# The Heights

## Neighbourhood Concept Plan
## February 2018


Associated Engineering

North Ridge
DEVELOPMENT CORPORATION

CATTERALL & WRIGHT
CONSULTING ENGINEERS

# *Contents*

# 1. Introduction

## Neighbourhood Theme

The Heights is a proposed new residential neighbourhood in the City of Swift Current (City) and is located in the north west area of the city. The neighbourhood design embraces the unique lay of the land Swift Current is gifted with.

The topography has played an instrumental role in influencing development in the city. This varied terrain provides a unique opportunity to develop interesting and natural spaces for residents and visitors to enjoy. The Heights seeks to protect and leverage the existing unique natural landscape and scenic views to create an attractive and environmentally responsible community. The neighbourhood features a comprehensive network of dedicated trails and linear parks; enabling access for residents and visitors to explore and enjoy the natural areas and vistas.

## Plan Purpose

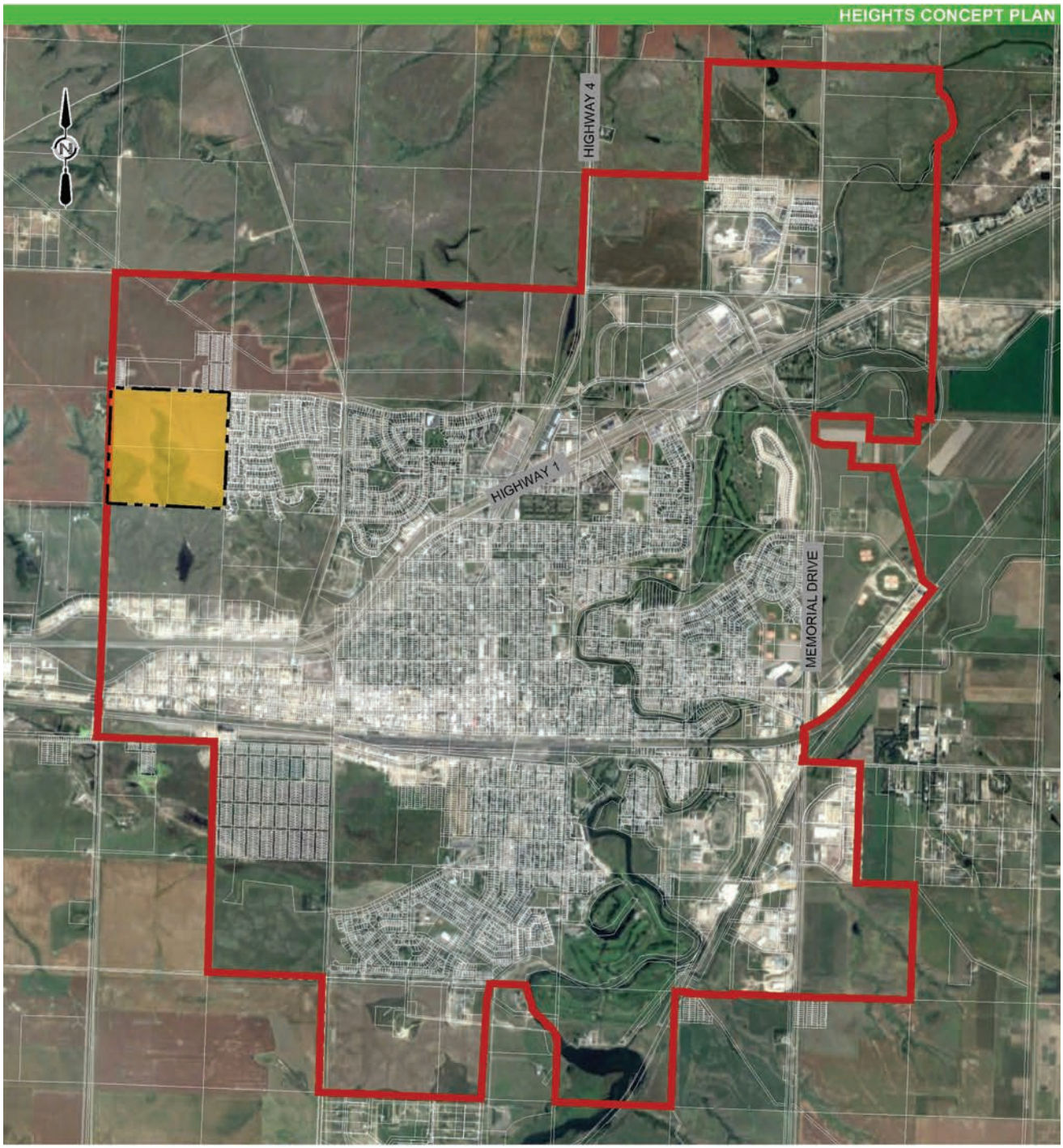
This concept plan report has been prepared on behalf of CMR Corporation. The plan is intended to provide a design basis for the future development of the plan area illustrated on Map 1.

This plan provides information relating to:

- Site conditions
- Land use
- Community integration
- Provision of open space and associated amenities
- Core infrastructure and development phasing

The plan has been prepared in conformance with the City's higher level plans including the Development Plan and the North West Urban Expansion Area Sector Plan. This plan also considers the influence of natural and physical site conditions, existing and future land uses and municipal servicing capacities.

The subject property comprises a total of 64.62 hectares of which 28.41 hectares is situated within the South Valley Natural Area as identified in the North West Urban Expansion Area Sector Plan. These low lying areas located within a coulee are considered to be environmentally sensitive lands and as such are intended to be dedicated as environmental reserve through future subdivisions.




**MAP 1 - LOCATION PLAN**

**LEGEND**

PLAN AREA

PLAN BOUNDARY

CITY OF SWIFT CURRENT CORPORATE LIMITS

SCALE: N.T.S.

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# 2. Policy Context

## City of Swift Current Development Plan

The City of Swift Current Development Plan No. 3 – 2003 (DP) is the overarching policy document guiding the orderly development of lands within the City. The DP contains the City's vision, goals, objectives and policies which need to be considered when developing in the community. The following key objectives and policies from the DP have been considered in the development of this concept plan:

***Section 3: Development Pattern***

Objectives

3.1.1 - To provide for orderly growth.
3.1.3 - To establish a form that incorporates visual variety, urban amenities, public spaces, beauty and scale to streets and buildings.
3.1.4 - To ensure the efficient and cost-effective use of land and infrastructure.

Policies

3.2.2 - To plan and stage municipal water and sewer services consistent with the demand and financial resources of the city.
3.2.3 - To encourage continued farming operations within City until the need for development is imminent.
3.2.4 - To take into account functional roadway design for major transportation corridors which incorporate mitigation measures such as noise attenuation, streetscaping, lighting and roadside vegetation.
3.2.6 - To maintain development which is compact and efficient by setting overall density guidelines for new residential areas.
3.2.7 - To ensure development takes place in a contiguous manner, in order to make the most efficient use of municipal services and community infrastructure.

***Section 4: Economy***

Objectives

4.1.1 - To encourage new development and redevelopment in the City in a manner which will improve the level of service.
4.1.2 - To encourage the location of diverse shopping, administrative, office, cultural and personal services in the City for employment opportunities.

***Section 5: Residential Development***

Objectives

5.1 - To ensure that an adequate supply of housing accommodation (in type, tenure and lifestyle) is available to meet the needs and demands of the present and future residents.

Policies

5.2.1 - To ensure orderly, contiguous development and efficient use of lands designated for residential and related uses.
5.2.5 - To provide for an adequate supply of residential housing types, lots sizes and densities which takes into account the age, family or household and economic structure of City residents.

5.2.7 - To establish annual housing targets based on the following considerations:
(a) housing mix;
(b) housing tenure;
(c) housing for Seniors;
(d) housing for low income persons; and
(e) housing for challenged citizens and those requiring supportive services.

5.2.13 - To maintain an average residential density of approximately 10.5 dwelling units per hectare.

5.2.14 - To ensure residential streets are appropriately designed so as to promote maximum traffic safety, using traffic calming measures and ensuring that local streets are served by appropriate collector and arterial streets.

5.2.15 - To ensure that any new residential subdivisions and development shall not adversely affect significant natural and archaeological features of the area.

5.2.16 - To ensure that new residential dwellings adjacent to major roadways, railways and other incompatible uses are provided with adequate buffering.

5.2.19 - To ensure that subdivision design should maintain, whenever possible, natural features such as wetlands and ravines.

5.2.20 - To appropriately integrate schools, playgrounds and open space within residential subdivision layouts.

5.2.21 - To provide that multi-unit dwellings be locate near collector and arterial streets.

***Section 8: Heritage Conservation***

Objectives

8.1 - To protect buildings, sites, districts and other unique features of the City's history and culture and to promote the interest of residents in their heritage.

Policies

8.2.1 - To investigate and research potential heritage buildings and sites.

***Section 9: Open Spaces, Parks and Recreation Facilities***

Objectives

9.1.1 - To designate and protect the unique natural features within the City for open space to meet the needs of the present and future City and area residents, visitors and tourists.

9.1.4 - To provide safe and scenic trails in public open spaces and parks.

9.1.5 - To integrate the City's trail system with existing and new neighbourhoods.

Policies

9.2.2 - To designate the Swift Current Creek, steep slopes and valleys for open space and both passive and active recreation.

9.2.6 - Open spaces, parks and recreation facilities should be linked to a continuous City wide trail system, providing access for both pedestrians and cyclists.

***Section 10 Transportation***

Objectives

10.1.1 - To provide an efficient, convenient and safe transportation system that will accommodate vehicles as well as encourage alternate forms of transportation such as public transit, walking and cycling.

10.1.2 - To plan future road, transit and parking facilities as part of a total integrated transportation system consistent with the land use and Development Pattern.

Road Policies

10.2.2 - (j) The right-of-ways, design of new streets and the reconstruction of existing streets shall take into consideration:

(i) the requirements for pedestrian movements;
(ii) construction of bicycle paths where warranted and feasible;
(iii) visual and noise impact; and
(iv) landscaping and tree planting.

10.2.2 - (m) Appropriate design considerations are utilized to ensure that development is supported by cost effective and functional transportation services (streets, trails, sidewalks, public transit, etc.).

10.2.2 - (n) Neighbourhood design shall be required to meet the diverse transportation needs of pedestrians, cyclists, public transit rider, and private vehicle drivers.

10.2.2 - (r) The needs of pedestrians and cyclists are integrated into the planning and design of transportation facilities. In general, pedestrians should be provided with adequate sidewalks, walkways, crosswalks, lighting and street furniture. Pathways through linear parks should be safe for both pedestrians and cyclists.

10.2.2 - (s) The needs of the physically challenged shall be incorporated into the design of transportation facilities.

10.2.2 - (t) Vehicle and pedestrian traffic should be separated by using the appropriate siting of sidewalks and City pedestrian bicycle trails.

Public Transit Policies

10.3.2 - (b) The planning of public transit routes will take into account the location of:

(i) major employment and retail concentrations;
(ii) the concentration of higher density;
(iii) schools, major medical and social service centres; and
(iv) housing developments for seniors and challenged citizens.

The concept plan is considered a third tier plan which is required to be prepared in conformity with the overall objectives and policies represented within the DP. It is anticipated that this concept plan reports land-use, circulation, and infrastructure plan maps will be adopted by resolution of Council and appended as a schedule to the DP. This report will be used to provide textual background to support the mapping appended to the DP.

## City of Swift Current North West Urban Expansion Area Sector Plan

The North West Urban Expansion Area Sector Plan, April 2015, (NW Sector Plan) is a second tier policy document building on the direction provided in the City's DP; presenting more detailed direction concerning the development of land within the northwest sector of the City. The NW Sector Plan establishes a framework for decisions concerning future land use distribution, transportation routing, extension of municipal services and development staging. It represents the City's vision, principles, objectives, and policies related to growth and development for the lands within this specific area of the city.

The NW Sector Plan includes lands within the Highlands, Trail and Heights development area. The Heights development area is located at the height of land within the NW Sector Plan. The development area is considered an extension of the existing developed Highlands and Trail neighbourhoods. As an extension, it reinforces the need to pay particular attention to the existing community interface when planning for new development within the subject property to ensure land use compatibility and connectivity is promoted.

Low density residential is the predominant land use envisioned within the Heights. The NW Sector Plan anticipates higher density development will be situated in the immediate vicinity and as a complement to

the planned commercial hub to be located at the intersection of 11th Avenue Northwest and Battleford Trail.

A new elementary school site is planned to locate on a 8 hectare parcel of land situated north of Battleford Trail and along Highland Drive NW. This facility represents a significant amenity to the area.

The NW Sector Plan identifies a trail corridor linking the South Valley Natural area to the proposed elementary school site and the North Valley Natural Area. This corridor is intended to facilitate active transportation in the area; minimizing potential conflicts between pedestrians, cyclists and vehicles. The following key principles and policies from the NW Sector Plan have been considered in the development of the concept plan:

***Orderly & Efficient Expansion Policies***

5.4.2 - Concepts shall be built with activity hubs and nodes that facilitate planned and chance social interaction.
5.4.18 - 10 % municipal reserve dedication is required for residential developments
- 5% municipal reserve dedication is required for non-residential developments
5.4.19 - Parks & trails shall include accessible elements and be adaptable to provide long term flexibility of the space.
5.4.20 - Landscaping to include drought resistant species in parks and open spaces.
5.4.24 - Tot parks should be equally distributed and range in size from 0.5 to 1.5 ha.
5.4.25 - Storm utilities and utility corridors shall accommodate passive recreation opportunities.
5.4.26 - Storm management facilities that include recreation opportunities shall relieve MR credit for 20% of the entire area set aside for the storm facility.

***Diverse & Inclusive Neighbourhood Policies***

5.5.1 - Low density shall provide housing forms that primarily consist of single detached I Semi-detached.
5.5.2 - Medium density shall provide a range of housing forms such as row housing, town housing, cluster developments, and apartment complexes.
5.5.3 - Medium density sites shall be located adjacent to arterial and collector roads.
5.5.4 - Need and location of affordable housing will be determined during each development phase with the city, public, and private organizations.
5.5.5 - Concept plans are required to identify community needs and potential sites to be used for supportive housing.
5.5.6 - Heights Development area will consider the existing development in the Highlands and Trail Development area to encourage and integrate the two areas.

***Safe Neighbourhood Policies***

5.6.1 - CPTED principles shall be employed in the design of public and private spaces.
5.6.5 - Roads shall be designed to accommodate safe and efficient delivery of protective services and emergency services.

***Walkable & Connected Neighbourhood Policies***

5.7.1 - Dwellings adjacent collector and local roads will be orientated to the road to create desirable and walkable streets.
5.7.3 - The road pattern should be grid or modified grid to provide alternate routes and link community destinations.

5.7.4 - Distribution of trails, nodes, and connectivity between parks shall be generally consistent with recommendations from the Chinook Plan.
5.7.5 - Where roads and key pedestrian crossing, intersect, special attention will need to be provided at these crossings.
5.7.7 - Road planning and design should incorporate elements of complete streets.
5.7.8 - Pedestrian & bicycle infrastructure should be considered in key trail and road corridors.
5.7.9 - Concepts shall ensure multiple links from the neighbourhoods to trail heads.
5.7.10 - Concepts shall consider efficient multi-modal transportation linkages between residential development and destinations within and outside the plan area.

***Neighbourhood with a Sense of Place Policies***

5.8.1 - Development shall integrate existing terrain into design to emphasize natural characteristics and establish unique character and superior views, and open spaces.

***Protection of the Environment Policies***

5.9.1 - Strive to maintain natural drainage patterns.
5.9.2 - Employ mitigative measure to ensure that construction debris and erosion is limited.
5.9.3 - Ground disturbance must be done in accordance with Migratory Birds Convention Act.
5.9.5 - Complete a biophysical assessment of the site.
5.9.6 - Confirm heritage resources on site.
5.9.7 - Complete a preliminary geotechnical investigation.
5.9.9 - Creek valley and upland slopes greater than 15% shall be dedicated as environmental reserve.
5.9.12 - Local roads should be aligned to allow for dwellings to benefit from solar orientation.
5.9.13 - All natural lands shall be dedicated as environmental reserve.
5.9.14 - Low impact passive recreation opportunities can be located in natural areas.

As a third tier plan, the concept plan is required to be prepared in conformity with the principles, policies, and content represented within the NW Sector Plan. This concept plan reports land-use, circulation, and infrastructure plan maps will consider and be consistent with the NW Sector Plans various report figures.

## City of Swift Current Servicing Master Plan

To understand the existing infrastructure near the proposed development, Catterall & Wright Engineering obtained infromation from a variety of sources including record drawings, the City of Swift Current Servicing Master Plan (SCSMP) as well as the City of Swift Current North West Urban Expansion Area Sector Plan (NWUEASP). A site visit was also conducted to visually assess the property.

## City of Swift Current Zoning Bylaw

The City of Swift Current Zoning Bylaw No. 24/2014 is a regulatory companion document to the City's DP which contains specific regulations and standards for the implementation of the Development Plan policies. The future development of the Heights neighbourhood will be governed by the application of the zoning regulations associated with the intended zoning districts to be applied within the plan area.

# 3. Site Inventory and Analysis

## Existing Site Features and Topography

The subject property is registered to Ryco Holdings Limited and includes LSD 3, 4, 5, and 6 located in the SW 35-15-14-W3M. The plan area encompasses 64.62 hectares of land but only 36.21 hectares, known as the uplands, is considered to be developable. The uplands has been traditionally cultivated agricultural land while the lowlands within the coulee have remained relatively natural and undisturbed.

The subject property is bound by Battleford Trail to the north, the Highland and Trail neighbourhoods to the east, the South Valley Natural Area to the south, and undeveloped agricultural land to the west. Existing road connections leading into the subject property include Highland Drive, Hamilton Drive and Battleford Trail. A pedestrian walkway that cuts through the residential block along Prestwick Drive provides the only formal pedestrian connection into the Heights from developed lands to the east.

The upland area is relatively flat with a gradual slope from north to south towards the coulee. Geodetic elevations within the upland area range between 810 and 792 metres. Lands within the lowland coulee are more variable in terms of topography but generally slope to the south with a minimum ground elevation of 766 metres at the coulee bottom. Along the coulee bottom, there appears to be several trails and loop tracks. The area wihtin the coulee bottom appears to have been used informally for activities such as bmx biking, motocross, or hiking. Also, based on a site inspection, there appears to be some old vehicles and other waste materials along the bottom of the coulee.

A preliminary geotechnical investigation was performed for the subject property by Ground Engineering in July 2015. This investigation was intended to characterize the physical properties of the site and confirm its suitability for development. This investigation concluded that the upland area is suitable to accommodate residential development as per the following recommendations:

1. Residential development should maintain a minimum 10 metre setback from the edge of the ravine where the base of the ravine is at or above geodetic elevation of 785.0 metres. Where the ravine is below geodetic elevation of 785.0 metres, a minimum setback of 20 metres is recommended.
2. Residential development is not recommended in the central "peninsula" extending into the ravine due to risks associated with soil instability.
3. Residential buildings may be supported on either bored concrete piles or shallow footing type foundation systems. Landscaping should maintain a 3 % slope away from perimeter of all buildings.
4. Water should be encouraged to drain off the property, no water ponding on slopes, and natural drainage course should be maintained as best as possible.
5. Ravine slopes are highly susceptible to erosion. Removal of existing vegetation should be prohibited.
6. The final subdivision layout and grading plans should be reviewed by Ground Engineering prior to construction.

A copy of the preliminary geotechnical investigation is attached to this report as Appendix A.

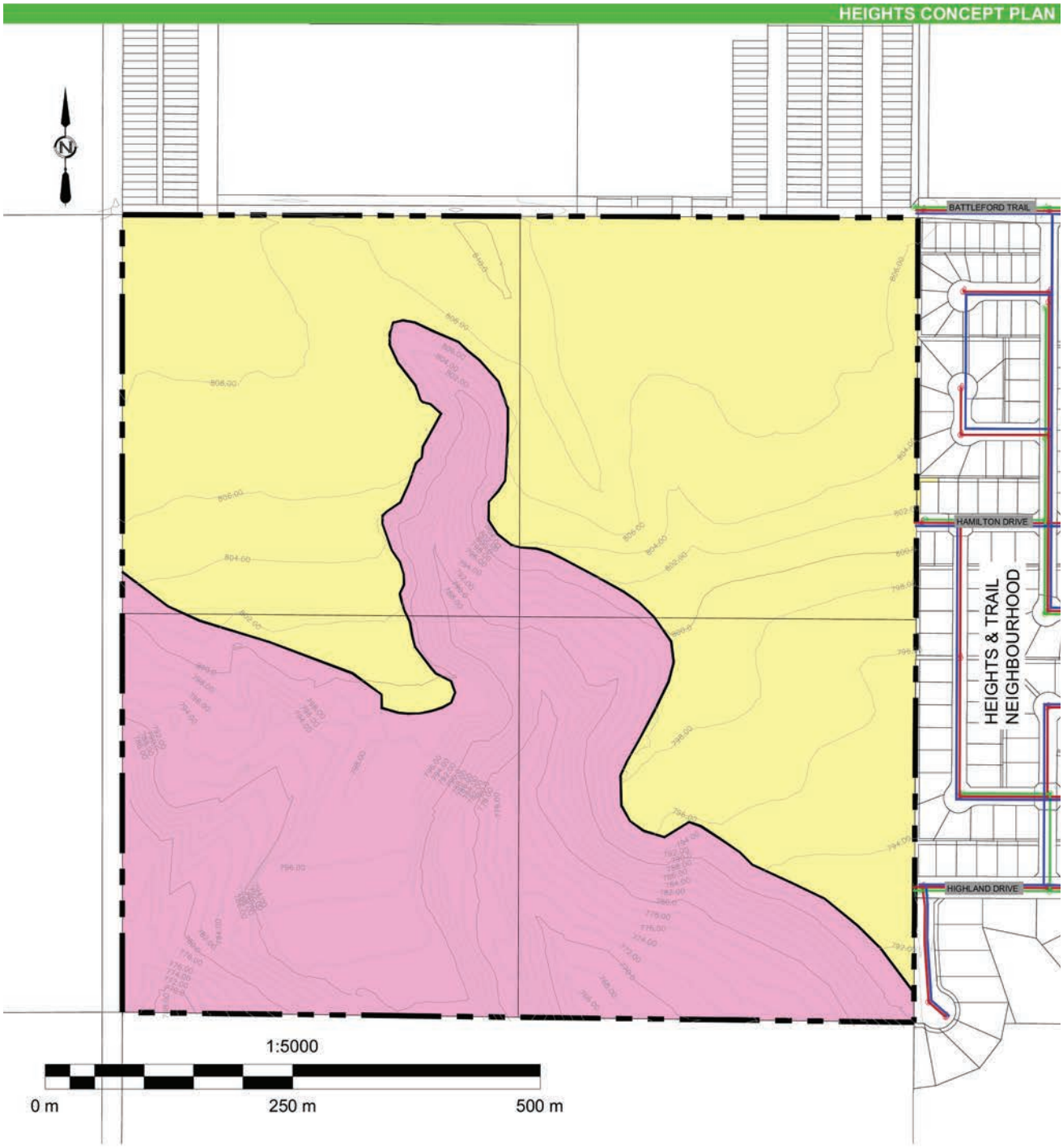
## Adjacent Land Uses

Land to the north of the site is predominantly undeveloped farmland with the exception of two SaskTel radio transmission towers, a farmstead including a quonset and grain bin. Development to the east consists of predominantly single detached residential dwellings located in the Highland and Trail neighbourhoods. The adjacent built-up residential areas includes some medium density development along 11th Avenue Northwest and Battleford Trail. Medium density development in the adjacent neighbourhoods comprises mainly semi-detached, three-plex and four-plex buildings. Medium density development in the area is predominantly located within comprehensively planned sites which feature privately owned internal roads, sidewalks and green spaces. The medium density developments are estimated to comprise a density of 31.5 units per net hectare. The low density developments to the east comprise an average density of 12 units per net hectare.

The Highland and Trial neighbourhoods feature a 6 hectare park space known as Highland Park. It is located approximately 430 metres east of the subject property along Highland Drive. This neighbourhood scale park space supports both passive and active uses including: tot sized soccer pitches, a full size soccer pitch, a football field, a paved outdoor skating rink, a basketball court, playground equipment, a splash pad, benches, garbage receptacles, and washroom facilities.

Southern lowlands are known as the South Valley Natural Area. This area consists of steep slopes, grasslands and drainage courses, and include a dirt bike track to the southeast. There is a natural low lying area which collects and stores run-off water along the bottom of the coulee. Based on a review of historical imagery for the area, it appears this natural lowland has acted as a reservoir; collecting and storing runoff from surrounding upland areas.

Development to the west of the subject property includes a single farmstead, cultivated agricultural land, and the continuation of the South Valley Natural Area.




**MAP 2 - EXISTING CONDITIONS**

**LEGEND**

SCALE: N.T.S.

| | | | |
|---|---|---|---|
| CONCEPT PLAN AREA | | CONTOURS | 794.00 |
| TOP OF BANK | | EXISTING WATER LINE | |
| UPLANDS | | EXISTING SANITARY SEWER LINE | |
| LOWLANDS | | EXISTING STORM SEWER LINE | |

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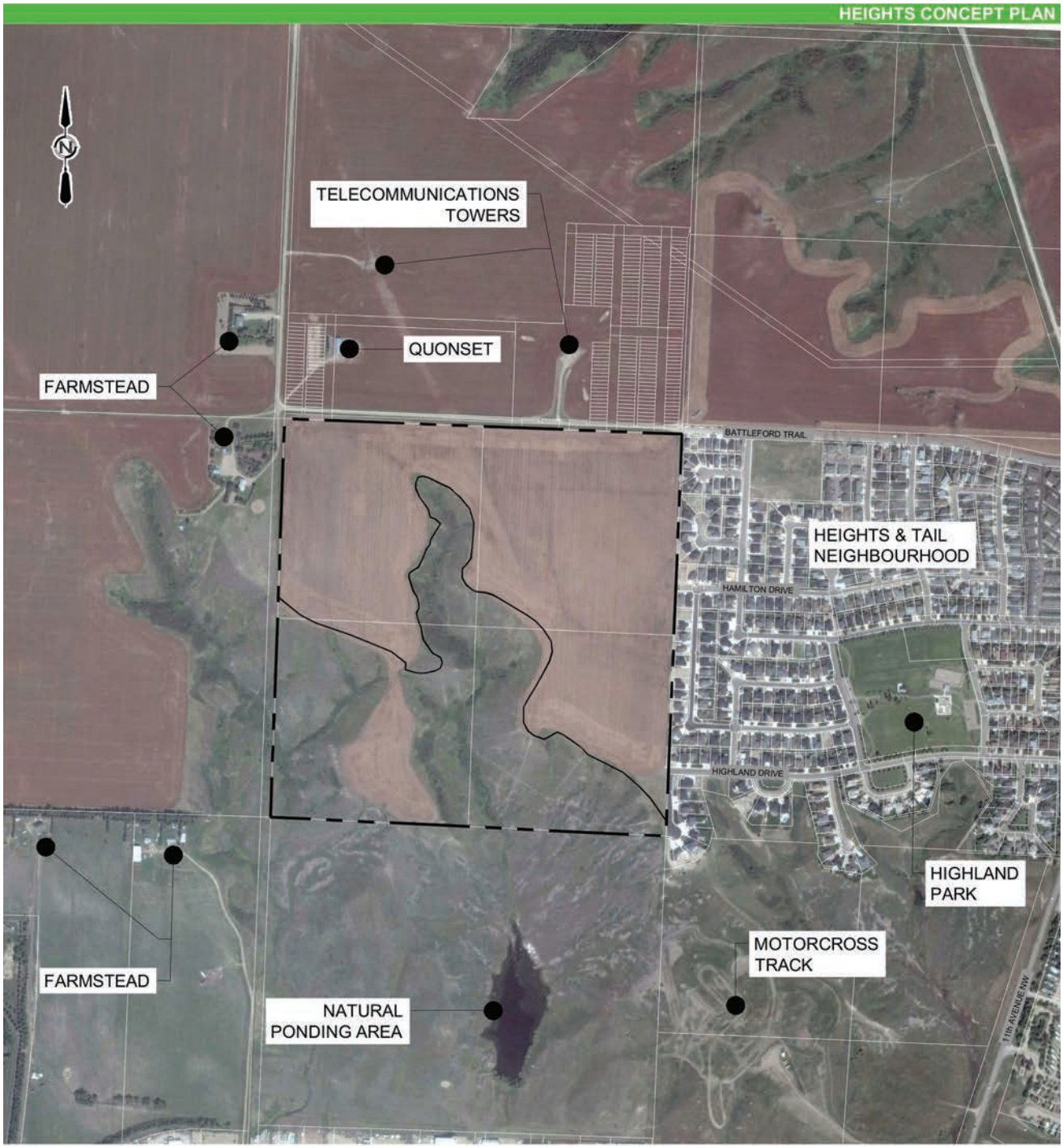


**MAP 3 - EXISTING LAND USES**
**LEGEND**

CONCEPT PLAN AREA

TOP OF BANK

SCALE: 1:10000

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## Heritage Resources

The City of Swift Current is committed to the protection of historic, archaeological and other cultural features and sites from incompatible development. The Heritage Conservation Branch of the Ministry of Parks, Culture, and Sport governs heritage resources in the province. The Heritage Conservation Branch provides an on-line searchable database which can be accessed by users to determine whether a parcel of land potentially contains heritage resources. Where this potential is identified, a copy of the development concept for the property must be submitted for comment by their office to confirm the need for any additional investigation.

A query was performed of the on-line database and the results of the inquiry are attached as Appendix B. The query confirmed that additional screening was necessary for the subject property either as a result of known archaeological resources or on account of insufficient data for the property. Section 5.63 of *The Heritage Property Act* considers the presence of previously recorded heritage sites, the area's overall heritage resource potential, the extent of previous land disturbance and the scope of new proposed land development in determining the need for, and scope of a Heritage Resource Impact Assessment (HRIA).

Further screening confirmed that the site is not considered to be heritage sensitive. A heritage clearance was subsequently issued by the Heritage Conservation Branch confirming that development within the subject property could proceed without any additional investigation required. A copy of this clearance letter is attached to this report as Appendix B.

## Environmental Resources

The City of Swift Current is committed to the protection of significant environmental resources such as rare or endangered species and wildlife. The NW Sector Plan included a Regional Environmental Setting report which comprised a desktop review of the terrain and soils, vegetation, wetlands and water resources, wildlife, and heritage resources within the sector plan area. This report recommended completion of additional site specific studies during the concept plan process to build on these desktop findings.

Associated Environmental completed a biophysical field assessment for the development area on August 24th, 2017. This assessment was intended to confirm any additional consideration that should be made in these areas in advance of development. Below is a description of the findings from the assessment.

The coulee slopes allow surface drainage to flow southward from upland areas into a larger pond on NW 26-15-14-W3 that has been dammed on its south boundary. The coulee has a dense cover of shrubs, snowberry and wolf willow in lower areas and on north facing slopes. The majority of the coulee is dominated by areas of native grassland, needle and thread grass, blazing star, slender wheat grass, sedge species with larger patches of non-native grasses, smooth brome grass and Kentucky bluegrass. The coulee is generally undisturbed with the exception of several informal trails which are present.

Two dirt bike loops and some pieces of garbage (e.g. metal scrap, three car bodies, wooden pallets, old car battery, etc.) were observed within the coulee. A barb wire fence was also present along the south boundary of the low lands. Three Swainson's hawks were flying overhead during the site visit in this area, no nesting activities were observed.

Upon review of the Saskatchewan Conservation Data Center's HABISask website, three protected plant species have historical occurrences within 1 km of subject property. These species include crowfoot violet, few-flowered oat grass, and narrow-leaved water plantain. There were all provincially ranked as uncommon (S3). As the uplands have been under active agricultural production and are no longer in a natural state, there is no suitable habitat present for these species to exist within the cultivated area being

considered for development.

Based on the field inspection, no protected species are known or have the potential to occur within the plan area. The annual disturbance of growing a crop has limited the potential for these plant and animal species to occur in this area. No additional environmental sensitivities (wetland or native grassland) were identified within the plan area and no further environmental investigation is recommended at this time. Measures to minimize environmental impacts (e.g. sediment and erosion control) are recommended to be applied during construction to reduce potential impacts to this nearby coulee and existing residences.

## Shallow Utilities

SaskEnergy supplies natural gas services for the area. The NW Sector Plan confirmed that there is sufficient capacity in the existing network to service the subject property.

The City of Swift Current Light and Power Department is involved in the design and distribution of power to the subject property. The NW Sector Plan confirms there is sufficient capacity to service the subject property.

There are several options available for providing telecommunication services to the residential and commercial developments in the area. Based on the NW Sector Plan both SaskTel and Rogers are capable of servicing the area. Further investigation of options for delivery of these services will be completed during the detailed design phase of the project.

# 4. Land Use Strategy

## Design Basis

The NW Sector Plan identifies the area situated west of the Highland and Trail neighbourhood as best suited for the continued extension of residential development.

The core planning principles and policies used to inform the preparation of the NW Sector Plan have been used as a basis for defining the overall vision and design objectives for the plan area. The vision for the Heights is best described by the application of the following design objectives:

- To promote positive integration with the adjacent neighbourhood
- To promote the development of a walkable and well connected neighbourhood designed to enable safe and efficient access for all users
- To promote the development of a diverse and inclusive neighbourhood that accommodates a variety of land uses and housing options
- To promote a smart neighbourhood design which is efficient, safe, and economically serviced
- To protect and enhance the views and natural landscape of the South Valley Natural Area

## Land Use Distribution

The neighbourhood will contain a full range of housing forms including single-unit detached with no lanes, single unit detached with lanes, street orientated townhouses, comprehensively planned dwelling group townhouses, and the potential for medium density apartments. As represented in the NW Sector Plan, development within the plan area is intended to generate residential populations to support the planned commercial development along Battleford Trail and 11th Avenue NW.


Low density residential development consisting of single detached dwellings is the predominate form of planned residential development within the plan area representing approximately 54.9% of the planned units. A variety of lot widths are to be provided to satisfy market demands and to support housing accessibility for a broad population. The range of housing forms within the neighbourhood is intended to support a sustainable neighbourhood life cycle that can meet the basic housing requirements of individuals and families at different stages in their lives, including varying income levels and household size.

Medium density residential development in the plan area represents approximately 20.3% of the planned residential housing units in the Heights neighbourhood. This calculation assumes that one of the swing sites within the plan area are developed as medium density. This form of development will predominantly comprise street orientated and comprehensively planned town housing which is consistent with the NW Sector Plan. The NW Sector Plan estimates that up to 13% of the land area provided for housing may represent multi-unit dwellings. Medium density development within the plan area is intended to be situated along the key transportation corridors, near the proposed elementary school and near the commercial lands to provide shorter walking distances for residents. Comprehensively planned medium density areas will be developed with privately owned internal roadways to minimize driveway access along the municipal roadways.

Higher density development is intended to present a more vertically orientated form of development represented by apartment style buildings up to four-stories. An increased density would provide sufficient local population to assist in supporting shops and services along the planned commercial corridor and the school site as represented in the NW Sector Plan. If the market demand is directed towards high density development then one of the swing sites will enable the opportunity to develop apartment style buildings up to four-stories.

Two swing sites have been introduced into the plan area to accommodate changing community demographics and to respond to changing local market conditions. The intention of providing swing sites within the plan area is to provide the developer and the City with the flexibility to consider either medium or high density residential or commercial

development in a location where the road network has sufficient capacity to accommodate either intensity of development.

The internal road network follows a modified grid pattern wherever possible to facilitate convenient pedestrian access to key destinations within the broader plan area including the South Valley Natural Area and the proposed new elementary school sit. Block lengths have been designed to promote walkability by maximizing the number of available pedestrian and vehicle routes available. This results in shorter trips and less frequent vehicle and pedestrian interactions. Effective pedestrian navigation is also supported through the provision of sidewalks and trails.

Traffic calming measures may be incorporated at strategic locations within the plan area where more frequent pedestrian and vehicle interactions are anticipated and where the active transportation component is intended to preside. Traffic calming measures to be utilized within the plan area will be designed to suit the location and circumstances and may include any or a combination of curb extensions, pedestrian islands, raised and ground level cross walks, signage and flashing pedestrian crosswalk beacons. The details concerning the location and type of traffic calming measures to be employed will be confirmed during the detailed design phase of the project.

Where practical, rear laneways have been provided to offer opportunities for the development of laneway housing, secondary suites and garden suites. Rear laneways facilitate rear property access allowing for a continuous and uniform sidewalk and street frontage.

The block layout maximizes an east/west orientation to enable homeowners to take advantage of passive solar gains as part of a localized alternative energy scheme including heating, lighting or electrical generation.

## Summary Development Statistics

| Heights Land Use Statistics | | | | |
|---|---|---|---|---|
| **Land Use** | | | **Area (ha)** | **%** |
| | | | | |
| **Total Plan Plan Area** | | | 64.62 | 100.00 |
| **South Valley Natural Area (Environmental Reserve Dedication)** | | | 28.41 | 43.96 |
| **Gross Development Area** | | | 36.21 | 56.04 |
| | | | | |
| **Heights Gross Development Area** | | | 36.21 | 100.00 |
| | | | | |
| **Low Density** | | | 21.00 | 58.00 |
| **Medium Density** | | | 1.87 | 5.16 |
| **High Density** | | | 1.79 | 4.94 |
| **Swing Site** | | | 1.33 | 3.67 |
| **Parks and Open Space (Municipal Reserve Dedication)** | | | 2.11 | 5.83 |
| **Roads** | | | 8.11 | 22.40 |
| | | | | |
| **Total Net Development Area** | | | 25.99 | 71.78 |
| | | | | |
| **Residential Units and Population** | | | | |
| | | | | |
| **Low Density Area (ha)** | | | 21.00 | |
| **Low Density Dwelling Units** | **Units/Net Hectare** | **16.5** | 347 | |
| **Low Density Population** | **People /Dwelling Unit** | **3.1** | 1074 | |
| | | | | |
| **Medium Density Area (ha)** | | | 1.87 | |
| **Medium Density Dwelling Units** | **Units/Net Hectare** | **40** | 75 | |
| **Medium Density Population** | **People/Dwelling Unit** | **1.9** | 142 | |
| | | | | |
| **High Density Area (ha)** | | | 1.79 | |
| **High Density Dwelling Units** | **Units/Net Hectare** | **88** | 158 | |
| **High Density Population** | **People/Dwelling Unit** | **1.2** | 189 | |
| | | | | |
| **Swing Site Area (ha)** | | | 1.33 | |
| **Swing Site Dwelling Units** | **Units/Net Hectare** | **40** | 53 | |
| **Swing Site Population** | **People/Dwelling Unit** | **1.9** | 101 | |
| | | | | |
| **Total Area (ha)** | | | 26.85 | |
| **Total Dwelling Units** | **Units/Net Hectare** | **25** | 632 | |
| **Total Population** | **People/Dwelling Unit** | **2.3** | 1506 | |
| | | | | |

## Swing Sites

The Heights includes two proposed swing sites intended to build flexibility into the plan to respond to changes in the market in the future. The two sites are intended to be developed as either medium or high density residential or as commercial land use. The use of a swing site designation allows for the form of development of these sites to be determined prior to subdivision based on the current market conditions.

In the situation where the swing sites are developed for residential use, these sites will be comprehensively planned units which include privately owned internal access and greenspace areas. These types of residential developments are best situated along higher order roadways such as Battleford Trail to accommodate the higher volumes of traffic generated by higher density development. These sites are often located along transit routes and in proximity to neighbourhood amenities and employment areas to maximize walkability.

If market conditions support the development of high density residential development, the westernmost swing site would be considered to be most appropriate to host low rise apartment style buildings up to four-stories tall. Similar to medium density developments, higher density developments are usually located along collector roadways which can accommodate the associated transportation requirements. Low-rise apartment development provides residents with the ability to enjoy the natural vistas provided by the coulee and South Valley Natural area.

In the event the market supports local commercial development in the neighbourhood, the westernmost swing site provides the best opportunity to meet this need. The types of commercial developments envisioned for the area include: a grocery store, gas station, liquor store, and a strip mall style building that provides space for professional or personal services, retail, or restaurant business opportunities. These commercial uses would serve the needs of the surrounding neighbourhood. The westernmost swing site is planned to abut a comprehensively medium density residential development to the south. This enables the use of a combination of distance, building orientation, parking and landscaping to create a physical and visual separation between the land uses.

## South Valley Natural Area

A segment of the South Valley Natural Area is located along the southern boundary of the subject property and is intended to be dedicated as Environmental Reserve through the subdivision process. This lowland area is intended to remain relatively undisturbed with exception of the potential construction of a low impact trail by the City as part of the development of a broader regional trail network in the future.

Based on the NW Sector Plan, the South Valley Natural Area will remain as undeveloped land to be dedicated as environmental reserve that includes a low impact trail for public access and navigation through the area and to other parts of the City.

## Parks and Open Space

Public parks within Heights include a combination of tot lot and linear parks situated to provide residents with convenient access to open space areas. The one tot lot park provided within the plan area is sized and located to supplement rather than replicate the function of Highland Neighbourhood Park by providing a space to host a variety of spontaneous and informal outdoor recreational activities. The park space is sufficiently sized to accommodate the construction of children's playground facility.

The location of the public parks have been selected to align with the general locations established by the NW Sector Plan and their intended functions within the neighbourhood. These spaces are accessible from various locations within the surrounding neighbourhoods via a series of interconnected linear open space corridors. The same network of linear parks and pathways provide public access to the South Valley Natural Area ensuring the public is able to access and enjoy the scenery of the South Valley Natural Area while also having the ability to explore the area via the dedicated trail system.

The planned parks and open spaces for the Heights are represented on Map 5.

## CPTED Principles

Promoting a safe neighbourhood is a major consideration within the neighbourhood design process. Crime Prevention Through Environmental Design (CPTED) principles were considered and incorporated into the design of this neighbourhood. These considerations include but are not limited to the following:

- The modified grid street layout provides for shorter street blocks, open sight lines, easier way-finding and a street layout that is less confining.
- Local park spaces are designed to enable good visibility of the site interior from the surrounding streets by limiting the amount of development along its perimeter.
- Fencing around public park areas and along internal linear pathways will utilize "see through" fencing to distinguish between private and public properties and to increase natural surveillance in public areas.
- All street corners with sidewalks will have wheelchair accessible ramps.
- Traffic calming measures will be employed in areas of frequent pedestrian and vehicle interactions.

## Fire and Protective Services

The City of Swift Current values fire and protective services and wants to ensure these services are considered in the design of future developments. The City provides centralized fire and utilized RCMP for providing protective services.

***Fire Services***

The Fire Chief was contacted on September 26th, 2017 to obtain comments concerning the development of the Heights neighbourhood as it relates to the provision of fire services. The following comments were received:


- Development in this area is subject to the residential sprinkler requirement as per the City's building bylaw, section 9.3.
- Development plans must include Autoturn travel paths for the City's fire apparatus for intersections, curves, cul-de-sacs, etc. These templates are available on the City's website.

Planning and design for the water distribution network within the subject property will give due consideration to the necessity to provide adequate pressure and volumes to support sprinkler usage.

The internal road network has been designed in compliance with the City's roadway design standards which acknowledges the required turning movements referenced above.

Correspondence from the Fire Department is reproduced in Appendix C.

***Protective Services***

The Swift Current City RCMP Detachment was contacted on September 29th, 2017 to discuss the proposed residential development and to provide an opportunity to comment from a protective services perspective. Based a conversation with the Support Staff Manager of the Swift Current City RCMP Detachment the following comments were received:

- The Swift Current City RCMP would provide service to this area.
- Without knowing what additional service you are seeking as far as an emergency our members would be responding to calls in that area.
- We have no other concerns at this time.

Based on the response from the Swift Current City RCMP Detachment, there are no concerns in providing protective services to the proposed concept plan. Correspondence from the RCMP is attached as Appendix C.

HEIGHTS CONCEPT PLAN


**MAP 4 - HEIGHTS LAND USE CONCEPT**

**LEGEND**

| | AREA (HA) | | AREA (HA) | |
|---|---|---|---|---|
| LOW DENSITY RESIDENTIAL | 21.00 | MUNICIPAL RESERVE (PARK AND OPEN SPACE) | 2.11 | SAFE BUILDING SETBACK |
| MEDIUM DENSITY RESIDENTIAL | 1.87 | SAFE BUILDING SETBACK AREA | 2.62 | TOP OF BANK |
| SWING SITE | 3.12 | RIGHT-OF-WAY | 8.11 | FUTURE ROAD CONNECTION |
| ENVIRONMENTAL RESERVE (SOUTH VALLEY NATURAL AREA) | 28.41 | | | |

SCALE: 1:4000

Associated Engineering
Suite 1001 - 400 - 4th Avenue South, Lethbridge, Alberta, T1J 4E1
Ph: 403 329 1404 Fax: 403 329-4745
www.ae.ca

HEIGHTS CONCEPT PLAN


**MAP 5 - HEIGHTS OPEN SPACE AND TRANSPORTATION PLAN**

**LEGEND**

- ENVIRONMENTAL RESERVE (SOUTH VALLEY NATURAL AREA)
- MUNICIPAL RESERVE (PARK AND OPEN SPACE)
- SAFE BUILDING SETBACK AREA
- COLLECTOR ROADWAY
- LOCAL ROADWAY
- MUTLI-USE TRAIL
- SAFE BUILDING SETBACK
- TOP OF BANK
- FUTURE ROAD CONNECTIONS
- ENHANCED PEDESTRIAN CROSSING

SCALE: 1:4000

Associated Engineering
Suite 1001 - 400 - 4th Avenue South, Lethbridge, Alberta, T1J 4E1
Ph: 403 329 1454 Fax: 403 329 4745
www.ae.ca

# 5. Circulation Strategy

## Roadways

The transportation network within the neighbourhood is designed to operate as an integrated system; considering multiple modes of travel including pedestrians, cyclists, public transit and private vehicles. The basis for this network was established within the NW Sector Plan and refined following the establishment of the land use concept and preparation of a subsequent Traffic Impact Assessment attached as Appendix D. The transportation network recognizes the need to integrate the road and pathway layout with the existing networks to maximize inter-neighbourhood connectivity.

The internal road network has been designed based upon a modified grid pattern which combines elements of a traditional grid with a curvilinear road network. The modified grid features a network of collector and local streets orientated in a traditional grid designed to accommodate moderate levels of traffic, enhancing navigability and improving overall connectivity in the neighbourhood. The curvilinear road network allows for the road layout to take advantage of the plan areas topographical features by meandering around significant land features including the coulee. Cul-de-sacs and crescents are integrated into the concept design to provide local access to homes and to discourage shortcutting through the neighbourhood.

The plan area is accessed by two collector roads, Battleford Trail along the north boundary of the site and Highland Drive from the east. Hamilton Drive provides a third local access to the neighbourhood from the east. These collector and local roads have been extended into the plan area to provide continuity between the neighbourhoods. Battleford Trail will extend along the northern plan area boundary and will eventually connect to a future Memorial Drive highway bypass route located directly west of the subject property. Highland Drive represents the key north south roadway within the subject property. This collector is intended to be extended north across Battleford Trail in the future to provide access to the proposed new elementary school site and future development to the north.

Map 5 - Heights Open Space and Transportation Plan, identifies the hierarchy of roads and the location of the multi-use trail system.

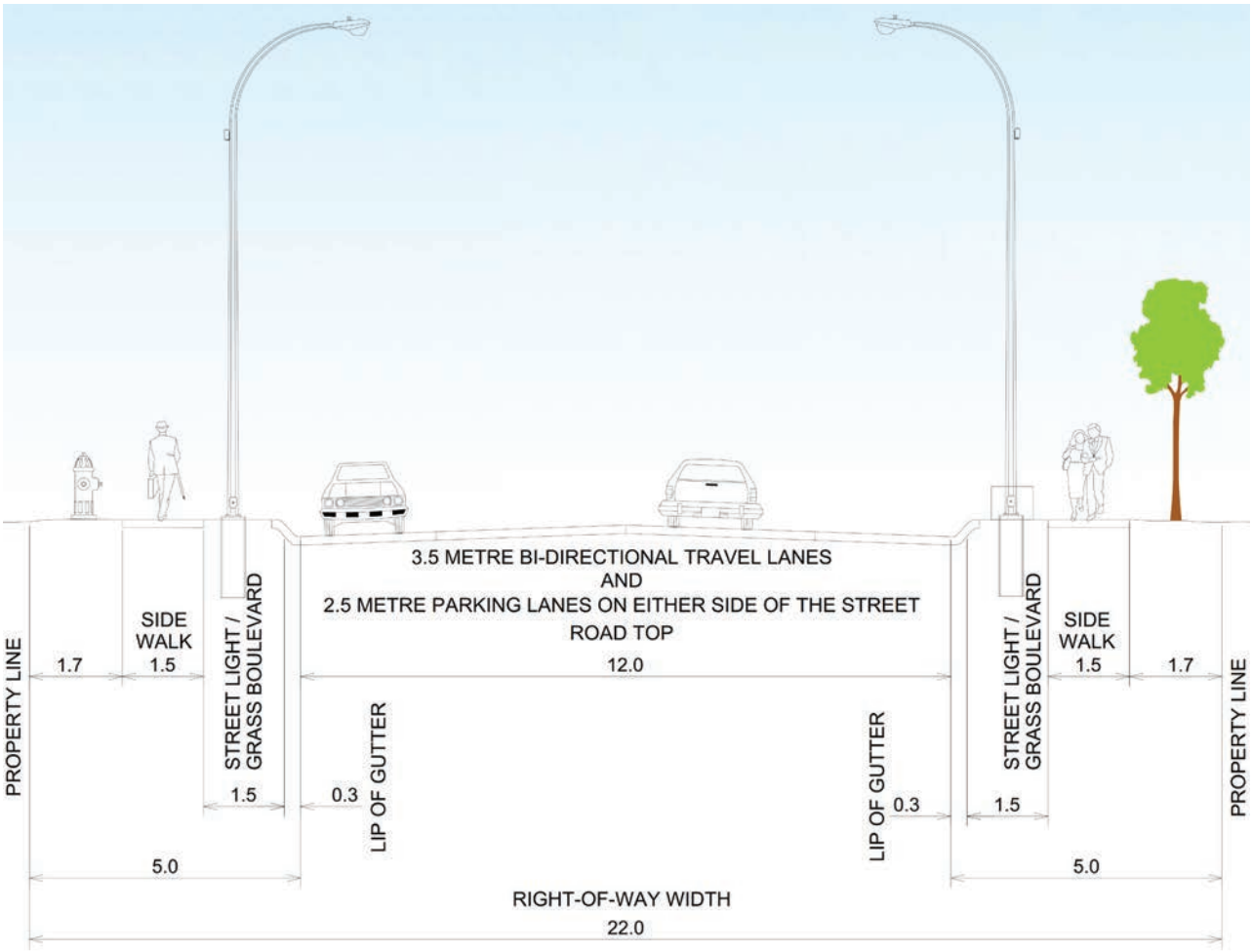
## Collector Roadways

As previously mentioned, there are two collector roads within the plan area including Highland Drive and Battleford Trail. The extension of Highland Drive through the Heights neighbourhood has been designed to be constructed within a 22-metre right-of-way according to the cross section provided below. As a collector road, direct property access is permitted along the entire street frontage. To maintain consistency with adjacent neighbourhoods this street will include sidewalks with rolled curb and gutters on both sides to accommodate pedestrians.

The sidewalks along Highland Drive will be physically separated from the roadway curb by a grassed boulevard as represented in the cross-section figure below. This creates a safer and more pleasant pedestrian experience by providing a buffer between the two types of transportation movements.

Battleford Trail will be extended along the northern plan boundary and will remain consistent with the current design of a monolithic sidewalk with rolled curb and gutter along the south side of the roadway. The right-of-way will be 25-metres wide and will accommodate an ~13-metre wide road top.

Figure 1: Collector Roadway Typical Cross Section

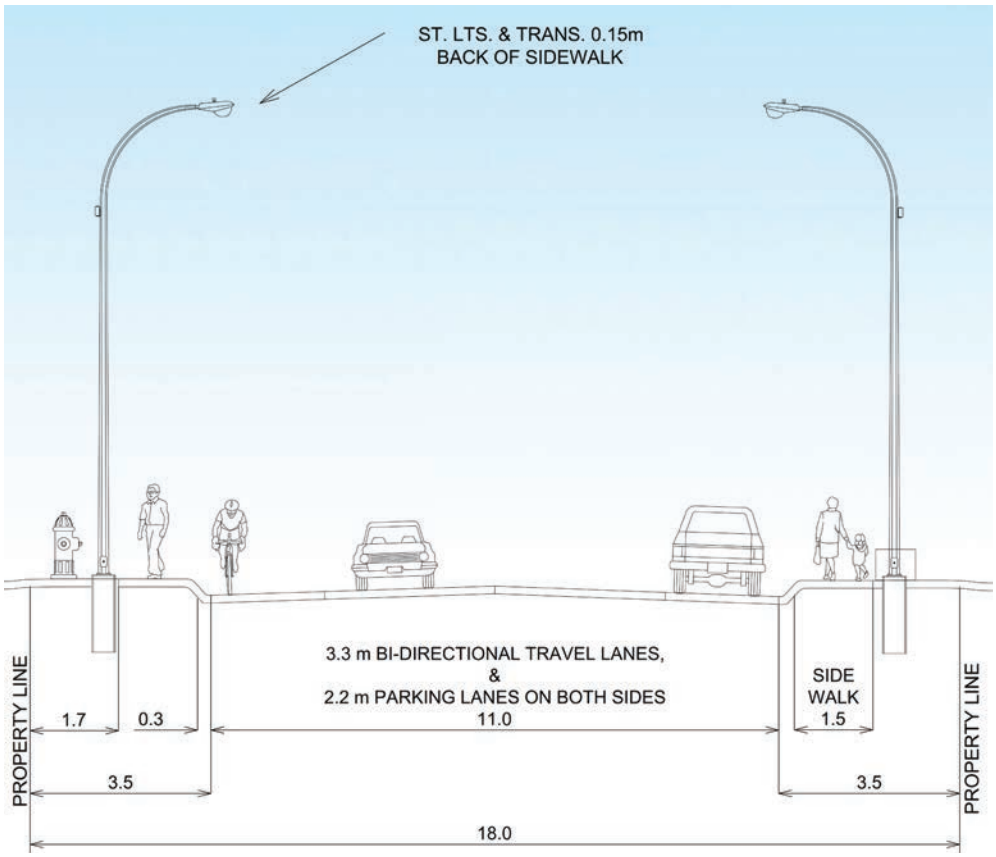



## Local Roadways

Local roads within the proposed neighbourhood are to be situated in an 18- metre right-of-way as per the City's design standards. An 11-metre paved driving surface is intended for local roadways. Cul-de-sacs will feature an 11-metre paved driving surface constructed in a 16-metre radius and with a 32-metre right-of-way provided within the bulb. All local roadways will have an urban curb and gutter cross section with integrated storm water drainage and continuous sidewalks.

A typical cross section for the local roads is represented in Figure 2.

Figure 2: Local Road Typical Cross Section




## Active Transportation

The NW Sector Plan recommends that road networks should give preference to pedestrians and cyclists over private vehicles. As such, the proposed neighbourhood includes sidewalks on both sides of local and collector streets to ensure pedestrians have multiple route options. The neighbourhood design includes an off-street trail system which transverses the South Valley Natural Area. The proposed trail is intended to connect to a future regional trail system facilitating non-vehicular access to other areas of the City.

Active open spaces, including pedestrian and cycling routes, link to jobs, homes, and local destinations. They play a key role in the creation of sustainable and healthy places. The neighbourhood features a network of interconnected linear parks and multi-use trails linking the residents to key internal and external destinations. The active transportation network offers the following sustainable advantages:

- The pedestrian trail network links to other planned external trail systems offering attractive alternatives to vehicular use; and
- Areas of potential pedestrian and vehicle conflicts have been avoided, thus encouraging pedestrian movement.

The active transportation network is illustrated within Map 5. The multi-use trails may include enhanced pedestrian crossings at points of intersection with higher volume roadways to ensure pedestrian safety.

## Traffic Impact Assessment (TIA)

A TIA has been prepared for the Heights neighbourhood to determine impacts of development on the transportation network and to provide recommended mitigation measures. The purpose of this TIA is to:

1. Determine impacts from the proposed development on the adjacent transportation network and relevant intersections.
2. Determine what measures may be required to mitigate impacts and allow the transportation network to provide a satisfactory level of service.

The study area for the TIA was determined in consultation with the City's Manager of Engineering Services. It included the following four roads and eight intersections:

*Roads*

1. Battleford Trail
2. 11th Avenue NW
3. Highland Drive
4. Hamilton Drive

*Intersections*

1. Battleford Trail and 11th Avenue NW
2. Colonel Otter Drive and 11th Avenue NW
3. Highland Drive and 11th Avenue NW
4. Battleford Trail and Central Avenue
5. Battleford Trail and Highland Drive extension
6. Battleford Trail and Hamilton Drive extension
7. Battleford Trail and Local Heights Road
8. Battleford Trail and Local Heights Road

A traffic count was conducted by Associated Engineering on September 6th and 7th, 2017 at intersections 1, 2, and 3 as described above. The City provided additional counts for intersection 4 as they requested this intersection to be added as part of the TIA.

The traffic counts indicated the majority of traffic movements are heading towards the City's employment centers, such as the downtown core and towards the east side of the city, during the AM time period. During the PM time periods, the traffic counts indicated the majority of traffic movements are heading back towards the residential neighbourhoods away from the employment centers. Based on the future traffic analysis, it appears as though traffic movements will remain consistent with the majority of traffic heading towards the City's employment centers in the AM time periods and heading towards residential neighbourhoods in the PM time periods.

The TIA provides a description of acceptable levels of service for intersections. Based on the future traffic counts and acceptable levels of service, the intersections at 11th Avenue NW and Colonel Otter and Highland Drive are expected to operate with an acceptable level of service. Therefore, the TIA recommends no changes to these intersections.

However, the other two intersections that were reviewed as part of the TIA are expected to be operating at unacceptable levels of service. The TIA recommends the following mitigation measures for both these intersections:

- 11th Avenue NW and Battleford Trail recommended mitigation strategy is to install a four-way stop and to create additional lanes by prohibiting parking in the curb lanes of Battleford Trail for a

distance of at least 50 metres back from the stop bar.
- Battleford Trail and Central Avenue recommended mitigation strategy is for the City to conduct a functional planning study for this intersection in the next 15-20 years.

The TIA recommends that stop signs be installed for any new intersections along Battleford Trail. The TIA also recommends the installation of yield signs on all streets intersecting Highland Drive from within the plan area.

The TIA report can be reviewed in its entirety in Appendix E.

# 6. Servicing Strategy

Catterall & Wright Engineers were contracted to plan and design a servicing strategy for the neighbourhood based upon their review of available background data including but not limited to record drawings, the Swift Current Servicing Master Plan (SCSMP) as well as the City of Swift Current North West Urban Expansion Area Sector Plan. A site visit was also conducted to visually assess the property.

## Sanitary Sewer System

The City of Swift Current provides a gravity sewer system that is available to connect to for future developments in the North West Sector. The natural drainage of the proposed development parcel is from northwest to southeast. Due to this elevation change across the property it is most practical to service the neighbourhood via a gravity sanitary sewer that would flow into the sanitary sewer system on Highland Drive.

There is currently a 250 mm diameter sanitary sewer on Highland Drive that the property could be serviced to. The SCSMP indicates that the sanitary sewer on Highland Drive is only using 25 % of its capacity. The capacity of this sewer main is approximately 56 litres per second (l/s) under full flow conditions. If the current developments are only using 25 % of the sewer capacity on Highland drive, then there would be approximately 42 l/s of capacity remaining. Preliminary estimates of the peak design flow for the subject property indicate that there is sufficient capacity to support the full development flowing to the connection on Highland Drive. There is also an available sanitary connection point at Hamilton Drive. The north east portion of the proposed development would drain by gravity to Hamilton Drive and the remainder of the development would drain to the Highland Drive system.

The Phase 6/7/8 areas will drain by gravity to a sewage pumping station (SPS) in the southeast corner of Phase 4 and then pumped through a force main that will be connected to the gravity system at the interface between Phase 4 and Phase 5. To minimize the impact on the park space in the development, a below grade lift station package is recommended, with a simple control panel that would be accessible above grade.

## Water System

There are three available connection points into the existing water distribution system consisting of an existing 250 mm water line in the southeast corner of the plan area on Highland Drive, a 300 mm water line at Hamilton Drive and a 250 mm on the northeast corner of the development on Battleford Trail. All three of these lines will be connected to during the development of the subject property to improve flow conditions throughout the area.

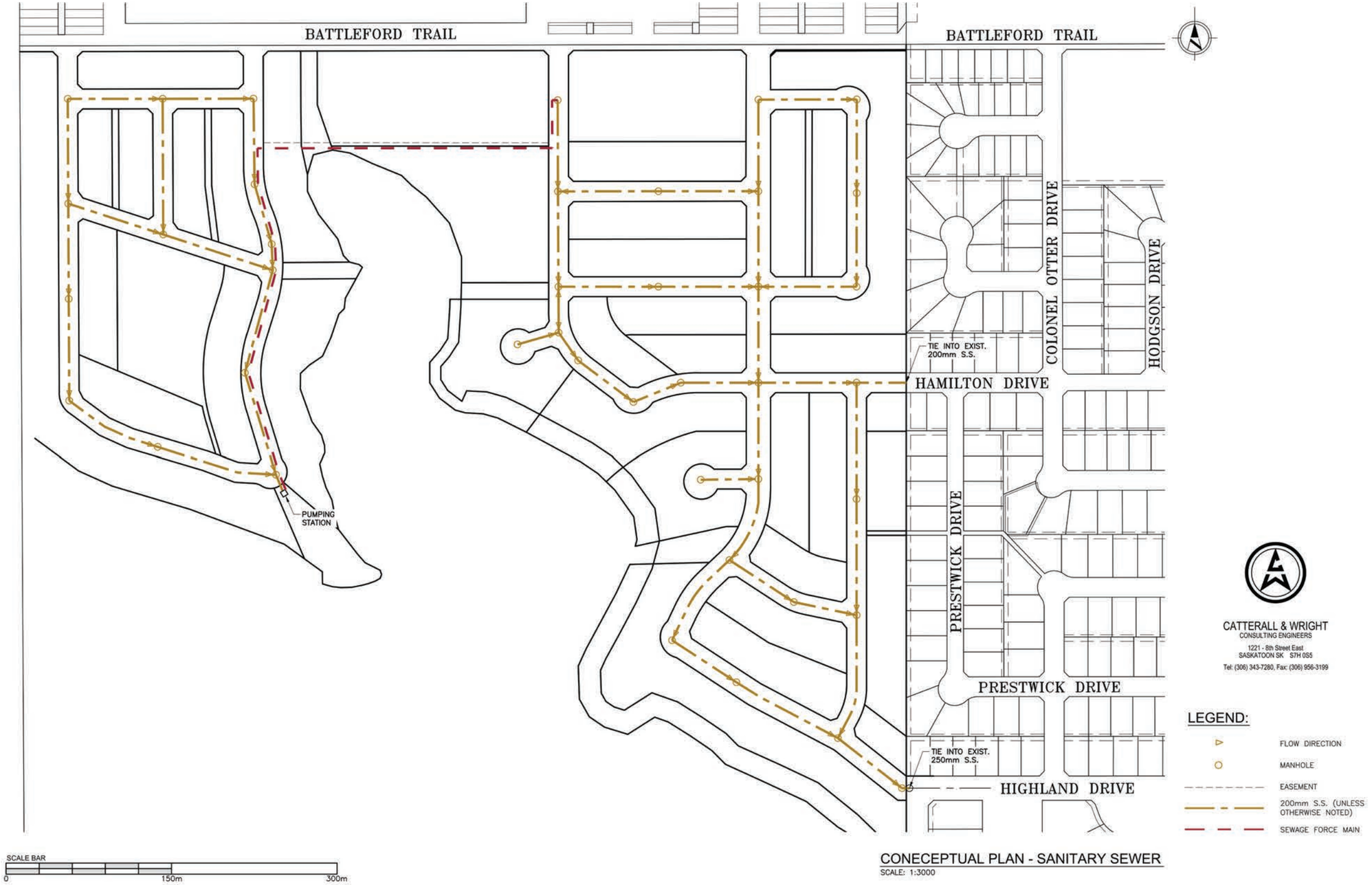
Based on the results identified in the SCSMP, there is sufficient capacity in the nearby water system to service the subject property. Fire flows are sufficient in this area.

The proposed water distribution sewer system is illustrated on Map 7.

## Stormwater Management

The general drainage of the plan area is from northwest to southeast. There are two storm sewer connection points available for the development areas on the eastern side of the coulee. A 750 mm diameter storm sewer on Highland Drive and a 600 mm storm sewer on Hamilton Drive. Natural drainage of this area goes towards Highland Drive. The SCMSP indicates that the storm sewer at this location is only using approximately 25% of its capacity. A secondary connection will be made to the 600 mm storm line on Hamilton Drive to improve flow conditions and not overload the system on Highland Drive during storm events.

The development areas on the western side of the coulee naturally drain from northwest to southeast as well. This area will naturally drain into the coulee. A storm sewer network is proposed for this area that will require a storm water outfall to be constructed that outlets into the coulee.

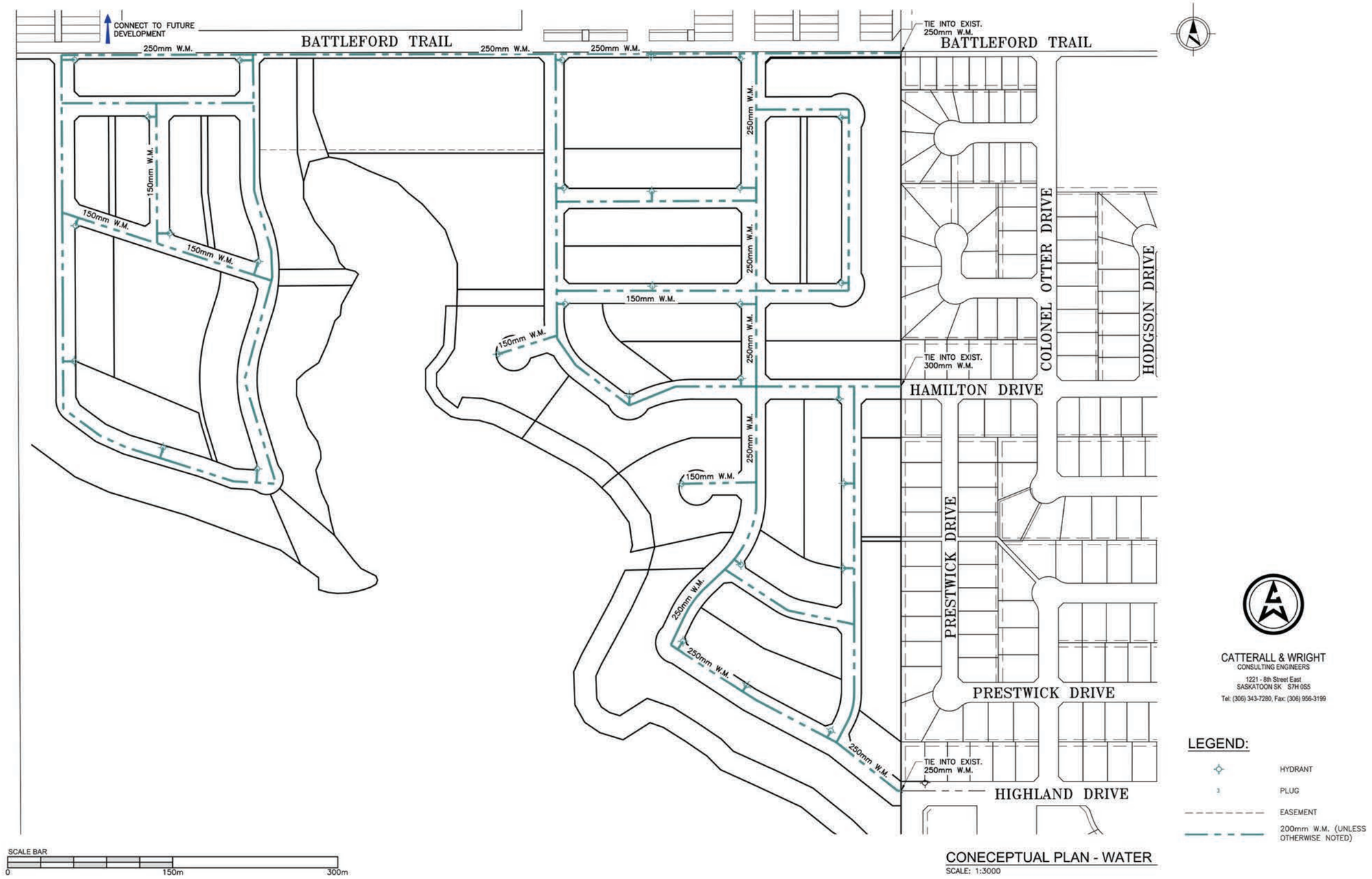


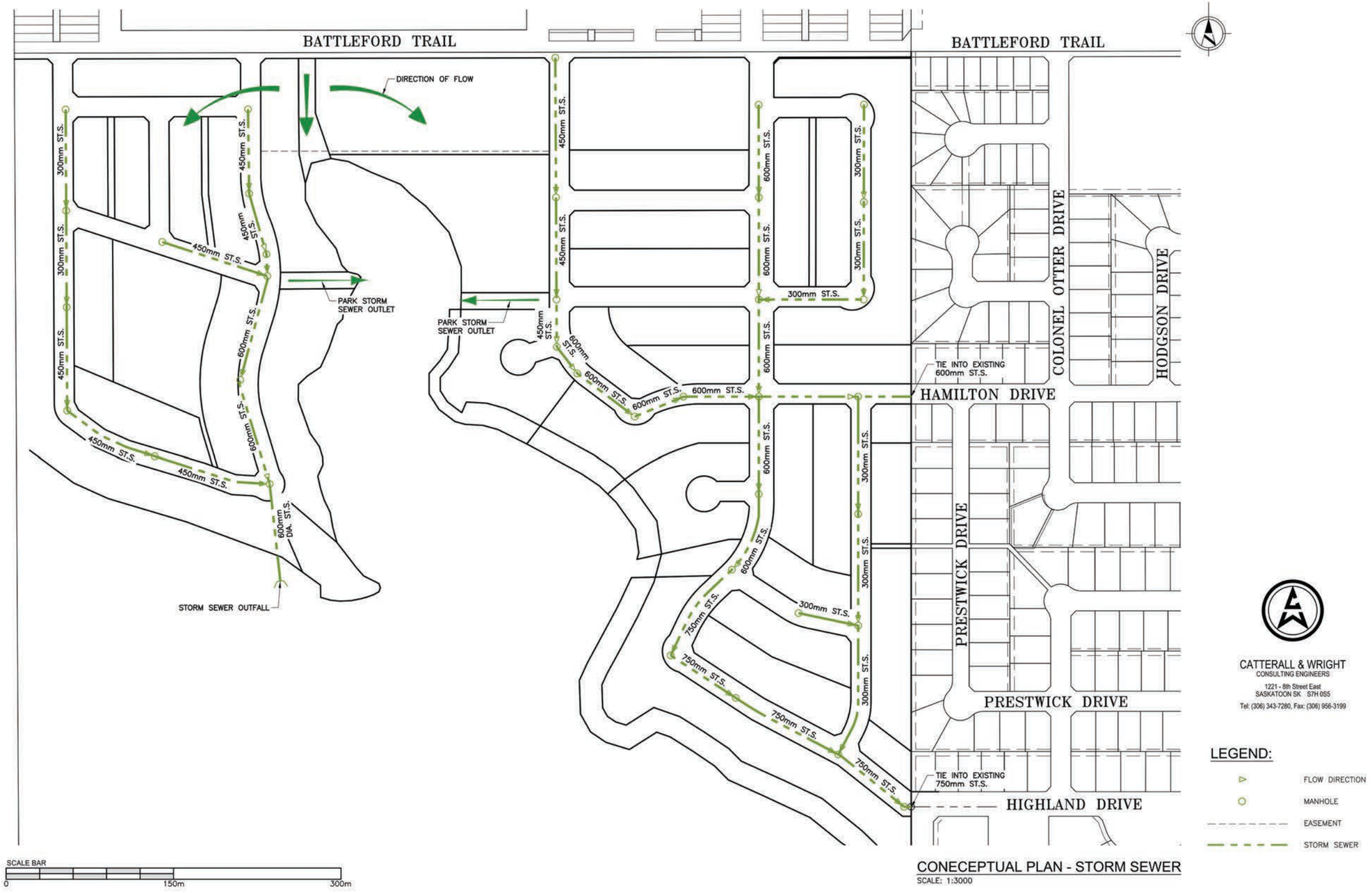

CONECEPTUAL PLAN - SANITARY SEWER
SCALE: 1:3000

CATTERALL & WRIGHT
CONSULTING ENGINEERS
1221 - 8th Street East
SASKATOON SK S7H 0S5
Tel: (306) 343-7280, Fax: (306) 956-3199

LEGEND:

- FLOW DIRECTION
- MANHOLE
- EASEMENT
- 200mm S.S. (UNLESS OTHERWISE NOTED)
- SEWAGE FORCE MAIN


CONNECT TO FUTURE DEVELOPMENT
BATTLEFORD TRAIL
250mm W.M.
150mm W.M.
TIE INTO EXIST. 250mm W.M.
TIE INTO EXIST. 300mm W.M.
COLONEL OTTER DRIVE
HODGSON DRIVE
HAMILTON DRIVE
PRESTWICK DRIVE
HIGHLAND DRIVE
SCALE BAR
0
150m
300m
CONECEPTUAL PLAN - WATER
SCALE: 1:3000
CATTERALL & WRIGHT
CONSULTING ENGINEERS
1221 - 8th Street East
SASKATOON SK S7H 0S5
Tel: (306) 343-7280, Fax: (306) 956-3199
LEGEND:
HYDRANT
PLUG
EASEMENT
200mm W.M. (UNLESS OTHERWISE NOTED)




CONECEPTUAL PLAN - STORM SEWER
SCALE: 1:3000

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CONSULTING ENGINEERS
1221 - 8th Street East
SASKATOON SK S7H 0S5
Tel: (306) 343-7280, Fax: (306) 956-3199

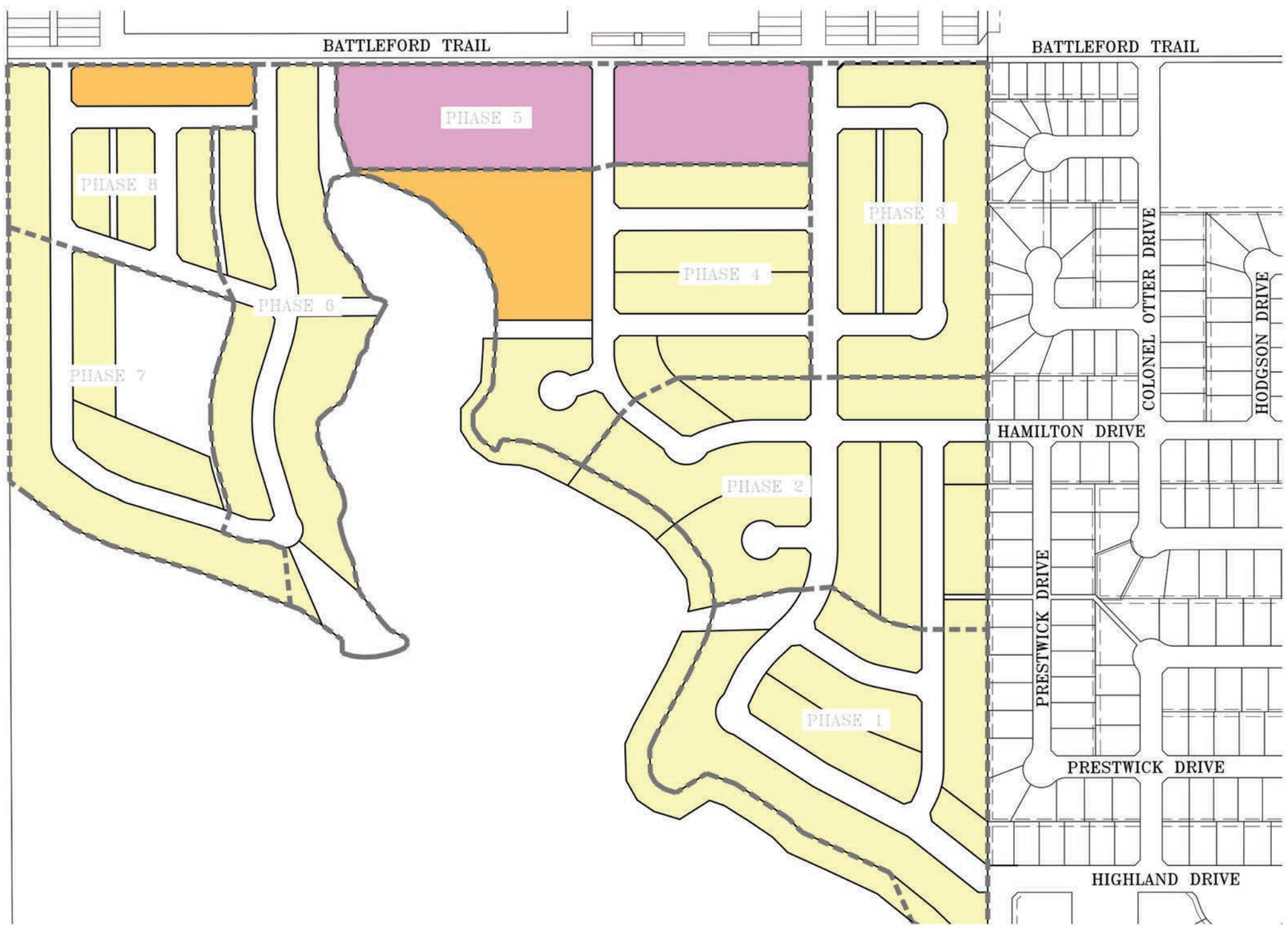
LEGEND:

- FLOW DIRECTION
- MANHOLE
- EASEMENT
- STORM SEWER

# 7. Phasing Strategy

Development phasing for the neighborhood is based upon the logical extension of municipal services. Development is expected to be initiated in the southeast corner of the site as an extension along Highland Drive. An assessment of the City's core infrastructure in the area indicates available sanitary and storm sewer capacity exist at this location. This location also represents a high-value development area within the neighbourhood. Development within the neighbourhood is expected to proceed in a northerly direction towards Battleford Trail, eventually extending to the west side of the coulee.

The phasing represented herein is conceptual in nature and may be subject to change following a more detailed assessment of municipal infrastructure systems during the detailed design phase of the project. The timing and final configuration of phases will also give due consideration to market conditions.




CONECEPTUAL PLAN - PHASING
SCALE: 1:3000

CATTERALL & WRIGHT
CONSULTING ENGINEERS
1221 - 8th Street East
SASKATOON SK S7H 0S5
Tel: (306) 343-7280, Fax: (306) 956-3199

# 8. Public Consultation

## Open House Event

A come and go open house event was facilitated by project team members from Associated Engineering and the City of Swift Current on January 11th, 2018 at the Swift Current Mall. The event was intended to share information with the public regarding the project and offer them an opportunity to comment. Approximately 10 attendees participated in the open house.

The following information provides a summary of comments received during the public open house.

## General Comments

The plan was received well by the participants with several reinforcing that this is a desireable area of the city. The attendees were pleased with the allocation land within the plan area and felt that promotion of a variety of housing types would be a welcome addition to the area. The proposed swing sites were well perceived and attendees indicated agreement with the value of providing flexibility for the future in this regard.

A concern was expressed with the lack of a municipal buffer along the land directly behind the housing backing onto the development property. The concern related to the possibility of having development extend directly adjacent to the rear property line. The concern is mitigated by the application of yard setabcks which would inhibit new development to encroach on the existing yards.

There was some concern regarding the lack of formal greenspace available for residents in the area. We noted that although manicured open space is relatively limited, a large amount of land in the 1/4 section within the South Valley Natural Area is being dedicated as environmental reserve providing public access to this expansive naturalized area. The provision of formal park space within the plan area corresponds with the direction provided in the NW Sector Plan.

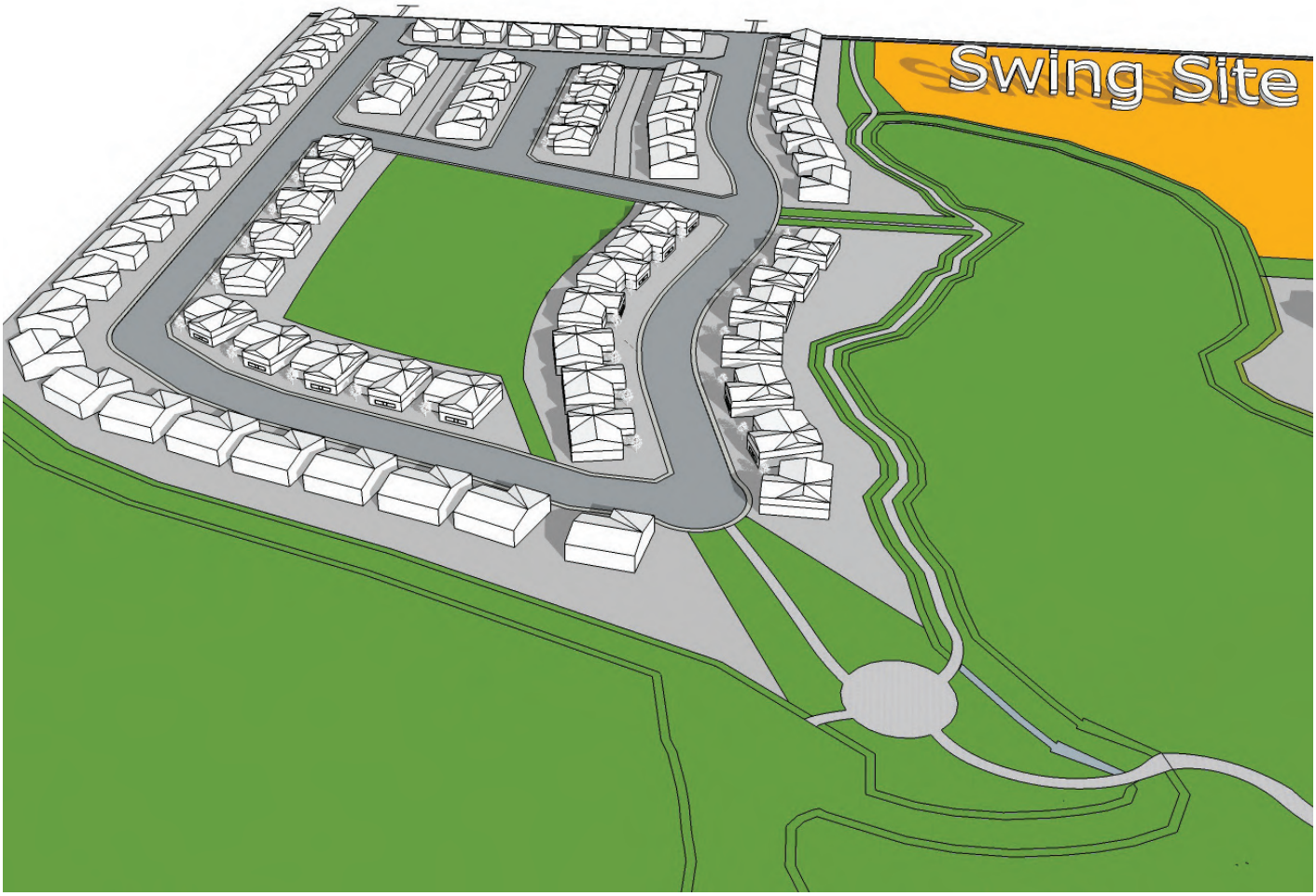
Another concern was expressed with the reduced access to the South Valley Natural Area from Highland Drive with the introduction of housing along the valley bank. We note that there are multiple points of access to the ravine through linear parkways. As for cyclists, they would share Highland Drive's vehicle travel lanes until they could safely cross the road to access the linear parkway into the South Valley Natural Area. Once the pedestrians and cyclists reach the linear parkway, it is anticipated there would be a multi-use trail system developed throughout the South Valley Natural Area as per the NW Sector Plan.

Attendees commented on the linear trail connection between Prestwick Drive and the Heights neighbourhood. It was unclear to the attendees why the trail did not continue along the rear of the lots. However, after explaining the rational based on concerns of safety and the desire to have pedestrians travelling along the sidewalk network, the attendees had no further concerns.

## Transportation

There were some concerns regarding traffic along Battleford Trail. One attendee felt the local signage is regularly disregarded creating unsafe conditions for other motorists and pedestrians. The intersection location in which the attendee was discussing is Battleford Trail and 11th Avenue NW which was part of the Traffic Impact Assessment (TIA) that was completed as part of the Heights report. The TIA provided recommendations for this intersection to increase safety; however, traffic that is disregarding the signage becomes an enforcement issue to be addressed by the local police force.

There were also concerns regarding traffic volumes and emergency service vehicles along Highland Drive. The traffic volume concerns were raise as people perceive Highland Drive as a busy street and additional development will further increase these traffic volumes. However, Highland Drive is classified as a collector roadway and it was designed to accommodate larger volumes of traffic. In regard to the emergency service vehicles, the City of Swift Current Fire Department and City of Swift Current RCMP were contacted to comment on the land use concept plan for Heights and both emergency service providers had no concerns in regards to servicing the proposed development.



# *Appendices*

# Appendix A - Preliminary Geotechnical Investigation

TITLE: GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL SUBDIVISION
SW 35-15-14-W3
SWIFT CURRENT, SASKATCHEWAN

CLIENT: NORTHRIDGE DEVELOPMENT CORP.

FILE NO: GE-14110 DATE: JULY 17, 2015

# TABLE OF CONTENTS

## TABLE OF CONTENTS (Cont.)

### DRAWINGS



### APPENDICES

**GROUND ENGINEERING CONSULTANTS LTD.**

CIVIL & GEOENVIRONMENTAL ENGINEERS

415 - 7th AVENUE • REGINA • SASKATCHEWAN • CANADA • S4N 4P1
TELEPHONE: (306) 569-9075 FAX: (306) 565-3677 EMAIL: groundeng@myaccess.ca

FILE: GE-14110

July 17, 2015

Northridge Development Corp.
c/o Catterall & Wright
1221 – 8th Street East
SASKATOON, Saskatchewan
S7H 0S5

**ATTENTION: MR. RYAN ROGAL, P. ENG.**

Dear Sir:

**SUBJECT: GEOTECHNICAL INVESTIGATION**
**PROPOSED RESIDENTIAL SUBDIVISION**
**SW 35-15-14-W3M**
**SWIFT CURRENT, SASKATCHEWAN**

## 1.0 INTRODUCTION

This report presents the results of a site specific subsurface soils investigation and geotechnical analysis carried out at the site of the above captioned proposed residential subdivision development located in the City of Swift Current, Saskatchewan. It is understood that the proposed subdivision layout has not been finalized but will consist of single family dwellings and associated infrastructure.

The objectives of this investigation were to provide the following information:

.1 To define the subsurface soil stratigraphy and engineering properties of the foundation soils;

.2 To provide design and installation recommendations for the most suitable and economical foundation system to support the proposed residential buildings;

.3 To comment on possible excavation and construction problems related to foundation construction with particular reference to groundwater conditions;

.4 To provide recommendations for floor slab design and construction;

.5 To investigate the stability of the slopes within the proposed development, comment on possible slope stability problems and provide recommendations for site development, including suitable building sites and set-back distances for residential development;

.6 To provide recommendations on pertinent geotechnical issues identified during the subsurface investigation.

Authorization to proceed with this work was received in your e-mail dated November 14, 2014.

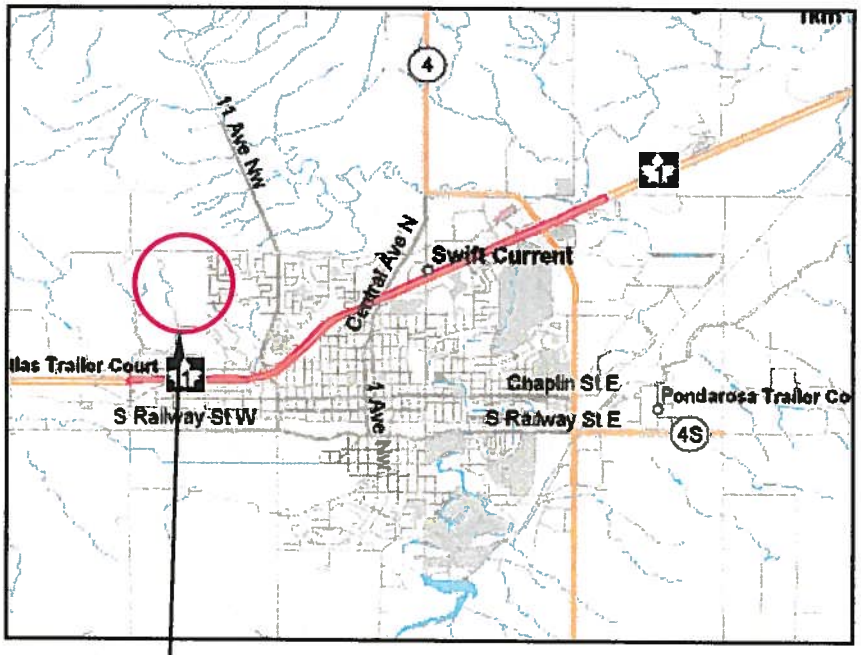
## 2.0 DESCRIPTION OF THE SITE

The study area shown in Figure 1 is located in the northwest corner of the City of Swift Current, Saskatchewan. The legal description of the property is SW 35-15-14-W3M.

The site consists of an upper glaciolacustrine plain which is currently cultivated farmland and covers the majority of the north portion of the site. The south end of the property slopes down into a deep valley at the south end of the property. A deep ravine runs in a north-south direction through the approximate centre of the property. The upper plain generally slopes down from north to south. Ground surface elevations vary up to 18.1 metres between the test hole locations.

## 3.0 FIELD AND LABORATORY INVESTIGATION

The subsurface conditions were investigated by drilling 13 test borings at the locations shown on Drawing No. GE-14110-1. The test holes were drilled on December 8, 9 and 10, 2014 using a truck-mounted, Brat 22 digger equipped with a 150 mm diameter continuous flight auger to depths ranging from 7.6 to 22.9 metres below existing grade.





STUDY AREA


**FIGURE 1**

**LOCATION OF STUDY AREA**

Representative disturbed auger samples, split-spoon samples and undisturbed Shelby tube soil samples were recovered from the test borings and taken to our laboratory for analysis. Standard Penetration tests were conducted in each test hole. Each soil sample was visually examined to determine its textural classification and a natural moisture content test was performed on each sample. In addition, Atterberg Limits, group index, dry density, unconfined compressive strength and sulphate content tests were performed on selected representative soil samples. Details of the soil profile, samples taken, laboratory test results and stratigraphic interpretations of the subsoils are appended to this report on Drawing Nos. GE-14110-5 to -20, inclusive.

The test holes were surveyed by representatives of Catterall & Wright Consulting Engineers. The ground surface elevations are referenced to geodetic datum.

## 4.0 GEOTECHNICAL ANALYSIS

### 4.1 Stratigraphy

The drilling information indicates that the surficial topsoil is generally 50 to 100 mm in thickness at the test hole locations. The topsoil is underlain by a stratified drift unit which extends to depths ranging from 9.1 to 17.7 metres below grade. The stratified drift extends to the maximum depth penetrated in several of the test holes. The stratified drift unit consists predominantly of silty clay with interbedded layers of silt and fine grained sand. A surficial clayey silt layer was encountered in Test Holes 103, 104, 106, 107, 108 and 109 which extends to depths ranging from 1.2 to 2.4 metres. Clayey till lenses were encountered in Test Holes 101, 110, 112 and 113. The till lenses consist of a heterogeneous mixture of gravel, sand, silt and clay with silt and sand lenses as well as occasional cobblestones and/or boulders.

The bedrock surface was penetrated beneath the stratified drift unit in Test Holes 102, 103, 104, 105 and 110. The bedrock encountered is known locally as the Bearpaw Shale. It consists of non-calcareous, highly plastic clay and silt of marine origin with bentonitic lenses. The shale is highly over-consolidated, weathered and jointed. The shale extends to the maximum depth penetrated in the test holes (22.9 metres).

## 4.2 Groundwater

The drilling information indicates that the soils encountered are generally clayey and cohesive. Standpipe piezometers were installed in six (6) test holes to monitor the long term groundwater levels. The piezometric surface measurements are summarized in Table 1, below:

**TABLE 1**

**PIEZOMETRIC SURFACE MEASUREMENTS**

| STANDPIPE PIEZOMETER NO. | DATE MEASURED | DEPTH TO BOTTOM OF SCREEN FROM GROUND SURFACE (m) | GROUNDWATER LEVEL BELOW GRADE (m) | PIEZOMETRIC SURFACE ELEVATION (m) |
|---|---|---|---|---|
| TH 101 | December 8, 2014 | 7.3 | Dry | -- |
| | February 11, 2015 | | Dry | -- |
| | March 3, 2015 | | Dry | -- |
| | April 1, 2015 | | Dry | -- |
| TH 102 | December 8, 2014 | 21.6 | Dry | -- |
| | February 11, 2015 | | Dry | -- |
| | March 3, 2015 | | 19.93 | 772.26 |
| | April 1, 2015 | | 18.68 | 773.57 |
| TH 103 | December 8, 2014 | 21.0 | Dry | -- |
| | February 11, 2015 | | Dry | -- |
| | March 3, 2015 | | Dry | -- |
| | April 1, 2015 | | Dry | -- |
| TH 104 | December 9, 2014 | 21.4 | Dry | -- |
| | February 11, 2015 | | Dry | -- |
| | March 3, 2015 | | Dry | -- |
| | April 1, 2015 | | Dry | -- |
| TH 105 | December 9, 2014 | 16.3 | 15.26 | 782.58 |
| | December 10, 2014 | | 11.44 | 786.40 |
| | February 11, 2015 | | 11.62 | 786.22 |
| | March 3, 2015 | | 11.41 | 786.43 |
| | April 1, 2015 | | 11.37 | 786.47 |
| TH 109 | December 9, 2014 | 7.5 | Dry | -- |
| | February 11, 2015 | | Dry | -- |
| | March 3, 2015 | | Dry | -- |
| | April 1, 2015 | | Dry | -- |

The piezometers in Test Holes 102, 103 and 104 have screened intervals completed entirely within the Bearpaw Shale Formation which typically has a low hydraulic conductivity. Therefore, the water levels in these wells may not yet have stabilized during the monitoring period. During periods of heavy rainfall or spring runoff, the water table could be higher than noted.

## 5.0 DISCUSSION

### 5.1 Stratified Drift Unit

The drift unit is variable in lithology and corresponding engineering properties. The undrained shear strength of the silty clay layers ranges from a low of 75 kPa to a high of 330 kPa based on unconfined compressive strength tests. The silty clay layers are medium to highly plastic with a Liquid Limit ranging from 32 to 84 percent and a Plasticity Index ranging from 21 to 58 percent. Generally, the plasticity increases with depth. Standard Penetration test "N" values in the drift unit range from a low of 12 blows per foot to a high of 70 blows per foot. The dry density of the drift unit ranges from 1.21 to 1.60 tonnes per cubic metre depending on its clay content.

### 5.2 Bearpaw Shale Formation

The shale is highly over-consolidated, weathered and jointed. It is very stiff to hard in consistency and brittle. Standard Penetration test "N" values in the shale range from a low of 28 blows per foot to a high of 35 blows per foot. Atterberg Limits tests indicate the Liquid Limit is in the order of 93 to 102 percent and the Plasticity Index is in the order of 66 to 78 percent. The dry density of the clay shale is in the order of 1.45 tonnes per cubic metre.

The shale typically contains thin bentonitic layers. These layers are relatively weak and are prone to landslide failures.

## 6.0 SLOPE STABILITY

### 6.1 Stratigraphy

The surficial stratified drift unit contains highly plastic clay layers which may be competent when dry but become softened and weak during periods of high rainfall and a raised water table. The underlying shale bedrock contains weak bentonitic layers which are highly susceptible to landsliding.

One of the main factors controlling slope stability for this site is the position of the shale contact with respect to the bottom of the ravine which cuts through the central portion of the

property. Where the shale contact is at or above the base of the ravine, the lower portion of the slopes is typically flatter. These slopes are generally less stable than the steeper sloped areas where the shale contact is below the base of the ravine.

The contact between the stratified drift unit and shale bedrock was encountered at geodetic elevations ranging from 779.6 to 784.8 metres at the test hole locations. The bottom of the ravine extends down to an elevation of approximately 765.0 metres at the south end of the property. A slight flattening of the ravine slopes is noted at the approximate elevation of the shale bedrock along the ravine side slopes.

During our site inspections, areas of previous slope instability were noted along the ravine particularly the south portion of the west ravine slope. The approximate location of the historical slope failure is shown on Drawing No. GE-14110-1, attached. The elevation of the failure corresponds to the approximate elevation of the shale in the adjacent test hole (± 780 metres, Geodetic).

## 6.2 Topography

The angle of the slopes generally ranges from approximately 6 horizontal to 1 vertical (6:1) to 2.7 horizontal to 1 verticle (2.7:1). As mentioned previously, the lower portion of the slopes generally becomes flatter where the bedrock surface is encountered. The steeper angled slopes are close to failure where the shale contact elevation is above the eroded surface of the shale.

## 6.3 Groundwater

One of the major factors controlling slope stability is the position of the water table. It is generally accepted that a slope that is fully drained will stand at an angle approximately twice that of a slope that has the groundwater table at surface. A high water table induces a higher water pressure at the slide surface which tends to hold the soil particles apart, thereby reducing the effective stress. The total weight of overlying soil is taken by the sum of the pore pressure and the effective stress between soil particles. Therefore, a rise in the water table causes a reduction in the factor of safety against sliding, conversely, lowering the water table would tend to stabilize the slide. Typically, the water table rises after development has taken place.

## 6.4 Discussion

Once landsliding has occurred on a valley slope, the factor of safety with respect to slope stability would be close to unity (1.0) under natural conditions before any new developments constructed by man. The factor of safety is defined as the resisting forces divided by the driving forces. A safety factor close to 1.0 means that small changes in the stress environment may initiate additional down slope movement in the landslide slump blocks. Usually these movements are gradual creep type movements that range from a few millimetres to possibly several centimetres per year. Large, sudden drops in the order of 300 to 600 mm may also occur, however, these types of movements are less common than gradual creep type movements.

Development on the slopes will usually result in a reduction in the safety factor against sliding due to:

.1 An increase in the groundwater table due to lawn watering and reduction in surface evaporation;

.2 Installation of a water supply system which leads to higher groundwater levels via pipe leaks and increased water consumption;

.3 Landscaping which cuts the toe of individual slump blocks and/or places fill at the top of old slides. This results in decreased resisting forces and increased driving forces. Importing fill material generally increases the driving forces on a slide;

.4 Increased surcharge loads due to road construction and the construction of new buildings.

## 7.0 SLOPE STABILITY ANALYSIS

The purpose of a slope stability analysis is to estimate the factor of safety of a potential failure surface. The analysis involves passing an assumed slip surface through the slope and dividing the inscribed portion into slices. The factor of safety is defined as a ratio between the resisting force and the driving force both applied along the potential failure surface. When the driving force due to the weight of the soil is equal to the resisting force due to shear strength, the factor of safety is equal to 1 and failure is imminent. The slope stability

analysis was performed using the *Slide Version 6.0* computer software developed by Rocscience Inc. An effective stress slope stability analysis using the Morgenstern-Price method and half sine interslice force function was used.

## 7.1 Soil Strength Parameters

The soil strength parameters were interpreted using index properties of the soil determined during the geotechnical testing at the site in addition to our previous experience and information available in our Company files. The interpreted shear strength parameters used in our slope stability analysis are summarized in Table 2, below:

**TABLE 2**

**SOIL STRENGTH PARAMETERS**

| SOIL TYPE | PEAK STRENGTH | | UNIT WEIGHT |
|---|---|---|---|
| | Friction Angle | Cohesion | |
| Stratified Drift | 20° | 15 kPa | 17 kN/m$^3$ |
| Bearpaw Shale (undisturbed) | 25° | 15 kPa | 18 kN/m$^3$ |
| Bearpaw Shale (reduced) | 15° | 5 kPa | 18 kN/m$^3$ |
| Bearpaw Shale (failure plane) | 8° | 0 kPa | 18 kN/m$^3$ |

Reduced shear strength parameters were used for the bedrock soils encountered above the water table and near exposures along the ravine slopes to account for strength reductions resulting from exposure to frost, desiccation and oxidation. Residual shear strength properties were used for a layer of bedrock in the area of the pre-existing slope failure.

## 7.2 Slope Stability Model

The cross section locations for stability analysis were selected based on existing slope angles and the location of previous instability along the ravine slopes. The location of the three cross sections are indicated on Drawing No. GE-14110-1, attached.

The factor of safety at each cross section was calculated using the provided topographic information, stratigraphy from the test holes and the above soil index properties. The water table was interpreted using data obtained from the monitoring wells (where available), conservative assumptions were made in areas where the water levels have not yet stabilized. A weak layer of shale bedrock (residual strength) was input to the model at cross section 2-

2 to estimate the impact of the pre-existing failure in the area. The resulting factor of safety values shown in Table 3, below.

**TABLE 3**
**FACTOR OF SAFETY**

| Cross Section Location | Factor of Safety |
|---|---|
| 1-1 | 1.28 |
| 2-2 | 1.09 |
| 3-3 | 1.28 |

The results of the stability analysis at each cross section are shown on the figures included in Appendix B. The analyses indicate that the estimated factor of safety in the area of the ravine slopes is generally in the order of 1.3 in areas where there are no pre-existing failures. A factor of safety in the order of 1.1 was calculated the area of the previous failure.

It must be appreciated that the safety factors calculated by the model are estimates only, based on available information, interpreted soil strength characteristics, computer modeling techniques and previous experience. Additional stability analysis, including installation and monitoring of slope inclinometers, soil shear strength testing and additional modeling would be required to fully understand failure mechanisms, locations and factors of safety along the ravine slopes. However, the estimates provided herein are considered suitable for residential development purposes provided appropriate development controls are established to reduce the risks associated with slope instability. The following section outlines recommended development guidelines for the proposed subdivision.

## 7.3 Site Development Guidelines

Development in an area of previous and potential landslide activity involves risk. The risk is associated with the possible reactivation of old landslides or the creation of entirely new landslides which the Owner must accept. Development controls are recommended to minimize the risk of future landslides, however, even with development controls there is no guarantee that landsliding will never occur. To reduce the potential problems associated with slope instability, the following guidelines are provided for lot development at this time.

.1 Suitable residential building sites within the development should be restricted to areas at the top of the ravine slopes where no previous landslide activity has occurred. A minimum set back distance of 10.0 metres from the edge of the ravine wall is recommended in areas where the base of the ravine is at, or above, geodetic elevation 785.0. Where the ravine extends below geodetic elevation 785.0, a minimum setback of 20 metres is recommended as shown on Drawing No. GE-14410-1.

.2 Residential development is not recommended within the "peninsula" area between the ravines south of Test Hole 105 due to the risk of landsliding.

.3 Residential buildings in this development may be supported on either bored concrete piles or shallow footing type foundation systems, as discussed in Section 8.0. Landscaping should ensure a minimum of 3% slope away from the perimeter of all buildings.

.4 Water should be encouraged to drain off the property. No landscaping should be done which results in water ponding on the slopes. The natural drainage courses should be maintained as best as possible.

.5 The ravine slopes are highly susceptible to erosion. Removal of existing vegetation should be prohibited. Areas where the vegetation is removed should be re-vegetated as soon as possible. Any erosion which does occur should be repaired immediately.

.6 It is recommended that the final subdivision layout and grading plans for the proposed development be reviewed by our office for approval prior to construction.

## 8.0 FOUNDATION CONSIDERATIONS

Based on the results of this investigation the foundations for typical residential structures will be located in the surficial stratified drift sediments. The soils encountered at the basement level may consist of any one of the following: silty clay, clayey silt, clayey till and/or fine grained sand.

The soils encountered are generally competent for construction of shallow footing type foundation systems which are anticipated to be the most cost effective foundation for conventional houses with full basements. Alternatively, for buildings with no basement or with walk-out type basements, a bored concrete pile type foundation system would be a suitable alternative. Our specific design recommendations for each type of foundation system are provided below:

## 8.1 Spread Footing and/or Post and Pad Type Foundation System

.1 Properly constructed shallow spread footings bearing on the undisturbed stratified drift may be designed for an ultimate bearing pressure (ULS) of 250 kPa. A geotechnical resistance factor of 0.5 is recommended for shallow foundation design. Maximum toe pressure under wind loading may exceed the average pressure by no more than one-third (1/3). Regardless of footing pressure considerations, the minimum width of the footings should be 450 mm.

.2 The footings should be placed at a minimum depth of 1.8 metres below finished grade elevation to ensure that the footings are bearing on soil with adequate bearing capacity and below the maximum depth of frost penetration. Footings constructed above this depth should be insulated to prevent frost from penetrating beneath the footings. All footings should be adequately reinforced to resist localized stresses.

.3 In some areas the foundation soils may be highly susceptible to disturbance by the movement of workmen, equipment, etc., particularly when wet (silty and sandy soils). In this regard, every effort should be made to pour the footings as soon as possible after excavation is completed. The steel reinforcing mats should be made up in advance to minimize the possibility of soil disturbance during placement.

.4 All loose or disturbed material at the base of the footing excavations should be removed or compacted prior to placement of forms, reinforcing steel and concrete.

## 8.2 Bored Concrete Pile Type Foundation System

.1 The residential buildings may be supported by straight shaft piles designed to develop load carrying capacity on the basis of side friction only. For Limits State

Design, an ultimate skin friction value of 75 kPa, based on the contact area between the pile surface and the surrounding undisturbed native soil, is recommended for bored concrete friction type piles at this site. Geotechnical resistance factors of 0.4 (compression) and 0.3 (tension) should be used for design purposes.

.2 The upper 2.0 metres of pile length below finished ground surface or the maximum depth of fill should be discounted insofar as side friction carrying capacity is concerned. It is recommended that the minimum pile shaft diameter be 300 mm to ensure that an adequate pile cross-section is maintained for the full drilled depth. A minimum pile length of 5.5 metres is also recommended.

.3 Temporary sleeves should not be required to construct the majority of bored concrete piles at this site. It is recommended that the steel reinforcement and concrete be placed immediately after the pile hole is excavated in order to reduce the potential for groundwater seepage and sloughing into the pile excavations.

.4 Pile shafts carrying little or no bending movement should be reinforced with nominal vertical reinforcement in the form of intermediate grade deformed bars, composing about one-half (1/2) of one (1) percent of the cross-sectional area. The steel reinforcing cage should be projected or dowels set into the top of the caisson to tie into the foundation walls and/or columns.

.5 Concrete used for constructing piles may be placed using the free fall method and the slump should be specified as being not less than 100 mm. This will insure that voids do not exist in the finished pile foundation units. The concrete should remain fluid in the hole until the shaft is completely full in order to take advantage of the fluid pressure in the column of concrete which will develop high pressure against the soil and maximize the shaft's capacity.

.6 Grade beams should be reinforced continuously at both top and bottom to resist possible negative bending stresses at mid span. To reduce the possibility of upheaval, the grade beams should be constructed with a minimum 150 mm cardboard void space underneath to prevent contact with the underlying soil.

## 9.0 EXCAVATION CONSIDERATIONS

Building and utility excavations at this site will be in the surficial stratified drift unit. The soils encountered will likely include silty clay, clayey silt, clayey till and fine grained sand. Groundwater is not anticipated within the depth of typical foundation and utility excavations. Conventional excavation procedures should therefore be applicable to the soils at this site. OH&S Regulations require that any trench or excavation in which people must work, must be cut back at least one (1) horizontal to one (1) vertical. Alternatively, a temporary protective structure must be used to support the sides of the excavation.

## 10.0 UNDERGROUND WALLS AND DRAINAGE PROVISIONS

The underground basement walls should be damp-proofed and designed to withstand the lateral earth pressure (p) at any depth (H) in metres as estimated by the following expression:

$$p = k(\gamma H + q) \text{ kPa}$$

WHERE:

$k$= 0.4 (the coefficient of earth pressure considered appropriate for the design condition).

$\gamma$= the unit weight of the drained granular backfill, approximately 19.0 kN/m$^3$.

$q$= the equivalent uniform vertical pressure, in kPa of any surcharge acting at the ground surface near the wall.

The expression assumes that the backfill is free-draining and drains to an efficient perimeter drainage system (as described below), thus preventing the build-up of hydrostatic pressure on walls. If effective drainage facilities are not provided or free draining backfill is not placed against the foundation walls, the full hydrostatic pressure which could act on the walls must be considered in design.

Perimeter drainage facilities should be provided around the perimeter of the foundation. Drain tile with a minimum diameter of 100 mm, or pipe equivalent should be installed below the level of the lowest floor slab. **The base of the tile must also be located below any granular structure (radon rock) or void space below basement floor slabs to reduce the potential for build up of excess moisture below the floor.** The tile should be

wrapped in filter cloth and encased in a graded, granular filter consisting of at least 100 mm of pea gravel encased by 300 mm of drainage sand. The tile must drain to a positive frost-free sump or outlet from which the water is removed.

Free-draining backfill material should be placed adjacent to the exterior underground walls. The upper 600 mm of the backfill should consist of the native soil compacted to a minimum of 95% Standard Proctor density. The ground surface should be sloped at 3% to 5% grade away from the building to further discourage the infiltration of surface water into the backfill.

## 11.0 FLOOR SLAB CONSIDERATIONS

The stratified drift unit contains highly plastic clay layers which are potentially active type soils, therefore, there is a potential for differential movement of grade supported floor slabs in some areas of the site. In the case of grade supported concrete floor slabs, cracking and differential heaving in the order of 50 to 100 mm is not uncommon where highly plastic clay soils are present. In this regard, a structural floor system would be the most desirable alternative insofar as overcoming the problems associated with differential movement of the floor slab. Alternatively, if differential movement can be tolerated, the floor may be constructed as a grade supported concrete slab. The following guidelines are provided for both types of floor systems.

### 11.1 Grade Supported Floor Slabs

.1 The subgrade under a grade supported slab should be as uniform as possible. Any surficial topsoil should be stripped from the site and the exposed sand subgrade should be proof-rolled with a vibratory smooth drum roller. The final 200 mm below underside of the floor slab should be radon rock (below interior spaces) or a well graded granular base course (Type 33) compacted to a minimum of 100% Standard Proctor density. Granular material specifications are included in Appendix A.

.2 The concrete slab in areas where only light floor loads are to be supported, may have a minimum thickness of 100 mm. The minimum 28 day concrete compressive strength should be specified as 25 MPa.

.3 A generous amount of reinforcing steel running both ways in the slab is desirable.

.4 A layer of robust polyethylene sheeting should be placed between the granular base and the concrete slab to deter the migration of moisture through the floor.

## 11.2 Structurally Supported Floor Systems

A structural floor system would be the most positive way to ensure satisfactory long term performance of the floor. We recommend the following items of work for preparation of the subgrade in the crawl space area beneath the floor slab.

.1 The crawl space should be covered with a Permalon X-150 type vapour barrier to reduce the humidity in the crawl space and prevent drying of the subgrade soils. If the subgrade is not protected, there is a potential for a reduction in the carrying capacity of the shallow footings over the long term.

.2 The ground surface in the crawl space should be graded no steeper than 3:1 (horizontal to vertical) to slope towards a positive outlet in order to drain any water that may enter the crawl space area.

.3 Provisions should be made to ventilate the crawl space area.

## 12.0 OTHER

.1 Adequate drainage away from the building structures should be provided and maintained to minimize infiltration of water into the subgrade. Buildings should be set as high as possible in relation to the surrounding area.

.2 Test results indicate that the soluble sulphate contents in the soil are in the order of 0.13 to 0.73 percent by dry soil weight. Exposure Class S-2 is considered appropriate for design of concrete in contact with the native soil, as specified in CSA Standard CAN3-A23.1-09. Minimum requirements for Exposure Class S-2 are as follows:

.1 Cement Type: MS, MSb, LH, HS or HSb
.2 Maximum water to cementing materials ratio: 0.45
.3 Air Content: as per CSA CAN-A23.1-09 Tables 2 and 4
.4 Minimum specified Compressive Strength: 32 MPa at 56 days

.3 In the event that changes are made in the design, location or nature of the project, the conclusions and recommendations included in this report would not be deemed valid unless the changes in the project were reviewed by our firm. Modification to this report would then be made if necessary. Furthermore, it is recommended that this firm be allowed an opportunity for a general review of the final design plans and specifications in order to ensure that the recommendations made in this report are properly interpreted and implemented. If this firm is not allowed the opportunity for this review, we assume no responsibility for the misinterpretation of any of the recommendations.

.4 It is recommended that Ground Engineering Consultants Ltd. be retained to provide inspection services during construction of the foundation system for this project. This is to observe compliance with the design concepts, specifications or recommendations and to allow design changes in the event that the subsurface conditions differ from what was anticipated.

.5 This report has been prepared for Northridge Development Corp. and is intended for the specific application to the design of the proposed residential subdivision to be constructed in SW 35-15-14-W3M in the City of Swift Current, Saskatchewan. The analysis and recommendations are based in part on the data obtained from the test hole logs. The boundaries between soil strata have been established at bore hole locations. Between the bore holes, the boundaries are assumed from geological evidence and may be subject to considerable error. Contractors bidding on the project works are particularly advised against reviewing the report without realizing the limitations of the subsurface information. It is recommended that Contractors should make such tests, inspections and other on-site investigations as is considered necessary to satisfy themselves as to the nature of the conditions to be encountered.

.6 It is recommended that the geotechnical workscope include the following services in addition to subsurface exploration and development of foundation design recommendations. These two services are:

i) geotechnical review of other design professionals' plans relative to their interpretation of geotechnical findings and recommendations, and;

ii) construction monitoring to observe construction activities in light of plans and specifications, and to help assure that unforeseen conditions are detected quickly to permit prompt corrective action and thus prevent minor problems from growing to major proportion.

.7 The soil samples from this site will be retained in our laboratory for 90 days following the date of this report. Should no instructions be received to the contrary, these samples will then be discarded.

## 13.0 CLOSURE

We trust that this report is satisfactory for your purposes. If you have any questions or require additional information, please contact this office.

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
**Ground Engineering Consultants Ltd.**
Number C0008
Permission to Consult held by:
Discipline Sk. Reg. No. Signature
GEOTECHNICAL 6307

Yours very truly,
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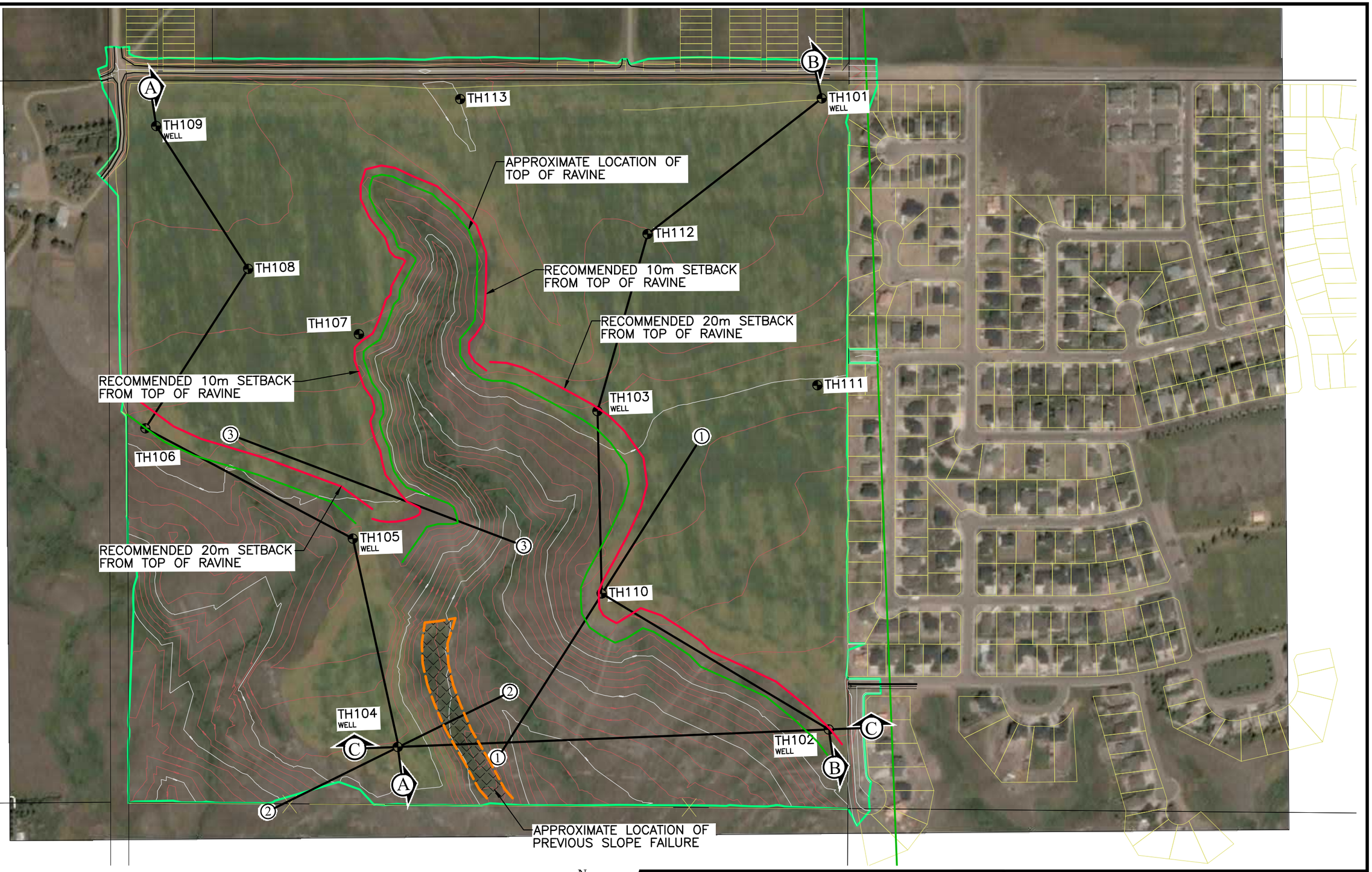
**DRAWINGS**




(X)—(X) SLOPE STABILITY CROSS SECTION

N

SCALE: 1:4000

GROUND ENGINEERING CONSULTANTS LTD.
CIVIL & GEOENVIRONMENTAL ENGINEERS
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REGINA, SASKATCHEWAN, CANADA

SITE PLAN SHOWING LOCATION OF TEST HOLES
PROPOSED RESIDENTIAL SUBDIVISION
SW 35–15–14–W3M
SWIFT CURRENT, SASKATCHEWAN

CLIENT: NORTH RIDGE DEVELOPMENT CORP.

APPROVED: P. WALSH

DATE: JULY 17, 2015

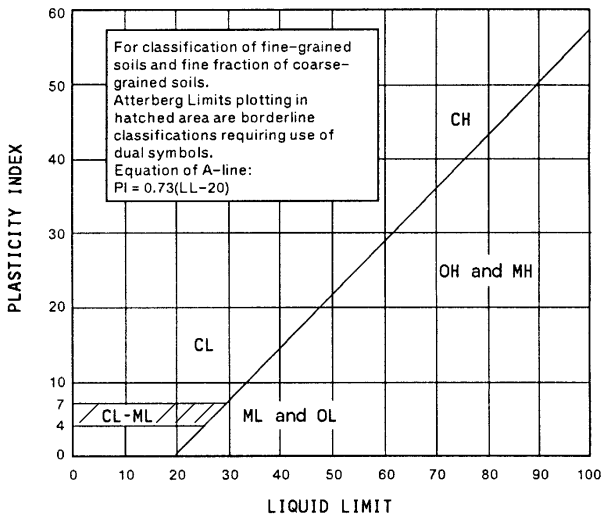
DWG. No.: GE–14110–1

## CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487 - 69 AND D 2488 - 69

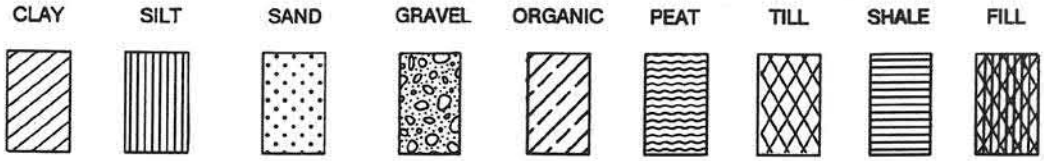
(Unified Soil Classification System)

| Major Divisions | | | Group Symbols | Typical Names | Classification Criteria |
|---|---|---|---|---|---|
| Coarse-grained soils<br>More than 50% retained on No. 200 sieve * | Gravels<br>50% or more of coarse fraction retained on No. 4 sieve | Clean gravels | GW | Well-graded gravels and gravel-sand mixtures, little or no fines | Classification on basis of percentage of fines<br>Less than 5% pass No. 200 sieve . . . . . GW, GP, SW, SP<br>More than 12% pass No. 200 sieve . . . . . GM, GC, SM, SC<br>5 to 12% pass No. 200 sieve . . . . . Borderline classifications requiring use of dual symbols<br>$C_u = \frac{D_{60}}{D_{10}}$ greater than 4:<br>$C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ 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 below "A" line or P.I. less than 4 |
| | | | GC | Clayey gravels, gravel-sand-clay mixtures | Atterberg limits above "A" line with P.I. greater than 7<br>Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols |
| | Sands<br>More than 50% of coarse fraction passes No. 4 sieve | Clean sands | SW | Well-graded sands and gravelly sands, little or no fines | $C_u = \frac{D_{60}}{D_{10}}$ greater than 6:<br>$C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ 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 below "A" line or P.I. less than 4 |
| | | | SC | Clayey sands, sand-clay mixtures | Atterberg limits above "A" line with P.I. greater than 7<br>Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols |
| Fine-grained soils<br>50% or more passes No. 200 sieve * | Silts and clays<br>Liquid limit 50% or less | | ML | Inorganic silts, very fine sands, rock flour, silty or clayey fine sands | PLASTICITY CHART |
| | | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays | |
| | | | OL | Organic silts and organic silty clays of low plasticity | |
| | Silts and clays<br>Liquid limit greater than 50% | | MH | Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts | |
| | | | CH | Inorganic clays of high plasticity, fat clays | |
| | | | OH | Organic clays of medium to high plasticity | |
| | Highly organic soils | | Pt | Peat, muck and other highly organic soils | |




*Based on the material passing the 75mm (3in) sieve.

## SYMBOLS AND TERMS USED IN THE REPORT




The symbols may be combined to denote various soil combinations, the predominate soil being heavier.

### RELATIVE PROPORTIONS

| TERM | RANGE |
|---|---|
| Trace | 0 – 5% |
| A Little | 5 – 15% |
| Some | 15 – 30% |
| With | 30 – 50% |

### ASTM CLASSIFICATION BY PARTICLE SIZE

| | | |
|---|---|---|
| Boulder | | > 300 mm |
| Cobble | | 300 mm – 75 mm |
| Gravel | | 75 mm – 4.75 mm |
| Sand | | |
| | coarse | 4.75 mm – 2 mm |
| | medium | 2 mm – 425 um |
| | fine | 425 um – 75 um |
| Silt | | 75 um – 5 um |
| Clay | | < 5 um |

### DENSITY OF SANDS AND GRAVELS

| DESCRIPTIVE TERM | RELATIVE DENSITY [1] | N VALUE STANDARD PENETRATION TEST [2] |
|---|---|---|
| Very loose | 0 – 15% | 0 – 4 Blows per 300mm |
| Loose | 15 – 35% | 4 – 10 Blows per 300mm |
| Medium Dense | 35 – 65% | 10 – 30 Blows per 300mm |
| Dense | 65 – 85% | 30 – 50 Blows per 300mm |
| Very Dense | 85 – 100% | > 50 Blows per 300mm |

### CONSISTENCY OF CLAYS AND SILTS

| DESCRIPTIVE TERM | UNDRAINED SHEAR STRENGTH (kPa) (CFEM, 2nd Edt., 1985) | N VALUE STANDARD PENETRATION TEST [2] | FIELD IDENTIFICATION (ASTM D 2488-84) |
|---|---|---|---|
| Very Soft | <12 | < 2 Blows per 300mm | Thumb will penetrate soil more than 25 mm |
| Soft | 12 – 25 | 2 – 4 Blows per 300mm | Thumb will penetrate soil about 25 mm |
| Firm | 25 – 50 | 4 – 8 Blows per 300mm | Thumb will indent soil about 6 mm |
| Stiff | 50 – 100 | 8 – 15 Blows per 300mm | Thumb will indent, but only with great effort (CFEM) |
| Very Stiff | 100 – 200 | 15 – 30 Blows per 300mm | Readily indented by thumbnail (CFEM) |
| Hard | >200 | > 30 Blows per 300mm | Thumb will not indent soil but readily indented with thumbnail |

**NOTES:** 1. Relative Density determined by standard laboratory tests.
2. N Value – Blows/300mm of a 620N hammer falling 762mm on a 50mm O.D. Split Spoon.

SYMBOLS AND TERMS USED IN THE REPORT (continued)

## GROUNDWATER

▼ Water level measured in the borings at the time and under the conditions indicated. In sand, the indicated levels can be considered reliable groundwater levels. In clay soil, it is not possible to determine the groundwater level within the normal scope of a test boring investigation, except where lenses or layers of more pervious waterbearing soil are present and then a long period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed texture soils may not indicate the true level of the groundwater table. The available water level information is given at the bottom of the log sheet.

▽ Water level determined by piezometer installation – In all soils the levels can be considered reliable groundwater levels.

## DESCRIPTIVE SOIL TERMS

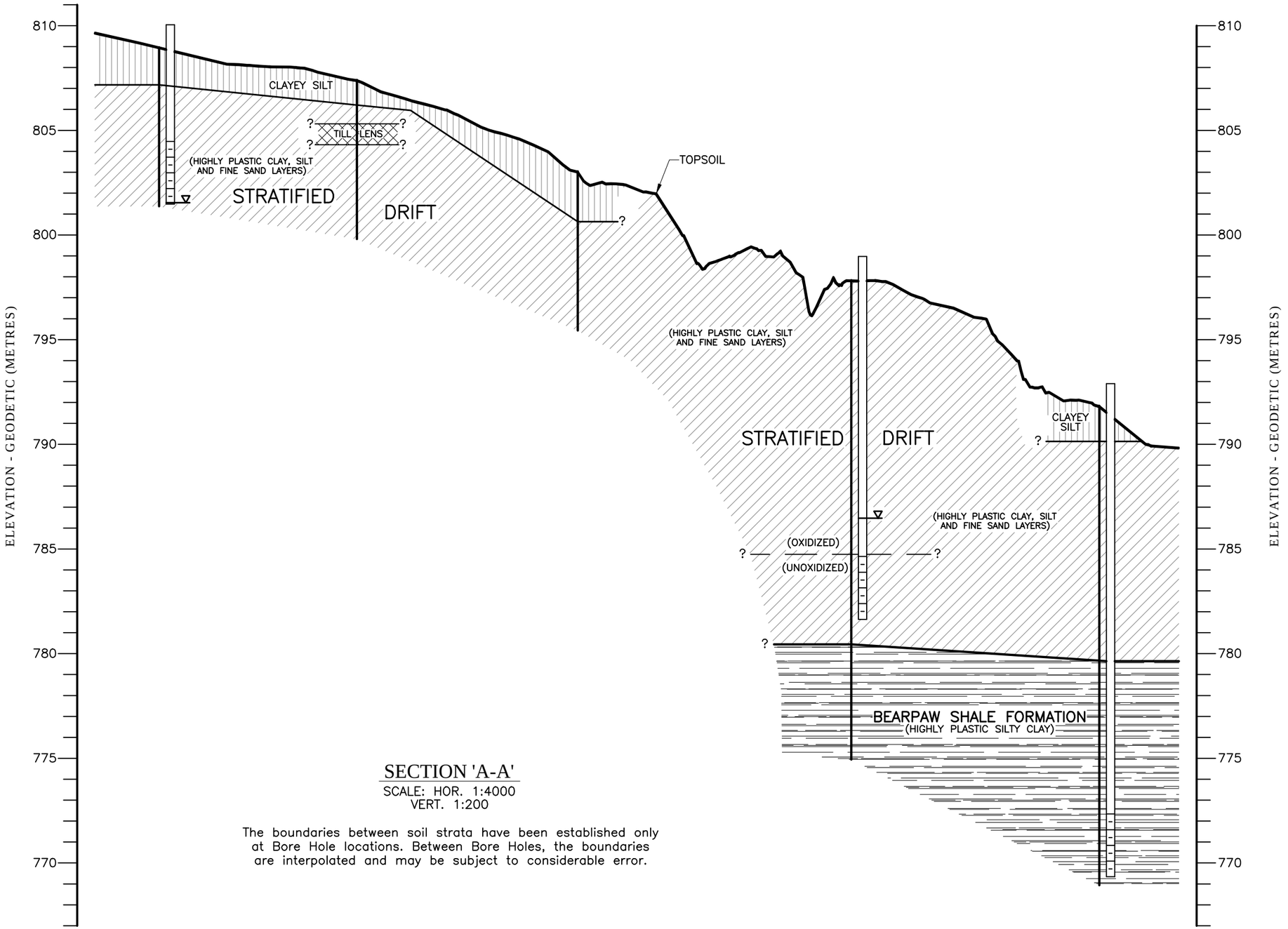
| | |
|---|---|
| WELL GRADED | Having wide range of grain sizes and substantial amounts of all intermediate sizes. |
| POORLY GRADED | Predominantly of one grain size. |
| SLICKENSIDES | Refers to a clay that has planes that are slick and glossy in appearance; slickensides are caused by shear movements. |
| SENSITIVE | Exhibiting loss of strength on remolding. |
| FISSURED | Containing cracks, usually attributable to shrinkage. Fissured clays are sometimes described as having a nuggetty structure. |
| STRATIFIED | Containing layers of different soil types. |
| ORGANIC | Containing organic matter; may be decomposed or fibrous. |
| PEAT | A fibrous mass of organic matter in various stages of decomposition. Generally dark brown to black in color and of spongy consistency. |
| BEDROCK | Preglacial material. |
| DRIFT | Material deposited directly by glaciers or glacial melt-water. |
| ALLUVIAL | Soils that have been deposited from suspension from moving water. |
| LACUSTRINE | Soils that have been deposited from suspension in fresh water lakes. |

## DRILLING AND SAMPLING TERMS

| SYMBOL | DEFINITION |
|---|---|
| C.S. | Continuous Sampling |
| Sy | 75mm Thin Wall Tube Sample |
| Sy (2) | 50mm Thin Wall Tube Sample |
| SPT (SS) | 50mm O.D. Split Spoon Sample |
| BLOWS / 300mm | "N" Value – Standard Penetration Test |
| Bag | Disturbed Bag Sample |
| No. | Sample Identification Number |
| ⟶ | Piezometer Tip |
| S.I. | Slope Indicator |
| SPG ⟶ | Observed Seepage |

## LABORATORY TEST SYMBOLS

| SYMBOL | DEFINITION |
|---|---|
| ● | Moisture Content – Percent of Dry Weight |
| ⟼ | Plastic and Liquid Limit determined in accordance with ASTM D-423 and D-424 |
| ◆ | Dry Density – $t/m^3$ |
| ■ | Shear Strength – As determined by Unconfined Compression Test |
| ▲ | Shear Strength – As determined by Field Vane |
| ▲ | Shear Strength – As determined by Pocket Penetrometer Test |
| $\%SO_4$ | Water Soluable Sulphates – Percent of Dry Weight |
| M.A. | Grain Size Analysis |




## SECTION 'A-A'

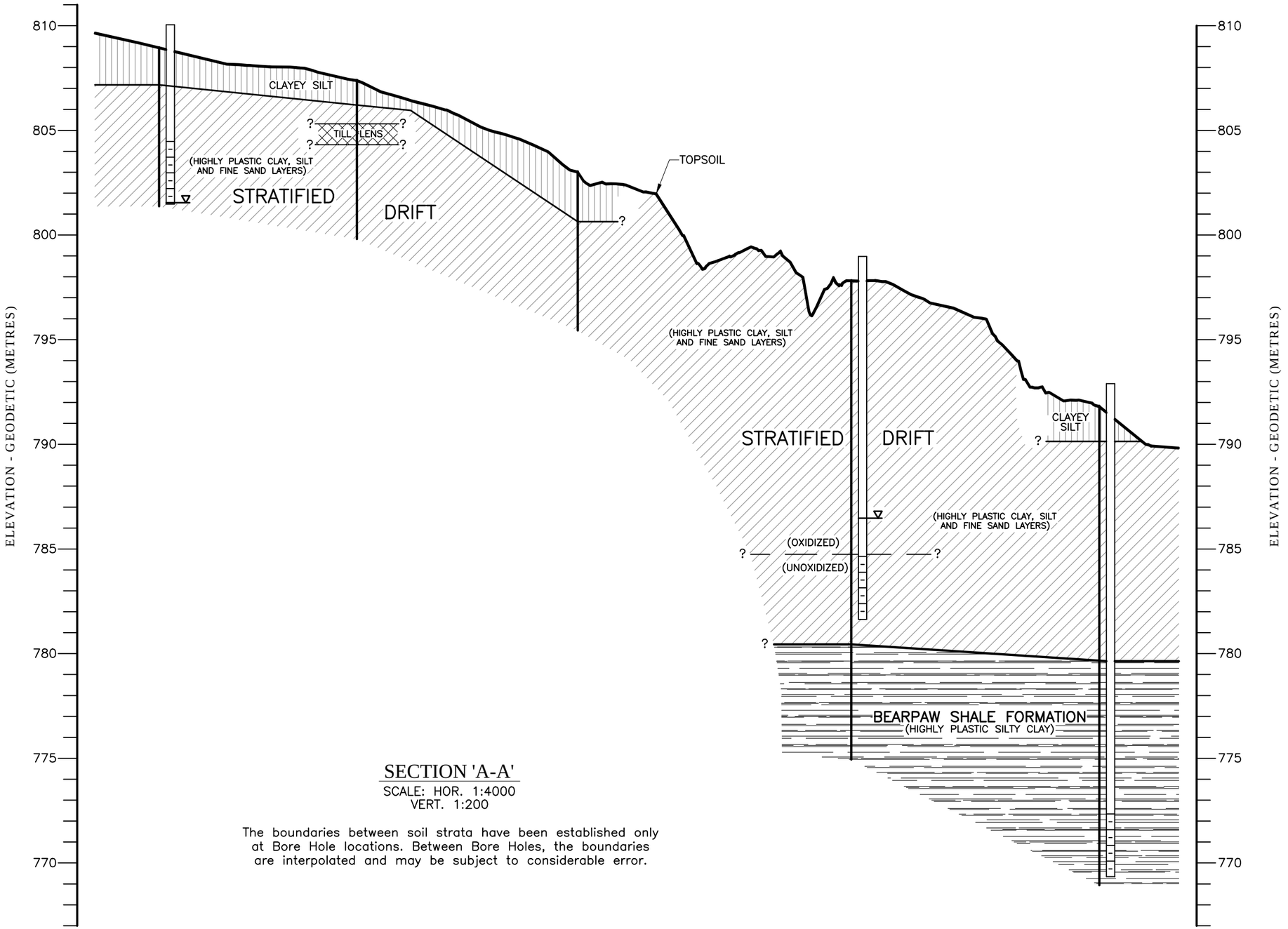
SCALE: HOR. 1:4000
VERT. 1:200

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes, the boundaries are interpolated and may be subject to considerable error.

GROUND ENGINEERING CONSULTANTS LTD.
CIVIL & GEOENVIRONMENTAL ENGINEERS
415–7th AVENUE
REGINA, SASKATCHEWAN, CANADA

STRATIGRAPHIC CROSS SECTION 'A–A'
PROPOSED RESIDENTIAL SUBDIVISION
SW 35–15–14–W3M
SWIFT CURRENT, SASKATCHEWAN

| CLIENT: | APPROVED: | DATE: | DWG. No.: |
|---|---|---|---|
| NORTH RIDGE DEVELOPMENT CORP. | P. WALSH | JULY 17, 2015 | GE–14110–5 |




## SECTION 'A-A'

SCALE: HOR. 1:4000
VERT. 1:200

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes, the boundaries are interpolated and may be subject to considerable error.

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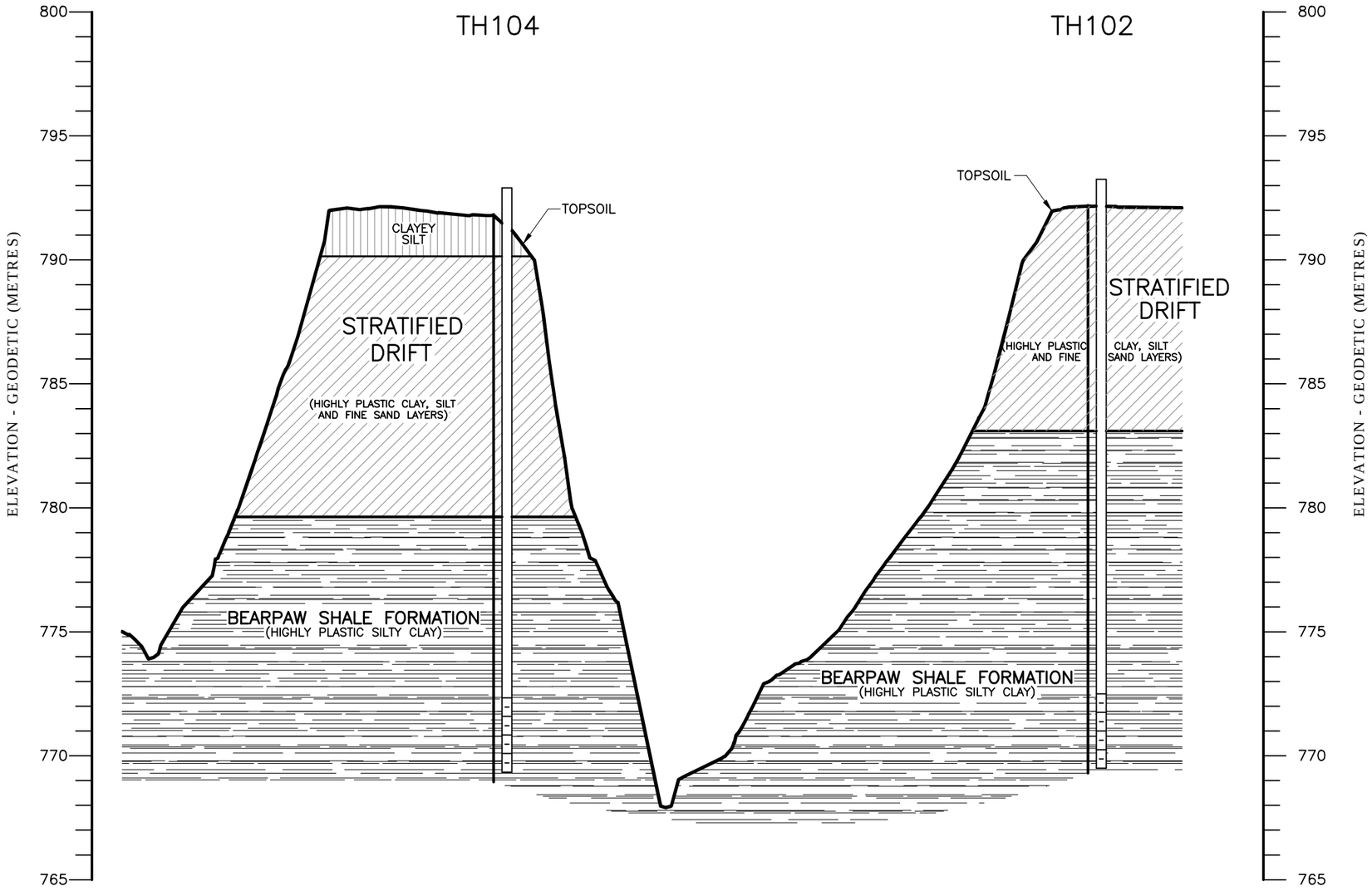
CIVIL & GEOENVIRONMENTAL ENGINEERS
415–7th AVENUE
REGINA, SASKATCHEWAN, CANADA

STRATIGRAPHIC CROSS SECTION 'A–A'
PROPOSED RESIDENTIAL SUBDIVISION
SW 35–15–14–W3M
SWIFT CURRENT, SASKATCHEWAN

| CLIENT: | APPROVED: | DATE: | DWG. No.: |
|---|---|---|---|
| NORTH RIDGE DEVELOPMENT CORP. | P. WALSH | JULY 17, 2015 | GE–14110–5 |




## SECTION 'C-C'

SCALE: HOR. 1:4000
VERT. 1:200

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes, the boundaries are interpolated and may be subject to considerable error.

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CIVIL & GEOENVIRONMENTAL ENGINEERS
415–7th AVENUE
REGINA, SASKATCHEWAN, CANADA

STRATIGRAPHIC CROSS SECTION 'C–C'
PROPOSED RESIDENTIAL SUBDIVISION
SW 35–15–14–W3M
SWIFT CURRENT, SASKATCHEWAN

| CLIENT: | APPROVED: | DATE: | DWG. No.: |
|---|---|---|---|
| NORTH RIDGE DEVELOPMENT CORP. | P. WALSH | JULY 17, 2015 | GE–14110–7 |

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH101 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5576086 N; 298693 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 806.14 m (Geodetic) | Date Drilled: 08/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Dry Density (t/m3) 0.4 0.8 1.2 1.6 / Sulphate Cont. (%) 0.2 0.4 0.6 0.8 / Plastic M.C. Liquid 20 40 60 80 | Soil Description | Group Index | Blow Count 20 40 60 80 / Vane Shear (kPa) / Pocket Pen (kPa) / Unconfined (kPa) 60 120 180 240 | Well Construction | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | ⊠ | 1 | CL | | | 0.00 m 806.1 m<br>TOPSOIL | 15.0 | | | 806.0 |
| 2.0 | ⊠ | 2 | | | | 0.05 m 806.1 m<br>STRATIFIED DRIFT<br>- predominantly silty clay<br>- till lens between 1.8 and 3.4 metres<br>- interbedded silt and fine grained sand layers below 3.4 metres<br>- moist, stiff to very stiff<br>- oxidized<br>- highly plastic clay layers<br>- light olive brown (2.5Y 5/4) to dark grayish brown (2.5Y 4/2) | | | | 805.0 |
| 3.0 | ⊟ | 3 | | | | | | | | 804.0 |
| 4.0 | | | | | | | | | | 803.0 |
| 5.0 | ⊠ | 4 | | | | | | | | 802.0 |
| 6.0 | ▬ | 5 | | | | | | | | 801.0 |
| 7.0 ▽ | ⊠ | 6 | | | | | | | | 800.0 |
| 8.0 | | | | | | | | | | 799.0 ▽ |
| 9.0 | | | | | | | | | | 798.0 |
| 10.0 | | | | | | | | | | 797.0 |
| 11.0 | | | | | | | | | | 796.0 |
| 12.0 | | | | | | | | | | 795.0 |
| 13.0 | | | | | | | | | | 794.0 |
| 14.0 | | | | | | | | | | 793.0 |
| 15.0 | | | | | | | | | | 792.0 |
| 16.0 | | | | | | | | | | 791.0 |
| 17.0 | | | | | | | | | | 790.0 |
| 18.0 | | | | | | | | | | 789.0 |
| 19.0 | | | | | | | | | | 788.0 |
| 20.0 | | | | | | | | | | 787.0 |
| 21.0 | | | | | | | | | | 786.0 |
| 22.0 | | | | | | | | | | 785.0 |
| 23.0 | | | | | | | | | | 784.0 |
| 24.0 | | | | | | | | | | 783.0 |
| | | | | | | Test hole terminated at 7.6 m below grade. | | | | 782.0 |

Backfill Type: Bentonite | Grout | Sand | Cuttings / Slough

Notes:
1. Test hole was excavated on December 8, 2014 using a 150 mm dia. continuous flight auger.
2. Standpipe piezometer was installed.

Piezo. Details & Water Level Meas.
Top of pipe Elev.: 807.26 m
Ht. of pipe above grade: 1.12 m

| Date | Depth (m) | Elev. (m) |
|---|---|---|
| 01/04/2015 | 8.50 | 798.76 |
| 03/03/2015 | 8.48 | 798.78 |
| 11/02/2015 | 8.50 | 798.76 |

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CIVIL & GEOENVIRONMENTAL ENGINEERS
415 - 7th AVENUE, REGINA, SASKATCHEWAN, S4N 4P1

Logged By: R. Yaremko | Figure No.: GE-14110-8
Drawn By: M. Creary | Date Plotted: 17/07/2015
Reviewed By: P. Walsh | Page 1 OF 13

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH102 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5575385 N; 298674 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 792.20 m (Geodetic) | Date Drilled: 08/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Dry Density (t/m3) 0.4 0.8 1.2 1.6 / Sulphate Cont. (%) 0.2 0.4 0.6 0.8 / Plastic M.C. Liquid 20 40 60 80 | Soil Description | Group Index | Blow Count 20 40 60 80 / Vane Shear (kPa) / Pocket Pen (kPa) / Unconfined (kPa) 60 120 180 240 | Well Construction | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | ⊠ | 7 | | | | 0.00 m 792.2 m<br>TOPSOIL | | | | 792.0 |
| 2.0 | ⊠ | 8 | | | | 0.08 m 792.1 m<br>STRATIFIED DRIFT<br>- predominantly silty clay<br>- interbedded silt and sand layers<br>- medium to highly plastic<br>- moist, stiff to hard<br>- oxidized, iron stains<br>- light olive brown (2.5Y 5/4) to dark grayish brown (2.5Y 4/2) | | | | 791.0 |
| 3.0 | ▬ | 9 | CL | | | | | | | 790.0 |
| 4.0 | | | | | | | | | | 789.0 |
| 5.0 | ⊠ | 10 | | | | | | | | 788.0 |
| 6.0 | ⊟ | 11 | | | | | | | | 787.0 |
| 7.0 | | | | | | | | | | 786.0 |
| 8.0 | ⊠ | 12 | | | | | | | | 785.0 |
| 9.0 | ▬ | 13 | | | | 9.10 m 783.1 m<br>BEARPAW SHALE FORMATION<br>- silty, highly plastic clay<br>- moist, hard<br>- unoxidized<br>- salt crystals<br>- dark gray (5Y 4/1) | | | | 784.0 |
| 10.0 | | | | | | | | | | 783.0 |
| 11.0 | ⊠ | 14 | | | | | | | | 782.0 |
| 12.0 | ⊟ | 15 | CH | | | | | | | 781.0 |
| 13.0 | | | | | | | | | | 780.0 |
| 14.0 | ⊠ | 16 | | | | | | | | 779.0 |
| 15.0 | ▬ | 17 | | | | | | | | 778.0 |
| 16.0 | | | | | | | | | | 777.0 |
| 17.0 | ⊠ | 18 | | | | | | | | 776.0 |
| 18.0 ▽ | ⊟ | 19 | | | | | | | | 775.0 |
| 19.0 | | | | | | | | | | 774.0 ▽ |
| 20.0 | ⊠ | 20 | | | | | | | | 773.0 |
| 21.0 | ▬ | 21 | | | | | | | | 772.0 |
| 22.0 | | | | | | | | | | 771.0 |
| 23.0 | ⊠ | 22 | | | | Test hole terminated at 22.9 m below grade. | | | | 770.0 |
| 24.0 | | | | | | | | | | 769.0 |
| | | | | | | | | | | 768.0 |

Backfill Type: Bentonite | Grout | Sand | Cuttings / Slough

Notes:
1. Test hole was excavated on December 8, 2014 using a 150 mm dia. continuous flight auger.
2. Standpipe piezometer was installed.

Piezo. Details & Water Level Meas.
Top of pipe Elev.: 793.25 m
Ht. of pipe above grade: 1.06 m

| Date | Depth (m) | Elev. (m) |
|---|---|---|
| 01/04/2015 | 19.68 | 773.57 |
| 03/03/2015 | 20.99 | 772.26 |
| 11/02/2015 | 23.85 | 769.40 |

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CIVIL & GEOENVIRONMENTAL ENGINEERS
415 - 7th AVENUE, REGINA, SASKATCHEWAN, S4N 4P1

Logged By: R. Yaremko | Figure No.: GE-14110-9
Drawn By: M. Creary | Date Plotted: 17/07/2015
Reviewed By: P. Walsh | Page 2 OF 13

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH103 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5575748 N; 298431 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 801.73 m (Geodetic) | Date Drilled: 08/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Dry Density (t/m3) 0.4 0.8 1.2 1.6 / Sulphate Cont. (%) 0.2 0.4 0.6 0.8 / Plastic M.C. Liquid 20 40 60 80 | Soil Description | Group Index | Blow Count 20 40 60 80 / Vane Shear (kPa) / Pocket Pen (kPa) / Unconfined (kPa) 60 120 180 240 | Well Construction | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | | 23 | | | | 0.00 m 801.7 m<br>TOPSOIL | | | | 801.0 |
| 2.0 | | 24 | | | | 0.05 m 801.7 m<br>STRATIFIED DRIFT<br>- clayey silt to 1.8 metres<br>- predominantly silty clay below 1.8 metres<br>- interbedded silt and fine grained sand layers<br>- medium to highly plastic<br>- moist, stiff to hard<br>- oxidized, iron stains<br>- unoxidized below 16.2 metres<br>- olive brown (2.5Y 4/4) to olive gray (5Y 4/2) | | | | 800.0 |
| 3.0 | | 25 | CH | | | | | >> | | 799.0 |
| 4.0 | | | | | | | | | | 798.0 |
| 5.0 | | 26 | | | | | | | | 797.0 |
| 6.0 | | 27 | | | | | | | | 796.0 |
| 7.0 | | | | | | | | | | 795.0 |
| 8.0 | | 28 | | | | | | | | 794.0 |
| 9.0 | | 29 | | | | | | | | 793.0 |
| 10.0 | | | | | | | | | | 792.0 |
| 11.0 | | 30 | | | | | | | | 791.0 |
| 12.0 | | 31 | | | | | | | | 790.0 |
| 13.0 | | | | | | | | | | 789.0 |
| 14.0 | | 32 | | | | | | | | 788.0 |
| 15.0 | | 33 | | | | | | | | 787.0 |
| 16.0 | | | | | | | | | | 786.0 |
| 17.0 | | 34 | | | | | | | | 785.0 |
| 18.0 | | | | | | 17.70 m 784.0 m<br>BEARPAW SHALE FORMATION<br>- silty, highly plastic clay<br>- moist, hard<br>- unoxidized<br>- salt crystals<br>- dark gray (5Y 4/1) | | | | 784.0 |
| 19.0 | | 35 | | | | | | | | 783.0 |
| 20.0 | | 36 | | | | | | | | 782.0 |
| 21.0 | | | | | | | | | | 781.0 |
| 22.0 | | 37 | | | | | | | | 780.0 |
| 23.0 | | 38 | | | | Test hole terminated at 22.9 m below grade. | | | | 779.0 |
| 24.0 | | | | | | | | | | 778.0 |
| | | | | | | | | | | 777.0 |

Backfill Type: Bentonite | Grout | Sand | Cuttings / Slough

Notes:
1. Test hole was excavated on December 8, 2014 using a 150 mm dia. continuous flight auger.
2. Standpipe piezometer was installed.

Piezo. Details & Water Level Meas.
Top of pipe Elev.: 802.84 m
Ht. of pipe above grade: 1.11 m

| Date | Depth (m) | Elev. (m) |
|---|---|---|
| 01/04/2015 | Dry | Dry |
| 03/03/2015 | Dry | Dry |
| 11/02/2015 | - | Dry |

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415 - 7th AVENUE, REGINA, SASKATCHEWAN, S4N 4P1

Logged By: R. Yaremko | Figure No.: GE-14110-10
Drawn By: M. Creary | Date Plotted: 17/07/2015
Reviewed By: P. Walsh | Page 3 OF 13

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH104 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5575384 N; 298195 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 791.84 m (Geodetic) | Date Drilled: 09/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Dry Density (t/m3) 0.4 0.8 1.2 1.6 / Sulphate Cont. (%) 0.2 0.4 0.6 0.8 / Plastic M.C. Liquid 20 40 60 80 | Soil Description | Group Index | Blow Count 20 40 60 80 / Vane Shear (kPa) / Pocket Pen (kPa) / Unconfined (kPa) 60 120 180 240 | Well Construction | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | | 39 | | | | 0.00 m 791.8 m<br>TOPSOIL | | | | 791.0 |
| 2.0 | | 40 | CL | | | 0.05 m 791.8 m<br>STRATIFIED DRIFT<br>- clayey silt to 1.7 metres<br>- predominantly silty clay below 1.7 metres<br>- interbedded silt and fine grained sand layers<br>- medium to highly plastic<br>- moist, stiff to hard<br>- oxidized, iron stains<br>- unoxidized below 16.2 metres<br>- olive brown (2.5Y 4/4) to olive gray (5Y 4/2) | | | | 790.0 |
| 3.0 | | 40A | | | | | | | | 789.0 |
| 4.0 | | 41 | | | | | | | | 788.0 |
| 5.0 | | 42 | | | | | | | | 787.0 |
| 6.0 | | 43 | | | | | | | | 786.0 |
| 7.0 | | 44 | | | | | | | | 785.0 |
| 8.0 | | 45 | | | | | | | | 784.0 |
| 9.0 | | 46 | | | | | | | | 783.0 |
| 10.0 | | 47 | CH | | | 12.20 m 779.6 m<br>BEARPAW SHALE FORMATION<br>- silty, highly plastic clay<br>- moist, hard<br>- unoxidized<br>- salt crystals<br>- dark gray (5Y 4/1) | | | | 782.0 |
| 11.0 | | 48 | | | | | | | | 781.0 |
| 12.0 | | 49 | | | | | | | | 780.0 |
| 13.0 | | 50 | | | | | | | | 779.0 |
| 14.0 | | 51 | | | | | | | | 778.0 |
| 15.0 | | 52 | | | | | | | | 777.0 |
| 16.0 | | 53 | | | | | | | | 776.0 |
| 17.0 | | 54 | | | | | | | | 775.0 |
| 18.0 | | | | | | | | | | 774.0 |
| 19.0 | | | | | | | | | | 773.0 |
| 20.0 | | | | | | | | | | 772.0 |
| 21.0 | | | | | | | | | | 771.0 |
| 22.0 | | | | | | | | | | 770.0 |
| 23.0 | | | | | | Test hole terminated at 22.9 m below grade. | | | | 769.0 |
| 24.0 | | | | | | | | | | 768.0 |
| | | | | | | | | | | 767.0 |

Backfill Type: Bentonite | Grout | Sand | Cuttings / Slough

Notes:
1. Test hole was excavated on December 9, 2014 using a 150 mm dia. continuous flight auger.
2. Standpipe piezometer was installed.

Piezo. Details & Water Level Meas.
Top of pipe Elev.: 792.90 m
Ht. of pipe above grade: 1.06 m

| Date | Depth (m) | Elev. (m) |
|---|---|---|
| 01/04/2015 | Dry | Dry |
| 03/03/2015 | Dry | Dry |
| 11/02/2015 | - | Dry |

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Logged By: R. Yaremko | Figure No.: GE-14110-11
Drawn By: M. Creary | Date Plotted: 17/07/2015
Reviewed By: P. Walsh | Page 4 OF 13

| | | |
|---|---|---|
| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH105 |
| Project No.: GE-14110 | Coordinate: 5575617 N; 298154 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 797.84 m (Geodetic) | Date Drilled: 09/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Dry Density (t/m3) 0.4 0.8 1.2 1.6 / Sulphate Cont. (%) 0.2 0.4 0.6 0.8 / Plastic M.C. Liquid 20 40 60 80 | Soil Description | Group Index | Blow Count 20 40 60 80 / Vane Shear (kPa) / Pocket Pen (kPa) / Unconfined (kPa) 60 120 180 240 | Well Construction | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | ⊠ | 55 | | | | 0.00 m 797.8 m<br>TOPSOIL | | | | 797.0 |
| 2.0 | ⊠ | 56 | | | | 0.05 m 797.8 m<br>STRATIFIED DRIFT<br>- predominantly silty clay<br>- interbedded silt and sand layers<br>- medium to highly plastic<br>- moist, stiff to hard<br>- oxidized, iron stains<br>- unoxidized below 13.1 metres<br>- olive brown (2.5Y 4/4) to dark gray (5Y 4/1) | | | | 796.0 |
| 3.0 | ⊟ | 57 | | | ▲ | | | >>▲ ■ | | 795.0 |
| 4.0 | | | | | | | | | | 794.0 |
| 5.0 | ⊠ | 58 | | | | | | | | 793.0 |
| 6.0 | ▬ | 59 | | | | | | ● | | 792.0 |
| 7.0 | | | | | | | | | | 791.0 |
| 8.0 | ⊠ | 60 | | | | | | | | 790.0 |
| 9.0 | ⊟ | 61 | | | ▲ | | | | | 789.0 |
| 10.0 | | | | | | | | | | 788.0 |
| 11.0 | ⊠ | 62 | | | | | | | | 787.0 |
| 12.0 | ▬ | 63 | | | | | | ● | | 786.0 |
| 13.0 | | | | | | | | | | 785.0 |
| 14.0 | ⊠ | 64 | | | | | | | | 784.0 |
| 15.0 | ⊠ | 65 | | | | | | | | 783.0 |
| 16.0 | | | | | | | | | | 782.0 |
| 17.0 | ⊠ | 66 | | | | | | | | 781.0 |
| 18.0 | | | | | | 17.40 m 780.4 m<br>BEARPAW SHALE FORMATION<br>- silty, highly plastic clay<br>- moist, hard<br>- unoxidized<br>- salt crystals<br>- dark gray (5Y 4/1) | | | | 780.0 |
| 19.0 | | | | | | | | | | 779.0 |
| 20.0 | ⊠ | 68 | | | | | | | | 778.0 |
| 21.0 | | | | | | | | | | 777.0 |
| 22.0 | ⊠ | 69 | | | | | | | | 776.0 |
| 23.0 | ⊠ | 70 | | | | Test hole terminated at 22.9 m below grade. | | | | 775.0 |
| 24.0 | | | | | | | | | | 774.0 |
| | | | | | | | | | | 773.0 |

Backfill Type: Bentonite | Grout | Sand | Cuttings / Slough

Notes:
1. Test hole was excavated on December 9, 2014 using a 150 mm dia. continuous flight auger.
2. Standpipe piezometer was installed.

Piezo. Details & Water Level Meas.
Top of pipe Elev.: 798.98 m
Ht. of pipe above grade: 1.14 m

| Date | Depth (m) | Elev. (m) |
|---|---|---|
| 01/04/2015 | 12.51 | 786.47 |
| 03/03/2015 | 12.55 | 786.43 |
| 11/02/2015 | 12.76 | 786.22 |

**GROUND ENGINEERING CONSULTANTS LTD.**
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Logged By: R. Yaremko | Figure No.: GE-14110-12
Drawn By: M. Creary | Date Plotted: 17/07/2015
Reviewed By: P. Walsh | Page 5 OF 13

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH106 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5575749 N; 297928 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 803.04 m (Geodetic) | Date Drilled: 09/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Dry Density (t/m3) 0.4 0.8 1.2 1.6 / Sulphate Cont. (%) 0.2 0.4 0.6 0.8 / Plastic M.C. Liquid 20 40 60 80 | Soil Description | Group Index | Blow Count 20 40 60 80 / Vane Shear (kPa) / Pocket Pen (kPa) / Unconfined (kPa) 60 120 180 240 | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|---|---|
| 1.0 | ⊠ | 71 | | | | 0.00 m 803.0 m<br>TOPSOIL<br>0.05 m 803.0 m<br>STRATIFIED DRIFT<br>- clayey silt to 2.4 metres<br>- predominantly silty clay below 2.4 metres<br>- interbedded silt and fine grained sand layers<br>- highly plastic below 3.1 metres<br>- moist, stiff to hard<br>- oxidized, iron stains<br>- olive brown (2.5Y 4/4) | | | 802.0 |
| 2.0 | ⊠ | 72 | | | | | | | 801.0 |
| 3.0 | ⊠ | 73 | | | | | | | 800.0 |
| | ▬ | 73A | | | | | | | |
| 4.0 | ⊠ | 74 | | | | | | | 799.0 |
| 5.0 | | | | | | | | | 798.0 |
| 6.0 | ▭ | 75 | | | | | | | 797.0 |
| 7.0 | ⊠ | 76 | | | | Test hole terminated at 7.6 m below grade. | | | 796.0 |
| 8.0 | | | | | | | | | 795.0 |
| 9.0 | | | | | | | | | 794.0 |
| 10.0 | | | | | | | | | 793.0 |
| 11.0 | | | | | | | | | 792.0 |
| 12.0 | | | | | | | | | 791.0 |
| 13.0 | | | | | | | | | 790.0 |
| 14.0 | | | | | | | | | 789.0 |
| 15.0 | | | | | | | | | 788.0 |
| 16.0 | | | | | | | | | 787.0 |
| 17.0 | | | | | | | | | 786.0 |
| 18.0 | | | | | | | | | 785.0 |
| 19.0 | | | | | | | | | 784.0 |
| 20.0 | | | | | | | | | 783.0 |
| 21.0 | | | | | | | | | 782.0 |
| 22.0 | | | | | | | | | 781.0 |
| 23.0 | | | | | | | | | 780.0 |
| 24.0 | | | | | | | | | 779.0 |

Notes:
1. Test hole was excavated on December 9, 2014 using a 150 mm dia. continuous flight auger.
2. No groundwater accumulation or sloughing was noted during drilling.
3. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

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| Logged By: R. Yaremko | Figure No.: GE-14110-13 |
|---|---|
| Drawn By: M. Creary | Date Plotted: 17/07/2015 |
| Reviewed By: P. Walsh | Page 6 OF 13 |

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH107 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5575844 N; 298169 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 805.49 m (Geodetic) | Date Drilled: 09/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Dry Density (t/m3) 0.4 0.8 1.2 1.6 / Sulphate Cont. (%) 0.2 0.4 0.6 0.8 / Plastic M.C. Liquid 20 40 60 80 | Soil Description | Group Index | Blow Count 20 40 60 80 / Vane Shear (kPa) / Pocket Pen (kPa) / Unconfined (kPa) 60 120 180 240 | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|---|---|
| 1.0 | ⊠ | 77 | CL | | | 0.00 m 805.5 m<br>TOPSOIL<br>0.08 m 805.4 m<br>STRATIFIED DRIFT<br>- clayey silt to 2.4 metres<br>- predominantly silty clay below 2.4 metres<br>- interbedded silt and fine grained sand layers<br>- highly plastic below 2.4 metres<br>- moist, stiff to hard<br>- oxidized, iron stains<br>- unoxidized below 13.7 metres<br>- olive brown (2.5Y 4/4) to dark gray (5Y 4/1) | 13.0 | | 805.0 |
| 2.0 | ⊠ | 78 | | | | | | | 804.0 |
| 3.0 | ⊟ | 79 | | | | | | | 803.0 |
| 4.0 | | | | | | | | | 802.0 |
| 5.0 | ⊠ | 80 | | | | | | | 801.0 |
| 6.0 | ◪ | 81 | | | | | | | 800.0 |
| 7.0 | | | | | | | | | 799.0 |
| 8.0 | ⊠ | 82 | | | | | | | 798.0 |
| 9.0 | ⊟ | 83 | | | | | | | 797.0 |
| 10.0 | | | | | | | | | 796.0 |
| 11.0 | ⊠ | 84 | | | | | | | 795.0 |
| 12.0 | ◪ | 85 | | | | | | | 794.0 |
| 13.0 | | | | | | | | | 793.0 |
| 14.0 | ⊠ | 86 | | | | | | | 792.0 |
| 15.0 | ⊠ | 87 | | | | Test hole terminated at 15.2 m below grade. | | | 791.0 |
| 16.0 | | | | | | | | | 790.0 |
| 17.0 | | | | | | | | | 789.0 |
| 18.0 | | | | | | | | | 788.0 |
| 19.0 | | | | | | | | | 787.0 |
| 20.0 | | | | | | | | | 786.0 |
| 21.0 | | | | | | | | | 785.0 |
| 22.0 | | | | | | | | | 784.0 |
| 23.0 | | | | | | | | | 783.0 |
| 24.0 | | | | | | | | | 782.0 |
| | | | | | | | | | 781.0 |

Notes:
1. Test hole was excavated on December 9, 2014 using a 150 mm dia. continuous flight auger.
2. No groundwater accumulation was noted immediately after completion of drilling.
3. Test hole sloughed to 14.9 metres.
4. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

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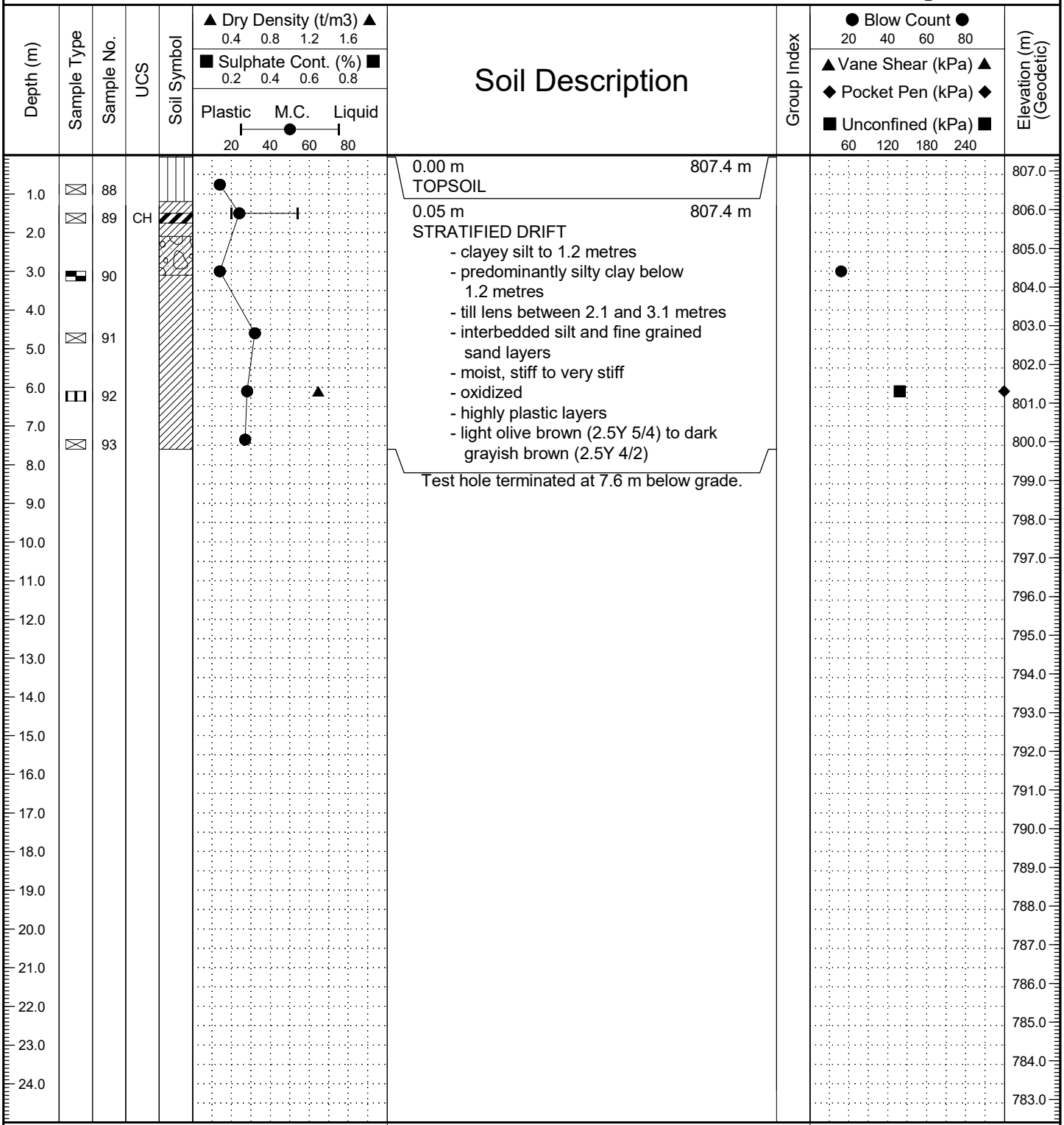
| Logged By: R. Yaremko | Figure No.: GE-14110-14 |
|---|---|
| Drawn By: M. Creary | Date Plotted: 17/07/2015 |
| Reviewed By: P. Walsh | Page 7 OF 13 |

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH108 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5575921 N; 298049 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 807.41 m (Geodetic) | Date Drilled: 09/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample




Notes:

1. Test hole was excavated on December 9, 2014 using a 150 mm dia. continuous flight auger.
2. No groundwater accumulation or sloughing was noted immediately after completion of drilling.
3. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

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415 - 7th AVENUE, REGINA, SASKATCHEWAN, S4N 4P1

| Logged By: R. Yaremko | Figure No.: GE-14110-15 |
|---|---|
| Drawn By: M. Creary | Date Plotted: 17/07/2015 |
| Reviewed By: P. Walsh | Page 8 OF 13 |

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH109 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5576084 N; 297953 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 808.97 m (Geodetic) | Date Drilled: 09/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Dry Density (t/m3) 0.4 0.8 1.2 1.6 / Sulphate Cont. (%) 0.2 0.4 0.6 0.8 / Plastic M.C. Liquid 20 40 60 80 | Soil Description | Group Index | Blow Count 20 40 60 80 / Vane Shear (kPa) / Pocket Pen (kPa) / Unconfined (kPa) 60 120 180 240 | Well Construction | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | ⊠ | 94 | CL | | | 0.00 m 809.0 m<br>TOPSOIL<br>0.08 m 808.9 m<br>STRATIFIED DRIFT<br>- clayey silt to 1.8 metres<br>- predominantly silty clay below 1.8 metres<br>- interbedded silt and fine grained sand layers<br>- highly plastic below 3.1 metres<br>- moist, stiff to hard<br>- oxidized, iron stains<br>- olive brown (2.5Y 4/4) | | | | 808.0 |
| 2.0 | ⊠ | 95 | | | | | | | | 807.0 |
| 3.0 | ▬ | 96 | | | | | | | | 806.0 |
| 4.0 | | | | | | | | | | 805.0 |
| 5.0 | ⊠ | 97 | | | | | | | | 804.0 |
| 6.0 | ▬ | 98 | | | | | | | | 803.0 |
| 7.0 | | | | | | | | | | 802.0 |
| 8.0 | ⊠ | 99 | | | | Test hole terminated at 7.6 m below grade. | | | | 801.0 |
| 9.0 | | | | | | | | | | 800.0 |
| 10.0 | | | | | | | | | | 799.0 |
| 11.0 | | | | | | | | | | 798.0 |
| 12.0 | | | | | | | | | | 797.0 |
| 13.0 | | | | | | | | | | 796.0 |
| 14.0 | | | | | | | | | | 795.0 |
| 15.0 | | | | | | | | | | 794.0 |
| 16.0 | | | | | | | | | | 793.0 |
| 17.0 | | | | | | | | | | 792.0 |
| 18.0 | | | | | | | | | | 791.0 |
| 19.0 | | | | | | | | | | 790.0 |
| 20.0 | | | | | | | | | | 789.0 |
| 21.0 | | | | | | | | | | 788.0 |
| 22.0 | | | | | | | | | | 787.0 |
| 23.0 | | | | | | | | | | 786.0 |
| 24.0 | | | | | | | | | | 785.0 |

Backfill Type: Bentonite | Grout | Sand | Cuttings / Slough

Notes:
1. Test hole was excavated on December 9, 2014 using a 150 mm dia. continuous flight auger.
2. Standpipe piezometer was installed.

Piezo. Details & Water Level Meas.
Top of pipe Elev.: 810.05 m
Ht. of pipe above grade: 1.07 m

| Date | Depth (m) | Elev. (m) |
|---|---|---|
| 01/04/2015 | Dry | Dry |
| 03/03/2015 | Dry | Dry |
| 11/02/2015 | 8.56 | 801.49 |

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Logged By: R. Yaremko | Figure No.: GE-14110-16
Drawn By: M. Creary | Date Plotted: 17/07/2015
Reviewed By: P. Walsh | Page 9 OF 13

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH110 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5575546 N; 298428 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 797.55 m (Geodetic) | Date Drilled: 10/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

▲ Dry Density (t/m3) ▲ 0.4 0.8 1.2 1.6
■ Sulphate Cont. (%) ■ 0.2 0.4 0.6 0.8
Plastic M.C. Liquid 20 40 60 80
● Blow Count ● 20 40 60 80
▲ Vane Shear (kPa) ▲
◆ Pocket Pen (kPa) ◆
■ Unconfined (kPa) ■ 60 120 180 240

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Soil Description | Group Index | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|
| | | | | | 0.00 m 797.6 m<br>TOPSOIL | 15.0 | |
| 1.0 | ⊠ | 100 | CL | | 0.08 m 797.5 m<br>STRATIFIED DRIFT<br>- clayey till to 2.1 metres<br>- predominantly silty clay below 2.1 metres<br>- interbedded silt and fine grained sand layers<br>- medium to highly plastic<br>- moist, stiff to hard<br>- oxidized, iron stains<br>- olive brown (2.5Y 4/4) | | 797.0 |
| 2.0 | ⊠ | 101 | | | | | 796.0 |
| 3.0 | ⊟ | 102 | | | | | 795.0 |
| 4.0 | | | | | | | 794.0 |
| 5.0 | ⊠ | 103 | | | | | 793.0 |
| 6.0 | ◪ | 104 | | | | | 792.0 |
| 7.0 | | | | | | | 791.0 |
| 8.0 | ⊠ | 105 | | | | | 790.0 |
| 9.0 | ⊟ | 106 | | | | | 789.0 |
| 10.0 | | | | | | | 788.0 |
| 11.0 | ⊠ | 107 | | | | | 787.0 |
| 12.0 | ◪ | 108 | | | | | 786.0 |
| 13.0 | | | | | 12.80 m 784.8 m<br>BEARPAW SHALE FORMATION<br>- silty, highly plastic clay<br>- moist, hard<br>- unoxidized<br>- salt crystals<br>- dark gray (5Y 4/1) | | 785.0 |
| 14.0 | ⊠ | 109 | | | | | 784.0 |
| 15.0 | ⊠ | 110 | CH | | | | 783.0 |
| 16.0 | | | | | | | 782.0 |
| 17.0 | ⊠ | 111 | | | | | 781.0 |
| 18.0 | | | | | | | 780.0 |
| 19.0 | ⊠ | 112 | | | | | 779.0 |
| 20.0 | ⊠ | 113 | | | | | 778.0 |
| 21.0 | | | | | | | 777.0 |
| 22.0 | ⊠ | 114 | | | | | 776.0 |
| 23.0 | ⊠ | 115 | | | Test hole terminated at 22.9 m below grade. | | 775.0 |
| 24.0 | | | | | | | 774.0 |
| | | | | | | | 773.0 |

Notes:
1. Test hole was excavated on December 10, 2014 using a 150 mm dia. continuous flight auger.
2. Auger refusal on boulder at 1.8 metres. Test hole moved and redrilled.
3. No groundwater accumulation was noted immediately after completion of drilling. Test hole sloughed to 22.6 metres.
4. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

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| Logged By: R. Yaremko | Figure No.: GE-14110-17 |
|---|---|
| Drawn By: M. Creary | Date Plotted: 17/07/2015 |
| Reviewed By: P. Walsh | Page 10 OF 13 |

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH111 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5575798 N; 298676 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 799.59 m (Geodetic) | Date Drilled: 10/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Soil Description | Group Index | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|
| | | | | | 0.00 m 799.6 m<br>TOPSOIL<br>0.05 m 799.5 m<br>STRATIFIED DRIFT<br>- predominantly silty clay<br>- interbedded silt and fine grained sand layers<br>- highly plastic below 2.5 metres<br>- moist, stiff to hard<br>- oxidized, iron stains<br>- olive brown (2.5Y 4/4) | | |
| 1.0 | | 116 | | | | | 799.0 |
| 2.0 | | 117 | | | | | 798.0 |
| 3.0 | | 118 | CH | | | | 797.0 |
| 4.0 | | | | | | | 796.0 |
| 5.0 | | 119 | | | | | 795.0 |
| 6.0 | | 120 | | | | | 794.0 |
| 7.0 | | 121 | | | | | 793.0 |
| 8.0 | | | | | Test hole terminated at 7.6 m below grade. | | 792.0 |
| 9.0 | | | | | | | 791.0 |
| 10.0 | | | | | | | 790.0 |
| 11.0 | | | | | | | 789.0 |
| 12.0 | | | | | | | 788.0 |
| 13.0 | | | | | | | 787.0 |
| 14.0 | | | | | | | 786.0 |
| 15.0 | | | | | | | 785.0 |
| 16.0 | | | | | | | 784.0 |
| 17.0 | | | | | | | 783.0 |
| 18.0 | | | | | | | 782.0 |
| 19.0 | | | | | | | 781.0 |
| 20.0 | | | | | | | 780.0 |
| 21.0 | | | | | | | 779.0 |
| 22.0 | | | | | | | 778.0 |
| 23.0 | | | | | | | 777.0 |
| 24.0 | | | | | | | 776.0 |
| | | | | | | | 775.0 |

▲ Dry Density (t/m3) ▲ 0.4 0.8 1.2 1.6
■ Sulphate Cont. (%) ■ 0.2 0.4 0.6 0.8
Plastic M.C. Liquid 20 40 60 80

● Blow Count ● 20 40 60 80
▲ Vane Shear (kPa) ▲
◆ Pocket Pen (kPa) ◆
■ Unconfined (kPa) ■ 60 120 180 240

Notes:
1. Test hole was excavated on December 10, 2014 using a 150 mm dia. continuous flight auger.
2. No groundwater accumulation or sloughing was noted immediately after completion of drilling.
3. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

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| Logged By: R. Yaremko | Figure No.: GE-14110-18 |
|---|---|
| Drawn By: M. Creary | Date Plotted: 17/07/2015 |
| Reviewed By: P. Walsh | Page 11 OF 13 |

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH112 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5575943 N; 298494 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 805.93 m (Geodetic) | Date Drilled: 10/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Soil Description | Group Index | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|
| | | | | | 0.00 m 805.9 m<br>TOPSOIL<br>0.05 m 805.9 m<br>STRATIFIED DRIFT<br>- predominantly silty clay<br>- till lens between 1.8 and 3.1 metres<br>- interbedded silt and fine grained sand layers<br>- moist, stiff to very stiff<br>- oxidized<br>- highly plastic layers<br>- light olive brown (2.5Y 5/4) to dark grayish brown (2.5Y 4/2)<br>Test hole terminated at 7.6 m below grade. | | |
| 1.0 | | 122 | | | | | 805.0 |
| 2.0 | | 123 | | | | | 804.0 |
| 3.0 | | 124 | | | | | 803.0 |
| 4.0 | | | | | | | 802.0 |
| 5.0 | | 125 | | | | | 801.0 |
| 6.0 | | 126 | | | | | 800.0 |
| 7.0 | | 127 | | | | | 799.0 |
| 8.0 | | | | | | | 798.0 |
| 9.0 | | | | | | | 797.0 |
| 10.0 | | | | | | | 796.0 |
| 11.0 | | | | | | | 795.0 |
| 12.0 | | | | | | | 794.0 |
| 13.0 | | | | | | | 793.0 |
| 14.0 | | | | | | | 792.0 |
| 15.0 | | | | | | | 791.0 |
| 16.0 | | | | | | | 790.0 |
| 17.0 | | | | | | | 789.0 |
| 18.0 | | | | | | | 788.0 |
| 19.0 | | | | | | | 787.0 |
| 20.0 | | | | | | | 786.0 |
| 21.0 | | | | | | | 785.0 |
| 22.0 | | | | | | | 784.0 |
| 23.0 | | | | | | | 783.0 |
| 24.0 | | | | | | | 782.0 |

▲ Dry Density (t/m3) ▲ 0.4 0.8 1.2 1.6
■ Sulphate Cont. (%) ■ 0.2 0.4 0.6 0.8
Plastic M.C. Liquid 20 40 60 80

● Blow Count ● 20 40 60 80
▲ Vane Shear (kPa) ▲
◆ Pocket Pen (kPa) ◆
■ Unconfined (kPa) ■ 60 120 180 240

Notes:
1. Test hole was excavated on December 10, 2014 using a 150 mm dia. continuous flight auger.
2. No groundwater accumulation or sloughing was noted immediately after completion of drilling.
3. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

**GROUND ENGINEERING CONSULTANTS LTD.**
CIVIL & GEOENVIRONMENTAL ENGINEERS
415 - 7th AVENUE, REGINA, SASKATCHEWAN, S4N 4P1

| Logged By: R. Yaremko | Figure No.: GE-14110-19 |
|---|---|
| Drawn By: M. Creary | Date Plotted: 17/07/2015 |
| Reviewed By: P. Walsh | Page 12 OF 13 |

| Project: Proposed Residential Subdivision | Location: SW 35-15-14-W3M | Test Hole No.:TH113 |
|---|---|---|
| Project No.: GE-14110 | Coordinate: 5576101 N; 298292 E (NAD83) | Drill Rig: Brat 22 |
| Client: North Ridge Development Corp. | Elevation: 809.93 m (Geodetic) | Date Drilled: 10/12/2014 |

Sample Type: Shelby Tube | Disturbed | SPT Sample | Pail Sample | No Recovery | Jar Sample

| Depth (m) | Sample Type | Sample No. | UCS | Soil Symbol | Dry Density (t/m3) 0.4 0.8 1.2 1.6 / Sulphate Cont. (%) 0.2 0.4 0.6 0.8 / Plastic M.C. Liquid 20 40 60 80 | Soil Description | Group Index | Blow Count 20 40 60 80 / Vane Shear (kPa) / Pocket Pen (kPa) / Unconfined (kPa) 60 120 180 240 | Elevation (m) (Geodetic) |
|---|---|---|---|---|---|---|---|---|---|
| 1.0 | ⊠ | 128 | | | | 0.00 m 809.9 m<br>TOPSOIL<br>0.10 m 809.8 m<br>STRATIFIED DRIFT<br>- clayey till to 6.4 metres<br>- predominantly silty clay below 6.4 metres<br>- interbedded silt and fine grained sand layers<br>- moist, stiff to very stiff<br>- oxidized<br>- highly plastic layers<br>- light olive brown (2.5Y 5/4) to dark grayish brown (2.5Y 4/2) | | | 809.0 |
| 2.0 | ⊟ | 129 | | | | | | >> | 808.0 |
| 3.0 | ⊠ | 130 | CL | | | | | | 807.0 |
| 4.0 | | | | | | | | | 806.0 |
| 5.0 | ⊠ | 131 | | | | | | | 805.0 |
| 6.0 | ⊠ | 132 | | | | | | | 804.0 |
| 7.0 | ⊠ | 133 | | | | | | | 803.0 |
| 8.0 | | | | | | Test hole terminated at 7.6 m below grade. | | | 802.0 |
| 9.0 | | | | | | | | | 801.0 |
| 10.0 | | | | | | | | | 800.0 |
| 11.0 | | | | | | | | | 799.0 |
| 12.0 | | | | | | | | | 798.0 |
| 13.0 | | | | | | | | | 797.0 |
| 14.0 | | | | | | | | | 796.0 |
| 15.0 | | | | | | | | | 795.0 |
| 16.0 | | | | | | | | | 794.0 |
| 17.0 | | | | | | | | | 793.0 |
| 18.0 | | | | | | | | | 792.0 |
| 19.0 | | | | | | | | | 791.0 |
| 20.0 | | | | | | | | | 790.0 |
| 21.0 | | | | | | | | | 789.0 |
| 22.0 | | | | | | | | | 788.0 |
| 23.0 | | | | | | | | | 787.0 |
| 24.0 | | | | | | | | | 786.0 |

Notes:
1. Test hole was excavated on December 10, 2014 using a 150 mm dia. continuous flight auger.
2. No groundwater accumulation or sloughing was noted immediately after completion of drilling.
3. Test hole was backfilled to surface with drill cuttings immediately after completion of drilling.

**GROUND ENGINEERING CONSULTANTS LTD.**
CIVIL & GEOENVIRONMENTAL ENGINEERS
415 - 7th AVENUE, REGINA, SASKATCHEWAN, S4N 4P1

| Logged By: R. Yaremko | Figure No.: GE-14110-20 |
|---|---|
| Drawn By: M. Creary | Date Plotted: 17/07/2015 |
| Reviewed By: P. Walsh | Page 13 OF 13 |

# APPENDIX A

## 3300 - 1 DESCRIPTION

1.01 The work shall consist of spreading and compacting screened or crushed aggregate on a prepared surface.

1.02 The following definitions shall apply for this specification:

(a) Mean:

The arithmetic average of a set of 'n' test results constituting the sample.

(b) Moving average:

The arithmetic mean of 3 consecutive test results.

(c) Sub-base aggregate:

The aggregate before mixing, when binder is to be added or the aggregate before spreading and compacting, when no binder is to be added.

(d) Sub-base mix:

The sub-base aggregate after mixing with binder and water but before spreading and compacting.

(e) Sub-base course:

The sub-base aggregate or sub-base mix in place on the road during and after spreading and compacting.

## 3300 - 2 MATERIALS

### Aggregate

2.01 Sub-base aggregate shall be composed of sound, hard, and durable particles of sand, gravel and rock free from injurious quantities of soft or flaky particles, shale, loam, clay balls and organic or other deleterious material.

## 3300 - 3 CONSTRUCTION

### General

3.01 (a) Sub-base course shall comply with the requirements listed in Table 1:

**TABLE 1**

| Sieve Designation | Percent By Weight Passing Canadian Metric Sieve Series | | |
|---|---|---|---|
| | TYPE | | |
| | 6 | 8 | 10 |
| 50.0 mm | 100.0 | 100.0 | 100.0 |
| 2.0 mm | 0 - 80.0 | 0 - 90.0 | |
| 400 um | 0 - 45.0 | 0 - 60.0 | |
| 160 um | 0 - 20.0 | 0- 25.0 | |
| 71 um | 0 - 6.0 | 0 - 15.0 | 0 - 20.0 |
| Plasticity Index (all types) | 0 - 6.0 | | |

## 3505 - 2 MATERIALS

### Aggregate

2.01 Base aggregate shall be composed of sound, hard and durable particles of sand, gravel and rock free from injurious quantities of elongated, soft or flaky particles, shale, loam, clay balls and organic or other deleterious material.

## 3505 - 3 CONSTRUCTION

### General

3.01 (a) Base course shall comply with the requirements listed in Table 1.

**TABLE 1**

| SIEVE DESIGNATION | PERCENT BY WEIGHT PASSING CANADIAN METRIC SIEVE SERIES | | |
|---|---|---|---|
| | TYPE | | |
| | 31 | 33 | 35 |
| 31.5 mm | 100.0 | | |
| 18.0 mm | 75.0 - 90.0 | 100.0 | 100.0 |
| 12.5 mm | 65.0 - 83.0 | 75.0 - 100.0 | 81.0 - 100.0 |
| 5.0 mm | 40.0 - 69.0 | 50.0 - 75.0 | 50.0 - 85.0 |
| 2.0 mm | 26.0 - 47.0 | 32.0 - 52.0 | 32.0 - 65.0 |
| 900 um | 17.0 - 32.0 | 20.0 - 35.0 | 20.0 - 43.0 |
| 400 um | 12.0 - 22.0 | 15.0 - 25.0 | 15.0 - 30.0 |
| 160 um | 7.0 - 14.0 | 8.0 - 15.0 | 8.0 - 18.0 |
| 71 um | 6.0 - 11.0 | 6.0 - 11.0 | 7.0 - 12.0 |
| Plasticity Index | 0 - 7.0 | 0 - 6.0 | 0 - 5.0 |
| Fractured Face % | 50.0 Minimum | | |
| Light Weight Pieces % | 5.0 Maximum | | |

(b) A tolerance of 3% in the percent by weight passing the maximum size sieve shall be permitted providing 100% of the oversize passes the 40.0 mm sieve for Type 31 base course and the 22.4 mm sieve for Types 33 and 35 base course.

3.02 The following shall apply to Department owned or controlled aggregate sources shown on the plans or as described in the Special Provisions:

(a) Overburden shall be removed from material deposits in accordance with Specification 2260 For Removal Of Overburden.

(b) Rock passing a 450 mm square opening screen and larger than the maximum specified size shall be crushed and incorporated simultaneously throughout the crushing operation.

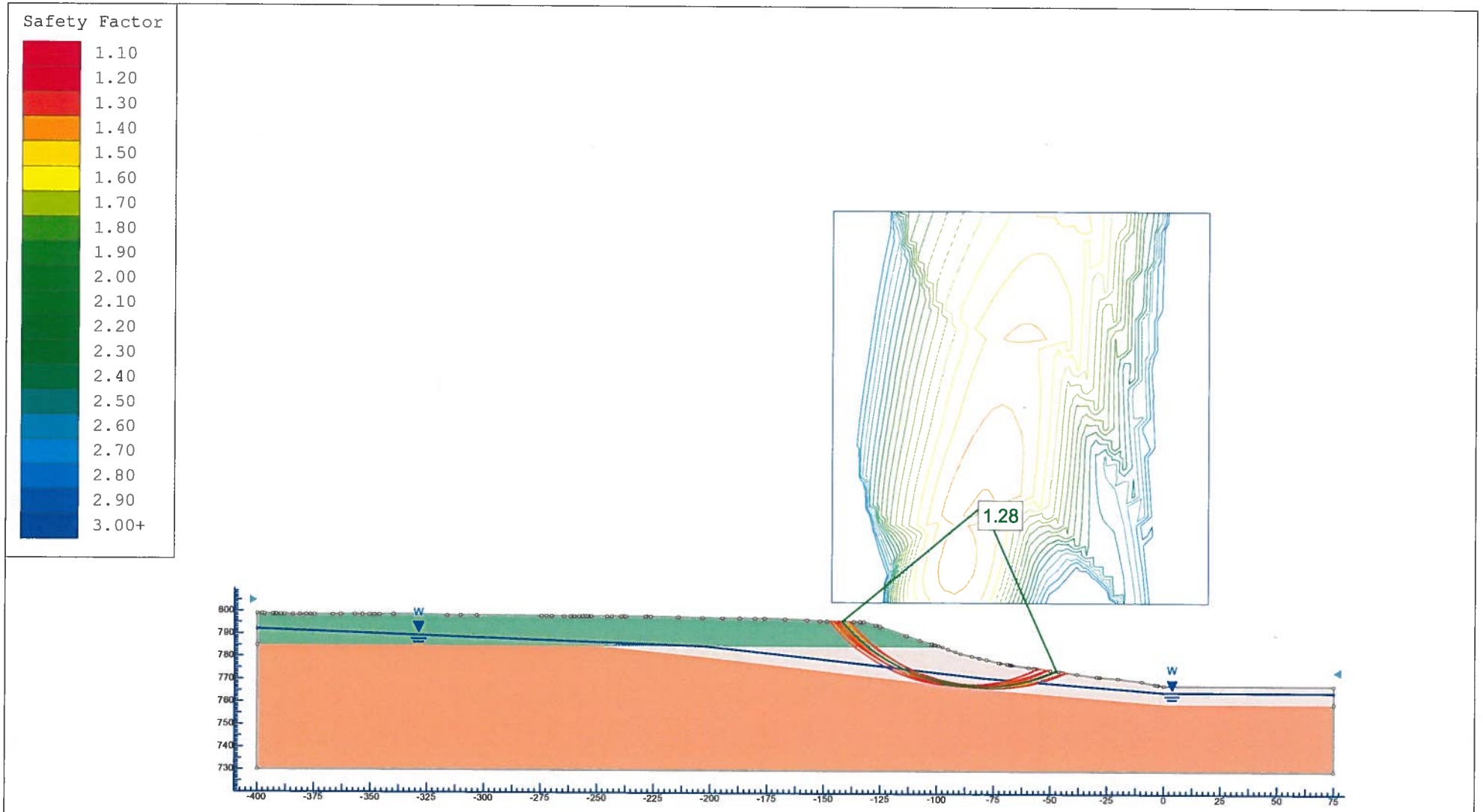
(c) Stockpiles shall be constructed in accordance with Specification 3600 For Stockpiling Aggregates.

3.03 Binder, filler, and blender sand shall be provided in accordance with Specification 3400 For Binder, Filler And Blender Sand.

3.04 Binder, filler and blender sand shall be added using a separate conveyor system.

3.05 Binder, filler and blender sand feeds shall be accurately controlled and coordinated.

# APPENDIX B

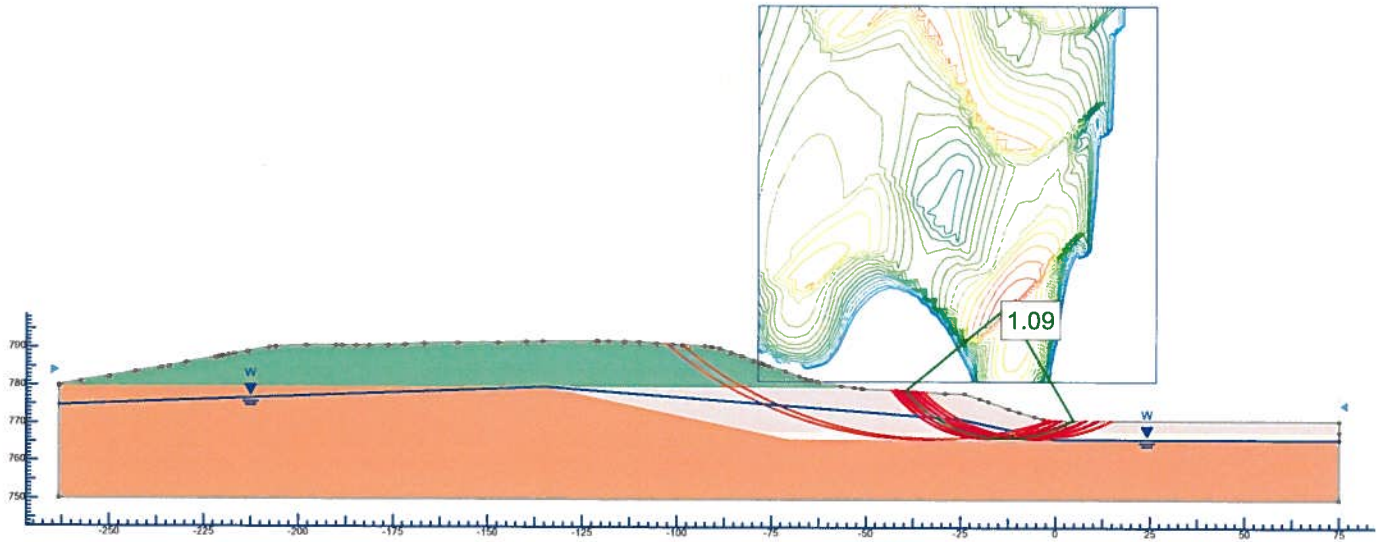



| | | | | |
|---|---|---|---|---|
| rocscience | *Project* | GE-14110 | | |
| | *Analysis Description* | Section 1-1 | | |
| | *Drawn By* | PCW | *Scale* 1:2500 | *Company* Ground Engineering Consultants Ltd. |
| | *Date* | | | *File Name* 1-1 Existing.slim |

SLIDEINTERPRET 6.035

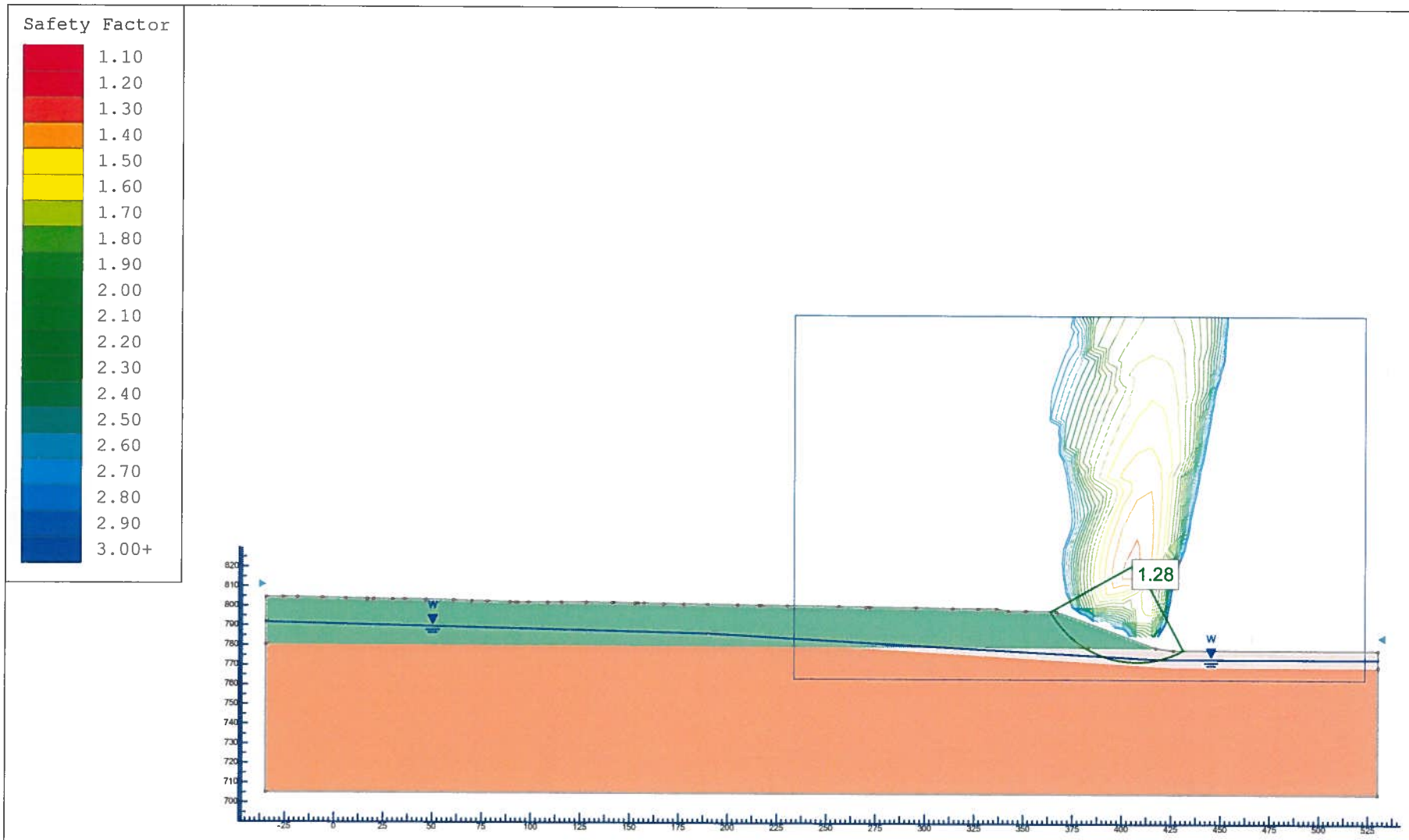
Safety Factor

1.10
1.20
1.30
1.40
1.50
1.60
1.70
1.80
1.90
2.00
2.10
2.20
2.30
2.40
2.50
2.60
2.70
2.80
2.90
3.00+




| | | | | |
|---|---|---|---|---|
| rocscience | Project | GE-14110 | | |
| | Analysis Description | Section 2-2 | | |
| | Drawn By | PCW | Scale 1:2000 | Company Ground Engineering Consultants Ltd. |
| | Date | | | File Name 2-2 Existing.slim |

SLIDEINTERPRET 6.035




| | | | | |
|---|---|---|---|---|
| rocscience | Project | GE-14110 | | |
| | Analysis Description | Section 3-3 | | |
| | Drawn By | PCW | Scale 1:3000 | Company Ground Engineering Consultants Ltd. |
| | Date | | | File Name 3-3 Existing.slim |

SLIDEINTERPRET 6.035

## Appendix B - Heritage Resource Review

Government of Saskatchewan

PARKS, CULTURE AND SPORT

## ABOUT PARKS, CULTURE AND SPORT

*Inquiry was made on August 31, 2017 at 8:18 AM*
You are inquiring about the heritage sensitivity of the following land location:

**Quarter-section:**
SW

**Section:**
35

**Township:**
15

**Range:**
14

**Meridian:**
3

**Development on this quarter-section will require further screening by the Heritage Conservation Branch.**

This quarter-section is heritage-sensitive OR has not been screened yet for heritage sensitivity. Please complete the **appropriate referral form** and submit the project to the Heritage Conservation Branch for further screening. Project referrals must be accompanied by survey plans. Please email **arms@gov.sk.ca** for more information.

Inquiry was made on August 31, 2017 at 8:18 AM

Government of Saskatchewan

Ministry of Parks Culture and Sport

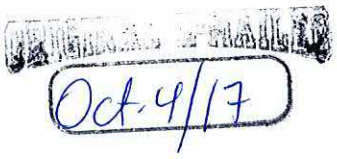
Heritage Conservation Branch
2nd Floor, 3211 Albert Street
Regina, Canada S4S 5W6

Phone: 306-787-2848
kim.cloutier@gov.sk.ca

October 4, 2017

Our file: 17-1803

Mr. Mike Markowski
Atlheritage Services Corp.
*Agent for:* **Associated Engineering**
150 – 203 Packham Ave.
SASKATOON SK S7N 4K5
Email: mike.markowski@atlheritage.ca




Dear Mr. Markowski:

**RE: Associated Engineering – Ryer Property Subdivision Development, City of Swift Current: SW-35-15-14-W3M;**
**HERITAGE RESOURCE REVIEW**

Thank you for referring this revised development proposal to our office for heritage resource review (original HCB file 17-1403). This revision refines the locations of the Municipal Reserves (MR1 to 3) and outlines the proposed development of a trail system through the coulee south of the proposed subdivision.

In determining the need for, and scope of, Heritage Resource Impact Assessment (HRIA) pursuant to s.63 of *The Heritage Property Act*, the following factors were considered: the presence of previously recorded heritage sites, the area's overall heritage resource potential, the extent of previous land disturbance, and the scope of new proposed land development.

No known archaeological sites are in direct conflict with the proposed developments. MR1 and MR3 are located on land disturbed by cultivation. MR2 is located on native prairie land that crosses a coulee. This portion of the coulee contains sloping walls and the upland has been cultivated to the edge of the valley crest. The likelihood that intact archaeological sites exist in these areas is low. Also, the development of a park or trail system in these MR areas is considered to be low impact. Therefore, our office has no further concerns with these municipal reserve developments proceeding as planned.

If you have any questions regarding this project please do not hesitate to contact me.

Sincerely,

Kim Cloutier
Archaeologist

# Appendix C - Consultations

## Mike Pawluski

From: Paige Aldag <paige.aldag@rcmp-grc.gc.ca>
Sent: Wednesday, October 04, 2017 10:31 AM
To: Mike Pawluski
Subject: Re: Protective Service Comments - Proposed Development - 20174002.00.E.01.00

Categories: AE FILED EMAIL

Good Morning Mike,

Sorry for the delayed reply. Below is our response to the following questions you enquired about:

-The Swift Current City RCMP would provide service to this area.
-Without knowing what additional service you are seeking as far as an emergency our members would be responding to calls in that area.
-We have no other concerns at this time.

Thank you for contacting us & asking for our input. This is a first for us to be contacted by developers so if there are any other specifics you need, let us know.

Paige

Paige Aldag
Support Staff Manager
Swift Current City RCMP Det.
(306)778-4875
(306)778-4882-fax
paige.aldag@rcmp-grc.gc.ca
>>> Mike Pawluski <pawluskim@ae.ca> 2017/09/29 10:06 AM >>>
Good Morning,

We represent a client who has asked us to prepare a concept plan report in support of a future residential neighbourhood plan in the northwest area of the City of Swift Current adjacent to the Highland and Trail neighbourhood.

As part of the concept plan process, it is our duty to consult with various protective service agencies such as the local RCMP Detachment.

We would like to confirm the following:
- That the Swift Current City RCMP Detachment provides service to this area;
- That the Swift Current City RCMP Detachment has the capacity to provide additional service to this area in the event of an emergency; and
- We want to provide the Swift Current City RCMP Detachment an opportunity to provide any additional comments or considerations they feel we should be making for the proposed development.

Attached is the draft concept plan drawing and location plan to provide context for your review.

If you need any additional information, please feel free to contact me.

Regards,

**Mike Pawluski, RPP**
Project Planner
**Associated Engineering (Sask.) Ltd.**
1 - 2225 Northridge Drive, Saskatoon, SK S7L 6X6
Tel: 306.653.4969





You may unsubscribe from Associated's electronic communications at any time.

Mike Pawluski

From: Denis Pilon <d.pilon@swiftcurrent.ca>
Sent: Tuesday, September 26, 2017 2:15 PM
To: Mike Pawluski
Cc: Michael Ruus; Pete L'Heureux
Subject: RE: Swift Current: Emergency Services Inquiry

Thank you for the opportunity to review your plans during the early design stages.

- Development in that area is subject to the residential sprinkler requirement in our building bylaw. Section 9.3 http://www.swiftcurrent.ca/home/showdocument?id=8495
- Development plans must include Autoturn travel paths for our fire apparatus for intersections, curves, cul de sacs, etc. The templates are available on our website. http://www.swiftcurrent.ca/divisions/emergency-services/apparatus-autoturn

Denis M. Pilon, CD, CFO
Fire Chief
Swift Current Fire Department
236 Chaplin Street East
Swift Current, SK, CAN, S9H 5B2

Phone – 306-778-2760
Fax – 306-778-9191
Email – d.pilon@swiftcurrent.ca
Web Site – www.swiftcurrent.ca

*Residential Sprinklers Save Lives*

---

From: Mike Pawluski [mailto:pawluskim@ae.ca]
Sent: September 26, 2017 10:40 AM
To: Denis Pilon <d.pilon@swiftcurrent.ca>
Subject: RE: Swift Current: Emergency Services Inquiry

Good morning Denis,

Attached is a draft concept plan figure for the northwest area of the City as per our discussion on the phone earlier this morning.

Can you please review the plan from a fire protection perspective and provide comment on additional considerations we should be making. If you could provide me with an email response that would be great.

If you have any questions, please contact me.

Regards,

**Mike Pawluski, RPP**
Project Planner
**Associated Engineering (Sask.) Ltd.**
1 - 2225 Northridge Drive, Saskatoon, SK S7L 6X6
Tel: 306.653.4969

From: Denis Pilon [mailto:d.pilon@swiftcurrent.ca]
Sent: Tuesday, September 26, 2017 8:32 AM
To: Mike Pawluski <pawluskim@ae.ca>
Subject: RE: Swift Current: Emergency Services Inquiry

Please contact me directly to discuss your proposal.

Denis M. Pilon, CD, CFO
Fire Chief
Swift Current Fire Department
236 Chaplin Street East
Swift Current, SK, CAN, S9H 5B2

Phone – 306-778-2760
Fax – 306-778-9191
Email – d.pilon@swiftcurrent.ca
Web Site – www.swiftcurrent.ca

*Residential Sprinklers Save Lives*

From: webmaster@swiftcurrent.ca [mailto:webmaster@swiftcurrent.ca]
Sent: September 26, 2017 8:12 AM
To: Fire Dept <fire@swiftcurrent.ca>
Subject: Swift Current: Emergency Services Inquiry

A new entry to a form/survey has been submitted.

| | |
|---|---|
| Form Name: | Emergency Services Inquiry Form |
| Date & Time: | 09/26/2017 8:11 AM |
| Response #: | 10 |
| Submitter ID: | 2690 |
| IP address: | 184.69.58.178 |
| Time to complete: | 8 min. , 33 sec. |

Survey Details

Page 1

1. Please tell us what you're inquiring about...

   (○) Other

2. Please provide us with some details...

   We represent a client who is in the process of preparing a Concept Plan Report for a future residential neighbourhood in the NW Area of the City of Swift Current adjacent to the Highlands and Trail Neighbourhood. As part of the concept plan process, we are required to consult with Fire and Protective Services to ensure there is sufficient resources, capacities, and time frames available to service the development in the event of an emergency. If you could provide me with a confirmation email that would be great. If you need additional information regarding this request, please contact me either at the email or phone number below.

3. Please tell us who you are...

4. Your name...

   Mike Pawluski

5. Your preferred method of contact...

   (○) Email

6. Please enter your telephone number...

   (306) 653-4969

7. ...or your email address...

   pawluskim@ae.ca

Thank you,
Swift Current

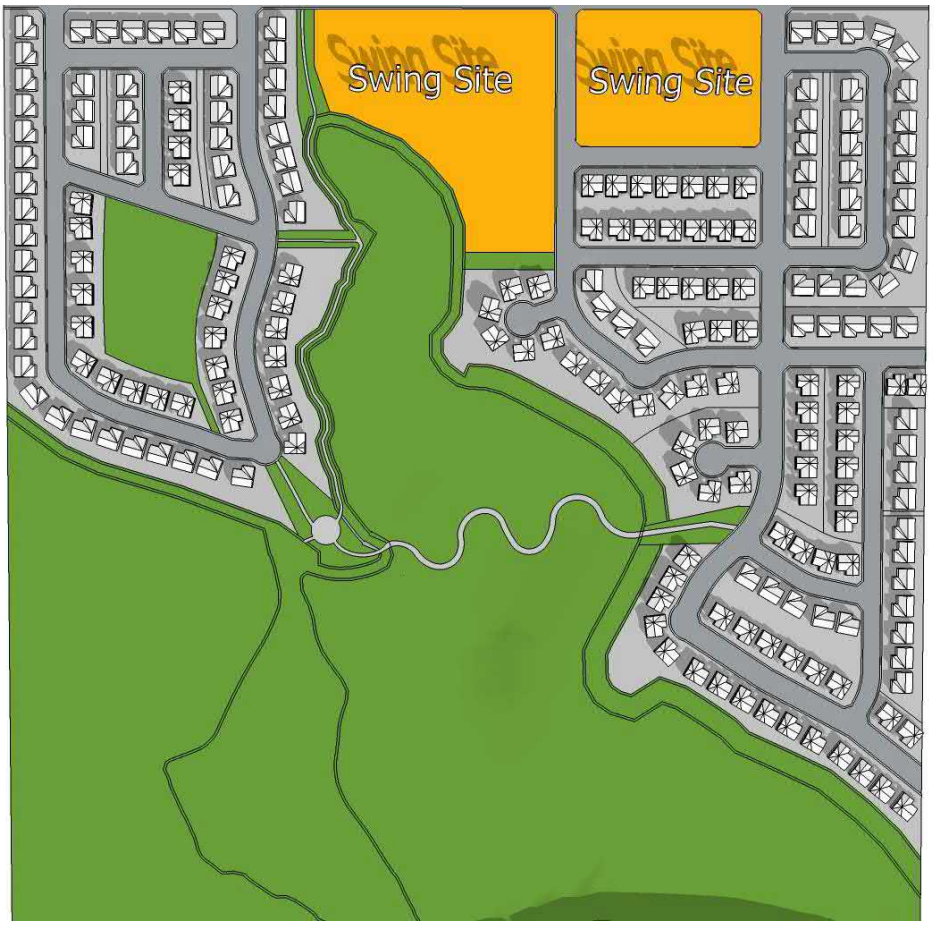
---

## Appendix D - Traffic Impact Assessment

# REPORT

**Michael Ryer**
**Northridge Developments**

The Heights Neighbourhood
Traffic Impact Assessment




**October 2017**

# Table of Contents

# List of Tables

# List of Figures

# 1 Introduction

The Heights Neighbourhood is a proposed new subdivision in the northwest corner of Swift Current. The neighbourhood is planned to be mainly residential, including single-family detached, townhouses, and low-rise apartments.

As part of the development process, the City requested a Traffic Impact Assessment (TIA) to determine impacts to the transportation network and appropriate mitigation measures. In accordance with best practices, the purpose of this study is to:

- Determine the impacts from the proposed development on the adjacent transportation network and relevant intersections.
- Determine what measures may be required to mitigate adverse impacts and allow the transportation network to provide a satisfactory level of service.

# 2 Proposed Development

## 2.1 LAND USE AND LOCATION

The Heights is in the northwest corner of Swift Current, adjacent to the existing Highland neighbourhood. The land is currently undeveloped agricultural land. Proposed land uses are outlined in Table 2-1. The concept plan area is shown in Figure 2-1.

**Table 2-1**
**Proposed Land Uses**

| Land Use | Area (ha) |
|---|---|
| South Valley Natural Area (Environmental Reserve Dedication) | 26.30 |
| Low Density | 21.40 |
| Medium Density | 1.91 |
| High Density | 1.80 |
| Swing Site | 2.72 |
| Parks and Open Space (Municipal Reserve Dedication) | 3.12 |
| Roads | 7.37 |
| Gross Development Area | 38.32 |
| Total | 64.62 |

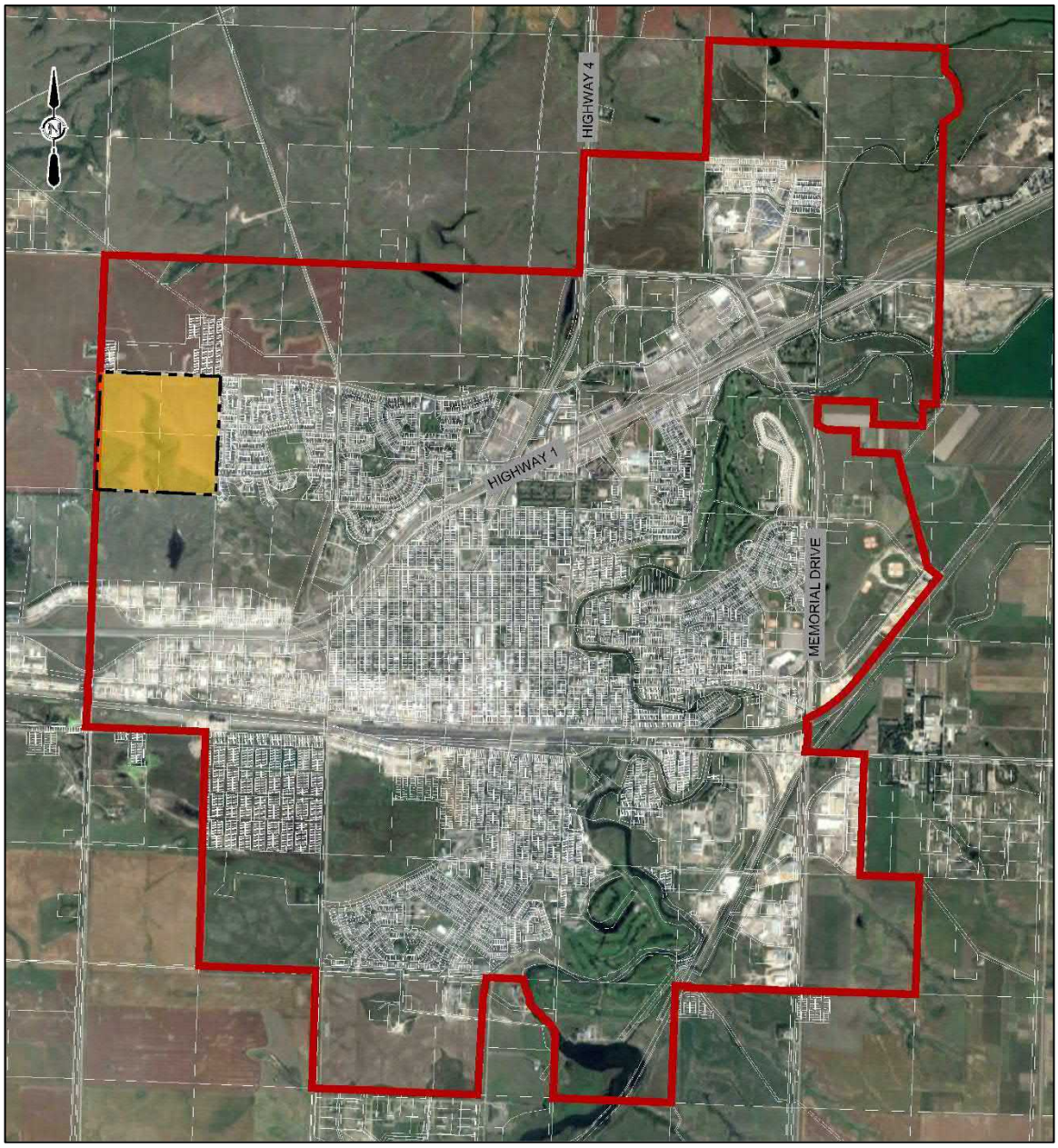



**Figure 2-1**
**Concept Plan Area within Swift Current**

The concept plan area and land use statistics used for this analysis were current as of mid-September, 2017. Small changes in the conceptual land use between that time and submission of the subdivision proposal may occur, but would not likely have a significant effect on the recommendations of this report.

## 2.2 DEVELOPMENT PHASING AND TIMELINE

Development of the neighbourhood is expected over a 15 to 20-year period, generally progressing from east to west.

## 2.3 STUDY AREA AND EXISTING TRANSPORTATION SYSTEM

The study area was determined in consultation with Ms. Jolene Peters, Manager of Engineering Services with the City of Swift Current, and includes adjacent streets and intersections that are expected to be measurably affected by the proposed development. A total of eight intersections are included in the traffic analysis. Figure 2-2 shows the study intersections and key streets.

**Battleford Trail** is an east-west street that will form the north boundary of the proposed development, and which is expected to be the main access for vehicular traffic. It is classified as an arterial street in the Development Bylaw (updated 2013), and designated a collector street in the Northwest Sector Plan (2015). It functions as a major collector or minor arterial. The Heights neighbourhood is bisected by a deep coulee, which will be maintained as community green space. The local street network on each side of the coulee will not be connected. Battleford Trail will provide the only vehicular connection between the two sides of the neighbourhood.

**11th Avenue NW** is a north-south arterial street east of Highland neighbourhood. The Heights neighbourhood does not reach 11th Avenue NW, however, any vehicle, pedestrian, or cyclists travelling from the rest of the city to The Heights would have to travel along or across 11th Avenue NW.

**Highland Drive** is a neighbourhood collector running east-west through the existing Highland neighbourhood from 11th Avenue NW west to the edge of existing development. It is proposed to extend west into the Heights, and curve north to parallel the coulee and intersect with Battleford Trail. Travelling from the rest of the city to The Heights, the Highland Drive extension would be the first access into the new neighbourhood, and it is also described as **Development Access #1**.

**Hamilton Drive** is a local street running east-west through the existing Highland neighbourhood. Similar to Highland Drive, Hamilton Drive is proposed to extend west into the Heights neighbourhood and curve north intersect with Battleford Trail. This west extension of Hamilton Drive can also be considered as **Development Access #2**. Unlike Highland Drive, Hamilton Drive does not intersection with 11th Avenue NW. To access 11th Avenue NW from Hamilton Drive requires a one-block detour to **Colonel Otter Drive**.

West of the coulee, two accesses to Battleford Trail are proposed, labelled **Development Access #3** and **Development Access #4.**

The above streets and their intersections are adjacent to or near the proposed neighbourhood. Further east, Battleford Trail intersects **Central Avenue**, the main north-south arterial street of Swift Current, which connects the downtown area to Highway 4 to the north. The City of Swift Current requested that the intersection of Battleford Trail and Central Avenue be included in the analysis.


**Figure 2-2**
**Study Intersections**

## 2.4 ACTIVE TRANSPORTATION

The Swift Current Developer's Guide identifies connectivity and safety as the key considerations for pedestrians and cyclists. The Concept Plan is guided by the Northwest Area Sector Plan, and will include significant green space and linear pathways within the neighbourhood and connecting to adjacent neighbourhoods.

People walking and biking will be able to travel within the neighbourhood and to adjacent neighbourhoods utilizing pathways, local streets, and walkway connections. An existing crosswalk on 11th Avenue NW exists between Highland Drive and Colonel Otter Drive, providing a safe route across this arterial street.

Additional detail on active transportation connections is available in the Concept Plan Report.

# 3 Traffic Volumes

## 3.1 CURRENT TRAFFIC VOLUMES

Traffic counts were conducted by Associated Engineering at the intersections of 11th Avenue NW at Battleford Trail, 11th Avenue NW at Colonel Otter Drive, and 11th Avenue NW at Highland Drive on September 6 and 7, 2017. Count data for Battleford Trail at Central Avenue was provided by the City of Swift Current and was collected on September 8, 2017.

The peak hours selected for analysis were 7:30 a.m. to 8:30 a.m. and 4:30 p.m. to 5:30p.m., except at the intersection of Central Avenue at Battleford Trail, where the morning peak hour was reported as 8:00 a.m. to 9:00 a.m., and this data was used for analysis at that location. The afternoon peak period times of day were the same at all four intersections.

FIGURE and FIGURE summarize the current traffic volumes.

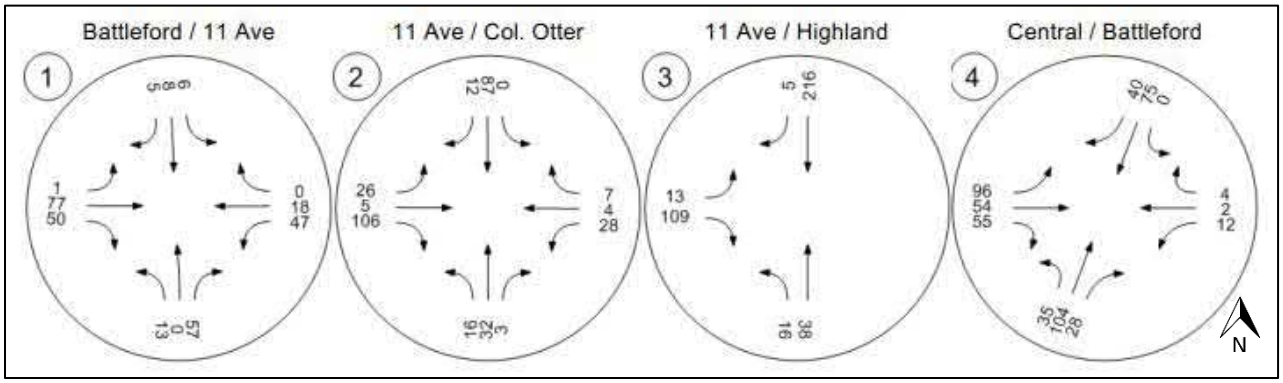



**Figure 3-1**
**Current Traffic Volumes, AM Peak**

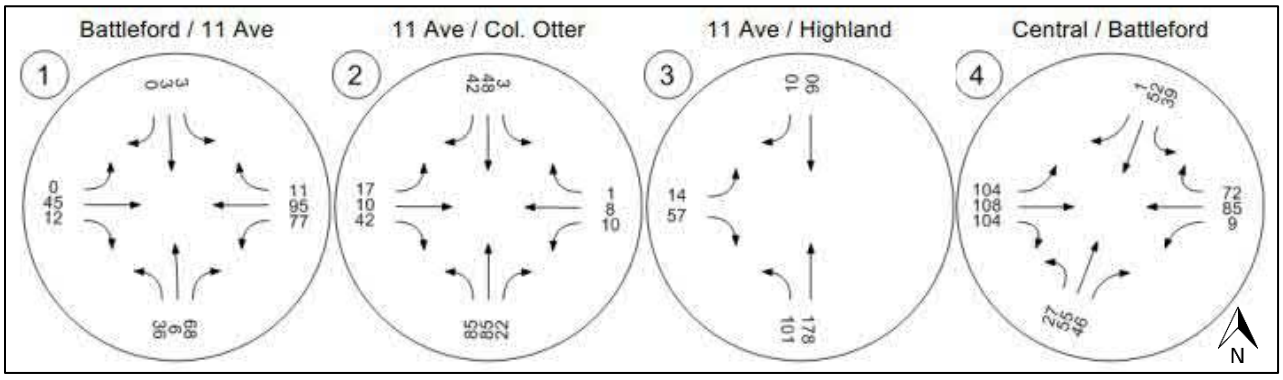



**Figure 3-2**
**Current Traffic Volumes, PM Peak**

## 3.2 FUTURE TRAFFIC VOLUMES

### 3.2.1 Design Horizon and Background Growth

The design horizon of 20 years (2037) was selected based on City of Swift Current standards and following discussion with the City.

An annual growth rate of 2% was assumed, also through discussion with the City, for background traffic growth on Battleford Trail and 11th Avenue NW, and Central Avenue. Over 20 years at compound growth, this results in a 49% background increase over current traffic volumes. This background growth rate was not included for Colonel Otter Drive and Highland Drive to avoid double-counting the growth from the development site, which is included separately.

### 3.2.2 Other Development

The Northwest Urban Expansion Area Sector Plan (2015) identifies the proposed land uses for the area north off Battleford Trail. A portion of this area near the intersection of Battleford Trail and 11th Avenue NW is planned to become a neighbourhood commercial hub. Based on discussions with the City of Swift Current, it is assumed that this commercial hub would just be getting started within the 20-year horizon of this report. It was assumed that in 20 years' time this commercial development would produce a moderate traffic volume of 200 vph on the north leg of 11th Avenue NW at Battleford Trail. It was also assumed that this traffic would be equally split coming from and going to the east and the south, i.e. 50 vph for each of the northbound through, southbound trough, southbound-to-eastbound left turn, and westbound-to-northbound right turn. This traffic is in addition to the 49% background traffic growth.

### 3.2.3 Total Background Traffic

Figure 3-3 and Figure 3-4 summarize the total background (non-development-related) traffic for the forecast year 2037.

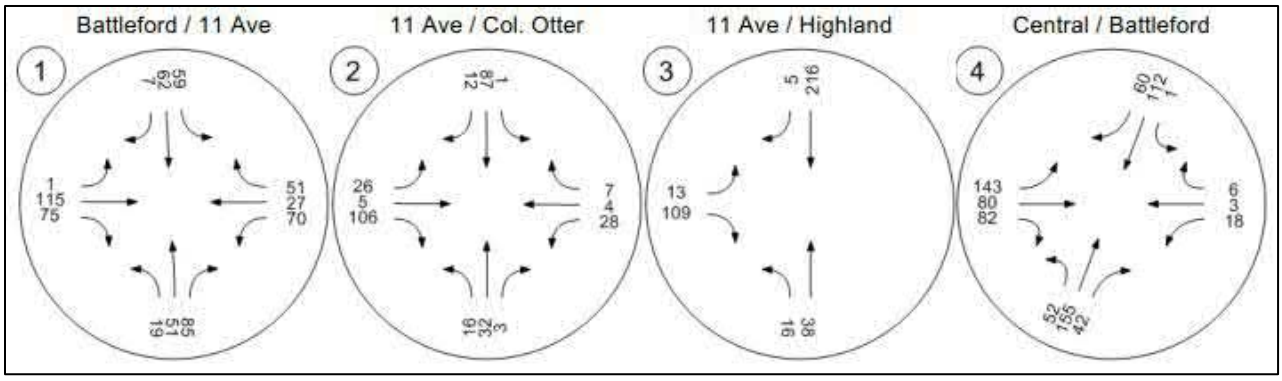



**Figure 3-3**
**Future Background Traffic Volumes, AM Peak**

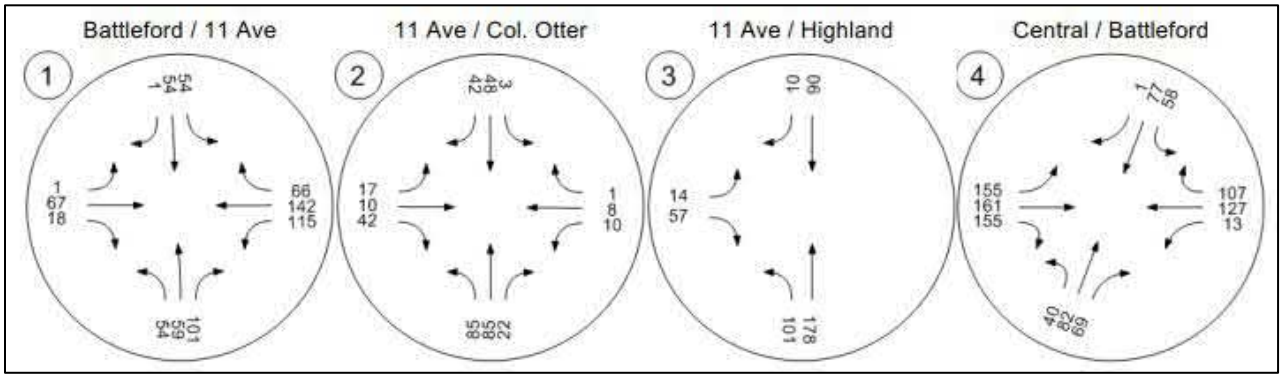



**Figure 3-4**
**Future Background Traffic Volumes, PM Peak**

## 3.3 DEVELOPMENT TRAFFIC

### 3.3.1 Trip Generation

The development is proposed to contain a variety of residential land uses and a “swing site”. For the purposes of trip generation analysis, the swing site was assumed to be similar to medium density residential land uses and to have a similar trip generation rate in peak periods. The Institute of Transportation Engineers (ITE) publication, Trip Generation Manual, 9th Edition, (TGM) is the industry-standard publication used to estimate trip generation rates. TABLE outlines the TGM land uses and codes used for each of the proposed land uses in the development.

**Table 3-1**
**Land Uses for Trip Generation**

| Land Use | ITE Land Use | ITE Code | Variable |
|---|---|---|---|
| Low Density | Single Family Detached | 210 | Dwelling Units |
| Med Density | Residential Condominium/Townhouse | 230 | Dwelling Units |
| High Density | Apartment | 220 | Dwelling Units |
| Swing Site | Residential Condominium/Townhouse | 230 | Dwelling Units |

TABLE summarizes the trip generation rates per dwelling unit for each land use from the TGM.

**Table 3-2**
**Trip Generation Rates**

| Land Use | AM Peak | % In | %Out | PM Peak | % In | %Out |
|---|---|---|---|---|---|---|
| Low Density | 0.75 | 25% | 75% | 1.00 | 63% | 37% |
| Med Density | 0.44 | 17% | 83% | 0.52 | 67% | 38% |
| High Density | 0.51 | 20% | 80% | 0.62 | 65% | 35% |
| Swing Site | 0.44 | 17% | 83% | 0.52 | 67% | 38% |

The development site is divided in the middle by a coulee. The trips generated by each side of the coulee were accounted for separately. TABLE and TABLE show the estimated trip generation for each side of the coulee.

**Table 3-3**
**Hourly Trip Generation, East Side of Coulee**

| East Side | Units | AM Total | In | Out | PM Total | In | Out |
|---|---|---|---|---|---|---|---|
| Low Density | 229 | 172 | 43 | 129 | 229 | 144 | 85 |
| Med Density | 55 | 24 | 4 | 20 | 30 | 19 | 11 |
| High Density | 158 | 80 | 16 | 64 | 98 | 64 | 34 |
| Swing Site | 109 | 48 | 8 | 40 | 60 | 38 | 22 |
| Total | 551 | 324 | 71 | 253 | 417 | 265 | 152 |

**Table 3-4**
**Hourly Trip Generation, West Side of Coulee**

| West Side | Units | AM Total | In | Out | PM Total | In | Out |
|---|---|---|---|---|---|---|---|
| Low Density | 123 | 92 | 23 | 69 | 123 | 77 | 46 |
| Med Density | 21 | 10 | 2 | 8 | 11 | 7 | 4 |
| High Density | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Swing Site | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 144 | 102 | 25 | 77 | 134 | 84 | 50 |

### 3.3.2 Trip Distribution

Trip distribution refers to the assumed directions to which and from which traffic will leave and enter the study area. Trip distribution was assumed to be equal in the departing and arriving directions. TABLE summarizes the assumed trip distribution.

**Table 3-5**
**Trip Distribution**

| Direction | Assumed Distribution | | |
|---|---|---|---|
| South on 11th Ave NW | 50% | | |
| East on Battleford Trail | 50% | Central Ave South | 20% |
| | | Battleford Trail East | 15% |
| | | Central Ave / Hwy 4 North | 15% |
| Other Directions | 0% | | |

### 3.3.3 Trip Assignment

Trip assignment refers to the process of estimating which streets drivers will choose to use to travel between their origin and destination. It was assumed that drivers would use the same routes to travel toward the development as they would to travel away from it.

For trips generated west of the coulee, Battleford Trail is the only access to all directions. Two accesses to Battleford Trail exist. It was assumed that 60% would use Development Access #3, the one closer to the rest of the city, and 40% would use Development Access #4. Once on Battleford Trail, it was assumed drivers would distribute per the splits outlined in Table 3-5 above.

For trips generated east of the coulee, several options exist. It was assumed 10% would use Hamilton Drive and Colonel Otter Drive to get to 11th Avenue NW, while 40% would use Highland Drive. The remaining 50% would use Battleford Trail, split 60%/40% (30% and 20% of the total) between the east access and west access. Once on Battleford Trail, it was assumed drivers would distribute per the splits outlined in Table 3-5 above.

### 3.3.4 Internal Capture, Pass-By, and Diverted-Link Trips

Internal capture refers to trips between an origin and a destination within the development. As a residential neighbourhood, it was assumed no trips would be captured internally.

Pass-by trips and diverted link trips refer to trips where the development will attract drivers already on the road network prior to development, as opposed to entirely new trips. A gas station would be an example of a land use that would generate pass-by and diverted-link trips. As a new residential subdivision, it was assumed that all trips would be new and none would be pass-by or diverted-link trips.

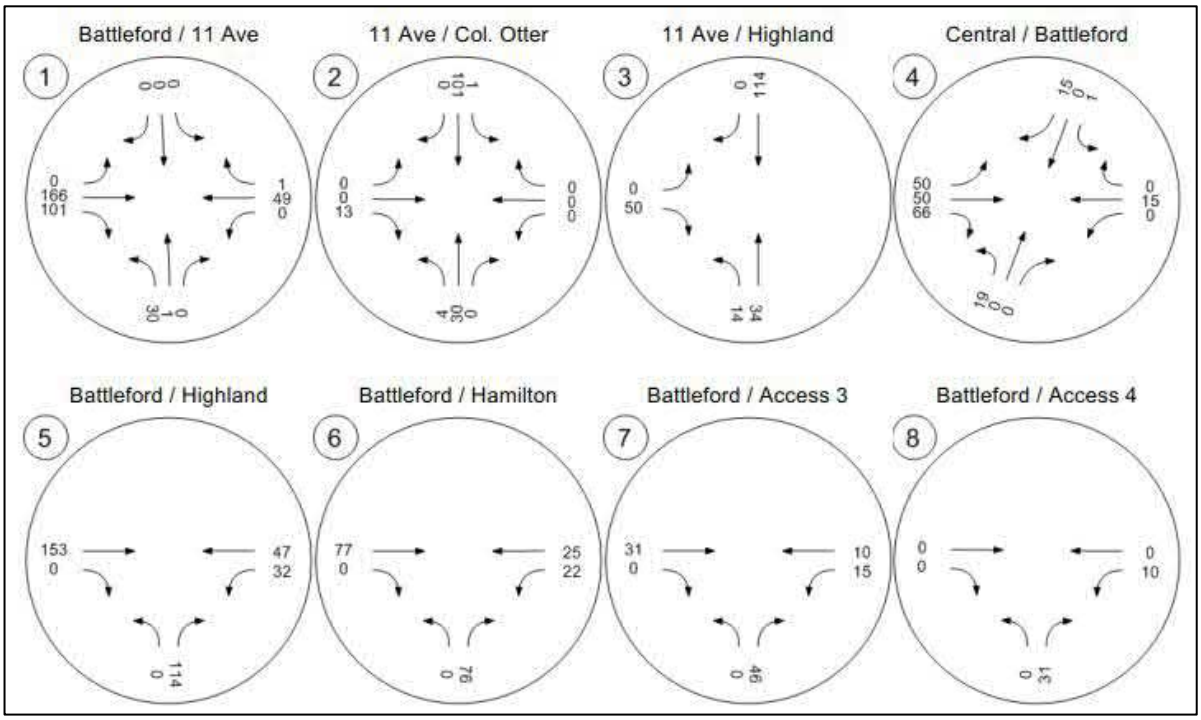



**Figure 3-5**
**Site-Generated Traffic, AM Peak**

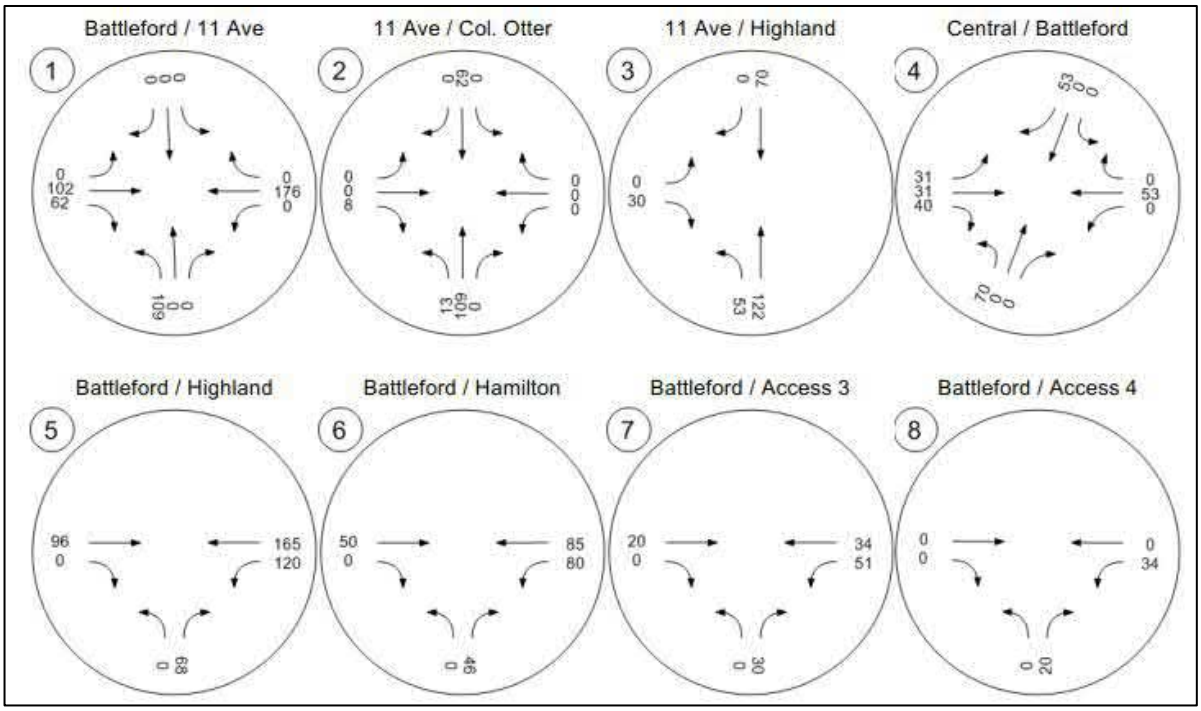



**Figure 3-6**
**Site-Generated Traffic, PM Peak**

## 3.4 TOTAL FUTURE TRAFFIC

The total future traffic represents the sum of the future background traffic volume, including natural growth and adjacent site assumptions, and the development-generated traffic. FIGURE and FIGURE summarize the future total traffic.

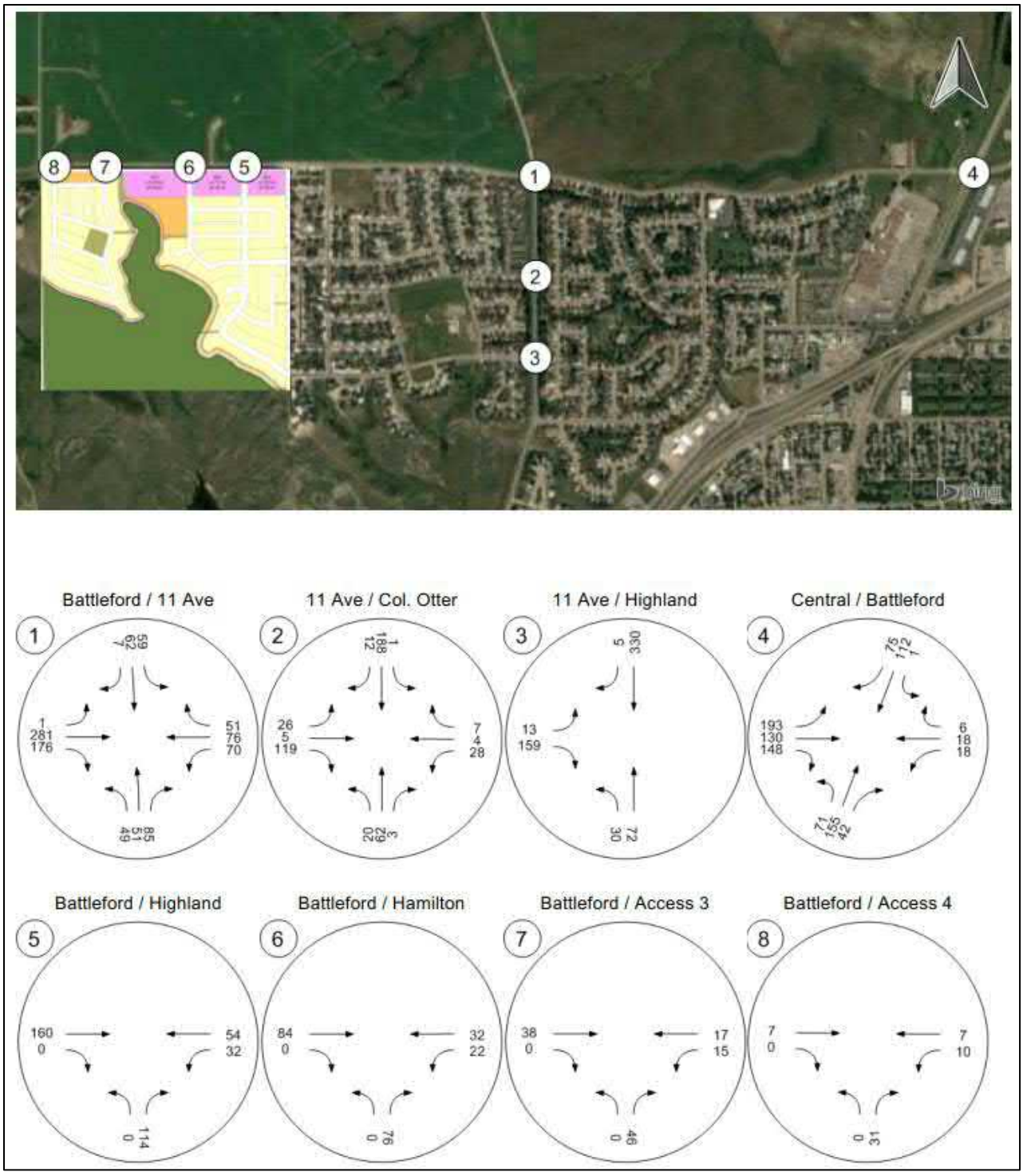



**Figure 3-7**
**Total Traffic, 2037 AM Peak**

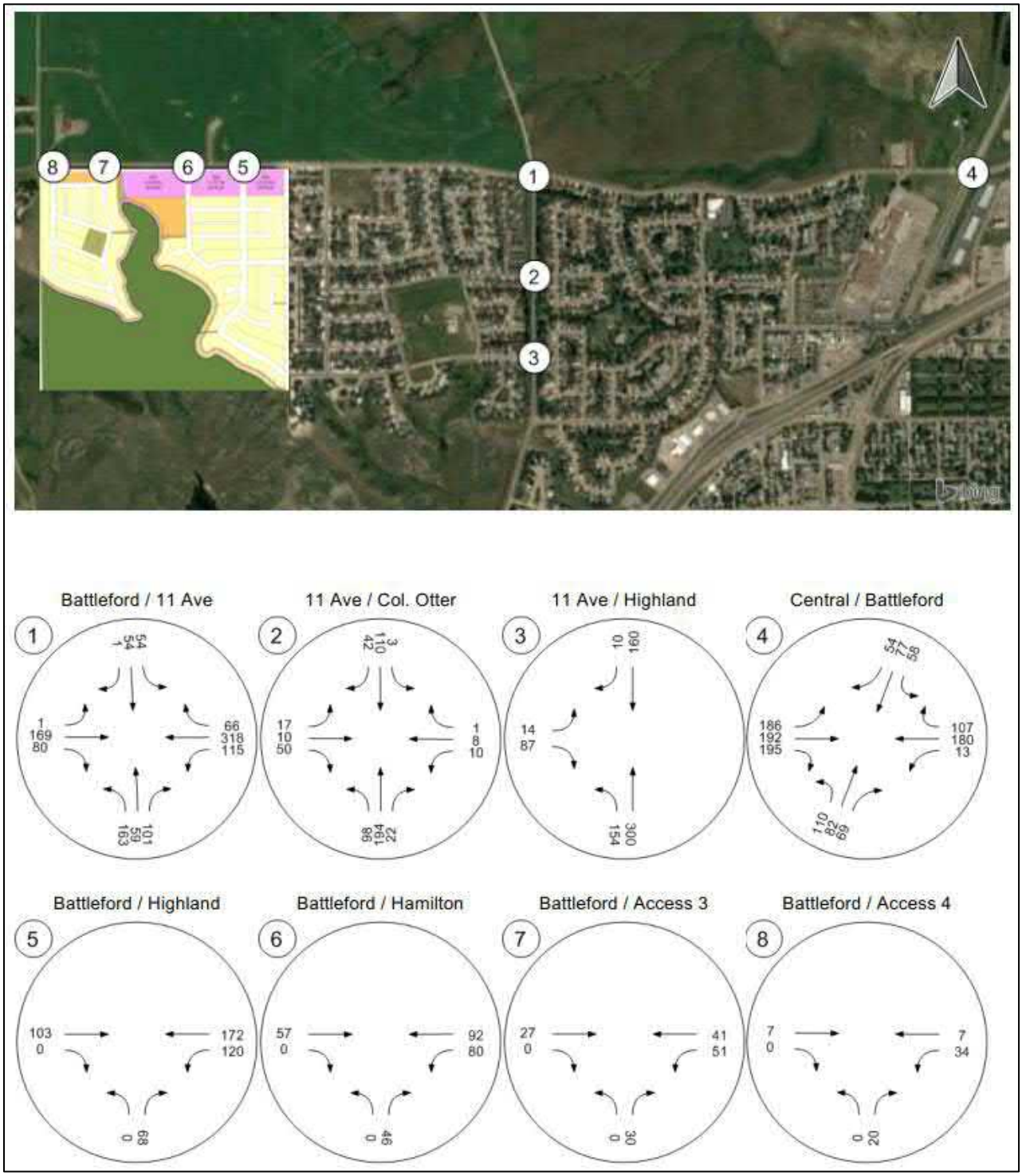



**Figure 3-8**
**Total Traffic, 2037 PM Peak**

# 4 Traffic Analysis

## 4.1 ANALYSIS METHODS

Traffic analysis was completed using PTV Vistro 5.0™ traffic analysis program, which is based on the Transportation Research Board Highway Capacity Manual, 6th Edition, 2016 (HCM). This software applies the traffic analysis methodology outlined in the HCM to output a level of service for a study intersection given the lane designations, vehicular volumes, and heavy vehicle percentages. Intersection operations are typically rated by three measures: average delay, level of service (LOS) and volume-to-capacity (V/C) ratio.

Level of service is based on the estimated average delay per vehicle for all traffic passing through an intersection. A high LOS is a result of a very low average delay; the highest is identified as level of service A. A low LOS is a result of a large average delay; the lowest is identified as a LOS F. The LOS categories vary depending on whether an intersection is signalized or stop/yield-controlled, including roundabouts. The Highway Capacity Manual justifies this difference by noting that drivers stopped at a signal will have more tolerance for delays because they perceive that eventually they will get their turn. Table 4-1 identifies the LOS criteria for intersections.

**Table 4-1**
**Level of Service Definitions**

| Level of Service | Signalized Control Averaged Delay per Vehicle | Unsignalized Average Delay per Vehicle |
|---|---|---|
| A | Less than 10 seconds | Less than 10 seconds |
| B | 10-20 seconds | 10-15 seconds |
| C | 20-35 seconds | 15-25 seconds |
| D | 35-55 seconds | 25-35 seconds |
| E | 55-80 seconds | 35-50 seconds |
| F | Greater than 80 seconds | Greater than 50 seconds |

Many road authorities set a LOS target for intersections under their control. In urban areas, a common target is LOS D or better under total traffic conditions for the horizon year. Swift Current's Developer's Guide to Concept Plans specifies LOS D as the minimum for an intersection or approach, while an individual turning movement reaching LOS E would be permitted.

This target strikes a balance between the significant cost involved in constructing major improvements and the expectation of motorists to travel without unreasonable delay.

The volume-to-capacity ratio of an intersection describes the extent to which the traffic volumes can be accommodated by the theoretical capacity of the intersection. A V/C below 0.90 indicates that there is generally sufficient capacity to accommodate the traffic on the approach or at the intersection. A value between 0.90 and 1.0 suggests unstable operations and congestion may occur as volumes are nearing the theoretical capacity of the roadway. A calculated value over 1.0 indicates that volumes are theoretically exceeding capacity. Swift Current's Developer's Guide to Concept Plans specifies that the V/C ratio for all movements must be below 0.85.

## 4.2 TRAFFIC ANALYSIS ASSUMPTIONS

As part of the traffic capacity analysis for existing conditions, the following assumptions were made with respect to specific analysis criteria, including:

- Truck volumes are assumed to be 2% on all roads in the study area, based on observations.
- The minimum turning movement volume is one vehicle per hour.
- The traffic volume on the gravel portion of Battleford Trail west of Col. Otter Drive was assumed to be 5 vph per direction.
- Pedestrian and cyclist volumes are small and will not affect motor vehicle traffic operations.
- Traffic counts were conducted on weekdays in September 2017. September weekdays generally represent an average case within the year, and no adjustments were made.

Traffic analysis is generally completed for the highest-volume 15-minute period in the peak hour. A peak hour factor (PHF) is used to convert from an hourly volume to a 15-minute volume. A PHF of 1.0 would indicate that traffic is evenly distributed throughout the hour, while lower values indicate greater peaking within the hour. Typical urban values range from 0.85 to 0.95. Smaller urban centres generally have lower values, corresponding to a stronger peak 15 minutes within the peak hour, while larger urban centres have larger values, as traffic volumes tend to spread more evenly throughout the peak hour. Based on the traffic counts, a PHF of 0.85 was selected for analysis.

## 4.3 INTERSECTION PERFORMANCE

Full details of the traffic analysis are included as Appendix B. The following sections summarize the key findings. In this section, the traffic analysis assumes no roadway infrastructure upgrades have taken place. Section 4.4 below discusses options for mitigating poor traffic operations where applicable.

### 4.3.1 Intersection of 11th Avenue NW and Battleford Trail

This intersection, numbered 1 in the traffic volume diagrams, is currently operating acceptably in both peak periods with LOS B or better for all movements. For the 2037 scenarios, the LOS is expected to deteriorate. Table 4-2 and Table 4-3 summarize the LOS for the morning and afternoon peak periods, without and with development, respectively.

**Table 4-2**
**11th Ave NW at Battleford Trail, 2037 Level of Service without Development**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| A | A | A | A | B | B | C | D | C (WBL) | D (WBL) |

*WBL: Westbound-to-southbound left turn movement

**Table 4-3**
**11th Ave NW at Battleford Trail, 2037 Level of Service with Development**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| A | A | A | A | E | F | F | F | F (WBL) | F (WBL) |

*WBL: Westbound-to-southbound left turn movement

Section 4.4 below discusses options to mitigate the expected poor operating conditions.

### 4.3.2 Intersections of 11th Avenue NW at Colonel Otter and Highland Drive

These two intersections, numbered 2 and 3 in the traffic volume diagrams, are expected to operate with acceptable levels of service. For eastbound traffic at each intersection, who face the stop sign, levels of service are expected to remain at C or better through all scenarios. For northbound left turns off 11th Avenue NW, levels of service at both intersections are expected to remain at LOS A, with queues less than two vehicles long 95% of the time during the peak 15 minutes of the afternoon, and average delays of 8 seconds. Some northbound through drivers may perceive any delay at all by left turning vehicles as an inconvenience, but the analysis does not indicate the need for a left turn lane or through-bypass lane. No changes to these intersections are required or recommended.

### 4.3.3 Intersection of Battleford Trail and Central Avenue

This intersection, numbered 4 in the traffic volume diagrams, is currently operating acceptably in both peak periods with LOS C or better for all movements. For the 2037 scenarios, the LOS is expected to deteriorate. TABLE and TABLE summarize the LOS for the morning and afternoon peak periods, without and with development, respectively.

**Table 4-4**
**Battleford Trail at Central Avenue, 2037 Level of Service without Development**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| A | A | A | A | C | F | B | B | C (EBT) | F (EBL) |

*EBT: Eastbound through movement, EBL: Eastbound-to-northbound left turn movement

**Table 4-5**
**Battleford Trail at Central Avenue, 2037 Level of Service with Development**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| A | A | A | A | F | F | C | C | F (EBT) | F (EBL) |

*EBT: Eastbound through movement, EBL: Eastbound-to-northbound left turn movement

Section 4.4 below discusses options to mitigate the expected poor operating conditions.

### 4.3.4 Development Access Intersections on Battleford Trail

These intersections, numbered 5 through 8 in the traffic volume diagrams, are assumed to have two-way stop control and no auxiliary lanes. Each of the four development access intersections is expected to operate with minimal delays and no congestion, with a level of service A for all movements within the design horizon.

## 4.4 INTERSECTION MITIGATION OPTIONS

All mitigation options were analysed for the 2037 with-development scenario, for both morning and afternoon peak periods. The sections below summarize the results, with full details provided in Appendix C.

Traffic signal timings were obtained by software optimization to balance V/C ratios and based on general assumptions for all-red, yellow and pedestrian clearance intervals. Other methods or priorities could be used to alter the traffic signal timing. These mitigation option analyses are not intended to be used to plan traffic signal timing in the field.

### 4.4.1 Intersection of 11th Avenue NW and Battleford Trail

Five mitigation options were considered for the intersection of Battleford Trail and 11th Avenue NW:

- Reverse the stop signs
- Convert to an all-way stop
- Convert to an all-way stop and add one lane eastbound and westbound
- Install a single-lane roundabout, and
- Install traffic signals.

TABLE through TABLE summarize the results of these options.

**Table 4-6**
**11th Ave NW at Battleford Trail, Reversed Stop Signs**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| C | F | E | F | A | A | A | A | E (SBL) | F (SBL) |

*SBL: Southbound-to-eastbound left turn movement

**Table 4-7**
**11th Ave NW at Battleford Trail, All-Way Stop**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| B | D | B | B | D | C | B | F | N/A | N/A |

**Table 4-8**
**11th Ave NW at Battleford Trail, All-Way Stop with One Extra Lane Eastbound and Westbound**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| B | C | B | B | B | B | B | C | N/A | N/A |

**Table 4-9**
**11th Ave NW at Battleford Trail, Roundabout**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| A | A | A | A | A | A | A | B | N/A | N/A |

**Table 4-10**
**11th Ave NW at Battleford Trail, Traffic Signals**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| D | D | D | C | B | B | B | C | D (NB) | D (NB) |

*NB: All northbound movements are equal

A roundabout offers the best traffic operations for both peak periods, and would essentially allow the unimpeded free-flow of traffic in all directions for most of the day. However, the all-way stop with additional lanes option also offers good levels of service, and would be less complicated and less expensive to implement. The recommended mitigation strategy is to install an all-way stop when traffic operations warrant, and to create the additional lanes by prohibiting parking in the curb lanes of Battleford Trail for a distance of at least 50 m back from the stop bar. The longest expected queue length (95th percentile) is 18 m. The additional distance would allow drivers to manoeuvre easily into the right hand lane between the back of the queue and parked car.

This parking restriction could be implemented immediately with little effect, as there is currently seems to be little demand for parking on Battleford Trail. The traffic control change could also be implemented immediately to acclimatize drivers while there is little surrounding development, although it is not required for acceptable operations.

### 4.4.2 Intersection of Battleford Trail and Central Avenue

Six mitigation options were considered for the intersection of Battleford Trail and Central Avenue:

- Add a dedicated eastbound left turn lane
- Convert to an all-way stop
- Convert to an all-way stop and add a dedicated eastbound left turn lane
- Install a single-lane roundabout

- Install traffic signals, and
- Install traffic signals and add a dedicated eastbound left turn lane

TABLE through TABLE summarize the results of these options.

**Table 4-11**
**Battleford Trail and Central Avenue, with Dedicated Eastbound Left Turn Lane**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| A | A | A | A | C | F | C | C | C (WBL) | F (EBL) |

*WBL: Westbound-to-southbound left turn movement; EBL: Eastbound-to-northbound left turn movement

**Table 4-12**
**Battleford Trail and Central Avenue, All-Way Stop**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| B | B | B | B | F | F | B | B | N/A | N/A |

**Table 4-13**
**Battleford Trail and Central Avenue, All-Way Stop with Dedicated Eastbound Left Turn Lane**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| B | B | B | B | C | C | B | B | N/A | N/A |

**Table 4-14**
**Battleford Trail and Central Avenue, Roundabout**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| A | A | A | A | A | A | A | A | N/A | N/A |

**Table 4-15**
**Battleford Trail and Central Avenue, Traffic Signals**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| D | C | D | C | B | D | D | B | D (NBL) | D (EB) |

*NBL: Northbound-to-westbound left turn movement, EB: All eastbound movements are equivalent

**Table 4-16**
**Battleford Trail and Central Avenue, Traffic Signals with Dedicated Eastbound Left Turn Lane**

| Northbound Approach | | Southbound Approach | | Eastbound Approach | | Westbound Approach | | Worst Movement | |
|---|---|---|---|---|---|---|---|---|---|
| AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| D | B | D | B | A | C | B | B | D (NBL) | C (EBL) |

*NBL: Northbound-to-westbound left turn movement, EBL: Eastbound-to-northbound left turn movement

A roundabout offers the best traffic operations for both peak periods, and would essentially allow the unimpeded free-flow of traffic in all directions for most of the day. Drivers would have fewer than two cars in front of them for all but 5% of the peak 15 minutes of the day.

An all-way stop or traffic signals, combined with a new dedicated left turn lane for eastbound traffic, would also offer levels of service within the range deemed acceptable by the City of Swift Current. However, the delays in both cases would be significantly higher than a roundabout.

Central Avenue is also an extension of Highway 4, and the intersection of Battleford Trail is the second intersection that a driver entering the city would encounter. The cross-section of Central Avenue remains rural at this location, despite the 50 km/h speed limit, resulting in a conflict with driver expectation. This

situation likely leads to a perceived speeding problem at this location. A roundabout would also serve as an effective gateway to the city and traffic calming device, slowing traffic down and enabling the opportunity for landscaping or other aesthetic features directly within the field of view of a driver entering Swift Current.

According to the United States Federal Highway Administration, roundabouts reduce fatal and serious injury collisions by over 80%, and are especially effective as a transition between rural and urban driving environments.

While an all-way stop or traffic signals, along with construction of a turning lane, could be effective at bringing traffic operations within acceptable levels, the roundabout would offer much superior operations, while reducing the likelihood of a fatal or serious injury collision, and allowing the City an opportunity for an aesthetic gateway feature. It is recommended that the City strongly consider construction of a single lane roundabout prior to 2037. However; roundabouts are generally not feasible on slopes steeper than approximately 2%. Central Avenue is on a slope downward from south to north at this location. If the slope is too steep for a roundabout, construction may not be feasible. In this case, an all-way stop or traffic signal with the addition of a dedicated eastbound left turn lane may be required.

It is recommended that the City undertake an intersection planning study over the next ten to fifteen years to determine the optimal intersection control and geometries at this intersection. Details such as slopes and grades, and rights of way are not within the scope of this study. As well, the traffic volumes forecast for 20 years are subject to an inherent level of uncertainty. Additional study with updated traffic counts will be required closer to the time the infrastructure is needed.

## 4.5 OTHER TRAFFIC CONTROL

During a site visit it was noted that none of the intersections within the Highland neighbourhood have traffic controls (yield or stop signs). Drivers would generally assume a collector street would have right of way over a local street. Nearly all existing intersections along Highland Drive are T-intersections. Drivers may already treat them as though Highland Drive has right of way, however, without yield signs, a driver travelling on Highland Drive would legally have to yield to anyone approaching from the right.

It is recommended that the City install yield signs on all existing streets intersecting with Highland Drive, and that the Developer install yield signs on all new streets intersecting with Highland Drive.

It is also recommended that the Developer install stop signs at the intersections of the development access with Battleford Trail.

# 5 Recommendations

1. Add yield signs on all streets intersecting Highland Drive.

2. For the intersection of Battleford Trail and 11th Avenue NW:
- Install an all-way stop when traffic operations warrant.
- Create additional lanes by prohibiting parking in the curb lanes of Battleford Trail for a distance of at least 50 m back from the stop bar. This change can be made immediately.

3. For the intersection of Battleford Trail and Central Avenue, the City should undertake an intersection planning study in the next ten to fifteen years to determine the optimal intersection control and geometry, with an emphasis on determining if a roundabout would be feasible.

# Appendix A – Traffic Data

Traffic Count Data Summary

| 11th Ave NW at Battleford Tr | | Northbound | | | | | | Southbound | | | | | | Eastbound | | | | | | Westbound | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date: Sept 6-7, 2017 | | Left | | Through | | Right | | Left | | Through | | Right | | Left | | Through | | Right | | Left | | Through | | Right | | |
| Time Interval | | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | |
| 7:00 | 7:15 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 6 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | 30 |
| 7:15 | 7:30 | 0 | 0 | 0 | 0 | 12 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 1 | 0 | 4 | 0 | 1 | 0 | 0 | 0 | 28 |
| 7:30 | 7:45 | 2 | 2 | 0 | 0 | 10 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 11 | 0 | 10 | 2 | 2 | 0 | 0 | 0 | 54 |
| 7:45 | 8:00 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 19 | 2 | 16 | 0 | 13 | 0 | 3 | 0 | 0 | 0 | 74 |
| 8:00 | 8:15 | 6 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 2 | 0 | 4 | 1 | 0 | 1 | 25 | 0 | 8 | 0 | 8 | 1 | 6 | 0 | 0 | 0 | 75 |
| 8:15 | 8:30 | 3 | 0 | 0 | 0 | 14 | 1 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 20 | 1 | 14 | 1 | 12 | 1 | 6 | 1 | 0 | 0 | 79 |
| AM Peak Subtotal | | 11 | 2 | 0 | 0 | 56 | 1 | 6 | 0 | 8 | 0 | 4 | 1 | 0 | 1 | 74 | 3 | 49 | 1 | 43 | 4 | 17 | 1 | 0 | 0 | |
| AM Peak Total (non-PCE) | | 13 | | 0 | | 57 | | 6 | | 8 | | 5 | | 1 | | 77 | | 50 | | 47 | | 18 | | 0 | | |
| AM Peak %Truck | | 15% | | 0% | | 2% | | 0% | | 0% | | 20% | | 100% | | 4% | | 2% | | 9% | | 6% | | 0% | | |
| 16:00 | 16:15 | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 16:15 | 16:30 | 3 | 0 | 1 | 0 | 4 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 4 | 0 | 21 | 0 | 26 | 1 | 1 | 1 | 73 |
| 16:30 | 16:45 | 14 | 0 | 0 | 0 | 8 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 2 | 0 | 18 | 0 | 29 | 0 | 2 | 0 | 87 |
| 16:45 | 17:00 | 7 | 0 | 2 | 0 | 20 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 | 0 | 17 | 1 | 17 | 0 | 1 | 1 | 88 |
| 17:00 | 17:15 | 8 | 0 | 4 | 0 | 26 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 2 | 0 | 24 | 0 | 25 | 0 | 3 | 0 | 99 |
| 17:15 | 17:30 | 6 | 1 | 0 | 0 | 13 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 1 | 1 | 2 | 16 | 1 | 24 | 0 | 4 | 0 | 82 |
| 17:30 | 17:45 | 4 | 0 | 2 | 0 | 11 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 11 | 0 | 25 | 0 | 3 | 0 | 64 |
| PM Peak Subtotal | | 35 | 1 | 6 | 0 | 67 | 1 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 44 | 1 | 10 | 2 | 75 | 2 | 95 | 0 | 10 | 1 | |
| PM Peak Total (non-PCE) | | 36 | | 6 | | 68 | | 3 | | 3 | | 0 | | 0 | | 45 | | 12 | | 77 | | 95 | | 11 | | |
| PM Peak %Truck | | 3% | | 0% | | 1% | | 0% | | 0% | | 0% | | 0% | | 2% | | 17% | | 3% | | 0% | | 9% | | |

Traffic Count Data Summary

| 11th Ave NW at Colonel Otter Dr | | Northbound | | | | | | Southbound | | | | | | Eastbound | | | | | | Westbound | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date: Sept 6-7, 2017 | | Left | | Through | | Right | | Left | | Through | | Right | | Left | | Through | | Right | | Left | | Through | | Right | | |
| Time Interval | | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | |
| 7:00 | 7:15 | 1 | 0 | 7 | 1 | 1 | 0 | 0 | 0 | 9 | 1 | 0 | 0 | 2 | 0 | 1 | 0 | 12 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 37 |
| 7:15 | 7:30 | 0 | 0 | 8 | 0 | 0 | 1 | 0 | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 17 | 0 | 6 | 0 | 0 | 0 | 1 | 0 | 39 |
| 7:30 | 7:45 | 1 | 0 | 5 | 2 | 0 | 0 | 0 | 0 | 19 | 1 | 4 | 1 | 6 | 0 | 0 | 0 | 23 | 0 | 9 | 0 | 0 | 0 | 2 | 0 | 73 |
| 7:45 | 8:00 | 2 | 0 | 8 | 0 | 2 | 0 | 0 | 0 | 27 | 0 | 3 | 0 | 10 | 0 | 1 | 0 | 37 | 0 | 8 | 0 | 2 | 0 | 1 | 0 | 101 |
| 8:00 | 8:15 | 3 | 0 | 8 | 0 | 0 | 1 | 0 | 0 | 16 | 1 | 0 | 0 | 6 | 0 | 1 | 0 | 19 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 59 |
| 8:15 | 8:30 | 10 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 23 | 0 | 3 | 1 | 4 | 0 | 3 | 0 | 27 | 0 | 8 | 0 | 1 | 1 | 3 | 0 | 93 |
| AM Peak Subtotal | | 16 | 0 | 30 | 2 | 2 | 1 | 0 | 0 | 85 | 2 | 10 | 2 | 26 | 0 | 5 | 0 | 106 | 0 | 28 | 0 | 3 | 1 | 7 | 0 | |
| AM Peak Total (non-PCE) | | 16 | | 32 | | 3 | | 0 | | 87 | | 12 | | 26 | | 5 | | 106 | | 28 | | 4 | | 7 | | |
| AM Peak %Truck | | | 0% | | 6% | | 33% | | 0% | | 2% | | 17% | | 0% | | 0% | | 0% | | 0% | | 25% | | 0% | |
| 16:00 | 16:15 | 6 | 0 | 22 | 0 | 6 | 0 | 1 | 0 | 10 | 1 | 6 | 0 | 3 | 0 | 0 | 0 | 11 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 70 |
| 16:15 | 16:30 | 9 | 0 | 10 | 0 | 3 | 0 | 1 | 0 | 20 | 0 | 6 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 60 |
| 16:30 | 16:45 | 12 | 0 | 18 | 0 | 4 | 0 | 1 | 0 | 12 | 0 | 9 | 0 | 3 | 0 | 3 | 0 | 9 | 0 | 1 | 0 | 4 | 0 | 0 | 0 | 76 |
| 16:45 | 17:00 | 16 | 0 | 24 | 0 | 2 | 0 | 0 | 0 | 13 | 0 | 11 | 0 | 4 | 0 | 1 | 0 | 15 | 0 | 5 | 0 | 1 | 0 | 1 | 0 | 93 |
| 17:00 | 17:15 | 35 | 0 | 29 | 0 | 10 | 1 | 0 | 0 | 10 | 0 | 13 | 0 | 6 | 0 | 3 | 0 | 9 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 119 |
| 17:15 | 17:30 | 22 | 0 | 14 | 0 | 5 | 0 | 2 | 0 | 13 | 0 | 9 | 0 | 4 | 0 | 3 | 0 | 8 | 1 | 3 | 0 | 1 | 0 | 0 | 0 | 85 |
| 17:30 | 17:45 | 23 | 0 | 16 | 0 | 8 | 0 | 0 | 0 | 10 | 0 | 3 | 0 | 1 | 0 | 1 | 0 | 15 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 79 |
| PM Peak Subtotal | | 85 | 0 | 85 | 0 | 21 | 1 | 3 | 0 | 48 | 0 | 42 | 0 | 17 | 0 | 10 | 0 | 41 | 1 | 10 | 0 | 7 | 1 | 1 | 0 | |
| PM Peak Total (non-PCE) | | 85 | | 85 | | 22 | | 3 | | 48 | | 42 | | 17 | | 10 | | 42 | | 10 | | 8 | | 1 | | |
| PM Peak %Truck | | | 0% | | 0% | | 5% | | 0% | | 0% | | 0% | | 0% | | 0% | | 2% | | 0% | | 13% | | 0% | |

Traffic Count Data Summary

| 11th Ave NW at Highland Dr | | Northbound | | | | | | Southbound | | | | | | Eastbound | | | | | | Westbound | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date: Sept 6-7, 2017 | | Left | | Through | | Right | | Left | | Through | | Right | | Left | | Through | | Right | | Left | | Through | | Right | | |
| Time Interval | | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | Car | Truck | |
| 7:00 | 7:15 | 1 | 0 | | | | | | | | | 0 | 0 | 3 | 0 | | | 10 | 0 | | | | | | | 14 |
| 7:15 | 7:30 | 2 | 0 | | | | | | | | | 0 | 0 | 2 | 0 | | | 14 | 0 | | | | | | | 18 |
| 7:30 | 7:45 | 3 | 0 | | | | | | | | | 2 | 0 | 2 | 0 | | | 20 | 0 | | | | | | | 27 |
| 7:45 | 8:00 | 5 | 0 | | | | | | | | | 0 | 0 | 7 | 0 | | | 37 | 0 | | | | | | | 49 |
| 8:00 | 8:15 | 5 | 0 | | | | | | | | | 2 | 0 | 1 | 0 | | | 27 | 0 | | | | | | | 35 |
| 8:15 | 8:30 | 3 | 0 | | | | | | | | | 1 | 0 | 3 | 0 | | | 25 | 0 | | | | | | | 32 |
| AM Peak Subtotal | | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 13 | 0 | 0 | 0 | 109 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| AM Peak Total (non-PCE) | | 16 | | 0 | | 0 | | 0 | | 0 | | 5 | | 13 | | 0 | | 109 | | 0 | | 0 | | 0 | | |
| AM Peak %Truck | | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | |
| 16:00 | 16:15 | 9 | 0 | | | | | | | | | 0 | 0 | 0 | 0 | | | 5 | 0 | | | | | | | 14 |
| 16:15 | 16:30 | 13 | 0 | | | | | | | | | 7 | 0 | 3 | 0 | | | 16 | 0 | | | | | | | 39 |
| 16:30 | 16:45 | 19 | 0 | | | | | | | | | 4 | 0 | 3 | 0 | | | 12 | 0 | | | | | | | 38 |
| 16:45 | 17:00 | 38 | 0 | | | | | | | | | 0 | 0 | 6 | 0 | | | 17 | 0 | | | | | | | 61 |
| 17:00 | 17:15 | 21 | 0 | | | | | | | | | 3 | 0 | 2 | 0 | | | 11 | 0 | | | | | | | 37 |
| 17:15 | 17:30 | 23 | 0 | | | | | | | | | 3 | 0 | 3 | 0 | | | 17 | 0 | | | | | | | 46 |
| 17:30 | 17:45 | 19 | 0 | | | | | | | | | 3 | 0 | 1 | 0 | | | 13 | 0 | | | | | | | 36 |
| PM Peak Subtotal | | 101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 14 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PM Peak Total (non-PCE) | | 101 | | 0 | | 0 | | 0 | | 0 | | 10 | | 14 | | 0 | | 57 | | 0 | | 0 | | 0 | | |
| PM Peak %Truck | | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | | 0% | |

MMM GROUP

MMM Group Limited - Regina
1853 Hamilton Street, Suite 601

Regina, Saskatchewan, Canada S4P 2B9
(306) 522-7158 e.232 dewaltd@mmm.ca

Count Name: Central Ave N & Battleford Trail
Site Code: 5416225-000
Start Date: 11/08/2016


# Turning Movement Data

| Start Time | Central Ave N Northbound | | | | | | Central Ave N Southbound | | | | | | Battleford Trail Eastbound | | | | | | Battleford Trail Westbound | | | | | | Int. Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U-Turn | Peds | App. Total | Left | Thru | Right | U-Turn | Peds | App. Total | Left | Thru | Right | U-Turn | Peds | App. Total | Left | Thru | Right | U-Turn | Peds | App. Total | |
| 4:00 PM | 26 | 17 | 29 | 0 | 0 | 72 | 1 | 25 | 15 | 0 | 0 | 41 | 7 | 9 | 8 | 0 | 0 | 24 | 16 | 5 | 1 | 0 | 0 | 22 | 159 |
| 4:15 PM | 26 | 20 | 20 | 0 | 0 | 66 | 2 | 22 | 19 | 0 | 0 | 43 | 9 | 11 | 15 | 0 | 0 | 35 | 15 | 9 | 2 | 0 | 0 | 26 | 170 |
| 4:30 PM | 25 | 20 | 30 | 0 | 0 | 75 | 4 | 16 | 11 | 0 | 0 | 31 | 6 | 12 | 10 | 0 | 0 | 28 | 16 | 13 | 1 | 0 | 0 | 30 | 164 |
| 4:45 PM | 28 | 23 | 27 | 0 | 0 | 78 | 0 | 21 | 19 | 0 | 0 | 40 | 6 | 17 | 13 | 0 | 0 | 36 | 8 | 8 | 0 | 0 | 0 | 16 | 170 |
| Hourly Total | 105 | 80 | 106 | 0 | 0 | 291 | 7 | 84 | 64 | 0 | 0 | 155 | 28 | 49 | 46 | 0 | 0 | 123 | 55 | 35 | 4 | 0 | 0 | 94 | 663 |
| 5:00 PM | 19 | 32 | 23 | 0 | 0 | 74 | 0 | 27 | 25 | 0 | 0 | 52 | 6 | 11 | 9 | 0 | 0 | 26 | 6 | 13 | 0 | 0 | 0 | 19 | 171 |
| 5:15 PM | 32 | 33 | 24 | 0 | 0 | 89 | 5 | 21 | 17 | 0 | 0 | 43 | 9 | 15 | 14 | 0 | 0 | 38 | 9 | 18 | 0 | 0 | 0 | 27 | 197 |
| 5:30 PM | 24 | 26 | 19 | 0 | 0 | 69 | 2 | 20 | 11 | 0 | 0 | 33 | 9 | 12 | 9 | 0 | 0 | 30 | 11 | 14 | 2 | 0 | 0 | 27 | 159 |
| 5:45 PM | 23 | 18 | 20 | 0 | 1 | 61 | 0 | 50 | 14 | 0 | 0 | 64 | 4 | 8 | 7 | 0 | 0 | 19 | 8 | 12 | 1 | 0 | 0 | 21 | 165 |
| Hourly Total | 98 | 109 | 86 | 0 | 1 | 293 | 7 | 118 | 67 | 0 | 0 | 192 | 28 | 46 | 39 | 0 | 0 | 113 | 34 | 57 | 3 | 0 | 0 | 94 | 692 |
| 6:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *** BREAK *** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Hourly Total | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:00 AM | 1 | 11 | 3 | 0 | 0 | 15 | 1 | 5 | 1 | 0 | 0 | 7 | 14 | 9 | 5 | 0 | 0 | 28 | 4 | 0 | 0 | 0 | 0 | 4 | 54 |
| 7:15 AM | 7 | 19 | 5 | 0 | 0 | 31 | 2 | 14 | 3 | 0 | 0 | 19 | 16 | 15 | 3 | 0 | 0 | 34 | 6 | 2 | 0 | 0 | 0 | 8 | 92 |
| 7:30 AM | 4 | 22 | 5 | 0 | 0 | 31 | 4 | 12 | 6 | 0 | 0 | 22 | 14 | 20 | 9 | 0 | 0 | 43 | 2 | 1 | 1 | 0 | 0 | 4 | 100 |
| 7:45 AM | 14 | 16 | 10 | 0 | 0 | 40 | 1 | 13 | 6 | 0 | 0 | 20 | 26 | 13 | 16 | 0 | 0 | 55 | 3 | 0 | 1 | 0 | 0 | 4 | 119 |
| Hourly Total | 26 | 68 | 23 | 0 | 0 | 117 | 8 | 44 | 16 | 0 | 0 | 68 | 70 | 57 | 33 | 0 | 0 | 160 | 15 | 3 | 2 | 0 | 0 | 20 | 365 |
| 8:00 AM | 6 | 29 | 6 | 0 | 0 | 41 | 0 | 22 | 5 | 0 | 0 | 27 | 25 | 10 | 14 | 0 | 0 | 49 | 4 | 2 | 2 | 0 | 0 | 8 | 125 |
| 8:15 AM | 11 | 30 | 6 | 0 | 0 | 47 | 0 | 12 | 16 | 0 | 0 | 28 | 39 | 9 | 16 | 0 | 0 | 64 | 4 | 0 | 1 | 0 | 0 | 5 | 144 |
| 8:30 AM | 11 | 25 | 7 | 0 | 0 | 43 | 0 | 15 | 11 | 0 | 0 | 26 | 17 | 13 | 14 | 0 | 0 | 44 | 2 | 0 | 1 | 0 | 0 | 3 | 116 |
| 8:45 AM | 7 | 20 | 9 | 0 | 0 | 36 | 0 | 26 | 8 | 0 | 0 | 34 | 15 | 22 | 11 | 0 | 0 | 48 | 2 | 0 | 0 | 0 | 0 | 2 | 120 |
| Hourly Total | 35 | 104 | 28 | 0 | 0 | 167 | 0 | 75 | 40 | 0 | 0 | 115 | 96 | 54 | 55 | 0 | 0 | 205 | 12 | 2 | 4 | 0 | 0 | 18 | 505 |
| 9:00 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Grand Total | 264 | 361 | 243 | 0 | 1 | 868 | 22 | 321 | 187 | 0 | 0 | 530 | 222 | 206 | 173 | 0 | 0 | 601 | 116 | 97 | 13 | 0 | 0 | 226 | 2225 |
| Approach % | 30.4 | 41.6 | 28.0 | 0.0 | - | - | 4.2 | 60.6 | 35.3 | 0.0 | - | - | 36.9 | 34.3 | 28.8 | 0.0 | - | - | 51.3 | 42.9 | 5.8 | 0.0 | - | - | - |
| Total % | 11.9 | 16.2 | 10.9 | 0.0 | - | 39.0 | 1.0 | 14.4 | 8.4 | 0.0 | - | 23.8 | 10.0 | 9.3 | 7.8 | 0.0 | - | 27.0 | 5.2 | 4.4 | 0.6 | 0.0 | - | 10.2 | - |
| Lights | 262 | 337 | 241 | 0 | - | 840 | 21 | 307 | 179 | 0 | - | 507 | 212 | 205 | 171 | 0 | - | 588 | 113 | 96 | 10 | 0 | - | 219 | 2154 |
| % Lights | 99.2 | 93.4 | 99.2 | - | - | 96.8 | 95.5 | 95.6 | 95.7 | - | - | 95.7 | 95.5 | 99.5 | 98.8 | - | - | 97.8 | 97.4 | 99.0 | 76.9 | - | - | 96.9 | 96.8 |
| Buses | 1 | 9 | 0 | 0 | - | 10 | 1 | 2 | 6 | 0 | - | 9 | 6 | 0 | 2 | 0 | - | 8 | 0 | 0 | 0 | 0 | - | 0 | 27 |
| % Buses | 0.4 | 2.5 | 0.0 | - | - | 1.2 | 4.5 | 0.6 | 3.2 | - | - | 1.7 | 2.7 | 0.0 | 1.2 | - | - | 1.3 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 1.2 |
| Trucks | 1 | 15 | 2 | 0 | - | 18 | 0 | 12 | 2 | 0 | - | 14 | 4 | 1 | 0 | 0 | - | 5 | 3 | 1 | 3 | 0 | - | 7 | 44 |
| % Trucks | 0.4 | 4.2 | 0.8 | - | - | 2.1 | 0.0 | 3.7 | 1.1 | - | - | 2.6 | 1.8 | 0.5 | 0.0 | - | - | 0.8 | 2.6 | 1.0 | 23.1 | - | - | 3.1 | 2.0 |
| Bicycles on Road | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 |
| % Bicycles on Road | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 |
| Bicycles on Crosswalk | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % Bicycles on Crosswalk | - | - | - | - | 0.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pedestrians | - | - | - | - | 1 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - |
| % Pedestrians | - | - | - | - | 100.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

MMM Group Limited - Regina
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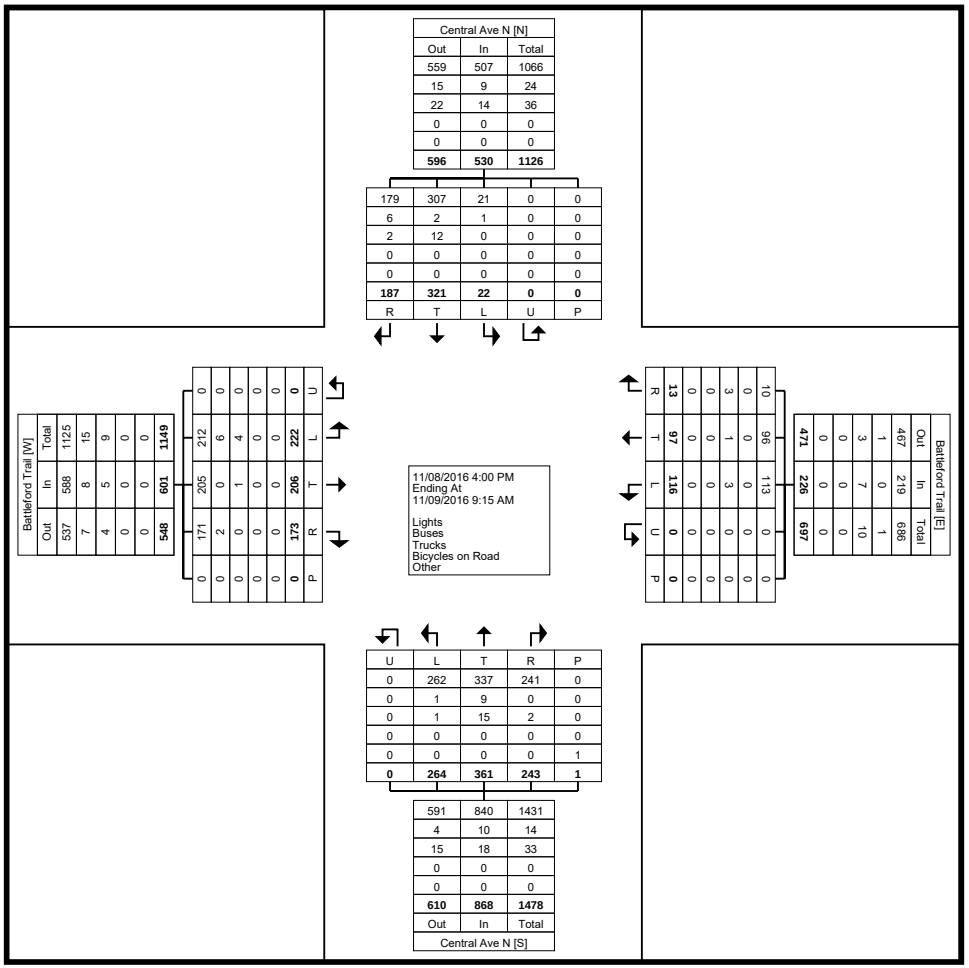
Count Name: Central Ave N & Battleford Trail
Site Code: 5416225-000
Start Date: 11/08/2016


Turning Movement Data Plot

MMM Group Limited - Regina
1853 Hamilton Street, Suite 601

Regina, Saskatchewan, Canada S4P 2B9
(306) 522-7158 e.232 dewaltd@mmm.ca

Count Name: Central Ave N & Battleford Trail
Site Code: 5416225-000
Start Date: 11/08/2016


# Turning Movement Peak Hour Data (4:30 PM)

| Start Time | Central Ave N Northbound | | | | | | Central Ave N Southbound | | | | | | Battleford Trail Eastbound | | | | | | Battleford Trail Westbound | | | | | | Int. Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U-Turn | Peds | App. Total | Left | Thru | Right | U-Turn | Peds | App. Total | Left | Thru | Right | U-Turn | Peds | App. Total | Left | Thru | Right | U-Turn | Peds | App. Total | |
| 4:30 PM | 25 | 20 | 30 | 0 | 0 | 75 | 4 | 16 | 11 | 0 | 0 | 31 | 6 | 12 | 10 | 0 | 0 | 28 | 16 | 13 | 1 | 0 | 0 | 30 | 164 |
| 4:45 PM | 28 | 23 | 27 | 0 | 0 | 78 | 0 | 21 | 19 | 0 | 0 | 40 | 6 | 17 | 13 | 0 | 0 | 36 | 8 | 8 | 0 | 0 | 0 | 16 | 170 |
| 5:00 PM | 19 | 32 | 23 | 0 | 0 | 74 | 0 | 27 | 25 | 0 | 0 | 52 | 6 | 11 | 9 | 0 | 0 | 26 | 6 | 13 | 0 | 0 | 0 | 19 | 171 |
| 5:15 PM | 32 | 33 | 24 | 0 | 0 | 89 | 5 | 21 | 17 | 0 | 0 | 43 | 9 | 15 | 14 | 0 | 0 | 38 | 9 | 18 | 0 | 0 | 0 | 27 | 197 |
| Total | 104 | 108 | 104 | 0 | 0 | 316 | 9 | 85 | 72 | 0 | 0 | 166 | 27 | 55 | 46 | 0 | 0 | 128 | 39 | 52 | 1 | 0 | 0 | 92 | 702 |
| Approach % | 32.9 | 34.2 | 32.9 | 0.0 | - | - | 5.4 | 51.2 | 43.4 | 0.0 | - | - | 21.1 | 43.0 | 35.9 | 0.0 | - | - | 42.4 | 56.5 | 1.1 | 0.0 | - | - | - |
| Total % | 14.8 | 15.4 | 14.8 | 0.0 | - | 45.0 | 1.3 | 12.1 | 10.3 | 0.0 | - | 23.6 | 3.8 | 7.8 | 6.6 | 0.0 | - | 18.2 | 5.6 | 7.4 | 0.1 | 0.0 | - | 13.1 | - |
| PHF | 0.813 | 0.818 | 0.867 | 0.000 | - | 0.888 | 0.450 | 0.787 | 0.720 | 0.000 | - | 0.798 | 0.750 | 0.809 | 0.821 | 0.000 | - | 0.842 | 0.609 | 0.722 | 0.250 | 0.000 | - | 0.767 | 0.891 |
| Lights | 104 | 105 | 104 | 0 | - | 313 | 9 | 83 | 70 | 0 | - | 162 | 27 | 55 | 46 | 0 | - | 128 | 39 | 51 | 1 | 0 | - | 91 | 694 |
| % Lights | 100.0 | 97.2 | 100.0 | - | - | 99.1 | 100.0 | 97.6 | 97.2 | - | - | 97.6 | 100.0 | 100.0 | 100.0 | - | - | 100.0 | 100.0 | 98.1 | 100.0 | - | - | 98.9 | 98.9 |
| Buses | 0 | 1 | 0 | 0 | - | 1 | 0 | 0 | 1 | 0 | - | 1 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 2 |
| % Buses | 0.0 | 0.9 | 0.0 | - | - | 0.3 | 0.0 | 0.0 | 1.4 | - | - | 0.6 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.3 |
| Trucks | 0 | 2 | 0 | 0 | - | 2 | 0 | 2 | 1 | 0 | - | 3 | 0 | 0 | 0 | 0 | - | 0 | 0 | 1 | 0 | 0 | - | 1 | 6 |
| % Trucks | 0.0 | 1.9 | 0.0 | - | - | 0.6 | 0.0 | 2.4 | 1.4 | - | - | 1.8 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 1.9 | 0.0 | - | - | 1.1 | 0.9 |
| Bicycles on Road | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 |
| % Bicycles on Road | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 |
| Bicycles on Crosswalk | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - |
| % Bicycles on Crosswalk | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pedestrians | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - |
| % Pedestrians | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

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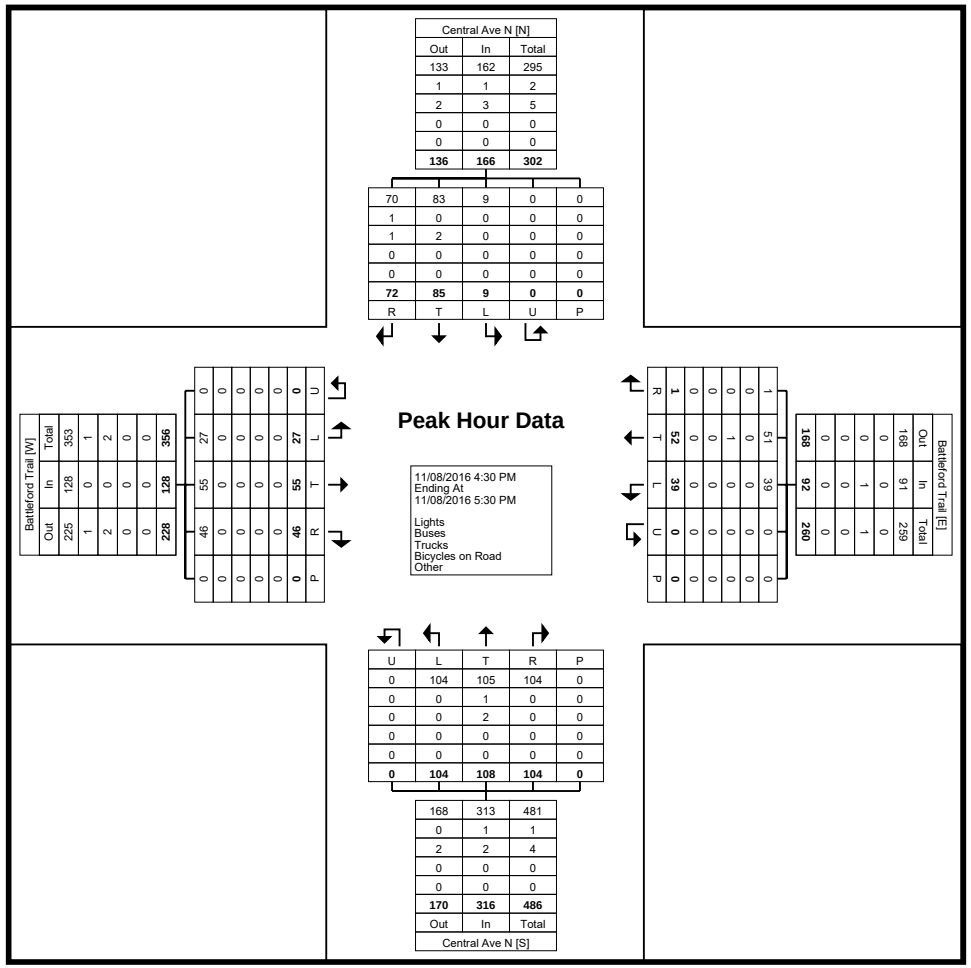



Turning Movement Peak Hour Data Plot (4:30 PM)

MMM Group Limited - Regina
1853 Hamilton Street, Suite 601

Regina, Saskatchewan, Canada S4P 2B9
(306) 522-7158 e.232 dewaltd@mmm.ca

Count Name: Central Ave N & Battleford Trail
Site Code: 5416225-000
Start Date: 11/08/2016

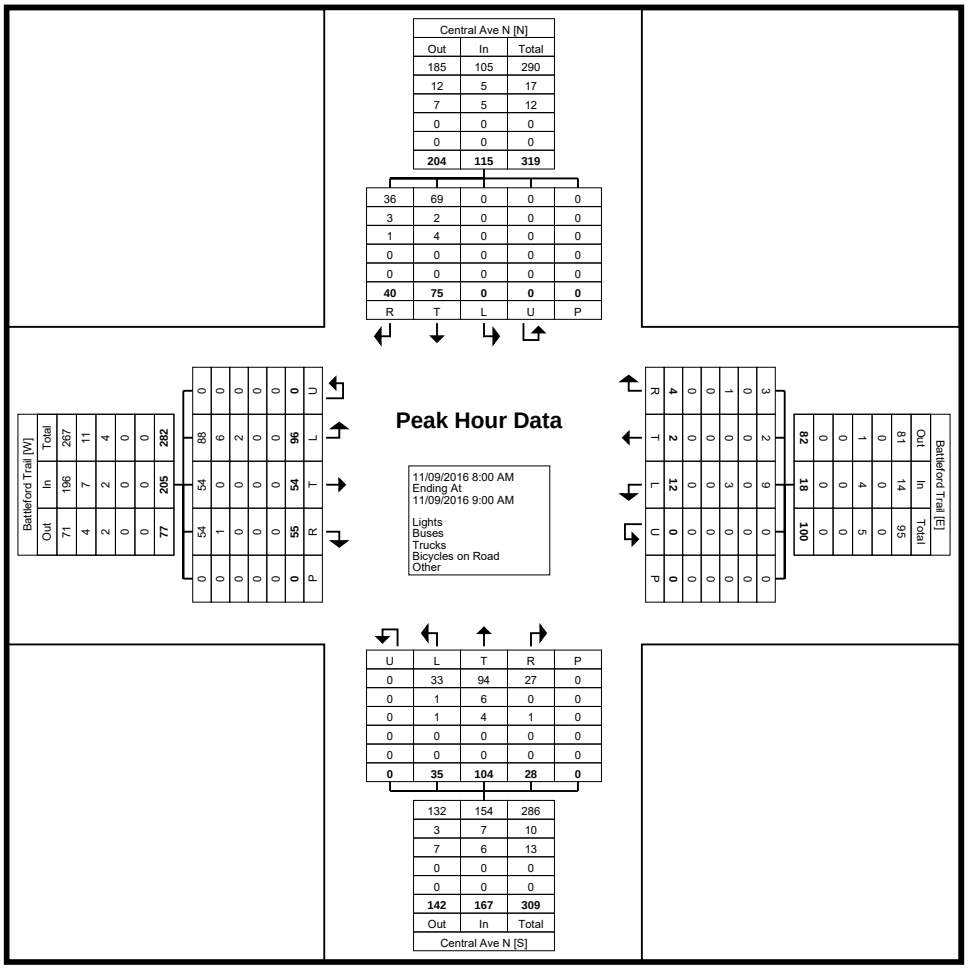

# Turning Movement Peak Hour Data (8:00 AM)

| Start Time | Central Ave N Northbound | | | | | | Central Ave N Southbound | | | | | | Battleford Trail Eastbound | | | | | | Battleford Trail Westbound | | | | | | Int. Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U-Turn | Peds | App. Total | Left | Thru | Right | U-Turn | Peds | App. Total | Left | Thru | Right | U-Turn | Peds | App. Total | Left | Thru | Right | U-Turn | Peds | App. Total | |
| 8:00 AM | 6 | 29 | 6 | 0 | 0 | 41 | 0 | 22 | 5 | 0 | 0 | 27 | 25 | 10 | 14 | 0 | 0 | 49 | 4 | 2 | 2 | 0 | 0 | 8 | 125 |
| 8:15 AM | 11 | 30 | 6 | 0 | 0 | 47 | 0 | 12 | 16 | 0 | 0 | 28 | 39 | 9 | 16 | 0 | 0 | 64 | 4 | 0 | 1 | 0 | 0 | 5 | 144 |
| 8:30 AM | 11 | 25 | 7 | 0 | 0 | 43 | 0 | 15 | 11 | 0 | 0 | 26 | 17 | 13 | 14 | 0 | 0 | 44 | 2 | 0 | 1 | 0 | 0 | 3 | 116 |
| 8:45 AM | 7 | 20 | 9 | 0 | 0 | 36 | 0 | 26 | 8 | 0 | 0 | 34 | 15 | 22 | 11 | 0 | 0 | 48 | 2 | 0 | 0 | 0 | 0 | 2 | 120 |
| Total | 35 | 104 | 28 | 0 | 0 | 167 | 0 | 75 | 40 | 0 | 0 | 115 | 96 | 54 | 55 | 0 | 0 | 205 | 12 | 2 | 4 | 0 | 0 | 18 | 505 |
| Approach % | 21.0 | 62.3 | 16.8 | 0.0 | - | - | 0.0 | 65.2 | 34.8 | 0.0 | - | - | 46.8 | 26.3 | 26.8 | 0.0 | - | - | 66.7 | 11.1 | 22.2 | 0.0 | - | - | - |
| Total % | 6.9 | 20.6 | 5.5 | 0.0 | - | 33.1 | 0.0 | 14.9 | 7.9 | 0.0 | - | 22.8 | 19.0 | 10.7 | 10.9 | 0.0 | - | 40.6 | 2.4 | 0.4 | 0.8 | 0.0 | - | 3.6 | - |
| PHF | 0.795 | 0.867 | 0.778 | 0.000 | - | 0.888 | 0.000 | 0.721 | 0.625 | 0.000 | - | 0.846 | 0.615 | 0.614 | 0.859 | 0.000 | - | 0.801 | 0.750 | 0.250 | 0.500 | 0.000 | - | 0.563 | 0.877 |
| Lights | 33 | 94 | 27 | 0 | - | 154 | 0 | 69 | 36 | 0 | - | 105 | 88 | 54 | 54 | 0 | - | 196 | 9 | 2 | 3 | 0 | - | 14 | 469 |
| % Lights | 94.3 | 90.4 | 96.4 | - | - | 92.2 | - | 92.0 | 90.0 | - | - | 91.3 | 91.7 | 100.0 | 98.2 | - | - | 95.6 | 75.0 | 100.0 | 75.0 | - | - | 77.8 | 92.9 |
| Buses | 1 | 6 | 0 | 0 | - | 7 | 0 | 2 | 3 | 0 | - | 5 | 6 | 0 | 1 | 0 | - | 7 | 0 | 0 | 0 | 0 | - | 0 | 19 |
| % Buses | 2.9 | 5.8 | 0.0 | - | - | 4.2 | - | 2.7 | 7.5 | - | - | 4.3 | 6.3 | 0.0 | 1.8 | - | - | 3.4 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 3.8 |
| Trucks | 1 | 4 | 1 | 0 | - | 6 | 0 | 4 | 1 | 0 | - | 5 | 2 | 0 | 0 | 0 | - | 2 | 3 | 0 | 1 | 0 | - | 4 | 17 |
| % Trucks | 2.9 | 3.8 | 3.6 | - | - | 3.6 | - | 5.3 | 2.5 | - | - | 4.3 | 2.1 | 0.0 | 0.0 | - | - | 1.0 | 25.0 | 0.0 | 25.0 | - | - | 22.2 | 3.4 |
| Bicycles on Road | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 |
| % Bicycles on Road | 0.0 | 0.0 | 0.0 | - | - | 0.0 | - | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 |
| Bicycles on Crosswalk | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - |
| % Bicycles on Crosswalk | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pedestrians | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - |
| % Pedestrians | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

MMM Group Limited - Regina
1853 Hamilton Street, Suite 601

Regina, Saskatchewan, Canada S4P 2B9
(306) 522-7158 e.232 dewaltd@mmm.ca

Count Name: Central Ave N & Battleford Trail
Site Code: 5416225-000
Start Date: 11/08/2016


Turning Movement Peak Hour Data Plot (8:00 AM)

# Appendix B - Traffic Analysis Reports

**Intersection Level Of Service Report**
**Intersection 1: Battleford / 11 Ave**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 11.0 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.082 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 13 | 0 | 57 | 6 | 8 | 5 | 1 | 77 | 50 | 47 | 18 | 0 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 13 | 1 | 57 | 6 | 8 | 5 | 1 | 77 | 50 | 47 | 18 | 1 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 4 | 0 | 17 | 2 | 2 | 1 | 0 | 23 | 15 | 14 | 5 | 0 |
| Total Analysis Volume [veh/h] | 15 | 1 | 67 | 7 | 9 | 6 | 1 | 91 | 59 | 55 | 21 | 1 |
| Pedestrian Volume [ped/h] | 2 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.06 | 0.08 | 0.03 | 0.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.27 | 0.00 | 0.00 | 7.36 | 0.00 | 0.00 | 9.63 | 10.17 | 8.79 | 10.95 | 10.20 | 9.08 |
| Movement LOS | A | A | A | A | A | A | A | B | A | B | B | A |
| 95th-Percentile Queue Length [veh] | 0.16 | 0.16 | 0.16 | 0.04 | 0.04 | 0.04 | 0.41 | 0.41 | 0.41 | 0.36 | 0.36 | 0.36 |
| 95th-Percentile Queue Length [m] | 1.25 | 1.25 | 1.25 | 0.33 | 0.33 | 0.33 | 3.16 | 3.16 | 3.16 | 2.76 | 2.76 | 2.76 |
| d_A, Approach Delay [s/veh] | 1.31 | | | 2.34 | | | 9.62 | | | 10.72 | | |
| Approach LOS | A | | | A | | | A | | | B | | |
| d_I, Intersection Delay [s/veh] | 7.33 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 2: 11 Ave / Col. Otter**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 11.4 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.055 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 16 | 32 | 3 | 0 | 87 | 12 | 26 | 5 | 106 | 28 | 4 | 7 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 16 | 32 | 3 | 1 | 87 | 12 | 26 | 5 | 106 | 28 | 4 | 7 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 5 | 9 | 1 | 0 | 26 | 4 | 8 | 1 | 31 | 8 | 1 | 2 |
| Total Analysis Volume [veh/h] | 19 | 38 | 4 | 1 | 102 | 14 | 31 | 6 | 125 | 33 | 5 | 8 |
| Pedestrian Volume [ped/h] | 0 | | | 2 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.01 | 0.13 | 0.06 | 0.01 | 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.48 | 0.00 | 0.00 | 7.30 | 0.00 | 0.00 | 10.30 | 10.63 | 9.26 | 11.37 | 10.55 | 8.83 |
| Movement LOS | A | A | A | A | A | A | B | B | A | B | B | A |
| 95th-Percentile Queue Length [veh] | 0.13 | 0.13 | 0.13 | 0.24 | 0.24 | 0.24 | 0.46 | 0.46 | 0.46 | 0.20 | 0.20 | 0.20 |
| 95th-Percentile Queue Length [m] | 0.99 | 0.99 | 0.99 | 1.84 | 1.84 | 1.84 | 3.47 | 3.47 | 3.47 | 1.52 | 1.52 | 1.52 |
| d_A, Approach Delay [s/veh] | 2.33 | | | 0.06 | | | 9.51 | | | 10.84 | | |
| Approach LOS | A | | | A | | | A | | | B | | |
| d_I, Intersection Delay [s/veh] | 5.67 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 3: 11 Ave / Highland**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 11.4 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.023 |

**Intersection Setup**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Southbound | | Eastbound | |
| Lane Configuration | | | | | | |
| Turning Movement | Left | Thru | Thru | Right | Left | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 16 | 38 | 216 | 5 | 13 | 109 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 16 | 38 | 216 | 5 | 13 | 109 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 5 | 11 | 64 | 1 | 4 | 32 |
| Total Analysis Volume [veh/h] | 19 | 45 | 254 | 6 | 15 | 128 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| | | | |
|---|---|---|---|
| Priority Scheme | Free | Free | Stop |
| Flared Lane | | | Yes |
| Storage Area [veh] | 0 | 0 | 2 |
| Two-Stage Gap Acceptance | | | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| V/C, Movement V/C Ratio | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.16 |
| d_M, Delay for Movement [s/veh] | 7.80 | 0.00 | 0.00 | 0.00 | 11.38 | 10.41 |
| Movement LOS | A | A | A | A | B | B |
| 95th-Percentile Queue Length [veh] | 0.15 | 0.15 | 0.00 | 0.00 | 0.58 | 0.58 |
| 95th-Percentile Queue Length [m] | 1.18 | 1.18 | 0.00 | 0.00 | 4.45 | 4.45 |
| d_A, Approach Delay [s/veh] | 2.32 | | 0.00 | | 10.51 | |
| Approach LOS | A | | A | | B | |
| d_I, Intersection Delay [s/veh] | 3.54 | | | | | |
| Intersection LOS | B | | | | | |

## Intersection Level Of Service Report
## Intersection 4: Central / Battleford

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 12.8 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.110 |

**Intersection Setup**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Pocket Length [m] | 100.00 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | No | | | No | | | No | | | No | | |

**Volumes**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 35 | 104 | 28 | 0 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 35 | 104 | 28 | 1 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 10 | 31 | 8 | 0 | 22 | 12 | 28 | 16 | 16 | 4 | 1 | 1 |
| Total Analysis Volume [veh/h] | 41 | 122 | 33 | 1 | 88 | 47 | 113 | 64 | 65 | 14 | 2 | 5 |
| Pedestrian Volume [ped/h] | 0 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.11 | 0.07 | 0.03 | 0.00 | 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.46 | 0.00 | 0.00 | 7.46 | 0.00 | 0.00 | 12.14 | 12.85 | 10.31 | 12.00 | 11.16 | 8.74 |
| Movement LOS | A | A | A | A | A | A | B | B | B | B | B | A |
| 95th-Percentile Queue Length [veh] | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.16 | 1.16 | 1.16 | 0.08 | 0.01 | 0.02 |
| 95th-Percentile Queue Length [m] | 0.64 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 8.87 | 8.87 | 8.87 | 0.62 | 0.08 | 0.12 |
| d_A, Approach Delay [s/veh] | 1.56 | | | 0.05 | | | 11.84 | | | 11.14 | | |
| Approach LOS | A | | | A | | | B | | | B | | |
| d_I, Intersection Delay [s/veh] | 5.73 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |

## Intersection Level Of Service Report
## Intersection 5: Battleford / Highland

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 1 | 0 | 0 | 1 |
| Total Analysis Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.56 | 8.34 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.45 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

## Intersection Level Of Service Report
## Intersection 6: Battleford / Hamilton

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 1 | 0 | 0 | 1 |
| Total Analysis Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.56 | 8.34 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.45 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 7: Battleford / Access 3**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Access 3 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Access 3 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 1 | 0 | 0 | 1 |
| Total Analysis Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.56 | 8.34 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.45 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 8: Battleford / Access 4**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Access 4 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Access 4 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 1 | 0 | 0 | 1 |
| Total Analysis Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

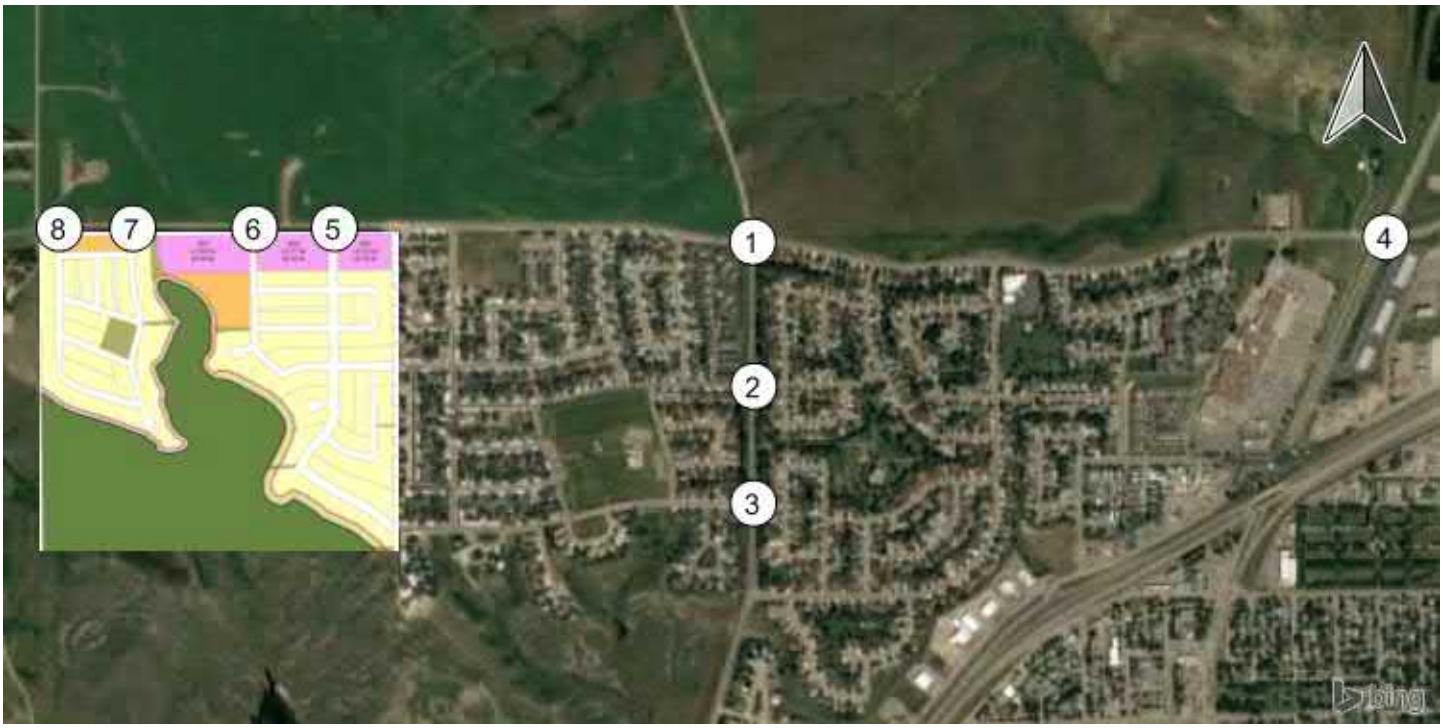
**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

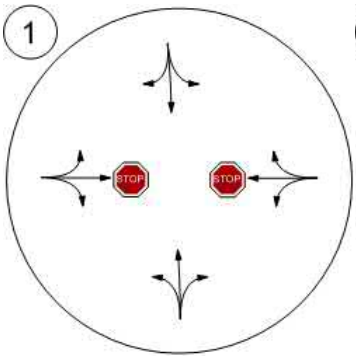
**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.56 | 8.34 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.45 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

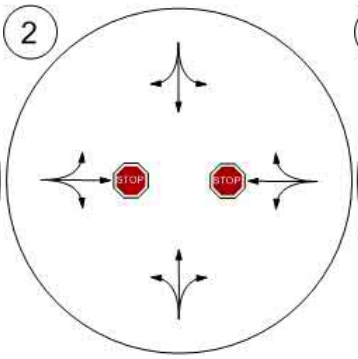
## Lane Configuration and Traffic Control



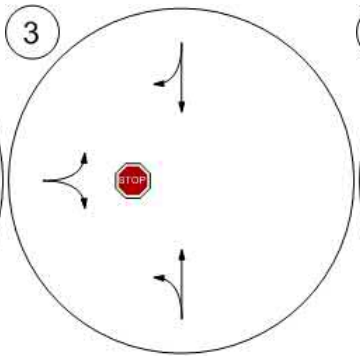

Battleford / 11 Ave



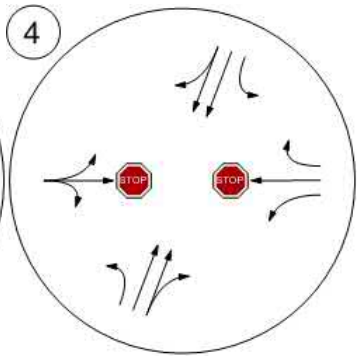

11 Ave / Col. Otter



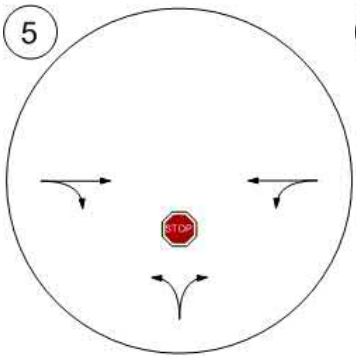

11 Ave / Highland



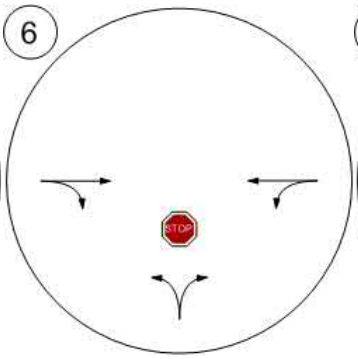

Central / Battleford



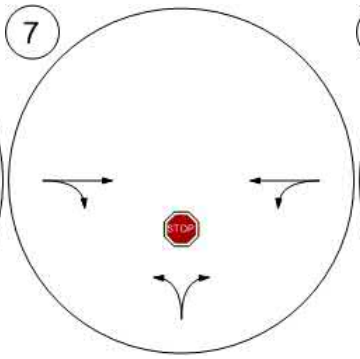

Battleford / Highland



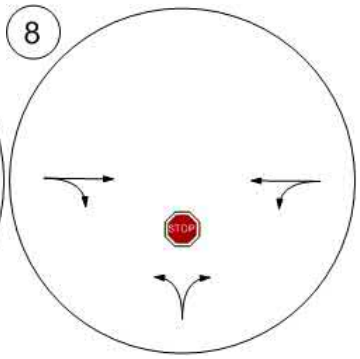

Battleford / Hamilton



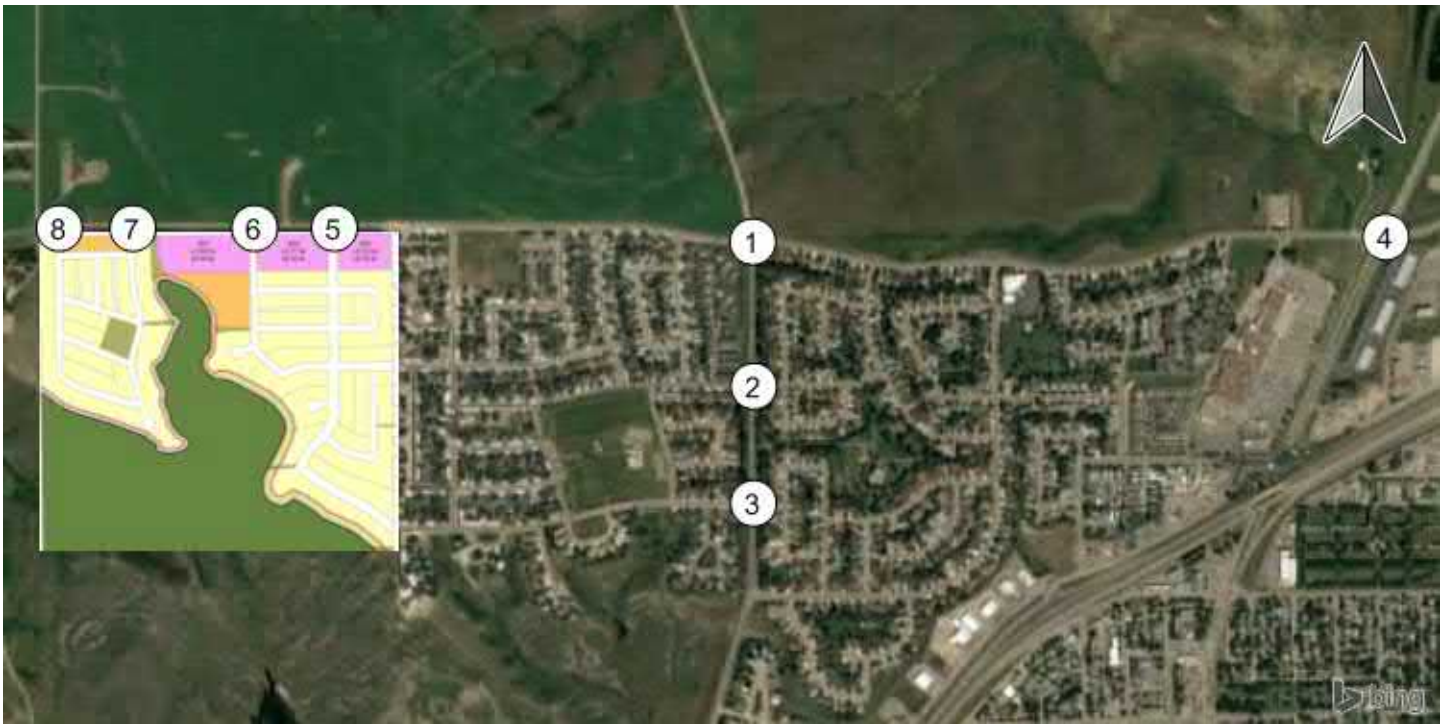

Battleford / Access 3



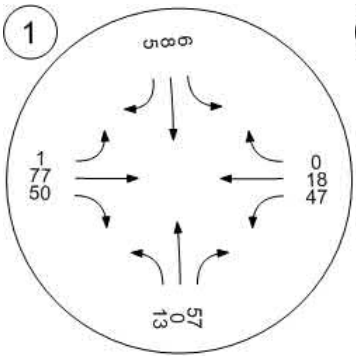

Battleford / Access 4



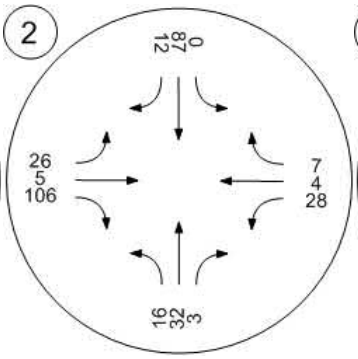
## Traffic Volume - Base Volume



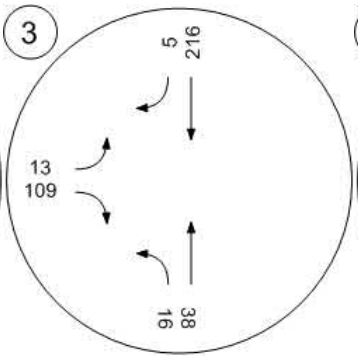

### Battleford / 11 Ave



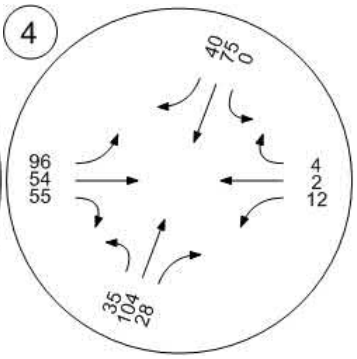

### 11 Ave / Col. Otter



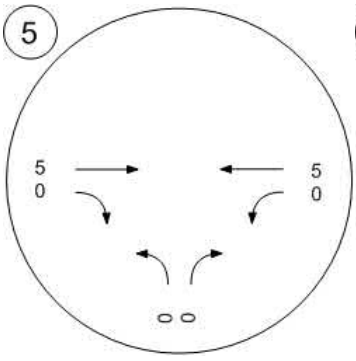

### 11 Ave / Highland



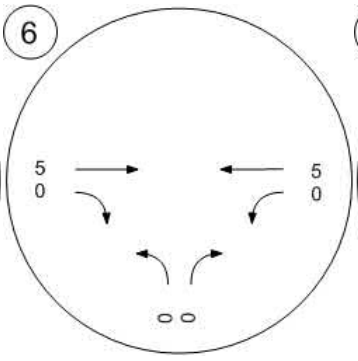

### Central / Battleford



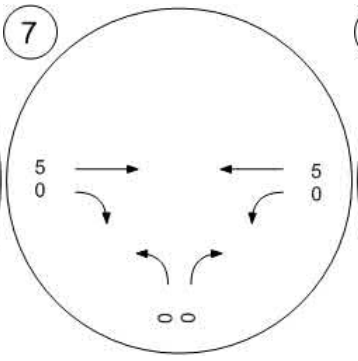

### Battleford / Highland



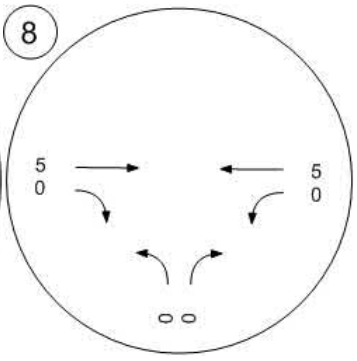

### Battleford / Hamilton




### Battleford / Access 3




### Battleford / Access 4



**Intersection Level Of Service Report**
**Intersection 1: Battleford / 11 Ave**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 11.9 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.128 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 36 | 6 | 68 | 3 | 3 | 0 | 0 | 45 | 12 | 77 | 95 | 11 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 36 | 6 | 68 | 3 | 3 | 1 | 1 | 45 | 12 | 77 | 95 | 11 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 11 | 2 | 20 | 1 | 1 | 0 | 0 | 13 | 4 | 23 | 28 | 3 |
| Total Analysis Volume [veh/h] | 42 | 7 | 80 | 4 | 4 | 1 | 1 | 53 | 14 | 91 | 112 | 13 |
| Pedestrian Volume [ped/h] | 1 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.01 | 0.13 | 0.15 | 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.29 | 0.00 | 0.00 | 7.39 | 0.00 | 0.00 | 10.98 | 10.58 | 8.70 | 11.91 | 11.81 | 10.37 |
| Movement LOS | A | A | A | A | A | A | B | B | A | B | B | B |
| 95th-Percentile Queue Length [veh] | 0.26 | 0.26 | 0.26 | 0.02 | 0.02 | 0.02 | 0.25 | 0.25 | 0.25 | 1.16 | 1.16 | 1.16 |
| 95th-Percentile Queue Length [m] | 1.98 | 1.98 | 1.98 | 0.14 | 0.14 | 0.14 | 1.94 | 1.94 | 1.94 | 8.85 | 8.85 | 8.85 |
| d_A, Approach Delay [s/veh] | 2.37 | | | 3.29 | | | 10.20 | | | 11.76 | | |
| Approach LOS | A | | | A | | | B | | | B | | |
| d_I, Intersection Delay [s/veh] | 8.46 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 2: 11 Ave / Col. Otter**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 13.0 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.026 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 85 | 85 | 22 | 3 | 48 | 42 | 17 | 10 | 42 | 10 | 8 | 1 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 85 | 85 | 22 | 3 | 48 | 42 | 17 | 10 | 42 | 10 | 8 | 1 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 25 | 25 | 6 | 1 | 14 | 12 | 5 | 3 | 12 | 3 | 2 | 0 |
| Total Analysis Volume [veh/h] | 100 | 100 | 26 | 4 | 56 | 49 | 20 | 12 | 49 | 12 | 9 | 1 |
| Pedestrian Volume [ped/h] | 0 | | | 5 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.02 | 0.05 | 0.03 | 0.02 | 0.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.60 | 0.00 | 0.00 | 7.47 | 0.00 | 0.00 | 12.27 | 12.56 | 8.87 | 13.01 | 12.82 | 9.21 |
| Movement LOS | A | A | A | A | A | A | B | B | A | B | B | A |
| 95th-Percentile Queue Length [veh] | 0.54 | 0.54 | 0.54 | 0.24 | 0.24 | 0.24 | 0.20 | 0.20 | 0.20 | 0.14 | 0.14 | 0.14 |
| 95th-Percentile Queue Length [m] | 4.09 | 4.09 | 4.09 | 1.84 | 1.84 | 1.84 | 1.56 | 1.56 | 1.56 | 1.06 | 1.06 | 1.06 |
| d_A, Approach Delay [s/veh] | 3.36 | | | 0.27 | | | 10.26 | | | 12.76 | | |
| Approach LOS | A | | | A | | | B | | | B | | |
| d_I, Intersection Delay [s/veh] | 4.34 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |

## Intersection Level Of Service Report
## Intersection 3: 11 Ave / Highland

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 13.3 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.036 |

**Intersection Setup**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Southbound | | Eastbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Thru | Thru | Right | Left | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 101 | 178 | 90 | 10 | 14 | 57 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 101 | 178 | 90 | 10 | 14 | 57 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 30 | 52 | 26 | 3 | 4 | 17 |
| Total Analysis Volume [veh/h] | 119 | 209 | 106 | 12 | 16 | 67 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| | | | |
|---|---|---|---|
| Priority Scheme | Free | Free | Stop |
| Flared Lane | | | Yes |
| Storage Area [veh] | 0 | 0 | 2 |
| Two-Stage Gap Acceptance | | | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| V/C, Movement V/C Ratio | 0.08 | 0.00 | 0.00 | 0.00 | 0.04 | 0.07 |
| d_M, Delay for Movement [s/veh] | 7.66 | 0.00 | 0.00 | 0.00 | 13.32 | 9.06 |
| Movement LOS | A | A | A | A | B | A |
| 95th-Percentile Queue Length [veh] | 0.86 | 0.86 | 0.00 | 0.00 | 0.23 | 0.23 |
| 95th-Percentile Queue Length [m] | 6.53 | 6.53 | 0.00 | 0.00 | 1.75 | 1.75 |
| d_A, Approach Delay [s/veh] | 2.78 | | 0.00 | | 9.88 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 3.27 | | | | | |
| Intersection LOS | B | | | | | |

**Intersection Level Of Service Report**
**Intersection 4: Central / Battleford**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 16.4 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | C |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.254 |

**Intersection Setup**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Pocket Length [m] | 100.00 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | No | | | No | | | No | | | No | | |

**Volumes**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 8 | 16 | 14 | 11 | 15 | 0 | 31 | 32 | 31 | 3 | 25 | 21 |
| Total Analysis Volume [veh/h] | 32 | 65 | 54 | 46 | 61 | 1 | 122 | 127 | 122 | 11 | 100 | 85 |
| Pedestrian Volume [ped/h] | 0 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.02 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.25 | 0.21 | 0.12 | 0.03 | 0.17 | 0.09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.39 | 0.00 | 0.00 | 7.42 | 0.00 | 0.00 | 16.43 | 15.00 | 12.41 | 13.86 | 12.59 | 8.96 |
| Movement LOS | A | A | A | A | A | A | C | B | B | B | B | A |
| 95th-Percentile Queue Length [veh] | 0.06 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 | 2.52 | 2.52 | 2.52 | 0.08 | 0.63 | 0.28 |
| 95th-Percentile Queue Length [m] | 0.48 | 0.00 | 0.00 | 0.71 | 0.00 | 0.00 | 19.20 | 19.20 | 19.20 | 0.62 | 4.77 | 2.13 |
| d_A, Approach Delay [s/veh] | 1.57 | | | 3.16 | | | 14.62 | | | 11.09 | | |
| Approach LOS | A | | | A | | | B | | | B | | |
| d_I, Intersection Delay [s/veh] | 9.90 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 5: Battleford / Highland**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 1 | 0 | 0 | 1 |
| Total Analysis Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.56 | 8.34 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.45 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 6: Battleford / Hamilton**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 1 | 0 | 0 | 1 |
| Total Analysis Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.56 | 8.34 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.45 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 7: Battleford / Access 3**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Access 3 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Access 3 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 1 | 0 | 0 | 1 |
| Total Analysis Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.56 | 8.34 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.45 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 8: Battleford / Access 4**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Access 4 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Access 4 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 1 | 0 | 0 | 1 |
| Total Analysis Volume [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

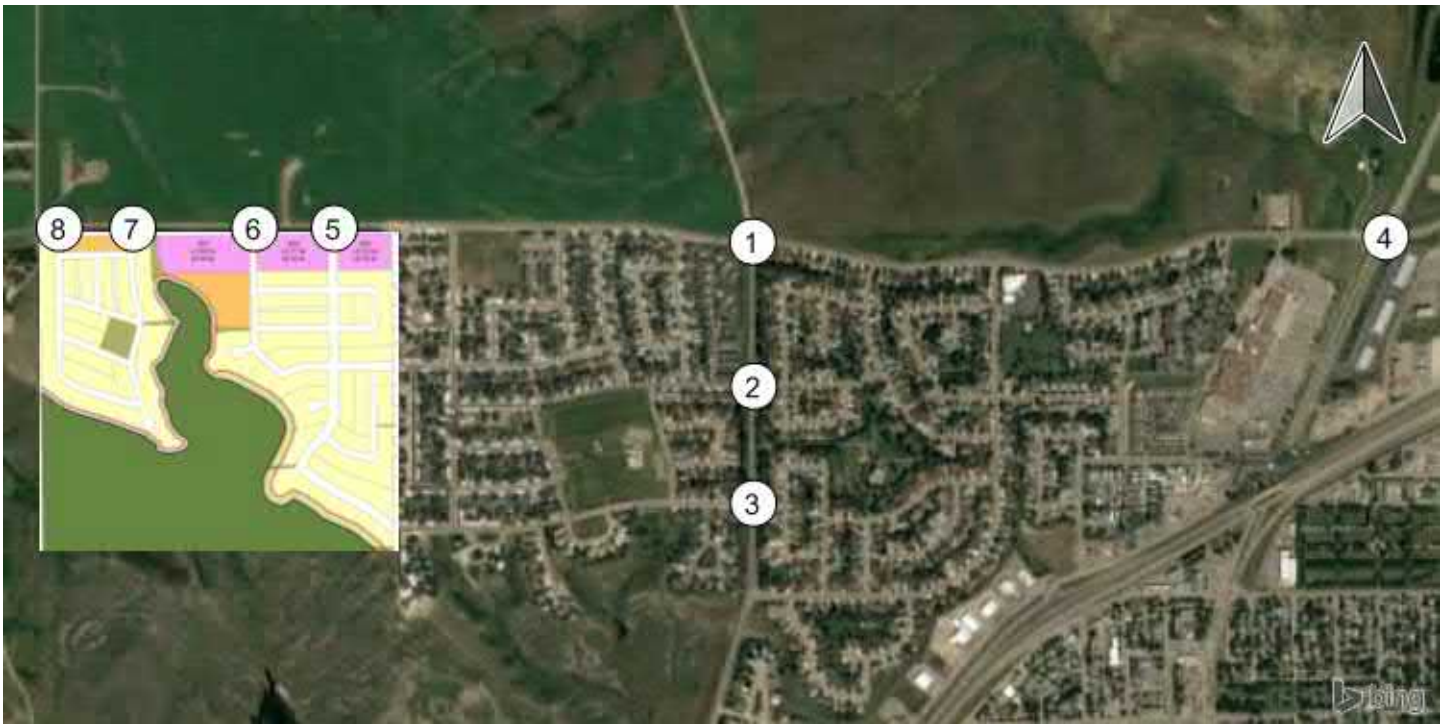
**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

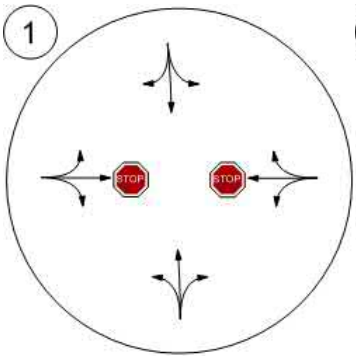
**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.56 | 8.34 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.45 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

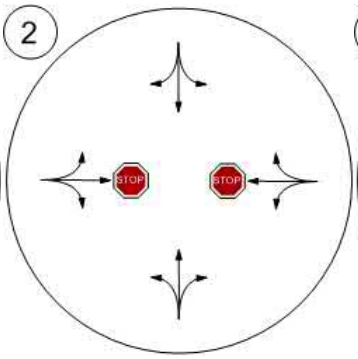
## Lane Configuration and Traffic Control



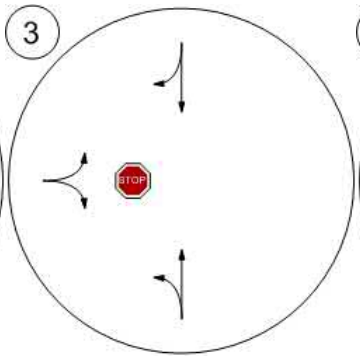

Battleford / 11 Ave



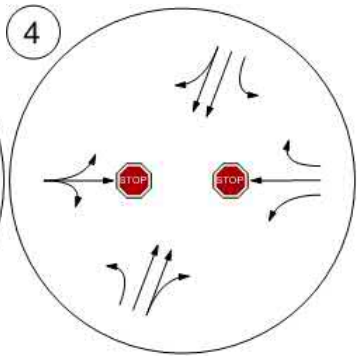

11 Ave / Col. Otter



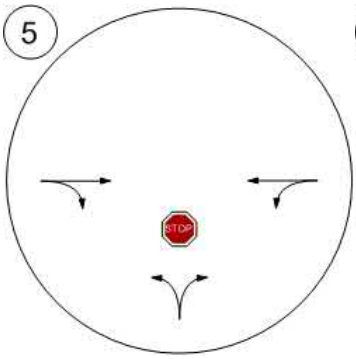

11 Ave / Highland



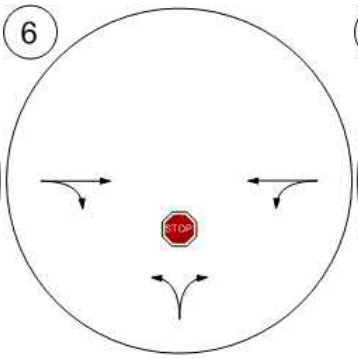

Central / Battleford



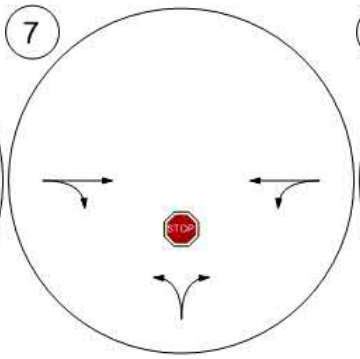

Battleford / Highland



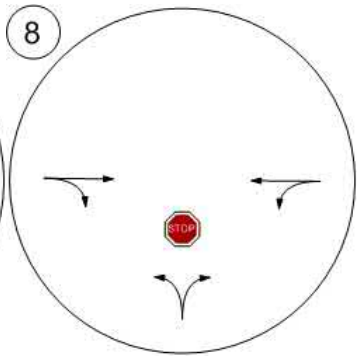

Battleford / Hamilton



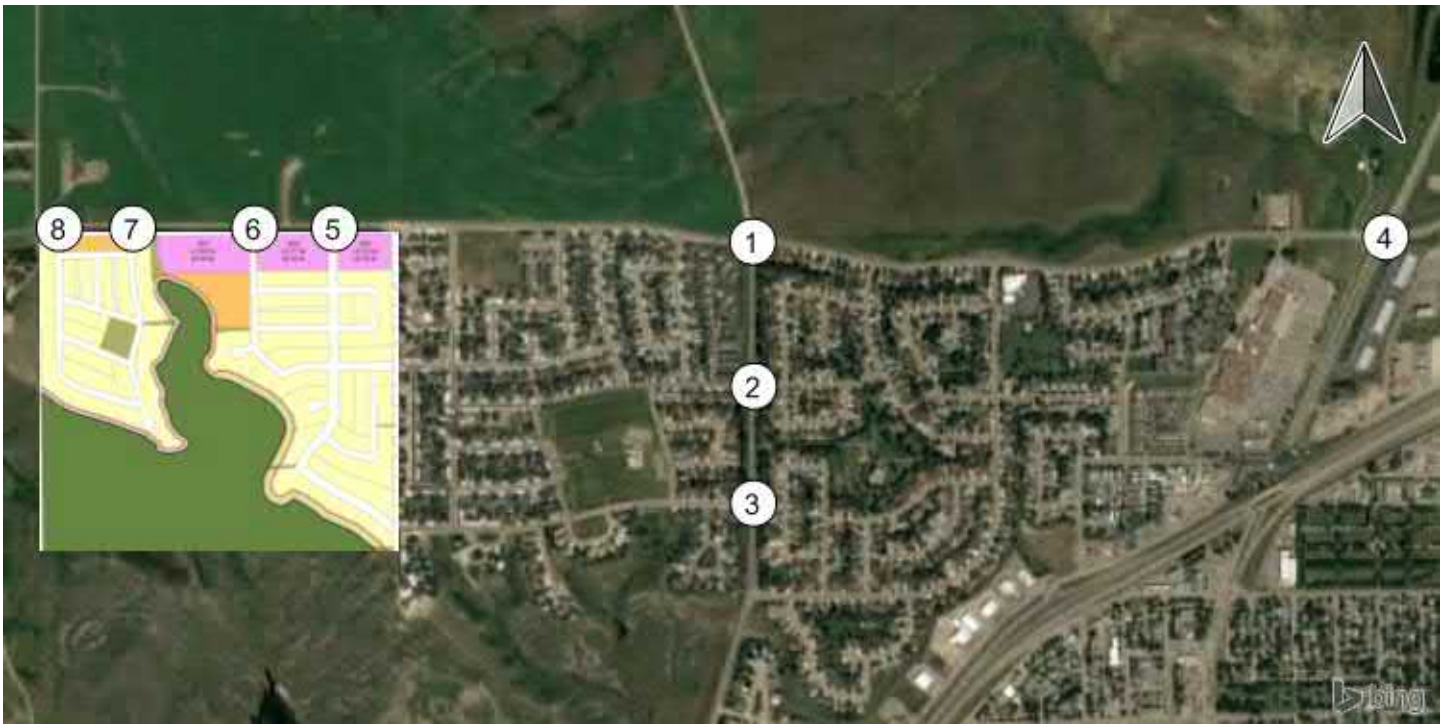

Battleford / Access 3



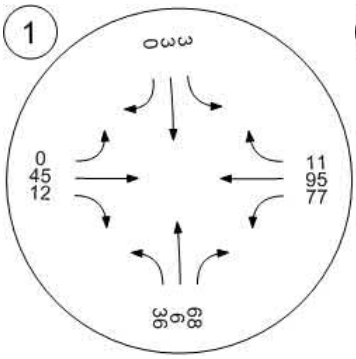

Battleford / Access 4



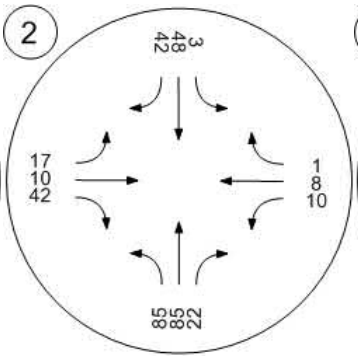
## Traffic Volume - Base Volume



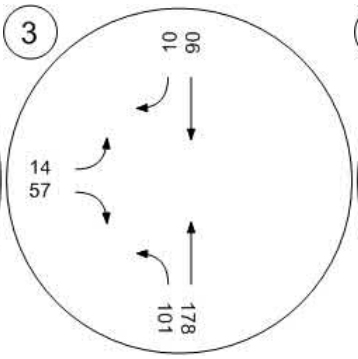

### Battleford / 11 Ave



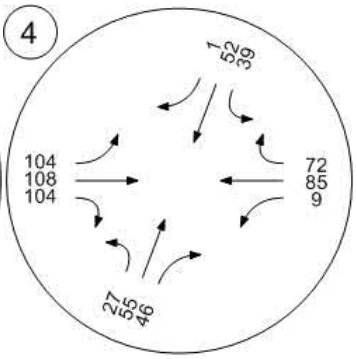

### 11 Ave / Col. Otter



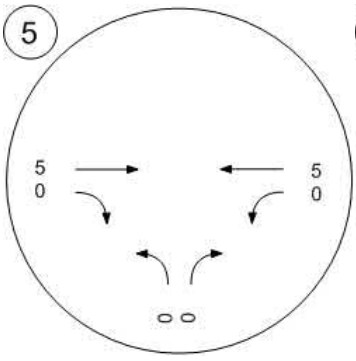

### 11 Ave / Highland



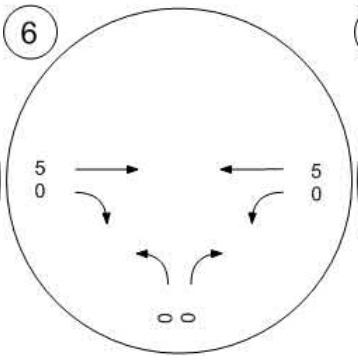

### Central / Battleford



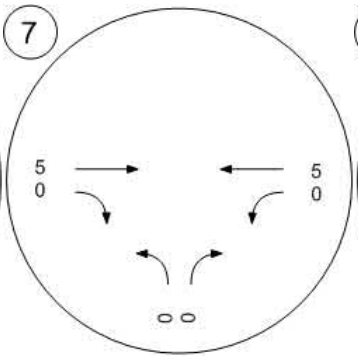

### Battleford / Highland



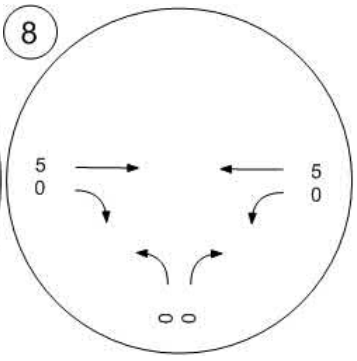

### Battleford / Hamilton




### Battleford / Access 3




### Battleford / Access 4



**Intersection Level Of Service Report**
**Intersection 1: Battleford / 11 Ave**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 18.4 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | C |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.244 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 13 | 0 | 57 | 6 | 8 | 5 | 1 | 77 | 50 | 47 | 18 | 0 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 50 | 0 | 50 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 50 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 19 | 51 | 85 | 59 | 62 | 7 | 1 | 115 | 75 | 70 | 27 | 51 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 6 | 15 | 25 | 17 | 18 | 2 | 0 | 34 | 22 | 21 | 8 | 15 |
| Total Analysis Volume [veh/h] | 22 | 60 | 100 | 69 | 73 | 8 | 1 | 135 | 88 | 82 | 32 | 60 |
| Pedestrian Volume [ped/h] | 2 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.01 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.28 | 0.09 | 0.24 | 0.06 | 0.06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.41 | 0.00 | 0.00 | 7.67 | 0.00 | 0.00 | 14.46 | 14.04 | 10.38 | 18.45 | 14.67 | 11.57 |
| Movement LOS | A | A | A | A | A | A | B | B | B | C | B | B |
| 95th-Percentile Queue Length [veh] | 0.41 | 0.41 | 0.41 | 0.35 | 0.35 | 0.35 | 1.13 | 1.13 | 1.13 | 1.28 | 1.28 | 1.28 |
| 95th-Percentile Queue Length [m] | 3.11 | 3.11 | 3.11 | 2.70 | 2.70 | 2.70 | 8.64 | 8.64 | 8.64 | 9.79 | 9.79 | 9.79 |
| d_A, Approach Delay [s/veh] | 0.90 | | | 3.53 | | | 12.61 | | | 15.38 | | |
| Approach LOS | A | | | A | | | B | | | C | | |
| d_I, Intersection Delay [s/veh] | 8.48 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 2: 11 Ave / Col. Otter**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 11.4 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.055 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 16 | 32 | 3 | 0 | 87 | 12 | 26 | 5 | 106 | 28 | 4 | 7 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 16 | 32 | 3 | 1 | 87 | 12 | 26 | 5 | 106 | 28 | 4 | 7 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 5 | 9 | 1 | 0 | 26 | 4 | 8 | 1 | 31 | 8 | 1 | 2 |
| Total Analysis Volume [veh/h] | 19 | 38 | 4 | 1 | 102 | 14 | 31 | 6 | 125 | 33 | 5 | 8 |
| Pedestrian Volume [ped/h] | 0 | | | 2 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.01 | 0.13 | 0.06 | 0.01 | 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.48 | 0.00 | 0.00 | 7.30 | 0.00 | 0.00 | 10.30 | 10.63 | 9.26 | 11.37 | 10.55 | 8.83 |
| Movement LOS | A | A | A | A | A | A | B | B | A | B | B | A |
| 95th-Percentile Queue Length [veh] | 0.13 | 0.13 | 0.13 | 0.24 | 0.24 | 0.24 | 0.46 | 0.46 | 0.46 | 0.20 | 0.20 | 0.20 |
| 95th-Percentile Queue Length [m] | 0.99 | 0.99 | 0.99 | 1.84 | 1.84 | 1.84 | 3.47 | 3.47 | 3.47 | 1.52 | 1.52 | 1.52 |
| d_A, Approach Delay [s/veh] | 2.33 | | | 0.06 | | | 9.51 | | | 10.84 | | |
| Approach LOS | A | | | A | | | A | | | B | | |
| d_I, Intersection Delay [s/veh] | 5.67 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 3: 11 Ave / Highland**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 11.4 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.023 |

**Intersection Setup**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Southbound | | Eastbound | |
| Lane Configuration | | | | | | |
| Turning Movement | Left | Thru | Thru | Right | Left | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 16 | 38 | 216 | 5 | 13 | 109 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 16 | 38 | 216 | 5 | 13 | 109 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 5 | 11 | 64 | 1 | 4 | 32 |
| Total Analysis Volume [veh/h] | 19 | 45 | 254 | 6 | 15 | 128 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| | | | |
|---|---|---|---|
| Priority Scheme | Free | Free | Stop |
| Flared Lane | | | Yes |
| Storage Area [veh] | 0 | 0 | 2 |
| Two-Stage Gap Acceptance | | | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| V/C, Movement V/C Ratio | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.16 |
| d_M, Delay for Movement [s/veh] | 7.80 | 0.00 | 0.00 | 0.00 | 11.38 | 10.41 |
| Movement LOS | A | A | A | A | B | B |
| 95th-Percentile Queue Length [veh] | 0.15 | 0.15 | 0.00 | 0.00 | 0.58 | 0.58 |
| 95th-Percentile Queue Length [m] | 1.18 | 1.18 | 0.00 | 0.00 | 4.45 | 4.45 |
| d_A, Approach Delay [s/veh] | 2.32 | | 0.00 | | 10.51 | |
| Approach LOS | A | | A | | B | |
| d_I, Intersection Delay [s/veh] | 3.54 | | | | | |
| Intersection LOS | B | | | | | |

## Intersection Level Of Service Report
## Intersection 4: Central / Battleford

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 18.3 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | C |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.201 |

**Intersection Setup**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Pocket Length [m] | 100.00 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | No | | | No | | | No | | | No | | |

**Volumes**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 35 | 104 | 28 | 0 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 52 | 155 | 42 | 1 | 112 | 60 | 143 | 80 | 82 | 18 | 3 | 6 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 15 | 46 | 12 | 0 | 33 | 18 | 42 | 24 | 24 | 5 | 1 | 2 |
| Total Analysis Volume [veh/h] | 61 | 182 | 49 | 1 | 132 | 71 | 168 | 94 | 96 | 21 | 4 | 7 |
| Pedestrian Volume [ped/h] | 0 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.32 | 0.20 | 0.10 | 0.06 | 0.01 | 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.59 | 0.00 | 0.00 | 7.59 | 0.00 | 0.00 | 17.48 | 18.31 | 14.46 | 15.45 | 12.66 | 8.97 |
| Movement LOS | A | A | A | A | A | A | C | C | B | C | B | A |
| 95th-Percentile Queue Length [veh] | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.05 | 3.05 | 3.05 | 0.18 | 0.03 | 0.02 |
| 95th-Percentile Queue Length [m] | 1.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 23.27 | 23.27 | 23.27 | 1.39 | 0.19 | 0.18 |
| d_A, Approach Delay [s/veh] | 1.59 | | | 0.04 | | | 16.89 | | | 13.68 | | |
| Approach LOS | A | | | A | | | C | | | B | | |
| d_I, Intersection Delay [s/veh] | 7.85 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 5: Battleford / Highland**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 2 | 0 | 0 | 2 |
| Total Analysis Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.58 | 8.35 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.46 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 6: Battleford / Hamilton**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 2 | 0 | 0 | 2 |
| Total Analysis Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.58 | 8.35 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.46 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 7: Battleford / Access 3**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Access 3 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Access 3 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 2 | 0 | 0 | 2 |
| Total Analysis Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.58 | 8.35 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.46 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 8: Battleford / Access 4**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Access 4 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Access 4 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 2 | 0 | 0 | 2 |
| Total Analysis Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

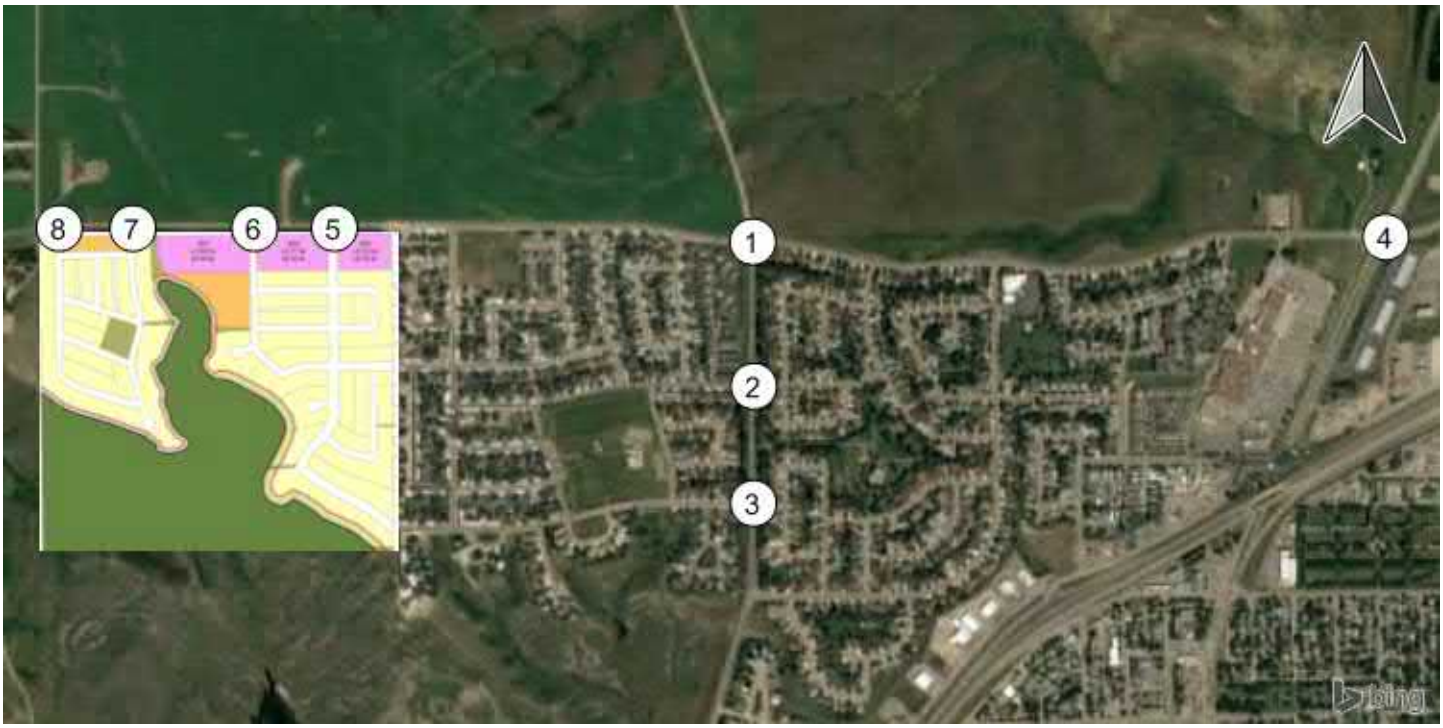
**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

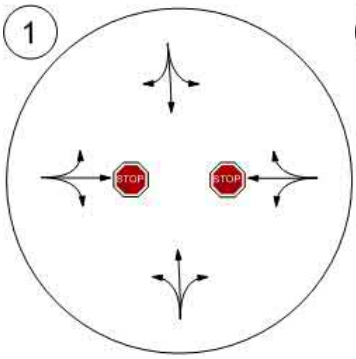
**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.58 | 8.35 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.46 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

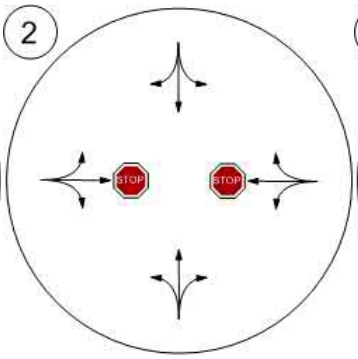
## Lane Configuration and Traffic Control



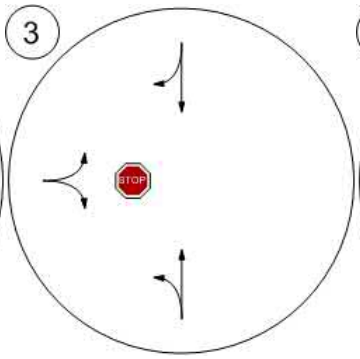

Battleford / 11 Ave



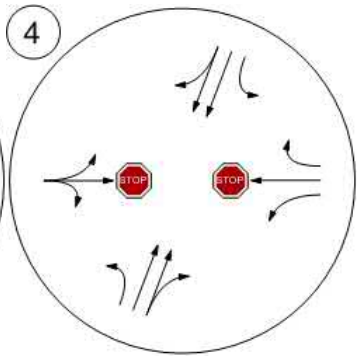

11 Ave / Col. Otter



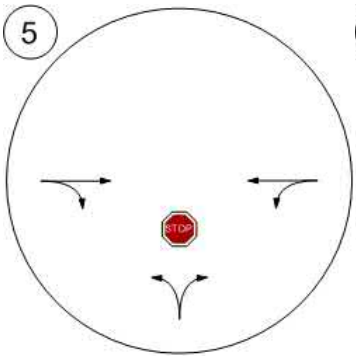

11 Ave / Highland



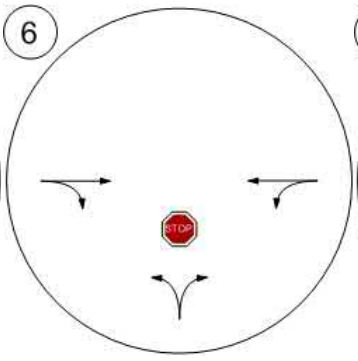

Central / Battleford



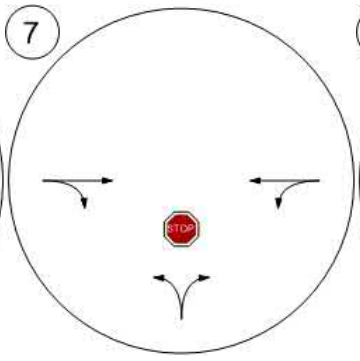

Battleford / Highland



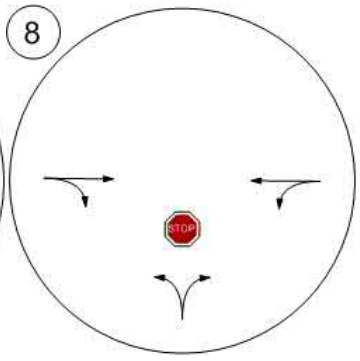

Battleford / Hamilton



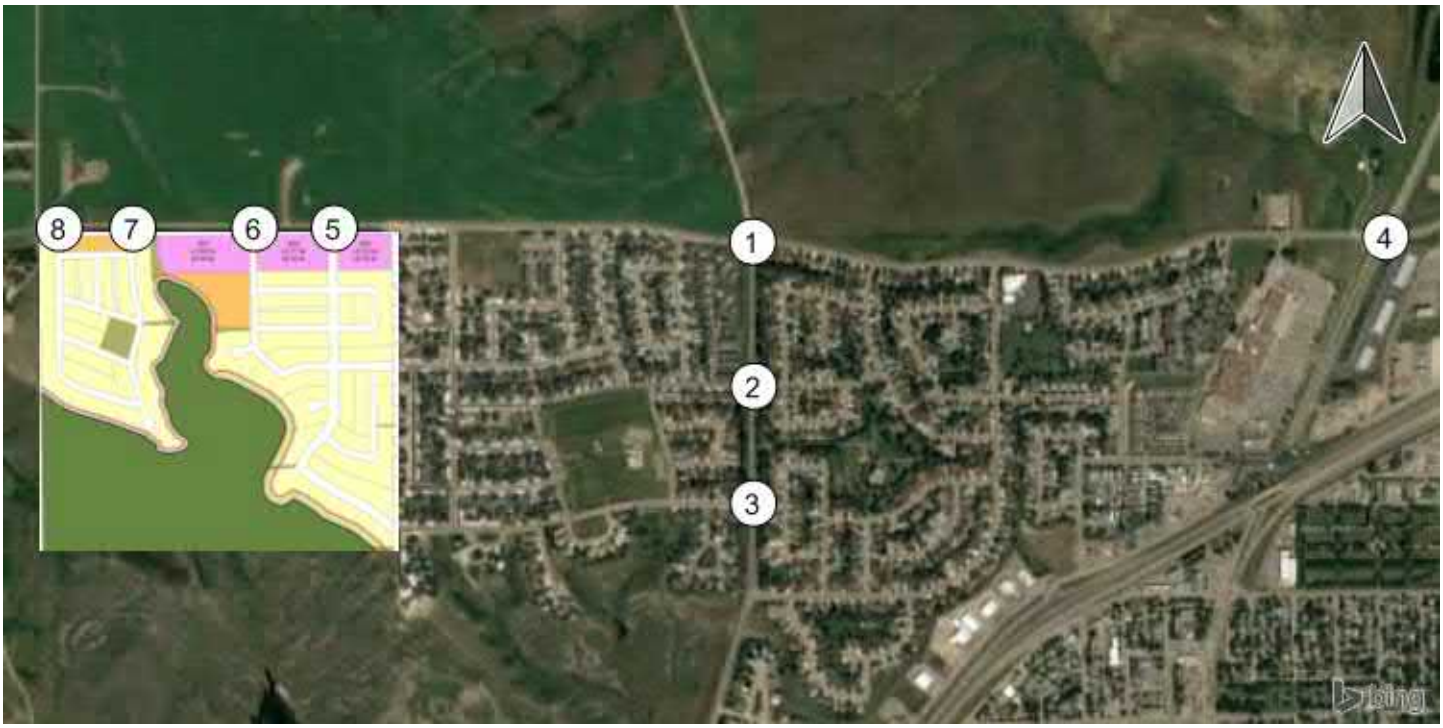

Battleford / Access 3



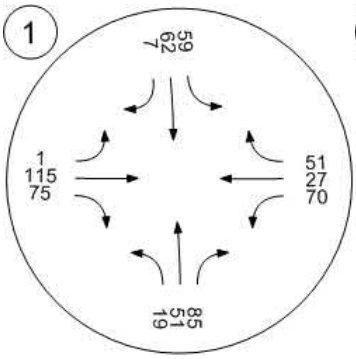

Battleford / Access 4



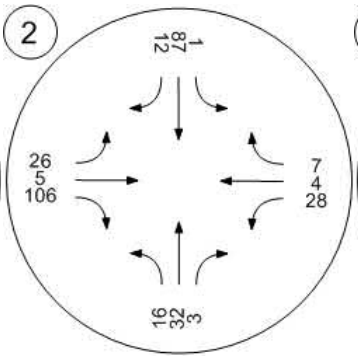
## Traffic Volume - Future Total Volume



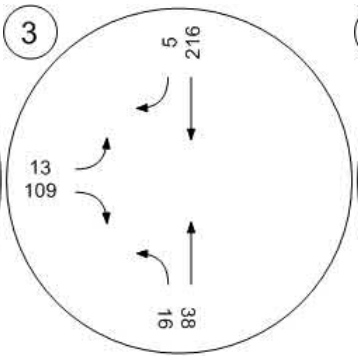

### Battleford / 11 Ave



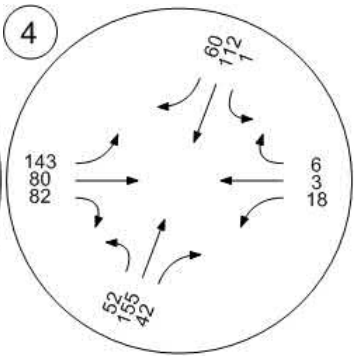

### 11 Ave / Col. Otter



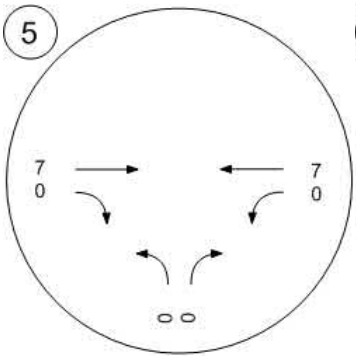

### 11 Ave / Highland



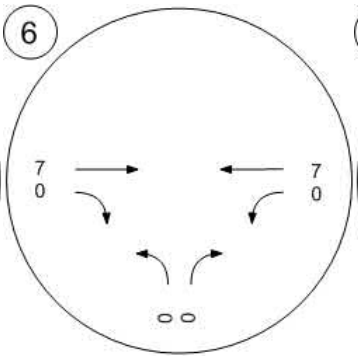

### Central / Battleford



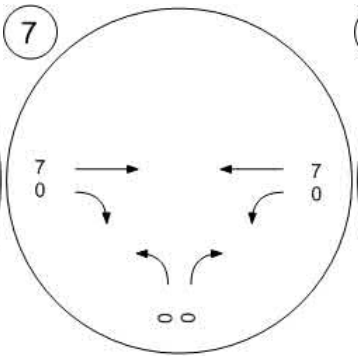

### Battleford / Highland



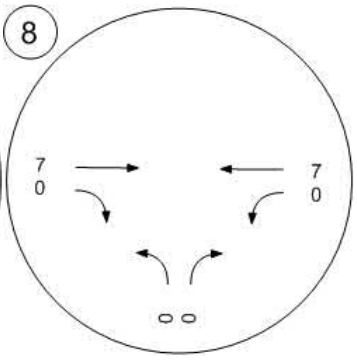

### Battleford / Hamilton




### Battleford / Access 3




### Battleford / Access 4



**Intersection Level Of Service Report**
**Intersection 1: Battleford / 11 Ave**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 156.1 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | F |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.850 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 13 | 0 | 57 | 6 | 8 | 5 | 1 | 77 | 50 | 47 | 18 | 0 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 50 | 0 | 50 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 50 |
| Site-Generated Trips [veh/h] | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 166 | 101 | 0 | 49 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 49 | 51 | 85 | 59 | 62 | 7 | 1 | 281 | 176 | 70 | 76 | 51 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 14 | 15 | 25 | 17 | 18 | 2 | 0 | 83 | 52 | 21 | 22 | 15 |
| Total Analysis Volume [veh/h] | 58 | 60 | 100 | 69 | 73 | 8 | 1 | 331 | 207 | 82 | 89 | 60 |
| Pedestrian Volume [ped/h] | 2 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.04 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.76 | 0.21 | 0.85 | 0.19 | 0.06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.47 | 0.00 | 0.00 | 7.67 | 0.00 | 0.00 | 40.11 | 38.09 | 33.49 | 156.08 | 126.55 | 122.57 |
| Movement LOS | A | A | A | A | A | A | E | E | D | F | F | F |
| 95th-Percentile Queue Length [veh] | 0.50 | 0.50 | 0.50 | 0.35 | 0.35 | 0.35 | 9.68 | 9.68 | 9.68 | 10.58 | 10.58 | 10.58 |
| 95th-Percentile Queue Length [m] | 3.83 | 3.83 | 3.83 | 2.70 | 2.70 | 2.70 | 73.73 | 73.73 | 73.73 | 80.59 | 80.59 | 80.59 |
| d_A, Approach Delay [s/veh] | 1.99 | | | 3.53 | | | 36.33 | | | 136.00 | | |
| Approach LOS | A | | | A | | | E | | | F | | |
| d_I, Intersection Delay [s/veh] | 45.66 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 2: 11 Ave / Col. Otter**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 13.9 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.076 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 16 | 32 | 3 | 0 | 87 | 12 | 26 | 5 | 106 | 28 | 4 | 7 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 4 | 30 | 0 | 0 | 101 | 0 | 0 | 0 | 13 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 20 | 62 | 3 | 1 | 188 | 12 | 26 | 5 | 119 | 28 | 4 | 7 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 6 | 18 | 1 | 0 | 55 | 4 | 8 | 1 | 35 | 8 | 1 | 2 |
| Total Analysis Volume [veh/h] | 24 | 73 | 4 | 1 | 221 | 14 | 31 | 6 | 140 | 33 | 5 | 8 |
| Pedestrian Volume [ped/h] | 0 | | | 2 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.01 | 0.17 | 0.08 | 0.01 | 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.75 | 0.00 | 0.00 | 7.37 | 0.00 | 0.00 | 11.99 | 12.17 | 10.17 | 13.88 | 12.09 | 9.28 |
| Movement LOS | A | A | A | A | A | A | B | B | B | B | B | A |
| 95th-Percentile Queue Length [veh] | 0.25 | 0.25 | 0.25 | 0.55 | 0.55 | 0.55 | 0.62 | 0.62 | 0.62 | 0.28 | 0.28 | 0.28 |
| 95th-Percentile Queue Length [m] | 1.87 | 1.87 | 1.87 | 4.18 | 4.18 | 4.18 | 4.74 | 4.74 | 4.74 | 2.11 | 2.11 | 2.11 |
| d_A, Approach Delay [s/veh] | 1.84 | | | 0.03 | | | 10.55 | | | 12.89 | | |
| Approach LOS | A | | | A | | | B | | | B | | |
| d_I, Intersection Delay [s/veh] | 4.74 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |

## Intersection Level Of Service Report
## Intersection 3: 11 Ave / Highland

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 14.5 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.031 |

**Intersection Setup**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Southbound | | Eastbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Thru | Thru | Right | Left | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 16 | 38 | 216 | 5 | 13 | 109 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 14 | 34 | 114 | 0 | 0 | 50 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 30 | 72 | 330 | 5 | 13 | 159 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 9 | 21 | 97 | 1 | 4 | 47 |
| Total Analysis Volume [veh/h] | 35 | 85 | 388 | 6 | 15 | 187 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| | | | |
|---|---|---|---|
| Priority Scheme | Free | Free | Stop |
| Flared Lane | | | Yes |
| Storage Area [veh] | 0 | 0 | 2 |
| Two-Stage Gap Acceptance | | | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| V/C, Movement V/C Ratio | 0.03 | 0.00 | 0.00 | 0.00 | 0.03 | 0.28 |
| d_M, Delay for Movement [s/veh] | 8.19 | 0.00 | 0.00 | 0.00 | 14.46 | 12.48 |
| Movement LOS | A | A | A | A | B | B |
| 95th-Percentile Queue Length [veh] | 0.34 | 0.34 | 0.00 | 0.00 | 1.17 | 1.17 |
| 95th-Percentile Queue Length [m] | 2.62 | 2.62 | 0.00 | 0.00 | 8.92 | 8.92 |
| d_A, Approach Delay [s/veh] | 2.39 | | 0.00 | | 12.62 | |
| Approach LOS | A | | A | | B | |
| d_I, Intersection Delay [s/veh] | 3.96 | | | | | |
| Intersection LOS | B | | | | | |

**Intersection Level Of Service Report**
**Intersection 4: Central / Battleford**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 61.4 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | F |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.358 |

**Intersection Setup**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Pocket Length [m] | 100.00 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | No | | | No | | | No | | | No | | |

**Volumes**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 35 | 104 | 28 | 0 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 19 | 0 | 0 | 0 | 0 | 15 | 50 | 50 | 66 | 0 | 15 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 71 | 155 | 42 | 1 | 112 | 75 | 193 | 130 | 148 | 18 | 18 | 6 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 21 | 46 | 12 | 0 | 33 | 22 | 57 | 38 | 44 | 5 | 5 | 2 |
| Total Analysis Volume [veh/h] | 84 | 182 | 49 | 1 | 132 | 88 | 227 | 153 | 174 | 21 | 21 | 7 |
| Pedestrian Volume [ped/h] | 0 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.36 | 0.19 | 0.09 | 0.05 | 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.63 | 0.00 | 0.00 | 7.59 | 0.00 | 0.00 | 60.97 | 61.42 | 56.90 | 20.94 | 13.62 | 8.97 |
| Movement LOS | A | A | A | A | A | A | F | F | F | C | B | A |
| 95th-Percentile Queue Length [veh] | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 13.63 | 13.63 | 13.63 | 0.28 | 0.15 | 0.02 |
| 95th-Percentile Queue Length [m] | 1.40 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 103.89 | 103.89 | 103.89 | 2.11 | 1.15 | 0.18 |
| d_A, Approach Delay [s/veh] | 2.04 | | | 0.03 | | | 59.82 | | | 16.09 | | |
| Approach LOS | A | | | A | | | F | | | C | | |
| d_I, Intersection Delay [s/veh] | 30.36 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 5: Battleford / Highland**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 10.8 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 114 | 153 | 0 | 32 | 47 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 114 | 160 | 0 | 32 | 54 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 29 | 40 | 0 | 8 | 14 |
| Total Analysis Volume [veh/h] | 0 | 114 | 160 | 0 | 32 | 54 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.13 | 0.00 | 0.00 | 0.02 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 10.78 | 9.67 | 0.00 | 0.00 | 7.60 | 0.00 |
| Movement LOS | B | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.44 | 0.44 | 0.00 | 0.00 | 0.19 | 0.19 |
| 95th-Percentile Queue Length [m] | 3.36 | 3.36 | 0.00 | 0.00 | 1.47 | 1.47 |
| d_A, Approach Delay [s/veh] | 9.67 | | 0.00 | | 2.83 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 3.74 | | | | | |
| Intersection LOS | B | | | | | |

**Intersection Level Of Service Report**
**Intersection 6: Battleford / Hamilton**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 9.7 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 76 | 77 | 0 | 22 | 25 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 76 | 84 | 0 | 22 | 32 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 19 | 21 | 0 | 6 | 8 |
| Total Analysis Volume [veh/h] | 0 | 76 | 84 | 0 | 22 | 32 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.08 | 0.00 | 0.00 | 0.01 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 9.71 | 9.00 | 0.00 | 0.00 | 7.41 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.25 | 0.25 | 0.00 | 0.00 | 0.11 | 0.11 |
| 95th-Percentile Queue Length [m] | 1.93 | 1.93 | 0.00 | 0.00 | 0.85 | 0.85 |
| d_A, Approach Delay [s/veh] | 9.00 | | 0.00 | | 3.02 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 3.96 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 7: Battleford / Access 3**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 9.1 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Access 3 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Access 3 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 46 | 31 | 0 | 15 | 10 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 46 | 38 | 0 | 15 | 17 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 12 | 10 | 0 | 4 | 4 |
| Total Analysis Volume [veh/h] | 0 | 46 | 38 | 0 | 15 | 17 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.04 | 0.00 | 0.00 | 0.01 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 9.13 | 8.64 | 0.00 | 0.00 | 7.31 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.14 | 0.14 | 0.00 | 0.00 | 0.06 | 0.06 |
| 95th-Percentile Queue Length [m] | 1.06 | 1.06 | 0.00 | 0.00 | 0.47 | 0.47 |
| d_A, Approach Delay [s/veh] | 8.64 | | 0.00 | | 3.43 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 4.37 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 8: Battleford / Access 4**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.8 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Access 4 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Access 4 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 31 | 0 | 0 | 10 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 31 | 7 | 0 | 10 | 7 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 8 | 2 | 0 | 3 | 2 |
| Total Analysis Volume [veh/h] | 0 | 31 | 7 | 0 | 10 | 7 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.03 | 0.00 | 0.00 | 0.01 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.80 | 8.45 | 0.00 | 0.00 | 7.24 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.09 | 0.09 | 0.00 | 0.00 | 0.03 | 0.03 |
| 95th-Percentile Queue Length [m] | 0.68 | 0.68 | 0.00 | 0.00 | 0.24 | 0.24 |
| d_A, Approach Delay [s/veh] | 8.45 | | 0.00 | | 4.26 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 6.08 | | | | | |
| Intersection LOS | A | | | | | |

The Heights Neighbourhood

Vistro File: \...\The_Heights_TIA_v2.vistro
Report File: \...\The_Heights_2037_AM_WithDev.pdf

Scenario 3 AM Peak 2037
21-Sep-17

## Trip Generation summary

### Added Trips

| Zone ID: Name | Land Use variables | Code | Ind. Var. | Rate | Quantity | % In | % Out | Trips In | Trips Out | Total Trips | % of Total Trips |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1: East of Coulee | Residential | | | 1.000 | 0.000 | 50.00 | 50.00 | 71 | 253 | 324 | 76.06 |
| 2: West of Coulee | Residential | | | 1.000 | 0.000 | 50.00 | 50.00 | 25 | 77 | 102 | 23.94 |
| | | | | | **Added Trips Total** | | | **96** | **330** | **426** | **100.00** |

The Heights Neighbourhood

Vistro File: \...\The_Heights_TIA_v2.vistro
Report File: \...\The_Heights_2037_AM_WithDev.pdf

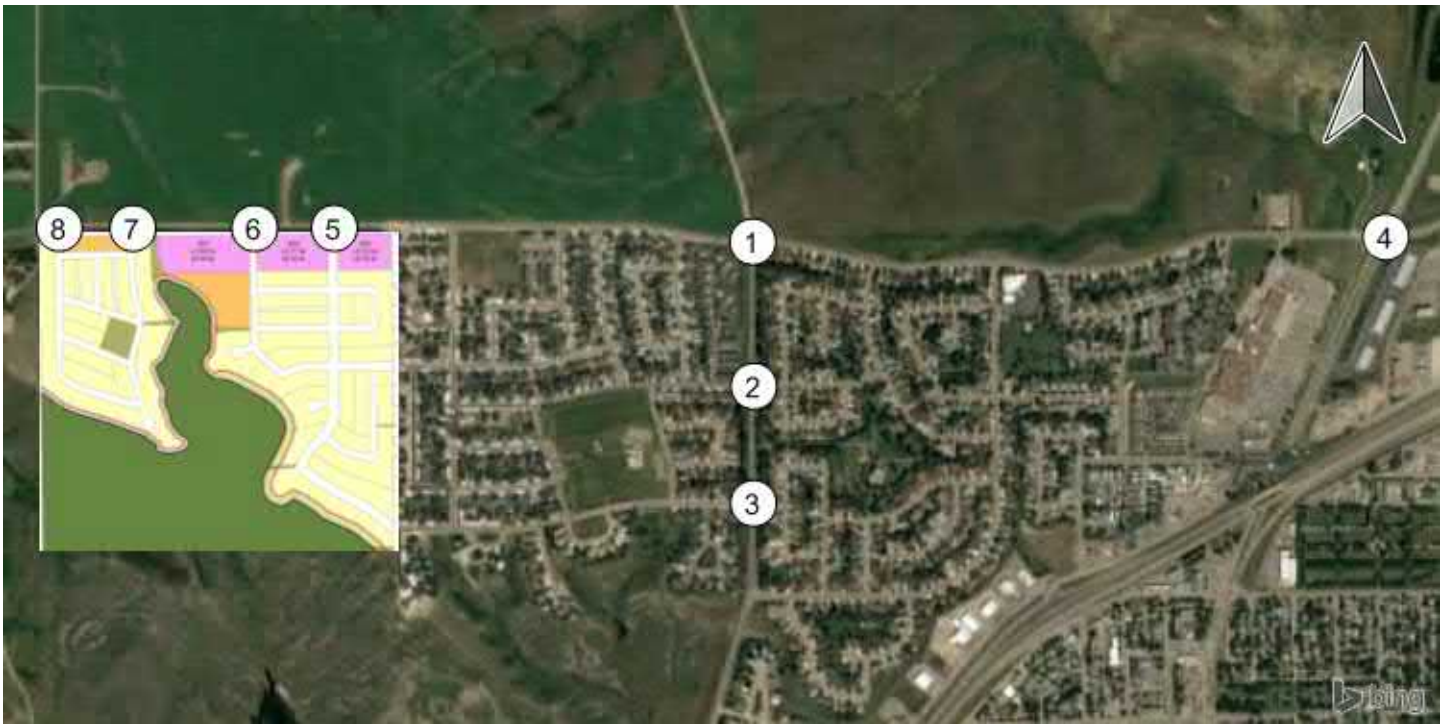
Scenario 3 AM Peak 2037
21-Sep-17

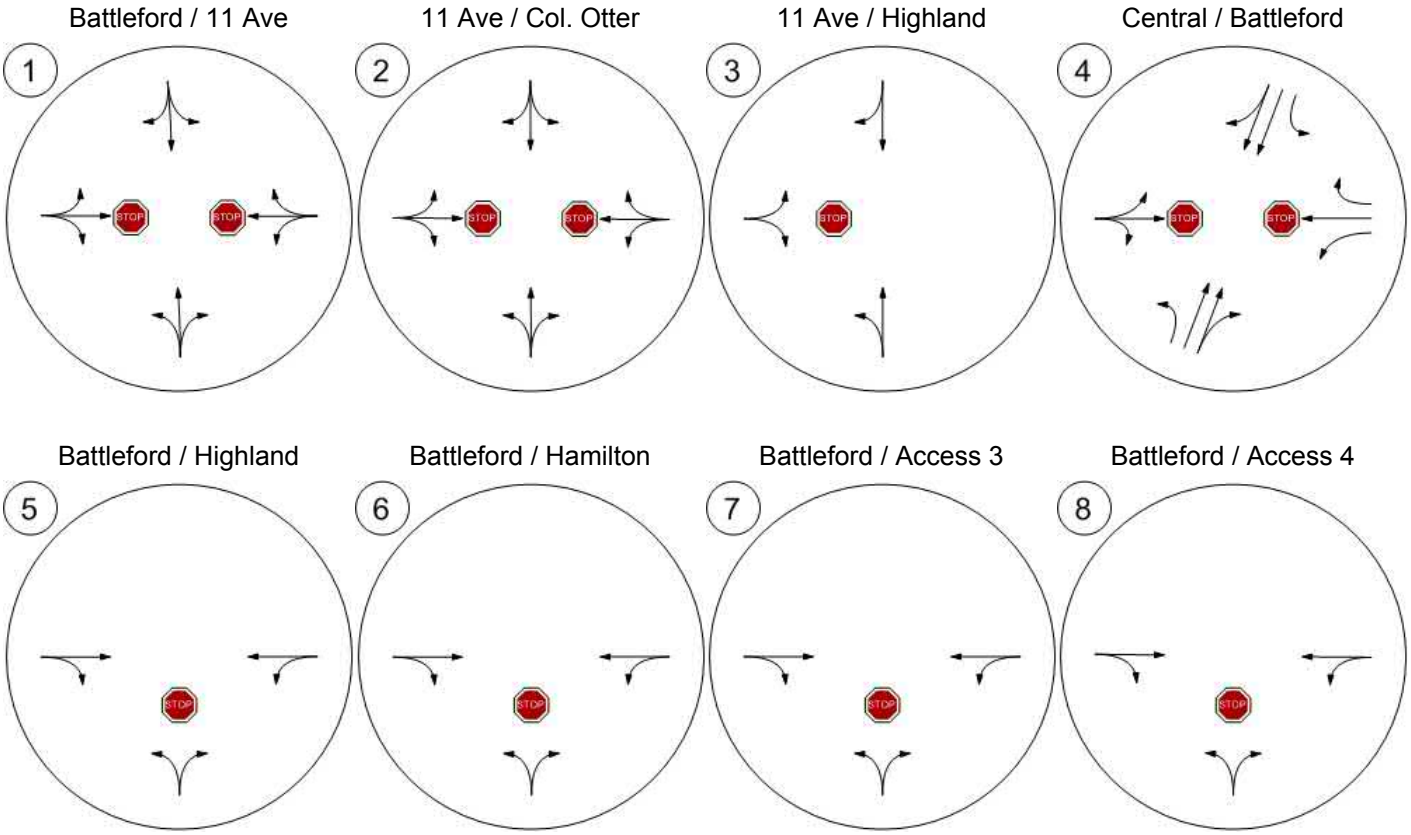
## Trip Distribution summary

| Zone / Gate | Zone 1: East of Coulee | | | |
|---|---|---|---|---|
| | To East of Coulee: | | From East of Coulee: | |
| | Share % | Trips | Share % | Trips |
| 2: West of Coulee | 0.00 | 0 | 0.00 | 0 |
| 11: South on 11th Ave | 50.00 | 36 | 50.00 | 126 |
| 12: Central Ave via Battleford | 20.00 | 14 | 20.00 | 51 |
| 13: Seymour St via Battleford | 15.00 | 11 | 15.00 | 38 |
| 14: Hwy 4 N via Battleford | 15.00 | 11 | 15.00 | 38 |
| 15: Walsh Neighbourhood/Back of Mall | 0.00 | 0 | 0.00 | 0 |
| 16: North on 11th St Extension | 0.00 | 0 | 0.00 | 0 |
| 17: Northwest on Grid Road | 0.00 | 0 | 0.00 | 0 |
| **Total** | **100.00** | **72** | **100.00** | **253** |

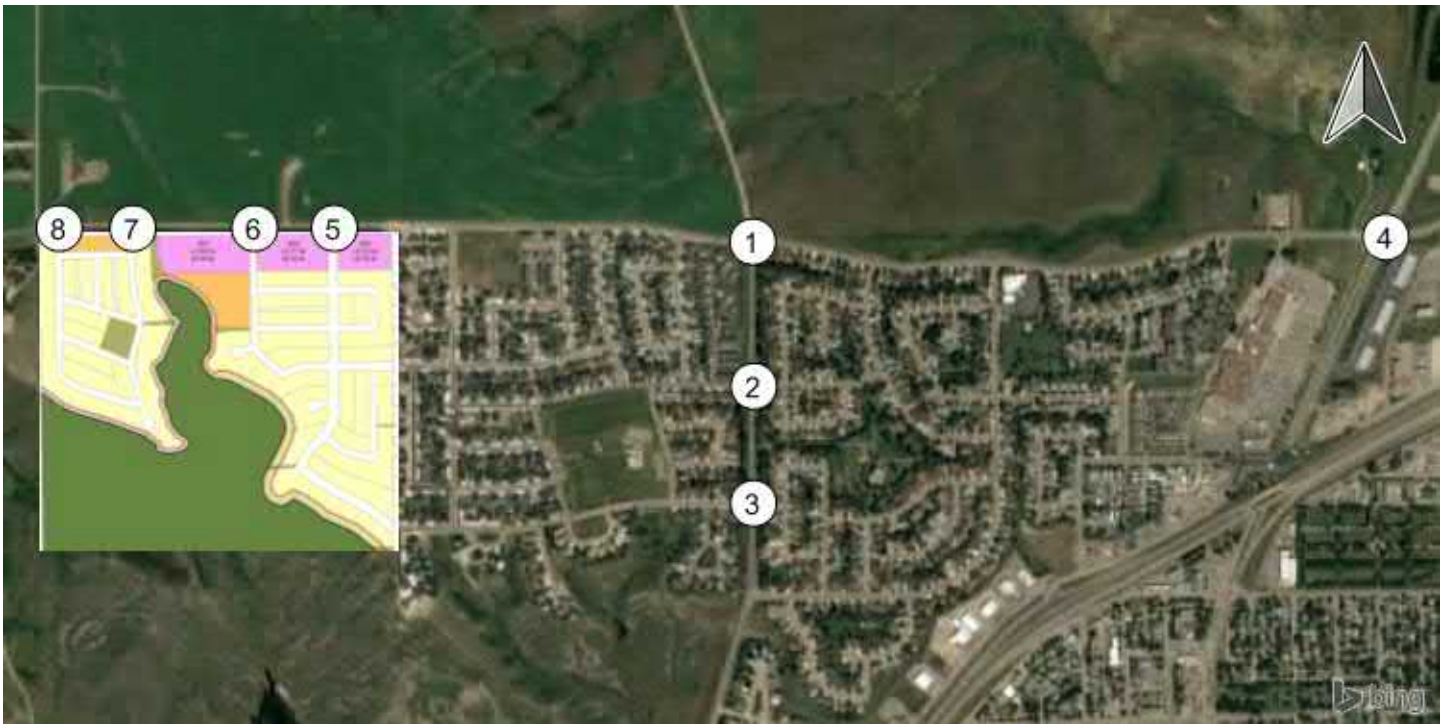
| Zone / Gate | Zone 2: West of Coulee | | | |
|---|---|---|---|---|
| | To West of Coulee : | | From West of Coulee : | |
| | Share % | Trips | Share % | Trips |
| 1: East of Coulee | 0.00 | 0 | 0.00 | 0 |
| 11: South on 11th Ave | 50.00 | 13 | 50.00 | 38 |
| 12: Central Ave via Battleford | 20.00 | 5 | 20.00 | 15 |
| 13: Seymour St via Battleford | 15.00 | 4 | 15.00 | 12 |
| 14: Hwy 4 N via Battleford | 15.00 | 4 | 15.00 | 12 |
| 15: Walsh Neighbourhood/Back of Mall | 0.00 | 0 | 0.00 | 0 |
| 16: North on 11th St Extension | 0.00 | 0 | 0.00 | 0 |
| 17: Northwest on Grid Road | 0.00 | 0 | 0.00 | 0 |
| **Total** | **100.00** | **26** | **100.00** | **77** |

## Lane Configuration and Traffic Control

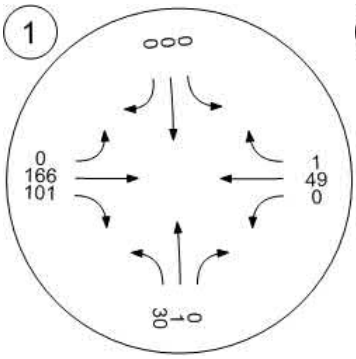


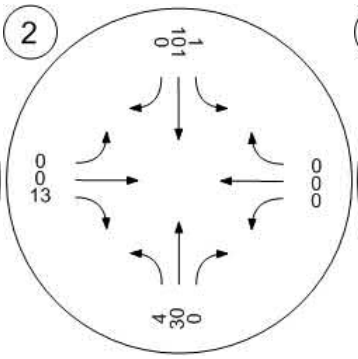
## Traffic Volume - Net New Site Trips



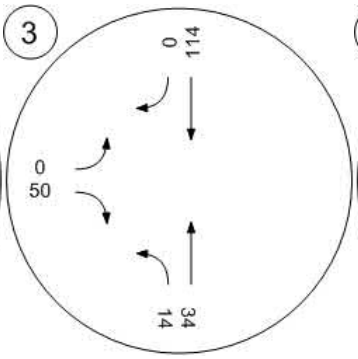

### Battleford / 11 Ave



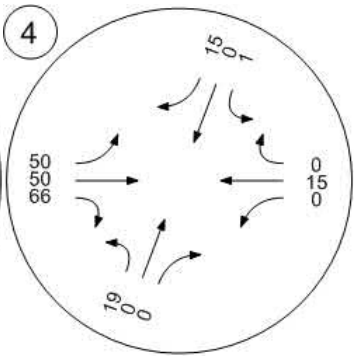

### 11 Ave / Col. Otter



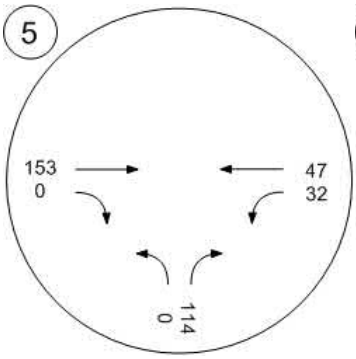

### 11 Ave / Highland



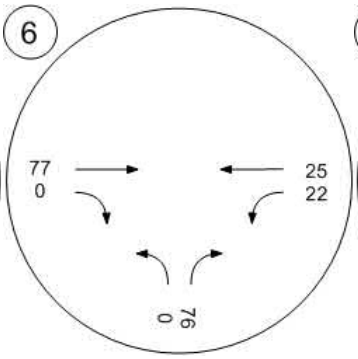

### Central / Battleford



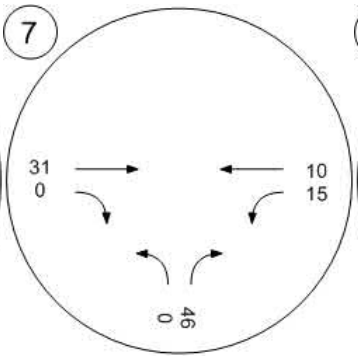

### Battleford / Highland



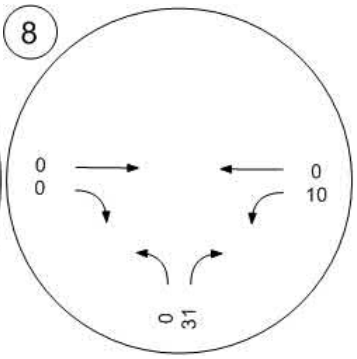

### Battleford / Hamilton



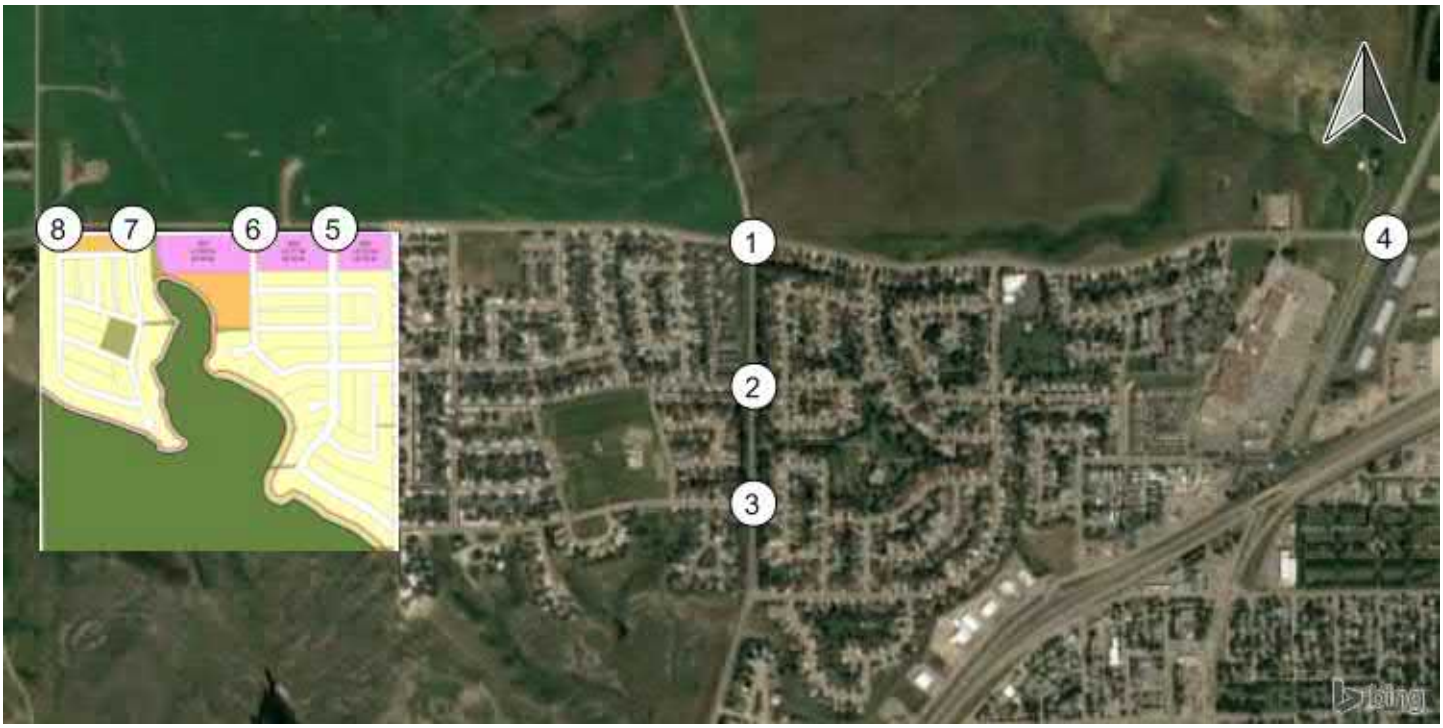

### Battleford / Access 3



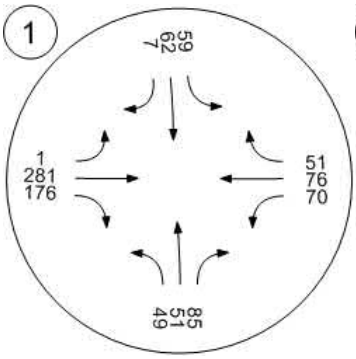

### Battleford / Access 4



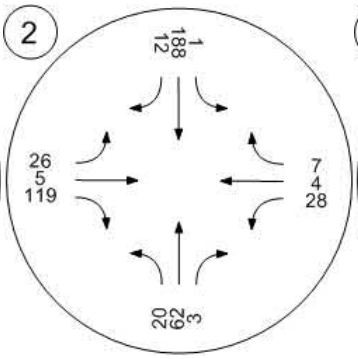
## Traffic Volume - Future Total Volume



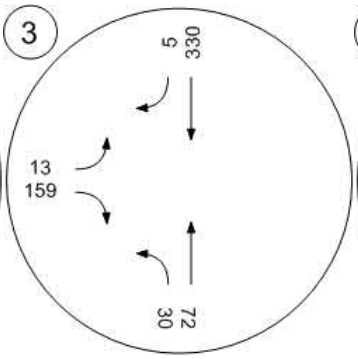

### Battleford / 11 Ave



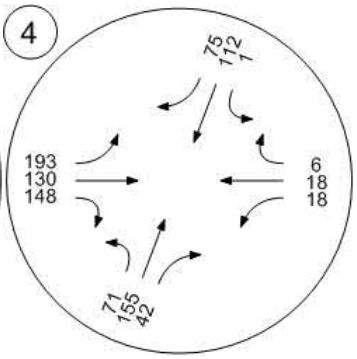

### 11 Ave / Col. Otter



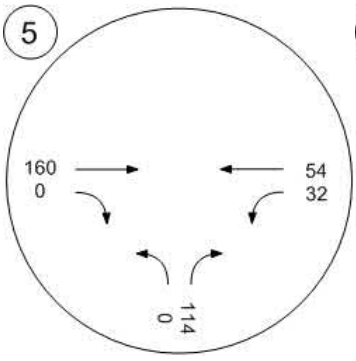

### 11 Ave / Highland



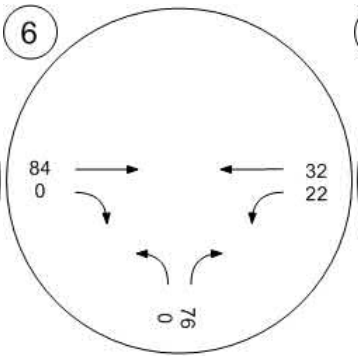

### Central / Battleford



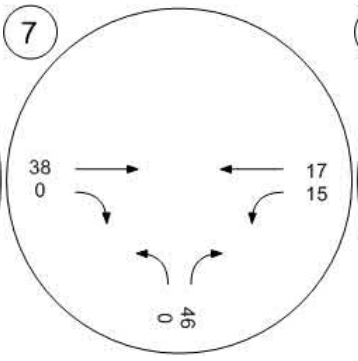

### Battleford / Highland



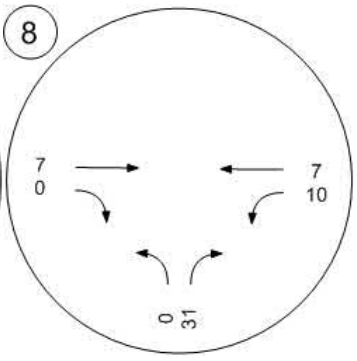

### Battleford / Hamilton




### Battleford / Access 3




### Battleford / Access 4



**Intersection Level Of Service Report**
**Intersection 1: Battleford / 11 Ave**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 34.5 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | D |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.360 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 36 | 6 | 68 | 3 | 3 | 1 | 1 | 45 | 12 | 77 | 95 | 11 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 50 | 0 | 50 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 50 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 54 | 59 | 101 | 54 | 54 | 1 | 1 | 67 | 18 | 115 | 142 | 66 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 16 | 17 | 30 | 16 | 16 | 0 | 0 | 20 | 5 | 34 | 42 | 19 |
| Total Analysis Volume [veh/h] | 64 | 69 | 119 | 64 | 64 | 1 | 1 | 79 | 21 | 135 | 167 | 78 |
| Pedestrian Volume [ped/h] | 2 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| | | | | |
|---|---|---|---|---|
| Priority Scheme | Free | Free | Stop | Stop |
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| V/C, Movement V/C Ratio | 0.04 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.19 | 0.02 | 0.36 | 0.36 | 0.08 |
| d_M, Delay for Movement [s/veh] | 7.44 | 0.00 | 0.00 | 7.72 | 0.00 | 0.00 | 20.21 | 15.07 | 10.20 | 34.49 | 32.73 | 28.78 |
| Movement LOS | A | A | A | A | A | A | C | C | B | D | D | D |
| 95th-Percentile Queue Length [veh] | 0.59 | 0.59 | 0.59 | 0.31 | 0.31 | 0.31 | 0.70 | 0.70 | 0.70 | 6.70 | 6.70 | 6.70 |
| 95th-Percentile Queue Length [m] | 4.47 | 4.47 | 4.47 | 2.34 | 2.34 | 2.34 | 5.30 | 5.30 | 5.30 | 51.03 | 51.03 | 51.03 |
| d_A, Approach Delay [s/veh] | 1.89 | | | 3.83 | | | 14.11 | | | 32.54 | | |
| Approach LOS | A | | | A | | | B | | | D | | |
| d_I, Intersection Delay [s/veh] | 17.13 | | | | | | | | | | | |
| Intersection LOS | D | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 2: 11 Ave / Col. Otter**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 13.0 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.026 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 85 | 85 | 22 | 3 | 48 | 42 | 17 | 10 | 42 | 10 | 8 | 1 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 85 | 85 | 22 | 3 | 48 | 42 | 17 | 10 | 42 | 10 | 8 | 1 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 25 | 25 | 6 | 1 | 14 | 12 | 5 | 3 | 12 | 3 | 2 | 0 |
| Total Analysis Volume [veh/h] | 100 | 100 | 26 | 4 | 56 | 49 | 20 | 12 | 49 | 12 | 9 | 1 |
| Pedestrian Volume [ped/h] | 0 | | | 2 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.02 | 0.05 | 0.03 | 0.02 | 0.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.60 | 0.00 | 0.00 | 7.47 | 0.00 | 0.00 | 12.22 | 12.56 | 8.87 | 13.01 | 12.82 | 9.18 |
| Movement LOS | A | A | A | A | A | A | B | B | A | B | B | A |
| 95th-Percentile Queue Length [veh] | 0.54 | 0.54 | 0.54 | 0.24 | 0.24 | 0.24 | 0.20 | 0.20 | 0.20 | 0.14 | 0.14 | 0.14 |
| 95th-Percentile Queue Length [m] | 4.09 | 4.09 | 4.09 | 1.84 | 1.84 | 1.84 | 1.55 | 1.55 | 1.55 | 1.06 | 1.06 | 1.06 |
| d_A, Approach Delay [s/veh] | 3.36 | | | 0.27 | | | 10.24 | | | 12.76 | | |
| Approach LOS | A | | | A | | | B | | | B | | |
| d_I, Intersection Delay [s/veh] | 4.34 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |

## Intersection Level Of Service Report
## Intersection 3: 11 Ave / Highland

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 13.3 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.036 |

**Intersection Setup**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Southbound | | Eastbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Thru | Thru | Right | Left | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 101 | 178 | 90 | 10 | 14 | 57 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 101 | 178 | 90 | 10 | 14 | 57 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 30 | 52 | 26 | 3 | 4 | 17 |
| Total Analysis Volume [veh/h] | 119 | 209 | 106 | 12 | 16 | 67 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| | | | |
|---|---|---|---|
| Priority Scheme | Free | Free | Stop |
| Flared Lane | | | Yes |
| Storage Area [veh] | 0 | 0 | 2 |
| Two-Stage Gap Acceptance | | | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| V/C, Movement V/C Ratio | 0.08 | 0.00 | 0.00 | 0.00 | 0.04 | 0.07 |
| d_M, Delay for Movement [s/veh] | 7.66 | 0.00 | 0.00 | 0.00 | 13.32 | 9.06 |
| Movement LOS | A | A | A | A | B | A |
| 95th-Percentile Queue Length [veh] | 0.86 | 0.86 | 0.00 | 0.00 | 0.23 | 0.23 |
| 95th-Percentile Queue Length [m] | 6.53 | 6.53 | 0.00 | 0.00 | 1.75 | 1.75 |
| d_A, Approach Delay [s/veh] | 2.78 | | 0.00 | | 9.88 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 3.27 | | | | | |
| Intersection LOS | B | | | | | |

**Intersection Level Of Service Report**
**Intersection 4: Central / Battleford**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 109.7 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | F |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.595 |

**Intersection Setup**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Pocket Length [m] | 100.00 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | No | | | No | | | No | | | No | | |

**Volumes**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 40 | 82 | 69 | 58 | 77 | 1 | 155 | 161 | 155 | 13 | 127 | 107 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 12 | 24 | 20 | 17 | 23 | 0 | 46 | 47 | 46 | 4 | 37 | 31 |
| Total Analysis Volume [veh/h] | 47 | 96 | 81 | 68 | 91 | 1 | 182 | 189 | 182 | 15 | 149 | 126 |
| Pedestrian Volume [ped/h] | 0 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.03 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.60 | 0.39 | 0.18 | 0.06 | 0.32 | 0.13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.47 | 0.00 | 0.00 | 7.52 | 0.00 | 0.00 | 109.68 | 105.33 | 101.46 | 20.80 | 16.51 | 9.36 |
| Movement LOS | A | A | A | A | A | A | F | F | F | C | C | A |
| 95th-Percentile Queue Length [veh] | 0.10 | 0.00 | 0.00 | 0.14 | 0.00 | 0.00 | 18.53 | 18.53 | 18.53 | 0.20 | 1.39 | 0.46 |
| 95th-Percentile Queue Length [m] | 0.74 | 0.00 | 0.00 | 1.09 | 0.00 | 0.00 | 141.19 | 141.19 | 141.19 | 1.49 | 10.56 | 3.47 |
| d_A, Approach Delay [s/veh] | 1.57 | | | 3.20 | | | 105.49 | | | 13.62 | | |
| Approach LOS | A | | | A | | | F | | | B | | |
| d_I, Intersection Delay [s/veh] | 51.46 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 5: Battleford / Highland**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 2 | 0 | 0 | 2 |
| Total Analysis Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.58 | 8.35 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.46 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 6: Battleford / Hamilton**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 2 | 0 | 0 | 2 |
| Total Analysis Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.58 | 8.35 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.46 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 7: Battleford / Access 3**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Access 3 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Access 3 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 2 | 0 | 0 | 2 |
| Total Analysis Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.58 | 8.35 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.46 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

**Intersection Level Of Service Report**
**Intersection 8: Battleford / Access 4**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 8.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | A |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Access 4 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Access 4 | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 0 | 2 | 0 | 0 | 2 |
| Total Analysis Volume [veh/h] | 0 | 0 | 7 | 0 | 0 | 7 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

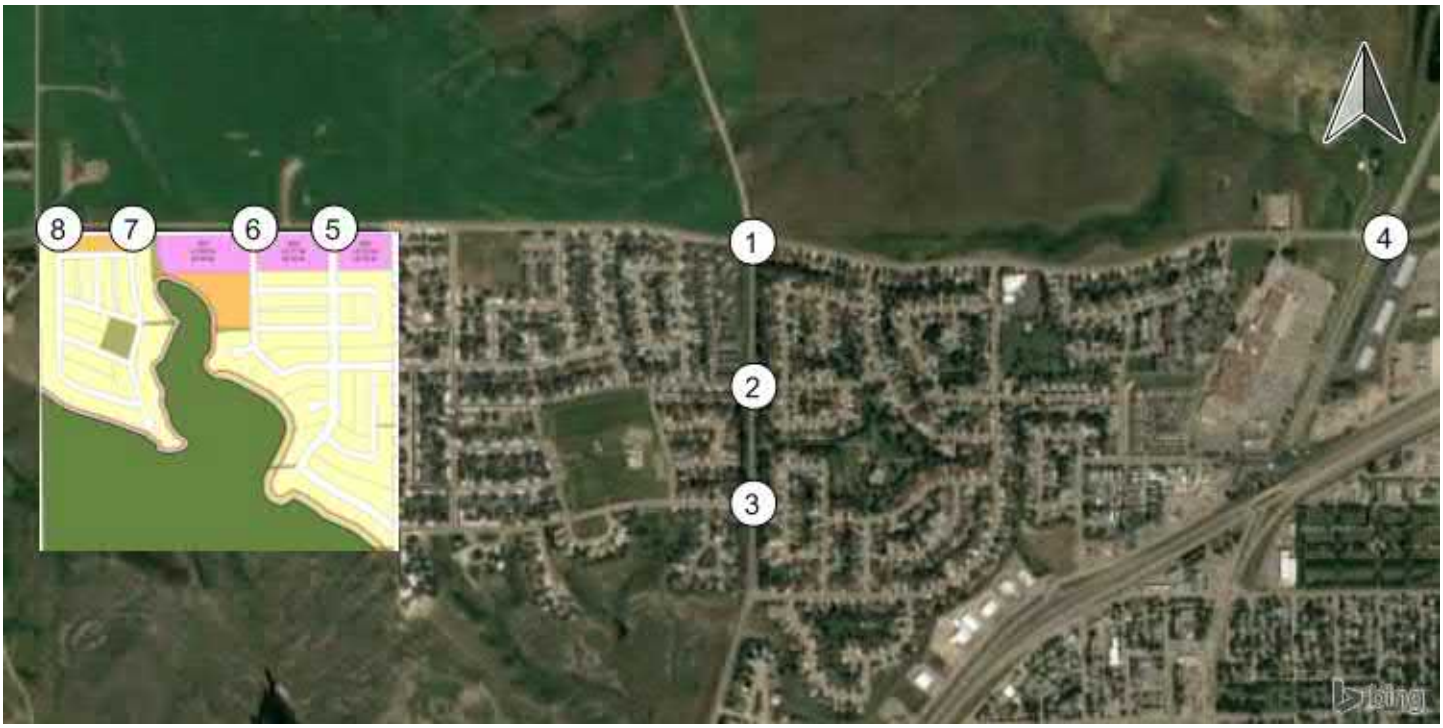
**Intersection Settings**

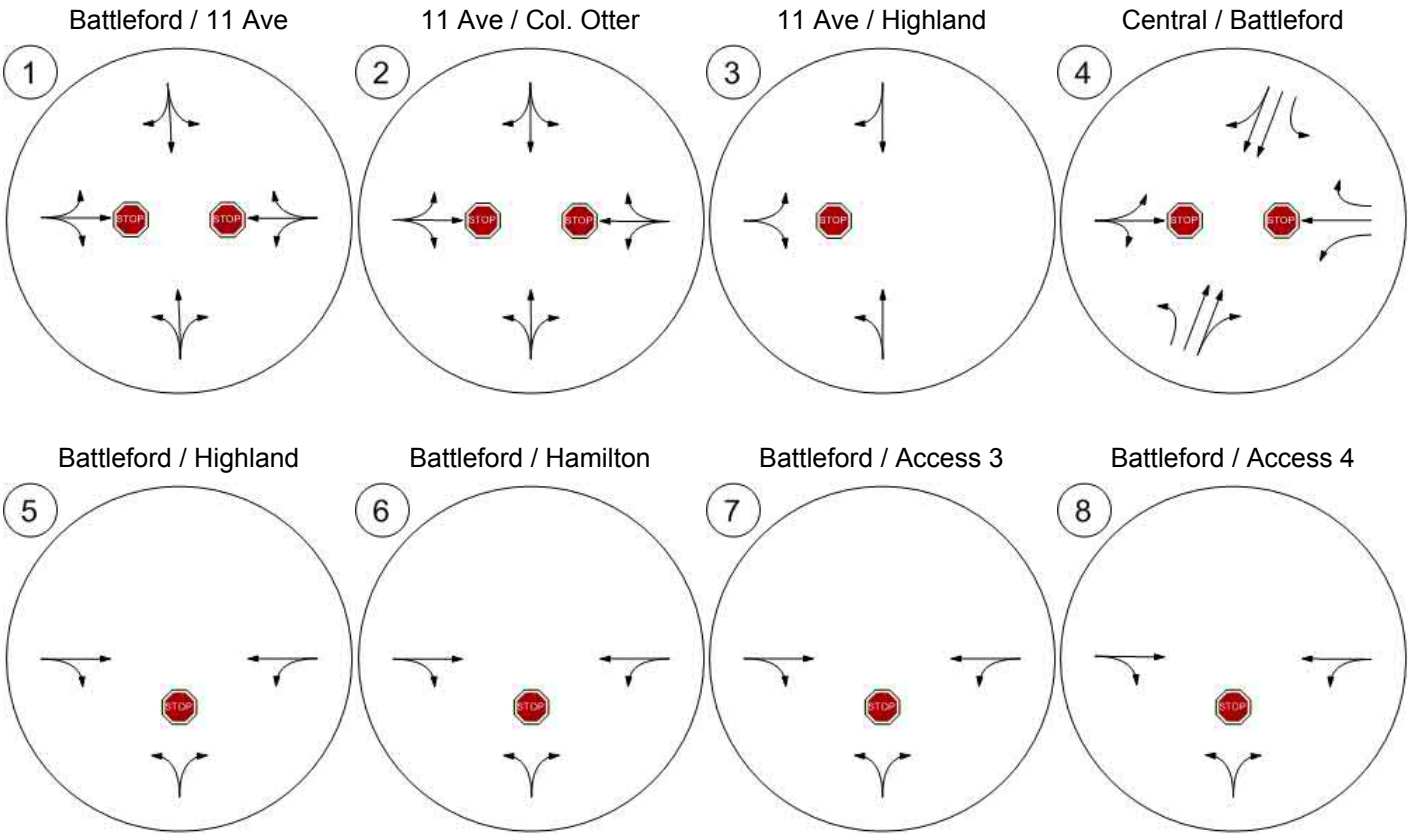
| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

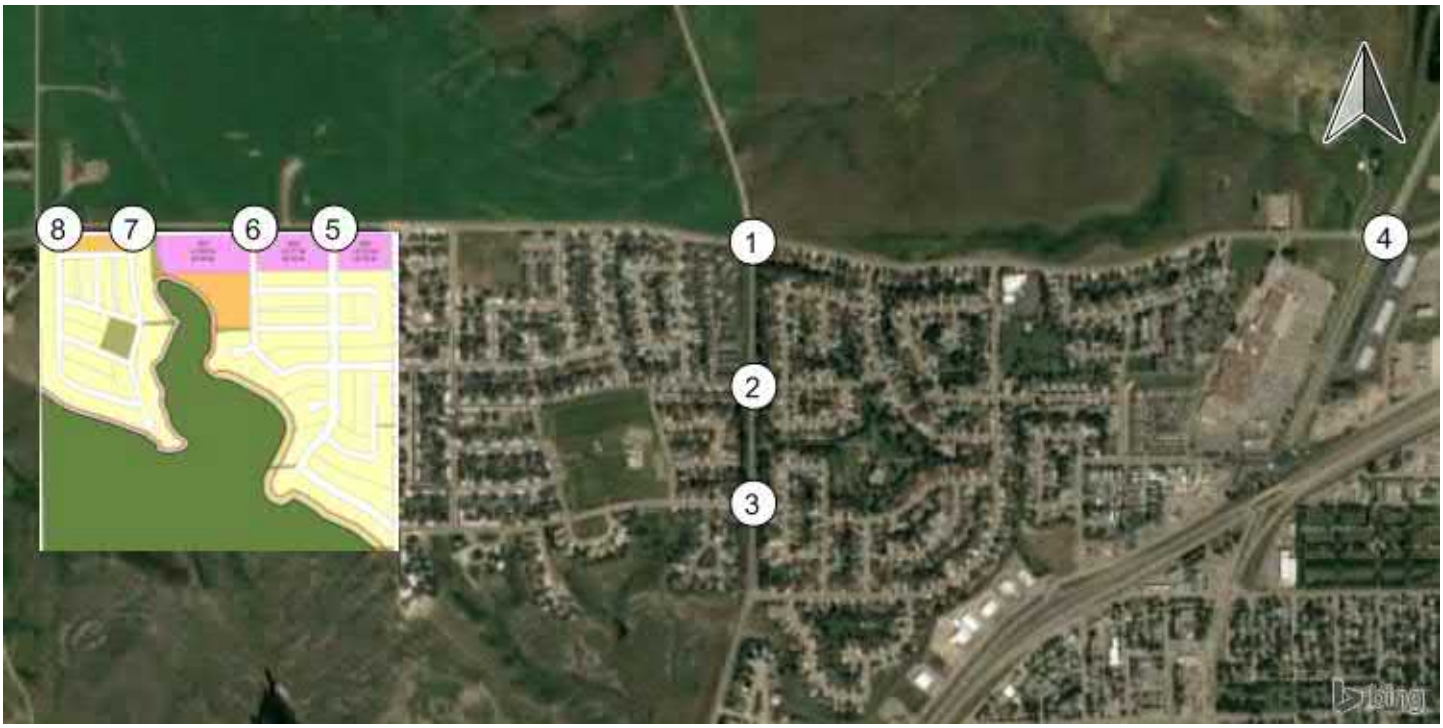
| V/C, Movement V/C Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 8.58 | 8.35 | 0.00 | 0.00 | 7.23 | 0.00 |
| Movement LOS | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95th-Percentile Queue Length [m] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| d_A, Approach Delay [s/veh] | 8.46 | | 0.00 | | 0.00 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 0.00 | | | | | |
| Intersection LOS | A | | | | | |

## Lane Configuration and Traffic Control

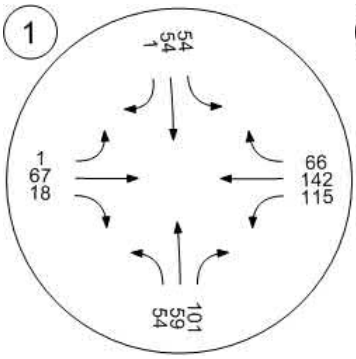


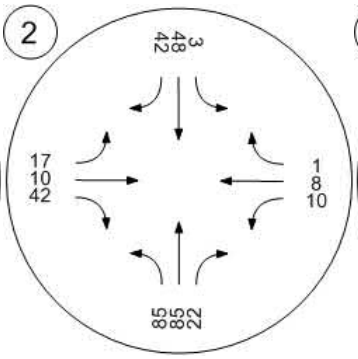
## Traffic Volume - Future Total Volume



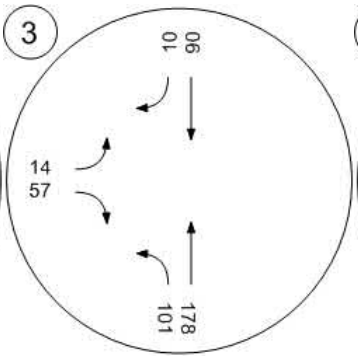

### Battleford / 11 Ave



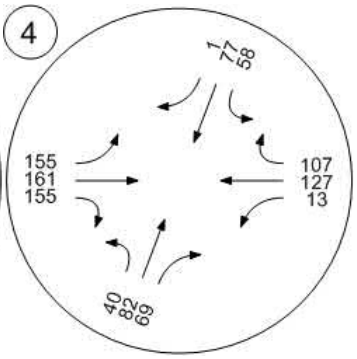

### 11 Ave / Col. Otter



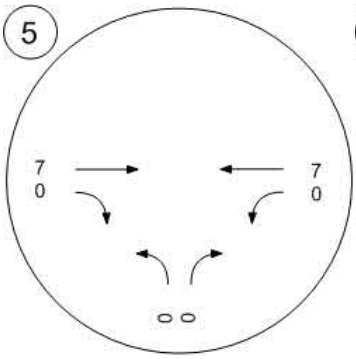

### 11 Ave / Highland



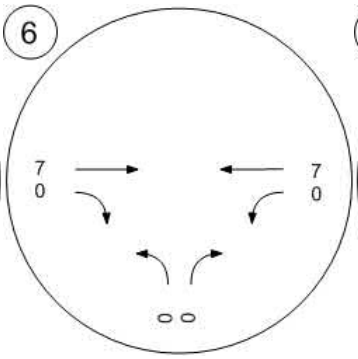

### Central / Battleford



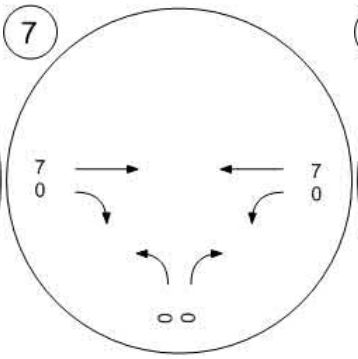

### Battleford / Highland



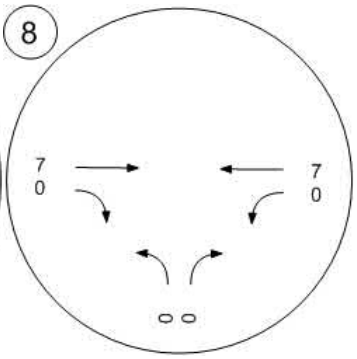

### Battleford / Hamilton




### Battleford / Access 3




### Battleford / Access 4



**Intersection Level Of Service Report**
**Intersection 1: Battleford / 11 Ave**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 10,000.0 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | F |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 36 | 6 | 68 | 3 | 3 | 1 | 1 | 45 | 12 | 77 | 95 | 11 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 50 | 0 | 50 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 50 |
| Site-Generated Trips [veh/h] | 109 | 0 | 0 | 0 | 0 | 0 | 0 | 102 | 62 | 0 | 176 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 163 | 59 | 101 | 54 | 54 | 1 | 1 | 169 | 80 | 115 | 318 | 66 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 48 | 17 | 30 | 16 | 16 | 0 | 0 | 50 | 24 | 34 | 94 | 19 |
| Total Analysis Volume [veh/h] | 192 | 69 | 119 | 64 | 64 | 1 | 1 | 199 | 94 | 135 | 374 | 78 |
| Pedestrian Volume [ped/h] | 2 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.12 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.73 | 0.09 | 1.50 | 1.27 | 0.08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.68 | 0.00 | 0.00 | 7.72 | 0.00 | 0.00 | 10000.0 | 599.16 | 589.57 | 904.77 | 876.96 | 868.66 |
| Movement LOS | A | A | A | A | A | A | F | F | F | F | F | F |
| 95th-Percentile Queue Length [veh] | 0.98 | 0.98 | 0.98 | 0.31 | 0.31 | 0.31 | 24.47 | 24.47 | 24.47 | 51.89 | 51.89 | 51.89 |
| 95th-Percentile Queue Length [m] | 7.46 | 7.46 | 7.46 | 2.34 | 2.34 | 2.34 | 186.49 | 186.49 | 186.49 | 395.43 | 395.43 | 395.43 |
| d_A, Approach Delay [s/veh] | 3.88 | | | 3.83 | | | 628.07 | | | 882.25 | | |
| Approach LOS | A | | | A | | | F | | | F | | |
| d_I, Intersection Delay [s/veh] | 506.84 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 2: 11 Ave / Col. Otter**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 17.2 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | C |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.038 |

**Intersection Setup**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | Yes | | | Yes | | | Yes | | | Yes | | |

**Volumes**

| Name | 11th Ave NW | | | 11th Ave NW | | | Colonel Otter Dr | | | Colonel Otter Dr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 85 | 85 | 22 | 3 | 48 | 42 | 17 | 10 | 42 | 10 | 8 | 1 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 13 | 109 | 0 | 0 | 62 | 0 | 0 | 0 | 8 | 0 | 0 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 98 | 194 | 22 | 3 | 110 | 42 | 17 | 10 | 50 | 10 | 8 | 1 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 29 | 57 | 6 | 1 | 32 | 12 | 5 | 3 | 15 | 3 | 2 | 0 |
| Total Analysis Volume [veh/h] | 115 | 228 | 26 | 4 | 129 | 49 | 20 | 12 | 59 | 12 | 9 | 1 |
| Pedestrian Volume [ped/h] | 0 | | | 2 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | Yes |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.03 | 0.07 | 0.04 | 0.03 | 0.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.81 | 0.00 | 0.00 | 7.75 | 0.00 | 0.00 | 15.62 | 15.59 | 9.39 | 17.24 | 16.11 | 10.26 |
| Movement LOS | A | A | A | A | A | A | C | C | A | C | C | B |
| 95th-Percentile Queue Length [veh] | 1.07 | 1.07 | 1.07 | 0.48 | 0.48 | 0.48 | 0.30 | 0.30 | 0.30 | 0.21 | 0.21 | 0.21 |
| 95th-Percentile Queue Length [m] | 8.13 | 8.13 | 8.13 | 3.67 | 3.67 | 3.67 | 2.29 | 2.29 | 2.29 | 1.56 | 1.56 | 1.56 |
| d_A, Approach Delay [s/veh] | 2.43 | | | 0.17 | | | 11.58 | | | 16.46 | | |
| Approach LOS | A | | | A | | | B | | | C | | |
| d_I, Intersection Delay [s/veh] | 3.53 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |

## Intersection Level Of Service Report
## Intersection 3: 11 Ave / Highland

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 19.6 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | C |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.063 |

**Intersection Setup**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Southbound | | Eastbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Thru | Thru | Right | Left | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | 11th Ave NW | | 11th Ave NW | | Highland Dr | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 101 | 178 | 90 | 10 | 14 | 57 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 53 | 122 | 70 | 0 | 0 | 30 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 154 | 300 | 160 | 10 | 14 | 87 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 45 | 88 | 47 | 3 | 4 | 26 |
| Total Analysis Volume [veh/h] | 181 | 353 | 188 | 12 | 16 | 102 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| | | | |
|---|---|---|---|
| Priority Scheme | Free | Free | Stop |
| Flared Lane | | | Yes |
| Storage Area [veh] | 0 | 0 | 2 |
| Two-Stage Gap Acceptance | | | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| | | | | | | |
|---|---|---|---|---|---|---|
| V/C, Movement V/C Ratio | 0.13 | 0.00 | 0.00 | 0.00 | 0.06 | 0.12 |
| d_M, Delay for Movement [s/veh] | 8.02 | 0.00 | 0.00 | 0.00 | 19.61 | 9.75 |
| Movement LOS | A | A | A | A | C | A |
| 95th-Percentile Queue Length [veh] | 1.88 | 1.88 | 0.00 | 0.00 | 0.41 | 0.41 |
| 95th-Percentile Queue Length [m] | 14.31 | 14.31 | 0.00 | 0.00 | 3.12 | 3.12 |
| d_A, Approach Delay [s/veh] | 2.72 | | 0.00 | | 11.09 | |
| Approach LOS | A | | A | | B | |
| d_I, Intersection Delay [s/veh] | 3.24 | | | | | |
| Intersection LOS | C | | | | | |

**Intersection Level Of Service Report**
**Intersection 4: Central / Battleford**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 694.0 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | F |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 1.559 |

**Intersection Setup**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Pocket Length [m] | 100.00 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 100.00 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | | 50.00 | | | 50.00 | | | 50.00 | | |
| Grade [%] | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | | |
| Crosswalk | No | | | No | | | No | | | No | | |

**Volumes**

| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 70 | 0 | 0 | 0 | 0 | 53 | 31 | 31 | 40 | 0 | 53 | 0 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 110 | 82 | 69 | 58 | 77 | 54 | 186 | 192 | 195 | 13 | 180 | 107 |
| Peak Hour Factor | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 | 0.8500 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 32 | 24 | 20 | 17 | 23 | 16 | 55 | 56 | 57 | 4 | 53 | 31 |
| Total Analysis Volume [veh/h] | 129 | 96 | 81 | 68 | 91 | 64 | 219 | 226 | 229 | 15 | 212 | 126 |
| Pedestrian Volume [ped/h] | 0 | | | 0 | | | 0 | | | 0 | | |

**Intersection Settings**

| Priority Scheme | Free | Free | Stop | Stop |
|---|---|---|---|---|
| Flared Lane | | | Yes | |
| Storage Area [veh] | 0 | 0 | 2 | 2 |
| Two-Stage Gap Acceptance | | | No | No |
| Number of Storage Spaces in Median | 0 | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.09 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 1.56 | 0.64 | 0.24 | 0.13 | 0.61 | 0.13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.62 | 0.00 | 0.00 | 7.52 | 0.00 | 0.00 | 694.02 | 678.54 | 672.11 | 41.53 | 29.82 | 9.36 |
| Movement LOS | A | A | A | A | A | A | F | F | F | E | D | A |
| 95th-Percentile Queue Length [veh] | 0.28 | 0.00 | 0.00 | 0.14 | 0.00 | 0.00 | 54.20 | 54.20 | 54.20 | 0.44 | 3.77 | 0.46 |
| 95th-Percentile Queue Length [m] | 2.14 | 0.00 | 0.00 | 1.09 | 0.00 | 0.00 | 412.98 | 412.98 | 412.98 | 3.36 | 28.75 | 3.47 |
| d_A, Approach Delay [s/veh] | 3.21 | | | 2.29 | | | 681.38 | | | 23.02 | | |
| Approach LOS | A | | | A | | | F | | | C | | |
| d_I, Intersection Delay [s/veh] | 301.33 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

**Intersection Level Of Service Report**
**Intersection 5: Battleford / Highland**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 12.9 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Highland Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 68 | 96 | 0 | 120 | 165 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 68 | 103 | 0 | 120 | 172 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 17 | 26 | 0 | 30 | 43 |
| Total Analysis Volume [veh/h] | 0 | 68 | 103 | 0 | 120 | 172 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

**Intersection Settings**

| Priority Scheme | Stop | Free | Free |
|---|---|---|---|
| Flared Lane | No | | |
| Storage Area [veh] | 0 | 0 | 0 |
| Two-Stage Gap Acceptance | No | | |
| Number of Storage Spaces in Median | 0 | 0 | 0 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.00 | 0.07 | 0.00 | 0.00 | 0.08 | 0.00 |
|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 12.89 | 9.07 | 0.00 | 0.00 | 7.63 | 0.00 |
| Movement LOS | B | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.23 | 0.23 | 0.00 | 0.00 | 0.73 | 0.73 |
| 95th-Percentile Queue Length [m] | 1.76 | 1.76 | 0.00 | 0.00 | 5.55 | 5.55 |
| d_A, Approach Delay [s/veh] | 9.07 | | 0.00 | | 3.14 | |
| Approach LOS | A | | A | | A | |
| d_I, Intersection Delay [s/veh] | 3.31 | | | | | |
| Intersection LOS | B | | | | | |

**Intersection Level Of Service Report**
**Intersection 6: Battleford / Hamilton**

| | | | |
|---|---|---|---|
| Control Type: | Two-way stop | Delay (sec / veh): | 10.7 |
| Analysis Method: | HCM 6th Edition | Level Of Service: | B |
| Analysis Period: | 15 minutes | Volume to Capacity (v/c): | 0.000 |

**Intersection Setup**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Approach | Northbound | | Eastbound | | Westbound | |
| Lane Configuration |  | |  | |  | |
| Turning Movement | Left | Right | Thru | Right | Left | Thru |
| Lane Width [m] | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| No. of Lanes in Pocket | 0 | 0 | 0 | 0 | 0 | 0 |
| Pocket Length [m] | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 | 30.48 |
| Speed [km/h] | 50.00 | | 50.00 | | 50.00 | |
| Grade [%] | 0.00 | | 0.00 | | 0.00 | |
| Crosswalk | Yes | | Yes | | Yes | |

**Volumes**

| Name | Hamilton Dr | | Battleford Tr W | | Battleford Tr W | |
|---|---|---|---|---|---|---|
| Base Volume Input [veh/h] | 0 | 0 | 5 | 0 | 0 | 5 |
| Base Volume Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Heavy Vehicles Percentage [%] | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Growth Rate | 1.00 | 1.00 | 1.49 | 1.49 | 1.49 | 1.49 |
| In-Process Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Site-Generated Trips [veh/h] | 0 | 46 | 50 | 0 | 80 | 85 |
| Diverted Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Pass-by Trips [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Existing Site Adjustment Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Volume [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Hourly Volume [veh/h] | 0 | 46 | 57 | 0 | 80 | 92 |
| Peak Hour Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Other Adjustment Factor | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Total 15-Minute Volume [veh/h] | 0 | 12 | 14 | 0 | 20 | 23 |
| Total Analysis Volume [veh/h] | 0 | 46 | 57 | 0 | 80 | 92 |
| Pedestrian Volume [ped/h] | 0 | | 0 | | 0 | |

# Appendix C - Mitigation Options Analysis Results

## Unmitigated

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | Two-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 13 | 0 | 57 | 6 | 8 | 5 | 1 | 77 | 50 | 47 | 18 | 0 |
| Total Analysis Volume [veh/h] | 58 | 60 | 100 | 69 | 73 | 8 | 1 | 331 | 207 | 82 | 89 | 60 |

**Intersection Settings**

| Priority Scheme | Free | | | Free | | | Stop | | | Stop | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flared Lane | | | | | | | Yes | | | Yes | | |
| Storage Area [veh] | 0 | | | 0 | | | 2 | | | 2 | | |
| Two-Stage Gap Acceptance | | | | | | | No | | | No | | |
| Number of Storage Spaces in Median | 0 | | | 0 | | | 0 | | | 0 | | |

**Capacity Analysis**

| Calculated Rank | 2 | 1 | 1 | 2 | 1 | 1 | 4 | 3 | 2 | 4 | 3 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v_c, Conflicting Flow Rate [veh/h] | 81 | 0 | 0 | 160 | 0 | 0 | 516 | 491 | 77 | 710 | 445 | 110 |
| v_c, Stage 1 [veh/h] | 81 | 0 | 0 | 160 | 0 | 0 | 215 | 215 | 77 | 226 | 226 | 110 |
| v_c, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 301 | 276 | 0 | 484 | 219 | 0 |
| c_p,x, Potential Capacity [veh/h] | 1517 | 0 | 0 | 1419 | 0 | 0 | 470 | 478 | 981 | 347 | 508 | 943 |
| c_p,x, Stage 1 [veh/h] | 1663 | 0 | 0 | 1703 | 0 | 0 | 787 | 725 | 1123 | 777 | 717 | 1140 |
| c_p,x, Stage 2 [veh/h] | 1623 | 0 | 0 | 1623 | 0 | 0 | 709 | 682 | 1086 | 563 | 722 | 1085 |
| c_m,x, Movement Capacity [veh/h] | 1517 | 100000 | 100000 | 1419 | 100000 | 100000 | 349 | 435 | 980 | 96 | 461 | 943 |
| c_m,x, Stage 1 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_m,x, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_T, Total Capacity [veh/h] | 1517 | 100000 | 100000 | 1419 | 100000 | 100000 | 349 | 435 | 980 | 96 | 461 | 943 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.04 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.76 | 0.21 | 0.85 | 0.19 | 0.06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.47 | 0.00 | 0.00 | 7.67 | 0.00 | 0.00 | 40.11 | 38.09 | 33.49 | 156.08 | 126.55 | 122.57 |
| Movement LOS | A | A | A | A | A | A | E | E | D | F | F | F |
| Critical Movement | No | No | No | No | No | No | No | No | No | Yes | No | No |
| 95th-Percentile Queue Length [veh] | 0.50 | 0.50 | 0.50 | 0.35 | 0.35 | 0.35 | 9.68 | 9.68 | 9.68 | 10.58 | 10.58 | 10.58 |
| 95th-Percentile Queue Length [m] | 3.83 | 3.83 | 3.83 | 2.70 | 2.70 | 2.70 | 73.73 | 73.73 | 73.73 | 80.59 | 80.59 | 80.59 |
| d_A, Approach Delay [s/veh] | 1.99 | | | 3.53 | | | 36.33 | | | 136.00 | | |
| Approach LOS | A | | | A | | | E | | | F | | |
| V/C_I, Worst Movement V/C Ratio | 0.85 | | | | | | | | | | | |
| d_I, Worst Movement Control Delay [s/veh] | 156.08 | | | | | | | | | | | |
| d_I, Intersection Delay [s/veh] | 45.66 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

## Option 1: Reverse Stop Signs

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | Two-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 13 | 0 | 57 | 6 | 8 | 5 | 1 | 77 | 50 | 47 | 18 | 0 |
| Total Analysis Volume [veh/h] | 58 | 60 | 100 | 69 | 73 | 8 | 1 | 331 | 207 | 82 | 89 | 60 |

**Intersection Settings**

| Priority Scheme | Stop | | | Stop | | | Free | | | Free | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flared Lane | Yes | | | Yes | | | | | | | | |
| Storage Area [veh] | 2 | | | 2 | | | 2 | | | 2 | | |
| Two-Stage Gap Acceptance | No | | | No | | | | | | | | |
| Number of Storage Spaces in Median | 0 | | | 0 | | | 0 | | | 0 | | |

**Capacity Analysis**

| Calculated Rank | 4 | 3 | 2 | 4 | 3 | 2 | 2 | 1 | 1 | 2 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v_c, Conflicting Flow Rate [veh/h] | 760 | 750 | 435 | 800 | 823 | 119 | 149 | 0 | 0 | 538 | 0 | 0 |
| v_c, Stage 1 [veh/h] | 437 | 437 | 435 | 283 | 283 | 119 | 149 | 0 | 0 | 538 | 0 | 0 |
| v_c, Stage 2 [veh/h] | 324 | 313 | 0 | 517 | 540 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_p,x, Potential Capacity [veh/h] | 322 | 339 | 620 | 303 | 308 | 933 | 1432 | 0 | 0 | 1028 | 0 | 0 |
| c_p,x, Stage 1 [veh/h] | 597 | 578 | 1315 | 724 | 677 | 1145 | 1697 | 0 | 0 | 1901 | 0 | 0 |
| c_p,x, Stage 2 [veh/h] | 689 | 657 | 1085 | 542 | 520 | 1085 | 1623 | 0 | 0 | 1624 | 0 | 0 |
| c_m,x, Movement Capacity [veh/h] | 238 | 309 | 619 | 202 | 280 | 933 | 1432 | 100000 | 100000 | 1027 | 100000 | 100000 |
| c_m,x, Stage 1 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_m,x, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_T, Total Capacity [veh/h] | 238 | 309 | 619 | 202 | 280 | 933 | 1432 | 100000 | 100000 | 1027 | 100000 | 100000 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.24 | 0.19 | 0.16 | 0.34 | 0.26 | 0.01 | 0.00 | 0.00 | 0.00 | 0.08 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 25.68 | 22.19 | 16.35 | 42.81 | 37.86 | 28.86 | 7.52 | 0.00 | 0.00 | 8.81 | 0.00 | 0.00 |
| Movement LOS | D | C | C | E | E | D | A | A | A | A | A | A |
| Critical Movement | No | No | No | Yes | No | No | No | No | No | No | No | No |
| 95th-Percentile Queue Length [veh] | 2.20 | 2.20 | 2.20 | 3.56 | 3.56 | 3.56 | 1.78 | 1.78 | 1.78 | 0.86 | 0.86 | 0.86 |
| 95th-Percentile Queue Length [m] | 16.79 | 16.79 | 16.79 | 27.13 | 27.13 | 27.13 | 13.58 | 13.58 | 13.58 | 6.58 | 6.58 | 6.58 |
| d_A, Approach Delay [s/veh] | 20.44 | | | 39.66 | | | 0.01 | | | 3.13 | | |
| Approach LOS | C | | | E | | | A | | | A | | |
| V/C_I, Worst Movement V/C Ratio | 0.34 | | | | | | | | | | | |
| d_I, Worst Movement Control Delay [s/veh] | 42.81 | | | | | | | | | | | |
| d_I, Intersection Delay [s/veh] | 9.78 | | | | | | | | | | | |
| Intersection LOS | E | | | | | | | | | | | |

## Option 2: All-Way Stop

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | All-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 13 | 0 | 57 | 6 | 8 | 5 | 1 | 77 | 50 | 47 | 18 | 0 |
| Total Analysis Volume [veh/h] | 58 | 60 | 100 | 69 | 73 | 8 | 1 | 331 | 207 | 82 | 89 | 60 |

**Intersection Settings**

**Lanes**

| Capacity per Entry Lane [veh/h] | 576 | 536 | 670 | 598 |
|---|---|---|---|---|

**Movement, Approach, & Intersection Results**

| Average Lane Delay [s/veh] | 13.03 | 12.30 | 26.61 | 12.77 |
|---|---|---|---|---|
| 95th-Percentile Queue Length [veh] | 1.76 | 1.14 | 8.20 | 1.82 |
| 95th-Percentile Queue Length [m] | 13.43 | 8.67 | 62.52 | 13.86 |
| Approach Delay [s/veh] | 13.03 | 12.30 | 26.61 | 12.77 |
| Approach LOS | B | B | D | B |
| Intersection Delay [s/veh] | 19.32 | | | |
| Intersection LOS | C | | | |

## Option 3: Roundabout

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | Roundabout | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 13 | 0 | 57 | 6 | 8 | 5 | 1 | 77 | 50 | 47 | 18 | 0 |
| Total Analysis Volume [veh/h] | 58 | 60 | 100 | 69 | 73 | 8 | 1 | 331 | 207 | 82 | 89 | 60 |

**Intersection Settings**

| Number of Conflicting Circulating Lanes | 1 | | | 1 | | | 1 | | | 1 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Circulating Flow Rate [veh/h] | 409 | | | 234 | | | 228 | | | 121 | | |
| Exiting Flow Rate [veh/h] | 408 | | | 150 | | | 158 | | | 62 | | |
| Demand Flow Rate [veh/h] | 49 | 51 | 85 | 59 | 62 | 7 | 1 | 281 | 176 | 70 | 76 | 51 |
| Adjusted Demand Flow Rate [veh/h] | 58 | 60 | 100 | 69 | 73 | 8 | 1 | 331 | 207 | 82 | 89 | 60 |

**Lanes**

| Overwrite Calculated Critical Headway | No | No | No | No |
|---|---|---|---|---|
| User-Defined Critical Headway [s] | 4.00 | 4.00 | 4.00 | 4.00 |
| Overwrite Calculated Follow-Up Time | No | No | No | No |
| User-Defined Follow-Up Time [s] | 3.00 | 3.00 | 3.00 | 3.00 |
| A (intercept) | 1380.00 | 1380.00 | 1380.00 | 1380.00 |
| B (coefficient) | 0.00102 | 0.00102 | 0.00102 | 0.00102 |
| HV Adjustment Factor | 0.98 | 0.98 | 0.98 | 0.98 |
| Entry Flow Rate [veh/h] | 223 | 153 | 550 | 236 |
| Capacity of Entry and Bypass Lanes [veh/h] | 910 | 1088 | 1094 | 1220 |
| Pedestrian Impedance | 1.00 | 1.00 | 1.00 | 1.00 |
| Capacity per Entry Lane [veh/h] | 892 | 1067 | 1072 | 1196 |
| X, volume / capacity | 0.24 | 0.14 | 0.50 | 0.19 |

**Movement, Approach, & Intersection Results**

| Average Lane Delay [s/veh] | 6.57 | 4.63 | 9.22 | 4.70 |
|---|---|---|---|---|
| Lane LOS | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 0.96 | 0.49 | 2.91 | 0.71 |
| 95th-Percentile Queue Length [m] | 7.32 | 3.73 | 22.16 | 5.44 |
| Approach Delay [s/veh] | 6.57 | 4.63 | 9.22 | 4.70 |
| Approach LOS | A | A | A | A |
| Intersection Delay [s/veh] | 7.19 | | | |
| Intersection LOS | A | | | |

## Option 4: Signals

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | Signalized | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 13 | 0 | 57 | 6 | 8 | 5 | 1 | 77 | 50 | 47 | 18 | 0 |
| Total Analysis Volume [veh/h] | 58 | 60 | 100 | 69 | 73 | 8 | 1 | 331 | 207 | 82 | 89 | 60 |

**Intersection Settings**

| Cycle Length [s] | 120 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coordination Type | Time of Day Pattern Coordinated | | | | | | | | | | | |
| Actuation Type | Fixed time | | | | | | | | | | | |
| Lost time [s] | 0.00 | | | | | | | | | | | |
| Control Type | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss |
| Signal group | 0 | 2 | 0 | 0 | 6 | 0 | 0 | 8 | 0 | 0 | 4 | 0 |
| Auxiliary Signal Groups | | | | | | | | | | | | |
| Lead / Lag | - | - | - | - | - | - | - | - | - | - | - | - |
| Minimum Green [s] | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 |
| Maximum Green [s] | 0 | 30 | 0 | 0 | 30 | 0 | 0 | 30 | 0 | 0 | 30 | 0 |
| Amber [s] | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 |
| All red [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Split [s] | 0 | 38 | 0 | 0 | 38 | 0 | 0 | 82 | 0 | 0 | 82 | 0 |
| Walk [s] | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 |
| Pedestrian Clearance [s] | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 |
| I1, Start-Up Lost Time [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Minimum Recall | | No | | | No | | | No | | | No | |
| Maximum Recall | | No | | | No | | | No | | | No | |
| Pedestrian Recall | | No | | | No | | | No | | | No | |
| Pedestrian Signal Group | 0 | | | | | | | | | | | |
| Pedestrian Walk [s] | 0 | | | | | | | | | | | |
| Pedestrian Clearance [s] | 0 | | | | | | | | | | | |

**Lane Group Calculations**

| g / C, Green / Cycle | 0.27 | 0.27 | 0.63 | 0.63 |
|---|---|---|---|---|
| (v / s)_i Volume / Saturation Flow Rate | 0.17 | 0.14 | 0.37 | 0.25 |
| so, Base Saturation Flow per Lane [veh/h/ln] | 1750 | 1750 | 1750 | 1750 |
| Arrival type | 3 | 3 | 3 | 3 |
| s, saturation flow rate [veh/h] | 1308 | 1056 | 1451 | 935 |
| c, Capacity [veh/h] | 387 | 325 | 949 | 633 |
| X, volume / capacity | 0.56 | 0.46 | 0.57 | 0.36 |
| d, Delay for Lane Group [s/veh] | 44.38 | 42.51 | 15.30 | 12.77 |
| Lane Group LOS | D | D | B | B |
| Critical Lane Group | Yes | No | Yes | No |

| | | | | |
|---|---|---|---|---|
| 50th-Percentile Queue Length [veh] | 6.26 | 4.26 | 8.62 | 3.40 |
| 50th-Percentile Queue Length [m] | 47.69 | 32.48 | 65.66 | 25.87 |
| 95th-Percentile Queue Length [veh] | 10.36 | 7.65 | 13.43 | 6.11 |
| 95th-Percentile Queue Length [m] | 78.95 | 58.28 | 102.34 | 46.57 |

**Movement, Approach, & Intersection Results**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 44.38 | 44.38 | 44.38 | 42.51 | 42.51 | 42.51 | 15.30 | 15.30 | 15.30 | 12.77 | 12.77 | 12.77 |
| Movement LOS | D | D | D | D | D | D | B | B | B | B | B | B |
| Critical Movement | No | No | Yes | No | No | No | No | No | No | No | No | No |
| d_A, Approach Delay [s/veh] | 44.38 | | | 42.51 | | | 15.30 | | | 12.77 | | |
| Approach LOS | D | | | D | | | B | | | B | | |
| d_I, Intersection Delay [s/veh] | 23.94 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |
| Intersection V/C | 0.538 | | | | | | | | | | | |

## Option 5: All-Way Stop + Add EB/WB Lanes

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | All-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 13 | 0 | 57 | 6 | 8 | 5 | 1 | 77 | 50 | 47 | 18 | 0 |
| Total Analysis Volume [veh/h] | 58 | 60 | 100 | 69 | 73 | 8 | 1 | 331 | 207 | 82 | 89 | 60 |

**Intersection Settings**

**Lanes**

| Capacity per Entry Lane [veh/h] | 614 | 572 | 593 | 652 | 527 | 591 |
|---|---|---|---|---|---|---|

**Movement, Approach, & Intersection Results**

| Average Lane Delay [s/veh] | 12.05 | 11.50 | 13.73 | 12.06 | 11.43 | 10.27 |
|---|---|---|---|---|---|---|
| 95th-Percentile Queue Length [veh] | 1.60 | 1.04 | 2.36 | 2.03 | 0.83 | 0.72 |
| 95th-Percentile Queue Length [m] | 12.19 | 7.95 | 17.99 | 15.45 | 6.31 | 5.49 |
| Approach Delay [s/veh] | 12.05 | 11.50 | 12.89 | | 10.85 | |
| Approach LOS | B | B | B | | B | |
| Intersection Delay [s/veh] | 12.13 | | | | | |
| Intersection LOS | B | | | | | |

## Unmitigated

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Two-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 35 | 104 | 28 | 0 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Total Analysis Volume [veh/h] | 84 | 182 | 49 | 1 | 132 | 88 | 227 | 153 | 174 | 21 | 21 | 7 |

**Intersection Settings**

| Priority Scheme | Free | | | Free | | | Stop | | | Stop | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flared Lane | | | | | | | Yes | | | | | |
| Storage Area [veh] | 0 | | | 0 | | | 2 | | | 2 | | |
| Two-Stage Gap Acceptance | | | | | | | No | | | No | | |
| Number of Storage Spaces in Median | 0 | | | 0 | | | 0 | | | 0 | | |

**Capacity Analysis**

| Calculated Rank | 2 | 1 | 1 | 2 | 1 | 1 | 4 | 3 | 2 | 4 | 3 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v_c, Conflicting Flow Rate [veh/h] | 132 | 0 | 0 | 182 | 0 | 0 | 448 | 528 | 110 | 519 | 509 | 116 |
| v_c, Stage 1 [veh/h] | 132 | 0 | 0 | 182 | 0 | 0 | 178 | 178 | 110 | 375 | 375 | 116 |
| v_c, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 270 | 350 | 0 | 145 | 134 | 0 |
| c_p,x, Potential Capacity [veh/h] | 1451 | 0 | 0 | 1391 | 0 | 0 | 495 | 454 | 922 | 440 | 466 | 915 |
| c_p,x, Stage 1 [veh/h] | 1686 | 0 | 0 | 1711 | 0 | 0 | 806 | 751 | 1139 | 619 | 616 | 1142 |
| c_p,x, Stage 2 [veh/h] | 1622 | 0 | 0 | 1622 | 0 | 0 | 713 | 631 | 1084 | 843 | 785 | 1084 |
| c_m,x, Movement Capacity [veh/h] | 1451 | 100000 | 100000 | 1391 | 100000 | 100000 | 452 | 428 | 922 | 247 | 439 | 915 |
| c_m,x, Stage 1 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_m,x, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_T, Total Capacity [veh/h] | 1451 | 100000 | 100000 | 1391 | 100000 | 100000 | 452 | 428 | 922 | 247 | 439 | 915 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.36 | 0.19 | 0.09 | 0.05 | 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.63 | 0.00 | 0.00 | 7.59 | 0.00 | 0.00 | 60.97 | 61.42 | 56.90 | 20.94 | 13.62 | 8.97 |
| Movement LOS | A | A | A | A | A | A | F | F | F | C | B | A |
| Critical Movement | No | No | No | No | No | No | No | Yes | No | No | No | No |
| 95th-Percentile Queue Length [veh] | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 13.63 | 13.63 | 13.63 | 0.28 | 0.15 | 0.02 |
| 95th-Percentile Queue Length [m] | 1.40 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 103.89 | 103.89 | 103.89 | 2.11 | 1.15 | 0.18 |
| d_A, Approach Delay [s/veh] | 2.04 | | | 0.03 | | | 59.82 | | | 16.09 | | |
| Approach LOS | A | | | A | | | F | | | C | | |
| V/C_I, Worst Movement V/C Ratio | 0.36 | | | | | | | | | | | |
| d_I, Worst Movement Control Delay [s/veh] | 61.42 | | | | | | | | | | | |
| d_I, Intersection Delay [s/veh] | 30.36 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

## Option 1: Four-Way Stop

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | All-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 35 | 104 | 28 | 0 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Total Analysis Volume [veh/h] | 84 | 182 | 49 | 1 | 132 | 88 | 227 | 153 | 174 | 21 | 21 | 7 |

**Intersection Settings**

**Lanes**

| Capacity per Entry Lane [veh/h] | 444 | 474 | 495 | 433 | 462 | 499 | 567 | 460 | 491 | 544 |
|---|---|---|---|---|---|---|---|---|---|---|

**Movement, Approach, & Intersection Results**

| Average Lane Delay [s/veh] | 12.69 | 12.71 | 12.18 | 11.03 | 12.91 | 11.93 | 57.01 | 10.91 | 10.35 | 9.40 |
|---|---|---|---|---|---|---|---|---|---|---|
| 95th-Percentile Queue Length [veh] | 0.69 | 0.95 | 0.90 | 0.01 | 0.92 | 0.83 | 13.59 | 0.14 | 0.13 | 0.04 |
| 95th-Percentile Queue Length [m] | 5.25 | 7.20 | 6.83 | 0.05 | 7.00 | 6.35 | 103.54 | 1.09 | 1.02 | 0.30 |
| Approach Delay [s/veh] | 12.51 | | | 12.42 | | | 57.01 | 10.46 | | |
| Approach LOS | B | | | B | | | F | B | | |
| Intersection Delay [s/veh] | 34.05 | | | | | | | | | |
| Intersection LOS | D | | | | | | | | | |

# Option 2: Four-Way Stop + Add EB Lane

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Two-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 35 | 104 | 28 | 0 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Total Analysis Volume [veh/h] | 84 | 182 | 49 | 1 | 132 | 88 | 227 | 153 | 174 | 21 | 21 | 7 |

**Intersection Settings**

| Priority Scheme | Free | | | Free | | | Stop | | | Stop | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flared Lane | | | | | | | Yes | | | | | |
| Storage Area [veh] | 0 | | | 0 | | | 2 | | | 2 | | |
| Two-Stage Gap Acceptance | | | | | | | No | | | No | | |
| Number of Storage Spaces in Median | 0 | | | 0 | | | 0 | | | 0 | | |

**Capacity Analysis**

| Calculated Rank | 2 | 1 | 1 | 2 | 1 | 1 | 4 | 3 | 2 | 4 | 3 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v_c, Conflicting Flow Rate [veh/h] | 132 | 0 | 0 | 182 | 0 | 0 | 448 | 528 | 110 | 519 | 509 | 116 |
| v_c, Stage 1 [veh/h] | 132 | 0 | 0 | 182 | 0 | 0 | 178 | 178 | 110 | 375 | 375 | 116 |
| v_c, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 270 | 350 | 0 | 145 | 134 | 0 |
| c_p,x, Potential Capacity [veh/h] | 1451 | 0 | 0 | 1391 | 0 | 0 | 495 | 454 | 922 | 440 | 466 | 915 |
| c_p,x, Stage 1 [veh/h] | 1686 | 0 | 0 | 1711 | 0 | 0 | 806 | 751 | 1139 | 619 | 616 | 1142 |
| c_p,x, Stage 2 [veh/h] | 1622 | 0 | 0 | 1622 | 0 | 0 | 713 | 631 | 1084 | 843 | 785 | 1084 |
| c_m,x, Movement Capacity [veh/h] | 1451 | 100000 | 100000 | 1391 | 100000 | 100000 | 452 | 428 | 922 | 247 | 439 | 915 |
| c_m,x, Stage 1 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_m,x, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_T, Total Capacity [veh/h] | 1451 | 100000 | 100000 | 1391 | 100000 | 100000 | 452 | 428 | 922 | 247 | 439 | 915 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.36 | 0.19 | 0.09 | 0.05 | 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.63 | 0.00 | 0.00 | 7.59 | 0.00 | 0.00 | 20.74 | 15.60 | 11.08 | 20.94 | 13.62 | 8.97 |
| Movement LOS | A | A | A | A | A | A | C | C | B | C | B | A |
| Critical Movement | No | No | No | No | No | No | No | No | No | Yes | No | No |
| 95th-Percentile Queue Length [veh] | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.76 | 1.64 | 1.64 | 0.28 | 0.15 | 0.02 |
| 95th-Percentile Queue Length [m] | 1.40 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 21.01 | 12.46 | 12.46 | 2.11 | 1.15 | 0.18 |
| d_A, Approach Delay [s/veh] | 2.04 | | | 0.03 | | | 16.29 | | | 16.09 | | |
| Approach LOS | A | | | A | | | C | | | C | | |
| V/C_I, Worst Movement V/C Ratio | 0.09 | | | | | | | | | | | |
| d_I, Worst Movement Control Delay [s/veh] | 20.94 | | | | | | | | | | | |
| d_I, Intersection Delay [s/veh] | 9.18 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |

## Option 3: Roundabout (Single Lane)

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Roundabout | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 35 | 104 | 28 | 0 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Total Analysis Volume [veh/h] | 84 | 182 | 49 | 1 | 132 | 88 | 227 | 153 | 174 | 21 | 21 | 7 |

**Intersection Settings**

| Number of Conflicting Circulating Lanes | 1 | | | 1 | | | 1 | | | 1 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Circulating Flow Rate [veh/h] | 389 | | | 129 | | | 157 | | | 503 | | |
| Exiting Flow Rate [veh/h] | 157 | | | 107 | | | 156 | | | 417 | | |
| Demand Flow Rate [veh/h] | 71 | 155 | 42 | 1 | 112 | 75 | 193 | 130 | 148 | 18 | 18 | 6 |
| Adjusted Demand Flow Rate [veh/h] | 84 | 182 | 49 | 1 | 132 | 88 | 227 | 153 | 174 | 21 | 21 | 7 |

**Lanes**

| Overwrite Calculated Critical Headway | No | No | No | No | No | No | No | No |
|---|---|---|---|---|---|---|---|---|
| User-Defined Critical Headway [s] | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Overwrite Calculated Follow-Up Time | No | No | No | No | No | No | No | No |
| User-Defined Follow-Up Time [s] | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| A (intercept) | 1380.00 | 1380.00 | 1380.00 | 1380.00 | 1380.00 | 1380.00 | 1380.00 | 1380.00 |
| B (coefficient) | 0.00102 | 0.00102 | 0.00102 | 0.00102 | 0.00102 | 0.00102 | 0.00102 | 0.00102 |
| HV Adjustment Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Entry Flow Rate [veh/h] | 272 | 0 | 136 | 0 | 388 | 0 | 43 | 0 |
| Capacity of Entry and Bypass Lanes [veh/h] | 929 | 1176 | 1211 | 1238 | 1176 | 1177 | 827 | 902 |
| Pedestrian Impedance | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Capacity per Entry Lane [veh/h] | 911 | 1153 | 1187 | 1213 | 1153 | 1154 | 811 | 885 |
| X, volume / capacity | 0.29 | 0.04 | 0.11 | 0.07 | 0.33 | 0.15 | 0.05 | 0.01 |

**Movement, Approach, & Intersection Results**

| Average Lane Delay [s/veh] | 7.04 | 3.47 | 3.98 | 3.56 | 6.30 | 4.43 | 4.95 | 4.14 |
|---|---|---|---|---|---|---|---|---|
| Lane LOS | A | A | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 1.22 | 0.13 | 0.38 | 0.23 | 1.45 | 0.53 | 0.16 | 0.02 |
| 95th-Percentile Queue Length [m] | 9.30 | 1.01 | 2.88 | 1.79 | 11.08 | 4.04 | 1.25 | 0.18 |
| Approach Delay [s/veh] | 6.49 | | 3.81 | | 5.71 | | 4.83 | |
| Approach LOS | A | | A | | A | | A | |
| Intersection Delay [s/veh] | 5.52 | | | | | | | |
| Intersection LOS | A | | | | | | | |

## Option 4: Signals

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Signalized | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 35 | 104 | 28 | 0 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Total Analysis Volume [veh/h] | 84 | 182 | 49 | 1 | 132 | 88 | 227 | 153 | 174 | 21 | 21 | 7 |

**Intersection Settings**

| Cycle Length [s] | 120 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coordination Type | Time of Day Pattern Coordinated | | | | | | | | | | | |
| Actuation Type | Fixed time | | | | | | | | | | | |
| Lost time [s] | 0.00 | | | | | | | | | | | |
| Control Type | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Protecte | Permiss | Permiss | Permiss | Permiss | Permiss |
| Signal group | 0 | 2 | 0 | 0 | 6 | 0 | 3 | 8 | 0 | 0 | 4 | 0 |
| Auxiliary Signal Groups | | | | | | | | | | | | |
| Lead / Lag | - | - | - | - | - | - | Lead | - | - | - | - | - |
| Minimum Green [s] | 0 | 10 | 0 | 0 | 10 | 0 | 10 | 10 | 0 | 0 | 10 | 0 |
| Maximum Green [s] | 0 | 30 | 0 | 0 | 30 | 0 | 30 | 30 | 0 | 0 | 30 | 0 |
| Amber [s] | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 | 4.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 |
| All red [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Split [s] | 0 | 33 | 0 | 0 | 33 | 0 | 54 | 87 | 0 | 0 | 33 | 0 |
| Walk [s] | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 |
| Pedestrian Clearance [s] | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 |
| I1, Start-Up Lost Time [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Minimum Recall | | No | | | No | | No | No | | | No | |
| Maximum Recall | | No | | | No | | No | No | | | No | |
| Pedestrian Recall | | No | | | No | | No | No | | | No | |
| Pedestrian Signal Group | 0 | | | | | | | | | | | |
| Pedestrian Walk [s] | 0 | | | | | | | | | | | |
| Pedestrian Clearance [s] | 0 | | | | | | | | | | | |

**Lane Group Calculations**

| g / C, Green / Cycle | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.68 | 0.23 | 0.23 | 0.23 |
|---|---|---|---|---|---|---|---|---|---|---|
| (v / s)_i Volume / Saturation Flow Rate | 0.07 | 0.07 | 0.07 | 0.00 | 0.07 | 0.07 | 0.35 | 0.02 | 0.01 | 0.00 |
| so, Base Saturation Flow per Lane [veh/h/ln] | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 |
| Arrival type | 3 | | | 3 | | | 3 | 3 | | |
| s, saturation flow rate [veh/h] | 1161 | 1722 | 1600 | 1149 | 1722 | 1504 | 1565 | 1053 | 1722 | 1464 |
| c, Capacity [veh/h] | 233 | 388 | 360 | 232 | 388 | 338 | 1125 | 98 | 388 | 329 |
| X, volume / capacity | 0.36 | 0.30 | 0.31 | 0.00 | 0.29 | 0.32 | 0.49 | 0.21 | 0.05 | 0.02 |
| d, Delay for Lane Group [s/veh] | 51.13 | 40.70 | 41.05 | 43.49 | 40.47 | 41.23 | 11.23 | 42.72 | 36.75 | 36.33 |
| Lane Group LOS | D | D | D | D | D | D | B | D | D | D |
| Critical Lane Group | Yes | No | No | No | No | No | Yes | Yes | No | No |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50th-Percentile Queue Length [veh] | 2.58 | 3.11 | 3.02 | 0.03 | 2.98 | 2.86 | 7.18 | | | 0.64 | 0.52 | 0.17 |
| 50th-Percentile Queue Length [m] | 19.67 | 23.73 | 22.98 | 0.21 | 22.69 | 21.82 | 54.67 | | | 4.87 | 3.93 | 1.31 |
| 95th-Percentile Queue Length [veh] | 4.65 | 5.61 | 5.43 | 0.05 | 5.36 | 5.15 | 11.57 | | | 1.15 | 0.93 | 0.31 |
| 95th-Percentile Queue Length [m] | 35.40 | 42.71 | 41.37 | 0.38 | 40.84 | 39.28 | 88.15 | | | 8.76 | 7.07 | 2.36 |

**Movement, Approach, & Intersection Results**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 51.13 | 40.83 | 41.05 | 43.49 | 40.58 | 41.23 | 11.23 | 11.23 | 11.23 | 42.72 | 36.75 | 36.33 |
| Movement LOS | D | D | D | D | D | D | B | B | B | D | D | D |
| Critical Movement | Yes | No | No | No | No | No | No | No | No | No | No | No |
| d_A, Approach Delay [s/veh] | 43.61 | | | 40.85 | | | 11.23 | | | 39.25 | | |
| Approach LOS | D | | | D | | | B | | | D | | |
| d_I, Intersection Delay [s/veh] | 27.14 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |
| Intersection V/C | 0.355 | | | | | | | | | | | |

## Option 5: Signals + Add EB Lane

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Signalized | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 35 | 104 | 28 | 0 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Total Analysis Volume [veh/h] | 84 | 182 | 49 | 1 | 132 | 88 | 227 | 153 | 174 | 21 | 21 | 7 |

**Intersection Settings**

| Cycle Length [s] | 120 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coordination Type | Time of Day Pattern Coordinated | | | | | | | | | | | |
| Actuation Type | Fixed time | | | | | | | | | | | |
| Lost time [s] | 0.00 | | | | | | | | | | | |
| Control Type | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Protecte | Permiss | Permiss | Permiss | Permiss | Permiss |
| Signal group | 0 | 2 | 0 | 0 | 6 | 0 | 3 | 8 | 0 | 0 | 4 | 0 |
| Auxiliary Signal Groups | | | | | | | | | | | | |
| Lead / Lag | - | - | - | - | - | - | Lead | - | - | - | - | - |
| Minimum Green [s] | 0 | 10 | 0 | 0 | 10 | 0 | 10 | 10 | 0 | 0 | 10 | 0 |
| Maximum Green [s] | 0 | 30 | 0 | 0 | 30 | 0 | 30 | 30 | 0 | 0 | 30 | 0 |
| Amber [s] | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 | 4.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 |
| All red [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Split [s] | 0 | 36 | 0 | 0 | 36 | 0 | 16 | 84 | 0 | 0 | 68 | 0 |
| Walk [s] | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 |
| Pedestrian Clearance [s] | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 |
| I1, Start-Up Lost Time [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 2.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Minimum Recall | | No | | | No | | No | No | | | No | |
| Maximum Recall | | No | | | No | | No | No | | | No | |
| Pedestrian Recall | | No | | | No | | No | No | | | No | |
| Pedestrian Signal Group | 0 | | | | | | | | | | | |
| Pedestrian Walk [s] | 0 | | | | | | | | | | | |
| Pedestrian Clearance [s] | 0 | | | | | | | | | | | |

**Lane Group Calculations**

| g / C, Green / Cycle | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.65 | 0.65 | 0.52 | 0.52 | 0.52 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (v / s)_i Volume / Saturation Flow Rate | 0.07 | 0.07 | 0.07 | 0.00 | 0.07 | 0.07 | 0.16 | 0.21 | 0.02 | 0.01 | 0.00 |
| so, Base Saturation Flow per Lane [veh/h/ln] | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 |
| Arrival type | 3 | | | 3 | | | 3 | | 3 | | |
| s, saturation flow rate [veh/h] | 1161 | 1722 | 1600 | 1149 | 1722 | 1504 | 1435 | 1575 | 1053 | 1722 | 1464 |
| c, Capacity [veh/h] | 264 | 431 | 400 | 263 | 431 | 376 | 1012 | 1023 | 490 | 890 | 756 |
| X, volume / capacity | 0.32 | 0.27 | 0.28 | 0.00 | 0.26 | 0.28 | 0.22 | 0.32 | 0.04 | 0.02 | 0.01 |
| d, Delay for Lane Group [s/veh] | 47.06 | 37.80 | 38.08 | 40.77 | 37.61 | 38.22 | 9.05 | 10.10 | 21.60 | 14.24 | 14.11 |
| Lane Group LOS | D | D | D | D | D | D | A | B | C | B | B |
| Critical Lane Group | Yes | No | No | No | No | No | No | Yes | No | No | No |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50th-Percentile Queue Length [veh] | 2.45 | 2.98 | 2.88 | 0.03 | 2.85 | 2.74 | 2.45 | 3.84 | 0.38 | 0.29 | 0.10 |
| 50th-Percentile Queue Length [m] | 18.69 | 22.70 | 21.97 | 0.20 | 21.71 | 20.85 | 18.63 | 29.25 | 2.91 | 2.23 | 0.74 |
| 95th-Percentile Queue Length [veh] | 4.41 | 5.36 | 5.19 | 0.05 | 5.13 | 4.93 | 4.40 | 6.91 | 0.69 | 0.53 | 0.18 |
| 95th-Percentile Queue Length [m] | 33.64 | 40.86 | 39.55 | 0.36 | 39.08 | 37.53 | 33.54 | 52.65 | 5.24 | 4.01 | 1.34 |

**Movement, Approach, & Intersection Results**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 47.06 | 37.90 | 38.08 | 40.77 | 37.69 | 38.22 | 9.05 | 10.10 | 10.10 | 21.60 | 14.24 | 14.11 |
| Movement LOS | D | D | D | D | D | D | A | B | B | C | B | B |
| Critical Movement | Yes | No | No | No | No | No | No | No | No | No | No | No |
| d_A, Approach Delay [s/veh] | 40.37 | | | 37.92 | | | 9.67 | | | 17.38 | | |
| Approach LOS | D | | | D | | | A | | | B | | |
| d_I, Intersection Delay [s/veh] | 23.97 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |
| Intersection V/C | 0.280 | | | | | | | | | | | |

## Option 6: Add EB Lane

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Two-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 35 | 104 | 28 | 0 | 75 | 40 | 96 | 54 | 55 | 12 | 2 | 4 |
| Total Analysis Volume [veh/h] | 84 | 182 | 49 | 1 | 132 | 88 | 227 | 153 | 174 | 21 | 21 | 7 |

**Intersection Settings**

| Priority Scheme | Free | | | Free | | | Stop | | | Stop | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flared Lane | | | | | | | Yes | | | | | |
| Storage Area [veh] | 0 | | | 0 | | | 2 | | | 2 | | |
| Two-Stage Gap Acceptance | | | | | | | No | | | No | | |
| Number of Storage Spaces in Median | 0 | | | 0 | | | 0 | | | 0 | | |

**Capacity Analysis**

| Calculated Rank | 2 | 1 | 1 | 2 | 1 | 1 | 4 | 3 | 2 | 4 | 3 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v_c, Conflicting Flow Rate [veh/h] | 132 | 0 | 0 | 182 | 0 | 0 | 448 | 528 | 110 | 519 | 509 | 116 |
| v_c, Stage 1 [veh/h] | 132 | 0 | 0 | 182 | 0 | 0 | 178 | 178 | 110 | 375 | 375 | 116 |
| v_c, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 270 | 350 | 0 | 145 | 134 | 0 |
| c_p,x, Potential Capacity [veh/h] | 1451 | 0 | 0 | 1391 | 0 | 0 | 495 | 454 | 922 | 440 | 466 | 915 |
| c_p,x, Stage 1 [veh/h] | 1686 | 0 | 0 | 1711 | 0 | 0 | 806 | 751 | 1139 | 619 | 616 | 1142 |
| c_p,x, Stage 2 [veh/h] | 1622 | 0 | 0 | 1622 | 0 | 0 | 713 | 631 | 1084 | 843 | 785 | 1084 |
| c_m,x, Movement Capacity [veh/h] | 1451 | 100000 | 100000 | 1391 | 100000 | 100000 | 452 | 428 | 922 | 247 | 439 | 915 |
| c_m,x, Stage 1 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_m,x, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_T, Total Capacity [veh/h] | 1451 | 100000 | 100000 | 1391 | 100000 | 100000 | 452 | 428 | 922 | 247 | 439 | 915 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.36 | 0.19 | 0.09 | 0.05 | 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.63 | 0.00 | 0.00 | 7.59 | 0.00 | 0.00 | 20.74 | 15.60 | 11.08 | 20.94 | 13.62 | 8.97 |
| Movement LOS | A | A | A | A | A | A | C | C | B | C | B | A |
| Critical Movement | No | No | No | No | No | No | No | No | No | Yes | No | No |
| 95th-Percentile Queue Length [veh] | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.76 | 1.64 | 1.64 | 0.28 | 0.15 | 0.02 |
| 95th-Percentile Queue Length [m] | 1.40 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 21.01 | 12.46 | 12.46 | 2.11 | 1.15 | 0.18 |
| d_A, Approach Delay [s/veh] | 2.04 | | | 0.03 | | | 16.29 | | | 16.09 | | |
| Approach LOS | A | | | A | | | C | | | C | | |
| V/C_I, Worst Movement V/C Ratio | 0.09 | | | | | | | | | | | |
| d_I, Worst Movement Control Delay [s/veh] | 20.94 | | | | | | | | | | | |
| d_I, Intersection Delay [s/veh] | 9.18 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |

## Unmitigated

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | Two-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 36 | 6 | 68 | 3 | 3 | 1 | 1 | 45 | 12 | 77 | 95 | 11 |
| Total Analysis Volume [veh/h] | 192 | 69 | 119 | 64 | 64 | 1 | 1 | 199 | 94 | 135 | 374 | 78 |

**Intersection Settings**

| Priority Scheme | Free | | | Free | | | Stop | | | Stop | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flared Lane | | | | | | | Yes | | | Yes | | |
| Storage Area [veh] | 0 | | | 0 | | | 2 | | | 2 | | |
| Two-Stage Gap Acceptance | | | | | | | No | | | No | | |
| Number of Storage Spaces in Median | 0 | | | 0 | | | 0 | | | 0 | | |

**Capacity Analysis**

| Calculated Rank | 2 | 1 | 1 | 2 | 1 | 1 | 4 | 3 | 2 | 4 | 3 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v_c, Conflicting Flow Rate [veh/h] | 65 | 0 | 0 | 188 | 0 | 0 | 931 | 765 | 65 | 852 | 706 | 129 |
| v_c, Stage 1 [veh/h] | 65 | 0 | 0 | 188 | 0 | 0 | 193 | 193 | 65 | 513 | 513 | 129 |
| v_c, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 739 | 572 | 0 | 339 | 193 | 0 |
| c_p,x, Potential Capacity [veh/h] | 1537 | 0 | 0 | 1386 | 0 | 0 | 247 | 334 | 997 | 279 | 361 | 921 |
| c_p,x, Stage 1 [veh/h] | 1655 | 0 | 0 | 1717 | 0 | 0 | 809 | 741 | 1117 | 544 | 536 | 1150 |
| c_p,x, Stage 2 [veh/h] | 1623 | 0 | 0 | 1623 | 0 | 0 | 409 | 504 | 1086 | 674 | 741 | 1085 |
| c_m,x, Movement Capacity [veh/h] | 1537 | 100000 | 100000 | 1386 | 100000 | 100000 | 0 | 273 | 995 | 90 | 295 | 921 |
| c_m,x, Stage 1 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_m,x, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_T, Total Capacity [veh/h] | 1537 | 100000 | 100000 | 1386 | 100000 | 100000 | 0 | 273 | 995 | 90 | 295 | 921 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.12 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.73 | 0.09 | 1.50 | 1.27 | 0.08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.68 | 0.00 | 0.00 | 7.72 | 0.00 | 0.00 | 10000.0 | 599.16 | 589.57 | 904.77 | 876.96 | 868.66 |
| Movement LOS | A | A | A | A | A | A | F | F | F | F | F | F |
| Critical Movement | No | No | No | No | No | No | Yes | No | No | No | No | No |
| 95th-Percentile Queue Length [veh] | 0.98 | 0.98 | 0.98 | 0.31 | 0.31 | 0.31 | 24.47 | 24.47 | 24.47 | 51.89 | 51.89 | 51.89 |
| 95th-Percentile Queue Length [m] | 7.46 | 7.46 | 7.46 | 2.34 | 2.34 | 2.34 | 186.49 | 186.49 | 186.49 | 395.43 | 395.43 | 395.43 |
| d_A, Approach Delay [s/veh] | 3.88 | | | 3.83 | | | 628.07 | | | 882.25 | | |
| Approach LOS | A | | | A | | | F | | | F | | |
| V/C_I, Worst Movement V/C Ratio | 0.00 | | | | | | | | | | | |
| d_I, Worst Movement Control Delay [s/veh] | 10000.00 | | | | | | | | | | | |
| d_I, Intersection Delay [s/veh] | 506.84 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

## Option 1: Reverse Stop Signs

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | Two-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 36 | 6 | 68 | 3 | 3 | 1 | 1 | 45 | 12 | 77 | 95 | 11 |
| Total Analysis Volume [veh/h] | 192 | 69 | 119 | 64 | 64 | 1 | 1 | 199 | 94 | 135 | 374 | 78 |

**Intersection Settings**

| Priority Scheme | Stop | | | Stop | | | Free | | | Free | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flared Lane | Yes | | | Yes | | | | | | | | |
| Storage Area [veh] | 2 | | | 2 | | | 2 | | | 2 | | |
| Two-Stage Gap Acceptance | No | | | No | | | | | | | | |
| Number of Storage Spaces in Median | 0 | | | 0 | | | 0 | | | 0 | | |

**Capacity Analysis**

| Calculated Rank | 4 | 3 | 2 | 4 | 3 | 2 | 2 | 1 | 1 | 2 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v_c, Conflicting Flow Rate [veh/h] | 964 | 970 | 246 | 1025 | 978 | 413 | 452 | 0 | 0 | 293 | 0 | 0 |
| v_c, Stage 1 [veh/h] | 248 | 248 | 246 | 683 | 683 | 413 | 452 | 0 | 0 | 293 | 0 | 0 |
| v_c, Stage 2 [veh/h] | 716 | 722 | 0 | 342 | 295 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_p,x, Potential Capacity [veh/h] | 234 | 252 | 791 | 213 | 250 | 639 | 1109 | 0 | 0 | 1266 | 0 | 0 |
| c_p,x, Stage 1 [veh/h] | 754 | 700 | 1212 | 439 | 449 | 1302 | 1855 | 0 | 0 | 1771 | 0 | 0 |
| c_p,x, Stage 2 [veh/h] | 421 | 431 | 1085 | 673 | 668 | 1085 | 1623 | 0 | 0 | 1624 | 0 | 0 |
| c_m,x, Movement Capacity [veh/h] | 160 | 215 | 789 | 122 | 213 | 639 | 1109 | 100000 | 100000 | 1264 | 100000 | 100000 |
| c_m,x, Stage 1 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_m,x, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_T, Total Capacity [veh/h] | 160 | 215 | 789 | 122 | 213 | 639 | 1109 | 100000 | 100000 | 1264 | 100000 | 100000 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 1.20 | 0.32 | 0.15 | 0.53 | 0.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 357.63 | 351.87 | 339.72 | 95.94 | 83.29 | 72.03 | 8.25 | 0.00 | 0.00 | 8.19 | 0.00 | 0.00 |
| Movement LOS | F | F | F | F | F | F | A | A | A | A | A | A |
| Critical Movement | Yes | No | No | No | No | No | No | No | No | No | No | No |
| 95th-Percentile Queue Length [veh] | 24.59 | 24.59 | 24.59 | 5.46 | 5.46 | 5.46 | 1.07 | 1.07 | 1.07 | 2.53 | 2.53 | 2.53 |
| 95th-Percentile Queue Length [m] | 187.41 | 187.41 | 187.41 | 41.63 | 41.63 | 41.63 | 8.17 | 8.17 | 8.17 | 19.25 | 19.25 | 19.25 |
| d_A, Approach Delay [s/veh] | 350.98 | | | 89.48 | | | 0.03 | | | 1.88 | | |
| Approach LOS | F | | | F | | | A | | | A | | |
| V/C_I, Worst Movement V/C Ratio | 1.20 | | | | | | | | | | | |
| d_I, Worst Movement Control Delay [s/veh] | 357.63 | | | | | | | | | | | |
| d_I, Intersection Delay [s/veh] | 105.06 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

## Option 2: All-Way Stop

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | All-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 36 | 6 | 68 | 3 | 3 | 1 | 1 | 45 | 12 | 77 | 95 | 11 |
| Total Analysis Volume [veh/h] | 192 | 69 | 119 | 64 | 64 | 1 | 1 | 199 | 94 | 135 | 374 | 78 |

**Intersection Settings**

**Lanes**

| Capacity per Entry Lane [veh/h] | 516 | 447 | 518 | 587 |
|---|---|---|---|---|

**Movement, Approach, & Intersection Results**

| Average Lane Delay [s/veh] | 27.01 | 14.28 | 18.70 | 84.89 |
|---|---|---|---|---|
| 95th-Percentile Queue Length [veh] | 6.15 | 1.18 | 3.50 | 17.56 |
| 95th-Percentile Queue Length [m] | 46.88 | 9.00 | 26.70 | 133.80 |
| Approach Delay [s/veh] | 27.01 | 14.28 | 18.70 | 84.89 |
| Approach LOS | D | B | C | F |
| Intersection Delay [s/veh] | 48.51 | | | |
| Intersection LOS | E | | | |

## Option 3: All-Way Stop+Add EB/WB Lanes

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | All-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 36 | 6 | 68 | 3 | 3 | 1 | 1 | 45 | 12 | 77 | 95 | 11 |
| Total Analysis Volume [veh/h] | 192 | 69 | 119 | 64 | 64 | 1 | 1 | 199 | 94 | 135 | 374 | 78 |

**Intersection Settings**

**Lanes**

| Capacity per Entry Lane [veh/h] | 557 | 487 | 485 | 518 | 503 | 534 |
|---|---|---|---|---|---|---|

**Movement, Approach, & Intersection Results**

| Average Lane Delay [s/veh] | 22.22 | 13.03 | 13.31 | 12.39 | 19.45 | 17.35 |
|---|---|---|---|---|---|---|
| 95th-Percentile Queue Length [veh] | 5.22 | 1.06 | 1.27 | 1.16 | 3.69 | 3.30 |
| 95th-Percentile Queue Length [m] | 39.74 | 8.04 | 9.65 | 8.84 | 28.15 | 25.13 |
| Approach Delay [s/veh] | 22.22 | 13.03 | 12.85 | | 18.40 | |
| Approach LOS | C | B | B | | C | |
| Intersection Delay [s/veh] | 17.77 | | | | | |
| Intersection LOS | C | | | | | |

## Option 4: Roundabout

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | Roundabout | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 36 | 6 | 68 | 3 | 3 | 1 | 1 | 45 | 12 | 77 | 95 | 11 |
| Total Analysis Volume [veh/h] | 192 | 69 | 119 | 64 | 64 | 1 | 1 | 199 | 94 | 135 | 374 | 78 |

**Intersection Settings**

| Number of Conflicting Circulating Lanes | 1 | | | 1 | | | 1 | | | 1 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Circulating Flow Rate [veh/h] | 269 | | | 715 | | | 268 | | | 267 | | |
| Exiting Flow Rate [veh/h] | 268 | | | 577 | | | 203 | | | 71 | | |
| Demand Flow Rate [veh/h] | 163 | 59 | 101 | 54 | 54 | 1 | 1 | 169 | 80 | 115 | 318 | 66 |
| Adjusted Demand Flow Rate [veh/h] | 192 | 69 | 119 | 64 | 64 | 1 | 1 | 199 | 94 | 135 | 374 | 78 |

**Lanes**

| Overwrite Calculated Critical Headway | No | No | No | No |
|---|---|---|---|---|
| User-Defined Critical Headway [s] | 4.00 | 4.00 | 4.00 | 4.00 |
| Overwrite Calculated Follow-Up Time | No | No | No | No |
| User-Defined Follow-Up Time [s] | 3.00 | 3.00 | 3.00 | 3.00 |
| A (intercept) | 1380.00 | 1380.00 | 1380.00 | 1380.00 |
| B (coefficient) | 0.00102 | 0.00102 | 0.00102 | 0.00102 |
| HV Adjustment Factor | 0.98 | 0.98 | 0.98 | 0.98 |
| Entry Flow Rate [veh/h] | 388 | 132 | 300 | 599 |
| Capacity of Entry and Bypass Lanes [veh/h] | 1049 | 666 | 1050 | 1051 |
| Pedestrian Impedance | 1.00 | 1.00 | 1.00 | 1.00 |
| Capacity per Entry Lane [veh/h] | 1028 | 653 | 1030 | 1031 |
| X, volume / capacity | 0.37 | 0.20 | 0.29 | 0.57 |

**Movement, Approach, & Intersection Results**

| Average Lane Delay [s/veh] | 7.39 | 7.86 | 6.32 | 10.87 |
|---|---|---|---|---|
| Lane LOS | A | A | A | B |
| 95th-Percentile Queue Length [veh] | 1.72 | 0.73 | 1.18 | 3.72 |
| 95th-Percentile Queue Length [m] | 13.13 | 5.57 | 9.03 | 28.37 |
| Approach Delay [s/veh] | 7.39 | 7.86 | 6.32 | 10.87 |
| Approach LOS | A | A | A | B |
| Intersection Delay [s/veh] | 8.68 | | | |
| Intersection LOS | A | | | |

## Option 5: Signals

| Number | 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Battleford / 11 Ave | | | | | | | | | | | |
| Control Type | Signalized | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | 11th Ave NW | | | 11th Ave NW | | | Battleford Tr W | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 36 | 6 | 68 | 3 | 3 | 1 | 1 | 45 | 12 | 77 | 95 | 11 |
| Total Analysis Volume [veh/h] | 192 | 69 | 119 | 64 | 64 | 1 | 1 | 199 | 94 | 135 | 374 | 78 |

**Intersection Settings**

| Cycle Length [s] | 85 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coordination Type | Time of Day Pattern Coordinated | | | | | | | | | | | |
| Actuation Type | Fixed time | | | | | | | | | | | |
| Lost time [s] | 0.00 | | | | | | | | | | | |
| Control Type | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss |
| Signal group | 0 | 2 | 0 | 0 | 6 | 0 | 0 | 8 | 0 | 0 | 4 | 0 |
| Auxiliary Signal Groups | | | | | | | | | | | | |
| Lead / Lag | - | - | - | - | - | - | - | - | - | - | - | - |
| Minimum Green [s] | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 |
| Maximum Green [s] | 0 | 30 | 0 | 0 | 30 | 0 | 0 | 30 | 0 | 0 | 30 | 0 |
| Amber [s] | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 |
| All red [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Split [s] | 0 | 35 | 0 | 0 | 35 | 0 | 0 | 50 | 0 | 0 | 50 | 0 |
| Walk [s] | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 |
| Pedestrian Clearance [s] | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 |
| I1, Start-Up Lost Time [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Minimum Recall | | No | | | No | | | No | | | No | |
| Maximum Recall | | No | | | No | | | No | | | No | |
| Pedestrian Recall | | No | | | No | | | No | | | No | |
| Pedestrian Signal Group | 0 | | | | | | | | | | | |
| Pedestrian Walk [s] | 0 | | | | | | | | | | | |
| Pedestrian Clearance [s] | 0 | | | | | | | | | | | |

**Lane Group Calculations**

| g / C, Green / Cycle | 0.34 | 0.34 | 0.52 | 0.52 |
|---|---|---|---|---|
| (v / s)_i Volume / Saturation Flow Rate | 0.30 | 0.12 | 0.20 | 0.43 |
| so, Base Saturation Flow per Lane [veh/h/ln] | 1750 | 1750 | 1750 | 1750 |
| Arrival type | 3 | 3 | 3 | 3 |
| s, saturation flow rate [veh/h] | 1278 | 1109 | 1466 | 1351 |
| c, Capacity [veh/h] | 500 | 442 | 801 | 751 |
| X, volume / capacity | 0.76 | 0.29 | 0.37 | 0.78 |
| d, Delay for Lane Group [s/veh] | 36.75 | 22.12 | 13.66 | 25.17 |
| Lane Group LOS | D | C | B | C |
| Critical Lane Group | Yes | No | No | Yes |

| | | | | |
|---|---|---|---|---|
| 50th-Percentile Queue Length [veh] | 8.29 | 2.02 | 3.40 | 10.38 |
| 50th-Percentile Queue Length [m] | 63.15 | 15.41 | 25.89 | 79.06 |
| 95th-Percentile Queue Length [veh] | 13.01 | 3.64 | 6.12 | 15.66 |
| 95th-Percentile Queue Length [m] | 99.12 | 27.74 | 46.61 | 119.31 |

**Movement, Approach, & Intersection Results**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 36.75 | 36.75 | 36.75 | 22.12 | 22.12 | 22.12 | 13.66 | 13.66 | 13.66 | 25.17 | 25.17 | 25.17 |
| Movement LOS | D | D | D | C | C | C | B | B | B | C | C | C |
| Critical Movement | Yes | No | No | No | No | No | No | No | No | No | No | No |
| d_A, Approach Delay [s/veh] | 36.75 | | | 22.12 | | | 13.66 | | | 25.17 | | |
| Approach LOS | D | | | C | | | B | | | C | | |
| d_I, Intersection Delay [s/veh] | 25.62 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |
| Intersection V/C | 0.732 | | | | | | | | | | | |

## Unmitigated

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Two-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Total Analysis Volume [veh/h] | 129 | 96 | 81 | 68 | 91 | 64 | 219 | 226 | 229 | 15 | 212 | 126 |

**Intersection Settings**

| Priority Scheme | Free | | | Free | | | Stop | | | Stop | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flared Lane | | | | | | | Yes | | | | | |
| Storage Area [veh] | 0 | | | 0 | | | 2 | | | 2 | | |
| Two-Stage Gap Acceptance | | | | | | | No | | | No | | |
| Number of Storage Spaces in Median | 0 | | | 0 | | | 0 | | | 0 | | |

**Capacity Analysis**

| Calculated Rank | 2 | 1 | 1 | 2 | 1 | 1 | 4 | 3 | 2 | 4 | 3 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v_c, Conflicting Flow Rate [veh/h] | 91 | 0 | 0 | 96 | 0 | 0 | 671 | 613 | 78 | 689 | 622 | 89 |
| v_c, Stage 1 [veh/h] | 91 | 0 | 0 | 96 | 0 | 0 | 259 | 259 | 78 | 395 | 395 | 89 |
| v_c, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 412 | 354 | 0 | 295 | 227 | 0 |
| c_p,x, Potential Capacity [veh/h] | 1502 | 0 | 0 | 1496 | 0 | 0 | 342 | 406 | 968 | 332 | 402 | 952 |
| c_p,x, Stage 1 [veh/h] | 1666 | 0 | 0 | 1668 | 0 | 0 | 723 | 692 | 1123 | 602 | 603 | 1128 |
| c_p,x, Stage 2 [veh/h] | 1622 | 0 | 0 | 1622 | 0 | 0 | 588 | 629 | 1084 | 689 | 715 | 1084 |
| c_m,x, Movement Capacity [veh/h] | 1502 | 100000 | 100000 | 1496 | 100000 | 100000 | 140 | 354 | 968 | 113 | 350 | 952 |
| c_m,x, Stage 1 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_m,x, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_T, Total Capacity [veh/h] | 1502 | 100000 | 100000 | 1496 | 100000 | 100000 | 140 | 354 | 968 | 113 | 350 | 952 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.09 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 1.56 | 0.64 | 0.24 | 0.13 | 0.61 | 0.13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.62 | 0.00 | 0.00 | 7.52 | 0.00 | 0.00 | 694.02 | 678.54 | 672.11 | 41.53 | 29.82 | 9.36 |
| Movement LOS | A | A | A | A | A | A | F | F | F | E | D | A |
| Critical Movement | No | No | No | No | No | No | Yes | No | No | No | No | No |
| 95th-Percentile Queue Length [veh] | 0.28 | 0.00 | 0.00 | 0.14 | 0.00 | 0.00 | 54.20 | 54.20 | 54.20 | 0.44 | 3.77 | 0.46 |
| 95th-Percentile Queue Length [m] | 2.14 | 0.00 | 0.00 | 1.09 | 0.00 | 0.00 | 412.98 | 412.98 | 412.98 | 3.36 | 28.75 | 3.47 |
| d_A, Approach Delay [s/veh] | 3.21 | | | 2.29 | | | 681.38 | | | 23.02 | | |
| Approach LOS | A | | | A | | | F | | | C | | |
| V/C_I, Worst Movement V/C Ratio | 1.56 | | | | | | | | | | | |
| d_I, Worst Movement Control Delay [s/veh] | 694.02 | | | | | | | | | | | |
| d_I, Intersection Delay [s/veh] | 301.33 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

## Option 1: Add EBL Lane

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Two-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Total Analysis Volume [veh/h] | 129 | 96 | 81 | 68 | 91 | 64 | 219 | 226 | 229 | 15 | 212 | 126 |

**Intersection Settings**

| Priority Scheme | Free | | | Free | | | Stop | | | Stop | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flared Lane | | | | | | | Yes | | | | | |
| Storage Area [veh] | 0 | | | 0 | | | 2 | | | 2 | | |
| Two-Stage Gap Acceptance | | | | | | | No | | | No | | |
| Number of Storage Spaces in Median | 0 | | | 0 | | | 0 | | | 0 | | |

**Capacity Analysis**

| Calculated Rank | 2 | 1 | 1 | 2 | 1 | 1 | 4 | 3 | 2 | 4 | 3 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v_c, Conflicting Flow Rate [veh/h] | 91 | 0 | 0 | 96 | 0 | 0 | 671 | 613 | 78 | 689 | 622 | 89 |
| v_c, Stage 1 [veh/h] | 91 | 0 | 0 | 96 | 0 | 0 | 259 | 259 | 78 | 395 | 395 | 89 |
| v_c, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 412 | 354 | 0 | 295 | 227 | 0 |
| c_p,x, Potential Capacity [veh/h] | 1502 | 0 | 0 | 1496 | 0 | 0 | 342 | 406 | 968 | 332 | 402 | 952 |
| c_p,x, Stage 1 [veh/h] | 1666 | 0 | 0 | 1668 | 0 | 0 | 723 | 692 | 1123 | 602 | 603 | 1128 |
| c_p,x, Stage 2 [veh/h] | 1622 | 0 | 0 | 1622 | 0 | 0 | 588 | 629 | 1084 | 689 | 715 | 1084 |
| c_m,x, Movement Capacity [veh/h] | 1502 | 100000 | 100000 | 1496 | 100000 | 100000 | 140 | 354 | 968 | 113 | 350 | 952 |
| c_m,x, Stage 1 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_m,x, Stage 2 [veh/h] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c_T, Total Capacity [veh/h] | 1502 | 100000 | 100000 | 1496 | 100000 | 100000 | 140 | 354 | 968 | 113 | 350 | 952 |

**Movement, Approach, & Intersection Results**

| V/C, Movement V/C Ratio | 0.09 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 1.56 | 0.64 | 0.24 | 0.13 | 0.61 | 0.13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 7.62 | 0.00 | 0.00 | 7.52 | 0.00 | 0.00 | 340.41 | 27.11 | 20.67 | 41.53 | 29.82 | 9.36 |
| Movement LOS | A | A | A | A | A | A | F | D | C | E | D | A |
| Critical Movement | No | No | No | No | No | No | Yes | No | No | No | No | No |
| 95th-Percentile Queue Length [veh] | 0.28 | 0.00 | 0.00 | 0.14 | 0.00 | 0.00 | 15.22 | 5.70 | 5.70 | 0.44 | 3.77 | 0.46 |
| 95th-Percentile Queue Length [m] | 2.14 | 0.00 | 0.00 | 1.09 | 0.00 | 0.00 | 115.95 | 43.41 | 43.41 | 3.36 | 28.75 | 3.47 |
| d_A, Approach Delay [s/veh] | 3.21 | | | 2.29 | | | 126.72 | | | 23.02 | | |
| Approach LOS | A | | | A | | | F | | | C | | |
| V/C_I, Worst Movement V/C Ratio | 1.56 | | | | | | | | | | | |
| d_I, Worst Movement Control Delay [s/veh] | 340.41 | | | | | | | | | | | |
| d_I, Intersection Delay [s/veh] | 61.07 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

## Option 2: All-Way Stop

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | All-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Total Analysis Volume [veh/h] | 129 | 96 | 81 | 68 | 91 | 64 | 219 | 226 | 229 | 15 | 212 | 126 |
| **Intersection Settings** | | | | | | | | | | | | |
| **Lanes** | | | | | | | | | | | | |
| Capacity per Entry Lane [veh/h] | 429 | 455 | 497 | 421 | 446 | 479 | 674 | | | 481 | 514 | 568 |
| **Movement, Approach, & Intersection Results** | | | | | | | | | | | | |
| Average Lane Delay [s/veh] | 14.67 | 12.72 | 11.35 | 12.90 | 12.47 | 11.68 | 134.63 | | | 10.43 | 14.54 | 10.84 |
| 95th-Percentile Queue Length [veh] | 1.25 | 0.79 | 0.58 | 0.57 | 0.62 | 0.57 | 25.02 | | | 0.10 | 2.00 | 0.84 |
| 95th-Percentile Queue Length [m] | 9.52 | 6.01 | 4.40 | 4.35 | 4.75 | 4.37 | 190.62 | | | 0.73 | 15.25 | 6.42 |
| Approach Delay [s/veh] | 13.18 | | | 12.33 | | | 134.63 | | | 13.05 | | |
| Approach LOS | B | | | B | | | F | | | B | | |
| Intersection Delay [s/veh] | 65.63 | | | | | | | | | | | |
| Intersection LOS | F | | | | | | | | | | | |

## Option 3: All-Way Stop + EBL Lane

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | All-way stop | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Total Analysis Volume [veh/h] | 129 | 96 | 81 | 68 | 91 | 64 | 219 | 226 | 229 | 15 | 212 | 126 |
| **Intersection Settings** | | | | | | | | | | | | |
| **Lanes** | | | | | | | | | | | | |
| Capacity per Entry Lane [veh/h] | 436 | 463 | 507 | 430 | 456 | 491 | 508 | 572 | | 463 | 493 | 542 |
| **Movement, Approach, & Intersection Results** | | | | | | | | | | | | |
| Average Lane Delay [s/veh] | 14.40 | 12.50 | 11.14 | 12.63 | 12.19 | 11.40 | 15.05 | 29.11 | | 10.73 | 15.40 | 11.36 |
| 95th-Percentile Queue Length [veh] | 1.22 | 0.77 | 0.56 | 0.56 | 0.61 | 0.56 | 2.15 | 7.66 | | 0.10 | 2.13 | 0.89 |
| 95th-Percentile Queue Length [m] | 9.32 | 5.88 | 4.30 | 4.24 | 4.62 | 4.24 | 16.35 | 58.39 | | 0.76 | 16.27 | 6.82 |
| Approach Delay [s/veh] | 12.94 | | | 12.05 | | | 24.54 | | | 13.76 | | |
| Approach LOS | B | | | B | | | C | | | B | | |
| Intersection Delay [s/veh] | 18.02 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |

## Option 4: Roundabout (Single Lane)

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Roundabout | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration | | | | | | | | | | | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Total Analysis Volume [veh/h] | 129 | 96 | 81 | 68 | 91 | 64 | 219 | 226 | 229 | 15 | 212 | 126 |

**Intersection Settings**

| Number of Conflicting Circulating Lanes | 1 | | | 1 | | | 1 | | | 1 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Circulating Flow Rate [veh/h] | 523 | | | 363 | | | 177 | | | 453 | | |
| Exiting Flow Rate [veh/h] | 300 | | | 348 | | | 108 | | | 321 | | |
| Demand Flow Rate [veh/h] | 110 | 82 | 69 | 58 | 77 | 54 | 186 | 192 | 195 | 13 | 180 | 107 |
| Adjusted Demand Flow Rate [veh/h] | 129 | 96 | 81 | 68 | 91 | 64 | 219 | 226 | 229 | 15 | 212 | 126 |

**Lanes**

| Overwrite Calculated Critical Headway | No | No | No | No | No | No | No | No |
|---|---|---|---|---|---|---|---|---|
| User-Defined Critical Headway [s] | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Overwrite Calculated Follow-Up Time | No | No | No | No | No | No | No | No |
| User-Defined Follow-Up Time [s] | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| A (intercept) | 1380.00 | 1380.00 | 1380.00 | 1380.00 | 1380.00 | 1380.00 | 1380.00 | 1380.00 |
| B (coefficient) | 0.00102 | 0.00102 | 0.00102 | 0.00102 | 0.00102 | 0.00102 | 0.00102 | 0.00102 |
| HV Adjustment Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Entry Flow Rate [veh/h] | 230 | 0 | 163 | 0 | 454 | 0 | 232 | 0 |
| Capacity of Entry and Bypass Lanes [veh/h] | 810 | 1017 | 953 | 968 | 1152 | 1236 | 870 | 995 |
| Pedestrian Impedance | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Capacity per Entry Lane [veh/h] | 794 | 997 | 935 | 949 | 1129 | 1212 | 853 | 975 |
| X, volume / capacity | 0.28 | 0.08 | 0.17 | 0.07 | 0.39 | 0.19 | 0.27 | 0.13 |

**Movement, Approach, & Intersection Results**

| Average Lane Delay [s/veh] | 7.74 | 4.34 | 5.49 | 4.41 | 7.22 | 4.61 | 7.08 | 4.89 |
|---|---|---|---|---|---|---|---|---|
| Lane LOS | A | A | A | A | A | A | A | A |
| 95th-Percentile Queue Length [veh] | 1.17 | 0.26 | 0.61 | 0.22 | 1.91 | 0.70 | 1.07 | 0.44 |
| 95th-Percentile Queue Length [m] | 8.90 | 2.02 | 4.66 | 1.65 | 14.55 | 5.30 | 8.18 | 3.38 |
| Approach Delay [s/veh] | 6.84 | | 5.18 | | 6.33 | | 6.30 | |
| Approach LOS | A | | A | | A | | A | |
| Intersection Delay [s/veh] | 6.26 | | | | | | | |
| Intersection LOS | A | | | | | | | |

## Option 5: Traffic Signals

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Signalized | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Total Analysis Volume [veh/h] | 129 | 96 | 81 | 68 | 91 | 64 | 219 | 226 | 229 | 15 | 212 | 126 |

**Intersection Settings**

| Cycle Length [s] | 95 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coordination Type | Time of Day Pattern Isolated | | | | | | | | | | | |
| Actuation Type | Semi-actuated | | | | | | | | | | | |
| Lost time [s] | 0.00 | | | | | | | | | | | |
| Control Type | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss |
| Signal group | 0 | 2 | 0 | 0 | 6 | 0 | 0 | 8 | 0 | 0 | 4 | 0 |
| Auxiliary Signal Groups | | | | | | | | | | | | |
| Lead / Lag | - | - | - | - | - | - | - | - | - | - | - | - |
| Minimum Green [s] | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 |
| Maximum Green [s] | 0 | 30 | 0 | 0 | 30 | 0 | 0 | 30 | 0 | 0 | 30 | 0 |
| Amber [s] | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 |
| All red [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Split [s] | 0 | 33 | 0 | 0 | 33 | 0 | 0 | 62 | 0 | 0 | 62 | 0 |
| Walk [s] | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 |
| Pedestrian Clearance [s] | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 |
| I1, Start-Up Lost Time [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Minimum Recall | | No | | | No | | | No | | | No | |
| Maximum Recall | | No | | | No | | | No | | | No | |
| Pedestrian Recall | | No | | | No | | | No | | | No | |
| Pedestrian Signal Group | 0 | | | | | | | | | | | |
| Pedestrian Walk [s] | 0 | | | | | | | | | | | |
| Pedestrian Clearance [s] | 0 | | | | | | | | | | | |

**Lane Group Calculations**

| g / C, Green / Cycle | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.55 | 0.55 | 0.55 | 0.55 |
|---|---|---|---|---|---|---|---|---|---|---|
| (v / s)_i Volume / Saturation Flow Rate | 0.10 | 0.05 | 0.06 | 0.06 | 0.05 | 0.05 | 0.53 | 0.02 | 0.12 | 0.09 |
| so, Base Saturation Flow per Lane [veh/h/ln] | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 |
| Arrival type | 3 | | | 3 | | | 3 | 3 | | |
| s, saturation flow rate [veh/h] | 1232 | 1722 | 1474 | 1207 | 1722 | 1497 | 1267 | 936 | 1722 | 1464 |
| c, Capacity [veh/h] | 401 | 555 | 475 | 387 | 555 | 482 | 749 | 88 | 950 | 808 |
| X, volume / capacity | 0.32 | 0.17 | 0.18 | 0.18 | 0.14 | 0.16 | 0.90 | 0.17 | 0.22 | 0.16 |
| d, Delay for Lane Group [s/veh] | 30.89 | 23.71 | 23.98 | 28.69 | 23.44 | 23.67 | 35.67 | 10.95 | 11.01 | 10.54 |
| Lane Group LOS | C | C | C | C | C | C | D | B | B | B |
| Critical Lane Group | Yes | No | No | No | No | No | Yes | No | No | No |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50th-Percentile Queue Length [veh] | 2.61 | 1.56 | 1.45 | 1.30 | 1.33 | 1.28 | 16.08 | | | 0.16 | 2.19 | 1.25 |
| 50th-Percentile Queue Length [m] | 19.89 | 11.86 | 11.06 | 9.94 | 10.16 | 9.72 | 122.54 | | | 1.24 | 16.66 | 9.52 |
| 95th-Percentile Queue Length [veh] | 4.70 | 2.80 | 2.61 | 2.35 | 2.40 | 2.30 | 22.66 | | | 0.29 | 3.94 | 2.25 |
| 95th-Percentile Queue Length [m] | 35.81 | 21.35 | 19.90 | 17.89 | 18.30 | 17.49 | 172.65 | | | 2.23 | 29.99 | 17.14 |

**Movement, Approach, & Intersection Results**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 30.89 | 23.72 | 23.98 | 28.69 | 23.46 | 23.67 | 35.67 | 35.67 | 35.67 | 10.95 | 11.01 | 10.54 |
| Movement LOS | C | C | C | C | C | C | D | D | D | B | B | B |
| Critical Movement | No | No | No | No | No | No | No | No | Yes | No | No | No |
| d_A, Approach Delay [s/veh] | 26.81 | | | 25.12 | | | 35.67 | | | 10.84 | | |
| Approach LOS | C | | | C | | | D | | | B | | |
| d_I, Intersection Delay [s/veh] | 26.78 | | | | | | | | | | | |
| Intersection LOS | C | | | | | | | | | | | |
| Intersection V/C | 0.637 | | | | | | | | | | | |

# Option 6: Traffic Signals + EBL Lane

| Number | 4 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | Central / Battleford | | | | | | | | | | | |
| Control Type | Signalized | | | | | | | | | | | |
| Analysis Method | HCM 6th Edition | | | | | | | | | | | |
| Name | Central Ave | | | Central Ave | | | Battleford Tr | | | Battleford Tr | | |
| Approach | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
| Lane Configuration |  | | |  | | |  | | |  | | |
| Turning Movement | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right |
| Base Volume Input [veh/h] | 27 | 55 | 46 | 39 | 52 | 1 | 104 | 108 | 104 | 9 | 85 | 72 |
| Total Analysis Volume [veh/h] | 129 | 96 | 81 | 68 | 91 | 64 | 219 | 226 | 229 | 15 | 212 | 126 |

**Intersection Settings**

| Cycle Length [s] | 70 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coordination Type | Time of Day Pattern Coordinated | | | | | | | | | | | |
| Actuation Type | Semi-actuated | | | | | | | | | | | |
| Lost time [s] | 0.00 | | | | | | | | | | | |
| Control Type | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss | Permiss |
| Signal group | 0 | 2 | 0 | 0 | 6 | 0 | 0 | 8 | 0 | 0 | 4 | 0 |
| Auxiliary Signal Groups | | | | | | | | | | | | |
| Lead / Lag | - | - | - | - | - | - | - | - | - | - | - | - |
| Minimum Green [s] | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 |
| Maximum Green [s] | 0 | 30 | 0 | 0 | 30 | 0 | 0 | 30 | 0 | 0 | 30 | 0 |
| Amber [s] | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 4.0 | 0.0 |
| All red [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Split [s] | 0 | 33 | 0 | 0 | 33 | 0 | 0 | 37 | 0 | 0 | 37 | 0 |
| Walk [s] | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 7 | 0 |
| Pedestrian Clearance [s] | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 20 | 0 |
| I1, Start-Up Lost Time [s] | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| Minimum Recall | | No | | | No | | | No | | | No | |
| Maximum Recall | | No | | | No | | | No | | | No | |
| Pedestrian Recall | | No | | | No | | | No | | | No | |
| Pedestrian Signal Group | 0 | | | | | | | | | | | |
| Pedestrian Walk [s] | 0 | | | | | | | | | | | |
| Pedestrian Clearance [s] | 0 | | | | | | | | | | | |

**Lane Group Calculations**

| g / C, Green / Cycle | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (v / s)_i Volume / Saturation Flow Rate | 0.10 | 0.05 | 0.06 | 0.06 | 0.05 | 0.05 | 0.19 | 0.29 | 0.02 | 0.12 | 0.09 |
| so, Base Saturation Flow per Lane [veh/h/ln] | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 |
| Arrival type | 3 | | | 3 | | | 3 | | | 3 | |
| s, saturation flow rate [veh/h] | 1232 | 1722 | 1474 | 1207 | 1722 | 1497 | 1169 | 1582 | 936 | 1722 | 1464 |
| c, Capacity [veh/h] | 629 | 824 | 705 | 614 | 824 | 717 | 365 | 554 | 151 | 603 | 512 |
| X, volume / capacity | 0.21 | 0.11 | 0.12 | 0.11 | 0.10 | 0.10 | 0.60 | 0.82 | 0.10 | 0.35 | 0.25 |
| d, Delay for Lane Group [s/veh] | 13.56 | 10.33 | 10.44 | 12.71 | 10.21 | 10.31 | 27.47 | 25.50 | 32.30 | 17.22 | 16.43 |
| Lane Group LOS | B | B | B | B | B | B | C | C | C | B | B |
| Critical Lane Group | Yes | No | No | No | No | No | No | Yes | No | No | No |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50th-Percentile Queue Length [veh] | 1.31 | 0.77 | 0.72 | 0.66 | 0.66 | 0.63 | 3.43 | 6.92 | 0.25 | 2.40 | 1.37 |
| 50th-Percentile Queue Length [m] | 10.01 | 5.85 | 5.47 | 5.03 | 5.01 | 4.81 | 26.12 | 52.70 | 1.89 | 18.29 | 10.45 |
| 95th-Percentile Queue Length [veh] | 2.36 | 1.38 | 1.29 | 1.19 | 1.18 | 1.14 | 6.17 | 11.23 | 0.45 | 4.32 | 2.47 |
| 95th-Percentile Queue Length [m] | 18.02 | 10.53 | 9.84 | 9.06 | 9.03 | 8.65 | 47.01 | 85.56 | 3.40 | 32.93 | 18.80 |

**Movement, Approach, & Intersection Results**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d_M, Delay for Movement [s/veh] | 13.56 | 10.33 | 10.44 | 12.71 | 10.22 | 10.31 | 27.47 | 25.50 | 25.50 | 32.30 | 17.22 | 16.43 |
| Movement LOS | B | B | B | B | B | B | C | C | C | C | B | B |
| Critical Movement | No | No | No | No | No | No | No | No | No | Yes | No | No |
| d_A, Approach Delay [s/veh] | 11.72 | | | 11.00 | | | 26.14 | | | 17.58 | | |
| Approach LOS | B | | | B | | | C | | | B | | |
| d_I, Intersection Delay [s/veh] | 19.19 | | | | | | | | | | | |
| Intersection LOS | B | | | | | | | | | | | |
| Intersection V/C | 0.392 | | | | | | | | | | | |