through an 'Issued for Use' document, which will be issued subsequent to this review. Final design should not be undertaken based on the interim recommendations made herein. Once our report is issued for use, the 'Issued for Review' document should be either returned to Tetra Tech EBA or destroyed.

1.0 INTRODUCTION

Tetra Tech EBA Inc. (Tetra Tech EBA) conducted wildlife surveys as part of the supplemental environmental and geotechnical services, as requested by the City of Lethbridge (City), for a portion of the proposed Waterbridge Subdivision (Project) which encompasses 126.5 ha in SW¼ 23-08-22 W4M and NW¼ 14-08-22 W4M (Project Area; Figure 1) located in west Lethbridge, Alberta. The wildlife surveys included an amphibian survey (wetlands within 100 m of the Project Area), raptor nest survey (within a one kilometer buffer surrounding the Project Area); and a general wildlife reconnaissance within the Project Area.

2.0 METHODS

2.1 Desktop Review

Tetra Tech EBA compiled a list of all species of management concern (SOMC) known or having the potential to occur within the Project Area. The list was compiled by querying the Fisheries and Wildlife Internet Mapping Tool (FWMIT; 1 kilometer circular radius from the centre of the Project Area; Government of Alberta 2014a) and known species ranges (Alberta Conservation Association et al. 2006; Ridgely et al. 2007; International Union for Conservation of Nature 2014). SOMC are any that meet one or more of the following criteria:

- Have provincial and/or federal restricted activity dates or setback distances;
- Ranked as 'Sensitive', 'May Be At Risk', or 'At Risk', by the General Status of Alberta Wild Species (GSAWS; Government of Alberta 2010);
- Assessed as 'Threatened', 'Endangered', or 'Special Concern' by the Endangered Species Conservation Committee (ESCC; Government of Alberta 2014b);
- Listed as 'Threatened' or 'Endangered' under the Alberta *Wildlife Act* (AWA; Province of Alberta 2000);
- Assessed as 'Special Concern', 'Threatened', or 'Endangered' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC; Government of Canada 2015); and

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- Listed as 'Special Concern', 'Threatened', or 'Endangered', or under the *Species at Risk Act* (SARA; Government of Canada 2002).

Provincial recommended restricted activity dates and setback distances for grassland species are provided in *Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural* Regions of Alberta (Government of Alberta 2011). Federal recommended restricted activity dates and setback distances are provided in *Petroleum Industry Activity Guidelines for Wildlife Species at Risk in the Prairie and Northern Region* (Environment Canada 2011) and in a personal communication from Environment Canada (Gregoire 2013, 2014).

The location of the Project Area was compared to Key Range Layers and Key Wildlife Areas with FWIMT (Government of Alberta 2014a).

2.2 Amphibian survey

Tetra Tech EBA completed an Auditory Amphibian Survey following the AEP (formerly ESRD) *Sensitive Species Inventory Guidelines* (2013a) for six wetlands found within 100 m of the Project Area (Figure 1). Amphibian Acoustic Surveys in the prairie region target Northern Leopard Frog (*Lithobates pipiens*), Great Plains Toad (*Anaxyrus cognatus*), and Plains Spadefoot (*Spea bombifrons*). Tetra Tech EBA chose a 100 m buffer around the Project Area based on recommended setback distances for amphibian SOMC that may occur in the vicinity of the Project. At each station, all visual and aural detections of amphibians were recorded during a 3 minute point count. Each survey began 30 min after sunset and ended by midnight. The surveys were conducted in air temperatures between 4.9°C and 18°C, with winds were less than 3 on the Beaufort scale (0-19 kilometer/h), and in the absence of precipitation. Tetra tech EBA conducted surveys on May 4, May 6, and May 21, 2015. Incidental detections of all other wildlife were also recorded.

2.3 Raptor Nest Survey

Tetra Tech EBA conducted a raptor nest survey on June 23, 2015 via public roads for potential raptor stick-nesting locations (trees, power poles, buildings) within one kilometer of the Project Area where suitable habitat was present (Figure 1). Formal surveys for ground-nesting raptors were not conducted.

2.4 General Wildlife Reconnaissance Survey

Tetra Tech EBA completed a general wildlife reconnaissance survey June 23, 2015 to identify wildlife species that may be using the Project Area (Figure 1). The general wildlife reconnaissance included the auditory and visual identification of wildlife species present within the Project Area. In order to efficiently characterize wildlife use of the site, the survey was conducted during the peak of the wildlife breeding season. The survey was conducted between 8 am and 11 am and in favourable weather conditions (i.e., seasonal normal temperatures, winds less than 3 on the Beaufort scale, and in light to no precipitation).

3.0 RESULTS

3.1 Desktop Search

Tetra Tech EBA identified 44 SOMC having the potential to occur within the Project Area based on species ranges (Table 1). No known records of SOMC were identified within the FWIMT tool (Government of Alberta 2014a).

A Key Wildlife and Biodiversity Zone was identified south and east of the Project Area but the proposed development is not anticipated to affect wildlife habitat in this zone.

The Project Area falls within the Sensitive Raptor Range for: Prairie Falcon (*Falco mexicanus*), Golden Eagle (*Aquila chrysaetos*), and Ferruginous Hawk (*Buteo regalis*); Sensitive Amphibian Range; and Sharp-tailed Grouse Survey Area (Government of Alberta 2014a).

3.2 Auditory Amphibian Survey

No amphibian SOMC were identified during the Auditory Amphibian Survey. During the first survey night and third survey night (on May 5 and May 2, 2015, respectively) Boreal Chorus Frogs (*Pseudacris maculate)* were identified at all survey stations except AMPH4 (Figure 1). Call codes ranged from 1 – 3, where call code 1 is between 1-5 individuals calling, call code 2 is 6-10 individuals calling, call code 3 is more than 10 individuals calling. During the second survey night on May 6, 2015 Boreal Chorus Frogs were identified only at survey station AMPH3 where two individuals were heard. The lack of Boreal Chorus Frogs calling during the second survey night is likely attributed to cool air temperatures (approximately 5 degrees Celsius).

3.3 Raptor Nest Survey

No raptor nests were identified during the Raptor Nest Survey. A pair of Swainson's Hawks (*Buteo swainsoni*) were observed approximately 100 m northeast of the Project Area. Swainson's Hawks are ranked as 'Sensitive' in Alberta (Government of Alberta 2010; Table 1). A Red-tailed Hawk (*Buteo jamaicensis*) was observed approximately 100 m southwest of the Project Area but no roads were present to access the area. Neither hawk species were exhibiting behaviour indicative of a nest in close proximity (i.e., aggressive calling, swooping). No ground-nesting raptor species were observed.

3.4 Wildlife Reconnaissance Survey

The Project Area is primarily cultivated land which is generally considered low quality habitat for wildlife, although wildlife will still use this area. The survey focussed on areas of higher quality habitat for wildlife (e.g., wetlands, non-cultivated areas). The wetlands and surrounding vegetation provide suitable habitat for wetland-dependent species (e.g., waterfowl, blackbirds, frogs) and most species were concentrated in these areas. The ditches and non-cultivated areas around the periphery of the Project Area offers suitable habitat for certain wildlife species several of which were identified during the survey (e.g., Richardson's ground squirrels [*Spermophilus richardsonii*] and Clay-colored Sparrows [*Spizella pallida*]). A total of one amphibian species, 21 bird species, and three mammal species were identified during the Wildlife Reconnaissance Survey (Table 1). No reptiles were identified.

Three observations warrant additional discussion:

- A Spotted Sandpiper (*Actitis macularius*) nest containing four eggs was identified at GPS coordinate 12 U 363481 5502262 (Figure 1). Ground-nesting birds in the grassland region have a minimum recommended setback of 50 m from active nests from April 15 to August 15 (Gregoire pers. comm. 2014).

- A Black-billed Magpie Nest (*Pica hudsonia*) was identified at GPS coordinate 12 U 363433 5501424 (Figure 1). The minimum recommended setback for forest-nesting species is 30 m from active nests (Gregoire pers. comm. 2014); however, this nest was no longer active and thus no setbacks are warranted. This nest was likely used this season given the good condition of the nest and the family of Black-billed Magpies nearby.

- A pair of Long-billed Curlews (*Numenius americanus*) appears to be nesting in the Project Area near GPS coordinate 12 U 363698 5501299 (Figure 1). The pair was showing characteristic nesting behaviour (agitated, swooping, calling) at a dried wetland and are likely nesting in the surrounding vegetation. The nest was not found. Long-billed Curlews are federally listed under the SARA as 'Special Concern' and their nests and surrounding habitat have a provincially recommended setback of 100 m from April 15 to July 15 and a federally recommended setback of 200 m from April 15 to July 15 (Table 1).

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Limitations of Surveys

Field surveys can only confirm the presence of wildlife at the time of surveys.

4.2 Auditory Amphibian Survey

No amphibian SOMC were detected during the Auditory Amphibian Survey and thus no mitigation measures are recommended. If any Northern Leopard Frogs, Great Plains Toad, or Plains Spadefoot Toad are identified, either prior to or during construction, it is recommended that a qualified professional biologist be consulted.

4.3 Raptor Nest Survey

No raptor nests were located during the Raptor Nest Survey and there is minimal suitable habitat for stick-nesting raptors in the vicinity of the Project. No further mitigation measures are recommended for the management of stick-nesting raptors. If a large stick nest or a nest of a ground-nesting raptor (e.g., Northern Harrier) is identified, either prior to or during construction, it is recommended that a qualified professional biologist be consulted.

4.4 General Wildlife Reconnaissance Survey

Tetra Tech EBA called Canadian Wildlife Service – Environment Canada to determine appropriate mitigation for the federally listed Long-billed Curlews nesting in the Lethbridge area in cultivated fields; no Project details were discussed. Environment Canada recommended that the area where the Long-billed Curlews are potentially nesting not be cleared until after July 15 (Gregoire pers. comm. 2015). However, because of the presence of other breeding birds on site, Environment Canada and Tetra Tech EBA recommends that clearing be postponed until the end of the breeding bird season (approximately August 15) to avoid the destruction of bird nests (Environment Canada 2015). Wetlands containing waterfowl should not be drained until the broods (i.e., ducklings) are able to fly, which may be as late as August 31. If construction activities occur during the bird breeding season, it is recommended that a Pre-disturbance Nest Survey and Waterfowl Brood Survey is completed by a qualified professional biologist. If clearing does not occur within seven days of the survey, the surveys should be repeated. If an active nest or brood is found during construction, it is recommended that a qualified professional biologist be consulted to provide mitigation recommendations.

Tetra Tech EBA did not identify any wildlife issues pertaining to mammals or reptiles. In the event that an important wildlife feature (e.g., nest, den, hibernaculum, rookery) is identified prior to or during construction, it is recommended that a qualified professional biologist be consulted to provide mitigation recommendations.

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the City of Lethbridge and their agents. Tetra Tech EBA Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the City of Lethbridge, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are attached to this memo.

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ATTACHMENTS

TABLES (1)

FIGURES (1)

TETRA TECH EBA'S GENERAL CONDITIONS

Table 1. All Wildlife Species Detected and Species of Management Concern Potentially Found within 1 km of the Proposed Development Area[1]

Common Name	Scientific Name	GSAWS[2]	ESCC[3]	AWA[4]	COSEWIC[5]	SARA[6]	AEP Recommended Setback for High Disturbance Activities[7]			CWS Recommended Setback for High Disturbance Activities[8]		
							Distance (m)	Time of Year	Feature	Distance (m)	Time of Year	Feature
Amphibians												
Boreal Chorus Frog	*Pseudacris maculata*	Secure	-	-	-	-	-	-	-	-	-	-
Canadian Toad	*Anaxyrus hemiophrys*	May Be at Risk	Data Deficient	-	Not at Risk	-	-	-	-	-	-	-
Long-toed Salamander	*Ambystoma macrodactylum*	Sensitive	Special Concern	-	-	-	-	-	-	-	-	-
Northern Leopard Frog	*Lithobates pipiens*	At Risk	Threatened	-	Special Concern	Special Concern	100	Year Round	Breeding Pond	400	Year Round	Breeding Pond and Wintering Site
Plains Spadefoot	*Spea bombifrons*	May Be at Risk	-	-	Not at Risk	-	100	Year Round	Class III Wetlands on Native Prairie	-	-	-
Birds												
American Bittern	*Botaurus lentiginosus*	Sensitive	-	-	-	-	-	-	-	-	-	-
American Crow	*Corvus brachyrhynchos*	Secure	-	-	-	-	-	-	-	-	-	-
American Kestrel	*Falco sparverius*	Sensitive	-	-	-	-	-	-	-	-	-	-
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive	-	-	-	-	1000	Year Round	Nesting Site	-	-	-
Baltimore Oriole	*Icterus galbula*	Sensitive	-	-	-	-	-	-	-	-	-	-
Bank Swallow	*Riparia riparia*	Secure	-	-	Threatened	-	-	-	-	-	-	-
Barn Swallow	*Hirundo rustica*	Sensitive	-	-	Threatened	-	-	-	-	100	May 1 - Aug. 31	Nest
Black-billed Magpie	*Pica hudsonia*	Secure	-	-	-	-	-	-	-	-	-	-
Black-crowned Night Heron	*Nycticorax nycticorax*	Sensitive	-	-	-	-	-	-	-	-	-	-
Brewer's Blackbird	*Euphagus cyanocephalus*	Secure	-	-	-	-	-	-	-	-	-	-
Canvasback	*Aythya valisineria*	Secure	-	-	-	-	-	-	-	-	-	-
Common Nighthawk	*Chordeiles minor*	Sensitive	-	-	Threatened	Threatened	-	-	-	200	May 1 - Aug 31	Nest
Common Yellowthroat	*Geothlypis trichas*	Sensitive	-	-	-	-	-	-	-	-	-	-
Ferruginous Hawk	*Buteo regalis*	At Risk	Endangered	Endangered	Threatened	Threanted	1000	Year Round	Nesting Site	1000	Year Round	Nest
Golden Eagle	*Aquila chrysaetos*	Sensitive	-	-	-	-	1000	Year Round	Nesting Site	-	-	-
Great Blue Heron	*Ardea herodias*	Sensitive	-	-	-	-	100	Year Round	Nesting Site	-	-	-
Horned Grebe	*Podiceps auritus*	Sensitive	-	-	Special Concern	-	-	-	-	100	Apr. 1 - Aug. 31	Nesting Waterbody
House Sparrow	*Passer domesticus*	Exotic	-	-	-	-	-	-	-	-	-	-
Killdeer	*Charadrius vociferus*	Secure	-	-	-	-	-	-	-	-	-	-
Lesser Scaup	*Aythya affinis*	Sensitive	-	-	-	-	-	-	-	-	-	-
Loggerhead Shrike	*Lanius ludovicianus*	Sensitive	Special Concern	-	Threatened	Threatened	-	-	-	400	May 1 - Aug. 15	Nest
Long-billed Curlew	*Numenius americanus*	Sensitive	Special Concern	-	Special Concern	Special Concern	100	Apr. 1 - Jul. 15	Active Nest and Surrounding Habitat	200	Apr. 15 - Jul. 15	Nest
Mallard	*Anas platyrhynchos*	Secure	-	-	-	-	-	-	-	-	-	-
Marbled Godwit	*Limosa fedoa*	Secure	-	-	-	-	-	-	-	-	-	-
Mourning Dove	*Zenaida macroura*	Secure	-	-	-	-	-	-	-	-	-	-
Northern Harrier	Circus cyaneus	Sensitive	-	-	-	-	-	-	-	-	-	-
Northern Shoveler	*Anas clypeata*	Secure	-	-	-	-	-	-	-	-	-	-
Osprey	*Pandion haliaetus*	Sensitive	-	-	-	-	-	-	-	-	-	-
Pied-billed Grebe	*Podilymbus podiceps*	Sensitive	-	-	-	-	-	-	-	-	-	-
Prairie Falcon	*Falco mexicanus*	Sensitive	Special Concern	-	-	-	1000	Year Round	Nesting Site	-	-	-
Red-tailed Hawk	*Buteo jamaicensis*	Secure	-	-	-	-	-	-	-	-	-	-
Red-winged Blackbird	*Agelaius phoeniceus*	Secure	-	-	-	-	-	-	-	-	-	-
Savannah Sparrow	*Passerculus sandwichensis*	Secure	-	-	-	-	-	-	-	-	-	-
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Sensitive	-	-	-	-	500	Year Round	Lek	-	-	-
Short-eared Owl	*Asio flammeus*	May Be at Risk	-	-	Special Concern	Special Concern	100	Apr. 1 - Jul. 15	Active Nest and Surrounding Habitat	200	Apr. 1 - Jul. 31	Nest
Solitary Sandpiper	*Tringa solitaria*	Secure	-	-	-	-	-	-	-	-	-	-
Spotted Sandpiper	*Actitis macularius*	Secure	-	-	-	-	-	-	-	-	-	-
Sprague's Pipit	*Anthus spragueii*	Sensitive	Special Concern	-	Threatened	Threatened	100	Apr. 1 - Jul. 15	Active Nest and Surrounding Habitat	350	May 1 - Aug. 31	Nest
Swainson's Hawk	*Buteo swainsoni*	Sensitive	-	-	-	-	-	-	-	-	-	-
Tree Swallow	*Tachycineta bicolor*	Secure	-	-	-	-	-	-	-	-	-	-
Upland Sandpiper	*Bartramia longicauda*	Sensitive	-	-	-	-	100	Apr. 1 - Jul. 15	Active Nest and Surrounding Habitat	-	-	-
Vesper Sparrow	*Pooecetes gramineus*	Secure	-	-	-	-	-	-	-	-	-	-
Willet	*Tringa semipalmata*	Secure	-	-	-	-	-	-	-	-	-	-
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Secure	-	-	-	-	-	-	-	-	-	-
Mammals												
American Badger	*Taxidea taxus*	Sensitive	Data Deficient	-	Special Concern	-	-	-	-	200	-	Den
Bobcat	*Lynx rufus*	Sensitive	-	-	-	-	-	-	-	-	-	-
Canadian Lynx	*Lynx canadensis*	Sensitive	-	-	-	-	-	-	-	-	-	-
Cougar	*Puma concolor*	Sensitive	-	-	Data Deficient	-	-	-	-	-	-	-
Eastern Red Bat	*Lasiurus borealis*	Sensitive	-	-	-	-	-	-	-	-	-	-
Hoary Bat	*Lasiurus cinereus*	Sensitive	-	-	-	-	-	-	-	-	-	-
Little Brown Myotis	*Myotis lucifugus*	Secure	-	-	Endangered	Endangered	-	-	-	-	-	-
Long-tailed Weasel	*Mustela frenata*	May Be At Risk	-	May Be At Risk	-	-	-	-	-	-	-	-
Mule Deer	*Odocoileus hemionus*	Secure	-	-	-	-	-	-	-	-	-	-
Richardson's Ground Squirrel	*Spermophilus richardsonii*	Secure	-	-	-	-	-	-	-	-	-	-
Silver-haired Bat	*Lasionycteris noctivagans*	Sensitive	-	-	-	-	-	-	-	-	-	-
Western Harvest Mouse	*Reithrodontomys megalotis*	Undetermined	-	-	Endangered	Endangered	-	-	-	250	Year Round	Nest
Western Small-footed Bat	Myotis ciliolabrum	Sensitive	-	-	-	-	-	-	-	-	-	-
White-tailed Deer	*Odocoileus virginianus*	Secure	-	-	-	-	-	-	-	-	-	-
Reptiles												
Bull Snake	*Pituophis catenifer*	Sensitive	-	-	Data Deficient	-	500	Year Round	Hibernacula	-	-	-
							200	Year Round	Rookery			
Eastern Plains Garter Snake	*Thamnophis radix*	Sensitive	-	-	-	-	-	-	-	-	-	-
Prairie Rattlesnake	*Crotalus viridis*	May Be at Risk	Special Concern	-	Special Concern	-	500	Year Round	Hibernacula	-	-	-
							200	Year Round	Rookery			
Wandering Garter Snake	*Thamnophis elegans*	Sensitive	-	-	-	-	-	-	-	-	-	-

Notes:

Species of management concern potentially found within the proposed development area but not detected by Tetra Tech EBA

[1] Species Ranges from Government of Alberta Conservation Association et al. 2006; Ridgely et al. 2007; and International Union for Conservation of Nature 2014.

[2] General Status of Alberta Wild Species (Government of Alberta 2010)

[3] Endangered Species Conservation Committee (Government of Alberta 2014b)

[4] Alberta Wildlife Act (Province of Alberta 2000)

[5] Committee on the Status of Endangered Wildlife in Canada (Government of Canada 2015)

[6] Species At Risk Act (Government of Canada 2002)

[7] Alberta Environment and Parks (formerly Alberta Environment and Sustainable Resource Development) (Governent of Alberta 2011; Government of Alberta 2012)

[8] Canadian Wildlife Service (Environment Canada 2011; pers. comm. Gregoire 2013)

LEGEND

- Amphibian Survey Station
- Long-billed Curlew Nesting Area
- Black-billed Magpie Nest
- Spotted Sandpiper Nest
- General Wildlife Reconnaissance Tracks
- Road
- Project Area

NOTES
Imagery Source: Bing Imagery
Base data: CanVec (1:50,000)

STATUS
ISSUED FOR REVIEW

WATERBRIDGE - FURTHER ASSESSMENT
LETHBRIDGE, AB

Wildlife Surveys

PROJECTION	DATUM	CLIENT
UTM Zone 12	NAD83	City of Lethbridge

Scale: 1:13,000
200 100 0 200
Metres

TETRA TECH EBA

FILE NO.				
ENVIND03703_FIG1.mxd				
PROJECT NO.	**DWN**	**CKD**	**APVD**	**REV**
ENVIND03703-01	BB	MS	KM	0
OFFICE	**DATE**			
Tt EBA-CAL	July 6, 2015			

Figure 1

M:\ENVIRONMENTAL\IND\ENVIND03703\Maps\004\ENVIND03703_FIG1.mxd modified 7/7/2015 by Brittney.Bietz

GENERAL CONDITIONS

GEOENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Tetra Tech EBA’s client. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Tetra Tech EBA’s Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Tetra Tech EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. The Client warrants that Tetra Tech EBA’s instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by Tetra Tech EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

Ducks Unlimited Canada
Conserving Canada's Wetlands

June 8, 2015

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

Attention: **Michael Kelly**

Re: **Wetland Loss Compensation – Waterbridge**

Ducks Unlimited Canada (DUC) supports the protection of wetlands as the foundation to fulfilling the goals of the North American Waterfowl Management Plan (NAWMP), specifically the Alberta component. In cases where avoidance or minimization of the wetland impacts cannot be achieved, DUC through its proactive wetland restoration efforts supports the mitigation process by providing restoration of drained wetlands as a compensation option resulting in no net loss of wetlands.

DUC is currently engaged in implementing restoration activities for wetland loss compensation options based upon program area implementation. The wetlands to be restored will fall into the Alberta Prairie initiative and will replace the wetland loss from the proposed development with similar wetland classes within the same major watershed basin. This landscape has been identified as an important wetland restoration area, which will support the recovery of waterfowl, wildlife and biodiversity within the southern region of Alberta.

Following restoration of these drained wetlands, each individual project will be managed consistent with the Alberta NAWMP objectives. These projects and the wetlands associated with them vary in size and class. The restoration of wetlands in this initiative will provide adequate compensation for the wetland loss created by the proposed development.

The proposed development according to the wetland impact assessment supplied by Tetra Tech EBA states that there would be a direct loss of 6.73 hectares of wetland habitat. With the replacement ratio of 3:1, 20.19 hectares of restored wetland habitat will be required. The cost of restoring these wetlands in the Alberta Prairie initiative being $10,000/ha, this equates to $201,900.00 plus GST, as total compensation.

DUC requires written acceptance from The City of Lethbridge in the space provided below. Please return an executed copy of the proposal via email to c_bishop@ducks.ca. Once approved by Environment & Parks, please issue payment to DUC by a certified cheque or Bank draft to the address as indicated on the invoice.

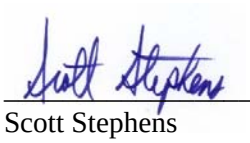
Upon receipt, DUC will provide a confirmation notice for The City of Lethbridge and Environment & Parks's files.

3520 – 114 Ave SE, Calgary, Alberta T2Z 3V6, Phone (403) 201-5577, Fax (403) 201-5580
Toll Free: 1-800-665-DUCK (3825), E-mail: webfoot@ducks.ca, Website: ducks.ca

This proposal and the fees charged will be available for acceptance for 90 days from the date of issue. Payment must be received within 30 days after approval has been issued from Environment & Parks. If these terms are not met, DUC will not be obligated to complete the agreement.

Please feel free to call Craig Bishop at (403) 668-0974 if you have any questions or concerns regarding this proposal.

Yours Truly,



Scott Stephens

Director of Regional Operations, Prairies
Ducks Unlimited Canada

Cc: Hensel, Bryan – Tetra Tech EBA

Enclosures

I, Michael Kelly, on behalf of The City of Lethbridge, do acknowledge and agree to accept the Wetland Loss Compensation proposal and its terms as prepared by Ducks Unlimited Canada.

_____

Signature of Michael Kelly for The City of Lethbridge.

Ducks Unlimited Canada – Wetland Loss Compensation Proposal

Impacted Wetland Site Information

Clients Name:	The City of Lethbridge
Development Name:	Waterbridge
Impact Location:	SW 23-08-22-W4m
Impact Area:	6.73 ha.
Classification System:	Stewart & Kantrud
Impacted Classes:	Class II's & III's
Impacted Watershed:	South Saskatchewan River

Restoration Compensation

DUC Initiative:	Alberta Prairie
Restoration Watershed:	South Saskatchewan River
Replacement Ratio:	3:1
Replacement Area:	20.19 ha.
Compensation Rate:	$10,000/ha.
Total Compensation:	$201,900.00 + GST
Prepared for:	The City of Lethbridge
Prepared by:	Craig Bishop Ducks Unlimited Canada
Date:	June 8, 2015

Ducks Unlimited Canada
Conserving Canada's Wetlands

INVOICE

Invoice#: CB15/085-WR

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

PAYABLE TO: Ducks Unlimited Canada
17915 – 118th Avenue
Edmonton, AB
T5S 1L6

ATTENTION: Pamela Corbett

DATE: June 8, 2015

DESCRIPTION: Waterbridge
Compensation for Wetland Loss

Compensation Total:	$201,900.00
5% GST:	10,095.00
Total Payable to DUC:	$211,995.00

GST#: 118888957

Terms: Payment due 30 days from issue of Environment & Parks approval.

APPENDIX E: REVISED PHASE 1 ENVIRONMENTAL SITE ASSESSMENT

CITY OF LETHBRIDGE

REVISED PHASE I ENVIRONMENTAL SITE ASSESSMENT

WATERMARK COMMUNITY

SW 23-008-22 W4M & NW 14-008-22 W4M

APRIL 2023

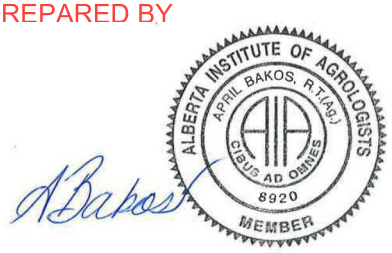
WSP
3300, 237 – 4 AVENUE SW
CALGARY, ALBERTA
T2P 4K3 CANADA

TEL: 1+ 403-243-8380
WSP.COM

WSP PROJECT NO. 201-04167-00

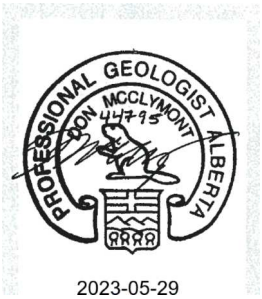
SIGNATURES

PREPARED BY



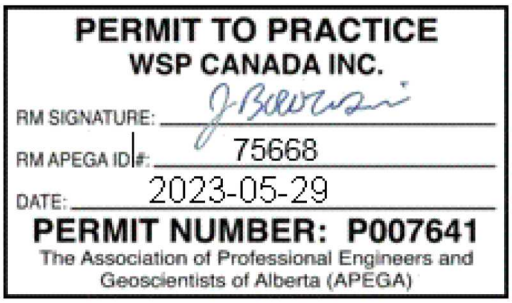
April Bakos, B.A.Sc., RT(Ag)
Project Scientist, Environment

REVIEWED BY



2023-05-29

Don McClymont, P.Geol
Senior Technical Lead, Environment



PREPARED FOR:
City of Lethbridge
910 4 Avenue South
Lethbridge, Alberta
T1J 0P6

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EXECUTIVE SUMMARY

The City of Lethbridge (CoL) contracted WSP to conduct a Phase I Environmental Site Assessment (ESA) of the future Watermark Community development (the Property). The Property is located predominantly within SW 23-008-22 W4M & NW 14-008-22 W4M but also small portions of NW 23-008-22 W4M and NE 14-008-22 W4M.

The objectives of the ESA were to identify evidence of actual or potential contamination on the Property and to summarize:

Contaminants of Potential Concern (CoPCs)	–	CoPCs may include designated substances and/or chemical wastes.
Potentially Contaminating Activities (PCAs)	–	PCAs may include waste management, industrial processes, or materials handling and storage activities on the Property or on adjacent/adjoining properties.
Areas of Potential Environmental Concern (APECs)	–	An APEC is an area where one or more CoPCs may be present on, in, or under the Property as determined through the identification of a PCA.
Areas of Environmental Concern (AEC)	–	An AEC is an area where one or more CoPCs are known to be present on, in, or under the Property as determined through documented assessments.

The purpose of the ESA was to provide information to CoL for a due diligence investigation prior to development.

This report presents the results of the assessment, based on a records review, current owner/occupant interview, and a site visit. The following table summarizes the APECs identified.

Description of APECs	PCAs	Possible COPCs and Special Attention Items
1. Areas of sparse vegetation in the north, east-central and southeastern portions of the Property.	On-site: It is unknown why the sparse vegetation exists. It may be due to natural soil chemistry.	CoPCs: Salinty/sodicity
2. Presence of soil piles southeast of the school and skate park of unknown origin.	On-site: Possibly from street sweeping	CoPCs: Salinity Metals Petroleum hydrocarbons
3. Possible organic soils associated with ephemeral wetlands.	On-site: Natural build-up of organic soils which off-gas methane	CoPCs: Methane gas
4. Substation on the western boundary of the Property and pole-mounted transformer east of the substation.	On-site: Historical use of PCBs in the cooling oil	CoPCs: Polychlorinated biphenyls (PCBs)
5. Presence of transformers along the eastern boundary of the Property.	Off-site: Historical use of PCBs in the cooling oil	CoPCs: PCBs

CONCLUSIONS AND RECOMMENDATIONS

As of June 10, 2020, within the limitations of the Phase I ESA methodology, no evidence of potential or actual contamination was revealed in connection with the Property. No further investigations are recommended at this time; however, the following recommendations are made:

- An intrusive investigation is not recommended for APEC #1, as the lack of vegetation growth in the three areas does not appear to be associated with an anthropogenic impact. The soils may be naturally saline or sodic, and this may be contributing to the lack of vegetation. It should be noted that these soils may not be suitable for vegetation growth in future landscaped areas of the Property. Soil sampling and testing can be conducted to confirm the saline/sodic characteristics of the soil.
- Unless the origin of APEC #2 (small soil piles southwest of the skate park and school) can be confirmed as originating from the Property, soil sampling should be conducted to determine the suitability of this soil for reuse on-site, or the soil piles should be disposed to landfill.
- If encountered, organic soils (APEC #3) should not be used as engineered fill beneath buildings or under sealed surfaces such as asphalt parking lots due to the potential for methane generation and accumulation.
- The presence of the substation and pole-mounted transformer (APEC #4) on the eastern portion of the Property, or the transformers on the eastern adjacent properties (APEC #5) does not warrant any action at the present; however, a qualified professional is required for safe and proper removal and disposal at the time the transformer is no longer required. If the transformer is damaged and leaks are apparent, the owner of the transformer should be contacted to rectify the unit.

This executive summary is intended to be read in conjunction with, and is subject to, the same limitations as the remainder of the report.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

The City of Lethbridge (CoL) contracted WSP to conduct a Phase I Environmental Site Assessment (ESA) of the future Watermark Community development (the Property, Figure 1). The Property is located predominantly within SW 23-008-22 W4M & NW 14-008-22 W4M but also small portions of NW 23-008-22 W4M and NE 14-008-22 W4M.

1.1 Scope and Objectives

The objectives of the Phase I ESA were to identify evidence of actual or potential contamination on the Property and to summarize:

Contaminants of Potential Concern (CoPCs)	–	CoPCs may include designated substances and/or chemical wastes.
Potentially Contaminating Activities (PCAs)	–	PCAs may include waste management, industrial processes, or materials handling and storage activities.
Areas of Potential Environmental Concern (APECs)	–	An APEC is an area where one or more CoPCs may be present on, in or under the Property as determined through the identification of a PCA.
Areas of Environmental Concern (AEC)	–	An AEC is an area where one or more CoPCs are known to be present on, in, or under the Property as determined through documented assessments.

The purpose of the Phase I ESA was to provide information to the CoL for a due diligence investigation prior to development.

This Phase I ESA documents the information gathered and presents an evaluation of the available information.

1.2 Methodology

The Phase I ESA was performed in general conformance with the Canadian Standards Association *Z768 01 (R2016) Phase I Environmental Site Assessment* (CSA, 2001).

This Phase I ESA is based on a site visit, a records review and an interview with personnel knowledgeable regarding the history of the Property. The distance outside the Property boundary within which available records are reviewed varies with the record requiring review. While the CSA standard does not specify distances, it does require a review of such records for adjoining properties along with determination and documentation of appropriate search distances for any other property that can reasonably be expected to have been a source of CoPCs on the Property is prescribed by the CSA standards and available records were reviewed and are summarized in the Phase I ESA.

The records that were sought included:

- Publicly available information including:
  - Historical aerial photographs
  - Title searches
  - Previous environmental assessments and reports
  - Wellsite and pipeline locations
  - Flood hazard maps
  - City Directories
  - Regulatory information (e.g., permits/approvals/authorizations, regulatory orders, enforcement actions)
  - Petroleum storage tank records
  - Reported spills
  - Land use (i.e., zoning)
  - Fire Insurance Products
- Property and owner/operator records as available, including:
  - Site plans
  - Asbestos surveys
  - Spill records
  - Chemical inventory
  - Environmental monitoring records
  - Waste management protocols
  - Materials management protocols
  - Tank information
  - Previous audits or assessments

The Phase I ESA did not include tasks such as sample gathering, laboratory testing, or intrusive investigations.

Variances from the methodology standards, based on time limitations, included the following:

- Some historical use records for the Property and adjoining properties (i.e., fire insurance maps, business directories) were not reviewed.
- Land titles were not determined for adjoining properties.
- Interviews were not conducted with adjoining property landowners.

The Phase I ESA also contains WSP's professional opinion on site-specific potential or actual environmental issues, the associated risks, and the follow up action required to better understand and mitigate the issues.

2 SITE DESCRIPTION

2.1 General Property Information

Property and Local Environment Figure 2; Figure 3	Property address:	No civic address
	Property Dominion Land Survey location:	SW 23-008-22 W4M & NW 14-008-22 W4M
	Property area and dimensions:	148.5 hectares (342 acres) 2,000 x 1,000 m (measured at the widest areas)
	Nearest populated centre:	Located in the southwestern portion of the City of Lethbridge in southeast Alberta
	Nearest waterbody:	Oldman River is located 1.7 km southeast of the Property.

2.2 Titles and Land Use

Land Title

(Service Alberta Spatial Information System [SPIN], 2020)

Appendix A-1

The Property consists of 10 separate titled parcels on SPIN. A map located in Appendix A-1 depicts the parcels.

Property legal designation: 4;22;8;23; NW

Land Identification Number Code: 0035 575 341

Title Number: 131 029 851 +1

Legal Description:

LEGAL DESCRIPTION
MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER NORTHWEST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES MORE OR LESS
SUBDIVISION	7710684		52.32
REPLOTTING SCHEME	7710705		1.06
REPLOTTING SCHEME	7710882		71.57
REPLOTTING SCHEME	7810431		9.01
SUBDIVISION	0814827	0.101	0.25
ROAD	1112320	3.477	8.59
SUBDIVISION	1310320	1.341	3.31

EXCEPTING THEREOUT ALL MINES AND MINERALS

Property legal designation: Plan 1012889, Block 1, Lot 2PUL

Land Identification Number Code: 0034 394 973

Title Number: 101 218 536

Legal Description:

LEGAL DESCRIPTION
PLAN 1012889
BLOCK 1
LOT 2PUL (PUBLIC UTILITY LOT)
EXCEPTING THEREOUT ALL MINES AND MINERALS

Property legal designation:	4;22;8;23; SW
Land Identification Number Code:	0038 368 817
Title Number:	191 128 871 +2
Legal Description:	THE SOUTHWEST QUARTER OF SECTION TWENTY THREE (23) TOWNSHIP EIGHT (8) RANGE TWENTY TWO (22) WEST OF THE FOURTH MERIDIAN CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS EXCEPTING THEREOUT

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	7.99	19.74
SUBDIVISION	7911317	5.26	12.99
SUBDIVISION	8910881	0.702	1.74
SUBDIVISION	1012889	0.182	0.45
ROAD	1112320	0.164	0.41
SUBDIVISION	1810565	0.172	0.43
SUBDIVISION	1911404	1.467	3.63

EXCEPTING THEREOUT ALL MINES AND MINERALS

Property legal designation:	Plan 1911404, Block 1, Lot 4
Land Identification Number Code:	0038 368 833
Title Number:	191 128 870
Legal Description:	LEGAL DESCRIPTION PLAN 1911404 BLOCK 1 LOT 4 EXCEPTING THEREOUT ALL MINES AND MINERALS

Property legal designation:	Plan 1911404, Block 1, Lot 3MR (MUNICIPAL RESERVE)
Land Identification Number Code:	0038 368 841
Title Number:	191 128 870 +1
Legal Description:	LEGAL DESCRIPTION PLAN 1911404 BLOCK 1 LOT 3MR (MUNICIPAL RESERVE) EXCEPTING THEREOUT ALL MINES AND MINERALS
Property legal designation:	Plan 1710944, Block A
Land Identification Number Code:	0038 368 825
Title Number:	191 128 870 +3
Legal Description:	PLAN 1710914 AREA `A' CONTAINING 8.093 HECTARES (20.00 ACRES) MORE OR LESS EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	1810565	0.033	0.08
SUBDIVISION	1911404	0.845	2.09

EXCEPTING THEREOUT ALL MINES AND MINERALS

Property legal designation:	4;22;8;14; NW
Land Identification Number Code:	0037 886 785
Title Number:	181 052 918 +1
Legal Description:	MERIDIAN 4 RANGE 22 TOWNSHIP 8 SECTION 14 QUARTER NORTHWEST CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	1810565	1.563	3.86
ROAD	1810568	3.017	7.46

EXCEPTING THEREOUT ALL MINES AND MINERALS

Property legal designation:	Plan 1810565, Block 100, Lot 2MSR
Land Identification Number Code:	0037 885 580
Title Number:	181 052 305 +1
Legal Description:	LEGAL DESCRIPTION PLAN 1810565 BLOCK 100 LOT 2MSR (MUNICIPAL AND SCHOOL RESERVE) EXCEPTING THEREOUT ALL MINES AND MINERALS
Property legal designation:	Plan 1810565, Block 100, Lot 1SR
Land Identification Number Code:	0037 885 572
Title Number:	181 052 305
Legal Description:	LEGAL DESCRIPTION PLAN 1810565 BLOCK 100 LOT 1SR (SCHOOL RESERVE) EXCEPTING THEREOUT ALL MINES AND MINERALS

Property legal designation:	4;22;8;14; NE
Land Identification Number Code:	0037 886 777
Title Number:	181 052 918
Legal Description:	LEGAL DESCRIPTION MERIDIAN 4 RANGE 22 TOWNSHIP 8 SECTION 14 QUARTER NORTHEAST CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70
SUBDIVISION	0911396	0.280	0.69
ROAD	1010289	1.57	3.88
SUBDIVISION	1010942	4.13	10.21
SUBDIVISION	1012954	4.912	12.1
ROAD	1013789	4.569	11.3
SUBDIVISION	1112039	3.048	7.53
SUBDIVISION	1810565	4.880	12.06
ROAD	1810568	0.827	2.04

EXCEPTING THEREOUT ALL MINES AND MINERALS

A title search was conducted on the SPIN website for the locations. The registered owner of the Property is the CoL, except for the parcels containing the school (LINC # 0037 885 580 & 0037 885 572). It is also owned by Lethbridge School Division No. 51. All other parcels of land have always been owned by the CoL.

The restrictive covenants, easements, and caveats on the title were not identified as PCAs at this time.

Land Use Figure 2 (CoL, 2020) Appendix A-2	Subject Property	Property is an undeveloped portion of land located within the future Watermark Community in the southwest edge of the City of Lethbridge, Alberta. It is zoned predominantly as a Future Urban (FUD) Development District with Parks and Recreation (P-R), Public Building (P-B), Direct Control (DC) and Small Parcel Low-Density Residential (R-SL) Development Districts in the City of Lethbridge Land Use Bylaw.
	– North-adjacent:	Zoned: Mixed Density Residential (R-M), Comprehensively Planned Low-Density Residential (R-CL), Medium Density Residential (R-75)
	– East-adjacent:	Zoned: Comprehensively Planned Low-Density Residential (R-CL), Comprehensively Planned Medium Density Residential (R-CM), and Parks and Recreation (P-R)
	– South-adjacent:	Zoned: Future Urban Development District
	– West-adjacent:	Zoned: Future Urban Development District

2.3 Biophysical Setting

Natural Region and Subregion (Downing & Pettapiece, 2006)	The Property is situated within the following Region and Subregion.		
	Region:	Grassland	
	Subregion:	Mixedgrass	
	Vegetation:	Mainly agricultural with needle and thread, porcupine grass, northern and western wheatgrass	
	Climate:	Warmest month, temperature:	July, 17.6°C
		Coldest month, temperature:	January, -10.2°C
		Maximum Precipitation (month, volume):	June, 394 mm
	Soils:	Dark Brown Chernozems and Gleysols in wetlands	
	Regional Land Use:	Oil and gas, grazing, and irrigation-based farming	
Soils and Topography (Agriculture Canada, 1989)	Soil Classification:	Reference Soil:	Regosolic
		Parent Material:	Loam
		Mode of Deposition:	Undifferentiated
		Topography:	Dissected
		Slopes:	16 to 30%

Regional Bedrock and Surficial Geology (Downing & Pettapiece, 2006)	Bedrock Geology:	The underlying bedrock is a mixture of Upper Cretaceous non-marine sandstones and siltstones and marine shales, with some Tertiary sandstones and siltstones along the west side.
	Surficial Geology:	The surficial materials on the plains are a mixture of silty glaciolacustrine (or eolian) sediments and medium textured glacial till, with some inclusions of glaciofluvial and eolian sands. All are moderately calcareous. The drift thickness is often relatively shallow (often 2 m to 3 m thick), and saline seepage frequently occurs on sloping terrain. On the upland slopes, the material is usually a thicker till deposit.
Surface Water and Groundwater Flow (Alberta Environment and Parks [AEP], 2020a) Appendix A-3	Flood Hazard:	Flood hazard mapping is prepared for some communities in Alberta and is available via the AEP website. Flood hazards have not been identified in all communities and may exist in areas without flood hazard mapping. The current design flood standard in Alberta is the 100-year flood, determined when a flood hazard study is undertaken. The Flood Hazard Map for the region does not show any floodway within 300 m of the Property.
(Natural Resources Canada, 2020) Appendix A-4 Figure 3	Regional Surface Drainage:	The region is rolling to undulating with regional surface drainage to the south towards the Oldman River.
	Local Surface Drainage:	The town stormwater collection system captures surface drainage in the eastern area in the developed area and directs it to the Oldman River south of the Property.
	Local Groundwater Flow:	No information was available on flow direction(s) of shallow groundwater in the Property area. However, based on the location of the Oldman River, it is inferred to flow towards the west, south, or east.

3 RECORDS REVIEW

Various documents and resources were reviewed for information concerning past uses of, and activities at, the Property.

3.1 Historical Aerial Photograph Summary

Aerial photographs of the Property and vicinity were obtained from Google Earth Pro (GEPro, 2020) and the Aerial Photographic Record System (APRS, 2020).

WSP reviewed aerial photographs from 1950 to 2020, as summarized in Table 1. Historically, the Property was situated on agricultural land and remains undeveloped with the exception of the CoL Bowron Substation, the Senator Joyce Fairborn School, and the fire station lot currently under construction. The CoL Bowron Substation was constructed between 1979 and 1988. Residential land development adjacent to the Property was first evident

in 1979. Soil disturbances assumed associated with initial construction activities were visible in the southeastern portion of the Property in 2016 and in the east-central portion in 2019.

Table 1 Historical Aerial Photograph Summary

Date	Scale	Source	Subject Property	North Adjacent Property	South Adjacent Property	East Adjacent Property	West Adjacent Property
May 10, 1950	1:40,000	APRS	The Property was cultivated agricultural land, and several small low areas (ephemeral wetlands) were visible.	The properties were agricultural land. 24 Ave W was visible approximately 300 m north.	The properties were agricultural land. An acreage was visible 180 m southwest of the Property.	An acreage and irrigation canal were visible approximately greater than 300 m from the northeastern portion of the Property.	The properties were agricultural land. An acreage was located approximately along the central portion of the western boundary, west of 25 St. W (adjacent to the Property).
August 23, 1961	1:32,000	APRS	No significant changes were apparent.	No significant changes were apparent.	No significant changes were apparent.	No significant changes were apparent.	The acreage was no longer visible (the footprint of the buildings were still evident).
May 1, 1970	1:32,000	APRS	The land appeared to be farmed with different crops (dark and light strips). More wetlands were visible throughout the Property.	No significant changes were apparent.	Some wetlands were visible adjacent to the south.	Some wetlands were visible greater than 100 m from the Property boundary.	Some wetlands were visible adjacent to the west of 25 St. W.
April 25, 1979	1:25,000	APRS	An area of soil storage was visible in the northern portion of the Property (small triangular area), presumably from the adjacent residential development.	24 Ave W was redirected to the northeast. The community of Varsity Village was under construction.	The ephemeral wetlands contained more water than in previous years.	The community of Varsity Village was under construction with residences evident adjacent to the northeast.	The wetlands contained more water than in previous years.
July 8, 1988	1:30,000	APRS	The CoL Bowron Substation was visible along the western boundary adjacent to 25 Street W. The powerline running from the substation to the east, towards the current Macleod Drive W, was evident.	More residences were visible in Varsity Village north of the Property.	The wetland areas were dry.	More residences were visible in Varsity Village. The community of Mountain Heights was under construction.	The wetland areas were dry.
June 23, 1994	1:23,000	APRS	Only one farming technique was used.	No significant changes were apparent.	No significant changes were apparent.	More residences were visible in the Mountain Heights community.	No significant changes were apparent.

Date	Scale	Source	Subject Property	North Adjacent Property	South Adjacent Property	East Adjacent Property	West Adjacent Property
May 12, 2005	Digital	GEPro	No significant changes were apparent.	No significant changes were apparent.	No significant changes were apparent.	The land was cleared for the future Sunridge community.	No significant changes were apparent.
June 29, 2012	Digital	GEPro	An area northeast of the community of Sunridge was cleared, but no structures were apparent. There were trails leading northeast to Rocky Mountain Blvd. adjacent to the northeast of the lot containing the future Senator Joyce Fairborn School. A couple of ephemeral wetlands were visible throughout the Property.	The current Metis Trail was visible which ran from the northwest to join with 25 Street.	A couple of ephemeral wetlands were visible adjacent to the Property.	The Sunridge community was constructed.	The community of Copperwood was under construction to the northwest (170 m from the Property).
October1 0, 2014	Digital	GEPro	The cleared area was no longer visible and was farmed over.	No significant changes were apparent.	No significant changes were apparent.	Sunridge Park was visible adjacent to the southeastern portion of the Property.	More of the Copperwood community was under construction (west of Metis Trail)
September 19, 2016	Digital	GEPro	Soil stripping was evident on the Senator Joyce Fairborn School lot. A portion of the foundation was poured. A trail from 25 St W led to the school lot. The area south of the school lot also stripped	No significant changes were apparent.	No significant changes were apparent.	No significant changes were apparent.	More residential development was apparent in the Copperwood community.
July 22, 2018	Digital	GEPro	Construction on the school was complete. Watermark Park, west of the school building, was vegetated with grasses. The area south of the school lot was still disturbed, presumably for future development. Ephemeral wetlands were visible throughout the Property.	No significant changes were apparent.	No significant changes were apparent.	Rocky Mountain Blvd. was apparent adjacent to the school lot. A paved roadway was visible south of the school parcel.	More residential development was apparent in the Copperwood community.
June 16, 2019	Digital	GEPro	Soil stripping was evident on the fire station lot adjacent to Macleod Drive W.	No significant changes were apparent.	No significant changes were apparent.	No significant changes were apparent.	No significant changes were apparent.
March 2, 2020	Digital	GEPro	The cribbing of the fire station was evident.	No significant changes were apparent.	No significant changes were apparent.	No significant changes were apparent.	Construction within the Copperwood community appeared to be complete.

3.2 Environmental Enforcement Search

(Environmental Law, Centre, 2020)
(Province of Alberta, 2014)

Appendix A-5

WSP requested an Environmental Enforcement Historical Search for the owner of the Property, the City of Lethbridge. The search does not include cleanup orders under the *Litter Act*, or Environmental Protection Orders respecting unsightly property issued under *the Environmental Protection and Enhancement Act* (EPEA).

No enforcement actions were identified related to the Property under the EPEA or its predecessor legislation.

3.3 Fire Insurance Maps and Products

(Environmental Risk Information Service™ [ERIS], 2020)

Fire insurance products (FIPs) can provide historical information on structures and activities for locations in developed areas. A search for FIPs was not requested for the municipal location of Lethbridge, Alberta, as FIP production ceased production, per ERIS, in 1974. The Property is currently mainly undeveloped, and the surrounding areas were developed after 1974.

3.4 City Directory

City directories provide a historical listing of former businesses and activities in some municipal areas.

As the Property is undeveloped and the surrounding areas are residential, City Directories were not requested.

3.5 Storage Tanks

(Petroleum Tank Management Association of Alberta [PTMAA], 2020)

Appendix A-6

The PTMAA maintains a registry of active tank sites and abandoned tank sites. The PTMAA cannot guarantee that tanks do not or have not existed on the locations requested. The main limitation of the PTMAA database is that it only includes information reported through registration or a survey of abandoned sites since 1992.

The PTMAA performed a search of the Legal Land Descriptions of the Property. There were no tanks registered with the PTMAA at the Property.

3.6 Oil and Gas Wells, Pipelines and Facilities

(Abacus Datagraphics Ltd. [Abadata], 2020)

Figure 2

Appendix A-7

The Alberta Energy Regulator's (AER's) databases of oil and gas (O&G) wells, pipelines and facilities were searched using the map capabilities of Abadata.

No O&G facilities, wells or pipelines have been located on or adjacent to the Property.

3.7 Water Wells

(AEP, 2020b)

Appendix A-8

As of May 21, 2020, the Alberta Water Wells Information Database (AWWID) was searched via the AEP website to identify wells that may be on or within 300 m of the Property. The exact locations for wells in the AWWID may be inaccurate due to the age of the records and/or the recording methods. Locations for wells are generally accurate to the quarter-section (+/- 560 m).

WSP identified no cased wells that may be on or within 300 m of the Property. There was one federal well survey, one well inventory, and one structure test hole. A summary of the structure test hole is provided in Appendix A-8.

- The structure test hole drilled in 1930 was located on the Property.
- The federal well survey and inventory well are not located on the Property but may be within 300 m of the Property.

The depth to the usable aquifer is estimated to be 1.5 m (data from only one borehole).

The scope of this Phase I ESA does not include assessing abandoned wells or the efficacy of closure(s).

3.8 Spill Records

Railway Spills

(Railway Association of Canada, 2020)

There are no railways on the Property or the adjacent/adjoining properties.

Oil and Gas Spills

(AER, 2020a)

Appendix A-7

The spill database of the AER, last updated May 5, 2020, was searched for reported spills from oil and gas facilities.

There were no spills from oil and gas facilities or pipelines recorded on the Property or the adjacent/adjoining properties in the AER database.

Client Spill Records

No internal records of spills were provided as no known spills occurred on the Property according to the interview.

3.9 Chemical Inventories

National Pollutant Release Inventory (NPRI)

(Environment Canada, 2020)

The NPRI requires that facilities which meet thresholds for full time employees and threshold volumes of certain substances must report the volumes discharged. As such, the NPRI list is not a complete list of all chemicals on a site, but does provide an indication of some of the chemicals that are used in large volumes, as required by the NPRI program.

There were no NPRI reports from 1993 to 2018 on or within 300 m of the Property.

Safety Data Sheets (SDS)

No SDS were provided by the client as the interviewee was unaware of any chemicals used on the Property.

3.10 Authorizations and Permits

(AEP, 2020d)
Appendix A-9

The Authorization Viewer is a searchable database of documents related to AEP approvals, licenses, registrations, authorizations, permits and certificates issued under the *Water Act* and *EPEA*.

The Property's location Sections 14 & 23 008-22 W4M was searched on May 21, 2020, for authorizations and/or approvals on the AEP Authorization Viewer.

A total of five documents were identified:

- All of the documents refer to expired *Water Act* Approvals regarding the infilling of wetlands by the CoL.

No PCAs or CoPCs were identified as a result of the documents identified in the AEP Authorization Viewer.

3.11 Hazardous Waste Generators and Receivers

(AEP, 2020d)

As of May 21, 2020, the lists of hazardous waste generators (updated August 2018) and hazardous waste receivers (updated August 2018) were obtained from the AEP website.

The lists did not include the Property, or the current owner, as a hazardous waste generator or receiver.

The lists also did not include the neighbouring properties:

- 25 Street
- Rocky Mountain Blvd
- Mt Sunburst
- Mt Crandell
- Sunridge Crescent
- Ryerson
- Simon Fraser
- Claire Promenade
- McLeod Drive W
- Metis Trail W

3.12 Landfills and Coal Facilities

Alberta Energy Regulator
(AER, 2020b)
(Abadata, 2020)
Figure 2
Appendix A-7

The AER listings of landfills, coal holes, and coal mines were searched using the map capabilities of Abadata.

There were no findings on or within 300 m of the Property.

Help End Landfill Pollution (H.E.L.P.)

(Alberta Environment, 1988)

H.E.L.P. was created to provide tracking and management of industrial landfills in Alberta. The document identifies 680 sites in Alberta.

The location of the Property was searched in H.E.L.P. and no landfills were identified on or within 300 m of the Property.

MacLaren Report

(Alberta Environment, 1982)

The MacLaren Report was undertaken to prepare an inventory of active and inactive landfill disposal sites. The document identifies 705 active sites and 447 inactive sites in Alberta, as of 1982.

The location of the Property was searched in the MacLaren Report, and no landfills were identified on or within 300 m of the Property.

Regional Waste Contact List

(Alberta Government, 2016)

The location of the Property was searched in the Regional Waste Management Authority Contact List.

No landfills were identified on or within 300 m of the Property.

3.13 Federal Contaminated Sites Inventory

(Treasury Board of Canada Secretariat, 2020)

The Federal Contaminated Sites Inventory (FCSI) includes information on all known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility. It does not include sites where contamination has been caused by, and which are under the control of, enterprise Crown corporations, private individuals, firms or other levels of government.

The FCSI was accessed on May 21, 2020, and does not show a federal contaminated site on or adjacent to the Property.

3.14 Previous Environmental Reports and Assessments

AEP Freedom of Information and Protection of Privacy Act (FOIPP) Request

(AEP, 2020e)

Appendix A-10

A search request regarding information related to potential environmental impact for the Property was submitted to AEP on May 21 & 22, 2020, using the FOIPP request form. The original request did not include the parcels owned by the School Division.

On May 22 & 25, 2020, the AEP indicated no records related to the search requests were identified.

Environmental Site Assessment Repository (ESAR)

(AEP, 2020f)

Appendix A-11

The ESAR database, which is maintained by AEP, contains scientific and technical information about assessed and/or reclaimed sites throughout Alberta. ESAR shows the approximate locations of assessed or reclaimed sites with markers. Each marker may contain links to multiple documents.

As of May 22, 2020, the AEP ESAR identified no markers with previous environmental assessments on properties adjacent/adjoining the Property. There was one Reclamation Certificate identified; however, the former well lease is located over 400 m west of the Property.

Client Documents The Client provided a 2008 and a 2012 Phase I ESA, which are summarized in Table 2.

Table 2 Summary of Pertinent Previous Environmental Reports and Assessments

Source of Document	Summary of Contents
Document: 2008 Phase I ESA **Year of Work**: 2008 **Reference Source:** Client	**On-Site Location:** The Property **Document Title:** *Phase I Environmental Site Assessment – Revised Portions of 14 and 23-008-22 W4M, Lethbridge, Alberta*, Prepared for Associated Engineering Alberta Ltd. by EBA Engineering Consultants Ltd.(EBA), November 2008. 68 pages, (EBA, 2008) **Purpose:** To determine the potential of past or present land use to cause environmental impairment to the Property. **Summary:** – According to aerial photograph review, a soil stockpile was observed on the northern portion of the Property (100 Benton Drive) in 1979, and the source was thought to be the development of the residential Mountain Heights subdivision. Aerial photographs also revealed several ephemeral wetlands that were cultivated over the years, potentially generating methane. – A soil stockpile was noted. – There was no additional potential for environmental impacts from current or historical land uses on the Property. – A potential source of contamination adjacent to the Property was identified as the #674S CoL Electrical Substation which may introduce polychlorinated biphenyls (PBCs) to the environment; however, no incidents of releases were found. – A Phase II ESA was not recommended by EBA. **WSP Comments:** WSP agrees with the recommendations by EBA. The potential PCB contamination, if any, would likely be localized to the substation site.
Document: 2012 Phase I ESA **Year of Work:** 2012 **Reference Source:** Client	**Off-Site Location:** Agricultural Area (immediately west of the Property) **Document Title**: *Phase I Environmental Site Assessment, Waterbridge Expansion, 4020 & 3800 – 25 Street West and 4025 & 3505 – 30 Street West, Lethbridge, Alberta.* Lethbridge, AB. Prepared for the City of Lethbridge by EBA, January 2012. 84 pages, (EBA, 2012) **Purpose:** To determine the potential of past or present land use to cause environmental impairment to the site. **Summary:** – The Water Bridge Planned Community encompasses a portion of the SE 22-008-2 W4M, NE-15-008-22 W4M, NE15-008-22 W4M and a small portion of SE 22-008-22 W4M. – There was a Reclamation Certified well, Licence No. 919472, within 10-15-008-22 W4M. The well was spudded in January 1974 and abandoned four days after the final drill date. Two natural gas pipelines were located through the Property. – The site was situated on agricultural land with small wetlands. – Potential environmental impairments on-site included the wetlands with potential to generate methane, the Reclamation Certified well, and the Bonavista wellsite and pipelines on the west side to the site. – EBA recommended reviewing additional information related to the wellsites (i.e., well file reports), and prior to future development, the organic materials in the wetland areas should be removed. **WSP Comments:** The wellsites are not considered to be an APEC for the Property as the closest well, 100/10-15-008-22 W4M (Licence No. 919472) is over 400 m from the western Property boundary.

4 SITE VISIT

WSP visited the Property on June 6, 2020. The purpose of the visit was to observe conditions at the Property and neighbouring sites that may have impacted soil and/or groundwater at the Property. The site visit documentation is contained in Appendix B.

4.1 Property Overview

The following observations were made during the visit of the Property (Figure 3):

Limitations Accessing or Observing the Property:	– The transmission substation was not entered. – The school was not entered as the scope was focused on the undeveloped portion of the Property.
Topography:	– The topography of the Property and adjacent land is undulating to gently rolling with a general slope south-southeast toward the Oldman River.

Summary of Activities and Features on the Property.	– The majority of the Property was undeveloped agricultural land. There is an electrical substation (Bowron) along the western boundary, the fire station lot which was under construction, and the middle school and skate part lots.
	– A pole-mounted transformer was noted east of the substation.
	– A dozen transformers were observed in the eastern portion of the Property. The transformers were manufactured within the last 10 years.
	– There were large soil piles observed southwest of the fire station which were assumed to be from the development of the fire station or adjacent residential communities.
	– The housekeeping is good throughout, except for some domestic/construction debris observed along a wooden fenceline in the northern portion of the Property. The waste appeared wind-blown and was comprised of plastics, cardboards, residential building materials, and other inert waste. There were no chemical containers or staining observed.
	– There were four areas of sparse vegetation noted on the Property:
	  – One in the narrow northern portion (35 m x 15 m) appeared to not have been seeded due to equipment access.
	  – One was noted west of the fire station construction lot (130 m x 40 m), which was surrounded by wooden fencing.
	  – Two were observed in the southeastern portion of the Property, south of the school and skate park and also adjacent to the residential community of Sundance (200 m x 100 m for the eastern and 125 m x 75 m for the western).
	– There were small soil piles (60 m x 35 m approximate size) located southwest of the skate park and school. The piles may have possibly been from recent street sweeping in the area. They were near a larger soil pile, presumably from adjacent residential development.

4.2 Surrounding Properties

The following observations were made of the surrounding properties adjacent to and in the vicinity of the subject Property (Figure 2).

–	North:	Current Occupant(s) and Activity:	Residential
		Topography:	Mostly flat with a slope to the south and same elevation as the Property
–	East:	Current Occupant(s) and Activity:	Residential Three older transformers (not dated) were observed along the boundary to the Property. The age of the transformers, based on aerial photograph review, would be between 1979 and 1988.
		Topography:	Mostly flat with a slope to the east and same elevation as the Property
–	South:	Current Occupant(s) and Activity:	Agricultural
		Topography:	Undulating
–	West:	Current Occupant(s) and Activity:	Residential and Agricultural
		Topography:	Undulating

4.3 Other Potential Issues

During the site visit there was no evidence observed of the following:

- Asbestos-containing materials
- Urea-formaldehyde foam insulation
- Ozone-depleting substances
- Lead and lead-based paint
- Mould
- Radon
- Hydraulic equipment
- Chemical storage
- Unidentified odours
- Aboveground storage tanks
- Underground storage tanks and sumps
- Hazardous waste
- Surface staining
- Pits, ponds, or excavations
- Electric/magnetic fields
- Vibrations

4.4 Special Attention Items

Section 7.2.1.12 of the CSA Standard requires that some items and conditions require special attention because of heightened public concern and/or specific environmental legislation. The special attention items, as listed in the CSA standard, include but are not limited to:

- PCBs
- Asbestos-containing materials
- Lead-containing materials
- Ozone-depleting substances
- Urea-formaldehyde foam insulation
- Radon
- Mould
- Noise
- Electric and magnetic fields vibration

The following special attention items were identified during this ESA.

- PCBs Radon

A description of the special item identified is included here to clarify the significance of the findings.

4.4.1 Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) are synthetic compounds with stable chemical properties. They are a persistent organic pollutant and are toxic to humans. PCBs were first manufactured in 1929 and widely used until the 1970s as dielectric and coolant fluids in electrical transformers, capacitors, and fluorescent light ballasts. Their stable chemical properties made them ideally suited for applications that required durability and resistance to heat and light. They were never manufactured in Canada, but were widely used in this country. Although some equipment that contains PCBs remains in use, the manufacturing, processing, importing and offering for sale of PCBs have been prohibited in Canada since 1977. The PCB Regulations, which came into effect in 2008, implement stricter deadlines on equipment containing PCBs in use and in storage in order to reduce releases of PCBs into the environment.

The transmission station and the pole-mounted transformer east of the transmission station may have been installed circa 1979, and consequently may contain PCBs in the cooling oil. The transmission station and pole-mounted transformer appeared to be in good condition. The newly installed transformers near the fire station and school lots are not expected to contain PCBs as they were manufactured in the last 10 years and are in good condition; therefore, they are not considered APECs. The other, older transformers along the eastern adjacent properties appeared to be good condition. There were no placards that indicated whether the transformer oil was PCB containing; however, the label indicated they were tested for PCBs.

As long as this equipment is being used for its intended purpose, and is in good operating condition, it is not considered to be waste material. If the transformer(s) is damaged or leaks, the owner of the transformer should be contacted immediately and required to address the situation as soon as possible.

4.4.1 Radon

Although no evidence of radon was observed during the site visit or document review, all sites in Canada have the potential for the presence of radon. In compliance with the CSA standard, a brief overview of radon is provided here.

Radon is a colourless, odourless, and tasteless radioactive gas formed from the breakdown of uranium, a naturally occurring radioactive material found in soil, rock, and groundwater. Radon concentrations will vary depending on underlying geologic units, uranium geochemistry and radiometric geophysical response. As a gas, radon can move freely from the soil or bedrock into the atmosphere and may accumulate in enclosed areas, such as mines or buildings.

According to Health Canada (Health Canada, 2020a), “Remedial measures should be undertaken in … [the normal occupancy area of a building, excluding mines and workplaces covered by guidelines for naturally occurring radioactive materials,] … whenever the average annual radon concentration exceeds 200 Becquerel per cubic meter.” The "normal occupancy area" refers to any part of the building where a person is likely to spend greater than four hours per day.

Generally, there are no legal requirements to test for radon. There were no direct observations of radon at the Property; however, the potential for radon exists throughout most of North America. In the absence of any region-specific or user-specific legislation for testing, there are no recommendations for radon testing at the Property at this time. However, the Alberta Building Code requires that a roughed-in radon mitigation system be installed in new buildings with occupied spaces.

5 INTERVIEW

WSP interviewed Ms. Abby Slovack, Land Development Manager with the CoL, on June 2, 2020 (Appendix C). Ms. Slovack indicated the following:

- The majority of the Property is farmed by College Farms. The crop in 2019 was peas.
- The only buildings on the Property are the substation, the Senator Joyce Fairborn School, and the fire station under construction. The school opened in 2018 and took two years to construct, and the substation was constructed between 1979 and 1986.
- Ms. Slovack was unaware of any spills or chemicals used on the Property.
- The total property size is 313.5 acres and does not include the fire station lot.

6 DEVIATIONS

There were no deviations from the principal components (records review, site visit, interview, and information evaluation and reporting) of a Phase I ESA during the completion of this assessment.

7 LIMITATIONS

The findings and conclusions stated in this report regarding contamination of the Property are based solely on the extent of observations and information gathered during the Phase I ESA. No limiting conditions were encountered during the conduct of the records review, site visit, and interviews.

8 FINDINGS

The three APECs associated with the PCAs identified by WSP in the previous sections are summarized in Table 3 and shown on Figure 4.

Table 3 Findings: Contaminants of Potential Concern in Areas of Potential Environmental Concern

Description of APECs	PCAs	Possible COPCs and Special Attention Items
1. Areas of sparse vegetation in the north, east-central and southeastern portion of the Property.	On-site: It is unknown why the sparse vegetation exists. It may be due to natural soil chemistry.	CoPCs: Salinty/sodicity
2. Presence of soil piles southeast of the school and skate park of unknown origin.	On-site: Possibly from street sweeping	CoPCs: Salinity Metals Petroleum hydrocarbons
3. Possible organic soils associated with ephemeral wetlands	On-site: Natural build up of organic soils which off-gas methane	CoPCs: Methane gas
4. Substation on the western boundary of the Property and pole-mounted transformer east of the substation.	On-site: Historical use of PCBs in the cooling oil	CoPCs: Polychlorinated biphenyls (PCBs)
5. Presence of transformers along the eastern boundary of the Property.	Off-site: Historical use of PCBs in the cooling oil	CoPCs: PCBs

9 CONCLUSIONS AND RECOMMENDATIONS

As of June 10, 2020, within the limitations of the Phase I ESA methodology, no evidence of potential or actual contamination was revealed in connection with the Property. No further investigations are recommended at this time; however, the following recommendations are made:

- An intrusive investigation is not recommended for APEC #1 as the lack of vegetation growth in the three areas does not appear to be associated with an anthropogenic impact. The soils may be naturally saline or sodic, and this may be contributing to the lack of vegetation. It should be noted that these soils may not be suitable for vegetation growth in future landscaped areas of the Property. Soil sampling and testing can be conducted to confirm the saline/sodic characteristics of the soil.
- Unless the origin of APEC #2 (small soil piles southwest of the skate park and school) can be confirmed as originating from the Property, soil sampling should be conducted to determine the suitability of this soil for reuse on-site, or the soil piles should be disposed to landfill.
- If encountered, organic soils (APEC #3) should not be used as engineered fill beneath buildings or under sealed surfaces such as asphalt parking lots due to the potential for methane generation and accumulation.

- The presence of the substation and pole-mounted transformer (APEC #4) on the eastern portion of the Property or the transformers on the eastern adjacent properties (APEC #5) does not warrant any action at the present; however, a qualified professional is required for safe and proper removal and disposal at the time the transformer is no longer required. If the transformer is damaged and leaks are apparent, the owner of the transformer should be contacted to rectify the unit.

10 DISCLAIMER

The CoL acknowledges and agrees that this report was prepared solely on its behalf and functions solely as a Phase I Environmental Site Assessment.

Where the CoL is required to disseminate this report, either by law or in connection with the CoL's business activities, to any other party to whom this report is not addressed (the "Third Party"), the CoL agrees to notify the Third Party of the terms of this disclaimer who in turn shall be bound by such terms. WSP accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made, or actions taken, based on this report.

Conclusions presented in this report represent the best technical judgment of WSP staff and should not be construed as legal advice. The conclusions are based on the Property conditions observed by WSP at the time of the site visit, and can only be extrapolated to an undefined limited area around these locations. The extent of the limited area depends on the soil and groundwater conditions, as well as the history of the Property reflecting natural, construction and other activities. Due to the nature of the investigation and the limited data available, WSP cannot warrant against undiscovered environmental liabilities or adverse impacts off-Property. By accepting this report, the CoL acknowledges and agrees that it may, in part, rely upon sources, either written or oral, that WSP considers reliable but which are not guaranteed or independently verified by WSP.

11 ROLES AND QUALIFICATIONS OF PERSONNEL

April Bakos, B.A.Sc., RT(Ag) was responsible for the preparation of the Phase I ESA report. Ms. Bakos has seven years of experience in the environmental industry. This is her sixth year conducting liability assessments for acquisitions and divestitures, and environmental compliance audits and liability assessments in conjunction with Phase 1 ESAs. She has written over 180 Phase 1 ESAs and environmental liability assessments, and over 80 Indian Oil and Gas Canada environmental audit reports.

David Simpson, P. Eng. was responsible for the technical review of the Phase I ESA report, a Senior Environmental (M.Sc.) and Chemical Engineer (B.A.Sc.) with 24 years of Environmental Engineering Consulting experience on projects located throughout Alberta. He is a Professional Engineer with APEGA. Mr. Simpson has completed, managed, and/or been involved in more than 1,000 environmental site assessments, remediation, risk management, soil vapour and environmental due diligence projects for government (all levels), and commercial and industrial clients. Mr. Simpson is a recipient of Project Awards of Excellence and Merit with the Association of Consulting Engineers of Canada and Alberta for his role as Project Manager for the environmental assessment and cleanup of the former Harvey Barracks, CFB Calgary. Mr. Simpson generally acts as a Senior Technical Lead and Reviewer. Mr. Simpson provides environmental training to staff and clients.

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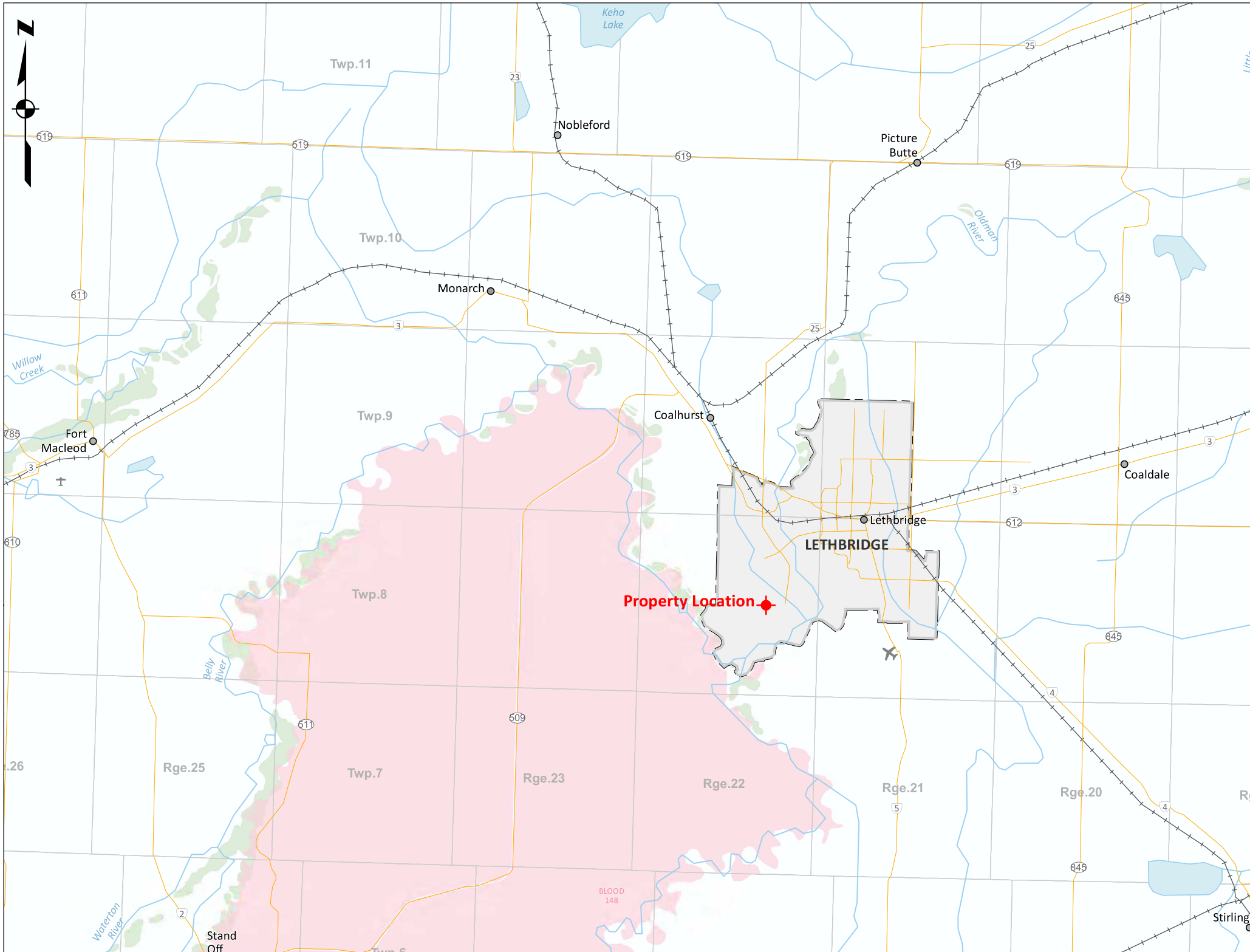
FIGURES

LIST OF FIGURES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LETHBRIDGE
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Property Location
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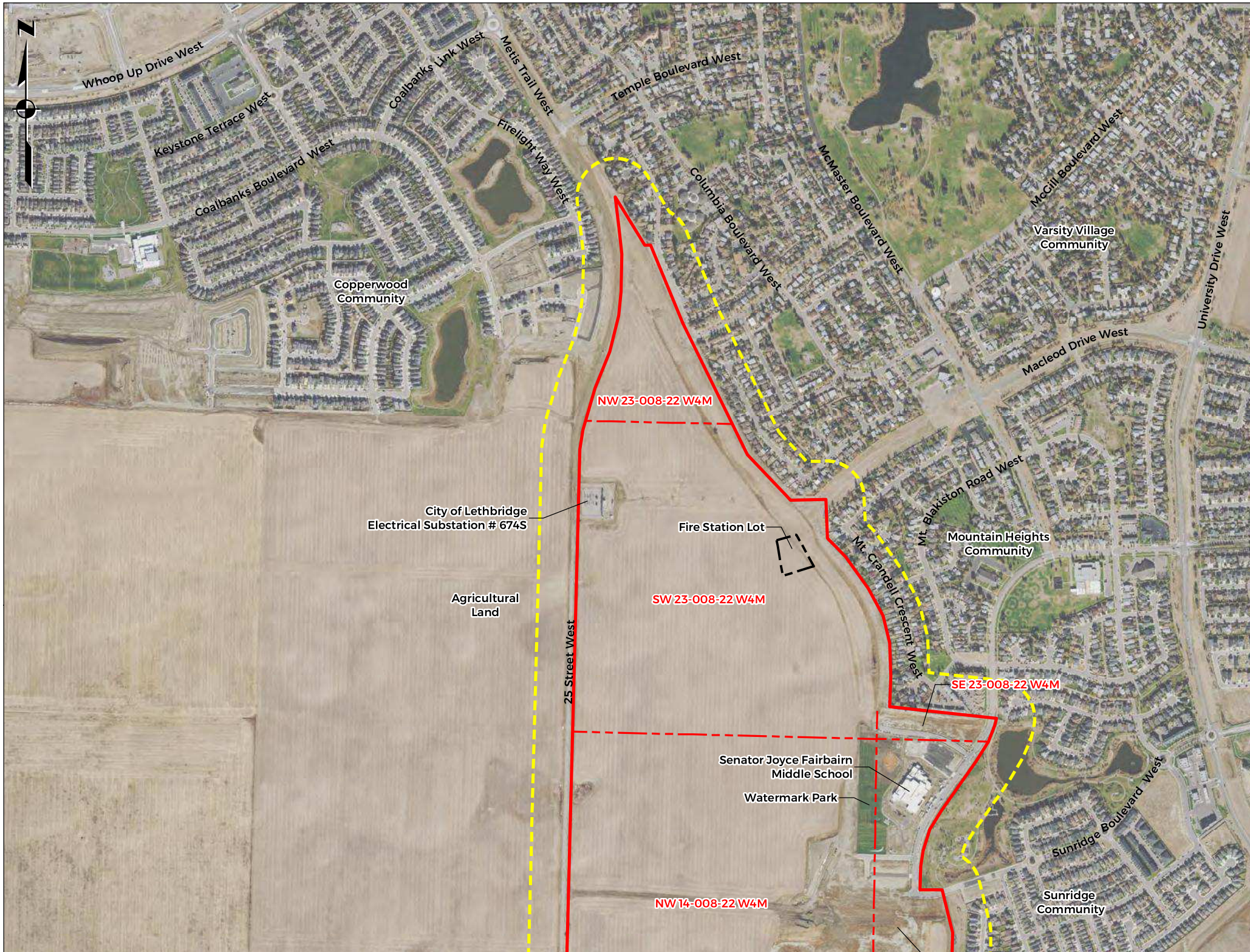
Belly River
511
509
Rge.25
Twp.7
Rge.23
Rge.22
Rge.21
Rge.20
Waterton River
Stand Off
Stirling


N
Whoop Up Drive West
Keystone Terrace West
Coalbanks Link West
Metis Trail West
Temple Boulevard West
Coalbanks Boulevard West
Firelight Way West
Columbia Boulevard West
McMaster Boulevard West
McGill Boulevard West
Varsity Village Community
University Drive West
Copperwood Community
Macleod Drive West
NW 23-008-22 W4M
Mt. Blakiston Road West
City of Lethbridge Electrical Substation # 674S
Fire Station Lot
Mt. Crandell Crescent West
Mountain Heights Community
Agricultural Land
SW 23-008-22 W4M
25 Street West
SE 23-008-22 W4M
Senator Joyce Fairbairn Middle School
Watermark Park
Sunridge Boulevard West
NW 14-008-22 W4M
Sunridge Community


N
Copperwood Community
Varsity Village Community
Sparse Vegetation
Wind Blown
Vegetation Mound
NW 23-008-22 W4M
Inert Debris
Low / Wet Area
City of Lethbridge Electrical Substation # 674S
Mountain Heights Community
Sparse Vegetation
Agricultural Land
Fire Station Lot
New Drainage Catchment
SW 23-008-22 W4M
25 Street West
SE 23-008-22 W4M
Senator Joyce Fairbairn Middle School
Watermark Park
Skate Park
Small Soil Piles
Sunridge Community

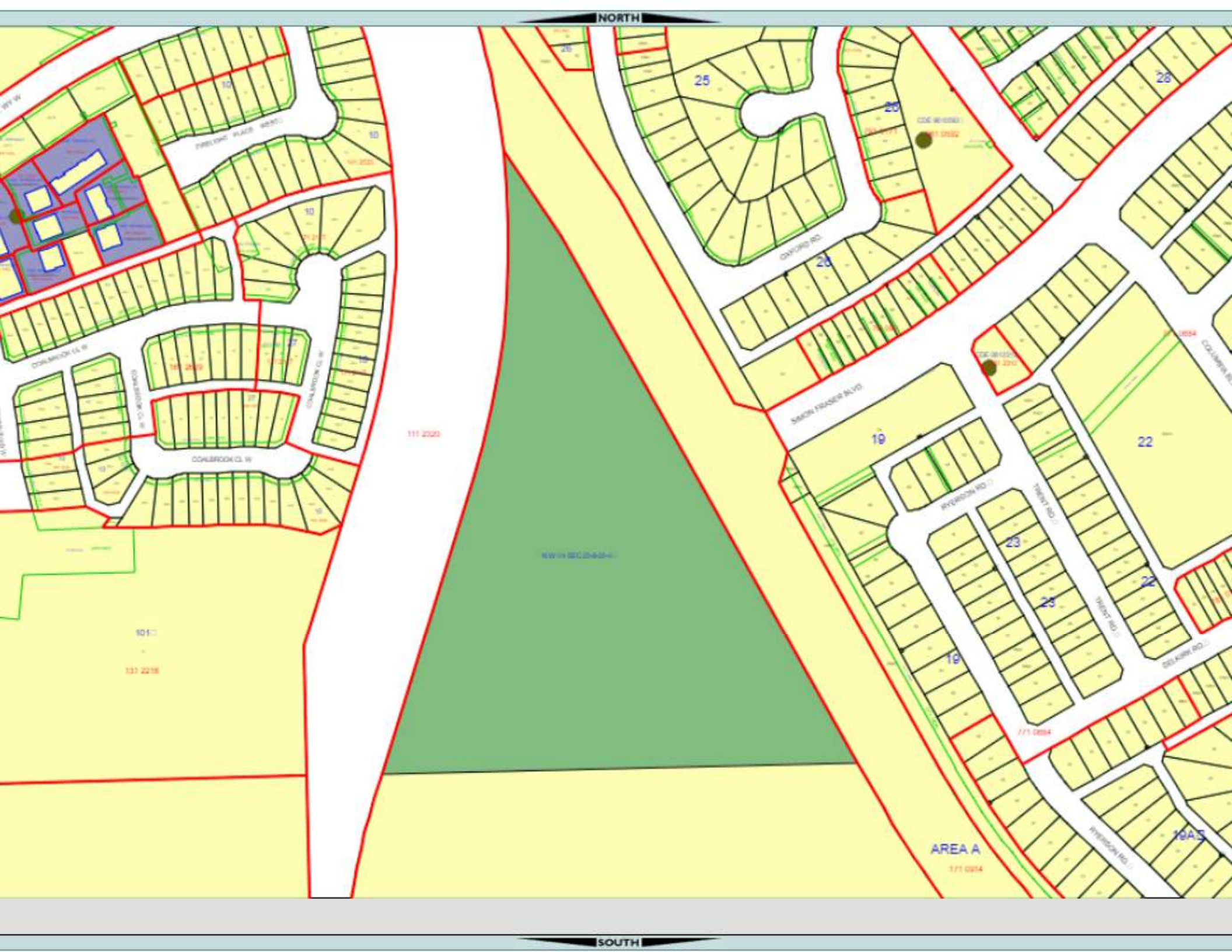

N
Copperwood Community
Varsity Village Community
Sparse Vegetation
Wind Blown
Vegetation Mound
NW 23-008-22 W4M
Inert Debris
APEC #5
APEC #4
Low / Wet Area
City of Lethbridge Electrical Substation # 674S
Mountain Heights Community
Sparse Vegetation
APEC #1
Fire Station Lot
New Drainage Catchment
Agricultural Land
25 Street West
SW 23-008-22 W4M
APEC #3 (Interior of Property)
SE 23-008-22 W4M
Senator Joyce Fairbairn Middle School
Watermark Park
Skate Park
Small Soil Piles
APEC #2
Sunridge Community

APPENDIX

A RECORDS REVIEW

APPENDIX

A-1 TITLES


NORTH
SOUTH
AREA A

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0035 575 341	4;22;8;23;NW	131 029 851 +1

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER NORTH WEST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES	MORE OR LESS
SUBDIVISION	7710684		52.32	
REPLOTTING SCHEME	7710705		0.06	
REPLOTTING SCHEME	7710882		71.57	
REPLOTTTNG SCHEME	7810431		9.01	
SUBDIVISION	0814827	0.101	0.25	
ROAD	1112320	3.477	8.59	
SUBDIVISION	1310320	1.341	3.31	

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 111 186 538

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
131 029 851	01/02/2013	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 003 252	10/01/1974	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
771 055 709	04/05/1977	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:02 A.M.

ORDER NUMBER: 39341295

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON NOVEMBER 03,2008

S

LINC	SHORT LEGAL	TITLE NUMBER
0033 565 666	4;22;8;23;NW	081 411 086 +1

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER NORTH WEST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES	MORE OR LESS
SUBDIVISION	7710684		52.32	
REPLOTTING SCHEME	7710705		0.06	
REPLOTTING SCHEME	7710882		71.57	
REPLOTTTNG SCHEME	7810431		9.01	
SUBDIVISION	081----	0.101	0.25	

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 751 130 428

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
081 411 086	03/11/2008	TRANSFER OF PART OF LAND		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 003 252	10/01/1974	CAVEAT RE : DEFERRED RESERVE

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
771 055 709	04/05/1977	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
071 444 489	05/09/2007	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. 910 - 4TH AVE. SOUTH, LETHBRIDGE ALBERTA AS TO PORTION OR PLAN:0714451 UR/W "C"
081 411 298	03/11/2008	SUBDIVISION PLAN 0814827 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:02 A.M.

ORDER NUMBER: 39341295

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON NOVEMBER 03,2008

S

LINC	SHORT LEGAL	TITLE NUMBER
0022 102 685	4;22;8;23;NW	751 130 428

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER NORTH WEST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING

PLAN	NUMBER	ACRES MORE OR LESS
SUBDIVISION	7710684	52.32
REPLOTTING SCHEME	7710705	0.06
REPLOTTING SCHEME	7710882	71.57
REPLOTTTNG SCHEME	7810431	9.01

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
751 130 428	19/11/1975		$36,050	

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 003 252	10/01/1974	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
771 055 709	04/05/1977	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
071 444 489	05/09/2007	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. 910 - 4TH AVE. SOUTH, LETHBRIDGE ALBERTA AS TO PORTION OR PLAN:0714451 UR/W "C"
081 411 086	03/11/2008	TRANSFER OF PART OF LAND OWNERS - COPPERWOOD LAND CORP. SUITE 100, 10423 - 178 STREET EDMONTON ALBERTA T5S1R5 NEW TITLE ISSUED

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:02 A.M.

ORDER NUMBER: 39341295

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JULY 22,2011

S

LINC	SHORT LEGAL	TITLE NUMBER
0033 565 823	4;22;8;23;NW	081 411 298 +47

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER NORTH WEST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES	MORE OR LESS
SUBDIVISION	7710684		52.32	
REPLOTTING SCHEME	7710705		0.06	
REPLOTTING SCHEME	7710882		71.57	
REPLOTTTNG SCHEME	7810431		9.01	
SUBDIVISION	0814827	0.101	0.25	

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 081 411 086 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
081 411 298	03/11/2008	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 003 252	10/01/1974	CAVEAT RE : DEFERRED RESERVE

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
771 055 709	04/05/1977	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
071 444 489	05/09/2007	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. 910 - 4TH AVE. SOUTH, LETHBRIDGE ALBERTA AS TO PORTION OR PLAN:0714451 UR/W "C"
111 186 538	22/07/2011	ROAD PLAN 1112320 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:02 A.M.

ORDER NUMBER: 39341295

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON FEBRUARY 01,2013

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 878 059	4;22;8;23;NW	111 186 538

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER NORTH WEST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES	MORE OR LESS
SUBDIVISION	7710684		52.32	
REPLOTTING SCHEME	7710705		0.06	
REPLOTTING SCHEME	7710882		71.57	
REPLOTTTNG SCHEME	7810431		9.01	
SUBDIVISION	0814827	0.101	0.25	
ROAD	1112320	3.477	8.59	

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 081 411 298 +47

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
111 186 538	22/07/2011	ROAD PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
741 003 252	10/01/1974	CAVEAT

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		RE : DEFERRED RESERVE CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
771 055 709	04/05/1977	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION.
071 444 489	05/09/2007	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. 910 - 4TH AVE. SOUTH, LETHBRIDGE ALBERTA AS TO PORTION OR PLAN:0714451 UR/W "C"
131 029 851	01/02/2013	SUBDIVISION PLAN 1310320 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

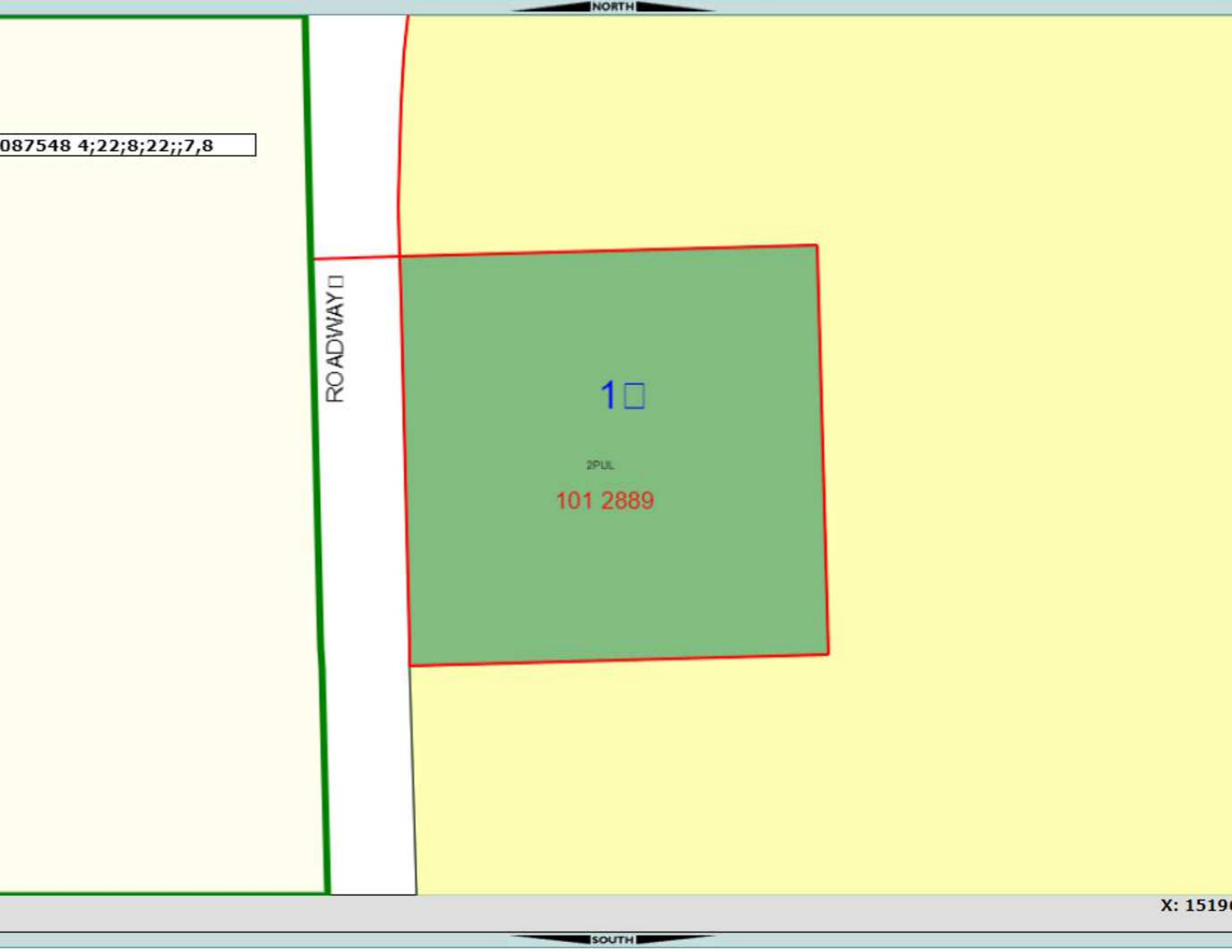
TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:02 A.M.

ORDER NUMBER: 39341295

CUSTOMER FILE NUMBER:

END OF CERTIFICATE


NORTH
087548 4;22;8;22;;7,8
ROADWAY
1
2PUL
101 2889
X: 1519
SOUTH

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 394 973	1012889;1;2PUL	101 218 536

LEGAL DESCRIPTION
PLAN 1012889
BLOCK 1
LOT 2PUL (PUBLIC UTILITY LOT)
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 0.884 HECTARES (2.18 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;22;8;23;SW

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 891 124 105 +1
891 124 105

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
101 218 536	22/07/2010	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVE. SOUTH, LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS

NO REGISTRATIONS

TOTAL INSTRUMENTS: 000

(CONTINUED)

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:19 A.M.

ORDER NUMBER: 39341426

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JUNE 30,1989

S

LINC	SHORT LEGAL	TITLE NUMBER
0010 802 312	4;22;8;23;SW	751 130 428 A .

LEGAL DESCRIPTION

THE SOUTH WEST QUARTER OF SECTION TWENTY THREE (23)
TOWNSHIP EIGHT (8)
RANGE TWENTY TWO (22)
WEST OF THE FOURTH MERIDIAN
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	7.99	19.74
SUBDIVISION	7911317	5.26	12.99

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
751 130 428	19/11/1975		$127,270	

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
771 055 708	04/05/1977	CAVEAT CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION. DEFERRED RESERVE CAVEAT
891 124 104	30/06/1989	DISCHARGE OF CAVEAT 771055708

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
891 124 105	30/06/1989	SUBDIVISION PLAN 8910881 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:19 A.M.

ORDER NUMBER: 39341426

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JULY 22,2010

S

LINC	SHORT LEGAL	TITLE NUMBER
0010 806 925	8910881;1;1	891 124 105

LEGAL DESCRIPTION
PLAN 8910881
BLOCK 1
LOT 1
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 0.702 HECTARES (1.73 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;22;8;23;SW

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 751 130 428 A .

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
891 124 105	30/06/1989	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
891 124 107	30/06/1989	REQUEST FOR RELEASE OF D.C.T. DCT ISSUED SURRENDERED BY 101218536
101 218 536	22/07/2010	SUBDIVISION PLAN 1012889 TITLE CANCELLED IN FULL

TOTAL INSTRUMENTS: 002

(CONTINUED)

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 09:09 A.M.

ORDER NUMBER: 39341879

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JULY 22,2010

S

LINC	SHORT LEGAL	TITLE NUMBER
0010 806 917	4;22;8;23;SW	891 124 105 +1

LEGAL DESCRIPTION

THE SOUTH WEST QUARTER OF SECTION TWENTY THREE (23)
TOWNSHIP EIGHT (8)
RANGE TWENTY TWO (22)
WEST OF THE FOURTH MERIDIAN
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	7.99	19.74
SUBDIVISION	7911317	5.26	12.99
SUBDIVISION	8910881	0.702	1.74

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 751 130 428 A .

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
891 124 105	30/06/1989	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
891 124 106	30/06/1989	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE.

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		CITY HALL 910 4 AVENUE SOUTH LETHBRIDGE ALBERTA
891 124 107	30/06/1989	REQUEST FOR RELEASE OF D.C.T. DCT ISSUED SURRENDERED BY 101218536
101 218 536	22/07/2010	SUBDIVISION PLAN 1012889 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

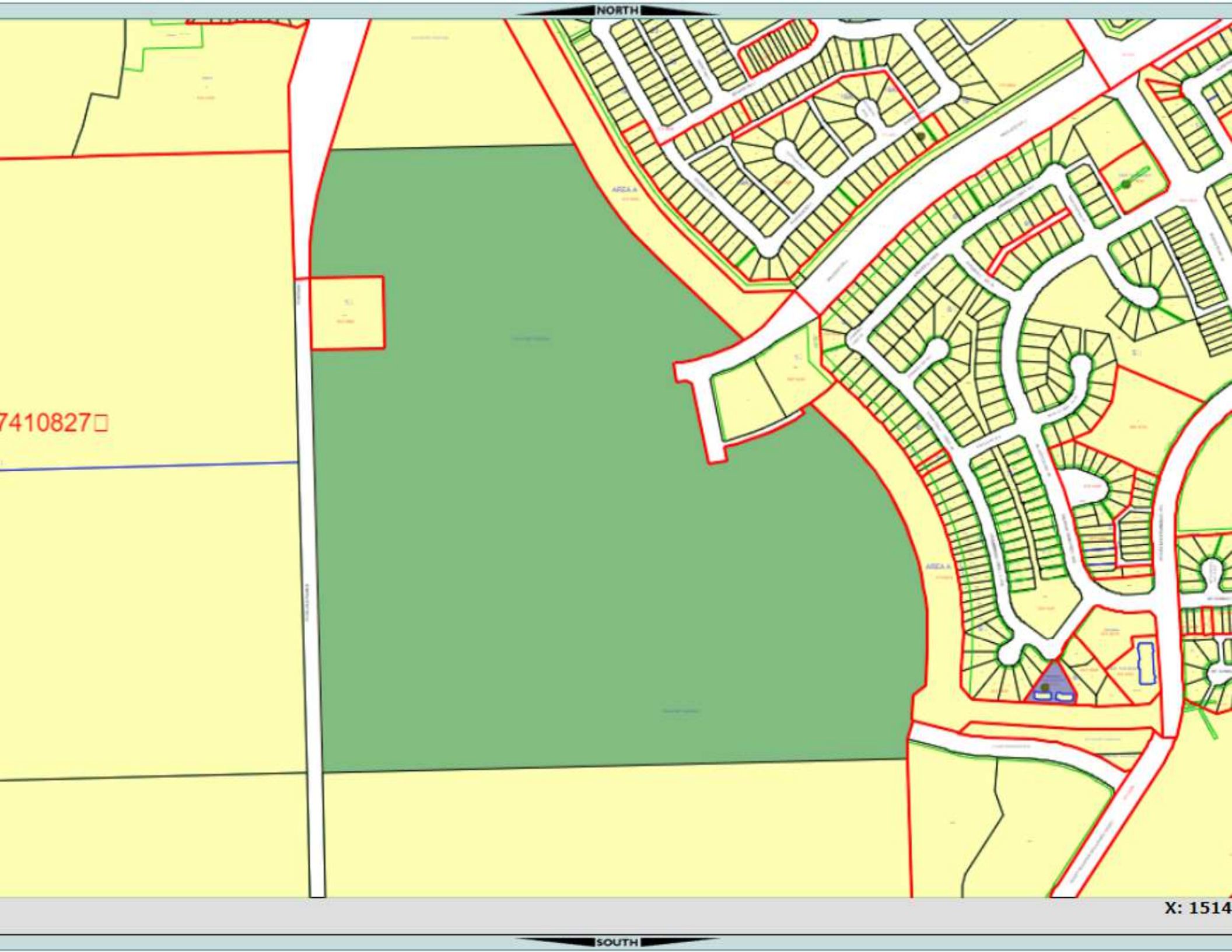
TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:19 A.M.

ORDER NUMBER: 39341426

CUSTOMER FILE NUMBER:

END OF CERTIFICATE


NORTH
7410827
X: 1514
SOUTH

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0038 368 817	4;22;8;23;SW	191 128 870 +2

LEGAL DESCRIPTION

THE SOUTH WEST QUARTER OF SECTION TWENTY THREE (23)
TOWNSHIP EIGHT (8)
RANGE TWENTY TWO (22)
WEST OF THE FOURTH MERIDIAN
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	7.99	19.74
SUBDIVISION	7911317	5.26	12.99
SUBDIVISION	8910881	0.702	1.74
SUBDIVISION	1012889	0.182	0.45
ROAD	1112320	0.164	0.41
SUBDIVISION	1810565	0.172	0.43
SUBDIVISION	1911404	1.467	3.63

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 181 052 305 +4

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION

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191 128 870 02/07/2019 SUBDIVISION PLAN

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
891 124 106	30/06/1989	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL 910 4 AVENUE SOUTH LETHBRIDGE ALBERTA

TOTAL INSTRUMENTS: 001

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:28 A.M.

ORDER NUMBER: 39341494

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JULY 22,2011

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 394 965	4;22;8;23;SW	101 218 536 +1

LEGAL DESCRIPTION

THE SOUTH WEST QUARTER OF SECTION TWENTY THREE (23)
TOWNSHIP EIGHT (8)
RANGE TWENTY TWO (22)
WEST OF THE FOURTH MERIDIAN
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	7.99	19.74
SUBDIVISION	7911317	5.26	12.99
SUBDIVISION	8910881	0.702	1.74
SUBDIVISION	1012889	0.182	0.45

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 891 124 105 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
101 218 536	22/07/2010	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
891 124 106	30/06/1989	CAVEAT RE : DEFERRED RESERVE

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL 910 4 AVENUE SOUTH LETHBRIDGE ALBERTA
111 186 538	22/07/2011	ROAD PLAN 1112320 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:28 A.M.

ORDER NUMBER: 39341494

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MARCH 07,2018

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 878 066	4;22;8;23;SW	111 186 538 +1

LEGAL DESCRIPTION

THE SOUTH WEST QUARTER OF SECTION TWENTY THREE (23)
TOWNSHIP EIGHT (8)
RANGE TWENTY TWO (22)
WEST OF THE FOURTH MERIDIAN
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	7.99	19.74
SUBDIVISION	7911317	5.26	12.99
SUBDIVISION	8910881	0.702	1.74
SUBDIVISION	1012889	0.182	0.45
ROAD	1112320	0.164	0.41

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 101 218 536 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
111 186 538	22/07/2011	ROAD PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
891 124 106	30/06/1989	CAVEAT

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL 910 4 AVENUE SOUTH LETHBRIDGE ALBERTA
181 052 304	07/03/2018	SURVEYS DISCHARGE AFFECTS INSTRUMENT: 891124106 AS TO NEW PLAN
181 052 305	07/03/2018	SUBDIVISION PLAN 1810565 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:28 A.M.

ORDER NUMBER: 39341494

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JULY 02,2019

S

LINC	SHORT LEGAL	TITLE NUMBER
0037 885 549	4;22;8;23;SW	181 052 305 +4

LEGAL DESCRIPTION

THE SOUTH WEST QUARTER OF SECTION TWENTY THREE (23)
TOWNSHIP EIGHT (8)
RANGE TWENTY TWO (22)
WEST OF THE FOURTH MERIDIAN
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	7.99	19.74
SUBDIVISION	7911317	5.26	12.99
SUBDIVISION	8910881	0.702	1.74
SUBDIVISION	1012889	0.182	0.45
ROAD	1112320	0.164	0.41
SUBDIVISION	1810565	0.172	0.43

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 111 186 538 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
181 052 305	07/03/2018	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
891 124 106	30/06/1989	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL 910 4 AVENUE SOUTH LETHBRIDGE ALBERTA
191 128 868	02/07/2019	SURVEYS DISCHARGE AFFECTS INSTRUMENT: 891124106 AS TO NEW PLAN
191 128 870	02/07/2019	SUBDIVISION PLAN 1911404 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

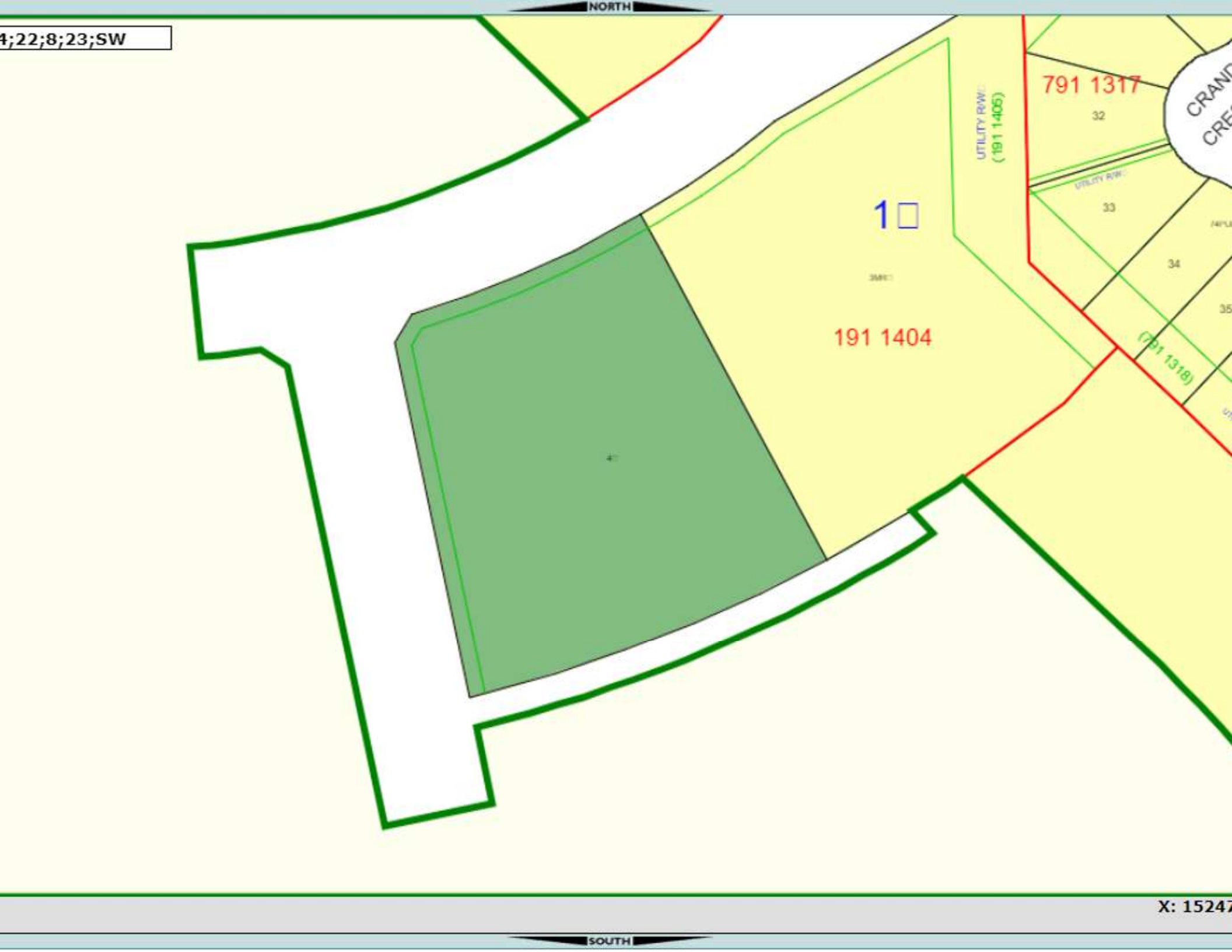
TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:28 A.M.

ORDER NUMBER: 39341494

CUSTOMER FILE NUMBER:

END OF CERTIFICATE


NORTH
4;22;8;23;SW
1□
191 1404
UTILITY R/W
(191 1405)
791 1317
32
33
34
(791 1318)
X: 15247
SOUTH

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0038 368 833	1911404;1;4	191 128 870

LEGAL DESCRIPTION
PLAN 1911404
BLOCK 1
LOT 4
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 0.653 HECTARES (1.61 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;22;8;23;SW

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 181 052 305 +4

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
191 128 870	02/07/2019	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
191 128 872	02/07/2019	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1911405

TOTAL INSTRUMENTS: 001

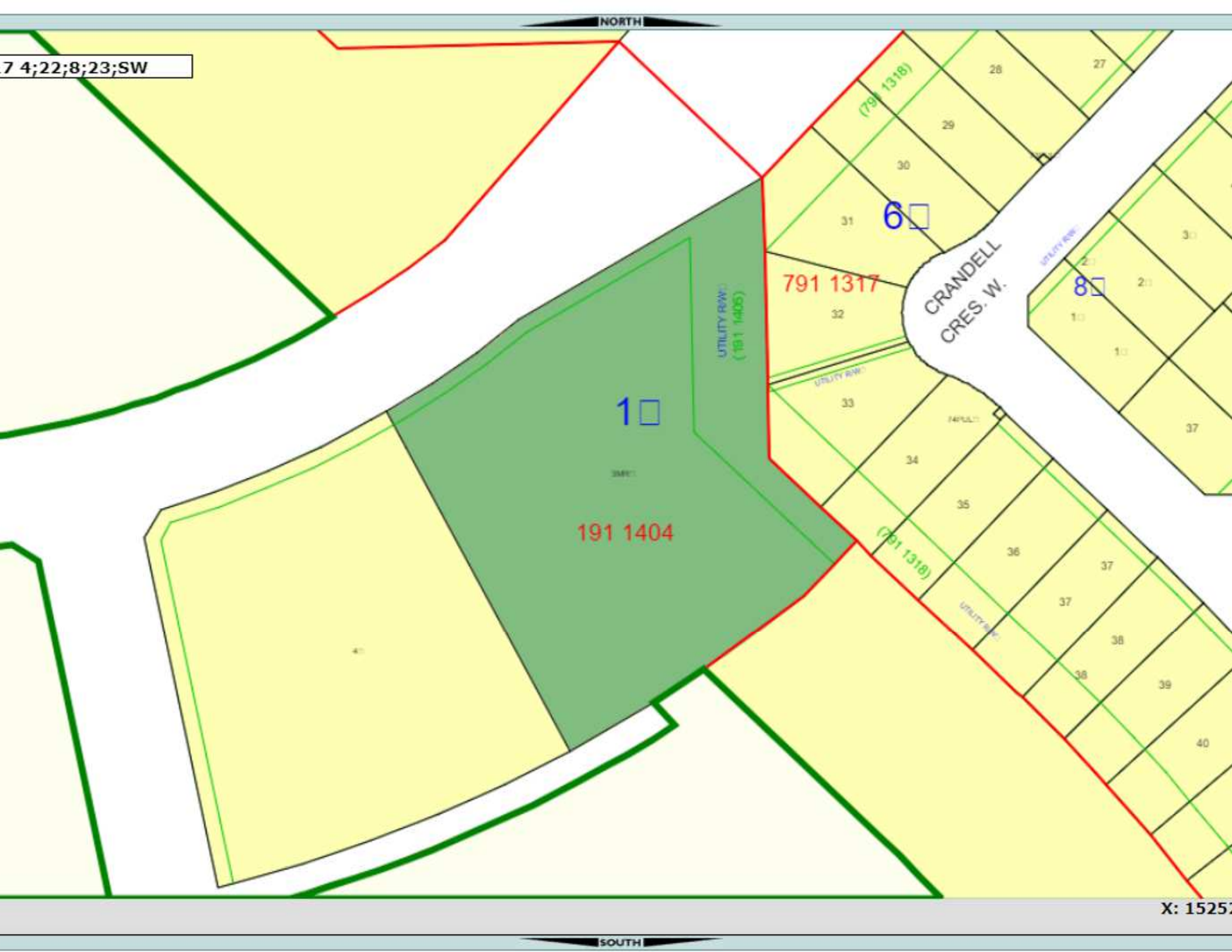
(CONTINUED)

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 09:09 A.M.

ORDER NUMBER: 39341879

CUSTOMER FILE NUMBER:

END OF CERTIFICATE


NORTH
7 4;22;8;23;SW
(791 1318)
28
27
29
30
31
6
791 1317
32
CRANDELL CRES. W.
UTILITY R/W
(191 1405)
8
1
191 1404
33
34
35
36
37
38
39
40
X: 1525
SOUTH

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0038 368 841	1911404;1;3MR	191 128 870 +1

LEGAL DESCRIPTION
PLAN 1911404
BLOCK 1
LOT 3MR (MUNICIPAL RESERVE)
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 0.745 HECTARES (1.84 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;22;8;23;SW

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 181 052 305 +5
181 052 305 +4

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
191 128 870	02/07/2019	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
191 128 872	02/07/2019	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1911405

TOTAL INSTRUMENTS: 001

(CONTINUED)

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 09:09 A.M.

ORDER NUMBER: 39341879

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JULY 02,2019

S

LINC	SHORT LEGAL	TITLE NUMBER
0037 885 557	1710914;A	181 052 305 +5

LEGAL DESCRIPTION

PLAN 1710914
AREA `A'
CONTAINING 8.093 HECTARES (20.00 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	1810565	0.033	0.08

EXCEPTING THEREOUT ALL MINES AND MINERALS

ATS REFERENCE: 4;22;8;23;W
ATS REFERENCE: 4;22;8;23;SE
ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 171 082 225

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
181 052 305	07/03/2018	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVE. SOUTH, LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
171 082 233	20/04/2017	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE.
191 128 869	02/07/2019	SURVEYS DISCHARGE AFFECTS INSTRUMENT: 171082233

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		AS TO NEW PLAN
191 128 870	02/07/2019	SUBDIVISION PLAN 1911404 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

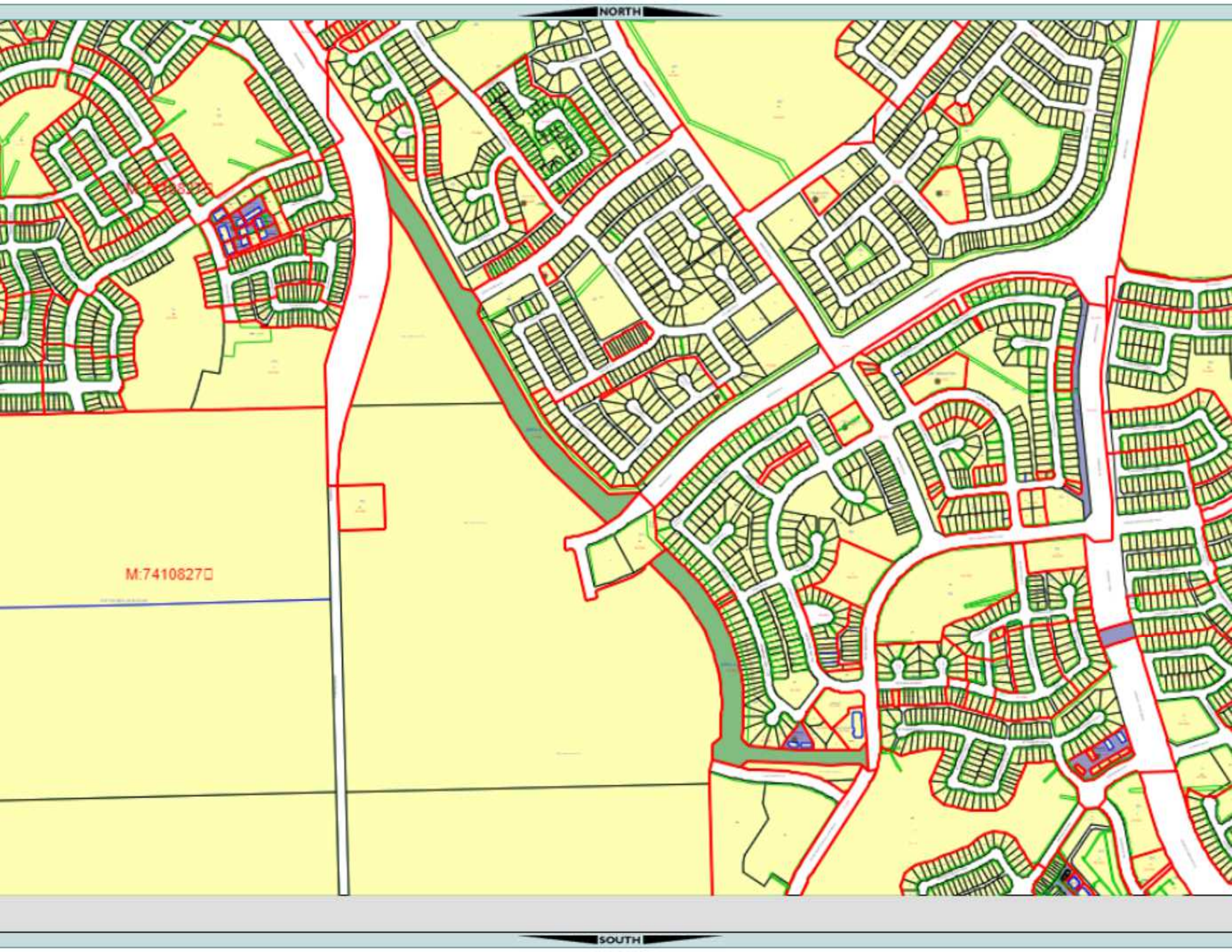
TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 09:09 A.M.

ORDER NUMBER: 39341879

CUSTOMER FILE NUMBER:

END OF CERTIFICATE


NORTH
M:7410827
SOUTH

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0038 368 825	1710914;A	191 128 870 +3

LEGAL DESCRIPTION

PLAN 1710914
AREA `A'
CONTAINING 8.093 HECTARES (20.00 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	1810565	0.033	0.08
SUBDIVISION	1911404	0.845	2.09

EXCEPTING THEREOUT ALL MINES AND MINERALS

ATS REFERENCE: 4;22;8;23;W
ATS REFERENCE: 4;22;8;23;SE
ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 181 052 305 +5

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
191 128 870	02/07/2019	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVE. SOUTH, LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
171 082 233	20/04/2017	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE.

TOTAL INSTRUMENTS: 001

(CONTINUED)

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 09:09 A.M.

ORDER NUMBER: 39341879

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MARCH 07,2018

S

LINC	SHORT LEGAL	TITLE NUMBER
0037 552 289	1710914;A	171 082 225

LEGAL DESCRIPTION

PLAN 1710914
AREA `A'
CONTAINING 8.093 HECTARES (20.00 ACRES) MORE OR LESS
EXCEPTING THEREOUT ALL MINES AND MINERALS

ATS REFERENCE: 4;22;8;23;W
ATS REFERENCE: 4;22;8;23;SE
ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
171 082 225	20/04/2017	ROAD CLOSURE BYLAW		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVE. SOUTH, LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
171 082 233	20/04/2017	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE.
181 052 305	07/03/2018	SUBDIVISION PLAN 1810565 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 002

(CONTINUED)

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 09:08 A.M.

ORDER NUMBER: 39341879

CUSTOMER FILE NUMBER:

END OF CERTIFICATE


NORTH
:7410827□
:2185FL
SOUTH

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S LINC	SHORT LEGAL	TITLE NUMBER
0037 886 785	4;22;8;14;NW	181 052 918 +1

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH WEST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	1810565	1.563	3.86
ROAD	1810568	3.017	7.46

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 181 052 305 +6

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
181 052 918	08/03/2018	ROAD PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
181 052 307	07/03/2018	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL, 910-4TH AVENUE SOUTH, LETHBRIDGE ALBERTA T1J0P6

(CONTINUED)

REGISTRATION
NUMBER DATE (D/M/Y) PARTICULARS

AGENT - MAUREEN GAEHRING.

TOTAL INSTRUMENTS: 001

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:33 A.M.

ORDER NUMBER: 39341528

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MARCH 07,2018

S

LINC	SHORT LEGAL	TITLE NUMBER
0022 111 843	4;22;8;14;NW	751 130 428 D .

LEGAL DESCRIPTION
MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH WEST
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 64.7 HECTARES (160 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
751 130 428	19/11/1975		$160,000	

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT 20 FT. STRIP BY INSTRUMENT 761071193, 04 06 1976"
171 212 494	22/09/2017	DISCHARGE OF UTILITY RIGHT OF WAY 751003083
181 052 305	07/03/2018	SUBDIVISION PLAN 1810565 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

(CONTINUED)

TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:33 A.M.

ORDER NUMBER: 39341528

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MARCH 08,2018

S

LINC	SHORT LEGAL	TITLE NUMBER
0037 885 564	4;22;8;14;NW	181 052 305 +6

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH WEST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	1810565	1.563	3.86

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 751 130 428 D .

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
181 052 305	07/03/2018	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
181 052 307	07/03/2018	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. CITY HALL, 910-4TH AVENUE SOUTH, LETHBRIDGE ALBERTA T1J0P6 AGENT - MAUREEN GAEHRING.

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
181 052 918	08/03/2018	ROAD PLAN 1810568 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:33 A.M.

ORDER NUMBER: 39341528

CUSTOMER FILE NUMBER:

END OF CERTIFICATE


NORTH
CLAIRE PROMENADE W
ROCKY MOUNTAIN BOULEVARD WEST
100
CHAMPLAIN RD W
SUNRIDGE BLVD W
SOUTH

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0037 885 580	1810565;100;2MSR	181 052 305 +1

LEGAL DESCRIPTION
PLAN 1810565
BLOCK 100
LOT 2MSR (MUNICIPAL AND SCHOOL RESERVE)
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 3.583 HECTARES (8.85 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;22;8;23;S
ATS REFERENCE: 4;22;8;14;N

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 751 130 428 D .
111 186 538 +1
111 153 619 +3
101 017 493

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
181 052 305	07/03/2018	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE SOUTH, LETHBRIDGE,
ALBERTA T1J 0P6

AND
LETHBRIDGE SCHOOL DISTRICT NO. 51.
OF 433-15 STREET,SOUTH
LETHBRIDGE
ALBERTA T1J 2Z5

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
171 223 857	05/10/2017	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1711973
181 093 537	07/05/2018	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1810566

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2020 AT 01:40 P.M.

ORDER NUMBER: 39353768

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON AUGUST 28,1991

S

LINC	SHORT LEGAL	TITLE NUMBER
0019 208 032	4;22;8;23;SE	751 130 428 B .

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER SOUTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	0.615	1.52
SUBDIVISION	7911317	39.7	98.19

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
751 130 428	19/11/1975		$60,290	

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
771 055 707	04/05/1977	CAVEAT CAVEATOR - THE OLDMAN RIVER REGIONAL PLANNING COMMISSION. DEFERRED RESERVE CAVEAT
911 192 849	28/08/1991	DISCHARGE OF CAVEAT 771055707

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
911 192 998	28/08/1991	SUBDIVISION PLAN 9111700 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2020 AT 01:40 P.M.

ORDER NUMBER: 39353768

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON APRIL 17,2000

S

LINC	SHORT LEGAL	TITLE NUMBER
0019 543 158	4;22;8;23;SE	911 192 998 +20

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER SOUTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	0.615	1.52
SUBDIVISION	7911317	39.7	98.19
SUBDIVISION	9111700	15.31	37.8

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 751 130 428 B .

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
911 192 998	28/08/1991	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
911 193 002	28/08/1991	REQUEST FOR RELEASE OF D.C.T. DCT ISSUED SURRENDERED BY 001100655

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
001 100 655	17/04/2000	STATUTORY DECLARATION RE LOST DCT
001 100 657	17/04/2000	SUBDIVISION PLAN 0010942 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2020 AT 01:40 P.M.

ORDER NUMBER: 39353768

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON OCTOBER 30,2000

S

LINC	SHORT LEGAL	TITLE NUMBER
0028 361 707	4;22;8;23;SE	001 100 657 +64

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER SOUTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	0.615	1.52
SUBDIVISION	7911317	39.7	98.19
SUBDIVISION	9111700	15.31	37.8
SUBDIVISION	0010942	0.951	2.35

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 911 192 998 +20

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
001 100 657	17/04/2000	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
001 309 804	30/10/2000	SUBDIVISION PLAN 0012775 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS

TOTAL INSTRUMENTS: 001

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2020 AT 01:40 P.M.

ORDER NUMBER: 39353768

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON DECEMBER 05,2005

S

LINC	SHORT LEGAL	TITLE NUMBER
0028 606 846	4;22;8;23;SE	001 309 804 +83

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER SOUTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	0.615	1.52
SUBDIVISION	7911317	39.7	98.19
SUBDIVISION	9111700	15.31	37.8
SUBDIVISION	0010942	0.951	2.35
SUBDIVISION	0012775	0.129	0.32

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 001 100 657 +64

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
001 309 804	30/10/2000	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
021 388 150	05/11/2002	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE.

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		AS TO PORTION OR PLAN:0213542
051 461 590	05/12/2005	SUBDIVISION PLAN 0514137 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2020 AT 01:40 P.M.

ORDER NUMBER: 39353768

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON DECEMBER 06,2005

S

LINC	SHORT LEGAL	TITLE NUMBER
0031 436 207	4;22;8;23;SE	051 461 590 +102

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER SOUTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	0.615	1.52
SUBDIVISION	7911317	39.7	98.19
SUBDIVISION	9111700	15.31	37.8
SUBDIVISION	0010942	0.951	2.35
SUBDIVISION	0012775	0.129	0.32
SUBDIVISION	0514137	6.145	15.18

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 001 309 804 +83

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
051 461 590	05/12/2005	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
051 462 293	06/12/2005	SUBDIVISION PLAN 0514150

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 001

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2020 AT 01:40 P.M.

ORDER NUMBER: 39353768

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JANUARY 18,2010

S

LINC	SHORT LEGAL	TITLE NUMBER
0031 440 655	4;22;8;23;SE	051 462 293 +3

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER SOUTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	0.615	1.52
SUBDIVISION	7911317	39.7	98.19
SUBDIVISION	9111700	15.31	37.8
SUBDIVISION	0010942	0.951	2.35
SUBDIVISION	0012775	0.129	0.32
SUBDIVISION	0514137	6.145	15.18
SUBDIVISION	0514150	0.821	2.03

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 051 461 590 +102

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
051 462 293	06/12/2005	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
101 017 493	18/01/2010	ROAD PLAN 1010289 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 001

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2020 AT 01:40 P.M.

ORDER NUMBER: 39353768

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MARCH 07,2018

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 199 471	4;22;8;23;SE	101 017 493

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 23
QUARTER SOUTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	ACRES
SUBDIVISION	7710684	0.615	1.52
SUBDIVISION	7911317	39.7	98.19
SUBDIVISION	9111700	15.31	37.8
SUBDIVISION	0010942	0.951	2.35
SUBDIVISION	0012775	0.129	0.32
SUBDIVISION	0514137	6.145	15.18
SUBDIVISION	0514150	0.821	2.03
ROAD	1010289	0.071	0.18

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 051 462 293 +3

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
101 017 493	18/01/2010	ROAD PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF 910 - 4TH AVENUE S., LETHBRIDGE
ALBERTA T1J 0P6

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
181 052 305	07/03/2018	SUBDIVISION PLAN 1810565 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 001

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2020 AT 01:40 P.M.

ORDER NUMBER: 39353768

CUSTOMER FILE NUMBER:

END OF CERTIFICATE


NORTH
S.E.1/4 SEC.23-8-22-4
CLAIRE PROMENADE W
N.E.1/4 SEC.14-8-22-4
101 0289
ROCKY MOUNTAIN BOULEVARD WEST
100
181 0565
SOUTH

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0037 885 572	1810565;100;1SR	181 052 305

LEGAL DESCRIPTION
PLAN 1810565
BLOCK 100
LOT 1SR (SCHOOL RESERVE)
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 2.503 HECTARES (6.19 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;22;8;23;S
ATS REFERENCE: 4;22;8;14;N

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 111 153 619 +3

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
181 052 305	07/03/2018	SUBDIVISION PLAN		

OWNERS

LETHBRIDGE SCHOOL DISTRICT NO. 51.
OF 433-15 STREET,SOUTH
LETHBRIDGE
ALBERTA T1J 2Z5

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
171 223 857	05/10/2017	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1711973
181 093 536	07/05/2018	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1810566

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
181 187 992	31/08/2018	BUILDER'S LIEN LIENOR - ECOSSE WELDING (2009) LTD. C/O HMC LAWYERS 320, 903-8 AVE SW CALGARY ALBERTA T2P0P7 AGENT - PATRICK CLARK AMOUNT: $84,150
181 210 550	28/09/2018	DISCHARGE OF BUILDER'S LIEN 181187992

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF MAY, 2020 AT 01:40 P.M.

ORDER NUMBER: 39353768

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

NORTH
SOUTH

HISTORICAL LAND TITLE CERTIFICATE

CURRENT TITLE WITH HISTORICAL DATA

S

LINC	SHORT LEGAL	TITLE NUMBER
0037 886 777	4;22;8;14;NE	181 052 918

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70
SUBDIVISION	0911396	0.280	0.69
ROAD	1010289	1.57	3.88
SUBDIVISION	1010942	4.13	10.21
SUBDIVISION	1012954	4.912	12.1
ROAD	1013789	4.569	11.3
SUBDIVISION	1112039	3.048	7.53
SUBDIVISION	1810565	4.880	12.06
ROAD	1810568	0.827	2.04

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 181 052 305 +3

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
181 052 918	08/03/2018	ROAD PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS

NO REGISTRATIONS

TOTAL INSTRUMENTS: 000

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:53 A.M.

ORDER NUMBER: 39341702

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON DECEMBER 05,2005

S

LINC	SHORT LEGAL	TITLE NUMBER
0022 107 346	4;22;8;14;NE	751 130 428 C .

LEGAL DESCRIPTION
MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 64.7 HECTARES (160 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE

MUNICIPALITY: LETHBRIDGE COUNTY

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
751 130 428	19/11/1975		$160,000	

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT 20 FT STRIP BY INST. 761071193, 04 06 1976"
051 461 590	05/12/2005	SUBDIVISION PLAN 0514137 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 002

(CONTINUED)

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:53 A.M.

ORDER NUMBER: 39341702

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON DECEMBER 06,2005

S

LINC	SHORT LEGAL	TITLE NUMBER
0031 436 272	4;22;8;14;NE	051 461 590 +109

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

	HECTARES	(ACRES) MORE OR LESS
A) PLAN 0514137 SUBDIVISION	1.555	3.84

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: LETHBRIDGE COUNTY

REFERENCE NUMBER: 751 130 428 C .

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
051 461 590	05/12/2005	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT 20 FT STRIP BY INST. 761071193, 04 06 1976"

(CONTINUED)

REGISTRATION NUMBER | DATE (D/M/Y) | PARTICULARS

051 462 293 | 06/12/2005 | SUBDIVISION PLAN 0514150
TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED
FOR THE REMAINDER

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:53 A.M.

ORDER NUMBER: 39341702

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON DECEMBER 06,2005

S

LINC	SHORT LEGAL	TITLE NUMBER
0031 440 670	4;22;8;14;NE	051 462 293 +5

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: LETHBRIDGE COUNTY

REFERENCE NUMBER: 051 461 590 +109

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
051 462 293	06/12/2005	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT 20 FT STRIP BY INST. 761071193, 04 06 1976"

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
051 463 980	06/12/2005	SUBDIVISION PLAN 0514162 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 002

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:53 A.M.

ORDER NUMBER: 39341702

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MARCH 31,2008

S

LINC	SHORT LEGAL	TITLE NUMBER
0031 442 577	4;22;8;14;NE	051 463 980 +125

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 051 462 293 +5

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
051 463 980	06/12/2005	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT 20 FT STRIP BY INST. 761071193,

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		04 06 1976"
051 463 994	06/12/2005	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. 910 - 4TH AVENUE SOUTH, LETHBRIDGE, ALBERTA T1J0P6
081 115 508	31/03/2008	SURVEYS DISCHARGE AFFECTS INSTRUMENT: 051463994 AS TO NEW PLAN
081 115 509	31/03/2008	SUBDIVISION PLAN 0811402 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:47 A.M.

ORDER NUMBER: 39341644

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MAY 05,2008

S

LINC	SHORT LEGAL	TITLE NUMBER
0033 145 005	4;22;8;14;NE	081 115 509 +1

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 051 463 980 +125

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
081 115 509	31/03/2008	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED.

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		"DISCHARGED EXCEPT 20 FT STRIP BY INST. 761071193, 04 06 1976"
051 463 994	06/12/2005	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. 910 - 4TH AVENUE SOUTH, LETHBRIDGE, ALBERTA T1J0P6
081 163 624	05/05/2008	SURVEYS DISCHARGE AFFECTS INSTRUMENT: 051463994 AS TO NEW PLAN
081 163 625	05/05/2008	SUBDIVISION PLAN 0812285 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:47 A.M.

ORDER NUMBER: 39341644

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MARCH 06,2009

S

LINC	SHORT LEGAL	TITLE NUMBER
0033 216 904	4;22;8;14;NE	081 163 625 +100

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 081 115 509 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
081 163 625	05/05/2008	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		LIMITED. "DISCHARGED EXCEPT 20 FT STRIP BY INST. 761071193, 04 06 1976"
051 463 994	06/12/2005	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. 910 - 4TH AVENUE SOUTH, LETHBRIDGE, ALBERTA T1J0P6
091 062 330	06/03/2009	SURVEYS DISCHARGE AFFECTS INSTRUMENT: 051463994 AS TO NEW PLAN
091 062 331	06/03/2009	SUBDIVISION PLAN 0911396 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:47 A.M.

ORDER NUMBER: 39341644

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JANUARY 18,2010

S

LINC	SHORT LEGAL	TITLE NUMBER
0033 809 617	4;22;8;14;NE	091 062 331 +2

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70
SUBDIVISION	0911396	0.280	0.69

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 081 163 625 +100

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
091 062 331	06/03/2009	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT 20 FT STRIP BY INST. 761071193, 04 06 1976"
051 463 994	06/12/2005	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. 910 - 4TH AVENUE SOUTH, LETHBRIDGE, ALBERTA T1J0P6
091 119 000	04/05/2009	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:0912416
101 017 493	18/01/2010	ROAD PLAN 1010289 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:47 A.M.

ORDER NUMBER: 39341644

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MARCH 08,2010

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 199 489	4;22;8;14;NE	101 017 493 +1

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70
SUBDIVISION	0911396	0.280	0.69
ROAD	1010289	1.57	3.88

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 091 062 331 +2

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
101 017 493	18/01/2010	ROAD PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT 20 FT STRIP BY INST. 761071193, 04 06 1976"
051 463 994	06/12/2005	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. 910 - 4TH AVENUE SOUTH, LETHBRIDGE, ALBERTA T1J0P6
091 119 000	04/05/2009	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:0912416
101 067 772	08/03/2010	SURVEYS DISCHARGE AFFECTS INSTRUMENT: 051463994 AS TO NEW PLAN
101 067 773	08/03/2010	SUBDIVISION PLAN 1010942 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 005

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:47 A.M.

ORDER NUMBER: 39341644

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JULY 29,2010

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 262 089	4;22;8;14;NE	101 067 773 +35

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70
SUBDIVISION	0911396	0.280	0.69
ROAD	1010289	1.57	3.88
SUBDIVISION	1010942	4.13	10.21

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 101 017 493 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
101 067 773	08/03/2010	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 003 083	14/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "DISCHARGED EXCEPT 20 FT STRIP BY INST. 761071193, 04 06 1976"
051 463 994	06/12/2005	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. 910 - 4TH AVENUE SOUTH, LETHBRIDGE, ALBERTA T1J0P6
091 119 000	04/05/2009	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:0912416
101 225 551	29/07/2010	SURVEYS DISCHARGE AFFECTS INSTRUMENT: 051463994 AS TO NEW PLAN
101 225 552	29/07/2010	DISCHARGE OF UTILITY RIGHT OF WAY 751003083
101 225 553	29/07/2010	SUBDIVISION PLAN 1012954 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 006

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:47 A.M.

ORDER NUMBER: 39341644

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

(CONTINUED)

THIS ELECTRONICALLY TRANSMITTED LAND TITLES PRODUCT IS INTENDED FOR THE SOLE USE OF THE ORIGINAL PURCHASER, AND NONE OTHER, SUBJECT TO WHAT IS SET OUT IN THE PARAGRAPH BELOW.

THE ABOVE PROVISIONS DO NOT PROHIBIT THE ORIGINAL PURCHASER FROM INCLUDING THIS UNMODIFIED PRODUCT IN ANY REPORT, OPINION, APPRAISAL OR OTHER ADVICE PREPARED BY THE ORIGINAL PURCHASER AS PART OF THE ORIGINAL PURCHASER APPLYING PROFESSIONAL, CONSULTING OR TECHNICAL EXPERTISE FOR THE BENEFIT OF CLIENT(S).

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON OCTOBER 14,2010

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 401 258	4;22;8;14;NE	101 225 553 +64

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70
SUBDIVISION	0911396	0.280	0.69
ROAD	1010289	1.57	3.88
SUBDIVISION	1010942	4.13	10.21
SUBDIVISION	1012954	4.912	12.1

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 101 067 773 +35

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
101 225 553	29/07/2010	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
051 463 994	06/12/2005	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. 910 - 4TH AVENUE SOUTH, LETHBRIDGE, ALBERTA T1J0P6
091 119 000	04/05/2009	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:0912416
101 303 743	14/10/2010	ROAD PLAN 1013789 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:47 A.M.

ORDER NUMBER: 39341644

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON JUNE 20,2011

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 520 198	4;22;8;14;NE	101 303 743 +1

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70
SUBDIVISION	0911396	0.280	0.69
ROAD	1010289	1.57	3.88
SUBDIVISION	1010942	4.13	10.21
SUBDIVISION	1012954	4.912	12.1
ROAD	1013789	4.569	11.3

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 101 225 553 +64

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
101 303 743	14/10/2010	ROAD PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
051 463 994	06/12/2005	CAVEAT RE : DEFERRED RESERVE CAVEATOR - THE CITY OF LETHBRIDGE. 910 - 4TH AVENUE SOUTH, LETHBRIDGE, ALBERTA T1J0P6
091 119 000	04/05/2009	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:0912416
111 153 538	20/06/2011	DISCHARGE OF CAVEAT 051463994
111 153 540	20/06/2011	DISCHARGE OF UTILITY RIGHT OF WAY 091119000
111 153 619	20/06/2011	SUBDIVISION PLAN 1112039 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 005

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:47 A.M.

ORDER NUMBER: 39341644

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MARCH 07,2018

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 844 712	4;22;8;14;NE	111 153 619 +3

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70
SUBDIVISION	0911396	0.280	0.69
ROAD	1010289	1.57	3.88
SUBDIVISION	1010942	4.13	10.21
SUBDIVISION	1012954	4.912	12.1
ROAD	1013789	4.569	11.3
SUBDIVISION	1112039	3.048	7.53

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 101 303 743 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
111 153 619	20/06/2011	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
161 214 930	12/09/2016	BUILDER'S LIEN LIENOR - 1670606 ALBERTA LTD. 5904-51 AVENUE NW EDMONTON ALBERTA T6B2R1 AGENT - ROBERT FORGIE AMOUNT: $49,400
161 226 743	22/09/2016	BUILDER'S LIEN LIENOR - ALBERTA STEEL AND FAB INC. ATTN ANDREW P GEISTERFER MASUCH ALBERT LLP 4528-99 ST EDMONTON ALBERTA T6E5H5 AGENT - GLENN KREGER AMOUNT: $35,736
161 230 056	27/09/2016	BUILDER'S LIEN LIENOR - ANCHORBOLT WAREHOUSE LTD. 6108-80 STREET, NW EDMONTON ALBERTA T6E4Y7 AGENT - BETTY HUEGLE AMOUNT: $12,424
161 240 560	11/10/2016	BUILDER'S LIEN LIENOR - BONNYBROOK BOLT MFG CORP. 1415-38 AVE SE CALGARY ALBERTA T2G1W7 AGENT - LAM THAI NGUYEN AMOUNT: $5,943
161 294 579	12/12/2016	DISCHARGE OF BUILDER'S LIEN 161214930 AND BUILDER'S LIEN 161226743 AND BUILDER'S LIEN 161230056 AND BUILDER'S LIEN 161240560
171 155 191	13/07/2017	BUILDER'S LIEN LIENOR - RIVERBEND ROCK PRODUCTS LTD. C/O BALDRY SUGDEN LLO ATTN: BRANDON M GIBB 5401A 50 AVE TABER ALBERTA T1G1V2 AGENT - BRANDON M GIBB AMOUNT: $20,926

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
171 205 634	14/09/2017	BUILDER'S LIEN LIENOR - GILMAR CRANE SERVICE LETHBRIDGE LTD. C/O HUCKVALE LLP 410-6 STREET SOUTH LETHBRIDGE ALBERTA T1J2C9 AGENT - ROBERT GILMAR AMOUNT: $43,085
171 223 857	05/10/2017	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1711973
171 284 987	14/12/2017	DISCHARGE OF BUILDER'S LIEN 171155191
171 284 993	14/12/2017	DISCHARGE OF BUILDER'S LIEN 171205634
181 052 305	07/03/2018	SUBDIVISION PLAN 1810565 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 011

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:47 A.M.

ORDER NUMBER: 39341644

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

HISTORICAL LAND TITLE CERTIFICATE

TITLE CANCELLED ON MARCH 08,2018

S

LINC	SHORT LEGAL	TITLE NUMBER
0037 885 531	4;22;8;14;NE	181 052 305 +3

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 14
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES(160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES) MORE OR LESS
SUBDIVISION	0514137	1.555	3.84
SUBDIVISION	0514150	14.040	34.69
SUBDIVISION	0514162	7.583	18.74
SUBDIVISION	0811402	0.103	0.25
SUBDIVISION	0812285	5.545	13.70
SUBDIVISION	0911396	0.280	0.69
ROAD	1010289	1.57	3.88
SUBDIVISION	1010942	4.13	10.21
SUBDIVISION	1012954	4.912	12.1
ROAD	1013789	4.569	11.3
SUBDIVISION	1112039	3.048	7.53
SUBDIVISION	1810565	4.880	12.06

EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF LETHBRIDGE

REFERENCE NUMBER: 111 153 619 +3

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
181 052 305	07/03/2018	SUBDIVISION PLAN		

OWNERS

THE CITY OF LETHBRIDGE.
OF LETHBRIDGE
ALBERTA

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
181 052 918	08/03/2018	ROAD PLAN 1810568 TITLE CANCELLED AS TO PART AND NEW TITLE ISSUED FOR THE REMAINDER

TOTAL INSTRUMENTS: 001

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF MAY, 2020 AT 08:47 A.M.

ORDER NUMBER: 39341644

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

APPENDIX

A-2 BYLAW AND ZONING MAP

Leth

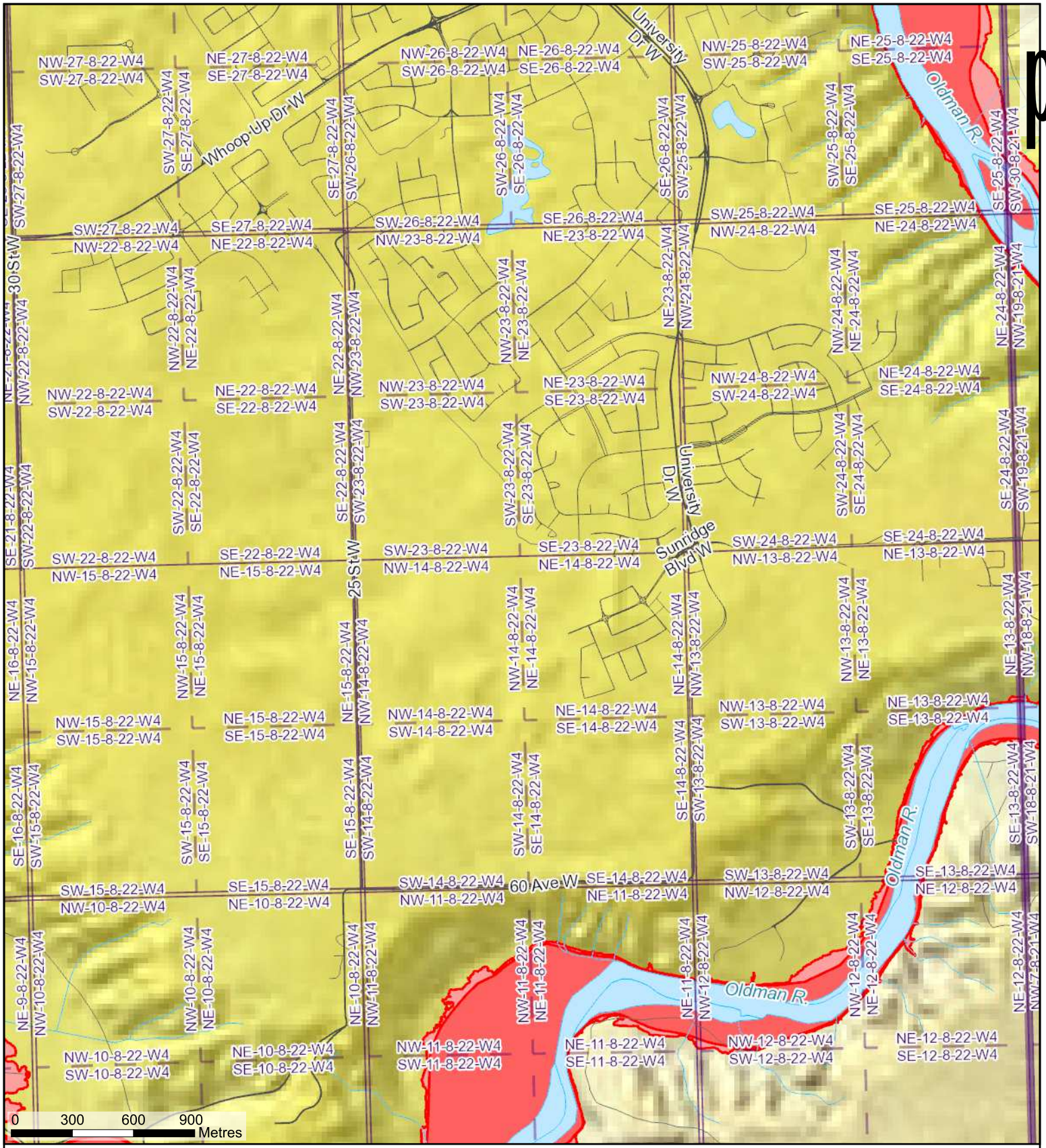
LAND USE DIS

AMENDMENTS T

C-D	Downtown Commercial	
C-G	General Commercial	
C-H	Highway Commercial	
C-L	Local Commercial	
C-N	Neighbourhood Commercial	
C-S	Shopping Mall Commercial	
DC	Direct Control	
I-B	Industrial Business	
I-G	General Industrial	
I-H	Heavy Industrial	
P-B	Public Building	
P-R	Parks and Recreation	
P-SO	Specialist Office	
P-T	Public Transportation	
R-L	Low D	
R-Lb	Low D	
R-Lz	Low D	
R-CL	Compr	
R-CM	Compr	
R-CM-20	Compr	
R-M	Mixed	
R-MH	Mobile	
R-RL	Restric	
R-SL	Small P	
R-37	Medium	
R-50	Medium	
R-60	Medium	
R-75	Medium	
R-100	High D	
R-150	High D	
R-200	High D	
U-I	Urban	
FUD	Future	
V	Valley	

APPENDIX

A-3 FLOOD HAZARD



Legend

- Floodway
- Flood Fringe
- Overland Flow (Flood Fringe)
- Under Review
- 855.09 m Cross Section and Design Flood Level
- Water Body
- First Nation Boundary
- Municipal Boundary

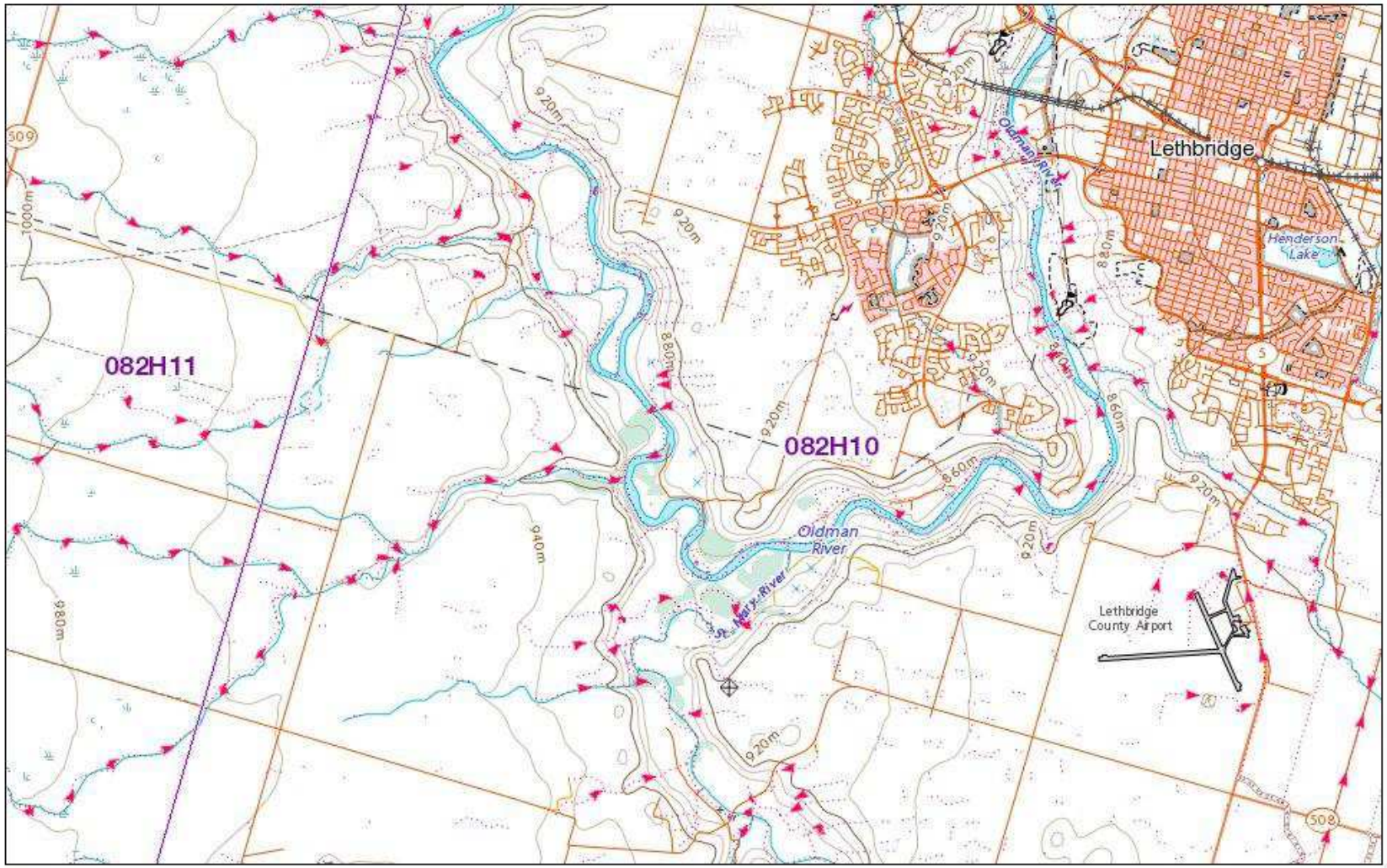
Flood Hazard Map

Projection:	Datum:	Date:
ALBERTA 10TM	NAD 83	2020-May-21

maps.alberta.ca/FloodHazard/

A-4 TOPORAMA MAP

Toporama



May 21, 2020

NTS_SNRC_1M

NTS_SNRC_250K

NTS_SNRC_50K

1:85,000

0 0.75 1.5 3 mi

0 1 2 4 km

Natural Resources Canada | Ressources naturelles Canada

Canada

APPENDIX

A-5 ENFORCEMENT SEARCH

ENVIRONMENTAL LAW CENTRE
#410, 10115 - 100A Street, Edmonton, AB T5J 2W2
Phone: (780) 424-5099 Fax: (780) 424-5133
Internet: www.elc.ab.ca E-Mail: elc@elc.ab.ca

May 21, 2020

Our File: 130456

Ms. April Bakos
WSP
3300, 237-4 Ave. SW
Calgary, AB T2P 4K3

Dear Ms. Bakos:

RE: Search Requested - The City of Lethbridge

In response to your request of May 21, 2020, we have searched the Environmental Enforcement Historical Search Service database for an exact match with respect to the above request, and can advise that as of today's date, there have been NO enforcement actions issued by Alberta Environment and Parks (AEP) pursuant to the Alberta "Environmental Protection and Enhancement Act" ("EPEA") and its predecessor legislation, the "Hazardous Chemicals Act", "Agricultural Chemicals Act", "Clean Water Act" and "Clean Air Act" to 1971, and/or pursuant to the "Water Act" from 1999 onwards. However, we enclose a report which may be related to the subject of your search.

This search is limited to the following enforcement actions under EPEA and its predecessor legislation: Tickets, Prosecutions, Administrative Penalties, Warnings, Enforcement Orders, Enforcement Orders Concerning Waste, Environmental Protection Orders, Emergency Environmental Protection Orders, Emission Control Orders, Chemical Control Orders, Water Quality Control Orders and Stop Orders. This search is limited to the following enforcement actions under the Water Act: Prosecutions, Administrative Penalties, Water Management Orders, Warnings and Enforcement Orders. It does not include Clean Up Orders issued under the Litter Act or Environmental Protection Orders respecting unsightly property issued under EPEA; this information may be available from the local municipality.

Enforcement actions are entered in the database following: (1) the decision date, for prosecutions; (2) the date an administrative penalty was paid or due (30 days after issuance), whichever is sooner; and (3) the date the document was issued for all other enforcement actions.

These search results are based on information provided by AEP. AEP advises that they try to provide the best information possible. However, AEP advises that it cannot guarantee that the information provided is complete or accurate and that any person relying on these search results does so at their own risk. More information may be gained by referring to original enforcement documents. Alberta Energy Regulator (AER) enforcement actions are not included (see the AER Public Compliance dashboard database).

Copies of orders are available from the Environmental Law Centre. Any other enforcement information may be available directly from Alberta Environment.

Yours sincerely,

Cindy Dewing
Enforcement Search Service
Encl.

ENVIRONMENTAL LAW CENTRE
#410, 10115 - 100A Street, Edmonton, AB T5J 2W2
Phone: (780) 424-5099 Fax: (780) 424-5133
Internet: www.elc.ab.ca E-Mail: elc@elc.ab.ca

Environmental Enforcement Historical Search Service

Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	FFA 36(3)	Charged with depositing a deleterious substance into a waterbody frequented by fish; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.

Report Printed:
May 21, 2020
1:18 PM

Search Requested:
The City of Lethbridge

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
AEPEA:	Environmental Protection Enhancement Act(S.A.1992)	CC:	Criminal Code (Canada)	LA:	Litter Act
AEPEA(R)	Environmental Protection & Enhancement Act(R.S.A.2000)	CWA:	Clean Water Act	TDGCA:	Transportation of Dangerous Goods Control Act
BCA:	Beverage Container Act	DEA:	Dept. of Environment Act	WA:	Water Act
		FFA:	Fisheries Act (Canada)		

ENVIRONMENTAL LAW CENTRE
#410, 10115 - 100A Street, Edmonton, AB T5J 2W2
Phone: (780) 424-5099 Fax: (780) 424-5133
Internet: www.elc.ab.ca E-Mail: elc@elc.ab.ca

Environmental Enforcement Historical Search Service

Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $0.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; charge withdrawn.
Lethbridge, City of	Prosecution	16-Aug-1990 $25.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; plead guilty and fined.
Lethbridge, City of	Prosecution	16-Aug-1990 $500.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; plead guilty and fined.
Lethbridge, City of	Prosecution	16-Aug-1990 $500.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; plead guilty and fined.
Lethbridge, City of	Prosecution	16-Aug-1990 $500.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; plead guilty and fined.

Report Printed:
May 21, 2020
1:18 PM

Search Requested:
The City of Lethbridge

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
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Environmental Enforcement Historical Search Service

Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Lethbridge, City of	Prosecution	16-Aug-1990 $500.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; plead guilty and fined.
Lethbridge, City of	Prosecution	16-Aug-1990 $500.00	Lethbridge	CWA 4(8)	Charged with contravening licence conditions; plead guilty and fined.
Lethbridge, City of	Administrative Penalty	18-Nov-1996 $3,000.00	Lethbridge	AEPEA 182	Consigned hazardous waste (used oil containing PCBs) for transportation and disposal without the required manifest; paid 17-DEC-1996.
Lethbridge, City of	Environmental Protection Order	28-Oct-2002	County of Lethbridge SW-4-10-21-W4	AEPEA(R) 113, 140	The City owns and operates the City of Lethbridge Regional Landfill pursuant to an Approval which authorizes the operation of a Class II landfill and Class III landfill. There have been several public complaints regarding waste blowing from the landfill and accumulating on private property that has caused an impact. The Approval requires the City to submit an updated Operation Plan to include the "procedures for the management and control of litter". The plan was submitted in July of 2000 and on 1 February 2001, the City submitted a Draft Litter Control Plan, but it was deficient. The City was advised to complete the Litter Control Plan and to submit it along with the finalized Operations Plan by 17 May 2002, the plans were not received. The City shall cease accepting waste for disposal at the landfill when wind speeds exceed an average of 60 kph over a one-hour period, and instantaneous wind speeds exceed 75 kph twice in any one-hour period; submit a litter control plan to prevent the release of substances into the environment and implement the plan; submit written status reports; and submit a final written report detailing the work undertaken to comply with this order. Order complied with, and closed 16 December 2005.

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
AEPEA:	Environmental Protection Enhancement Act(S.A.1992)	CC:	Criminal Code (Canada)	LA:	Litter Act
AEPEA(R)	Environmental Protection & Enhancement Act(R.S.A.2000)	CWA:	Clean Water Act	TDGCA:	Transportation of Dangerous Goods Control Act
BCA:	Beverage Container Act	DEA:	Dept. of Environment Act	WA:	Water Act
		FFA:	Fisheries Act (Canada)		

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#410, 10115 - 100A Street, Edmonton, AB T5J 2W2
Phone: (780) 424-5099 Fax: (780) 424-5133
Internet: www.elc.ab.ca E-Mail: elc@elc.ab.ca

Environmental Enforcement Historical Search Service

Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Lethbridge, City of	Warning Letter	08-Jan-2004	Lethbridge SW-33-9-21-W4	AEPEA(R) 227(e)	The City operates the Lethbridge landfill pursuant to an Approval. It contravened its Approval by disposing of liquid wastes into the landfill at an area other than the liquids handling facility.
Lethbridge, City of **Additional Acct. Parties:** BFI Canada Inc.	Administrative Penalty	08-Jan-2008 $5,500.00	County of Lethbridge SW-4-10-21-W4 SE-4-10-21-W4	AEPEA(R) 227(e)	The City of Lethbridge operates the Lethbridge Regional Landfill pursuant to an Approval. It is operated on their behalf by BFI Canada Inc. The Approval was contravened with numerous releases of litter outside of a designated buffer zone as required within the Approval. Paid 7 February 2008.

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
AEPEA:	Environmental Protection Enhancement Act(S.A.1992)	CC:	Criminal Code (Canada)	LA:	Litter Act
		CWA:	Clean Water Act	TDGCA:	Transportation of Dangerous Goods Control Act
AEPEA(R)	Environmental Protection & Enhancement Act(R.S.A.2000)	DEA:	Dept. of Environment Act		
		FFA:	Fisheries Act (Canada)	WA:	Water Act
BCA:	Beverage Container Act				

ENVIRONMENTAL LAW CENTRE
#410, 10115 - 100A Street, Edmonton, AB T5J 2W2
Phone: (780) 424-5099 Fax: (780) 424-5133
Internet: www.elc.ab.ca E-Mail: elc@elc.ab.ca

Environmental Enforcement Historical Search Service

STATEMENT

Statement #: 130456
Date: May 21, 2020
Reference #: 189041

Ms. April Bakos
WSP
3300, 237-4 Ave. SW
Calgary, AB T2P 4K3

Search Requested - The City of Lethbridge

Item	Unit Price	Qty	Total Cost
Search	$75.00	1	$75.00
GST Reg. #: R11890 0679 RT0001		Total	$75.00
		No GST	$0.00
		Payment	$75.00
		Amount Owing	**$0.00**

Thank you!

Cindy Dewing
Enforcement Search Service
Environmental Law Centre (Alberta) Society

PRINTED ON RECYCLED PAPER

APPENDIX

A-6 STORAGE TANKS

Petroleum Tank Management
Association of Alberta
Suite 980, 10303 Jasper Avenue
Edmonton, Alberta T5J 3N6
PH: (780)425-8265 or 1-866-222-8265
FAX: (780)425-4722

May 22, 2020

April Bakos
WSP Canada Inc.
3300, 237 4 Avenue SW
Calgary, AB T2P 4K3

Dear April Bakos:

As per your request, the PTMAA has checked the registration of active tank sites and inventory of abandoned tank sites and there are no records for the property with the legal land description:

SW & NW 23-008-22 W4M
NW & NE 14-008-22 W4M

Please note that both databases are not complete. The main limitation of these databases is that they only include information reported through registration or a survey of abandoned sites completed in 1992 and should not be considered as a comprehensive inventory of all past or present storage tank sites. The PTMAA **cannot** guarantee that tanks do not or have not existed at this location. Information in the databases is based on information supplied by the owner and the PTMAA cannot guarantee its accuracy. Information on storage tanks or on past or present contaminant investigations may be filed with the local Fire Department or Alberta Environment.

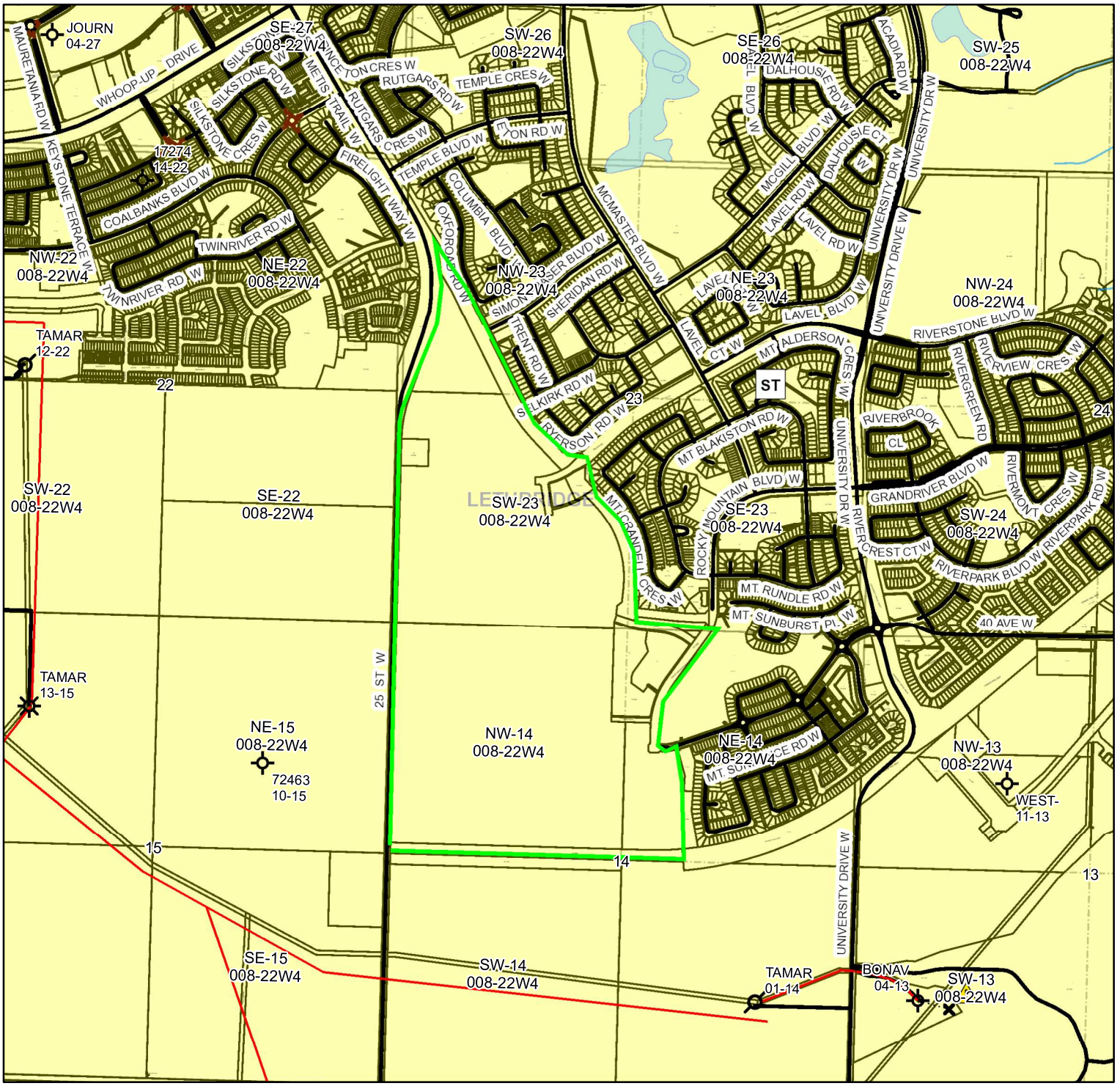
Yours truly,

Jess Bolwerk
Compliance Officer
Petroleum Tank Management Association of Alberta (PTMAA)

APPENDIX

A-7 OIL AND GAS FACILITIES, LANDFILLS, AND COAL FACILITIES

Watermark Community



Friday, May 22, 2020

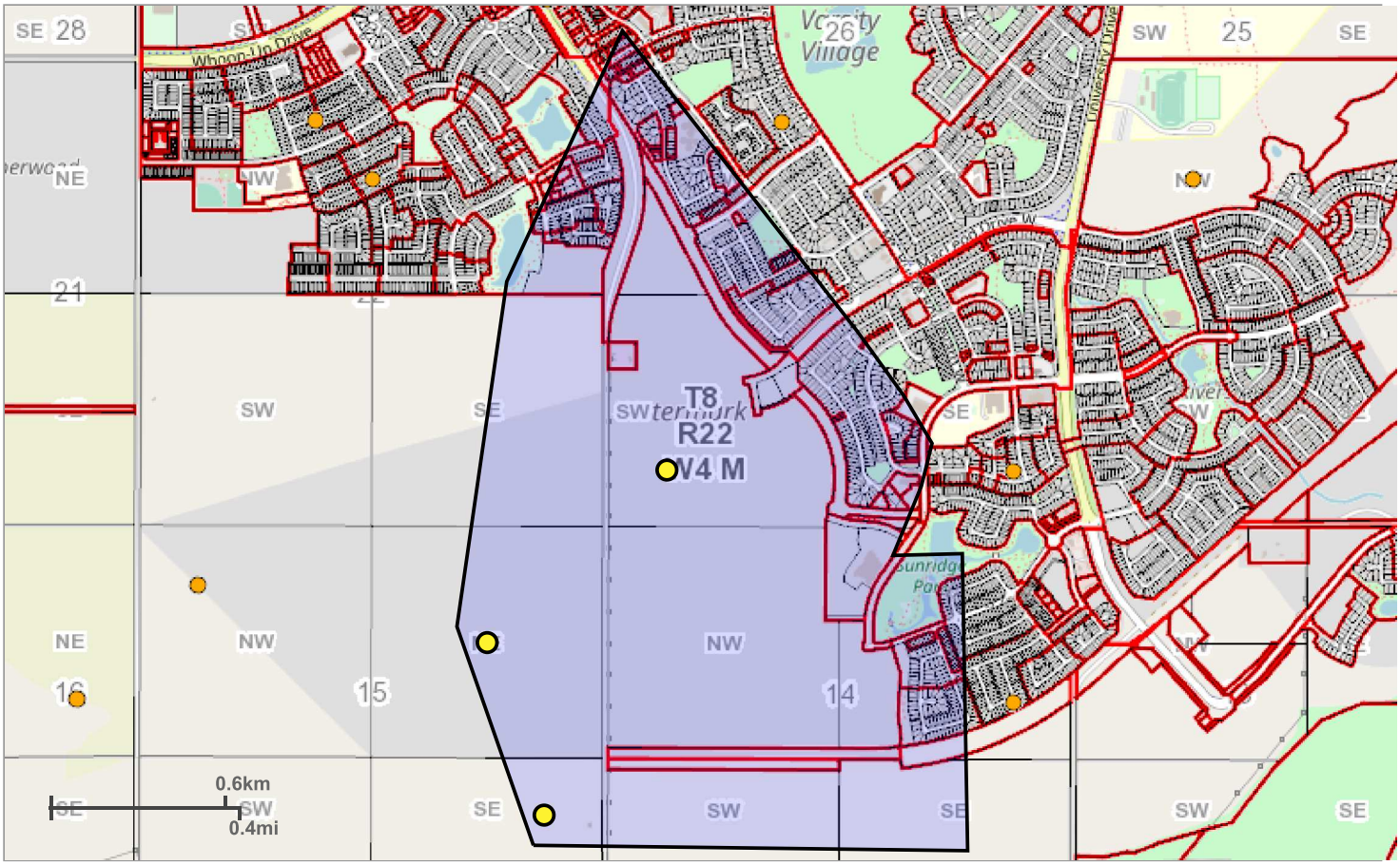
1:19,258

0 230 460 920 m

AbaData

APPENDIX

A-8 WATER WELLS



Alberta Water Well Information Database Map

Projection
Web Mercator (Auxillary Sphere)

Datum
WGS 84

Date
5/21/2020, 2:16:05 PM

Legend
- Groundwater Drilling Report
- Baseline Water Well Report

http://groundwater.alberta.ca/WaterWells/d/

Reconnaissance Report

View in Imperial

Export to Excel

Groundwater Wells

Please click the water Well ID to generate the Water Well Drilling Report.

GIC Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (m)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (m)	TEST RATE (L/min)	SC_DIA (cm)
118424	8	15	8	22	4	WATER RESOURCES	1968-03-25	22.86	Well Inventory	Unknown		3		FEKETE, JOHN			0.00
118425	NE	15	8	22	4	UNKNOWN DRILLER	1910-01-01	6.10	Federal Well Survey	Domestic & Stock				EDWARDS, WM	1.52		0.00
118432	4	23	8	22	4	UNKNOWN DRILLER	1930-02-27	106.68	Structure Test Hole	Industrial		15		LETHBRIDGE PETRO			0.00

Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

View in Imperial | Export to Excel

GIC Well ID 118432
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
LETHBRIDGE PETRO					

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	4	23	8	22	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.656469 Longitude -112.889100
How Location Obtained
Field

Elevation 936.04 m
How Elevation Obtained
Survey-Transit

Drilling Information

Method of Drilling
Drilled

Proposed Well Use
Industrial

Type of Work
Structure Test Hole

Formation Log

Measurement in Metric

Depth from ground level (m)	Water Bearing	Lithology Description
12.80		Stoney Clay & Coal
21.34		Gray Shale
33.53		Sandy Clay
45.72		Gray Shale
47.24		Gray Bentonitic Shale
59.74		Bentonitic Shale & Sandstone
60.66		Yellow Sandy Clay
60.96		Greenish Gray Clayey Sandstone
62.48		Gray Sandy Shale
71.32		Clay & Sandstone
71.63		Gray Shale & Sandstone
74.68		Gray Shale
77.72		Dark Carbonaceous Shale & Coal
83.82		Gray Sandy Shale
106.68		Light Gray Sandy Shale

Yield Test Summary

Measurement in Metric

Recommended Pump Rate L/min

Test Date	Water Removal Rate (L/min)	Static Water Level (m)

Well Completion

Measurement in Metric

Total Depth Drilled	Finished Well Depth	Start Date	End Date
106.68 m			1930/02/27

Borehole

Diameter (cm)	From (m)	To (m)
0.00	0.00	106.68

Surface Casing (if applicable)

Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Bottom at : 0.00 m

Well Casing/Liner

Size OD : 0.00 cm
Wall Thickness : 0.000 cm
Top at : 0.00 m
Bottom at : 0.00 m

Perforations

From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)

Perforated by

Annular Seal

Placed from 0.00 m to 0.00 m
Amount

Other Seals

Type	At (m)

Screen Type

Size OD : 0.00 cm

From (m)	To (m)	Slot Size (cm)

Attachment
Top Fittings
Bottom Fittings

Pack

Type
Grain Size
Amount

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner

Date approval holder signed

Water Well Drilling Report

View in Imperial | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID 118432
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

GOWN ID

Well Identification and Location

Measurement in Metric

Owner Name	Address	Town	Province	Country	Postal Code
LETHBRIDGE PETRO					

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	4	23	8	22	4				

Measured from Boundary of
m from
m from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.656469 Longitude -112.889100
How Location Obtained: Field

Elevation 936.04 m
How Elevation Obtained: Survey-Transit

Additional Information

Measurement in Metric

Distance From Top of Casing to Ground Level cm
Is Artesian Flow
Rate L/min
Is Flow Control Installed
Describe

Recommended Pump Rate L/min
Recommended Pump Intake Depth (From TOC) m
Pump Installed
Depth m
Type
Make
H.P.
Model (Output Rating)

Did you Encounter Saline Water (>4000 ppm TDS)
Depth m
Gas
Depth m
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to ESRD

Sample Collected for Potability
Submitted to ESRD

Additional Comments on Well

Yield Test

Taken From Ground Level | Measurement in Metric

Test Date	Start Time	Static Water Level
		m

Method of Water Removal

Type
Removal Rate L/min
Depth Withdrawn From m

If water removal period was < 2 hours, explain why

Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
UNKNOWN DRILLER

Copy of Well report provided to owner

Date approval holder signed

APPENDIX

A-9 AUTHORIZATIONS AND PERMITS

Skip To Navigation

Skip To Content

Alberta Energy Regulator | Alberta Environment and Parks

- Using This Site
- Ministries |
- Contact Government |
- Government of Alberta Home |

Authorization Viewer **Traditional Agriculture Registration Viewer** **Public Notices Viewer** **Help**

Authorization Viewer - Search Results

The Search Used the Following Values:	
Legal Land Location:	14-008-22-W4
Act / Document Type:	Water Act, EPEA
Show Inactive Authorizations:	Yes

The resulting Authorizations based on the search criteria will be displayed below. A will appear next to the Authorization when documentation is available for viewing or downloading. Please click Viewer Help if you encounter problems viewing the Authorization document.

2 Result(s)

	Document 00368917-00-00 LETHBRIDGE/INFILLING WETLANDS/CITY OF LETHBRIDGE - F00368917 is held by City of Lethbridge, under the provisions of the *Water Act.* This Approval is currently expired.
	Document 00368917-00-00 LETHBRIDGE/INFILLING WETLANDS/CITY OF LETHBRIDGE - F00368917 is held by City of Lethbridge, under the provisions of the *Water Act.* This Approval is currently expired.

Clear & Return

Comments regarding the Authorization Viewer page may be directed to the Regulatory Approvals Centre RAC.Environment@gov.ab.ca.

Alberta Environment and Parks

Skip To Navigation

Skip To Content

Alberta Energy Regulator | Alberta Environment and Parks

- Using This Site
- Ministries |
- Contact Government |
- Government of Alberta Home |

Authorization Viewer **Traditional Agriculture Registration Viewer** **Public Notices Viewer** **Help**

Authorization Viewer - Search Results

The Search Used the Following Values:	
Legal Land Location:	23-008-22-W4
Act / Document Type:	Water Act, EPEA
Show Inactive Authorizations:	Yes

The resulting Authorizations based on the search criteria will be displayed below. A will appear next to the Authorization when documentation is available for viewing or downloading. Please click Viewer Help if you encounter problems viewing the Authorization document.

3 Result(s)

	Document 00368917-00-00 LETHBRIDGE/INFILLING WETLANDS/CITY OF LETHBRIDGE - F00368917 is held by City of Lethbridge, under the provisions of the *Water Act.* This Approval is currently expired.
	Document 00368917-00-00 LETHBRIDGE/INFILLING WETLANDS/CITY OF LETHBRIDGE - F00368917 is held by City of Lethbridge, under the provisions of the *Water Act.* This Approval is currently expired.
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Clear & Return

Comments regarding the Authorization Viewer page may be directed to the Regulatory Approvals Centre RAC.Environment@gov.ab.ca.

Alberta Environment and Parks

APPENDIX

A-10 PREVIOUS ENVIRONMENTAL REPORT – AEP FOIPP

Bakos, April

From: keely.white@gov.ab.ca
Sent: May-25-20 1:03 PM
To: Bakos, April
Subject: [E20-G-0682] Closure Letter No Records Available on ESAR - Cont.Site

Environment & Parks and Agriculture & Forestry
FOIP Office
10th Floor, 9Triple8 Jasper,
9888 Jasper Avenue NW
Edmonton, Alberta, T5J 5C6
Telephone: 780-427-4429
www.alberta.ca

Alberta Service Alberta

May 25, 2020

Ms. April Bakos
WSP
3300 237 4 Ave SW
Calgary, Alberta T2P 4K3

Your File #: 201-04167-00
FOIP Request #: E20-G-0682
Order Number: FOIP-2020-7007

Dear Ms. Bakos:

Re: Freedom of Information and Protection of Privacy Act Request for records pertaining to the property located at Property that overlaps NE and NW 14-008-22 W4M.

The following is in response to your request of May 25, 2020 for access under the Freedom of Information and Protection of Privacy Act to the following subject records:

Location:	NW Sec 14 Twp 8 Rge 22 W 4 M, NE Sec 14 Twp 8 Rge 22 W 4 M, Lethbridge, Property that overlaps NE and NW 14-008-22 W4M
Name(s):	Lethbridge School District No. 51 Same as above
Time Frame:	Historical to May 25, 2020
Records:	(For the purposes of a Phase I Environmental Site Assessment) Any reports related to, or documentation of: - releases or spills - landfills - soils and/or groundwater and/or surface water monitoring - soils and/or groundwater and/or surface water assessment - soils and/or groundwater and/or surface water remediation I have already searched the ESAR. historical to current

A search of Alberta Environment & Parks record holdings has not identified any records relating to the subject of your request, based on the search parameters you provided to this office.

If you have any questions or concerns about the processing of your FOIP request, please write to the above address or call me at 825-468-4083, so that we can look at ways to address these issues. If, however, we are unable to resolve your concerns, under section 65(1) of the Freedom of Information and Protection of Privacy Act, you may ask the Information and Privacy Commissioner to review this decision. To request a review, you must complete and deliver a Request for Review form within 60 days from the date of this notice to the Commissioner at 410, 9925 – 109 Street, Edmonton, Alberta, T5K 2J8. The form is available under the Resources tab on the Commissioner's website www.oipc.ab.ca or you can call 1-888-878-4044 to request a copy of the form.

If you request a review, please provide the Commissioner with a copy of your original request, any letters of clarification, a copy of this letter and the reason why you are requesting a review.

If you have any questions or concerns, please write or call me at **825-468-4083**.

Yours truly,

Joseph Chidiak

Access and Privacy Advisor

Bakos, April

From: keely.white@gov.ab.ca
Sent: May-22-20 7:40 AM
To: Bakos, April
Subject: [E20-G-0670] Closure Letter No Records Available on ESAR - Cont.Site

Environment & Parks and Agriculture & Forestry
FOIP Office
10th Floor, 9Triple8 Jasper,
9888 Jasper Avenue NW
Edmonton, Alberta, T5J 5C6
Telephone: 780-427-4429
www.alberta.ca

Alberta Service Alberta

May 22, 2020

Ms. April Bakos
WSP
3300 237 4 Ave SW
Calgary, Alberta T2Z 0Y2

Your File #: 201-04167-00_02
FOIP Request #: E20-G-0670
Order Number: FOIPRD-2020-6992

Dear Ms. Bakos:

Re: Freedom of Information and Protection of Privacy Act Request for records pertaining to the property located at SW Sec 23 Twp 8 Rge 22 W 4 M, NW Sec 23 Twp 8 Rge 22 W 4 M, NW Sec 14 Twp 8 Rge 22 W 4 M, NE Sec 14 Twp 8 Rge 22 W 4 M, Lethbridge.

The following is in response to your request of May 21, 2020 for access under the Freedom of Information and Protection of Privacy Act to the following subject records:

Location:	SW Sec 23 Twp 8 Rge 22 W 4 M, NW Sec 23 Twp 8 Rge 22 W 4 M, NW Sec 14 Twp 8 Rge 22 W 4 M, NE Sec 14 Twp 8 Rge 22 W 4 M, Lethbridge, This is an undeveloped portion of land to be developed. I can send a map with the boundaries outlined.
Name(s):	The City of Lethbridge All titles indicated the City of Lethbridge has owned all parcels. A transfer of a portion of land was to Copperland Land Corp
Time Frame:	Historical to May 21, 2020
Records:	(For the purposes of a Phase I Environmental Site Assessment) Any reports related to, or documentation of: - releases or spills - landfills - soils and/or groundwater and/or surface water monitoring - soils and/or groundwater and/or surface water assessment - soils and/or groundwater and/or surface water remediation I have already searched the ESAR. historical to current

A search of Alberta Environment & Parks record holdings has not identified any records relating to the subject of your request, based on the search parameters you provided to this office.

If you have any questions or concerns about the processing of your FOIP request, please write to the above address or call me at 780-643-6687, so that we can look at ways to address these issues. If, however, we are unable to resolve your concerns, under section 65(1) of the Freedom of Information and Protection of Privacy Act, you may ask the Information and Privacy Commissioner to review this decision. To request a review, you must complete and deliver a Request for Review form within 60 days from the date of this notice to the Commissioner at 410, 9925 – 109 Street, Edmonton, Alberta, T5K 2J8. The form is available under the Resources tab on the Commissioner's website www.oipc.ab.ca or you can call 1-888-878-4044 to request a copy of the form.

If you request a review, please provide the Commissioner with a copy of your original request, any letters of clarification, a copy of this letter and the reason why you are requesting a review.

If you have any questions or concerns, please write or call me at **780-643-6687**

Yours truly,

Cameron Jones

Access and Privacy Advisor

APPENDIX

A-11 PREVIOUS ENVIRONMENTAL REPORT – ESAR

The ESA marker represents an approximate location of a s
40 meter diameter circle centered on the p

Alberta Environment and Parks

Search Form | Map Search

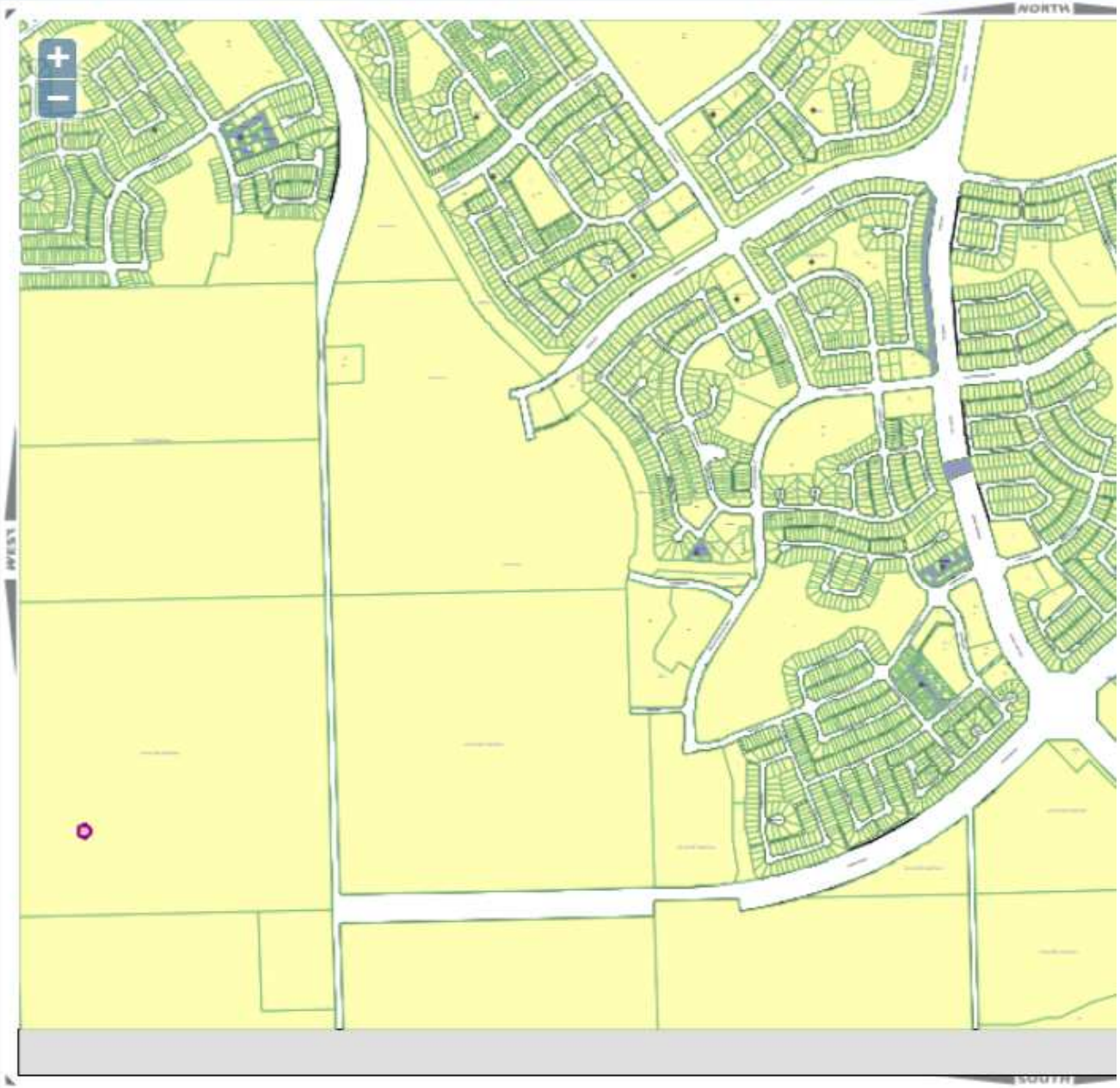
A designated location identifies a site where Alberta Environment and Parks has received scientific or technical information for that site and does not imply anything regarding the current state or condition of the site. Please refer to the studies and reports to determine the condition of the site.

ATS

Meridian W -	4
Range	22
Township	8
Section	14
[Quarter]	

Search

- PBL
- Address
- Place Name
- Coordinate
- Help with Map



Map Views

Map Information

APPENDIX

B SITE VISIT DOCUMENTATION

APPENDIX

B-1 FIELD PHOTOGRAPHS

June 05, 2020

Photograph 1 – Facing Southeast onto the Property from Bowron Substation

June 05, 2020

Photograph 2 – Property Overview Facing North-Northeast from Southern Access of Bowron Substation

June 05, 2020

Photograph 3 – Facing Northwest Towards Copperwood Community from Southern Access of Bowron Substation

June 05, 2020

Photograph 4 – Western Adjacent Agricultural Land from Southern Access of Bowron Substation

June 05, 2020

Photograph 5 – Facing Southwest Towards Agricultural Land West of the Property from Southern Access of Bowron Substation

June 05, 2020

Photograph 6 – Western Boundary of the Property Facing South

Note the overhead powerlines.

June 05, 2020

Photograph 7 – Bowron Substation Facing North

The substation lot was not accessed.

June 05, 2020

Photograph 8 – Bowron Substation Facing Northwest

Note the garbage bin to the left.

June 05, 2020

Photograph 9 – Overhead Powerlines Leading to the Substation Facing South

Note the pole-mounted transformer. No staining was observed.

June 05, 2020

Photograph 10 – Northern Side of Substation Facing South

June 05, 2020

Photograph 11 – Possible Geotech Piezometer on Northern Side of Northern Access Road to Substation

June 05, 2020

Photograph 12 – Facing South from Southwestern Edge of the Property

June 05, 2020

Photograph 13 – Facing West from Southwestern Edge of the Property

June 05, 2020

Photograph 14 – Facing North from Southwestern Portion of the Property

June 05, 2020

Photograph 15 – Facing East-Northeast from Southwestern Portion of the Property

June 05, 2020

Photograph 16 – Facing North from Northern Portion of the Property

Note the roadway, residential houses, and the walking path to the right.

June 05, 2020

Photograph 17 – Copperwood Community Northwest Western of the Property

June 05, 2020

Photograph 18 – Facing East from the Northern Tip of the Property

Note the residential houses and the bike path along the eastern boundary.

June 05, 2020

Photograph 19 – Facing South onto the Property from Northern Tip of Property Boundary

June 05, 2020

Photograph 20 – Area of Sparse Vegetation on Northern Portion of the Property Facing South

June 05, 2020

Photograph 21 – Mounded Area in Eastern Portion of the Property Facing South

Note the wooden fence along the western boundary of the mound. The mound was likely fill and is currently vegetated with grasses and shrubs.

June 05, 2020

Photograph 22 – Domestic Refuse along Fencing West of the Mound of Dirt

The waste appears to be wind-blown and domestic in nature, and no containers of chemicals or staining were observed.

June 05, 2020

Photograph 23 – More Domestic Refuse along Western Side of Fencing Facing South-southeast

None of the waste appeared to have any chemical containers and was mainly cardboard, plastic bags, building material, and other inert garbage that would be brought by the wind.

June 05, 2020

Photograph 24 – Facing North from Pathway along Eastern Boundary of the Property

June 05, 2020

Photograph 25 – Residential Dwellings Adjacent East of the Property

June 05, 2020

Photograph 26 – Switchgear Located Along Eastern Boundary of the Property Facing North

The switchgear was manufactured in 2015. Based on the age of manufacture, the switchgear is not expected to contain PCBs.

June 05, 2020

Photograph 27 – Electrical infrastructure along Eastern Boundary of the Property

There was no placard that indicated the percentage for PCBs, but the electrical infrstructure had been tested for PCBs in 2008. There were three other electrical infrastructures along the fenceline on adjacent properties.

June 05, 2020

Photograph 28 – New Fire Station Lot Under Construction Facing Southwest

Note the low area to the north of the new building.

June 05, 2020

Photograph 29 – Facing West from Eastern Boundary of the Property Towards the Substation

This area appeared to not have been seeded.

June 05, 2020

Photograph 30 – Two switchgears Adjacent to Macleod Drive West Facing Southeast

The switchgear to the right was manufactured in 2005, and the one in the background was manufactured in 2010.

June 05, 2020

Photograph 31 – Facing Northeast from Macleod Trail Adjacent to the Fire Station

June 05, 2020

Photograph 32 – Fire Station Building Under Construction Facing Southeast

June 05, 2020

Photograph 33 – Facing North Towards Fire Station

June 05, 2020

Photograph 34 – Facing West onto Property from Southern Side of Fire Station

June 05, 2020

Photograph 35 – Facing Southwest onto Property from Southern Portion of the Fire Station Lot

Note the soil pile in the background, presumably from recent local development.

June 05, 2020

Photograph 36 – Culverts and Drainage System East of the Fire Station Property Facing North

June 05, 2020

Photograph 37 – Facing West onto Property from Top of Construction Soil Pile Southeast of the Fire Station

June 05, 2020

Photograph 38 – Fenced Area with Sparse Vegetation Facing Southeast Located West of Fire Station Lot

June 05, 2020

Photograph 39 – School Property Facing Southwest

This photo was taken from the adjacent park on the other side of University Drive.

June 05, 2020

Photograph 40 – Adjacent Residential Houses North of the School Facing Northeast

June 05, 2020

Photograph 41 – Skate Park South of the School Facing Northeast

June 05, 2020

Photograph 42 – Dirt Piles from Unknown Origin Located Southwest of the School Facing North

June 05, 2020

Photograph 43– Facing South from Southwest Portion of the School and Skateboard Park Lot

June 05, 2020

Photograph 44 – Facing Southeast Towards Southeastern Property Boundary

June 05, 2020

Photograph 45 – Overview of Southern Property Boundary Facing South

June 05, 2020

Photograph 46 – Construction Topsoil Pile Area of Sparse Vegetation Facing West-Northwest

June 05, 2020

Photograph 47 – Eastern Area of Sparse Vegetation Facing East-Northeast

This area is located adjacent to the west of the new community Sundance.

June 05, 2020

Photograph 48 – Eastern Area of Sparse Vegetation Growth Facing North

Note the school and skate park in the background.

June 05, 2020

Photograph 49 – Facing Northeast onto Western Sparsely Vegetated Area

June 05, 2020

Photograph 50 – Southwestern Portion of Property Boundary

Note the acreage in the background.

APPENDIX

C INTERVIEW DOCUMENTATION

APPENDIX

C-1 ABBY SLOVACK

1 General Property Information

1.1 Property Details

1.1.1 Property Name: Watermark Community

1.1.2 Full Postal Address: No civic address

1.1.3 Telephone Number: *confidential*

1.1.4 Principal Contact Name: Abby Slovack

Position/years at this location: Land Development Manager / 4 years

1.1.5 Other Site Contacts: N/A

1.1.6 Number of Employees: [ ] Full-time [ ] Part-time [X] Not Applicable (N/A)

1.1.7 Property Size: Southern - 148.5 acres, Central - 120 acres (not including fire station), Top - 15 acres, and an additional 30 acres

1.1.8 Site Ownership and Occupants: *Is the Property Leased?* [X] Yes [ ] No [ ] N/A

Who is the landlord or management company? College Farms leases

Who is/are the tenant(s)? College Farms

Who is the owner of record? City of Lethbridge

1.2 Property History

1.2.1 Recent History:

Briefly describe the history of the site, focusing on previous site utilization, environmentally relevant activities / installations.

Duration		Owner or Tenant Name	Type of Use (e.g. agriculture, industrial activities)
from	to		
Unknown	Current	College Farms	Agricultural

1.2.2 Distant Past Agricultural

1.3 Property Setting

Building Name	Area (ft^2 or m^2)	Activities	Year of Construction	Building Materials (concrete block/wood frame)
Substation	2.18 acres	Substation	B/W 1979 and 1988	Possibly bricks
School	6,524 m^2	School - opened 2 years	2016/2018	Steel and concrete
Fire Station	Unknown	Under construction	Under construction	Steel and concrete

1.3.1 Major site layout modifications and/or utilization changes on the Property:

Year	Modification of production facilities or buildings / Extension of facilities / Demolition of facilities / Shut-down of facilities
None	N/A

1.3.2 Are there indications or information concerning spills or leakages on the property or in the neighbourhood?

(including current operations)

Date	Location	Substance	Spilled Amount	How or why did the spill occur?
None	N/A	N/A	N/A	N/A

1.3.3 Describe backfilling activities on the Property:

(including cut & fill, widespread backfilling, trenches / channels)

N/A or [X] None

Source of backfilling material: N/A or [ ] Unknown

1.3.4 Please describe pits/ponds or lagoons on subject property or adjoining property:

N/A or [X] None

1.4 Environmental Setting

1.4.1 Are there any sensitive receptors in the vicinity of the Property?
(i.e. endangered species)

N/A or [X] None

1.4.2 Describe past and present vegetation/pest control:
(methods / frequency / contractors / sterilants / pesticides)

Not aware of any. Pea crops in 2019 or [ ] None

1.4.3 Name of nearest waterbodies:

Sunridge Pond and Copperwood has Minor's Landin Pond or [ ] None

***1.4.4 Describe any mineral rights activities associated with the site** (oil wells, mining, quarrying, etc.) :*

N/A or [X] None

1.4.5 Describe surrounding land use and identify neighbouring facilities:
(residential, industrial, rural, industry (type of industry))

	Present	Past
North:	Residential	Agricultural and residential
East:	Residential	Agricultural
South:	Agricultural	Agricultural
West:	Agricultural	Agricultural

1.4.6 Have you had any environmental issues or conflicts with adjacent occupants?

N/A or [X] None

2 Property Activities

2.1 Documentation Available

2.1.1 Please provide an inventory of all chemicals used on-site:
(i.e. fuels, cleaners, lubricant, licensed or permitted chemicals). SDS lists are often the easiest means of finding a complete list.

Not aware of any or [ ] None

2.1.2 Briefly describe activities carried out on-site, including types of products / chemicals / materials handled:
If available, include / attach flow schematic.

N/A or [X] None

2.1.3 Provide copies of any known environmental reports / investigations / remediation measures, assessments, spill reports, or soil/groundwater investigations already conducted on the Property or in the neighborhood:

Already provided or [ ] None

2.1.4 Provide copies of any internal audits, inspections, procedures:
(i.e. spill response, material handling, tank testing).

N/A or [X] None

2.1.5 Provide copies of any regulatory approvals, licenses, or permits:

N/A or [X] None

2.2 Waste

2.2.1 Hazardous Waste Generator

Please indicate the hazardous waste generator classification of your facility:

N/A or X Never

Hazardous Waste	Code (see Alberta User Guide for Waste managers, AENV, 1996)
None	N/A

2.2.2 Waste Storage Areas

Unit	Storage Area Name	Location	Status (Active/Inactive)	Type of Waste Stored
Satellite Accumulation (including used oil)	None	N/A	N/A	N/A
Less than 365 Day Accumulation Areas	None	N/A	N/A	N/A
365 day storage areas	None	N/A	N/A	N/A
Permitted Container Storage Areas	None	N/A	N/A	N/A
Treatment Storage and Disposal (TSD) facilities	None	N/A	N/A	N/A
Impoundments	None	N/A	N/A	N/A
Landfills	None	N/A	N/A	N/A
Waste Piles (including illegal dumping)	Near soil stockpiles by school	By the school	Inactive	Domestic (couches and household). Removed when discovered
Boilers, Incinerators, Furnaces	None	N/A	N/A	N/A
Other	None	N/A	N/A	N/A

2.2.3 Corrective Action.

Please describe any corrective action/remediation related to current or previous hazardous waste storage installations performed on-site (include type and current status):

N/A or X None

Please provide an estimate of financial costs developed for Financial Assurances: N/A or X N/A

2.3 Material Storage & Handling for Chemicals or Hazardous Materials

2.3.1 Underground Storage Tanks (UST).

Please list all current and former USTs:

Location	Contents	Name same as site map	Size	Protection From Spills *	Age
None	N/A	N/A	N/A	N/A	N/A

** leakage control, double-walled, overfill prevention, secondary containment, integrity testing, overfill alarms, etc.*

2.3.2 Aboveground Storage Tanks (AST)

Please list all current and former ASTs:

Location	Contents	Name same as site map	Size	AST Construction				Protection from Spills*	Age
				Vertical or Horizontal	Saddle or Flush	Welded or Riveted	Metal or Plastic		
None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

** leakage control, double-walled, overfill prevention, secondary containment, integrity testing, overfill alarms, etc.*

2.3.3 *Drums and Other Receptacles*

Please list all current and former storage and handling locations for drums, and other containers, for materials, hazardous substances, fuel, and waste (liquid, solid, empty containers etc.), including loading/offloading areas:

Location	Contents	Number of drums and/or receptacles (greater than 55 g or 208 L)	Maximum storage per drum (L)	Protection from Spills*	Duration of Storage
None	N/A	N/A	N/A	N/A	N/A

** leakage control, double-walled, overfill prevention, secondary containment, integrity testing, spill kits, etc.*

2.3.4 *Loading/Offloading Areas*

Location	Name as shown on site map	Description (rail spur, weigh-scale etc.)	Procedures (SOP documented, Volumes transferred, frequency etc.)	Protection from Spills *
None	N/A	N/A	N/A	N/A

** leakage control, secondary containment, spill kits, track trays, etc.*

2.3.5 *Aboveground / Underground Pipelines*

Provide the names of owners of any underground pipelines or pipeline right-of-ways which cross the Property:

N/A or [X] None

Are there pipelines or way leaves used for chemicals and/or hazardous liquids on the Property?

[ ] Active [ ] Inactive [ ] Decommissioned [X] Never

Conveyed substances: N/A

Location and Purpose: N/A

Connected to: [ ] Off-Site Storage [ ] Loading [ ] Port [ ] Rail [X] N/A

2.3.6 *Are (were) fuel stations for trucks, cars, or fork-lifts present on the Property?*

[ ] Current [ ] Past [ ] Unknown [X] Never

Date Removed: N/A

If yes, who is (was) the operator? N/A

How is (was) the ground protected against contaminants? N/A

2.4 Utilities / Water / Wastewater / Underground Injection

2.4.1 *Contractors and Suppliers for the following services:*

Energy/Utility Service	Provider(s)
Gas	To the fire station and school. ATCO Gas
Electricity	To the fire station and school. City electric lines
Coal	N/A
District heating / steam	N/A
Drinking (Potable) Water*	To the fire station and school. City water lines
Storm water Disposal **	Overland in undeveloped area. Along the boulevard there are stormwater facilities. Watermark has storage. A dry pond is north and east of the fire station.
Sanitary Wastewater **	Great Bear Boulevard and connecting to the fire station. Services to the surrounding communities.
Production Wastewater **	N/A
Cooling Water **	N/A
Solid Waste Disposal	School has a dumpster.
Hazardous Waste Disposal	N/A

*Municipal System / Private well on-site / Private well off-site
**On-site WWTP / Publicly Owned Treatment Works (POTW) / Infiltration / Underground Injection Wells

2.4.2 Sewage System

Please describe the Property's sewage disposal system:
(age, materials, separate/combined, under/above ground, discharge volume (actual & permitted), separators, Permits, inspection results)

Hooked up to sanitary lines

2.4.3 List all groundwater extraction wells located on the Property?

(include current and former, potable, production water, monitoring wells) [ ] Unknown [ ] Never

Well Name/ID	Location	Utilization (irrigation, potable, sanitary, process, monitoring)	Active / Inactive / Decommissioned	Permit (authority, expiration)	Volume (Permitted and Actual)
None	N/A	N/A	N/A	N/A	N/A

2.4.4 Surface Water

Does or did the facility operate under or have a permit to discharge to surface water?

[ ] Current [ ] Past [ ] Unknown [X] Never

List all past and present permit numbers: N/A

Number of discharge points: N/A

Who is the permittee? N/A

2.4.5 Underground Injection Control

Does the facility inject fluids underground through:

[ ] Bored Holes [ ] Drilled Holes [ ] Driven Holes [ ] Dug Holes [X] Never

What is the permit number? N/A

Where is the disposal well and how is the waste handled? N/A

2.5 Special Substances

This Phase I ESA does not include intrusive testing or sampling for special substances

2.5.1 Asbestos Containing Materials (ACM)

List potential ACM including: Pre-1980: insulation, cement products, floor tiles (9"x9" or 12"x12"), grout, drywall, plaster, compressed papers/boards, duct tapes, sealants, protective coatings, ceiling tiles.

Location of ACM	Type of ACM	Age
None	N/A	N/A

Any demolition/renovations/construction or removal activities involving ACM at your facility? [ ] Yes [X] Never

Are there any removed ACMs stored / backfilled at your facility? [ ] Yes [X] None

If yes, please provide details on each issue: N/A

2.5.2 Polychlorinated biphenyl (PCB) in Electrical Units

List potential PCB-containing electrical units including: transformers, capacitors, electromagnetic switches, voltage regulators, cables, heat transfer equipment, pre-1980 fluorescent light ballasts:

Location of Unit	Type of unit (transformer / capacitor etc.)	[PCB] Range (look for label)	Age
Substation	Transformer	Unknown	Between 1979 and 1988 based on air photos

2.5.3 Urea Formaldehyde Foam Insulation (UFFI)

List potential UFFI (including: Pre-1980 insulation (injection holes in exterior of building)):

Location of UFFI	Description of UFFI	Age
None	N/A	N/A

2.5.4 Ozone Depleting Substances (ODS)

List potential ODS (including: Pre-1994 Air-conditioners, fire extinguisher systems (do not include fire extinguishers)):

Location of ODS Unit	Type of ODS Unit	Age
None	N/A	N/A

2.5.5 Lead

List potential areas for lead (including: Pre-1976 painted surfaces, vehicle battery storage areas):

Location of LCM	Description of LCM	Age
None	N/A	N/A

2.5.6 Mould

List potential areas of mould:

Location of Suspected Mould	Description of Suspected Mould	Date Removed
None	N/A	N/A

3 Interviewer and Interviewee

Form completed by :	Abby Slovack	and (WSP)
Date :	June-02-20	

APPENDIX F: WETLAND IMPACT ASSESSMENT & COMPENSATION LOSS MEMO

Alberta Environment and Parks

APPROVAL
PROVINCE OF ALBERTA
WATER ACT, R.S.A. 2000, c. W-3, as amended

APPROVAL NO.: 00368917-00-00

FILE NO.: 00368917

WATERBODY: Un-named Wetland

ACTIVITY LOCATION: N ½ 14-008-22-W4, S ½ 23-008-22-W4 & NW 23-008-22-W4

EFFECTIVE DATE: February 25, 2016

EXPIRY DATE: December 31, 2017

APPROVAL HOLDER: City of Lethbridge

Pursuant to the Water Act, R.S.A. 2000, c. W-3, as amended, an Approval is issued to the Approval Holder for the following activity:

placing, constructing, removing, disturbing works, in un-named wetlands;

removing or disturbing ground, vegetation or other material in un-named wetlands;

subject to the attached terms and conditions.

Designated Director under the Act: David Hunt

Date Signed: February 25, 2016

DEFINITIONS

1.0 All definitions from the Act and the Regulations apply except where expressly defined in this Approval.

1.1 In all parts of this Approval:

(a) "Act" means the Water Act, RSA 2000, c. W-3, as amended;

(b) "Director" means an employee of the Government of Alberta designated as a Director under the Act;

(c) "Regulations" means the regulations, as amended, enacted under the authority of the Act.

GENERAL

2.0 The Approval Holder shall immediately report to the Director by telephone, any contravention of the terms and conditions of this Approval at (780) 422-4505.

2.1 The terms and conditions of this Approval are severable. If any term or condition of this Approval is held invalid, the application of such term or condition to other circumstances and the remainder of this Approval shall not be affected thereby.

2.2 The Approval Holder shall retain a copy of:

(a) this Approval; and

(b) the plan(s)/report(s) referred to in Section 3.1

at the site of the activity at all times while conducting the activity.

PARTICULARS

3.0 This Approval is appurtenant to the undertaking as described as the loss of wetland area located at N ½ 14-008-22-W4, S ½ 23-008-22-W4 & NW 23-008-22-W4 as shown in Report Nos. 00368917-R001 and 00368917-R002.

3.1 The Approval Holder shall undertake the activity in accordance with the following plan(s)/report(s):

TITLE	AENV NUMBER
Waterbridge Subdivision Wetland Impact Assessment – Tetra Tech EBA – Dated May 2015	00368917-R001
Wetland Loss Compensation – Ducks Unlimited Canada – Waterbridge – Dated June 8, 2015	00368917-R002

3.2 The Approval Holder shall not undertake the activity in any manner or use any material that causes or may cause an adverse effect on the aquatic environment, human health or public safety.

SILTATION AND EROSION CONTROL

4.0 The Approval Holder shall minimize:

(a) siltation; and

(b) erosion

of the water body as a result of the activity.

WETLAND COMPENSATION

5.0 The Approval Holder shall provide compensation for the loss of wetland as stipulated in 00368917-R002 such that the Approval Holder shall pay financial compensation in the amount of $211,995.00 to Ducks Unlimited Canada.

5.1 On or before December 31, 2017, the Approval Holder shall provide to the Director written confirmation from Ducks Unlimited, that the compensation has been received.

CERTIFICATE OF COMPLETION

6.0 Within 30 days following completion of the activity, the Approval Holder shall submit to the Director, a Certificate of Completion.

6.1 The Certificate of Completion shall include:

(a) a statement that the activity has been completed in accordance with the Approval; and

(b) any other information requested in writing by the Director.

Date Signed: February 25, 2016

Designated Director under the Act
David Hunt

Alberta Environment and Parks

CERTIFICATE OF COMPLETION

PURSUANT TO THE PROVISIONS OF THE *WATER ACT*

APPROVAL No. 00368917-00-00

FILE No. 00368917

City of Lethbridge

certifies the activity was completed in accordance with the conditions of Approval No. 00368917-00-00.

_____

Approval Holder's Signature

_____

Print Name

_____

Dated (Y/M/D)

Jessica Firth Report No. 00368917-R001

From: Hensel, Bryan <Bryan.Hensel@tetratech.com>
Sent: Monday, February 08, 2016 11:49 AM
To: Jessica Firth
Subject: Errata - Addendum to Application for Approval (File No.: 00368917)

Good Morning Jessica,

Please accept this email as an addendum to the application for Approval under the Alberta *Water* Act, submitted for the proposed City of Lethbridge Waterbridge Subdivision (the Project) (Application No.: 00368917). Tetra Tech EBA Inc. identified a minor error in the associated Wetland Impact Assessment (WIA) report whereby the areas of impact for Wetlands 7 and 8 were misreported under Table 5 of the WIA report. These errors have been corrected and updated as shown in the following table:

Wetland Areas Impacted within the Project Area

Wetland	Location	Classification	Total Wetland Area (ha)	Area Impacted (ha) [% of Total Wetland Area]	Total Wetland Area for Compensation (ha)
Wetland 1	3-23/14-14/15-14-8-22-4	Class II Temporary Pond	1.36	1.36 [100]	1.36
Wetland 2	12-23-8-22-4 & 5-23-8-22-4	Class III Seasonal Pond	0.29	0.29 [100]	0.29
Wetland 3	12-23-8-22-4	Class II Temporary Pond	0.19	0.19 [100]	0.19
Wetland 4	4-23-8-22-4	Class II Temporary Pond	0.44	0.44 [100]	0.44
Wetland 5	4-23-8-22-4	Class II Temporary Pond	0.10	0.10 [100]	0.10
Wetland 6	13-14-8-22-4	Class III Seasonal Pond	0.43	0.43 [100]	0.43
Wetland 7	12-14-8-22-4	Class III Seasonal Pond	1.09	~~0.31 [28]~~ 0.78 [72][1]	~~0.31~~ 1.09
Wetland 8	12-14-8-22-4 & 5-14-8-22-4	Class III Seasonal Pond	1.35	~~0.88 [65]~~[1] 0.47 [35]	~~1.35~~ 0.47
Wetland 9	12-14-8-22-4	Class III Seasonal Pond	0.99	0.99 [100]	0.99
Wetland 10	11-14-8-22-4	Class II Temporary Pond	0.72	0.72 [100]	0.72
Wetland 11	10-14-8-22-4	Class II Temporary Pond	0.55	0.55 [100]	0.55
		Total	**7.51**	~~**6.26**~~ **6.32**	~~**6.73**~~ **6.63**

[1] Wetlands for which >50% of the total wetland area is impacted require restorative compensation for the loss of the entire wetland area.

As the error was the result of a miscalculation (rather than mapped boundaries of the Project or associated wetlands), the areas of impact as depicted on Figure 2 of the WIA report remain unchanged. Consequently, although the area of impact is amended, there are no changes to the nature of impacts associated with the Project (i.e., offsite impacts), nor the mitigation measures recommended for the Project. Tetra Tech EBA will obtain an updated Compensation Agreement with Ducks Unlimited Canada to appropriately reflect these changes.

Please do not hesitate to contact me if you have any questions regarding this error.

Sincerely,

Bryan Hensel, B.Sc., P.Biol. | Vegetation Ecologist
Direct +1 (403) 723-1516 | Business +1 (403) 203-3355 | Fax +1 (403) 203-3301 | Mobile +1 (403) 888-7370

Bryan.Hensel@tetratech.com

Tetra Tech | Complex World, Clear Solutions™
Environment Practice | 115 - Rivercrest Drive SE, Calgary, Alberta T2C 2X5 | tetratech.com

Ducks Unlimited Canada
Conserving Canada's Wetlands

REPORT NO. 00368917-R002
THIS DOCUMENT FORMS PART OF
AN AUTHORIZATION ISSUED UNDER THE
WATER ACT
February 25, 2016
DATE DESIGNATED DIRECTOR UNDER THE ACT

June 8, 2015

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

Attention: **Michael Kelly**

Re: **Wetland Loss Compensation – Waterbridge**

Ducks Unlimited Canada (DUC) supports the protection of wetlands as the foundation to fulfilling the goals of the North American Waterfowl Management Plan (NAWMP), specifically the Alberta component. In cases where avoidance or minimization of the wetland impacts cannot be achieved, DUC through its proactive wetland restoration efforts supports the mitigation process by providing restoration of drained wetlands as a compensation option resulting in no net loss of wetlands.

DUC is currently engaged in implementing restoration activities for wetland loss compensation options based upon program area implementation. The wetlands to be restored will fall into the Alberta Prairie initiative and will replace the wetland loss from the proposed development with similar wetland classes within the same major watershed basin. This landscape has been identified as an important wetland restoration area, which will support the recovery of waterfowl, wildlife and biodiversity within the southern region of Alberta.

Following restoration of these drained wetlands, each individual project will be managed consistent with the Alberta NAWMP objectives. These projects and the wetlands associated with them vary in size and class. The restoration of wetlands in this initiative will provide adequate compensation for the wetland loss created by the proposed development.

The proposed development according to the wetland impact assessment supplied by Tetra Tech EBA states that there would be a direct loss of 6.73 hectares of wetland habitat. With the replacement ratio of 3:1, 20.19 hectares of restored wetland habitat will be required. The cost of restoring these wetlands in the Alberta Prairie initiative being $10,000/ha, this equates to $201,900.00 plus GST, as total compensation.

DUC requires written acceptance from The City of Lethbridge in the space provided below. Please return an executed copy of the proposal via email to c_bishop@ducks.ca. Once approved by Environment & Parks, please issue payment to DUC by a certified cheque or Bank draft to the address as indicated on the invoice.

Upon receipt, DUC will provide a confirmation notice for The City of Lethbridge and Environment & Parks's files.

3520 – 114 Ave SE, Calgary, Alberta T2Z 3V6, Phone (403) 201-5577, Fax (403) 201-5580
Toll Free: 1-800-665-DUCK (3825), E-mail: webfoot@ducks.ca, Website: ducks.ca

This proposal and the fees charged will be available for acceptance for 90 days from the date of issue. Payment must be received within 30 days after approval has been issued from Environment & Parks. If these terms are not met, DUC will not be obligated to complete the agreement.

Please feel free to call Craig Bishop at (403) 668-0974 if you have any questions or concerns regarding this proposal.

Yours Truly,

Scott Stephens

Director of Regional Operations, Prairies
Ducks Unlimited Canada

Cc: Hensel, Bryan – Tetra Tech EBA

Enclosures

I, Michael Kelly, on behalf of The City of Lethbridge, do acknowledge and agree to accept the Wetland Loss Compensation proposal and its terms as prepared by Ducks Unlimited Canada.

Signature of Michael Kelly for The City of Lethbridge.

Ducks Unlimited Canada
Conserving Canada's Wetlands

INVOICE

Invoice#: CB15/085-WR

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

PAYABLE TO: Ducks Unlimited Canada
17915 – 118th Avenue
Edmonton, AB
T5S 1L6

ATTENTION: Pamela Corbett

DATE: June 8, 2015

DESCRIPTION: Waterbridge
Compensation for Wetland Loss

Compensation Total:	$201,900.00
5% GST:	10,095.00
Total Payable to DUC:	$211,995.00

GST#: 118888957

Terms: Payment due 30 days from issue of Environment & Parks approval.

Ducks Unlimited Canada – Wetland Loss Compensation Proposal

Impacted Wetland Site Information

Clients Name:	The City of Lethbridge
Development Name:	Waterbridge
Impact Location:	SW 23-08-22-W4m
Impact Area:	6.73 ha.
Classification System:	Stewart & Kantrud
Impacted Classes:	Class II's & III's
Impacted Watershed:	South Saskatchewan River

Restoration Compensation

DUC Initiative:	Alberta Prairie
Restoration Watershed:	South Saskatchewan River
Replacement Ratio:	3:1
Replacement Area:	20.19 ha.
Compensation Rate:	$10,000/ha.
Total Compensation:	$201,900.00 + GST
Prepared for:	The City of Lethbridge
Prepared by:	Craig Bishop Ducks Unlimited Canada
Date:	June 8, 2015

APPENDIX G: WILDLIFE SURVEY REPORT

TETRA TECH EBA

TECHNICAL MEMO

ISSUED FOR REVIEW

To:	The City of Lethbridge	**Date:**	July 8, 2015
c:		**Memo No.:**	
From:	Tetra Tech EBA Inc.	**File:**	704-ENVIND03703-01
Subject:	Waterbridge Wildlife Surveys		

This 'Issued for Review' document is provided solely for the purpose of client review and presents our interim findings and recommendations to date. Our usable findings and recommendations are provided only through an 'Issued for Use' document, which will be issued subsequent to this review. Final design should not be undertaken based on the interim recommendations made herein. Once our report is issued for use, the 'Issued for Review' document should be either returned to Tetra Tech EBA or destroyed.

1.0 INTRODUCTION

Tetra Tech EBA Inc. (Tetra Tech EBA) conducted wildlife surveys as part of the supplemental environmental and geotechnical services, as requested by the City of Lethbridge (City), for a portion of the proposed Waterbridge Subdivision (Project) which encompasses 126.5 ha in SW¼ 23-08-22 W4M and NW¼ 14-08-22 W4M (Project Area; Figure 1) located in west Lethbridge, Alberta. The wildlife surveys included an amphibian survey (wetlands within 100 m of the Project Area), raptor nest survey (within a one kilometer buffer surrounding the Project Area); and a general wildlife reconnaissance within the Project Area.

2.0 METHODS

2.1 Desktop Review

Tetra Tech EBA compiled a list of all species of management concern (SOMC) known or having the potential to occur within the Project Area. The list was compiled by querying the Fisheries and Wildlife Internet Mapping Tool (FWMIT; 1 kilometer circular radius from the centre of the Project Area; Government of Alberta 2014a) and known species ranges (Alberta Conservation Association et al. 2006; Ridgely et al. 2007; International Union for Conservation of Nature 2014). SOMC are any that meet one or more of the following criteria:

- Have provincial and/or federal restricted activity dates or setback distances;
- Ranked as 'Sensitive', 'May Be At Risk', or 'At Risk', by the General Status of Alberta Wild Species (GSAWS; Government of Alberta 2010);
- Assessed as 'Threatened', 'Endangered', or 'Special Concern' by the Endangered Species Conservation Committee (ESCC; Government of Alberta 2014b);
- Listed as 'Threatened' or 'Endangered' under the Alberta *Wildlife Act* (AWA; Province of Alberta 2000);
- Assessed as 'Special Concern', 'Threatened', or 'Endangered' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC; Government of Canada 2015); and

Tetra Tech EBA Inc.
442 - 10 Street N.
Lethbridge, AB T1H 2C7 CANADA
Tel 403.329.9009 Fax 403.328.8817

- Listed as 'Special Concern', 'Threatened', or 'Endangered', or under the *Species at Risk Act* (SARA; Government of Canada 2002).

Provincial recommended restricted activity dates and setback distances for grassland species are provided in *Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural* Regions of Alberta (Government of Alberta 2011). Federal recommended restricted activity dates and setback distances are provided in *Petroleum Industry Activity Guidelines for Wildlife Species at Risk in the Prairie and Northern Region* (Environment Canada 2011) and in a personal communication from Environment Canada (Gregoire 2013, 2014).

The location of the Project Area was compared to Key Range Layers and Key Wildlife Areas with FWIMT (Government of Alberta 2014a).

2.2 Amphibian survey

Tetra Tech EBA completed an Auditory Amphibian Survey following the AEP (formerly ESRD) *Sensitive Species Inventory Guidelines* (2013a) for six wetlands found within 100 m of the Project Area (Figure 1). Amphibian Acoustic Surveys in the prairie region target Northern Leopard Frog (*Lithobates pipiens*), Great Plains Toad (*Anaxyrus cognatus*), and Plains Spadefoot (*Spea bombifrons*). Tetra Tech EBA chose a 100 m buffer around the Project Area based on recommended setback distances for amphibian SOMC that may occur in the vicinity of the Project. At each station, all visual and aural detections of amphibians were recorded during a 3 minute point count. Each survey began 30 min after sunset and ended by midnight. The surveys were conducted in air temperatures between 4.9°C and 18°C, with winds were less than 3 on the Beaufort scale (0-19 kilometer/h), and in the absence of precipitation. Tetra tech EBA conducted surveys on May 4, May 6, and May 21, 2015. Incidental detections of all other wildlife were also recorded.

2.3 Raptor Nest Survey

Tetra Tech EBA conducted a raptor nest survey on June 23, 2015 via public roads for potential raptor stick-nesting locations (trees, power poles, buildings) within one kilometer of the Project Area where suitable habitat was present (Figure 1). Formal surveys for ground-nesting raptors were not conducted.

2.4 General Wildlife Reconnaissance Survey

Tetra Tech EBA completed a general wildlife reconnaissance survey June 23, 2015 to identify wildlife species that may be using the Project Area (Figure 1). The general wildlife reconnaissance included the auditory and visual identification of wildlife species present within the Project Area. In order to efficiently characterize wildlife use of the site, the survey was conducted during the peak of the wildlife breeding season. The survey was conducted between 8 am and 11 am and in favourable weather conditions (i.e., seasonal normal temperatures, winds less than 3 on the Beaufort scale, and in light to no precipitation).

3.0 RESULTS

3.1 Desktop Search

Tetra Tech EBA identified 44 SOMC having the potential to occur within the Project Area based on species ranges (Table 1). No known records of SOMC were identified within the FWIMT tool (Government of Alberta 2014a).

A Key Wildlife and Biodiversity Zone was identified south and east of the Project Area but the proposed development is not anticipated to affect wildlife habitat in this zone.

The Project Area falls within the Sensitive Raptor Range for: Prairie Falcon (*Falco mexicanus*), Golden Eagle (*Aquila chrysaetos*), and Ferruginous Hawk (*Buteo regalis*); Sensitive Amphibian Range; and Sharp-tailed Grouse Survey Area (Government of Alberta 2014a).

3.2 Auditory Amphibian Survey

No amphibian SOMC were identified during the Auditory Amphibian Survey. During the first survey night and third survey night (on May 5 and May 2, 2015, respectively) Boreal Chorus Frogs (*Pseudacris maculate)* were identified at all survey stations except AMPH4 (Figure 1). Call codes ranged from 1 – 3, where call code 1 is between 1-5 individuals calling, call code 2 is 6-10 individuals calling, call code 3 is more than 10 individuals calling. During the second survey night on May 6, 2015 Boreal Chorus Frogs were identified only at survey station AMPH3 where two individuals were heard. The lack of Boreal Chorus Frogs calling during the second survey night is likely attributed to cool air temperatures (approximately 5 degrees Celsius).

3.3 Raptor Nest Survey

No raptor nests were identified during the Raptor Nest Survey. A pair of Swainson's Hawks (*Buteo swainsoni*) were observed approximately 100 m northeast of the Project Area. Swainson's Hawks are ranked as 'Sensitive' in Alberta (Government of Alberta 2010; Table 1). A Red-tailed Hawk (*Buteo jamaicensis*) was observed approximately 100 m southwest of the Project Area but no roads were present to access the area. Neither hawk species were exhibiting behaviour indicative of a nest in close proximity (i.e., aggressive calling, swooping). No ground-nesting raptor species were observed.

3.4 Wildlife Reconnaissance Survey

The Project Area is primarily cultivated land which is generally considered low quality habitat for wildlife, although wildlife will still use this area. The survey focussed on areas of higher quality habitat for wildlife (e.g., wetlands, non-cultivated areas). The wetlands and surrounding vegetation provide suitable habitat for wetland-dependent species (e.g., waterfowl, blackbirds, frogs) and most species were concentrated in these areas. The ditches and non-cultivated areas around the periphery of the Project Area offers suitable habitat for certain wildlife species several of which were identified during the survey (e.g., Richardson's ground squirrels [*Spermophilus richardsonii*] and Clay-colored Sparrows [*Spizella pallida*]). A total of one amphibian species, 21 bird species, and three mammal species were identified during the Wildlife Reconnaissance Survey (Table 1). No reptiles were identified.

Three observations warrant additional discussion:

- A Spotted Sandpiper (*Actitis macularius*) nest containing four eggs was identified at GPS coordinate 12 U 363481 5502262 (Figure 1). Ground-nesting birds in the grassland region have a minimum recommended setback of 50 m from active nests from April 15 to August 15 (Gregoire pers. comm. 2014).

- A Black-billed Magpie Nest (*Pica hudsonia*) was identified at GPS coordinate 12 U 363433 5501424 (Figure 1). The minimum recommended setback for forest-nesting species is 30 m from active nests (Gregoire pers. comm. 2014); however, this nest was no longer active and thus no setbacks are warranted. This nest was likely used this season given the good condition of the nest and the family of Black-billed Magpies nearby.

- A pair of Long-billed Curlews (*Numenius americanus*) appears to be nesting in the Project Area near GPS coordinate 12 U 363698 5501299 (Figure 1). The pair was showing characteristic nesting behaviour (agitated, swooping, calling) at a dried wetland and are likely nesting in the surrounding vegetation. The nest was not found. Long-billed Curlews are federally listed under the SARA as 'Special Concern' and their nests and surrounding habitat have a provincially recommended setback of 100 m from April 15 to July 15 and a federally recommended setback of 200 m from April 15 to July 15 (Table 1).

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Limitations of Surveys

Field surveys can only confirm the presence of wildlife at the time of surveys.

4.2 Auditory Amphibian Survey

No amphibian SOMC were detected during the Auditory Amphibian Survey and thus no mitigation measures are recommended. If any Northern Leopard Frogs, Great Plains Toad, or Plains Spadefoot Toad are identified, either prior to or during construction, it is recommended that a qualified professional biologist be consulted.

4.3 Raptor Nest Survey

No raptor nests were located during the Raptor Nest Survey and there is minimal suitable habitat for stick-nesting raptors in the vicinity of the Project. No further mitigation measures are recommended for the management of stick-nesting raptors. If a large stick nest or a nest of a ground-nesting raptor (e.g., Northern Harrier) is identified, either prior to or during construction, it is recommended that a qualified professional biologist be consulted.

4.4 General Wildlife Reconnaissance Survey

Tetra Tech EBA called Canadian Wildlife Service – Environment Canada to determine appropriate mitigation for the federally listed Long-billed Curlews nesting in the Lethbridge area in cultivated fields; no Project details were discussed. Environment Canada recommended that the area where the Long-billed Curlews are potentially nesting not be cleared until after July 15 (Gregoire pers. comm. 2015). However, because of the presence of other breeding birds on site, Environment Canada and Tetra Tech EBA recommends that clearing be postponed until the end of the breeding bird season (approximately August 15) to avoid the destruction of bird nests (Environment Canada 2015). Wetlands containing waterfowl should not be drained until the broods (i.e., ducklings) are able to fly, which may be as late as August 31. If construction activities occur during the bird breeding season, it is recommended that a Pre-disturbance Nest Survey and Waterfowl Brood Survey is completed by a qualified professional biologist. If clearing does not occur within seven days of the survey, the surveys should be repeated. If an active nest or brood is found during construction, it is recommended that a qualified professional biologist be consulted to provide mitigation recommendations.

Tetra Tech EBA did not identify any wildlife issues pertaining to mammals or reptiles. In the event that an important wildlife feature (e.g., nest, den, hibernaculum, rookery) is identified prior to or during construction, it is recommended that a qualified professional biologist be consulted to provide mitigation recommendations.

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the City of Lethbridge and their agents. Tetra Tech EBA Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the City of Lethbridge, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are attached to this memo.

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ATTACHMENTS

TABLES (1)

FIGURES (1)

TETRA TECH EBA'S GENERAL CONDITIONS

Table 1. All Wildlife Species Detected and Species of Management Concern Potentially Found within 1 km of the Proposed Development Area[1]

Common Name	Scientific Name	GSAWS[2]	ESCC[3]	AWA[4]	COSEWIC[5]	SARA[6]	AEP Recommended Setback for High Disturbance Activities[7]			CWS Recommended Setback for High Disturbance Activities[8]		
							Distance (m)	Time of Year	Feature	Distance (m)	Time of Year	Feature
Amphibians												
Boreal Chorus Frog	*Pseudacris maculata*	Secure	-	-	-	-	-	-	-	-	-	-
Canadian Toad	*Anaxyrus hemiophrys*	May Be at Risk	Data Deficient	-	Not at Risk	-	-	-	-	-	-	-
Long-toed Salamander	*Ambystoma macrodactylum*	Sensitive	Special Concern	-	-	-	-	-	-	-	-	-
Northern Leopard Frog	*Lithobates pipiens*	At Risk	Threatened	-	Special Concern	Special Concern	100	Year Round	Breeding Pond	400	Year Round	Breeding Pond and Wintering Site
Plains Spadefoot	*Spea bombifrons*	May Be at Risk	-	-	Not at Risk	-	100	Year Round	Class III Wetlands on Native Prairie	-	-	-
Birds												
American Bittern	*Botaurus lentiginosus*	Sensitive	-	-	-	-	-	-	-	-	-	-
American Crow	*Corvus brachyrhynchos*	Secure	-	-	-	-	-	-	-	-	-	-
American Kestrel	*Falco sparverius*	Sensitive	-	-	-	-	-	-	-	-	-	-
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive	-	-	-	-	1000	Year Round	Nesting Site	-	-	-
Baltimore Oriole	*Icterus galbula*	Sensitive	-	-	-	-	-	-	-	-	-	-
Bank Swallow	*Riparia riparia*	Secure	-	-	Threatened	-	-	-	-	-	-	-
Barn Swallow	*Hirundo rustica*	Sensitive	-	-	Threatened	-	-	-	-	100	May 1 - Aug. 31	Nest
Black-billed Magpie	*Pica hudsonia*	Secure	-	-	-	-	-	-	-	-	-	-
Black-crowned Night Heron	*Nycticorax nycticorax*	Sensitive	-	-	-	-	-	-	-	-	-	-
Brewer's Blackbird	*Euphagus cyanocephalus*	Secure	-	-	-	-	-	-	-	-	-	-
Canvasback	*Aythya valisineria*	Secure	-	-	-	-	-	-	-	-	-	-
Common Nighthawk	*Chordeiles minor*	Sensitive	-	-	Threatened	Threatened	-	-	-	200	May 1 - Aug 31	Nest
Common Yellowthroat	*Geothlypis trichas*	Sensitive	-	-	-	-	-	-	-	-	-	-
Ferruginous Hawk	*Buteo regalis*	At Risk	Endangered	Endangered	Threatened	Threanted	1000	Year Round	Nesting Site	1000	Year Round	Nest
Golden Eagle	*Aquila chrysaetos*	Sensitive	-	-	-	-	1000	Year Round	Nesting Site	-	-	-
Great Blue Heron	*Ardea herodias*	Sensitive	-	-	-	-	100	Year Round	Nesting Site	-	-	-
Horned Grebe	*Podiceps auritus*	Sensitive	-	-	Special Concern	-	-	-	-	100	Apr. 1 - Aug. 31	Nesting Waterbody
House Sparrow	*Passer domesticus*	Exotic	-	-	-	-	-	-	-	-	-	-
Killdeer	*Charadrius vociferus*	Secure	-	-	-	-	-	-	-	-	-	-
Lesser Scaup	*Aythya affinis*	Sensitive	-	-	-	-	-	-	-	-	-	-
Loggerhead Shrike	*Lanius ludovicianus*	Sensitive	Special Concern	-	Threatened	Threatened	-	-	-	400	May 1 - Aug. 15	Nest
Long-billed Curlew	*Numenius americanus*	Sensitive	Special Concern	-	Special Concern	Special Concern	100	Apr. 1 - Jul. 15	Active Nest and Surrounding Habitat	200	Apr. 15 - Jul. 15	Nest
Mallard	*Anas platyrhynchos*	Secure	-	-	-	-	-	-	-	-	-	-
Marbled Godwit	*Limosa fedoa*	Secure	-	-	-	-	-	-	-	-	-	-
Mourning Dove	*Zenaida macroura*	Secure	-	-	-	-	-	-	-	-	-	-
Northern Harrier	Circus cyaneus	Sensitive	-	-	-	-	-	-	-	-	-	-
Northern Shoveler	*Anas clypeata*	Secure	-	-	-	-	-	-	-	-	-	-
Osprey	*Pandion haliaetus*	Sensitive	-	-	-	-	-	-	-	-	-	-
Pied-billed Grebe	*Podilymbus podiceps*	Sensitive	-	-	-	-	-	-	-	-	-	-
Prairie Falcon	*Falco mexicanus*	Sensitive	Special Concern	-	-	-	1000	Year Round	Nesting Site	-	-	-
Red-tailed Hawk	*Buteo jamaicensis*	Secure	-	-	-	-	-	-	-	-	-	-
Red-winged Blackbird	*Agelaius phoeniceus*	Secure	-	-	-	-	-	-	-	-	-	-
Savannah Sparrow	*Passerculus sandwichensis*	Secure	-	-	-	-	-	-	-	-	-	-
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Sensitive	-	-	-	-	500	Year Round	Lek	-	-	-
Short-eared Owl	*Asio flammeus*	May Be at Risk	-	-	Special Concern	Special Concern	100	Apr. 1 - Jul. 15	Active Nest and Surrounding Habitat	200	Apr. 1 - Jul. 31	Nest
Solitary Sandpiper	*Tringa solitaria*	Secure	-	-	-	-	-	-	-	-	-	-
Spotted Sandpiper	*Actitis macularius*	Secure	-	-	-	-	-	-	-	-	-	-
Sprague's Pipit	*Anthus spragueii*	Sensitive	Special Concern	-	Threatened	Threatened	100	Apr. 1 - Jul. 15	Active Nest and Surrounding Habitat	350	May 1 - Aug. 31	Nest
Swainson's Hawk	*Buteo swainsoni*	Sensitive	-	-	-	-	-	-	-	-	-	-
Tree Swallow	*Tachycineta bicolor*	Secure	-	-	-	-	-	-	-	-	-	-
Upland Sandpiper	*Bartramia longicauda*	Sensitive	-	-	-	-	100	Apr. 1 - Jul. 15	Active Nest and Surrounding Habitat	-	-	-
Vesper Sparrow	*Pooecetes gramineus*	Secure	-	-	-	-	-	-	-	-	-	-
Willet	*Tringa semipalmata*	Secure	-	-	-	-	-	-	-	-	-	-
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Secure	-	-	-	-	-	-	-	-	-	-
Mammals												
American Badger	*Taxidea taxus*	Sensitive	Data Deficient	-	Special Concern	-	-	-	-	200	-	Den
Bobcat	*Lynx rufus*	Sensitive	-	-	-	-	-	-	-	-	-	-
Canadian Lynx	*Lynx canadensis*	Sensitive	-	-	-	-	-	-	-	-	-	-
Cougar	*Puma concolor*	Sensitive	-	-	Data Deficient	-	-	-	-	-	-	-
Eastern Red Bat	*Lasiurus borealis*	Sensitive	-	-	-	-	-	-	-	-	-	-
Hoary Bat	*Lasiurus cinereus*	Sensitive	-	-	-	-	-	-	-	-	-	-
Little Brown Myotis	*Myotis lucifugus*	Secure	-	-	Endangered	Endangered	-	-	-	-	-	-
Long-tailed Weasel	*Mustela frenata*	May Be At Risk	-	May Be At Risk	-	-	-	-	-	-	-	-
Mule Deer	*Odocoileus hemionus*	Secure	-	-	-	-	-	-	-	-	-	-
Richardson's Ground Squirrel	*Spermophilus richardsonii*	Secure	-	-	-	-	-	-	-	-	-	-
Silver-haired Bat	*Lasionycteris noctivagans*	Sensitive	-	-	-	-	-	-	-	-	-	-
Western Harvest Mouse	*Reithrodontomys megalotis*	Undetermined	-	-	Endangered	Endangered	-	-	-	250	Year Round	Nest
Western Small-footed Bat	Myotis ciliolabrum	Sensitive	-	-	-	-	-	-	-	-	-	-
White-tailed Deer	*Odocoileus virginianus*	Secure	-	-	-	-	-	-	-	-	-	-
Reptiles												
Bull Snake	*Pituophis catenifer*	Sensitive	-	-	Data Deficient	-	500	Year Round	Hibernacula	-	-	-
							200	Year Round	Rookery			
Eastern Plains Garter Snake	*Thamnophis radix*	Sensitive	-	-	-	-	-	-	-	-	-	-
Prairie Rattlesnake	*Crotalus viridis*	May Be at Risk	Special Concern	-	Special Concern	-	500	Year Round	Hibernacula	-	-	-
							200	Year Round	Rookery			
Wandering Garter Snake	*Thamnophis elegans*	Sensitive	-	-	-	-	-	-	-	-	-	-

Notes:

Species of management concern potentially found within the proposed development area but not detected by Tetra Tech EBA

[1] Species Ranges from Government of Alberta Conservation Association et al. 2006; Ridgely et al. 2007; and International Union for Conservation of Nature 2014.

[2] General Status of Alberta Wild Species (Government of Alberta 2010)

[3] Endangered Species Conservation Committee (Government of Alberta 2014b)

[4] Alberta Wildlife Act (Province of Alberta 2000)

[5] Committee on the Status of Endangered Wildlife in Canada (Government of Canada 2015)

[6] Species At Risk Act (Government of Canada 2002)

[7] Alberta Environment and Parks (formerly Alberta Environment and Sustainable Resource Development) (Governent of Alberta 2011; Government of Alberta 2012)

[8] Canadian Wildlife Service (Environment Canada 2011; pers. comm. Gregoire 2013)

LEGEND

- Amphibian Survey Station
- Long-billed Curlew Nesting Area
- Black-billed Magpie Nest
- Spotted Sandpiper Nest
- General Wildlife Reconnaissance Tracks
- Road
- Project Area

NOTES
Imagery Source: Bing Imagery
Base data: CanVec (1:50,000)

STATUS
ISSUED FOR REVIEW

WATERBRIDGE - FURTHER ASSESSMENT
LETHBRIDGE, AB

Wildlife Surveys

PROJECTION	DATUM	CLIENT
UTM Zone 12	NAD83	City of Lethbridge

Scale: 1:13,000
200 100 0 200
Metres

TETRA TECH EBA

FILE NO.				
ENVIND03703_FIG1.mxd				
PROJECT NO.	**DWN**	**CKD**	**APVD**	**REV**
ENVIND03703-01	BB	MS	KM	0
OFFICE	**DATE**			
Tt EBA-CAL	July 6, 2015			

Figure 1

M:\ENVIRONMENTAL\IND\ENVIND03703\Maps\004\ENVIND03703_FIG1.mxd modified 7/7/2015 by Brittney.Bietz

GENERAL CONDITIONS

GEOENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Tetra Tech EBA’s client. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Tetra Tech EBA’s Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Tetra Tech EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. The Client warrants that Tetra Tech EBA’s instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by Tetra Tech EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

Ducks Unlimited Canada
Conserving Canada's Wetlands

June 8, 2015

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

Attention: **Michael Kelly**

Re: **Wetland Loss Compensation – Waterbridge**

Ducks Unlimited Canada (DUC) supports the protection of wetlands as the foundation to fulfilling the goals of the North American Waterfowl Management Plan (NAWMP), specifically the Alberta component. In cases where avoidance or minimization of the wetland impacts cannot be achieved, DUC through its proactive wetland restoration efforts supports the mitigation process by providing restoration of drained wetlands as a compensation option resulting in no net loss of wetlands.

DUC is currently engaged in implementing restoration activities for wetland loss compensation options based upon program area implementation. The wetlands to be restored will fall into the Alberta Prairie initiative and will replace the wetland loss from the proposed development with similar wetland classes within the same major watershed basin. This landscape has been identified as an important wetland restoration area, which will support the recovery of waterfowl, wildlife and biodiversity within the southern region of Alberta.

Following restoration of these drained wetlands, each individual project will be managed consistent with the Alberta NAWMP objectives. These projects and the wetlands associated with them vary in size and class. The restoration of wetlands in this initiative will provide adequate compensation for the wetland loss created by the proposed development.

The proposed development according to the wetland impact assessment supplied by Tetra Tech EBA states that there would be a direct loss of 6.73 hectares of wetland habitat. With the replacement ratio of 3:1, 20.19 hectares of restored wetland habitat will be required. The cost of restoring these wetlands in the Alberta Prairie initiative being $10,000/ha, this equates to $201,900.00 plus GST, as total compensation.

DUC requires written acceptance from The City of Lethbridge in the space provided below. Please return an executed copy of the proposal via email to c_bishop@ducks.ca. Once approved by Environment & Parks, please issue payment to DUC by a certified cheque or Bank draft to the address as indicated on the invoice.

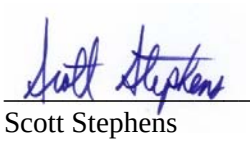
Upon receipt, DUC will provide a confirmation notice for The City of Lethbridge and Environment & Parks's files.

3520 – 114 Ave SE, Calgary, Alberta T2Z 3V6, Phone (403) 201-5577, Fax (403) 201-5580
Toll Free: 1-800-665-DUCK (3825), E-mail: webfoot@ducks.ca, Website: ducks.ca

This proposal and the fees charged will be available for acceptance for 90 days from the date of issue. Payment must be received within 30 days after approval has been issued from Environment & Parks. If these terms are not met, DUC will not be obligated to complete the agreement.

Please feel free to call Craig Bishop at (403) 668-0974 if you have any questions or concerns regarding this proposal.

Yours Truly,



Scott Stephens

Director of Regional Operations, Prairies
Ducks Unlimited Canada

Cc: Hensel, Bryan – Tetra Tech EBA

Enclosures

I, Michael Kelly, on behalf of The City of Lethbridge, do acknowledge and agree to accept the Wetland Loss Compensation proposal and its terms as prepared by Ducks Unlimited Canada.

_____

Signature of Michael Kelly for The City of Lethbridge.

Ducks Unlimited Canada – Wetland Loss Compensation Proposal

Impacted Wetland Site Information

Clients Name:	The City of Lethbridge
Development Name:	Waterbridge
Impact Location:	SW 23-08-22-W4m
Impact Area:	6.73 ha.
Classification System:	Stewart & Kantrud
Impacted Classes:	Class II's & III's
Impacted Watershed:	South Saskatchewan River

Restoration Compensation

DUC Initiative:	Alberta Prairie
Restoration Watershed:	South Saskatchewan River
Replacement Ratio:	3:1
Replacement Area:	20.19 ha.
Compensation Rate:	$10,000/ha.
Total Compensation:	$201,900.00 + GST
Prepared for:	The City of Lethbridge
Prepared by:	Craig Bishop Ducks Unlimited Canada
Date:	June 8, 2015

Ducks Unlimited Canada
Conserving Canada's Wetlands

INVOICE

Invoice#: CB15/085-WR

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

PAYABLE TO: Ducks Unlimited Canada
17915 – 118th Avenue
Edmonton, AB
T5S 1L6

ATTENTION: Pamela Corbett

DATE: June 8, 2015

DESCRIPTION: Waterbridge
Compensation for Wetland Loss

Compensation Total:	$201,900.00
5% GST:	10,095.00
Total Payable to DUC:	$211,995.00

GST#: 118888957

Terms: Payment due 30 days from issue of Environment & Parks approval.

APPENDIX H: HISTORICAL RESOURCES APPROVAL

Government of Alberta
Culture and Community Spirit

Historic Resources Management
Old St. Stephen's College
8820 – 112 Street
Edmonton, Alberta T6G 2P8
Canada
Telephone: 780-431-2300
www.culture.alberta.ca/hrm

November 18, 2009

Project File: 4840-115
SUNRIDGE B AREA STRUCTURE PLAN

Mr. Paul Mercer
Brown & Associates Planning Group
Suite 600, 222 -58th Avenue SW
Calgary, Alberta
12H 2S3

Dear Mr. Mercer:

SUBJECT: CITY OF LETHBRIDGE
AGENT BEING BROWN & ASSOCIATES PLANNING GROUP
SUNRIDGE B AREA STRUCTURE PLAN
PORTIONS OF SECTIONS 14 & 23, TOWNSHIP 8, RANGE 22, W4M
***HISTORICAL RESOURCES ACT* REQUIREMENTS**

Lifeways of Canada Ltd. has provided the Historic Resources Management Branch (HRMB) of Alberta Culture and Community Spirit with a "Historical Resources Overview" that describes the City of Lethbridge's proposed development plans with regard to the **SUNRIDGE B AREA STRUCTURE PLAN.**

Listing of Historic Resources

Staff of the HRMB has confirmed that lands included within the **SUNRIDGE B AREA STRUCTURE PLAN** are not listed within the *Listing of Historic Resources.*

Historic Resources Potential Evaluation

The entire project area has been previously cultivated. There are no known sites and the area is crossed by a historic trail. Although the consultants concerns for the existence of potential sediment traps containing historic resources is not unfounded, the likelihood of development disturbance of significant historic resources is low. Based on this evaluation, the HRMB has determined that a historic resources impact assessment is not required.

HISTORICAL RESOURCES ACT REQUIREMENTS

Reporting the discovery of historic resources

Please be aware, pursuant to Section 31 of the *Historical Resources Act*, should any historic resources be encountered during subdivision development activities, please contact George Chalut at (780) 431-2329, (Historic Resources Management Branch, Alberta Culture and Community Spirit, 8820 - 112 Street, Edmonton, Alberta, T6G 2P8), fax (780) 422-3106 or e-mail george.chalut@gov.ab.ca. It will then be necessary for the HRMB to issue further instructions regarding the documentation of these resources.

.../2

Project File: 4840-115

Should you require additional information or have any questions concerning the above, please contact George Chalut, (Southeast Region, Land Use Planner, Land Use Planning Section, Historic Resources Management Branch, 8820 - 112 Street, Edmonton, Alberta, T6G 2P8); telephone 780-431-2329, fax 780-422-3106 or e-mail at george.chalut@gov.ab.ca .

Sincerely,

George Chalut
Southeast Region, Land Use Planner
Land Use Planning Section

cc: City of Lethbridge
Don Hanna, Lifeways of Canada Ltd.

Government of Alberta

Culture and Community Spirit

Application for *Historical Resources Act* Clearance

Activity Administration

Date Received: January 16, 2012 HRM File: 4835-12-0010

Purpose of Application: ☐ All New Lands ☑ Additional Lands ☐ No New Lands

Project Category: Subdivisions (4835)

Project Type:

- ☑ Residential Subdivision
- ☐ Commercial Subdivision
- ☐ Industrial Subdivision
- ☐ Area Structure Plan / Outline Plan
- ☐ Access Road
- ☐ Electrical / Utility
- ☐ Water Supply Line
- ☐ Sewage Line
- ☐ Other

ESRI Shapefiles are attached (yes/no)

Approximate Project Area (ha) 287.124

Lot, Block, Plan

Other Reference Number

Project Identifier: City of Lethbridge Waterbridge and Extension

Additional Identifier(s):

Key Contact:	Brian C Vivian	Affiliation:	Lifeways of Canada Limited
Address:	#105, 809 Manning Road NE	City / Province:	Calgary, AB
Postal Code:	T2E 7M9	Phone:	(403) 730-9461
E-mail:	vivian@lifewaysofcanada.com, claire@lifewaysofcanada.com	Fax:	() -
		Your File Number:	

Is the Proponent the same as the Key Contact? ☐ Yes ☑ No If no, complete the following:

Proponent:	City of Lethbridge -Real Estate and Land	Contact Name:	Michael Kelly
Address:	910-4th Avenue South	City / Province:	Lethbridge,, AB
Postal Code:	T1J 0P6	Phone:	(403) 320-3194
E-mail:	Michael.Kelly@lethbridge.ca	Fax:	() -

Proposed Development Area

MER	RGE	TWP	SEC	LSD List	Land Ownership FRH	SA	CU	CT
4	22	8	22	3, 4	☑	☐	☐	☐
4	22	8	22	1, 2	☑	☐	☐	☐
4	22	8	15	9, 10, 15, 16	☑	☐	☐	☐
4	22	8	15	11, 12, 13, 14	☑	☐	☐	☐

Listed Lands Affected

MER	RGE	TWP	SEC	LSD	HRV	Category
4	22	8	15	9	5	a
4	22	8	15	10	5	a
4	22	8	15	11	5	a
4	22	8	15	11	5	a
4	22	8	15	12	5	a
4	22	8	15	12	5	a
4	22	8	15	13	5	a
4	22	8	15	14	5	a
4	22	8	15	15	5	a
4	22	8	15	16	5	a

Comments:

Historical Resources Impact Assessment:

For archaeological resources:

Has a HRIA been conducted? ☐ Yes ☑ No Permit Number (if applicable):

For palaeontological resource:

Has a HRIA been conducted? ☐ Yes ☑ No

Historical Resources Act clearance is granted subject to Section 31 of the Resources Act, "a person who discovers an historic resource in the course of making an excavation for a purpose other than for the purpose of seeking historic resources shall forthwith notify the minister of the discovery". The chance discovery of historical resources is to be reported to the contacts identified within the listing.

George Chahal

January 27, 2012
Date

Government of Alberta

Culture and Community Spirit

Application for *Historical Resources Act* Clearance

Activity Administration

Date Received: January 16, 2012 HRM File: 4835-12-0010

Purpose of Application: ☐ All New Lands ☑ Additional Lands ☐ No New Lands

Project Category: Subdivisions (4835)

Project Type:

- ☑ Residential Subdivision
- ☐ Commercial Subdivision
- ☐ Industrial Subdivision
- ☐ Area Structure Plan / Outline Plan
- ☐ Access Road
- ☐ Electrical / Utility
- ☐ Water Supply Line
- ☐ Sewage Line
- ☐ Other

ESRI Shapefiles are attached (yes/no)

Approximate Project Area (ha) 287.124

Lot, Block, Plan

Other Reference Number

Project Identifier:	City of Lethbridge Waterbridge and Extension
Additional Identifier(s):	

Key Contact:	Brian C Vivian	Affiliation:	Lifeways of Canada Limited
Address:	#105, 809 Manning Road NE	City / Province:	Calgary, AB
Postal Code:	T2E 7M9	Phone:	(403) 730-9461
E-mail:	vivian@lifewaysofcanada.com, claire@lifewaysofcanada.com	Fax:	() -
		Your File Number:	

Is the Proponent the same as the Key Contact? ☐ Yes ☑ No If no, complete the following:

Proponent:	City of Lethbridge -Real Estate and Land	Contact Name:	Michael Kelly
Address:	910-4th Avenue South	City / Province:	Lethbridge,, AB
Postal Code:	T1J 0P6	Phone:	(403) 320-3194
E-mail:	Michael.Kelly@lethbridge.ca	Fax:	() -

Proposed Development Area					Land Ownership			
MER	RGE	TWP	SEC	LSD List	FRH	SA	CU	CT
4	22	8	22	3, 4	☑	☐	☐	☐
4	22	8	22	1, 2	☑	☐	☐	☐
4	22	8	15	9, 10, 15, 16	☑	☐	☐	☐
4	22	8	15	11, 12, 13, 14	☑	☐	☐	☐

Listed Lands Affected						
MER	RGE	TWP	SEC	LSD	HRV	Category
4	22	8	15	9	5	a
4	22	8	15	10	5	a
4	22	8	15	11	5	a
4	22	8	15	11	5	a
4	22	8	15	12	5	a
4	22	8	15	12	5	a
4	22	8	15	13	5	a
4	22	8	15	14	5	a
4	22	8	15	15	5	a
4	22	8	15	16	5	a

Comments:

Historical Resources Impact Assessment:

For archaeological resources:

Has a HRIA been conducted? ☐ Yes ☑ No Permit Number (if applicable):

For palaeontological resource:

Has a HRIA been conducted? ☐ Yes ☑ No

Historical Resources Act clearance is granted subject to Section 31 of the Resources Act, "a person who discovers an historic resource in the course of making an excavation for a purpose other than for the purpose of seeking historic resources shall forthwith notify the minister of the discovery". The chance discovery of historical resources is to be reported to the contacts identified within the listing.

January 27, 2012
Date

Statement of Justification for *Historical Resources Act* Requirements for projects other than small-scale oil and gas

Project Name or Project Identifier: City of Lethbridge Waterbridge and Extension Area Structure Plan

Name: Christy de Mille
Corporate name of consulting company: Lifeways of Canada Limited
Phone number: (403) 730-9461
Fax number: (403) 730-5192
E-mail address: christy@lifewaysofcanada.com

Name of proponent contact: Michael Kelly
Corporate name of proponent: City of Lethbridge -Real Estate and Land Development
Address:910-4th Avenue South, Lethbridge, Alberta, T1J 0P6
Phone number: (403) 320-3194
Email: Michael.Kelly@lethbridge.ca

Name of agent contact: Derrick Tannahill
Corporate name of agent: Associated Engineering
Address:1-2225 Northridge Drive, Saskatoon, SK, Canada, S7L 6X6
Phone number: (306) 653-4969
Email: tannahill@ae.ca

Lands Affected

Legal Description	Land Ownership Type	HRV
NW 15-08-22 W4M (portion thereof)	Freehold	4a, 5a
NE 15-08-22 W4M	Freehold	5a
SE 22-08-22 W5M (portion thereof)`	Freehold	n/a
SW 22-08-22 W4M (portion thereof)	Freehold	n/a

Activity type and Anticipated Ground Disturbance
Area Structure Plan for future urban development on the southwestern edge of the City of Lethbridge (Figures 1-3).

Project size 287.124 ha

Existing Disturbance
All of the project lands are cultivated cropland and therefore surface deposits have been heavily disturbed by agricultural activities.

Landscape and Environmental Information
The project is on the uplands in a large bend of the Oldman River, upstream of the city of Lethbridge and north of the confluence of the Oldman and St. Mary Rivers (Figure 1). The uplands are weakly to moderately developed hummocky terrain (Shetsen 1990), while outside the study area, deeply incised coulees and slumping walls dominate the river valley. The upper valley margin of the Oldman River is more than 400 metres south of the closest margin of the study area. The proposed development is in the Mixed Grass region of the Grassland Natural Region (NRC 2006). The area is entirely cultivated and no natural vegetation communities remain. Due to the presence of the hummocky terrain there is some limited potential for sediment traps to be present.

Archaeological Resources			
Borden #	**HRV**	**Relationship to activity**	**Anticipated Impacts**
DjPf-30	0	Site within 1 km of project	No impact
DjPf-31	0	Site within 1 km of project	No impact
DjPf-32	0	Site within 1 km of project	No impact
DjPf-33	4	Site within 1 km of project	No impact
DjPf-34	4	Site within 1 km of project	No impact
DjPf-35	0	Site within 1 km of project	No impact
DjPf-36	4	Site within 1 km of project	No impact
DjPf-37	0	Site within 1 km of project	No impact
DjPf-40	4	Site within 1 km of project	No impact

Historic Structure(s)	**Anticipated Impacts**
Although a farmyard is present in SW 22-08-22-W4M, the development area includes only a small southern portion of this quarter section and will not impact the farmyard	No impact

Permit Number(s)	**Relationship to proposed development footprint**
75-045	Within same Township and Range as project area
76-013	Within same Township and Range as project area
77-020	Within same Township and Range as project area
80-013	Within same Township and Range as project area
82-092	Within same Township and Range as project area
84.065	Within same Township and Range as project area
91-034	Within same Township and Range as project area
99-078	Within same Township and Range as project area
00-200	Within same Township and Range as project area
03-032	Within same Township and Range as project area
07-198	Within same Township and Range as project area

Illustrative Materials (4 sheets)

Figure 1: NTS 1:50,000 of Proposed Project Area.

Figure 2. Proposed Project Plan.

Figure 3: Google Earth Imagery of Proposed Project Area.

Figure 4. 1891 Surveyor's Township Plan.

Evaluation

The proposed City of Lethbridge Waterbridge and Extension Area Structure Plan occurs on previously cultivated uplands, more than 400 metres north of the Oldman River's margin. All surface deposits have been disturbed. Both the NW and NE quarters of 15-08-22-W4M have an oil/gas wells located within the project boundary. In addition, a pipeline crosses over the NW quarter of 15-08-22-W4M (Figure 2). Although there is some limited potential for sediment traps, the potential for intersecting significant historical resources in the development area is considered low (see below).

All of the proposed project lands, with the exception of those portions in 22-08-22-W4M, are listed as having high potential to contain archaeological sites. These are based on the land's location on uplands above the confluence of the St. Mary and Oldman Rivers. It is believed that these lands were heavily used by First Nations peoples during Precontact times and during the early Historic Period. No known archaeological sites are present within the proposed project area. A number of sites have been recorded in adjacent sections, however they are all associated with the river valley margin (Figure 1). A number of Historic Resource Investigations have been undertaken on similar upland properties immediately to the east of the currently proposed development area, with no sites recorded away from the valley edges. Consequently, the potential for impacting significant archaeological sites in the proposed development footprint is considered low.

An Historic Trail connecting Fort Whoop-UP and the Kainah (Blood) Reserve to the southwest is indicated on the early surveyors Township plans of this area (Figure 4). A maps from 1891 shows this trail cutting across the broad meander of the Oldman River through the proposed project area; however traces of this trail have been obliterated by cultivation of these lands.

Although a farmyard is present in SW 22-08-22-W4M, the proposed project area is limited to the very southern portion of this quarter section and will not impact the farmyard.

Recommendations (*Recommendations regarding archaeological resources must be made by a professional archaeologist.)*

The entire project area has been previously cultivated and is located well back from the valley margin. No known sites are located within the project area. Although the project area is crossed by an Historic Trail, any traces of it would have been destroyed by the agricultural activities. Although there is some limited potential for sediment traps, the potential for the proposed development intersecting significant historic resources is considered low. **Therefore, I recommend that the City of Lethbridge be granted *Historical Resources Act* clearance for the Waterbridge and Extension Area Structure Plan development project as it now stands.** Pursuant to Section 31 of the *Historical Resources Act*, should any historic resources be discovered during construction, the Historical Resources Management Branch is to be contacted immediately.

Recommendations made by:	**Date:**
 Christy de Mille, Ph.D.	**December 15, 2011**

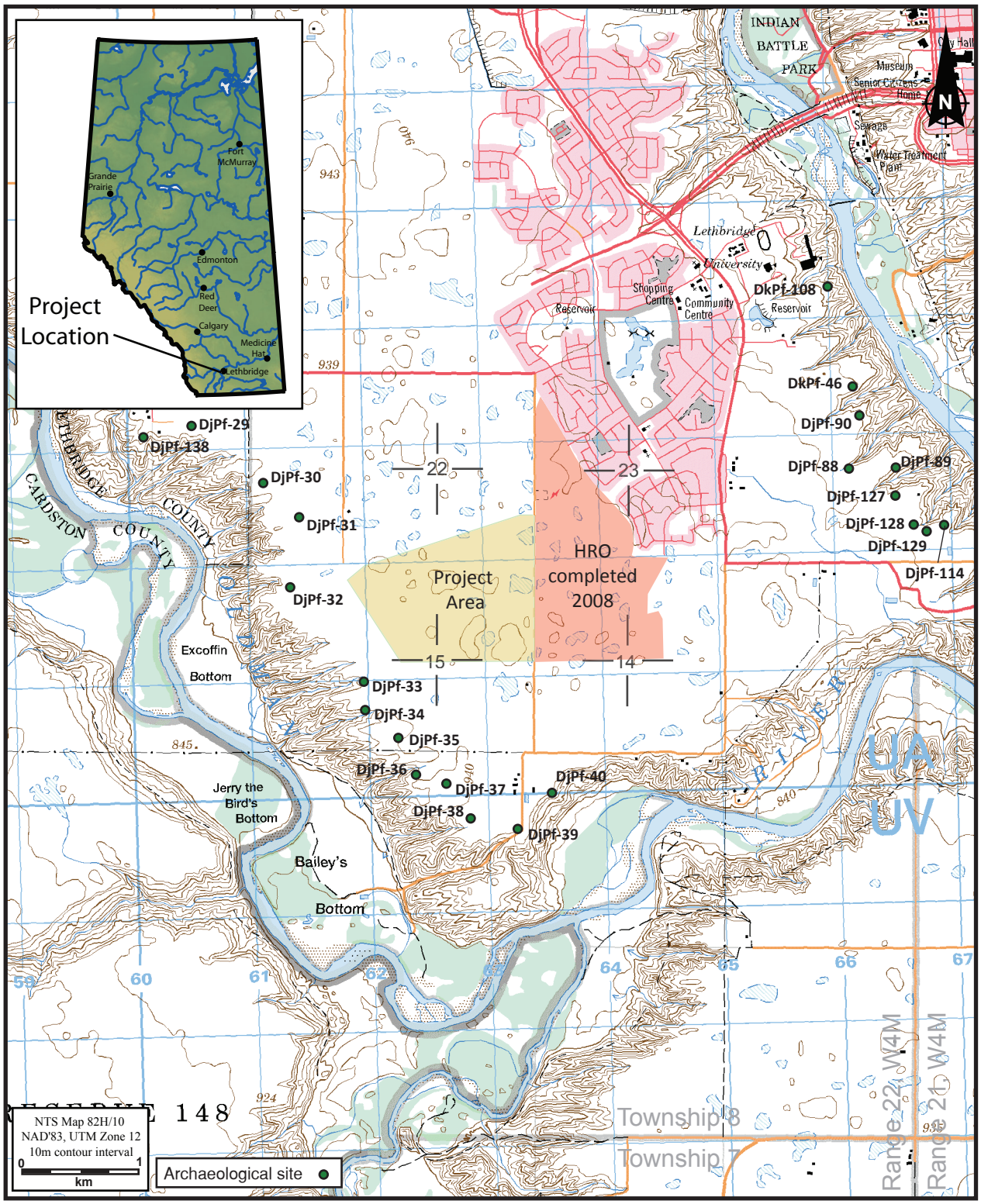


Figure 1. NTS 1:50 000 of Proposed Project Area

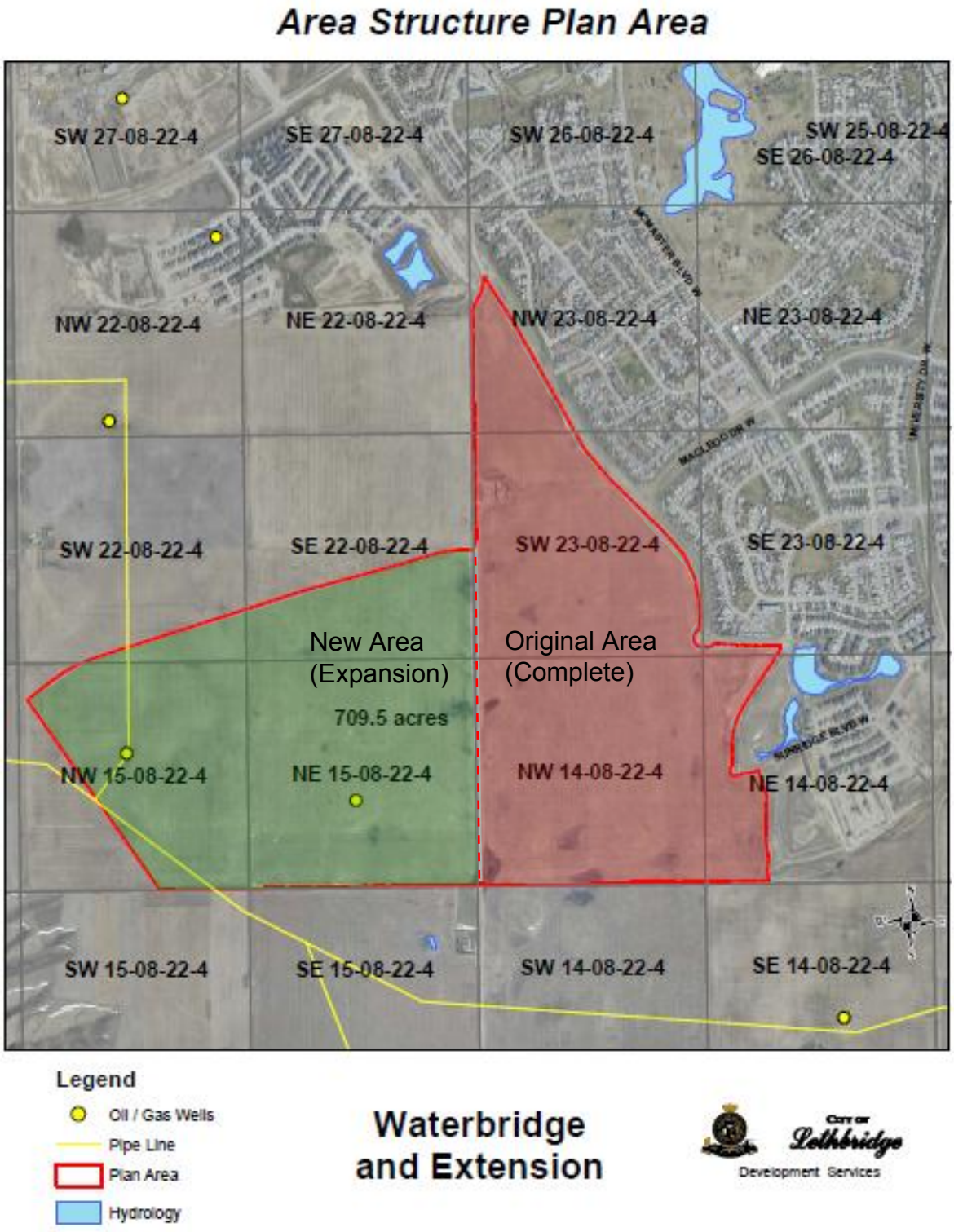


Figure 2. Proposed Project Plan

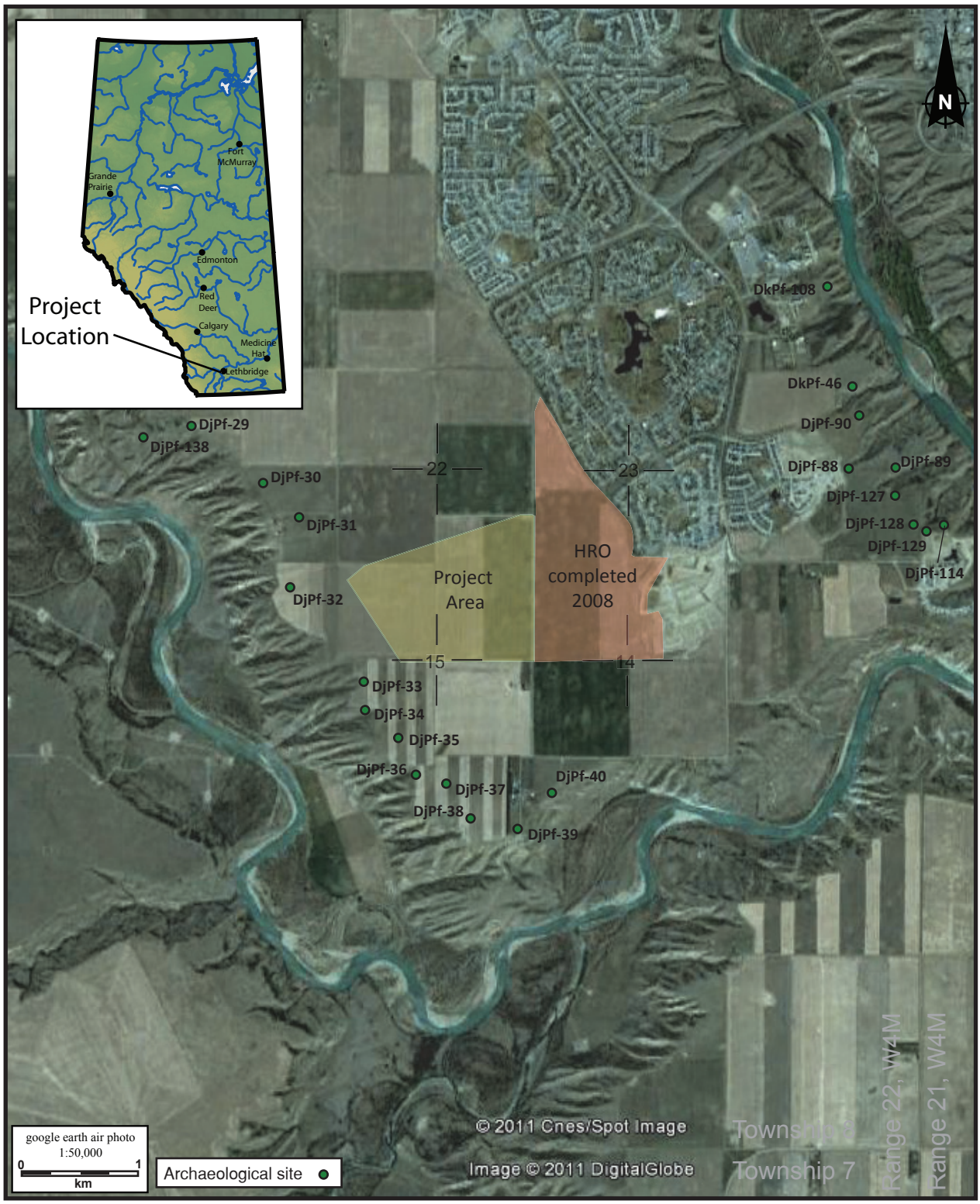


Figure 3. Google Earth Imagery of Proposed Project Area.

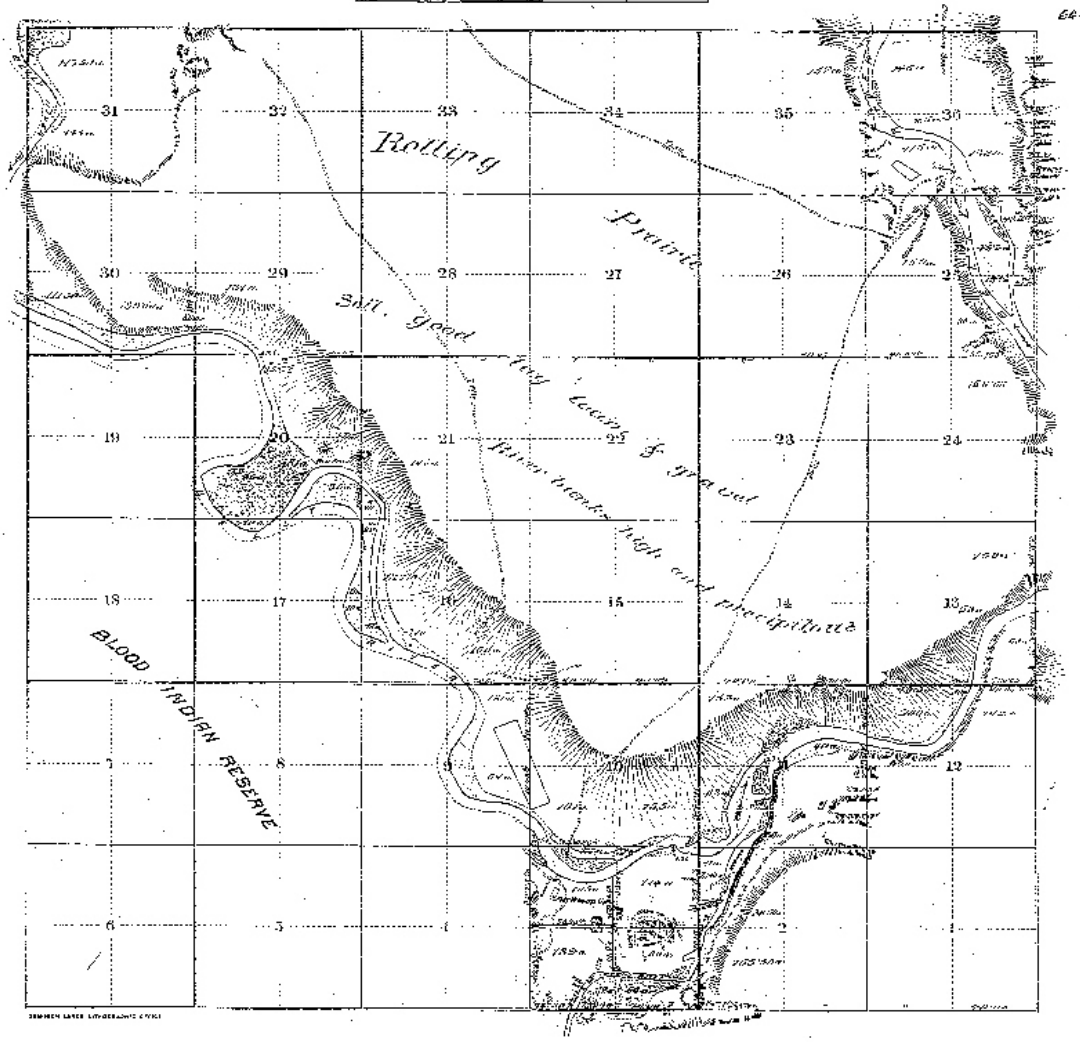
4th. Edition Corrected.

PLAN OF

TOWNSHIP Nº 8

RANGE 22 WEST OF 4th MERIDIAN

Scale, 40 Chains to an inch.



Compiled from surveys by

J.L. Strachan, D.L.S. 1885

F.W. Armstrong, D.L.S. 1885

C.F. Aldous, D.L.S. 1889

L. Crossetin, D.L.S. 1890

DEPARTMENT OF THE INTERIOR
TOPOGRAPHICAL SURVEYS BRANCH

Ottawa 16th June 1891

Approved and confirmed

Surveyor General

Contents:

Land in Sections	46080.00 Acres
Roads	284.00
Water	336.00
Total Area	46700.00

Figure 4: 1891 Surveyors Township Plan.

APPENDIX I: TRANSPORTATION IMPACT ASSESSMENT

CITY OF LETHBRIDGE

WATERMARK OUTLINE PLAN AMENDMENT

TRANSPORTATION IMPACT ASSESSMENT

WATERMARK OUTLINE PLAN AMENDMENT

TRANSPORTATION IMPACT ASSESSMENT

CITY OF LETHBRIDGE

FINAL (SUBMISSION 2)

PROJECT NO.: 201-04167-00
DATE: JANUARY 06, 2023

WSP
SUITE 1200
10909 JASPER AVENUE
EDMONTON, AB, CANADA T5J 3L9

T: +1 780 466-6555
F: +1 780 421-1397
WSP.COM

January 06, 2023

CITY OF LETHBRIDGE
Lethbridge, Alberta

Attention: Adam St Amant, P.Eng, PTOE

Dear Sir:

Subject: Watermark Transportation Impact Assessment

Please find for your review the final submission of the Watermark Outline Plan Transportation Impact Assessment. We have identified future traffic volumes, road network recommendations, active modes and transit recommendations to support the Outline Plan submission. A spreadsheet tracking comments and how they have been addressed has been included in the overall Watermark Outline Plan submission package.

Yours sincerely,

Kristen Faber, P.Eng
Transportation Engineer

WSP ref.: 201-04167-00

SUITE 1200
10909 JASPER AVENUE
EDMONTON, AB, CANADA T5J 3L9

T: +1 780 466-6555
F: +1 780 421-1397
wsp.com

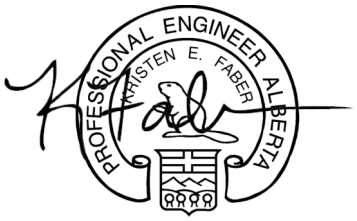
REVISION HISTORY

FIRST ISSUE

July 30, 2021	Draft for review			
Prepared by	Reviewed by	Approved by		
Kristen Faber, P.Eng	Carolyn Sherstone, P.Eng, RPP, MCIP	Carolyn Sherstone, P.Eng, RPP, MCIP		
REVISION 1				
October 25, 2021	Final for submission			
Prepared by	Reviewed by	Approved by		
Kristen Faber, P.Eng	Carolyn Sherstone, P.Eng, RPP, MCIP	Carolyn Sherstone, P.Eng, RPP, MCIP		
REVISION 2				
September 9, 2022	Final report (revision 1)			
Prepared by	Reviewed by	Approved by		
Kristen Faber, P.Eng.	Mariya Otten-Andrew, P.Eng., PTOE	Mariya Otten-Andrew, P.Eng., PTOE		
REVISION 3				
January 6, 2023	Final report (submission 2)			
Prepared by	Reviewed by	Approved by		
Kristen Faber, P.Eng.	Carolyn Sherstone, P.Eng, RPP MCIP	Carolyn Sherstone, P.Eng, RPP MCIP		

SIGNATURES

PREPARED BY



ID# 277636
January 6, 2023

Kristen Faber, P.Eng.
Transportation Planner

Date

APPROVED[1] BY *(must be reviewed for technical accuracy prior to approval)*

Carolyn Sherstone, M.Pl, P.Eng, RPP, MCIP Date

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1 INTRODUCTION

1.1 BACKGROUND

This Transportation Impact Assessment (TIA) was developed to support the amendment to the Watermark Community Outline Plan on behalf of Lethbridge Land. The Watermark Community is located in West Lethbridge and is approximately 140.8 Ha in size. The site is bounded by 25th Street West (the future extension of Metis Trail) to the west, future potential Chinook Trail extension to the south, and the existing residential neighbourhoods of Sunridge and Mountain Heights to the east / north. To the northwest of the site is the residential community of Copperwood and Varsity Village is to the northeast. The site context is illustrated in **Figure 1-1**.

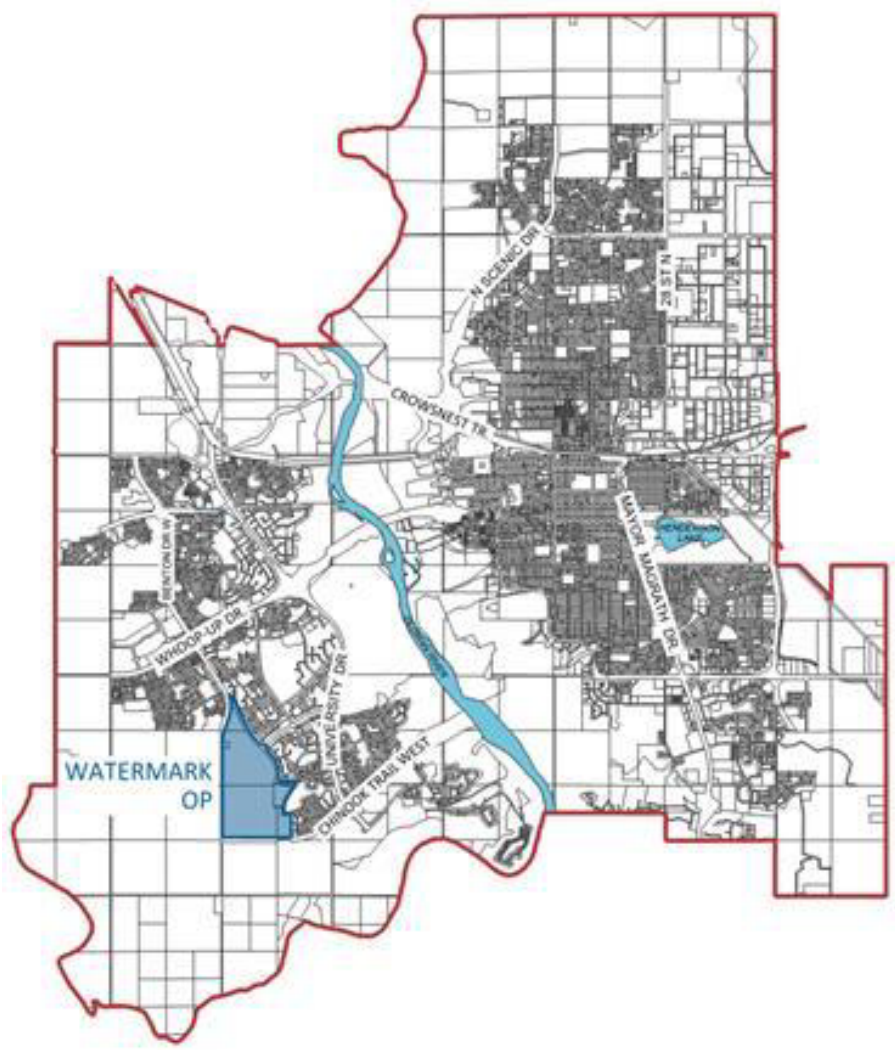

Figure 1-1 Watermark Community Outline Plan Area

A previous TIA was prepared by Associated Engineering in support of the Watermark (previously Waterbridge) Outline Plan in June 2017. This TIA considered the Watermark Community (formerly known as Waterbridge East) in conjunction with Waterbridge West, which is proposed on the west side of 25th Street West (Metis Trail).

1.2 STUDY SCOPE

The purpose of this TIA is to identify the future multi-modal transportation infrastructure needed to support the proposed development in the Watermark Outline Plan area, while considering background growth from other areas in the City and the build out of the proposed Waterbridge West Outline Plan Area. The TIA will identify the proposed intersection configurations, Collector Road and Arterial Road cross section components, active modes network and transit planning considerations. The Watermark Outline Plan concept is shown in **Figure 1-2**.

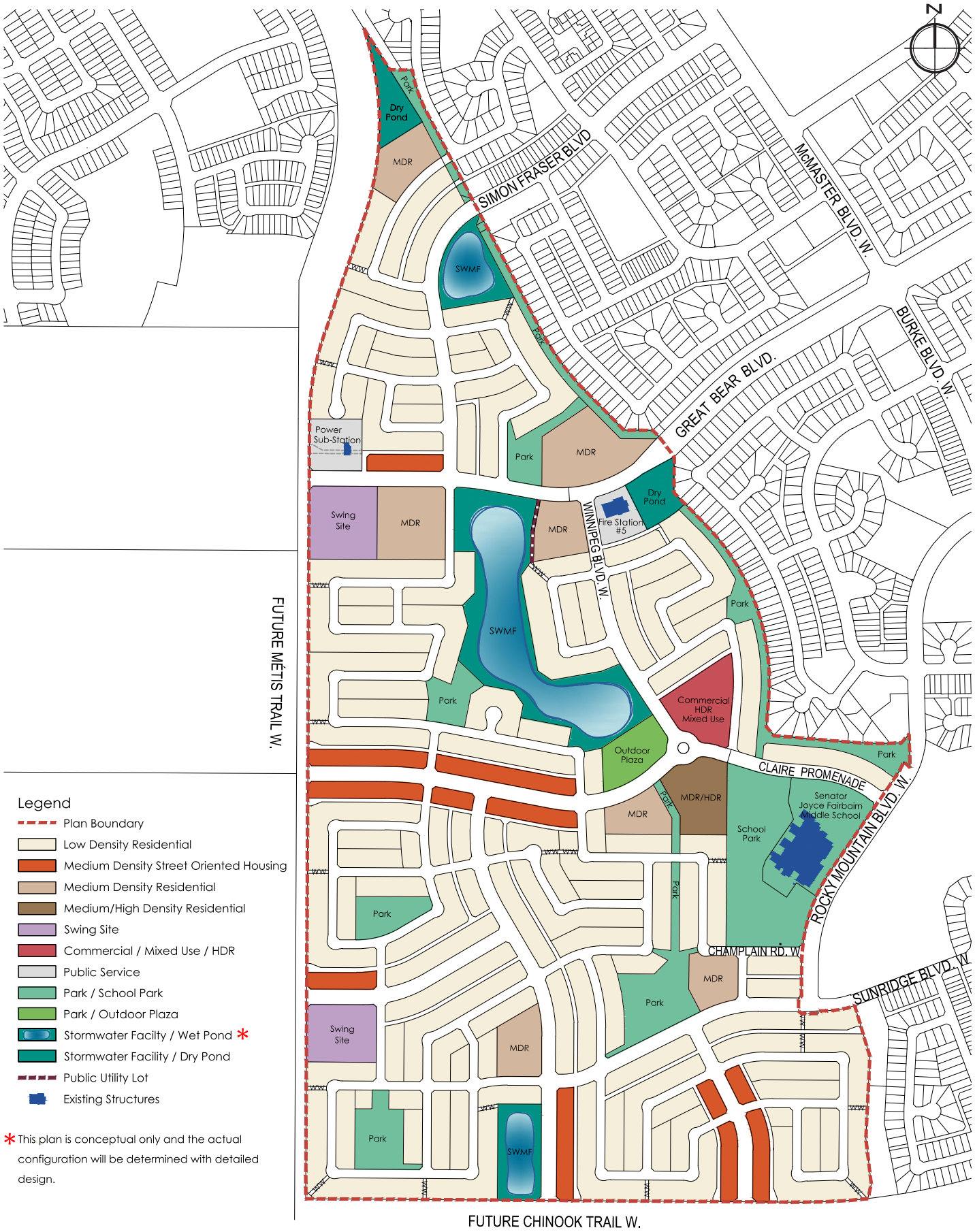

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Figure 1-2
Watermark Outline Plan
Watermark Outline Plan Amendment Transportation Impact Assessment

The TIA will focus on the “full build” horizon of the study area, particularly because the arterial network supporting the area has not yet been constructed, thereby eliminating the possibility of evaluating existing conditions in most locations. This horizon roughly corresponds to a 30-year build out period.

Four existing intersections to the east of the proposed Watermark Outline Plan area are also included as “existing conditions” and will be evaluated at the full build horizon to confirm what upgrades may be required to the existing road network to support development.

The study intersections are shown in **Figure 1-3**.

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Figure 1-3
Study Intersections
Watermark Outline Plan Amendment Transportation Impact Assessment

1.3 METHODOLOGY

The methodology of the TIA is summarized as follows:

- Confirm study area and study intersections;
- Identify existing traffic volumes at existing study intersections;
- Identify future background traffic volumes at study intersections along Metis Trail;
- Identify future volumes from Watermark West neighbourhood based on the 2017 Outline Plan and Traffic Impact Assessment;
- Generate multi-modal traffic volumes based on the Watermark Outline Plan, distribute and assign those volumes to the proposed road network; and
- Identify the intersection controls, road network cross section elements, active mode connections, and transit considerations for all internal collector roads and for connections to Metis Trail and Chinook Trail.

2 SITE CONTEXT

2.1 SITE LOCATION

The Watermark Outline Plan is located on approximately 141 ha of land west of Varsity Village, Mountain Heights, and Sunridge neighbourhoods, east of the proposed south extension of Metis Trail and north of the future Chinook Trail alignment. The Watermark Outline Plan and Waterbridge West (called Watermark West on the attached figure) is shown in **Figure 2-1**.

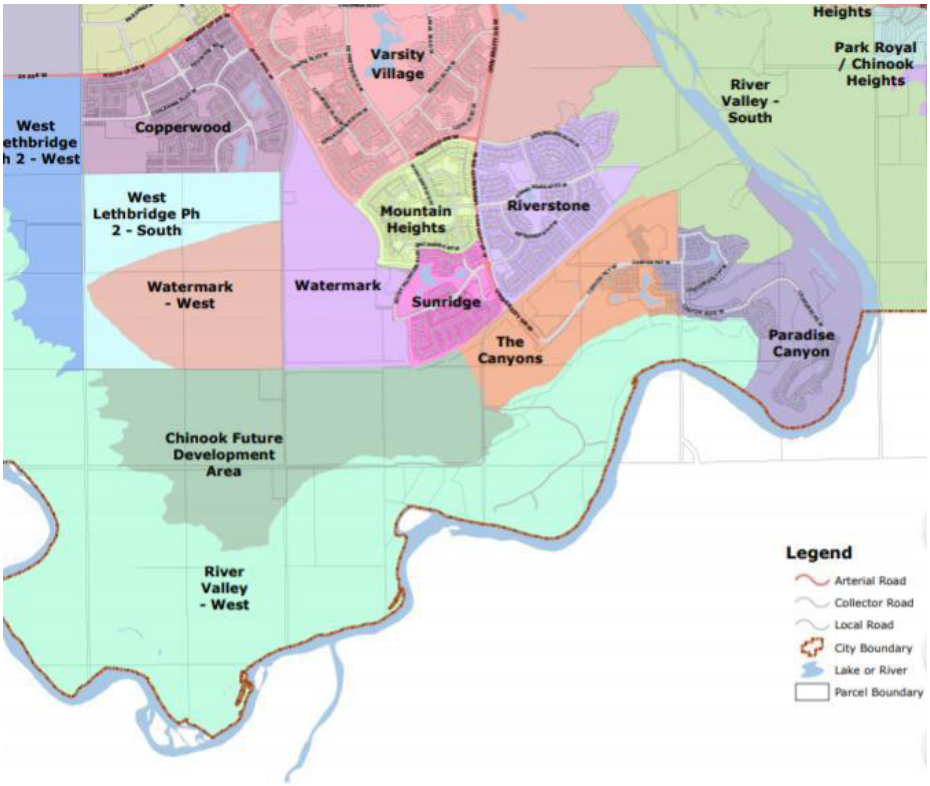


Figure 2-1 Watermark Outline Plan Neighbourhood Plan

2.2 EXISTING AND ADJACENT LAND USES

Within the Watermark development, there are three existing land uses: Senator Joyce Fairbairn Middle School, located at the corner of Rocky Mountain Boulevard W and Claire Promenade West, City of Lethbridge Fire Station #5, located on Great Bear Boulevard W (future southeast corner of Great Bear Boulevard W and Winnipeg Boulevard W), and a power sub-station, located along 25th Street W (future northeast corner of Great Bear Boulevard W and Metis Trail).

Adjacent to the Watermark Development, there is residential development to the east and to the north. As previously mentioned, the development is bounded by the Mountain Heights and Sunridge neighbourhoods to the east, Varsity Village to the northeast and Copperwood to the northwest. The land to the west and south of Watermark is currently undeveloped; however, Waterbridge West will occupy 128.5 ha of land to the west of Metis Trail.

2.3 EXISTING TRANSPORTATION NETWORK

2.3.1 BOUNDARY ROAD NETWORK

The existing road network adjacent to the site includes the following roads:

25th Street West is a north-south gravel road with a posted speed limit of 50 km/h. 25th Street West transitions into Metis Trail further north of the subject development, however a future extension of Metis Trail is planned that will see 25th Street upgraded to an arterial road.

Simon Fraser Boulevard W is a two-lane collector road that extends from the eastern boundary of the Watermark site to McMaster Boulevard W. The street is fronted by residential development and includes street parking and sidewalks on both sides.

Great Bear Boulevard W / MacLeod Drive W is a two-lane collector road that extends from University Drive W, into Watermark, terminating at the Fire Station. West of Mount Burke Boulevard W, a raised concrete median separates the eastbound and westbound lanes. A multi-use pathway is located on both sides of the road west of University Drive W.

Rocky Mountain Boulevard W is a two-lane collector road that extends from Sunridge Boulevard W to University Drive W. On-street parking and sidewalks are provided on both sides of the road. Rocky Mountain Boulevard fronts the recently constructed Senator Joyce Fairbairn Middle School within the Watermark site.

Sunridge Boulevard W is a two-lane collector road that extends from Rocky Mountain Boulevard to University Drive W. The street is fronted by residential development and provides street parking and sidewalks on both sides of the road.

2.3.2 BOUNDARY TRANSIT NETWORK

The City of Lethbridge redesigned their transit network in the fall of 2021. The updated transit network is a combination of High Frequency Lines and Neighbourhood Lines, which are serviced with regular route locations and times, with Demand Response Zones. Demand Response Zones are designated areas where on-demand shuttles will collect riders and drop them off either within the zone or at transfer hubs. Routes near the Watermark Outline Plan area are described below.

High Frequency Routes

cityLink Orange (Route 4) – This route runs between ATB Centre and Downtown Lethbridge along Whoop Up Dr W.

Neighbourhood Routes

Route 52 (Columbia) – This route runs through Varsity Village, Mountain Heights and Sunridge providing connection to the University.

Route 53 (McGill) – This route runs between ATB Centre and University Station along Whoop up Drive, Metis Trail and through Varsity Village.

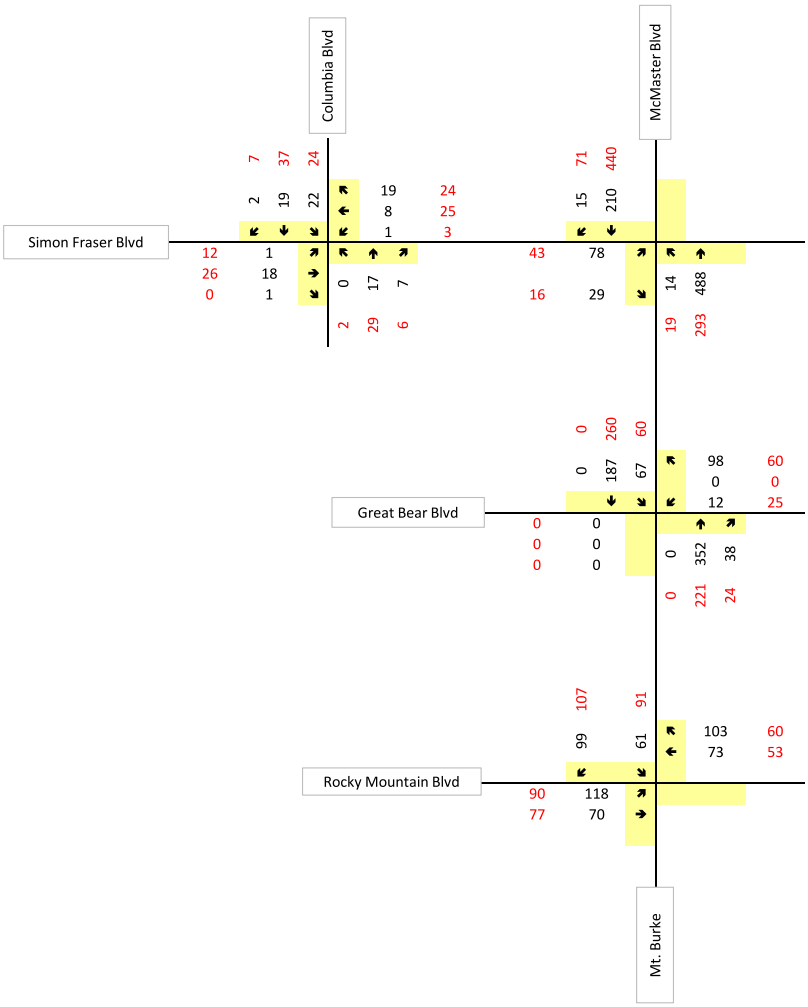
Demand Response Zones

DRZ 102A – This is located in Copperwood, north of the proposed Waterbridge West site.

DRZ 102B – Located to the east of Metis Trail, this zone covers Varsity Village and Mountain Heights, with some coverage in Copperwood and Sunridge.

2.4 EXISTING TRAFFIC VOLUMES

The traffic volumes at the existing study intersections were provided by the City of Lethbridge to be used in this TIA. Traffic counts conducted between October 2013 and March 2021 were adjusted to reflect existing conditions. A technical memorandum, included in **Appendix A**, was prepared by the City for WSP that outlines the process used to adjust historical traffic volumes and traffic volumes collected during the COVID-19 pandemic to reflect existing conditions. The existing traffic volumes are illustrated in **Figure 2-2**.



LEGEND

A.M. Peak Hour Traffic Volumes

P.M. Peak Hour Traffic Volumes

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Figure 2-2
Existing Traffic Volumes

3 PROPOSED DEVELOPMENT

The proposed Watermark Community development is primarily residential, with some mixed-use commercial at the corner of Claire Promenade W and Winnipeg Boulevard W. Parcels along Metis Trail that are identified as "Swing Site" on the site concept plan were assumed to be developed as medium-density residential. Residential development within Watermark is comprised of low, medium- and high-density areas. As previously mentioned, a fire station and a school are existing land uses within Watermark. The land use statistics are summarized in **Table 3-1**.

Table 3-1: Proposed Land Use Statistics

LAND USE	AREA (HA)	DWELLING UNITS	NON-RESIDENTIAL GFA (FT^2)	STUDENTS
Low Density Residential	62.64	1,252	-	-
Medium Density Residential	16.03	905	-	-
Mixed Use (High Density Residential & Commercial)	1.40	105	20,000	-
Medium / High Density Residential	1.30	130	-	-
Fire Station	0.65	-	12,917	-
Middle School	6.10	-	-	799

4 FUTURE BACKGROUND CONDITIONS

4.1 HORIZON YEAR

The study horizon year for this plan corresponds to roughly a 30 year build out of the plan area (2050). This horizon corresponds with anticipated construction of Chinook Trail and assumes the completion of Metis Trail. There are two sources of data input for the future background horizon: general background traffic based on growth outside of the study area, and development traffic from Waterbridge West, which is also assumed to be fully built out at the development horizon.

4.2 BACKGROUND TRAFFIC FORECAST

4.2.1 GENERAL BACKGROUND TRAFFIC

To establish the baseline future background conditions, WSP reviewed the 2016 Outline Plan TIA. This TIA included a background traffic horizon that identified the future background traffic volumes from the study area based on the City's 2040 EMME model, that excluded the impact of development of Waterbridge East and West.

The 2017 Outline Plan included a south connection through the Outline area at "Collector A" or "Road A" as shown in **Figure 4-1**. The full 2016 TIA is also included in **Appendix D**. This collector is not included in the potential revised Outline plan, therefore the traffic assigned to this street will instead stay on Metis Trail until one intersection further south where it will then travel east back to Rocky Mountain Boulevard.

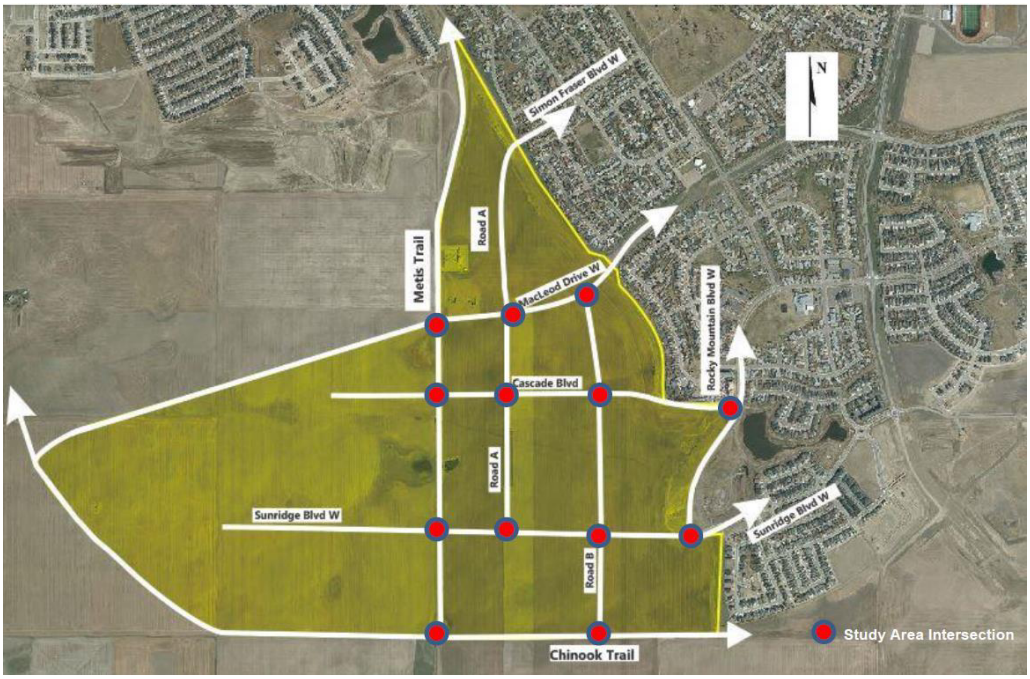
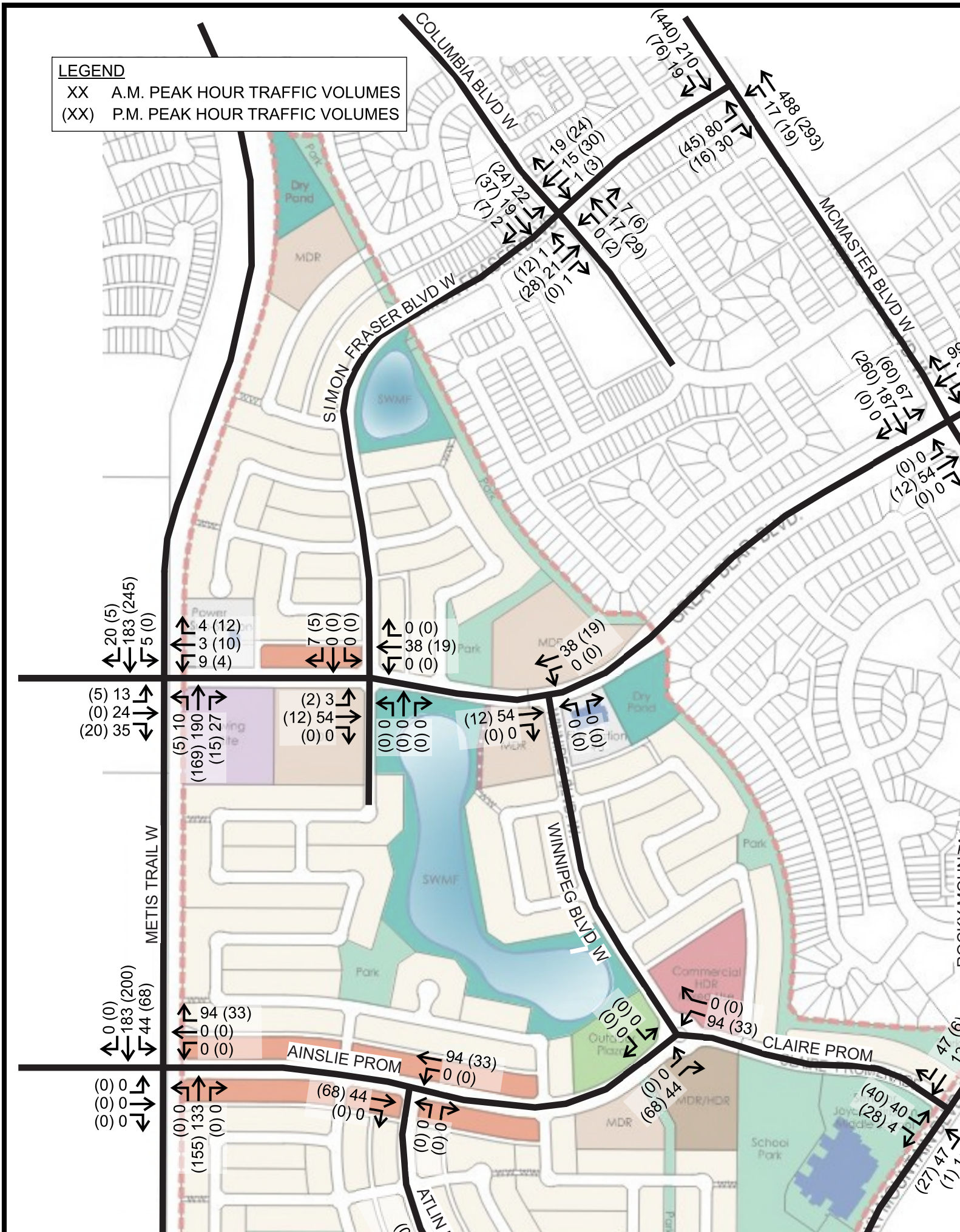


Figure 4-1 Road Network from 2016 Waterbridge Traffic Impact Assessment (source: Associated Engineering TIA)

The assumed general background traffic is illustrated in **Figure 4-2.**


LEGEND
XX A.M. PEAK HOUR TRAFFIC VOLUMES
(XX) P.M. PEAK HOUR TRAFFIC VOLUMES
COLUMBIA BLVD W
SIMON FRASER BLVD W
MCMASTER BLVD W
GREAT BEAR BLVD
METIS TRAIL W
WINNIPEG BLVD W
AINSLIE PROM
CLAIRE PROM
ATLIN
Dry Pond
SWMF
Park
MDR
Commercial HDR
MDR/HDR
School Park
(440) 210
(76) 19
488 (293)
17 (19)
(45) 80
(16) 30
19 (24)
15 (30)
1 (3)
(24) 22
(37) 19
(7) 2
7 (6)
17 (29)
0 (2)
(12) 1
(28) 21
(0) 1
(60) 67
(260) 187
(0) 0
(0) 0
(12) 54
(0) 0
20 (5)
183 (245)
5 (0)
4 (12)
3 (10)
9 (4)
7 (5)
0 (0)
0 (0)
0 (0)
38 (19)
0 (0)
38 (19)
0 (0)
(5) 13
(0) 24
(20) 35
(5) 10
(169) 190
(15) 27
(2) 3
(12) 54
(0) 0
(12) 54
(0) 0
0 (0)
94 (33)
0 (0)
0 (0)
94 (33)
0 (0)
0 (0)
94 (33)
(0) 0
(0) 0
(0) 0
(68) 44
(0) 0
(68) 44
(40) 40
(28) 4
(27) 47
(1)
(155) 133
(0) 0

5 SITE TRAFFIC

This section of the assessment describes the methodology for site traffic generation, distribution and assignment.

5.1 TRIP GENERATION

The vehicle trips generated by the proposed development during the weekday morning and afternoon peak hours were estimated using the Institute of Transportation Engineers (ITE) *Trip Generation Manual* 10th Edition as well as Lethbridge Trip Generation Rates where applicable. The trip generation rates used for each land use within the study area are summarized in **Table 5-1**. The City of Lethbridge's low-density trip rate was assumed to apply to the medium density (townhouse) land use as the low-density trip rate applies to single family residential land uses up to quadraplexes. Although secondary suites are supported on parcels with rear lane access, the number of residential units was not adjusted to account for secondary suites (i.e. residential units that can support a secondary suite were considered as one unit, not two).

Table 5-1: Trip Generation Rates

LAND USE	SOURCE	A.M. PEAK HOUR		P.M. PEAK HOUR	
		TRIP RATE	IN / OUT	TRIP RATE	IN / OUT
Low Density Residential	City of Lethbridge – Low Density Residential	0.77	26% / 74%	1.02	64% / 36%
Medium Density Residential – Apartment	City of Lethbridge – Medium Density Residential	0.75	29% / 71%	0.92	61% / 39%
Medium Density Residential – Town House	City of Lethbridge – Low Density Residential	0.77	26% / 74%	1.02	64% / 36%
Mixed Use - Residential	City of Lethbridge – Medium Density Residential	0.75	29% / 71%	0.92	61% / 39%
Mixed Use - Commercial	ITE LUC 820 (Shopping Centre)	T=0.5X+151.78	62% / 38%	Ln(T)=0.74Ln(X)+2.89	48% / 52%
Medium / High Density Residential	City of Lethbridge – Medium Density Residential	0.75	29% / 71%	0.92	61% / 39%

Fire Station	ITE LUC 575 (Fire and Rescue Station)	0.48	71% / 29%	0.48	29% / 71%
Middle School	ITE LUC 522 (Middle School/Junior High School)	0.58	54% / 46%	0.17	49% / 51%

For the purposes of trip generation / assignment, the site was subdivided into zones, as illustrated in **Figure 5-1**. The number of raw trips generated by zone is summarized in **Table 5-2**.

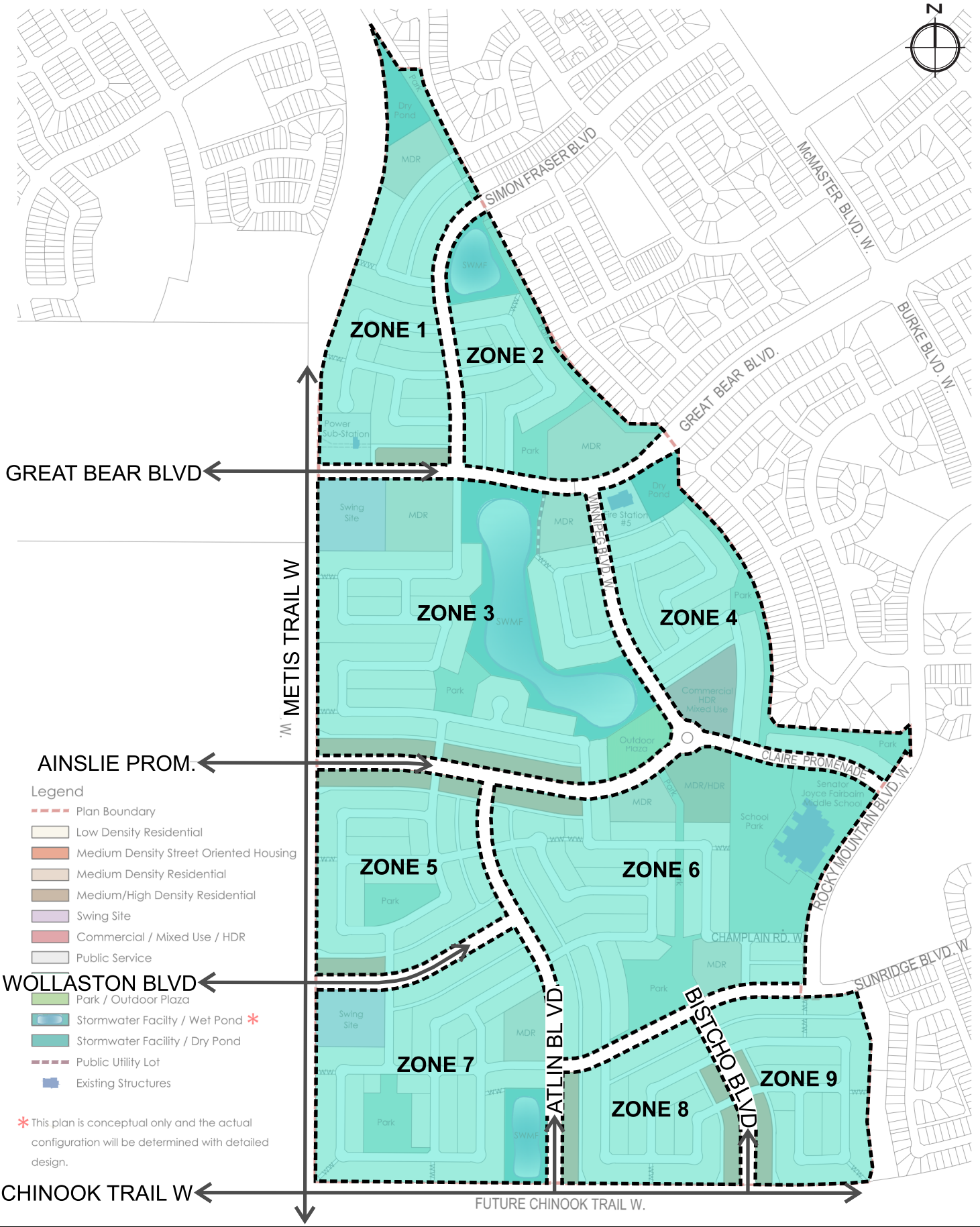


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Figure 5-1
Trip Generation Zones
Watermark Outline Plan Amendment Transportation Impact Assessment

Table 5-2: Raw Site-Generated Trips

VISTRO ZONE	LAND USE	UNITS OR GFA	RAW ITE TRIPS					
			AM PEAK HOUR			PM PEAK HOUR		
			TRIPS	INBOUND	OUTBOUND	TRIPS	INBOUND	OUTBOUND
1	LD Res	118	91	24	67	120	77	43
	MD Res (Apt)	60	45	13	32	55	34	21
	MD Res (TH)	16	12	3	9	16	10	6
2	LD Res	79	61	16	45	81	52	29
	MD Res (Apt)	117	88	26	62	108	66	42
3	LD Res	227	175	46	129	232	148	84
	MD Res (Apt)	271	203	59	144	249	152	97
	MD Res (TH)	56	43	11	32	57	36	21
4	LD Res	113	87	23	64	115	74	41
	HD Res	105	79	23	56	97	59	38
	Comm.	20,000 sq ft	162	100	62	165	79	86
	Fire Station	12,912 sq ft	6	4	2	6	2	4
5	LD Res	130	100	26	74	133	85	48
	MD Res (TH)	49	38	10	28	50	32	18
6	LD Res	196	151	39	112	200	128	72
	MD Res (Apt)	96	72	21	51	88	54	34
	MD Res (TH)	20	15	4	11	20	13	7
	MD / HD Res	130	98	28	70	120	73	47
	School	799 students	463	250	213	136	67	69

7	LD Res	178	137	36	101	182	116	66
	MD Res (Apt)	142	107	31	76	131	80	51
8	LD Res	100	77	20	57	102	65	37
	MD Res (TH)	49	38	10	28	50	32	18
9	LD Res	112	86	22	64	114	73	41
	MD Res (TH)	28	22	6	16	29	19	10
Total			**2456**	**851**	**1605**	**2656**	**1626**	**1030**

Note that the middle school in Zone 6 was partially occupied at the time of the existing traffic volume collection in 2019; therefore, only school trips anticipated to be generated from within Watermark and Waterbridge West were added to the network to avoid double-counting. The number of school trips generated by Watermark and Waterbridge West were estimated based on the anticipated number of middle school aged children within each neighbourhood. A rate of 0.11 middle school aged children per unit was applied, based on rates used by the planning team for population estimates. The calculations are included in **Table 5-3**.

Table 5-3: Watermark and Waterbridge West Middle School Trips

NEIGHBOURHOOD	UNITS	NO. MIDDLE SCHOOL AGED CHILDREN (0.11 / UNIT)	% OF SCHOOL POP. (799 STUDENT CAPACITY)	A.M. PEAK HOUR		P.M. PEAK HOUR	
				TOTAL SCHOOL TRIPS*	SCHOOL TRIPS TO / FROM NEIGHBOURHOOD	TOTAL SCHOOL TRIPS*	SCHOOL TRIPS TO / FROM NEIGHBOURHOOD
Watermark	2,392	263	33%	417	137	122	40
Waterbridge West	1,668	183	23%		96		28

*Total School Trips are based on rates included in Table 5-1 and an auto mode split of 90%.

5.1.1 TRIP ADJUSTMENT

The raw site-generated trips were adjusted to account for mode split, internal capture, and pass-by trips.

- **Mode Split:** an auto mode split of 90% was assumed. This was based on the 2010 household travel survey data, which showed approximately 10% of trips were taken by people walking, cycling, or using transit.
- **Internal Trips:** internal trips are those that have an origin and destination within the same zone. The only two zones where internal trips would apply are Zone 4 (i.e. trips between residential and commercial uses) and Zone 6 (i.e. trips between residential and school uses).

- **Pass-by Trips:** pass-by trips are trips made as intermediary stops along the course of a trip between an origin and primary destination. As per the ITE *Trip Generation Handbook* (10th Edition), a 34% reduction was applied to Zone 4 commercial trips. No other land uses within Watermark are anticipated to generate pass-by trips.

School trips can sometimes be chained with other trips, especially in the AM Peak when parents may be dropping students off on the way to other destinations. However, no adjustments were made to school trips from the ITE Trip Generation Manual (10th Edition) for this study. The most critical intersections when considering school sites are internal intersections near the school, which would not be impacted by the ultimate destination of the drivers. School drop off may alter the routes but should not significantly impact the recommendations identified in this analysis.

The adjusted site-generated trips are summarized in **Table 5-4**.

Table 5-4: Adjusted Site-Generated Trips

VISTRO ZONE	LAND USE	UNITS OR GFA	ADJUSTED SITE TRIPS					
			AM PEAK HOUR			PM PEAK HOUR		
			TRIPS	INBOUND	OUTBOUND	TRIPS	INBOUND	OUTBOUND
1	LD Res	118	82	22	60	108	69	39
	MD Res (Apt)	60	41	12	29	50	31	19
	MD Res (TH)	16	11	3	8	14	9	5
2	LD Res	79	55	14	41	73	47	26
	MD Res (Apt)	117	79	23	56	97	59	38
3	LD Res	227	158	41	117	209	133	76
	MD Res (Apt)	271	183	53	130	224	137	87
	MD Res (TH)	56	39	10	29	51	32	19
4	LD Res	113	78	21	57	104	67	37
	HD Res	105	71	21	50	87	53	34
	Comm.	20,000 sq ft	79	55	23	80	38	42
	Fire Station	12,912 sq ft	5	4	1	5	2	3
5	LD Res	130	90	23	67	120	77	43
	MD Res (TH)	49	34	9	25	45	29	16
6	LD Res	196	136	35	101	180	115	65

	MD Res (Apt)	96	65	19	46	79	49	30
	MD Res (TH)	20	14	4	10	18	12	6
	MD / HD Res	130	88	25	63	108	66	42
	School	799 students	417	225	192	122	60	62
7	LD Res	178	123	32	91	164	104	60
	MD Res (Apt)	142	96	28	68	118	72	46
8	LD Res	100	69	18	51	92	59	33
	MD Res (TH)	49	34	9	25	45	29	16
9	LD Res	112	77	20	57	103	66	37
	MD Res (TH)	28	20	5	15	26	17	9
Total			**2144**	**731**	**1412**	**2322**	**1432**	**890**

5.2 TRIP DISTRIBUTION AND ASSIGNMENT

The site-generated trips were distributed and assigned to the study road network. Trip distribution refers to the origins and destinations of the site-generated trips whereas trip assignment accounts for the actual route that drivers will use to reach their destination and which access points they will use.

Trip distribution was developed using the 2012 Transportation Master Plan's travel survey data. This data is included in **Appendix C.** The AM and PM Peak hour driver trips from the West South Zone were assigned to specific routes from the study area and adjusted based on feedback from the City of Lethbridge transportation team. Those final assumptions are summarized in **Table 5-5** and shown in **Figure 5-2**.

Table 5-5: Trip Distribution

GATEWAY ROAD	A.M. PEAK HOUR		P.M. PEAK HOUR	
	INBOUND	OUTBOUND	INBOUND	OUTBOUND
Chinook Trail	23%	20%	20%	19%
Sunridge Boulevard	4%	4%	5%	4%
Rocky Mountain Boulevard	11%	13%	13%	12%
Great Bear Boulevard	20%	22%	20%	20%

Simon Fraser Boulevard	4%	4%	5%	4%
Metis Trail	39%	37%	38%	39%

The site traffic was further assigned to the boundary road network considering the location of accesses to each zone and by giving favour to the shortest / quickest routes.

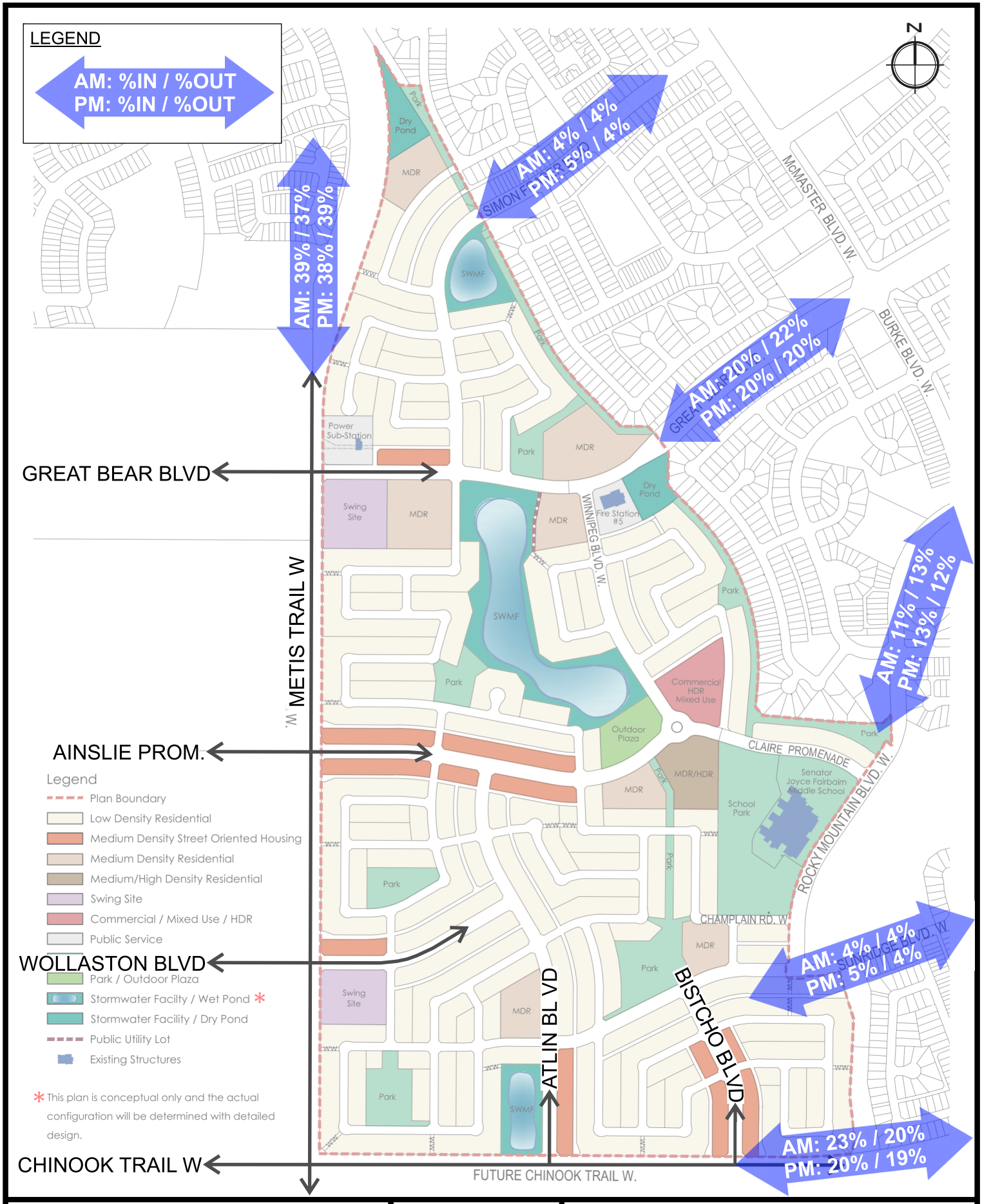

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Figure 5-2
Trip Distribution
Watermark Outline Plan Amendment Transportation Impact Assessment

5.3 WATERBRIDGE WEST TRAFFIC

Waterbridge West is assumed to be built out at the same horizon as Watermark. The development assumptions for Waterbridge West are summarized in **Table 5-6**.

Table 5-6: Waterbridge West Land Use Assumptions

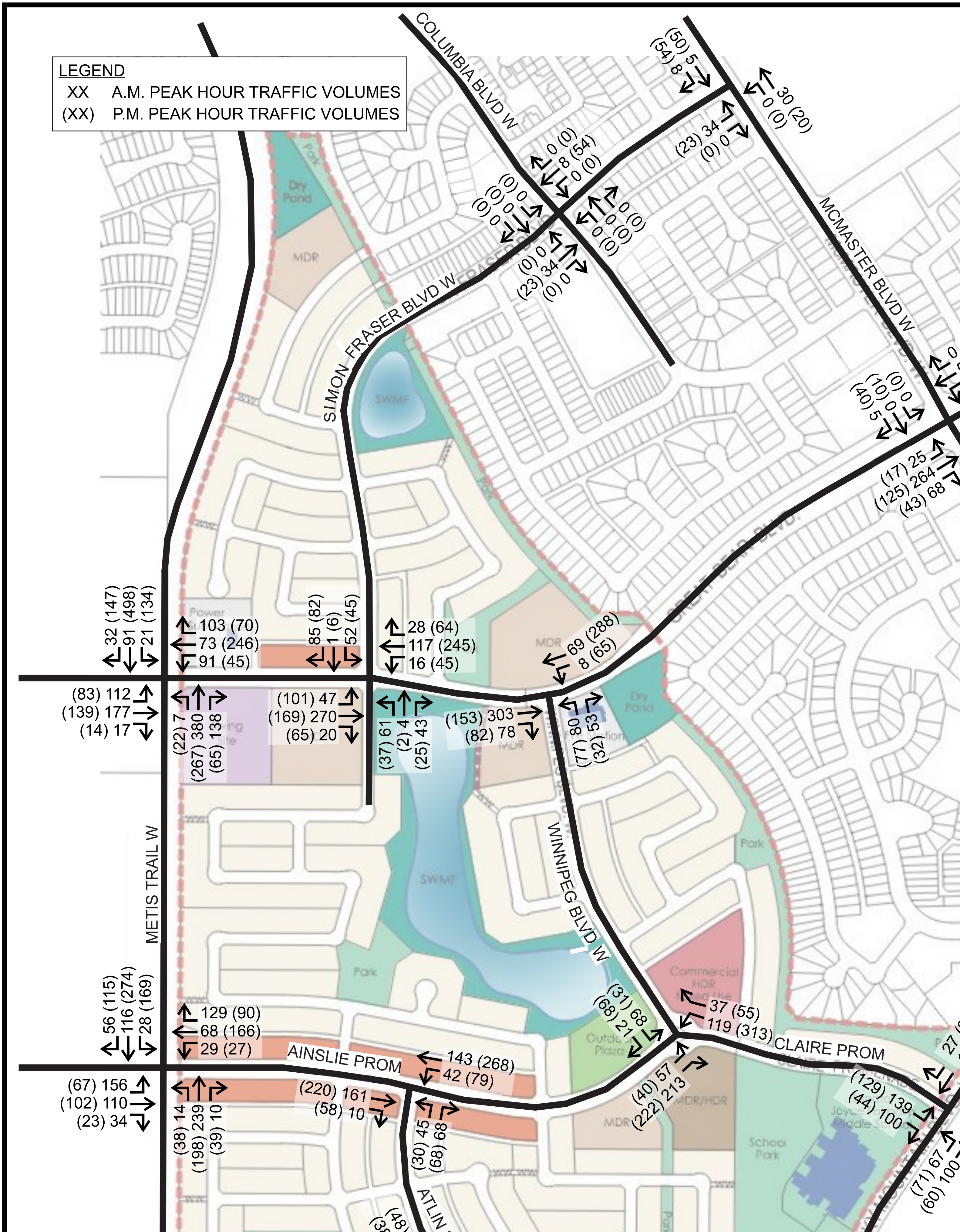
LAND USE	UNITS
Low Density Residential	1218 DU
Medium Density Residential (Apartment)	450 DU
Church	17, 000 sq ft GFA
Elementary School	900 Students*

*The number of students projected at the Elementary School use was updated from the 2017 TIA based on the 2021-2024 Lethbridge School Division Capital Plan, which calls for a 900 student school. https://www.lethsd.ab.ca/download/334330

Trips were generated for these uses based on the City of Lethbridge Trip Generation Rates or ITE 9th Edition rates as identified in the 2017 TIA. These trips were assigned to the network using the trip distribution assumptions as outlined in Section 5.2 of this report. That assumption conservatively places more of the Waterbridge trips on the internal roads of Watermark when compared to the 2017 TIA. This presents a worse case scenario of perceived collector road usage in the overall Waterbridge ASP area. Internal trip capture was applied to capture school trips, as was previously detailed.

5.4 SUMMARY

The site-generated trips, distributed and assigned to the study road network (including both Waterbridge West and Watermark Outline Plan Area are illustrated in **Figure 5-3**. The full build-out traffic forecast was completed by superimposing the site-generated trips onto the background traffic forecast. The full build-out traffic forecast is illustrated in **Figure 54** with estimated ADTs shown in **Figure 5-5**. Note that the ADT on Claire Promenade, east of the Winnipeg Boulevard roundabout was broken down into two segments in order to more accurately show the ADT on the segment of Claire Promenade that fronts the residential lots north of the school. Because these lots do not have rear lane access, it was important to ensure that the traffic volumes would not reach a level that impedes driveway operation or front garbage collection (i.e., ADT ≥ 7,000 vpd).


LEGEND
XX A.M. PEAK HOUR TRAFFIC VOLUMES
(XX) P.M. PEAK HOUR TRAFFIC VOLUMES
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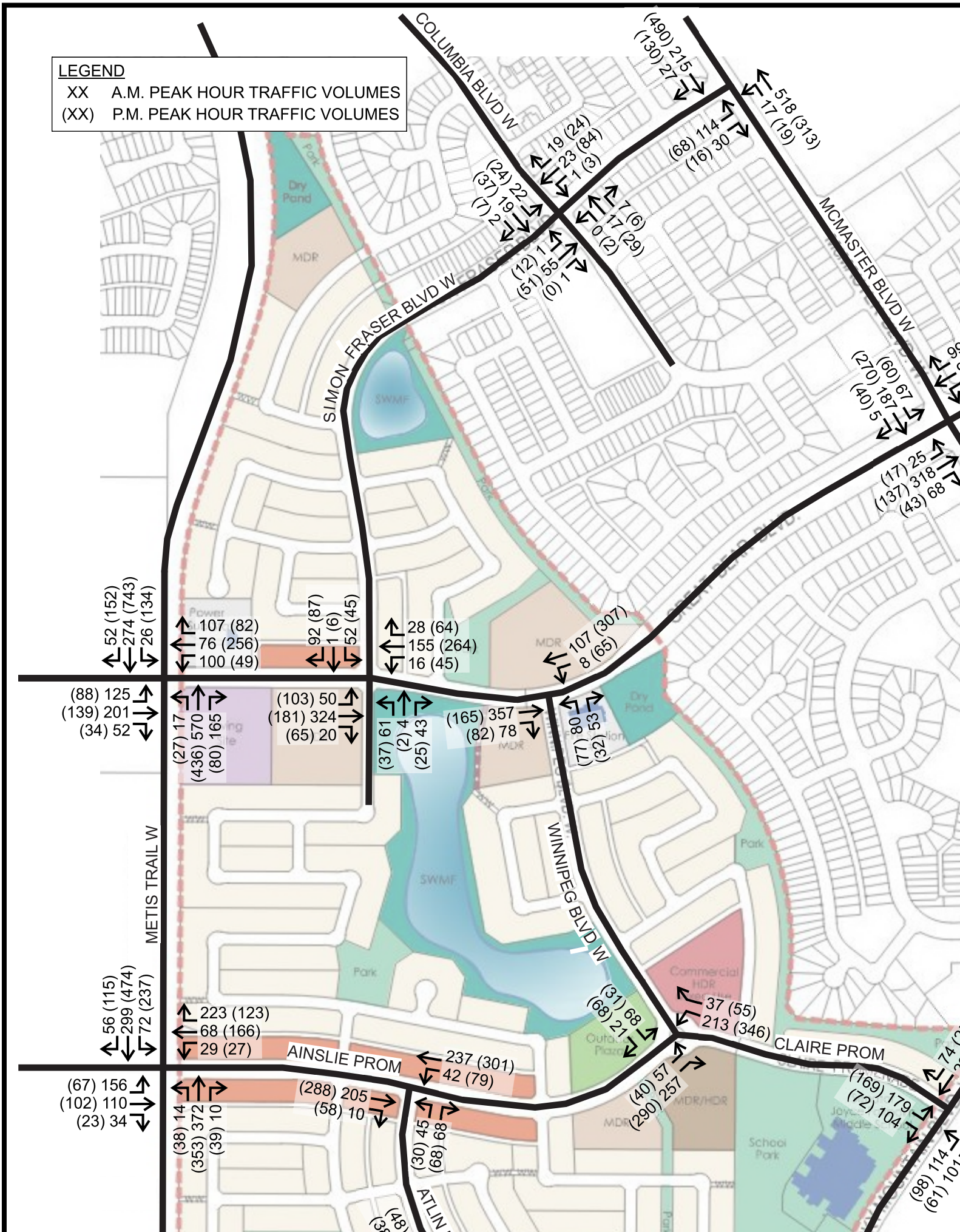
MCMASTER BLVD W
SIMON FRASER BLVD W
METIS TRAIL W
WINNIPEG BLVD W
AINSLIE PROM
CLAIRE PROM
ATLIN


LEGEND
XX A.M. PEAK HOUR TRAFFIC VOLUMES
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COLUMBIA BLVD W
SIMON FRASER BLVD W
MCMASTER BLVD W
METIS TRAIL W
WINNIPEG BLVD W
AINSLIE PROM
CLAIRE PROM
ATLIN
Dry Pond
SWMF
MDR
Park
Commercial HDR
MDR/HDR
School Park
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518 (313)
17 (19)
(68) 114
(16) 30
19 (24)
23 (84)
1 (3)
(24) 22
(37) 19
(7) 2
7 (6)
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0 (2)
(12) 1
(51) 55
(0) 1
(60) 67
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(40) 5
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26 (134)
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1 (6)
52 (45)
28 (64)
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16 (45)
107 (307)
8 (65)
(88) 125
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(27) 17
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(103) 50
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(39) 10
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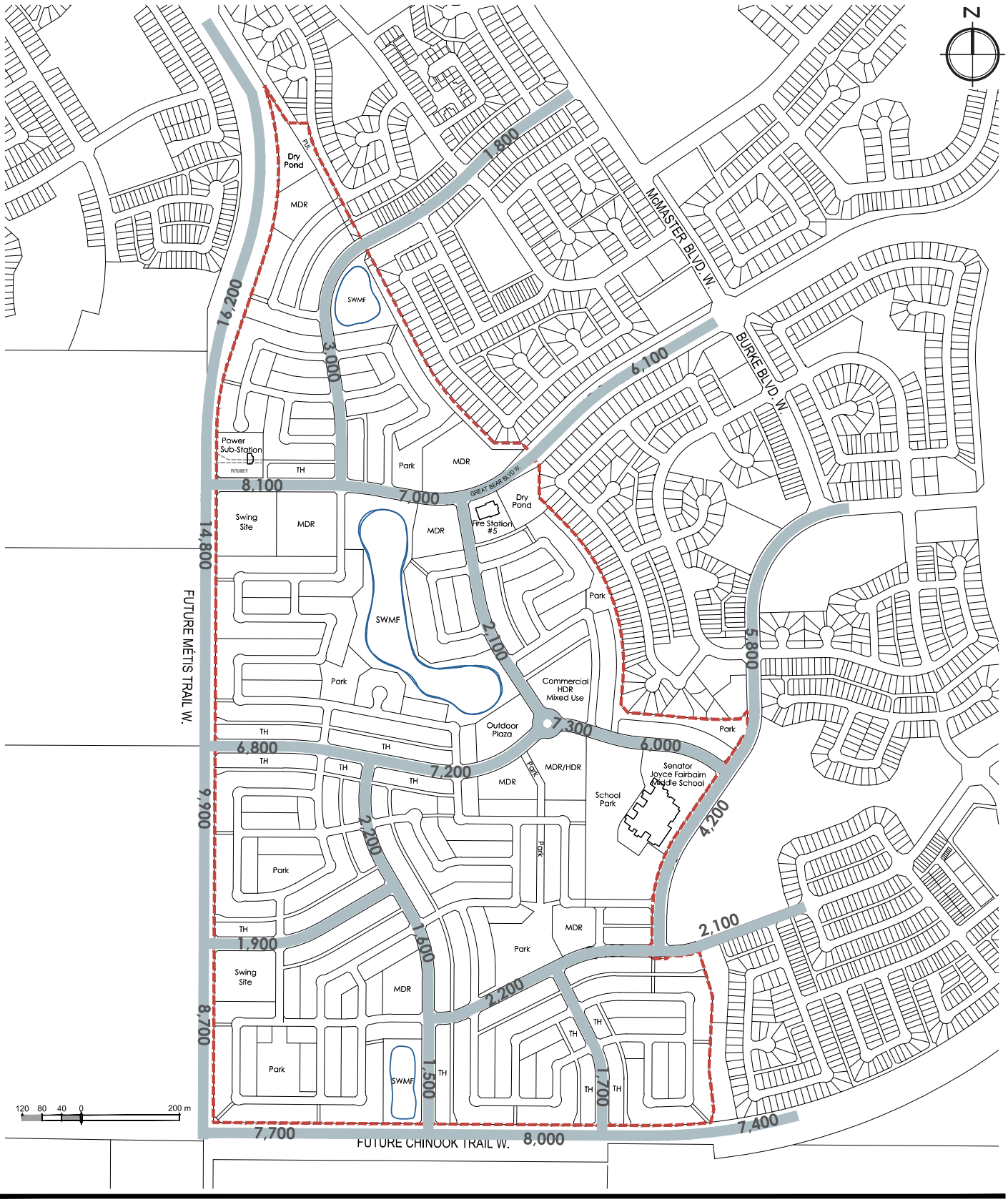
(98) 114
(61) 101



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Legend
Plan Boundary
1,000 Full Build Total Estimated Average Daily Volumes

WATERMARK

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Issue Date - 2023-01-04
Scale: NTS
Aerial Imagery: n/a
Note: All Dimensions shown in Metres unless otherwise noted

Figure 5-5
Estimated Total Development ADT
Watermark Outline Plan Amendment Transportation Impact Assessment

DRAWING: FIG-201-04167-Watermark TIA Figures-20210611.cdr DATE: 2021-06-14 DRAWN BY: faberk

6 TRAFFIC OPERATIONS ANALYSIS

An analysis of traffic operations and intersection capacity was performed using Synchro Studio 11, an industry standard software program to analyze the existing, background and full build-out traffic conditions. The City of Lethbridge's *Traffic Impact Study Guidelines* (March 2008) were used in the preparation of the Synchro model.

Synchro produces two key measures to determine the operational effectiveness of an intersection. The first is Level-of-Service (LOS), which is based on the average delay per vehicle, and the second is volume-to-capacity (v/c) ratio, which indicates the available capacity of an intersection or movement. The LOS can be measured for the whole intersection, an intersection approach or an individual movement. The level of effectiveness ranges from LOS A (excellent) to LOS F (beyond capacity). Typically LOS D is considered the threshold of acceptable operation. The v/c ratio identifies the intersection's or individual movement's ability to accommodate fluctuations in traffic flow. A system that is reaching the limits of its operational effectiveness will experience ratios greater than 0.85. The City of Lethbridge's Traffic Impact Study Guidelines indicate that improvements should be implemented where the v/c of through or shared through / right-turn movements greater than or equal to 0.80.

SimTraffic, a microsimulation model included in the Synchro 11 suite, was used for the purposes of determining 95th percentile queue lengths. These queue lengths were used to determine the required storage length for turn lanes.

6.1 EXISTING

The existing traffic volumes, as illustrated in **Figure 2-2,** were analyzed to determine if there are any pre-existing capacity or delay issues. The results of the existing traffic operations analysis are summarized in **Table 6-1**. More detailed Synchro results for the existing traffic conditions are included in **Appendix B**.

Table 6-1: Existing Traffic Operations

INTERSECTION	A.M. PEAK HOUR		P.M. PEAK HOUR	
	Overall LOS (Delay)	Critical Movement[1] (v/c) [95th % Queue]	Overall LOS (Delay)	Critical Movement[1] (v/c) [95th % Queue]
Simon Fraser Boulevard W & Columbia Boulevard W	A (6 s)	--	A (6 s)	--
McMaster Boulevard W & Simon Fraser Boulevard W	A (2 s)	--	A (1 s)	--
McMaster Boulevard W / Mt. Burke Boulevard W & Great Bear Boulevard W / MacLeod Drive W	A (3 s)	--	A (2 s)	--
Mt. Burke Boulevard W & Rocky Mountain Boulevard W	A (5 s)	--	A (6 s)	--

1. Critical movements are those that are operating at a LOS of E / F or a v/c of greater than 0.80.

Under existing conditions, all intersections are operating at LOS A during both peak hours and no critical movements were identified.

6.2 FUTURE BACKGROUND

The background traffic volumes, as illustrated in **Figure 4-1**, were analyzed to determine if any capacity or delay issues are present even without the implementation of the subject development. All existing intersections were modelled with existing traffic control and new intersections along Metis Trail were modelled as east-west stop-controlled. The results of the background traffic operations analysis are summarized in **Table 6-2**. More detailed Synchro results for the background traffic conditions are included in **Appendix B**.

Table 6-2: Background Traffic Operations

INTERSECTION	A.M. PEAK HOUR		P.M. PEAK HOUR	
	Overall LOS (Delay)	Critical Movement[1] (v/c) [95th % Queue]	Overall LOS (Delay)	Critical Movement[1] (v/c) [95th % Queue]
Simon Fraser Boulevard W & Columbia Boulevard W	A (5 s)	--	A (6 s)	--
McMaster Boulevard W & Simon Fraser Boulevard W	A (2 s)	--	A (1 s)	--
McMaster Boulevard W / Mt. Burke Boulevard W & Great Bear Boulevard W / MacLeod Drive W	A (5 s)	--	A (3 s)	--
Mt. Burke Boulevard W & Rocky Mountain Boulevard W	A (5 s)	--	A (5 s)	--
Metis Trail W & Great Bear Boulevard W	A (2 s)	--	A (1 s)	--
Metis Trail W & Claire Promenade	A (3 s)	--	A (2 s)	--
Claire Promenade & Rocky Mountain Boulevard W	A (5 s)	--	A (6 s)	--
Metis Trail W & Chinook Trail W	A (5 s)	--	A (3 s)	--

1. Critical movements are those that are operating at a LOS of E / F or a v/c of greater than 0.80.

Under background conditions, all intersections are operating at LOS A during both peak hours and no critical movements were identified.

6.3 FULL BUILD-OUT

The full build-out traffic volumes, as illustrated in Figure 5-3, were analyzed to determine if any capacity or delay issues arise as a result of the traffic generated by Watermark and Waterbridge West. Based on an initial review, it was determined that the new intersections along Metis Trail at Great Bear Boulevard W, Claire Promenade, Wollaston Boulevard, and Chinook Trail would not continue to function as single-lane, two-way stop-control intersections as they did under background traffic conditions and would require improvements. Additionally, the existing intersection at McMaster Boulevard W & Great Bear Boulevard W would require improvements. These

intersections were modelled as both signalized intersections and as roundabouts. The results of the signalized intersection and stop-controlled intersection traffic operations (Synchro) analysis are summarized in **Table 6-3** and the results of the roundabout (SIDRA) traffic operations analysis are summarized in **Table 6-4**. The intersection lane configuration and traffic control used in the analysis are illustrated in **Figure 6-1** and listed in **Table 6-5**.

More detailed Synchro and SIDRA results for the full build-out traffic conditions are included in **Appendix B**.

Table 6-3: Full Build-out Traffic Operations (Synchro)

INTERSECTION	A.M. PEAK HOUR		P.M. PEAK HOUR	
	Overall LOS (Delay)	Critical Movement[1] (v/c) [95th % Queue]	Overall LOS (Delay)	Critical Movement[1] (v/c) [95th % Queue]
Simon Fraser Boulevard W & Columbia Boulevard W (Stop Controlled)	A (4 s)	--	A (4 s)	--
McMaster Boulevard W & Simon Fraser Boulevard W (Stop Controlled)	A (3 s)	--	A (2 s)	--
McMaster Boulevard W / Mt. Burke Boulevard W & Great Bear Boulevard W / MacLeod Drive W (Stop Controlled)	F (Err)	EB-L (0.26) [30 m] EB-TR (1.62) [95 m] WB-L (Err) [14 m]	F (57 s)	NB-LTR (1.10) [51 m]
McMaster Boulevard W / Mt. Burke Boulevard W & Great Bear Boulevard W / MacLeod Drive W (Signals)	B (17 s)	--	B (17 s)	--
Mt. Burke Boulevard W & Rocky Mountain Boulevard W (Stop Controlled)	A (10 s)	SB-L (0.67) [30 m]	B (11 s)	SB-L (0.72) [54 m]
Metis Trail W & Great Bear Boulevard W (Stop Controlled)	F (Err)	EB-L (1.76) [45 m] EB-TR (1.47) [89 m] WB-L (Err) [27 m]	F (Err)	EB-L (Err) [53 m] EB-TR (2.55) [181 m] WB-L (Err) [48 m] WB-T (5.22) [71 m] WB-R (5.22) [47 m]
Metis Trail W & Great Bear Boulevard W (Signals)	C (28 s)	--	D (44 s)	WB-T (0.86) [77 m] SB-T (0.85) [225 m]
Great Bear Boulevard W & Simon Fraser Boulevard W (Stop Controlled)	A (6 s)	--	A (6 s)	--
Great Bear Boulevard W & Winnipeg Boulevard W (Stop Controlled)	A (3 s)	--	A (3 s)	--
Metis Trail W & Claire Promenade (Stop Controlled)	F (100 s)	EB-L (2.56) [32 m] EB-TR (0.62) [33 m]	F (Err)	EB-L (Err) [31 m] EB-TR (1.74) [47 m] WB-TL (72.91) [176 m] WB-R (72.91) [58 m]

Metis Trail W & Claire Promenade (Signals)	B (19 s)	--	C (27 s)	--
Claire Promenade & Atlin Boulevard (Stop Controlled)	A (3 s)	--	A (3 s)	--
Claire Promenade W & Winnipeg Boulevard W[2]				
Claire Promenade W & Rocky Mountain Boulevard W (Stop Controlled)	A (9 s)	--	A (8 s)	--
Metis Trail W & Wollaston Boulevard (Stop Controlled)	B (11 s)	EB-LTR (0.72) [27 m]	A (7 s)	EB-LTR (0.60) [21 m]
Metis Trail W & Wollaston Boulevard (Signals)	B (11 s)	--	A (8 s)	--
Wollaston Boulevard & Atlin Boulevard (Stop Controlled)	A (5 s)	--	A (3 s)	--
Sunridge Boulevard W & Atlin Boulevard (Stop Controlled)	A (8 s)	--	A (7 s)	--
Sunridge Boulevard W & Bistcho Boulevard (Stop Controlled)	A (4 s)	--	A (4 s)	--
Sunridge Boulevard W & Rocky Mountain Boulevard W (Stop Controlled)	A (6 s)	--	A (7 s)	--
Metis Trail W & Chinook Trail W (Stop Controlled)	F (51 s)	EB-LTR (1.26) [26 m]	E (43 s)	EB-LTR (0.96) [20 m] WB-LTR (0.98) [55 m]
Metis Trail W & Chinook Trail W (Signals)	B (17 s)	--	B (17 s)	--
Chinook Trail W & Atlin Boulevard (Stop Controlled)	A (2 s)	--	A (2 s)	--
Chinook Trail W & Bistcho Boulevard (Stop Controlled)	A (2 s)	--	A (2 s)	--

1. Critical movements are those that are operating at a LOS of E / F or a v/c of greater than 0.80.
2. Claire Promenade W & Winnipeg Blvd W is proposed as a roundabout and is therefore included in the SIDRA analysis in Table 6-4.

Table 6-4: Full Build-out Traffic Operations (SIDRA)

INTERSECTION	A.M. PEAK HOUR	P.M. PEAK HOUR

	Overall LOS (Delay)	Critical Movement[1] (v/c) [95th % Queue]	Overall LOS (Delay)	Critical Movement[1] (v/c) [95th % Queue]
McMaster Boulevard W / Mt. Burke Boulevard W & Great Bear Boulevard W / MacLeod Drive W	A (7 s)	--	A (9 s)	--
Metis Trail W & Great Bear Boulevard W	A (7 s)	--	A (8 s)	--
Metis Trail W & Claire Promenade	A (7 s)	--	A (9 s)	--
Claire Promenade W & Winnipeg Boulevard W	A (6 s)	--	A (7 s)	--
Metis Trail W & Wollaston Boulevard	A (5 s)	--	A (5 s)	--
Metis Trail W & Chinook Trail W	A (7 s)	--	A (6 s)	--

Table 6-5: Intersection Improvements

INTERSECTION	REQUIRED IMPROVEMENTS[1]
Simon Fraser Boulevard W & Columbia Boulevard W	None
McMaster Boulevard W & Simon Fraser Boulevard W	None
McMaster Boulevard W / Mt. Burke Boulevard W & Great Bear Boulevard W / MacLeod Drive W	Install traffic signals **OR** Install a single-lane roundabout
Mt. Burke Boulevard W & Rocky Mountain Boulevard W	None
Metis Trail W & Great Bear Boulevard W	Install traffic signals + left-turn lanes on all approaches + right-turn lanes on northbound, southbound and westbound approaches **OR** Install a 2-lane roundabout (eastbound and westbound approaches single lane entering, northbound and southbound approaches two entering lanes)
Great Bear Boulevard W & Simon Fraser Boulevard W	None

Great Bear Boulevard W & Winnipeg Boulevard W	None
Metis Trail W & Claire Promenade	Install traffic signals + left-turn lanes on southbound and eastbound approaches + right-turn lane on westbound approach **OR** Install a single-lane roundabout with a southbound right-turn slip lane.
Claire Promenade & Atlin Boulevard	None
Claire Promenade W & Winnipeg Boulevard W	Install a single-lane roundabout
Claire Promenade W & Rocky Mountain Boulevard W	None
Metis Trail W & Wollaston Boulevard	Install traffic signals **OR** Install a single-lane roundabout
Wollaston Boulevard & Atlin Boulevard	None
Sunridge Boulevard W & Atlin Boulevard	None
Sunridge Boulevard W & Bistcho Boulevard	None
Sunridge Boulevard W & Rocky Mountain Boulevard W	None
Metis Trail W & Chinook Trail W	Install traffic signals **OR** Install a single-lane roundabout
Chinook Trail W & Atlin Boulevard	None
Chinook Trail W & Bistcho Boulevard	None

1. Required improvements are those that beyond a minor road stop-controlled intersection with a single lane per direction

Based on the results of the full build-out analysis all internal neighbourhood intersections will operate acceptably as single lane, minor road stop-control configuration with the exception of the Claire Promenade W intersection which is proposed as a single-lane roundabout. The Metis Trail intersections will operate acceptably as both traffic signals and roundabouts with the lane configurations shown in **Figure 6-1**.

6.3.1 4 WAY/3 WAY STOP WARRANTS

All stop-controlled intersections in this analysis are identified/assumed to be two way stop controlled intersections with the stop having been recommended on the lower volume approach when the roads are of the same classification. All-way stop control can be used in locations where there are capacity challenges with two way stop control, but signals are not yet warranted. All-way stop control may also be considered in locations with high pedestrian/cycling volumes where other pedestrian crossing control devices may not be appropriate.

The 2021 Transportation Association of Canada Manual of Uniform Traffic Control Devices, (MUTCD) identifies guidance for where all-way stop should be considered. This guidance indicates that all-way stop control may be justified where one or more of the following conditions exists:

a. Where the traffic volumes on the intersecting roads are approximately equal and the combined pedestrian and vehicular volumes on the minor road average 200 per hour for an eight-hour period,
b. Where the average delay to the minor road vehicular traffic entering the intersection exceeds 30 seconds per vehicle during the peak hour,
c. Where traffic signals are not warranted, and a collision problem has been identified by a statistical methodology that indicates that a location is operating with below average safety compared to similar intersections. If not statistical analysis is available, a threshold of five collisions per year over a three-year period (or an alternate frequency approved by local policy), of a type susceptible to prevention by the implementation of an all-way stop should be used. Such collisions typically include right- and left-turn collisions as well as right-angle collisions,
d. As an interim measure prior to the installation of traffic signals, or
e. As an interim measure, for a period of approximately one month prior to switching the stop control from one road to an intersecting road, and the subsequent removal of existing stop signs on the first road.

Part A and Part B of the guidance above will apply to the Watermark Outline Plan area. As such, all two-way stop control intersections were evaluated to all-way stop is required. **Table 6-6** includes information on the traffic volumes and delay at all two-way stop-controlled intersections in the study area. Note that the 8-hour volumes were estimated by applying a factor of 0.58 to the daily traffic volumes on the minor leg. This factor was developed by examining 24-hour counts conducted by Alberta Transportation in the Lethbridge area and determining what percentage of the daily volume occurs within the peak 8-hour timeframe.

Table 6-6: MUTCD All-Way Stop-Control Warrants

INTERSECTION	PART A					PART B	
	INTERSECTION LEG VOLUMES[1] (Entering ADT)				MINOR ROAD 8-HR VOLUME	MINOR ROAD DELAY (s)	
	SB	NB	WB	EB		NB or EB	SB or WB
Simon Fraser Blvd & Columbia Blvd	**620**	**340**	860	670	557	**10**	**11**
McMaster Blvd W & Simon Fraser Blvd W	4830	4860	--	**1280**	742	**21**	**--**
Mt. Burke Blvd W & Rocky Mountain Blvd W	**2080**	--	2350	3250	1206	**--**	**30**
Great Bear Blvd W & Simon Fraser Blvd W	**1590**	**960**	3200	4160	1479	**27**	**21**
Great Bear Boulevard W & Winnipeg Boulevard W	--	**1360**	2730	3820	789	**17**	**--**

Claire Promenade & Atlin Boulevard	--	**1180**	3690	3140	684	**15**	--
Claire Promenade W & Rocky Mountain Blvd W	2920	2090	--	**2930**	1699	**23**	--
Wollaston Boulevard & Atlin Boulevard	820	780	--	**720**	418	**10**	--
Sunridge Boulevard W & Atlin Boulevard	**780**	**690**	1080	710	853	**10**	**11**
Sunridge Boulevard W & Bistcho Boulevard	--	**850**	1660	980	493	**2**	--
Sunridge Boulevard W & Rocky Mountain Blvd W	**1870**	--	1070	1750	1085	--	**12**
Chinook Trail W & Atlin Boulevard	**880**	--	3760	4350	510	--	**16**
Chinook Trail W & Bistcho Boulevard	**820**	--	3400	4560	476	--	**15**

1. Minor road volumes are **bolded**

Regarding Part A of the MUTCD guidance, the only intersection with relatively equal volumes on all legs is Wollaston Boulevard and Atlin Boulevard. The second half of Part A requires that the 8-hour combined pedestrian and vehicular volume on the minor road equals an average of 200 per hour. Given that the 8-hour vehicular volume on Wollaston Blvd is estimated at 418, the average hourly vehicular volume over that 8-hour period would equal approximately 52. Even if pedestrians are accounted for, it is highly unlikely to meet the 200 vehicle/pedestrian threshold. Part B of the MUTCD guidance considers minor road delay. Based on the results of the Synchro analysis included in Section 6.3, there are no instances where minor road delay exceeds the threshold of 30 seconds.

Based on these results, two-way stop control is appropriate at all stop-controlled study intersections.

The MUTCD also includes guidance on where not to consider all-way stop control including:

- On roads where progressive signal timing exists;
- As a speed control device;
- To defer movement through a residential area;
- On intersections with less than 3 and more then 4 approaches;
- When parked vehicles, curves or grades, would obscure the view of the stop sign;
- Where traffic would be required to stop on steep grades;
- Where other traffic devices are within 250 m of the stop sign; and
- Where the primary function is protection of pedestrians and there are other more effective means to address that safety.

Based on this list, the two primary considerations for the Watermark Outline Plan are that all way stop control should not be considered for traffic calming, and that locations identified as Priority Crossing Locations for people walking and cycling on the Recommended Active Modes Network (Figure 8-2), should first be reviewed for pedestrian crossing control warrants. Additional discussion on this topic is included in Section 8.

6.3.2 OTHER NETWORK RESTRICTIONS

Additional restrictions on the road network include identification of where on-street parking should be restricted, and where front-access drives should be restricted.

Front drive restrictions are shown in **Figure 6-2**, based on street classification and volumes. As previously mentioned in Section 5.4, a front drive restriction was not applied to the segment of Claire Promenade north of the school. As the residential properties north of the school do not have rear lane access, front driveways must be provided. The daily traffic volumes on this segment of Claire Promenade are 6,000 vpd, which falls below the City's 7,000 vpd threshold for front drive restrictions.

On busier local streets which access collectors and are near to higher density housing, the volume of on-street parking can create operational issues near intersections. To mitigate this, the TIA identified which local roads should be built to a wider carriageway. This is shown in the recommended road classification **Figure 6-3**. Note that the figure includes an alternate configuration where dead-end lanes exist within the outline plan area. This alternate configuration allows for the lane to exit back onto the neighbourhood streets and has been provided to facilitate rear waste and recycling pick-up if it is required in the future.

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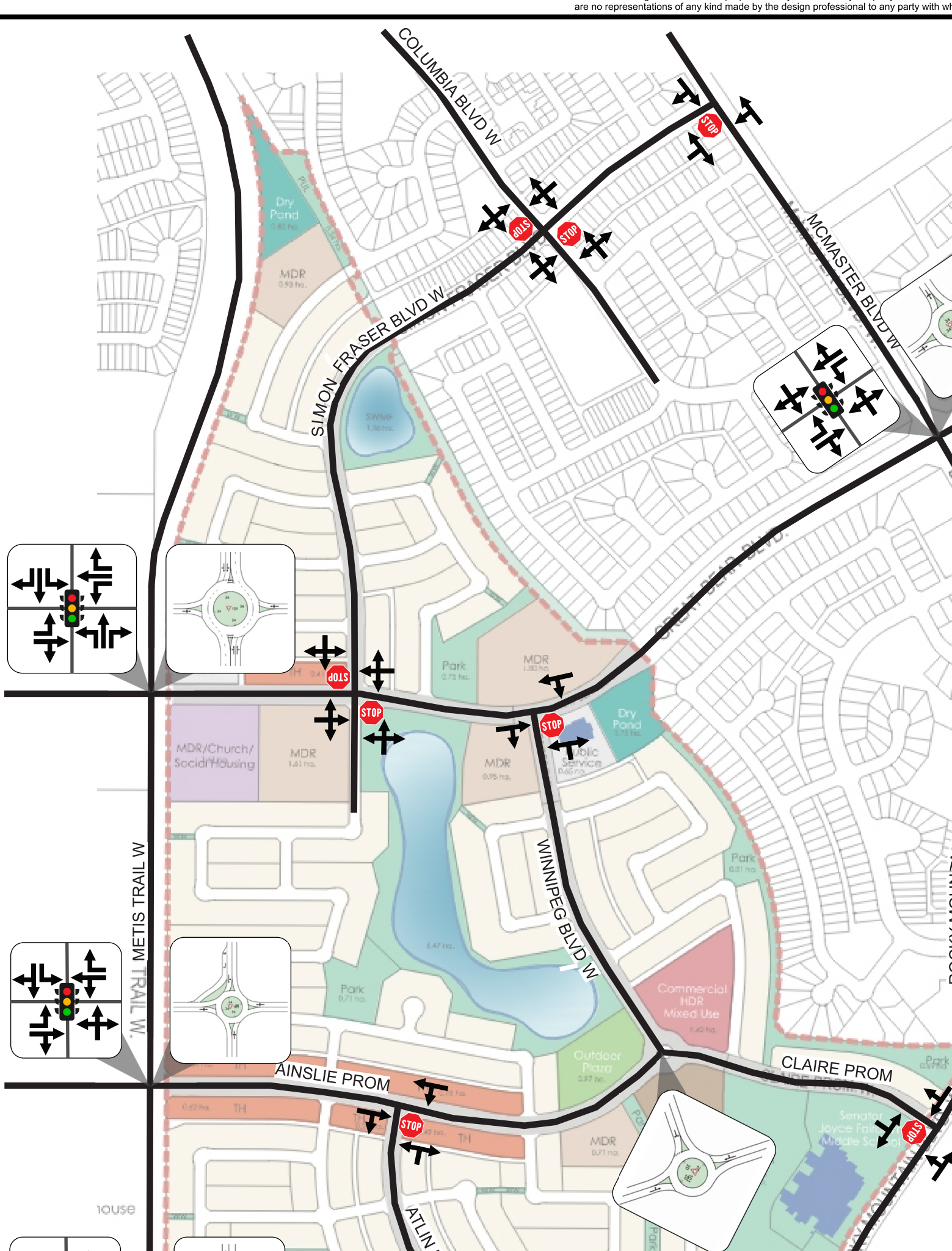

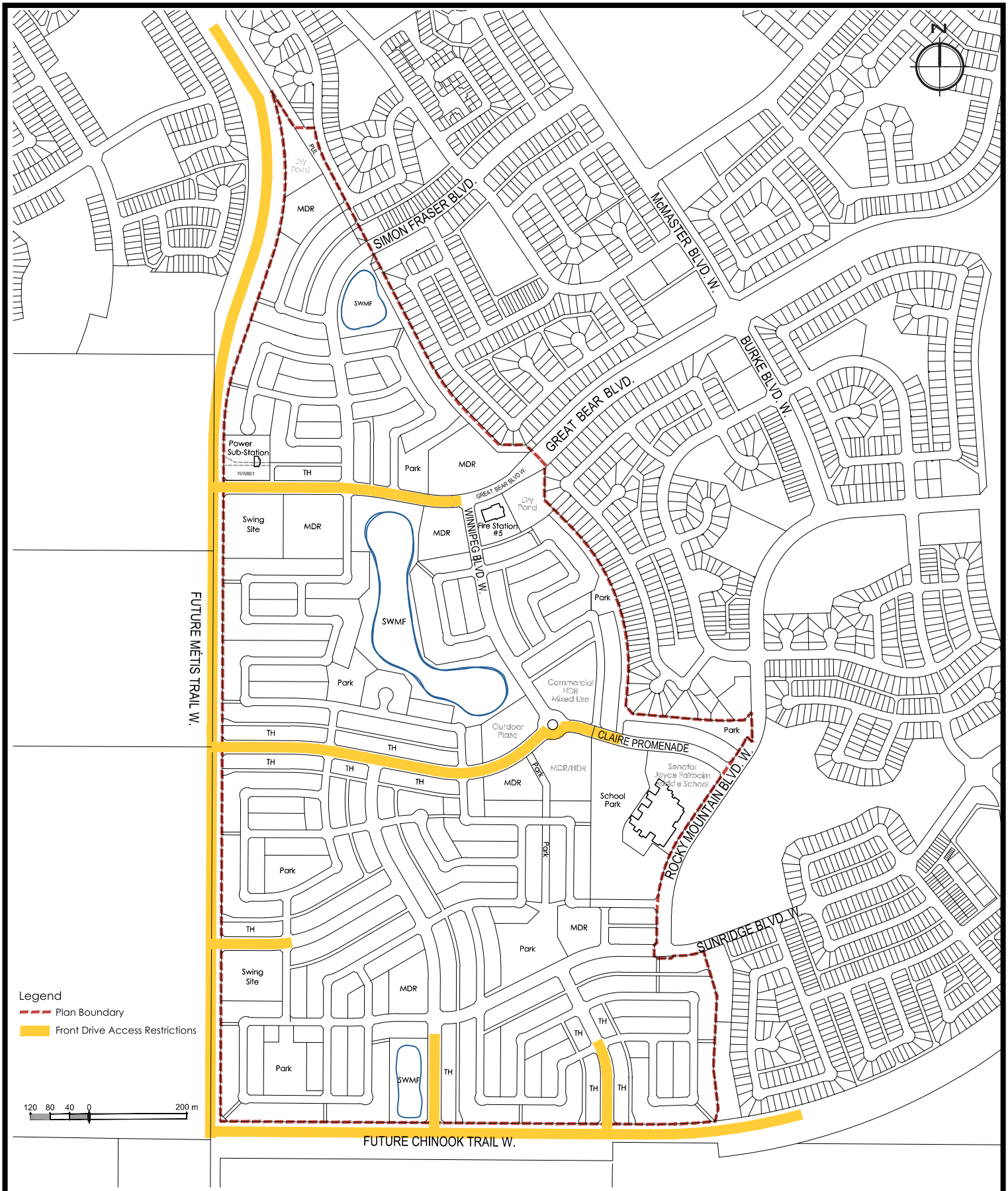

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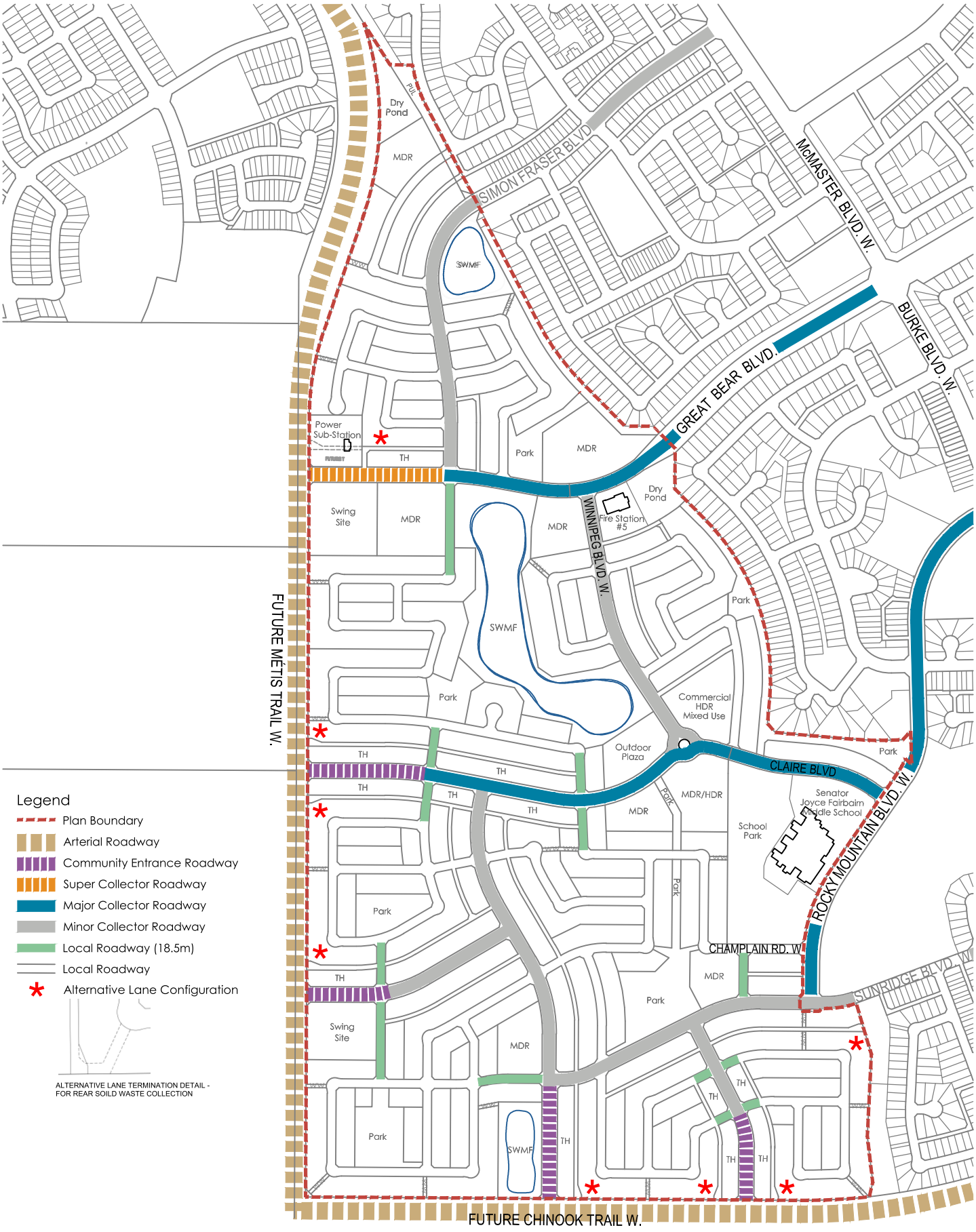
Figure 6-2
Front Drive Restrictions
Watermark Outline Plan Amendment Transportation Impact Assessment



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Aerial Imagery: n/a
Note: All Dimensions shown in Metres unless otherwise noted

Figure 6-3
Recommended Road Classification
Watermark Outline Plan Amendment Transportation Impact Assessment

6.4 CHINOOK TRAIL AND METIS TRAIL PHASING

This study recommends the build out of Chinook Trail at some time during the build out of the Watermark Outline Plan. A phasing plan for the Outline Plan Area is shown in **Figure 6-4.**

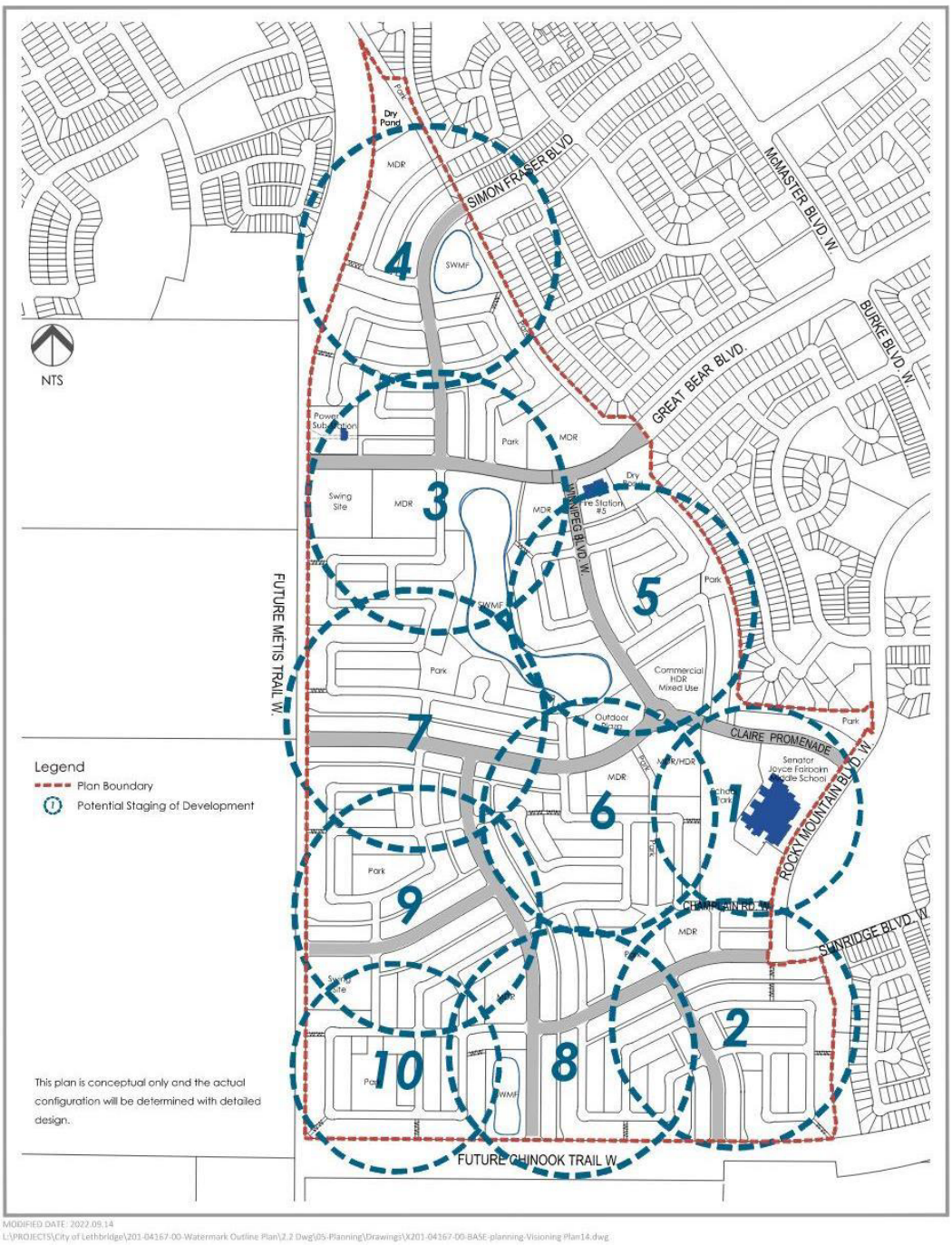


Figure 6-4 Watermark Outline Plan Phasing

Based on this phasing, the first phases of the plan area will build out with access through the existing collector roads on Sunridge Boulevard and Rocky Mountain Boulevard. The TIA identifies a total of approximately 5,000 ADT through the first two phases, which can currently be accommodated on the available capacity on the existing Sunridge Boulevard and Rocky Mountain Boulevard. Phases 3 and 4 will require the extension of Great Bear Boulevard west to connect with Metis Trail and upgrades to Metris Trail between Great Bear Boulevard and the existing roundabout at Coalbrook Gate W. The implementation of Phases 5, 6 and 7, will require improves further south on Metis Trail to the intersection of Claire Promenade.

Finally, with the completion of Phases 8, 9 and 10, the road network should be full built-out as shown in Figure 6-3 including the construction of Chinook Trail. Without the implementation of the Chinook Trail connection by the completion of the project, some of these trips may redirect up Metis Trail, but many will instead redirect through the neighbourhood streets, which will not have sufficient available capacity to carry that traffic. WSP recommends that the complete connection between Metis Trail and Chinook Trail is built prior to initiation of the final phase of the project.

7 TRANSIT

7.1 FUTURE TRANSIT NETWORK

Lethbridge Transit's new network, cityLINK launched September 2021. cityLINK will provide a combination of high frequency fixed routes in high demand areas with demand response service in lower ridership areas. Proposed within that plan include a Neighbourhood Link on Sunridge Boulevard W and Rocky Mountain Boulevard W, with a proposed Terminal on Sunridge Boulevard.

Future transit routes within Watermark will be determined as build out occurs. However, the road network and associated active modes network have been developed with a consideration for future transit, which includes collector roads that can accommodate buses and a highly walkable and bikeable network that will encourage ease of use for first mile last mile trips.

8 ACTIVE MODES

8.1 EXISTING CONDITIONS

Because there is limited road network within the study area, there are also limited walking and cycling facilities. Key existing or planned external connections include:

- *Metis Trail* – has an existing or planned multi-use trail (3.0 m) on the east side of the road. This facility is planned to extend south with the extension of Metis Trail
- *Macleod Dr W* – There are paved 3.0 m multi-use trails on the north and south side of Macleod Drive east of McMaster Blvd W.

There are no other significant on-street facilities adjacent into the study area. Nearby parks, and notably around Senator Joyce Fairbairn Middle School are well circulated with paved pathways. The existing active modes network is the study area is shown in **Figure 8-1**.

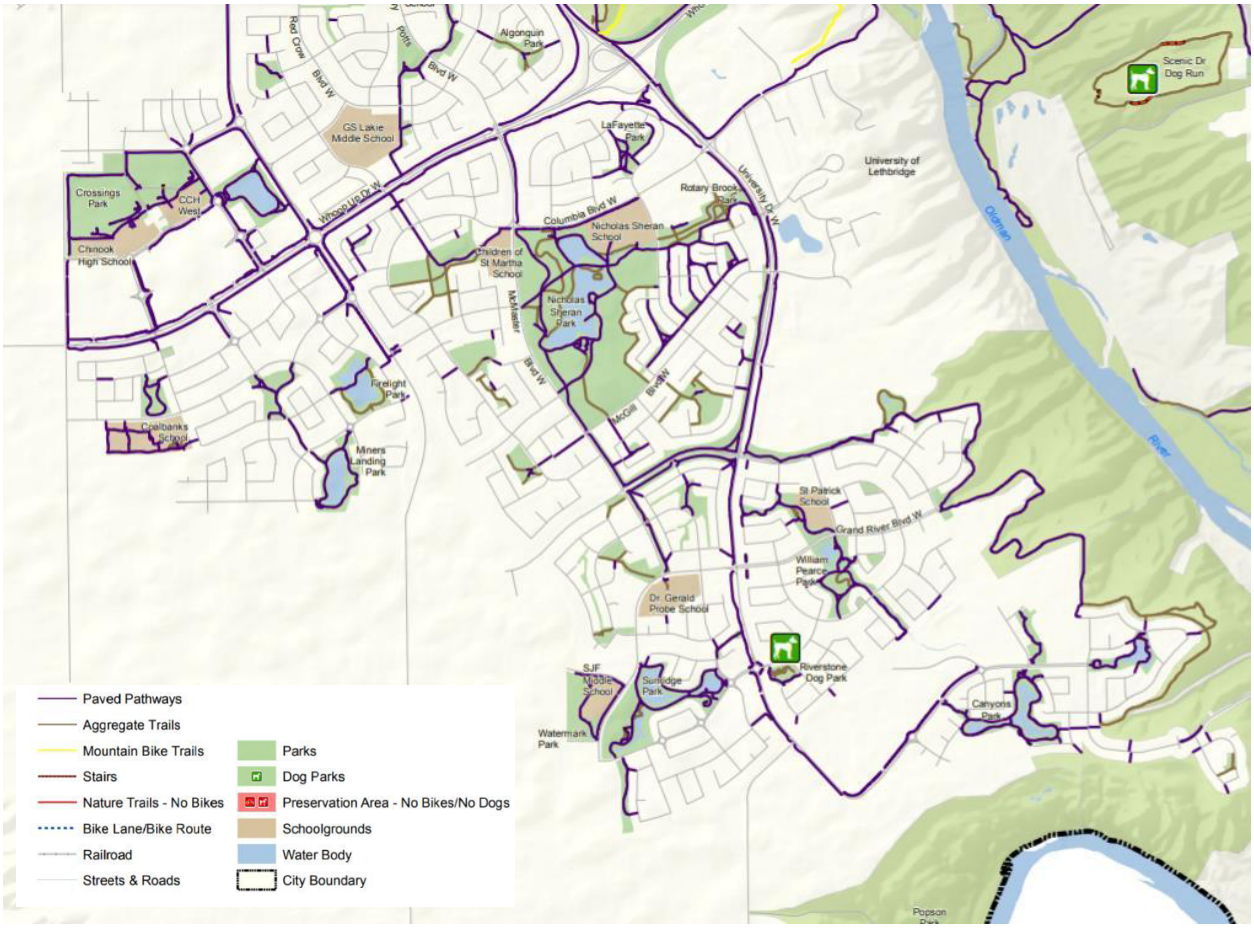


Figure 8-1 Existing Active Modes Network

8.2 RECOMMENDED ACTIVE MODES NETWORK

The active modes network for the Watermark Outline Plan is focused on providing a mixture of connectivity for recreation between green spaces and safe routes on and off street for people moving between their homes and destinations outside of the Outline Plan area.

Metis Trail and Chinook Trail should include a multi-use trail on at least one side, with eventual trails on both sides when development extends to the west and south of Watermark.

According to the Cycling Master Plan, if a road has ADT of less than 4000 VPD and a speed limit of between 30 – 50km/h, a painted on-street bike lane is an acceptable cycling facility. While this classification is acceptable from a safety perspective on some of the minor collector roads in the Outline Plan Area, we have recommended implementing a multi-use trail on one side of the road for all collector roads in the study area. This will improve legibility of the network, safety at crossings at intersections, and will be more easily implemented through adaptation of the existing cross sections.

Based on that, the recommended active modes network is shown on **Figure 8-2**.

Along Winnipeg Boulevard W and Claire Promenade, two locations were identified where rear lane access is not available and therefore front driveways will be required. These two locations are illustrated in **Figure 8-3** below. To avoid potential conflicts between multi-use trails and front driveways, the multi-use trail should be located along the east side of Winnipeg Boulevard W and the south side of Claire Promenade.

8.2.1 CROSSING CONTROL

Figure 8-2 shows key locations for priority crossing, where traffic calming in the form of curb extensions and appropriate crossing controls must be considered.

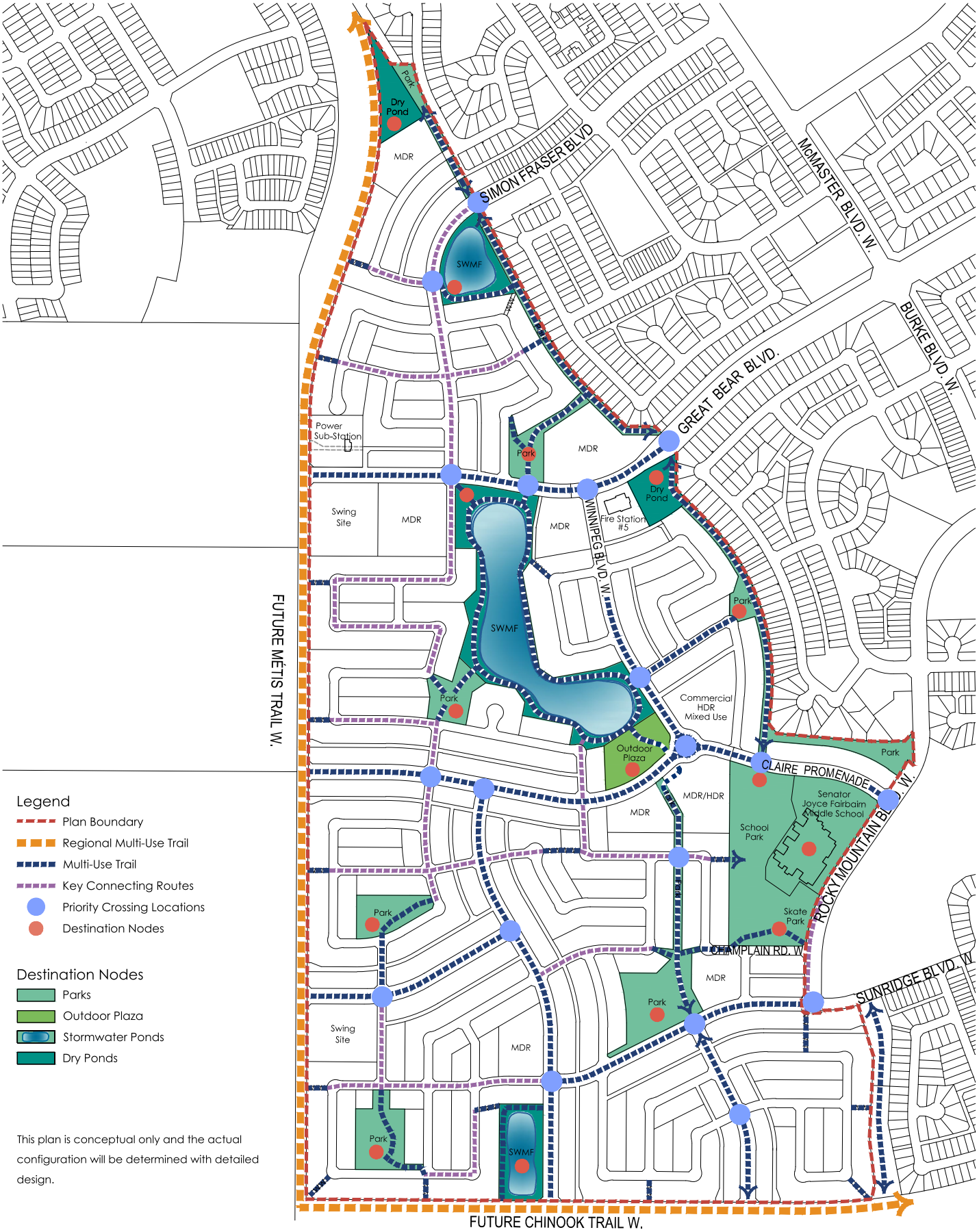
The 2018 TAC Pedestrian Crossing Control Guide provides a warrant procedure for pedestrian crossing control based on a combination of pedestrian volumes, traffic volumes, proximity to other traffic control devices, pedestrian desire lines, or if the location is needed for connectivity.

The minimum threshold for pedestrian crossing control treatments is 100 Equivalent Adult Units over a 7 hour period, which translates to approximately 15 per hour. The minimum traffic volumes at which pedestrian crossing controls should be considered is 1,500 vehicles/day. There are no pedestrian/cycling volumes estimated as part of this analysis. However, the traffic warrant is met at all collectors in the Watermark Study Area.

All identified Priority Crossing Locations in Figure 8-2 should be considered for pedestrian crossing control treatment. The following guidelines, based on the TAC Crossing Control Guideline should be considered:

- Collectors with less than 9000 ADT and speed limit at 50 km/h (which includes all minor collectors in the study area) can be serviced with a Ground Mounted System that includes passive signs (no flashing lights) and marked on-street crossing.
- Collectors with a volume between 4500 and 9000 ADT and a speed limit of 60 km/h (which may include major collectors in the study area), should include an enhanced ground mounted system which should have zebra crossing markings and may include other features like overhead signs and curb extensions. An enhanced ground mounted system is recommended at all major collector crosswalk locations for the Watermark Outline Plan Area.

- Rectangular Rapid Flashing Beacons are warranted in locations with volumes in excess of 9000 ADT where the speed limit is greater than 50 km/h. This is not currently met at any location in the Watermark Outline Plan Area, but could be considered on Great Bear Boulevard, where volumes are higher.



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Issue Date - 2023-01-04
Scale: NTS
Aerial Imagery: n/a
Note: All Dimensions shown in Metres unless otherwise noted

Figure 8-2
Recommended Active Modes Network
Watermark Outline Plan Amendment Transportation Impact Assessment

Figure 8-3 Potential Front Drive and Multi-use Trail Conflict Zones

8.3 UPDATED CROSS SECTIONS

To accommodate the active mode recommendation of multi-use trails on Community Entrance Roads, Major Collectors, and Minor Collectors, an adjustment to the existing City of Lethbridge Cross Sections will be needed. All three of these classification types currently include an option with 1.5 m separated sidewalks on both sides of the right of way. A high-level review of these cross sections indicate that it is possible to provide the required 3.0 m multi-use trail within the existing right of way through some adjustments to the transformer space and space provided for trees/lights. Discussions with electrical indicate that the currently allocated 1.1 m for transformer outside of the sidewalk can be reduced to 0.5 m. The additional space needed for the multi-use trail can be taken by reducing the space between the streetlight and the multi-use trail on the Community Entrance Road and Minor Collector. This same adjustment could be considered on the Major Collector, though a review of the lane widths on the carriage way indicate that there may be opportunity to narrow lanes and provide more space to the active modes though that adjustment.

No adjustment to the overall right of way is needed to accommodate the multi-use trails and then details of design can be considered at future stages of plan implementation.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 OVERVIEW

This TIA identifies the transportation infrastructure needed to support the long-term build out of the Watermark Outline Plan.

The full build of the area is anticipated to take approximately 30 years. The Watermark Outline Plan area includes almost 2,400 residential units, with an additional 1,700 units in Waterbridge West. Both development areas are included in the analysis volumes.

At full build of the study area, it is assumed that Chinook Trail and the extension of Metis Trail south will be constructed within the study area.

9.2 ROAD NETWORK

The full build-out traffic volumes were analyzed to determine if any capacity or delay issues arise as a result of the traffic generated by Watermark and Waterbridge West. Based on an initial review, it was determined that the new intersections along Metis Trail at Great Bear Boulevard W, Claire Promenade, Wollaston Blvd and Chinook Trail would not continue to function as single-lane, two-way stop-control intersections. Additionally, the existing intersection at McMaster Boulevard W & Great Bear Boulevard W would also require improvements. These intersections were modelled as both signalized intersections and as roundabouts.

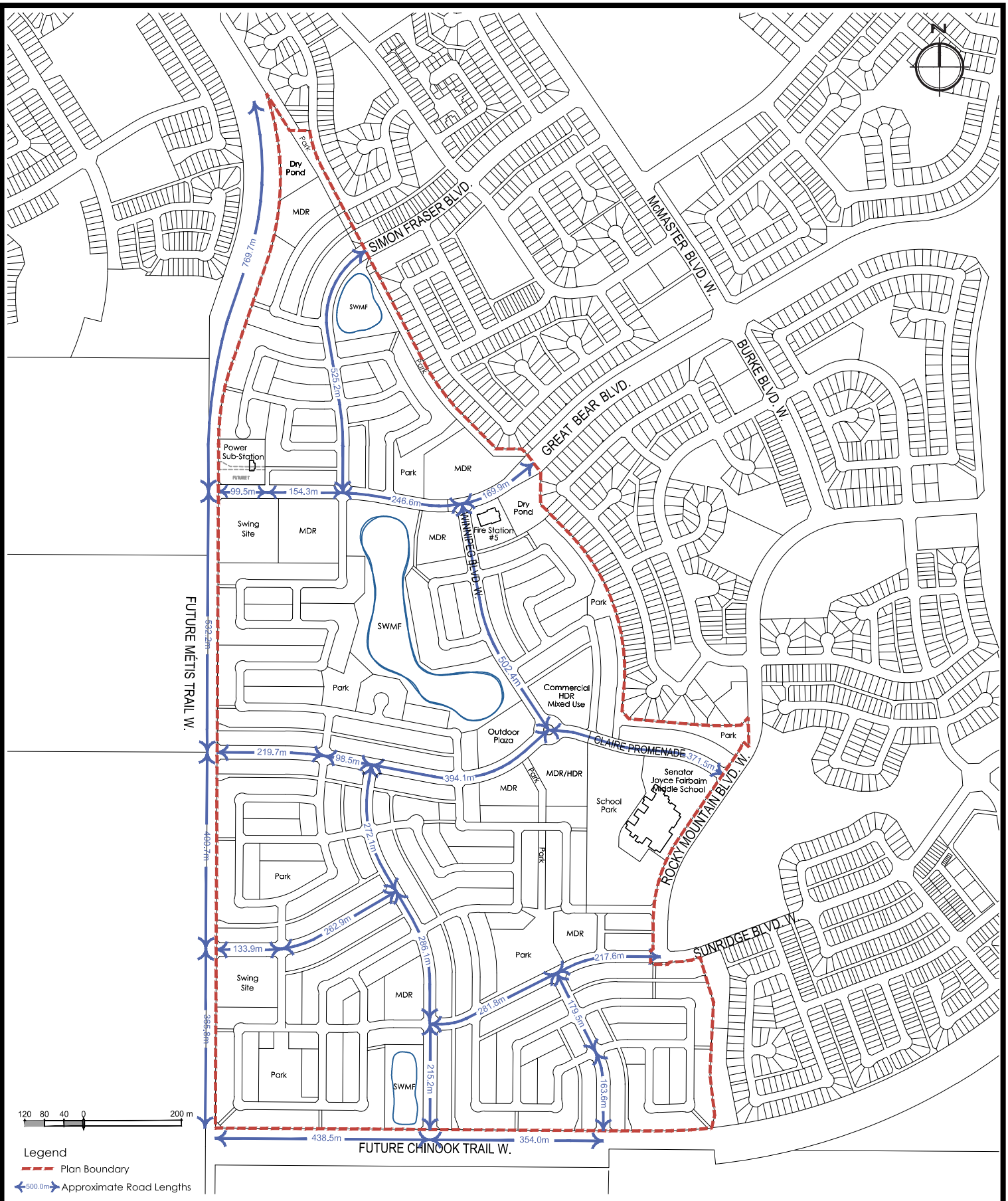
With the exception of the intersection of Claire Promenade and Winnipeg Boulevard W, which is planned to be a single lane roundabout regardless of traffic volumes, all internal collector intersections within Watermark will function as single lane stop-controlled intersections.

The recommended intersection configurations for locations with requirements beyond single lane stop controlled are summarized in **Table 9-1** and were illustrated in **Figure 6-1**.

Table 9-1: Recommended Intersection Upgrades

INTERSECTION	CONFIGURATION
Metis Trail/Great Bear Boulevard	Two lane roundabout with single lane approaches for EB and WB OR Single lane signalized with left and right turn bays for WB, NB and SB. EB approach requires left turn bay and shared through right lane.
Metis Trail/Claire Promenade	Single lane roundabout with southbound right slip lane OR Single lane signalized intersection with left turn bay for southbound and eastbound and right turn bay for westbound right.
Metis Trail/Wollaston Blvd	Single lane roundabout OR Single lane signalized intersection with no turn bays needed
Metis Trail/Chinook Trail	Single lane roundabout OR Single lane signalized intersection with no turn bays needed
Chinook Trail/Atlin Boulevard	Single lane stop controlled in SB direction.
Chinook Trail/Bistcho Boulevard	Single lane stop controlled in SB direction.
Great Bear Boulevard/McMaster Boulevard W	Single lane roundabout OR Signalized with left turn bay for EB and WB direction.

The collector streets are a mixture of Community Entrance Roads, Super Collectors, Major Collectors and Minor Collectors as previously illustrated in **Figure 6-3.** Link lengths are shown in **Figure 9-1.** Note that on Super Collector roads, minimum access spacing is 200m for all-turns accesses. Therefore, the laneway / swing site access to Great Bear Boulevard will need to be a limited movements access. The access configuration will be determined through later design stages.



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Aerial Imagery: n/a
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Figure 9-1
Link Lengths
Watermark Outline Plan Amendment Transportation Impact Assessment

DRAWING: FIG-201-04167-Watermark TIA Figures-20210611.cdr DATE: 2021-06-24 DRAWN BY: faberk

9.3 TRANSIT NETWORK

WSP has not identified a recommended transit network at this time. All collector streets can accommodate transit facilities. Stops should be provided at key destinations within the area.

9.4 ACTIVE MODES NETWORK

The active modes network for the Watermark Outline Plan is focused on providing a mixture of connectivity for recreation between green spaces and safe routes on and off street for people moving between their homes and destinations outside of the Outline Plan area.

Off-street multi-use trails are recommended on the collector roads in the Outline Plan area. This will require an evaluation of the current cross sections, but should be able to be accommodated within the existing proposed right of ways. In addition to the infrastructure paralleling the streets, we have also identified a network of priority connecting routes through the neighbourhood, and priority crossing locations where traffic calming and appropriate pedestrian crossing infrastructure must be included.

APPENDIX

A EXISTING TRAFFIC VOLUMES

CITY OF Lethbridge

Infrastructure Services

Technical Memorandum

April 22, 2021

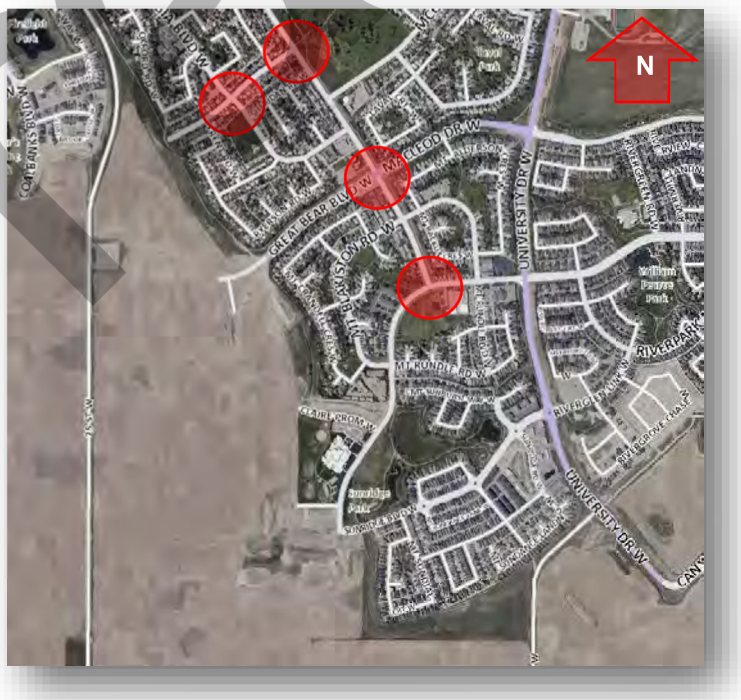
Carolyn Sherstone, P.Eng.

Alberta Manager | Transportation Planning

Subject:

Existing Traffic Volume Estimates at Select Intersections

The traffic volume estimates presented in this memorandum are to be used as background traffic volumes for the Watermark TIA. The intersections for which background traffic volume estimates are being provided are:

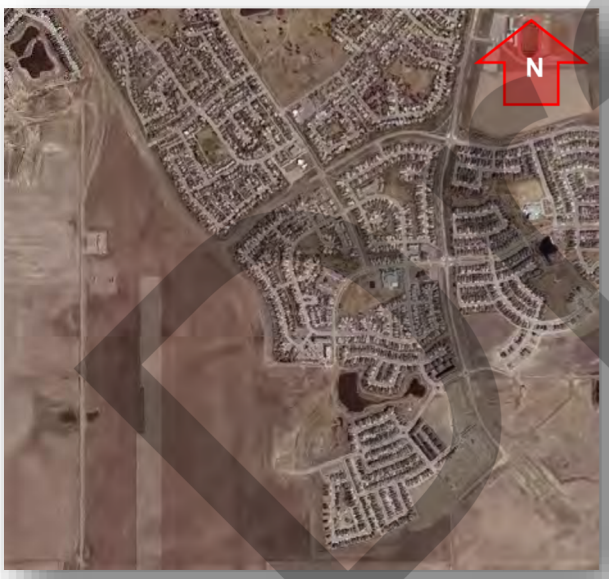


- Columbia Boulevard W at Simon Fraser Boulevard W
- McMaster Boulevard W at Simon Fraser Boulevard W
- McMaster Boulevard W / Mt Burke Boulevard W at Great Bear Boulevard W / Macleod Drive W
- Mt Burke Boulevard W at Rocky Mountain Boulevard W

The City has turning movement counts available as follows:

- Columbia Boulevard W at Simon Fraser Boulevard W: March 2021; counted during the COVID-19 pandemic.
- McMaster Boulevard W at Simon Fraser Boulevard W: October 2013; very old turning movement count.
- McMaster Boulevard W / Mt Burke Boulevard W at Great Bear Boulevard W / Macleod Drive W: January 2016.
- Mt Burke Boulevard W at Rocky Mountain Boulevard W: January 2016 and January 2019.

Based on aerial photos from 2013 and 2019, the area for which traffic volumes are being developed does not appear to have experienced significant development from 2013 through 2019, with the exception being the connection of Rocky Mountain Boulevard W with Sunridge Boulevard W and the installation of a new school (Senator Joyce Fairbairn Middle School) on Rocky Mountain Boulevard W in the Watermark neighbourhood.



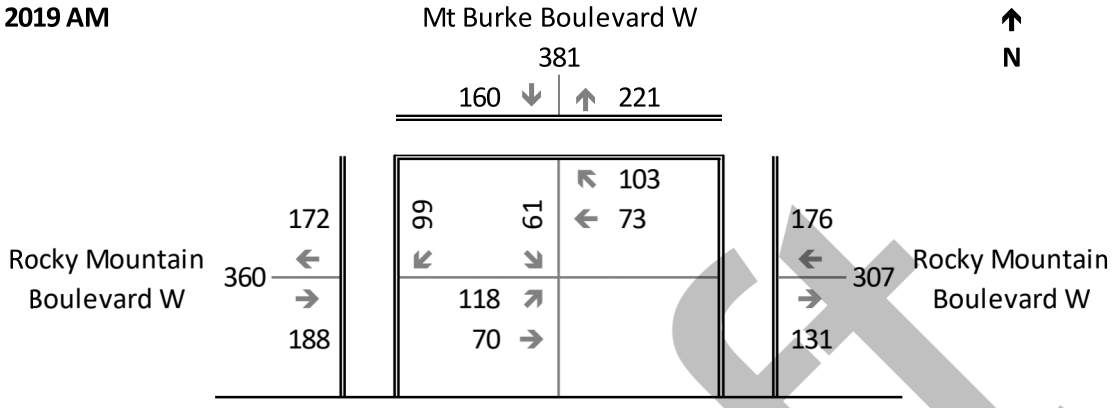
2013

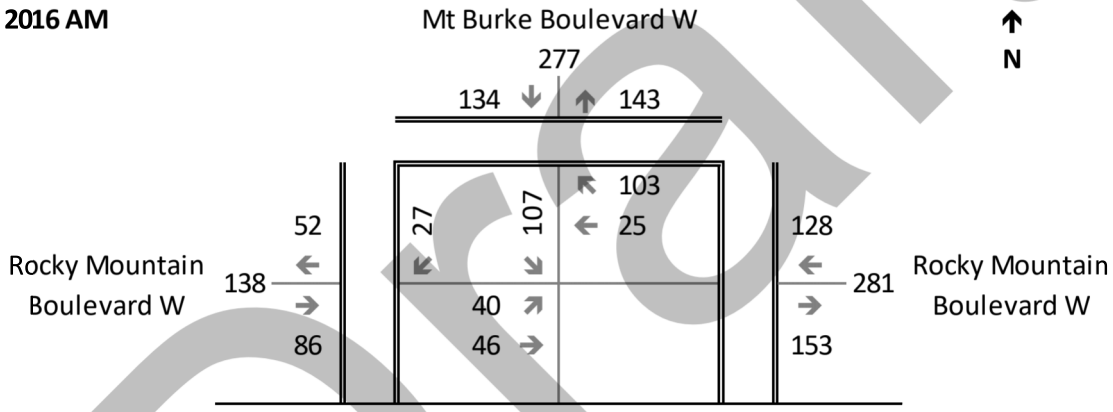
2019

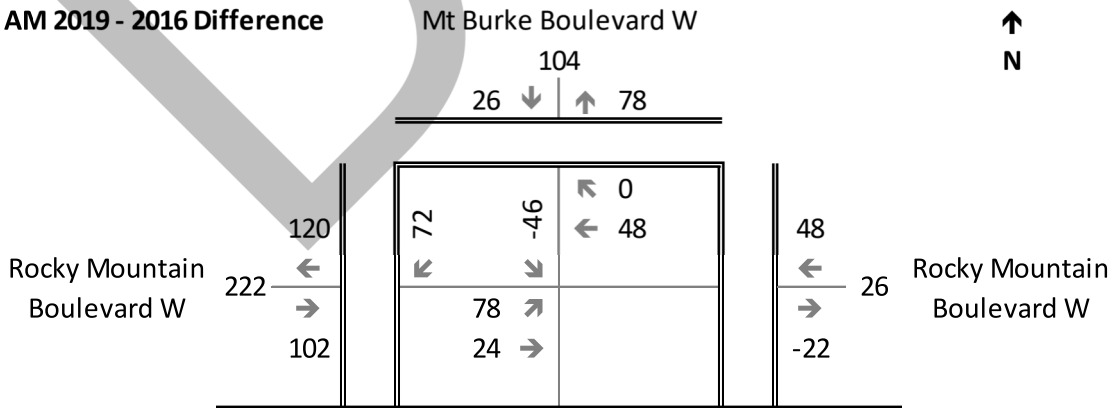
Construction on Rocky Mountain Boulevard W and the school site started in 2016. The school opened in 2018 and associated traffic volumes are reflected in the 2019 turning movement count at the intersection of Rocky Mountain Boulevard W at Mt Burke Boulevard W.

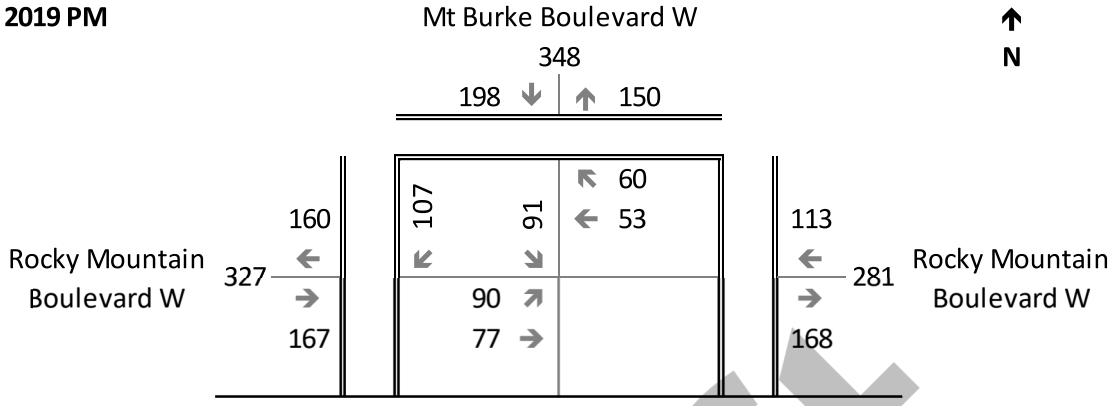
The City has turning movement counts available from both 2016 and 2019 for the intersection of Rocky Mountain Boulevard W at Mt Burke Boulevard W. Both the 2016 and 2019 counts were completed on a

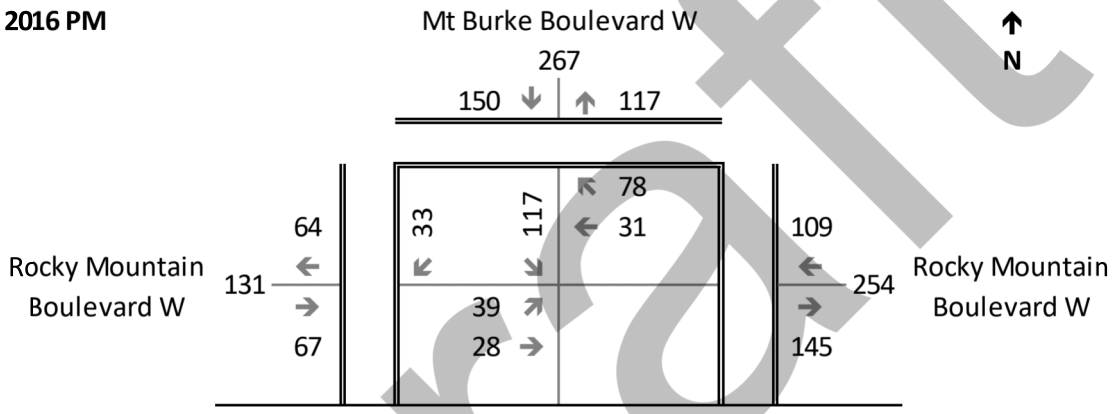
Tuesday in late January (for the 2016 count, this would have been before the road and school construction).

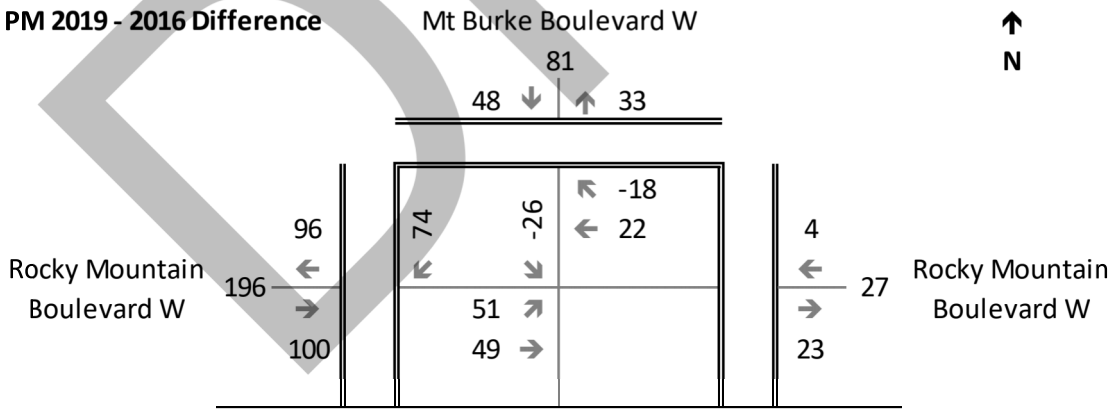












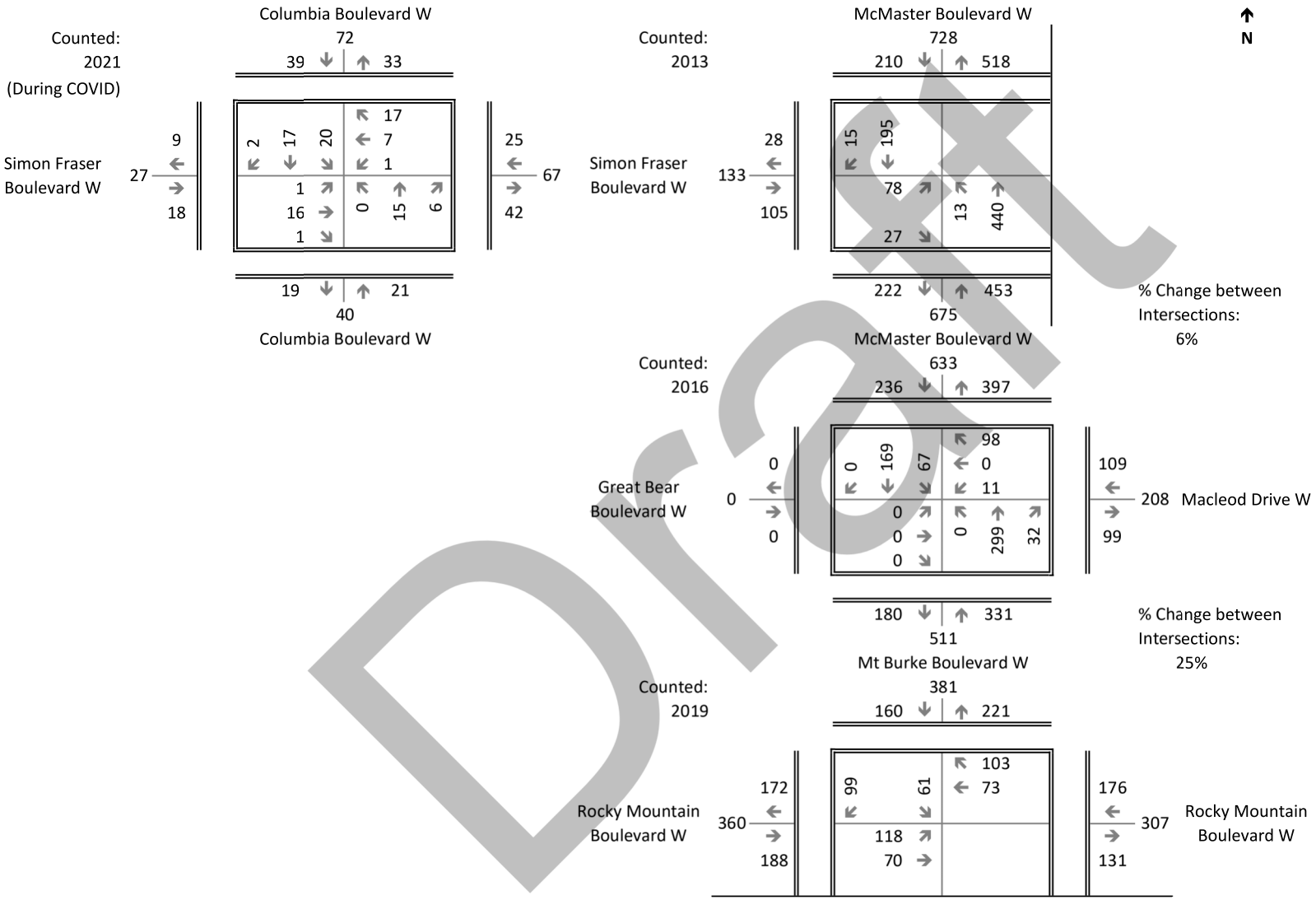
Comparing the volumes along Mt Burke Boulevard W, volumes have increased since the school opened on Mt Burke Boulevard W north of Rocky Mountain Boulevard W. To adjust the traffic volumes along Mt Burke Boulevard W and McMaster Boulevard W to reflect changes resulting from the new school at the intersections counted before the school opened in 2018, the difference in volumes is propagated back along the roads. Between the analysis intersections, direct driveway accesses to adjacent land uses and

other intersecting roads are present. These driveways and intersections provide opportunities for traffic to enter or exit the roadways and the volumes are adjusted according to the difference in volumes between the analysis intersections.

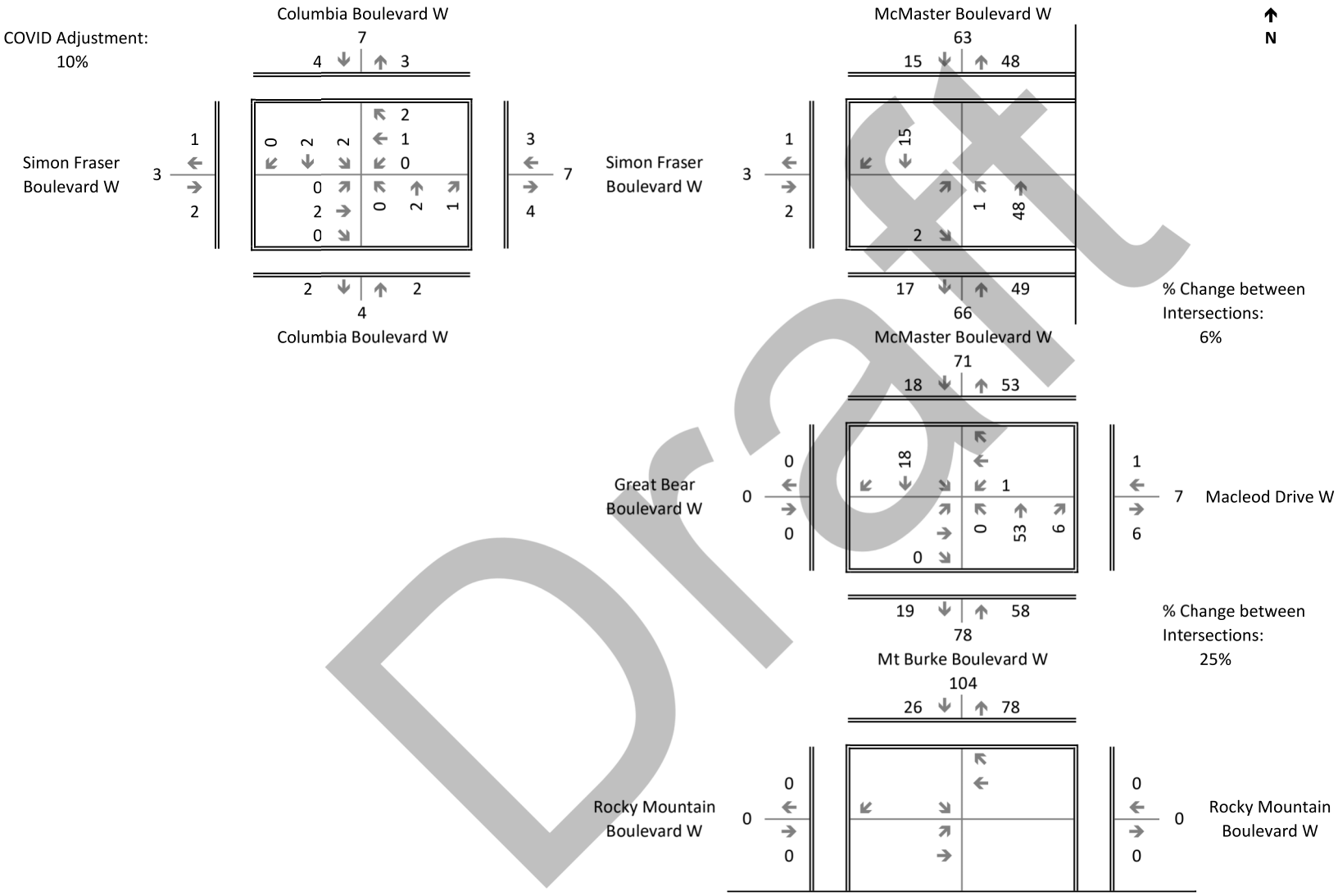
For the adjustments between intersections, the difference between the total two-way traffic is used. Another option would have been to use directional changes, however, this would have resulted in a large decrease in additional traffic between the Rocky Mountain Boulevard W and Macleod Drive W intersections, which seemed unreasonable as this area is likely within walking distance of the school, meaning there should be a lower impact on vehicle trip changes. Using the two-way traffic difference, the reduction is lower. At the analysis intersections, the additional incoming and outgoing traffic volumes are distributed proportionally to the volumes from the turning movement counts.

The intersection of Columbia Boulevard W at Simon Fraser Boulevard W was counted during the COVID-19 pandemic during March 2021. This would be around the time of the beginning of the third wave of the pandemic in Alberta. Traffic counts were completed at various locations around the city in November/December 2020 during the beginning of the second wave and compared to pre-pandemic traffic counts. Traffic volumes were approximately 10% lower in the November/December 2020 counts, compared to pre-pandemic traffic counts at the same locations. Similar counts were conducted at the height of the first wave during lockdowns, which indicated an approximately 30% decrease in traffic volumes. Due to the similarities in circumstance between the March 2021 counts and the November/December 2020 counts, traffic volumes for the intersection of Columbia Boulevard W at Simon Fraser Boulevard W are grown 10% to better reflect traffic volumes beyond the pandemic. The intersection of Columbia Boulevard W at Simon Fraser Boulevard W was not adjusted to account for additional school related traffic as school related traffic should be included in the 2021 turning movement counts, as in-person classes appear to have been in progress at the new school at the time of the traffic count.

AM Raw Turning Movement Counts

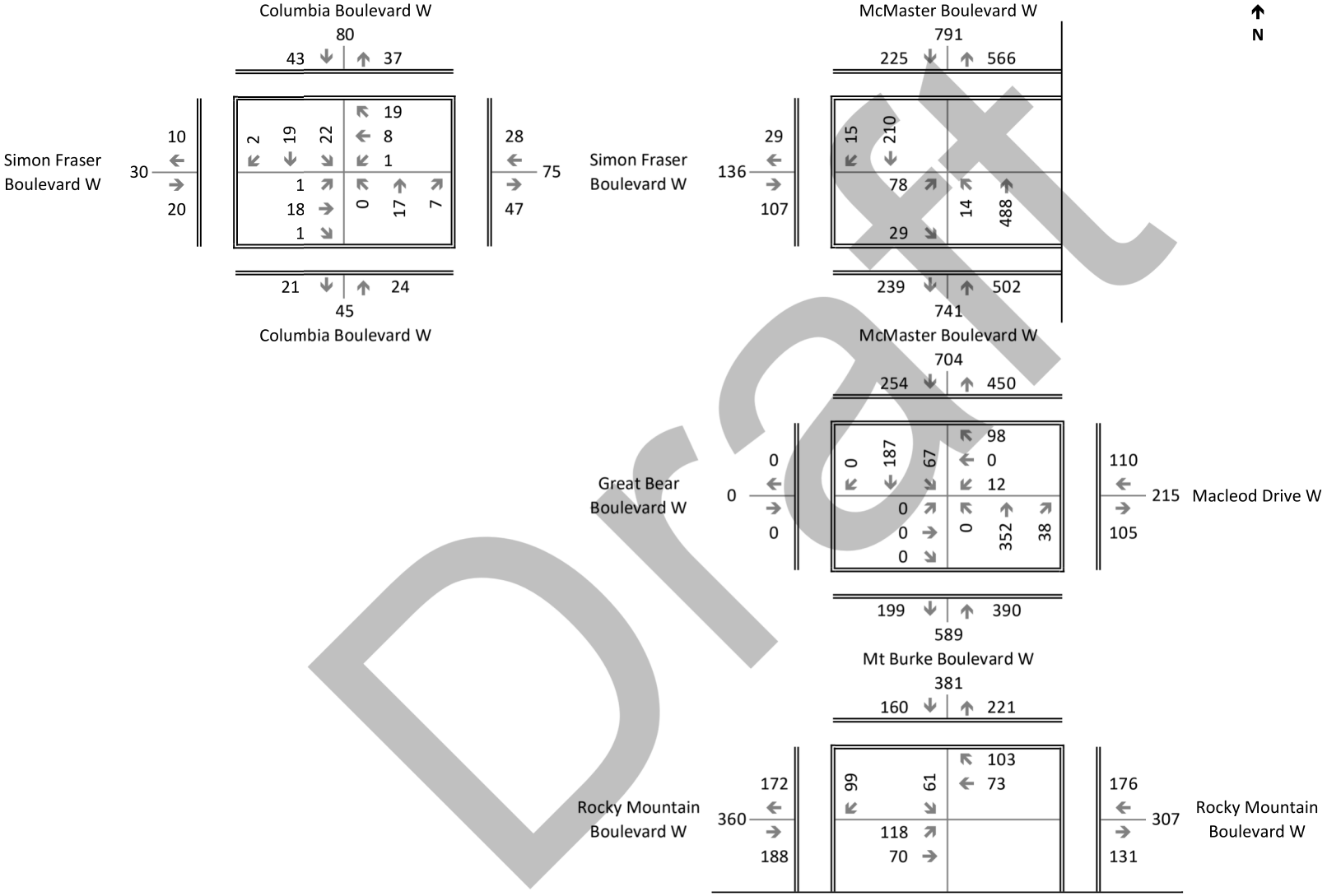


AM Adjustments

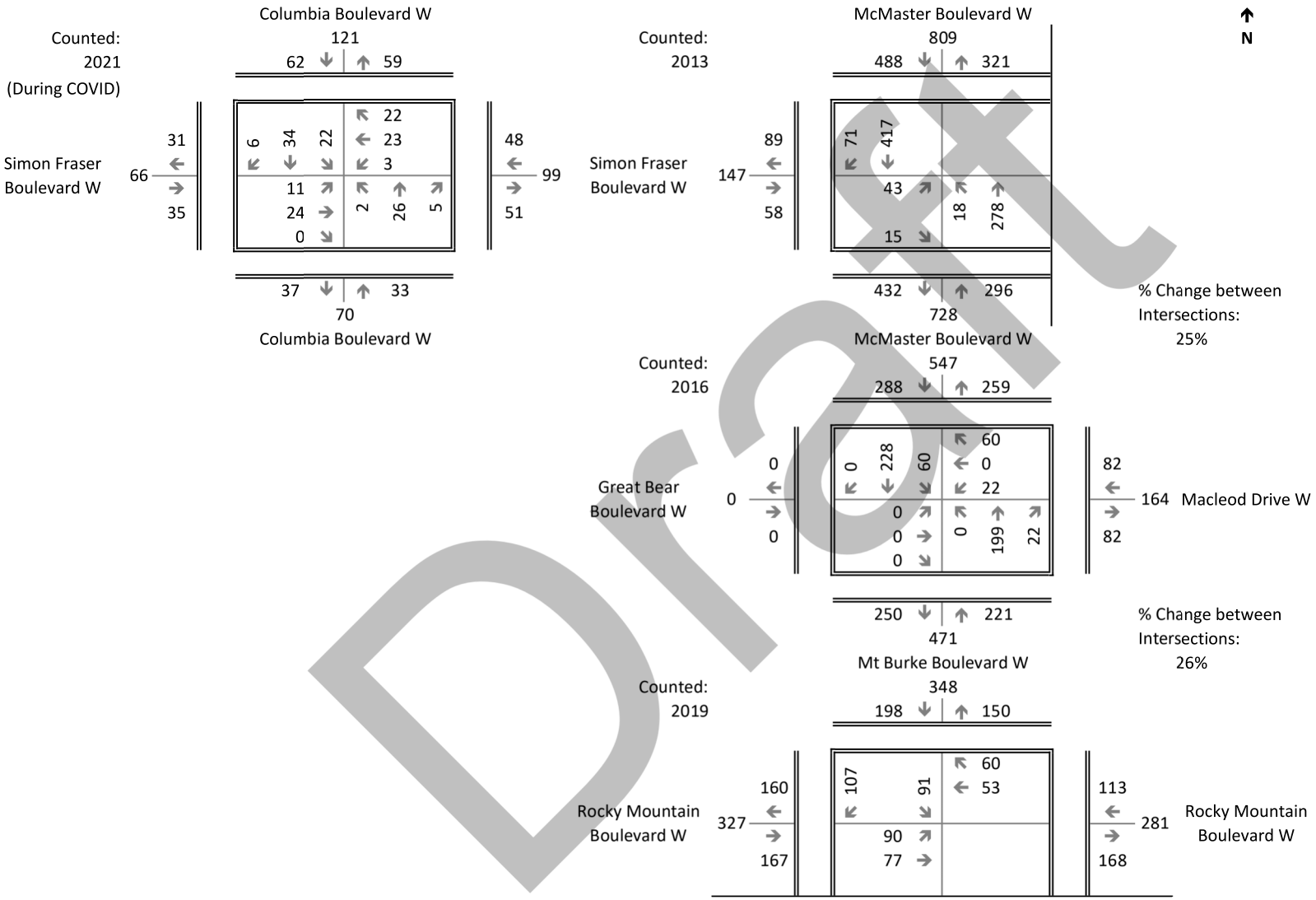


AM Background Traffic for Watermark TIA

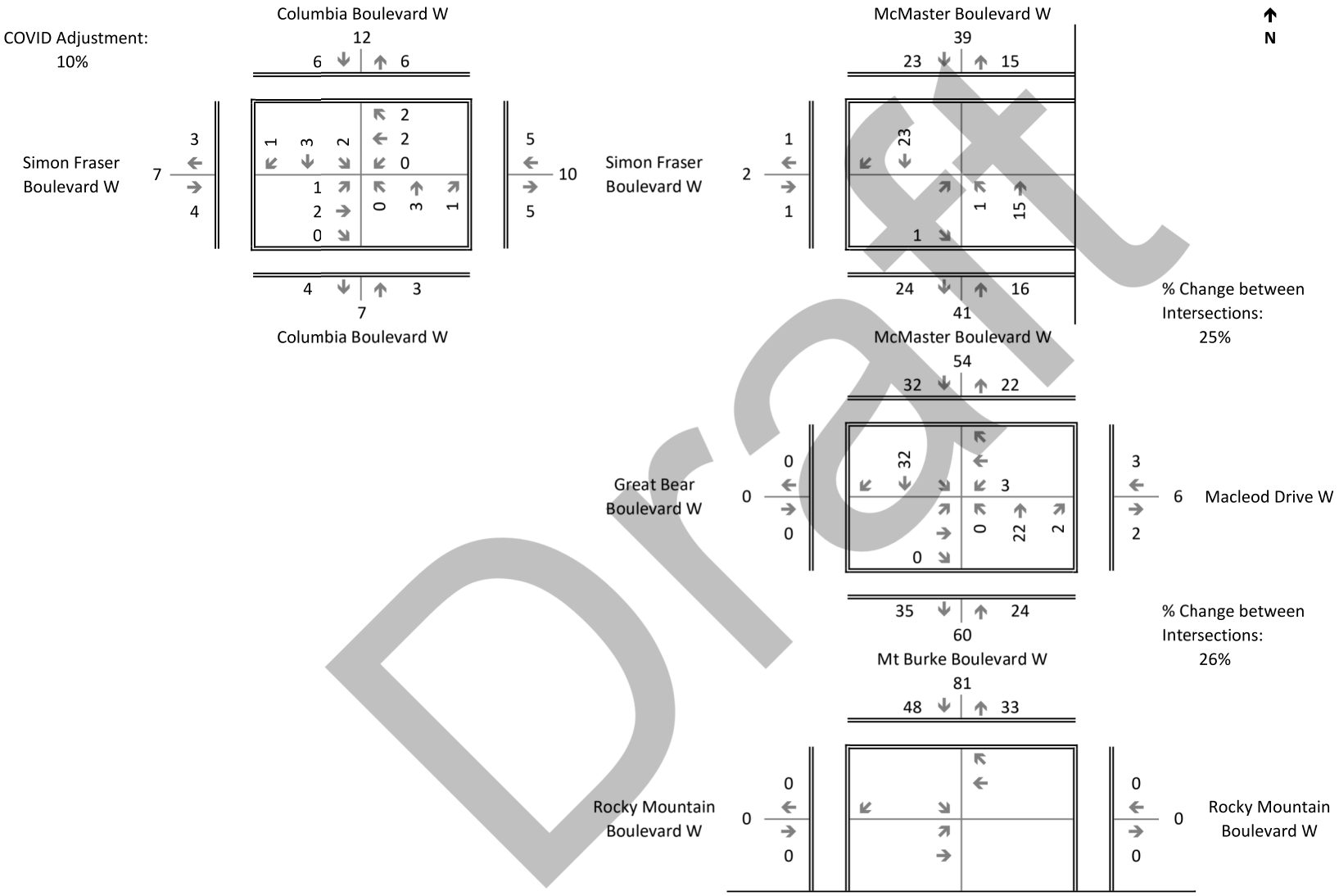
(All rounding takes place here.)



PM Raw Turning Movement Counts

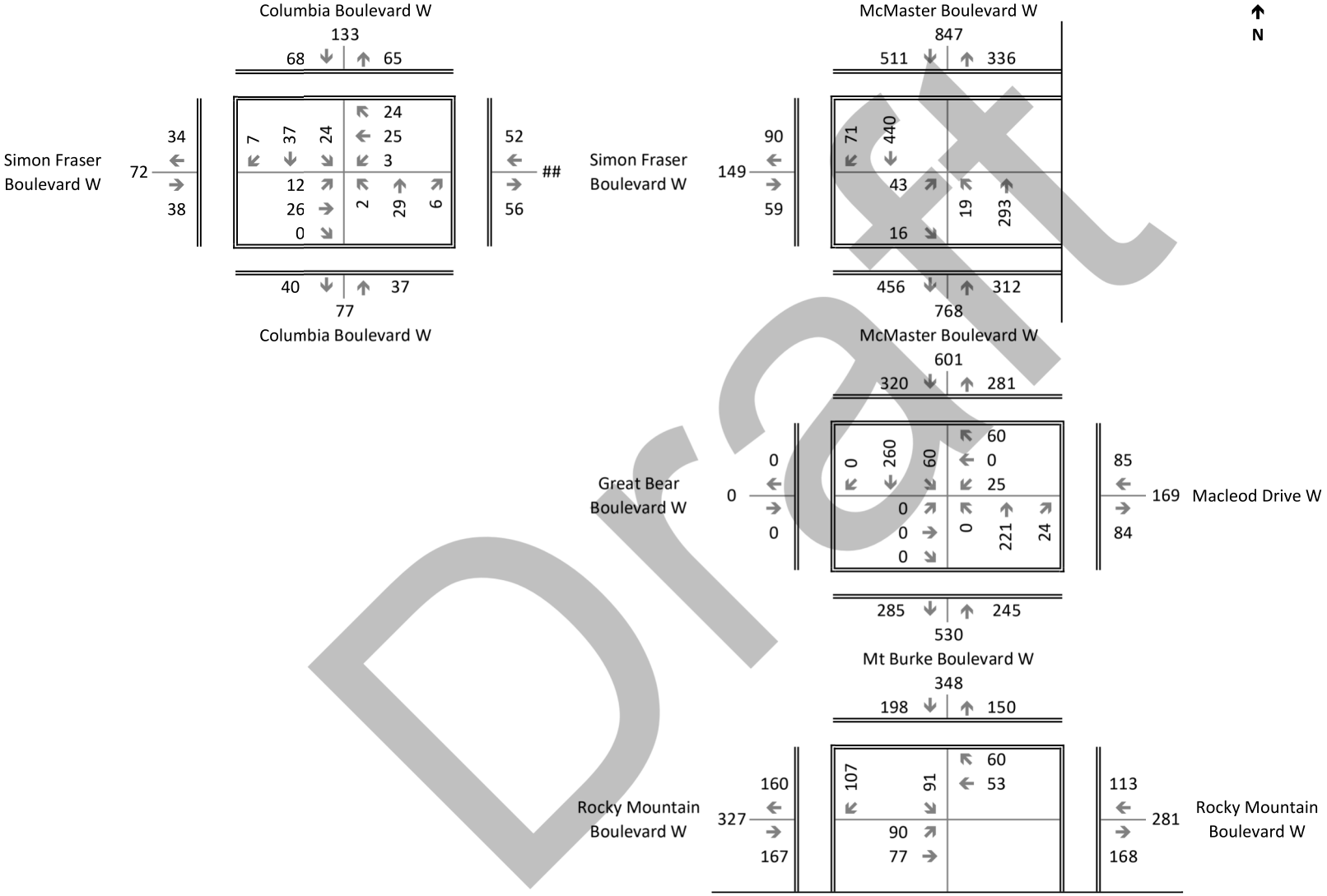


PM Adjustments



PM Background Traffic for Watermark TIA

(All rounding takes place here.)



APPENDIX

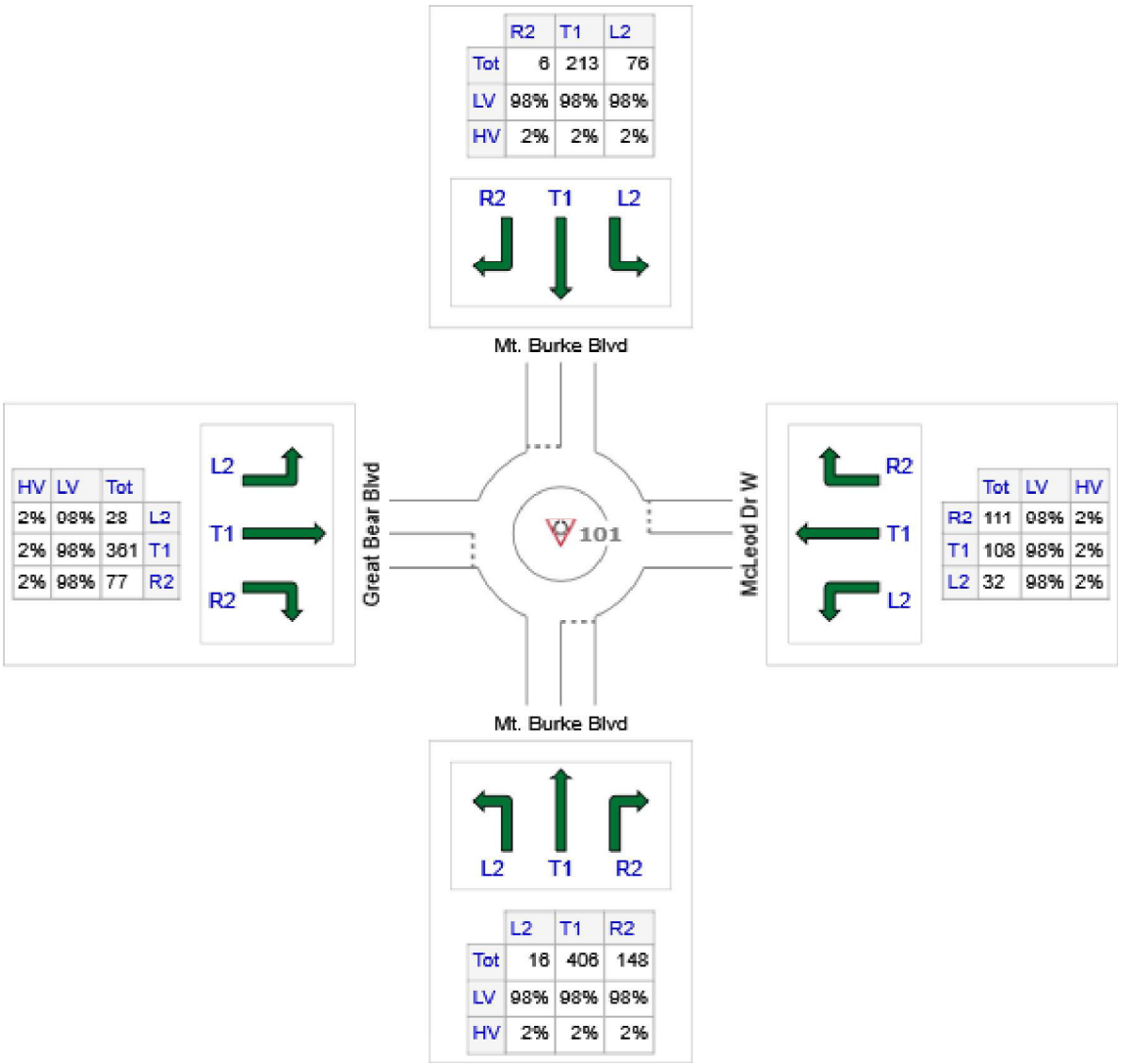
B SYNCHRO AND SIDRA REPORTS

OD MOVEMENT DEMAND FLOWS

Site Origin - Destination Movement Demand Flow Rates (veh/h) and Pedestrian Flow Rates (ped/h)

Site: 101 [AM - 3:Great Bear Blvd & Mt. Burke]

New Site
Roundabout

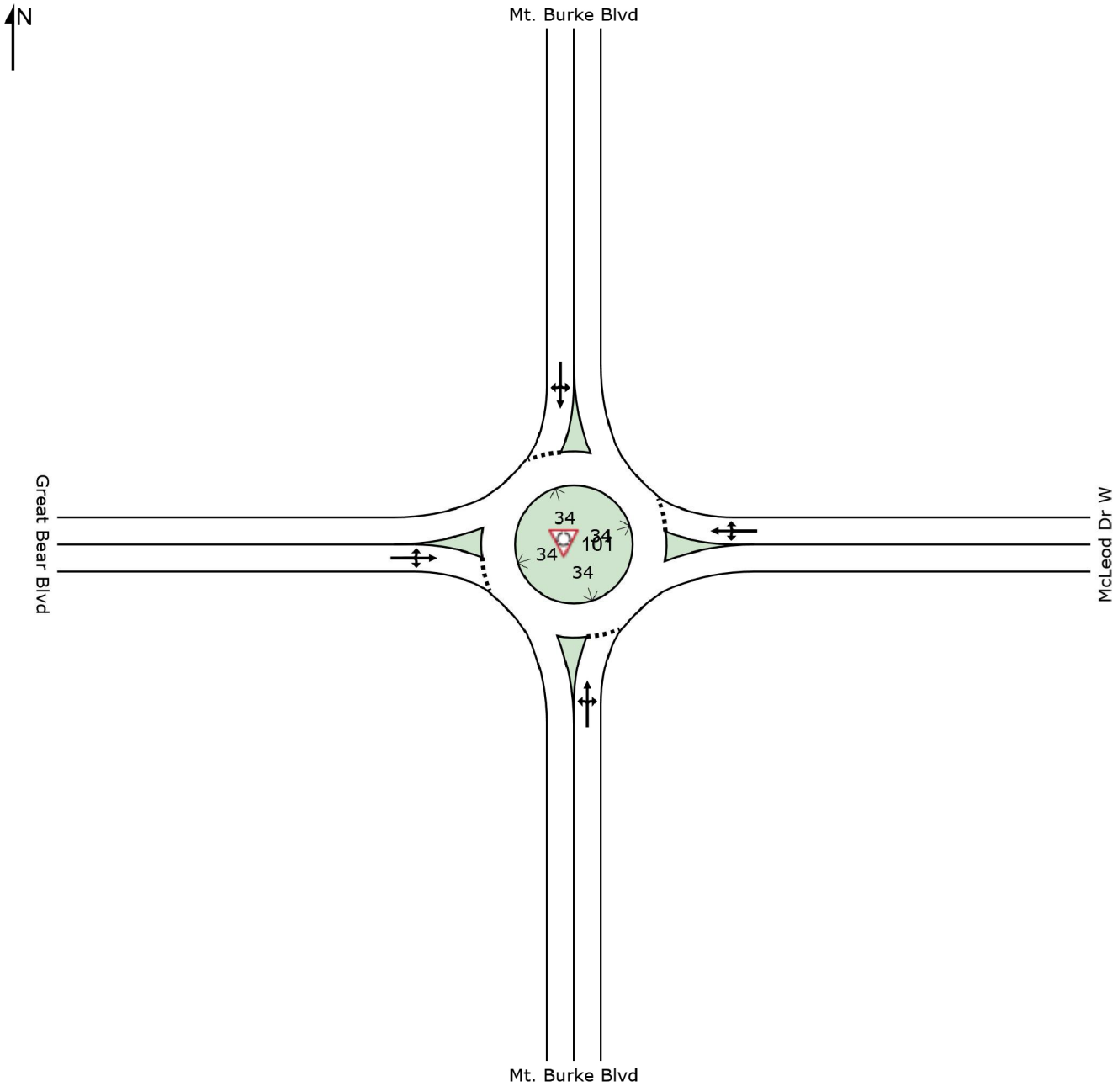


	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Mt. Burke Blvd	569	558	11
E: McLeod Dr W	251	246	5
N: Mt. Burke Blvd	294	288	6
W: Great Bear Blvd	467	458	9
Total	1582	1550	32

SITE LAYOUT

Site: 101 [AM - 3:Great Bear Blvd & Mt. Burke]

New Site
Roundabout



MOVEMENT SUMMARY

Site: 101 [AM - 3:Great Bear Blvd & Mt. Burke]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mt. Burke Blvd											
1	L2	16	2.0	0.673	15.5	LOS B	5.9	42.3	0.83	1.00	54.0
2	T1	406	2.0	0.673	9.4	LOS A	5.9	42.3	0.83	1.00	53.6
3	R2	148	2.0	0.673	9.5	LOS A	5.9	42.3	0.83	1.00	52.0
Approach		569	2.0	0.673	9.6	LOS A	5.9	42.3	0.83	1.00	53.2
East: McLeod Dr W											
4	L2	32	2.0	0.292	11.9	LOS B	1.4	9.9	0.59	0.67	56.0
5	T1	108	2.0	0.292	5.8	LOS A	1.4	9.9	0.59	0.67	55.5
6	R2	111	2.0	0.292	5.9	LOS A	1.4	9.9	0.59	0.67	53.8
Approach		251	2.0	0.292	6.6	LOS A	1.4	9.9	0.59	0.67	54.8
North: Mt. Burke Blvd											
7	L2	76	2.0	0.253	10.1	LOS B	1.3	9.3	0.36	0.49	56.4
8	T1	213	2.0	0.253	4.0	LOS A	1.3	9.3	0.36	0.49	55.9
9	R2	6	2.0	0.253	4.1	LOS A	1.3	9.3	0.36	0.49	54.2
Approach		294	2.0	0.253	5.6	LOS A	1.3	9.3	0.36	0.49	56.0
West: Great Bear Blvd											
10	L2	28	2.0	0.476	11.6	LOS B	2.9	20.7	0.62	0.60	55.9
11	T1	361	2.0	0.476	5.5	LOS A	2.9	20.7	0.62	0.60	55.4
12	R2	77	2.0	0.476	5.6	LOS A	2.9	20.7	0.62	0.60	53.7
Approach		467	2.0	0.476	5.9	LOS A	2.9	20.7	0.62	0.60	55.1
All Vehicles		1582	2.0	0.673	7.3	LOS A	5.9	42.3	0.64	0.73	54.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

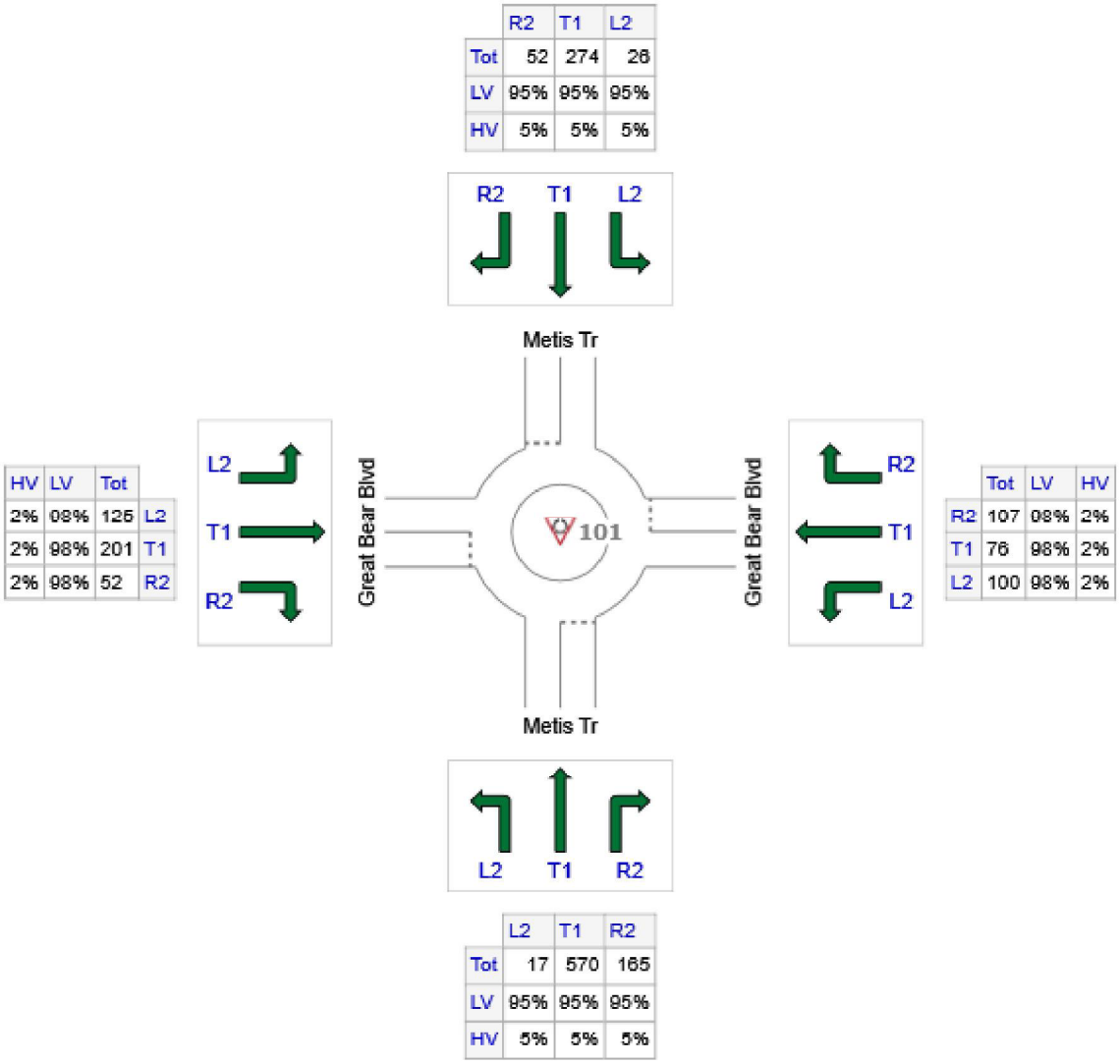
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: 101 [AM - 22: Metis Trail & Great Bear Blvd - Imp]

New Site
Roundabout

Volume Display Method: Total and %

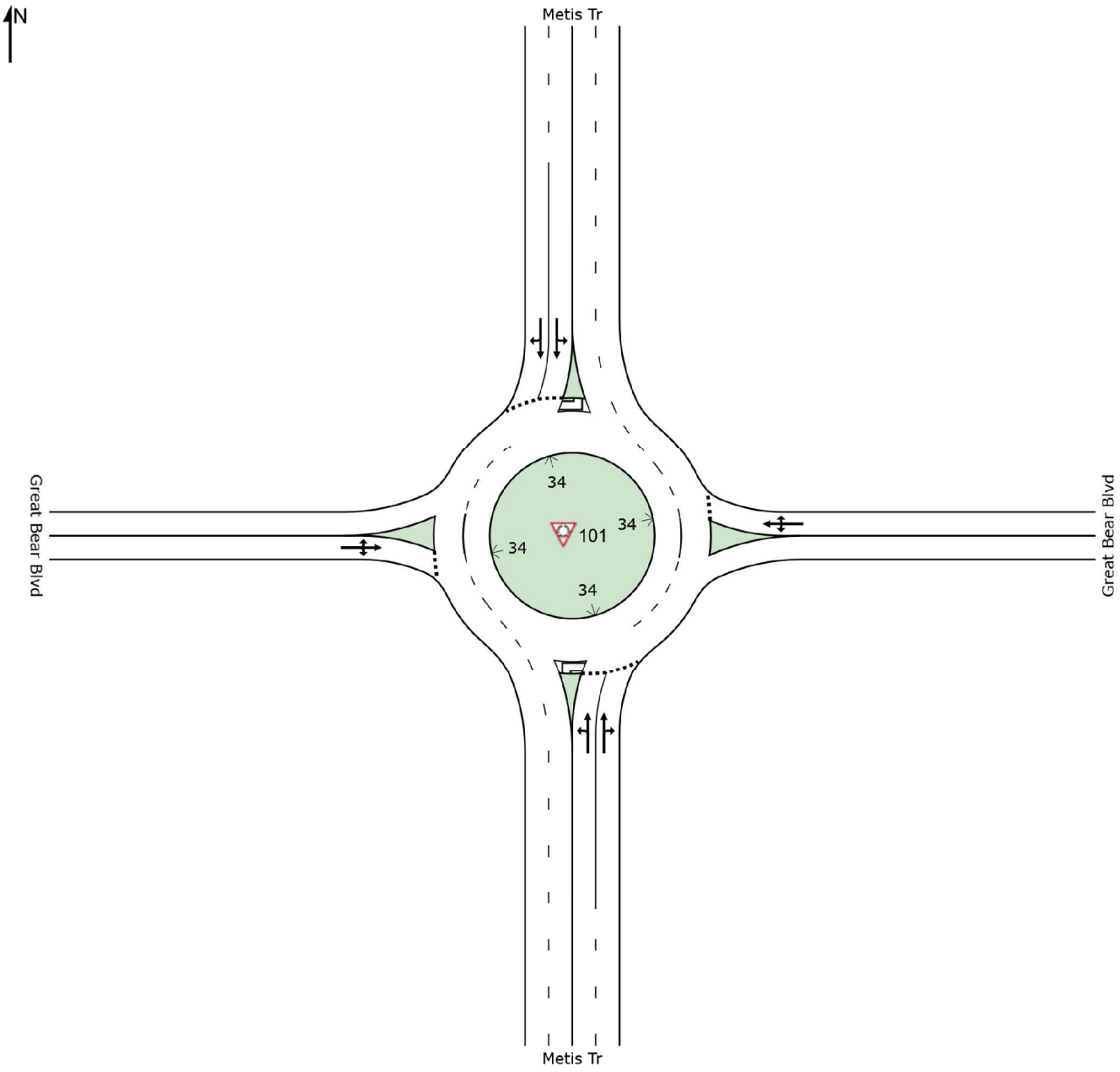


	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Metis Tr	752	714	38
E: Great Bear Blvd	283	277	6
N: Metis Tr	352	334	18
W: Great Bear Blvd	378	370	8
Total	1765	1697	68

SITE LAYOUT

Site: 101 [AM - 22: Metis Trail & Great Bear Blvd - Imp]

New Site
Roundabout



MOVEMENT SUMMARY

Site: 101 [AM - 22: Metis Trail & Great Bear Blvd - Imp]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Tr											
1	L2	19	5.0	0.446	11.7	LOS B	2.4	17.3	0.60	0.58	55.8
2	T1	648	5.0	0.446	5.5	LOS A	2.4	17.3	0.60	0.60	55.5
3	R2	188	5.0	0.446	5.8	LOS A	2.4	17.3	0.60	0.63	53.9
Approach		855	5.0	0.446	5.7	LOS A	2.4	17.3	0.60	0.61	55.2
East: Great Bear Blvd											
4	L2	114	2.0	0.462	14.3	LOS B	2.2	16.0	0.70	0.90	53.4
5	T1	86	2.0	0.462	8.2	LOS A	2.2	16.0	0.70	0.90	53.0
6	R2	122	2.0	0.462	8.3	LOS A	2.2	16.0	0.70	0.90	51.4
Approach		322	2.0	0.462	10.4	LOS B	2.2	16.0	0.70	0.90	52.5
North: Metis Tr											
7	L2	30	5.0	0.177	10.2	LOS B	0.8	5.5	0.36	0.47	56.5
8	T1	311	5.0	0.177	4.3	LOS A	0.8	5.5	0.36	0.46	56.4
9	R2	59	5.0	0.177	4.4	LOS A	0.8	5.5	0.36	0.45	54.9
Approach		400	5.0	0.177	4.7	LOS A	0.8	5.5	0.36	0.46	56.2
West: Great Bear Blvd											
10	L2	142	2.0	0.453	11.8	LOS B	2.4	17.0	0.61	0.72	54.7
11	T1	228	2.0	0.453	5.9	LOS A	2.4	17.0	0.61	0.72	54.3
12	R2	59	2.0	0.453	6.0	LOS A	2.4	17.0	0.61	0.72	52.6
Approach		430	2.0	0.453	7.9	LOS A	2.4	17.0	0.61	0.72	54.2
All Vehicles		2006	3.9	0.462	6.7	LOS A	2.4	17.3	0.57	0.65	54.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [AM - 31: Metis Trail & Ainslie Prom - Imp]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Tr											
1	L2	16	5.0	0.497	12.5	LOS B	3.1	22.7	0.66	0.68	55.0
2	T1	423	5.0	0.497	6.3	LOS A	3.1	22.7	0.66	0.68	54.6
3	R2	11	5.0	0.497	6.4	LOS A	3.1	22.7	0.66	0.68	52.7
Approach		450	5.0	0.497	6.6	LOS A	3.1	22.7	0.66	0.68	54.6
East: Ainslie Prom											
4	L2	33	2.0	0.505	14.9	LOS B	3.0	21.6	0.75	0.92	53.6
5	T1	77	2.0	0.505	8.8	LOS A	3.0	21.6	0.75	0.92	53.7
6	R2	253	2.0	0.505	8.9	LOS A	3.0	21.6	0.75	0.92	52.1
Approach		364	2.0	0.505	9.4	LOS A	3.0	21.6	0.75	0.92	52.5
North: Metis Tr											
7	L2	82	5.0	0.342	9.9	LOS A	1.8	13.2	0.32	0.45	56.7
8	T1	340	5.0	0.342	3.8	LOS A	1.8	13.2	0.32	0.45	55.9
9	R2	64	5.0	0.050	3.5	LOS A	0.2	1.4	0.20	0.41	56.1
Approach		485	5.0	0.342	4.8	LOS A	1.8	13.2	0.31	0.44	56.1
West: Ainslie Prom											
10	L2	177	2.0	0.401	12.4	LOS B	2.1	15.0	0.64	0.78	53.9
11	T1	125	2.0	0.401	6.2	LOS A	2.1	15.0	0.64	0.78	53.5
12	R2	39	2.0	0.401	6.3	LOS A	2.1	15.0	0.64	0.78	51.2
Approach		341	2.0	0.401	9.4	LOS A	2.1	15.0	0.64	0.78	53.5
All Vehicles		1640	3.7	0.505	7.3	LOS A	3.1	22.7	0.57	0.68	54.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

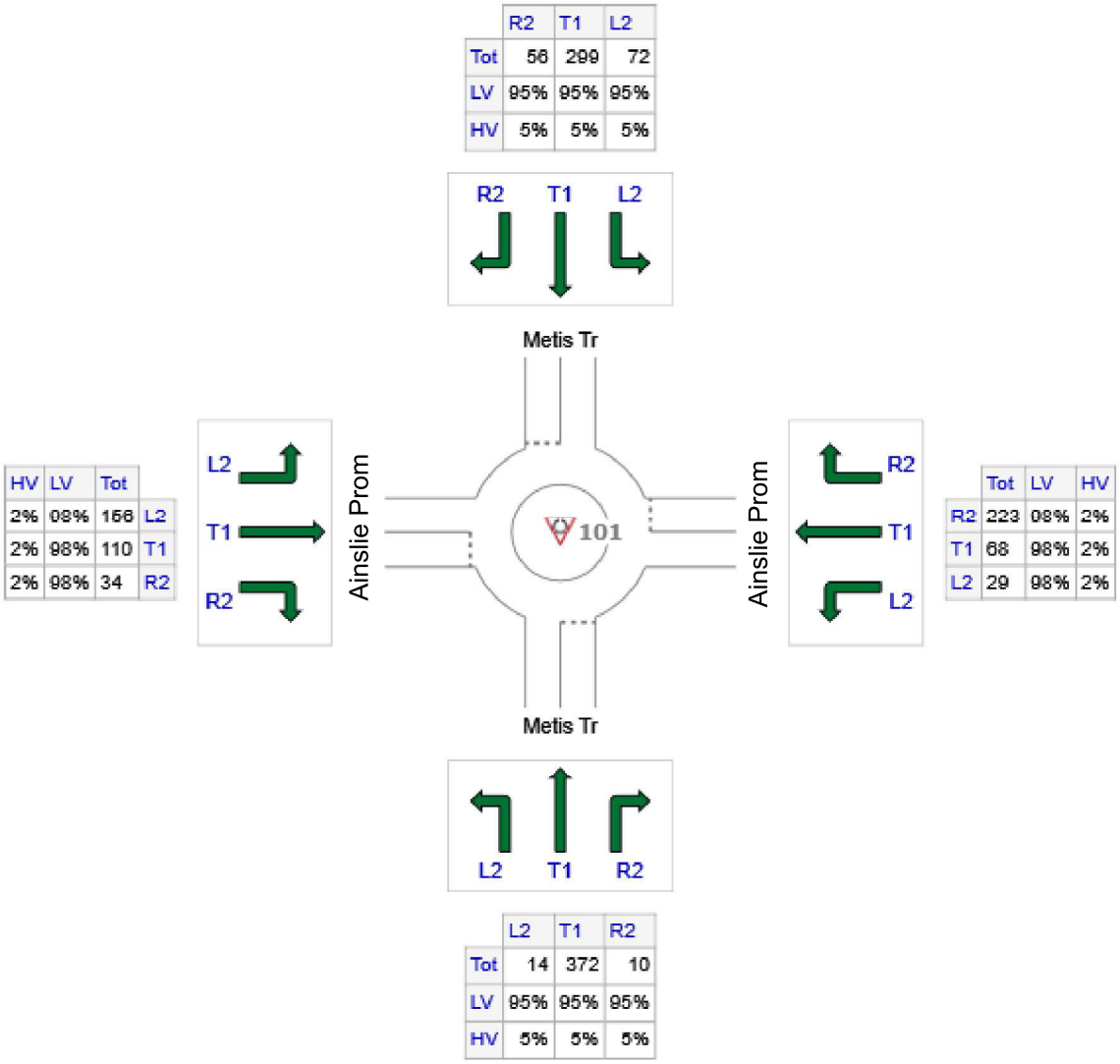
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: 101 [AM - 31: Metis Trail & Ainslie Prom Imp]

New Site
Roundabout

Volume Display Method: Total and %

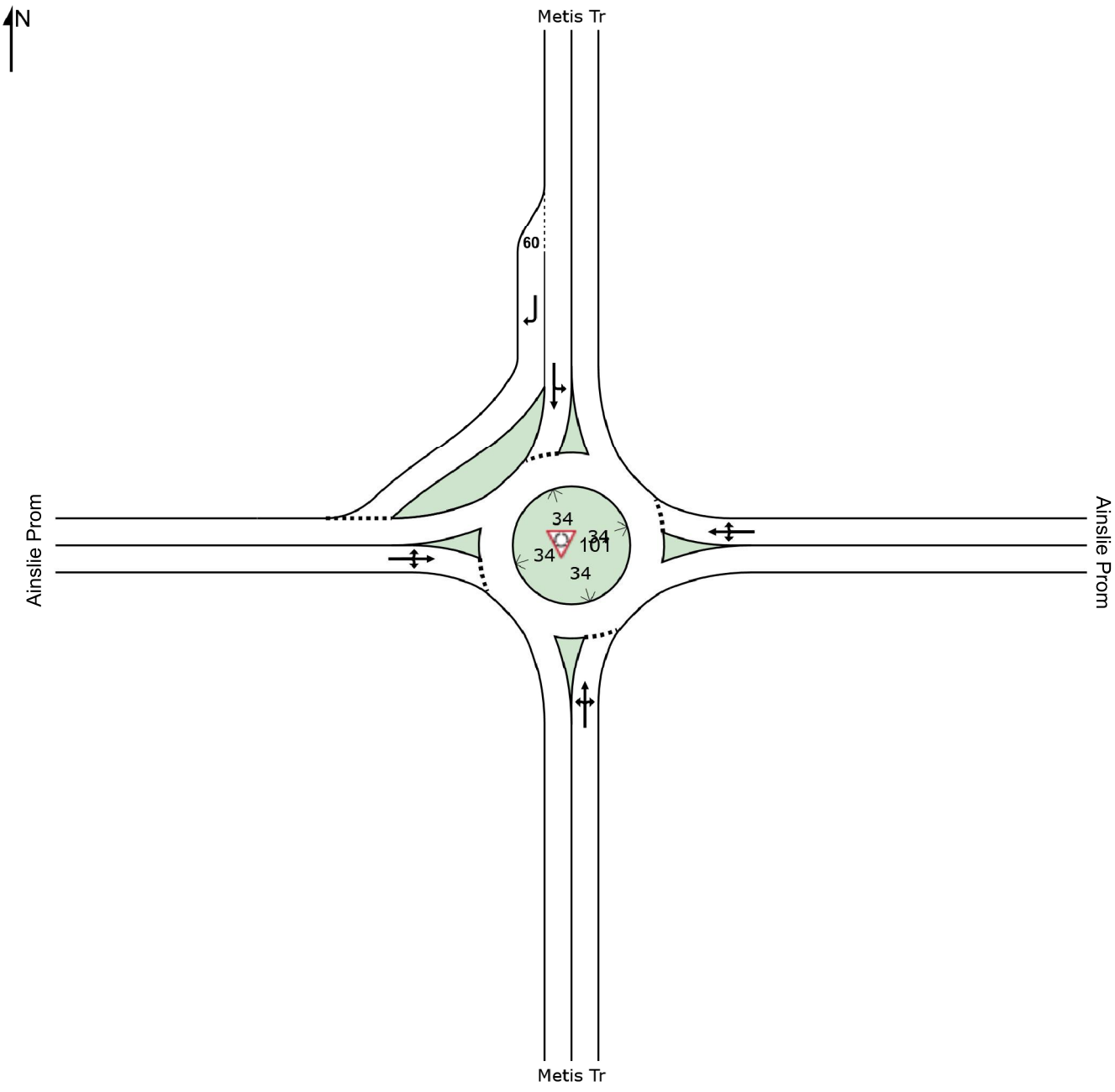


	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Metis Tr	396	376	20
E: Ainslie Prom	320	314	6
N: Metis Tr	427	406	21
W: Ainslie Prom	300	294	6
Total	1443	1389	54

SITE LAYOUT

Site: 101 [AM - 31: Metis Trail & Ainslie Prom - Imp]

New Site
Roundabout



INPUT VOLUMES

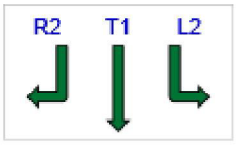
Vehicles and pedestrians per 60 minutes

Site: 101 [AM - 33: Metis Trail & Chinook Trail]

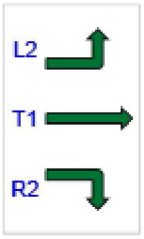
New Site
Roundabout

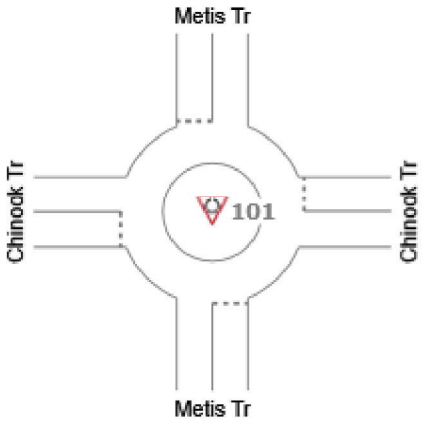
Volume Display Method: Total and %

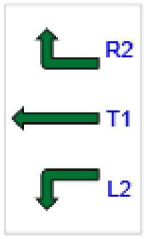
	R2	T1	L2
Tot	17	30	348
LV	95%	98%	95%
HV	5%	2%	5%



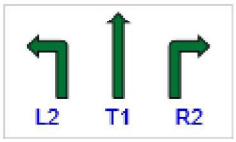
HV	LV	Tot	
5%	95%	47	L2
5%	95%	108	T1
2%	98%	1	R2







	Tot	LV	HV
R2	121	95%	5%
T1	57	95%	5%
L2	5	98%	2%



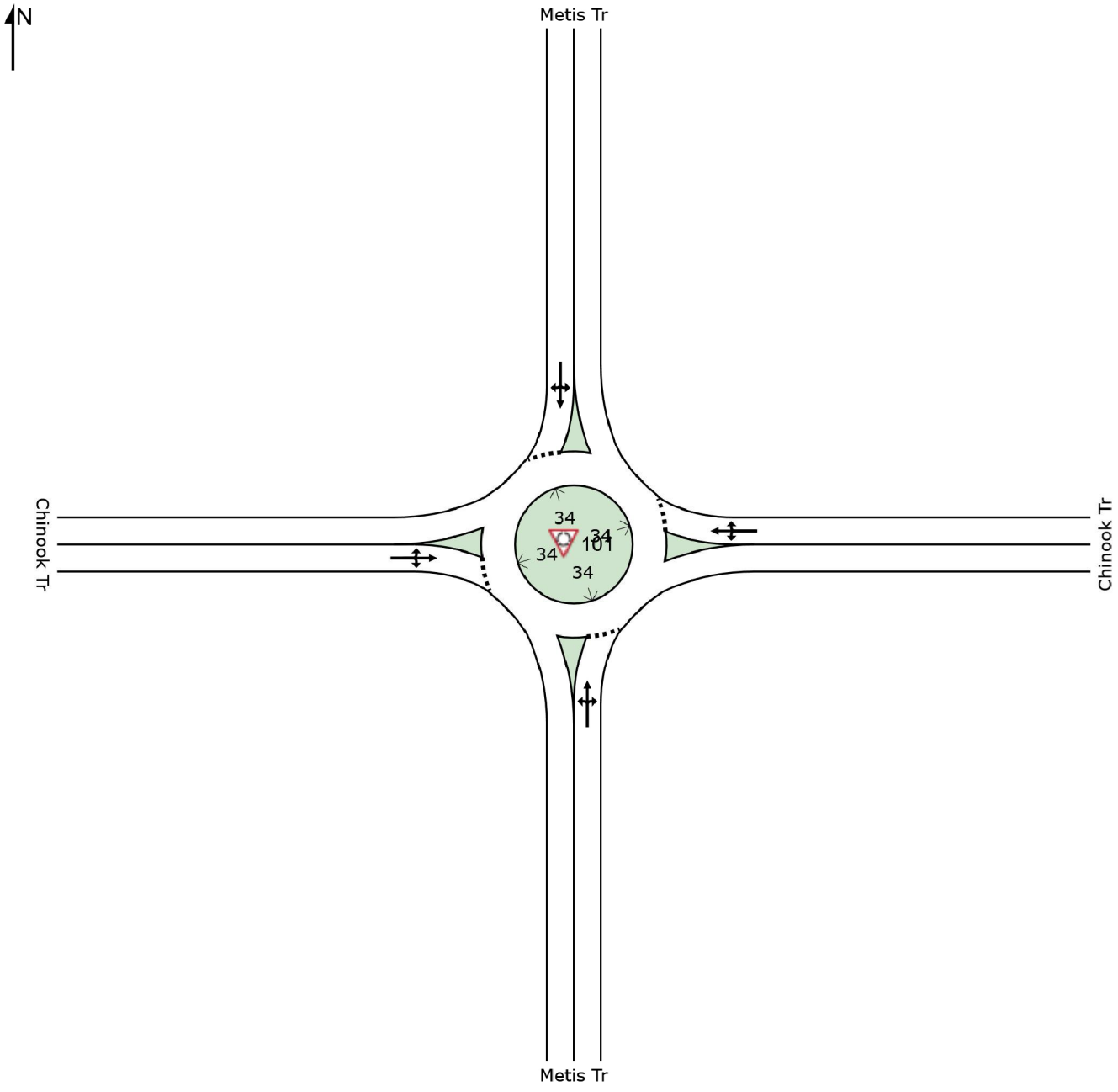
	L2	T1	R2
Tot	1	108	1
LV	98%	98%	98%
HV	2%	2%	2%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Metis Tr	110	108	2
E: Chinook Tr	183	174	9
N: Metis Tr	395	376	19
W: Chinook Tr	156	148	8
Total	844	806	38

SITE LAYOUT

Site: 101 [AM - 33: Metis Trail & Chinook Trail]

New Site
Roundabout



MOVEMENT SUMMARY

Site: 101 [AM - 33: Metis Trail & Chinook Trail]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Tr											
1	L2	1	2.0	0.166	12.4	LOS B	0.7	4.9	0.59	0.64	55.7
2	T1	123	2.0	0.166	6.3	LOS A	0.7	4.9	0.59	0.64	55.2
3	R2	1	2.0	0.166	6.4	LOS A	0.7	4.9	0.59	0.64	52.9
Approach		125	2.0	0.166	6.4	LOS A	0.7	4.9	0.59	0.64	55.2
East: Chinook Tr											
4	L2	6	2.0	0.185	10.2	LOS B	0.9	6.4	0.36	0.47	57.2
5	T1	65	5.0	0.185	4.1	LOS A	0.9	6.4	0.36	0.47	56.9
6	R2	138	5.0	0.185	4.2	LOS A	0.9	6.4	0.36	0.47	54.9
Approach		208	4.9	0.185	4.3	LOS A	0.9	6.4	0.36	0.47	55.6
North: Metis Tr											
7	L2	395	5.0	0.359	9.8	LOS A	2.2	15.7	0.27	0.59	53.7
8	T1	34	2.0	0.359	3.6	LOS A	2.2	15.7	0.27	0.59	53.0
9	R2	19	5.0	0.359	3.7	LOS A	2.2	15.7	0.27	0.59	52.0
Approach		449	4.8	0.359	9.0	LOS A	2.2	15.7	0.27	0.59	53.5
West: Chinook Tr											
10	L2	53	5.0	0.207	11.7	LOS B	0.9	6.6	0.55	0.64	55.1
11	T1	123	5.0	0.207	5.5	LOS A	0.9	6.6	0.55	0.64	54.4
12	R2	1	2.0	0.207	5.6	LOS A	0.9	6.6	0.55	0.64	52.4
Approach		177	5.0	0.207	7.4	LOS A	0.9	6.6	0.55	0.64	54.6
All Vehicles		959	4.5	0.359	7.4	LOS A	2.2	15.7	0.38	0.58	54.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

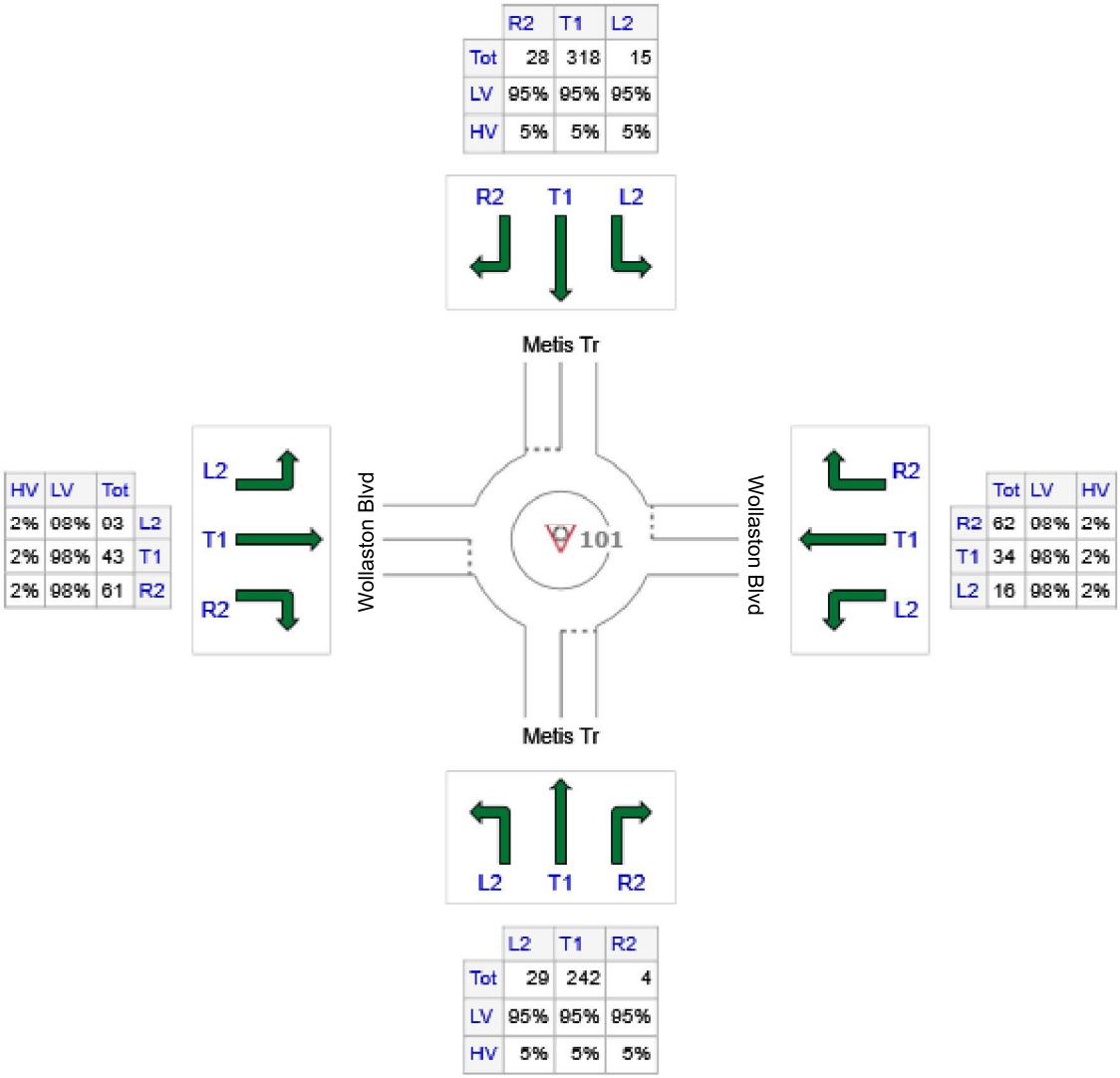
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: 101 [AM - 38: Metis Trail & Wollaston Blvd]

New Site
Roundabout

Volume Display Method: Total and %

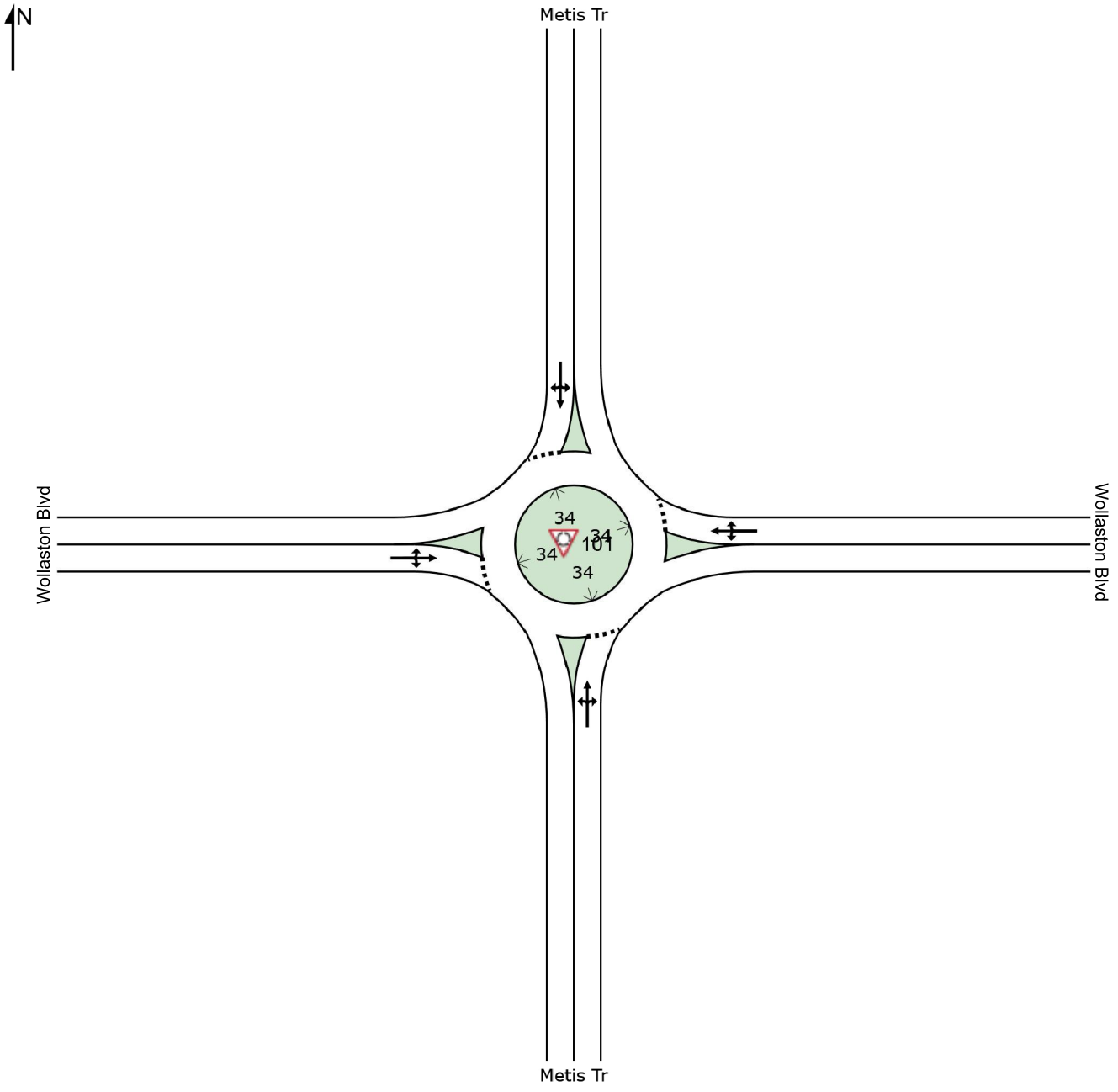


	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Metis Tr	275	261	14
E: Wollaston	112	110	2
N: Metis Tr	361	343	18
W:Wollaston	197	193	4
Total	945	907	38

SITE LAYOUT

Site: 101 [AM - 38: Metis Trail & Wollaston Blvd]

New Site
Roundabout



MOVEMENT SUMMARY

Site: 101 [AM - 38: Metis Trail & Wollaston Blvd]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Tr											
1	L2	33	5.0	0.277	10.3	LOS B	1.4	10.4	0.38	0.45	56.4
2	T1	275	5.0	0.277	4.1	LOS A	1.4	10.4	0.38	0.45	56.0
3	R2	5	5.0	0.277	4.2	LOS A	1.4	10.4	0.38	0.45	53.7
Approach		313	5.0	0.277	4.8	LOS A	1.4	10.4	0.38	0.45	56.0
East: Wollaston Blvd											
4	L2	18	2.0	0.143	11.4	LOS B	0.6	4.4	0.51	0.62	55.8
5	T1	39	2.0	0.143	5.3	LOS A	0.6	4.4	0.51	0.62	55.7
6	R2	70	2.0	0.143	5.4	LOS A	0.6	4.4	0.51	0.62	53.8
Approach		127	2.0	0.143	6.2	LOS A	0.6	4.4	0.51	0.62	54.6
North: Metis Tr											
7	L2	17	5.0	0.334	9.8	LOS A	1.9	14.0	0.30	0.39	57.4
8	T1	361	5.0	0.334	3.7	LOS A	1.9	14.0	0.30	0.39	56.8
9	R2	32	5.0	0.334	3.8	LOS A	1.9	14.0	0.30	0.39	55.2
Approach		410	5.0	0.334	4.0	LOS A	1.9	14.0	0.30	0.39	56.7
West: Wollaston Blvd											
10	L2	106	2.0	0.248	11.5	LOS B	1.2	8.2	0.54	0.70	54.8
11	T1	49	2.0	0.248	5.4	LOS A	1.2	8.2	0.54	0.70	54.1
12	R2	69	2.0	0.248	5.5	LOS A	1.2	8.2	0.54	0.70	52.1
Approach		224	2.0	0.248	8.3	LOS A	1.2	8.2	0.54	0.70	53.8
All Vehicles		1074	4.0	0.334	5.4	LOS A	1.9	14.0	0.40	0.50	55.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INPUT VOLUMES

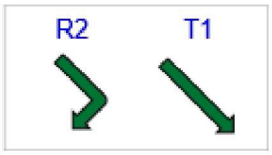
Vehicles and pedestrians per 60 minutes

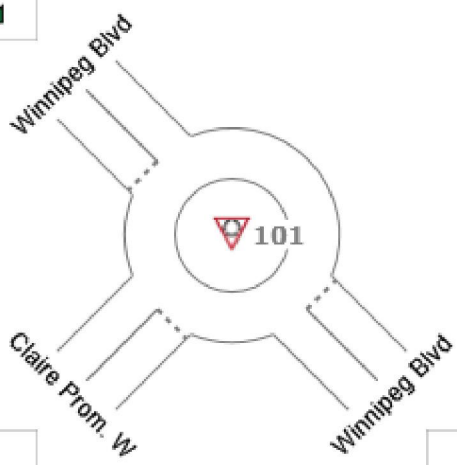
Site: 101 [AM - 58: Claire Prom W & Winnipeg Blvd]

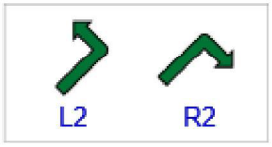
New Site
Roundabout

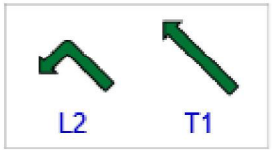
Volume Display Method: Total and %

	R2	T1
Tot	21	68
LV	98%	98%
HV	2%	2%









	L2	R2
Tot	57	257
LV	98%	98%
HV	2%	2%

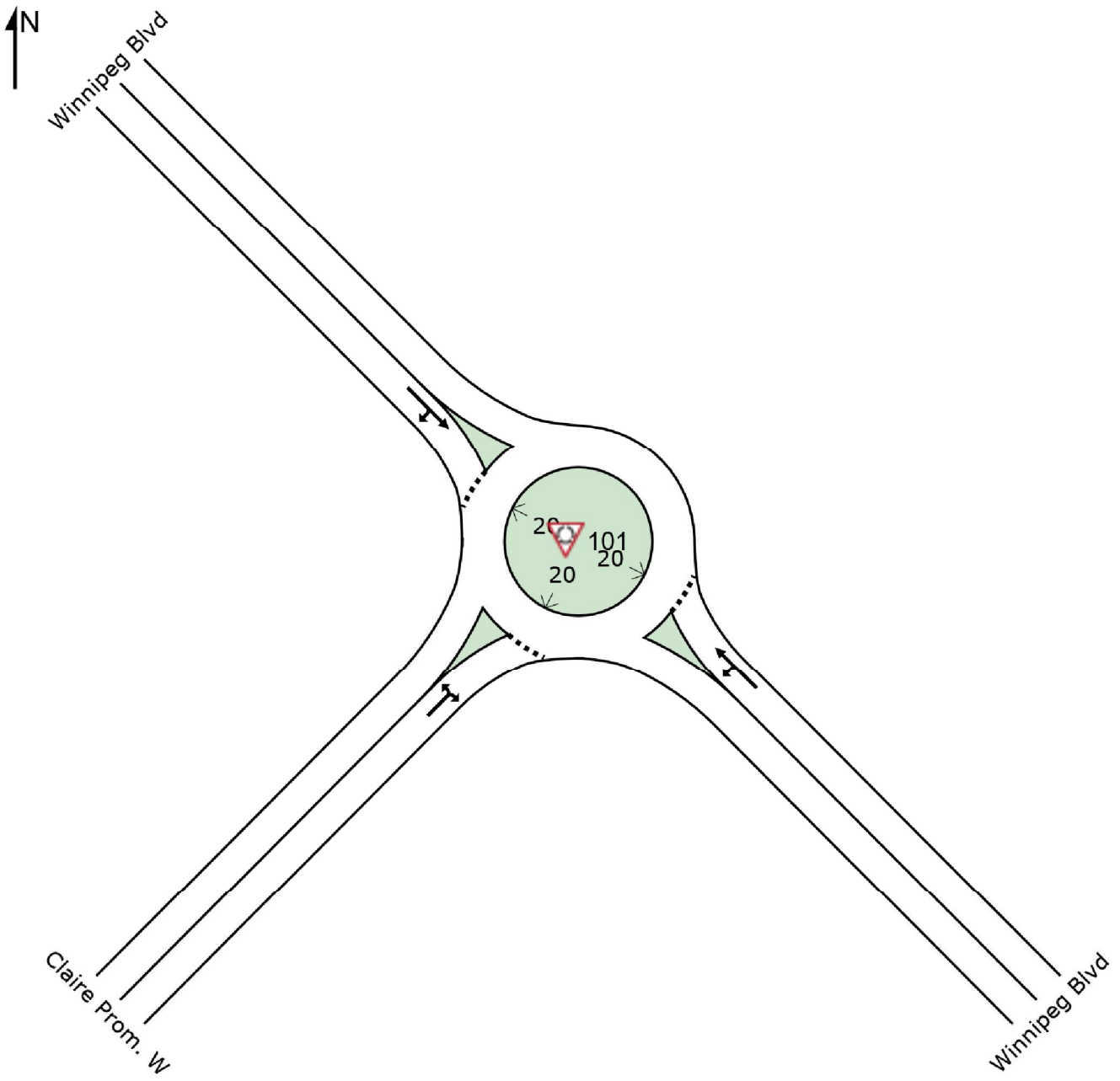
	L2	T1
Tot	213	37
LV	98%	98%
HV	2%	2%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
SE: Winnipeg Blvd	250	245	5
NW: Winnipeg Blvd	89	87	2
SW: Claire Prom. W	314	308	6
Total	653	640	13

SITE LAYOUT

Site: 101 [AM - 58: Claire Prom W & Winnipeg Blvd]

New Site
Roundabout



MOVEMENT SUMMARY

Site: 101 [AM - 58: Claire Prom W & Winnipeg Blvd]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Winnipeg Blvd											
21	L2	242	2.0	0.222	9.1	LOS A	1.2	8.2	0.22	0.60	53.0
22	T1	42	2.0	0.222	4.4	LOS A	1.2	8.2	0.22	0.60	53.0
Approach		284	2.0	0.222	8.4	LOS A	1.2	8.2	0.22	0.60	53.0
NorthWest: Winnipeg Blvd											
28	T1	77	2.0	0.095	5.2	LOS A	0.4	2.9	0.38	0.51	55.1
29	R2	24	2.0	0.095	5.0	LOS A	0.4	2.9	0.38	0.51	53.8
Approach		101	2.0	0.095	5.2	LOS A	0.4	2.9	0.38	0.51	54.8
SouthWest: Claire Prom. W											
30	L2	65	2.0	0.283	9.2	LOS A	1.6	11.2	0.26	0.51	55.3
32	R2	292	2.0	0.283	4.3	LOS A	1.6	11.2	0.26	0.51	54.1
Approach		357	2.0	0.283	5.2	LOS A	1.6	11.2	0.26	0.51	54.3
All Vehicles		742	2.0	0.283	6.4	LOS A	1.6	11.2	0.26	0.55	53.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

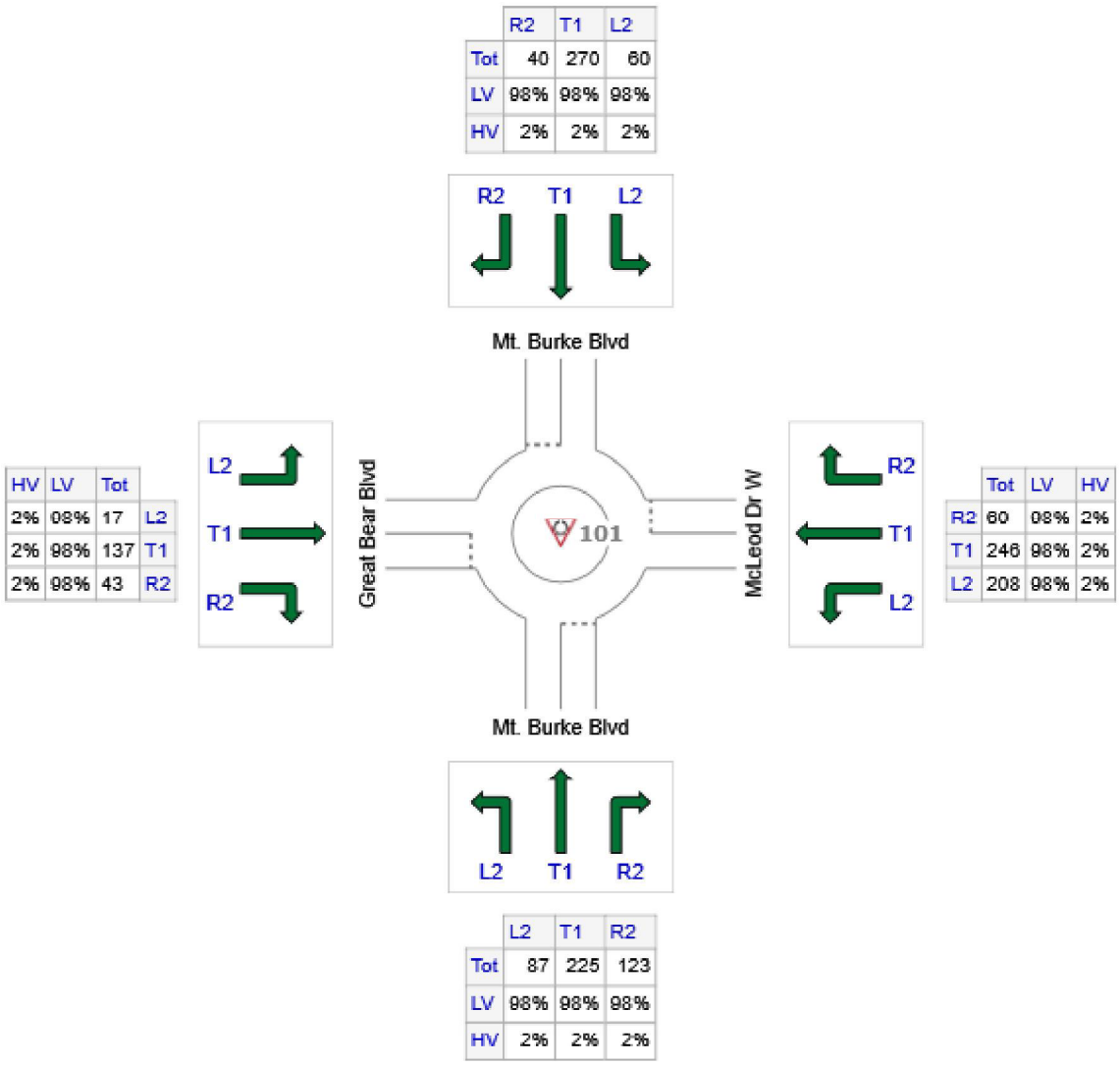
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: 101 [PM - 3:Great Bear Blvd & Mt. Burke]

New Site
Roundabout

Volume Display Method: Total and %

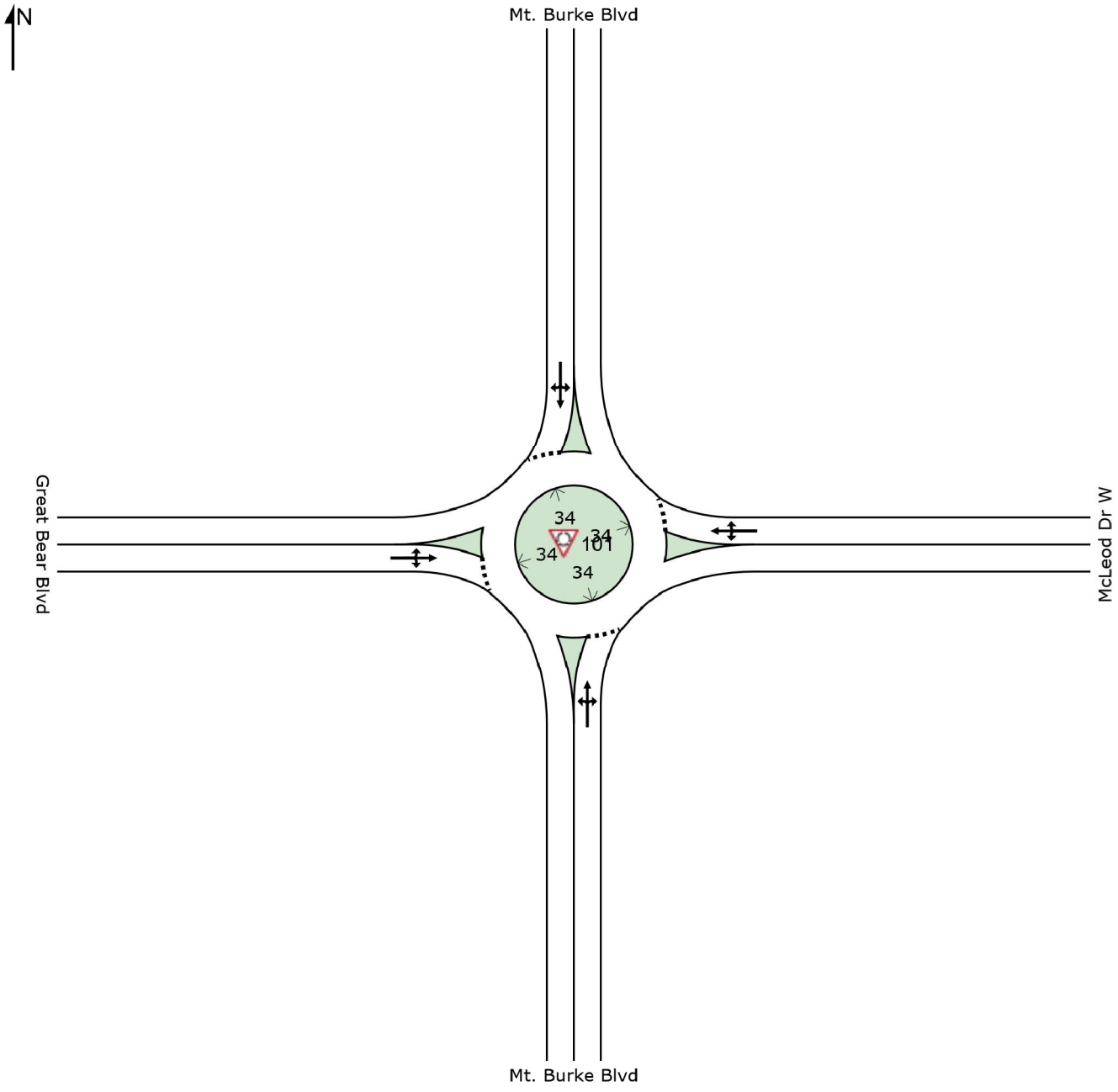


	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Mt. Burke Blvd	435	426	9
E: McLeod Dr W	514	504	10
N: Mt. Burke Blvd	370	363	7
W: Great Bear Blvd	197	193	4
Total	1516	1486	30

SITE LAYOUT

Site: 101 [PM - 3:Great Bear Blvd & Mt. Burke]

New Site
Roundabout



MOVEMENT SUMMARY

Site: 101 [PM - 3:Great Bear Blvd & Mt. Burke]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mt. Burke Blvd											
1	L2	99	2.0	0.465	11.0	LOS B	2.9	20.6	0.56	0.58	55.8
2	T1	256	2.0	0.465	4.8	LOS A	2.9	20.6	0.56	0.58	55.4
3	R2	140	2.0	0.465	4.9	LOS A	2.9	20.6	0.56	0.58	53.6
Approach		494	2.0	0.465	6.1	LOS A	2.9	20.6	0.56	0.58	55.0
East: McLeod Dr W											
4	L2	236	2.0	0.628	13.8	LOS B	5.3	37.8	0.76	0.89	53.5
5	T1	280	2.0	0.628	7.6	LOS A	5.3	37.8	0.76	0.89	53.1
6	R2	68	2.0	0.628	7.7	LOS A	5.3	37.8	0.76	0.89	51.5
Approach		584	2.0	0.628	10.1	LOS B	5.3	37.8	0.76	0.89	53.1
North: Mt. Burke Blvd											
7	L2	68	2.0	0.580	15.7	LOS B	3.9	28.0	0.79	0.96	53.3
8	T1	307	2.0	0.580	9.6	LOS A	3.9	28.0	0.79	0.96	52.9
9	R2	45	2.0	0.580	9.7	LOS A	3.9	28.0	0.79	0.96	51.3
Approach		420	2.0	0.580	10.6	LOS B	3.9	28.0	0.79	0.96	52.8
West: Great Bear Blvd											
10	L2	19	2.0	0.308	13.0	LOS B	1.4	9.9	0.65	0.74	55.4
11	T1	156	2.0	0.308	6.9	LOS A	1.4	9.9	0.65	0.74	55.0
12	R2	49	2.0	0.308	7.0	LOS A	1.4	9.9	0.65	0.74	53.3
Approach		224	2.0	0.308	7.4	LOS A	1.4	9.9	0.65	0.74	54.6
All Vehicles		1723	2.0	0.628	8.7	LOS A	5.3	37.8	0.69	0.80	53.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

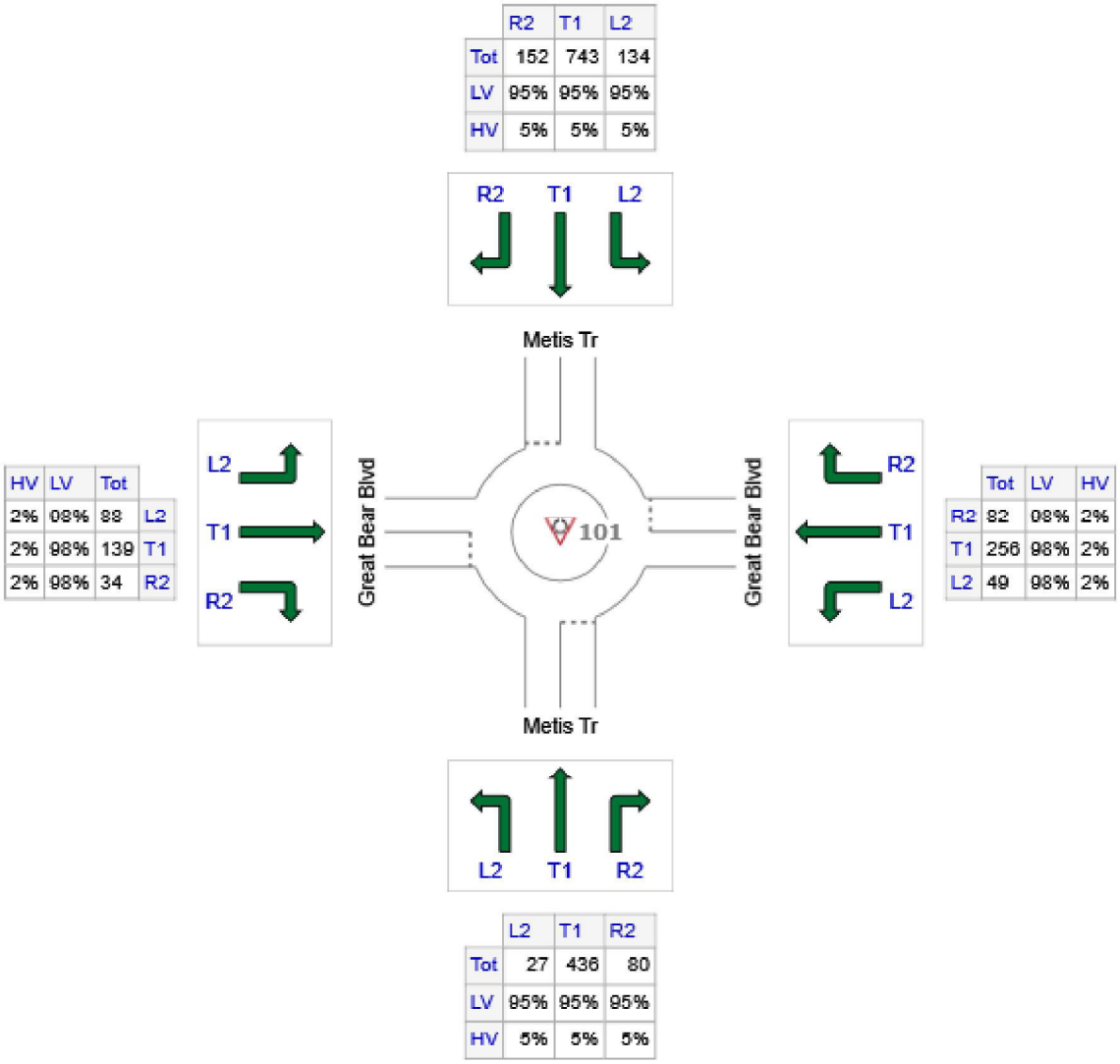
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: 101 [PM - 22: Metis Trail & Great Bear Blvd - Imp]

New Site
Roundabout

Volume Display Method: Total and %

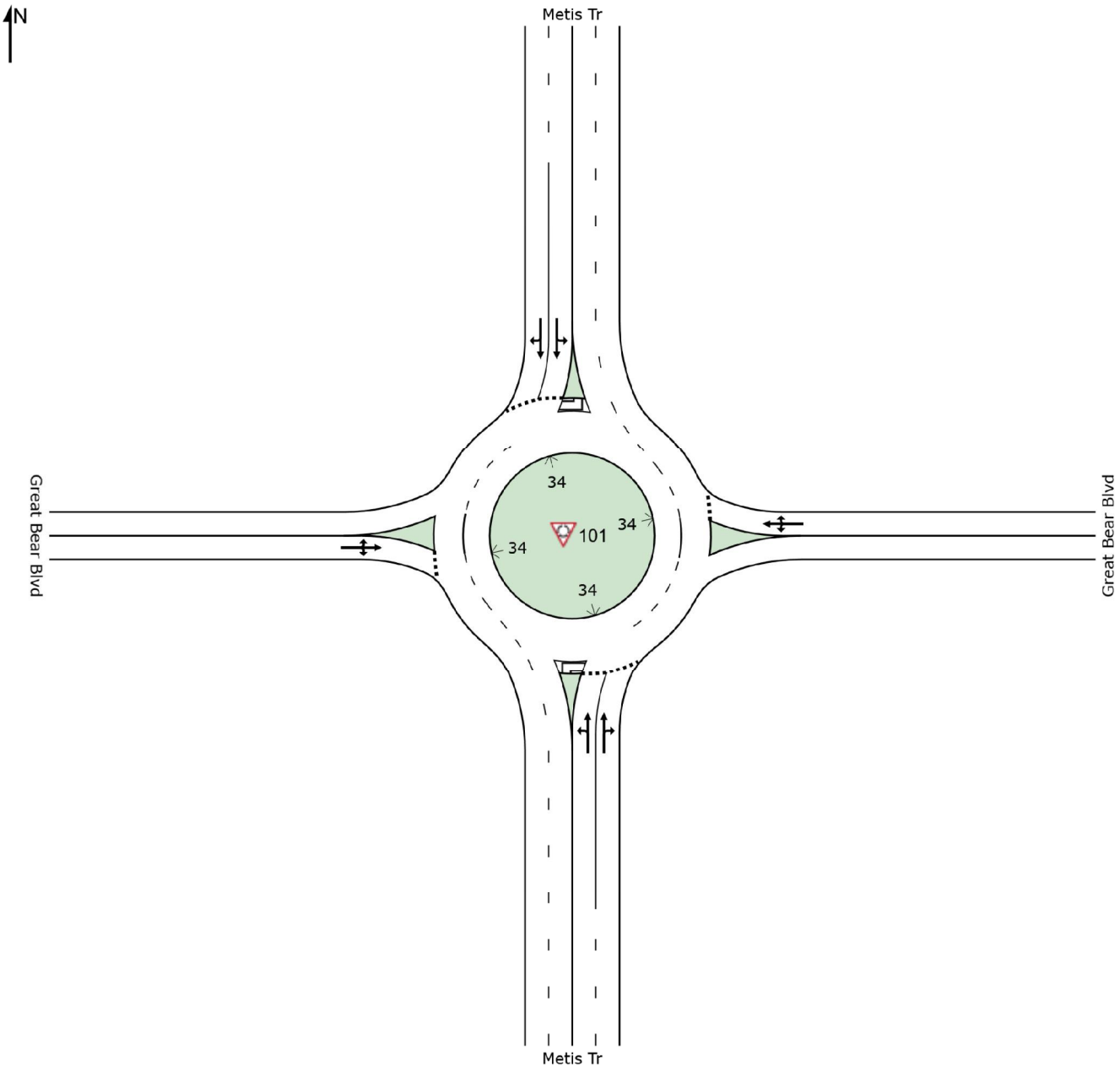


	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Metis Tr	543	516	27
E: Great Bear Blvd	387	379	8
N: Metis Tr	1029	978	51
W: Great Bear Blvd	261	256	5
Total	2220	2128	92

SITE LAYOUT

Site: 101 [PM - 22: Metis Trail & Great Bear Blvd - Imp]

New Site
Roundabout



MOVEMENT SUMMARY

Site: 101 [PM - 22: Metis Trail & Great Bear Blvd - Imp]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Tr											
1	L2	31	5.0	0.325	11.3	LOS B	1.5	10.9	0.54	0.56	55.9
2	T1	495	5.0	0.325	5.2	LOS A	1.5	10.9	0.54	0.56	55.7
3	R2	91	5.0	0.325	5.5	LOS A	1.5	10.9	0.54	0.57	54.1
Approach		617	5.0	0.325	5.5	LOS A	1.5	10.9	0.54	0.56	55.5
East: Great Bear Blvd											
4	L2	56	2.0	0.539	13.7	LOS B	3.1	22.3	0.71	0.87	54.8
5	T1	291	2.0	0.539	7.6	LOS A	3.1	22.3	0.71	0.87	54.4
6	R2	93	2.0	0.539	7.7	LOS A	3.1	22.3	0.71	0.87	52.7
Approach		440	2.0	0.539	8.4	LOS A	3.1	22.3	0.71	0.87	54.1
North: Metis Tr											
7	L2	152	5.0	0.597	12.7	LOS B	4.4	31.8	0.69	0.77	54.2
8	T1	844	5.0	0.597	6.8	LOS A	4.4	31.8	0.69	0.76	54.4
9	R2	173	5.0	0.597	6.9	LOS A	4.4	31.8	0.69	0.75	53.3
Approach		1169	5.0	0.597	7.6	LOS A	4.4	31.8	0.69	0.76	54.2
West: Great Bear Blvd											
10	L2	100	2.0	0.527	17.0	LOS B	2.6	18.3	0.76	0.96	51.5
11	T1	158	2.0	0.527	11.1	LOS B	2.6	18.3	0.76	0.96	51.1
12	R2	39	2.0	0.527	11.1	LOS B	2.6	18.3	0.76	0.96	49.6
Approach		297	2.0	0.527	13.1	LOS B	2.6	18.3	0.76	0.96	51.0
All Vehicles		2523	4.1	0.597	7.9	LOS A	4.4	31.8	0.67	0.75	54.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

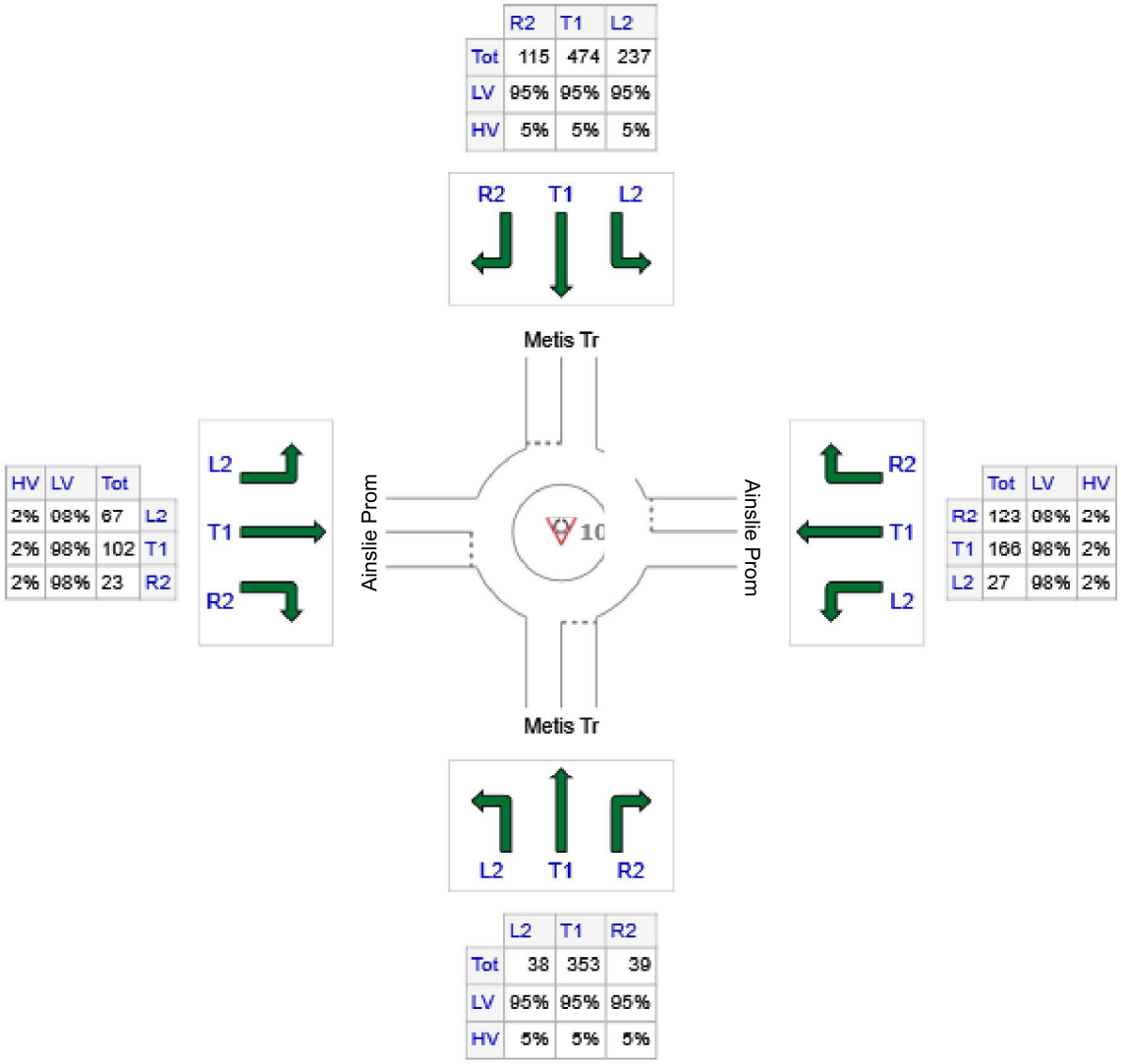
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: 101 [PM - 31: Metis Trail & Ainslie Prom - Imp]

New Site
Roundabout

Volume Display Method: Total and %

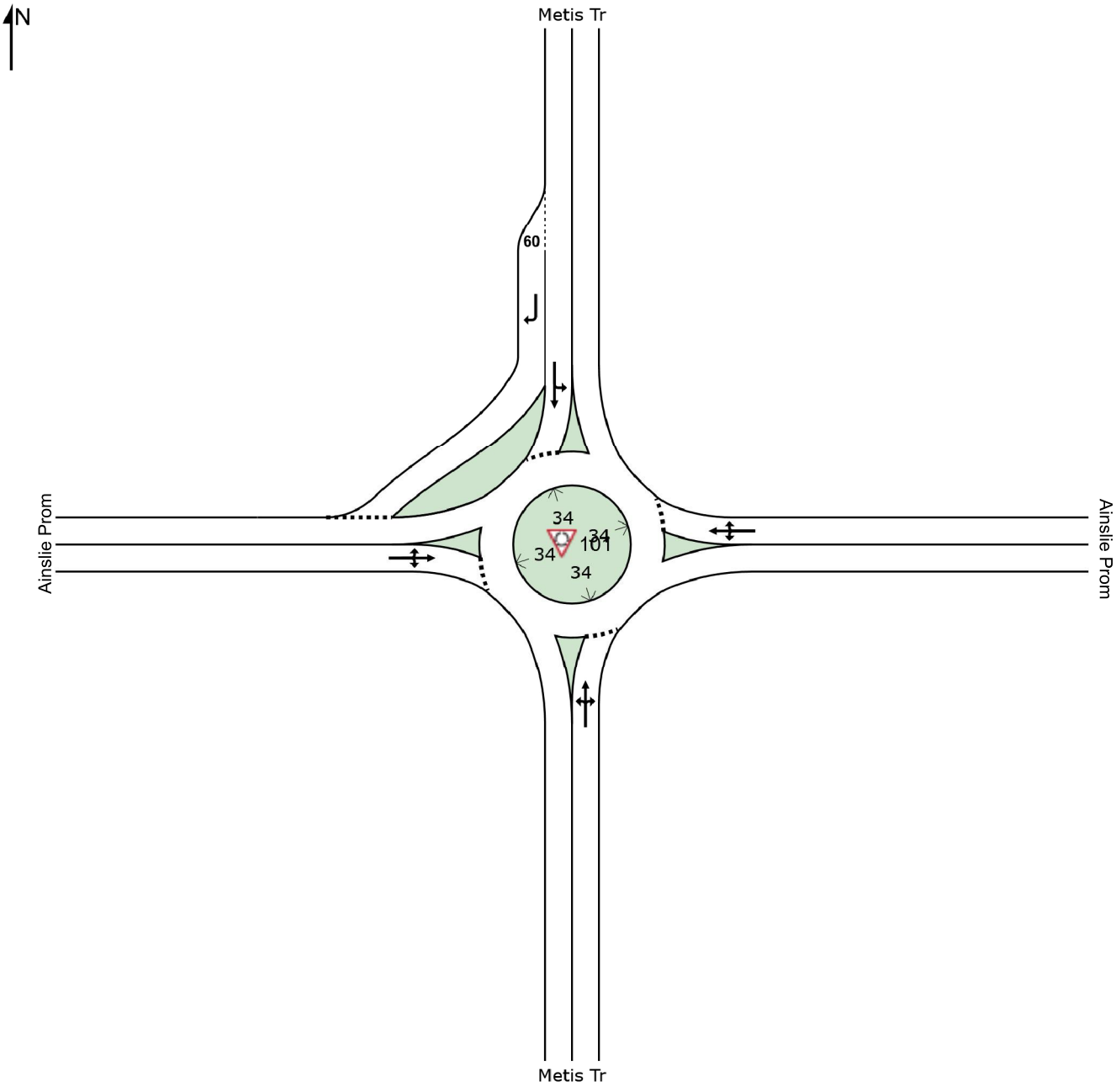


	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Metis Tr	430	409	22
E: Ainslie Prom	316	310	6
N: Metis Tr	826	785	41
W: Ainslie Prom	192	188	4
Total	1764	1691	73

SITE LAYOUT

Site: 101 [PM - 31: Metis Trail & Ainslie Prom - Imp]

New Site
Roundabout



MOVEMENT SUMMARY

Site: 101 [PM - 31: Metis Trail & Ainslie Prom - Imp]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Tr											
1	L2	43	5.0	0.586	14.2	LOS B	4.2	31.0	0.75	0.90	54.2
2	T1	401	5.0	0.586	8.1	LOS A	4.2	31.0	0.75	0.90	53.7
3	R2	44	5.0	0.586	8.2	LOS A	4.2	31.0	0.75	0.90	51.9
Approach		489	5.0	0.586	8.7	LOS A	4.2	31.0	0.75	0.90	53.6
East: Ainslie Prom											
4	L2	31	2.0	0.452	13.4	LOS B	2.6	18.4	0.69	0.82	54.8
5	T1	189	2.0	0.452	7.3	LOS A	2.6	18.4	0.69	0.82	54.8
6	R2	140	2.0	0.452	7.4	LOS A	2.6	18.4	0.69	0.82	53.1
Approach		359	2.0	0.452	7.9	LOS A	2.6	18.4	0.69	0.82	54.1
North: Metis Tr											
7	L2	269	5.0	0.743	13.3	LOS B	8.2	59.6	0.79	0.82	53.7
8	T1	539	5.0	0.743	7.1	LOS A	8.2	59.6	0.79	0.82	52.7
9	R2	131	5.0	0.117	4.1	LOS A	0.5	3.4	0.35	0.49	55.5
Approach		939	5.0	0.743	8.5	LOS A	8.2	59.6	0.73	0.77	53.4
West: Ainslie Prom											
10	L2	76	2.0	0.384	15.8	LOS B	1.8	12.8	0.73	0.90	52.5
11	T1	116	2.0	0.384	9.7	LOS A	1.8	12.8	0.73	0.90	52.1
12	R2	26	2.0	0.384	9.8	LOS A	1.8	12.8	0.73	0.90	49.7
Approach		218	2.0	0.384	11.8	LOS B	1.8	12.8	0.73	0.90	51.9
All Vehicles		2005	4.1	0.743	8.8	LOS A	8.2	59.6	0.73	0.83	53.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INPUT VOLUMES

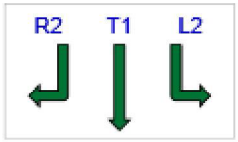
Vehicles and pedestrians per 60 minutes

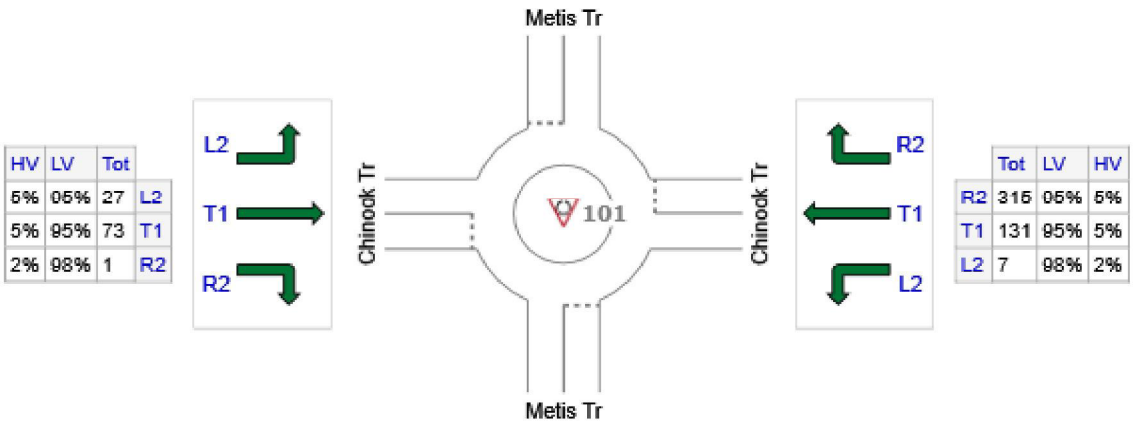
Site: 101 [PM - 33: Metis Trail & Chinook Trail]

New Site
Roundabout

Volume Display Method: Total and %

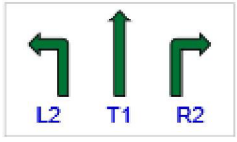
	R2	T1	L2
Tot	43	154	215
LV	95%	98%	95%
HV	5%	2%	5%





HV	LV	Tot	
5%	95%	27	L2
5%	95%	73	T1
2%	98%	1	R2

	Tot	LV	HV
R2	316	95%	5%
T1	131	95%	5%
L2	7	98%	2%



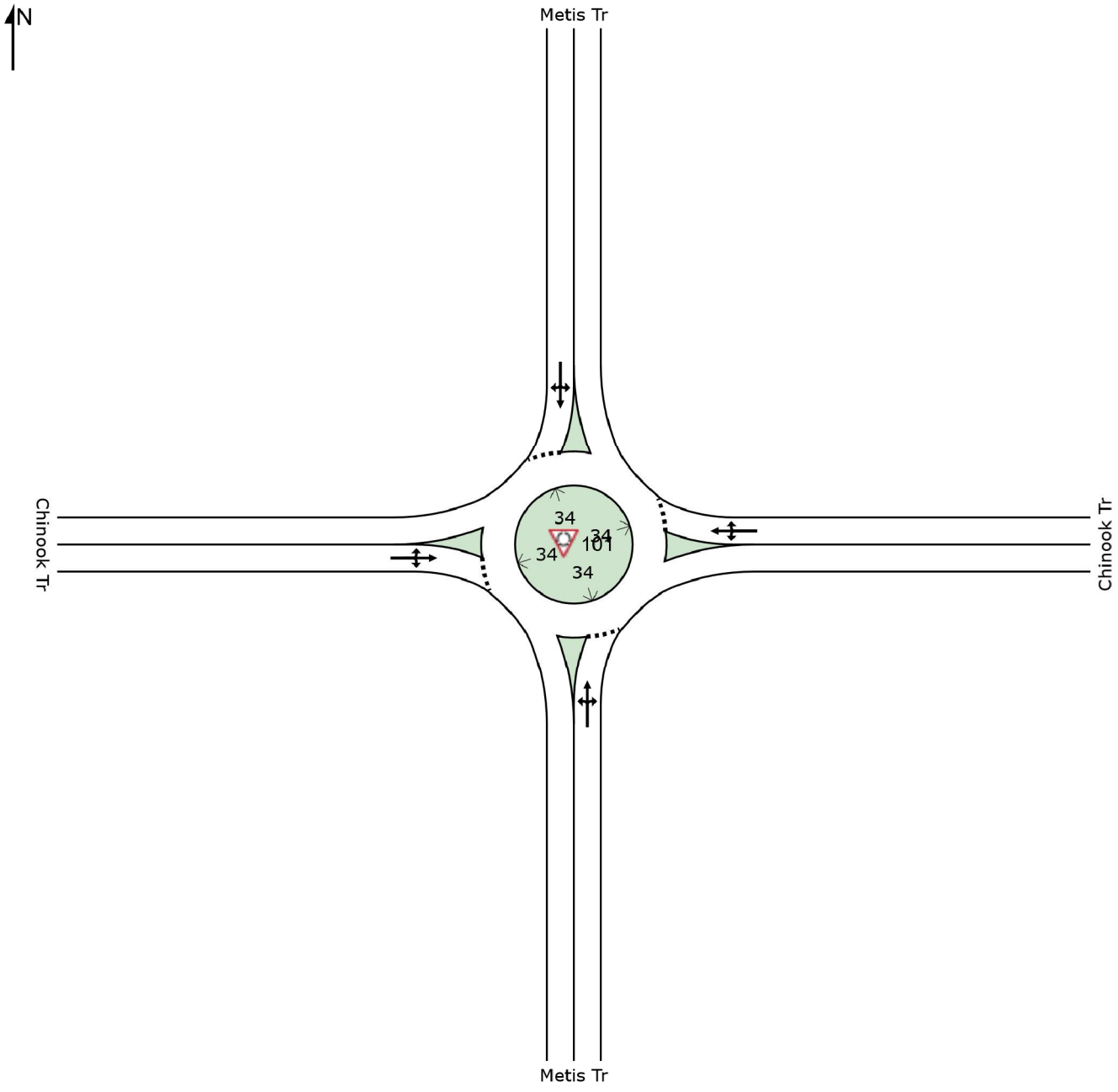
	L2	T1	R2
Tot	1	81	1
LV	98%	98%	98%
HV	2%	2%	2%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Metis Tr	83	81	2
E: Chinook Tr	453	431	22
N: Metis Tr	412	396	16
W: Chinook Tr	101	96	5
Total	1049	1004	45

SITE LAYOUT

Site: 101 [PM - 33: Metis Trail & Chinook Trail]

New Site
Roundabout



MOVEMENT SUMMARY

Site: 101 [PM - 33: Metis Trail & Chinook Trail]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Tr											
1	L2	1	2.0	0.100	11.0	LOS B	0.4	3.0	0.47	0.50	56.4
2	T1	92	2.0	0.100	4.9	LOS A	0.4	3.0	0.47	0.50	55.9
3	R2	1	2.0	0.100	5.0	LOS A	0.4	3.0	0.47	0.50	53.6
Approach		94	2.0	0.100	5.0	LOS A	0.4	3.0	0.47	0.50	55.9
East: Chinook Tr											
4	L2	8	2.0	0.434	10.1	LOS B	2.8	20.3	0.40	0.46	57.1
5	T1	149	5.0	0.434	4.0	LOS A	2.8	20.3	0.40	0.46	56.8
6	R2	358	5.0	0.434	4.1	LOS A	2.8	20.3	0.40	0.46	54.8
Approach		515	5.0	0.434	4.2	LOS A	2.8	20.3	0.40	0.46	55.4
North: Metis Tr											
7	L2	244	5.0	0.408	10.4	LOS B	2.5	17.9	0.43	0.57	54.7
8	T1	175	2.0	0.408	4.2	LOS A	2.5	17.9	0.43	0.57	54.1
9	R2	49	5.0	0.408	4.3	LOS A	2.5	17.9	0.43	0.57	52.9
Approach		468	3.9	0.408	7.4	LOS A	2.5	17.9	0.43	0.57	54.3
West: Chinook Tr											
10	L2	31	5.0	0.133	11.5	LOS B	0.6	4.1	0.51	0.61	55.4
11	T1	83	5.0	0.133	5.3	LOS A	0.6	4.1	0.51	0.61	54.7
12	R2	1	2.0	0.133	5.4	LOS A	0.6	4.1	0.51	0.61	52.7
Approach		115	5.0	0.133	7.0	LOS A	0.6	4.1	0.51	0.61	54.9
All Vehicles		1192	4.3	0.434	5.8	LOS A	2.8	20.3	0.43	0.52	55.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

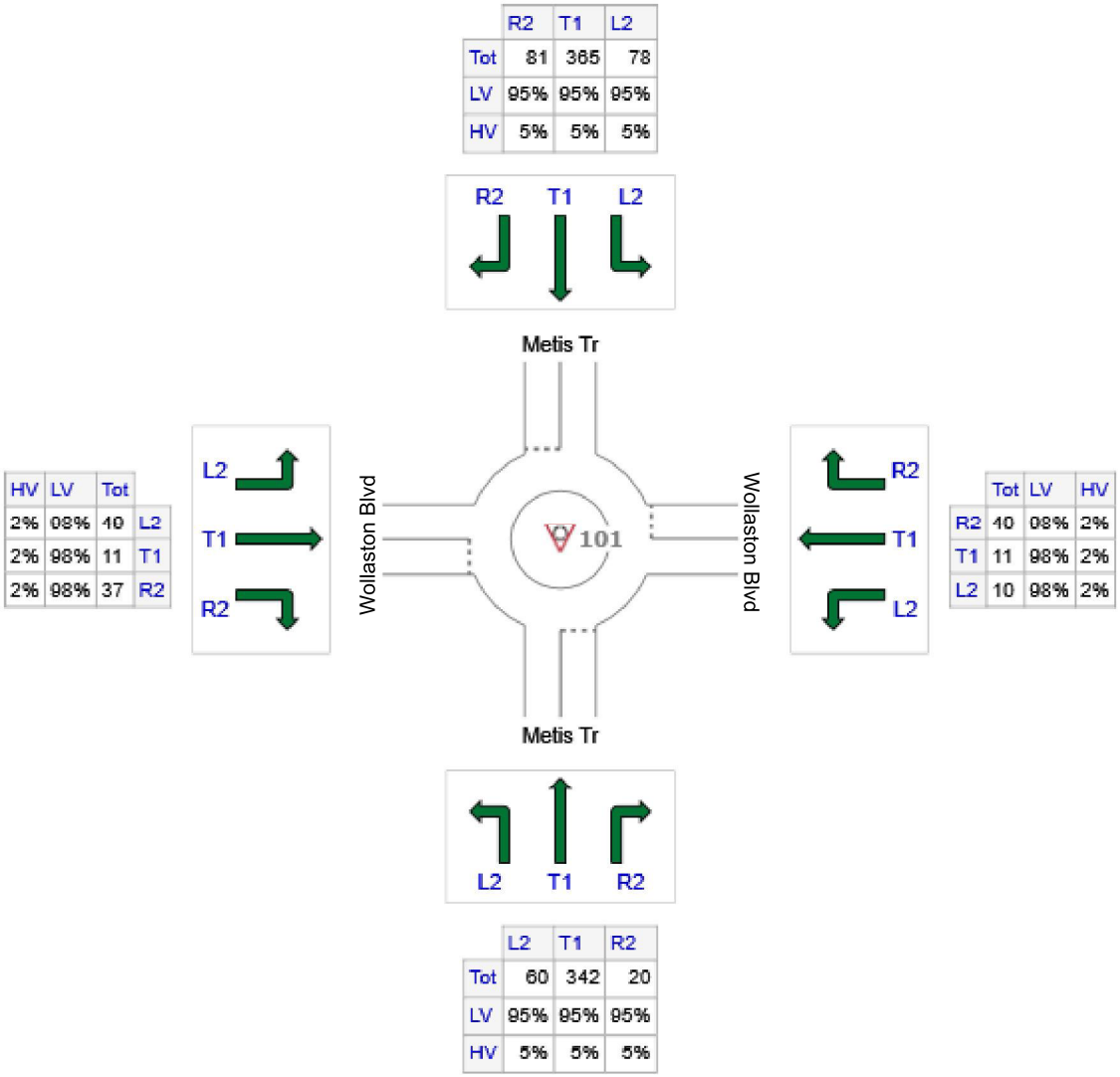
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: 101 [PM - 38: Metis Trail & Wollaston Blvd]

New Site
Roundabout

Volume Display Method: Total and %

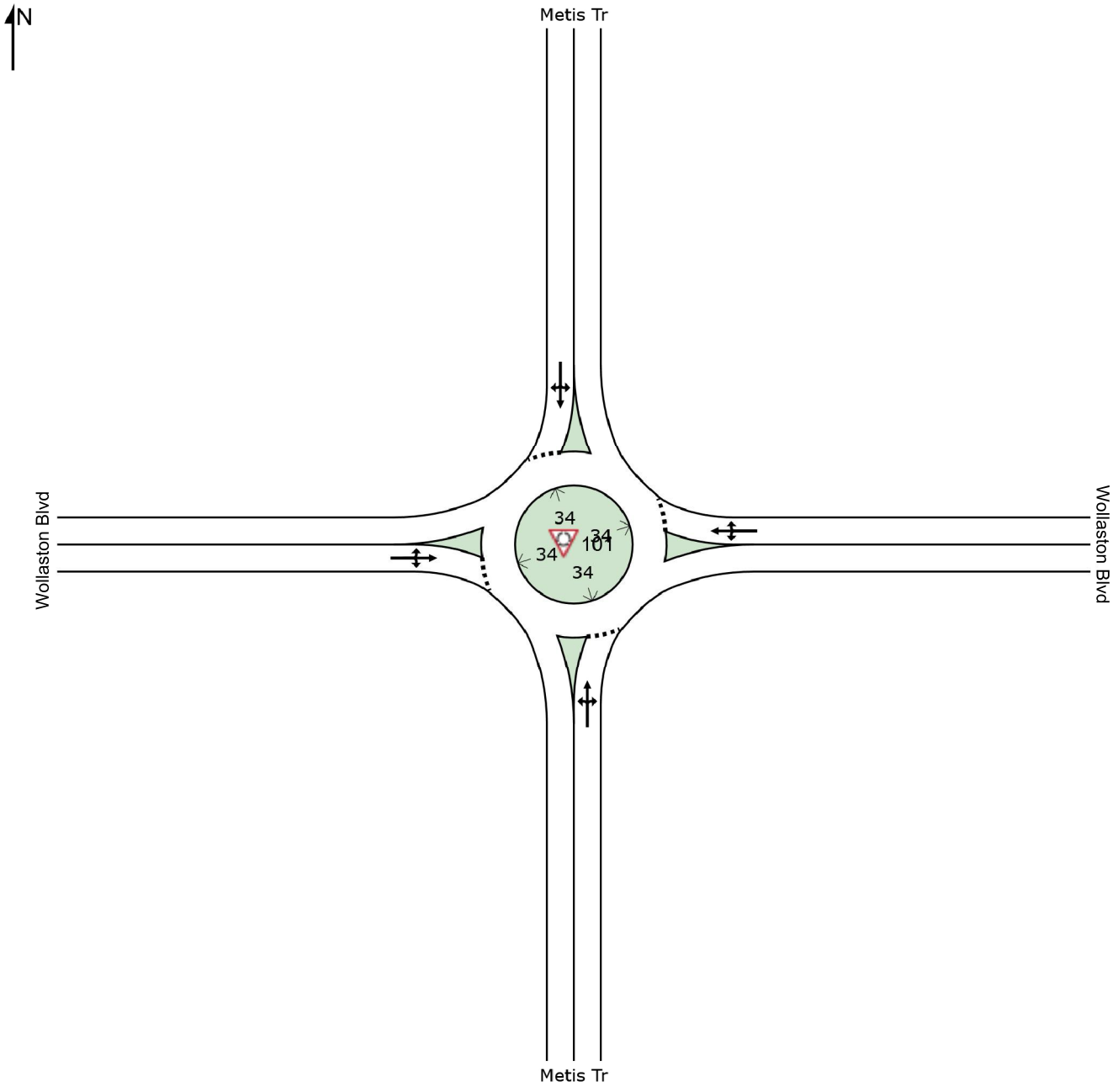


	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Metis Tr	422	401	21
E: Wollaston	61	60	1
N: Metis Tr	524	498	26
W:Wollaston	97	95	2
Total	1104	1054	50

SITE LAYOUT

Site: 101 [PM - 38: Metis Trail & Wollaston Blvd]

New Site
Roundabout



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Project: C:\Users\thaia\Desktop\Roundabout Analysis\Watermark Roundabout\Watermark Roundabout - v00.sip7

MOVEMENT SUMMARY

Site: 101 [PM - 38: Metis Trail & Wollaston Blvd]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Metis Tr											
1	L2	68	5.0	0.419	10.4	LOS B	2.6	18.8	0.44	0.47	56.0
2	T1	389	5.0	0.419	4.2	LOS A	2.6	18.8	0.44	0.47	55.6
3	R2	23	5.0	0.419	4.3	LOS A	2.6	18.8	0.44	0.47	53.3
Approach		480	5.0	0.419	5.1	LOS A	2.6	18.8	0.44	0.47	55.5
East: Wollaston Blvd											
4	L2	11	2.0	0.087	11.9	LOS B	0.3	2.5	0.54	0.66	55.5
5	T1	13	2.0	0.087	5.7	LOS A	0.3	2.5	0.54	0.66	55.4
6	R2	45	2.0	0.087	5.8	LOS A	0.3	2.5	0.54	0.66	53.6
Approach		69	2.0	0.087	6.8	LOS A	0.3	2.5	0.54	0.66	54.2
North: Metis Tr											
7	L2	89	5.0	0.487	10.0	LOS B	3.5	25.2	0.37	0.44	56.6
8	T1	415	5.0	0.487	3.9	LOS A	3.5	25.2	0.37	0.44	55.9
9	R2	92	5.0	0.487	4.0	LOS A	3.5	25.2	0.37	0.44	54.5
Approach		595	5.0	0.487	4.8	LOS A	3.5	25.2	0.37	0.44	55.8
West: Wollaston Blvd											
10	L2	56	2.0	0.138	12.0	LOS B	0.6	4.1	0.56	0.74	54.5
11	T1	13	2.0	0.138	5.9	LOS A	0.6	4.1	0.56	0.74	53.8
12	R2	42	2.0	0.138	6.0	LOS A	0.6	4.1	0.56	0.74	51.7
Approach		110	2.0	0.138	9.0	LOS A	0.6	4.1	0.56	0.74	53.4
All Vehicles		1255	4.6	0.487	5.4	LOS A	3.5	25.2	0.42	0.49	55.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INPUT VOLUMES

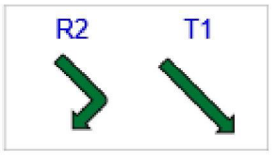
Vehicles and pedestrians per 60 minutes

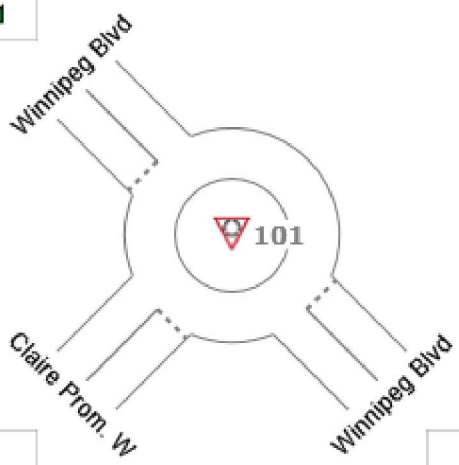
Site: 101 [PM - 58: Claire Prom W & Winnipeg Blvd]

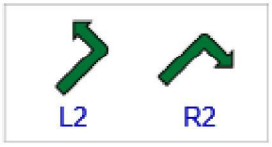
New Site
Roundabout

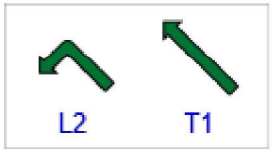
Volume Display Method: Total and %

	R2	T1
Tot	68	31
LV	98%	98%
HV	2%	2%









	L2	R2
Tot	40	290
LV	98%	98%
HV	2%	2%

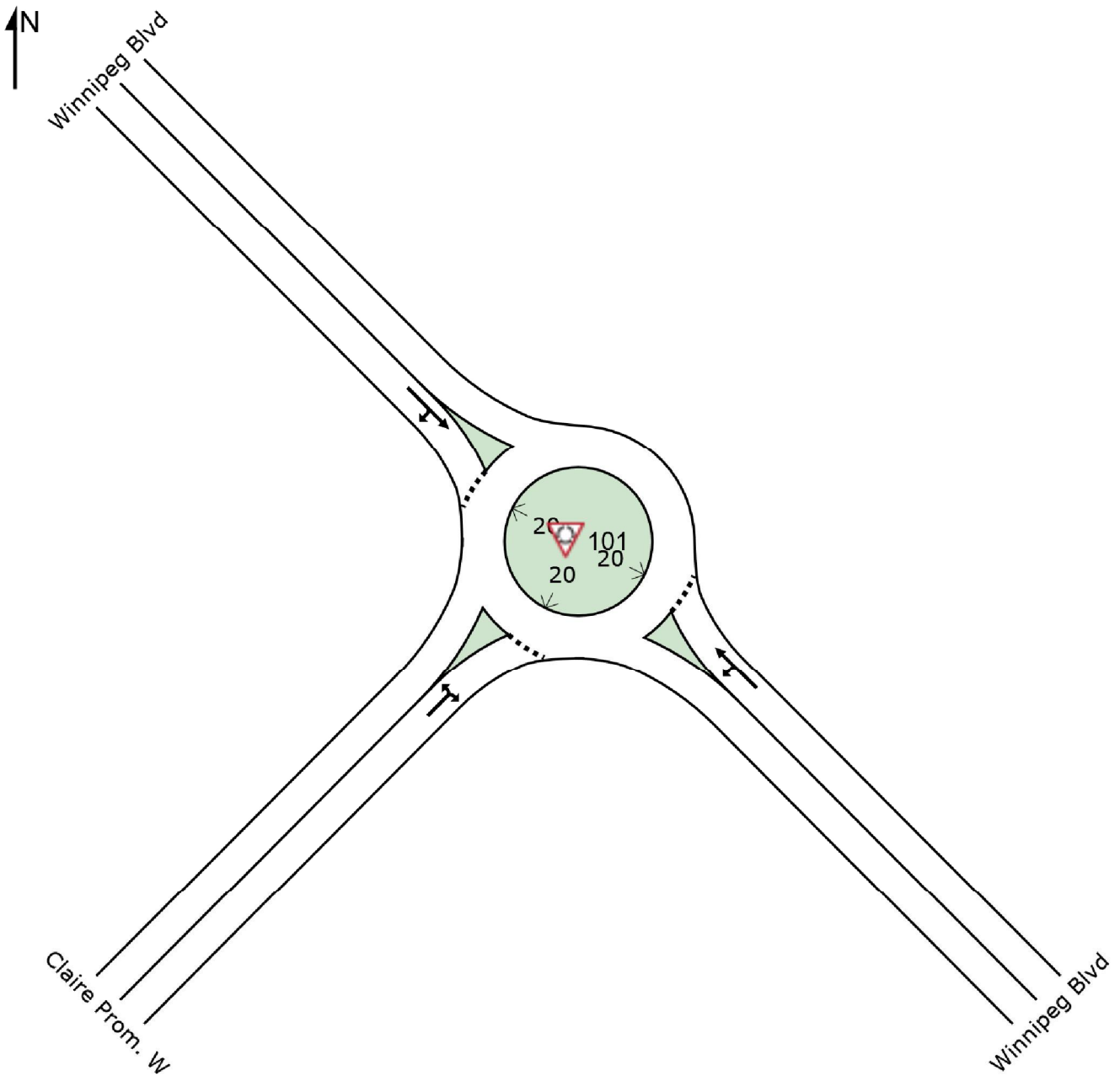
	L2	T1
Tot	346	55
LV	98%	98%
HV	2%	2%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
SE: Winnipeg Blvd	401	393	8
NW: Winnipeg Blvd	99	97	2
SW: Claire Prom. W	330	323	7
Total	830	813	17

SITE LAYOUT

Site: 101 [PM - 58: Claire Prom W & Winnipeg Blvd]

New Site
Roundabout



MOVEMENT SUMMARY

Site: 101 [PM - 58: Claire Prom W & Winnipeg Blvd]

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Winnipeg Blvd											
21	L2	393	2.0	0.349	9.0	LOS A	2.2	15.3	0.21	0.59	53.0
22	T1	63	2.0	0.349	4.4	LOS A	2.2	15.3	0.21	0.59	53.0
Approach		456	2.0	0.349	8.4	LOS A	2.2	15.3	0.21	0.59	53.0
NorthWest: Winnipeg Blvd											
28	T1	35	2.0	0.123	6.1	LOS A	0.5	3.7	0.49	0.63	55.0
29	R2	77	2.0	0.123	5.8	LOS A	0.5	3.7	0.49	0.63	53.7
Approach		113	2.0	0.123	5.9	LOS A	0.5	3.7	0.49	0.63	54.1
SouthWest: Claire Prom. W											
30	L2	45	2.0	0.285	8.9	LOS A	1.6	11.5	0.17	0.48	55.9
32	R2	330	2.0	0.285	4.1	LOS A	1.6	11.5	0.17	0.48	54.6
Approach		375	2.0	0.285	4.7	LOS A	1.6	11.5	0.17	0.48	54.7
All Vehicles		943	2.0	0.349	6.6	LOS A	2.2	15.3	0.23	0.55	53.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection: 3: Mt. Burke Blvd/McMaster Blvd W & Great Bear Blvd/McLeod Dr W

Movement	EB	WB	WB	NB	SB
Directions Served	TR	L	TR	LTR	LTR
Maximum Queue (m)	19.4	10.2	28.7	2.8	23.1
Average Queue (m)	8.3	2.8	12.8	0.1	6.8
95th Queue (m)	16.3	9.6	21.7	1.6	18.0
Link Distance (m)	218.2		164.9	135.5	535.8
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)		80.0			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Simon Fraser Blvd & McMaster Blvd W

Movement	NW	NE	NE
Directions Served	LT	L	R
Maximum Queue (m)	16.5	22.5	17.7
Average Queue (m)	1.2	9.1	6.7
95th Queue (m)	7.6	16.9	16.4
Link Distance (m)	535.8	277.0	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			15.0
Storage Blk Time (%)		2	0
Queuing Penalty (veh)		0	0

Intersection: 8: Simon Fraser Blvd & Columbia Blvd

Movement	SE	NW	SW
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	11.6	10.3	0.8
Average Queue (m)	6.7	4.6	0.0
95th Queue (m)	12.9	11.8	0.8
Link Distance (m)	96.1	76.5	277.0
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Rocky Mountain Blvd & Mt. Burke Blvd

Movement	EB	WB	SB	SB
Directions Served	LT	R	L	R
Maximum Queue (m)	20.2	15.6	20.6	17.4
Average Queue (m)	6.6	1.8	7.2	10.4
95th Queue (m)	16.3	9.2	14.0	16.6
Link Distance (m)	150.5		99.3	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		15.0		15.0
Storage Blk Time (%)		0	0	0
Queuing Penalty (veh)		0	0	0

Intersection: 17: Simon Fraser Blvd & Great Bear Blvd

Movement	EB	SB
Directions Served	LTR	LTR
Maximum Queue (m)	0.8	9.0
Average Queue (m)	0.0	1.9
95th Queue (m)	0.8	7.8
Link Distance (m)	134.7	122.6
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 22: Metis Tr & Great Bear Blvd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	16.6	9.6	10.3	5.0
Average Queue (m)	8.9	3.2	0.7	0.2
95th Queue (m)	14.8	10.3	5.2	3.2
Link Distance (m)	110.1	44.0	518.7	181.8
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 28: Winnipeg Blvd & Great Bear Blvd

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 31: Metis Tr & Ainslie Prom.

W

Movement	WB	SB
Directions Served	LTR	LTR
Maximum Queue (m)	18.3	11.8
Average Queue (m)	9.9	1.7
95th Queue (m)	15.8	7.8
Link Distance (m)	74.4	518.7
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 32: Chinook Tr

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 33: Chinook Tr & Metis Tr

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	6.0	14.9	20.2
Average Queue (m)	0.3	6.3	3.8
95th Queue (m)	3.1	13.5	13.4
Link Distance (m)	110.0	434.3	387.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 35: Chinook Tr

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 38: Metis Tr & Wollaston

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 41: Sunridge Blvd

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 44: Sunridge Blvd

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 51: Sunridge Blvd & Rocky Mountain Blvd

Movement	WB
Directions Served	TR
Maximum Queue (m)	14.1
Average Queue (m)	7.5
95th Queue (m)	14.1
Link Distance (m)	56.0
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 55: Ainslie Prom

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 58: Claire Blvd. W & Winnipeg Blvd

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 63: Rocky Mountain Blvd & Claire Blvd. W

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	16.9	11.0
Average Queue (m)	7.2	0.9
95th Queue (m)	15.0	5.8
Link Distance (m)	71.0	88.0
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 67:

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 1

Intersection: 3: Mt. Burke Blvd/McMaster Blvd W & Great Bear Blvd/McLeod Dr W

Movement	EB	WB	WB	NB	SB
Directions Served	TR	L	TR	LTR	LTR
Maximum Queue (m)	9.2	14.0	19.2	1.4	21.1
Average Queue (m)	2.7	5.0	9.1	0.0	4.2
95th Queue (m)	9.5	12.8	15.9	1.0	14.5
Link Distance (m)	218.2		164.9	135.5	535.8
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)		80.0			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Simon Fraser Blvd & McMaster Blvd W

Movement	SE	NW	NE	NE
Directions Served	R	LT	L	R
Maximum Queue (m)	16.4	20.1	15.7	13.8
Average Queue (m)	1.6	2.8	6.8	4.2
95th Queue (m)	9.0	11.8	13.9	12.5
Link Distance (m)		535.8	277.0	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	15.0			15.0
Storage Blk Time (%)	0		1	0
Queuing Penalty (veh)	0		0	0

Intersection: 8: Simon Fraser Blvd & Columbia Blvd

Movement	SE	NW	NE	SW
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	16.7	15.0	4.4	0.9
Average Queue (m)	8.4	6.3	0.2	0.0
95th Queue (m)	14.2	13.5	2.4	0.9
Link Distance (m)	96.1	76.5	229.0	277.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 11: Rocky Mountain Blvd & Mt. Burke Blvd

Movement	EB	WB	SB	SB
Directions Served	LT	R	L	R
Maximum Queue (m)	18.5	12.1	22.5	17.3
Average Queue (m)	4.1	1.0	8.4	10.4
95th Queue (m)	13.3	7.0	15.3	16.8
Link Distance (m)	150.5		99.3	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		15.0		15.0
Storage Blk Time (%)		0	1	0
Queuing Penalty (veh)		0	1	0

Intersection: 17: Simon Fraser Blvd & Great Bear Blvd

Movement	SB
Directions Served	LTR
Maximum Queue (m)	8.8
Average Queue (m)	1.2
95th Queue (m)	6.2
Link Distance (m)	122.6
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 22: Metis Tr & Great Bear Blvd

Movement	EB	WB	NB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	10.9	11.1	5.1
Average Queue (m)	5.1	5.2	0.2
95th Queue (m)	12.1	12.6	2.8
Link Distance (m)	110.1	44.0	518.7
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 28: Winnipeg Blvd & Great Bear Blvd

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 31: Metis Tr & Claire BLvd. W

Movement	WB	SB
Directions Served	LTR	LTR
Maximum Queue (m)	17.3	17.5
Average Queue (m)	6.4	2.4
95th Queue (m)	14.2	10.5
Link Distance (m)	74.4	518.7
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 32: Chinook Tr

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 33: Chinook Tr & Metis Tr

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	8.0	20.0	10.5
Average Queue (m)	0.7	10.0	0.8
95th Queue (m)	4.7	16.9	5.4
Link Distance (m)	110.0	434.3	387.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 35: Chinook Tr

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 38: Metis Tr

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 41: Sunridge Blvd

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 44: Sunridge Blvd

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 51: Sunridge Blvd & Rocky Mountain Blvd

Movement	WB
Directions Served	TR
Maximum Queue (m)	15.3
Average Queue (m)	5.7
95th Queue (m)	13.6
Link Distance (m)	56.0
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 55: Ainslie Prom.

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 58: Claire Blvd. W & Winnipeg Blvd

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 63: Rocky Mountain Blvd & Claire Blvd. W

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	17.6	7.3
Average Queue (m)	9.0	0.4
95th Queue (m)	15.3	3.3
Link Distance (m)	71.0	88.0
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 67:

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 1

Intersection: 3: Mt. Burke Blvd/McMaster Blvd & Great Bear Blvd/MacLeod Dr

Movement	WB	WB	NB	SB
Directions Served	L	TR	LTR	LTR
Maximum Queue (m)	9.3	20.7	2.0	21.7
Average Queue (m)	2.8	10.4	0.1	6.6
95th Queue (m)	9.7	16.4	1.6	17.3
Link Distance (m)		165.4	135.5	533.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	80.0			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Simon Fraser Blvd & McMaster Blvd

Movement	NB	NE	NE
Directions Served	LT	L	R
Maximum Queue (m)	17.0	20.0	17.6
Average Queue (m)	1.2	9.4	7.0
95th Queue (m)	8.6	16.5	16.4
Link Distance (m)	533.9	273.1	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			15.0
Storage Blk Time (%)		2	0
Queuing Penalty (veh)		0	0

Intersection: 8: Simon Fraser Blvd & Columbia Blvd

Movement	SE	NW	NE
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	12.4	9.3	0.9
Average Queue (m)	6.8	5.0	0.0
95th Queue (m)	13.2	12.3	1.1
Link Distance (m)	113.8	139.6	97.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Rocky Mountain Blvd & Mt. Burke Blvd

Movement	EB	WB	SB	SB
Directions Served	LT	R	L	R
Maximum Queue (m)	18.2	14.8	16.4	17.5
Average Queue (m)	5.4	1.8	7.1	10.1
95th Queue (m)	14.7	8.7	13.4	16.5
Link Distance (m)	150.5		99.3	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		15.0		15.0
Storage Blk Time (%)		0	0	0
Queuing Penalty (veh)		0	0	0

Network Summary

Network wide Queuing Penalty: 1

Intersection: 3: Mt. Burke Blvd/McMaster Blvd & Great Bear Blvd/MacLeod Dr

Movement	WB	WB	NB	SB
Directions Served	L	TR	LTR	LTR
Maximum Queue (m)	14.0	19.9	0.6	18.3
Average Queue (m)	5.2	8.8	0.0	4.0
95th Queue (m)	13.3	15.4	0.6	13.1
Link Distance (m)		165.4	135.5	533.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	80.0			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Simon Fraser Blvd & McMaster Blvd

Movement	NB	SB	NE	NE
Directions Served	LT	R	L	R
Maximum Queue (m)	21.8	14.0	16.6	13.8
Average Queue (m)	3.2	0.8	7.3	4.0
95th Queue (m)	13.5	6.3	14.7	12.2
Link Distance (m)	533.9		273.1	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		15.0		15.0
Storage Blk Time (%)		0	1	0
Queuing Penalty (veh)		0	0	0

Intersection: 8: Simon Fraser Blvd & Columbia Blvd

Movement	SE	NW	NE
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	16.2	14.4	3.6
Average Queue (m)	8.6	6.1	0.2
95th Queue (m)	14.0	13.8	2.1
Link Distance (m)	113.8	139.6	97.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Rocky Mountain Blvd & Mt. Burke Blvd

Movement	EB	WB	SB	SB
Directions Served	LT	R	L	R
Maximum Queue (m)	15.7	11.6	19.4	17.6
Average Queue (m)	2.9	0.7	8.4	10.4
95th Queue (m)	11.1	5.8	15.0	16.5
Link Distance (m)	150.5		99.3	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		15.0		15.0
Storage Blk Time (%)		0	1	0
Queuing Penalty (veh)		0	1	0

Network Summary

Network wide Queuing Penalty: 1

Intersection: 3: Mt. Burke Blvd/McMaster Blvd W & Great Bear Blvd/McLeod Dr W

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (m)	17.7	62.9	19.0	38.6	72.8	65.6
Average Queue (m)	4.6	33.8	6.8	16.8	37.3	26.9
95th Queue (m)	13.6	54.4	15.7	30.0	64.0	51.3
Link Distance (m)		218.2		164.9	135.5	535.8
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	65.0		80.0			
Storage Blk Time (%)		0				
Queuing Penalty (veh)		0				

Intersection: 7: Simon Fraser Blvd & McMaster Blvd W

Movement	SE	NW	NE	NE
Directions Served	R	LT	L	R
Maximum Queue (m)	1.4	15.9	25.6	17.7
Average Queue (m)	0.0	1.3	11.0	7.3
95th Queue (m)	1.0	7.9	20.0	17.8
Link Distance (m)		535.8	277.0	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	15.0			15.0
Storage Blk Time (%)			3	0
Queuing Penalty (veh)			1	0

Intersection: 8: Simon Fraser Blvd & Columbia Blvd

Movement	SE	NW
Directions Served	LTR	LTR
Maximum Queue (m)	13.8	10.1
Average Queue (m)	6.9	5.0
95th Queue (m)	13.5	12.1
Link Distance (m)	96.1	76.5
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 11: Rocky Mountain Blvd & Mt. Burke Blvd

Movement	EB	WB	SB	SB
Directions Served	LT	R	L	R
Maximum Queue (m)	33.3	16.3	40.7	19.5
Average Queue (m)	13.0	3.0	15.0	13.3
95th Queue (m)	26.1	11.3	30.2	19.6
Link Distance (m)	150.5		99.3	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		15.0		15.0
Storage Blk Time (%)		0	10	1
Queuing Penalty (veh)		0	11	2

Intersection: 17: Simon Fraser Blvd & Great Bear Blvd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	14.9	13.6	23.3	27.2
Average Queue (m)	2.3	1.6	11.4	12.6
95th Queue (m)	9.9	8.2	19.1	21.7
Link Distance (m)	134.7	55.9	68.9	122.6
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 22: Metis Tr & Great Bear Blvd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (m)	42.3	94.8	36.0	47.9	31.8	25.4	139.4	42.5	18.9	59.3	31.4
Average Queue (m)	24.7	42.3	17.3	15.3	12.6	3.0	70.3	22.2	4.8	23.9	4.9
95th Queue (m)	46.6	76.1	31.4	34.2	27.4	13.9	124.0	49.9	13.5	49.5	18.0
Link Distance (m)		104.4		53.4			511.3			176.5	
Upstream Blk Time (%)		0		0							
Queuing Penalty (veh)		0		0							
Storage Bay Dist (m)	40.0		35.0		30.0	25.0		40.0	35.0		40.0
Storage Blk Time (%)	1	9	1	1	0	0	25	0		3	0
Queuing Penalty (veh)	3	11	2	3	1	1	45	2		2	0

Intersection: 28: Winnipeg Blvd & Great Bear Blvd

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (m)	2.0	10.5	24.7
Average Queue (m)	0.1	0.9	12.8
95th Queue (m)	1.2	5.4	21.1
Link Distance (m)	58.8	116.2	83.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 31: Metis Tr & Ainslie Prom.

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	TR	LT	R	LTR	L	TR
Maximum Queue (m)	37.1	62.4	49.1	41.6	82.6	42.2	73.5
Average Queue (m)	24.3	23.8	18.3	20.9	38.7	10.6	26.4
95th Queue (m)	39.4	49.9	36.3	35.6	69.5	27.2	56.0
Link Distance (m)		62.3	72.5		386.2		511.3
Upstream Blk Time (%)		0	0				
Queuing Penalty (veh)		0	0				
Storage Bay Dist (m)	35.0			40.0		40.0	
Storage Blk Time (%)	4	2	1	1		0	3
Queuing Penalty (veh)	6	3	1	1		0	2

Intersection: 32: Chinook Tr & Bistcho Blvd

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (m)	20.4	22.2
Average Queue (m)	1.8	10.0
95th Queue (m)	10.1	16.7
Link Distance (m)	348.9	110.8
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 33: Chinook Tr & Metis Tr

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	41.8	44.4	27.2	76.3
Average Queue (m)	19.1	17.6	9.6	37.2
95th Queue (m)	34.9	32.6	20.9	65.7
Link Distance (m)	110.0	434.3	62.2	387.6
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 35: Chinook Tr & Atlin Blvd

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (m)	13.0	21.6
Average Queue (m)	0.8	9.9
95th Queue (m)	6.1	16.3
Link Distance (m)	434.3	232.7
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 38: Metis Tr & Wolllaston

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	54.5	35.2	46.6	57.7
Average Queue (m)	24.7	13.3	18.2	22.4
95th Queue (m)	43.5	25.9	37.1	46.0
Link Distance (m)	62.5	97.8	387.6	386.2
Upstream Blk Time (%)	0			
Queuing Penalty (veh)	0			
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 41: Atlin Blvd & Sunridge Blvd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	18.3	17.5	3.5	9.7
Average Queue (m)	9.0	9.2	0.1	0.6
95th Queue (m)	14.2	14.9	2.0	4.6
Link Distance (m)	97.1	90.4	232.7	79.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 44: Bistcho Blvd & Sunridge Blvd

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (m)	9.0	18.3
Average Queue (m)	1.1	9.1
95th Queue (m)	6.1	15.1
Link Distance (m)	53.2	65.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 51: Sunridge Blvd & Rocky Mountain Blvd

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	17.3	1.4	19.0
Average Queue (m)	3.4	0.1	10.1
95th Queue (m)	12.6	1.2	15.5
Link Distance (m)	91.4	56.0	88.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 55: Atlin Blvd & Ainslie Prom.

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (m)	15.4	23.1
Average Queue (m)	2.0	11.4
95th Queue (m)	9.4	18.6
Link Distance (m)	60.9	66.1
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 58: Claire Prom. W & Winnipeg Blvd

Movement	WB	SE	NE
Directions Served	LR	LR	LR
Maximum Queue (m)	14.2	12.3	14.2
Average Queue (m)	2.1	2.6	2.9
95th Queue (m)	9.0	9.6	10.7
Link Distance (m)	64.9	64.3	58.9
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 63: Rocky Mountain Blvd & Claire Prom. W

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	37.5	17.7	0.7
Average Queue (m)	18.1	3.7	0.0
95th Queue (m)	30.8	12.8	0.7
Link Distance (m)	71.0	88.0	77.0
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 67: Ainslie Prom & Atlin Blvd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	18.1	5.3
Average Queue (m)	9.2	0.2
95th Queue (m)	14.9	2.4
Link Distance (m)	69.1	70.6
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 96

Intersection: 3: Mt. Burke Blvd/McMaster Blvd W & Great Bear Blvd/McLeod Dr W

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (m)	13.0	34.2	54.6	52.3	88.1	75.1
Average Queue (m)	3.4	16.8	26.1	25.5	38.0	31.7
95th Queue (m)	11.1	29.3	43.6	43.0	67.3	57.2
Link Distance (m)		218.2		164.9	135.5	535.8
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	65.0		80.0			
Storage Blk Time (%)			0			
Queuing Penalty (veh)			0			

Intersection: 7: Simon Fraser Blvd & McMaster Blvd W

Movement	SE	NW	NE	NE
Directions Served	R	LT	L	R
Maximum Queue (m)	15.6	26.9	22.1	15.5
Average Queue (m)	2.4	4.1	9.5	4.4
95th Queue (m)	10.7	16.0	17.5	13.1
Link Distance (m)		535.8	277.0	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	15.0			15.0
Storage Blk Time (%)	0		3	0
Queuing Penalty (veh)	0		0	0

Intersection: 8: Simon Fraser Blvd & Columbia Blvd

Movement	SE	NW	NE	SW
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	15.9	14.7	6.2	0.9
Average Queue (m)	8.5	6.5	0.4	0.0
95th Queue (m)	13.8	13.7	3.3	0.9
Link Distance (m)	96.1	76.5	229.0	277.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 11: Rocky Mountain Blvd & Mt. Burke Blvd

Movement	EB	WB	SB	SB
Directions Served	LT	R	L	R
Maximum Queue (m)	39.6	16.2	71.8	19.0
Average Queue (m)	15.3	3.6	24.0	16.0
95th Queue (m)	30.5	12.2	54.1	19.1
Link Distance (m)	150.5		99.3	
Upstream Blk Time (%)			0	
Queuing Penalty (veh)			0	
Storage Bay Dist (m)		15.0		15.0
Storage Blk Time (%)		0	14	9
Queuing Penalty (veh)		0	41	12

Intersection: 17: Simon Fraser Blvd & Great Bear Blvd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	21.2	19.7	21.1	30.4
Average Queue (m)	6.9	3.3	9.4	13.2
95th Queue (m)	17.3	12.7	16.9	23.2
Link Distance (m)	134.7	55.9	68.9	122.6
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 22: Metis Tr & Great Bear Blvd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (m)	42.3	84.6	37.3	67.2	32.5	27.2	139.0	42.5	37.3	191.1	42.5
Average Queue (m)	21.6	34.6	13.2	54.9	15.9	8.4	57.7	13.0	20.2	139.1	17.8
95th Queue (m)	43.0	67.6	35.4	77.2	37.7	21.6	111.1	38.2	41.1	225.4	46.9
Link Distance (m)		104.4		58.3			511.4			176.4	
Upstream Blk Time (%)		0		22						14	
Queuing Penalty (veh)		0		0						0	
Storage Bay Dist (m)	40.0		35.0		30.0	25.0		40.0	35.0		40.0
Storage Blk Time (%)	1	6	0	38	0	0	21	0	1	27	0
Queuing Penalty (veh)	2	5	0	50	1	2	23	1	6	77	3

Intersection: 28: Winnipeg Blvd & Great Bear Blvd

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (m)	0.7	18.8	23.9
Average Queue (m)	0.0	4.6	11.7
95th Queue (m)	0.7	14.4	19.5
Link Distance (m)	58.8	116.2	83.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 31: Metis Tr & Ainslie Prom.

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	TR	LT	R	LTR	L	TR
Maximum Queue (m)	34.9	44.5	75.2	42.5	142.7	42.3	161.2
Average Queue (m)	13.2	19.5	36.5	19.1	62.6	29.1	68.5
95th Queue (m)	27.3	36.6	63.2	40.5	122.5	50.5	141.6
Link Distance (m)		105.4	72.5		386.4		511.4
Upstream Blk Time (%)			1				
Queuing Penalty (veh)			0				
Storage Bay Dist (m)	35.0			40.0		40.0	
Storage Blk Time (%)	0	2	7	0		2	12
Queuing Penalty (veh)	0	1	8	1		13	27

Intersection: 32: Chinook Tr & Bistcho Blvd

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	24.9	1.4	17.9
Average Queue (m)	7.3	0.0	9.4
95th Queue (m)	20.2	0.9	15.9
Link Distance (m)	348.9	142.1	110.8
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 33: Chinook Tr & Metis Tr

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	33.0	85.1	23.1	77.8
Average Queue (m)	13.9	40.8	8.0	35.8
95th Queue (m)	27.8	70.4	18.8	64.0
Link Distance (m)	110.0	434.3	62.2	387.6
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 35: Chinook Tr & Atlin Blvd

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	27.3	0.7	18.7
Average Queue (m)	3.9	0.0	9.2
95th Queue (m)	15.8	1.0	15.6
Link Distance (m)	434.3	348.9	232.7
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 38: Metis Tr & Wollaston Blvd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	35.8	21.8	60.2	88.5
Average Queue (m)	15.4	9.5	23.3	35.5
95th Queue (m)	28.7	18.7	48.6	73.1
Link Distance (m)	62.5	97.8	387.6	386.4
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 41: Atlin Blvd & Sunridge Blvd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	10.6	20.5	4.5	9.5
Average Queue (m)	7.2	10.2	0.3	0.6
95th Queue (m)	13.3	16.4	3.0	4.6
Link Distance (m)	97.1	90.4	232.7	79.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 44: Bistcho Blvd & Sunridge Blvd

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (m)	11.1	14.7
Average Queue (m)	1.7	8.0
95th Queue (m)	7.8	13.7
Link Distance (m)	53.2	99.6
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 51: Sunridge Blvd & Rocky Mountain Blvd

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	18.5	1.4	28.3
Average Queue (m)	4.4	0.0	13.6
95th Queue (m)	13.4	1.0	22.0
Link Distance (m)	91.5	55.8	127.1
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 55: Atlin Blvd & Ainslie Prom

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (m)	2.7	25.5	22.2
Average Queue (m)	0.1	6.7	10.6
95th Queue (m)	1.5	18.4	17.5
Link Distance (m)	79.0	60.9	66.1
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 58: Claire Prom. W & Winnipeg Blvd

Movement	WB	SE	NE
Directions Served	LR	LR	LR
Maximum Queue (m)	18.4	14.0	13.2
Average Queue (m)	2.8	4.8	1.1
95th Queue (m)	11.6	12.7	6.9
Link Distance (m)	64.9	86.9	83.8
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 63: Rocky Mountain Blvd & Claire Prom. W

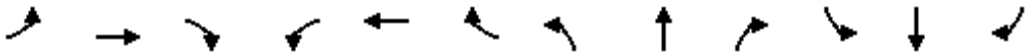
Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	42.3	27.1	11.4
Average Queue (m)	18.3	9.5	0.8
95th Queue (m)	31.5	20.5	5.6
Link Distance (m)	89.6	88.0	77.0
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 67: Atlin Blvd & Wollaston

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	16.3	6.3
Average Queue (m)	8.1	0.4
95th Queue (m)	14.3	3.4
Link Distance (m)	69.1	70.6
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 275



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	54	0	12	38	98	0	352	38	67	187	0
Future Volume (vph)	0	54	0	12	38	98	0	352	38	67	187	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	65.0		0.0	80.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	35.0			35.0			2.5			2.5		
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
Frt					0.892			0.987				
Flt Protected				0.950							0.987	
Satd. Flow (prot)	1735	1735	0	1648	1547	0	0	1712	0	0	1712	0
Flt Permitted				0.950							0.987	
Satd. Flow (perm)	1735	1735	0	1648	1547	0	0	1712	0	0	1712	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		223.7			170.6			142.8			551.0	
Travel Time (s)		16.1			12.3			10.3			39.7	
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)	0	61	0	14	43	111	0	400	43	76	213	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	61	0	14	154	0	0	443	0	0	289	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)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 56.0%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	54	0	12	38	98	0	352	38	67	187	0
Future Vol, veh/h	0	54	0	12	38	98	0	352	38	67	187	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	650	-	-	800	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	61	0	14	43	111	0	400	43	76	213	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	864	808	213	818	787	422	213	0	0	443	0	0
Stage 1	365	365	-	422	422	-	-	-	-	-	-	-
Stage 2	499	443	-	396	365	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	274	315	827	295	324	632	1357	-	-	1117	-	-
Stage 1	654	623	-	609	588	-	-	-	-	-	-	-
Stage 2	554	576	-	629	623	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	189	291	827	233	299	632	1357	-	-	1117	-	-
Mov Cap-2 Maneuver	189	291	-	233	299	-	-	-	-	-	-	-
Stage 1	654	575	-	609	588	-	-	-	-	-	-	-
Stage 2	423	576	-	519	575	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.6	16.4	0	2.2
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1357	-	-	-	291	233	482	1117	-	-
HCM Lane V/C Ratio	-	-	-	-	0.211	0.059	0.321	0.068	-	-
HCM Control Delay (s)	0	-	-	0	20.6	21.4	16	8.5	0	-
HCM Lane LOS	A	-	-	A	C	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.8	0.2	1.4	0.2	-	-

Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	210	15	14	488	81	29
Future Volume (vph)	210	15	14	488	81	29
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)		15.0	0.0		0.0	15.0
Storage Lanes		1	0		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.999	0.950	
Satd. Flow (prot)	1735	1475	0	1733	1648	1475
Flt Permitted				0.999	0.950	
Satd. Flow (perm)	1735	1475	0	1733	1648	1475
Link Speed (k/h)	50			50	50	
Link Distance (m)	123.9			551.0	291.6	
Travel Time (s)	8.9			39.7	21.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	239	17	16	555	92	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	239	17	0	571	92	33
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 51.7%		ICU Level of Service A	
Analysis Period (min) 15			

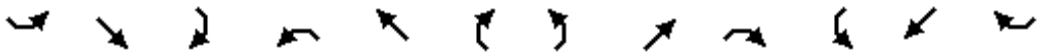
Intersection	
Int Delay, s/veh	2.4

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	210	15	14	488	81	29
Future Vol, veh/h	210	15	14	488	81	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	-	0	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	239	17	16	555	92	33

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	256	0	826	239
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	587	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1309	-	342	800
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	556	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1309	-	336	800
Mov Cap-2 Maneuver	-	-	-	-	336	-
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	546	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.2	17.1
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	336	800	1309	-	-	-
HCM Lane V/C Ratio	0.274	0.041	0.012	-	-	-
HCM Control Delay (s)	19.7	9.7	7.8	0	-	-
HCM Lane LOS	C	A	A	A	-	-
HCM 95th %tile Q(veh)	1.1	0.1	0	-	-	-



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	22	19	2	0	17	7	1	21	1	1	15	19
Future Volume (vph)	22	19	2	0	17	7	1	21	1	1	15	19
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.994			0.960			0.995			0.926	
Flt Protected		0.975						0.998			0.999	
Satd. Flow (prot)	0	1681	0	0	1665	0	0	1723	0	0	1605	0
Flt Permitted		0.975						0.998			0.999	
Satd. Flow (perm)	0	1681	0	0	1665	0	0	1723	0	0	1605	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		102.0			82.2			234.8			291.6	
Travel Time (s)		7.3			5.9			16.9			21.0	
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
Adj. Flow (vph)	25	22	2	0	19	8	1	24	1	1	17	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	49	0	0	27	0	0	26	0	0	40	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 19.2%		ICU Level of Service A	
Analysis Period (min) 15			

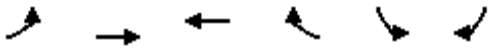
Intersection	
Int Delay, s/veh	5.1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	22	19	2	0	17	7	1	21	1	1	15	19
Future Vol, veh/h	22	19	2	0	17	7	1	21	1	1	15	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	22	2	0	19	8	1	24	1	1	17	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	70	57	28	69	68	25	39	0	0	25	0	0
Stage 1	30	30	-	27	27	-	-	-	-	-	-	-
Stage 2	40	27	-	42	41	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	922	834	1047	923	823	1051	1571	-	-	1589	-	-
Stage 1	987	870	-	990	873	-	-	-	-	-	-	-
Stage 2	975	873	-	972	861	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	897	832	1047	902	821	1051	1571	-	-	1589	-	-
Mov Cap-2 Maneuver	897	832	-	902	821	-	-	-	-	-	-	-
Stage 1	986	869	-	989	872	-	-	-	-	-	-	-
Stage 2	945	872	-	945	860	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	9.4	9.2	0.3	0.2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NEL	NET	NER	NWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1571	-	-	877	873	1589	-	-
HCM Lane V/C Ratio	0.001	-	-	0.031	0.056	0.001	-	-
HCM Control Delay (s)	7.3	0	-	9.2	9.4	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0	-	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	118	111	133	103	61	99
Future Volume (vph)	118	111	133	103	61	99
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0			15.0	0.0	15.0
Storage Lanes	0			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected		0.975			0.950	
Satd. Flow (prot)	0	1691	1735	1475	1648	1475
Flt Permitted		0.975			0.950	
Satd. Flow (perm)	0	1691	1735	1475	1648	1475
Link Speed (k/h)		50	50		50	
Link Distance (m)		157.6	140.4		108.3	
Travel Time (s)		11.3	10.1		7.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	134	126	151	117	69	113
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	260	151	117	69	113
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.7%		ICU Level of Service A	
Analysis Period (min) 15			

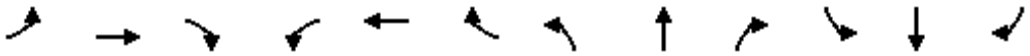
Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	118	111	133	103	61	99
Future Vol, veh/h	118	111	133	103	61	99
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	0	150
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	134	126	151	117	69	113

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	268	0	-	0	545	151
Stage 1	-	-	-	-	151	-
Stage 2	-	-	-	-	394	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1296	-	-	-	499	895
Stage 1	-	-	-	-	877	-
Stage 2	-	-	-	-	681	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1296	-	-	-	444	895
Mov Cap-2 Maneuver	-	-	-	-	444	-
Stage 1	-	-	-	-	780	-
Stage 2	-	-	-	-	681	-

Approach	EB	WB	SB
HCM Control Delay, s	4.2	0	11.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1296	-	-	-	444	895
HCM Lane V/C Ratio	0.103	-	-	-	0.156	0.126
HCM Control Delay (s)	8.1	0	-	-	14.6	9.6
HCM Lane LOS	A	A	-	-	B	A
HCM 95th %tile Q(veh)	0.3	-	-	-	0.5	0.4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	24	35	9	3	4	10	190	27	5	183	20
Future Volume (vph)	13	24	35	9	3	4	10	190	27	5	183	20
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.934			0.962			0.984			0.987	
Flt Protected		0.991			0.973			0.998			0.999	
Satd. Flow (prot)	0	1606	0	0	1624	0	0	1655	0	0	1662	0
Flt Permitted		0.991			0.973			0.998			0.999	
Satd. Flow (perm)	0	1606	0	0	1624	0	0	1655	0	0	1662	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		115.7			49.3			529.5			187.4	
Travel Time (s)		8.3			3.5			38.1			13.5	
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)	15	27	40	10	3	5	11	216	31	6	208	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	82	0	0	18	0	0	258	0	0	237	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 29.1%		ICU Level of Service A	
Analysis Period (min) 15			

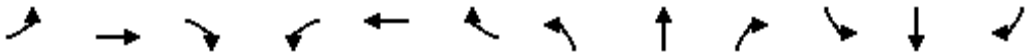
Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	13	24	35	9	3	4	10	190	27	5	183	20
Future Vol, veh/h	13	24	35	9	3	4	10	190	27	5	183	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	5	5	5	5	5	5
Mvmt Flow	15	27	40	10	3	5	11	216	31	6	208	23

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	490	501	220	519	497	232	231	0	0	247	0	0
Stage 1	232	232	-	254	254	-	-	-	-	-	-	-
Stage 2	258	269	-	265	243	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	489	472	820	467	475	807	1319	-	-	1302	-	-
Stage 1	771	713	-	750	697	-	-	-	-	-	-	-
Stage 2	747	687	-	740	705	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	478	465	820	420	468	807	1319	-	-	1302	-	-
Mov Cap-2 Maneuver	478	465	-	420	468	-	-	-	-	-	-	-
Stage 1	763	709	-	743	690	-	-	-	-	-	-	-
Stage 2	732	680	-	674	701	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12	12.7	0.3	0.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1319	-	-	593	488	1302	-	-
HCM Lane V/C Ratio	0.009	-	-	0.138	0.037	0.004	-	-
HCM Control Delay (s)	7.8	0	-	12	12.7	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.1	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	94	0	133	0	44	183	0
Future Volume (vph)	0	0	0	0	0	94	0	133	0	44	183	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt					0.865							
Flt Protected											0.990	
Satd. Flow (prot)	0	1735	0	0	1501	0	0	1685	0	0	1668	0
Flt Permitted											0.990	
Satd. Flow (perm)	0	1735	0	0	1501	0	0	1685	0	0	1668	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		69.7			79.9			399.0			529.5	
Travel Time (s)		5.0			5.8			28.7			38.1	
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)	0	0	0	0	0	107	0	151	0	50	208	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	107	0	0	151	0	0	258	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.0%		ICU Level of Service A	
Analysis Period (min) 15			

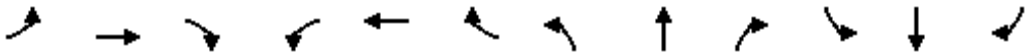
Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	94	0	133	0	44	183	0
Future Vol, veh/h	0	0	0	0	0	94	0	133	0	44	183	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	0	107	0	151	0	50	208	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	513	459	208	459	459	151	208	0	0	151	0	0
Stage 1	308	308	-	151	151	-	-	-	-	-	-	-
Stage 2	205	151	-	308	308	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	472	499	832	512	499	895	1345	-	-	1412	-	-
Stage 1	702	660	-	851	772	-	-	-	-	-	-	-
Stage 2	797	772	-	702	660	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	403	479	832	496	479	895	1345	-	-	1412	-	-
Mov Cap-2 Maneuver	403	479	-	496	479	-	-	-	-	-	-	-
Stage 1	702	634	-	851	772	-	-	-	-	-	-	-
Stage 2	702	772	-	674	634	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	9.6	0	1.5
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1345	-	-	-	895	1412	-	-
HCM Lane V/C Ratio	-	-	-	-	0.119	0.035	-	-
HCM Control Delay (s)	0	-	-	0	9.6	7.6	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.4	0.1	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	0	5	4	25	0	108	0	150	30	3
Future Volume (vph)	1	0	0	5	4	25	0	108	0	150	30	3
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt					0.903						0.998	
Flt Protected		0.950			0.992						0.961	
Satd. Flow (prot)	0	1601	0	0	1516	0	0	1735	0	0	1624	0
Flt Permitted		0.950			0.992						0.961	
Satd. Flow (perm)	0	1601	0	0	1516	0	0	1735	0	0	1624	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		115.5			443.6			68.0			398.4	
Travel Time (s)		8.3			31.9			4.9			28.7	
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 (%)	5%	5%	2%	2%	5%	5%	2%	2%	2%	5%	2%	5%
Adj. Flow (vph)	1	0	0	6	5	28	0	123	0	170	34	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1	0	0	39	0	0	123	0	0	207	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.6%		ICU Level of Service A	
Analysis Period (min) 15			

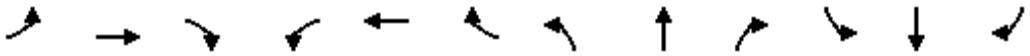
Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	0	5	4	25	0	108	0	150	30	3
Future Vol, veh/h	1	0	0	5	4	25	0	108	0	150	30	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	2	2	5	5	2	2	2	5	2	5
Mvmt Flow	1	0	0	6	5	28	0	123	0	170	34	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	516	499	36	499	500	123	37	0	0	123	0	0
Stage 1	376	376	-	123	123	-	-	-	-	-	-	-
Stage 2	140	123	-	376	377	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.22	7.12	6.55	6.25	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.318	3.518	4.045	3.345	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	465	469	1037	482	468	920	1574	-	-	1446	-	-
Stage 1	639	611	-	881	788	-	-	-	-	-	-	-
Stage 2	856	788	-	645	611	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	406	413	1037	438	412	920	1574	-	-	1446	-	-
Mov Cap-2 Maneuver	406	413	-	438	412	-	-	-	-	-	-	-
Stage 1	639	538	-	881	788	-	-	-	-	-	-	-
Stage 2	825	788	-	568	538	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.9	10.4	0	6.4
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1574	-	-	406	704	1446	-	-
HCM Lane V/C Ratio	-	-	-	0.003	0.055	0.118	-	-
HCM Control Delay (s)	0	-	-	13.9	10.4	7.8	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.2	0.4	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	12	0	25	19	60	0	221	24	60	260	0
Future Volume (vph)	0	12	0	25	19	60	0	221	24	60	260	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	65.0		0.0	80.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	35.0			35.0			2.5			2.5		
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
Frt					0.887			0.987				
Flt Protected				0.950							0.991	
Satd. Flow (prot)	1735	1735	0	1648	1539	0	0	1712	0	0	1719	0
Flt Permitted				0.950							0.991	
Satd. Flow (perm)	1735	1735	0	1648	1539	0	0	1712	0	0	1719	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		223.7			170.6			142.8			551.0	
Travel Time (s)		16.1			12.3			10.3			39.7	
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)	0	14	0	28	22	68	0	251	27	68	295	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	0	28	90	0	0	278	0	0	363	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)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	12	0	25	19	60	0	221	24	60	260	0
Future Vol, veh/h	0	12	0	25	19	60	0	221	24	60	260	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	650	-	-	800	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	14	0	28	22	68	0	251	27	68	295	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	741	709	295	703	696	265	295	0	0	278	0	0
Stage 1	431	431	-	265	265	-	-	-	-	-	-	-
Stage 2	310	278	-	438	431	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	332	359	744	352	365	774	1266	-	-	1285	-	-
Stage 1	603	583	-	740	689	-	-	-	-	-	-	-
Stage 2	700	680	-	597	583	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	275	336	744	325	342	774	1266	-	-	1285	-	-
Mov Cap-2 Maneuver	275	336	-	325	342	-	-	-	-	-	-	-
Stage 1	603	546	-	740	689	-	-	-	-	-	-	-
Stage 2	618	680	-	545	546	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.2	13.3	0	1.5
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1266	-	-	-	336	325	594	1285	-	-
HCM Lane V/C Ratio	-	-	-	-	0.041	0.087	0.151	0.053	-	-
HCM Control Delay (s)	0	-	-	0	16.2	17.1	12.1	8	0	-
HCM Lane LOS	A	-	-	A	C	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0.3	0.5	0.2	-	-

Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	440	76	19	293	45	16
Future Volume (vph)	440	76	19	293	45	16
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)		15.0	0.0		0.0	15.0
Storage Lanes		1	0		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.997	0.950	
Satd. Flow (prot)	1735	1475	0	1730	1648	1475
Flt Permitted				0.997	0.950	
Satd. Flow (perm)	1735	1475	0	1730	1648	1475
Link Speed (k/h)	50			50	50	
Link Distance (m)	123.9			551.0	291.6	
Travel Time (s)	8.9			39.7	21.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	500	86	22	333	51	18
Shared Lane Traffic (%)						
Lane Group Flow (vph)	500	86	0	355	51	18
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

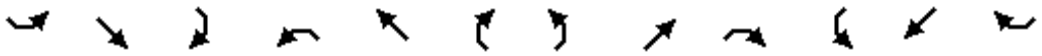
Intersection	
Int Delay, s/veh	1.3

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	440	76	19	293	45	16
Future Vol, veh/h	440	76	19	293	45	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	-	0	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	500	86	22	333	51	18

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	586	0	877	500
Stage 1	-	-	-	-	500	-
Stage 2	-	-	-	-	377	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	989	-	319	571
Stage 1	-	-	-	-	609	-
Stage 2	-	-	-	-	694	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	989	-	310	571
Mov Cap-2 Maneuver	-	-	-	-	310	-
Stage 1	-	-	-	-	609	-
Stage 2	-	-	-	-	675	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.5	17
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	310	571	989	-	-	-
HCM Lane V/C Ratio	0.165	0.032	0.022	-	-	-
HCM Control Delay (s)	18.9	11.5	8.7	0	-	-
HCM Lane LOS	C	B	A	A	-	-
HCM 95th %tile Q(veh)	0.6	0.1	0.1	-	-	-



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	24	37	7	2	29	6	12	28	0	3	30	24
Future Volume (vph)	24	37	7	2	29	6	12	28	0	3	30	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.986			0.977						0.943	
Flt Protected		0.983			0.998			0.985			0.998	
Satd. Flow (prot)	0	1681	0	0	1691	0	0	1709	0	0	1633	0
Flt Permitted		0.983			0.998			0.985			0.998	
Satd. Flow (perm)	0	1681	0	0	1691	0	0	1709	0	0	1633	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		102.0			82.2			234.8			291.6	
Travel Time (s)		7.3			5.9			16.9			21.0	
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
Adj. Flow (vph)	27	42	8	2	33	7	14	32	0	3	34	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	77	0	0	42	0	0	46	0	0	64	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 24.1%		ICU Level of Service A	
Analysis Period (min) 15			

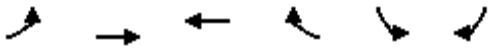
Intersection	
Int Delay, s/veh	5.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	24	37	7	2	29	6	12	28	0	3	30	24
Future Vol, veh/h	24	37	7	2	29	6	12	28	0	3	30	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	42	8	2	33	7	14	32	0	3	34	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	134	114	48	139	127	32	61	0	0	32	0	0
Stage 1	54	54	-	60	60	-	-	-	-	-	-	-
Stage 2	80	60	-	79	67	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	838	776	1021	831	764	1042	1542	-	-	1580	-	-
Stage 1	958	850	-	951	845	-	-	-	-	-	-	-
Stage 2	929	845	-	930	839	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	798	767	1021	784	756	1042	1542	-	-	1580	-	-
Mov Cap-2 Maneuver	798	767	-	784	756	-	-	-	-	-	-	-
Stage 1	949	848	-	942	837	-	-	-	-	-	-	-
Stage 2	879	837	-	875	837	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	10	9.8	2.2	0.4
HCM LOS	B	A		

Minor Lane/Major Mvmt	NEL	NET	NER	NWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1542	-	-	793	798	1580	-	-
HCM Lane V/C Ratio	0.009	-	-	0.053	0.097	0.002	-	-
HCM Control Delay (s)	7.4	0	-	9.8	10	7.3	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.3	0	-	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	90	118	99	60	91	107
Future Volume (vph)	90	118	99	60	91	107
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0			15.0	0.0	15.0
Storage Lanes	0			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected		0.979			0.950	
Satd. Flow (prot)	0	1698	1735	1475	1648	1475
Flt Permitted		0.979			0.950	
Satd. Flow (perm)	0	1698	1735	1475	1648	1475
Link Speed (k/h)		50	50		50	
Link Distance (m)		157.6	140.4		108.3	
Travel Time (s)		11.3	10.1		7.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	102	134	113	68	103	122
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	236	113	68	103	122
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	31.0%	ICU Level of Service	A
Analysis Period (min)	15		

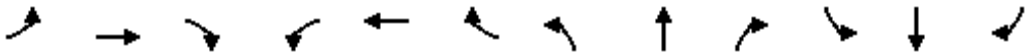
Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	90	118	99	60	91	107
Future Vol, veh/h	90	118	99	60	91	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	0	150
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	102	134	113	68	103	122

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	181	0	-	0	451	113
Stage 1	-	-	-	-	113	-
Stage 2	-	-	-	-	338	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1394	-	-	-	566	940
Stage 1	-	-	-	-	912	-
Stage 2	-	-	-	-	722	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1394	-	-	-	521	940
Mov Cap-2 Maneuver	-	-	-	-	521	-
Stage 1	-	-	-	-	840	-
Stage 2	-	-	-	-	722	-

Approach	EB	WB	SB
HCM Control Delay, s	3.4	0	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1394	-	-	-	521	940
HCM Lane V/C Ratio	0.073	-	-	-	0.198	0.129
HCM Control Delay (s)	7.8	0	-	-	13.6	9.4
HCM Lane LOS	A	A	-	-	B	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0.7	0.4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	0	20	4	10	12	5	169	15	0	245	5
Future Volume (vph)	5	0	20	4	10	12	5	169	15	0	245	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.893			0.937			0.989			0.997	
Flt Protected		0.990			0.992			0.999				
Satd. Flow (prot)	0	1534	0	0	1612	0	0	1665	0	0	1680	0
Flt Permitted		0.990			0.992			0.999				
Satd. Flow (perm)	0	1534	0	0	1612	0	0	1665	0	0	1680	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		115.7			49.3			529.5			187.4	
Travel Time (s)		8.3			3.5			38.1			13.5	
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)	6	0	23	5	11	14	6	192	17	0	278	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	29	0	0	30	0	0	215	0	0	284	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 25.1%		ICU Level of Service A	
Analysis Period (min) 15			

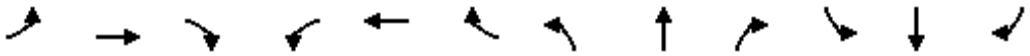
Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	0	20	4	10	12	5	169	15	0	245	5
Future Vol, veh/h	5	0	20	4	10	12	5	169	15	0	245	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	5	5	5	5	5	5
Mvmt Flow	6	0	23	5	11	14	6	192	17	0	278	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	506	502	281	506	497	201	284	0	0	209	0	0
Stage 1	281	281	-	213	213	-	-	-	-	-	-	-
Stage 2	225	221	-	293	284	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	477	471	758	477	475	840	1261	-	-	1344	-	-
Stage 1	726	678	-	789	726	-	-	-	-	-	-	-
Stage 2	778	720	-	715	676	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	459	469	758	461	473	840	1261	-	-	1344	-	-
Mov Cap-2 Maneuver	459	469	-	461	473	-	-	-	-	-	-	-
Stage 1	722	678	-	785	722	-	-	-	-	-	-	-
Stage 2	750	716	-	694	676	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	11.4	0.2	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1261	-	-	671	590	1344	-	-
HCM Lane V/C Ratio	0.005	-	-	0.042	0.05	-	-	-
HCM Control Delay (s)	7.9	0	-	10.6	11.4	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	33	0	155	0	68	200	0
Future Volume (vph)	0	0	0	0	0	33	0	155	0	68	200	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt					0.865							
Flt Protected											0.987	
Satd. Flow (prot)	0	1735	0	0	1501	0	0	1685	0	0	1663	0
Flt Permitted											0.987	
Satd. Flow (perm)	0	1735	0	0	1501	0	0	1685	0	0	1663	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		69.7			79.9			399.0			529.5	
Travel Time (s)		5.0			5.8			28.7			38.1	
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)	0	0	0	0	0	38	0	176	0	77	227	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	38	0	0	176	0	0	304	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.7%		ICU Level of Service A	
Analysis Period (min) 15			

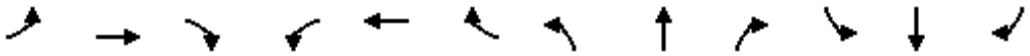
Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	33	0	155	0	68	200	0
Future Vol, veh/h	0	0	0	0	0	33	0	155	0	68	200	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	5	5	5	5	5	5
Mvmt Flow	0	0	0	0	0	38	0	176	0	77	227	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	576	557	227	557	557	176	227	0	0	176	0	0
Stage 1	381	381	-	176	176	-	-	-	-	-	-	-
Stage 2	195	176	-	381	381	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.15	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.245	-	-	2.245	-	-
Pot Cap-1 Maneuver	428	439	812	441	439	867	1324	-	-	1382	-	-
Stage 1	641	613	-	826	753	-	-	-	-	-	-	-
Stage 2	807	753	-	641	613	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	389	411	812	419	411	867	1324	-	-	1382	-	-
Mov Cap-2 Maneuver	389	411	-	419	411	-	-	-	-	-	-	-
Stage 1	641	574	-	826	753	-	-	-	-	-	-	-
Stage 2	772	753	-	600	574	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	9.3	0	2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1324	-	-	-	867	1382	-	-
HCM Lane V/C Ratio	-	-	-	-	0.043	0.056	-	-
HCM Control Delay (s)	0	-	-	0	9.3	7.8	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0.2	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	0	0	7	0	73	0	81	0	44	154	2
Future Volume (vph)	3	0	0	7	0	73	0	81	0	44	154	2
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt					0.877						0.999	
Flt Protected		0.950			0.996						0.989	
Satd. Flow (prot)	0	1601	0	0	1476	0	0	1735	0	0	1702	0
Flt Permitted		0.950			0.996						0.989	
Satd. Flow (perm)	0	1601	0	0	1476	0	0	1735	0	0	1702	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		115.5			443.6			68.0			398.4	
Travel Time (s)		8.3			31.9			4.9			28.7	
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 (%)	5%	5%	2%	2%	5%	5%	2%	2%	2%	5%	2%	5%
Adj. Flow (vph)	3	0	0	8	0	83	0	92	0	50	175	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	3	0	0	91	0	0	92	0	0	227	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.0%		ICU Level of Service A	
Analysis Period (min) 15			

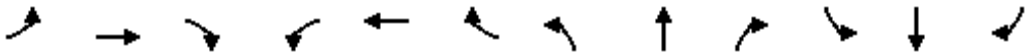
Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	0	0	7	0	73	0	81	0	44	154	2
Future Vol, veh/h	3	0	0	7	0	73	0	81	0	44	154	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	2	2	5	5	2	2	2	5	2	5
Mvmt Flow	3	0	0	8	0	83	0	92	0	50	175	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	410	368	176	368	369	92	177	0	0	92	0	0
Stage 1	276	276	-	92	92	-	-	-	-	-	-	-
Stage 2	134	92	-	276	277	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.22	7.12	6.55	6.25	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.318	3.518	4.045	3.345	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	547	556	867	588	556	957	1399	-	-	1484	-	-
Stage 1	724	676	-	915	813	-	-	-	-	-	-	-
Stage 2	862	813	-	730	676	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	486	535	867	572	535	957	1399	-	-	1484	-	-
Mov Cap-2 Maneuver	486	535	-	572	535	-	-	-	-	-	-	-
Stage 1	724	651	-	915	813	-	-	-	-	-	-	-
Stage 2	787	813	-	703	651	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.5	9.4	0	1.7
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1399	-	-	486	904	1484	-	-
HCM Lane V/C Ratio	-	-	-	0.007	0.101	0.034	-	-
HCM Control Delay (s)	0	-	-	12.5	9.4	7.5	0	-
HCM Lane LOS	A	-	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0.1	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	12	0	98	0	352	38	67	187	0
Future Volume (vph)	0	0	0	12	0	98	0	352	38	67	187	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	65.0		0.0	80.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	35.0			35.0			2.5			2.5		
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
Frt					0.850			0.987				
Flt Protected				0.950							0.987	
Satd. Flow (prot)	1735	1735	0	1648	1475	0	0	1712	0	0	1712	0
Flt Permitted				0.950							0.987	
Satd. Flow (perm)	1735	1735	0	1648	1475	0	0	1712	0	0	1712	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		223.7			170.6			142.8			549.2	
Travel Time (s)		16.1			12.3			10.3			39.5	
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)	0	0	0	14	0	111	0	400	43	76	213	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	14	111	0	0	443	0	0	289	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)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.9%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	12	0	98	0	352	38	67	187	0
Future Vol, veh/h	0	0	0	12	0	98	0	352	38	67	187	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	650	-	-	800	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	14	0	111	0	400	43	76	213	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	842	808	213	787	787	422	213	0	0	443	0	0
Stage 1	365	365	-	422	422	-	-	-	-	-	-	-
Stage 2	477	443	-	365	365	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	284	315	827	309	324	632	1357	-	-	1117	-	-
Stage 1	654	623	-	609	588	-	-	-	-	-	-	-
Stage 2	569	576	-	654	623	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	220	291	827	291	299	632	1357	-	-	1117	-	-
Mov Cap-2 Maneuver	220	291	-	291	299	-	-	-	-	-	-	-
Stage 1	654	575	-	609	588	-	-	-	-	-	-	-
Stage 2	469	576	-	604	575	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	12.6	0	2.2
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1357	-	-	-	-	291	632	1117	-	-
HCM Lane V/C Ratio	-	-	-	-	-	0.047	0.176	0.068	-	-
HCM Control Delay (s)	0	-	-	0	0	18	11.9	8.5	0	-
HCM Lane LOS	A	-	-	A	A	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	-	0.1	0.6	0.2	-	-

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	14	488	210	15	78	29
Future Volume (vph)	14	488	210	15	78	29
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0			15.0	0.0	15.0
Storage Lanes	0			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected		0.999			0.950	
Satd. Flow (prot)	0	1733	1735	1475	1648	1475
Flt Permitted		0.999			0.950	
Satd. Flow (perm)	0	1733	1735	1475	1648	1475
Link Speed (k/h)		50	50		50	
Link Distance (m)		549.2	139.5		287.2	
Travel Time (s)		39.5	10.0		20.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	16	555	239	17	89	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	571	239	17	89	33
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	2.3

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	14	488	210	15	78	29
Future Vol, veh/h	14	488	210	15	78	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	0	150
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	555	239	17	89	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	256	0	-	0	826	239
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	587	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1309	-	-	-	342	800
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	556	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1309	-	-	-	336	800
Mov Cap-2 Maneuver	-	-	-	-	336	-
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	556	-

Approach	NB	SB	NE
HCM Control Delay, s	0.2	0	16.8
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NBL	NBT	SBT	SBR
Capacity (veh/h)	336	800	1309	-	-	-
HCM Lane V/C Ratio	0.264	0.041	0.012	-	-	-
HCM Control Delay (s)	19.5	9.7	7.8	0	-	-
HCM Lane LOS	C	A	A	A	-	-
HCM 95th %tile Q(veh)	1	0.1	0	-	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	22	19	2	0	17	7	1	18	1	1	8	19
Future Volume (vph)	22	19	2	0	17	7	1	18	1	1	8	19
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.994			0.960			0.994			0.907	
Flt Protected		0.975						0.998			0.998	
Satd. Flow (prot)	0	1681	0	0	1665	0	0	1721	0	0	1570	0
Flt Permitted		0.975						0.998			0.998	
Satd. Flow (perm)	0	1681	0	0	1665	0	0	1721	0	0	1570	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		119.4			144.9			102.5			287.2	
Travel Time (s)		8.6			10.4			7.4			20.7	
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)	25	22	2	0	19	8	1	20	1	1	9	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	49	0	0	27	0	0	22	0	0	32	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 19.2%		ICU Level of Service A	
Analysis Period (min) 15			

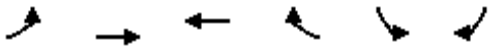
Intersection	
Int Delay, s/veh	5.5

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	22	19	2	0	17	7	1	18	1	1	8	19
Future Vol, veh/h	22	19	2	0	17	7	1	18	1	1	8	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	22	2	0	19	8	1	20	1	1	9	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	58	45	20	57	56	21	31	0	0	21	0	0
Stage 1	22	22	-	23	23	-	-	-	-	-	-	-
Stage 2	36	23	-	34	33	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	939	847	1058	940	835	1056	1582	-	-	1595	-	-
Stage 1	996	877	-	995	876	-	-	-	-	-	-	-
Stage 2	980	876	-	982	868	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	914	845	1058	918	833	1056	1582	-	-	1595	-	-
Mov Cap-2 Maneuver	914	845	-	918	833	-	-	-	-	-	-	-
Stage 1	995	876	-	994	875	-	-	-	-	-	-	-
Stage 2	950	875	-	955	867	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	9.3	9.2	0.4	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NEL	NET	NER	NWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1582	-	-	888	888	1595	-	-
HCM Lane V/C Ratio	0.001	-	-	0.031	0.055	0.001	-	-
HCM Control Delay (s)	7.3	0	-	9.2	9.3	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0	-	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	118	70	73	103	61	99
Future Volume (vph)	118	70	73	103	61	99
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0			15.0	0.0	15.0
Storage Lanes	0			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected		0.970			0.950	
Satd. Flow (prot)	0	1683	1735	1475	1648	1475
Flt Permitted		0.970			0.950	
Satd. Flow (perm)	0	1683	1735	1475	1648	1475
Link Speed (k/h)		50	50		50	
Link Distance (m)		157.6	141.1		108.3	
Travel Time (s)		11.3	10.2		7.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	134	80	83	117	69	113
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	214	83	117	69	113
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 28.1%		ICU Level of Service A	
Analysis Period (min) 15			

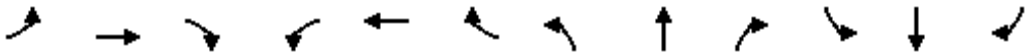
Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	118	70	73	103	61	99
Future Vol, veh/h	118	70	73	103	61	99
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	0	150
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	134	80	83	117	69	113

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	200	0	-	0	431	83
Stage 1	-	-	-	-	83	-
Stage 2	-	-	-	-	348	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1372	-	-	-	581	976
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	715	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1372	-	-	-	522	976
Mov Cap-2 Maneuver	-	-	-	-	522	-
Stage 1	-	-	-	-	844	-
Stage 2	-	-	-	-	715	-

Approach	EB	WB	SB
HCM Control Delay, s	5	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1372	-	-	-	522	976
HCM Lane V/C Ratio	0.098	-	-	-	0.133	0.115
HCM Control Delay (s)	7.9	0	-	-	13	9.2
HCM Lane LOS	A	A	-	-	B	A
HCM 95th %tile Q(veh)	0.3	-	-	-	0.5	0.4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	25	0	60	0	221	24	60	260	0
Future Volume (vph)	0	0	0	25	0	60	0	221	24	60	260	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	65.0		0.0	80.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	35.0			35.0			2.5			2.5		
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
Frt					0.850			0.987				
Flt Protected				0.950							0.991	
Satd. Flow (prot)	1735	1735	0	1648	1475	0	0	1712	0	0	1719	0
Flt Permitted				0.950							0.991	
Satd. Flow (perm)	1735	1735	0	1648	1475	0	0	1712	0	0	1719	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		223.7			170.6			142.8			549.2	
Travel Time (s)		16.1			12.3			10.3			39.5	
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)	0	0	0	28	0	68	0	251	27	68	295	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	28	68	0	0	278	0	0	363	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)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	46.7%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	25	0	60	0	221	24	60	260	0
Future Vol, veh/h	0	0	0	25	0	60	0	221	24	60	260	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	650	-	-	800	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	28	0	68	0	251	27	68	295	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	730	709	295	696	696	265	295	0	0	278	0	0
Stage 1	431	431	-	265	265	-	-	-	-	-	-	-
Stage 2	299	278	-	431	431	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	338	359	744	356	365	774	1266	-	-	1285	-	-
Stage 1	603	583	-	740	689	-	-	-	-	-	-	-
Stage 2	710	680	-	603	583	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	293	336	744	339	342	774	1266	-	-	1285	-	-
Mov Cap-2 Maneuver	293	336	-	339	342	-	-	-	-	-	-	-
Stage 1	603	546	-	740	689	-	-	-	-	-	-	-
Stage 2	647	680	-	565	546	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	12	0	1.5
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1266	-	-	-	-	339	774	1285	-	-
HCM Lane V/C Ratio	-	-	-	-	-	0.084	0.088	0.053	-	-
HCM Control Delay (s)	0	-	-	0	0	16.6	10.1	8	0	-
HCM Lane LOS	A	-	-	A	A	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	-	0.3	0.3	0.2	-	-

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	19	293	440	71	43	16
Future Volume (vph)	19	293	440	71	43	16
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0			15.0	0.0	15.0
Storage Lanes	0			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected		0.997			0.950	
Satd. Flow (prot)	0	1730	1735	1475	1648	1475
Flt Permitted		0.997			0.950	
Satd. Flow (perm)	0	1730	1735	1475	1648	1475
Link Speed (k/h)		50	50		50	
Link Distance (m)		549.2	139.5		287.2	
Travel Time (s)		39.5	10.0		20.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	22	333	500	81	49	18
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	355	500	81	49	18
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	1.3

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	19	293	440	71	43	16
Future Vol, veh/h	19	293	440	71	43	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	0	150
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	333	500	81	49	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	581	0	-	0	877	500
Stage 1	-	-	-	-	500	-
Stage 2	-	-	-	-	377	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	993	-	-	-	319	571
Stage 1	-	-	-	-	609	-
Stage 2	-	-	-	-	694	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	993	-	-	-	310	571
Mov Cap-2 Maneuver	-	-	-	-	310	-
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	694	-

Approach	NB	SB	NE
HCM Control Delay, s	0.5	0	16.8
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NBL	NBT	SBT	SBR
Capacity (veh/h)	310	571	993	-	-	-
HCM Lane V/C Ratio	0.158	0.032	0.022	-	-	-
HCM Control Delay (s)	18.8	11.5	8.7	0	-	-
HCM Lane LOS	C	B	A	A	-	-
HCM 95th %tile Q(veh)	0.6	0.1	0.1	-	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	24	37	7	2	29	6	12	26	0	3	25	24
Future Volume (vph)	24	37	7	2	29	6	12	26	0	3	25	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.986			0.977						0.937	
Flt Protected		0.983			0.998			0.984			0.997	
Satd. Flow (prot)	0	1681	0	0	1691	0	0	1707	0	0	1621	0
Flt Permitted		0.983			0.998			0.984			0.997	
Satd. Flow (perm)	0	1681	0	0	1691	0	0	1707	0	0	1621	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		119.4			144.9			102.5			287.2	
Travel Time (s)		8.6			10.4			7.4			20.7	
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)	27	42	8	2	33	7	14	30	0	3	28	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	77	0	0	42	0	0	44	0	0	58	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 23.8%		ICU Level of Service A	
Analysis Period (min) 15			

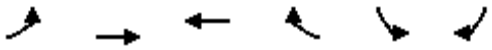
Intersection	
Int Delay, s/veh	5.8

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	24	37	7	2	29	6	12	26	0	3	25	24
Future Vol, veh/h	24	37	7	2	29	6	12	26	0	3	25	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	42	8	2	33	7	14	30	0	3	28	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	126	106	42	131	119	30	55	0	0	30	0	0
Stage 1	48	48	-	58	58	-	-	-	-	-	-	-
Stage 2	78	58	-	73	61	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	848	784	1029	841	771	1044	1550	-	-	1583	-	-
Stage 1	965	855	-	954	847	-	-	-	-	-	-	-
Stage 2	931	847	-	937	844	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	808	775	1029	793	763	1044	1550	-	-	1583	-	-
Mov Cap-2 Maneuver	808	775	-	793	763	-	-	-	-	-	-	-
Stage 1	956	853	-	945	839	-	-	-	-	-	-	-
Stage 2	881	839	-	882	842	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	9.9	9.7	2.3	0.4
HCM LOS	A	A		

Minor Lane/Major Mvmt	NEL	NET	NER	NWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1550	-	-	800	807	1583	-	-
HCM Lane V/C Ratio	0.009	-	-	0.053	0.096	0.002	-	-
HCM Control Delay (s)	7.3	0	-	9.7	9.9	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.3	0	-	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	90	77	53	60	91	107
Future Volume (vph)	90	77	53	60	91	107
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0			15.0	0.0	15.0
Storage Lanes	0			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected		0.974			0.950	
Satd. Flow (prot)	0	1690	1735	1475	1648	1475
Flt Permitted		0.974			0.950	
Satd. Flow (perm)	0	1690	1735	1475	1648	1475
Link Speed (k/h)		50	50		50	
Link Distance (m)		157.6	141.1		108.3	
Travel Time (s)		11.3	10.2		7.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	102	88	60	68	103	122
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	190	60	68	103	122
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 28.6%		ICU Level of Service A	
Analysis Period (min) 15			

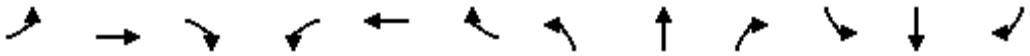
Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	90	77	53	60	91	107
Future Vol, veh/h	90	77	53	60	91	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	0	150
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	102	88	60	68	103	122

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	128	0	-	0	352	60
Stage 1	-	-	-	-	60	-
Stage 2	-	-	-	-	292	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1458	-	-	-	646	1005
Stage 1	-	-	-	-	963	-
Stage 2	-	-	-	-	758	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1458	-	-	-	598	1005
Mov Cap-2 Maneuver	-	-	-	-	598	-
Stage 1	-	-	-	-	892	-
Stage 2	-	-	-	-	758	-

Approach	EB	WB	SB
HCM Control Delay, s	4.1	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1458	-	-	-	598	1005
HCM Lane V/C Ratio	0.07	-	-	-	0.173	0.121
HCM Control Delay (s)	7.7	0	-	-	12.3	9.1
HCM Lane LOS	A	A	-	-	B	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0.6	0.4

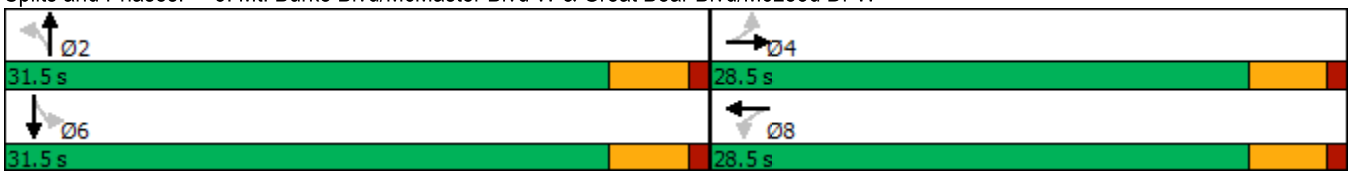


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	318	68	28	95	98	14	357	130	67	187	5
Future Volume (vph)	25	318	68	28	95	98	14	357	130	67	187	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	65.0		0.0	80.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	35.0			35.0			2.5			2.5		
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
Frt		0.974			0.924			0.965			0.997	
Flt Protected	0.950			0.950				0.999			0.987	
Satd. Flow (prot)	1648	1690	0	1648	1603	0	0	1672	0	0	1707	0
Flt Permitted	0.621			0.333				0.989			0.810	
Satd. Flow (perm)	1077	1690	0	578	1603	0	0	1656	0	0	1401	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			103			38			2	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		223.7			170.6			142.8			551.0	
Travel Time (s)		16.1			12.3			10.3			39.7	
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)	28	361	77	32	108	111	16	406	148	76	213	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	438	0	32	219	0	0	570	0	0	295	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)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	28.5	28.5		28.5	28.5		31.5	31.5		31.5	31.5	
Total Split (s)	28.5	28.5		28.5	28.5		31.5	31.5		31.5	31.5	
Total Split (%)	47.5%	47.5%		47.5%	47.5%		52.5%	52.5%		52.5%	52.5%	
Maximum Green (s)	24.0	24.0		24.0	24.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		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)	18.0	18.0		18.0	18.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	17.1	17.1		17.1	17.1			23.3			23.3	
Actuated g/C Ratio	0.34	0.34		0.34	0.34			0.47			0.47	
v/c Ratio	0.08	0.73		0.16	0.35			0.72			0.45	
Control Delay	11.7	21.9		13.8	8.5			17.6			12.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	11.7	21.9		13.8	8.5			17.6			12.8	
LOS	B	C		B	A			B			B	
Approach Delay		21.3			9.2			17.6			12.8	
Approach LOS		C			A			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 49.7			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 16.5		Intersection LOS: B	
Intersection Capacity Utilization 82.1%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 3: Mt. Burke Blvd/McMaster Blvd W & Great Bear Blvd/McLeod Dr W



Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	215	23	14	518	115	29
Future Volume (vph)	215	23	14	518	115	29
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)		15.0	0.0		0.0	15.0
Storage Lanes		1	0		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.999	0.950	
Satd. Flow (prot)	1735	1475	0	1733	1648	1475
Flt Permitted				0.999	0.950	
Satd. Flow (perm)	1735	1475	0	1733	1648	1475
Link Speed (k/h)	50			50	50	
Link Distance (m)	123.9			551.0	291.6	
Travel Time (s)	8.9			39.7	21.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	244	26	16	589	131	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	244	26	0	605	131	33
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	55.4%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	3.4

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	215	23	14	518	115	29
Future Vol, veh/h	215	23	14	518	115	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	-	0	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	244	26	16	589	131	33

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	270	0	865	244
Stage 1	-	-	-	-	244	-
Stage 2	-	-	-	-	621	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1293	-	324	795
Stage 1	-	-	-	-	797	-
Stage 2	-	-	-	-	536	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1293	-	318	795
Mov Cap-2 Maneuver	-	-	-	-	318	-
Stage 1	-	-	-	-	797	-
Stage 2	-	-	-	-	526	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.2	21.1
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	318	795	1293	-	-	-
HCM Lane V/C Ratio	0.411	0.041	0.012	-	-	-
HCM Control Delay (s)	24	9.7	7.8	0	-	-
HCM Lane LOS	C	A	A	A	-	-
HCM 95th %tile Q(veh)	1.9	0.1	0	-	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	22	19	2	0	17	7	1	55	1	1	23	19
Future Volume (vph)	22	19	2	0	17	7	1	55	1	1	23	19
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.994			0.960			0.998			0.939	
Flt Protected		0.975						0.999			0.999	
Satd. Flow (prot)	0	1681	0	0	1665	0	0	1730	0	0	1627	0
Flt Permitted		0.975						0.999			0.999	
Satd. Flow (perm)	0	1681	0	0	1665	0	0	1730	0	0	1627	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		102.0			82.2			234.8			291.6	
Travel Time (s)		7.3			5.9			16.9			21.0	
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
Adj. Flow (vph)	25	22	2	0	19	8	1	63	1	1	26	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	49	0	0	27	0	0	65	0	0	49	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 19.6%		ICU Level of Service A	
Analysis Period (min) 15			

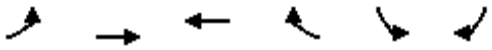
Intersection	
Int Delay, s/veh	3.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	22	19	2	0	17	7	1	55	1	1	23	19
Future Vol, veh/h	22	19	2	0	17	7	1	55	1	1	23	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	22	2	0	19	8	1	63	1	1	26	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	118	105	37	117	116	64	48	0	0	64	0	0
Stage 1	39	39	-	66	66	-	-	-	-	-	-	-
Stage 2	79	66	-	51	50	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	858	785	1035	859	774	1000	1559	-	-	1538	-	-
Stage 1	976	862	-	945	840	-	-	-	-	-	-	-
Stage 2	930	840	-	962	853	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	834	783	1035	838	772	1000	1559	-	-	1538	-	-
Mov Cap-2 Maneuver	834	783	-	838	772	-	-	-	-	-	-	-
Stage 1	975	861	-	944	839	-	-	-	-	-	-	-
Stage 2	900	839	-	935	852	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	9.7	9.5	0.1	0.2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NEL	NET	NER	NWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1559	-	-	827	818	1538	-	-
HCM Lane V/C Ratio	0.001	-	-	0.033	0.06	0.001	-	-
HCM Control Delay (s)	7.3	0	-	9.5	9.7	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0	-	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	215	252	160	117	129	115
Future Volume (vph)	215	252	160	117	129	115
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0			15.0	0.0	15.0
Storage Lanes	0			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected		0.977			0.950	
Satd. Flow (prot)	0	1695	1735	1475	1648	1475
Flt Permitted		0.977			0.950	
Satd. Flow (perm)	0	1695	1735	1475	1648	1475
Link Speed (k/h)		50	50		50	
Link Distance (m)		157.6	140.4		108.3	
Travel Time (s)		11.3	10.1		7.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	244	286	182	133	147	131
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	530	182	133	147	131
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 54.2%		ICU Level of Service A	
Analysis Period (min) 15			

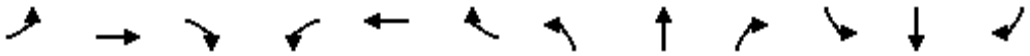
Intersection	
Int Delay, s/veh	9.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	215	252	160	117	129	115
Future Vol, veh/h	215	252	160	117	129	115
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	0	150
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	244	286	182	133	147	131

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	315	0	-	0	956	182
Stage 1	-	-	-	-	182	-
Stage 2	-	-	-	-	774	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1245	-	-	-	286	861
Stage 1	-	-	-	-	849	-
Stage 2	-	-	-	-	455	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1245	-	-	-	219	861
Mov Cap-2 Maneuver	-	-	-	-	219	-
Stage 1	-	-	-	-	651	-
Stage 2	-	-	-	-	455	-

Approach	EB	WB	SB
HCM Control Delay, s	4	0	30.8
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1245	-	-	-	219	861
HCM Lane V/C Ratio	0.196	-	-	-	0.669	0.152
HCM Control Delay (s)	8.6	0	-	-	49.4	9.9
HCM Lane LOS	A	A	-	-	E	A
HCM 95th %tile Q(veh)	0.7	-	-	-	4.2	0.5



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	324	20	16	155	28	61	4	43	52	1	92
Future Volume (vph)	50	324	20	16	155	28	61	4	43	52	1	92
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.993			0.981			0.946			0.914	
Flt Protected		0.994			0.996			0.973			0.982	
Satd. Flow (prot)	0	1712	0	0	1695	0	0	1597	0	0	1557	0
Flt Permitted		0.994			0.996			0.973			0.982	
Satd. Flow (perm)	0	1712	0	0	1695	0	0	1597	0	0	1557	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		140.1			61.5			74.5			128.0	
Travel Time (s)		10.1			4.4			5.4			9.2	
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)	57	368	23	18	176	32	69	5	49	59	1	105
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	448	0	0	226	0	0	123	0	0	165	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 52.1%		ICU Level of Service A	
Analysis Period (min) 15			

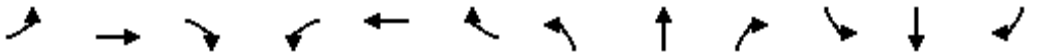
Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	50	324	20	16	155	28	61	4	43	52	1	92
Future Vol, veh/h	50	324	20	16	155	28	61	4	43	52	1	92
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	57	368	23	18	176	32	69	5	49	59	1	105

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	208	0	0	391	0	0	775	738	380	749	733	192
Stage 1	-	-	-	-	-	-	494	494	-	228	228	-
Stage 2	-	-	-	-	-	-	281	244	-	521	505	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1363	-	-	1168	-	-	315	346	667	328	348	850
Stage 1	-	-	-	-	-	-	557	546	-	775	715	-
Stage 2	-	-	-	-	-	-	726	704	-	539	540	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1363	-	-	1168	-	-	261	322	667	285	324	850
Mov Cap-2 Maneuver	-	-	-	-	-	-	261	322	-	285	324	-
Stage 1	-	-	-	-	-	-	527	517	-	733	703	-
Stage 2	-	-	-	-	-	-	625	692	-	468	511	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0.7	20.9	15.9
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	348	1363	-	-	1168	-	-	494
HCM Lane V/C Ratio	0.353	0.042	-	-	0.016	-	-	0.334
HCM Control Delay (s)	20.9	7.8	0	-	8.1	0	-	15.9
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	1.5	0.1	-	-	0	-	-	1.4

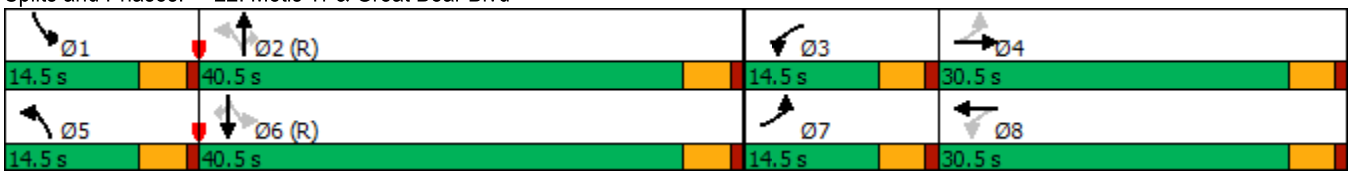


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	201	52	100	76	107	17	570	165	26	274	52
Future Volume (vph)	125	201	52	100	76	107	17	570	165	26	274	52
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	45.0		0.0	35.0		0.0	25.0		50.0	40.0		45.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
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
Frt		0.969			0.912				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1648	1681	0	1648	1582	0	1601	1685	1432	1601	1685	1432
Flt Permitted	0.440			0.298			0.516			0.193		
Satd. Flow (perm)	763	1681	0	517	1582	0	870	1685	1432	325	1685	1432
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			69				124			115
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		115.7			64.2			529.5			187.4	
Travel Time (s)		8.3			4.6			38.1			13.5	
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)	142	228	59	114	86	122	19	648	188	30	311	59
Shared Lane Traffic (%)												
Lane Group Flow (vph)	142	287	0	114	208	0	19	648	188	30	311	59
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)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2		2	6		6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	20.0	20.0	5.0	20.0	20.0
Minimum Split (s)	14.5	30.5		14.5	30.5		14.5	30.5	30.5	14.5	30.5	30.5
Total Split (s)	14.5	30.5		14.5	30.5		14.5	40.5	40.5	14.5	40.5	40.5
Total Split (%)	14.5%	30.5%		14.5%	30.5%		14.5%	40.5%	40.5%	14.5%	40.5%	40.5%
Maximum Green (s)	10.0	26.0		10.0	26.0		10.0	36.0	36.0	10.0	36.0	36.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
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	C-Min	C-Min	None	C-Min	C-Min
Walk Time (s)		6.0			6.0			6.0	6.0		6.0	6.0
Flash Dont Walk (s)		20.0			20.0			20.0	20.0		20.0	20.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	30.5	20.9		29.8	20.6		53.4	49.5	49.5	54.8	51.9	51.9
Actuated g/C Ratio	0.30	0.21		0.30	0.21		0.53	0.50	0.50	0.55	0.52	0.52
v/c Ratio	0.45	0.80		0.44	0.55		0.04	0.78	0.24	0.12	0.36	0.07
Control Delay	26.8	51.5		27.2	28.0		12.1	32.4	8.2	12.7	18.6	0.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.8	51.5		27.2	28.0		12.1	32.4	8.2	12.7	18.6	0.4
LOS	C	D		C	C		B	C	A	B	B	A
Approach Delay		43.4			27.7			26.7			15.4	
Approach LOS		D			C			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 28.2		Intersection LOS: C	
Intersection Capacity Utilization 64.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 22: Metis Tr & Great Bear Blvd



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	357	78	8	107	80	53
Future Volume (vph)	357	78	8	107	80	53
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.976				0.946	
Flt Protected				0.997	0.971	
Satd. Flow (prot)	1693	0	0	1730	1593	0
Flt Permitted				0.997	0.971	
Satd. Flow (perm)	1693	0	0	1730	1593	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	65.4			118.9	88.4	
Travel Time (s)	4.7			8.6	6.4	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	406	89	9	122	91	60
Shared Lane Traffic (%)						
Lane Group Flow (vph)	495	0	0	131	151	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 40.5%		ICU Level of Service A	
Analysis Period (min) 15			

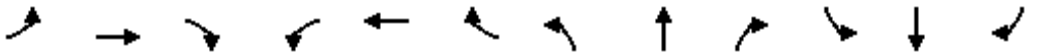
Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	357	78	8	107	80	53
Future Vol, veh/h	357	78	8	107	80	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	406	89	9	122	91	60

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	495	0	591	451
Stage 1	-	-	-	-	451	-
Stage 2	-	-	-	-	140	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1069	-	470	608
Stage 1	-	-	-	-	642	-
Stage 2	-	-	-	-	887	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1069	-	466	608
Mov Cap-2 Maneuver	-	-	-	-	466	-
Stage 1	-	-	-	-	642	-
Stage 2	-	-	-	-	879	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	14.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	514	-	-	1069	-
HCM Lane V/C Ratio	0.294	-	-	0.009	-
HCM Control Delay (s)	14.9	-	-	8.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	1.2	-	-	0	-

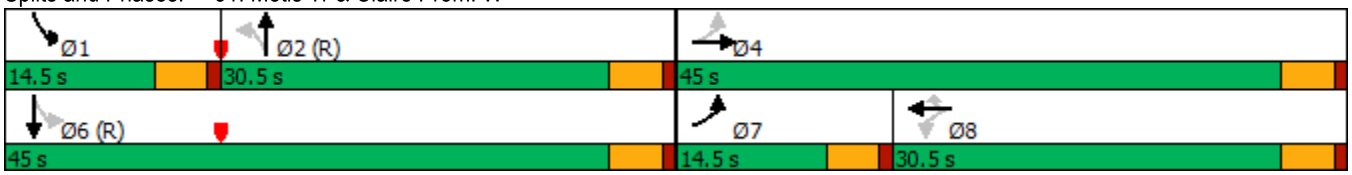


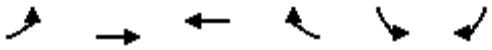
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	156	110	34	29	68	223	14	372	10	72	299	56
Future Volume (vph)	156	110	34	29	68	223	14	372	10	72	299	56
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	40.0		0.0	0.0		40.0	0.0		0.0	50.0		0.0
Storage Lanes	1		0	0		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
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
Frt		0.964				0.850		0.997			0.976	
Flt Protected	0.950				0.985			0.998		0.950		
Satd. Flow (prot)	1648	1672	0	0	1709	1475	0	1677	0	1601	1645	0
Flt Permitted	0.484				0.857			0.982		0.385		
Satd. Flow (perm)	840	1672	0	0	1487	1475	0	1650	0	649	1645	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23				253		1			14	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		69.7			79.9			399.0			529.5	
Travel Time (s)		5.0			5.8			28.7			38.1	
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)	177	125	39	33	77	253	16	423	11	82	340	64
Shared Lane Traffic (%)												
Lane Group Flow (vph)	177	164	0	0	110	253	0	450	0	82	404	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)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases	7	4			8			2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8		8	2			6		
Detector Phase	7	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0	10.0	20.0	20.0		5.0	20.0	
Minimum Split (s)	14.5	30.5		30.5	30.5	30.5	30.5	30.5		14.5	30.5	
Total Split (s)	14.5	45.0		30.5	30.5	30.5	30.5	30.5		14.5	45.0	
Total Split (%)	16.1%	50.0%		33.9%	33.9%	33.9%	33.9%	33.9%		16.1%	50.0%	
Maximum Green (s)	10.0	40.5		26.0	26.0	26.0	26.0	26.0		10.0	40.5	
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)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5			4.5	4.5		4.5		4.5	4.5	
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes		Yes		
Vehicle Extension (s)	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	C-Max	C-Max		None	C-Max	
Walk Time (s)		6.0		6.0	6.0	6.0	6.0	6.0			6.0	
Flash Dont Walk (s)		20.0		20.0	20.0	20.0	20.0	20.0			20.0	
Pedestrian Calls (#/hr)		0		0	0	0	0	0			0	
Act Effct Green (s)	26.9	26.9			12.6	12.6		44.1		54.1	54.1	
Actuated g/C Ratio	0.30	0.30			0.14	0.14		0.49		0.60	0.60	
v/c Ratio	0.52	0.32			0.53	0.60		0.56		0.17	0.41	
Control Delay	30.1	21.9			44.7	10.8		21.6		9.4	11.3	
Queue Delay	0.0	0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay	30.1	21.9			44.7	10.8		21.6		9.4	11.3	
LOS	C	C			D	B		C		A	B	
Approach Delay		26.1			21.1			21.6			11.0	
Approach LOS		C			C			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.60			
Intersection Signal Delay: 19.3		Intersection LOS: B	
Intersection Capacity Utilization 71.4%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 31: Metis Tr & Claire Prom. W





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	45	442	113	6	32	57
Future Volume (vph)	45	442	113	6	32	57
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.993		0.913	
Flt Protected		0.995			0.982	
Satd. Flow (prot)	0	1677	1673	0	1555	0
Flt Permitted		0.995			0.982	
Satd. Flow (perm)	0	1677	1673	0	1555	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		359.7	149.2		116.3	
Travel Time (s)		25.9	10.7		8.4	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	51	502	128	7	36	65
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	553	135	0	101	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 47.0%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	45	442	113	6	32	57
Future Vol, veh/h	45	442	113	6	32	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	51	502	128	7	36	65

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	135	0	-	0	736	132
Stage 1	-	-	-	-	132	-
Stage 2	-	-	-	-	604	-
Critical Hdwy	4.15	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.245	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1431	-	-	-	386	917
Stage 1	-	-	-	-	894	-
Stage 2	-	-	-	-	546	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1431	-	-	-	367	917
Mov Cap-2 Maneuver	-	-	-	-	367	-
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	546	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	12.3
HCM LOS			B

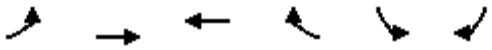
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1431	-	-	-	596
HCM Lane V/C Ratio	0.036	-	-	-	0.17
HCM Control Delay (s)	7.6	0	-	-	12.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	108	0	5	57	121	0	108	0	348	30	17
Future Volume (vph)	47	108	0	5	57	121	0	108	0	348	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt					0.911						0.994	
Flt Protected		0.985			0.999						0.958	
Satd. Flow (prot)	0	1660	0	0	1535	0	0	1735	0	0	1608	0
Flt Permitted		0.863			0.992						0.667	
Satd. Flow (perm)	0	1454	0	0	1524	0	0	1735	0	0	1120	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					138						5	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		115.5			443.6			68.0			398.4	
Travel Time (s)		8.3			31.9			4.9			28.7	
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 (%)	5%	5%	2%	2%	5%	5%	2%	2%	2%	5%	2%	5%
Adj. Flow (vph)	53	123	0	6	65	138	0	123	0	395	34	19
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	176	0	0	209	0	0	123	0	0	448	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	24.5	24.5		24.5	24.5		24.5	24.5		24.5	24.5	
Total Split (s)	24.8	24.8		24.8	24.8		35.2	35.2		35.2	35.2	
Total Split (%)	41.3%	41.3%		41.3%	41.3%		58.7%	58.7%		58.7%	58.7%	
Maximum Green (s)	20.3	20.3		20.3	20.3		30.7	30.7		30.7	30.7	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	14.0	14.0		14.0	14.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		20.0			20.0			31.0			31.0	
Actuated g/C Ratio		0.33			0.33			0.52			0.52	
v/c Ratio		0.36			0.35			0.14			0.77	
Control Delay		17.9			7.8			8.1			23.3	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		17.9			7.8			8.1			23.3	
LOS		B			A			A			C	
Approach Delay		17.9			7.8			8.1			23.3	
Approach LOS		B			A			A			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 17.0		Intersection LOS: B	
Intersection Capacity Utilization 71.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 33: Chinook Tr & Metis Tr



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	22	434	158	12	53	25
Future Volume (vph)	22	434	158	12	53	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.990		0.957	
Flt Protected		0.998			0.967	
Satd. Flow (prot)	0	1682	1668	0	1605	0
Flt Permitted		0.998			0.967	
Satd. Flow (perm)	0	1682	1668	0	1605	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		443.6	359.7		243.4	
Travel Time (s)		31.9	25.9		17.5	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	25	493	180	14	60	28
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	518	194	0	88	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 50.8%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	434	158	12	53	25
Future Vol, veh/h	22	434	158	12	53	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	25	493	180	14	60	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	194	0	-	0	730	187
Stage 1	-	-	-	-	187	-
Stage 2	-	-	-	-	543	-
Critical Hdwy	4.15	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.245	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1361	-	-	-	389	855
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	582	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1361	-	-	-	379	855
Mov Cap-2 Maneuver	-	-	-	-	379	-
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	582	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	14.7
HCM LOS			B

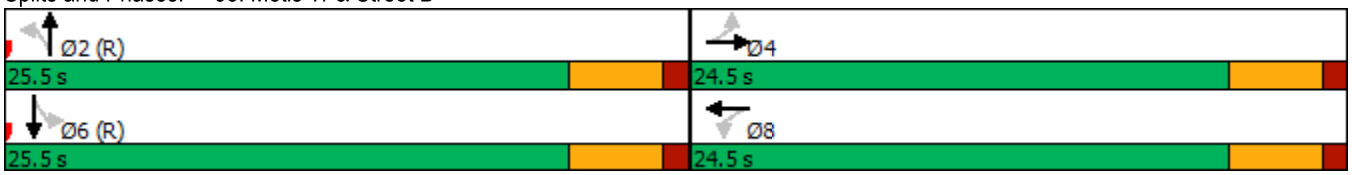
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1361	-	-	-	461
HCM Lane V/C Ratio	0.018	-	-	-	0.192
HCM Control Delay (s)	7.7	0	-	-	14.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.7

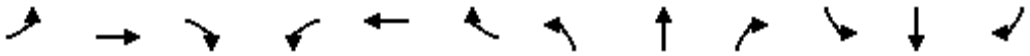
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	93	43	61	16	34	62	29	242	4	15	318	28
Future Volume (vph)	93	43	61	16	34	62	29	242	4	15	318	28
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.958			0.926			0.998			0.989	
Flt Protected		0.977			0.993			0.995			0.998	
Satd. Flow (prot)	0	1624	0	0	1595	0	0	1673	0	0	1663	0
Flt Permitted		0.827			0.938			0.941			0.984	
Satd. Flow (perm)	0	1374	0	0	1507	0	0	1583	0	0	1640	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		53			70			2			11	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		67.9			103.1			398.4			399.0	
Travel Time (s)		4.9			7.4			28.7			28.7	
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)	106	49	69	18	39	70	33	275	5	17	361	32
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	224	0	0	127	0	0	313	0	0	410	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	24.5	24.5		24.5	24.5		24.5	24.5		24.5	24.5	
Total Split (s)	24.5	24.5		24.5	24.5		25.5	25.5		25.5	25.5	
Total Split (%)	49.0%	49.0%		49.0%	49.0%		51.0%	51.0%		51.0%	51.0%	
Maximum Green (s)	20.0	20.0		20.0	20.0		21.0	21.0		21.0	21.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	14.0	14.0		14.0	14.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		12.8			12.8			28.2			28.2	
Actuated g/C Ratio		0.26			0.26			0.56			0.56	
v/c Ratio		0.57			0.29			0.35			0.44	
Control Delay		17.6			8.8			8.3			9.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		17.6			8.8			8.3			9.1	
LOS		B			A			A			A	
Approach Delay		17.6			8.8			8.3			9.1	
Approach LOS		B			A			A			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 10.6		Intersection LOS: B	
Intersection Capacity Utilization 52.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 38: Metis Tr & Street B





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	38	22	37	11	37	8	8	19	44	19	12
Future Volume (vph)	22	38	22	37	11	37	8	8	19	44	19	12
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.964			0.942			0.926			0.978	
Flt Protected		0.987			0.979			0.989			0.972	
Satd. Flow (prot)	0	1651	0	0	1600	0	0	1589	0	0	1649	0
Flt Permitted		0.987			0.979			0.989			0.972	
Satd. Flow (perm)	0	1651	0	0	1600	0	0	1589	0	0	1649	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		102.5			96.0			243.4			84.8	
Travel Time (s)		7.4			6.9			17.5			6.1	
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)	25	43	25	42	13	42	9	9	22	50	22	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	93	0	0	97	0	0	40	0	0	86	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 25.5%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	22	38	22	37	11	37	8	8	19	44	19	12
Future Vol, veh/h	22	38	22	37	11	37	8	8	19	44	19	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	43	25	42	13	42	9	9	22	50	22	14

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	195	178	29	201	174	20	36	0	0	31	0	0
Stage 1	129	129	-	38	38	-	-	-	-	-	-	-
Stage 2	66	49	-	163	136	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	764	716	1046	757	719	1058	1575	-	-	1582	-	-
Stage 1	875	789	-	977	863	-	-	-	-	-	-	-
Stage 2	945	854	-	839	784	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	703	689	1046	684	692	1058	1575	-	-	1582	-	-
Mov Cap-2 Maneuver	703	689	-	684	692	-	-	-	-	-	-	-
Stage 1	870	764	-	971	858	-	-	-	-	-	-	-
Stage 2	889	849	-	748	759	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.4	10	1.7	4.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1575	-	-	763	810	1582	-	-
HCM Lane V/C Ratio	0.006	-	-	0.122	0.119	0.032	-	-
HCM Control Delay (s)	7.3	0	-	10.4	10	7.3	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.4	0.1	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	105	1	48	36	4	81
Future Volume (vph)	105	1	48	36	4	81
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.999				0.872	
Flt Protected				0.972	0.997	
Satd. Flow (prot)	1733	0	0	1686	1508	0
Flt Permitted				0.972	0.997	
Satd. Flow (perm)	1733	0	0	1686	1508	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	51.3			57.4	71.1	
Travel Time (s)	3.7			4.1	5.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	119	1	55	41	5	92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	120	0	0	96	97	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 24.0%		ICU Level of Service A	
Analysis Period (min) 15			

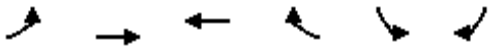
Intersection	
Int Delay, s/veh	4.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	105	1	48	36	4	81
Future Vol, veh/h	105	1	48	36	4	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	119	1	55	41	5	92

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	120	0	271	120
Stage 1	-	-	-	-	120	-
Stage 2	-	-	-	-	151	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1468	-	718	931
Stage 1	-	-	-	-	905	-
Stage 2	-	-	-	-	877	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1468	-	691	931
Mov Cap-2 Maneuver	-	-	-	-	691	-
Stage 1	-	-	-	-	905	-
Stage 2	-	-	-	-	844	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.3	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	916	-	-	1468	-
HCM Lane V/C Ratio	0.105	-	-	0.037	-
HCM Control Delay (s)	9.4	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	143	43	9	51	38	75
Future Volume (vph)	143	43	9	51	38	75
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.885		0.910	
Flt Protected		0.963			0.983	
Satd. Flow (prot)	0	1671	1535	0	1552	0
Flt Permitted		0.963			0.983	
Satd. Flow (perm)	0	1671	1535	0	1552	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		95.2	63.1		94.1	
Travel Time (s)		6.9	4.5		6.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	163	49	10	58	43	85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	212	68	0	128	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.7%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	6.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	143	43	9	51	38	75
Future Vol, veh/h	143	43	9	51	38	75
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	163	49	10	58	43	85

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	68	0	-	0	414	39
Stage 1	-	-	-	-	39	-
Stage 2	-	-	-	-	375	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1533	-	-	-	595	1033
Stage 1	-	-	-	-	983	-
Stage 2	-	-	-	-	695	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1533	-	-	-	530	1033
Mov Cap-2 Maneuver	-	-	-	-	530	-
Stage 1	-	-	-	-	876	-
Stage 2	-	-	-	-	695	-

Approach	EB	WB	SB
HCM Control Delay, s	5.9	0	10.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1533	-	-	-	783
HCM Lane V/C Ratio	0.106	-	-	-	0.164
HCM Control Delay (s)	7.6	0	-	-	10.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.4	-	-	-	0.6

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	205	10	42	237	45	68
Future Volume (vph)	205	10	42	237	45	68
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.994				0.919	
Flt Protected				0.992	0.980	
Satd. Flow (prot)	1724	0	0	1721	1562	0
Flt Permitted				0.992	0.980	
Satd. Flow (perm)	1724	0	0	1721	1562	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	57.6			64.4	71.5	
Travel Time (s)	4.1			4.6	5.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	233	11	48	269	51	77
Shared Lane Traffic (%)						
Lane Group Flow (vph)	244	0	0	317	128	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 45.7%		ICU Level of Service A	
Analysis Period (min) 15			

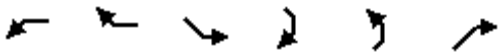
Intersection	
Int Delay, s/veh	2.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	205	10	42	237	45	68
Future Vol, veh/h	205	10	42	237	45	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	233	11	48	269	51	77

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	244	0	604	239
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	365	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1322	-	461	800
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	702	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1322	-	441	800
Mov Cap-2 Maneuver	-	-	-	-	441	-
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	672	-

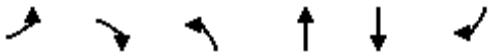
Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	12.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	604	-	-	1322	-
HCM Lane V/C Ratio	0.213	-	-	0.036	-
HCM Control Delay (s)	12.6	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0.1	-



Lane Group	WBL	WBR	SEL	SER	NEL	NER
Lane Configurations						
Traffic Volume (vph)	213	37	68	21	57	257
Future Volume (vph)	213	37	68	21	57	257
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.980		0.968		0.890	
Flt Protected	0.959		0.963		0.991	
Satd. Flow (prot)	1630	0	1617	0	1530	0
Flt Permitted	0.959		0.963		0.991	
Satd. Flow (perm)	1630	0	1617	0	1530	0
Link Speed (k/h)	50		50		50	
Link Distance (m)	78.4		77.8		72.4	
Travel Time (s)	5.6		5.6		5.2	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	242	42	77	24	65	292
Shared Lane Traffic (%)						
Lane Group Flow (vph)	284	0	101	0	357	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(m)	3.7		3.7		3.7	
Link Offset(m)	0.0		0.0		0.0	
Crosswalk Width(m)	1.6		1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24	14	24	14	24	14
Sign Control	Yield		Yield		Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 51.4%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	179	104	114	101	29	74
Future Volume (vph)	179	104	114	101	29	74
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.950				0.903	
Flt Protected	0.969			0.974		
Satd. Flow (prot)	1597	0	0	1690	1566	0
Flt Permitted	0.969			0.974		
Satd. Flow (perm)	1597	0	0	1690	1566	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	76.6			91.7	84.3	
Travel Time (s)	5.5			6.6	6.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	203	118	130	115	33	84
Shared Lane Traffic (%)						
Lane Group Flow (vph)	321	0	0	245	117	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			0.0	0.0	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24	14	24			14
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.6%		ICU Level of Service A	
Analysis Period (min) 15			

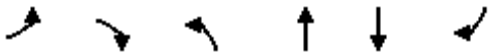
Intersection	
Int Delay, s/veh	9.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	179	104	114	101	29	74
Future Vol, veh/h	179	104	114	101	29	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	203	118	130	115	33	84

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	450	75	117	0	-	0
Stage 1	75	-	-	-	-	-
Stage 2	375	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	567	986	1471	-	-	-
Stage 1	948	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	514	986	1471	-	-	-
Mov Cap-2 Maneuver	514	-	-	-	-	-
Stage 1	859	-	-	-	-	-
Stage 2	695	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.7	4.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1471	-	624	-	-
HCM Lane V/C Ratio	0.088	-	0.515	-	-
HCM Control Delay (s)	7.7	0	16.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.3	-	3	-	-



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	36	39	34	38	39	22
Future Volume (vph)	36	39	34	38	39	22
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.930				0.951	
Flt Protected	0.976			0.977		
Satd. Flow (prot)	1575	0	0	1695	1650	0
Flt Permitted	0.976			0.977		
Satd. Flow (perm)	1575	0	0	1695	1650	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	75.0			74.8	53.3	
Travel Time (s)	5.4			5.4	3.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	41	44	39	43	44	25
Shared Lane Traffic (%)						
Lane Group Flow (vph)	85	0	0	82	69	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			0.0	0.0	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24	14	24			14
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 22.3%		ICU Level of Service A	
Analysis Period (min) 15			

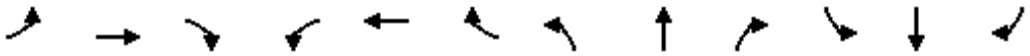
Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	36	39	34	38	39	22
Future Vol, veh/h	36	39	34	38	39	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	44	39	43	44	25

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	178	57	69	0	-	0
Stage 1	57	-	-	-	-	-
Stage 2	121	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	812	1009	1532	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	904	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	791	1009	1532	-	-	-
Mov Cap-2 Maneuver	791	-	-	-	-	-
Stage 1	941	-	-	-	-	-
Stage 2	904	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	3.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1532	-	891	-	-
HCM Lane V/C Ratio	0.025	-	0.096	-	-
HCM Control Delay (s)	7.4	0	9.5	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

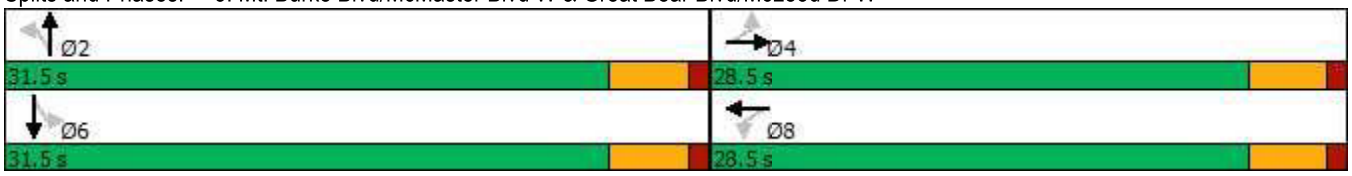


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	137	43	208	246	60	87	225	123	60	270	40
Future Volume (vph)	17	137	43	208	246	60	87	225	123	60	270	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	65.0		0.0	80.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	35.0			35.0			2.5			2.5		
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
Frt		0.964			0.971			0.962			0.986	
Flt Protected	0.950			0.950				0.990			0.992	
Satd. Flow (prot)	1648	1672	0	1648	1684	0	0	1652	0	0	1697	0
Flt Permitted	0.443			0.629				0.859			0.874	
Satd. Flow (perm)	768	1672	0	1091	1684	0	0	1434	0	0	1495	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31			24			43			13	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		223.7			170.6			142.8			551.0	
Travel Time (s)		16.1			12.3			10.3			39.7	
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)	19	156	49	236	280	68	99	256	140	68	307	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	19	205	0	236	348	0	0	495	0	0	420	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)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	28.5	28.5		28.5	28.5		30.5	30.5		30.5	30.5	
Total Split (s)	28.5	28.5		28.5	28.5		31.5	31.5		31.5	31.5	
Total Split (%)	47.5%	47.5%		47.5%	47.5%		52.5%	52.5%		52.5%	52.5%	
Maximum Green (s)	24.0	24.0		24.0	24.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		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)	18.0	18.0		18.0	18.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	16.3	16.3		16.3	16.3			23.2			23.2	
Actuated g/C Ratio	0.33	0.33		0.33	0.33			0.48			0.48	
v/c Ratio	0.07	0.35		0.65	0.60			0.70			0.59	
Control Delay	12.0	12.2		23.2	17.4			17.7			14.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	12.0	12.2		23.2	17.4			17.7			14.4	
LOS	B	B		C	B			B			B	
Approach Delay		12.2			19.8			17.7			14.4	
Approach LOS		B			B			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 48.8			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 16.9		Intersection LOS: B	
Intersection Capacity Utilization 75.4%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: Mt. Burke Blvd/McMaster Blvd W & Great Bear Blvd/McLeod Dr W



Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	490	130	19	313	68	16
Future Volume (vph)	490	130	19	313	68	16
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)		15.0	0.0		0.0	15.0
Storage Lanes		1	0		1	1
Taper Length (m)			2.5		2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.997	0.950	
Satd. Flow (prot)	1735	1475	0	1730	1648	1475
Flt Permitted				0.997	0.950	
Satd. Flow (perm)	1735	1475	0	1730	1648	1475
Link Speed (k/h)	50			50	50	
Link Distance (m)	123.9			551.0	291.6	
Travel Time (s)	8.9			39.7	21.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	557	148	22	356	77	18
Shared Lane Traffic (%)						
Lane Group Flow (vph)	557	148	0	378	77	18
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	45.5%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	1.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	490	130	19	313	68	16
Future Vol, veh/h	490	130	19	313	68	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	-	0	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	557	148	22	356	77	18

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	705	0	957	557
Stage 1	-	-	-	-	557	-
Stage 2	-	-	-	-	400	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	893	-	286	530
Stage 1	-	-	-	-	574	-
Stage 2	-	-	-	-	677	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	893	-	277	530
Mov Cap-2 Maneuver	-	-	-	-	277	-
Stage 1	-	-	-	-	574	-
Stage 2	-	-	-	-	656	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.5	20.8
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	277	530	893	-	-	-
HCM Lane V/C Ratio	0.279	0.034	0.024	-	-	-
HCM Control Delay (s)	22.9	12	9.1	0	-	-
HCM Lane LOS	C	B	A	A	-	-
HCM 95th %tile Q(veh)	1.1	0.1	0.1	-	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	24	37	7	2	29	6	12	51	0	3	84	24
Future Volume (vph)	24	37	7	2	29	6	12	51	0	3	84	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.986			0.977						0.971	
Flt Protected		0.983			0.998			0.990			0.999	
Satd. Flow (prot)	0	1681	0	0	1691	0	0	1717	0	0	1683	0
Flt Permitted		0.983			0.998			0.990			0.999	
Satd. Flow (perm)	0	1681	0	0	1691	0	0	1717	0	0	1683	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		102.0			82.2			234.8			291.6	
Travel Time (s)		7.3			5.9			16.9			21.0	
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
Adj. Flow (vph)	27	42	8	2	33	7	14	58	0	3	95	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	77	0	0	42	0	0	72	0	0	125	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.0%		ICU Level of Service A	
Analysis Period (min) 15			

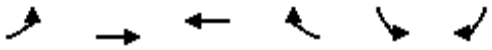
Intersection	
Int Delay, s/veh	4.4

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	24	37	7	2	29	6	12	51	0	3	84	24
Future Vol, veh/h	24	37	7	2	29	6	12	51	0	3	84	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	42	8	2	33	7	14	58	0	3	95	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	221	201	109	226	214	58	122	0	0	58	0	0
Stage 1	115	115	-	86	86	-	-	-	-	-	-	-
Stage 2	106	86	-	140	128	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	735	695	945	729	684	1008	1465	-	-	1546	-	-
Stage 1	890	800	-	922	824	-	-	-	-	-	-	-
Stage 2	900	824	-	863	790	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	697	687	945	683	676	1008	1465	-	-	1546	-	-
Mov Cap-2 Maneuver	697	687	-	683	676	-	-	-	-	-	-	-
Stage 1	881	798	-	913	816	-	-	-	-	-	-	-
Stage 2	849	816	-	809	788	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	10.7	10.3	1.4	0.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NEL	NET	NER	NWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1465	-	-	715	711	1546	-	-
HCM Lane V/C Ratio	0.009	-	-	0.059	0.109	0.002	-	-
HCM Control Delay (s)	7.5	0	-	10.3	10.7	7.3	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.4	0	-	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	193	204	278	147	134	301
Future Volume (vph)	193	204	278	147	134	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0			15.0	0.0	15.0
Storage Lanes	0			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected		0.976			0.950	
Satd. Flow (prot)	0	1693	1735	1475	1648	1475
Flt Permitted		0.976			0.950	
Satd. Flow (perm)	0	1693	1735	1475	1648	1475
Link Speed (k/h)		50	50		50	
Link Distance (m)		157.6	140.4		108.3	
Travel Time (s)		11.3	10.1		7.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	219	232	316	167	152	342
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	451	316	167	152	342
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

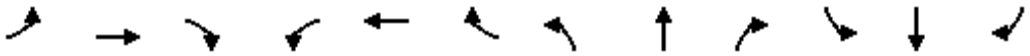
Intersection	
Int Delay, s/veh	10.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	193	204	278	147	134	301
Future Vol, veh/h	193	204	278	147	134	301
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	0	150
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	219	232	316	167	152	342

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	483	0	-	0	986	316
Stage 1	-	-	-	-	316	-
Stage 2	-	-	-	-	670	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1080	-	-	-	275	724
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	509	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1080	-	-	-	211	724
Mov Cap-2 Maneuver	-	-	-	-	211	-
Stage 1	-	-	-	-	567	-
Stage 2	-	-	-	-	509	-

Approach	EB	WB	SB
HCM Control Delay, s	4.5	0	27.4
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1080	-	-	-	211	724
HCM Lane V/C Ratio	0.203	-	-	-	0.722	0.472
HCM Control Delay (s)	9.2	0	-	-	56.7	14.3
HCM Lane LOS	A	A	-	-	F	B
HCM 95th %tile Q(veh)	0.8	-	-	-	4.7	2.5



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	181	65	45	264	64	37	2	25	45	6	87
Future Volume (vph)	103	181	65	45	264	64	37	2	25	45	6	87
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.975			0.977			0.947			0.915	
Flt Protected		0.985			0.994			0.972			0.984	
Satd. Flow (prot)	0	1666	0	0	1685	0	0	1597	0	0	1562	0
Flt Permitted		0.985			0.994			0.972			0.984	
Satd. Flow (perm)	0	1666	0	0	1685	0	0	1597	0	0	1562	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		140.1			61.5			74.5			128.0	
Travel Time (s)		10.1			4.4			5.4			9.2	
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)	117	206	74	51	300	73	42	2	28	51	7	99
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	397	0	0	424	0	0	72	0	0	157	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 57.3%		ICU Level of Service B	
Analysis Period (min) 15			

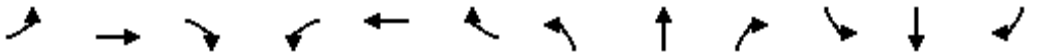
Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	103	181	65	45	264	64	37	2	25	45	6	87
Future Vol, veh/h	103	181	65	45	264	64	37	2	25	45	6	87
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	117	206	74	51	300	73	42	2	28	51	7	99

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	373	0	0	280	0	0	969	952	243	931	953	337
Stage 1	-	-	-	-	-	-	477	477	-	439	439	-
Stage 2	-	-	-	-	-	-	492	475	-	492	514	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1185	-	-	1283	-	-	233	259	796	247	259	705
Stage 1	-	-	-	-	-	-	569	556	-	597	578	-
Stage 2	-	-	-	-	-	-	558	557	-	558	535	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1185	-	-	1283	-	-	171	217	796	207	217	705
Mov Cap-2 Maneuver	-	-	-	-	-	-	171	217	-	207	217	-
Stage 1	-	-	-	-	-	-	502	490	-	527	549	-
Stage 2	-	-	-	-	-	-	450	529	-	472	472	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.5	1	25.3	21.3
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	249	1185	-	-	1283	-	-	375
HCM Lane V/C Ratio	0.292	0.099	-	-	0.04	-	-	0.418
HCM Control Delay (s)	25.3	8.4	0	-	7.9	0	-	21.3
HCM Lane LOS	D	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	1.2	0.3	-	-	0.1	-	-	2



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	139	34	49	256	82	27	436	80	134	743	152
Future Volume (vph)	88	139	34	49	256	82	27	436	80	134	743	152
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	45.0		0.0	35.0		0.0	25.0		50.0	40.0		45.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
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
Frt		0.970			0.964				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1648	1683	0	1648	1672	0	1601	1685	1432	1601	1685	1432
Flt Permitted	0.165			0.552			0.079			0.288		
Satd. Flow (perm)	286	1683	0	958	1672	0	133	1685	1432	485	1685	1432
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			11				82			82
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		115.7			69.1			529.5			187.4	
Travel Time (s)		8.3			5.0			38.1			13.5	
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)	100	158	39	56	291	93	31	495	91	152	844	173
Shared Lane Traffic (%)												
Lane Group Flow (vph)	100	197	0	56	384	0	31	495	91	152	844	173
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)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2		2	6		6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	20.0	20.0	5.0	20.0	20.0
Minimum Split (s)	14.5	30.5		14.5	30.5		14.5	30.5	30.5	14.5	30.5	30.5
Total Split (s)	16.0	43.2		16.0	43.2		14.5	66.0	66.0	14.8	66.3	66.3
Total Split (%)	11.4%	30.9%		11.4%	30.9%		10.4%	47.1%	47.1%	10.6%	47.4%	47.4%
Maximum Green (s)	11.5	38.7		11.5	38.7		10.0	61.5	61.5	10.3	61.8	61.8
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
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	C-Min	C-Min	None	C-Min	C-Min
Walk Time (s)		6.0			6.0			6.0	6.0		6.0	6.0
Flash Dont Walk (s)		20.0			20.0			20.0	20.0		20.0	20.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	48.1	39.1		43.5	34.9		73.1	66.4	66.4	80.1	73.8	73.8
Actuated g/C Ratio	0.34	0.28		0.31	0.25		0.52	0.47	0.47	0.57	0.53	0.53
v/c Ratio	0.50	0.41		0.17	0.90		0.22	0.62	0.13	0.43	0.95	0.22
Control Delay	38.1	42.3		29.4	74.1		18.5	33.1	6.1	18.8	53.8	11.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.1	42.3		29.4	74.1		18.5	33.1	6.1	18.8	53.8	11.8
LOS	D	D		C	E		B	C	A	B	D	B
Approach Delay		40.9			68.4			28.3			43.1	
Approach LOS		D			E			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 140			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.95			
Intersection Signal Delay: 43.6		Intersection LOS: D	
Intersection Capacity Utilization 87.0%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 22: Metis Tr & Great Bear Blvd

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	165	82	65	307	77	32
Future Volume (vph)	165	82	65	307	77	32
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.955				0.961	
Flt Protected				0.991	0.966	
Satd. Flow (prot)	1657	0	0	1719	1610	0
Flt Permitted				0.991	0.966	
Satd. Flow (perm)	1657	0	0	1719	1610	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	65.4			118.9	88.4	
Travel Time (s)	4.7			8.6	6.4	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	188	93	74	349	88	36
Shared Lane Traffic (%)						
Lane Group Flow (vph)	281	0	0	423	124	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.1%		ICU Level of Service A	
Analysis Period (min) 15			

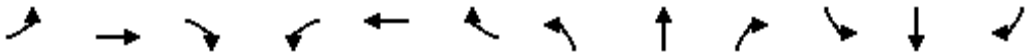
Intersection	
Int Delay, s/veh	3.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	165	82	65	307	77	32
Future Vol, veh/h	165	82	65	307	77	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	188	93	74	349	88	36

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	281	0	732	235
Stage 1	-	-	-	-	235	-
Stage 2	-	-	-	-	497	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1282	-	388	804
Stage 1	-	-	-	-	804	-
Stage 2	-	-	-	-	611	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1282	-	360	804
Mov Cap-2 Maneuver	-	-	-	-	360	-
Stage 1	-	-	-	-	804	-
Stage 2	-	-	-	-	567	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	16.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	430	-	-	1282	-
HCM Lane V/C Ratio	0.288	-	-	0.058	-
HCM Control Delay (s)	16.7	-	-	8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.2	-	-	0.2	-

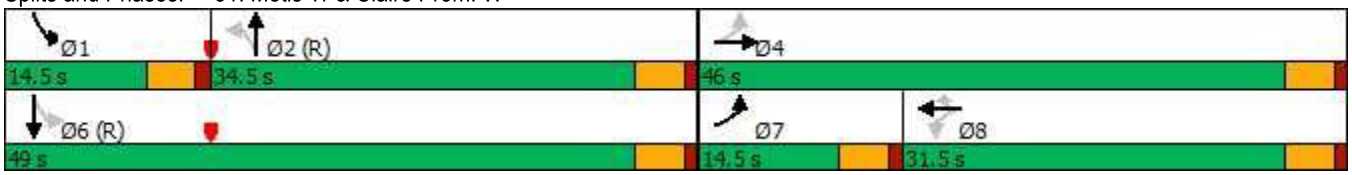


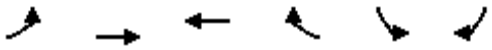
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	102	23	27	166	123	38	353	39	237	474	115
Future Volume (vph)	67	102	23	27	166	123	38	353	39	237	474	115
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	40.0		0.0	0.0		40.0	0.0		0.0	50.0		0.0
Storage Lanes	1		0	0		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
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
Frt		0.973				0.850		0.988			0.971	
Flt Protected	0.950				0.993			0.996		0.950		
Satd. Flow (prot)	1648	1688	0	0	1723	1475	0	1658	0	1601	1636	0
Flt Permitted	0.327				0.939			0.905		0.327		
Satd. Flow (perm)	567	1688	0	0	1629	1475	0	1507	0	551	1636	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15				140		5			17	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		112.6			79.9			399.0			529.5	
Travel Time (s)		8.1			5.8			28.7			38.1	
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)	76	116	26	31	189	140	43	401	44	269	539	131
Shared Lane Traffic (%)												
Lane Group Flow (vph)	76	142	0	0	220	140	0	488	0	269	670	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)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases	7	4			8			2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8		8	2			6		
Detector Phase	7	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0	10.0	20.0	20.0		5.0	20.0	
Minimum Split (s)	14.5	30.5		31.5	31.5	31.5	30.5	30.5		14.5	30.5	
Total Split (s)	14.5	46.0		31.5	31.5	31.5	34.5	34.5		14.5	49.0	
Total Split (%)	15.3%	48.4%		33.2%	33.2%	33.2%	36.3%	36.3%		15.3%	51.6%	
Maximum Green (s)	10.0	41.5		27.0	27.0	27.0	30.0	30.0		10.0	44.5	
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)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5			4.5	4.5		4.5		4.5	4.5	
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes		Yes		
Vehicle Extension (s)	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	C-Max	C-Max		None	C-Max	
Walk Time (s)		6.0		7.0	7.0	7.0	6.0	6.0			6.0	
Flash Dont Walk (s)		20.0		20.0	20.0	20.0	20.0	20.0			20.0	
Pedestrian Calls (#/hr)		0		0	0	0	0	0			0	
Act Effct Green (s)	29.2	29.2			18.1	18.1		39.1		56.8	56.8	
Actuated g/C Ratio	0.31	0.31			0.19	0.19		0.41		0.60	0.60	
v/c Ratio	0.28	0.27			0.71	0.36		0.78		0.57	0.68	
Control Delay	22.9	20.8			48.0	7.8		38.9		17.2	20.1	
Queue Delay	0.0	0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay	22.9	20.8			48.0	7.8		38.9		17.2	20.1	
LOS	C	C			D	A		D		B	C	
Approach Delay		21.5			32.3			38.9			19.3	
Approach LOS		C			C			D			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 95			
Actuated Cycle Length: 95			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 95			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 26.6		Intersection LOS: C	
Intersection Capacity Utilization 94.1%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 31: Metis Tr & Claire Prom. W





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	56	244	429	39	20	49
Future Volume (vph)	56	244	429	39	20	49
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.989		0.904	
Flt Protected		0.991			0.986	
Satd. Flow (prot)	0	1670	1667	0	1546	0
Flt Permitted		0.991			0.986	
Satd. Flow (perm)	0	1670	1667	0	1546	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		359.7	149.2		116.3	
Travel Time (s)		25.9	10.7		8.4	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	64	277	488	44	23	56
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	341	532	0	79	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 58.9%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	56	244	429	39	20	49
Future Vol, veh/h	56	244	429	39	20	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	64	277	488	44	23	56

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	532	0	-	0	915	510
Stage 1	-	-	-	-	510	-
Stage 2	-	-	-	-	405	-
Critical Hdwy	4.15	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.245	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1020	-	-	-	303	563
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	673	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1020	-	-	-	281	563
Mov Cap-2 Maneuver	-	-	-	-	281	-
Stage 1	-	-	-	-	558	-
Stage 2	-	-	-	-	673	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	15.1
HCM LOS			C

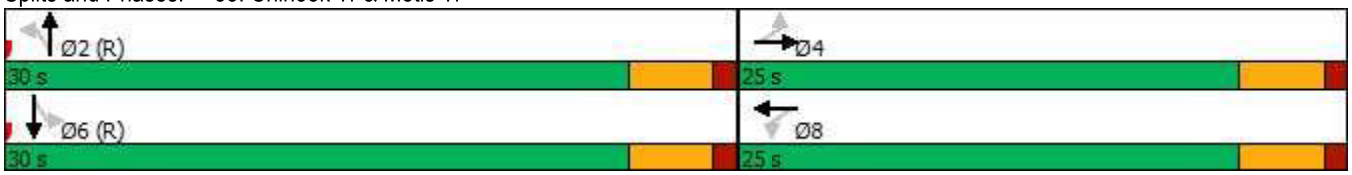
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1020	-	-	-	436
HCM Lane V/C Ratio	0.062	-	-	-	0.18
HCM Control Delay (s)	8.8	0	-	-	15.1
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	0.6

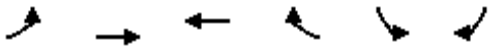
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	73	0	7	131	315	0	81	0	215	154	43
Future Volume (vph)	27	73	0	7	131	315	0	81	0	215	154	43
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.906						0.986	
Flt Protected		0.987			0.999						0.975	
Satd. Flow (prot)	0	1663	0	0	1526	0	0	1735	0	0	1638	0
Flt Permitted		0.853			0.996						0.788	
Satd. Flow (perm)	0	1437	0	0	1521	0	0	1735	0	0	1323	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					238						14	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		115.5			443.6			68.0			398.4	
Travel Time (s)		8.3			31.9			4.9			28.7	
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 (%)	5%	5%	2%	2%	5%	5%	2%	2%	2%	5%	2%	5%
Adj. Flow (vph)	31	83	0	8	149	358	0	92	0	244	175	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	114	0	0	515	0	0	92	0	0	468	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	24.5	24.5		24.5	24.5		24.5	24.5		24.5	24.5	
Total Split (s)	25.0	25.0		25.0	25.0		30.0	30.0		30.0	30.0	
Total Split (%)	45.5%	45.5%		45.5%	45.5%		54.5%	54.5%		54.5%	54.5%	
Maximum Green (s)	20.5	20.5		20.5	20.5		25.5	25.5		25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	14.0	14.0		14.0	14.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		20.2			20.2			25.8			25.8	
Actuated g/C Ratio		0.37			0.37			0.47			0.47	
v/c Ratio		0.22			0.73			0.11			0.75	
Control Delay		13.3			15.2			8.8			21.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		13.3			15.2			8.8			21.5	
LOS		B			B			A			C	
Approach Delay		13.3			15.2			8.8			21.5	
Approach LOS		B			B			A			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 55			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 17.0		Intersection LOS: B	
Intersection Capacity Utilization 68.0%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 33: Chinook Tr & Metis Tr





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	28	266	416	62	33	36
Future Volume (vph)	28	266	416	62	33	36
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.983		0.930	
Flt Protected		0.995			0.977	
Satd. Flow (prot)	0	1677	1657	0	1576	0
Flt Permitted		0.995			0.977	
Satd. Flow (perm)	0	1677	1657	0	1576	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		443.6	359.7		243.4	
Travel Time (s)		31.9	25.9		17.5	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	2%	2%
Adj. Flow (vph)	32	302	473	70	38	41
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	334	543	0	79	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 51.6%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	28	266	416	62	33	36
Future Vol, veh/h	28	266	416	62	33	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	32	302	473	70	38	41

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	543	0	-	0	874	508
Stage 1	-	-	-	-	508	-
Stage 2	-	-	-	-	366	-
Critical Hdwy	4.15	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.245	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1011	-	-	-	320	565
Stage 1	-	-	-	-	604	-
Stage 2	-	-	-	-	702	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1011	-	-	-	308	565
Mov Cap-2 Maneuver	-	-	-	-	308	-
Stage 1	-	-	-	-	581	-
Stage 2	-	-	-	-	702	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	16
HCM LOS			C

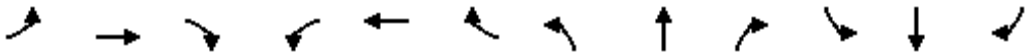
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1011	-	-	-	404
HCM Lane V/C Ratio	0.031	-	-	-	0.194
HCM Control Delay (s)	8.7	0	-	-	16
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	11	37	10	11	40	60	342	20	78	365	81
Future Volume (vph)	49	11	37	10	11	40	60	342	20	78	365	81
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.949			0.912			0.994			0.979	
Flt Protected		0.975			0.992			0.993			0.993	
Satd. Flow (prot)	0	1605	0	0	1569	0	0	1663	0	0	1638	0
Flt Permitted		0.825			0.945			0.873			0.878	
Satd. Flow (perm)	0	1358	0	0	1495	0	0	1462	0	0	1449	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42			45			6			23	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		67.9			103.1			398.4			399.0	
Travel Time (s)		4.9			7.4			28.7			28.7	
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)	56	13	42	11	13	45	68	389	23	89	415	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	111	0	0	69	0	0	480	0	0	596	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	24.5	24.5		24.5	24.5		24.5	24.5		24.5	24.5	
Total Split (s)	24.5	24.5		24.5	24.5		35.5	35.5		35.5	35.5	
Total Split (%)	40.8%	40.8%		40.8%	40.8%		59.2%	59.2%		59.2%	59.2%	
Maximum Green (s)	20.0	20.0		20.0	20.0		31.0	31.0		31.0	31.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Flash Dont Walk (s)	14.0	14.0		14.0	14.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		10.6			10.6			44.2			44.2	
Actuated g/C Ratio		0.18			0.18			0.74			0.74	
v/c Ratio		0.40			0.23			0.45			0.56	
Control Delay		19.3			12.5			6.3			7.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		19.3			12.5			6.3			7.6	
LOS		B			B			A			A	
Approach Delay		19.3			12.5			6.3			7.6	
Approach LOS		B			B			A			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.56			
Intersection Signal Delay: 8.4		Intersection LOS: A	
Intersection Capacity Utilization 62.1%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 38: Metis Tr & Street B



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	21	12	44	41	23	22	22	45	28	13	24
Future Volume (vph)	12	21	12	44	41	23	22	22	45	28	13	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
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
Frt		0.964			0.971			0.932			0.951	
Flt Protected		0.987			0.980			0.988			0.979	
Satd. Flow (prot)	0	1651	0	0	1651	0	0	1597	0	0	1615	0
Flt Permitted		0.987			0.980			0.988			0.979	
Satd. Flow (perm)	0	1651	0	0	1651	0	0	1597	0	0	1615	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		102.5			96.0			243.4			84.8	
Travel Time (s)		7.4			6.9			17.5			6.1	
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	24	14	50	47	26	25	25	51	32	15	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	52	0	0	123	0	0	101	0	0	74	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)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
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)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 24.0%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	6.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	12	21	12	44	41	23	22	22	45	28	13	24
Future Vol, veh/h	12	21	12	44	41	23	22	22	45	28	13	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	24	14	50	47	26	25	25	51	32	15	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	230	219	29	213	207	51	42	0	0	76	0	0
Stage 1	93	93	-	101	101	-	-	-	-	-	-	-
Stage 2	137	126	-	112	106	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	725	679	1046	744	690	1017	1567	-	-	1523	-	-
Stage 1	914	818	-	905	811	-	-	-	-	-	-	-
Stage 2	866	792	-	893	807	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	649	653	1046	693	663	1017	1567	-	-	1523	-	-
Mov Cap-2 Maneuver	649	653	-	693	663	-	-	-	-	-	-	-
Stage 1	898	800	-	890	797	-	-	-	-	-	-	-
Stage 2	781	779	-	836	789	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.4	10.9	1.8	3.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1567	-	-	724	730	1523	-	-
HCM Lane V/C Ratio	0.016	-	-	0.071	0.168	0.021	-	-
HCM Control Delay (s)	7.3	0	-	10.4	10.9	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.6	0.1	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	63	6	94	118	3	63
Future Volume (vph)	63	6	94	118	3	63
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.988				0.870	
Flt Protected				0.978	0.998	
Satd. Flow (prot)	1714	0	0	1697	1506	0
Flt Permitted				0.978	0.998	
Satd. Flow (perm)	1714	0	0	1697	1506	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	84.9			57.4	105.5	
Travel Time (s)	6.1			4.1	7.6	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	72	7	107	134	3	72
Shared Lane Traffic (%)						
Lane Group Flow (vph)	79	0	0	241	75	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.1%		ICU Level of Service A	
Analysis Period (min) 15			

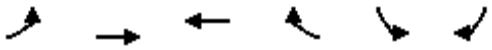
Intersection	
Int Delay, s/veh	3.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	63	6	94	118	3	63
Future Vol, veh/h	63	6	94	118	3	63
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	72	7	107	134	3	72

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	79	0	424	76
Stage 1	-	-	-	-	76	-
Stage 2	-	-	-	-	348	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1519	-	587	985
Stage 1	-	-	-	-	947	-
Stage 2	-	-	-	-	715	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1519	-	542	985
Mov Cap-2 Maneuver	-	-	-	-	542	-
Stage 1	-	-	-	-	947	-
Stage 2	-	-	-	-	661	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.3	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	950	-	-	1519	-
HCM Lane V/C Ratio	0.079	-	-	0.07	-
HCM Control Delay (s)	9.1	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.2	-



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	96	30	71	60	80	141
Future Volume (vph)	96	30	71	60	80	141
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.938		0.914	
Flt Protected		0.963			0.982	
Satd. Flow (prot)	0	1671	1627	0	1557	0
Flt Permitted		0.963			0.982	
Satd. Flow (perm)	0	1671	1627	0	1557	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		95.2	63.1		132.7	
Travel Time (s)		6.9	4.5		9.6	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	109	34	81	68	91	160
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	143	149	0	251	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 39.7%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	96	30	71	60	80	141
Future Vol, veh/h	96	30	71	60	80	141
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	109	34	81	68	91	160

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	149	0	-	0	367	115
Stage 1	-	-	-	-	115	-
Stage 2	-	-	-	-	252	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1432	-	-	-	633	937
Stage 1	-	-	-	-	910	-
Stage 2	-	-	-	-	790	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1432	-	-	-	584	937
Mov Cap-2 Maneuver	-	-	-	-	584	-
Stage 1	-	-	-	-	839	-
Stage 2	-	-	-	-	790	-

Approach	EB	WB	SB
HCM Control Delay, s	5.9	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1432	-	-	-	769
HCM Lane V/C Ratio	0.076	-	-	-	0.327
HCM Control Delay (s)	7.7	0	-	-	11.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	1.4

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	288	58	79	301	30	68
Future Volume (vph)	288	58	79	301	30	68
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.977				0.906	
Flt Protected				0.990	0.985	
Satd. Flow (prot)	1695	0	0	1717	1548	0
Flt Permitted				0.990	0.985	
Satd. Flow (perm)	1695	0	0	1717	1548	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	85.7			64.4	71.5	
Travel Time (s)	6.2			4.6	5.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	327	66	90	342	34	77
Shared Lane Traffic (%)						
Lane Group Flow (vph)	393	0	0	432	111	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)		14	24		24	14
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 58.6%		ICU Level of Service B	
Analysis Period (min) 15			

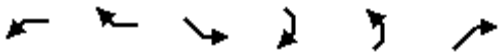
Intersection	
Int Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	288	58	79	301	30	68
Future Vol, veh/h	288	58	79	301	30	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	327	66	90	342	34	77

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	393	0	882	360
Stage 1	-	-	-	-	360	-
Stage 2	-	-	-	-	522	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1166	-	317	684
Stage 1	-	-	-	-	706	-
Stage 2	-	-	-	-	595	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1166	-	287	684
Mov Cap-2 Maneuver	-	-	-	-	287	-
Stage 1	-	-	-	-	706	-
Stage 2	-	-	-	-	538	-

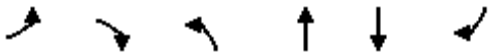
Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	14.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	481	-	-	1166	-
HCM Lane V/C Ratio	0.232	-	-	0.077	-
HCM Control Delay (s)	14.7	-	-	8.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.9	-	-	0.2	-



Lane Group	WBL	WBR	SEL	SER	NEL	NER
Lane Configurations						
Traffic Volume (vph)	346	55	31	68	40	290
Future Volume (vph)	346	55	31	68	40	290
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.981		0.907		0.881	
Flt Protected	0.959		0.985		0.994	
Satd. Flow (prot)	1632	0	1550	0	1519	0
Flt Permitted	0.959		0.985		0.994	
Satd. Flow (perm)	1632	0	1550	0	1519	0
Link Speed (k/h)	50		50		50	
Link Distance (m)	78.4		100.4		97.3	
Travel Time (s)	5.6		7.2		7.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	393	63	35	77	45	330
Shared Lane Traffic (%)						
Lane Group Flow (vph)	456	0	112	0	375	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(m)	3.7		3.7		3.7	
Link Offset(m)	0.0		0.0		0.0	
Crosswalk Width(m)	1.6		1.6		1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24	14	24	14	24	14
Sign Control	Yield		Yield		Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 62.7%		ICU Level of Service B	
Analysis Period (min) 15			



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	169	72	98	61	165	254
Future Volume (vph)	169	72	98	61	165	254
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.960				0.918	
Flt Protected	0.966			0.970		
Satd. Flow (prot)	1609	0	0	1683	1592	0
Flt Permitted	0.966			0.970		
Satd. Flow (perm)	1609	0	0	1683	1592	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	95.1			91.7	84.3	
Travel Time (s)	6.8			6.6	6.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	192	82	111	69	188	289
Shared Lane Traffic (%)						
Lane Group Flow (vph)	274	0	0	180	477	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			0.0	0.0	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24	14	24			14
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 60.7%		ICU Level of Service B	
Analysis Period (min) 15			

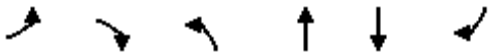
Intersection	
Int Delay, s/veh	8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	169	72	98	61	165	254
Future Vol, veh/h	169	72	98	61	165	254
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	192	82	111	69	188	289

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	624	333	477	0	-	0
Stage 1	333	-	-	-	-	-
Stage 2	291	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	449	709	1085	-	-	-
Stage 1	726	-	-	-	-	-
Stage 2	759	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	401	709	1085	-	-	-
Mov Cap-2 Maneuver	401	-	-	-	-	-
Stage 1	649	-	-	-	-	-
Stage 2	759	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23.6	5.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1085	-	461	-	-
HCM Lane V/C Ratio	0.103	-	0.594	-	-
HCM Control Delay (s)	8.7	0	23.6	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.3	-	3.8	-	-



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	31	23	20	48	48	38
Future Volume (vph)	31	23	20	48	48	38
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.942				0.941	
Flt Protected	0.972			0.985		
Satd. Flow (prot)	1588	0	0	1709	1632	0
Flt Permitted	0.972			0.985		
Satd. Flow (perm)	1588	0	0	1709	1632	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	75.0			74.8	53.3	
Travel Time (s)	5.4			5.4	3.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	35	26	23	55	55	43
Shared Lane Traffic (%)						
Lane Group Flow (vph)	61	0	0	78	98	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			0.0	0.0	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	1.6			1.6	1.6	
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24	14	24			14
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 20.7%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	31	23	20	48	48	38
Future Vol, veh/h	31	23	20	48	48	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	35	26	23	55	55	43

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	178	77	98	0	-	0
Stage 1	77	-	-	-	-	-
Stage 2	101	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	812	984	1495	-	-	-
Stage 1	946	-	-	-	-	-
Stage 2	923	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	799	984	1495	-	-	-
Mov Cap-2 Maneuver	799	-	-	-	-	-
Stage 1	931	-	-	-	-	-
Stage 2	923	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	2.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1495	-	869	-	-
HCM Lane V/C Ratio	0.015	-	0.071	-	-
HCM Control Delay (s)	7.4	0	9.5	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

APPENDIX

C TRAVEL SURVEY DATA

Exhibit 4.6 Lethbridge Map

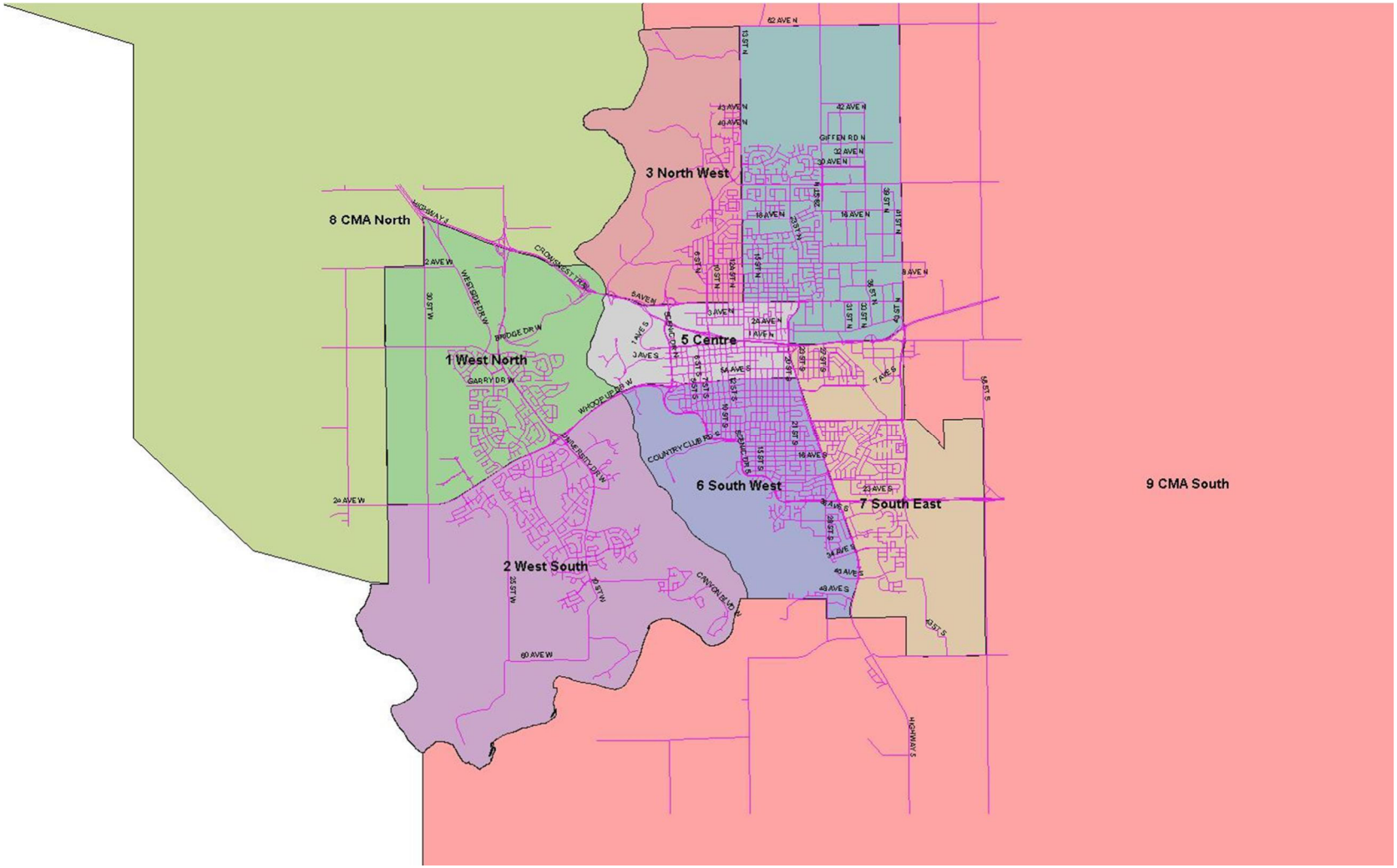


Exhibit 7.5 shows the trips made between districts during the AM Peak, while **Exhibit 7.6** shows the autodriver trips between districts made during the AM Peak. The Centre district is the top destination (16,098 trips. Within districts, the highest trip volumes occur within the North East (4,295 trips), South West (3,647) and West North (3,349) districts. Trips typically start and finish within the same district in the AM Peak, however there are exception to this (e.g. AM Peak trips starting in the Centre district usually end in another district).

Exhibit 7.5 Total Trips For AM Peak Period

	Trip Origin										
Trip Destination	West North	West South	North West	North East	Centre	South West	South East	CMA North	CMA South	Out of Region	Total
West North	3,349	1,715	92	240	131	156	142	107	35	32	6,001
West South	1,711	3,476	219	503	475	958	433	245	183	17	8,220
North West	97	167	307	472	226	143	136	437	219	-	2,203
North East	973	1,061	1,083	4,295	700	1,092	873	492	804	183	11,555
Centre	2,733	2,084	1,256	1,850	1,958	2,676	2,003	815	674	48	16,098
South West	985	1,594	714	1,020	1,372	3,647	1,707	225	587	71	11,921
South East	345	390	105	841	299	737	1,762	176	411	-	5,065
CMA North	92	155	23	177	86	67	108	1,990	35	-	2,733
CMA South	157	102	23	286	79	153	126	28	2,715	-	3,670
Out of Region	343	53	90	409	102	257	144	248	192	-	1,839
Total Trips	10,785	10,796	3,911	10,092	5,430	9,887	7,434	4,765	5,855	350	**69,305**

Exhibit 7.6 Total Auto Driver Trips For AM Peak Period

	Trip Origin										
Trip Destination	West North	West South	North West	North East	Centre	South West	South East	CMA North	CMA South	Out of Region	Total
West North	1,474	711	72	172	83	108	126	75	35	32	2,889
West South	1,030	1,691	111	370	360	738	299	245	141	17	5,002
North West	66	134	160	212	150	91	87	67	-	-	966
North East	847	925	777	2,626	561	872	804	464	520	117	8,514
Centre	2,160	1,521	881	1,562	1,440	1,717	1,399	442	563	15	11,701
South West	737	1,105	546	810	866	1,914	1,153	196	502	71	7,900
South East	310	271	105	644	223	591	1,318	119	339	-	3,919
CMA North	60	105	23	132	86	49	61	617	-	-	1,132
CMA South	142	102	23	190	50	134	126	28	1,264	-	2,061
Out of Region	297	53	90	228	58	197	110	220	114	-	1,366
Total Trips	7,122	6,616	2,789	6,946	3,876	6,411	5,485	2,474	3,479	253	**45,450**

Exhibit 7.7 shows the total trips made between zones during the PM Peak. **Exhibit 7.8** shows the auto driver trips made between zones during the PM Peak. PM Peak trip volume is the highest within the North East (5,806 trips) and Centre (5,316) districts. Again, the trips typically start and finish within the same district for both. The highest volume in the PM Peak are seen between West North and South West districts.

Exhibit 7.7 Total Trips For PM Peak Period

	Trip Origin										
Trip Destination	West North	West South	North West	North East	Centre	South West	South East	CMA North	CMA South	Out of Region	Total
West North	4,275	2,400	213	935	2,265	1,304	266	212	161	309	12,339
West South	2,206	4,312	126	789	2,482	1,352	617	184	131	95	12,293
North West	130	302	783	1,005	1,532	539	325	82	23	109	4,830
North East	294	514	928	5,806	2,453	1,153	913	234	419	401	13,115
Centre	831	1,434	730	1,641	6,146	2,258	1,479	409	641	83	15,650
South West	696	1,127	250	1,535	3,659	5,316	2,194	82	627	253	15,739
South East	239	521	312	1,173	2,133	3,085	2,295	258	199	146	10,361
CMA North	268	121	300	437	713	343	171	1,819	28	289	4,489
CMA South	77	75	169	534	1,063	653	297	92	3,367	115	6,442
Out of Region	31	33	43	32	98	107	140	71	142	-	697
Total Trips	9,048	10,837	3,853	13,886	22,545	16,109	8,698	3,443	5,739	1,799	**95,957**

Exhibit 7.8 Total Auto Driver Trips For PM Peak Period

	Trip Origin										
Trip Destination	West North	West South	North West	North East	Centre	South West	South East	CMA North	CMA South	Out of Region	Total
West North	1,963	1,565	99	682	1,845	946	234	108	161	263	7,865
West South	1,294	1,971	92	690	1,733	981	452	151	114	95	7,572
North West	107	177	548	731	1,065	429	254	82	23	86	3,503
North East	178	380	482	3,929	1,935	946	677	140	188	337	9,194
Centre	566	1,116	519	1,163	4,185	1,467	972	249	289	38	10,563
South West	495	669	158	1,231	2,538	3,034	1,733	46	383	174	10,462
South East	177	412	191	974	1,440	2,156	1,445	144	199	130	7,268
CMA North	135	121	129	267	528	221	158	965	28	189	2,741
CMA South	77	75	36	424	652	540	262	28	1,323	79	3,496
Out of Region	15	16	20	32	65	107	63	32	64	-	414
Total Trips	5,008	6,502	2,276	10,123	15,986	10,827	6,250	1,945	2,773	1,389	**63,079**

APPENDIX

D 2016 OUTLINE PLAN TIA

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

REPORT

City of Lethbridge

Waterbridge
Traffic Impact Assessment
Lethbridge, AB

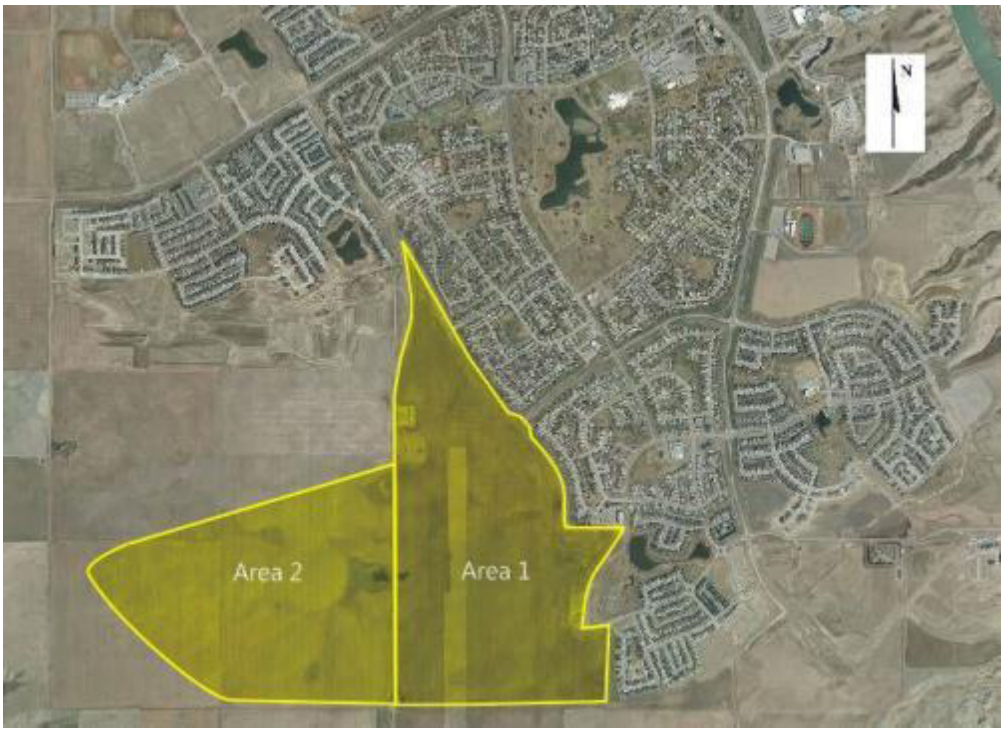


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Table of Contents

1 Introduction

1.1 BACKGROUND

Waterbridge is a proposed residential subdivision on 263 hectares located in the southwest area of Lethbridge, AB. The subdivision will contain two neighbourhoods with Waterbridge East on the east side of Métis Trail West and Waterbridge West on the west side. According to the Area Structure Plan (ASP), dated February 2, 2015, the subdivision will be developed gradually from east to west over the next ten years. In keeping with this, the City of Lethbridge will begin by developing the 140.8 hectares on the east side of Métis Trail West, identified as Waterbridge East. Waterbridge East is bound by the existing communities of Varsity Village, Mountain Heights and Sunridge to the east, the future Chinook Trail to the south, and Métis Trail West to the west. Waterbridge East will have a population of approximately 4,853 and will include a mix of land uses with a range of housing types, a network of pathways and open spaces, and neighbourhood activity nodes promoting social activities. It will have access from the surrounding road network including the existing Rocky Mountain Boulevard West, Sunridge Boulevard West, MacLeod Drive West and Simon Fraser Boulevard West, as well as the future Chinook Trail and Métis Trail West. Waterbridge West will have a population of approximately 4,400 and contain 128.5ha. It will have access from the future extension of MacLeod Drive West, Chinook Trail, and Métis Trail West.

The City of Lethbridge requires a Traffic Impact Assessment (TIA) that identifies internal roadway classification, as well as intersection configuration and traffic control. Information available in the ASP document and previously completed Traffic Impact Assessments for the Waterbridge subdivision were used to inform this Traffic Impact Assessment. The study has been prepared in accordance with the City of Lethbridge Traffic Impact Study Guidelines.

1.2 STUDY OBJECTIVES

The specific objectives to be achieved from this study include the following:

- Review existing data and information available from the:
  - Area Structure Plan (February 2, 2015);
  - Waterbridge Area Structure Plan Traffic Impact Assessment – 2014 Update (June 2014)
- Determine AM and PM peak hour traffic volumes for Waterbridge East based on the Waterbridge Outline Plan (April, 2016);
- Determine and analyze the projected traffic volumes resulting from other planned development and evaluate their impacts on relevant adjacent roadways and intersections for AM and PM peak hours under the full build-out horizon year (Waterbridge East and Waterbridge West);
- Determine the projected delay and level of service under full build-out horizon;
- Identify and recommend appropriate infrastructure and traffic control requirements to accommodate the estimated traffic volumes at key study area intersections;
- Determine internal roadway classification based on daily volume estimates derived from peak hour volume projections;
- Review and discuss site access and circulation based on the Waterbridge Outline Plan; and

- Review and discuss cycling, walking and transit facilities and recommend requirements within the context of the development.

2 Site Content

2.1 STUDY AREA

The proposed Waterbridge subdivision consisting of Waterbridge East and Waterbridge West is located in the southwest part of Lethbridge, AB. Figure 2-1 shows the study area. The existing land is undeveloped. The area surrounding the site includes residential neighbourhoods to the east and north and undeveloped land to the west and south.

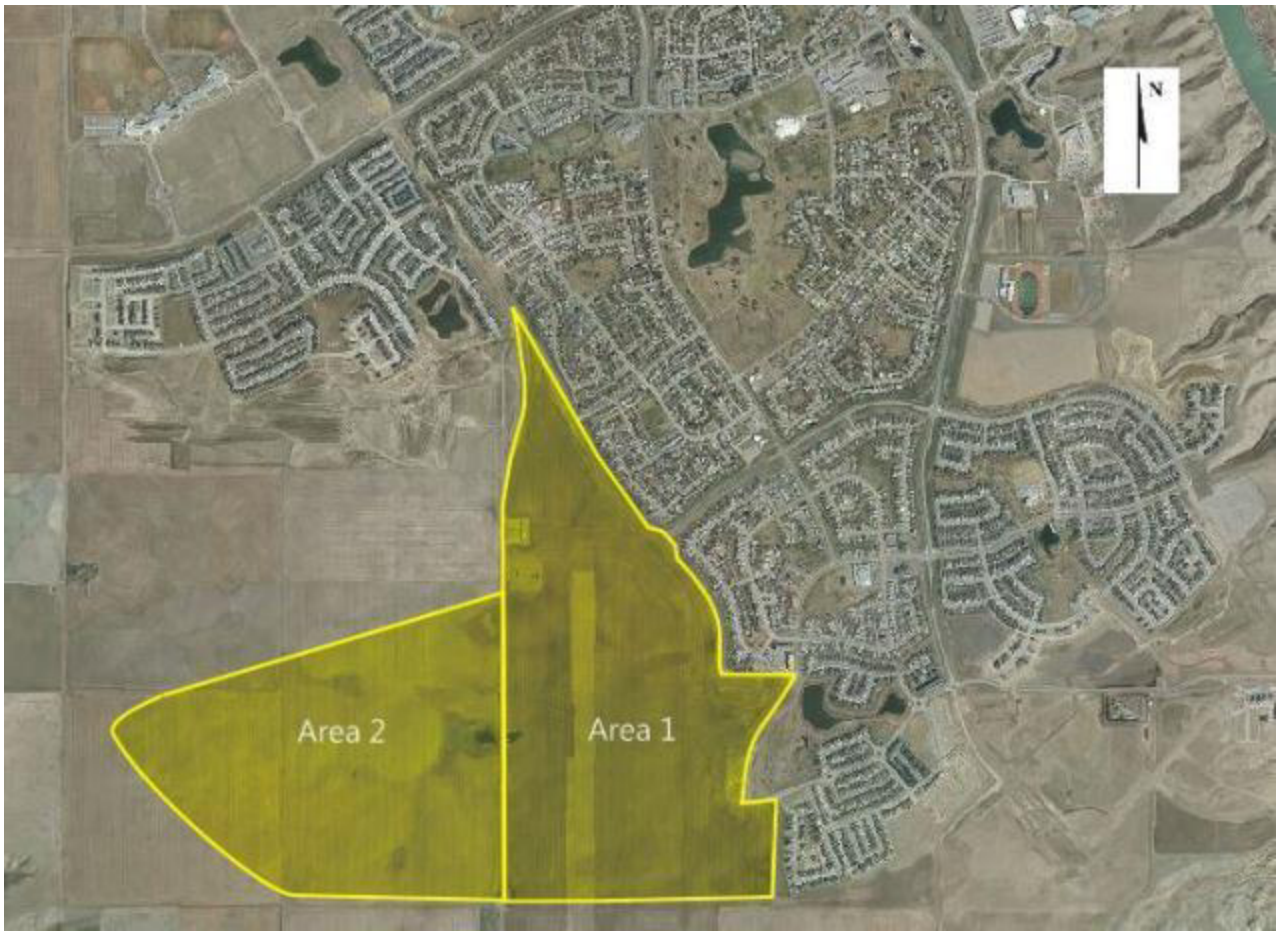

Figure 2-1: Study Area

2.2 TRANSPORTATION SYSTEM

Listed below are the existing and planned primary roads within the study area. The study area transportation system and intersections are shown in Figure 2-2.

Rocky Mountain Boulevard West
Rocky Mountain Boulevard West, a two-lane collector road in the study area that extends from University Drive West to the south of Mt. Rundle Road. As the lands to the west are developed, Rocky Mountain Boulevard West will terminate in a T-intersection at Sunridge Boulevard West.

MacLeod Drive West
MacLeod Drive West is an east-west two-lane arterial between University Drive West and McMaster Boulevard West. As the lands to the west are developed, MacLeod Drive West will be extended into the Waterbridge subdivision and connect to Métis Trail West and Chinook Trail.

Sunridge Boulevard West
Sunridge Boulevard West is an east-west two-lane collector west of University Drive West. As the lands to the west are developed, Sunridge Boulevard West will be extended into the Waterbridge subdivision and will connect to Métis Trail West.

Simon Fraser Boulevard West
Simon Fraser Boulevard West is an east-west two-lane collector road that extends west of McMaster Boulevard West to the current western limits of the residential development. As the lands to the west are developed, Simon Fraser Boulevard West will be extended to the south (Collector/Road A) to provide access to Waterbridge East of the Waterbridge subdivision.

Cascade Boulevard
Cascade Boulevard is a new proposed two lane road into the Waterbridge subdivision that will tie into the existing Rocky Mountain Boulevard West and will connect to Métis Trail West.

Métis Trail West
Métis Trail West is a north-south two-lane arterial road that currently extends between Whoop Up Drive West and Temple Boulevard West. It will be extended along the existing 25 Street West alignment to the future Chinook Trail, and will bisect the Waterbridge subdivision into Waterbridge East and Waterbridge West. It will intersect with MacLeod Drive West, Cascade Boulevard, Sunridge Boulevard West, and Chinook Trail.

Chinook Trail
Chinook Trail is a future four-lane arterial road bordering the south portion of the study area that extends between University Drive West and the future Whoop Up Drive. It will intersect Métis Trail West, Road B, and MacLeod Drive West.

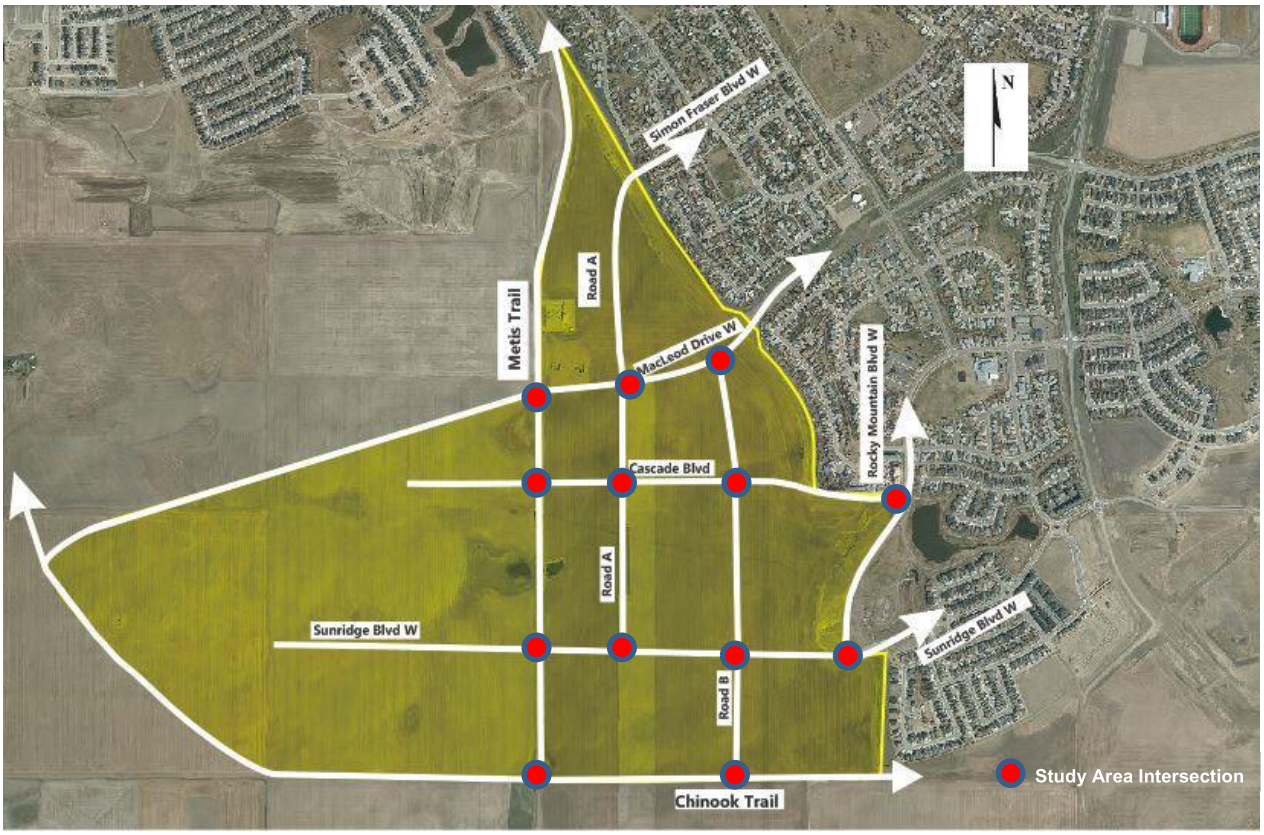

Figure 2-2: Study Area Transportation System

2.3 EXISTING TRANSIT SERVICE

Lethbridge Transit currently services the Varsity Village, Mountain Heights and Sunridge areas as shown in Figure 2-3. The following routes service the existing neighbourhoods surrounding the study area:

- Route 32 - Indian Battle Heights/Columbia Boulevard West;
- Route 35 - Copperwood; and
- Route 36 - Sunridge.

These transit routes generally operate Monday to Friday from 5:45 am to 11:45 pm, Saturdays 7:00 am to 11:45 pm, and Sunday 8:00 am to 6:45 pm.

City-wide transit routes and services is currently being reviewed by the City as part of the Transit Master Plan.

Source: http://www.lethbridge.ca/living-here/getting around/Transit/Documents/Centerfold%20System%20Map.pdf

Figure 2-3 – Existing Transit Service Near the Study Area

2.4 DEVELOPMENT SITE PLAN

The Waterbridge subdivision will contain two neighbourhoods with Waterbridge East on the east side of Métis Trail West and Waterbridge West on the west side. The site plan for the overall Waterbridge subdivision available from the ASP is provided in Appendix A.

According to the Area Structure Plan (ASP), dated February 2, 2015, the subdivision will be developed gradually from east to west over the next ten years. In keeping with this, Waterbridge East, comprising of the 140.8 hectares to the east of Métis Trail West, will be developed first. The Waterbridge Outline Plan for Waterbridge East is shown in Appendix A.

Waterbridge East is bound by the existing communities of Varsity Village, Mountain Heights and Sunridge to the east, the future Chinook Trail to the south, and Métis Trail West to the west. Waterbridge East will have a population of approximately 4,853 and will include a mix of land uses with a range of housing types, a network of pathways and open spaces, and neighbourhood activity nodes promoting social activities. It will have access from the surrounding road network including the existing Sunridge Boulevard West, Rocky Mountain Boulevard West, MacLeod Drive West and Simon Fraser Boulevard West, as well as the future Chinook Trail and Métis Trail West.

The intersections along Métis Trail West, Chinook Trail and Rocky Mountain Boulevard West are considered gateway intersections into the Waterbridge development, while the remainder of the study area intersections are referred to as internal intersections.

The study area intersections identified in Figure 2-2 include:

- Métis Trail West / MacLeod Drive West (gateway)
- MacLeod Drive West / Road A (internal)
- MacLeod Drive West / Road B (internal)
- Métis Trail West / Cascade Boulevard (gateway)
- Cascade Boulevard / Road A (internal)
- Cascade Boulevard / Road B (internal)
- Cascade Boulevard / Rocky Mountain Boulevard West (gateway)
- Métis Trail West / Sunridge Boulevard West (gateway)
- Sunridge Boulevard West / Road A (internal)
- Sunridge Boulevard West / Road B (internal)
- Rocky Mountain Boulevard West / Sunridge Boulevard West (gateway)
- Métis Trail West / Chinook Trail (gateway); and
- Chinook Trail / Road B (gateway).

2.5 FUTURE DEVELOPMENT IN THE AREA

In addition to the Waterbridge East neighbourhood, the Waterbridge subdivision will contain an Waterbridge West neighbourhood (128.5 ha) on the west side of Métis Trail West, as shown in Appendix A. The development of Waterbridge West will follow the completion of Waterbridge East.

Waterbridge West will be bound by MacLeod Drive West to the north, the future Chinook Trail to the south and west, and Métis Trail West to the east. Similar to Waterbridge East, Waterbridge West will have a population of approximately 4,400 and will include a mix of land uses with a range of housing types, a network of pathways and open spaces, and neighbourhood activity nodes promoting social activities. It will have access from the future extension of MacLeod Drive West, as well as the future Chinook Trail and Métis Trail West.

For the purpose of this study, Waterbridge West is included in the full build-out horizon analysis for the Waterbridge development.

3 Background Traffic Conditions

The 2040 AM and PM peak hour background volumes are obtained from the City's EMME model, that includes a Chinook Trail connection to the east across the Old Man River as shown in Appendix B. Background traffic, including existing and planned development traffic associated with the South Village (Copperwood), the North Village (The Crossings), Sunridge, and the Canyons developments will impact the relevant study area gateway intersections:

- Métis Trail West / MacLeod Drive West
- Métis Trail West / Cascade Boulevard
- Cascade Boulevard / Rocky Mountain Boulevard West
- Métis Trail West / Sunridge Boulevard West
- Rocky Mountain Boulevard West / Sunridge Boulevard West
- Métis Trail West / Chinook Trail
- Chinook Trail / Road B

In addition, some of the intersections internal to the Waterbridge subdivision are expected to be impacted by background traffic choosing new links through the Waterbridge development that connect to Métis Trail West. The background traffic volumes for the study area are shown in Figure 3-1.

According to previous TIAs (Waterbridge ASP TIA, 2014), the specific background developments combined with the Waterbridge subdivision traffic are assumed to account for general traffic growth in the study area and as such an additional annual growth was not applied.

Based on the City of Lethbridge Traffic Impact Study Guidelines, truck traffic on Métis Trail West and Chinook Trail is assumed to make up approximately 5% of the overall traffic stream, while truck traffic on all internal streets is assumed to make up approximately 2% of traffic on those roadways.

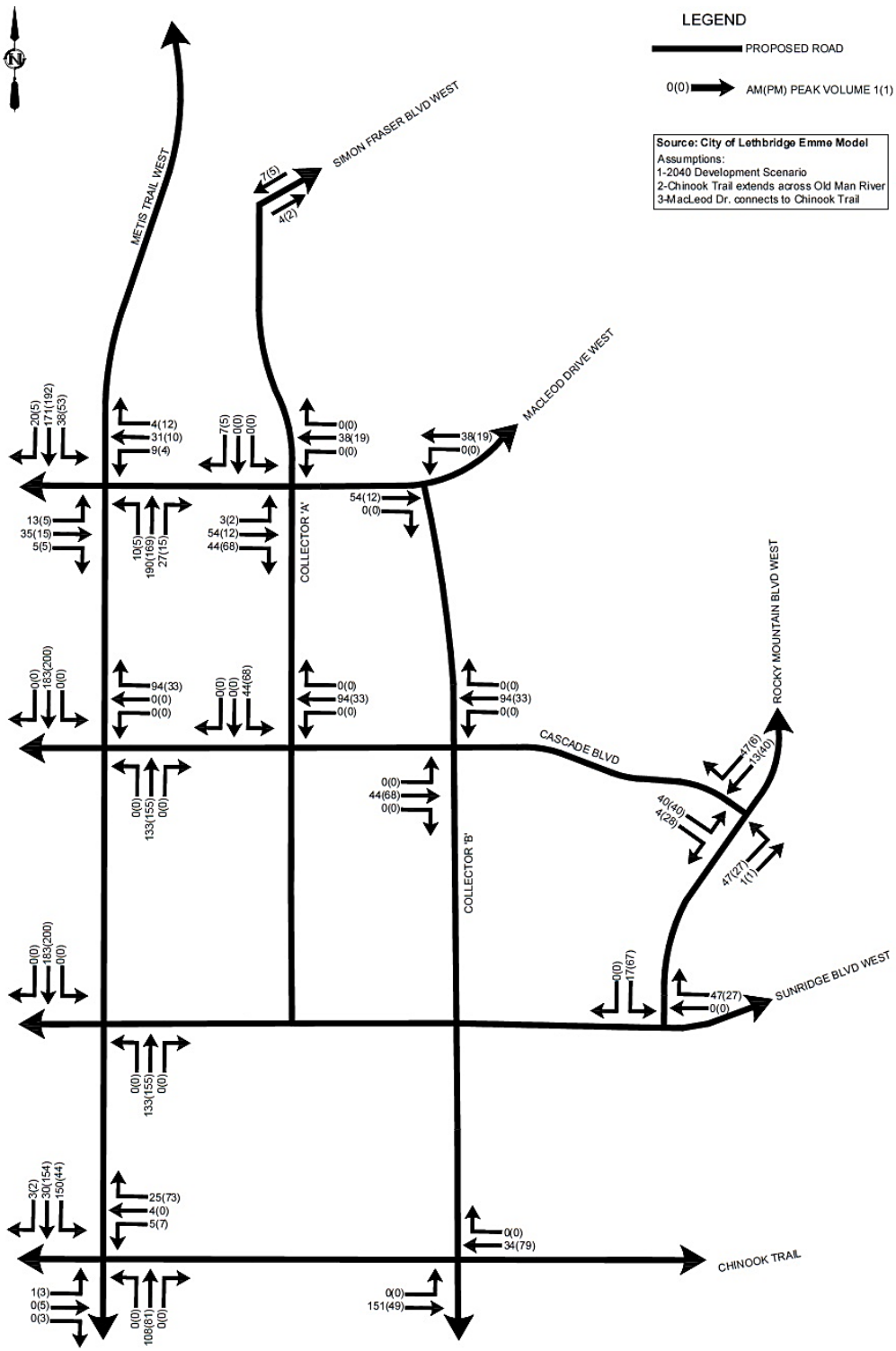

Figure 3-1 – Background Traffic

4 Development Related Trip Generation

4.1 WATERBRIDGE SUBDIVISION

The Waterbridge Outline Plan Concept for Waterbridge East includes residential, commercial, institutional and recreational land uses as shown in Appendix A. The Outline Plan Concept for Waterbridge West is not available at this time, however, based on the Waterbridge Area Structure Plan document and Traffic Impact Assessment – 2014 Update (June 2014), Waterbridge West will include similar land uses as Waterbridge East. In order to identify transportation network requirements, a single, full build-out planning horizon is assumed for the purpose of this traffic assessment that includes full development and occupancy of both Waterbridge East and Waterbridge West.

4.2 SITE TRIP GENERATION, DISTRIBUTION AND ASSIGNMENT

Trip generation rates for the site are based on the Institute of Transportation Engineers Traffic Generation Manual – 9th Edition and the City of Lethbridge Traffic Impact Study Guidelines. In keeping with the land use information described in Sections 2.4 and 2.5, Table 4-1 shows the weekday AM and PM peak-hour trips generated by the development.

Table 4-1
Waterbridge Subdivision Waterbridge East and 2 - Trip Generation

Waterbridge East Land Use	Peak Hour	Trip Generation Variable	Units	Trip Generation Rate (Trip/Unit)	Source	Entry	Exit	Peak Hour Volumes (vph)		
								In	Out	Total
Low Density Residential	AM Peak	Dwelling Units	1485	0.77	Lethbridge Trip Generation	26%	74%	297	846	1143
	PM Peak			1.02		64%	36%	969	545	1514
Medium Density Residential	AM Peak	Dwelling Units	280	0.75	Lethbridge Trip Generation	29%	71%	61	149	210
	PM Peak			0.92		61%	39%	157	100	257
Commercial-Specialty Retail Center	AM Peak	1000 sq.ft. GFA	21	6.84	ITE 9th Edition - Code 826	48%	52%	70	76	145
	PM Peak			2.71		44%	56%	25	32	58
Middle School	AM Peak	Students	900	0.54	ITE 9th Edition - Code 522	55%	45%	267	219	486
	PM Peak			0.16		49%	51%	71	73	144
Total	**AM Peak**							**695**	**1290**	**1985**
	PM Peak							**1222**	**750**	**1972**

Waterbridge West Land Use	Peak Hour	Trip Generation Variable	Scope of Development	Trip Generation Rate (Trip/Unit)	Source	Entry	Exit	Peak Hour Volumes (vph)		
								In	Out	Total
Low Density Residential	AM Peak	Dwelling Units	1218	0.77	Lethbridge Trip Generation	26%	74%	244	694	938
	PM Peak			1.02		64%	36%	795	447	1242
Medium Density Residential	AM Peak	Dwelling Units	450	0.75	Lethbridge Trip Generation	29%	71%	98	240	338
	PM Peak			0.92		61%	39%	253	161	414
Church	AM Peak	1000 sq.ft. GFA	17	0.56	ITE 9th Edition - Code 560	62%	38%	6	4	10
	PM Peak			0.55		48%	52%	5	5	10
Elementary School	AM Peak	Students	500	0.45	ITE 9th Edition - Code 520	55%	45%	124	101	225
	PM Peak			0.15		49%	51%	37	38	75
Total	**AM Peak**							**472**	**1039**	**1511**
	PM Peak							**1089**	**652**	**1741**

- Peak hour volumes are rounded to the nearest one
- GFA - Gross Floor Area
- Scope and size of residential development is obtained from "LAND USE STATISTICS" from "WATERBRIDGE AREA STRUCTURE PLAN". Scope of commercial and institutional development assumed as per Waterbridge ASP TIA (2014 TIS Update)
- The total area of commercial development was obtained from updated site plan
- The ITE Land Uses codes as per 2009 Waterbridge TIA
- The AM Peak of Commercial is the AM Peak of Generator-NO available AM Peak trip generation rate between 7-9 (2009 TIA used the same methodology)

At full build-out, Waterbridge East and Waterbridge West will generate approximately 3,496 trips during the weekday AM peak hour and 3,713 trips during the PM peak hour.

The following trip distribution assumptions were made for the purpose of this study:

- 90% of all residential traffic generated at full built-out will be external trips, while 10% will be internal trips generated and destined within Waterbridge;
- 50% of all school trips will be internal to the Waterbridge development, while 50% will come from surrounding neighbourhoods; and
- 10% of all commercial trips will be external and 90% will be internal to Waterbridge.

Table 4-2 shows the trip distribution. The trip distribution has been derived based on the following transportation network assumptions and in consideration of the proposed Waterbridge East network identified in the Waterbridge Outline Plan:

- Chinook Trail extends north of Whoop Up Drive and to crosses the Old Man River to the east.
- Métis Trail West extends north of Whoop Up Drive and south of Chinook Trail.
- MacLeod Drive West extends to the west and connects to Chinook Trail.

Table 4-2
Waterbridge Subdivision Waterbridge East and Waterbridge West - Trip Distribution

Direction to/from	Via	Waterbridge East % Trips	Waterbridge West % Trips
North	Métis Trail West	15%	15%
	Chinook Trail	5%	15%
	McMaster Dr. and University Dr.	10%	5%
	Sunridge Blvd. W and University Dr.	5%	--
	Métis Trail West / Whoop Up Dr. / University Dr.	15%	15%
East	Métis Trail West (going south) and Chinook Trail (going east)	20%	20%
	Métis Trail West and Whoop Up Dr.	25%	25%
	McMaster Dr. / University Dr. / Whoop Up Dr.	5%	5%

Interaction trips within the Waterbridge subdivision are assumed to take place between Waterbridge East and Waterbridge West across Métis Trail West in accordance with the approach used in both of the previous Waterbridge ASP TIA (2009 and 2014 Update). These interactions are shown below:

- 2% of church trips will cross Métis Trail West, between Waterbridge East and Waterbridge West;
- 20% of school trips will cross Métis Trail West, between Waterbridge East and Waterbridge West; and
- 10% of commercial trips will cross Métis Trail West, between Waterbridge East and Waterbridge West.

A detailed trip assignment was completed using Vistro software. Vistro trip assignment is based on allocating the share (percent) of trips to take specific paths between each origin and destination (or each land use). Trips were assigned to the road network by considering access locations for Waterbridge East and Waterbridge West, along Métis Trail West, Chinook Trail, Simon Fraser Boulevard West, MacLeod Drive West, Cascade Boulevard, Rocky Mountain Boulevard West, Sunridge Boulevard West, Road 1, and Road 2, relative to the proportion of development. There are a total of 15 intersections in the network, with each intersection representing an access point into the road network. Trips were assigned to the network based on the shortest path between origin and destination. Detailed trip assignment data is available electronically through Vistro files generated for this study.

Based on the trip generation, distribution and assignment described in this section, Figures 4-1 and 4-2 show the weekday AM and PM peak hour development volumes associated with the Waterbridge subdivision.

4.3 POST-DEVELOPMENT VOLUMES

The volumes provided in Section 4.2 were added to the background volumes provided in Section 3 of this report to derive the post-development traffic volumes for the study area. Figures 4-3 and 4-4 show the total post-development weekday AM and PM peak hour volumes for the full build-out planning horizon.

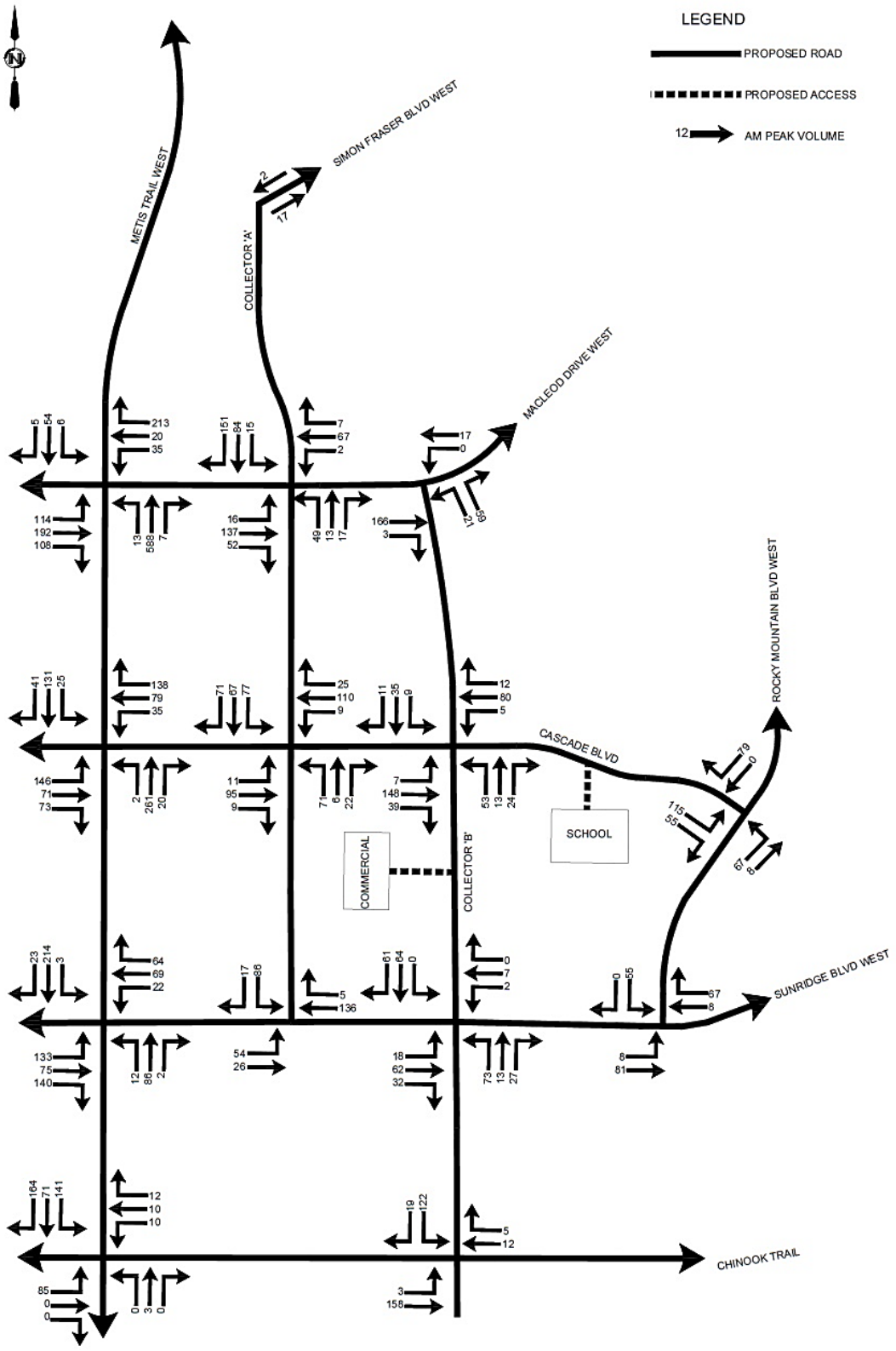

Figure 4-1 – AM Peak Hour Waterbridge Development Volumes

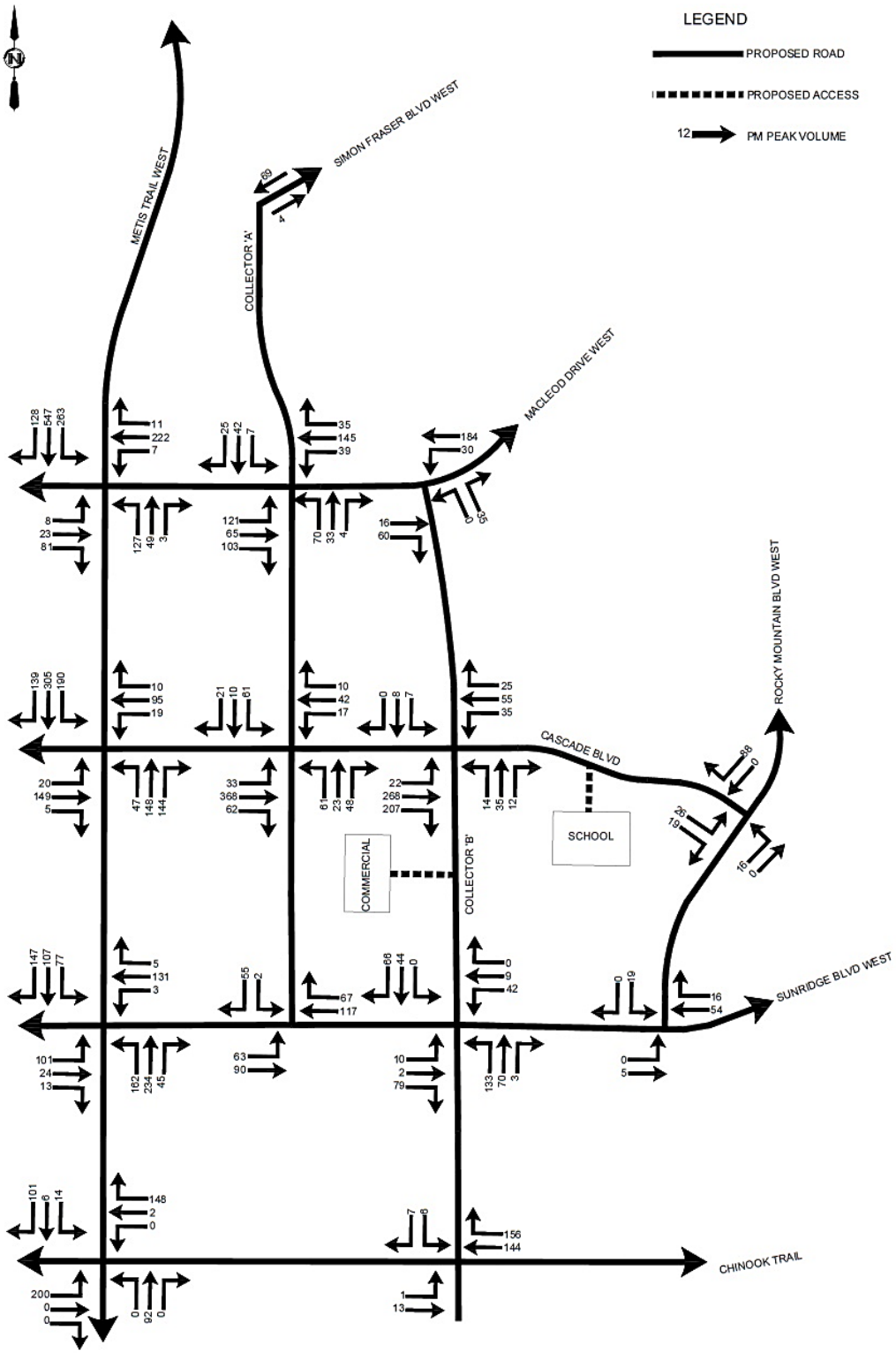

Figure 4-2 – PM Peak Hour Waterbridge Development Volumes

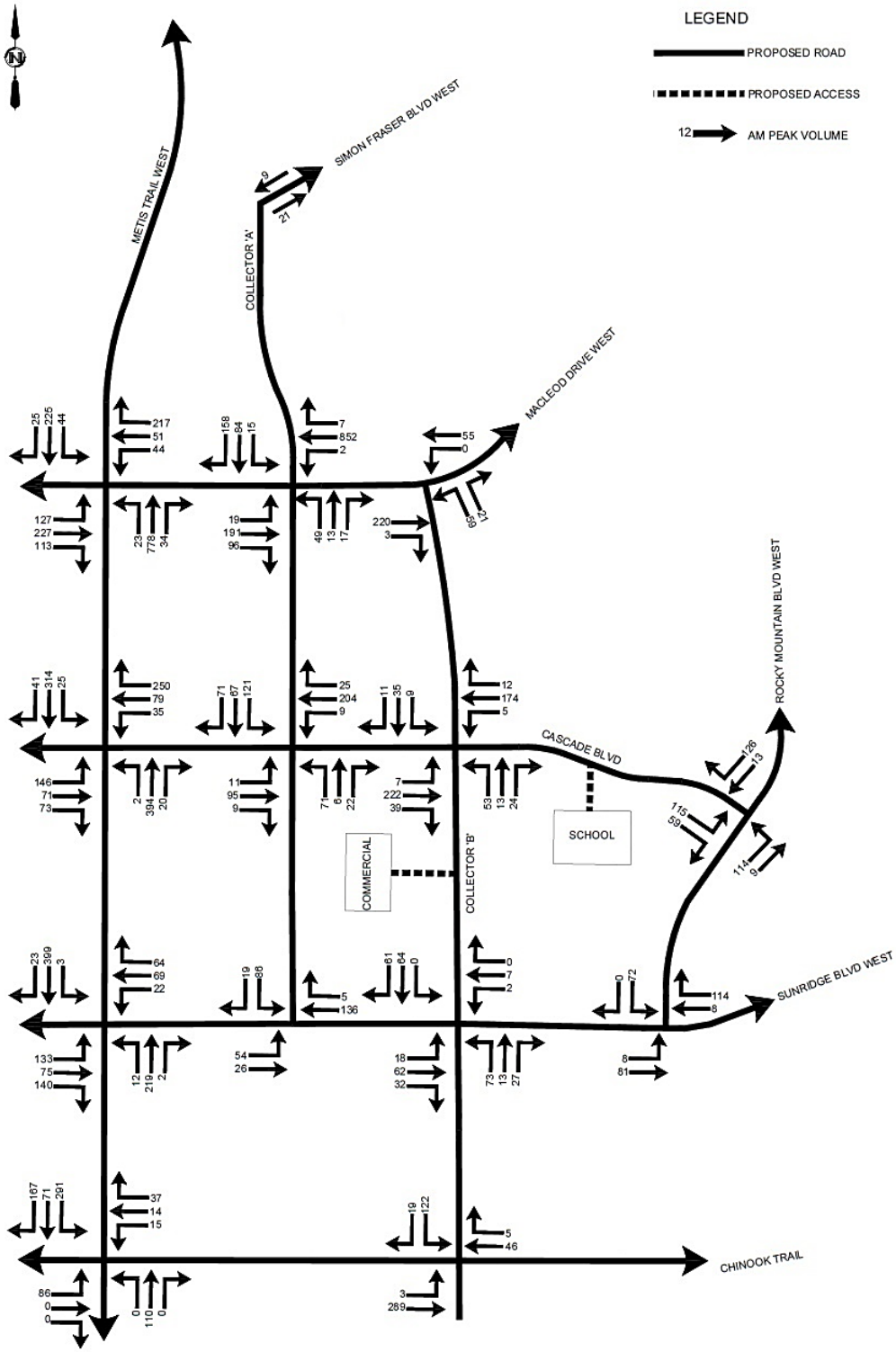

Figure 4-3 – AM Peak Hour Post-Development Volumes

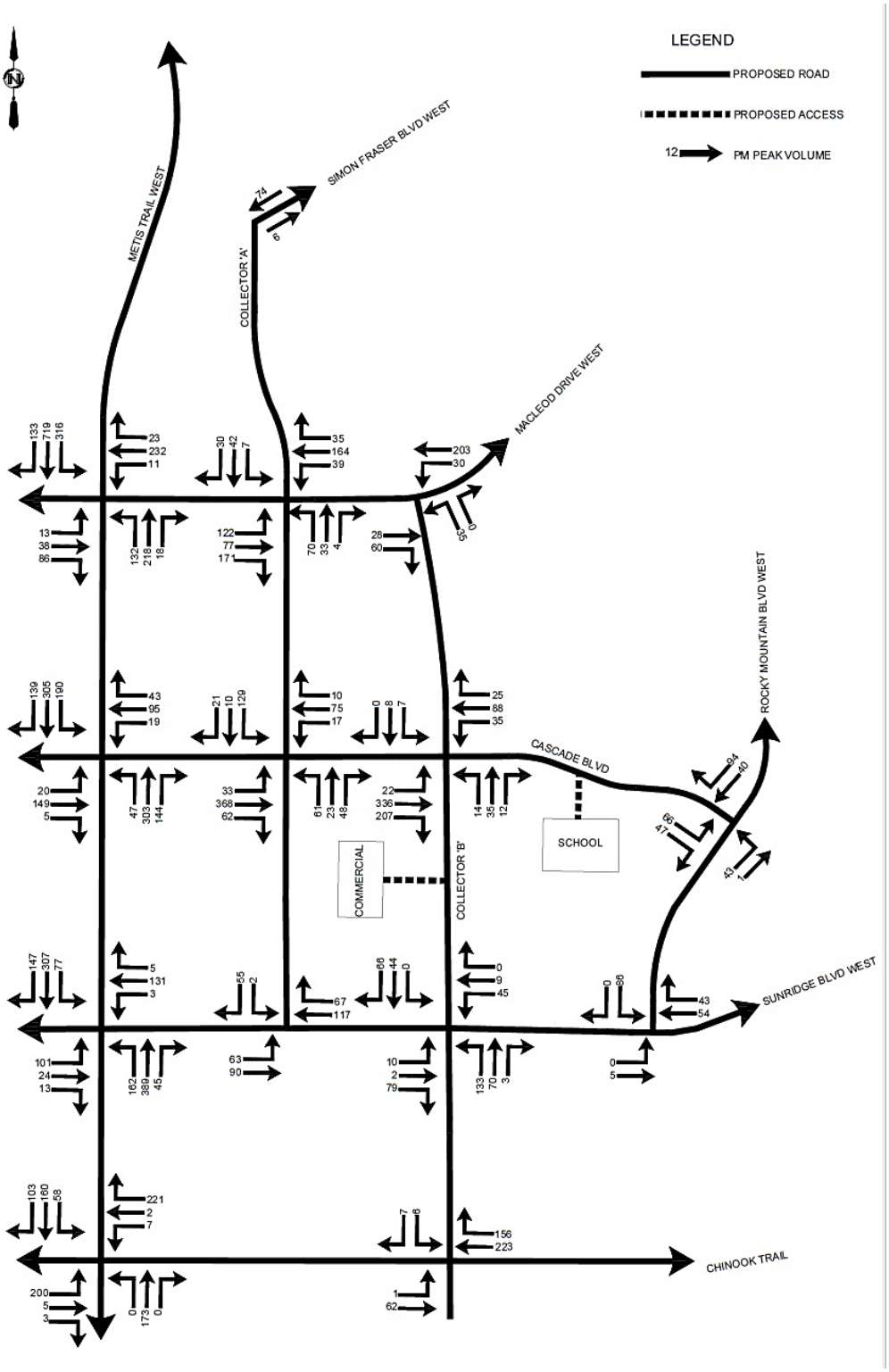

Figure 4-4 – PM Peak Hour Post-Development Volumes

5 Traffic Analysis

5.1 ANALYSIS BACKGROUND

5.1.1 Vehicle Delay Based Intersection Analysis

The relative performance of an intersection depends on a number of different factors including:

- **Degree of Saturation** – measured in terms of a ratio of demand flow rate (v) to maximum capacity (c); intersections with v/c ratios = 1.0 are at capacity;
- **Level of Service** – a measure of the average delay per vehicle during a 15-minute analysis period. Levels of service (LOS) range from A (minimal delay) to F (unacceptable delay); and
- **Vehicle Delay** – average vehicle delay on an intersection or movement basis. Measured in sec/veh.

For design and planning purposes, the City of Lethbridge TIA Design Standards state that a minimum intersection level of service (LOS) "D" is determined acceptable and is typically used under AM and PM peak hour traffic conditions.

Table 5-1 summarizes the various LOS for un-signalized (stop-controlled) intersections and roundabouts. Table 5-2 summarizes the LOS for signalized intersections

Table 5-1
Un-signalized Intersections
Level of Service Characteristics

HCM Level of Service	Average Total Delay (seconds / vehicle)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Table 5-2
Signalized Intersections - Level of Service Characteristics

Level of Service	Average Signal Delay (seconds / vehicle)	Characteristics
A	≤ 10	Good progression and/or short cycle lengths, and few vehicle stops.
B	> 10 and ≤ 20	Good progression and/or short cycle lengths; more vehicle stops.
C	> 20 and ≤ 35	Fair progression and/or longer cycle lengths, some cycle failures; significant portion of vehicles must stop.
D	> 35 and ≤ 55	Congestion becomes noticeable; high volume-to-capacity ratio, longer delays, noticeable cycle failures.
E	> 55 and ≤ 80	At or beyond limit of acceptable delay; poor progression, long cycles, high volumes, long queues.
F	> 80	Arrival volumes greater than discharge capacity; long cycle lengths, unstable-unpredictable flows.

5.2 TRAFFIC ANALYSIS METHODOLOGY

5.2.1 Basis for Traffic Analysis

Intersection performance was modeled using the Synchro 9 software for signalised and stop-controlled intersections. In addition, traffic control and geometric adjustments were made during the analysis in accordance with the traffic control hierarchy identified in the City of Lethbridge Traffic Impact Study Guidelines in order to achieve acceptable intersection performance. Roundabout analysis was conducted using SIDRA software.

In accordance with the City of Lethbridge standards, for design and planning purposes a v/c ratio of 0.80 should not be exceeded for overall intersection, through and shared through/turning vehicle movement at a signalized intersection or roundabout.

5.2.2 Traffic Analysis Assumptions

As part of the traffic capacity analysis, the following assumptions were made with respect to specific analysis criteria and based on the City of Lethbridge Traffic Analysis Parameters, including:

- The 85th percentile speeds on all roadways in the study area were assumed to be equal to the posted speed. Posted speed is assumed to be 60km/hr. for arterials and 50 km/hr. for other roads;
- Commercial truck volumes along Métis Trail West and Chinook Trail are assumed to make up 5% of the overall traffic stream, while on the remainder of the streets, trucks are assumed to make up 2% of the overall traffic;
- Ideal saturated flow = 1,750 vehicles per hour per lane; and

- Pedestrian crossing of ten per hour per leg of intersection.

5.3 INTERSECTION PERFORMANCE

Roadway and intersection geometry, traffic control and post-development traffic volumes, based on traffic projections developed in Section 4, were modeled in Synchro 9 for signalized and stop controlled intersections, and in SIDRA for roundabouts, to assess traffic conditions under the full build-out scenario. This analysis includes background traffic as well as Waterbridge East and Waterbridge West Waterbridge development traffic.

Tables 5-3 and 5-4 summarize the post-development performance at the internal and gateway intersections in the study area. All relevant Synchro and SIDRA outputs are provided in Appendix C.

Based on this traffic analysis, the stop controlled intersections internal to the development, as well as the internal roundabouts at Cascade Boulevard / Road A and Cascade Boulevard / Road B, operate at an acceptable LOS in under the post-development scenario. Stop control was found to be ineffective for the intersections along Métis Trail West including at MacLeod Drive West, Cascade Boulevard, and Sunridge Boulevard West.

Based on a preliminary signal warrant analysis provided in Appendix D, the intersection of Métis Trail West / MacLeod Drive West warrants a signal under the post-development scenario. Alternatively, a multi-lane roundabout would also provide acceptable operations at this intersection. However, consideration should be given to the property requirements of the roundabout option at this location.

Single lane roundabouts also operate acceptably at the intersections of Métis Trail West / Cascade Boulevard and Métis Trail West / Sunridge Boulevard West under the same planning horizon. A two lane roundabout operates acceptably at Métis Trail West and Chinook Trail.

Table 5-3
Post-Development Internal Intersection Performance

Full Build Out Peak Hour Level of Service and V/C																	
Internal Intersection	Overall Intersection	Peak Time	Performance	West Approach			East Approach			South Approach			North Approach		
				Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
MacLeod Drive West / Road A (2-Way Stop)	LOS=A Delay=7.7	AM	LOS	A	A	A	A	A	A	C	C	C	B	B	B
			V/C	0.02	0.02	0.02	0.00	0.00	0.00	0.29	0.29	0.29	0.44	0.44	0.44
			95th queue(m)	0.30	0.30	0.30	0.00	0.00	0.00	8.90	8.90	8.90	17.10	17.10	17.10
	LOS=A Delay=9.2	PM	LOS	A	A	A	A	A	A	D	D	D	C	C	C
			V/C	0.14	0.14	0.14	0.03	0.03	0.03	0.48	0.48	0.48	0.23	0.23	0.23
			95th queue(m)	2.70	2.70	2.70	0.70	0.70	0.70	17.20	17.20	17.20	6.50	6.50	6.50
MacLeod Drive West / Road B (1-Way Stop)	LOS=A Delay=2.4	AM	LOS		A	A	A	A		B		B			
			V/C		0.15	0.15	0.00	0.00		0.12		0.12			
			95th queue(m)		0.00	0.00	0.10	0.10		3.20		3.20			
	LOS=A Delay=2.0	PM	LOS		A	A	A	A		B		B			
			V/C		0.06	0.06	0.02	0.02		0.07		0.07			
			95th queue(m)		0.00	0.00	0.50	0.50		1.80		1.80			
Cascade Boulevard / Road A (Roundabout)	LOS=A Delay=5.4	AM	LOS	A	A	A	A	A	A	A	A	A	A	A	A
			V/C	0.12	0.12	0.12	0.21	0.21	0.21	0.10	0.10	0.10	0.28	0.28	0.28
			95th queue(m)	4.60	4.60	4.60	8.70	8.70	8.70	4.00	4.00	4.00	11.90	11.90	11.90
	LOS=A Delay=5.5	PM	LOS	A	A	A	A	A	A	A	A	A	A	A	A
			V/C	0.43	0.43	0.43	0.10	0.10	0.10	0.19	0.19	0.19	0.16	0.16	0.16
			95th queue(m)	21.60	21.60	21.60	3.70	3.70	3.70	8.30	8.30	8.30	5.90	5.90	5.90
Cascade Boulevard / Road B (Roundabout)	LOS=A Delay=3.9	AM	LOS	A	A	A	A	A	A	A	A	A	A	A	A
			V/C	0.22	0.22	0.22	0.16	0.16	0.16	0.10	0.10	0.10	0.06	0.06	0.06
			95th queue(m)	9.20	9.20	9.20	6.60	6.60	6.60	3.60	3.60	3.60	2.00	2.00	2.00
	LOS=A Delay=3.8	PM	LOS	A	A	A	A	A	A	A	A	A	A	A	A
			V/C	0.44	0.44	0.44	0.14	0.14	0.14	0.07	0.07	0.07	0.02	0.02	0.02
			95th queue(m)	22.70	22.70	22.70	5.30	5.30	5.30	5.00	5.00	5.00	0.90	0.90	0.90
Sunridge Boulevard West / Road A (1-Way Stop)	LOS=A Delay=5.1	AM	LOS	A	A			A	A				B		B
			V/C	0.04	0.04			0.09	0.09				0.18		0.18
			95th queue(m)	1.00	1.00			0.00	0.00				5.00		5.00
	LOS=A Delay=2.8	PM	LOS	A	A			A	A				A		A
			V/C	0.05	0.05			0.12	0.12				0.08		0.08
			95th queue(m)	1.30	1.30			0.00	0.00				2.00		2.00
Sunridge Boulevard West / Road B (2-Way Stop)	LOS=A Delay=7.8	AM	LOS	A	A	A	A	A	A	B	B	B	B	B	B
			V/C	0.01	0.01	0.01	0.00	0.00	0.00	0.20	0.20	0.20	0.18	0.18	0.18
			95th queue(m)	0.30	0.30	0.30	0.00	0.00	0.00	5.70	5.70	5.70	5.00	5.00	5.00
	LOS=B Delay=10.3	PM	LOS	A	A	A	A	A	A	C	C	C	B	B	B
			V/C	0.01	0.01	0.01	0.03	0.03	0.03	0.41	0.41	0.41	0.16	0.16	0.16
			95th queue(m)	0.20	0.20	0.20	0.80	0.80	0.80	15.20	15.20	15.20	4.50	4.50	4.50

Notes:
Proposed intersection configuration and traffic control

Table 5-4
Post-Development Gateway Intersection Performance

Full Build Out Peak Hour Level of Service and V/C																
Gateway Intersection	Overall Intersection	Peak Time	Performance	West Approach			East Approach			South Approach			North Approach			
				Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Metis Trail West / MacLeod Drive West (Signal)*	LOS=C Delay=20.4	AM	LOS	C	C	C	B	B	B	C	C	C	C	B	A	
			V/C	0.82	0.82	0.82	0.53	0.53	0.53	0.79	0.79	0.79	0.42	0.38	0.05	
			95th queue(m)	92.70	92.70	92.70	40.60	40.60	40.60	64.30	64.30	64.30	13.00	33.70	3.70	
	LOS=B Delay=15.9	PM	LOS	B	B	B	D	D	D	A	A	A	B	B	A	
			V/C	0.35	0.35	0.35	0.71	0.71	0.71	0.36	0.36	0.36	0.64	0.77	0.16	
			95th queue(m)	20.80	20.80	20.80	68.50	68.50	68.50	19.80	19.80	19.80	54.80	120.60	7.20	
Metis Trail West / MacLeod Drive West (Roundabout)*	LOS=A Delay=6.9	AM	LOS	A	A	A	B	B	B	A	A	A	A	A	A	
			V/C	0.24	0.24	0.24	0.25	0.25	0.42	0.48	0.48	0.48	0.13	0.13	0.13	
			95th queue(m)	10.20	10.60	10.60	12.50	12.50	25.40	25.90	26.60	26.60	5.70	5.90	5.90	
	LOS=A Delay=8.7	PM	LOS	B	B	B	A	A	A	A	A	A	B	A	A	
			V/C	0.18	0.22	0.22	0.15	0.15	0.15	0.21	0.21	0.21	0.66	0.66	0.66	
			95th queue(m)	9.40	9.40	13.50	6.50	6.70	6.70	9.50	10.30	10.30	50.20	52.00	52.00	
Metis Trail West / Cascade Boulevard (Roundabout)	LOS=A Delay=6.5	AM	LOS	A	A	A	B	B	B	A	A	A	A	A	A	
			V/C	0.36	0.36	0.36	0.54	0.54	0.54	0.45	0.45	0.45	0.28	0.28	0.05	
			95th queue(m)	16.80	16.80	16.80	34.20	34.20	34.20	25.30	25.30	25.30	14.70	14.70	2.00	
	LOS=A Delay=6.5	PM	LOS	A	A	A	A	A	A	A	A	A	A	A	A	
			V/C	0.25	0.25	0.25	0.20	0.20	0.20	0.59	0.59	0.59	0.42	0.42	0.18	
			95th queue(m)	11.40	11.40	11.40	9.20	9.20	9.20	40.50	40.50	40.50	22.20	22.20	6.80	
Cascade Boulevard/Rocky Mountain Boulevard West (1-Way Stop)	LOS=A Delay=8.3	AM	LOS	B		B				A	A			A	A	
			V/C	0.39		0.39				0.09	0.09			0.09	0.09	
			95th queue(m)	13.90		13.90				2.30	2.30			0.00	0.00	
	LOS=A Delay=5.2	PM	LOS	B		B				A	A			A	A	
			V/C	0.16		0.16				0.03	0.03			0.09	0.09	
			95th queue(m)	4.30		4.30				0.80	0.80			0.00	0.00	
Metis Trail West / Sunridge Boulevard West (Roundabout)	LOS=A Delay=5.3	AM	LOS	A	A	A	A	A	A	A	A	A	A	A	A	
			V/C	0.43	0.43	0.43	0.18	0.18	0.18	0.25	0.25	0.25	0.37	0.37	0.37	
			95th queue(m)	20.70	20.70	20.70	7.30	7.30	7.30	12.00	12.00	12.00	19.30	19.30	19.30	
	LOS=A Delay=6.7	PM	LOS	A	A	A	A	A	A	A	A	A	A	A	A	
			V/C	0.17	0.17	0.17	0.23	0.23	0.23	0.59	0.59	0.59	0.58	0.58	0.58	
			95th queue(m)	7.60	7.60	7.60	10.90	10.90	10.90	37.90	37.90	37.90	36.40	36.40	36.40	
Rocky Mountain Boulevard West / Sunridge Boulevard West (1-Way Stop)	LOS=A Delay=3.0	AM	LOS	A	A			A	A				B		B	
			V/C	0.01	0.01			0.08	0.08				0.11		0.11	
			95th queue(m)	0.10	0.10			0.00	0.00				2.90		2.90	
	LOS=A Delay=4.7	PM	LOS	A	A			A	A				A		A	
			V/C	0.00	0.00			0.06	0.06				0.12		0.12	
			95th queue(m)	0.10	0.10			0.00	0.00				3.10		3.10	
Metis Trail West / Chinook Trail (Roundabout)	LOS=A Delay=5.8	AM	LOS	A	A	A	A	A	A	A	A	A	A	A	A	
			V/C	0.09	0.09	0.09	0.03	0.03	0.03	0.07	0.07	0.07	0.21	0.21	0.21	
			95th queue(m)	3.30	3.30	3.30	1.20	1.20	1.20	2.60	2.60	2.60	9.00	9.00	9.00	
	LOS=A Delay=5.7	PM	LOS	A	A	A	B	B	A	A	A	A	A	A	A	
			V/C	0.23	0.23	0.23	0.29	0.29	0.29	0.11	0.11	0.11	0.14	0.14	0.14	
			95th queue(m)	8.90	8.90	8.90	1.70	1.70	1.70	4.30	4.30	4.30	5.40	5.40	5.40	
Chinook Trail / Road B (1-Way Stop)	LOS=A Delay=3.8	AM	LOS	A	A			A	A				B		B	
			V/C	0.00	0.00			0.03	0.03				0.26		0.26	
			95th queue(m)	0.10	0.10			0.00	0.00				7.80		7.80	
	LOS=A Delay=0.3	PM	LOS	A	A			A	A				B		B	
			V/C	0.00	0.00			0.25	0.25				0.02		0.02	
			95th queue(m)	0.00	0.00			0.00	0.00				0.60		0.60	

*Signal and roundabout options analyzed for the Métis Trail West/MacLeod Drive West intersection
Notes:
Proposed intersection configuration and traffic control
Optimized signal cycle length (max. 120s) and splits

5.4 INTERSECTION CONFIGURATION

Based on the foregoing traffic analysis, Figure 5-1 summarizes the intersection configuration and traffic control required to accommodate traffic under the post-development scenario.

While safety and traffic operations generally guide intersection control requirements, adjacent land uses, as well as traffic control pre-determined by the City of Lethbridge, were also taken into consideration in the development of the traffic control for the Waterbridge subdivision intersections, shown in Figure 5-1. In keeping with this, the Cascade Boulevard and Road B intersection is shown as a single lane roundabout.

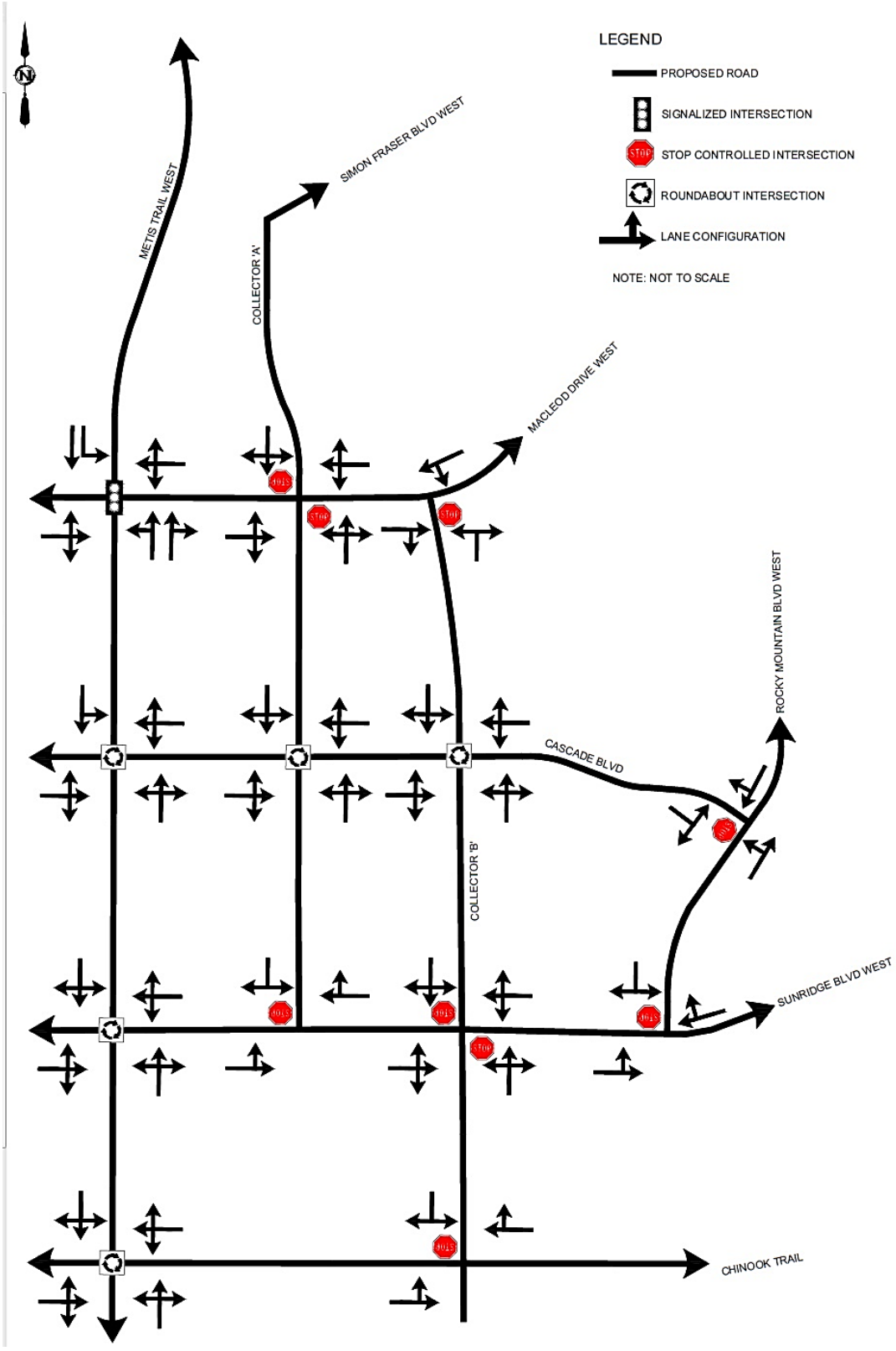

Figure 5-1 – Intersection Configuration and Traffic Control

6 Road Classification

The road classification for the study area is based on the City of Lethbridge Design Standards – Section 6: Transportation (2016). Table 6-1 shows the post-development volumes and daily traffic volume criteria generally guiding the road classification in the City.

Table 6-1
Road Classification

Road Classification	Daily Traffic Volume (veh/day)
Arterial	over 15,000
Super Collector	2,000 to 15,000
Community Entrance Road	2,000 to 8,000
Major Collector	2,000 to 8,000
Minor Collector	up to 4,000
Local	< 2,000

Source: City of Lethbridge Design Standards (2016)

Daily traffic volumes for the study area road network were derived from the PM peak hour post-development volumes. For the purpose of this planning assignment it was assumed that the daily volumes correspond to approximately ten times the PM peak hour link volumes.

While daily traffic volume generally guides the classification of roadways, adjacent land uses, and existing and future roadway classifications pre-determined by the City of Lethbridge were also taken into consideration in the development of the roadway classification for the Waterbridge subdivision roads. These are shown in Figure 6-1. In keeping with this Métis Trail West and Chinook Trail are both shown as arterial roads, while Cascade Boulevard, Rocky Mountain Boulevard West, Sunridge Boulevard West between Road A and Road B, and Road B are shown as major collector roads.

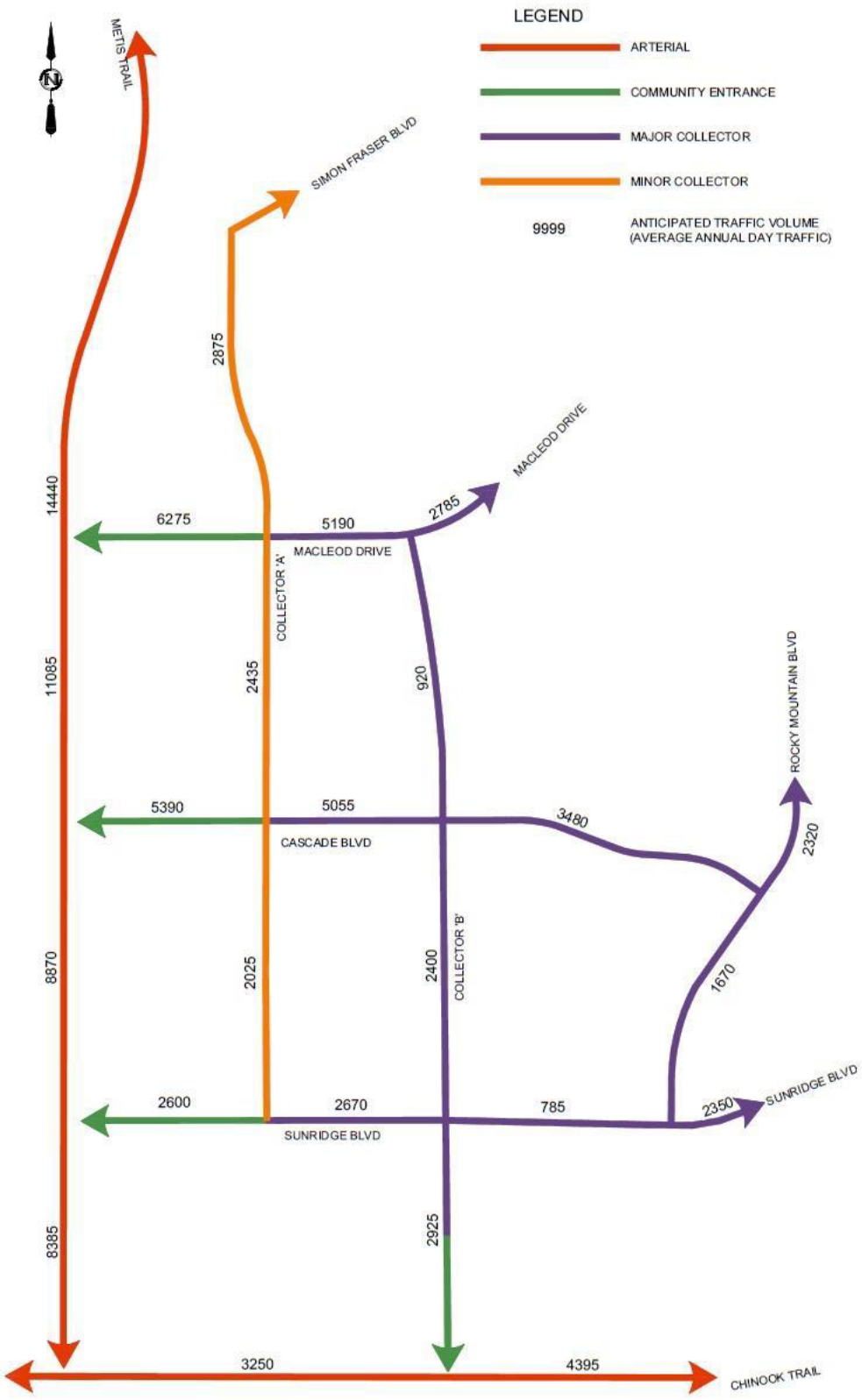

Figure 6-1 – Future Road Classification

7 Pedestrians and Bicycles

The pedestrian and cycling network in the study area (as shown in the current ASP) currently consists of paved multi-use pathways and unpaved trails in the adjacent Sunridge, Copperwood and Varsity Village neighbourhoods.

It is expected that the proposed residential development and the interaction between both the internal and surrounding residential, along with open space and school land uses, will generate pedestrian and cyclist trips. The City has advised that new bikeways may be considered along Métis Trail West and MacLeod Trail West.

The provision of new cyclist and pedestrian links within the Waterbridge subdivision, and connections to the existing pedestrian and cycling network, is recommended to ensure a continuous network of sidewalks, multi-use paths and trails for non-motorized road users. In addition, the strategic provision of new links and connections will facilitate pedestrian access to transit.

8 Transit Service

The proposed Waterbridge subdivision will make this part of west Lethbridge one of the more significant trip generators in the City. Lethbridge Transit currently services the Varsity Village, Mountain Heights and Sunridge areas, and plans to expand transit service to the Waterbridge area.

Lethbridge Transit's service standards will guide the extension of transit services through the Waterbridge development, as well as linkages to other west Lethbridge routes. Based on the Waterbridge Outline Plan for Waterbridge East, shown in Appendix A, Lethbridge Transit has indicated that potential transit routes may enter or exit on McLeod Drive West and pass through the nodes on Cascade Boulevard and Sunridge Boulevard West.

Future transit routes within the Waterbridge area will consider the Lethbridge Transit service standards including:

- Stops conveniently located within a 400 m walking distance;
- Service along arterial and collectors (not on locals);
- Service on the doorstep of community nodes and higher density residential areas.

These standards are currently being reviewed as part of the Transit Master Plan. Pedestrian facilities should be designed in accordance with City standards to facilitate pedestrian access to transit.

9 Findings and Recommendations

Based on the foregoing discussion and analysis, the following summarizes the report findings and recommendations.

- The proposed Waterbridge subdivision is located on 263 hectares in west Lethbridge, AB
- The subdivisions will contain two neighbourhoods, with a 140.8 ha Waterbridge East on the east side of Métis Trail West and the remaining 128.5 ha Waterbridge West on the west side.
- The total population will be approximately 9,253 and will include a mix of land uses, with a range of housing types, a network of pathways and open spaces, and neighbourhood activity nodes promoting social activities.
- The subdivision will be developed gradually from east to west over the next ten years.
- The subdivision will have access from the surrounding road network including the existing Rocky Mountain Boulevard West, Sunridge Boulevard West, MacLeod Drive West and Simon Fraser Boulevard West, as well as the future Chinook Trail and Métis Trail West.
- At full build-out the Waterbridge East and Waterbridge West will generate approximately 3,496 trips during the weekday AM peak hour and 3,713 trips during the PM peak hour.
- At full build-out all intersections will operate with an LOS C or higher with many operating at LOS A.
- The following conditions are expected during peak periods under the post-development scenario:
    - Stop-controlled intersections internal to the development, as well as the Chinook Trail / Road B interactions, operate at an acceptable LOS.
    - Single lane roundabouts proposed in accordance with City of Lethbridge requirements at the intersections of Cascade Boulevard and Road B and at Cascade Boulevard and Road A operate acceptably.
    - Stop-control operation is expected to be ineffective for the intersections along Métis Trail West including at MacLeod Drive West, Cascade Boulevard, Sunridge Boulevard West, and Chinook Trail.
    - A signal is warranted at the intersection of Métis Trail West / MacLeod Drive West. Alternatively, a multi-lane roundabout would also provide acceptable operations at Métis Trail West and MacLeod Drive West. However, consideration needs to be given to the property requirements of the roundabout option at this location.
    - Single lane roundabouts operate acceptably at the intersections of Métis Trail West / Cascade Boulevard and Métis Trail West / Sunridge Boulevard West.
    - A multi-lane roundabout will operate acceptably at the intersection of Métis Trail West / Chinook Trail.
- The provision of new pedestrian and cycling links within the Waterbridge subdivision, as well as connections to the existing network, is recommended to ensure a continuous network of sidewalks, multi-use paths and trails for non-motorized road users.
- Transit service expansion as well as linkages to other west Lethbridge routes to the area will be guided by Lethbridge Transit's service standards. Lethbridge Transit has indicated that potential transit routes may enter or exit on McLeod Drive West and pass through the nodes on Cascade Boulevard and Sunridge Boulevard West.

Closure

This report was prepared for the City of Lethbridge to assess the traffic impact of the Waterbridge Subdivision.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,

Associated Engineering Alberta Ltd.

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2017-07-18
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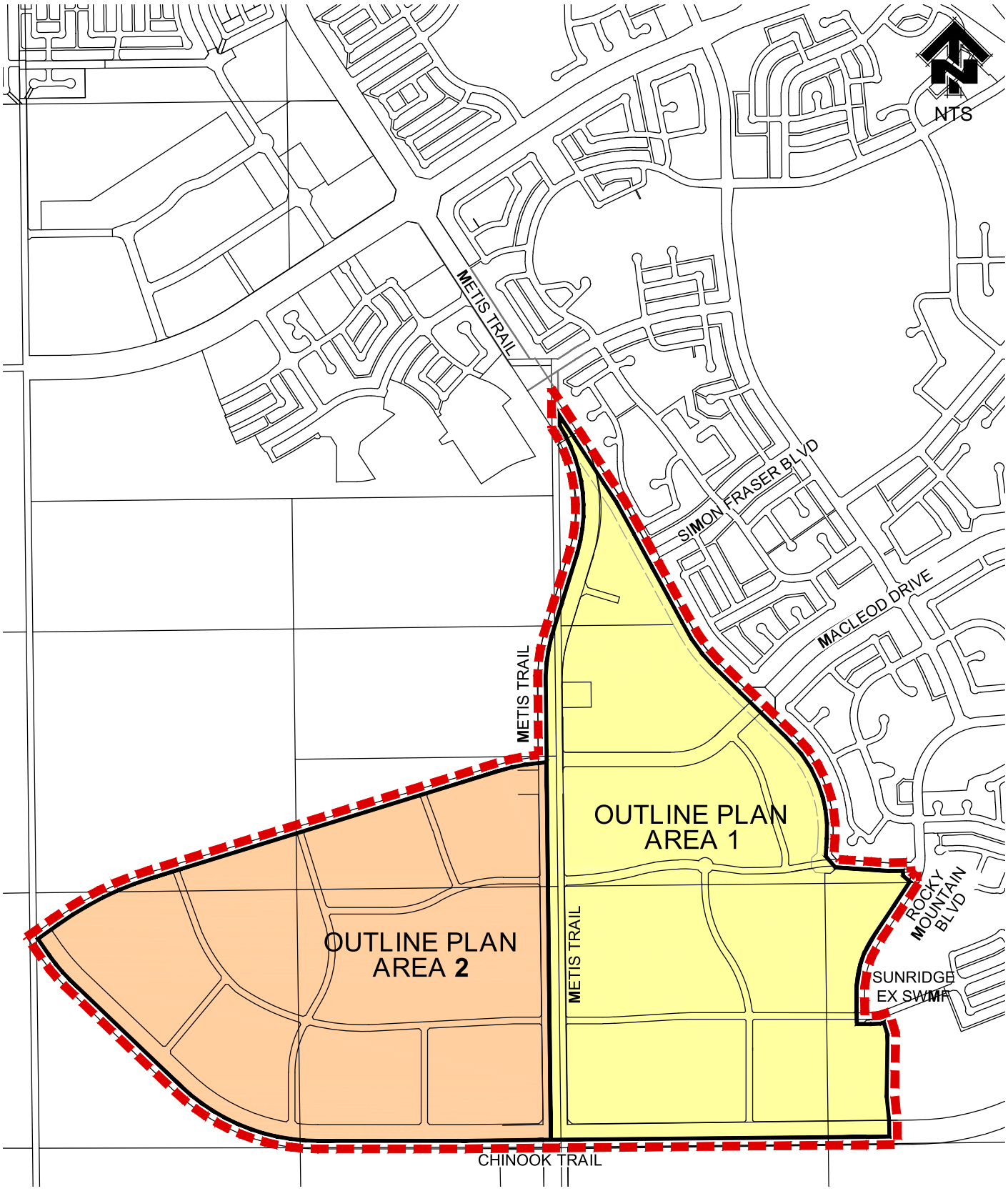
Manager, Transportation

TJ/DS/mh

Appendix A - Site Plans



Legend

Area Structure Plan Boundary

Figure 16
Future Outline Plan Areas

Land Use Statistics

Waterbridge Area Structure Plan

	Metric	Outline Plan Area 1 (ha)	Outline Plan Area 2 (ha)	Total (ha)	% of Gross Area
GROSS AREA		**134.5**	**128.5**	**263.0**	**100.0%**
Arterial Roadways[1]		19.5	18.5	38.0	14.4%
Gas Collection Pipeline R/W		0	0.5	0.5	0.2%
					% of Gross Developable Area
GROSS DEVELOPABLE AREA		**115.0**	**109.5**	**224.5**	**100.0%**
Public Land Use					
Open Space - Parks and School					
Schools	1 Elementary in West Community and 1 Middle School in East Community	5.5	4.0	9.5	4.2%
Parks		8.0	9.0	17.0	7.6%
Open Space - Sub-Total[2]		13.5	13.0	26.5	11.8%
Circulation (23% GDA)		26.5	25.0	51.5	23.0%
Stormwater Management Facilities		8.0	6.5	14.5	6.5%
Public Service Swing Sites[3]		3.0	0.0	3.0	1.3%
Public Land Use Total Area		**51.0**	**44.5**	**95.5**	**42.5%**
NET DEVELOPABLE AREA		64.0	65.0	129.0	57.5%
Neighbourhood Commercial/Institutional		1.0	1.0	2.0	0.9%
Low Density Residential		56.0	58.0	114.0	50.8%
Medium/High Density Residential		7.0	6.0	13.0	5.8%
NET DEVELOPABLE AREA TOTAL		***64.0***	***65.0***	***129.0***	***57.5%***

Residential Population and Unit Projections	**Units per ha**	**Persons per Unit**	**Number of Units**	**Population**	**Number of Units**	**Population**	**Number of Units**	**Population**
Low Density Residential	21	2.9	1176	3410	1218	3532	2394	6943
Medium/High Density Residential	75	1.9	525	998	450	855	975	1853
Total Residential			***1701***	***4408***	***1668***	***4387***	***3369***	***8795***

[1]Assumes average right-of-way width of 75 metres and that both communities contain the Arterial Roadways of Chinook Tr. and Metis Tr. This figure is approximate and subject to change.

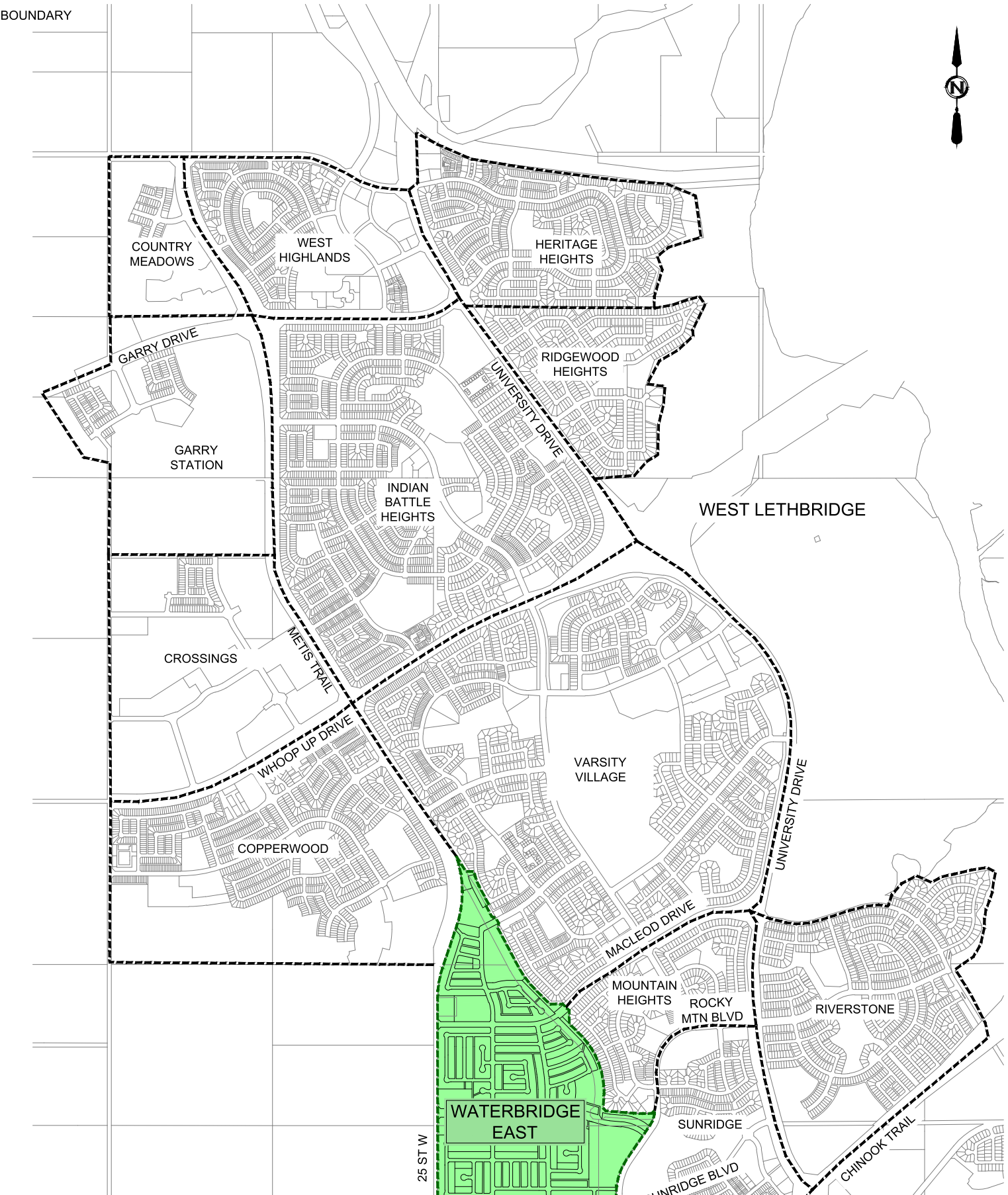
[2]Open space is based upon a 10% dedication of GROSS AREA (i.e. with arterial roadways and pipeline right-of-ways included) for Municipal and School Reserve land.

[3]Two potential Public Service Swing Sites are shown in the ASP, however only one site will be selected at the Outline Plan stage. The intended use of this swing site is for a Fire and Emergenergency Services Facility and a recycling depot.

Notes to Reader:

* Figures are approximate, are rounded to the nearest 0.5 hectare and are subject to change at the Outline Plan stage.

Source: Waterbridge ASP



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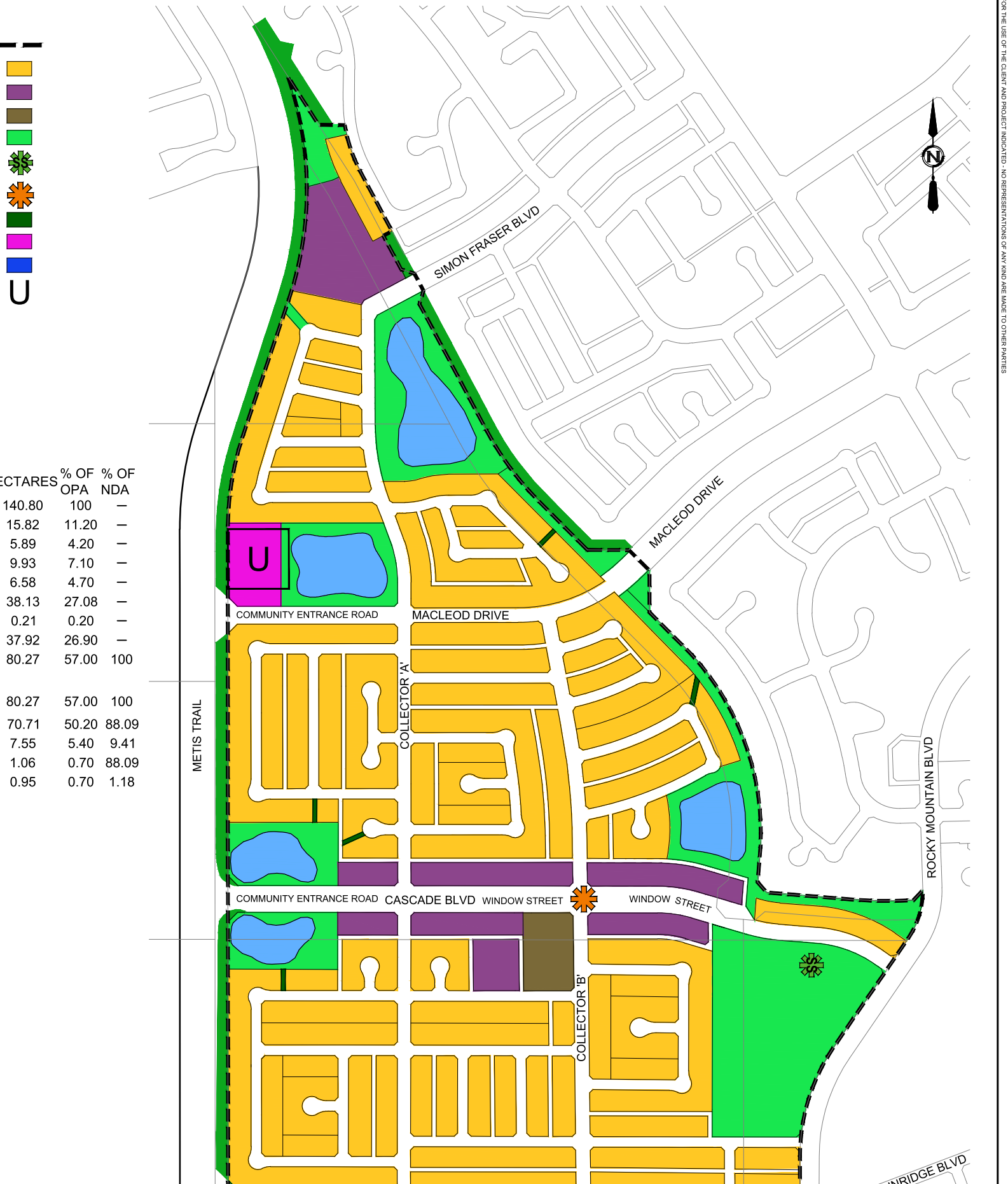
SCALE(S) SHOWN ARE INTENDED FOR TABLOID (11X17) SIZE DRAWINGS UNLESS NOTED OTHERWISE

IF NOT 25 mm ADJUST SCALES
25 mm

THIS DRAWING IS FOR THE USE OF THE CLIENT AND PROJECT INDICATED - NO REPRESENTATIONS OF ANY KIND ARE MADE TO OTHER PARTIES



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ECTARES	% OF OPA	% OF NDA
140.80	100	–
15.82	11.20	–
5.89	4.20	–
9.93	7.10	–
6.58	4.70	–
38.13	27.08	–
0.21	0.20	–
37.92	26.90	–
80.27	57.00	100
80.27	57.00	100
70.71	50.20	88.09
7.55	5.40	9.41
1.06	0.70	88.09
0.95	0.70	1.18

Appendix B - Traffic Data

Rationale for City of Lethbridge EMME Model Adjustments

Appendix B shows the background volumes obtained from the City of Lethbridge EMME Model.

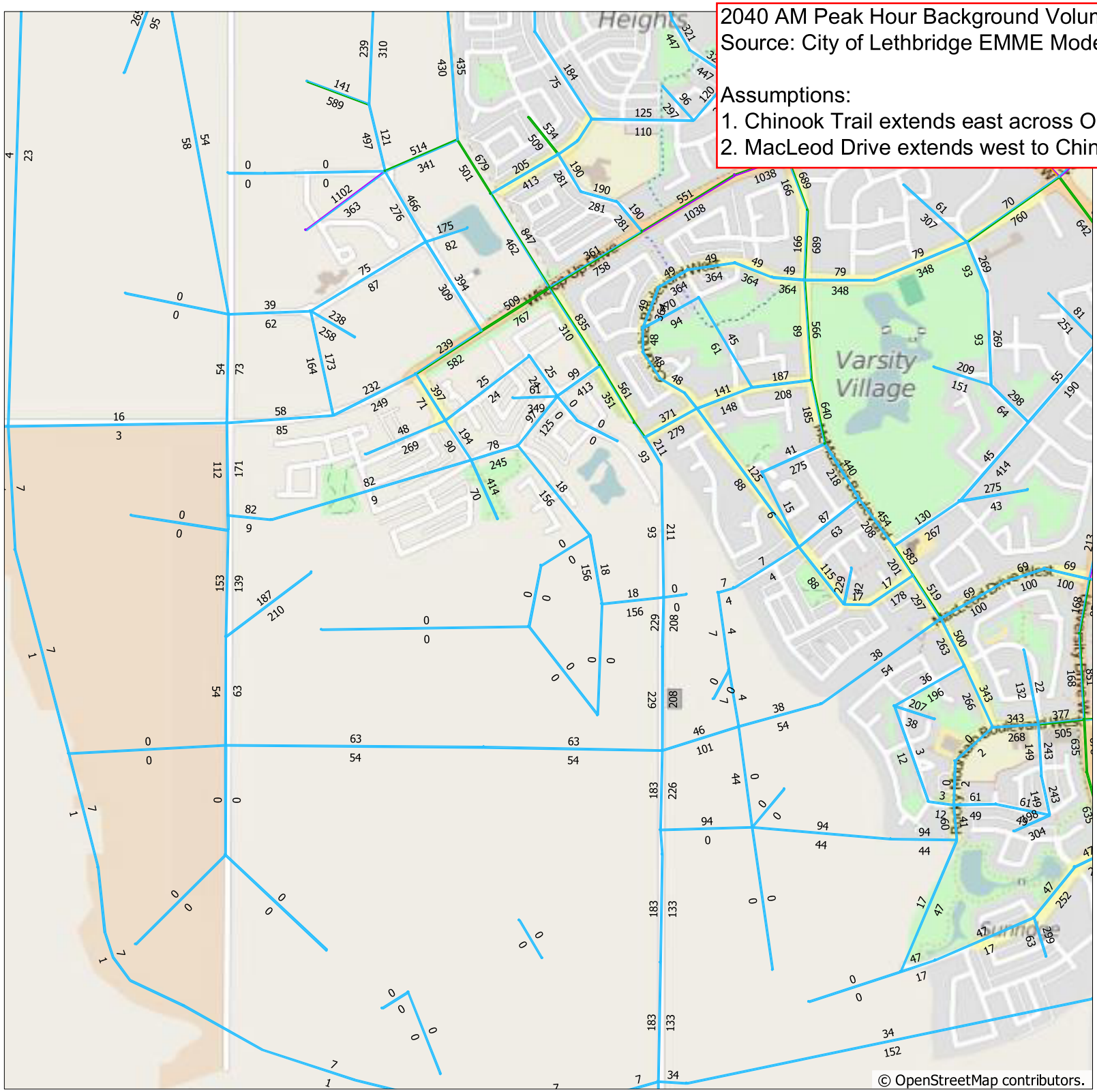
For the purpose of this study the model was adjustment to account for the extension of MacLeod Drive West, Cascade Boulevard and Sunridge Boulevard West through the Waterbridge development.

Background traffic is expected to use MacLeod Drive West and Cascade Boulevard. Therefore, a connection of each of these two streets with Metis Trail West is included in EMME.

Background traffic on Sunridge Boulevard West was assumed to be negligible and as such Sunridge was not connected to Metis Trial West in the EMME model. Similarly, background traffic is not expected to use the remainder of the internal road network and those links were not modelled.

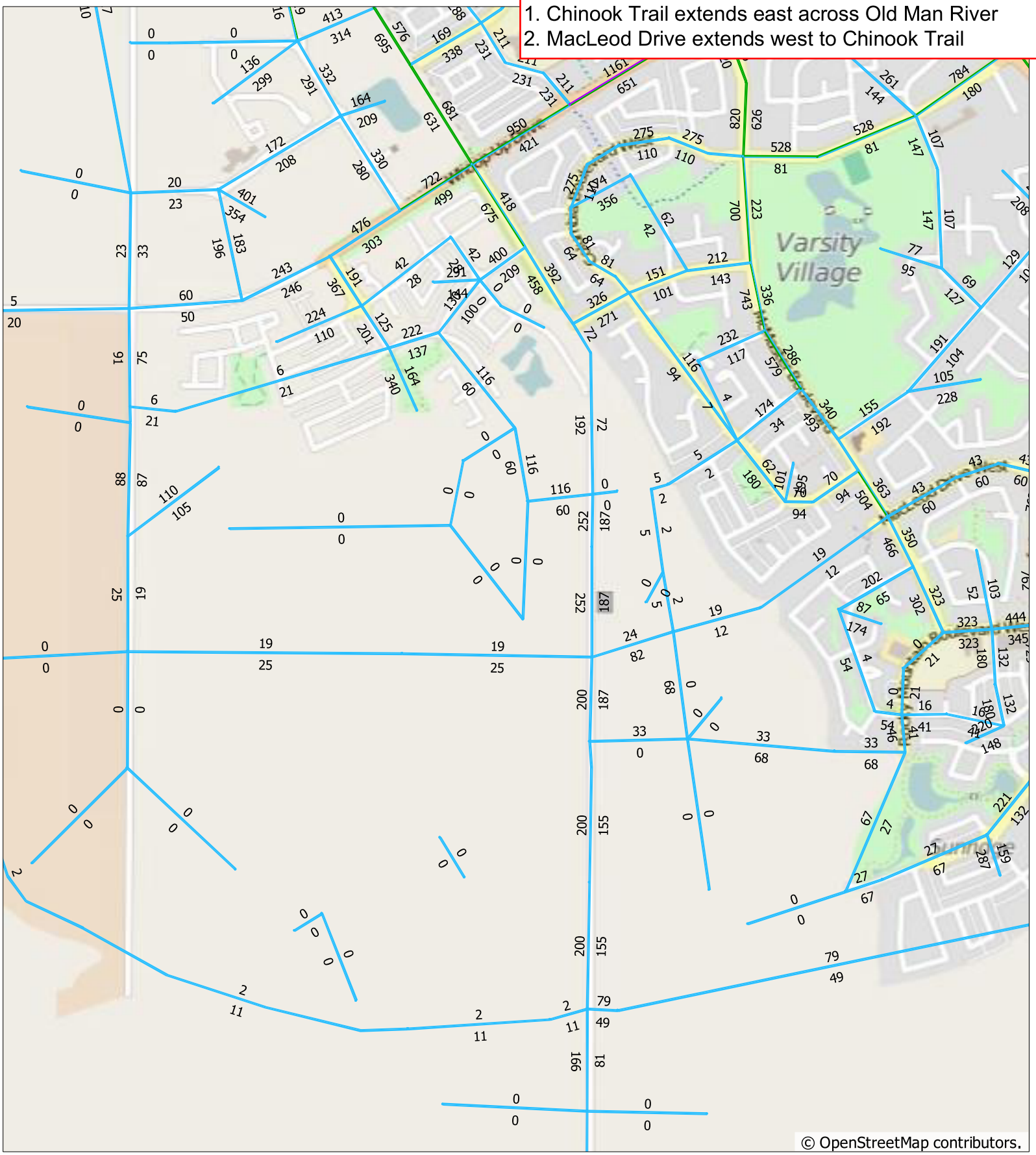
2040 AM Peak Hour Background Volumes
Source: City of Lethbridge EMME Model

Assumptions:
1. Chinook Trail extends east across Old Man River
2. MacLeod Drive extends west to Chinook Trail



2040 PM Peak Hour Background Volumes
Source: City of Lethbridge EMME Model

Assumptions:
1. Chinook Trail extends east across Old Man River
2. MacLeod Drive extends west to Chinook Trail



Appendix C - Synchro and SIDRA Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	127	227	113	44	51	217	23	778	34	44	225	25
Future Volume (vph)	127	227	113	44	51	217	23	778	34	44	225	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	30.0		30.0	30.0		0.0	30.0		0.0	0.0		30.0
Storage Lanes	0		0	0		0	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	1641	0	0	1536	0	0	3181	0	1648	1685	1475
Flt Permitted		0.813			0.894			0.943		0.178		
Satd. Flow (perm)	0	1350	0	0	1382	0	0	3002	0	308	1685	1420
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		36			53			8				28
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		676.2			433.6			705.0			1350.7	
Travel Time (s)		50.7			32.5			52.9			101.3	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Adj. Flow (vph)	144	258	128	50	58	247	26	884	39	50	256	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	530	0	0	355	0	0	949	0	50	256	28
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Total Split (s)	32.0	32.0		32.0	32.0		28.0	28.0		28.0	28.0	28.0
Total Lost Time (s)		4.0			4.0			4.0		4.0	4.0	4.0
Act Effct Green (s)		28.0			28.0			24.0		24.0	24.0	24.0
Actuated g/C Ratio		0.47			0.47			0.40		0.40	0.40	0.40
v/c Ratio		0.82			0.53			0.79		0.41	0.38	0.05
Control Delay		26.0			13.0			21.7		25.1	14.8	5.2
Queue Delay		0.0			0.0			0.0		0.0	0.0	0.0
Total Delay		26.0			13.0			21.7		25.1	14.8	5.2
LOS		C			B			C		C	B	A
Approach Delay		26.0			13.0			21.7			15.6	
Approach LOS		C			B			C			B	
Queue Length 50th (m)		44.0			21.4			45.9		3.8	19.1	0.0
Queue Length 95th (m)		#92.7			40.6			64.3		13.0	33.7	3.7
Internal Link Dist (m)		652.2			409.6			681.0			1326.7	
Turn Bay Length (m)												30.0
Base Capacity (vph)		649			673			1205		123	674	584
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		0.82			0.53			0.79		0.41	0.38	0.05

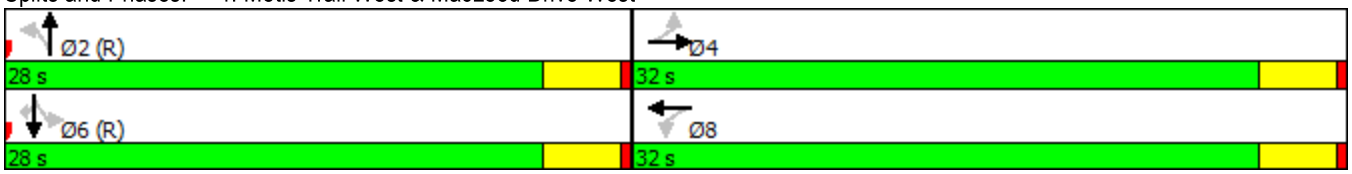
Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 60	

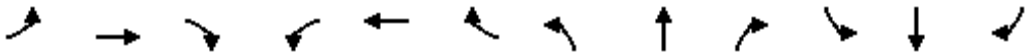
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 20.4	Intersection LOS: C
Intersection Capacity Utilization 99.0%	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: 1: Metis Trail West & MacLeod Drive West



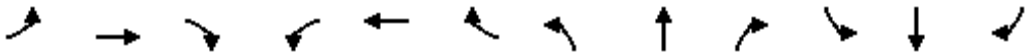


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	191	96	2	85	7	49	13	17	15	84	158
Future Volume (vph)	19	191	96	2	85	7	49	13	17	15	84	158
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		20.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	1657	0	0	1716	0	0	1634	0	0	1586	0
Flt Permitted		0.997			0.999			0.970			0.997	
Satd. Flow (perm)	0	1657	0	0	1716	0	0	1634	0	0	1586	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		433.6			422.9			697.6			844.5	
Travel Time (s)		32.5			31.7			52.3			63.3	
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)	22	217	109	2	97	8	56	15	19	17	95	180
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	348	0	0	107	0	0	90	0	0	292	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 57.5%		ICU Level of Service B	
Analysis Period (min) 15			

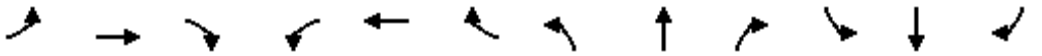
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	220	3	5	55	54	21
Future Volume (vph)	220	3	5	55	54	21
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	1731	0	0	1728	1610	0
Flt Permitted				0.996	0.965	
Satd. Flow (perm)	1731	0	0	1728	1610	0
Link Speed (k/h)	48			48	48	
Link Distance (m)	422.9			344.3	724.4	
Travel Time (s)	31.7			25.8	54.3	
Confl. Peds. (#/hr)						
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	250	3	6	63	61	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	253	0	0	69	85	0
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 24.1%		ICU Level of Service A	
Analysis Period (min) 15			



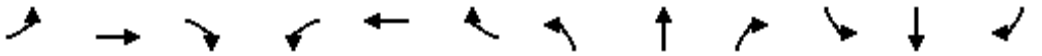
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	95	9	9	204	25	71	6	22	121	67	71
Future Volume (vph)	11	95	9	9	204	25	71	6	22	121	67	71
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1709	0	0	1707	0	0	1624	0	0	1632	0
Flt Permitted		0.995			0.998			0.965			0.977	
Satd. Flow (perm)	0	1709	0	0	1707	0	0	1624	0	0	1632	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		437.5			429.9			243.1			697.6	
Travel Time (s)		32.8			32.2			18.2			52.3	
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)	13	108	10	10	232	28	81	7	25	138	76	81
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	131	0	0	270	0	0	113	0	0	295	0
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 38.7%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	146	71	73	35	79	250	2	394	20	25	314	41
Future Volume (vph)	146	71	73	35	79	250	2	394	20	25	314	41
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		30.0	0.0		30.0	0.0		30.0	0.0		30.0
Storage Lanes	0		1	0		1	0		1	0		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	1678	1475	0	1709	1475	0	1685	1475	0	1682	1475
Flt Permitted		0.967			0.985						0.996	
Satd. Flow (perm)	0	1678	1475	0	1709	1475	0	1685	1475	0	1682	1475
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		440.3			437.5			689.0			705.0	
Travel Time (s)		33.0			32.8			51.7			52.9	
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%	2%	5%	2%	2%	5%	2%
Adj. Flow (vph)	166	81	83	40	90	284	2	448	23	28	357	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	247	83	0	130	284	0	450	23	0	385	47
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 66.5%		ICU Level of Service C	
Analysis Period (min) 15			

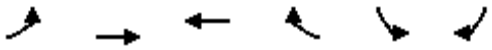


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	133	75	140	22	69	64	12	219	2	3	367	23
Future Volume (vph)	133	75	140	22	69	64	12	219	2	3	367	23
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		30.0	0.0		30.0	0.0		30.0	0.0		30.0
Storage Lanes	0		1	0		1	0		1	0		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	1681	1475	0	1714	1475	0	1683	1475	0	1686	1475
Flt Permitted		0.969			0.988			0.997				
Satd. Flow (perm)	0	1681	1475	0	1714	1475	0	1683	1475	0	1686	1475
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		615.2			415.0			579.4			689.0	
Travel Time (s)		46.1			31.1			43.5			51.7	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Confl. Bikes (#/hr)			5			5			5			5
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%	2%	5%	2%	2%	5%	2%
Adj. Flow (vph)	151	85	159	25	78	73	14	249	2	3	417	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	236	159	0	103	73	0	263	2	0	420	26
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 50.0%		ICU Level of Service A	
Analysis Period (min) 15			

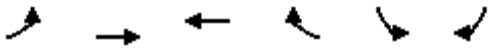
Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	155	59	114	9	13	126
Future Volume (vph)	155	59	114	9	13	126
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	1612	0	0	1658	1523	0
Flt Permitted	0.965			0.956		
Satd. Flow (perm)	1612	0	0	1658	1523	0
Link Speed (k/h)	48			48	48	
Link Distance (m)	770.2			619.5	207.0	
Travel Time (s)	57.8			46.5	15.5	
Confl. Peds. (#/hr)	10	10	10			10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	176	67	130	10	15	143
Shared Lane Traffic (%)						
Lane Group Flow (vph)	243	0	0	140	158	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 41.9%		ICU Level of Service A	
Analysis Period (min) 15			



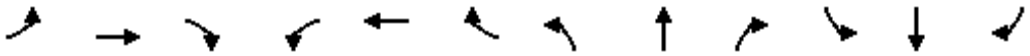
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	54	26	136	5	86	19
Future Volume (vph)	54	26	136	5	86	19
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1679	1726	0	1625	0
Flt Permitted		0.968			0.961	
Satd. Flow (perm)	0	1679	1726	0	1625	0
Link Speed (k/h)		48	48		48	
Link Distance (m)		415.0	465.5		453.4	
Travel Time (s)		31.1	34.9		34.0	
Confl. Peds. (#/hr)	10			10	10	10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	61	30	155	6	98	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	91	161	0	120	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.9%		ICU Level of Service A	
Analysis Period (min) 15			



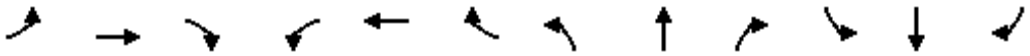
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	8	81	8	114	72	5
Future Volume (vph)	8	81	8	114	72	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1728	1516	0	1642	0
Flt Permitted		0.996			0.955	
Satd. Flow (perm)	0	1728	1516	0	1642	0
Link Speed (k/h)		48	48		48	
Link Distance (m)		522.1	331.3		619.5	
Travel Time (s)		39.2	24.8		46.5	
Confl. Peds. (#/hr)	10			10	10	10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	9	92	9	130	82	6
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	101	139	0	88	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 25.7%		ICU Level of Service A	
Analysis Period (min) 15			



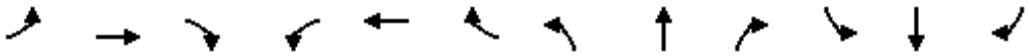
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	212	39	5	174	12	53	13	24	9	35	11
Future Volume (vph)	7	212	39	5	174	12	53	13	24	9	35	11
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1698	0	0	1717	0	0	1624	0	0	1673	0
Flt Permitted		0.999			0.999			0.971			0.992	
Satd. Flow (perm)	0	1698	0	0	1717	0	0	1624	0	0	1673	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		429.9			770.2			703.1			724.4	
Travel Time (s)		32.2			57.8			52.7			54.3	
Confl. Peds. (#/hr)			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	241	44	6	198	14	60	15	27	10	40	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	293	0	0	218	0	0	102	0	0	63	0
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 37.8%		ICU Level of Service A	
Analysis Period (min) 15			



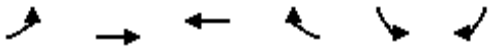
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	86	5	5	15	14	37	5	110	5	291	71	167
Future Volume (vph)	86	5	5	15	14	37	5	110	5	291	71	167
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		30.0	60.0		15.0	30.0		15.0	110.0		15.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	1649	0	0	1585	0	0	1676	0	0	1609	0
Flt Permitted		0.957			0.989			0.998			0.973	
Satd. Flow (perm)	0	1649	0	0	1585	0	0	1676	0	0	1609	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		1003.6			860.8			160.9			579.4	
Travel Time (s)		75.3			64.6			12.1			43.5	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Confl. Bikes (#/hr)			5			5			5			5
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%	2%	5%	2%	2%	5%	2%
Adj. Flow (vph)	98	6	6	17	16	42	6	125	6	331	81	190
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	110	0	0	75	0	0	137	0	0	602	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 59.0%		ICU Level of Service B	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	62	32	2	7	5	73	13	27	5	64	61
Future Volume (vph)	18	62	32	2	7	5	73	13	27	5	64	61
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1654	0	0	1636	0	0	1627	0	0	1622	0
Flt Permitted		0.992			0.994			0.969			0.998	
Satd. Flow (perm)	0	1654	0	0	1636	0	0	1627	0	0	1622	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		465.5			522.1			556.4			703.1	
Travel Time (s)		34.9			39.2			41.7			52.7	
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)	20	70	36	2	8	6	83	15	31	6	73	69
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	126	0	0	16	0	0	129	0	0	148	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 39.5%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	3	284	46	5	122	19
Future Volume (vph)	3	284	46	5	122	19
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1686	1667	0	1634	0
Flt Permitted					0.959	
Satd. Flow (perm)	0	1686	1667	0	1634	0
Link Speed (k/h)		48	48		48	
Link Distance (m)		860.8	705.4		556.4	
Travel Time (s)		64.6	52.9		41.7	
Confl. Peds. (#/hr)	10			10	10	10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	5%	5%	2%	2%	2%
Adj. Flow (vph)	3	323	52	6	139	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	326	58	0	161	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 35.5%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	38	86	11	232	23	132	218	18	316	739	133
Future Volume (vph)	13	38	86	11	232	23	132	218	18	316	739	133
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	30.0		30.0	30.0		0.0	30.0		0.0	0.0		30.0
Storage Lanes	0		0	0		0	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	1537	0	0	1707	0	0	3152	0	1648	1685	1475
Flt Permitted		0.963			0.986			0.549		0.507		
Satd. Flow (perm)	0	1486	0	0	1685	0	0	1762	0	868	1685	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		98			6			13				114
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		676.2			433.6			705.0			1350.7	
Travel Time (s)		50.7			32.5			52.9			101.3	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Adj. Flow (vph)	15	43	98	13	264	26	150	248	20	359	840	151
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	156	0	0	303	0	0	418	0	359	840	151
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Total Split (s)	24.0	24.0		24.0	24.0		56.0	56.0		56.0	56.0	56.0
Total Lost Time (s)		4.0			4.0			4.0		4.0	4.0	4.0
Act Effct Green (s)		20.0			20.0			52.0		52.0	52.0	52.0
Actuated g/C Ratio		0.25			0.25			0.65		0.65	0.65	0.65
v/c Ratio		0.35			0.71			0.36		0.64	0.77	0.16
Control Delay		12.9			37.7			7.3		14.8	15.8	2.2
Queue Delay		0.0			0.0			0.0		0.0	0.0	0.0
Total Delay		12.9			37.7			7.3		14.8	15.8	2.2
LOS		B			D			A		B	B	A
Approach Delay		12.9			37.7			7.3			14.0	
Approach LOS		B			D			A			B	
Queue Length 50th (m)		6.9			41.2			12.8		28.5	77.9	1.8
Queue Length 95th (m)		20.8			#68.5			19.8		54.8	120.6	7.2
Internal Link Dist (m)		652.2			409.6			681.0			1326.7	
Turn Bay Length (m)												30.0
Base Capacity (vph)		445			425			1149		564	1095	957
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		0.35			0.71			0.36		0.64	0.77	0.16

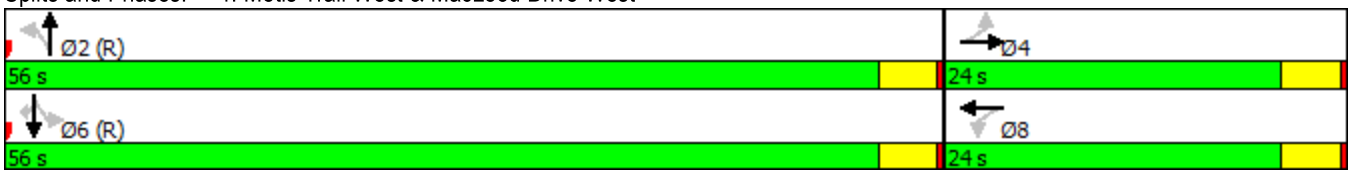
Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	

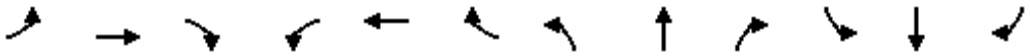
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 15.9	Intersection LOS: B
Intersection Capacity Utilization 86.4%	ICU Level of Service E
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Metis Trail West & MacLeod Drive West



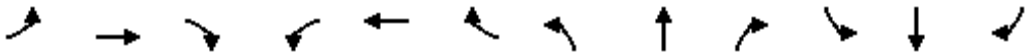


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	122	77	17	39	164	35	70	33	4	7	42	30
Future Volume (vph)	122	77	17	39	164	35	70	33	4	7	42	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		20.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	1671	0	0	1686	0	0	1673	0	0	1640	0
Flt Permitted		0.973			0.992			0.969			0.996	
Satd. Flow (perm)	0	1671	0	0	1686	0	0	1673	0	0	1640	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		433.6			422.9			697.6			844.5	
Travel Time (s)		32.5			31.7			52.3			63.3	
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)	139	88	19	44	186	40	80	38	5	8	48	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	246	0	0	270	0	0	123	0	0	90	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 50.4%		ICU Level of Service A	
Analysis Period (min) 15			

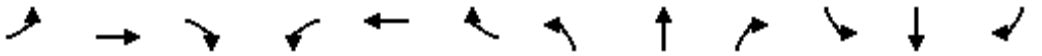
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	28	60	30	203	35	5
Future Volume (vph)	28	60	30	203	35	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	1575	0	0	1724	1632	0
Flt Permitted				0.994	0.958	
Satd. Flow (perm)	1575	0	0	1724	1632	0
Link Speed (k/h)	48			48	48	
Link Distance (m)	422.9			344.3	724.4	
Travel Time (s)	31.7			25.8	54.3	
Confl. Peds. (#/hr)						
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	32	68	34	231	40	6
Shared Lane Traffic (%)						
Lane Group Flow (vph)	100	0	0	265	46	0
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.1%		ICU Level of Service A	
Analysis Period (min) 15			



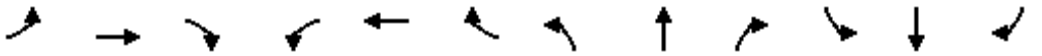
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	372	58	17	75	10	61	23	48	129	10	21
Future Volume (vph)	35	372	58	17	75	10	61	23	48	129	10	21
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1698	0	0	1699	0	0	1612	0	0	1637	0
Flt Permitted		0.996			0.992			0.978			0.961	
Satd. Flow (perm)	0	1698	0	0	1699	0	0	1612	0	0	1637	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		437.5			429.9			243.1			697.6	
Travel Time (s)		32.8			32.2			18.2			52.3	
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)	40	423	66	19	85	11	69	26	55	147	11	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	529	0	0	115	0	0	150	0	0	182	0
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 53.8%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	149	5	19	95	43	47	303	144	190	305	139
Future Volume (vph)	20	149	5	19	95	43	47	303	144	190	305	139
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		30.0	0.0		30.0	0.0		30.0	0.0		30.0
Storage Lanes	0		1	0		1	0		1	0		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	1724	1475	0	1721	1475	0	1680	1475	0	1671	1475
Flt Permitted		0.994			0.992			0.993			0.981	
Satd. Flow (perm)	0	1724	1475	0	1721	1475	0	1680	1475	0	1671	1475
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		440.3			437.5			689.0			705.0	
Travel Time (s)		33.0			32.8			51.7			52.9	
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%	2%	5%	2%	2%	5%	2%
Adj. Flow (vph)	23	169	6	22	108	49	53	344	164	216	347	158
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	192	6	0	130	49	0	397	164	0	563	158
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 81.5%		ICU Level of Service D	
Analysis Period (min) 15			

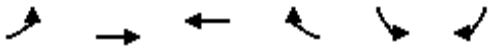


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	24	13	3	131	5	162	389	45	77	307	147
Future Volume (vph)	101	24	13	3	131	5	162	389	45	77	307	147
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0		30.0	0.0		30.0	0.0		30.0	0.0		30.0
Storage Lanes	0		1	0		1	0		1	0		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	1667	1475	0	1733	1475	0	1676	1475	0	1678	1475
Flt Permitted		0.961			0.999			0.986			0.990	
Satd. Flow (perm)	0	1667	1475	0	1733	1475	0	1676	1475	0	1678	1475
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		615.2			415.0			579.4			689.0	
Travel Time (s)		46.1			31.1			43.5			51.7	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Confl. Bikes (#/hr)			5			5			5			5
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%	2%	5%	2%	2%	5%	2%
Adj. Flow (vph)	115	27	15	3	149	6	184	442	51	88	349	167
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	142	15	0	152	6	0	626	51	0	437	167
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 85.8%		ICU Level of Service E	
Analysis Period (min) 15			

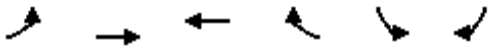
Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	66	47	43	1	40	94
Future Volume (vph)	66	47	43	1	40	94
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	1592	0	0	1653	1570	0
Flt Permitted	0.972			0.953		
Satd. Flow (perm)	1592	0	0	1653	1570	0
Link Speed (k/h)	48			48	48	
Link Distance (m)	770.2			619.5	207.0	
Travel Time (s)	57.8			46.5	15.5	
Confl. Peds. (#/hr)	10	10	10			10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	75	53	49	1	45	107
Shared Lane Traffic (%)						
Lane Group Flow (vph)	128	0	0	50	152	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.9%		ICU Level of Service A	
Analysis Period (min) 15			



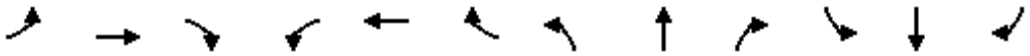
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	63	90	117	67	2	55
Future Volume (vph)	63	90	117	67	2	55
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1700	1650	0	1504	0
Flt Permitted		0.980			0.998	
Satd. Flow (perm)	0	1700	1650	0	1504	0
Link Speed (k/h)		48	48		48	
Link Distance (m)		415.0	465.5		453.4	
Travel Time (s)		31.1	34.9		34.0	
Confl. Peds. (#/hr)	10			10	10	10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	72	102	133	76	2	63
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	174	209	0	65	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 38.2%		ICU Level of Service A	
Analysis Period (min) 15			



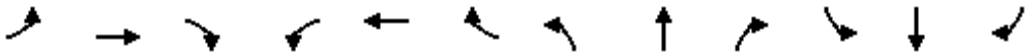
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	5	5	54	43	86	5
Future Volume (vph)	5	5	54	43	86	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1693	1631	0	1643	0
Flt Permitted		0.976			0.955	
Satd. Flow (perm)	0	1693	1631	0	1643	0
Link Speed (k/h)		48	48		48	
Link Distance (m)		522.1	331.3		619.5	
Travel Time (s)		39.2	24.8		46.5	
Confl. Peds. (#/hr)	10			10	10	10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	6	6	61	49	98	6
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	12	110	0	104	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 22.8%		ICU Level of Service A	
Analysis Period (min) 15			



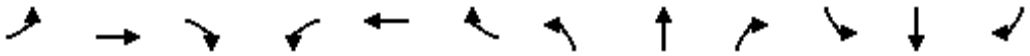
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	336	201	35	88	25	14	35	12	7	8	0
Future Volume (vph)	22	336	201	35	88	25	14	35	12	7	8	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1648	0	0	1675	0	0	1669	0	0	1695	0
Flt Permitted		0.998			0.988			0.989			0.977	
Satd. Flow (perm)	0	1648	0	0	1675	0	0	1669	0	0	1695	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		429.9			770.2			703.1			724.4	
Travel Time (s)		32.2			57.8			52.7			54.3	
Confl. Peds. (#/hr)			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)	25	382	228	40	100	28	16	40	14	8	9	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	635	0	0	168	0	0	70	0	0	17	0
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 48.9%		ICU Level of Service A	
Analysis Period (min) 15			



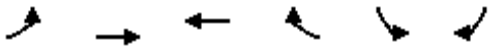
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	203	5	3	7	2	221	5	173	5	60	160	103
Future Volume (vph)	203	5	3	7	2	221	5	173	5	60	160	103
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	60.0		30.0	60.0		15.0	30.0		15.0	110.0		15.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Satd. Flow (prot)	0	1652	0	0	1506	0	0	1680	0	0	1622	0
Flt Permitted		0.954			0.998			0.999			0.991	
Satd. Flow (perm)	0	1652	0	0	1506	0	0	1680	0	0	1622	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		1003.6			860.8			160.9			579.4	
Travel Time (s)		75.3			64.6			12.1			43.5	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Confl. Bikes (#/hr)			5			5			5			5
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%	2%	5%	2%	2%	5%	2%
Adj. Flow (vph)	231	6	3	8	2	251	6	197	6	68	182	117
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	240	0	0	261	0	0	209	0	0	367	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 73.8%		ICU Level of Service D	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	2	79	45	9	5	133	70	3	5	44	66
Future Volume (vph)	10	2	79	45	9	5	133	70	3	5	44	66
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1522	0	0	1651	0	0	1678	0	0	1598	0
Flt Permitted		0.995			0.963			0.969			0.998	
Satd. Flow (perm)	0	1522	0	0	1651	0	0	1678	0	0	1598	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		465.5			522.1			556.4			703.1	
Travel Time (s)		34.9			39.2			41.7			52.7	
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)	11	2	90	51	10	6	151	80	3	6	50	75
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	103	0	0	67	0	0	234	0	0	131	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 36.7%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	1	62	223	156	6	7
Future Volume (vph)	1	62	223	156	6	7
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Satd. Flow (prot)	0	1684	1610	0	1573	0
Flt Permitted		0.999			0.977	
Satd. Flow (perm)	0	1684	1610	0	1573	0
Link Speed (k/h)		48	48		48	
Link Distance (m)		860.8	705.4		556.4	
Travel Time (s)		64.6	52.9		41.7	
Confl. Peds. (#/hr)	10			10	10	10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	5%	5%	2%	2%	2%
Adj. Flow (vph)	1	70	253	177	7	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	71	430	0	15	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 36.3%		ICU Level of Service A	
Analysis Period (min) 15			

LANE LEVEL OF SERVICE

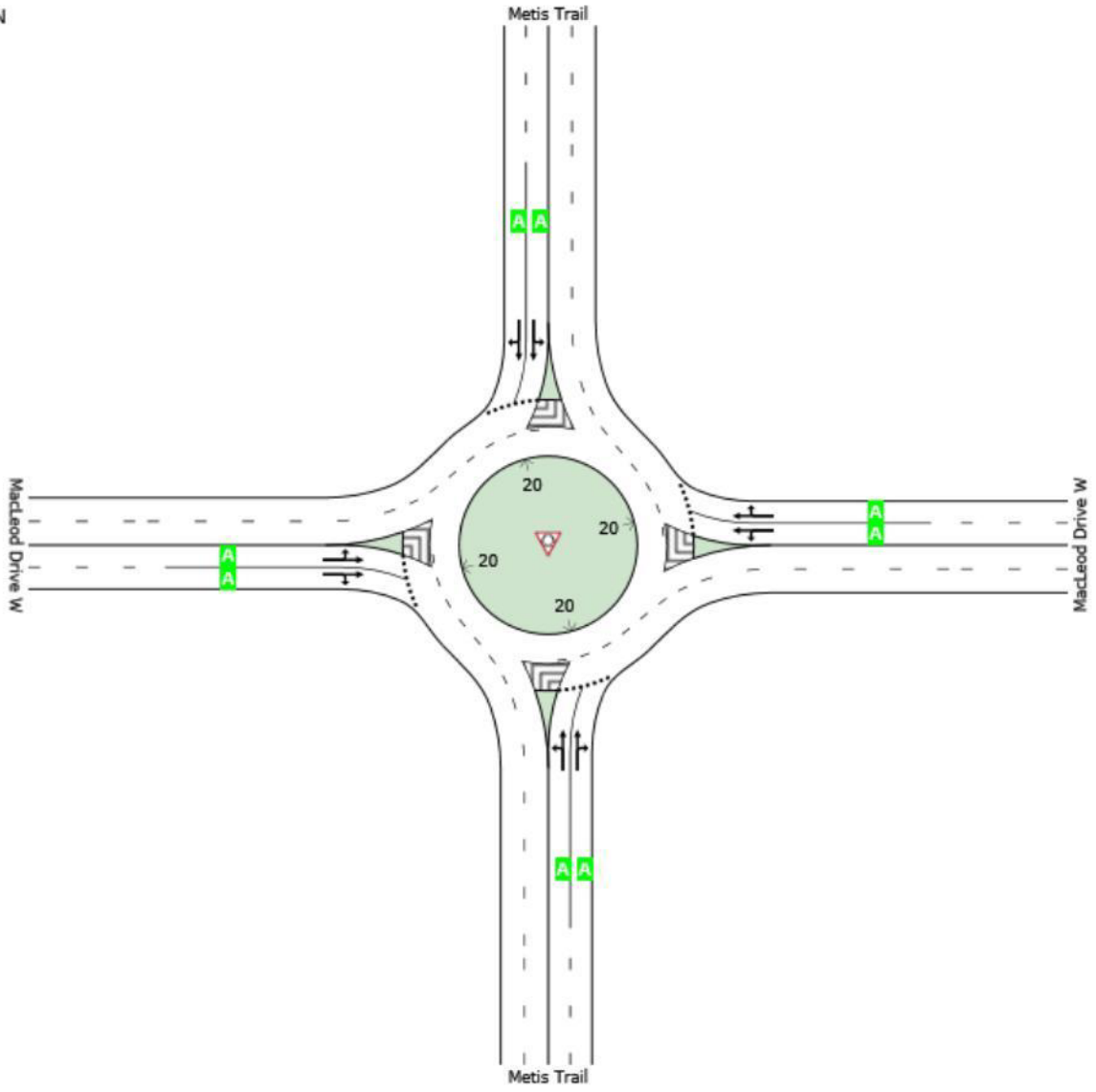
Lane Level of Service

Site: 1 [Metis Trail and Chinook Trail W_AM Peak Hour]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [Metis Trail and Chinook Trail W_AM Peak Hour]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Metis Trail													
Lane 1	62	4.7	933	0.066	100	5.5	LOS A	0.3	2.5	Full	500	0.0	0.0
Lane 2[d]	75	4.8	1130	0.066	100	4.6	LOS A	0.4	2.6	Full	500	0.0	0.0
Approach	136	4.8		0.066		5.0	LOS A	0.4	2.6				
East: MacLeod Drive W													
Lane 1	33	2.0	1093	0.030	92[5]	6.2	LOS A	0.2	1.1	Full	500	0.0	0.0
Lane 2[d]	42	2.0	1285	0.033	100	3.9	LOS A	0.2	1.2	Full	500	0.0	0.0
Approach	75	2.0		0.033		4.9	LOS A	0.2	1.2				
North: Metis Trail													
Lane 1[d]	331	2.0	1566	0.211	100	7.5	LOS A	1.3	9.0	Full	500	0.0	0.0
Lane 2	270	2.9	1341	0.202	96[5]	3.2	LOS A	1.2	8.4	Full	500	0.0	0.0
Approach	601	2.4		0.211		5.5	LOS A	1.3	9.0				
West: MacLeod Drive W													
Lane 1[d]	98	2.0	1150	0.085	100	9.1	LOS A	0.5	3.3	Full	500	0.0	0.0
Lane 2	11	2.0	739	0.015	18[5]	5.8	LOS A	0.1	0.5	Full	500	0.0	0.0
Approach	109	2.0		0.085		8.7	LOS A	0.5	3.3				
Intersection	922	2.7		0.211		5.8	LOS A	1.3	9.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

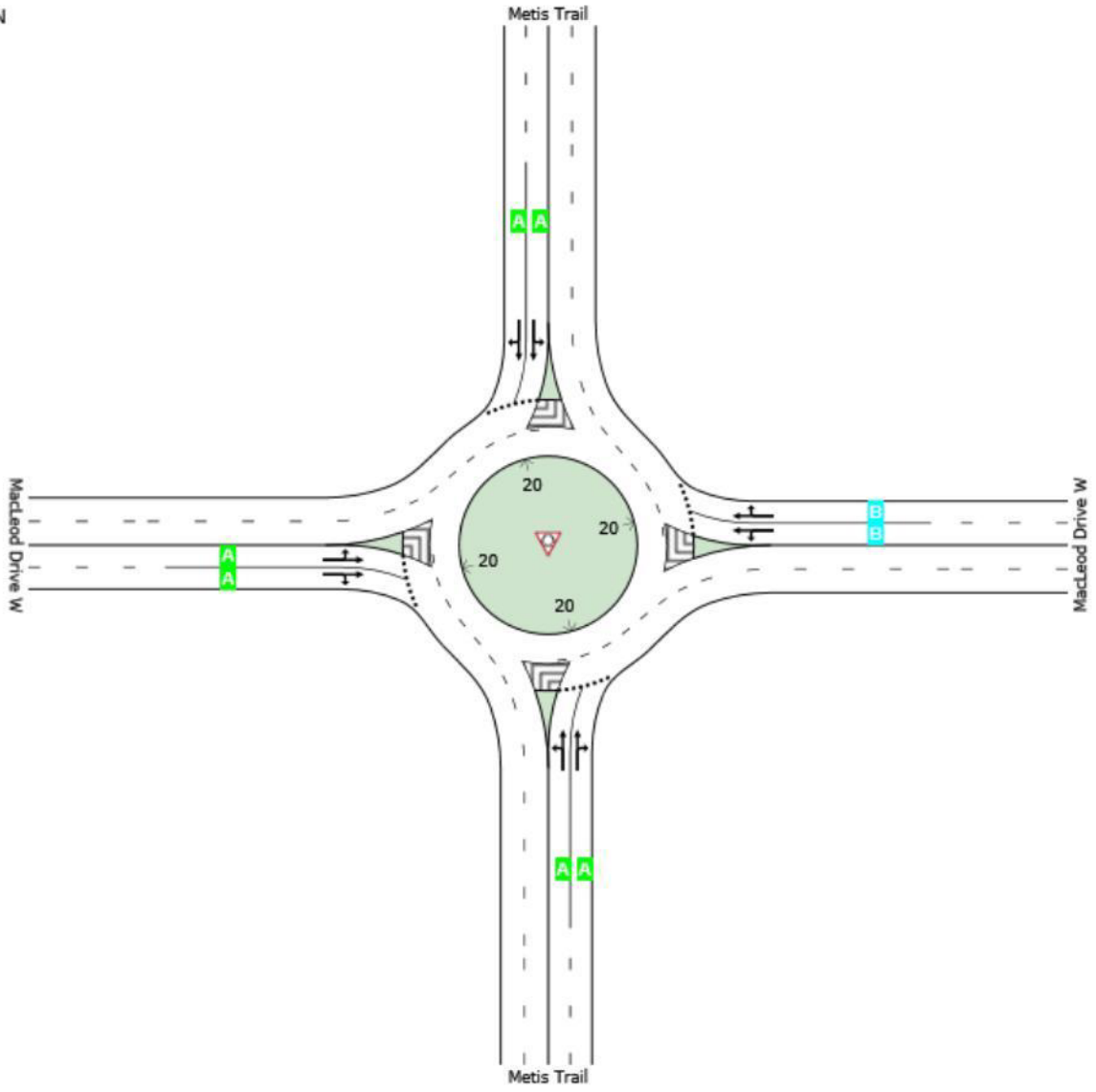
Lane Level of Service

Site: 1 [X-Metis Trail and MacLeaod Drive W_AM Peak Hour - Copy]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	B	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [X-Metis Trail and MacLeaod Drive W_AM Peak Hour - Copy]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Metis Trail													
Lane 1	428	4.8	884	0.484	100	6.8	LOS A	3.6	25.9	Full	500	0.0	0.0
Lane 2[d]	521	4.8	1076	0.484	100	5.6	LOS A	3.7	26.6	Full	500	0.0	0.0
Approach	949	4.8		0.484		6.1	LOS A	3.7	26.6				
East: MacLeod Drive W													
Lane 1	108	2.0	428	0.252	61[5]	15.7	LOS B	1.8	12.5	Full	500	0.0	0.0
Lane 2[d]	247	2.0	602	0.410	100	12.7	LOS B	3.6	25.4	Full	500	0.0	0.0
Approach	355	2.0		0.410		13.6	LOS B	3.6	25.4				
North: Metis Trail													
Lane 1	156	4.0	1172	0.133	100	4.9	LOS A	0.8	5.7	Full	500	0.0	0.0
Lane 2[d]	178	4.5	1334	0.133	100	3.4	LOS A	0.8	5.9	Full	500	0.0	0.0
Approach	334	4.3		0.133		4.1	LOS A	0.8	5.9				
West: MacLeod Drive W													
Lane 1	242	2.0	992	0.244	100	7.6	LOS A	1.4	10.2	Full	500	0.0	0.0
Lane 2[d]	289	2.0	1184	0.244	100	4.6	LOS A	1.5	10.6	Full	500	0.0	0.0
Approach	531	2.0		0.244		6.0	LOS A	1.5	10.6				
Intersection	2168	3.6		0.484		7.0	LOS A	3.7	26.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

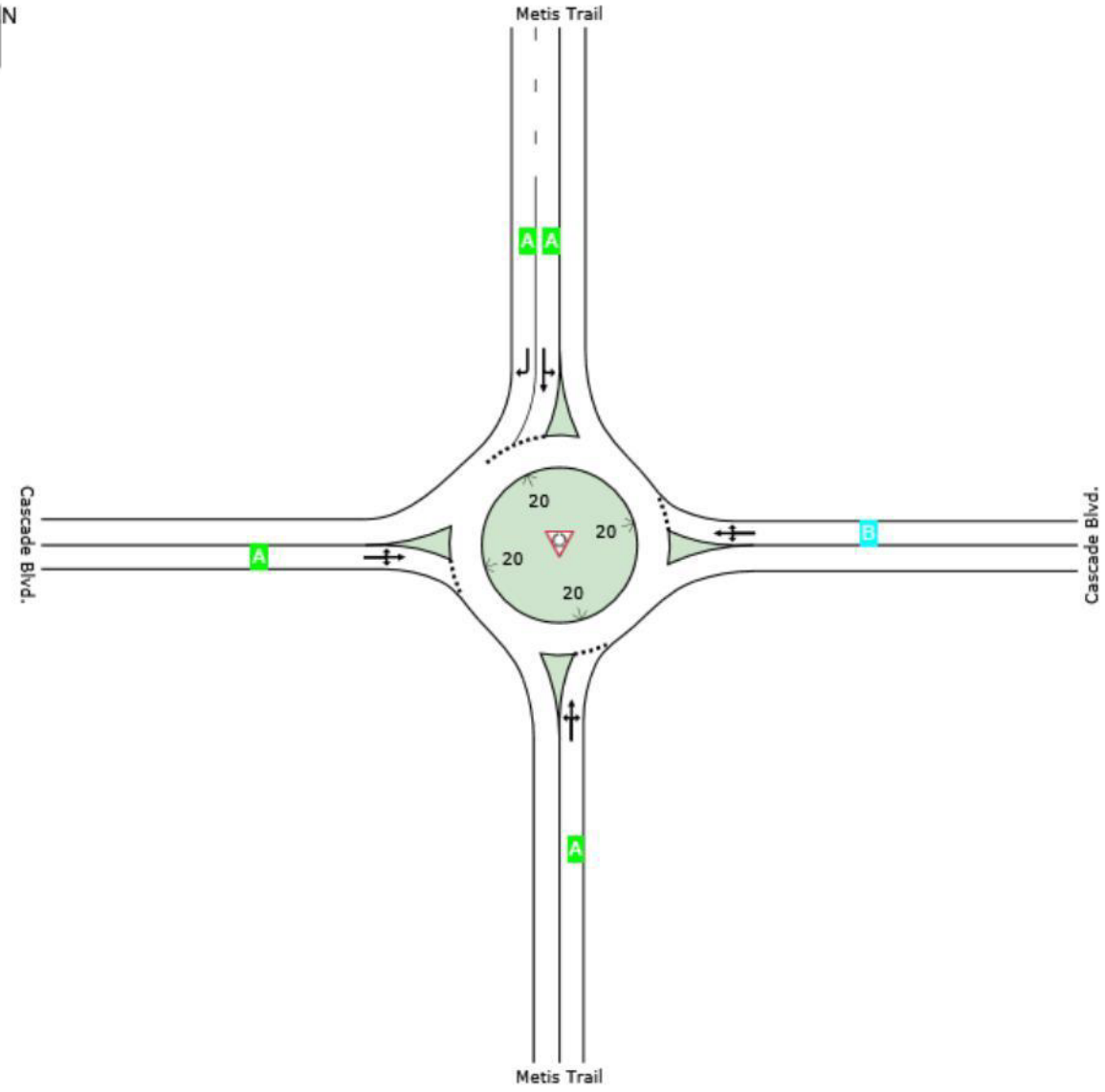
Lane Level of Service

Site: 1 [Metis Trail and Cascade Blvd._AM Peak Hour]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	B	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [Metis Trail and Cascade Blvd._AM Peak Hour]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Metis Trail													
Lane 1[d]	473	4.8	1046	0.452	100	4.9	LOS A	3.5	25.3	Full	500	0.0	0.0
Approach	473	4.8		0.452		4.9	LOS A	3.5	25.3				
East: Cascade Blvd.													
Lane 1[d]	414	2.0	767	0.540	100	10.0	LOS B	4.8	34.2	Full	500	0.0	0.0
Approach	414	2.0		0.540		10.0	LOS B	4.8	34.2				
North: Metis Trail													
Lane 1[d]	385	4.8	1361	0.283	100	3.8	LOS A	2.0	14.7	Full	500	0.0	0.0
Lane 2	47	2.0	897	0.052	100	4.0	LOS A	0.3	2.0	Full	500	0.0	0.0
Approach	432	4.5		0.283		3.8	LOS A	2.0	14.7				
West: Cascade Blvd.													
Lane 1[d]	330	2.0	930	0.355	100	8.1	LOS A	2.4	16.8	Full	500	0.0	0.0
Approach	330	2.0		0.355		8.1	LOS A	2.4	16.8				
Intersection	1648	3.5		0.540		6.5	LOS A	4.8	34.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

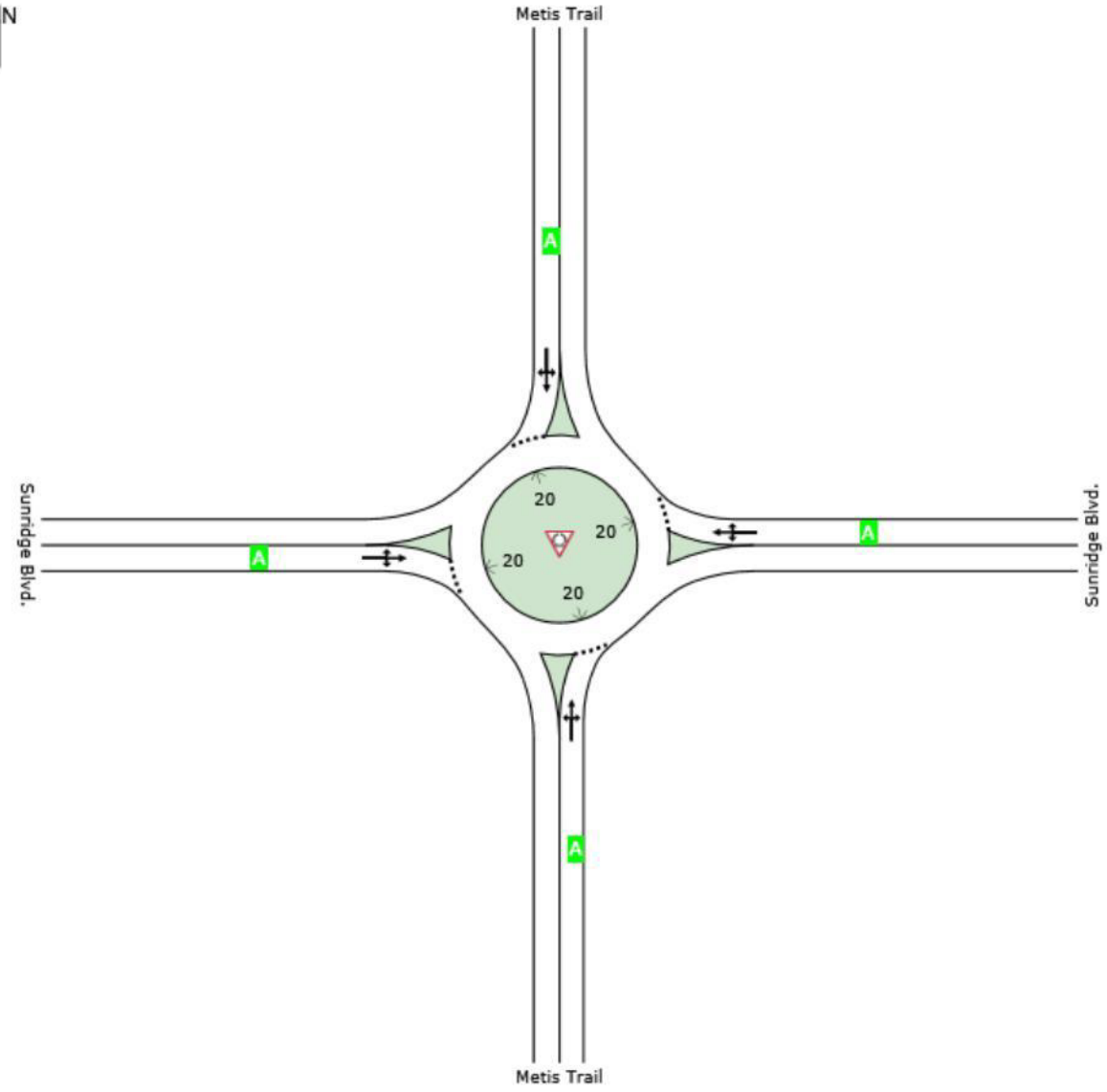
Lane Level of Service

Site: 1 [Metis Trail and Sunridge Blvd._AM Peak Hour]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [Metis Trail and Sunridge Blvd._AM Peak Hour]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Metis Trail													
Lane 1[d]	265	4.8	1059	0.250	100	4.5	LOS A	1.6	12.0	Full	500	0.0	0.0
Approach	265	4.8		0.250		4.5	LOS A	1.6	12.0				
East: Sunridge Blvd.													
Lane 1[d]	176	2.0	968	0.182	100	5.7	LOS A	1.0	7.3	Full	500	0.0	0.0
Approach	176	2.0		0.182		5.7	LOS A	1.0	7.3				
North: Metis Trail													
Lane 1[d]	481	4.8	1291	0.372	100	3.6	LOS A	2.7	19.3	Full	500	0.0	0.0
Approach	481	4.8		0.372		3.6	LOS A	2.7	19.3				
West: Sunridge Blvd.													
Lane 1[d]	390	2.0	909	0.429	100	7.9	LOS A	2.9	20.7	Full	500	0.0	0.0
Approach	390	2.0		0.429		7.9	LOS A	2.9	20.7				
Intersection	1311	3.6		0.429		5.3	LOS A	2.9	20.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

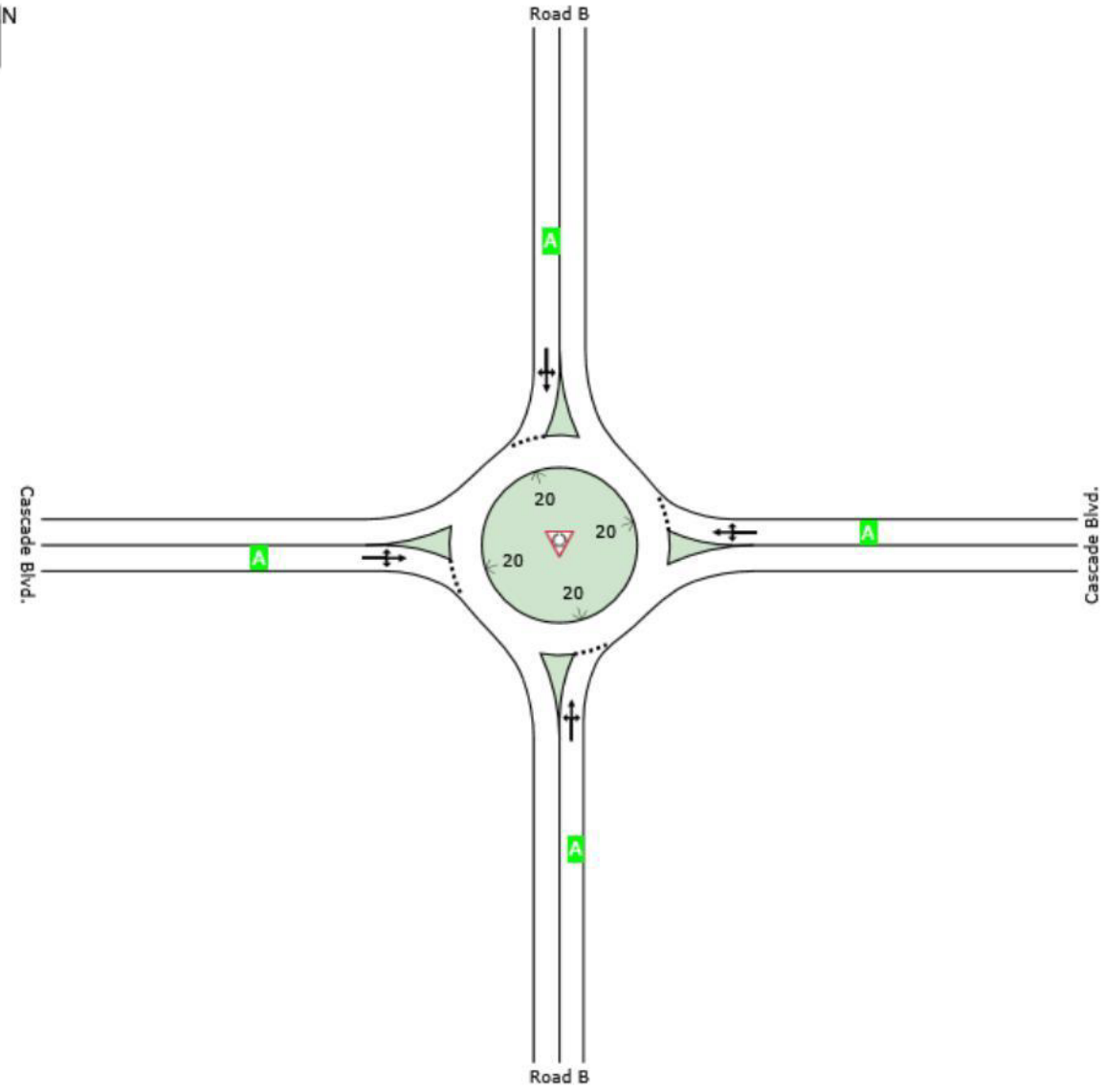
Lane Level of Service

Site: 1 [Road A and Cascade Blvd._AM Peak Hour]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [Road A and Cascade Blvd._AM Peak Hour]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Road B													
Lane 1[d]	113	2.2	1080	0.104	100	7.4	LOS A	0.6	4.0	Full	500	0.0	0.0
Approach	113	2.2		0.104		7.4	LOS A	0.6	4.0				
East: Cascade Blvd.													
Lane 1[d]	270	2.0	1306	0.207	100	3.5	LOS A	1.2	8.7	Full	500	0.0	0.0
Approach	270	2.0		0.207		3.5	LOS A	1.2	8.7				
North: Road B													
Lane 1[d]	294	2.8	1045	0.282	100	6.8	LOS A	1.7	11.9	Full	500	0.0	0.0
Approach	294	2.8		0.282		6.8	LOS A	1.7	11.9				
West: Cascade Blvd.													
Lane 1[d]	131	2.0	1113	0.117	100	4.3	LOS A	0.6	4.6	Full	500	0.0	0.0
Approach	131	2.0		0.117		4.3	LOS A	0.6	4.6				
Intersection	808	2.3		0.282		5.4	LOS A	1.7	11.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

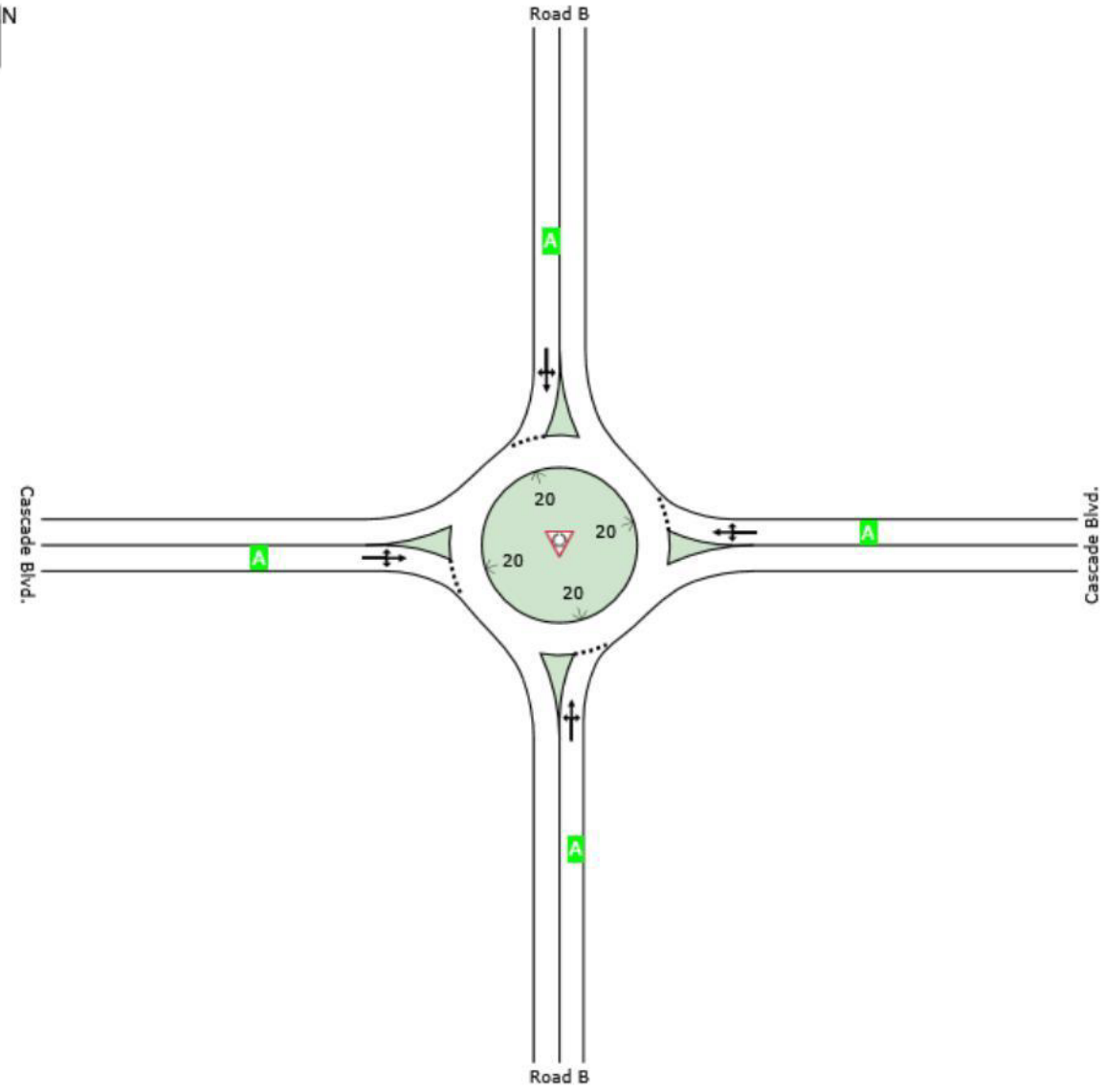
Lane Level of Service

Site: 1 [Road B and Cascade Blvd._AM Peak Hour - Copy]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [Road B and Cascade Blvd._AM Peak Hour - Copy]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Road B													
Lane 1[d]	102	2.4	1073	0.095	100	6.9	LOS A	0.5	3.6	Full	500	0.0	0.0
Approach	102	2.4		0.095		6.9	LOS A	0.5	3.6				
East: Cascade Blvd.													
Lane 1[d]	217	2.0	1324	0.164	100	3.3	LOS A	0.9	6.6	Full	500	0.0	0.0
Approach	217	2.0		0.164		3.3	LOS A	0.9	6.6				
North: Road B													
Lane 1[d]	63	3.9	1087	0.057	100	4.8	LOS A	0.3	2.0	Full	500	0.0	0.0
Approach	63	3.9		0.057		4.8	LOS A	0.3	2.0				
West: Cascade Blvd.													
Lane 1[d]	305	2.0	1411	0.216	100	3.2	LOS A	1.3	9.2	Full	500	0.0	0.0
Approach	305	2.0		0.216		3.2	LOS A	1.3	9.2				
Intersection	686	2.2		0.216		3.9	LOS A	1.3	9.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

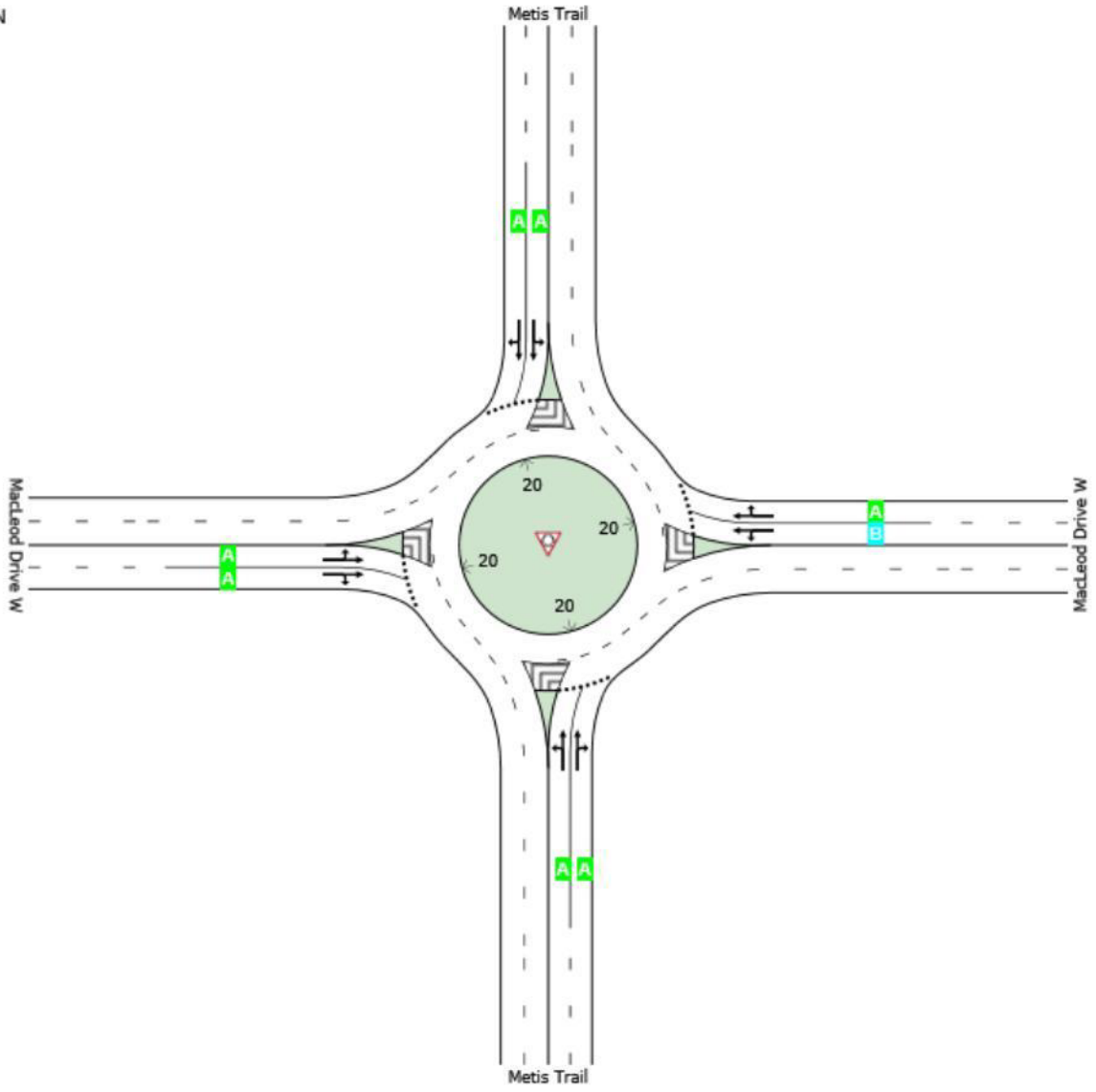
Lane Level of Service

Site: 1 [Metis Trail and Chinook Trail W_PM Peak Hour]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [Metis Trail and Chinook Trail W_PM Peak Hour]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Metis Trail													
Lane 1	102	4.8	915	0.112	100	4.9	LOS A	0.6	4.3	Full	500	0.0	0.0
Lane 2[d]	106	4.8	943	0.112	100	4.6	LOS A	0.6	4.3	Full	500	0.0	0.0
Approach	208	4.8		0.112		4.7	LOS A	0.6	4.3				
East: MacLeod Drive W													
Lane 1	10	2.0	485	0.021	7[5]	11.2	LOS B	0.1	0.7	Full	500	0.0	0.0
Lane 2[d]	251	2.0	876	0.287	100	6.1	LOS A	1.7	12.1	Full	500	0.0	0.0
Approach	261	2.0		0.287		6.3	LOS A	1.7	12.1				
North: Metis Trail													
Lane 1	176	3.8	1305	0.135	100	4.6	LOS A	0.8	5.4	Full	500	0.0	0.0
Lane 2[d]	191	3.2	1413	0.135	100	3.1	LOS A	0.8	5.4	Full	500	0.0	0.0
Approach	367	3.5		0.135		3.8	LOS A	0.8	5.4				
West: MacLeod Drive W													
Lane 1[d]	231	2.0	1013	0.228	100	9.0	LOS A	1.2	8.9	Full	500	0.0	0.0
Lane 2	9	2.0	585	0.016	7[5]	5.8	LOS A	0.1	0.5	Full	500	0.0	0.0
Approach	240	2.0		0.228		8.8	LOS A	1.2	8.9				
Intersection	1076	3.1		0.287		5.7	LOS A	1.7	12.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

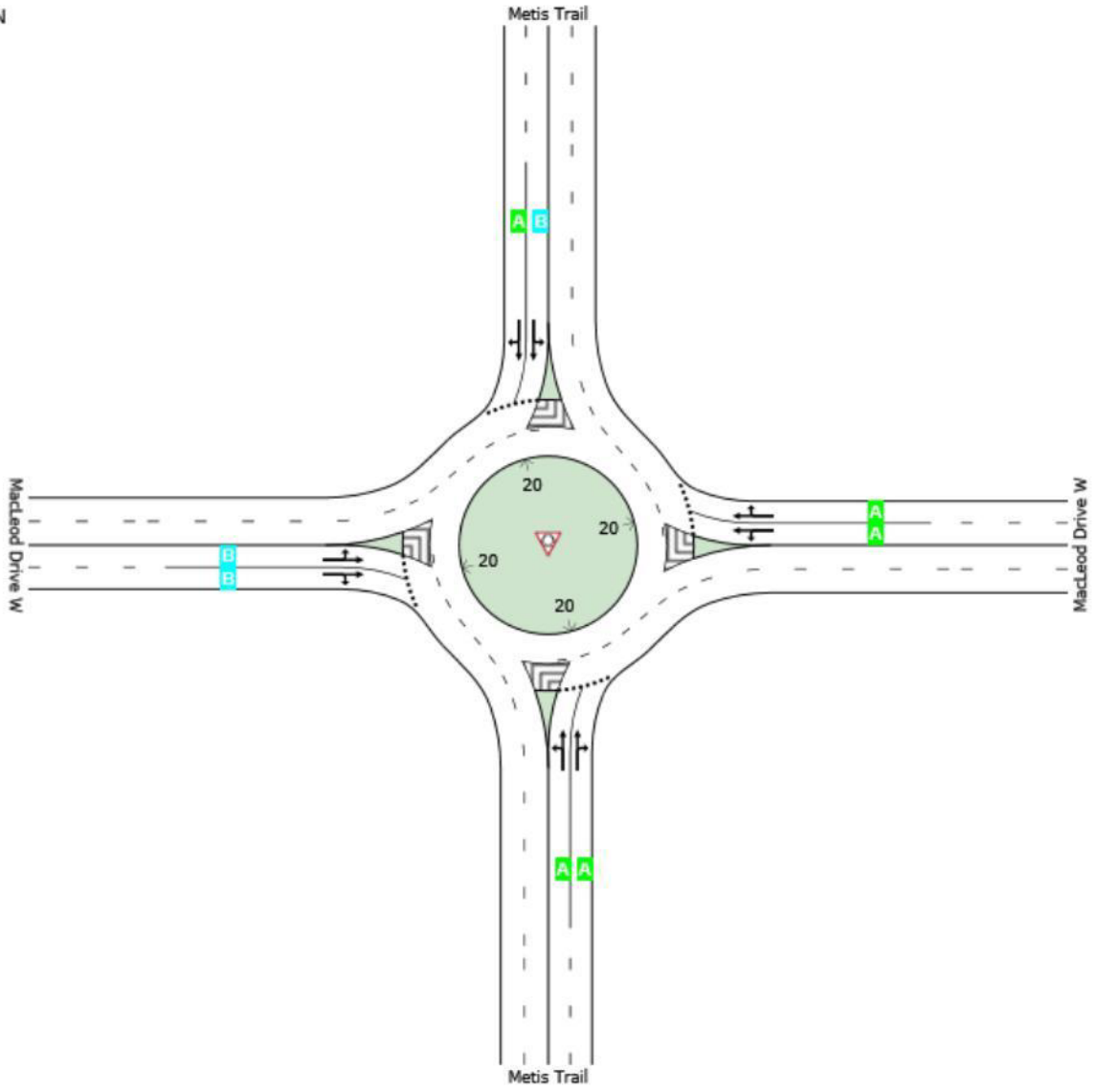
Lane Level of Service

Site: 1 [X-Metis Trail and MacLeod Drive W_PM Peak Hour - Copy]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	A	B	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [X-Metis Trail and MacLeod Drive W_PM Peak Hour - Copy]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Metis Trail													
Lane 1	191	2.6	897	0.213	100	8.8	LOS A	1.3	9.5	Full	500	0.0	0.0
Lane 2[d]	227	4.7	1067	0.213	100	4.8	LOS A	1.4	10.3	Full	500	0.0	0.0
Approach	418	3.8		0.213		6.6	LOS A	1.4	10.3				
East: MacLeod Drive W													
Lane 1	137	2.0	919	0.149	100	5.5	LOS A	0.9	6.2	Full	500	0.0	0.0
Lane 2[d]	165	2.0	1109	0.149	100	4.7	LOS A	0.9	6.5	Full	500	0.0	0.0
Approach	302	2.0		0.149		5.0	LOS A	0.9	6.5				
North: Metis Trail													
Lane 1	612	3.2	924	0.662	100	11.5	LOS B	7.0	50.2	Full	500	0.0	0.0
Lane 2[d]	738	4.4	1115	0.662	100	7.6	LOS A	7.2	52.0	Full	500	0.0	0.0
Approach	1350	3.9		0.662		9.3	LOS A	7.2	52.0				
West: MacLeod Drive W													
Lane 1	58	2.0	316	0.183	83[5]	18.9	LOS B	1.3	9.4	Full	500	0.0	0.0
Lane 2[d]	98	2.0	444	0.220	100	15.3	LOS B	1.9	13.5	Full	500	0.0	0.0
Approach	156	2.0		0.220		16.6	LOS B	1.9	13.5				
Intersection	2226	3.5		0.662		8.7	LOS A	7.2	52.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

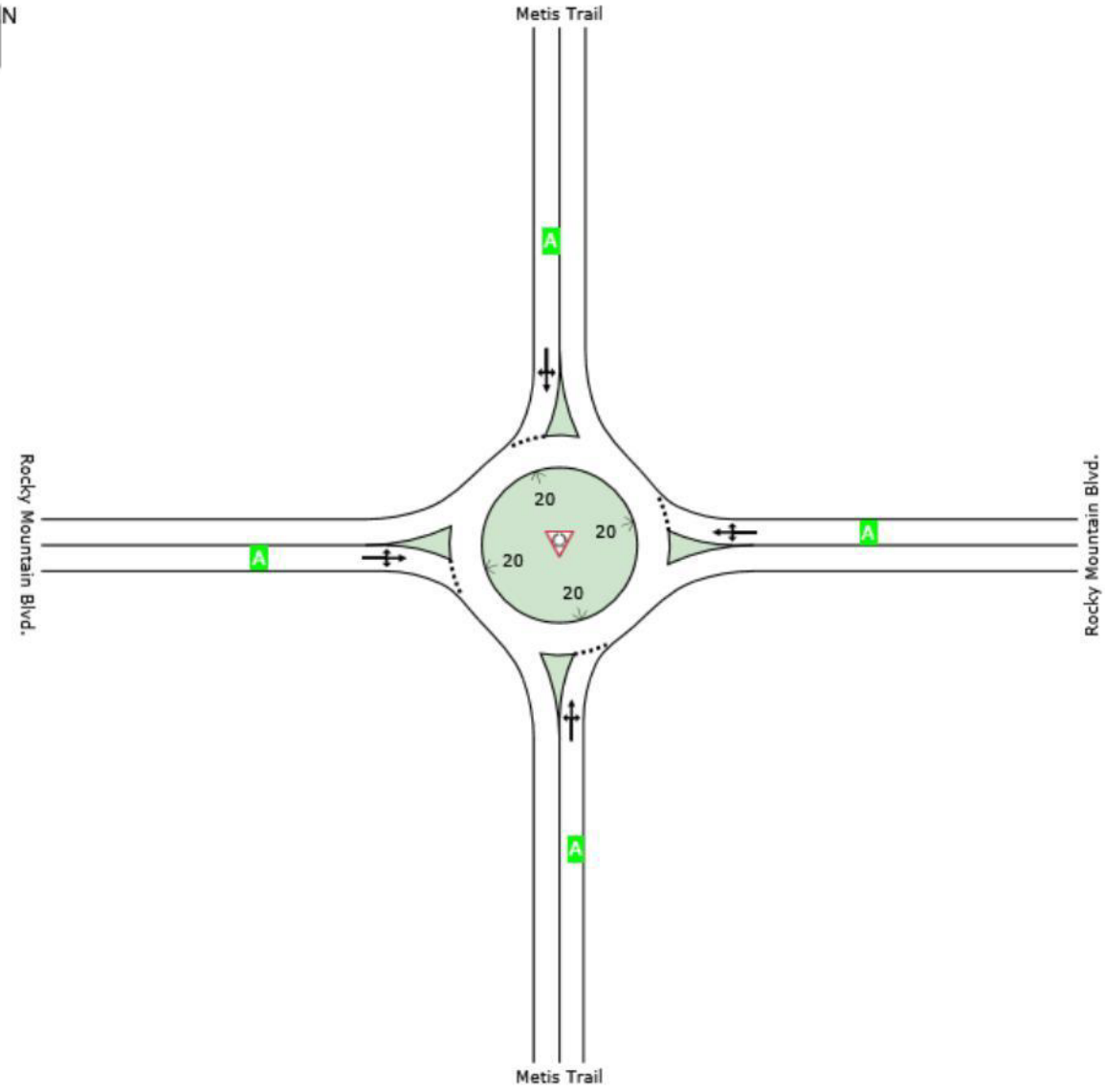
Lane Level of Service

Site: 1 [Metis Trail and Sunridge Blvd._PM Peak Hour]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [Metis Trail and Sunridge Blvd._PM Peak Hour]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Metis Trail													
Lane 1[d]	677	4.0	1144	0.592	100	6.1	LOS A	5.2	37.9	Full	500	0.0	0.0
Approach	677	4.0		0.592		6.1	LOS A	5.2	37.9				
East: Rocky Mountain Blvd.													
Lane 1[d]	158	2.0	677	0.233	100	7.8	LOS A	1.5	10.9	Full	500	0.0	0.0
Approach	158	2.0		0.233		7.8	LOS A	1.5	10.9				
North: Metis Trail													
Lane 1[d]	603	3.7	1037	0.582	100	6.7	LOS A	5.0	36.4	Full	500	0.0	0.0
Approach	603	3.7		0.582		6.7	LOS A	5.0	36.4				
West: Rocky Mountain Blvd.													
Lane 1[d]	157	2.0	899	0.174	100	8.5	LOS A	1.1	7.6	Full	500	0.0	0.0
Approach	157	2.0		0.174		8.5	LOS A	1.1	7.6				
Intersection	1595	3.5		0.592		6.7	LOS A	5.2	37.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

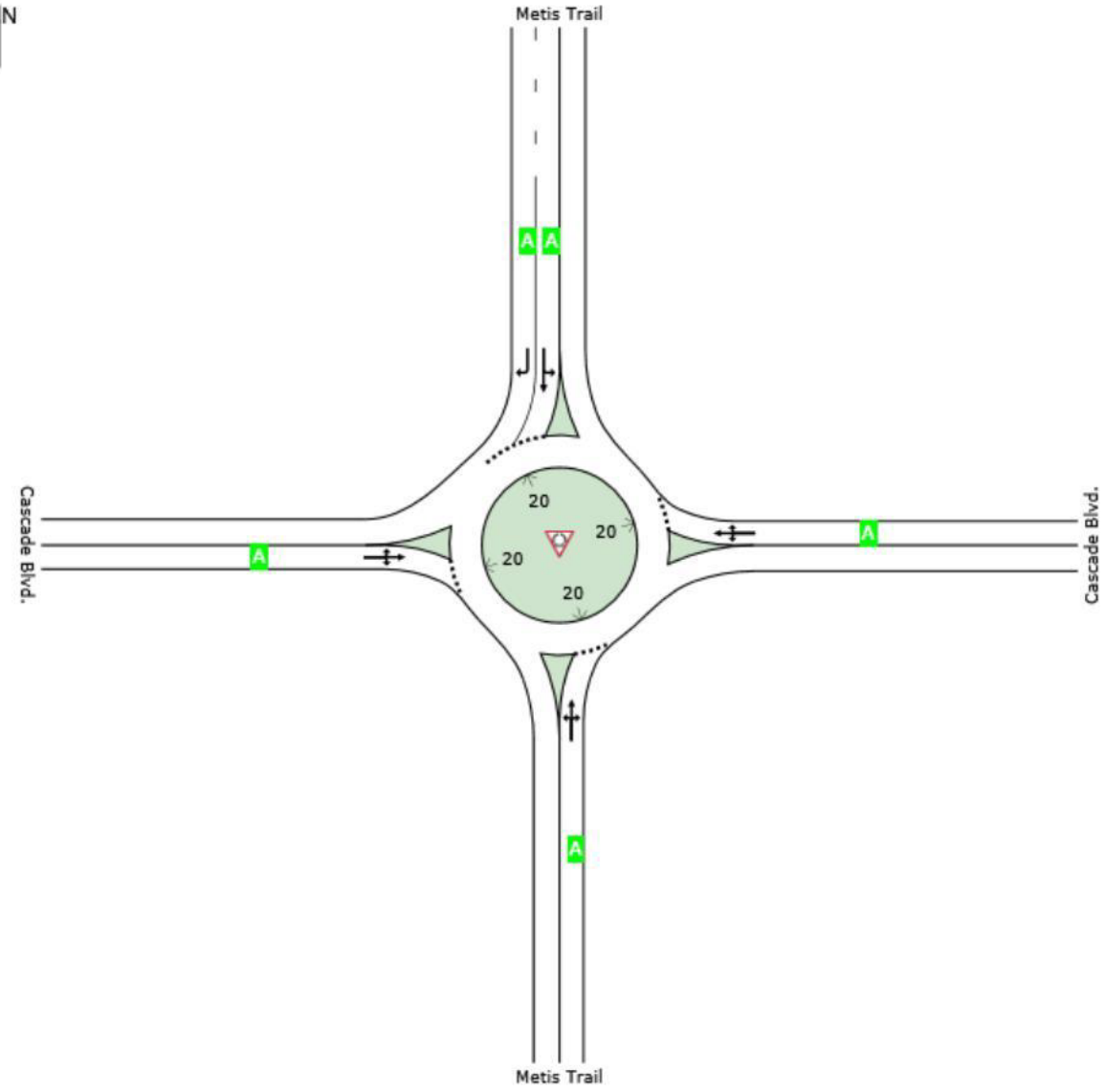
Lane Level of Service

Site: 1 [Metis Trail and Cascade Blvd._PM Peak Hour]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [Metis Trail and Cascade Blvd._PM Peak Hour]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Metis Trail													
Lane 1[d]	561	3.8	945	0.594	100	8.0	LOS A	5.6	40.5	Full	500	0.0	0.0
Approach	561	3.8		0.594		8.0	LOS A	5.6	40.5				
East: Cascade Blvd.													
Lane 1[d]	178	2.0	892	0.200	100	5.9	LOS A	1.3	9.2	Full	500	0.0	0.0
Approach	178	2.0		0.200		5.9	LOS A	1.3	9.2				
North: Metis Trail													
Lane 1[d]	563	3.8	1337	0.421	100	5.5	LOS A	3.1	22.2	Full	500	0.0	0.0
Lane 2	158	2.0	903	0.175	100	4.5	LOS A	1.0	6.8	Full	500	0.0	0.0
Approach	720	3.4		0.421		5.3	LOS A	3.1	22.2				
West: Cascade Blvd.													
Lane 1[d]	198	2.0	795	0.249	100	7.2	LOS A	1.6	11.4	Full	500	0.0	0.0
Approach	198	2.0		0.249		7.2	LOS A	1.6	11.4				
Intersection	1658	3.3		0.594		6.5	LOS A	5.6	40.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

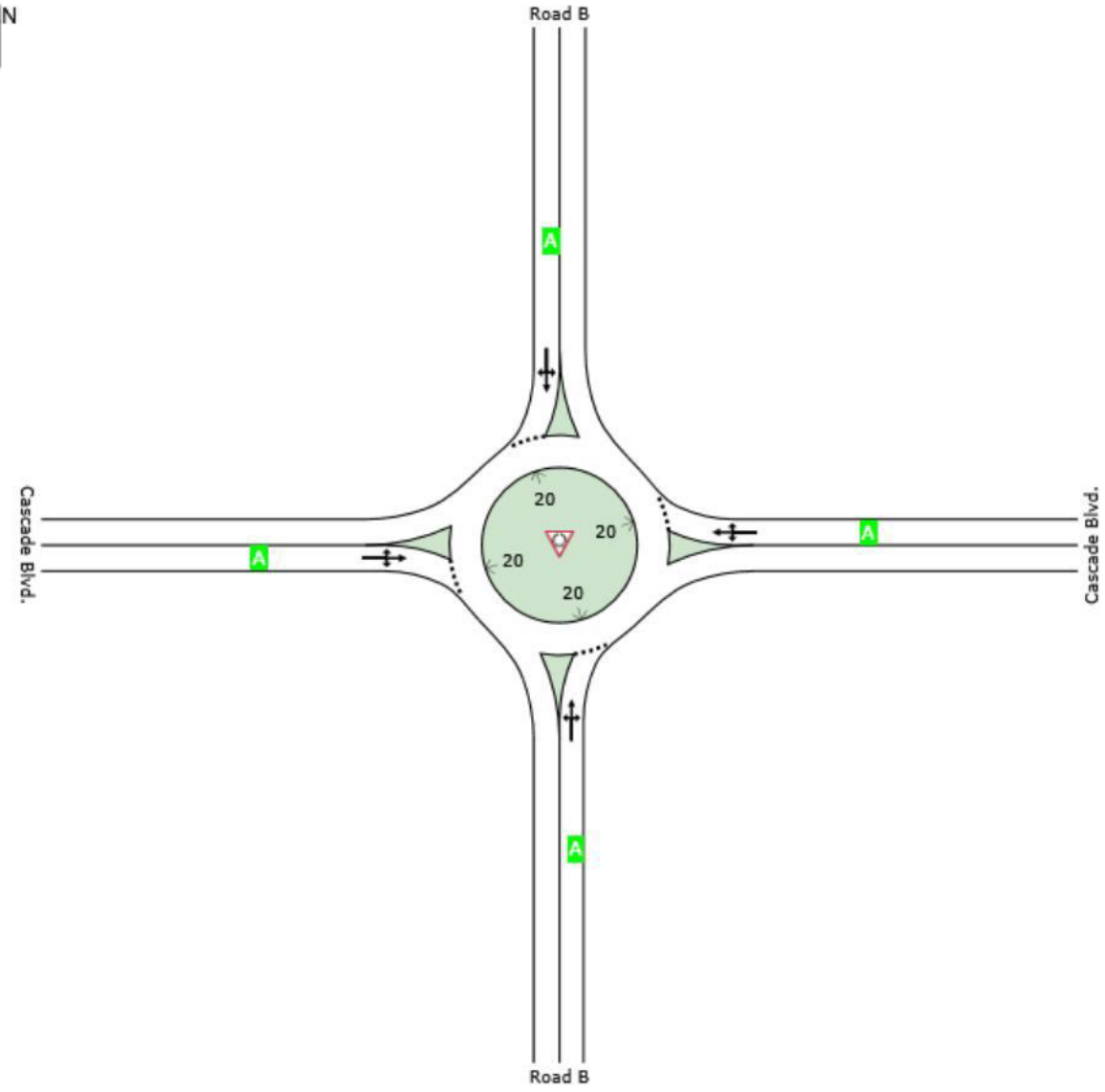
Lane Level of Service

Site: 1 [Road A and Cascade Blvd._PM Peak Hour]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [Road A and Cascade Blvd._PM Peak Hour]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Road B													
Lane 1[d]	150	2.5	797	0.188	100	8.8	LOS A	1.2	8.3	Full	500	0.0	0.0
Approach	150	2.5		0.188		8.8	LOS A	1.2	8.3				
East: Cascade Blvd.													
Lane 1[d]	116	2.0	1206	0.096	100	4.2	LOS A	0.5	3.7	Full	500	0.0	0.0
Approach	116	2.0		0.096		4.2	LOS A	0.5	3.7				
North: Road B													
Lane 1[d]	182	2.2	1175	0.155	100	7.3	LOS A	0.8	5.9	Full	500	0.0	0.0
Approach	182	2.2		0.155		7.3	LOS A	0.8	5.9				
West: Cascade Blvd.													
Lane 1[d]	526	2.0	1230	0.428	100	4.3	LOS A	3.0	21.6	Full	500	0.0	0.0
Approach	526	2.0		0.428		4.3	LOS A	3.0	21.6				
Intersection	974	2.1		0.428		5.5	LOS A	3.0	21.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE LEVEL OF SERVICE

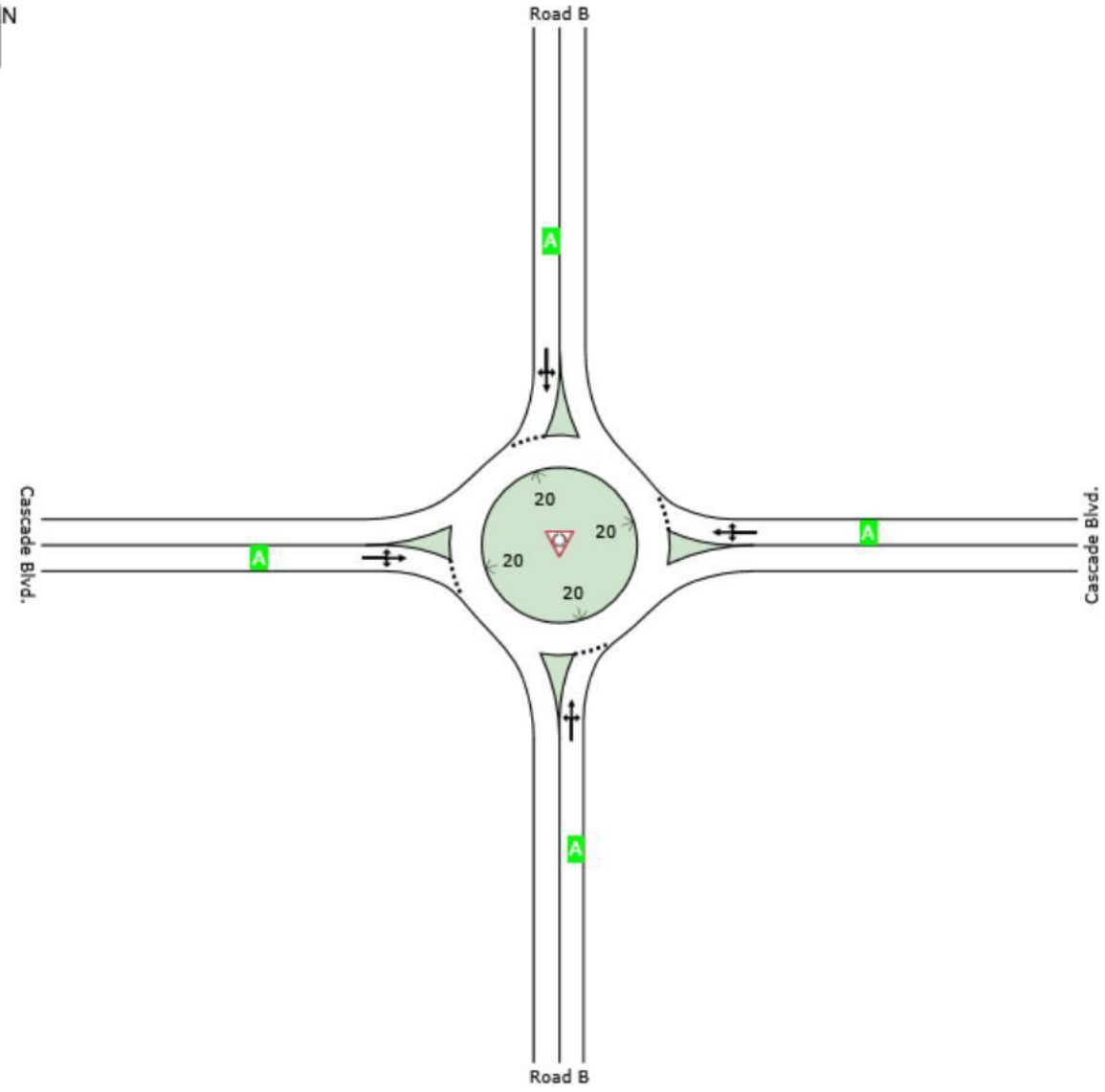
Lane Level of Service

Site: 1 [Road B and Cascade Blvd._PM Peak Hour - Copy]

New Site
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	A	A	A



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [Road B and Cascade Blvd._PM Peak Hour - Copy]

New Site
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Road B													
Lane 1[d]	69	3.7	943	0.073	100	6.1	LOS A	0.4	2.9	Full	500	0.0	0.0
Approach	69	3.7		0.073		6.1	LOS A	0.4	2.9				
East: Cascade Blvd.													
Lane 1[d]	180	2.0	1315	0.137	100	4.2	LOS A	0.7	5.3	Full	500	0.0	0.0
Approach	180	2.0		0.137		4.2	LOS A	0.7	5.3				
North: Road B													
Lane 1[d]	23	3.2	1189	0.019	100	5.1	LOS A	0.1	0.7	Full	500	0.0	0.0
Approach	23	3.2		0.019		5.1	LOS A	0.1	0.7				
West: Cascade Blvd.													
Lane 1[d]	642	2.0	1472	0.436	100	3.3	LOS A	3.2	22.7	Full	500	0.0	0.0
Approach	642	2.0		0.436		3.3	LOS A	3.2	22.7				
Intersection	914	2.2		0.436		3.8	LOS A	3.2	22.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Appendix D - Signal Warrants and Analysis

City of Lethbridge Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Metis Trail West	Direction (EW or NS)	NS
Side Street (name)	MacLeod Drive West	Direction (EW or NS)	EW
Quadrant / Int #		Comments	1 hr of each peak period is equal to post-development volumes, while hrs 2 and 3 of each peak period are 1/3 of those volumes.

for Warrant Calculation Results, please hit 'Page Down'

CHECK SHEET

Road Authority:	City of Lethbridge
City:	Lethbridge
Analysis Date:	2015 Jun 15, Mon
Count Date:	
Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Metis Trail West	NB	0	1	0	0	1	0	500	2
Metis Trail West	SB	1	0	1	0	0	1	500	1
MacLeod Drive West	WB	0	0	0	1	0	0		
MacLeod Drive West	EB	0	0	0	1	0	0		

Are the MacLeod Drive West WB right turns significantly impeded by through movements?	(y/n)	n
Are the MacLeod Drive West EB right turns significantly impeded by through movements?	(y/n)	n

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	100,000
Central Business District	(y/n)	n

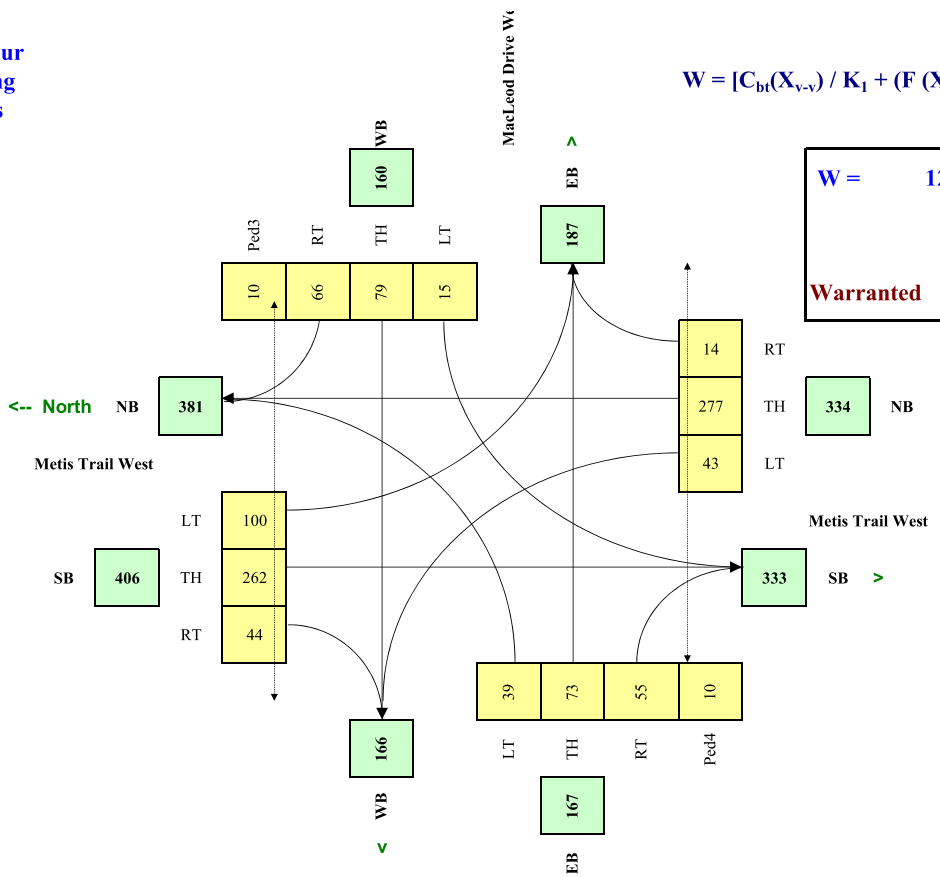
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Metis Trail West	NS	50	5.0%	n	0.0
MacLeod Drive West	EW		2.0%	n	

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
													W Side	E Side	N Side	S Side
	23	778	34	44	225	25	44	51	217	127	227	113	10	10	10	10
	8	259	11	15	75	8	15	17	72	42	76	38	10	10	10	10
press 'Set Peak Hours' Button to set the peak hour periods	8	259	11	15	75	8	15	17	66	42	74	36	10	10	10	10
	44	73	6	105	240	44	4	77	8	4	12	29	10	10	10	10
	44	73	6	105	240	44	4	77	8	4	12	29	10	10	10	10
	132	218	18	316	719	133	11	232	23	13	36	86	10	10	10	10
Total (6-hour peak)	**258**	**1,660**	**87**	**601**	**1,573**	**263**	**92**	**472**	**393**	**233**	**437**	**330**	**60**	**60**	**60**	**60**
Average (6-hour peak)	**43**	**277**	**14**	**100**	**262**	**44**	**15**	**79**	**66**	**39**	**73**	**55**	**10**	**10**	**10**	**10**

Average 6-hour Peak Turning Movements

$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\,(X_{v\text{-}p})\,L) / K_2] \times C_i$$



W =	124	108	16
		Veh	*Ped*

Warranted

RESET SHEET