

## *Appendix 8.1-A*

### *Ajax Mine Traffic Impact Assessment*

AJAX PROJECT

**Environmental Assessment Certificate Application / Environmental Impact Statement  
for a Comprehensive Study**



*KGHM International Inc.*

# **Ajax Mine Traffic Impact Assessment**





*KGHM International Inc.*

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# Ajax Mine

## Traffic Impact Assessment

Prepared By

ORIGINAL SIGNED

Lindsay McCauley, EIT  
Assistant Transportation Engineer

Opus International Consultants (Canada) Limited  
Kelowna Office  
Suite 206, 2365 Gordon Drive  
Kelowna BC V1W 3C2  
Canada

Reviewed By

ORIGINAL SIGNED

Matthew Rodwell, CEng (UK)  
Senior Asset Management Consultant

Telephone: +1 250 868 4925  
Facsimile: +1 250 868 4923

Reviewed and  
Approved for  
Release By

ORIGINAL SIGNED

Barbara Thomas, P. Eng.  
Transportation Engineer

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# List of Acronyms

## General Acronyms

The acronyms used in this document and their unabbreviated titles are listed alphabetically in the table below:

Acronym	Unabbreviated Title
ADT	Average Daily Traffic
AIR/EISG	Application Information Requirements/Environmental Impact Statement Guidelines
AM	Morning
AMAR	Ajax Mine Access Road
BC	British Columbia
BCEAA	<b>British Columbia's Environmental Assessment Act</b>
CoK	City of Kamloops
EA	Environmental Assessment
EAO	Environmental Assessment Office
EB	Eastbound
EIS	Environmental Impact Statement
GLR	Goose Lake Road
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
Hwy	Highway
ITE	Institute of Transportation Engineers
KAM	KGHM Ajax Mining Inc.
LoS	Level(s) of Service
LLJR	Lac Le Jeune Road
m	Metres
MoTI	BC Ministry of Transportation and Infrastructure
MRSF	Mine rock storage facilities
NHS	National Household Survey
OD	Origin-destination
PM	Evening
PV	Personal Vehicle
SW	Southwest
TAC	Transportation Association of Canada
TDM	Transportation Demand Management
TIA	Traffic Impact Assessment
TMP	Transportation Management Plan
TMCP	Traffic Management and Control Plan
TNRD	Thompson-Nicola Regional District
ToR	Terms of Reference
TSF	Tailings Storage Facility
v/c	Volume-to-capacity
VC	Valued Component(s)
WB	Westbound

## Traffic Capacity Analysis Acronyms

The acronyms used in the traffic capacity analysis section of the document and their unabbreviated titles are listed in the table below:

Acronym	Unabbreviated Title
EBL	Eastbound – Left
EBT	Eastbound – Through
EBR	Eastbound – Right
EBLT	Eastbound – Left/Through
EBTR	Eastbound – Through/Right
EBLTR	Eastbound – Left/Through/Right
EBLTU	Eastbound – Left/Through/U-Turn
WBL	Westbound – Left
WBT	Westbound – Right
WBR	Westbound – Through
WBLT	Westbound – Left/Through
WBTR	Westbound – Through/Right
WBLTR	Westbound – Left/Through/Right
WBTRU	Westbound – Through/Right/U-Turn

Acronym	Unabbreviated Title
NBL	Northbound – Left
NBT	Northbound – Right
NBR	Northbound – Through
NBLT	Northbound – Left/Through
NBTR	Northbound – Through/Right
NBLTR	Northbound – Left/Through/Right
SBL	Southbound – Left
SBT	Southbound – Right
SBR	Southbound – Through
SBLT	Southbound – Left/Through
SBTR	Southbound – Through/Right
SBLTR	Southbound – Left/Through/Right
SBLRU	Southbound – Left/Right/U-Turn

# EXECUTIVE SUMMARY

## ES.1 Introduction

KGHM Ajax Mining Inc. (KAM) has proposed to build and operate an open pit copper-gold mine (the Project) at the historic Afton Mining Camp, south of Kamloops in the Thompson-Nicola Regional District, British Columbia.

As part of the Environmental Assessment requirements, the impacts of the anticipated traffic volumes must be estimated in a Traffic Impact Assessment (TIA). Opus was commissioned by KAM to prepare the TIA. A Terms of Reference (ToR) document was established to provide the assumptions upon which the traffic analysis would be based.

The ToR for this traffic impact assessment was completed in consultation with KAM and the Thompson-Nicola Regional District (TNRD), the City of Kamloops (CoK), and the Ministry of Transportation and Infrastructure (MoTI). The TNRD was involved in initial discussions to develop the ToR; however ultimately **deferred to MoTI's expertise in the area of transportation matters**.

The objectives of this traffic impact study are to:

- » Evaluate the traffic impacts of the Project on the existing road network;
- » Identify mitigation measures to address the traffic impacts;
- » Assess the network operation and property access impacts arising from changes to the road network;
- » Identify potential safety issues; and,
- » Develop conceptual designs for the access roads to the Project site.

Per the requirements provided by CoK and MoTI, derived in the ToR, the study area includes:

- » Highway 5 Inks Lake Interchange;
- » Lac Le Jeune Road / Ajax Mine Access Road intersection;
- » Copperhead Interchange;
- » Pacific Way Interchange;
- » Lac Le Jeune Road, Copperhead Drive to Inks Lake Road; and,
- » Goose Lake Road.

The overall life of the Ajax Project is roughly 30 years (including Construction, Decommissioning and Closure and Post-Closure phases). The construction phase will last approximately two years to substantial mechanical completion, followed by the 23 year operation phase. Decommissioning, closure and reclamation is expected to last up to 5 years.

## ES.2 Access Options Review

The Access Options Review involved a high level review of the design alternatives for the Inks Lake Interchange, LLJR and AMAR intersection, and typical AMAR cross-section. It is recommended:

- » Inks Lake Interchange be reconstructed using current TAC design guidelines and conceptual design Option 1;
- » The crossing of AMAR/LLJR be constructed with grade separation, as per conceptual design Option 3. If this option proves financially not viable, the crossing could be constructed as at-

grade with traffic signals, Option 2, including additional safety measures to accommodate high speed traffic on LLJR and heavy traffic on AMAR; and,

- » AMAR be designed to a 60 km/h, two-lane local rural undivided road standard, per MoTI design standards.

### ES.3 Traffic Analysis

The TIA considered the effects of Project generated traffic for the following horizon years: 2016 and 2018 Construction phase; and 2024 and 2039 Operations phase. The later phases of the Project, decommission, closure, and post-closure were not included in the analysis.

Base, total, and mitigated conditions were modeled using traffic capacity analysis software and outputs were then compared to acceptable operational thresholds specified by MoTI and CoK to determine the impacts of the Project generated traffic on the road network performance. Operational thresholds included levels of service, v/c ratios, queue lengths of waiting traffic, and delay per vehicle.

It was determined that the planned roundabout at Versatile Drive/Hugh Allan Drive has unacceptable Levels of Service before the addition of Project generated traffic, and, the Project traffic has only a **minor effect on the roundabout's performance.**

The analysis also indicated left turn storage bays are insufficient in base conditions by 2016 because of background traffic growth for a number of locations. Mitigated Project traffic conditions also show two locations have storage inadequacies: the eastbound left turn at Pacific Way and Hugh Allan Drive; and, the westbound left turn/through lane at Highway 1/Pacific Way. These two left turn storage bays are exceeded in the base conditions of 2016. Therefore, it can be concluded that the Project traffic has only a minor effect on these two locations.

Planned mitigation measures include shift staggering, busing of workers, and carpool incentives. Shift staggering and busing are scheduled to occur during construction, 2016 to 2018, and, carpooling is intended during all phases. These mitigation measures will be necessary to mitigate Project traffic impacts on the road network.

Traffic analysis included review of the feasibility of closing Goose Lake Road. The assessment concluded traffic volumes are low, approximately 50 vehicles per day, and users could reasonably reroute along higher quality roads. Some use types including recreational use will cease with the Project construction. It was therefore concluded closing GLR is feasible and has virtually no traffic impacts.

### ES.4 Road Conditions Assessment

The road safety and maintenance review included in-service reviews and documentation of existing road conditions, analysis of five-year collision histories for Inks Lake interchange and LLJR, and, assessment of the potential safety impact of Project traffic on the road network. The review also included an assessment of pavement maintenance impact on LLJR.

The in-service reviews brought to light some concerns at Copperhead Interchange which MoTI is aware of and working to address. A speed review led to the conclusion that speeding may be of concern on LLJR. The collision history analysis indicated that inclement weather and winter driving conditions may be contributing to collision propensity. Collisions appear to be linked to traffic volumes as they increased during busier times of the day and year. Safe driving behaviour of contractors and staff of KAM will be addressed in the TMP and detailed further in the TMCP.

Pavement analysis was completed for LLJR from AMAR north to Copperhead Interchange. The analysis indicated most of the pavement is in poor to very poor condition. During construction of Inks Lake Interchange and AMAR, the temporary addition of Project traffic is anticipated to affect reactive maintenance during the use of the road; however the temporary addition of Project traffic is not anticipated to have much effect on the overall lifespan of LLJR pavement. The deterioration of LLJR from Project traffic was estimated to have a fair value of \$60,000. It is recommended that KAM provide CoK with a one-time payment to address impacts of Project construction traffic on LLJR, and CoK complete maintenance projects on LLJR prior to Project use of the road, and/or, CoK use the funds to address reactive maintenance during the Temporary Access Plan use.

The southerly section of LLJR from AMAR south to Walloper Way Interchange was not analyzed because its design and construction were considered adequate to accommodate Project traffic during the Temporary Access Plan which is anticipated to be in place for six months.

## **ES.5 Conclusions**

The conclusions of the traffic impact assessment are:

- » All network effects of Project traffic can be mitigated.
- » The proposed mitigation measures, bus staging, shift staggering, and increased carpooling, will adequately mitigate the impacts of the Project traffic in all horizon years.
- » The mid-section of GLR may be closed with negligible impacts to traffic including bicycles, pedestrians, recreational, emergency services, heavy vehicles, ranching, and residential users.
- » Cleaning of drainage ditches and crack sealing on LLJR will reduce pavement deterioration, and maintaining LLJR during use will minimize impacts of Project traffic.
- » The recommended option for the Inks Lake interchange reconstruction is Option 1: All new diamond interchange at AMAR and Inks Lake Connection (West).
- » The recommended configuration of LLJR/AMAR intersection is Option 3: grade-separated movements with a connecting road to the north-west.

# 1 INTRODUCTION

## 1.1 Overview

This report provides an overview of the transportation issues associated with the development of an open pit copper-gold mine at the historic Afton Mining Camp, south of the City of Kamloops (CoK), British Columbia (BC). The report serves as a background document to the Environmental Assessment (EA) being prepared by KGHM- Ajax Mining Inc. and as a formal traffic impact assessment.

Opus International Consultants (Canada) Limited (Opus) was engaged by KGHM- Ajax Mining Inc. (KAM) to conduct a transportation impact assessment (TIA) study of the proposed Ajax Mine (Project). The Project is located mostly within the Thompson-Nicola Regional District (TNRD) and will produce concentrates of copper and gold that will be transported to Vancouver for shipping.

The scope of the impact analysis as provided herein is high level and consistent with the agreed Terms of Reference (Appendix A) and the requirements outlined the **Project's EA** Application Information Requirements (AIR) that have been formally approved and issued by the Environmental Assessment Office (EAO).

This report provides two levels of assessment:

- 1) The first addresses the transportation access options and issues between the existing Highway network and the proposed mine location, with particular attention to the selection of preferred intersection locations and general arrangements on Highway 5 and Lac Le Jeune Road.
- 2) The second level of assessment is at a traffic operations level that provides:
  - i. A full review of capacity and operational impacts at the existing Copperhead and Pacific Way interchanges in Kamloops and any other new intersections proposed by the project. This review is carried out at 4 horizon years:
    - 2016: Construction ramp-up
    - 2018: Peak Construction
    - 2024: Established Operations (short term)
    - 2039: Established Operations (long term)
  - ii. A full review of existing road safety and maintenance conditions on Lac Le Jeune Road and assessment of the likely impact arising from use of this route by mine construction traffic accessing the Project site.
  - iii. A high level review of the network operation and property access impacts arising from the proposed closure of the mid-section of Goose Lake Road.

Wider network impacts have not been analysed as part of this impact assessment, although some anticipated operational, safety and travel time implications are broadly identified and discussed based engineering judgement.

## 1.2 Study Purpose and Objectives

The objectives of this TIA are to:

- 1) Evaluate the traffic impacts of the Project on the existing road network;

- 2) Identify mitigation measures to address the traffic impacts;
- 3) Assess the network operation and property access impacts arising from changes to the road network;
- 4) Identify potential safety issues; and,
- 5) Develop conceptual designs for the access roads to the Project site.

The TIA will meet the requirements of the Environmental Impact Statement Guidelines (EISG) and the **Project’s Application Information Requirements (AIR)** by: identifying potential effects the Project generated traffic and network changes could have on identified Valued Components (VC); providing recommended mitigation measures; and, evaluating residual effects that may persist after the application of mitigation measures.

The TIA will include the information shown in Table 1 to assess the Project related potential effects, mitigation measures, residual effects, and cumulative effects.

**Table 1: TIA Information Requirements from AIR**

Potential Effects	Means of Addressing in the TIA
<p><b>Potential Effects to Infrastructure, Public Facilities and Services</b></p>	<p>Identify and analyze potential adverse effects resulting from the Project. For example:</p> <ul style="list-style-type: none"> <li>» Traffic capacity and congestion at selected study intersections resulting from trips to/from the Project.</li> <li>» Reduced road safety resulting from increased traffic volumes.</li> <li>» Impacts on properties, transportation modes, and connectivity resulting from road closures such as the Goose Lake Road closure.</li> <li>» Increased maintenance requirements due to heavy vehicles on vulnerable sections of the existing network such as LLJR.</li> <li>» Altered connectivity to/from existing road maintenance facilities and recreational areas</li> </ul>
<p><b>Mitigation Measures</b></p>	<p>Mitigation measures KAM will implement to mitigate potential effects include:</p> <ul style="list-style-type: none"> <li>» Implementation of Transportation Demand Management (TDM) strategies to reduce traffic volumes and congestion by busing during construction and carpooling during operations;</li> <li>» Staggering worker shift start and end times to reduce volumes at peak hours;</li> <li>» Contractual requirements for contractors and employees to use specific pre-determined access routes to travel to/from the Project;</li> <li>» Road safety improvement recommendations (e.g. signage, barriers, pavement markings, geometrics);</li> <li>» Construction of new accesses to ensure safe access for Project related vehicles; and,</li> <li>» Improving existing network connectivity via new roads and intersections that are related to Project impacts.</li> </ul>
<p><b>Residual Effects</b></p>	<p>Residual effects are those that may occur after consideration of mitigation measures. For example:</p> <ul style="list-style-type: none"> <li>» Traffic congestion effects remain;</li> <li>» Reduced road safety due to increased volumes;</li> <li>» Altered access to recreational sites; and,</li> <li>» Increased time required for maintenance contractors to access the road maintenance facility.</li> </ul>

Potential Effects	Means of Addressing in the TIA
<p><b>Cumulative Effects</b></p>	<p>Identification and description of existing or reasonably foreseeable projects or activities that have the potential to interact with the Project. Evaluate how residual effects of the Project could combine and interact with effects from other past, present, and future known projects to produce adverse cumulative effects. Cumulative effects analysis for traffic related effects include:</p> <ul style="list-style-type: none"> <li>» Interactions with other development traffic, such as the Casino on Versatile Drive, at study intersections (e.g. base versus total conditions); and,</li> <li>» Interactions with properties and transportation modes on Goose Lake Road affected by the road closure.</li> </ul>

The information requirements addressed in the TIA are specific and detailed for the transportation planning and engineering discipline. However, specific effects assessments for additional VCs will use results from the TIA for the assessment of potential socio-economic effects.

### 1.3 Report Structure

The TIA consists of five sections:

1) Proposed Project

This section contains description of the Project, the study parameters and methodology including the phases of development, study area, and access plan, and, the traffic capacity analysis parameters including study horizon years and base and future traffic data.

2) Existing Conditions

This section contains description of all roads impacted by the Project and adjacent land use. Also included in this section is a collision analysis for all roads in the study area.

3) Access Options Review

Within this section are descriptions of the route options for primary access, discussion and recommendations for Inks Lake Interchange design alternatives, discussion and recommendations for the LLJR/AMAR design alternatives, and, design criteria and recommendations for AMAR.

4) Traffic Analysis

The detailed traffic capacity analysis is presented in this section, including base, total, and mitigated conditions. Also presented in this section is the Goose Lake Road closure analysis.

5) Road Conditions Assessment

This section contains a road safety and pavement conditions review for all roads used in the temporary access plan.

### 1.4 Traffic Reporting Framework

This TIA forms part of a group of documents that collectively inform an understanding of the potential effects of the Project generated traffic and network changes, and describes the traffic management processes and procedures for managing those effects.

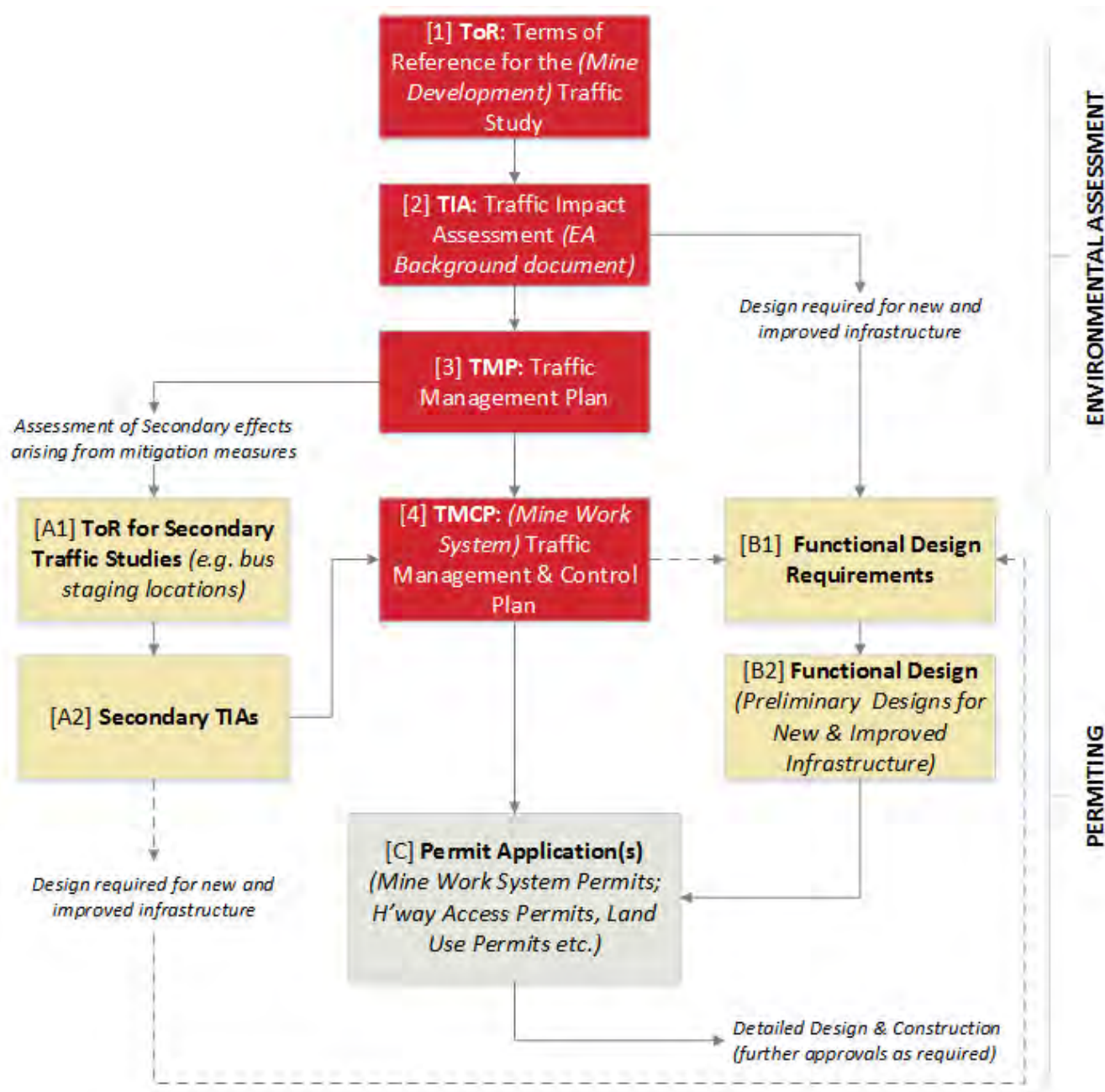


Figure 1: Traffic Reporting Framework

**[1] Terms of Reference (ToR):**

The ToR informs the Traffic Impact Assessment (see next). The ToR are important for establishing agreement between key stakeholders (specifically KAM, CoK and the BC MoTI) on how the Traffic Impact Assessment for the development should be carried out, including assumptions, methodology, data requirements, and parameters for conceptual road designs, safety analysis, and mitigation measures. It allows Provincial permitting agencies to provide input to the process and ensure that their

concerns (and by extension those of the stakeholders the authorities represent) are fully addressed in the study.

### **[2] Traffic Impact Assessment (TIA):**

The TIA report documents the traffic analysis outcomes. Its goal is to identify and quantify potential effects the Project generated traffic and network changes will have on performance of the existing transportation networks and to recommend appropriate mitigation measures. The TIA informs the Traffic Management Plan (see next).

### **[3] Traffic Management Plan (TMP):**

The TMP identifies the traffic management processes and procedures necessary to safely implement mitigation and manage any residual effects that may persist after the application of mitigation measures. It forms part of the Environmental Management System proposed in the EA application. The TMP informs the Traffic Management and Control Plan (see next).

### **[4] Traffic Management and Control Plan (TMCP):**

The TMCP is a more detailed version of the TMP that is required under the BC *Mines Act* and *Transportation Act*. The TMCP describes the processes and procedures that will be implemented as outlined in the TMP. It provides detailed requirements for the design of any transport infrastructure improvements (see [B] below) and any other mitigation measures.

### **[4A] Secondary Traffic Studies:**

Mitigation measures identified in the TMP for the Environmental Assessment may create secondary traffic effects and require Permits in their own right from controlling authorities (e.g. Park & Ride Facilities). Studies may require a Traffic Impact Assessment per agreed ToR and as required by MoTI and CoK.

### **[4B] Functional Design**

Preliminary design of any new and improved highway infrastructure required for the proposed development and mitigation effects is part of the permit application. Design requirements must be agreed with the highway authority and the level of design development required for the Transportation Design Report must at least be to the functional design level (the horizontal and vertical geometric design for the phase preceding the development of the final detailed, design drawing).

# PROPOSED PROJECT

**IN THIS SECTION:**

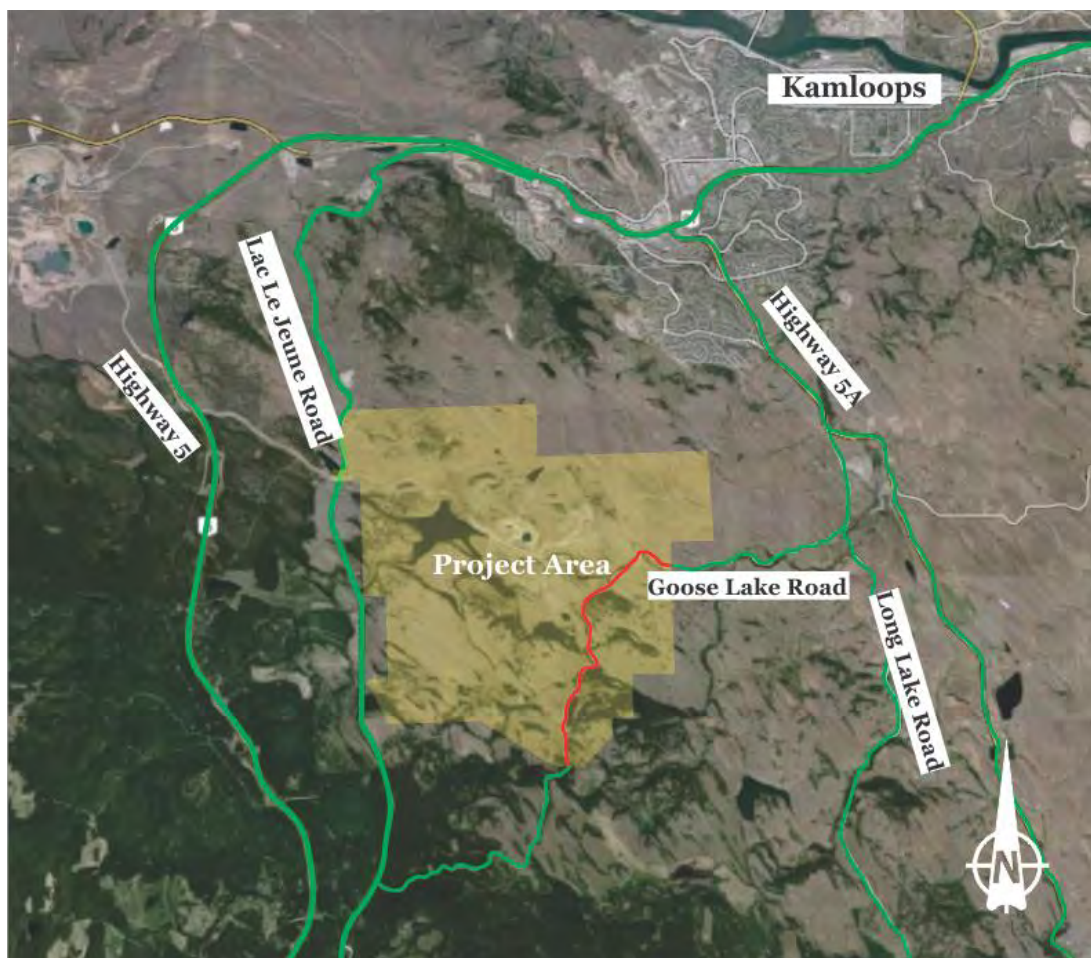
- Project Description
- TIA Study Parameters
- Methodology and Traffic Capacity Analysis Parameters\*

\* Note: Detailed modelling parameters can be found in the ToR.

## 2 Project Description

KGHM Ajax Mining Inc. proposes to develop the Ajax Project (Project), an open pit copper-gold mine at the historic Afton Mining Camp, south of the Kamloops, British Columbia (BC). The Project is located in the South-Central Interior of British Columbia, southeast of the junction of the Trans-Canada Highway (No. 1) and the Coquihalla Highway (No. 5), within the Thompson Nicola Regional District.

The general project area is shown below in Figure 2:



**Figure 2: General Project Area**

The Project lies in the traditional territory of the Secwepemc Nation. Within the Secwepemc Nation, the **Tk'emlúps te Secwepemc** and the Skeetchestn Indian Band are the Aboriginal groups in proximity to the

Project. **In a cooperative effort, the Tk'emlúps te Secwepemc and Skeetchestn Indian Bands have formed the Stk'emlupsemc te Secwepemc Nation (SSN), as a division of the greater Secwepemc Nation. The Ashcroft Indian Band and Lower Nicola Indian Band, whose members are part of the Nlaka'pamux Nation also assert their Aboriginal rights to the Project area- an area of common interest with the SSN.**

The Ajax property includes two historic pits: the Ajax West Pit, and the Ajax East Pit. Both pits were formerly mined in the 1980s and 1990s. As many as 25 rock types have been recognized in the Project area, some of which are “hybrid” units resulting from the intermixing of multiple rock types.

Key Project facilities include the Tailings Storage Facility (TSF), which is planned as a conventional tailings storage facility; water management ponds; Peterson Creek diversion, and the Tailings Embankments, which will be constructed using mine rock; and four mine rock storage facilities (MRSFs). The four MRSFs include:

- » The South Mine Rock Storage Facility (SMRSF);
- » East Mine Rock Storage Facility (EMRSF);
- » Tailings Embankment Mine Rock Storage Facility (TEMRSF); and,
- » The In-Pit Mine Rock Storage Facility (IPMRSF).

Several facilities that will be part of the operation phase but not remain after project closure include the:

- » Plant facilities and administration buildings;
- » Reclamation stockpiles;
- » Explosives facility;
- » Truck stop and fuel storage;
- » Power lines; and,
- » Access roads.

The mine plan for the Project predicts an operation based on a mill throughput of 65,000 tonnes of ore per day from the Ajax Pit with up to a 23 year mine life. The construction phase of the Project will be approximately two and a half years, and following the 23 year operation the decommissioning and closure phase is expected to take up to 5 years. Over the mine life the Project will produce approximately 140 million pounds of copper and 130,000 ounces of gold annually with the concentrate shipped by truck to the Port of Vancouver.

The proposed General Arrangement is presented below in Figure 3:

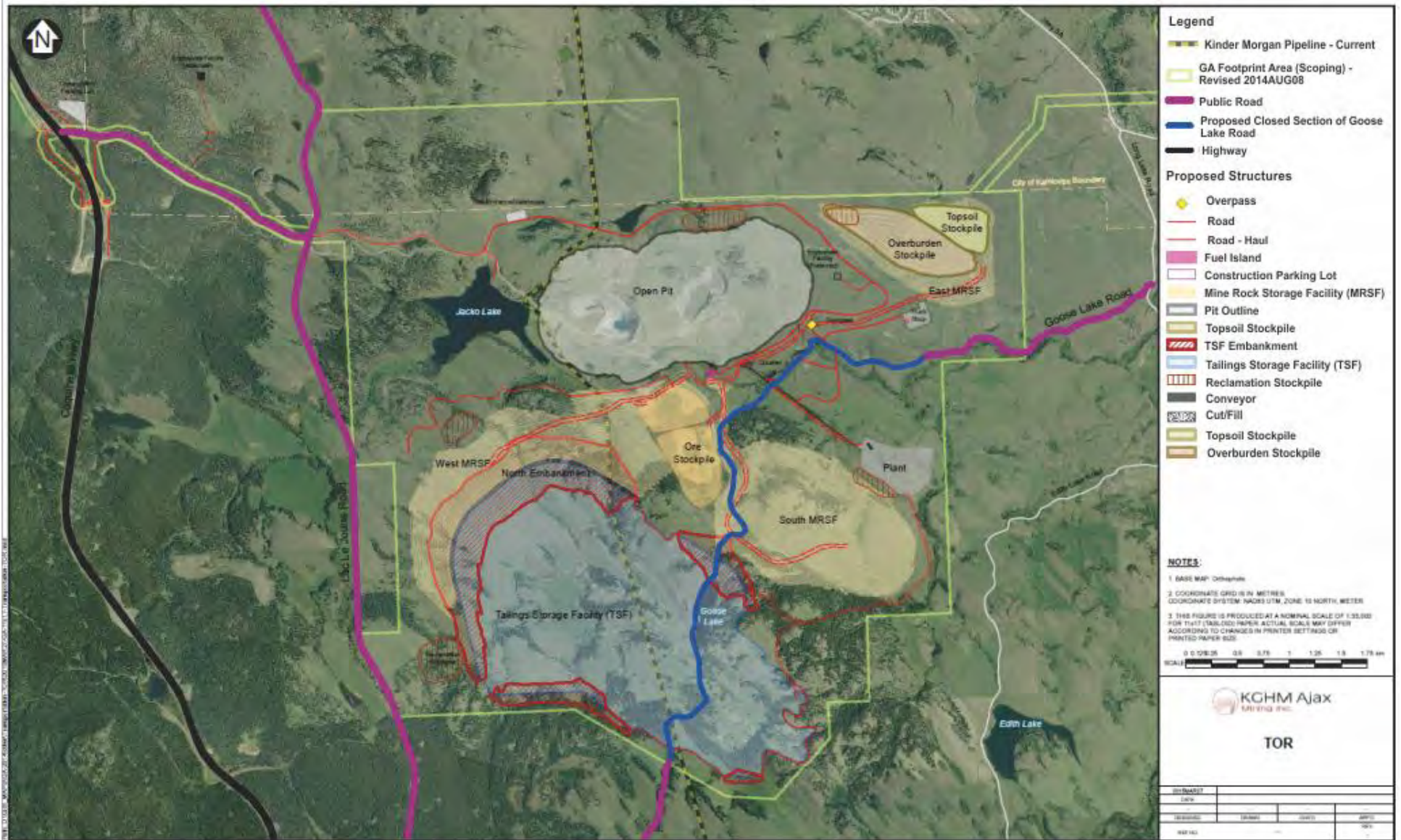


Figure 3: Proposed General Arrangement

## 2.1 Project Phasing

The proposed Project consists of four distinct phases: Construction, Operation, Decommissioning and Closure, and Post-closure. For the purpose of this traffic capacity analysis, only the first two stages are considered.

KAM anticipates the Project construction phase will begin in the fourth quarter of 2016 and carry through to the second quarter of 2019. Over this two-and-a-half year period, the majority of equipment and materials will be brought onto site to construct the mining facilities and prepare for operations. The Project will be commissioned in the second quarter of 2019 and operations are expected to start by the end of the second quarter of 2019.

The Project is expected to operate for 23 years from the start of operations on a 24 hours/day, 7 days a week schedule throughout its operational life.

**Table 2: Project Development Summary**

Assessment Input		Assumption
<b>Construction duration</b>		Quarter 4 2016 to Quarter 2, 2019
<b>Operations Start</b>		Quarter 2, 2019
<b>Operations duration</b>		23 years
<b>Decommissioning and Closure</b>		5 years, Start approximately 2042
<b>Post closure</b>		2+ years
<b>Horizon Years for Impact Assessment</b>		2016 & 2018 (Construction); 2024 & 2039 (Operations)
<b>Shifts:</b>	Construction	12 hrs/day, 7 days/week
	Operations (Mine Process & Maintenance)	24 hr working, 12 hr shifts, 7 days/week
	Operations (Non-Shift)	8:00 am - 6:00 pm, Mon - Fri

**Table 3: Estimated Construction Phasing Timeline**

Year:	2016		2017			2018		2019	
Quarter:	Q1-Q3	Q4	Q1	Q2-Q3	Q4	Q1-Q3	Q4	Q1	Q2
Description	EA Submission & Project Approval	Project on-site Construction phase starts	Construction Ramps Up	Peak Construction Period	Construction Ramps Down	Construction Phase Complete	Project Operations Begin		
Access Plan		Temporary Access Plan	Primary Access Plan						
Access Description	Early works construction of LLJR / Mine Access Road intersection.	Light vehicle traffic routed through Copperhead Interchange. Heavy traffic routed via Walloper Way Interchange. Construction of new/upgraded Highway 5 Interchange and Mine Access Road.	Project vehicle traffic routed via new/upgraded Highway 5 Interchange and Mine Access Road.						
Total Staff On-Site		400	1200	1800	1200	800	580 Permanent Staff		
Heavy Loads per Quarter		200*	400		300	150	2100		

\* Construction phase heavy vehicles access Project only via the Walloper Lake Interchange

## 2.2 Project Access Plans

The Project requires a temporary access plan to allow for transportation infrastructure improvements prior to implementation of a permanent access plan that will then be used for the life of the Project. The permanent Project access plan requires construction of a new interchange on Highway 5 in the vicinity of the existing Inks Lake Interchange.

Prior to completion of the new interchange, Project-related traffic will be contractually required to use temporary access arrangements via the Copperhead Interchange and LLJR as per the Temporary Access Plan shown in Figure 4. KAM will upgrade the LLJR and AMAR intersection as advanced work prior to construction of the Project to ensure safe, functional access to the Project site for existing operations. This work will also benefit access to Jacko Lake by improving sight distance and facilitating left turn movements as well as to Inks Lake through an upgraded crossing. While the temporary access plan is in effect, all heavy vehicles will be required to access and egress the Project via LLJR and the Walloper Way Interchange:

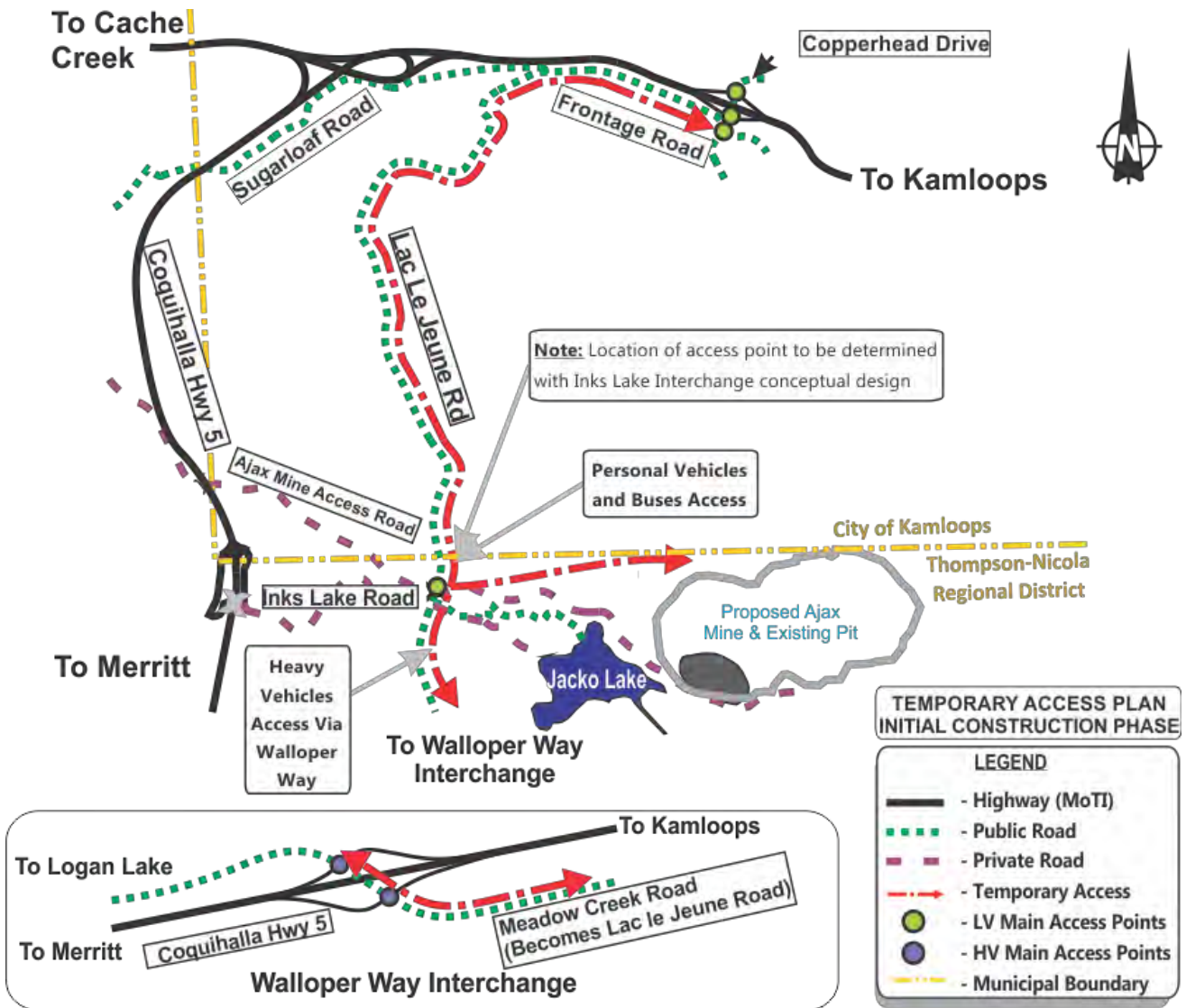


Figure 4: Temporary Access Plan for Initial Construction Phase

As previously mentioned, KAM will reconfigure and/or rebuild the intersection at LLJR and AMAR as part of an early works program during the Construction phase, to enable safe and efficient access to the mine site from the public highway network as per the Temporary Access Plan. The Temporary Access Plan will be effective from the start of mine construction and is anticipated to be in use for approximately 6 months during which time the construction of the new and improved infrastructure necessary for the Primary Access Plan will take place. While Project traffic is using the Temporary Access Plan KAM will: upgrade/construct the new Inks Lake Interchange and improve the AMAR to public road standards as required. Once road upgrades and construction are complete, all Project traffic will be routed through the upgraded Inks Lake Interchange and along the AMAR as shown in Figure 5. The Primary Access Plan will be in effect for the remaining life of the Project with road infrastructure upgrades remaining in place for public use post Project closure.

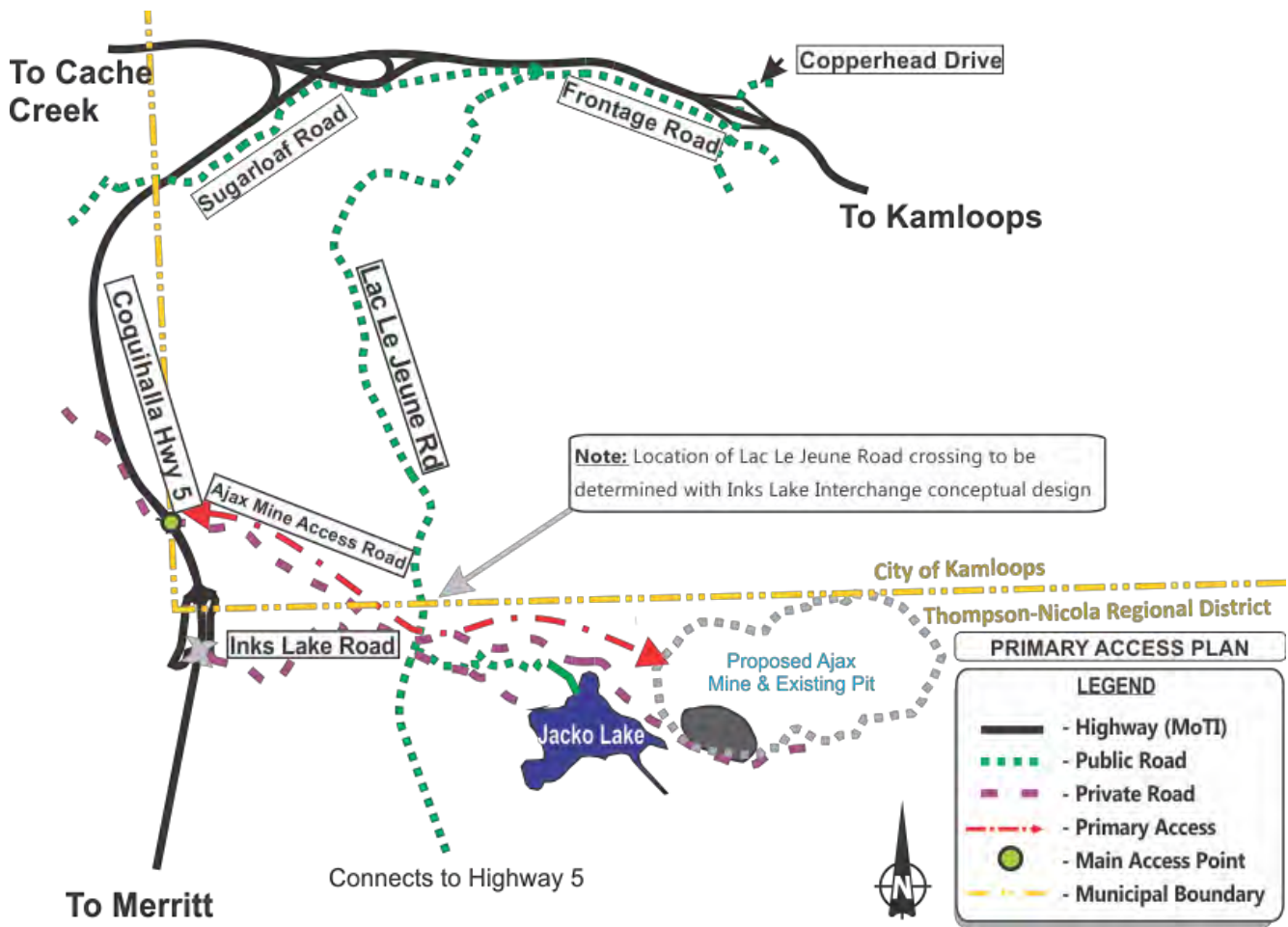


Figure 5: Primary Access Plan

## 3 TIA Study Parameters

This chapter presents the study parameters used for the TIA. Study parameters were established in the ToR, provided in Appendix A.

### 3.1 Terms of Reference

The Terms of Reference (ToR) describes the scope of the TIA, including data collection, assumptions, methodology, conceptual road designs, safety analysis, mitigation measures, and the organization of the report. It is developed in consultation with stakeholders so that they may provide input to the process and agree to the scope of the study. In this way, it is planned that the concerns of Provincial and Municipal agencies may be fully addressed, and by extension those of the stakeholders the agencies represent.

The ToR for the TIA were developed through comprehensive consultation between KAM, Opus, CoK, Thompson-Nicola Regional District (TNRD) and MoTI. Although involved initially, the TNRD deferred **to MoTI's transportation expertise to address TNRD concerns. CoK and MoTI staff reviewed and approved the ToR prior to the commencement of the TIA.**

KAM, MoTI, and Opus held a start-up meeting on April 23, 2014 and a capstone meeting on July 10, 2014 to discuss the parameters of the ToR. Over the course of a year, the ToR were discussed and amended multiple times to address concerns raised by MoTI and CoK. The ToR were finalized on April 8, 2015 and is included as Appendix A.

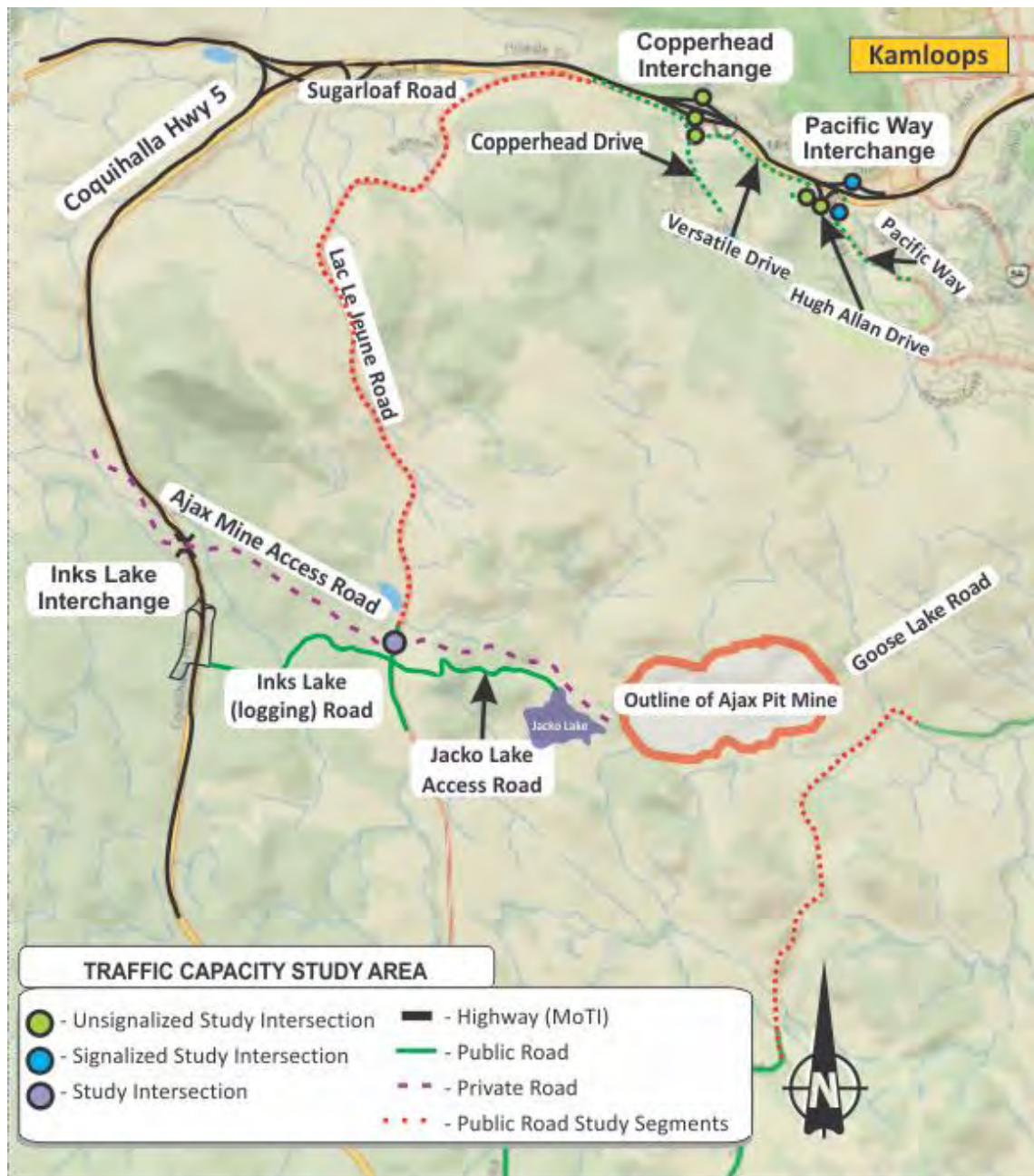
There are nine components to the ToR: background information; study parameters; construction phase conditions; operations phase conditions; mitigation strategies; project access conceptual designs; Goose Lake Road closure impacts; road safety and conditions review; and references.

### 3.2 TIA Study Area

The TIA study area includes the following highway and road segments:

- » Highway 5 from Pacific Way Interchange south to Inks Lake Interchange;
- » LLJR from Copperhead Interchange south to the Jacko Lake access road;
- » Goose Lake Road within the KAM Project limits; and,
- » AMAR from Highway 5 east to LLJR.

The study area for the TIA is shown in Figure 6:



**Figure 6: Traffic Capacity Analysis Study Area**

Traffic operations were assessed at the following locations:

- » Proposed Inks Lake Interchange configuration
- » Proposed LLJR/AMAR intersection
- » Copperhead Interchange
  - Frontage Road / Copperhead Drive Intersection
  - Hwy 1 WB On-Off Ramps / Copperhead Drive Intersection
  - Hwy 1 EB On-Off Ramps / Copperhead Drive Intersection

- » Pacific Way Interchange
  - Hwy 1 EB On-Off Ramps / Hugh Allan Drive Intersection
  - Pacific Way / Hugh Allan Drive Intersection
  - Hwy 1 WB On-Off Ramps / Pacific Way Intersection
  - Versatile Drive / Hugh Allan Drive Intersection

### 3.2.1 Study Location Laning & Controls

Intersections in the study area have various forms of laning and control. Laning refers to the number of through lanes, the presence or absence of right turn and left turn lanes, and which lanes share functions such as combined left and through movements. Control refers to the presence of stop signs or traffic signals. The existing laning and controls for the study intersections in this TIA are shown in Figure 7.

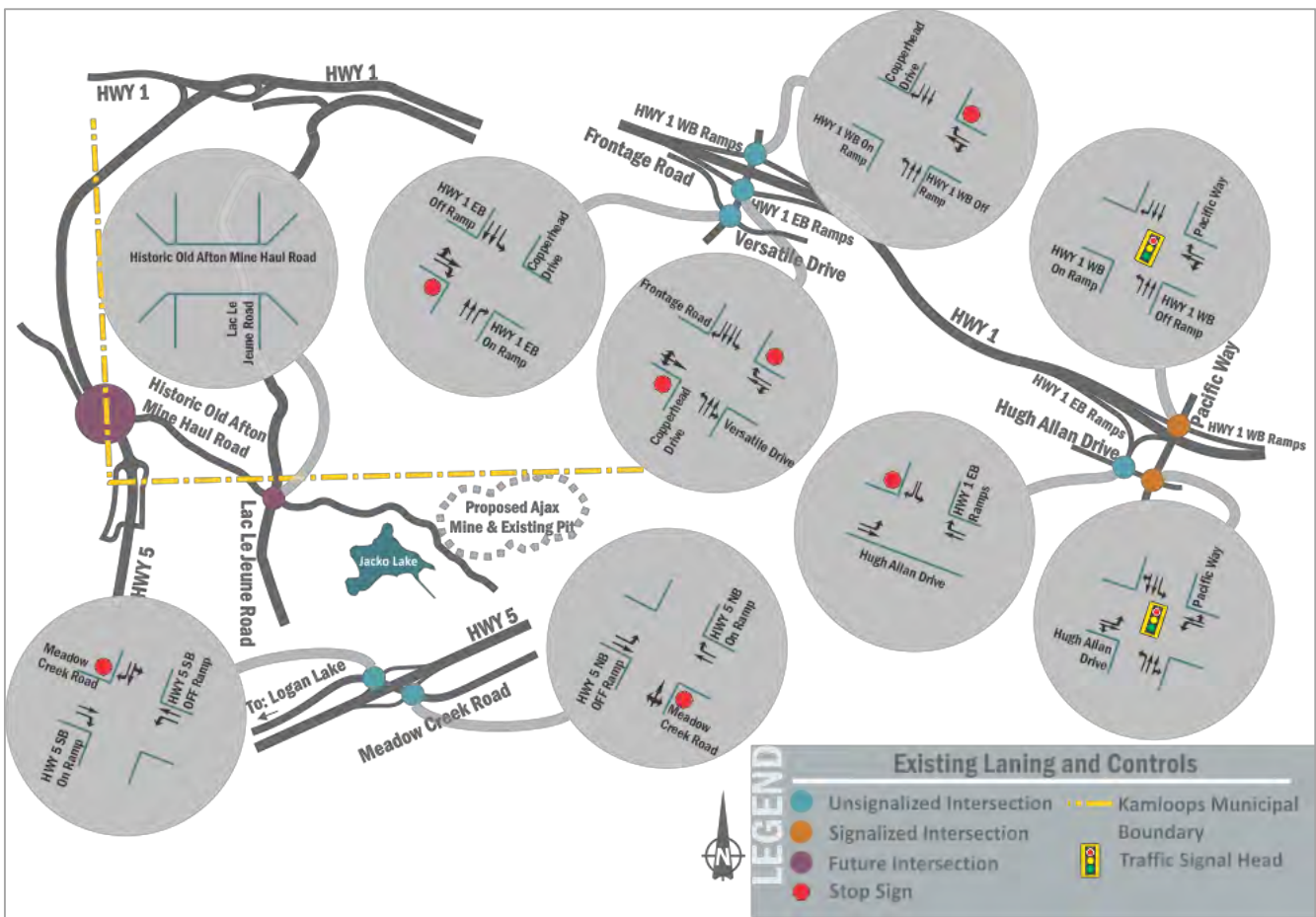


Figure 7: Existing Intersection Laning and Controls

## 4 TIA Methodology

This TIA is comprised of the following assessment elements:

- » Access Improvement Options Assessment.
- » Traffic capacity analysis;
- » Goose Lake Road Closure Assessment; and
- » Lac Le Jeune Road Safety and Maintenance Conditions Review.

Together, these elements provide a comprehensive assessment of the potential traffic and transportation effects related to the proposed Project.

An outline of the methodology used for each assessment element is given below.

### 4.1 Access Improvement Options Assessment

Approval and permitting of new and improved access off the public road network falls under the jurisdiction of MoTI and CoK. Specifically, improvements to Inks Lake Interchange and the majority of the proposed AMAR are under MoTI jurisdiction. A portion of the proposed AMAR falls within the **CoK's jurisdiction** and the **intersection of AMAR and LLJR is under MoTI's jurisdiction**.

Prior to submitting designs for approval to relevant jurisdictions as part of the permitting process, a key step is to gain approval of conceptual design elements including routes and intersection configurations.

For this TIA, a series of conceptual design options were created for review prior to recommendation of a preferred option. Preferred options were selected upon presentation to and feedback provided by MoTI.

Conceptual designs are based on a site visit and desktop study of the location, land ownership, available topographic data, and current geometric design standards. Eight conceptual options for each location were compared using un-weighted criteria that considers:

- Connectivity;
- Lane balance and function;
- Traffic operations; Level of investment;
- Ongoing operational costs; and,
- Road safety.

For details of conceptual designs, refer to Section 9.

### 4.2 Traffic capacity analysis

Trafficware Synchro 8 and SimTraffic using Highway Capacity Manual 2010 methodology were used to model traffic performance of the study intersections. Traffic capacity analysis of the study intersections was completed using input parameters defined in Section 2.9 of the ToR.

Table 4 provides intersection approach performance thresholds used to determine if recommendations for roadway modifications are required. These parameters have been reviewed and accepted by CoK and MoTI.

**Table 4: Network Performance Parameter Thresholds**

Performance Indicator	Thresholds
<b>HCM Level of Service (LoS)</b>	<ul style="list-style-type: none"> <li>» Overall LoS C or better for the overall intersection.</li> <li>» LoS C or better for turning movements on Higher Order Roads intersecting with Lower Order Roads.</li> <li>» LoS D or better for turning movements on Lower Order Roads Intersecting with Higher Order Roads.</li> </ul>
<b>HCM Volume to Capacity Ratio (v/c)</b>	<ul style="list-style-type: none"> <li>» <math>v/c \leq 0.80</math> for mainline (highway) through movements</li> <li>» <math>v/c \leq 0.85</math> for all other turning movements</li> </ul>
<b>HCM 95<sup>th</sup> Percentile Queue Length</b>	MoTI left turn warrant, or if required for safety. Turn bay storage length will be determined using Synchro output for 95 <sup>th</sup> percentile queue length.

### 4.3 Goose Lake Road Closure Assessment

Currently, Goose Lake Road is a public road used for recreational purposes (photography, cycling, horseback riding, etc.), the movement of cattle, and access for some land parcels. To facilitate construction and operation of the Tailings Storage Facility (TSF), KAM proposes the closure and decommissioning of a section of Goose Lake Road by MoTI. The section of the road proposed for closure is **between KAM’s southern and northern property limits as shown in Figure 2.**

To assess the effects of this closure, Opus collected data, contacted residents and users, evaluated alternate routes and included recommendations for mitigation based on the analysis of:

- » Private and Crown land parcels that will no longer have road access (e.g. parcels that will become “islands”) as a result of the closure;
- » Private and Crown land parcels that already do not have road access (e.g. parcels that are already “islands”);
- » Existing usage of Goose Lake Road by collecting qualitative information from discussions with potentially affected ranchers and residents, and quantitative traffic count data;
- » All transportation modes such as bicycles, pedestrians, personal vehicles, etc.;
- » Connectivity for commuting vehicles, road maintenance activities, and emergency vehicles; and,
- » The potential for increased volumes on other roadways as a result of the closure.

### 4.4 Lac Le Jeune Road Safety and Pavement Review

#### 4.4.1 Road Safety Review

An in-service road safety review was performed to assess current safety concerns on a section of a road network and estimate any effects on safety performance of development related changes to traffic mix and volume.

The road safety review assesses the sections of the existing network included in the Temporary Access Plan (Copperhead Intersection & LLJR) as the in-service roads that would be potentially affected by the Project traffic. The assessment was carried out by site visit and included examining existing road conditions for signage, markings, road width and edging, lighting and sightline issues, and making recommendations for improvements. The in-service road safety review included the following locations:

- » Copperhead Interchange;
  - Highway 1/5 WB On/Off Ramps and Copperhead Drive intersection for full length of merge/diverge lanes;
  - Highway 1/5 EB On/Off Ramps and Copperhead Drive intersection for full length of merge/diverge lanes; and
  - Frontage Road (Versatile Drive)/Copperhead Drive Highway 1/5 WB On/Off Ramps and Copperhead Drive intersection for full length of merge/diverge lanes.
- » AMAR overpass at LLJR; and
- » LLJR from Versatile Drive/Copperhead Drive intersection to 1 kilometre south of the existing AMAR overpass.

#### **4.4.2 Pavement Conditions Assessment**

A pavement condition review is performed to assess current condition of a section of a road network and estimate the effect (in physical and monetary terms) that development related changes to traffic mix and volume may have on the maintenance cost and remaining life of the section.

The pavement conditions review assessed the sections of the existing network included in the Temporary Access Plan that are not already carrying high volumes of heavy commercial vehicles. The Temporary Access Plan will be in place during construction of Inks Lake Interchange and AMAR, a period of six months. The assessment is therefore limited to LLJR between Copperhead Drive and the AMAR. The outcome of the analysis included a financial estimate of the degradation that will likely occur as a result of Project traffic using LLJR while Inks Lake Interchange and the AMAR are under construction. Knowing this financial assessment, recommendations can be made with regard to this aspect of mitigation of Project traffic impacts on LLJR.

## 5 Traffic Capacity Analysis Parameters

A detailed description of parameters and assumptions for the Traffic Capacity Analysis can be found in the Terms of Reference (Appendix A). For ease of reference, key parameters are presented here.

### 5.1 Study Horizon Years

For the purposes of this study, base condition refers to existing (i.e. pre-Project) background traffic plus other development trips and growth that is projected to happen in the area regardless of the proposed Project. Total conditions refers to base conditions plus Project generated trips. The horizon years for assessing base and total conditions' capacity were determined by CoK and MoTI, and include:

- » 2016 – construction phase horizon year (access provided through existing road network using temporary access plan prior to upgrade of Inks Lake Interchange);
- » 2018 – peak construction phase horizon year (assumes new Inks Lake Interchange complete);
- » 2024 – typical operations phase horizon year; and,
- » 2039 – long-term operations phase horizon year.

The 2016 horizon year represents the traffic conditions at the start of construction while the temporary access plan is in effect.

The 2018 horizon year represents peak construction traffic conditions while the primary access plan is in effect.

The 2024 and 2039 horizon years represent typical Project operation phase traffic conditions, and align with the horizon years being used in other strategic regional transportation studies on related sections of the network including:

- » Kamloops Highway and Local Roads Interface Study (the Interface Study) undertaken by MoTI and CoK (Urban Systems Ltd, 2013); and,
- » Highway 1/5 Southwest Industrial Access Study undertaken by MoTI.

Excluded from the TIA are decommissioning, closure, and post-closure phases of the Project. These activities will occur after the typical long-term planning period of 25 years, and are anticipated to generate considerably less traffic than construction and operations phases of the Project.

The traffic capacity analysis assesses study intersections in the morning (AM) and evening (PM) adjacent street peak hour traffic periods for each horizon year, which were determined to be 07:30-08:30 and 16:30-17:30 respectively.

### 5.2 Base Traffic Data

Base traffic data was used as part of the TIA from multiple sources dependent upon study area. The following provides a summary of base data sources for each study area.

#### 5.2.1 Copperhead and Pacific Way Interchanges

Base 2011 traffic data was extracted from the aforementioned Interface Study for the Copperhead Interchange and Pacific Way Interchange study intersections.

### 5.2.2 Lac Le Jeune Road

Tube-counted traffic data was collected along LLJR in two locations during 2012. The data was collected over 5 days from July 26 to July 30 and captured vehicle classification and speed data. Traffic during this period ranged from motorcycles (smallest vehicle) up to multi-trailers with seven or more axles (**largest vehicle**). Tube counter 'A' collected data approximately 175 meters north of the AMAR overpass of LLJR. Bicycles were not observed to be a part of the traffic recorded during the LLJR traffic count.

### 5.2.3 Highway 5 - Inks Lake Interchange to Highway 1 Interchange

The TIA includes data from the permanent count site owned by MoTI, Ironmask P-21-3NS-C for mainline movements at the upgraded Inks Lake Interchange. Traffic data is not currently available from MoTI for the Inks Lake Interchange ramps and terminal intersections. However, traffic data was collected by Opus at the Inks Lake Interchange on- and off-ramps during the midday peak period on November 4, 2014. To ensure that the results derived from the analysis are conservative, a seasonal factor was applied to convert the data from November to July and an hourly factor applied to convert the midday peak hour volumes to AM peak and PM peak hour volumes.

### 5.2.4 Goose Lake Road

Traffic data was collected on Goose Lake Road near Goose Lake itself on Friday April 10 and Saturday April 11, 2015. The data was collected via video which allowed both the numbers and the types of users to be identified. Users were observed to be bicycle, pedestrian, passenger vehicle, light goods trucks, and single unit trucks.

## 5.3 Background Growth & Development

This section describes background growth rates assumed and major developments that could impact traffic in the study area to create base conditions at each horizon year. The growth rates and developments that have been incorporated were confirmed by the CoK and MoTI.

### 5.3.1 Background Growth

The background traffic volumes were extracted from the Interface Study, starting with 2011 and applying the growth rates to determine horizon year volumes.

#### 5.3.1.1 Background Developments

Background developments are defined as the reasonably foreseeable future developments independent of the Project. A number of background developments are planned for the study area and have been assessed in other strategic regional transportation studies, including:

- » Iron Mask Development – proposed industrial area;
- » Domtar Development – proposed industrial area;
- » Gateway Casino Development – recently approved development;
- » 1775 Versatile Drive/1730 Hugh Allan Drive – proposed commercial shopping centre, restaurant, and hotel area;
- » 1475 Hugh Allan Drive – proposed hotel and restaurant; and,
- » Aberdeen Highlands – proposed residential growth.

At the request of CoK and MoTI, traffic volumes from only one of the six known developments, the Gateway Casino development was included in the study. The Gateway Casino development, located at 1555 Versatile Drive, is expected to be completed by 2016. Predicted background trips associated with the casino were provided by the CoK and incorporated in this study.

The other five developments, should they proceed, will impose new traffic on the road network. By excluding them from this TIA, the traffic created by the Project is of greater proportion to anticipated total traffic, and therefore greater impact, to the base conditions than it would be if the other five developments were included. Therefore this choice to exclude these proposed developments exaggerates the share of traffic impacts associated with the Project and thereby produces conservative results from the traffic capacity analysis.

### **5.3.1.2 Inks Lake Interchange**

The growth rate for the Inks Lake Interchange terminal intersections and Highway through traffic was calculated using the permanent count station data at the Ironmask P-21-3NS-C count site. Highway through movements were used and rounded up to the next 0.5 %. The growth rate was determined to be linear at 3.0% per year.

### **5.3.1.3 Ajax Mine Access Road/Lac Le Jeune Road intersection**

The growth rate for all the movements at AMAR/LLJR intersection was calculated from the permanent count station data at the Ironmask P-21-3NS-C. It was determined to be a linear factor of 2.78% per year.

### **5.3.1.4 Copperhead and Pacific Way Interchanges:**

A 1.2% growth rate (obtained from the Interface Study) was applied for all turning movements at the Copperhead and Pacific Way Interchange study intersections.

## **5.3.2 Coordination with Highway 1/5 Access Study and Interface Study**

MoTI is undertaking a Highway 1/5 Corridor Access Study in order to plan for access needs to future development anticipated in the Ironmask area of Kamloops. The corridor study will assess development in the southwest industrial area of Kamloops, including the Ajax Mine project. KAM and Opus have prepared this TIA in coordination with the Highway 1/5 Corridor Access Study, and as per the ToR. Including development conditions identified in the access study ensures that this TIA reflects as accurately as possible future traffic conditions in the study area.

## **5.3.3 Base Network Improvements**

Multiple improvements are planned for the road network independent to the Project and will be completed by others. The goal of these planned network improvements is to improve levels of service. As per MoTI and CoK requirements, planned network improvements included in the TIA base conditions included:

- » Hugh Allan Drive and Versatile Drive – one-lane roundabout with westbound right-turn slip lane;
- » Highway 1/5 eastbound on/off ramp – access restrictions to left-in and right-in/out only (all southbound left-turn traffic will turn right and U-turn at the proposed Versatile Drive/Hugh Allan Drive roundabout);
- » Copperhead Drive and Versatile Drive – new traffic signal;

- » Copperhead Drive and Highway 1/5 westbound on/off-ramp – new traffic signal; and,
- » Hugh Allan Drive – addition of one westbound lane between Pacific Way and Versatile Drive.

Network improvements are assumed to be constructed by the year 2016, and were modelled using Trafficware Synchro 8 and SimTraffic for all horizon years (2016, 2018, 2024, and 2039). Detailed designs for the planned improvements were not available at the time of this study.

The background network improvement assumptions do not include other recommended improvements identified in the MoTI access study or the South West Industrial Access Study.

# EXISTING CONDITIONS

- IN THIS SECTION:**
- Road characteristics
  - Road Safety
  - Adjacent Land Use

This section describes existing road and adjacent land use conditions for areas of the existing network included within the Temporary and Primary Access Plans (refer to Figure 4 and Figure 5). Description of the existing conditions also includes a collision analysis of the whole study area (Chapter 7.2.3).

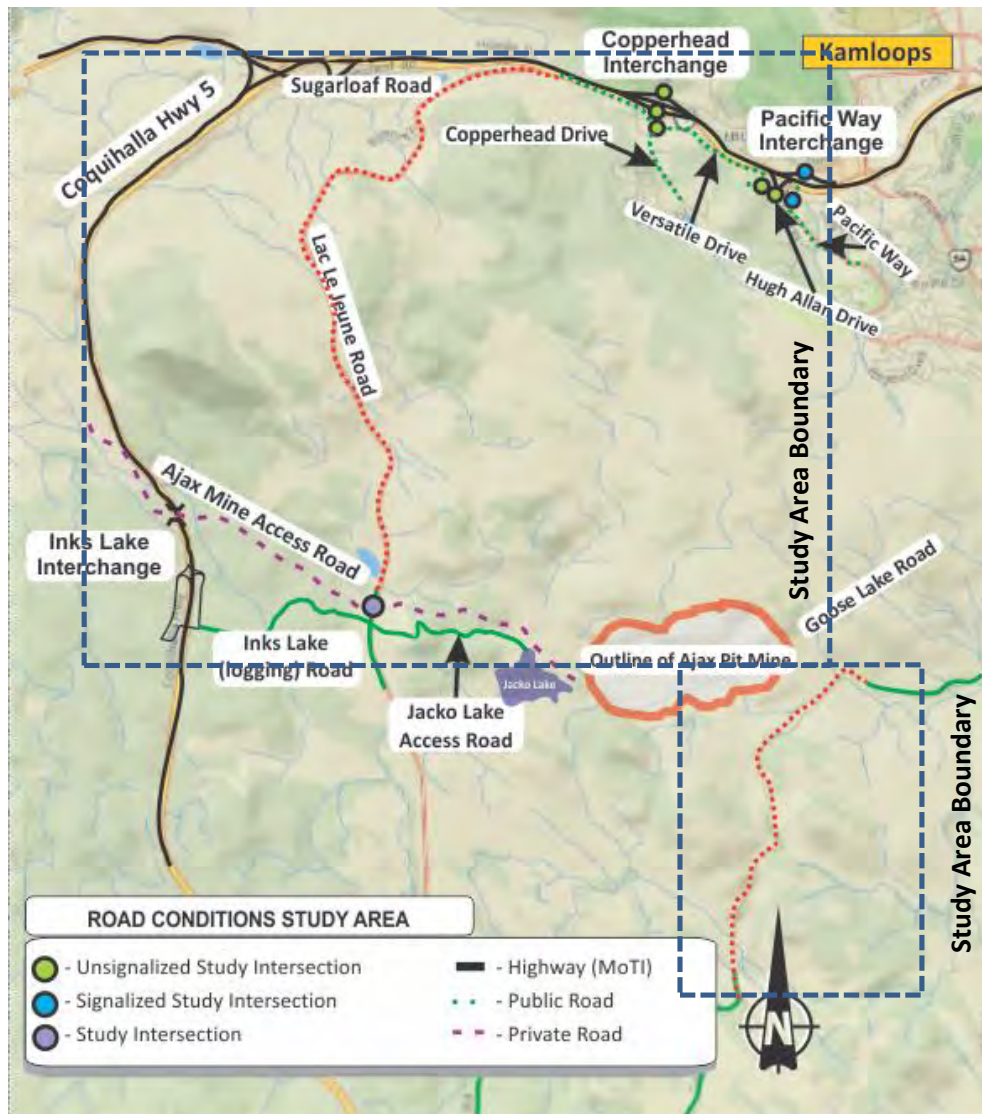
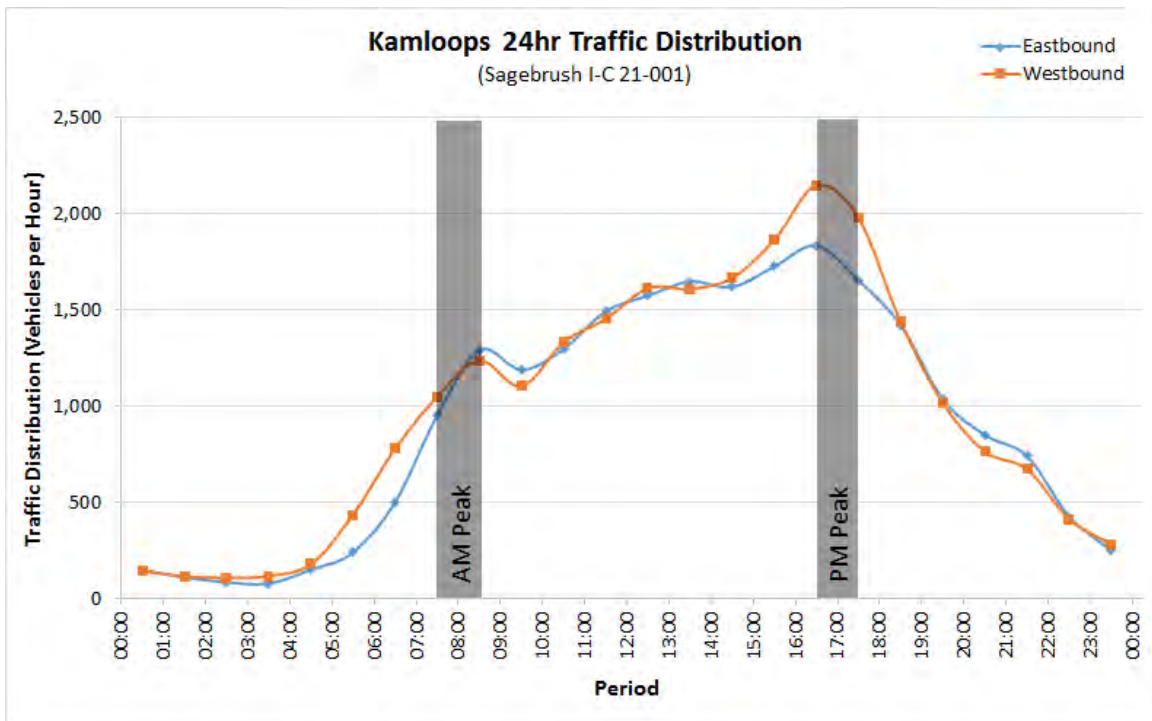


Figure 8 : Road Conditions Study Area

## 6 Road Characteristics

### 6.1 Highway 5

Highway 5 is a provincial highway that connects Kamloops to Merritt, Hope and through to Vancouver via Highway 1. To the north, Highway 5 extends from Kamloops to Tête Jaune Cache. The highway is operated and maintained under the jurisdiction of MoTI. It typically comprises two paved travel lanes in each direction; however it widens to five or six travel lanes on steep gradients to allow passing of slow moving vehicles. Roads in the area are used by a wide variety of users. Highway 5 is part of the National Highway System and part of the principal trans-provincial route, carrying approximately 10,000 vehicles per day (vpd) in the rural sections and up to 46,000 vpd within Kamloops.



**Figure 9: Highway 1/5 Traffic Distribution (Kamloops Urban Area)**

At the Inks Lake Road Interchange with Highway 5 (Exit 355) the highway consists of two lanes in the northbound direction and 3 lanes in the southbound direction with a posted speed limit of 110 kilometres per hour. There are right turnoff slip lanes and merge lanes provided in each direction on the highway for the Inks Lake Road turnoff. Individual lanes are marked, shoulder lines are marked, and a concrete median safety crash barrier is installed along the highway. This section of highway has an average gradient of approximately 5%.

The Inks Lake Interchange provides access to the Greenstone Mountain recreational area and a highway maintenance depot owned by MoTI and operated by a private highway maintenance contractor in service to MoTI.

The Sugarloaf Road overpass on Highway 5 is located north of the Inks Lake Interchange. Highway 5 in this area consists of a similar cross-section in laning with the same speed limit and pavement markings as the section at the Inks Lake Interchange. An off-ramp and on-ramp are present on the northbound carriageway and previously provided access to a now decommissioned information centre. The on-ramp does not meet current Transportation Association of Canada (TAC) geometric design requirements for

ramps. By **today's standards, the speed differential** (i.e. the difference between the design speed of the highway and the design speed of the ramp) would require larger curve radii and longer merge lane lengths.

## 6.2 Lac Le Jeune Road

Lac Le Jeune Road (LLJR) is a rural arterial two-lane paved public road, 23 km in length with a marked centerline and no shoulder lines. The road becomes Frontage Road to the north and intersects Copperhead Drive, where there is an interchange with Highway 5. To the south, LLJR becomes Meadow Creek Road at the location where the road connects to Highway 5 at the Walloper Lake interchange, Exit 336 from Highway 5. LLJR provides access to a small industrial park near Kamloops, Iron Mask Trailer Park, private agricultural land, recreational land, and three provincial parks. LLJR has a posted speed limit of 80 kilometres per hour with the following exceptions: a posted speed limit of 60 km/h between Iron Mask Trailer Park/Concert Industrial Park (Bowers Place) and Sugarloaf Road, and 50 km/h from Sugarloaf through to Copperhead interchange (along Frontage Road).

LLJR is used primarily by passenger vehicles, with commercial vehicles generally restricted to the north of the road, near the existing industrial development. A traffic count was conducted on LLJR, with classification data provided in Section 17.3.2.2 of this report. Average Daily Traffic (ADT) in the vicinity of Inks Lake Road is about 825 vpd and the mean speed of traffic consistently exceeds the 80 kilometre per hour speed limit in both directions (the mean speed ranges between 84 kilometres per hour for northbound traffic and 81 kilometres per hour for southbound traffic).

## 6.3 Sugarloaf Road

Sugarloaf Road is a public rural 2-lane road that is approximately 9 km in length. The road starts at an intersection with LLJR and Frontage Road about 2km west of the Copperhead Interchange and runs in a generally southwesterly direction parallel to (and on the south side of) Highway 5 for approximately 3 km. This section is paved with a marked centerline and shoulder line. From a point just south of the Highway 1 / Highway 5 interchange it becomes a gravel road before it crosses underneath Highway 5 and continues in a southwesterly direction around the southeast boundary of the New Afton Mine until it terminates in a private access. The road provides access to ranch land, recreational users, Northern Trailer commercial operations, and Sugarloaf Ranch. It also provides secondary access to the New Afton underground mine owned and operated by New Gold Inc.; however, their primary access is elsewhere off Highway 1, the Trans-Canada Highway.

## 6.4 Goose Lake Road

Goose Lake Road is a rural 2-lane gravel public road that is 24 km in length and connects to Princeton Kamloops Highway 5A to the east. The road intersects with LLJR to the south and is primarily used for recreation and access agricultural properties. A section of Goose Lake Road crosses the Project site in an area proposed for use as a TSF, requiring closure of a 6 km section of the road. A traffic count was conducted on Goose Lake Road, with classification data provided in Section 15 of this report. Average Daily Traffic (ADT) in the mid-section of the Road ranges between 37 vpd (weekday) and 58 vpd (weekend). This TIA assesses the impacts of the proposed closure in Section 17.

## 6.5 Inks Lake Road

Inks Lake Road is an un-maintained forestry road with informal public access that connects the southeast corner of Highway 5 Inks Lake interchange with LLJR. It is a 1-lane compacted gravel road approximately 5 meters in width. This road intersects LLJR just south of the AMAR overpass. It has no

posted speed limit. The land owner (Government), two ranch lessees, and MoTI desire this road to be closed once proposed transportation infrastructure upgrades for the Project are complete.

## 6.6 Jacko Lake Road

Jacko Lake Road provides access to Jacko Lake and its boat ramp from Inks Lake Road and LLJR via an easement over private property; the road is open during the summer from April to October. It is a 1-lane compacted gravel road approximately 5 meters in width. It is proposed that future access to Jacko Lake will be maintained although some access control will be required to ensure public safety during open pit blasting operations.

## 6.7 Ajax Mine Access Road

The Ajax Mine Access Road (AMAR) is an existing private road that connects an existing decommissioned open pit formerly operated by the Afton Operation Corporation with the New Afton Mine site on the west side of Highway 5. It is a compacted gravel road originally designed for mining haul truck traffic to transport ore from the Historical Ajax East and West Pits to the mill at the Historical Afton Mine. It is approximately 7.5 meters or greater in width and, from Highway 5 to LLJR, it is approximately 2.5 km in length.

A multi-plate culvert provides the overpass of the AMAR above LLJR. The culvert is owned by KAM who also have inspection and maintenance responsibility for the structure. The multi-plate culvert overpass was constructed in 1988 and is 45 metres long by 11 metres wide by 8 metres high. A permit was granted at that time to the Afton Operating Corporation to construct, operate, and maintain the multi-plate overpass for haul truck access.

As part of the Project, AMAR would become a public road between Highway 5 and **the Project's** gatehouse to provide local connectivity, and AMAR would be upgraded to the appropriate MoTI design standard. MoTI and CoK have indicated the culvert must be upgraded, removed, or replaced because it is considered to be at or near to the end of its service life.

## 6.8 Copperhead Interchange

The Copperhead Interchange allows connection between Highway 5 and Copperhead Drive at the western limits of Kamloops. It is a basic diamond interchange configuration with single lane on- and off-ramps to (from) Highway 5. The ramps meet Copperhead Drive at stop-controlled intersections. At the interchange, Copperhead Drive is four lanes, two directions, with a centre median and left turn slots for intersecting roads.

Immediately south of the interchange ramps, Frontage Road connects with Copperhead Drive. Frontage Road becomes LLJR to the southwest, and in the opposite direction, becomes Versatile Drive to the northeast. The land use in the area of the interchange includes light industrial development, an elementary school, a truck stop/corner store, and residential neighbourhoods.

Improvements to the design of the roads and intersections at this interchange are under consideration by MoTI and CoK.

## 6.9 Pacific Way Interchange

The Pacific Way Interchange connects Highway 5, Pacific Way, and Hugh Allan Drive. In comparison to Copperhead Interchange, its configuration is more complex and includes single lane on- and off-ramps that connect with Hugh Allan Drive as well as Pacific Way. At the interchange, Pacific Way is four lanes, two directions, with a centre median and left turn slots for intersecting roads. The

intersections with Hugh Allan Drive and the on/off ramp on the north side of Highway 5 are both signalized. The intersection of Pacific Way with Hillside Drive includes a signalized intersection which is approximately 200 meters north of the interchange.

The land use in the area of the interchange is heavily urbanized, with hotels, shopping malls, restaurants, and other such urban amenities. Residential neighbourhoods exist nearby.

## 7 Road Safety

Road safety performance within the study area was examined to determine how safety performance might be impacted by Project traffic. To carry out this analysis, collision histories for the roads in the study area were examined for trends and patterns, and underlying causes of collisions. Once these factors were identified, recommendations for safety-related mitigation were developed.

### 7.1 Information for Collision Analysis

Collision claim summaries and details were provided by the Insurance Corporation of British Columbia (ICBC) for a five year period between 2007 and 2011 and were analysed to identify temporal, severity and road condition trends. ICBC provided claim data and police data for sections of road near the proposed Project development, including; LLJR; Highway 5; and, Goose Lake Road.

ICBC claim data recorded a total of 40 collision records over the 5-year period within the study area. Police data recorded a total of 81 collision records over the 5-year period within the study area.

### 7.2 Collision Characteristics

Based on the above information for each road section, collision information was analysed on the basis of: Rate and Severity; Temporal Distribution; Location; and Road (Weather) Conditions

#### 7.2.1 Rate and Severity

Collision severity is measured by the consequences of the collisions, which are categorized by ICBC and the Police as “Property Damage Only” (PDO) or “Casualty”. Casualty collisions may include injuries or death.

##### 7.2.1.1 Lac Le Jeune Road

Figure 10 illustrates the collision severity by percentage split of total collisions along LLJR for both ICBC and Police data sets over the 5-year study period. The ICBC data set contained 12 collision records while the Police data set contained 6 collision records.

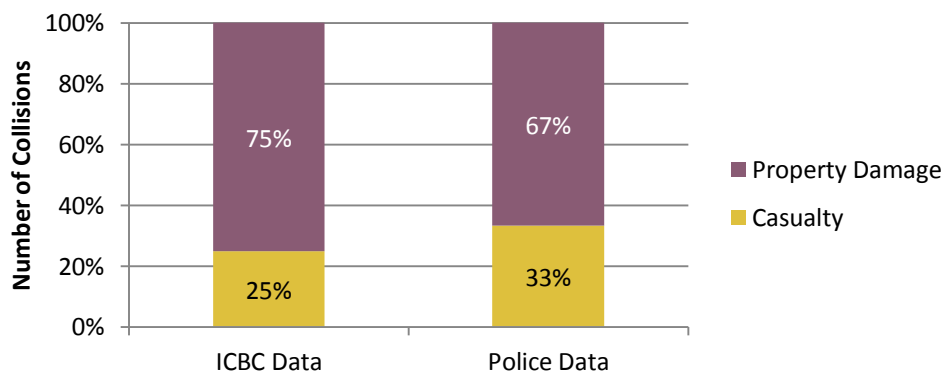
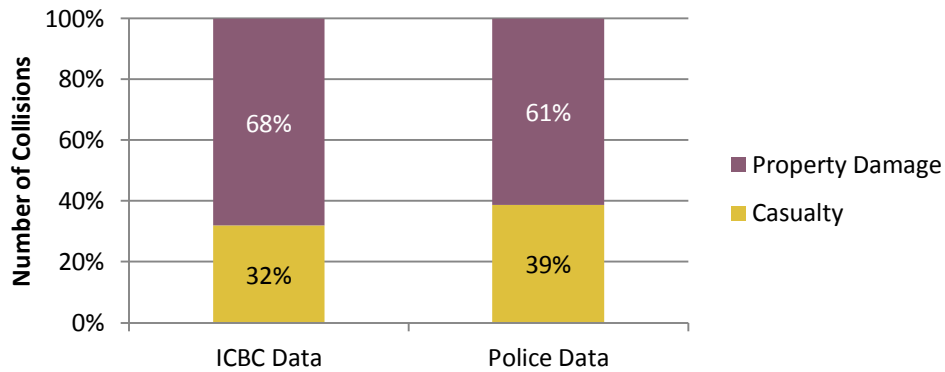


Figure 10 : Lac Le Jeune Road Collision Severity

Both datasets show similar proportions of collision severity with approximately 70% of collisions resulting in PDO and 30% resulting in a casualty. Collision severity rates here are considered typical. None of these collisions occurred near the AMAR overpass.

**7.2.1.2 Highway 5**

Figure 11 illustrates the collision severity by percentage split of total collisions along Highway 5 for both ICBC and Police data sets over the 5-year period. The ICBC data set contained 25 collision records and the Police data set contained 75 collision records. Both datasets show similar results for collision severity with approximately 65% of collisions resulting in PDO and approximately 35% of collisions resulting in a casualty. These proportions are similar to provincial averages.



**Figure 11 : Highway 5 Collision Severity**

**7.2.1.3 Goose Lake Road**

ICBC claim data recorded 3 collision events over the 5-year period on Goose Lake Road, with all 3 events recorded as PDO. There were no collision events recorded in the Police dataset.

**7.2.2 Temporal Distribution**

The temporal trends for LLJR and Highway 5 collision data were reviewed to gain further insight into the time periods under which the collisions occurred, including: Year (between 2007 and 2011); Month; Day of week; and, Time of Day.

Results of the temporal analysis are discussed below.

**7.2.2.1 Lac Le Jeune Road**

Collisions on LLJR indicate some trends within the five-year reporting period in the temporal analysis graphics shown in Figure 12 to Figure 15. Collisions reported in the winter months of January and February account for 50% of the ICBC recorded collisions and 50% of the Police recorded collisions, suggesting inclement weather may play a role in collisions. Collisions appear to be clustered around the peak morning and afternoon hours, when traffic volumes on LLJR are at their highest. No trends for collisions per year and collisions per day of week were observed, other than a spot increase in collisions on Thursdays.

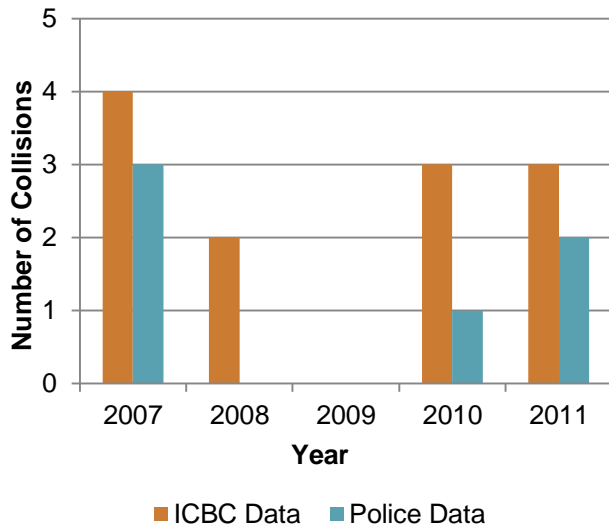


Figure 12: Number of Collisions per Year on Lac Le Jeune Road

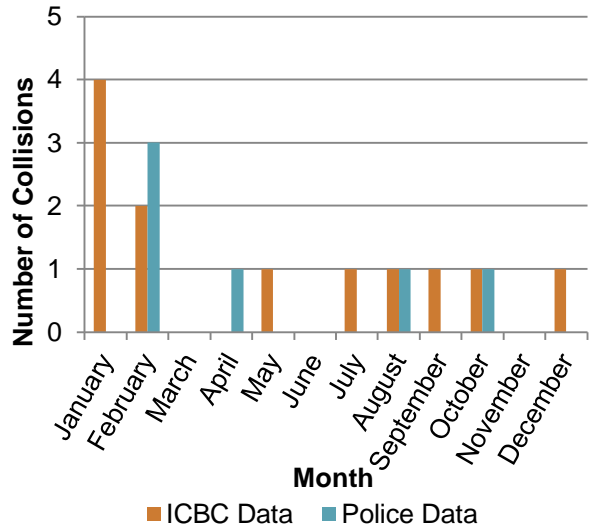


Figure 13: Number of Collisions per Month on Lac Le Jeune Road

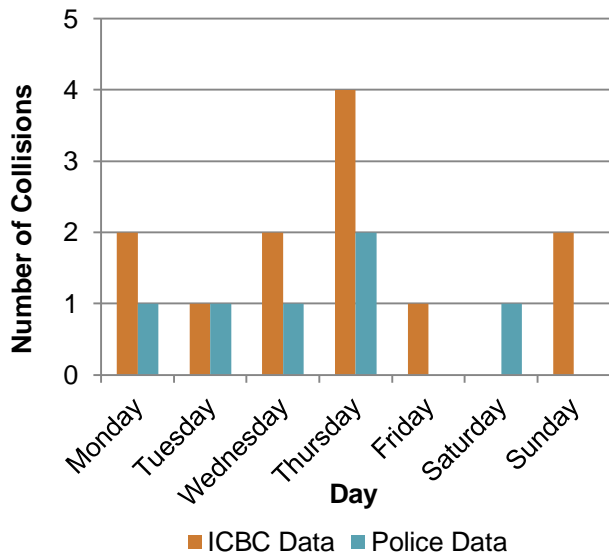


Figure 14: Number of Collisions per Day of Week on Lac Le Jeune Road

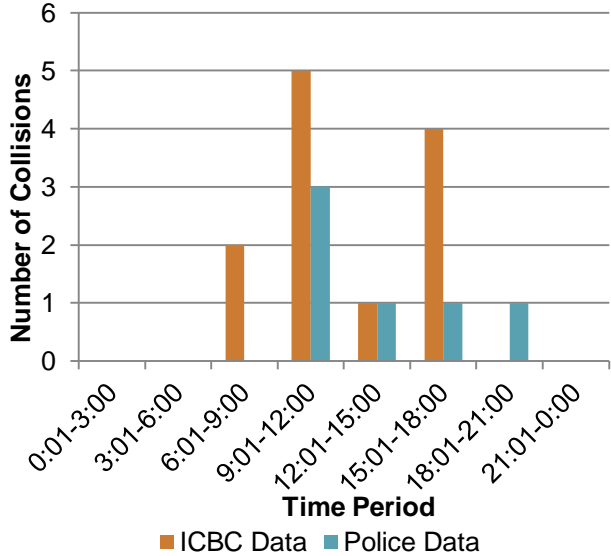


Figure 15: Number of Collisions per Time Period of Day on Lac Le Jeune Road

### 7.2.2.2 Highway 5

Collisions on Highway 5 indicate some trends within the five-year reporting period in the temporal analysis graphics shown in Figure 16 to Figure 19. Collisions appear to show a decreasing trend over the five year period from 2007 to 2011. Collisions by month show an increase in collisions in the winter and fall months and, consequently, a decrease in the summer months. This trend is most reflected in the police data. Collisions also appear to occur at a higher rate on week days than on weekends. Collisions occur more frequently in the afternoon between 3:00 p.m. and 6:00 p.m. during the typical adjacent street peak traffic hours.

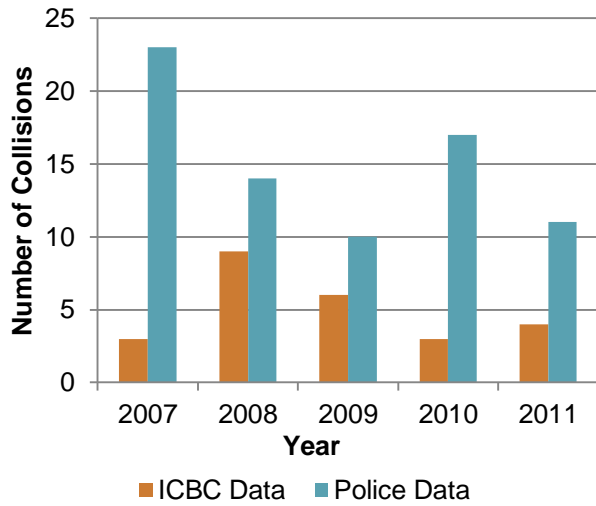


Figure 16: Number of Collisions per Year on Highway 5

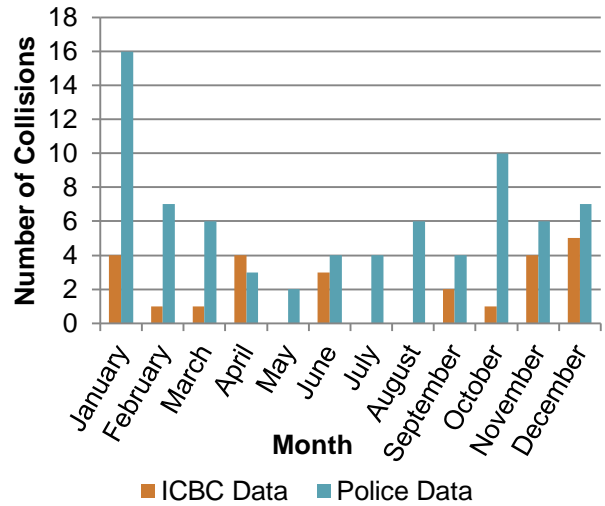


Figure 17: Number of Collisions per Month on Highway 5

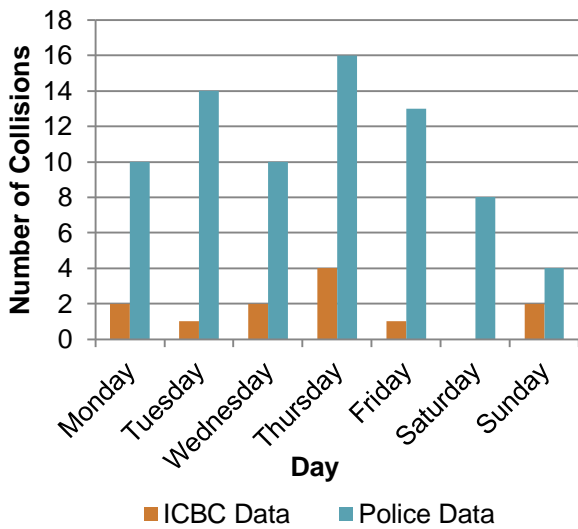


Figure 18: Number of Collisions Day of Week on Highway 5

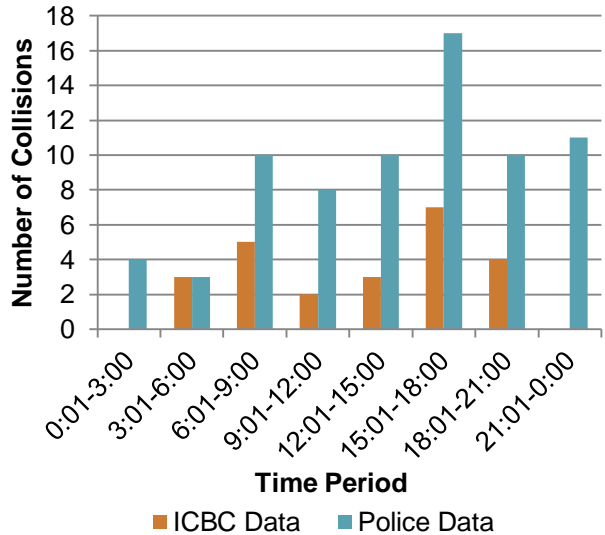


Figure 19: Number of Collisions per Time Period of Day on Highway 5

### 7.2.2.3 Goose Lake Road

Only three collisions occurred on Goose Lake Road over the five-year study period, with no obvious trends. Of the 3 total collisions that occurred on Goose Lake Road, one occurred in 2008 and the remaining two occurred in 2010. Each collision occurred in a different month of year and a different day of the week. One collision occurred in the time period between 3:00 p.m. and 6:00 p.m., and the other two collisions occurred between 6:00 p.m. and 9:00 p.m.

### 7.2.3 Collision Locations

Subsections below review collision locations to determine if there were any specific locations that may have potential safety issues. The ICBC dataset was referenced for this analysis since there were more detailed descriptions relating to the nature of the collisions.

#### 7.2.3.1 Lac Le Jeune Road

Table 5 below shows the number of collisions that occurred in specific locations within the LLJR study segment according to the ICBC data.

**Table 5: Collision Locations along Lac Le Jeune Road**

Location	Number of Collisions (ICBC Data)
LLJR and Sugarloaf Road	7
LLJR and Bowers Place	3
LLJR and Goose Lake Road	0
Midblock LLJR	2

The majority of collisions occurred at the intersection of LLJR and Sugarloaf Road. The collisions at this intersection were reviewed further to determine if there could be any trends at this intersection, but no trend in collision types were found.

#### 7.2.3.2 Highway 5

Table 6 below shows the number of collisions that occurred in specific locations within the Highway 5 study segment according to the ICBC data.

**Table 6: Collision Locations along Highway 5**

Location	Number of Collisions (ICBC Data)
Highway 1/5	2
Highway 97	2
Highway 5/Highway 1 Interchange	19
LLJR and Goose Lake Road	0
Inks Lake Interchange	2

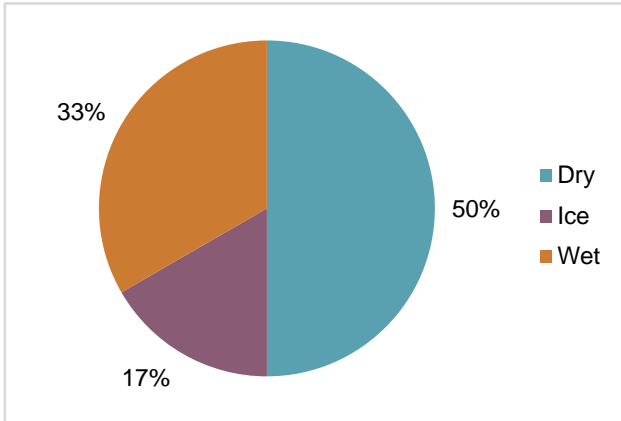
Only two collisions occurred near the Inks Lake Interchange, and both were single vehicle collisions including 1) a collision with a deer, and 2) driver fell asleep at the wheel. Ultimately, collision data from 2007 to 2011 does not suggest there are any safety issues at the Inks Lake Interchange at Highway 5.

At the Highway 1/Highway 5 Interchange there were 19 collisions, almost ten times more collisions than near the Inks Lake Interchange. This is expected due to the likely higher volumes and intricacies of this major interchange (i.e. confluence of two major routes as well as proximity to weigh scales and issues with weaving lanes).

### 7.2.4 Road Conditions

As a result of the greater number of collisions during the winter months on LLJR and Highway 5, an analysis of road conditions prevalent at the time of the collisions is provided for these roads. Only the Police data set provided records of road conditions.

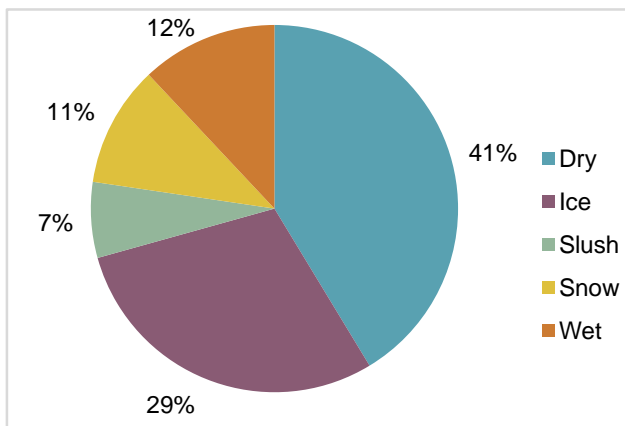
**7.2.4.1 Lac Le Jeune Road**



The percentage splits of collisions categorized by road conditions on the study section of LLJR are shown in Figure 20. Fifty percent of collisions occurred under dry conditions, 33% of collisions occurred under wet conditions, and 17% of collisions occurred under icy conditions.

**Figure 20: Collision Percentage Split by Road Condition for Lac Le Jeune Road**

**7.2.4.2 Highway 5**



The percentage splits of collisions categorized by road conditions on the study section of Highway 5 are shown in Figure 21.

According to results, fifty-nine percent (59%) of collisions occurred under non-dry conditions where ice, slush, snow, or wet conditions were present during the time of collision. Forty-one percent (41%) of collisions occurred under dry conditions. Since there is typically higher traffic volumes in the summer, and there were more collisions during winter conditions, it may be concluded that winter road conditions are contributing to collision propensity.

**Figure 21: Collision Percentage Split by Road Condition for Highway 5**

## 8 Adjacent Land Use

Land use adjacent north of the Project is located within the CoK jurisdiction and consists mostly of agricultural land. Figure 22 shows the current land use north of the Project, adapted from the interactive maps utility from the CoK website.



**Figure 22: City of Kamloops Land Zoning**

The Project is surrounded by agricultural land in all directions, including Knutsford to the northeast. The Aberdeen neighbourhood which consists of Country Residential, Comprehensive Development, Service Commercial, Service Commercial, and General Commercial zoning is located northeast of the Project by approximately 2-3 km. These urban land uses are accessed from local streets and the Princeton-Kamloops Highway (5A) leading into the core business areas of Kamloops. Knutsford is also accessed via Highway 5A.

Land use south of the Project is located within the TNRD jurisdiction and consists mostly of agricultural land. Figure 23 shows the current land use south of the Project, adapted from the Kamloops South Official Community Plan, developed by the TNRD. As shown in Figure 23, the Project is primarily surrounded by agricultural land. To the west, the land use is agricultural land, followed by forestry/grazing and recreation land uses.

Overall, land use in the Project area is mainly rural. Although the Aberdeen area is located within a few kilometers distance of the Project site, there is no direct route from Aberdeen to the Project site. Traffic from the Aberdeen area is connected north towards Highway 1/5 and CoK and no existing or future connection is planned between the Aberdeen area and the Project site. Overall, it is not expected that traffic generated by the Project will impact the Aberdeen area or other specific neighbourhood areas within the CoK.

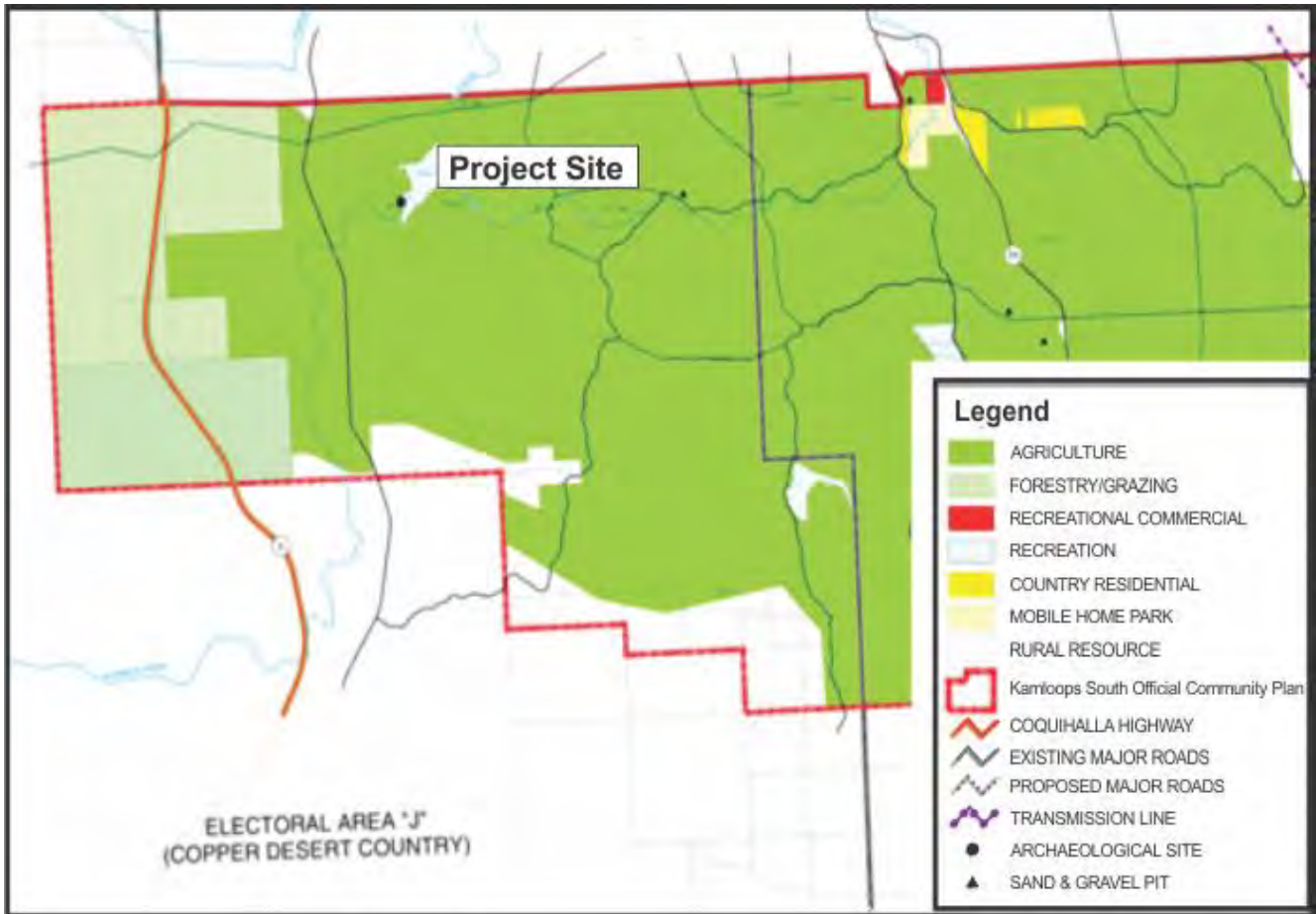


Figure 23: TNRD Land Zoning South of Kamloops (Source: TNRD Mapping)

## ACCESS OPTIONS REVIEW

### IN THIS SECTION:

- Primary Access Options
- Inks Lake Interchange Conceptual Design
- Lac Le Jeune Road / Ajax Mine Access Road Intersection Conceptual Design
- Ajax Mine Access Road Typical Cross-Section

Project operations will require haulage of mineral concentrate to Vancouver, which results in a need for safe and efficient access between the Project and Highway 5. Feasible options for this connection were evaluated utilizing a multi-criteria decision analysis to identify the best option.

The primary access review considers access options, first at a macro route level, and then in more detail by looking at conceptual designs for key elements (intersections and link sections).

KAM and MoTI have agreed that the Highway 5 overpass of the existing Old Afton Mine Haul Road, now titled AMAR, is the preferred Highway access point. However, the CoK requested consideration of access to the Project via Sugarloaf Road for consideration of combined access to potential industrial expansion areas southwest of Kamloops (Domtar and Ironmask) as part of CoK's **Strategic Plan**.

It has also been agreed that the AMAR between the new Inks Lake Interchange ramps and the Project gatehouse will be vested as a public road to provide connectivity for the local network and ensure public benefit from a new interchange on Highway 5.

Connection southwards via LLJR, which becomes Meadow Creek Road, and the Walloper Way Interchange was discounted since it does not provide effective or economical access for commuting and service traffic from the Project for the long term. It is safer, faster, and less expensive to have vehicles use Highway 5 as much as possible before rerouting onto access roads. Highway 5 is designed and constructed to accommodate large volumes of heavy vehicles making it the preferred route. The Walloper Way Interchange will be used temporarily while the proposed Inks Lake Interchange is under construction. While Walloper Way is considered viable for the short term, its long term usage was discounted due to its distance from the Project site.

Access option(s) were evaluated and ranked by the following criteria:

- » Connectivity;
- » Lane balance and function;
- » Traffic operations;
- » Level of investment;
- » Ongoing operational costs; and,
- » Road safety.

## 9 Primary Access Options

### 9.1 Description of Route Options

Primary access options are presented in two groups by the following figures. Group 1 includes options for point of access at the Sugarloaf Road and Group 2 includes options for access in the vicinity of the existing Inks Lake Road interchange. New roads are shown in yellow.

#### **Sugarloaf Rd Interchange Upgrade Options**

Route Options 1 & 2 provide access to the Project via a proposed newly constructed interchange at the Highway 5 / Sugarloaf Road overpass. Options exist to connect either via LLJR east of Highway 5 or the existing haul road to the west.

#### **Inks Lake Rd Interchange Upgrade Options**

Route Options 3 & 4 connect at the existing Inks Lake Interchange using either existing AMAR or Inks Lake Road.

*Note: for Options 1, 2 & 3, The Inks Lake Road that is currently depicted off of the interchange would be decommissioned (as per discussions with MoTI and FLNRO).*

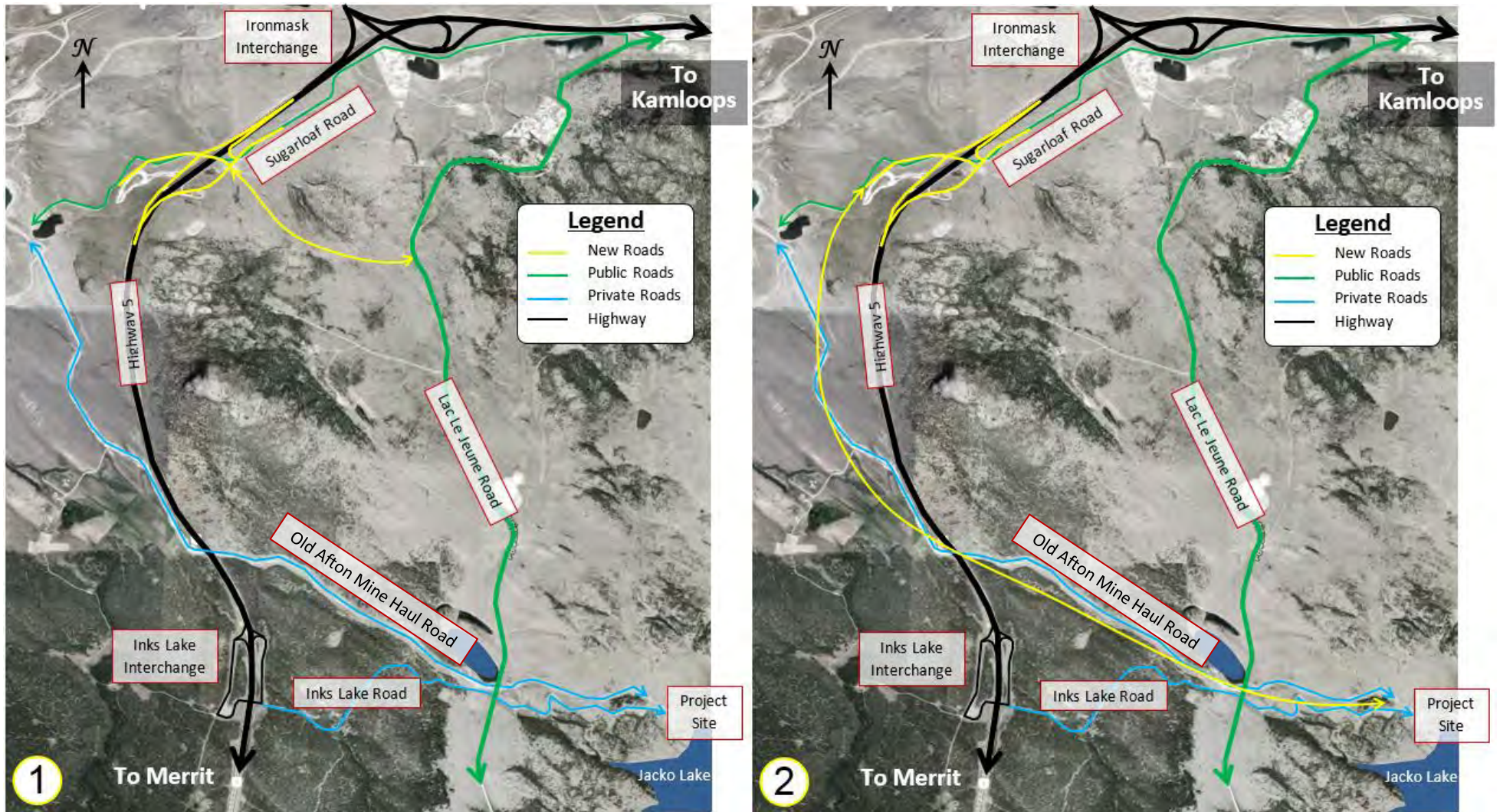


Figure 24: Primary Highway Access Options Group 1

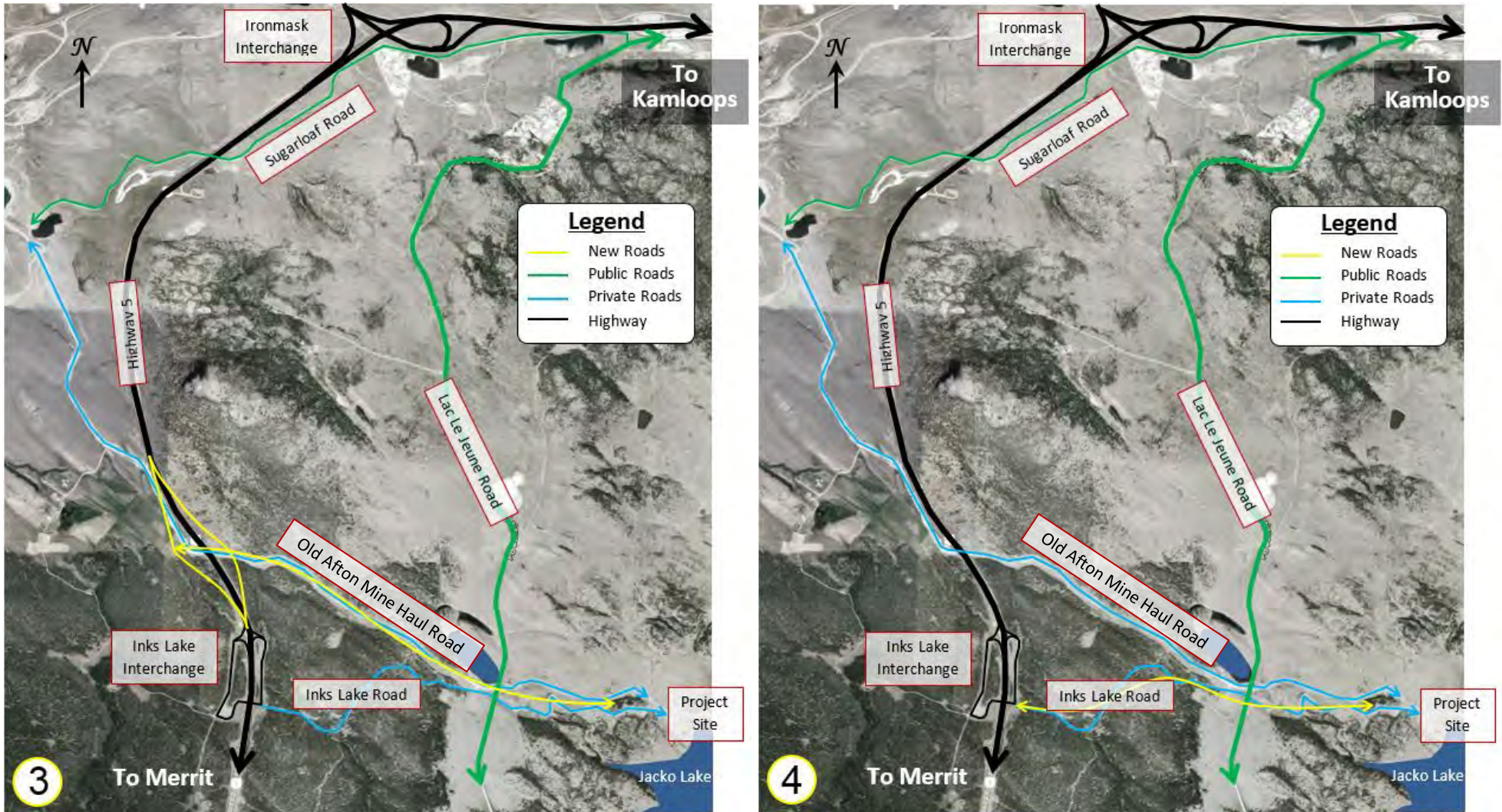


Figure 25: Primary Highway Access Options Group 2

## 9.2 Options Review

The high level review of the available options focused on the technical feasibility of the interchanges and connectivity issues for all users including Project traffic.

### 9.2.1 Interchanges

#### 9.2.1.1 Sugarloaf

Review of the Highway 5 Sugarloaf Road overpass and decommissioned tourist centre pullout as a potential interchange location revealed that the tourist centre ramps were not designed to TAC design standards and are sufficiently close to the Highway 1/Highway 5 interchange ramps that weaving would create safety concerns for a new interchange at this location. Weaving is a consequence of an exit ramp being located in too short distance after an entry ramp, so that traffic exiting the roadway at the next junction may conflict with traffic entering the highway from the previous entry point. Close spacing of ramps causes traffic to slow down because drivers must make additional allowances for entering and/or exiting vehicles. This in turn gives rise to a potential increase in conflicts and collisions between vehicles. With adequately spaced ramps, drivers can accommodate entering and exiting traffic with minimal decision-making and without changing speed. This improves highway operational and safety performance. The eastbound Highway 1 to southbound Highway 5 transition in particular may lead to weaving issues for motorists exiting at Sugarloaf Road. Greater separation is difficult to achieve at this location due to a hill crest on Highway 5 a short distance to the south that will lead to visibility issues at the merge point and excessive earthworks to construct the on-ramp spiral.

Although technically feasible, an interchange at the Sugarloaf overpass is not considered to be a feasible location for a new interchange due to safety concerns and operational efficiency for the Project.

#### 9.2.1.2 Inks Lake

The Inks Lake Interchange is currently operational and appears to function adequately. Although the geometry of the ramp connections does not meet current standards prescribed by the TAC Geometric Design Guide for Canadian Roads (1999), the ramps are considered readily upgradable with few property and technical constraints.

### 9.2.2 Connectivity

Existing connector roads, (Old Afton Mine Haul Road, Inks Lake Road, LLJR and Sugarloaf Road) are all currently below both the MoTI and CoK desirable design standards. Significant upgrades would be required along any of these routes to safely incorporate them within the primary access plan. This would necessitate agreement between the CoK, MoTI, and KAM on the level of road upgrades required for the sections being incorporated within the primary access plan. It is expected that KAM would be responsible for all upgrades, although cost sharing for pavement work on any incorporated section of LLJR is reasonable due to the poor existing condition of the pavement. On new construction which KAM has already committed to, the following upgrades are recommended to meet current Level of Service and TAC standards:

- » Paving / Resurfacing;
- » Widening to 8m to accommodate the marking of 0.5m shoulders and edge lines;
- » Creating 1m gravel shoulders where practical;
- » Installing safety crash barriers on all steep slopes and identified hazards;

- » Intersection improvements at LLJR / Inks lake Road / Old Afton Haul Road intersection;
- » Installing school bus shelters and transit stop widening; and,
- » Sign and delineation upgrades.

Length of required upgrades is significantly larger (>100%) for route options utilizing a new interchange at Sugarloaf Road. Using Sugarloaf interchange would increase trip distances for concentrate haul trucks by about 12km, and would lead to significant additional environmental footprint over the life of the Project, including exhaust emissions, vehicle noise, and potential wildlife and traffic interactions. Therefore access via a new interchange at Sugarloaf Road would not provide a safe, direct, or economical route for Project traffic to access the highway network.

### 9.3 Primary Access Recommendations

This assessment recommends a direct connection between the Project and Highway 5 in the vicinity of Inks Lake Interchange, utilizing the existing AMAR and the existing infrastructure associated with the current interchange overpass. The study area is shown in Figure 26:



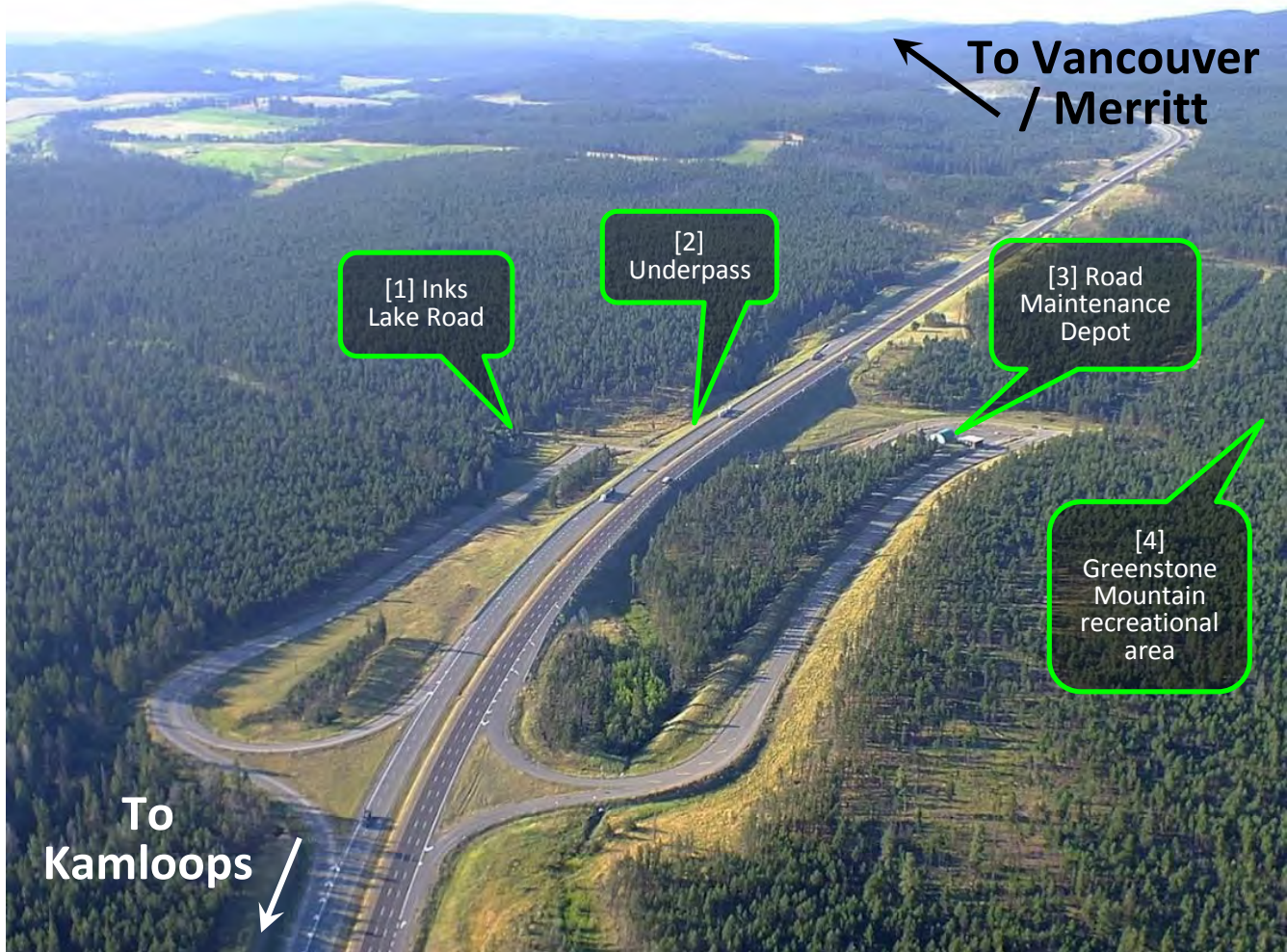
**Figure 26: Highway 5 Access Study Area (Source: Google 2015)**

A description of the study area roads is included in Section 6 of this report.

## 10 Inks Lake Interchange Conceptual Design Options

### 10.1 Background

The existing Inks Lake Interchange (Item 2 of Figure 26) was built primarily for winter maintenance vehicles to load aggregate for dispersing on Highway 5 during winter conditions and is substandard when compared to current TAC guidelines. Also, the underpass of Highway 5 at the existing Inks Lake interchange (Item 2 of Figure 27) is single lane. This structure provides minimum clear width of 13.9 m and minimum clear height of 7.4 m. The size is adequate for single lane operation; however, it is too narrow for two lanes which would be necessary to accommodate bi-directional traffic.



**Figure 27: Existing Highway 5 Inks Lake Interchange (Source: Google 2015)**

Due to these restrictions, both KAM and MoTI have identified the Highway 5 overpass of the existing AMAR (Item 1 of Figure 26) as a desired access point area for the Project, linking Highway 5 to the existing AMAR. Details of the structure are shown in Figure 28 and Figure 29:

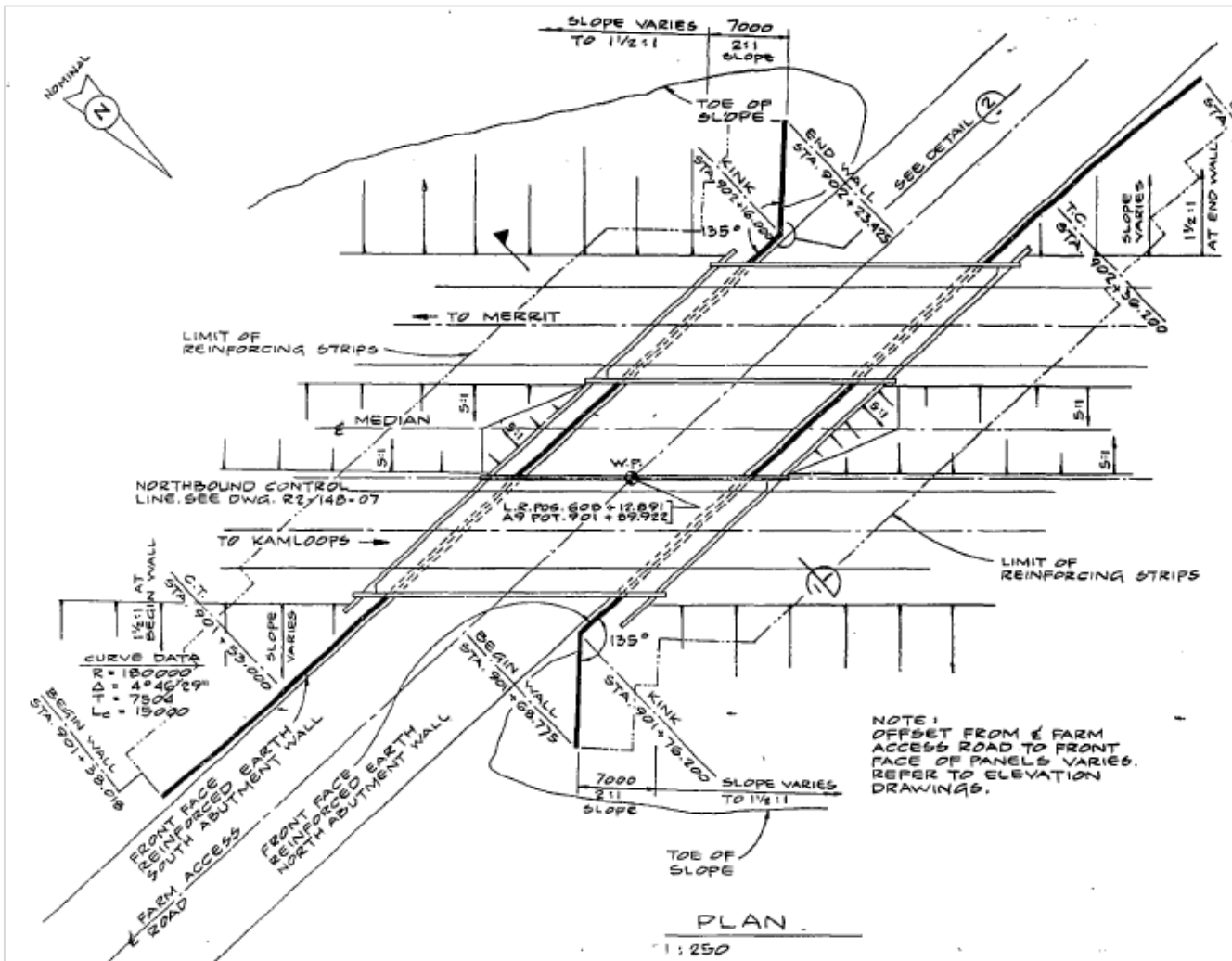


Figure 28: Existing Highway 5 AMAR Underpass – Plan

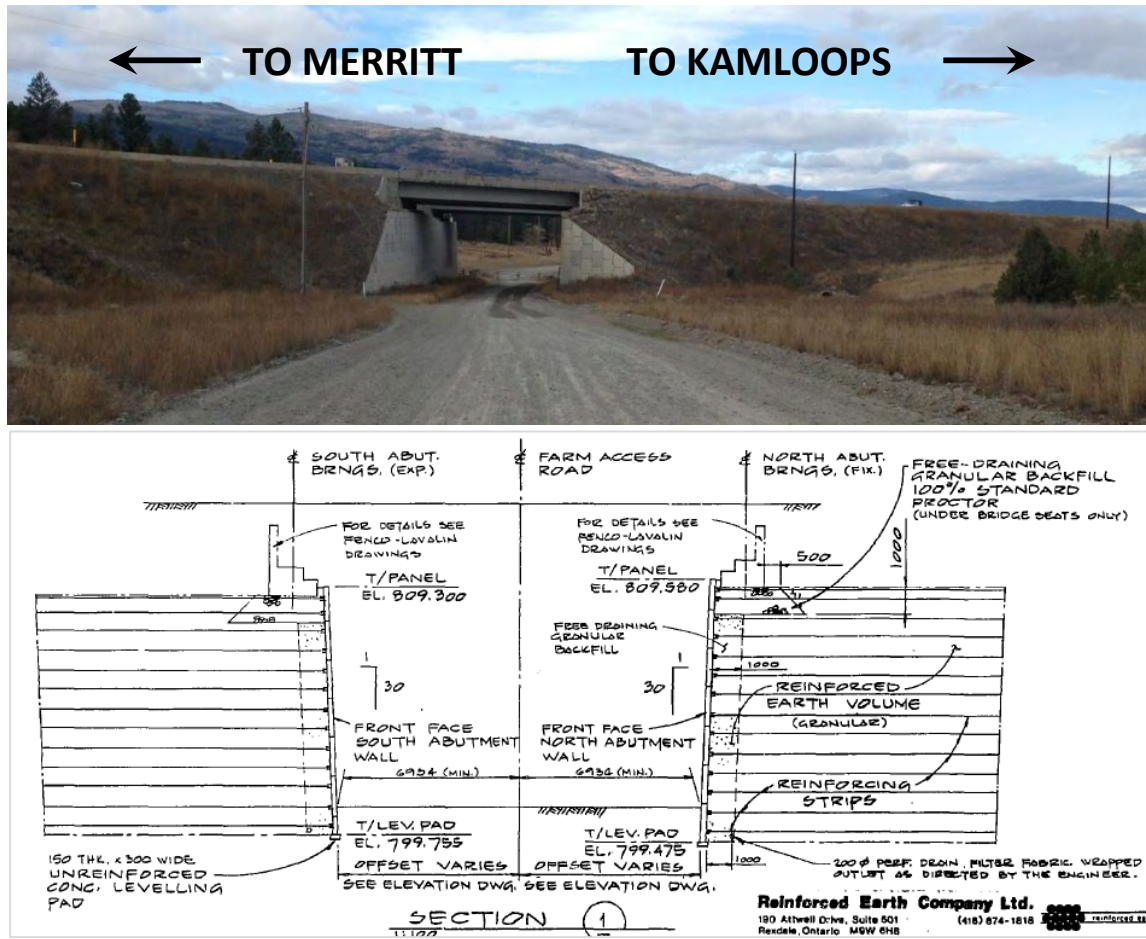


Figure 29: Existing Highway 5 AMAR Underpass - Elevation Photo & Cross-Section

## 10.2 Constraints

The constraints used to identify potential options for the Inks Lake Interchange concepts are presented in Table 7.

Table 7: Inks Lake Interchange Constraints

Ref	Constraint	Description
1	Highway grade	Highway 5 in the vicinity of the interchange is at approx. 6% grade leading to long acceleration and deceleration requirements for ramp connections.
2	Interchange Separation	Location of new ramps must allow consideration of future access options at Sugarloaf for industrial access.
3	Recreational Access	Recreational access to the Greenstone recreational area must be maintained.
4	Terrain	Steeply rising terrain and deeply incised water courses either side of Highway 5 constrain ramp locations if extensive earthworks are to be avoided. Unknown rock interface.
5	Inks Lake Underpass	Single lane height restriction posing problems for volume and mix of forecast traffic. Issue mitigated to some extent by the anticipated highly tidal flow characteristics.
6	Maintenance Depot access	Efficient operational access to the highway maintenance depot must be maintained.
7	Structural Modifications	Proximity of the Inks Lake Road underpass and the AMAR Underpass constrain the location of ramp connections if costly structure widening is to be avoided.

### 10.3 Options Description

Eight options for access routes, interchange ramps and terminals (and variants of those options) were developed after analysis of the constraints identified above. Concept drawings are included in Appendix B.

Options range from the least intrusive, least expensive which retains as much of the existing infrastructure as possible, through to reconstruction of entire ramps and overpasses to completely upgrade the main roads and connector links to current design standards. Although the most elaborate options are likely the most expensive options, the improvement to geometric road standards brings with it anticipated improvements in operational and safety performance.

### 10.4 Options Analysis

The relative merits, risks, and deficiencies of each option are presented in the Evaluation Matrix (Table 9). Each option was evaluated by a set of criteria and scored as per the following scale (Table 8). Each criterion was equally weighted.

**Table 8: Option Evaluation Criteria**

CRITERIA	SCORE								
	8	7	6	5	4	3	2	1	0
<b>Connectivity</b>	Shortest possible route to the Project site			Reasonable route but not ideal for some users			Extended and tortuous route for Project traffic & other users		
<b>Lane Balance and Function</b>	Fully compliant with TAC guidelines & simple way finding			Partially compliant (resolvable)			Partially compliant (un-resolvable) or substantially non-compliant		
<b>Traffic Operations</b>	Vehicle delay and queuing satisfactory			Vehicle delay and queuing marginal			Vehicle delay and queuing unsatisfactory		
<b>Capital Cost</b>	Least Cost Option			Estimated at less than double the cost of the lowest cost option			Estimated at more than double the cost of the lowest cost option		
<b>Operational Costs</b>	Future costs equal to or cheaper than current situation			Less than 6km of new lanes and no more than one significant other asset (signals, structure etc.)			More than 6km of new lanes and more than one significant other asset (signals, structure etc.)		
<b>Vehicle Safety</b>	Equal to or better than current situation			Some safety concerns (resolvable through traffic control measures)			Substantial safety concerns (un-resolvable)		

Opportunity to utilize the existing Inks Lake Interchange ramps was explored within the options. However, the existing Inks Lake Interchange was built primarily for winter maintenance vehicles to pick up aggregate and/or salt for dispersing on the Highway during winter conditions and the geometry of the interchange is deficient against current standards, in particular having sub-standard off-ramp radii for the speed environment. With increasing traffic volumes accessing the proposed Project site, the existing interchange arrangement needs to be improved.

The amount of rock excavation required will significantly affect option cost. Rock excavation is normally in the order of five times (5x) the cost of overburden excavation and the differences become exaggerated as the cut depth increases. Subsurface material characterization is critical for accurate cost estimation but is not included in this evaluation due to lack of subsurface data.

The highest ranked options were Option (1) a new interchange to the north of the existing location, and Option (2) an improvement of the existing Inks Lake Road Interchange.

Table 9: Access Options Evaluation Matrix - Inks Lake Interchange

Evaluation Criteria	Description	Option 1 All new Diamond Interchange @ AMAR & Inks Lake Connection (West)	S c o r e	Option 2 Full upgrade of existing Inks Lake Interchange & Connections to AMAR	S c o r e	Option 3 All new Diamond Interchange @ AMAR & Ramp Connections	S c o r e	Option 4 All new Diamond Interchange @ AMAR & Inks Lake Connection (East)	S c o r e	Option 5 AMAR connections from existing Inks Lake Interchange	S c o r e	Option 6 Partial upgrade of existing Inks Lake Interchange & Connections to AMAR	S c o r e	Option 7 Retain Existing, control traffic at underpass & add new connection to MAR	S c o r e	Option 8 Do Minimum	S c o r e
Connectivity	Ease of access between the highway and various facilities.	This option provides the most direct access to and from the Project. This option also adds the longest connection to and from the maintenance site. Note: it may be possible to relocate the maintenance depot and provide recreational parking at the current depot location.	6	The option provides relatively direct access between the proposed Project to and from the northbound lanes. Access to Highway 5 southbound is also relatively direct. The access from Highway 5 southbound adds travel distance in comparison with Options 1, 3 and 4.	6	This option provides the most direct access to and from the Project. This option also adds the longest connection to and from the maintenance site. Note: it may be possible to relocate the maintenance depot and provide recreational parking at the current depot location.	5	This option provides the most direct access to and from the Project. This option also adds the longest connection to and from the maintenance site. Note: it may be possible to relocate the maintenance depot and provide recreational parking at the current depot location.	5	Similar connectivity to Option 2	6	Connectivity is similar to Option 2.	6	This option retains existing access to and from Kamloops. Access to and from Vancouver have some degree of backtracking along the ramp connections to and from AMAR.	3	This option retains existing access to and from Kamloops. Access to and from Vancouver have some degree of backtracking along the ramp connections to and from Inks Lake Rd.	3
Lane Balance and Function	Comments on weaving lanes, speed change lanes, ramp alignments, and way finding.	> This option upgrades the ramps to existing national guidelines. > There is weaving between the southbound climbing lanes and the ramp speed change lanes. > Signing and way finding should not pose any significant issues for most movements. Some attention will be needed to differentiate southbound on-ramp traffic from recreation-bound traffic. > SB off ramp may conflict with the end of preceding SB climbing lane; potentially creating some confusion. If this option is selected further review will need to be done to determine the best design configuration.	8	> This option upgrades the ramps to existing national guidelines. > There is weaving between the southbound climbing lane and the ramp speed change lanes. > Signing and way finding for the connections to and from Inks Lake Rd may pose some issues. > There is the potential for confusion between the two-way connector roads and the one-way ramps leading to motorists using the off ramp to access the highway in the wrong direction.	6	> This option upgrades the ramps to existing national guidelines. > There is weaving between the southbound climbing lanes and the ramp speed change lanes. > Signing and way finding should not pose any significant issues for most movements. Some attention will be needed to differentiate southbound on-ramp traffic from recreation-bound traffic. > This option adds a merge point on the northbound off ramp. Merging and diverging on ramps is typically not desirable.	4	> This option upgrades the ramps to existing national guidelines. > There is weaving between the southbound climbing lanes and the ramp speed change lanes. > Signing and way finding should not pose any significant issues for most movements. > Northbound off-ramp traffic intersects near recreation traffic adding complexity to decision-making.	4	> This option does not upgrade the existing ramps and does not meet current national design guidelines for design speed differences between the highway and the controlling curves on the ramps. > There is weaving between the southbound climbing lane and the ramp speed change lanes. > Signing and way finding for the connections to and from Inks Lake Rd may pose some issues. > There is the potential for confusion between the two-way connector roads and the one-way ramps leading to motorists using the off ramp to access the highway in the wrong direction.	2	> This option only upgrades two of the four existing ramps. The remaining two ramps do not meet current national design guidelines for design speed differences between the highway and the controlling curves on the ramps. > There is weaving between the southbound climbing lane and the ramp speed change lanes. > Signing and way finding for the connections to and from Inks Lake Rd may pose some issues. > There is the potential for confusion between the two-way connector roads and the one-way ramps leading to motorists using the off ramp to access the highway in the wrong direction.	2	> This option does not upgrade the existing ramps and does not meet current national design guidelines for design speed differences between the highway and the controlling curves on the ramps. > There is weaving between the southbound climbing lane and the ramp speed change lanes. > Signing and way finding to/from the ramps and the recreational area may pose some issues. > The function of the ramps is intermingled with the function of the recreational area access.	1	> This option does not upgrade the existing ramps and does not meet current national design guidelines for design speed differences between the highway and the controlling curves on the ramps. > There is weaving between the southbound climbing lane and the ramp speed change lanes. > Signing and way finding should not pose any significant issues.	1
Traffic Operations	Average Delay per vehicle (expressed in seconds per vehicle), Level Of Service (LOS) for intersections, and queuing.	Four new three-legged intersections. The minor leg on four of these intersections is one-way only, therefore reducing conflict. AMAR allows two-way movements for all traffic.	7	Introduces four additional three-legged intersections to the existing interchange. Long ramps and space between intersections.	7	Four new three-legged intersections. The minor road is one-way only, therefore reducing conflict.	6	Five new three-legged intersections. The minor leg on four of these intersections is one-way only, therefore reducing conflict. The fifth intersection allows two-way movements for all three legs, but is in proximity to another three-legged intersection.	6	Introduces four new three-legged intersections. The new intersections at the on- and off- ramps are quite close to the ramps.	4	Introduces four additional three-legged intersections to the existing interchange. Similar to Option 2 but intersections closer to Highway 5 ramps.	5	Introduces two new intersections to the network. The new three-legged intersection near the northbound on- and off-ramps is close to the highway, which could create more congestion for vehicles entering and exiting Highway 5. One-way underpass could create additional congestion.	4	Introduces no new intersections, vehicles must use the one-way underpass for access between the northbound and southbound on/off ramps.	3
Level of Investment	Length of new or rebuilt roadways, and structure expansion.	This option requires the following: > Ramps: 3.2 km > Connector 1.0 km > Additional lanes on Hwy: 0.8 km > Decommissioning of all 4 ramps	2	This option requires the following: > Ramps: 2.8 km > Connector Rd: 1.8 km > Additional lanes on Hwy: 1.7 km > Lengthening of culvert underpass > Decommissioning of all 4 ramps.	2	This option requires the following: > Ramps: 3.3 km > Connector 1.1 km one way > Additional lanes on Hwy: 0.8 km > Decommissioning of all 4 ramps	2	This option requires the following: > Ramps: 3.3 km > Connector 0.7 km > Additional lanes on Hwy: 0.8 km > Decommissioning of all 4 ramps	2	This option requires the following: > Ramps: 0.1 km > Connector Rd: 2.1 km	5	This option requires the following: > Ramps: 1.2 km > Connector Rd: 2.1 km > Additional lanes on Hwy: 1.2 km > Lengthening of culvert underpass > Decommissioning of 2 ramps	3	This option requires the following: > Connector Rd: 800 m > Installation of traffic signals, or, > Widening of the culvert to two lanes	8	This option requires the following: > Connector Rd: 2.0 km > Installation of traffic signals, or, > Widening of the culvert to two lanes	5

Evaluation Criteria	Description	Option 1 All new Diamond Interchange @ AMAR & Inks Lake Connection (West)	S c o r e	Option 2 Full upgrade of existing Inks Lake Interchange & Connections to AMAR	S c o r e	Option 3 All new Diamond Interchange @ AMAR & Ramp Connections	S c o r e	Option 4 All new Diamond Interchange @ AMAR & Inks Lake Connection (East)	S c o r e	Option 5 AMAR connections from existing Inks Lake Interchange	S c o r e	Option 6 Partial upgrade of existing Inks Lake Interchange & Connections to AMAR	S c o r e	Option 7 Retain Existing, control traffic at underpass & add new connection to MAR	S c o r e	Option 8 Do Minimum	S c o r e
Ongoing Operational Costs	Linked to Investment Level.	This option adds 6.0 km of new lanes.	4	This option adds 7.5 km of new lanes.	2	This option adds 5.2 km of new lanes.	4	This option adds 5.5 km of new lanes.	4	This option adds 4.3 km of new lanes.	5	This option adds 6.6 km of new lanes.	2	This option adds 1.6 km of new lanes and, optionally, the maintenance of a traffic signal, or, the maintenance of a two-way culvert.	6	This option adds 4.0 km of upgraded lanes, and, optionally, the maintenance of a traffic signal, or, the maintenance of a two-way culvert.	6
Vehicle Safety	Comparison of safety factors for motorists.	> This option meets current design standards and has the most straight-forward decision making and way finding. > All intersections are on-way, reducing conflict opportunity. > All off-ramps terminate in a stop control prior to intersection conflict points.	8	> This option meets all current design standards, has simple decision-making and way finding. > Intersections between Link Roads and Maintenance Depot introduce decision making and conflict points at potentially high speed locations.	7	This option meets current design standards; however it introduces some weaving and decision-making for on- and off-ramps. MoTI does not favour connections to/from highway ramps.	5	This option meets current design standards and has similar safety characteristics to Option 1. Simpler decision-making than most options, although slightly more complex than Option 1.	6	This option is below the current guidelines for highway access. In comparison to other options, a higher collision frequency and severity could be expected.	2	This option addresses some of the deficiencies in two of the four ramps and provides functional spacing between intersections.	3	This option is below the current guidelines for highway access. With the mixed functions and one-way culvert, a higher collision frequency and severity could be expected.	0	This option is below the current guidelines for highway access. In comparison to other options, a higher collision frequency and severity could be expected.	0
<b>SCORE</b>		<b>35</b>		<b>30</b>		<b>26</b>		<b>27</b>		<b>24</b>		<b>21</b>		<b>22</b>		<b>18</b>	
<b>RANK</b>		<b>1</b>		<b>2</b>		<b>4</b>		<b>3</b>		<b>5</b>		<b>7</b>		<b>6</b>		<b>8</b>	

## 10.5 Recommended Option

Option 1 was ranked highest by this evaluation. Additional information and considerations for Option 1 includes:

- » From a safety perspective the ramp geometrics at the highway merge and diverge points for this option are superior to those presented in Option 2. However the SB off ramp may conflict with the end of preceding SB climbing lane, potentially creating confusion for weaving traffic. If this conceptual design option is selected, specific attention to this detail will be required as part of engineering design.
- » Improved connectivity to the maintenance depot and Greenstone Mountain recreational area compared to Option 2;
- » The overall footprint of Option 1 is much less than Option 2 leading to less disruption of the surrounding area; and,
- » Based on the quantity of new lane kilometre, the cost of Option 1 is likely to be in the order of 30% less than Option 2. Undertaking 3d modelling and earthwork profiles will be key to defining the level of investment required, as will some preliminary design and geotechnical investigation to determine the extent of rock excavation.

***Note: Reconstruction of Inks Lake Interchange and LLJR/AMAR intersection is considered an effective mitigation measure to remediate the impacts of Project generated traffic.***

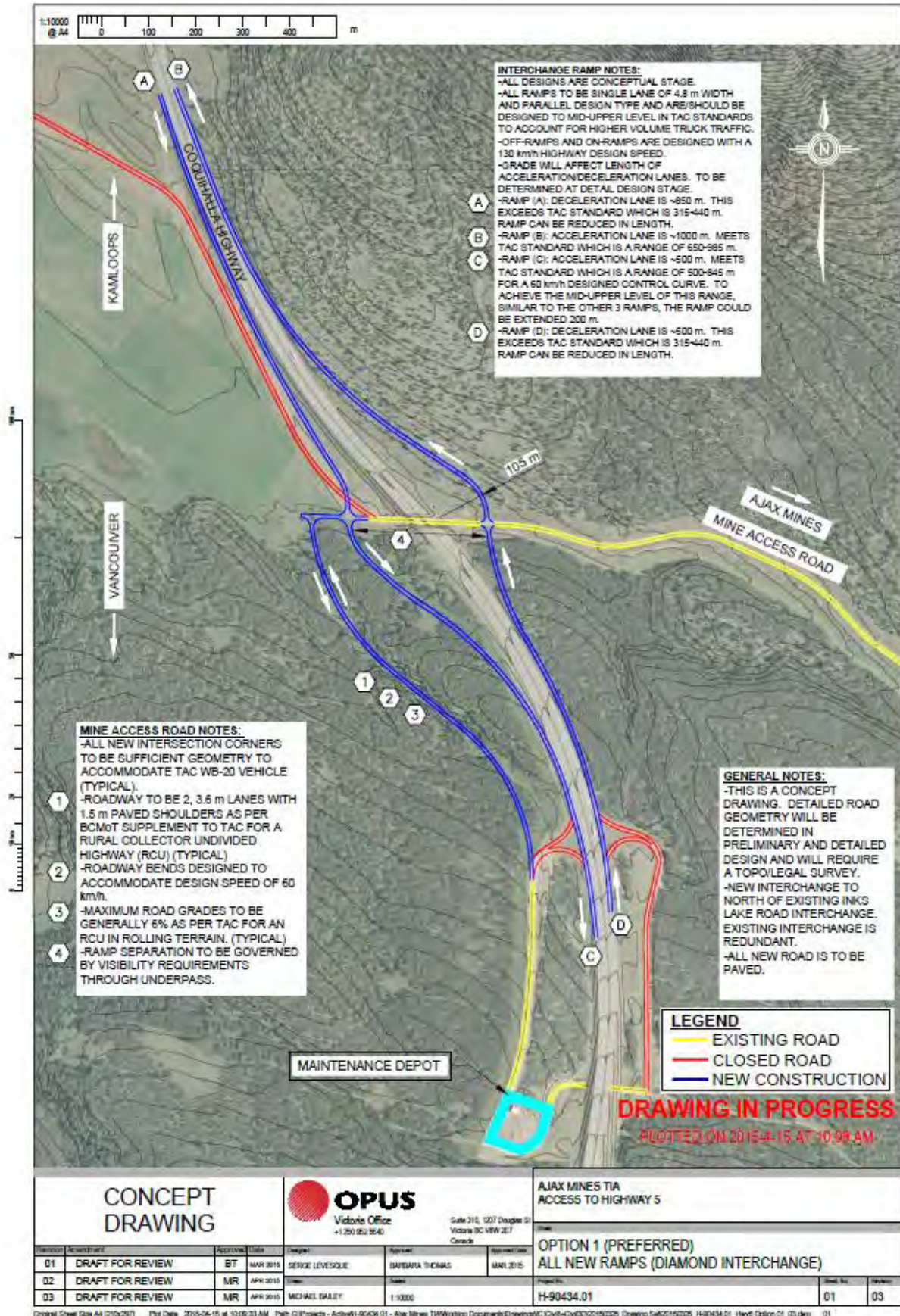
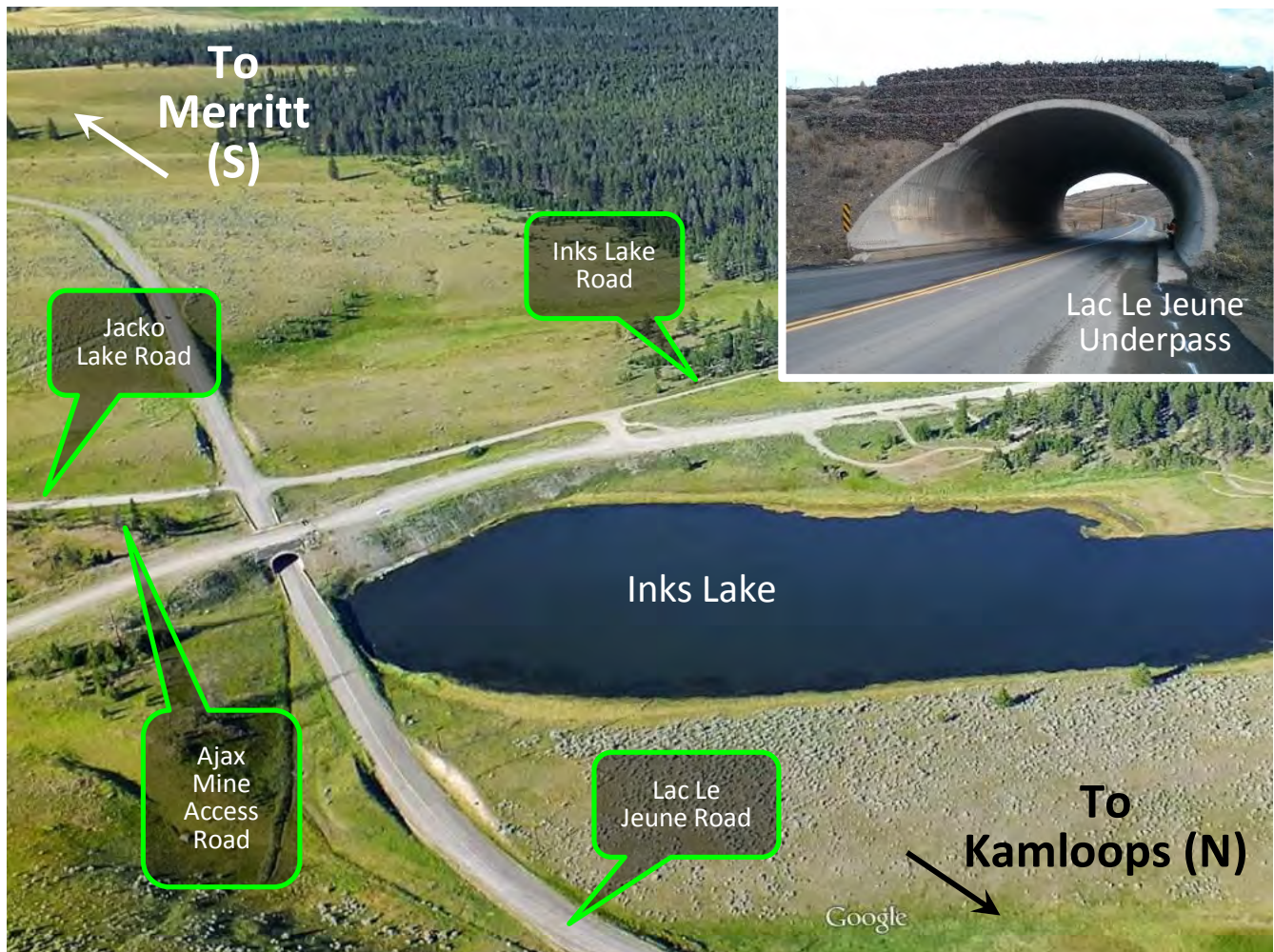


Figure 30: Inks Lake Interchange – Preferred Option

# 11 Lac Le Jeune Road / Ajax Mine Access Road Intersection Conceptual Design Options

## 11.1 Background

As part of the proposed project, AMAR would become a public road between Highway 5 and the Project gatehouse located east of LLJR. Connectivity between the AMAR and LLJR is therefore required and will need to be designed and constructed to current MoTI standards. The general location of the required intersection is shown in the following figure:



**Figure 31: Existing Lac Le Jeune Road / Ajax Mine Access Road Crossing (Source: Google 2015)**

The existing LLJR underpass was built to separate mine haul traffic from public traffic on LLJR. Constructed in 1988, the multi-plate structure is 45 metres long by 11 metres wide by 8 metres high. A recent condition inspection by MoTI shows this structure to be at or near to the end of its service life and requires upgrade or replacement. KAM intends to replace the structure and reconfigure the LLJR/AMAR intersection as an advanced works and permitting process to address MoTI comments regarding the structure as well as existing safety concerns for current site operations.

## 11.2 Constraints

The following table identifies the engineering and operational constraints considered in the scoping and evaluation of conceptual elements for an upgrade of the LLJR intersection.

**Table 10: Lac Le Jeune Road Intersection Constraints**

Ref	Constraint	Description
1	Inks Lake	Boundary constraint immediately northwest of the intersection.
2	Private Land	Land to the immediate south of AMAR in the vicinity of LLJR is in private ownership and preferred solutions are to avoid impact on the private property.
3	Terrain	Steeply rising ground to the northeast. Unknown rock interface.
4	MoTI Requirements	Requirement for all public sections of road to be paved and constructed to current MoTI standards. Underpass structure must be replaced or removed.
5	Access	Public access to Jacko Lake must be maintained although access on and to Jacko Lake will be subject to controls during daily blasting activities and necessary safety protocols.

## 11.3 Options Description

Six options for connecting AMAR and LLJR were developed. An illustration of each concept is included in the evaluation matrix is included in Appendix B.

The options are grouped broadly into two categories: at-grade; and grade-separated. At-grade options explore the range of available intersection controls including stop signs, signalization, and a roundabout, while grade-separated options include overpasses and connecting links between the two roads.

Access to Inks Lake Road was maintained in all options because its connection requirements have yet to be finalized. Discussions about long term access to property southwest of the AMAR/LLJR intersection are on-going between the owner(s) and KAM. Once the need for connection to Inks Lake Road is confirmed or negated, design details concerning connection to Inks Lake Road will be finalized.

## 11.4 Options Analysis

The relative merits, risks, and deficiencies of each option are presented in an evaluation matrix (Table 12). Each option was evaluated by a set of criteria and scored as per the following scale (Table 11). Each criterion was equally weighted.

**Table 11: Option Evaluation Criteria**

CRITERIA	SCORE								
	8	7	6	5	4	3	2	1	0
Connectivity	Shortest possible route to the Project site			Reasonable route but not ideal for some users			Extended and tortuous route for Project traffic & other users		
Lane Balance and Function	Fully compliant with TAC guidelines & simple way finding			Partially compliant (resolvable)			Partially compliant (un-resolvable) or substantially non-compliant		
Traffic Operations	Vehicle delay and queuing satisfactory			Vehicle delay and queuing marginal			Vehicle delay and queuing unsatisfactory		
Capital Cost	Lowest Cost Option			Estimated at less than double the cost of the lowest cost option			Estimated at more than double the cost of the lowest cost option		
Operational Costs	Future costs equal to or cheaper than current situation			Less than 6km of new lanes and no more than one significant other asset (signals, structure etc.)			More than 6km of new lanes and more than one significant other asset (signals, structure etc.)		
Vehicle Safety	Equal to or better than current situation			Some safety concerns (resolvable)			Substantial safety concerns (un-resolvable)		

Opportunity to utilize the existing Inks Lake Road and Jacko Lake Road intersection just south of the existing overpass was explored within the options. However, a combination of the proximity of the existing intersection to the overpass, limited sight-lines, and the predominant behaviour of drivers to exceed the speed limit in the area (see Section 18) means that the arrangement needs to be improved.

Similar to the Inks Lake Interchange, the amount of rock excavation required will significantly affect option cost (especially Option 3). Some sense of the rock surface underground is therefore key to an accurate cost estimate and is not included in this evaluation due to lack of subsurface data in the immediate area.

The highest ranked options were Option (2) an at-grade intersection with signal control, and Option (3) a grade-separated intersection with connecting road to the northwest. These options are discussed further in the evaluation matrix.

Table 12: Access Options Evaluation Matrix – Lac Le Jeune Intersection

Evaluation Criteria	Description	Option 1 Single At-Grade Intersection (Stop Control)	S c o r e	Option 2 Single At-Grade Intersection (Signal Control)	S c o r e	Option 3 Close Inks Lake Road & New Connection to LLJR	S c o r e	Option 4 Realign Inks Lake Road Crossroads	S c o r e	Option 5 5-Leg Roundabout	S c o r e	Option 6 4-Leg Roundabout	S c o r e	Option 7 Retain Existing & Install Larger Underpass	S c o r e	Option 8 Do Minimum	S c o r e
Connectivity	Ease of access between the highway and various facilities.	The option removes the LLJR underpass with AMAR to become an at-grade intersection. The existing crossroads intersection of LLJR with Inks Lake (logging) Road is closed. New connections to the AMAR are provided east and west of LLJR.  Stop signs are provided on AMAR and a flashing beacon installed.	6	The option removes the LLJR underpass with the AMAR to become an at-grade intersection. The existing crossroads intersection of LLJR with Inks Lake (logging) Road is closed. New connections to the AMAR are provided east and west of LLJR.  Full traffic signals are installed.	8	The option replaces the LLJR underpass with AMAR. The existing crossroads intersection of LLJR with Inks Lake (logging) Road is closed. New connection to LLJR is provided north of the AMAR.	7	The option replaces the LLJR underpass with AMAR. The existing crossroads intersection of LLJR with Inks Lake (logging) Road is closed, and relocated further south to increase the separation from the LLJR underpass.	5	The option provides a 5 leg roundabout incorporating LLJR, Inks Lake (logging) Road, and AMAR.	6	The option provides a 4 leg roundabout incorporating LLJR and AMAR.	6	The option replaces the LLJR underpass with a new structure that enables sight lines to be achieved at the Inks Lake Road intersection, which is retained. A new connection is provided between Jacko Lake Road and AMAR for traffic accessing the AMAR from LLJR. > Requires improvement of existing S.42 Road on Private Property to provide public access between AMAR & LLJR > Requires new intersection on AMAR for connection to Inks Lake/Jacko Rd.	6	The option retains the LLJR underpass with the AMAR. It also retains the existing crossroads intersection of LLJR with Inks Lake (logging) Road. A new connection is provided between Jacko Lake Road and AMAR for traffic accessing the Project from Kamloops prior to completion of the Coquihalla connection. > Requires new intersection on AMAR for interconnection to Inks Lake/Jacko Road.	2
Lane Balance and Function	Comments on weaving lanes, speed change lanes, ramp alignments, and way finding.	> Signing and way finding will need to be provided for the connection to LLJR.	6	> Signing and way finding will need to be provided for the connection to LLJR.	6	> Signing and way finding will need to be provided for the connection to LLJR. > Intersection location on LLJR may be constrained by grade on LLJR (should be less than 4%).	6	> Signing and way finding will need to be provided for the connection to LLJR.	6	> Signing and way finding should not pose any significant issues. > Incorporating 5 legs at the roundabout limits separation between the north eastern legs (LLJR, AMAR, and Inks Lake Road).	4	> Signing & way finding should not pose any significant issues. > Incorporating 4 legs at the roundabout simplifies traffic movements. The intersection of LLJR/Inks Lake Rd is removed, in lieu of new connections between Inks Lake Road & AMAR either side of LLJR.	4	> Signing and way finding will need to be provided for the connection to LLJR.	2	> Signing and way finding will need to be provided for the connection to LLJR. > Proximity of LLJR / Inks Lake Road intersection to underpass. Visibility review required.	2
Traffic Operations	Average Delay per vehicle (expressed in seconds per vehicle), Level Of Service (LOS) for intersections, and queuing.	> Peak flows in 2018 could see up to 315 vehicles travelling along the AMAR in the AM and PM peak. Two-way volumes on LLJR approximately 51 vehicles in the AM peak hour and 89 vehicles in the PM peak hour. > Stop control on AMAR would generate some congestion for and apply delay to the highest number of users.	2	> Peak flows in 2018 could see up to 315 vehicles travelling along the AMAR in the AM and PM peak. Two-way volumes on LLJR approximately 51 vehicles in the AM peak hour and 89 vehicles in the PM peak hour. > A traffic signal would be used & formatted to minimize delay: > Rest in green on LLJR > Advance loops on AMAR to bring up green for laden trucks > Advance warning flashers on all legs	5	> Peak flows in 2018 could see up to 315 vehicles travelling along the AMAR in the AM and PM peak. Two-way volumes on LLJR approximately 51 vehicles in the AM peak hour and 89 vehicles in the PM peak hour. > New tee intersection on LLJR > Adequate storage available for side road volumes.	7	> Peak flows in 2018 could see up to 315 vehicles travelling along the AMAR in the AM and PM peak. Two-way volumes on LLJR approximately 51 vehicles in the AM peak hour and 89 vehicles in the PM peak hour. > Adequate storage available for stop control on Inks Lake/Jacko.	6	> Peak flows in 2018 could see up to 315 vehicles travelling along the AMAR in the AM and PM peak. Two-way volumes on LLJR approximately 51 vehicles in the AM peak hour and 89 vehicles in the PM peak hour. > Five-legged roundabout may generate driver indecision or confusion. Delay would be evenly distributed amongst all users.	3	> Peak flows in 2018 could see up to 315 vehicles travelling along the AMAR in the AM and PM peak. Two-way volumes on LLJR approximately 51 vehicles in the AM peak hour and 89 vehicles in the PM peak hour. > Four-legged roundabout more conventional and better understood by drivers. Delay would be evenly distributed amongst all users.	3	> Peak flows in 2018 could see up to 315 vehicles travelling along the AMAR in the AM and PM peak. Two-way volumes on LLJR approximately 51 vehicles in the AM peak hour and 89 vehicles in the PM peak hour. > Separates functionality of traffic. Adequate storage for stop control on Inks Lake/Jacko.	4	> Peak flows in 2018 could see up to 315 vehicles travelling along the AMAR in the AM and PM peak. Two-way volumes on LLJR approximately 51 vehicles in the AM peak hour and 89 vehicles in the PM peak hour. > Separates functionality of traffic. Adequate storage for stop control on Inks Lake/Jacko.	4
Level of Investment	Length of new or rebuilt roadways, and structure expansion.	This option requires the following: > Earthworks > Removal of LLJR Underpass and installation of flashing beacon > New Road Construction 125m > Decommissioning of Roads: 635m	6	This option requires the following: > Earthworks > Removal of LLJR Underpass and installation of traffic signals > New Road Construction 125m > Decommissioning of Roads: 635m	4	This option requires the following: > New Underpass > New Road Construction 400m > Decommissioning of Roads: 635m > Significant earthworks / Retaining Wall on new link road	4	This option requires the following: > New Underpass > New Road Construction 690m > Decommissioning of Roads: 380m	3	This option requires the following: > Earthworks > Removal of LLJR Underpass > New Road Construction 825m > Decommissioning of Roads: 410m	3	This option requires the following: > Earthworks > Removal of LLJR Underpass > New Road Construction 1080m > Decommissioning of Roads: 610m	3	This option requires the following: > New Road Construction 70m > Improvements and paving on Inks Lake Road > New underpass (extended for visibility req. on Inks Lake Rd)	5	This option requires the following: > New Road Construction 70m	8

Evaluation Criteria	Description	Option 1 Single At-Grade Intersection (Stop Control)	Score	Option 2 Single At-Grade Intersection (Signal Control)	Score	Option 3 Close Inks Lake Road & New Connection to LLJR	Score	Option 4 Realign Inks Lake Road Crossroads	Score	Option 5 5-Leg Roundabout	Score	Option 6 4-Leg Roundabout	Score	Option 7 Retain Existing & Install Larger Underpass	Score	Option 8 Do Minimum	Score
Ongoing Operational Costs	Linked to Investment Level.	> This option adds 125m of new road, and a new flashing beacon.	7	> This option adds 125m of new road, and traffic signals	4	> This option adds 800m of new road. > Ongoing maintenance requirement for LLJR underpass.	5	> This option adds 690Xm of new road. > Ongoing maintenance requirement for LLJR underpass.	4	> This option adds 825m of new road.	4	> This option adds 1080m of new road.	5	> This option adds 70m of new road. > Ongoing maintenance requirement for LLJR underpass.	3	> This option adds 70m of new road. > Ongoing maintenance requirement for existing old LLJR underpass. > Unsealed road maintenance requirement on Inks Lake Road	2
Vehicle Safety	Comparison of safety factors for motorists.	> Stop control on AMAR would likely be disrespected by drivers. The flashing beacon (yellow for LLJR and red for AMAR) would provide some driver awareness. > Likely conflict is high-speed side impact	1	> A three-colour traffic signal is generally understood by drivers and can provide favourable operations to varying traffic volumes. Advance warning flashers would address driver expectations although signals would generally be out of context with the route and location. > Likely conflict is high-speed side impact and rear-end.	5	> This option provides safe passage for trucks travelling between Coquihalla Hwy and the Project. > There is good separation between the LLJR underpass and the two realigned Inks Lake Road intersections. > Tee intersections have better safety performance than four-legged intersections (generally) & v. low volumes on this leg.	8	> This option provides safe passage for trucks travelling between Coquihalla Hwy and the Project. > There is functional separation between the LLJR underpass and the realigned Inks Lake Road.	5	> High volume of traffic flows on the AMAR in the east/west direction. Significantly lower volumes on LLJR may encourage driver familiarity on AMAR to proceed without yielding. However adequate sightlines will be achievable. > Roundabouts generally have safer operation than intersections and conflict speeds are generally lower.	3	> High volume of traffic flows on the AMAR in the east/west direction. Significantly lower volumes on LLJR may encourage driver familiarity on AMAR to proceed without yielding. However adequate sightlines will be achievable. > Roundabouts generally have safer operation than intersections and conflict speeds are generally lower.	7	> This option provides safe passage for vehicles travelling between Coquihalla Hwy and the Project. > There is limited separation between the LLJR underpass and Inks Lake Road. > Proximity of LLJR / Inks Lake Road intersection to underpass. Visibility review required.	3	> This option provides safe passage for vehicles travelling between Coquihalla Hwy and the Project. > There is limited separation between the LLJR underpass and Inks Lake Road. > Proximity of LLJR / Inks Lake Road intersection to underpass. Visibility review required.	2
<b>SCORE</b>			<b>28</b>		<b>32</b>		<b>37</b>		<b>29</b>		<b>23</b>		<b>28</b>		<b>23</b>		<b>20</b>
<b>RANK</b>			<b>4=</b>		<b>2</b>		<b>1</b>		<b>3</b>		<b>6=</b>		<b>4=</b>		<b>6=</b>		<b>8</b>

## 11.5 Recommended Option

Option 3 is the highest ranked option by this evaluation. Additional information regarding the selection of this option includes:

- » From a safety perspective, the separation of Project traffic from LLJR traffic at the intersection is superior to the rural signal controlled intersection in Option 2. The significance of this consideration is elevated due to the results of the traffic speed analysis on LLJR which shows the majority of vehicles are travelling significantly faster than the posted speed limit;
- » The long term operating cost of Option 3 is much less than Option 2; and,
- » There are operational benefits of primary flows being uninterrupted with the grade-separated option.

The capital cost of Option 3 is potentially significantly more than Option 2, and its safety benefits are likely to outweigh the additional cost (Note: undertaking 3d modelling and earthwork profiles will be key to defining the level of investment required, as will some preliminary design and geotechnical investigation to determine the extent of rock excavation). Should additional earthworks and structures costs associated with Option 3 prove to be prohibitive, a signal controlled at-grade intersection (Option 2) may be further explored with stakeholder consultation and consideration of the following:

- » Advance warning flashers;
- » Commercial vehicle identification by advance loops or cameras (hold up green phase);
- » Design details such as all red-phase timing, yellow phase timing, etc.; and,
- » Adequate sight distance.

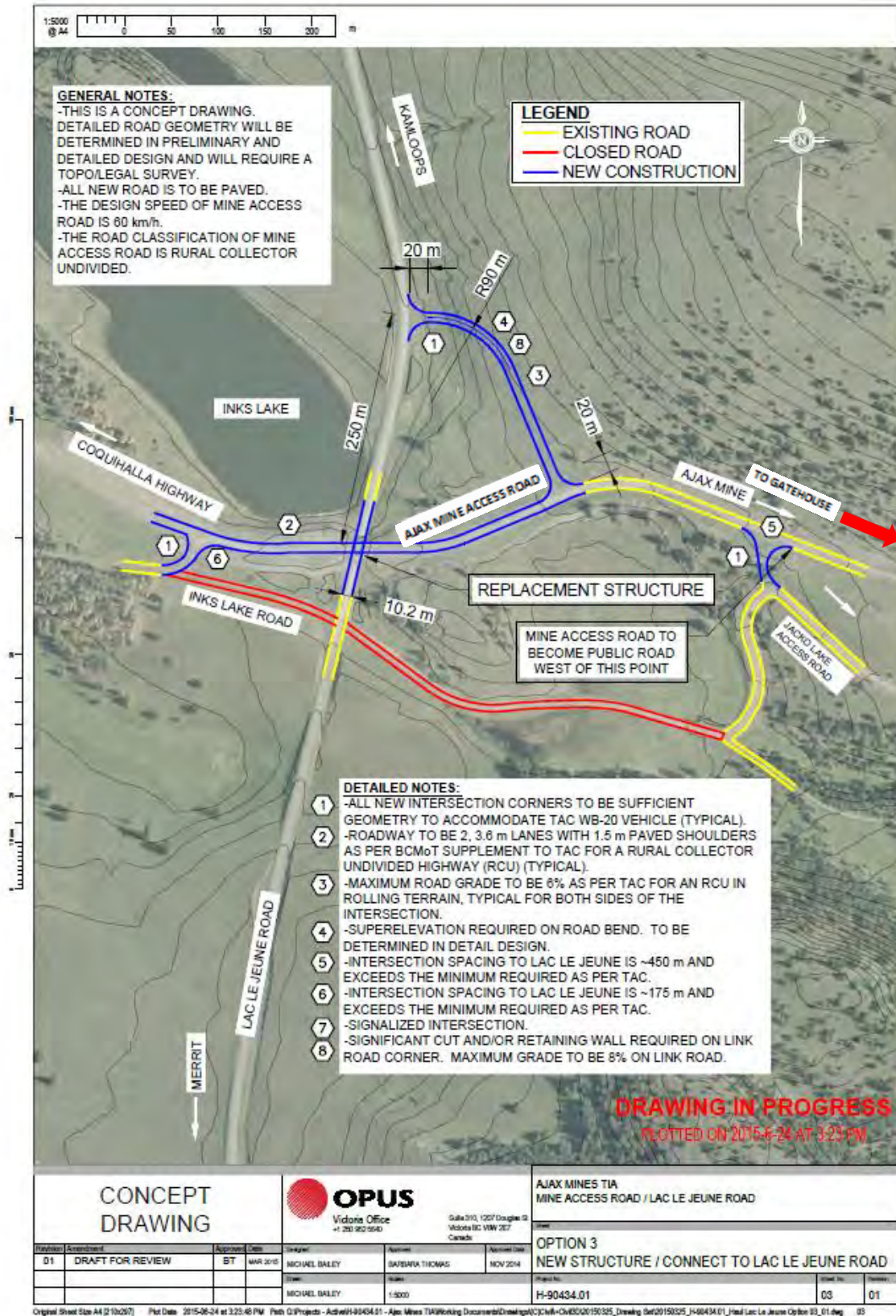


Figure 32: Lac Le Jeune Road Intersection – Preferred Option

## 12 Ajax Mine Access Road

The existing AMAR corridor provides the desired line of travel between the Project and the proposed upgraded Inks Lake Interchange. AMAR is a private road originally designed for haul trucks used as part of historic operations at the site conducted by previous owners. It is approximately 7.5 meters or greater in width. The road structure appears to be in good condition with no apparent structural failures and is likely to provide an excellent foundation for upgrading to public road standard.

KAM proposes to make AMAR a public road (as required by MoTI) if directly connected to Highway 5 and LLJR. The proposed alignment runs through both MoTI and CoK jurisdictions and therefore technical approval of the road design will be required from MoTI and CoK .

Figure 33 shows the proposed typical cross-section for the upgraded AMAR. This is the standard for a Local Rural Undivided 2-lane road, as taken from **MoTI's** BC Supplement to TAC Geometric Design Guide 2007 Edition.

MoTI standard for an undivided 2-lane rural road is 80 km/h. However, given the proposed mix of traffic that includes concentrate haul trucks, mine delivery vehicles, commuters and local recreational vehicles (which is likely to increase due to improved access in the area), Opus recommends that MoTI considers designing the road environment for, and posting, a 60km/h speed limit. This will help to ensure safe operation of the road and is considered appropriate from a network perspective given that the AMAR will function as a short (2.6km) connector road with what is effectively a stop control at either end.

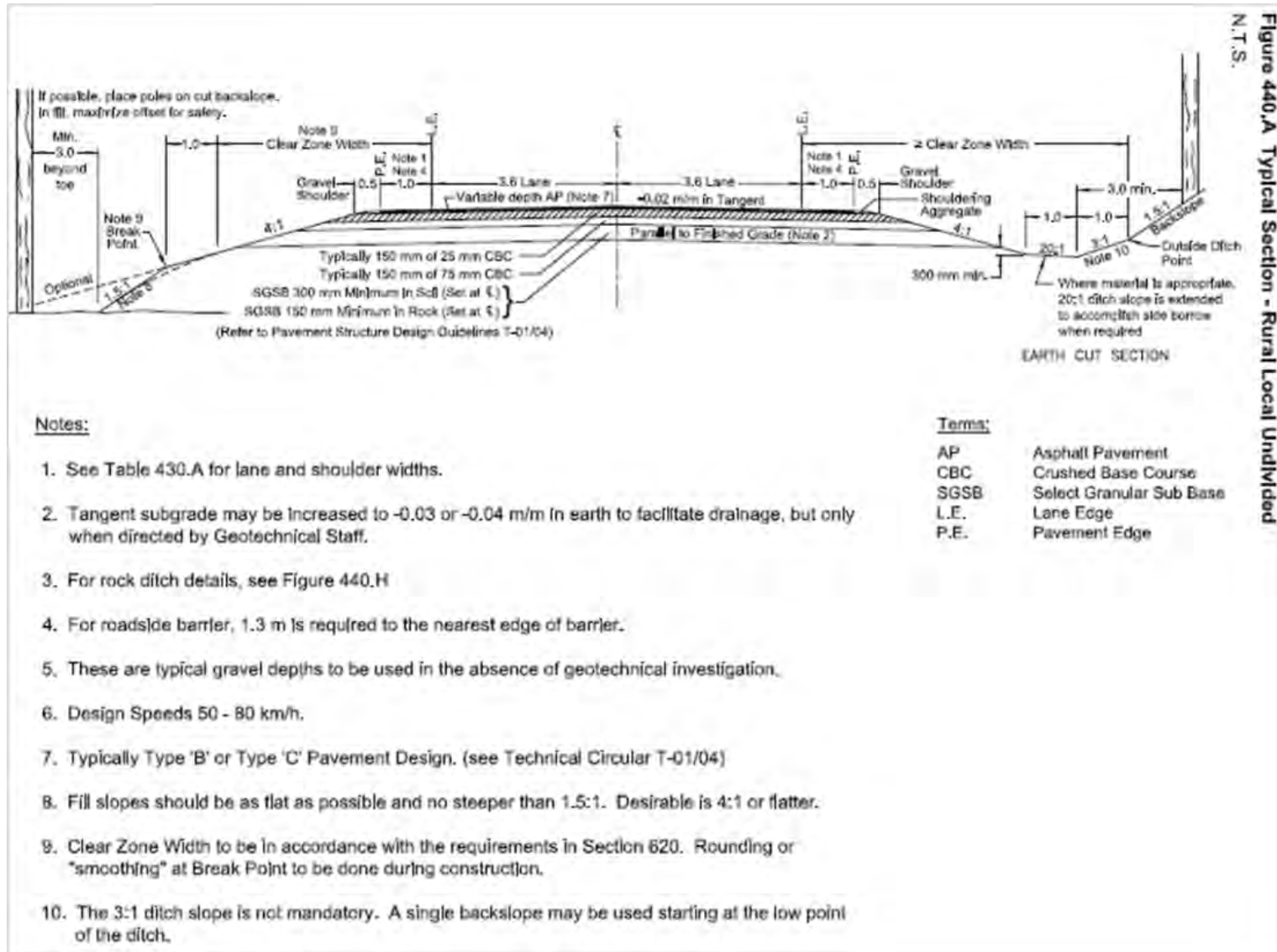


Figure 33: Typical Cross-Section for Ajax Mine Access Road

# TRAFFIC ANALYSIS

- IN THIS SECTION:**
- Intersections - Base Conditions
  - Intersections - Total Conditions
  - Mitigated Conditions (Residual Effect)
  - Goose Lake Road Closure Analysis
  - Traffic Capacity Analysis Results Summary & Recommendations

The following sections present the key results of the traffic modelling for each of the scenarios (Base, Total, and Mitigated) in each Horizon Year (2016, 2018, 2024, and 2039), highlighting areas of impact and recommendations for action. The sections should be read in conjunction with Appendix C: Traffic Input Data and Results.

Operational performance of the study intersections was assessed using modelling software which produces results based on levels of service, volume-to-capacity ratios, 95th percentile queue lengths, and, delay. The traffic operational parameters for which the thresholds apply and their definitions are presented in Table 13:

**Table 13: Operational Performance Criteria**

Criterion	Definition
<b>Level of Service (LoS)</b>	Qualitative measure used to relate the quality of traffic service. LOS is used to analyze highways by categorizing traffic flow and assigning quality levels based on performance measure like speed, density, etc. Ranges from A to F. A is free flow condition when traffic demand is much less than roadway capacity. F is failure when traffic demand greatly exceeds roadway capacity.
<b>Volume-to-capacity ratio (v/c)</b>	A quantitative measure of traffic demand compared to roadway capacity. Ranges from 0 (zero) when demand is non-existent to 1.0 when demand equals capacity. In theoretical modelling, the range extends above 1.0 to represent conditions when demand greatly exceeds capacity.
<b>95th percentile queue length (95th queue)</b>	The length of queue, sometimes called tailback, of waiting vehicles, measured in metres. Typically used at intersections to quantify the length of turn slot required for design purposes. 95th percentile is a mathematical expression meaning that 95% of the calculated queue lengths are this length or smaller.
<b>Delay</b>	The theoretical amount of delay, measured in seconds, experienced by each car in the traffic movement being modelled. It is a theoretical value allowing comparison between roadway design parameters.

Levels of Service range from A to F, where:

- » A represents free flow traffic conditions with minimal delays, if any;
- » B represents low levels of delay and queuing;
- » C represents stable and acceptable flow; however, intermittently vehicles wait through more than one signal cycle and back-ups may develop but are cleared quickly;

- » D represents interrupted flow where back-ups may be excessive, and delays for some vehicles may be extensive; periodically demand lessens and back-ups clear;
- » E represents long delays and queues; demand fills intersection capacity, and many vehicles wait more than one signal cycle; and,
- » F represents very heavy demand exceeding intersection capacity which generates very long delays and queues; most vehicles are delayed more than one signal cycle.

Summary diagrams are provided in each of the Base Conditions, Total Conditions and Mitigated Conditions sections. The diagrams are in the Analysis Results chapter of each respective section. Each diagram illustrates the study network and highlights only the individual intersections that either:

- 1) Have one or more movements that operate below specified thresholds, and/or,
- 2) The overall intersection operates below specified thresholds which are identified in Section 4.2.

Note: An intersection highlighted in red has an overall traffic operational parameter that functions poorly; however, an intersection may still be acceptable even if a movement functions poorly. Additionally, movements or lanes operating poorly may not necessarily be failing.

## 13 Intersections - Base Conditions

This section contains the summary of operational performance anticipated in the future horizon years for background traffic only, with the focus on operational problems.

To determine the impacts, base conditions were first determined by projecting current traffic volumes to horizon years. Base conditions exclude Project-generated traffic and are calculated based on assumed growth in the study area, as defined in the ToR. For this TIA, the base conditions included 2011 traffic count data and trips generated by the anticipated Gateway casino development. Base traffic volumes and trip assignment for the four horizon years are provided in Appendix C, Figures 1 through 8. Also included in Appendix C are the full details of the modelling analysis and outcomes.

In each section of this chapter, anticipated operational problems are presented and discussed for each horizon year. Intersections with movements operating at less than desired thresholds (see Table 4 in Section 4.2) are identified, the operational concerns are discussed, and opportunities to alleviate the performance issues are identified. The AM peak hour outcomes are presented first followed by the PM peak hour outcomes, and finally, recommendations.

Operational characteristics including Project traffic are discussed ahead in Total Conditions, Section 14, and Mitigated Conditions, Section 15, of this report.

### 13.1 2016 Base Conditions

All intersections and movements perform within stated thresholds discussed in Table 4 in Section 4.2 in the AM peak hour, with the exception of two movements at the Pacific Way/Hugh Allan Drive intersection. See Table 14 for more detail.

At Pacific Way/Hugh Allan Drive, two movements are anticipated: to perform below desired thresholds:

- » Westbound left turn = LoS E; and,
- » Westbound through = LoS D.

During the PM peak hour, all intersections perform at overall LoS acceptable within the stated thresholds. However, there are specific movements that experience low LoS and exceed storage capacities as follows:

At Pacific Way/Hugh Allan Drive:

- » Eastbound left turn = LoS D and exceeds its storage capacity;
- » Westbound left turn = LoS D; and,
- » Westbound through = LoS E.

**Table 14: Base 2016 - Pacific Way and Hugh Allan Drive Intersection**

Intersection	Turning Movement	Base 2016 AM Peak				Base 2016 PM Peak			
		LoS	v/c Ratio	95th Queue (m)	Delay (s)	LoS	v/c Ratio	95th Queue (m)	Delay (s)
Pacific Way / Hugh Allan Drive	Overall I/S	C	-	-	20.9	C	-	-	24.3
	EBL	C	0.25	14.9	30.9	D	0.65	#47.2	38.4
	EBTR	C	0.43	33.7	29.2	C	0.52	57.8	31.4
	WBL	D	0.27	14.4	45.1	D	0.10	6.9	39.2
	WBT	E	0.67	43.2	57.4	E	0.70	47.9	57.0

At the proposed roundabout, Versatile Drive/Hugh Allan Drive:

- » Southbound lane entering the roundabout = LoS D

**Table 15: Base 2016 – Versatile Drive and Hugh Allan Roundabout**

Intersection	Turning Movement	Base 2016 AM Peak				Base 2016 PM Peak			
		LoS	v/c Ratio	95th Queue (m)	Delay (s)	LoS	v/c Ratio	95th Queue (m)	Delay (s)
Versatile Drive / Hugh Allan Drive	Overall I/S	A	-	-	5.6	C	-	-	15.5
	EBLTU	A	0.27	11.0	6.9	A	0.24	11.0	9.8
	WBTRU	A	0.14	11.0	4.6	A	0.41	22.0	7.8
	SBLRU	A	0.09	11.0	5.5	D	0.43	99.0	27.7

At Highway 1/5 Westbound Ramps/Pacific Way:

- » The westbound through/left lane exceeds its storage capacity by.

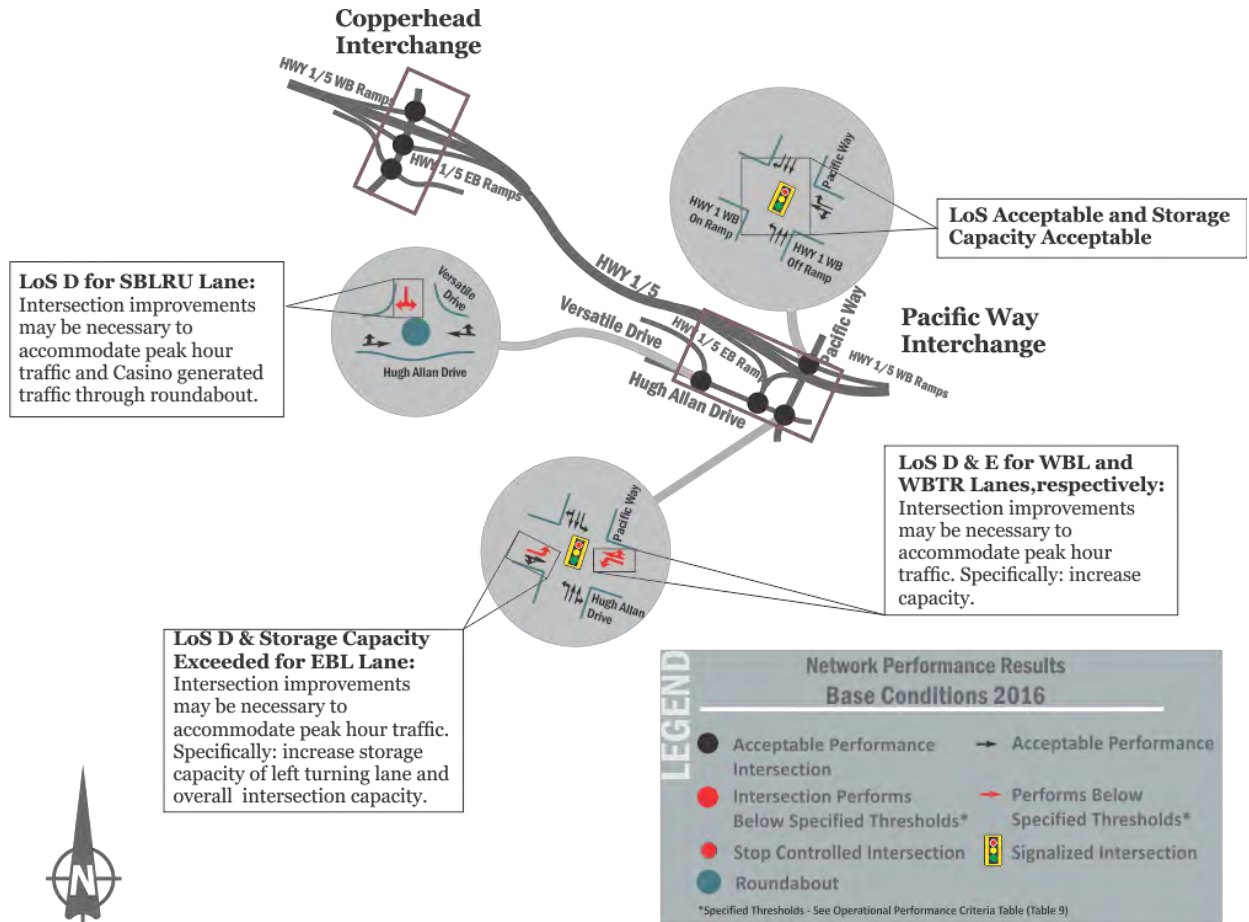


Figure 34: 2016 Base Conditions - Network Performance Results Summary

### 13.1.1 Recommendations

Intersection improvements may be necessary to accommodate predicted growth in background traffic. Left turn storages may require lengthening at Pacific Way/Hugh Allan Drive and at Highway 1/5 Westbound Ramps. Furthermore, the southbound lane entering the roundabout at Versatile Drive/Hugh Allan Drive is predicted to have 95th percentile queues of 99 m. These storage issues will likely need to be addressed regardless of additional development traffic.

### 13.2 2018 Base Conditions

All intersections and movements perform within the desired thresholds and are consistent with those experienced in the 2016 base scenario shown in Figure 34.

#### 13.2.1 Recommendations

As per the 2016 base conditions, intersection improvements may be necessary to accommodate predicted growth in background traffic. Left turn storages more urgently require lengthening at Pacific Way/Hugh Allan Drive and at Highway 1/5 Westbound Ramps. The southbound lane entering the roundabout at Versatile Drive/Hugh Allan Drive continues to have excessive queues predicted. These storage issues will likely need to be addressed regardless of additional development traffic.

### 13.3 2024 Base Conditions

Most intersections and movements perform within the specified thresholds and are consistent with those experienced in the 2016 and 2018 base scenarios. Pacific Way/Hugh Allan Drive, and, Versatile Drive/Hugh Allan Drive experience further decline in operation. Refer to Figure 35 for more information.

At Pacific Way/Hugh Allan Drive, in addition to the previously identified operational concerns:

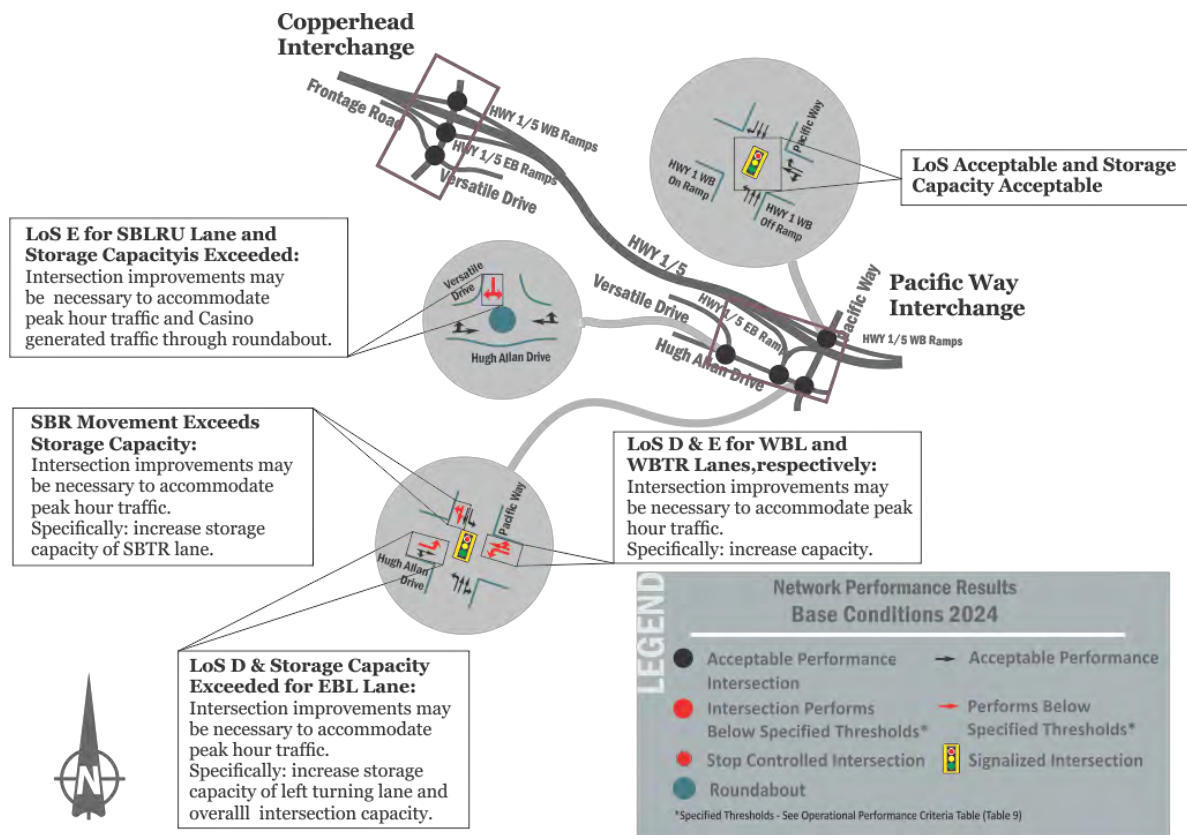
- » Southbound right turn exceeds its storage capacity.

At the proposed roundabout, Versatile Drive/Hugh Allan Drive (Table 11):

- » Southbound lane entering the roundabout = LoS E; and,
- » Southbound 95th percentile queue = 121 m.

**Table 16: Base 2024 - Versatile Drive and Hugh Allan Drive Roundabout**

Intersection	Turning Movement	Base 2024 AM Peak				Base 2024 PM Peak			
		LoS	v/c Ratio	95th Queue (m)	Delay (s)	LoS	v/c Ratio	95th Queue (m)	Delay (s)
Versatile Drive / Hugh Allan Drive	Overall I/S	A	-	-	5.9	C	-	-	19.4
	EBLTU	A	0.30	11.0	7.4	B	0.27	11.0	10.8
	WBTRU	A	0.17	11.0	4.9	A	0.45	22.0	8.5
	SBLRU	A	0.20	11.0	5.8	E	0.90	121.0	38.7



**Figure 35: 2024 Base Conditions: Network Performance Results Summary**

### 13.3.1 Recommendations

As per sections 13.1 and 13.2, the base conditions will generate operational problems that require resolution regardless of additional development traffic. Storage lengths for left and right turns will likely need lengthening and traffic signals will need adjustment.

### 13.4 2039 Base Conditions

Most intersections and movements perform within the specific thresholds and are consistent with those experienced in the base 2024 scenario. The same intersections indicate operational difficulties including Pacific Way/Hugh Allan Drive, the roundabout at Versatile Drive/Hugh Allan Drive, and Highway 1/5 Westbound Ramps/Pacific Way.

At Pacific Way/Hugh Allan Drive (Table 17):

- » Westbound left turn = LoS D; and,
- » Westbound through = LoS E.

**Table 17: Base 2039 - Pacific Way and Hugh Allan Drive Intersection**

Intersection	Turning Movement	Base 2039 AM Peak				Base 2039 PM Peak			
		LoS	v/c Ratio	95th Queue (m)	Delay (s)	LoS	v/c Ratio	95th Queue (m)	Delay (s)
Pacific Way / Hugh Allan Drive	Overall I/S	C	-	-	23.7	D	-	-	31.2
	EBL	C	0.31	16.50	29.1	E	0.93	#65.8	70.8
	EBTR	C	0.48	39.70	2.9	D	0.65	70.00	36.2
	WBL	D	0.30	16.60	43.2	D	0.11	7.80	37.2
	WBT	E	0.71	51.10	56.2	E	0.74	56.60	56.5

In the afternoon peak hour, Pacific Way/Hugh Allan Drive, the roundabout, and Highway 1/5 Westbound Ramps/Pacific Way show operational difficulties.

At Pacific Way/Hugh Allan Drive (Table 18):

- » The overall intersection operates at LoS D;
- » Eastbound left turn = LoS E and exceeds its storage capacity;
- » Eastbound through and right turn = LoS D;
- » Westbound left turn = LoS D; and,
- » Westbound through = LoS E.

At the roundabout at Versatile Drive/Hugh Allan Drive:

- » Southbound lane entering the roundabout = LoS F; and,
- » Southbound 95th percentile queue = 198 m.

Table 18: Base 2039 - Versatile Drive and Hugh Allan Drive Roundabout

Intersection	Turning Movement	Base 2039 AM Peak				Base 2039 PM Peak			
		LoS	v/c Ratio	95th Queue (m)	Delay (s)	LoS	v/c Ratio	95th Queue (m)	Delay (s)
Versatile Drive / Hugh Allan Drive	Overall I/S	A	-	-	6.5	D	-	-	33.5
	EBLTU	A	0.36	22.0	8.5	B	0.34	11.0	13.1
	WBTRU	A	0.19	11.0	5.2	A	0.51	33.0	9.6
	SBLRU	A	0.24	11.0	6.3	F	1.06	198.0	75.8

In addition, at Highway 1/5 Westbound Ramps/Pacific Way:

- » Northbound left turn = LoS D and exceeds its storage capacity.

Refer to Figure 36 for more information.

### 13.4.1 Recommendations

As with the previous base condition scenarios, storage lengths for turning movements and for the southbound lane entering the roundabout continue to generate operational challenges. These conditions are anticipated without the addition of Project traffic on the network.

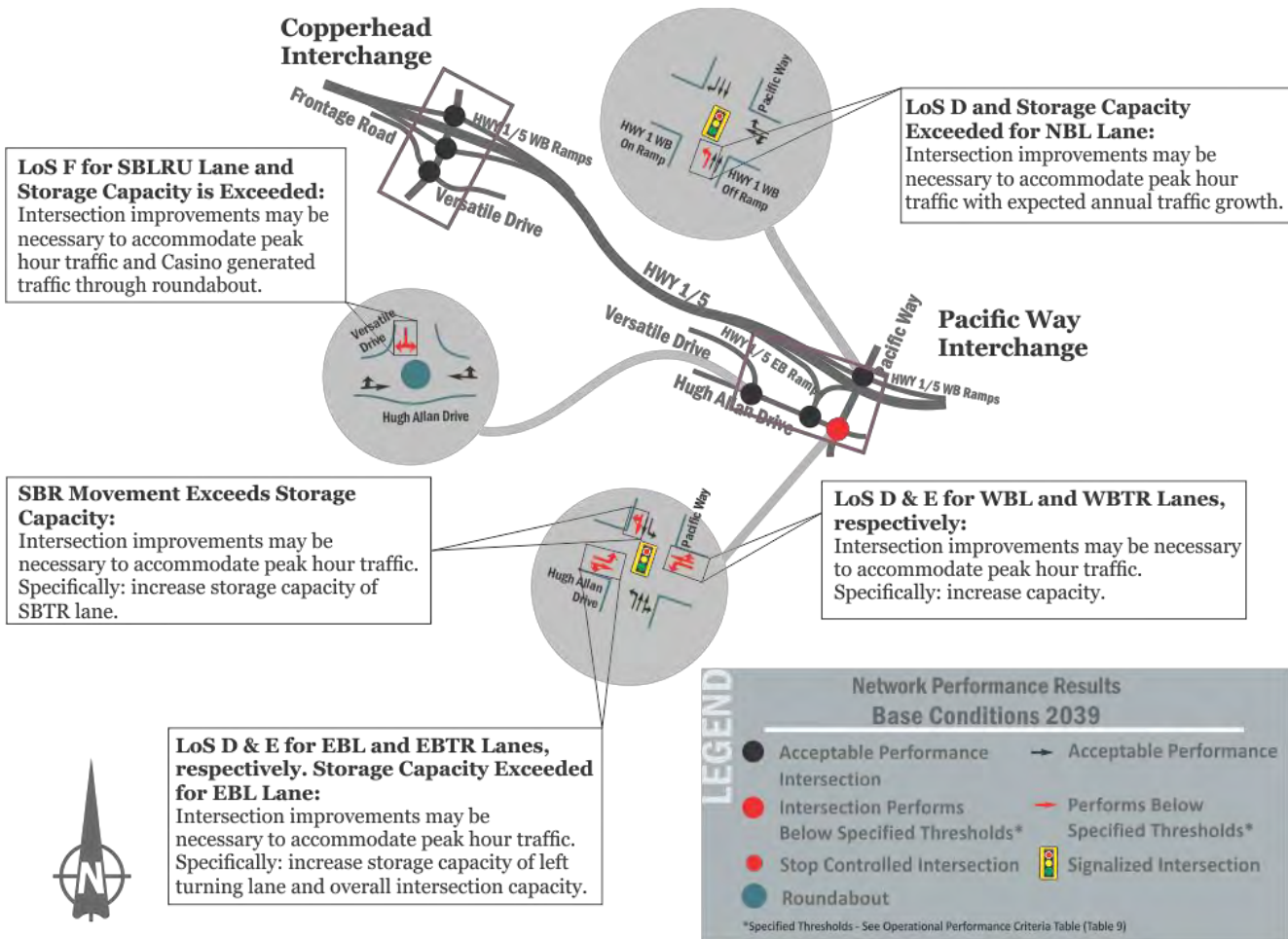


Figure 36: 2039 Base Conditions: Network Performance Results Summary

## 14 Intersections - Total Conditions

Presented in this section are the results of modelling total conditions, base conditions plus the anticipated traffic volumes from the Project. This analysis excludes proposed mitigation measures, which are discussed in Section 15. The operational outcomes presented here represent the worst case scenario and are unlikely to occur as KAM is committed to reducing and/or eliminating the effects of Project traffic.

### 14.1 Construction Phase Trip Generation

Traffic capacity analyses were conducted for the 2016 and 2018 horizon years to evaluate Project construction traffic conditions in comparison to the 2016 and 2018 base traffic conditions.

#### 14.1.1 Staff Trip Generation

Trip generation data specific to mining operations is limited. The Institute of Transportation Engineers (ITE) Trip Generation Manual 9th Edition (2012) does not contain mining land use trip generation data and other sources do not provide comparable data. Therefore, trip generation to/from the Project was based on predicted trip characteristics provided by KAM.

Workforce requirements are variable throughout the two year construction phase to accommodate the construction sequence. KAM estimates a maximum of 400 total staff and contractors will work at the Project site at any one time starting in Q4 of the 2016 horizon year, and increasing to a maximum of 1,800 during the 2018 horizon year. Night shift work will not occur during the construction phase so all commuting trips to/from the site are assumed to occur during the AM and PM peak hours respectively.

KAM is committed to implementing a number of mitigation measures during construction to reduce or eliminate significant adverse transportation network effects, including company bus transportation, car-pooling initiatives and staggered shifts. As per requests by MOTI and CoK, however, the total conditions assessment of the construction traffic does not include these mitigation strategies and therefore do not necessarily provide an accurate representation of residual effects to traffic after implementation of mitigation strategies. Mitigation strategies were added and their effectiveness evaluated in a subsequent assessment scenario as described in Section 15.

##### 14.1.1.1 2016 Trip Generation

At the request of MoTI and CoK, the TIA assumes in the total conditions assessment case that in 2016 all construction phase employees will travel by passenger car and that demand management strategies, which KAM is committed to providing, will not be implemented, thus presenting a highly conservative worst case scenario.

Table 19 shows the estimated morning (AM) and evening (PM) trip generation for the 2016 construction horizon year assuming 7% of staff will travel as passengers. The TIA assumes that 10% of the total estimated trips will leave in the AM peak hour after arriving at site and 10% will arrive in the PM peak hour to account for meetings, errands, and other miscellaneous trips during a given day. This in/out trip split is accounted for in the following tables.

**Table 19: Construction Phase Staff Trip Generation Estimate (2016)**

Peak Hour	Mode of Transport	Staff	Vehicles*	In/Out Split%	In	Out	Total
<b>AM</b>	Passenger Car	400	372	100/10	372	37	409
<b>PM</b>	Passenger Car	400	372	10/100	37	372	409

\*The number of vehicles is based on the assumption that 7% of staff will travel as passengers.

### 14.1.1.2 2018 Trip Generation

Similar to 2016 and also at the request of MoTI and CoK, the TIA assumes in the total conditions assessment case that in 2018 all construction phase employees will travel by passenger car and that mitigation measures proposed by KAM, will not be implemented thus presenting an unmitigated and highly conservative worst case scenario.

Table 20 shows the estimated morning (AM) and evening (PM) trip generation for the 2018 construction horizon year assuming 7% of staff will travel as passengers. The TIA assumes 10% of generated vehicles will leave in the AM peak hour and 10% will arrive in the PM peak hour to account for meetings, errands, and other miscellaneous trips.

**Table 20: Construction Phase Staff Trip Generation Estimate (2018)**

Peak Hour	Mode of Transport	Staff	Vehicles*	In/Out Split %	In	Out	Total
<b>AM</b>	Passenger Car	1,800	1,674	100/10	1,674	167	1,841
<b>PM</b>	Passenger Car	1,800	1,674	10/100	167	1,674	1,841

\*The number of vehicles is based on the assumption that 7% of staff will travel as passengers.

## 14.1.2 Heavy Vehicle Trip Generation

### 14.1.2.1 2016 Heavy Vehicles

The sizes, types, and activities of heavy vehicles were analyzed for the duration of the construction period to determine the effects heavy vehicle trips may have on the road network. During the 2016 horizon year, it is predicted that there will be 200 loads per quarter. This equates to 67 loads per month, 17 loads per week (assuming four weeks in a month), and about 2.5, or 3, loads per day (assuming they operate seven days per week).

To be conservative for the traffic capacity analysis, it is assumed that all heavy vehicles in the 2016 horizon year will enter the site in the AM peak hour and will leave during the PM peak hour. Note: this is an unlikely scenario as the majority of heavy load traffic will enter and leave the site during the late morning and early afternoon periods.

Table 21 shows the breakdown of the heavy vehicle trip generation estimate:

**Table 21: Construction Phase Heavy Vehicle Trip Generation Estimate (2016)**

Peak Hour	Type of Vehicle	In	Out	Total
<b>AM</b>	Heavy Vehicles	3	0	3
<b>PM</b>	Heavy Vehicles	0	3	3

### 14.1.2.2 2018 Heavy Vehicles

The peak in heavy vehicle traffic is estimated to occur between Q1 of 2017 and Q1 of 2018 with approximately 400 loads per quarter. Assuming heavy vehicle loads are evenly spread out over the quarter, 400 loads per quarter equates to 133 loads per month, and 33 loads per week (assuming 4 weeks per month). At 33 loads per week, this equates to five loads per day (assuming operations are conducted seven days per week).

To be conservative for the traffic capacity analysis, it is assumed that all heavy vehicles in the 2018 horizon year will enter the site in the morning peak hour and will leave during the evening peak hour. Note: this is an unlikely scenario as the majority of heavy load traffic will enter and leave the site during the late morning and early afternoon periods.

Table 22 shows the breakdown of the heavy vehicle trip generation estimate.

**Table 22: Construction Phase Heavy Vehicle Trip Generation Estimate (2018)**

Peak Hour	Type of Vehicle	In	Out	Total
AM	Heavy Vehicles	5	0	5
PM	Heavy Vehicles	0	5	5

### 14.1.3 Trip Generation Summary

Table 23 summarizes the 2016 construction phase trip generation estimates for all vehicle types entering and leaving the Project during the adjacent street AM and PM peak hours.

**Table 23: Construction Phase Trip Generation Estimate Summary (2016)**

Peak Hour	Staff Mode of Transport	In	Out	Total
AM	Passenger Car	372	37	409
	Heavy Vehicle	3	0	3
	Total	375	37	412
PM	Passenger Car	37	372	409
	Heavy Vehicle	0	3	3
	Total	37	375	412

Table 24 summarizes the 2018 construction phase trip generation for the adjacent street AM and PM peak hours.

**Table 24: Construction Phase Trip Generation Estimate Summary (2018)**

Peak Hour	Staff Mode of Transport	In	Out	Total
AM	Passenger Car	1,674	167	1,841
	Heavy Vehicle	5	0	5
	Total	1,679	167	1,846
PM	Passenger Car	167	1,674	1,841
	Heavy Vehicle	0	5	5
	Total	167	1,679	1,846

### 14.1.4 Trip Distribution and Assignment

The analysis was based on the assumption that 15% of employees will reside outside of the Kamloops area and 85% will reside in and travel to/from Kamloops. KAM prefers that all construction phase staff and contractors live within a 45 minute driving radius from the Project to enable eight hours rest

between 12 hour shifts. The following are communities identified as potential living area limits for construction employees outside of CoK, as per assessment basis:

- » West of the Project – Tobiano
- » East of the Project – Barnhartvale
- » South of the Project – Merritt
- » North of the Project – Heffley Creek

Contractual obligations requiring staff and contractors to access the site using prescribed routes during the construction phase will be provided in the Traffic Management and Control Plan (TMCP).

For presentation of Total Traffic Volumes and trip assignment for the two construction phase horizon years, refer to Figures 11 to 18 and 26 to 29 in Appendix C.

## **14.2 Operations Phase Trip Generation**

The horizon years 2024 and 2039 were assessed for the Project operations phase in comparison to corresponding base traffic conditions, as required by MoTI and CoK.

### **14.2.1 Staff Trip Generation**

KAM estimates up to 580 permanent staff will be employed during any typical operations phase year. This includes four groups of staff:

- » Non-shift staff who will work Monday to Friday from 8 am to 6 pm. KAM indicates there may be two teams of workers: one team working Monday to Thursday, and a second team Tuesday to Friday. It is conservative to assume the same number of employees are on the road network each week day rather than reducing the estimated volumes on Mondays and on Fridays;
- » Shift staff who will work in two 12 hour shifts per day (day shift and night shift), seven days per week, from 7 am to 7 pm;
- » Process shift staff who will work in two 12 hour shifts per day (day shift and night shift), seven days per week, from 7 am to 7 pm; and,
- » Maintenance shift staff who will work in two 12 hour shifts per day (day shift and night shift), seven days per week, from 6 am to 6 pm.

Based on KAM operational plans, shift staff will work 12-hour day and 12-hour night shifts. On any given day, 2/3 of the total permanent staff of 580 (approximately 387) will be scheduled to work while the other third will be on their time off. Thus, about 193 staff will be scheduled for the day shift and 193 staff will be scheduled for the night shift. Conservatively, these staff numbers were used in the traffic estimates during weekday peak hour analysis in the TIA.

#### **14.2.1.1 Staff Vehicle Traffic**

The estimated trip generation assuming 7% of staff will travel as passengers in personal vehicles is shown in Table 25.

Note: At the request of MOTI and CoK, the trip generation effect of staggering shift times and incentivising carpooling was not included in the base assessment of the operational traffic conditions (all shift traffic will be applied to the AM and PM peak hour models), thus presenting a highly conservative worst case scenario. Mitigation strategies are presented and evaluated in Chapter 15.

**Table 25: Operation Phase Staff Trip Generation Estimate**

Peak Hour	Mode of Transport	Staff	Vehicles*	In/Out Split	In	Out	Total
<b>AM</b>	Personal Vehicle	387	360	50/50	180	180	360
<b>PM</b>	Personal Vehicle	387	360	50/50	180	180	360

\*The number of vehicles is based on the assumption that 7% of staff will travel as passengers.

### 14.2.2 Heavy Vehicle Trip Generation

Heavy vehicle (HV) traffic during the operations phase will consist of concentrate trucks and supply trucks. Concentrate trucks will deliver the raw output material from the Project to Vancouver for shipping. Supply trucks will deliver fuel, small-sized mining equipment, and general mine supplies. Heavy vehicle traffic will typically consist of B-Trains that can move a maximum payload of 35 metric tonnes.

On occasion, larger loads including 40-m vehicles will be used for delivery of special equipment. This rare occurrence will be excluded from modelling and from the TIA as there are already processes in place **for the management of this type of vehicle and trip, specifically MoTI's oversize loads permitting process.**

Output capacity of the Project will vary from day to day and hence the number of concentrate trucks leaving and entering the site will also vary. KAM operational plans indicate the number of heavy vehicle trips will range from 15 to 23 per day. For the TIA analysis, it is conservatively assumed that 23 concentrate trucks arrive and depart daily, totalling 46 heavy vehicle concentrate trips in a day, 50% in and 50% out. KAM indicates this is the upper end of operational capacity and therefore a conservative assumption.

In addition to the concentrate trucks, supply vehicles will arrive on site for activities such as gasoline and diesel deliveries, explosives deliveries, reagent deliveries, general freight, etc. KAM operational plans indicate that these will range between 5 and 8 deliveries per day. For the TIA analysis, it will be conservatively assumed that 10 supply trucks arrive and depart daily, totalling 20 heavy vehicle supply trips in a day (in and out trips).

The total heavy vehicles trips for the purposes of the TIA will therefore equate to 33 heavy vehicles arriving and departing per day, totalling 66 trips (50% in and 50% out). See Table 26 for summary.

**Table 26: Summary of Heavy Vehicle Trip Generation**

Type of Heavy Vehicle (HV)	KAM Operational Plan (Round-Trip)	Assumption Total No. HVs (per day)	Trips Per Day (50% in /50% out)
<b>Deliveries</b>	5 to 8	10	20
<b>Concentrate Trucks</b>	23	23	46
<b>Total</b>	28 to 31	33	66

The TIA includes the assumption that 10% of the heavy vehicles arrive and depart during each peak hour, AM and PM. Using 10% of the total volumes as a peak hour assumption is consistent with typical peak hour traffic observations on average roads. Rounding 66 trips up to 80 to be conservative and facilitate the calculations, this equates to approximately 8 round trips during the AM and PM peaks. The remaining trips will be made during daytime off-peak hours. Table 27 shows the breakdown of the heavy vehicle trip generation estimate.

**Table 27: Operation Phase Heavy Vehicle Trip Generation Estimate (2024 & 2039)**

Peak Hour	Type of Vehicle	In	Out	Total
<b>AM</b>	Heavy Vehicles	4	4	8
<b>PM</b>	Heavy Vehicles	4	4	8

### 14.2.3 Trip Generation Summary

The total trips generated in the AM and PM peak hours are shown in Table 28.

**Table 28: Summary of Operation Phase Trip Generation Estimates**

Peak Hour	Type of Trips	In	Out	Total
AM	Personal Staff Vehicles	180	180	360
	Heavy Vehicles	4	4	8
	Total	184	184	368
PM	Personal Staff Vehicles	180	180	360
	Heavy Vehicles	4	4	8
	Total	184	184	368

### 14.2.4 Trip Distribution and Assignment

Similar to the construction phase, it is assumed that 15% of operations staff will reside outside of the Kamloops area and 85% will reside in Kamloops (85%). Contractual obligations requiring staff and contractors to access the site via prescribed routes during the construction phase will be provided in the TMCP.

For presentation of Total Traffic Volumes and trip assignment for the two operations phase horizon years, refer to Figures 9 and 10 in Appendix C.

## 14.3 Analysis Results

### 14.3.1 Summary Overview of Total Conditions

Synchro plus SimTraffic 8 – Traffic Signal Coordination Software was used to analyze the impacts of increased traffic on the identified study network. Full Synchro 8 outputs are presented in Appendix D. Outputs included in Appendix D include: HCM 2010 Signalized Intersection, HCM 2010 Roundabout, HCM 2010 TWSC (Two-Way Stop-Controlled), and Intersection reports. The type of report produced is contingent on the type of intersection being considered. For example, a HCM 2010 Roundabout report was produced for the roundabout situated at the Versatile Drive and Hugh Allan Drive intersection. The summary of the analysis is presented below.

The total unmitigated conditions impose minimal impacts to the base network in the 2016 Construction horizon year and the 2024 and 2039 Operations horizon years. However, due to the high number of staff anticipated for the 2018 Construction horizon year, the impacts on the road network are much more evident for some of the intersections in the study network. Inks Lake interchange and LLJR/AMAR intersection experience the bulk of the negative impacts during this phase as the traffic from all directions meet at the Inks Lake interchange and travel through the LLJR/AMAR intersection to access the Project.

### 14.3.2 2016 Total Conditions

All intersections and movements perform within stated thresholds discussed in Table 4 in Section 4.2 with the exception of two movements at the Pacific Way/Hugh Allan Drive intersection and one movement at the Frontage Road/Copperhead Drive intersection.

- » The westbound through and left turn movements at the Pacific Way/Hugh Allan Drive intersection operate at LOS D and E respectively.
- » The northbound left lane at the Frontage Road/Copperhead Drive intersection exceeds its storage capacity for the 95th percentile queue length.

During the PM peak hour, all intersections perform at overall LoS acceptable within the stated thresholds, however, there are several movements within the PM peak period that experience low LoS and two movements that exceed storage capacities.

- » The eastbound left/through/right lane at the Frontage Road/Copperhead Drive intersection exceeds its storage capacity for the 95th percentile queue length.
- » The southbound lane entering the roundabout at Versatile Drive/Hugh Allan Drive intersection performs at LoS D.
- » The eastbound left, westbound left and westbound through movements experience LoS D, D, and E respectively at the Pacific Way/Hugh Allan Drive intersection.
- » The eastbound left movement at the Pacific Way/Hugh Allan Drive intersection experiences a **95th percentile queue length that exceeds the lane's storage capacity.**
- » The westbound left/through lane at the Highway 1/5 Westbound Ramps/Pacific Way intersection experiences a **95th percentile queue length that exceeds the lane's storage capacity.**

With the introduction of Project generated traffic, minimal effects are experienced on the road network. Storage capacity remains an issue for some turning movements in the network. Regardless of whether the Project is constructed, it is recommended that storage bays be extended to accommodate population growth. See Figure 37 for more detail. These issues decrease with the planned mitigation measures discussed in Chapter 15.

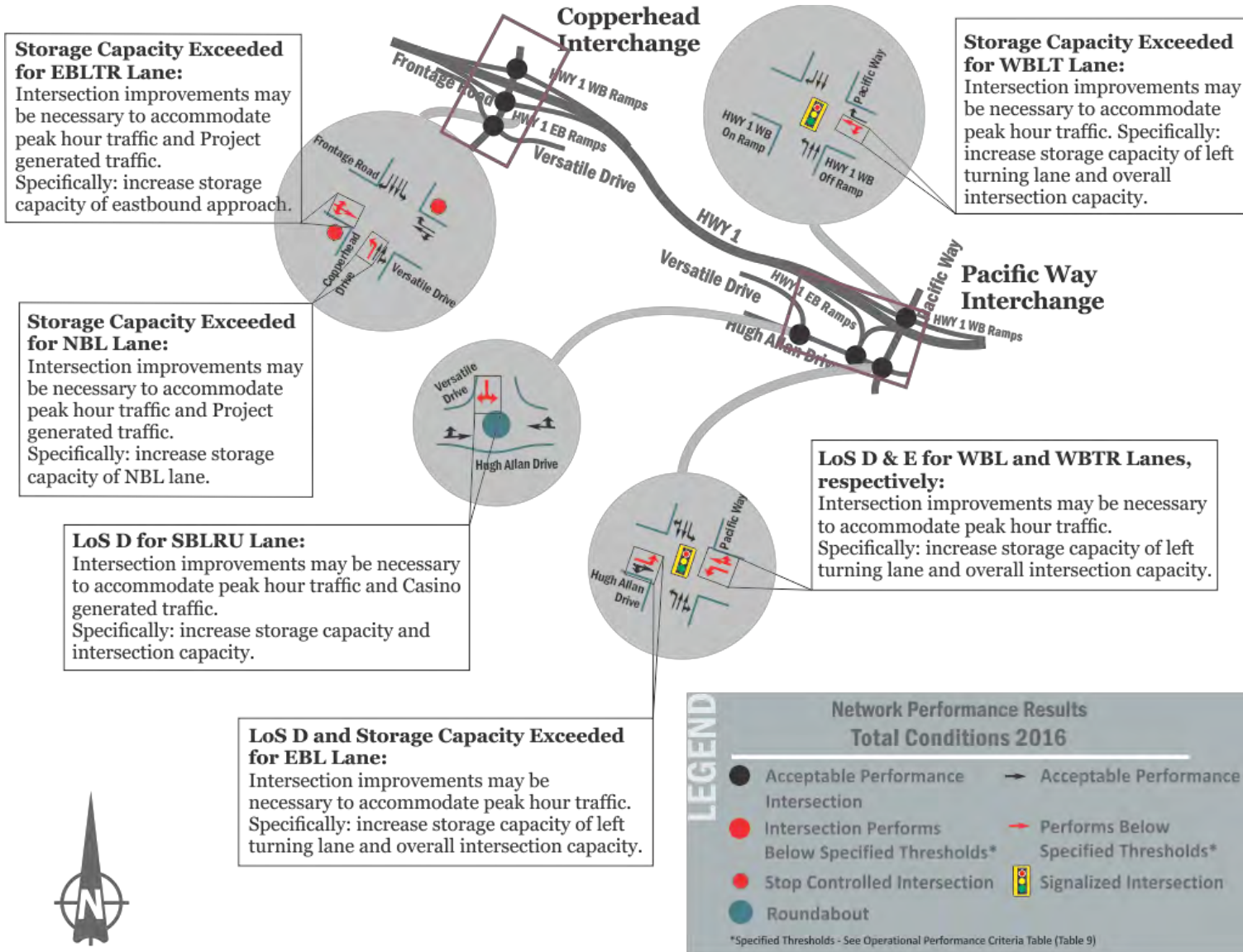


Figure 37: 2016 Total Conditions Network Performance Results Summary

### 14.3.3 Construction Phase – 2018

Unmitigated Project generated traffic during the peak construction phase, a number of the study locations are impacted negatively for both the AM and PM peak hours. Network impacts resulting from the unmitigated Project traffic in AM Peak hour include:

- » The northbound left turn lane at Highway 1/5 WB ramps/Copperhead Drive has a 95th percentile queue length **that exceeds the lane’s storage capacity.**
- » The northbound left turn lane at Highway 1 WB ramps/Pacific Way experiences a 95th percentile **queue length that exceeds the lane’s storage capacity.**
- » In the AM peak hour, the WB Off-Ramp at AMAR performs with a LoS F, shown in Table 29.
- » In the AM peak hour, the EB Off-Ramp at AMAR performs with a LoS F, shown in Table 29.

**Table 29: Total 2018 AM - Inks Lake Interchange**

Intersection	Turning Movement	Total 2018 AM Peak			
		LoS	v/c Ratio	95th Queue (m)	Delay (s)
Inks Lake Interchange - EB Off Ramp	Overall I/S	-	-	-	-
	EBT	-	-	-	-
	WBT	A	0.00	0	0
	NBL NBR	F	1.64	162.8	#384.4
Inks Lake Interchange - WB On Ramp	EBT	-	0.97	-	-
	EBR	-	-	-	-
	WBL	B	0.06	15.4	12.9
	WBT	-	-	-	-
Inks Lake Interchange - WB Off Ramp	EBT	A	0.00	0	0
	WBT	-	-	-	-
	SBL	F	1.63	953.7	299.5
	SBR	-	-	-	-

LLJR/AMAR intersection performs at an overall LoS F, shown in Table 30.

**Table 30: Total 2018 - Lac Le Jeune Road and Ajax Mine Access Road Intersection**

Intersection	Turning Movement	Total 2018 AM Peak				Total 2018 PM Peak			
		LoS	v/c Ratio	95th Queue (m)	Delay (s)	LoS	v/c Ratio	95th Queue (m)	Delay (s)
LLJR/AMAR	Overall I/S	F	-	-	131	F	-	-	131.6
	EBT	F	1.28	#658.4	151.3	A	0.13	17.1	4.4
	WBT	A	0.13	17.1	4.4	F	1.28	#658.4	151.3
	NBL	D	0.03	5.1	45.8	D	0.0	5.1	45.8
	NBT	D	0.13	16.1	47.5	D	0.25	27.3	49.8
	SBL	D	0.03	5.1	45.8	D	0.03	5.1	45.8
	SBT	D	0.10	14.2	46.9	D	0.15	18.9	47.8

- » Eastbound through movement fails and exceeds the storage capacity of the intersection.
- » Northbound left, northbound through, southbound left and southbound through movements all perform at LoS values D.

Operational impacts resulting from the unmitigated Project traffic in PM Peak hour include:

- » The southbound left/right/u-turn lane at Versatile Drive/Hugh Allan Drive roundabout drops to a LoS F from LoS D and experiences a 95th percentile **queue length that exceeds the lane’s storage capacity**, shown below in Table 31.

**Table 31: Total 2018 - Versatile Drive and Hugh Allan Drive Roundabout**

Intersection	Turning Movement	Total 2018 PM Peak			
		LoS	v/c Ratio	95th Queue (m)	Delay (s)
Versatile Drive / Hugh Allan Drive	Overall I/S	F	-	-	50.6
	EBLTU	C	0.35	22	16.4
	WBTRU	C	0.739	77	16.1
	SBLRU	F	1.209	242	138.7

- » The eastbound through/right lane at Pacific Way/Hugh Allan Drive drops to a LoS D and experiences a 95th percentile storage capacity that exceeds the storage capacity of the lane.
- » LLJR/AMAR intersection performs at an overall LoS F, shown in Table 31.
  - Westbound through movement fails and exceeds the storage capacity of the intersection.
  - Northbound left, northbound through, southbound left and southbound through movements all perform at LoS values D.

Project generated traffic during peak construction, without mitigation measures in place, result in predicted negative effects throughout the road network, especially at the new Inks Lake Interchange where all traffic converges to travel to the Project site. Storage capacity remains an issue for some turning movements in the network. Storage bays should be extended to accommodate the pre-existing growing population. Additional mitigation measures are required to alleviate the pressure experienced on the network with the introduction of the construction phase traffic. With the planned mitigation measures including bus staging, increased carpooling, and shift staggering, the negative effects on the study network are reduced or eliminated; this is discussed further in Section 15.

Please refer to Figure 38 for more detail.

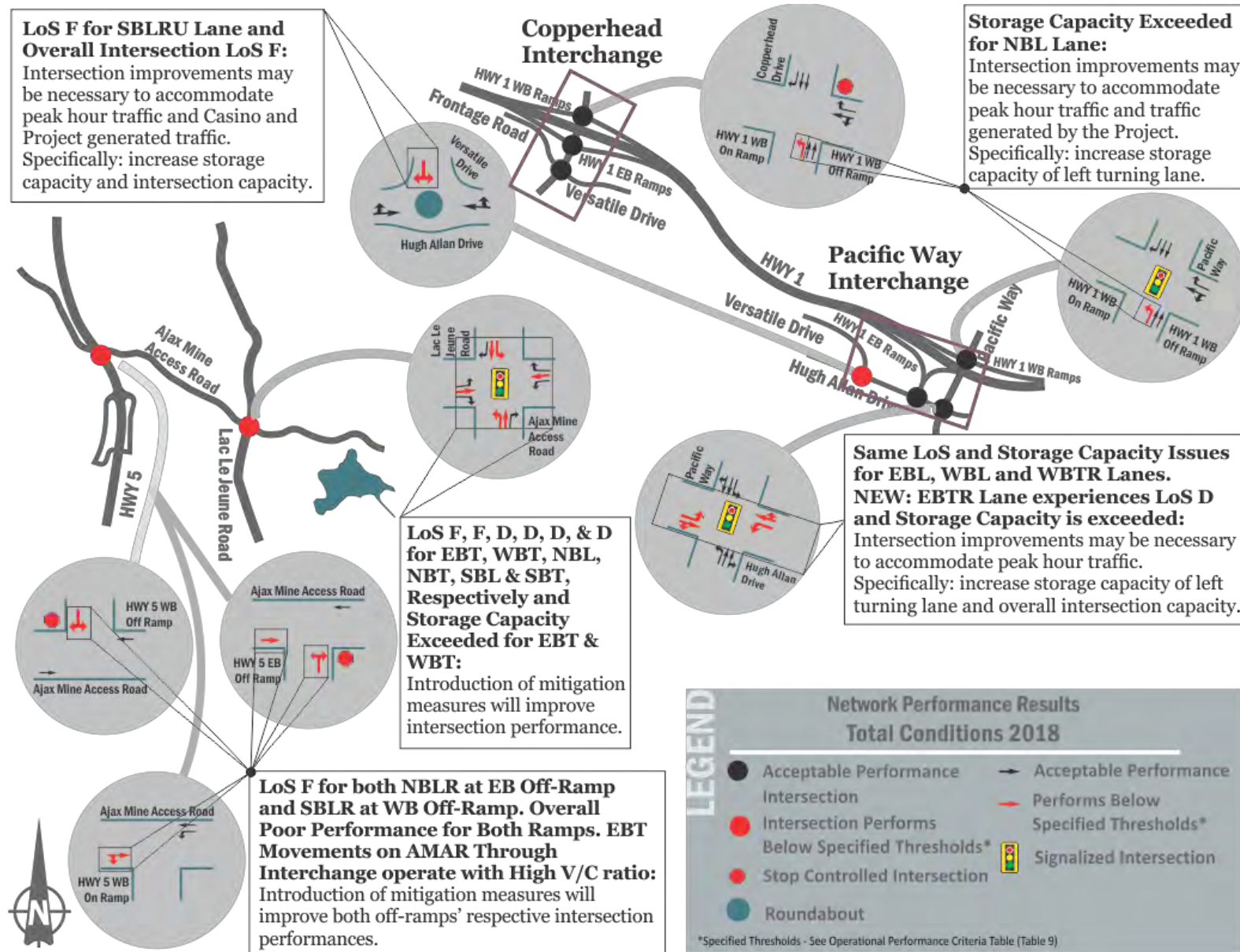


Figure 38: 2018 Total Conditions: Network Performance Results Summary

#### 14.3.4 Operations Phase – 2024

The introduction of operations phase Project generated traffic, without mitigation measures in place, have minimal effects on the road network as compared to the base condition results in Section 13.3. All intersections perform with the same or similar LoS values. Refer to Figure 35 for more information.

#### 14.3.5 Operations Phase – 2039

The introduction of operations phase Project generated traffic, without mitigation measures in place, have minimal effects on the majority of the road network as compared to the base condition results in Section 13.4. Most intersections perform with the same or similar LoS values with the exception of:

- » The Versatile Drive/Hugh Allan Drive roundabout which drops from an overall LoS D to LoS E in the PM peak hour.
- » The northbound left lane at the Highway 1/5 WB Ramps/Pacific Way intersection which drops from LoS D to LoS E in the PM peak hour.

While the Project traffic has some effect on these intersections in 2039, the impacts are minimal and intersection revisions in anticipation of 2039 volumes are not recommended.

Refer to Figure 39 for more information.

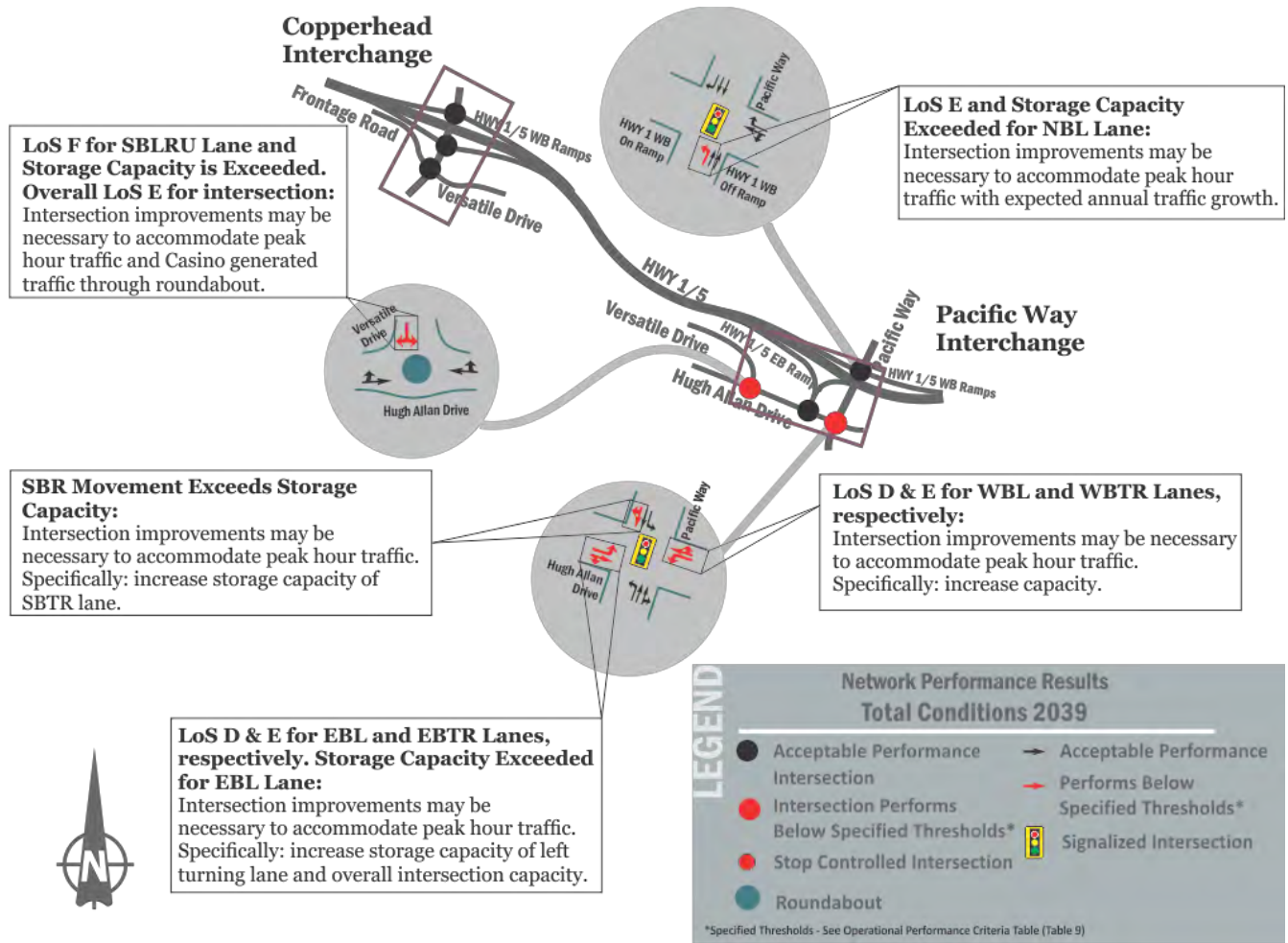


Figure 39: 2039 Total Conditions - Network Performance Results Summary

## 15 Intersections - Mitigated Conditions

To address the impacts on the network arising from the addition of Project related traffic, a mitigation strategy has been developed and modelled for each horizon year. The approach used has been to scope feasible non-infrastructure based travel demand management mitigation measures and modify the trip generation and assignment characteristics of the Project traffic accordingly. Should any residual effect exist, infrastructure based network alterations will then will be scoped and recommended to address the specific issues of concern. The accompanying Traffic Management Plan (TMP) includes a detailed demand management plan to support the mitigation strategy, including clear assumptions and enforcement mechanisms. The travel demand management mitigation measures adopted for the mitigated scenario include:

- » Carpooling incentives (Section 15.1) to increase the estimated number of carpool passengers from 7% to 15%;
- » Bus transportation for construction workers. Note: based on an assessment of available lands and zoning restriction, the strategy assumes (subject to permitting) that 85% of construction employees will be contractually required to use company provided transportation via bus<sup>1</sup>; and,
- » Staggered shift start and end times to reduce the number of trips imposed on the network during peak hours.

### 15.1 Carpooling Incentives

Professional and contractor staff not included in any busing allowance are anticipated to drive to and from the site with some proportion carpooling. To determine a reasonable carpooling mode split for staff travelling to/from the Project, Opus reviewed the 2011 National Household Survey (NHS) results for Kamloops. Table 32 shows the transportation mode split for the total employed population aged 15 years and over.

**Table 32: Kamloops Transportation Mode Split (National Household Survey 2011)**

Mode of Transportation	Percent Mode Split
Car, truck or van – as a driver	80%
Car, truck or van – as a passenger	7%
Public transit	4%
Walked	5%
Bicycle	1%
Other Methods	2%

In the operations phase, KAM anticipates a peak of 580 staff members will travel to/from the Project without busing provisions. Assuming a 15% carpool percentage with a +/- 50% error (minimum 7.5% carpool and maximum 22.5% carpool), this means a difference of about +/- 40 vehicles before and after work shifts. Typically, MoTI requires TIAs for developments generating at least 100 trips during each

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<sup>1</sup> KAM is aware that as part of the potential bus staging mitigation strategies, CoK and MoTI may require that KAM assess the transportation impacts of individual bus staging locations within Kamloops and **the surrounding area as a condition of the Project's EA certificate.**

peak hour; therefore the 44 vehicle error is not significant enough to warrant additional sensitivity analysis. Therefore, Opus used the 15% carpool percentage for the mitigated traffic capacity analysis.

Information about the assumptions made to determine the 15% carpool percentage for mitigated traffic capacity analysis are provided in Appendix A and further detailed in the Traffic Management Plan.

## 15.2 Bus Staging

KAM plans to mitigate the effect of peak traffic flows on the network during the construction phase by providing busing for about 85%<sup>2</sup> or 1500 construction workers.

Although definitive pick-up/drop-off locations are not yet defined, it is necessary to make some assumptions regarding their location so that trip distribution and assignment can be determined for traffic modelling.

Pick-up/drop-off location assumptions were made by dividing the trip generation catchment area into four quadrants based on the estimated locations where construction staff will reside, trip distribution, and the location of the study intersections. Busing rates have been assigned to each quadrant based on trip distribution rates and high level research into land availability.

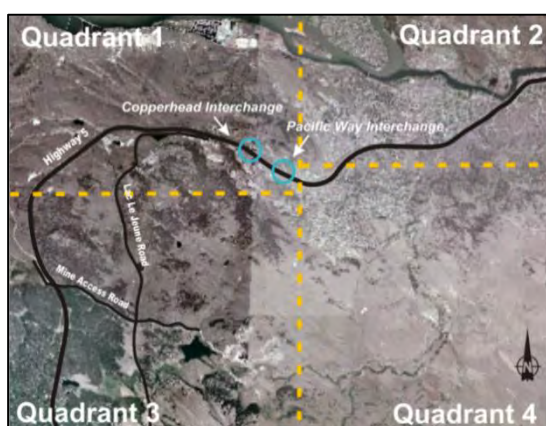


Figure 40: Bus Staging Quadrants

For the purposes of the assessment, it is assumed that each bus staging facility or arrangement will cater for up to 375 staff. To meet KAM’s target of busing 1,500 staff to site during peak construction, this means that 4 separate pick up/drop off locations are required. Fewer pick up/drop off locations may be possible with the addition of distributed bus routes either as part of the existing BC Transit service or via a private bus system contracted by KAM. Opus has reviewed existing land-use, zoning and potential availability and assigned a number of locations to each quadrant. Table 33 shows the target (best case) number of bus staging locations in each quadrant for the 2016 and 2018 horizon years.

Table 33: Bus Staging Locations in Each Quadrant

Quadrant	Number of Bus Staging Locations+	
	2016 Realistic Conditions*	2018 Target Conditions
1	0	0
2	1	2
3	0	1
4	0	1
Total:	1	4

+ It is assumed that bus staging may either operate as a park and ride, or a distributed collection system similar to public transit or a school bus style pick-up/drop-off system (in this case, buses would circulate neighbourhoods to collect workers from designated pick-up/drop-off locations within walking distance of their residences).  
 \* Only one staging location is required to accommodate the workforce in 2016.

<sup>2</sup> KAM estimated that they will be able to encourage 85% of the workforce during the construction phases to bus to and from the Project site. 85% of 1,800 total construction staff is rounded to 1,500 workers.

Quadrant Two has a higher population than the other three quadrants, and would likely require the only bus staging location in 2016 and two bus staging locations in 2018. Furthermore, encouraging staff to travel to a bus staging location in Quadrant Two would reduce Project related traffic at the Copperhead and Pacific Way interchange study intersections.

Impacts of private vehicle travel to and from possible staging locations will, if required, be undertaken during detailed assessment of individual staging locations during permit, and potentially rezoning and engineering, approval stages.

For more detailed routes please refer to the ToR in Appendix A.

### 15.3 Shift Staggering

To further mitigate the effect of the Project generated traffic during the peak periods, KAM intends to spread out inbound and outbound traffic by staggering shift start and end times over two hour periods. The two-hour periods included in the shift staggering are: 6:30 to 8:30 a.m.; and, 6:30 to 8:30 p.m. The staggering is planned in 30-minute (half hour) increments so that start/end times are spaced thus: 6:30, 7:00, 7:30, 8:00, and, 8:30 in the morning and evening.

#### 15.3.1 Construction Phase

Peak hours on the Kamloops area road network are 7:30 to 8:30 for the AM peak period and 4:30 to 5:30 for the PM peak period. KAM proposes to stagger construction shift start and end times to distribute traffic across 2-hour duration start and end periods, reducing the peak load on the network. Shifts include travel time. Workers leaving their homes at 7:00 am must arrive home at 7:00 pm according to KAM’s operational plans. Proposed shift start and end times in relation to existing traffic conditions on the network are shown in Figure 41.

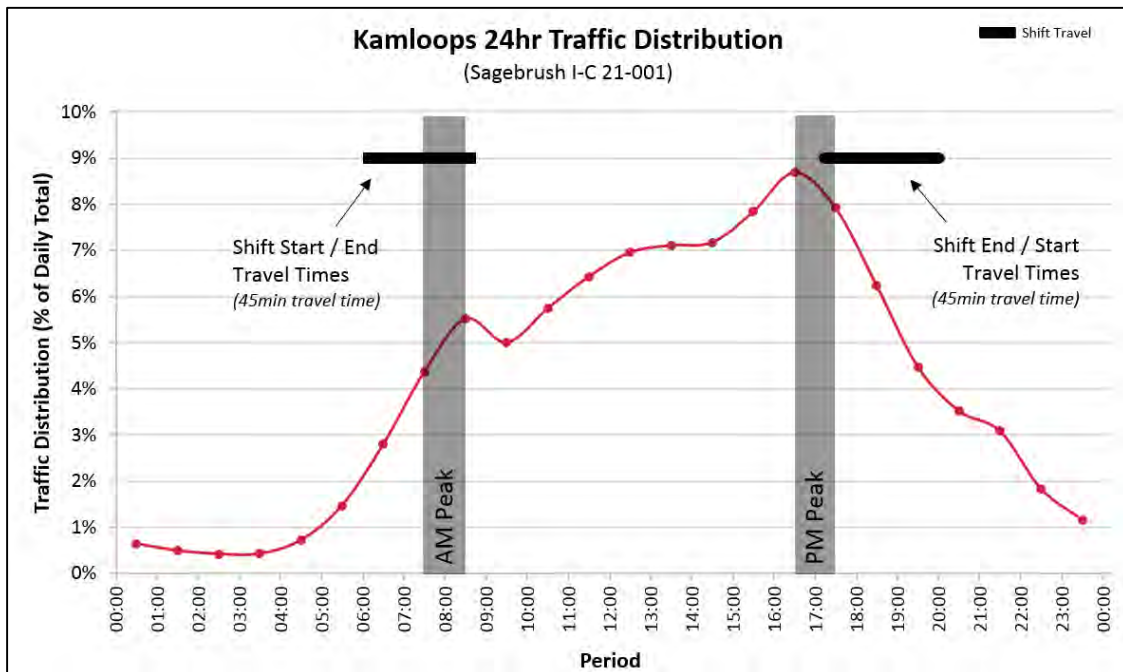


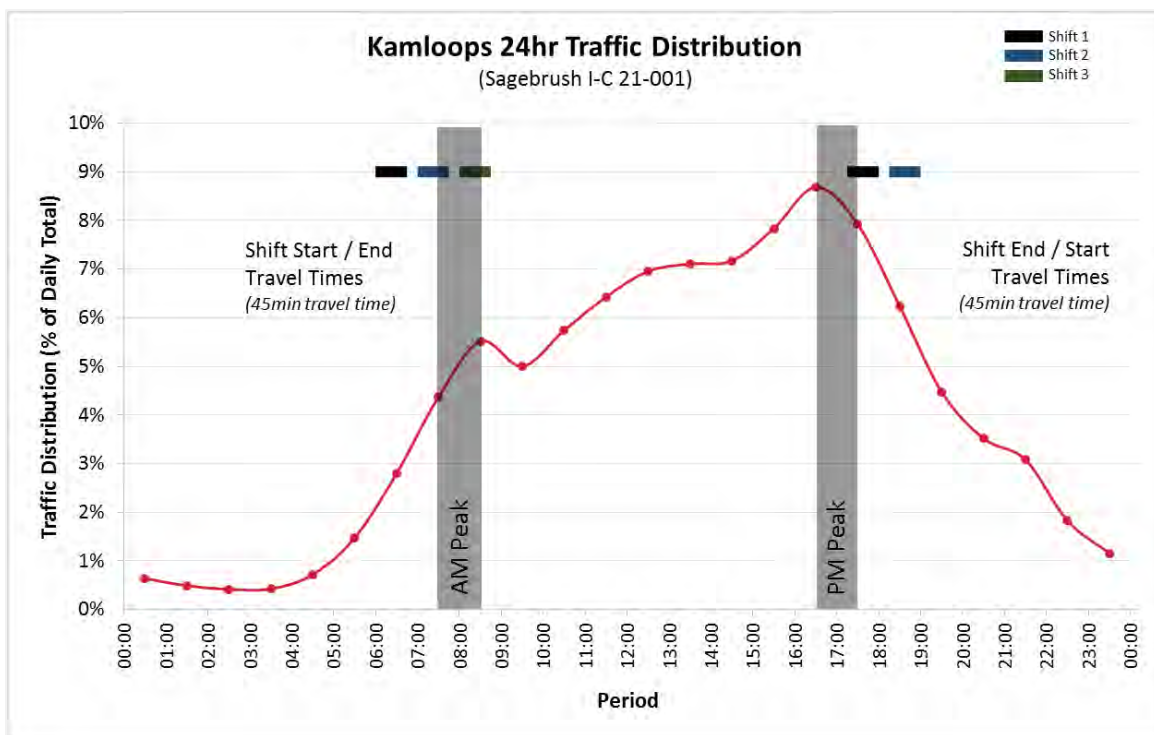
Figure 41: Construction Phase Shift Travel Schedule

For the purposes of the traffic capacity analysis, it was estimated that approximately 60%, of staff may travel through the road network during the AM peak hour. Although there are no trips anticipated during the PM peak hour, it was conservatively estimated that approximately 40%, of staff may travel through the road network during the PM peak hour. These conservative estimates were used to assign the construction phase trips to the road network for the traffic capacity analysis.

### 15.3.2 Operations Phase

KAM estimates 580 permanent staff will be employed during any typical operations phase year. Fifty (50) of these will work 8:00 am-6:00 pm weekday shifts and the remaining 530 staff (consisting of mine staff, process staff, and maintenance staff) will work 12-hour day and night shifts. As discussed previously, this is a conservative assumption. Mine staff and process staff will work from 7:00 am to 7:00 pm (day shift) and 7:00 pm to 7:00 am (night shift). The maintenance staff will work from 6:00 am to 6:00 pm (day shift) and 6:00 pm to 6:00 am (night shift).

Peak hours on the Kamloops area road network are 7:30 to 8:30 for the AM peak period and 4:30 to 5:30 for the PM peak period. Shift start and end times in relation to existing traffic conditions on the network are shown in Figure 42.



**Figure 42: Operations Phase Shift Travel Schedule**

It can be seen in Figure 42 that less than two-thirds (66%) of the AM trips travel during the peak hour, and less than one-third (33%) travel during the PM peak hour. For the operations phase, it was conservatively estimated that approximately three-fifths, or 60%, of staff may travel through the road network during the AM peak hour. It was conservatively estimated that approximately two-fifths, or 40%, of staff may travel through the road network during the PM peak hour. As with the construction phase, these conservative estimates were used to assign the operations phase trips to the road network for the traffic capacity analysis.

## 15.4 Construction Phase Mitigated Trip Generation

### 15.4.1 Staff Trip Generation

#### 15.4.1.1 2016 Trip Generation

The TIA assumes in the base assessment that all construction employees will travel by passenger car and that travel demand management strategies would not be implemented. However, KAM is committed to implementing travel demand strategies for the construction phase that consist of: bus staging, shift staggering and increased carpooling passenger percentage. Specifications for 2016 construction horizon year are as follows:

- » All deliveries will be directed through Walloper Way;
- » Bus Staging;
- » 85% of staff will commute to/from site from/to quadrant two, three, and four, discussed in Section 15.2
- » Shift Staggering; and,
  - 60% will commute during the AM Peak hour; and
  - 40% will commute during the PM Peak hour.
  - Increased passenger carpooling percentage to 15% from 7%.

Table 34 shows the estimated morning (AM) and evening (PM) trip generation for the mitigated scenario. More detailed calculations and Trip Generation assumptions are provided in the ToR in Appendix A.

**Table 34: Construction Phase Staff Trip Generation Estimate (2016)**

Peak Hour	Mode of Transport	Staff	Vehicles*	Shift Staggering	In/Out Split	In	Out	Total
<b>AM</b>	Passenger Car	60	51	-	100/10	51	5	56
	Bus	340	12	60%	100/0	7	0	7
<b>PM</b>	Passenger Car	60	51	-	10/100	5	51	56
	Bus	340	51	40%	0/100	0	5	5

\*The number of vehicles is based on the assumption that 15% of staff will travel as passengers.

### 15.4.1.2 2018 Trip Generation

Similar to 2016, the TIA assumes in the total assessment that all construction employees in 2018 will travel by passenger car and that travel demand management strategies would not be implemented. However, KAM is committed to implementing travel demand strategies for the construction phase that consist of: bus staging, shift staggering and increased carpooling passenger percentage. Specifications for 2018 construction horizon year are as follows:

- » Redirect all traffic through newly constructed Inks Lake Interchange;
- » Bus Staging;
- » 85% of staff will commute to/from site via bus, as discussed in Section 15.2:
  - 0% of staff will commute from Quadrant One (no accommodations in quadrant);
  - 50% of the 85% will travel to/from Quadrant Two;
  - 25% of the 85% will travel to/from Quadrant Four; and,
  - 25% of the 85% will travel to/from Quadrant Three.
- » Shift Staggering, as discussed in Section 15.3; and,
  - 60% will commute during the AM Peak hour; and
  - 40% will commute during the PM Peak hour.
- » Increased passenger carpooling percentage to 15% from 7%, as discussed in Section 15.1.
- » 15% of all staff (270 staff) will commute to/from site via passenger cars.

Table 35 shows the estimated morning (AM) and evening (PM) trip generation for the mitigated scenario.

**Table 35: Construction Phase Staff Trip Generation Estimate (2018)**

Peak Hour	Mode of Transport	Staff	Vehicles*	Shift Staggering	In/Out Split %	In	Out	Total
AM	Passenger Car (15% of all workers)	270	230	-	100/10	230	23	253
	Passenger Car to/from Q3	382	325	60%	100/0	195	0	195
	Bus - to/from Q2 & Q4	1148	39		100/0	23	0	23
	Bus – to/from Q3	382	13		100/0	8	0	8
PM	Passenger Car (15% of all workers)	270	230	40%	10/100	23	230	253
	Passenger Car to/from Q3	382	325		0/100	0	130	130
	Bus – to/from Q2 & Q4	1148	39		0/100	0	16	16
	Bus – to/from Q3	382	13		0/100	0	5	5

\*The number of vehicles is based on the assumption that 15% of staff will travel as passengers.  
 Note: Bus staging related buses and passenger cars are both accounted for in Quadrant Three because they will both impact traffic capacity at study intersections (particularly the Inks Lake Interchange). Other passenger cars travelling to/from bus staging locations are anticipated to impact intersections outside of the study area and are therefore not shown in this table.

### 15.4.2 Heavy Vehicle Trip Generation

Heavy vehicle traffic for the mitigated scenario is the same as the heavy vehicle traffic from the total unmitigated scenario. Please refer to Table 21 and Table 22 for Heavy Vehicle volumes.

### 15.4.3 Trip Generation Summary

Table 36 summarizes the 2016 construction phase mitigated trip generation estimates for all vehicle types entering and leaving the Project during the adjacent street peak AM and PM hours.

**Table 36: Construction Phase Trip Generation Estimate Summary (2016)**

Peak Hour	Staff Mode of Transport	In	Out	Total
<b>AM</b>	Passenger Car	51	5	56
	Heavy Vehicle (Incl. Buses)	10	0	10
	Total	61	5	66
<b>PM</b>	Passenger Car	5	51	56
	Heavy Vehicle (Incl. Buses)	0	8	8
	Total	5	59	64

Table 37 summarizes the 2018 construction phase mitigated trip generation estimates for all vehicle types entering and leaving the Project during the adjacent street peak AM and PM hours.

**Table 37: Construction Phase Trip Generation Estimate Summary (2018)**

Peak Hour	Staff Mode of Transport	In	Out	Total
<b>AM</b>	Passenger Car (Incl. PV to Qd.3)	425	23	448
	Heavy Vehicle (Incl. Buses)	36	0	36
	Total	461	23	484
<b>PM</b>	Passenger Car (Incl. PV to Qd.3)	23	360	383
	Heavy Vehicle (Incl. Buses)	0	26	26
	Total	23	386	409

For presentation of Mitigated Traffic Volumes and trip assignment for the two construction phase horizon years, refer to Figures 19 to 22 in Appendix C.

### 15.4.4 Trip Distribution and Assignment

Trip distribution and assignment percentages discussed in Section 14.1 for the total scenario construction traffic will be consistent with the distribution and assignment for the mitigated scenario traffic.

## 15.5 Operations Phase Mitigated Trip Generation

The horizon years 2024 and 2039 were assessed for the Project operations phase in comparison to corresponding base traffic conditions, as required by MoTI and CoK.

### 15.5.1 Staff Trip Generation

The TIA assumes in the base assessment that all construction employees will travel by passenger car and that travel demand management strategies would not be implemented. However, KAM is committed to implementing travel demand strategies for the Operation phase that consists of shift staggering and

increasing the carpooling passenger percentage from 7% to 15%. Specifications for the operations phase traffic are as follows:

- » Redirection through Inks Lake Interchange;
- » Shift Staggering, as discussed in Section 14.3.2; and,
  - 60% will commute during the AM Peak hour; and
  - 40% will commute during the PM Peak hour.
- » Increased passenger carpooling percentage to 15% from 7%, as discussed in Section 14.1.

Note: Based on KAM operational plans, shift staff will work 12-hour day and 12-hour night shifts. On any given day, 2/3 of the total permanent staff of 580 (approximately 387) will be scheduled to work while the other third will be on their time off. Thus, about 193 staff will be scheduled for the day shift and 193 staff will be scheduled for the night shift. These staff numbers were used as the basis for traffic estimations in the TIA.

**Table 38: Operation Phase Staff Trip Generation Estimate**

Peak Period	Mode of Transport	Staff	Vehicles*	Shift Staggering	In/Out Split	In	Out	Total
AM	Personal Vehicle	387	330	60%	50/50	99	99	198
PM	Personal Vehicle	387	330	40%	50/50	66	66	132
*The number of vehicles is based on the assumption that 15% of staff will travel as passengers.								

### 15.5.2 Heavy Vehicle Trip Generation

Heavy vehicle traffic for the mitigated scenario is the same as the heavy vehicle traffic from the total unmitigated scenario. Please refer to Table 27 for Heavy Vehicle volumes.

### 15.5.3 Trip Generation Summary

Table 39 highlights the total trips generated for the operations phase in the AM and PM peak hour for the mitigated scenario.

**Table 39: Summary of Operation Phase Trip Generation Estimates**

Peak Period	Type of Trips	In	Out	Total
AM	Personal Staff Vehicles	99	99	198
	Heavy Vehicles	4	4	8
	Total	103	103	206
PM	Personal Staff Vehicles	66	66	132
	Heavy Vehicles	4	4	8
	Total	70	70	140

For presentation of Mitigated Traffic Volumes and trip assignment for the two operations phase horizon years, refer to Figures 30 to 33 in Appendix C.

#### **15.5.4 Trip Distribution and Assignment**

Trip distribution and assignment percentages discussed in Section 14.2.4 for the total scenario operations traffic will be consistent with the distribution and assignment for the mitigated scenario traffic.

### **15.6 Analysis Results**

#### **15.6.1 Summary Overview of Mitigated Conditions (Residual Effect)**

Full modelling results are presented in Appendix D.

In addition to underlying storage capacity issues identified in the base conditions analysis and the PM peak hour performance of the roundabout at Versatile Drive/Hugh Allan Drive, the total mitigated conditions impose minimal impacts to the base network in all horizon years. The 2018 Construction horizon year in the total unmitigated condition analysis saw significant impacts to some intersections in the study network. The addition of mitigation measures (bus staging, shift staggering and increased carpooling), as well as the addition of the Inks Lake Interchange, drastically decreases the residual effects of the Project generated traffic.

#### **15.6.2 Construction Phase – 2016**

The introduction of construction phase Project generated traffic in 2016, with mitigation measures in place, have minimal effects on the road network as compared to the base condition results with the exception of two movements at the Pacific Way/Hugh Allan Drive intersection.

- » The westbound through and left turn movements at the Pacific Way/Hugh Allan Drive intersection operate at LOS D and E, respectively, in the AM peak.

See Figure 43 for more information. For comparison, please refer to Figure 34, where operations under 2016 Base Conditions (no Project traffic) are summarized.

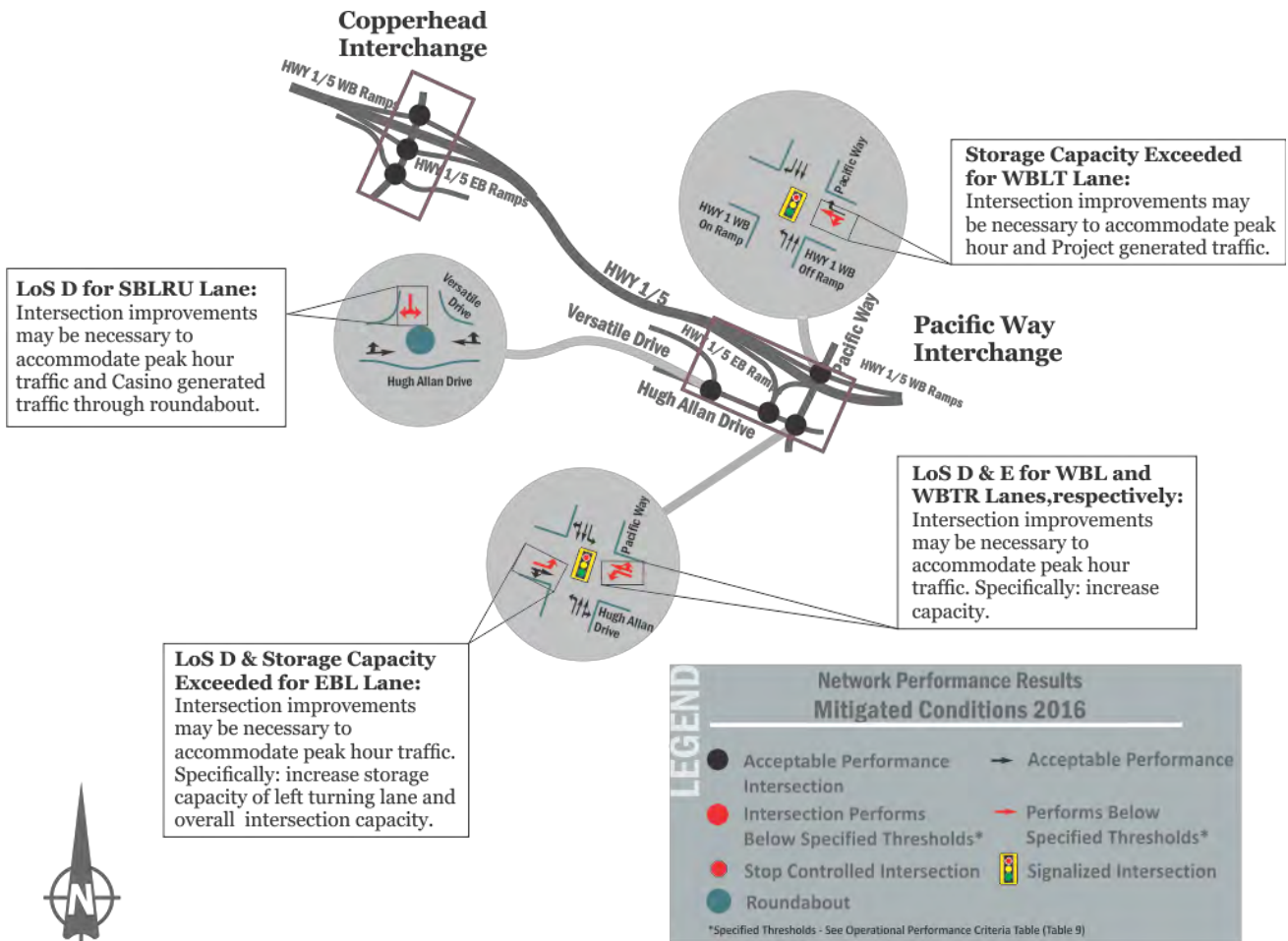


Figure 43: 2016 Mitigated Conditions - Network Performance Results Summary

### 15.6.3 Construction Phase – 2018

Acceptable conditions, similar to those found in the base conditions for 2018, are predicted after the introduction of mitigated measures for Project generated traffic, and the newly constructed Inks Lake Interchange for nearly all of the intersections that experienced significant impacts with unmitigated total conditions.

The roundabout at Versatile Drive/Hugh Allan Drive is the exception to this improvement. While the roundabout performs at an improved LoS from F (total conditions), it still experiences a LoS E (mitigated conditions) which is lower than the base condition LoS D. Refer to Figure 44 for more information. For comparison, please refer to Figure 34; this figure reflects output from 2016 Base Conditions analysis which is similar to 2018 Base Conditions.

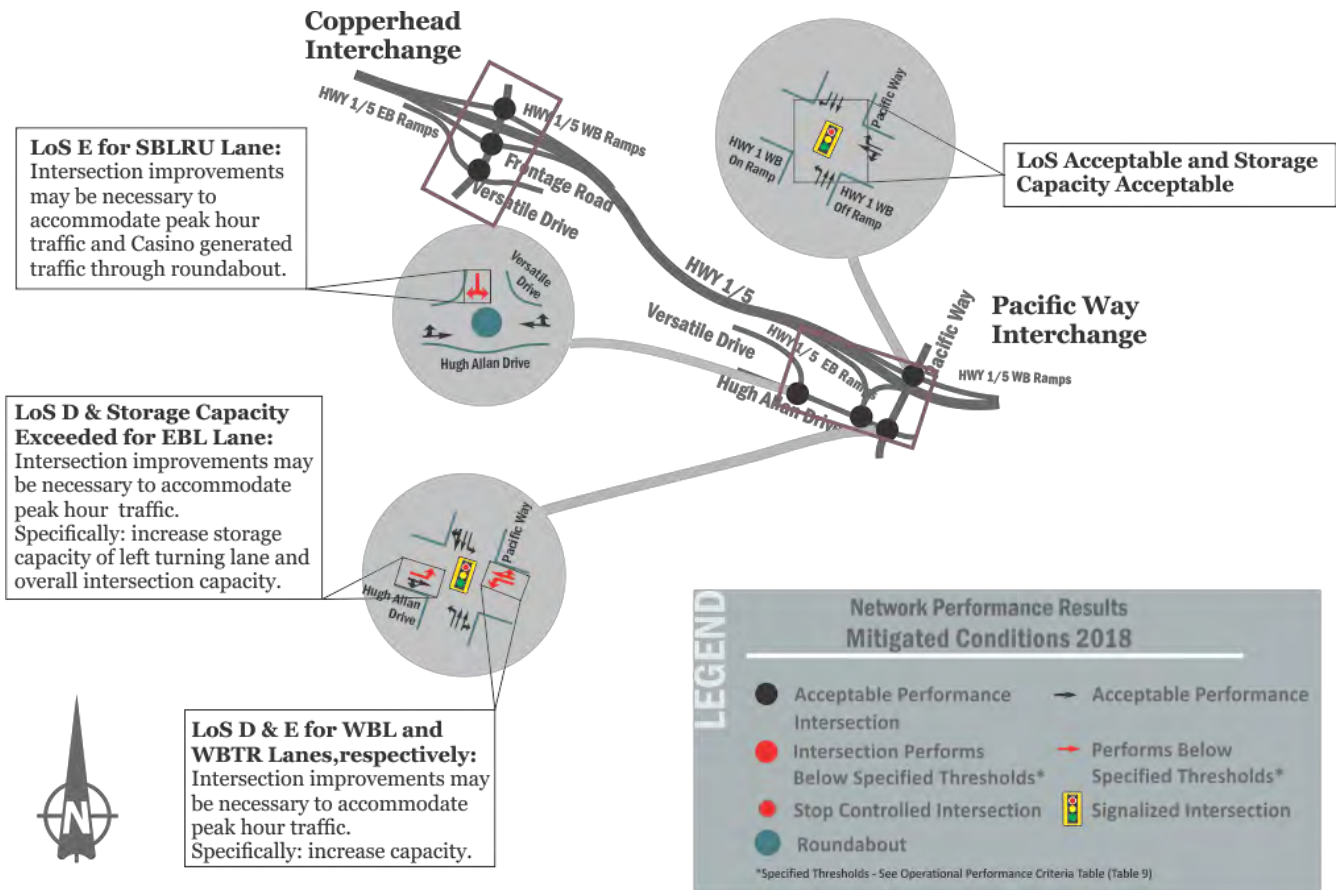


Figure 44: 2018 Mitigated Conditions - Network Performance Results Summary

### 15.6.4 Operations Phase – 2024

The introduction of operations phase Project generated traffic, with mitigation measures in place, have minimal effects on the road network as compared to the base condition results. All intersections perform with the same or similar LoS values. Introducing mitigation measures, increased carpooling, has minimal effects and no residual effects are experienced in both the AM and PM peak periods. See Figure 45 for more detail. For comparison with 2024 Base Conditions, please refer to Figure 35.

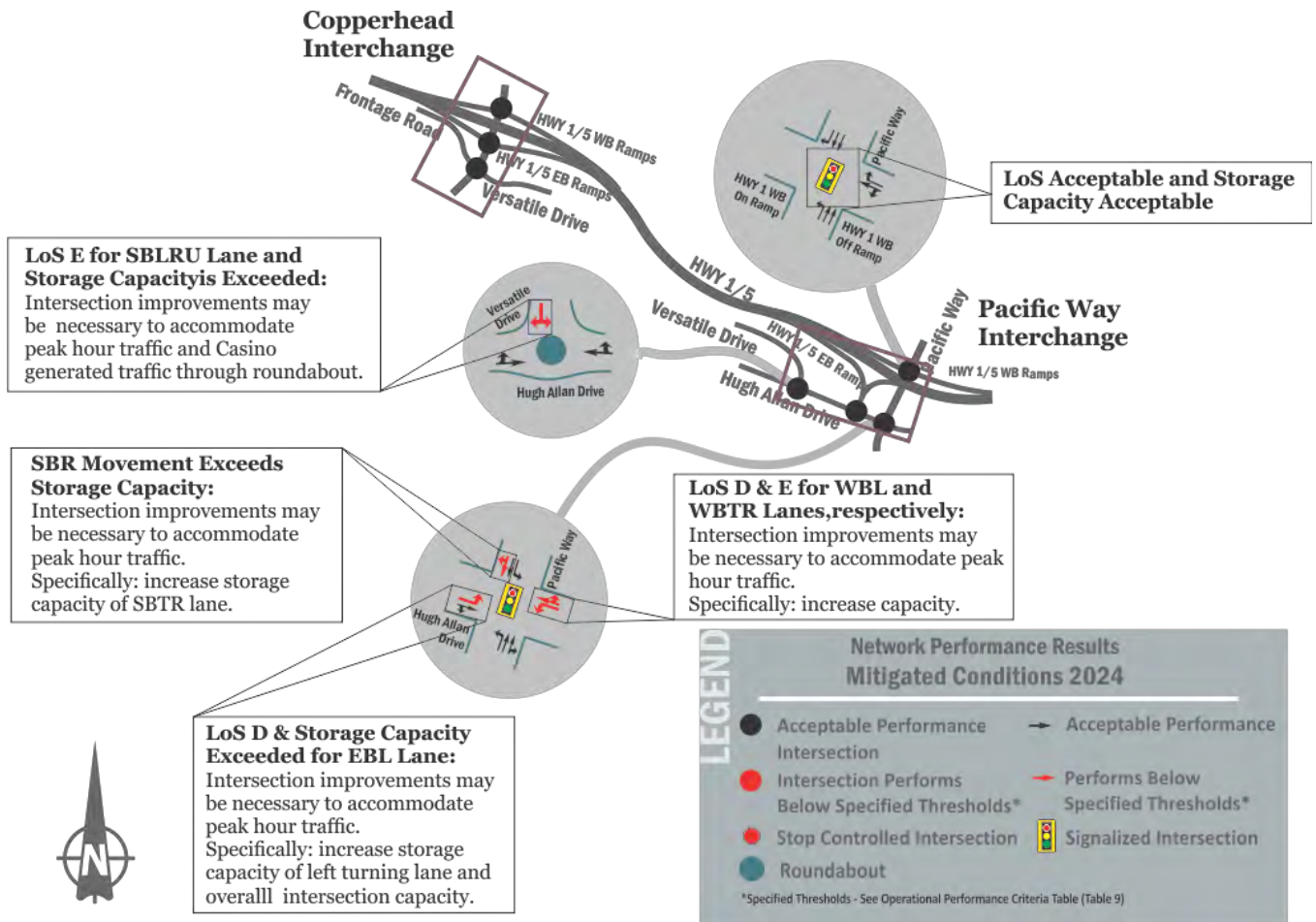


Figure 45: 2024 Mitigated Conditions - Network Performance Results Summary

### 15.6.5 Operations Phase – 2039

Applying an increased carpooling percentage to the Project generated traffic has minimal effects on the overall impacts of the Project traffic. The network performs similarly with or without mitigation measures in place in both the AM and PM peak periods. Refer to Figure 46 for more detail. Refer to Figure 36 for 2039 Base Conditions.

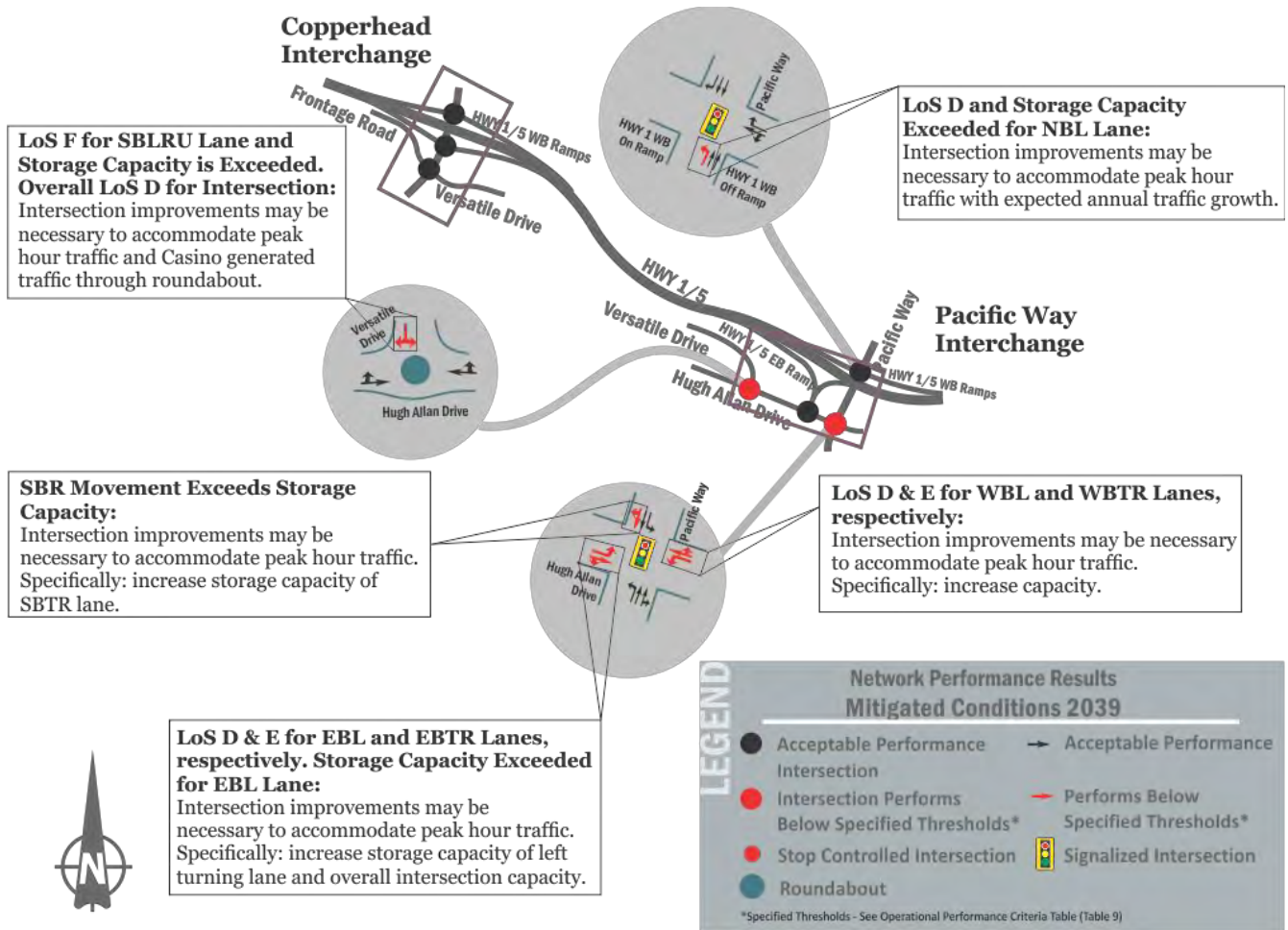


Figure 46: 2039 Mitigated Conditions - Network Performance Results Summary

## 16 Intersection Capacity Analysis Results Summary & Recommendations

### 16.1 Results Summary

#### 16.1.1 Base Conditions

Under Base Conditions the study network experiences storage bay capacity issues for future horizon years for several left and right turn lanes. The Versatile Drive/Hugh Allan Drive roundabout operates with an unacceptable LoS for the PM peak in all horizon years. The LoS for 2016 is a D and drops to an F by 2039. The southbound roundabout lane poses a low LoS in the PM peak, likely due to the Casino generated traffic.

#### 16.1.2 Total Conditions

Other than underlying storage capacity issues identified in the base conditions analysis and the PM peak hour performance of the roundabout at Versatile Drive/Hugh Allan Drive, the total unmitigated conditions impose minimal impacts to the base network in the 2016 Construction horizon year and the 2024 and 2039 Operations horizon years. However, due to the high number of staff anticipated for the 2018 Construction horizon year, the impacts on the road network are much more evident for some of the intersections through the study network. Inks Lake interchange and LLJR/AMAR intersection experience the bulk of the negative impacts during this phase as the traffic from all directions meet at the Inks Lake interchange and travel through the LLJR/AMAR intersection to access the Project.

#### 16.1.3 Mitigated Conditions (Residual Effect)

Other than underlying base conditions storage capacity issues identified in the base conditions analysis and the PM peak hour performance of the roundabout at Versatile Drive/Hugh Allan Drive, the total mitigated conditions impose minimal impacts to the base network through all horizon years. Mitigation measures imposed during the construction phase, 2016 and 2018 horizon years, include bus staging, shift staggering, and increased carpooling passengers. Additionally, the new construction of Inks Lake interchange will reduce traffic impact on LLJR. The operations phase, 2024 and 2039 horizon years, mitigation measures include shift staggering (to a lesser degree) and increased carpooling.

### 16.2 Conclusion & Recommendations

The roundabout at Versatile Drive/Hugh Allan Drive experiences unacceptable Levels of Service before the addition of Project generated traffic. The LoS F is worsened slightly with the introduction of Project traffic. However the southbound lane experiences a LoS F for all conditions – base, total, and mitigated. **Thus, it can be concluded that the Project traffic has only a minor effect on the roundabout's performance.**

The analysis indicates that left turn storage bays are insufficient in base conditions by 2016 because of background traffic growth for a number of locations. Mitigated Project traffic conditions also show two locations have storage inadequacies: the eastbound left turn at Pacific Way and Hugh Allan Drive; and, the westbound left turn/through lane at Highway 1/Pacific Way. These two left turn storage bays are exceeded in the Base Conditions of 2016. Therefore, it can be concluded that the Project traffic has only a minor effect on these two locations.

It is recommended that CoK and MoTI increase left turn storage lengths as early as possible and traffic signals be adjusted as necessary to accommodate increased background volumes.

## 17 Goose Lake Road Closure

### 17.1 Existing Conditions

#### 17.1.1 Network Function

Goose Lake Road (GLR) crosses the southeast corner of the Project and services ranching properties, recreational areas, and it has been suggested some commuting traffic (see Figure 48, General Project Area). The road is a rough two lane road with gravel surface. The general characteristics can be seen in Figure 47.

GLR connects LLJR with Highway 5A via Long Lake Road; however, it does not add significantly to overall network connectivity because of its slow operating speed and the alternative route via LLJR which is more easily accessed.



Figure 47: Goose Lake Road, April 2015

#### 17.1.2 Traffic Conditions

Traffic data were collected on Friday April 10 and Saturday April 11, 2015 so as to include both weekday and weekend traffic information. The summary is provided below in Table 40 and the detailed information is presented in Appendix E. The data collected are similar to the information offered by the ranchers which validates both the data collection and the ranchers' general observations. In the context of rural road usage in BC, GLR would be considered a low-volume road.

Table 40: Summary of Goose Lake Road Traffic Counts

Date	Motorecycles	Cars	Light Trucks	Buses	Single unit Trucks	Articulated Trucks	Pedestrians	Bicycles
Friday April 10	0	24	12	0	1	0	3	1
Saturday April 11	0	43	12	0	0	0	3	2
Average per hour	0	1 – 2	<1	0	<1	0	<1	<1
<b>Total</b>	<b>0</b>	<b>67</b>	<b>24</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>6</b>	<b>3</b>

Period	Northbound	Southbound	Total
<b>Friday</b>	<b>14</b>	<b>23</b>	<b>37</b>
AM	8	10	18
PM	6	13	19
<b>Saturday</b>	<b>29</b>	<b>29</b>	<b>58</b>
AM	4	5	9
PM	25	24	49
<b>Total</b>	<b>43</b>	<b>52</b>	<b>95</b>

### 17.1.3 Anecdotal Information from Ranchers & Residents

The following is a summary of the anecdotal information provided to KAM by ranchers and residents who reside on and/or use GLR:

- » They use the road for their purposes between four (4) and twelve (12) times a day, depending on each person/family.
- » They observe pedestrians (runners) using the road on weekends.
- » They see bicycles, about six (6) a day on the road.
- » They see recreational usage including bird watching and other seasonal activities.
- » They estimate 40 to 50 cars per day use the road on weekends, more in the fall.
- » They believe there is one commuter using the road.
- » They indicated heavy vehicle usage is present; however, it is less than it was in the past.

The data presented here were collected during a typical week in spring. Because of the apparent proportion of recreational traffic on the road, it is recommended that summer and fall weekday and weekend counts be conducted to confirm seasonality of traffic conditions.

## 17.1 Projected Change

### 17.1.1 Road Closure

The planned location of the Project tailings storage facility is currently serviced by Goose Lake Road (GLR). To accommodate Project operations, KAM has proposed closing a section of GLR, approximately 6 km in length. The extents of the proposed closure are shown in Figure 48 below:

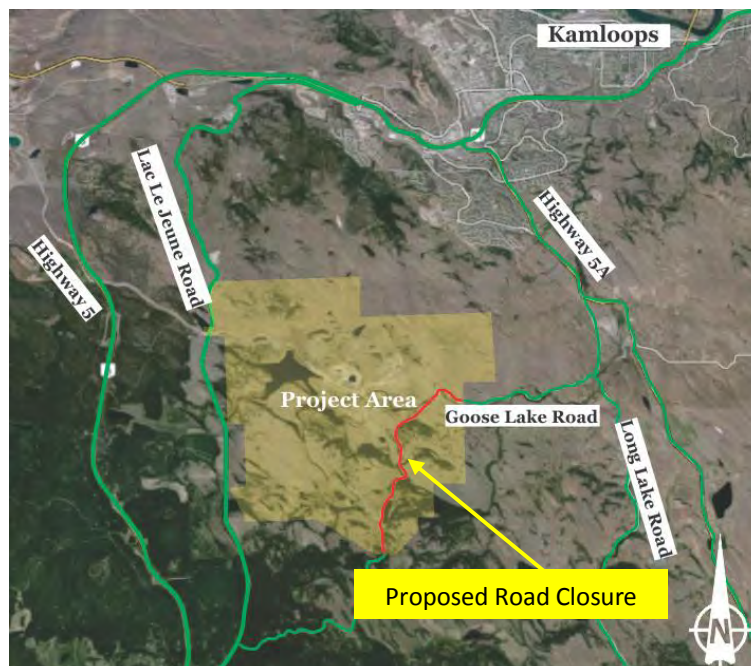


Figure 48: Extents of Proposed Goose Lake Road Closure

GLR falls under the jurisdiction of MoTI and is described as a Section 42 road, from the Transportation Act; however it has not been formally established as a road by public announcement known as gazetting. This may complicate the road closure as the process is different when the road has formal gazette than when it is believed to be Section 42. With gazetted roads, MoTI has authority to close roads as it so chooses by notifying affected parties and authorizing internal documents to affect the change.

Under Section 42, roads have evolved into general usage by the public and have been maintained by the government for public usage. No formal right-of-way has been established by survey and registered in **Land Titles Office, and therefore, the road's footprint is only its hard surface**. Without a court decision, the government does not formally own a Section 42 road. Its closure takes the process of essentially giving the land back to the owner of the surrounding property. If a re-establishment of the road is required in the future, the road would be considered new and would require purchase of the land for the re-established road.

This chapter presents a description of GLR, and the analysis, outcomes, and recommendations of the review process. The review incorporated the following steps:

- » Review of the current access opportunities for the existing properties;
- » Identification of which properties, if any, would be landlocked under the road closure;
- » Conversations with ranchers using the area to identify non-quantifiable needs;
- » Traffic data collection including volumes and types of vehicles as well as bicycles and pedestrians;
- » Review of network impacts; and,
- » Consideration of an alternate route.

### 17.1.2 Property Access

A detailed review was carried out for the properties adjacent to and accessing GLR. Shown in Figure 49 are: the properties with access that will not change as a result of the closure; the properties currently without access; and, the properties that will not have access if GLR is closed.

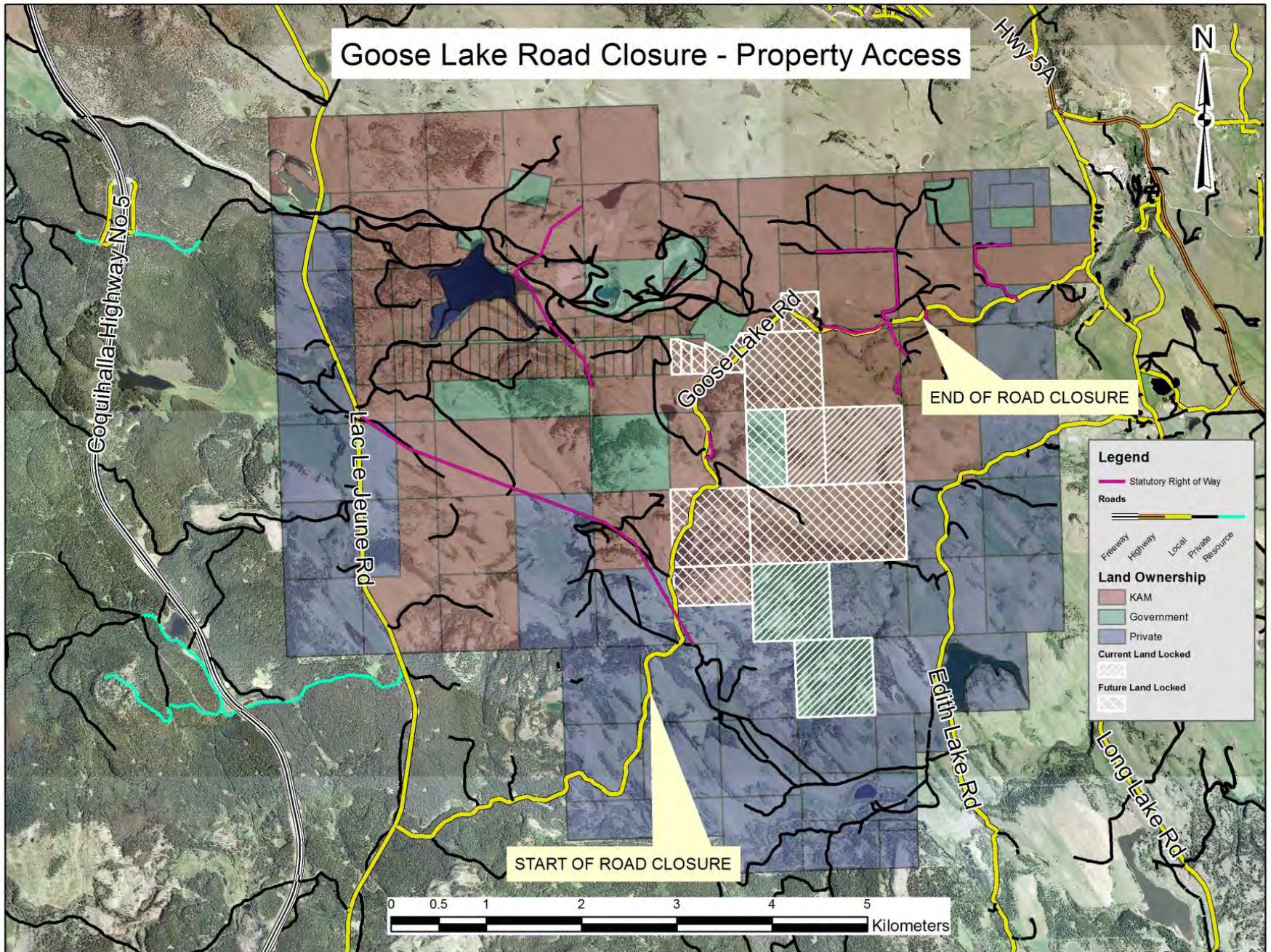


Figure 49: Goose Lake Road Closure – Property Access Impacts

## 17.2 Impact Assessment

### 17.2.1 Property Access & Land Use

#### 17.2.1.1 Properties currently without access

There are two (2) government-owned, “Crown” properties that currently do not have access. They are shown as landlocked on Figure 49. Included in this category are also two properties owned by KAM. The status of these four (4) properties will not change with the closure of GLR.

#### 17.2.1.2 Properties unaffected by the closure of Goose Lake Road

KAM owns eight (8) properties adjacent to GLR that either have direct access to GLR or an alternate route. There are two (2) Crown properties, and, three (3) private properties in this category. These 13 properties will be unaffected by closure of GLR.

#### 17.2.1.3 Properties affected by the closure of Goose Lake Road

As shown in Figure 49, there are seven (7) properties owned by KAM that will lose direct road access if GLR is closed. There are no private properties in this category. There is one (1) Crown parcel that could be impacted by the proposed road closure. In total, eight (8) properties would lose direct road access with the closure of GLR.

Closure of the road is estimated to directly impact eight (8) properties. Seven of these properties are currently owned by KAM and will be incorporated into mining operations; access to GLR is not required. KAM has also indicated that if road access is required to these properties, private roads will be constructed as needed for Operations, pursuant to approvals under the Mines Act and applicable regulations.

The remaining (1) property is Crown and does not have an alternate access route were GLR to be closed.

#### 17.2.1.4 Grazing Leases

Grazing leases survive temporary non-agricultural usage. For the Project site, reclamation land use objectives are unconfirmed at this time. Therefore, it is uncertain whether the existing grazing leases will still apply to the Project area given that grazing may or may not be available post-closure.

### 17.2.2 Network Function

Elements of a roadway system require a number of features to be considered “network”. Planning documentation indicates that network elements should be regionally significant; the roads should move people, goods, and services. The roads should provide access to jobs and markets, and offer efficiency. Users of network roads should include pedestrians, cyclists, passenger vehicles, transit buses, and commercial vehicles. In choosing and improving roads for network efficacy, value for money should be considered and such factors as congestion, travel time, reduced travel distances, and reduced greenhouse gas emissions should be weighed to determine which roads to improve and how much to invest.

**In examining the network value of GLR, certain “network” factors are noticeably absent and therefore, trips that would redirect as a result of a closure could be accommodated elsewhere on the existing network without significant traffic impact.**

Further network analysis is not recommended, but if network issues remain a concern of stakeholders, origin-destination surveys may be conducted to verify established points of need. This would enable corresponding alternate route journey-time surveys to be carried out to quantify the level of impact.

A discussion of network factors is provided below.

### 17.2.2.1 Reliability

The road surface is gravel which makes other routes such as Lac Le Jeune Road more desirable. The recently-collected data presented in Table 40 demonstrate that some user types are not accessing GLR, including motorcycles, school buses and transit buses, presumably because this demand does not exist and possibly because the route is less than ideal due to factors such as all-weather reliability, safety, vehicle operating costs and comfort. It has been reported that occasionally the road is impassable during winter conditions. Presumably the gravel surface also restricts the use by people in wheelchairs, using strollers, or with mobility challenges.

### 17.2.2.2 Connectivity

From a network perspective, GLR does not provide the shortest connection between its intersection with LLJR and the intersection of Highway 5A and Highway 1. However, the origin and destination of users has not been established and it is therefore unclear whether the road provides the shortest connection between established points of need.

### 17.2.2.3 Use

The volume of traffic using GLR is approximately 50 vehicles per day. If GLR is closed, approximately 50 vehicles per day could be imposed on other routes. Typical peak hour traffic volumes range from 10% of daily volumes for general use roads up to 15% of daily volumes for urban commuter roads. Factoring 50 vehicles per day to a peak hour volume, the peak hour volume of GLR is approximately five (5) vehicles. If GLR were closed, approximately five (5) vehicles per day could be added to a different road, possibly LLJR; this is highly unlikely to have significant effect.

In some cases however, because use of the land serviced by GLR is changing from ranching to mining, the trips will cease, rather than be transferred to a different road. This is likely the case for ranching usage. Ranch traffic will not be relocated if GLR is closed because ranching will cease in the area adjacent to GLR during the Project life.

Recreational traffic may be relocated to other road systems. Some may use LLJR to access the recreational area of Jacko Lake. Some may decide to use Greenstone Mountain, and others may head northward. In all of these cases, the roads accessing these locations have capacity to accept the number of trips per day. **Using the ranchers' information about their own trips being 4 to 12 per day, this suggests** at the upper end, there could be 46 recreational trips per day. These 46 trips could be accommodated on other roads such as LLJR, Highway 5A, and/or Highway 5 which are currently operating below capacity, or by the implementation of the Inks Lake Interchange and newly public AMAR.

Cyclists and pedestrians make up a small fraction of the traffic accessing GLR, approximately 6 each. Cyclists and pedestrians using GLR may be using the road as a location for physical training. The neighbouring road network, including Edith Lake Road and Long Lake Road, can sufficiently accommodate cyclists and pedestrians for training/workout purposes.

If GLR is closed, emergency vehicles would also need to be rerouted. Given that there are no emergency vehicle stations near the Project site, it does not appear that emergency vehicles would be unduly impacted by closure of GLR.

There has been indication that MoTI road maintenance contractors use GLR to reach Highway 5A. With the highway maintenance depot at the Inks Lake Interchange as the starting point, it is approximately 18 km to the intersection of Long Lake Road and Highway 5A via Highways 5 and 1 into Kamloops then east on Highway 5A. The alternative route using Inks Lake Road, LLJR, and GLR to the same point is approximately 23 km long over less serviceable roads. It therefore seems unlikely that closure of GLR will negatively impact road maintenance contractors originating at the maintenance depot. Maintenance of GLR would not be required with its closure resulting in a net maintenance cost saving to MoTI.

## 17.3 Mitigation of Residual Effects

### 17.3.1 Property Management

The proposed closure of GLR impacts one government-owned parcel of land. The parcel has access now, and will not have with the proposed closure. The counts of pedestrians, bicycles, and vehicles show that, while there is some usage of the road, the volumes are low, and only a few people will be impacted by closure of the road. The impacts of the closure of GLR are minimal and therefore, its closure could be carried out.

It is recommended that KAM approach government to determine what their plans are for the three **Crown properties impacted by the potential road closure. Depending on government's plans for the** three parcels, it may be optimal for KAM to construct private access from Edith Lake Road to the Crown properties, or to provide connection via existing internal private roads. If government has no plans for the properties, then no access is required.

### 17.3.2 Consideration of an Alternate Route

It is a conclusion of this assessment that the effect of closing a 6km mid-section of GLR is minor to both property and overall network connectivity and efficiency. For this reason, alternative route options have not been considered.

The proposed closure of GLR has raised concerns about access and questions regarding the feasibility of non-closure alternatives such as alternate route options.

In order to establish the feasibility of an alternate route, the following steps are typically taken:

- 1) Planning of the corridor: this requires collection of topographical, drainage catchment, environmental, geotechnical, land use, and more information. Typically several options are created for comparison, and approximate cost estimates are calculated.
- 2) Optimal route selection: the options created in the planning stage are presented for input from stakeholders. The options are evaluated against one another, and the best, optimal solution is moved forward to preliminary design. The cost estimate for the preferred option is more carefully calculated so that budgeting can occur.

Design stages for alternate route development typically include:

- 1) Preliminary design: this step requires detailed topographical survey, accurate geotechnical information, and accurate base mapping including property lines and watercourses etc. At this stage, the preferred concept has been proven to be viable.
- 2) Detailed design: at this stage, highly detailed cost estimates are calculated, project challenges have been identified and resolved, and design drawings are fulsome enough to permit land purchase, creation of contract documents and tenders for construction of the road.

If an alternate route to replace GLR is required, some options might include the following. However, the topography in the area and landownership considerations are likely to make identifying a suitable alternative route challenging:

- » A completely new road along the edge of KAM property;
- » **A new road that skirts the operations of KAM's mining, within KAM property;**
- » A new road outside of KAM property, through property owned by others;
- » A new route connecting GLR to Edith Lake Road (Edith Lake Road is shown on Figure 49 ); and,
- » Connection and improvement of the existing private roads within KAM property.

# ROAD CONDITIONS ASSESSMENT

**IN THIS SECTION:**

- In-Service Road Safety and Conditions Review
- Lac Le Jeune Road Pavement Review
- Road Conditions Assessment Recommendations

This section of the TIA assesses the impact of Project traffic on general road operating conditions and performance in terms of road safety and maintenance. The purpose of the assessment is to identify the current safety performance and maintenance need of the roads in the study area and to identify key issues or trends that may need to be addressed in order to safely accommodate Project traffic on the network.

Overall changes in traffic volume on the roads in the study area that are expected as a result of the Project are shown in the following table. Data presented includes:

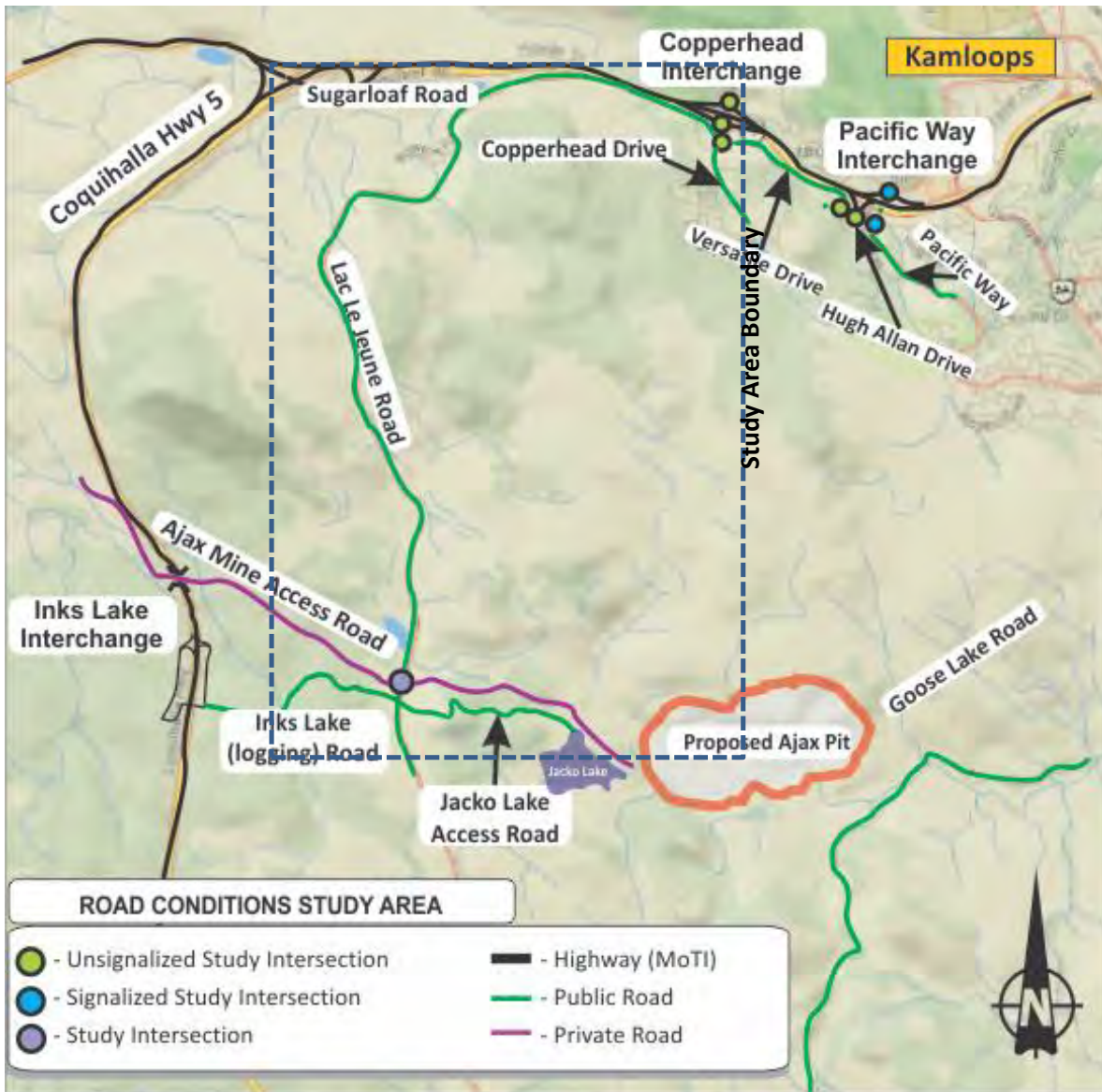
- Existing (Base) traffic volume (without Project related traffic volume);
- predicted total traffic volume (existing [base] traffic volumes plus Project related traffic volumes) *without* mitigation measures to reduce Project traffic volume; and,
- predicted total traffic volume (existing [base] traffic volume plus Project related traffic volume) *with* mitigation measures to reduce Project traffic volumes.

**Table 41: Existing and Predicted Traffic Volume on Study Area Roads**

Road	Segment	Direction	# Lanes	Base Volume (AADT)				Total Traffic Volumes without Mitigation Measures				Total Traffic Volumes with Mitigation Measures			
				2016	2018	2024	2039	2016	2018	2024	2039	2016	2018	2024	2039
HWY 5	Ironmask I/C to Copperhead I/C	EB	3	7,658	7,843	8,425	10,076	7,658 (+0.0%)	9,408 (+20.0%)	8,741 (+3.8%)	10,392 (+3.1%)	7,658 (+0.0%)	8,354 (+6.5%)	8,716 (+3.5%)	10,367 (+2.9%)
		WB	3	7,658	7,843	8,425	10,076	7,658 (+0.0%)	9,408 (+20.0%)	8,741 (+3.8%)	10,392 (+3.1%)	7,658 (+0.0%)	8,354 (+6.5%)	8,716 (+3.5%)	10,367 (+2.9%)
	Inks Lake I/C to Ironmask I/C	NB	2	4,946	5,065	5,441	6,507	4,946 (+0.0%)	6,722 (+32.7%)	5,775 (+6.1%)	6,841 (+5.1%)	4,946 (+0.0%)	5,604 (+10.6%)	5,748 (+5.6%)	6,814 (+4.7%)
		SB	2	4,946	5,065	5,441	6,507	4,946 (+0.0%)	6,722 (+32.7%)	5,775 (+6.1%)	6,841 (+5.1%)	4,946 (+0.0%)	5,604 (+10.6%)	5,748 (+5.6%)	6,814 (+4.7%)
	Wallopier I/C to Inks Lake I/C	NB	2	4,946	5,065	5,441	6,507	4,946 (+0.0%)	5,254 (+3.7%)	5,500 (+1.1%)	6,566 (+0.9%)	4,946 (+0.0%)	5,126 (+1.2%)	5,497 (+1.0%)	6,563 (+0.9%)
		SB	2	4,946	5,065	5,441	6,507	4,946 (+0.0%)	5,254 (+3.7%)	5,500 (+1.1%)	6,566 (+0.9%)	4,946 (+0.0%)	5,126 (+1.2%)	5,497 (+1.0%)	6,563 (+0.9%)
LLJR	Sugarloaf Rd to AMAR	NB	1	535	771	828	991	944 (+76.4%)	771 (+0.0%)	828 (+0.0%)	991 (+0.0%)	603 (+12.7%)	771 (+0.0%)	828 (+0.0%)	991 (+0.0%)
		SB	1	270	390	419	501	679 (+151.5%)	390 (+0.0%)	419 (+0.0%)	501 (+0.0%)	338 (+25.2%)	390 (+0.0%)	419 (+0.0%)	501 (+0.0%)
	AMAR to Goose Lake Rd	NB	1	535	771	828	991	538 (+0.6%)	771 (+0.0%)	828 (+0.0%)	991 (+0.0%)	538 (+0.6%)	771 (+0.0%)	828 (+0.0%)	991 (+0.0%)
		SB	1	270	390	419	501	273 (+1.1%)	390 (+0.0%)	419 (+0.0%)	501 (+0.0%)	273 (+1.1%)	390 (+0.0%)	419 (+0.0%)	501 (+0.0%)
AMAR	LLJR to Project Site	EB	1	0	9	10	13	412 (N/A)	1,855 (N/A)	403 (N/A)	406 (N/A)	71 (N/A)	291 (N/A)	373 (N/A)	376 (N/A)
		WB	1	0	9	10	13	412 (N/A)	1,855 (N/A)	403 (N/A)	406 (N/A)	71 (N/A)	291 (N/A)	373 (N/A)	376 (N/A)
	Highway 5 to LLJR	EB	1	0	9	10	13	0 (N/A)	1,855 (N/A)	403 (N/A)	406 (N/A)	0 (N/A)	291 (N/A)	373 (N/A)	376 (N/A)
		WB	1	0	9	10	13	0 (N/A)	1,855 (N/A)	403 (N/A)	406 (N/A)	0 (N/A)	291 (N/A)	373 (N/A)	376 (N/A)

For the purposes of the assessment, based on the figures in Table 41 Project-related traffic will minimally impact operation of Highways 1 and 5. The capacity of these two highways is sufficient to accommodate the additional traffic volumes and heavy traffic types from the Project. Because of the robust nature of highways, traffic analyses of the two highways were excluded from this TIA.

The primary access plan as described in Section 2.2 includes the use of Highway 1 and 5 with direct connection to the AMAR. The Temporary Access Plan utilizes LLJR to connect traffic from Highway 5 to the AMAR. This road conditions assessment therefore considers only areas of the existing network that are included within the Temporary Access Plan (refer to Figure 4). The scope of the analysis is defined in the ToR and includes a detailed road safety inspection (Chapter 18) and pavement condition analysis (Chapter 19) for LLJR between the Versatile Drive/Copperhead Drive intersection and a point 1 kilometre south of the existing AMAR overpass:



**Figure 50 : Road Conditions Study Boundary**

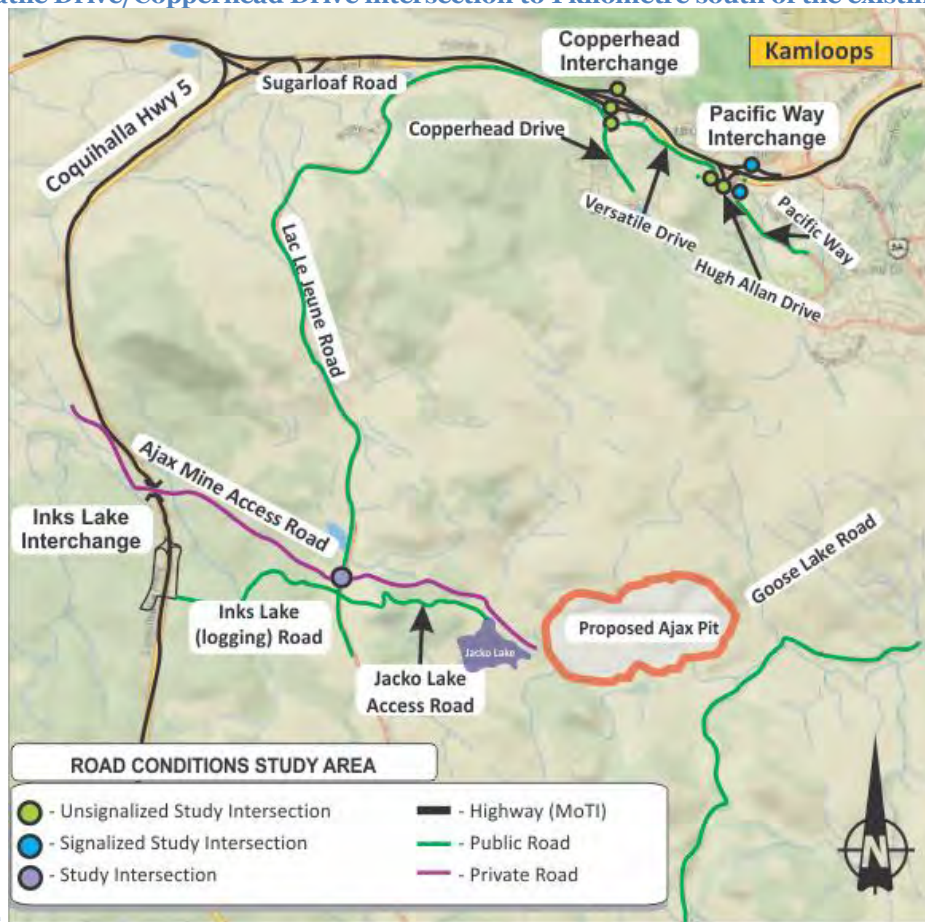
The southerly section of LLJR from the mine access point to Walloper Way Interchange was excluded from the study because it is under the jurisdiction of MoTI, and its design and construction were believed to be adequate for the anticipated volumes, size, and weight of Project traffic.

## 18 In-Service Road Safety and Conditions Review

An in-service road safety review of roads that make up the temporary and permanent access plans was completed. This review documents existing road conditions for signage, markings, road width and edging, lighting and sightline issues. The purpose was also to evaluate the likely impact of Project traffic on safety performance and seasonal maintenance requirements (Section 7.2.4.). The spatial extent of the road safety review includes:

- » Copperhead Interchange;
  - Highway 1/5 WB On/Off Ramps and Copperhead Drive intersection merge/diverge lanes;
  - Highway 1/5 EB On/Off Ramps and Copperhead Drive intersection merge/diverge lanes;
  - Frontage Road (Versatile Drive)/Copperhead Drive;
- » Proposed AMAR overpass at LLJR; and,

### LLJR from Versatile Drive/Copperhead Drive intersection to 1 kilometre south of the existing AMAR



overpass.

Figure 51 depicts the road safety review study area and each of the above portions of the network reviewed.

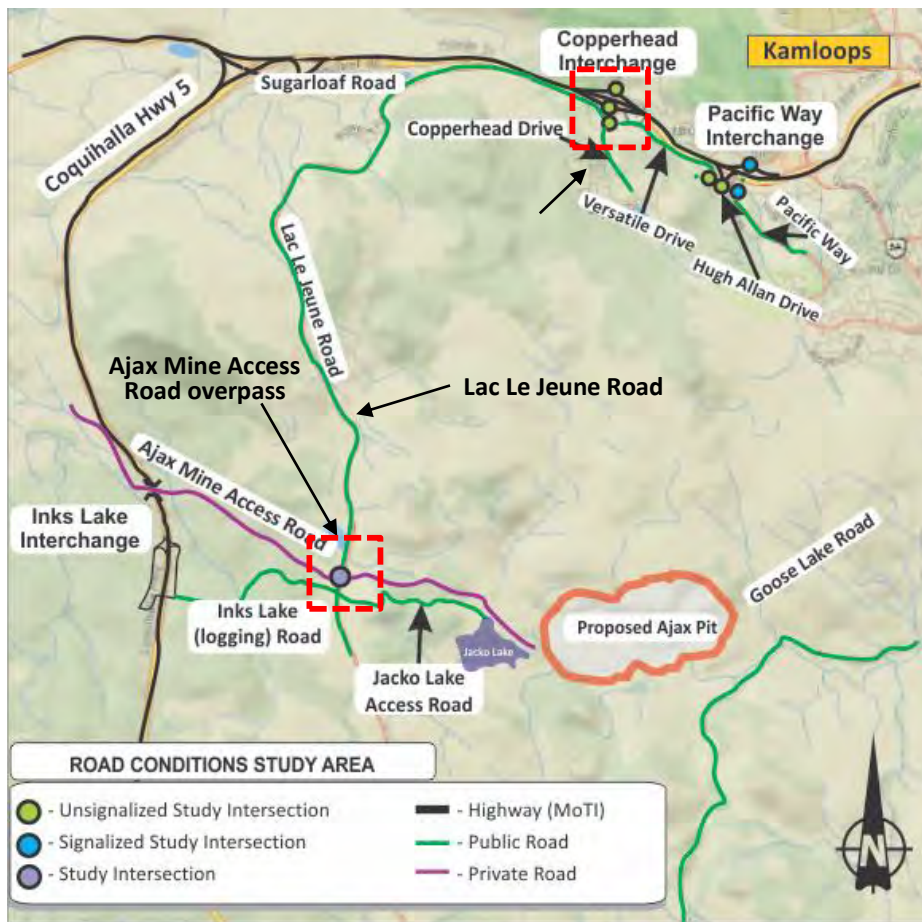


Figure 51 : Road Conditions Study Area

Opus conducted on site safety reviews at the locations on Tuesday, November 4, 2014 during the morning and early afternoon hours. Subsections below outline issues identified during the in-service safety review.

## 18.1 Existing Conditions

### 18.1.1 Copperhead Interchange



**Figure 52: Copperhead Interchange Study Intersections**

The safety review consisted of two Opus transportation engineers driving and walking the Copperhead Interchange study intersections. The review also included photo documentation, measurements (e.g. sidewalk widths and lane widths), and pedestrian interviews to identify pedestrian connectivity issues and safety concerns. Two main safety concerns were noted at the Copperhead interchange intersections:

1. Inadequate provisions for pedestrians, cyclists, and transit users, especially those with mobility restrictions (e.g. wheelchairs, scooters, strollers, etc.); and,
2. Intersections are not designed to accommodate the high percent of heavy vehicles using the intersections.

Figure 53 shows the identified pedestrian connectivity gaps at the Copperhead Interchange study intersections. The figure shows where there is no pedestrian receiving infrastructure (e.g. crosswalk let-downs or sidewalks) at the end of a crosswalk, no formal pedestrian infrastructure where pedestrians clearly desire to travel (evident from trodden pathways and seeing pedestrians use the pathways) and, pedestrian desire lines between the road network and nearby businesses (evident from trodden pathways and seeing pedestrians use the pathways). Overall, there is clearly a need for pedestrian infrastructure at the interchange based on visual evidence on site. Provision of safe pedestrian infrastructure (e.g. sidewalks and formal pathways) would provide safer

Figure 52 shows the three safety review study intersections at the Copperhead Interchange.

Table 42 outlines the road classifications for each road at the Copperhead Interchange, as per CoK’s 2010 Street Classification Map.

**Table 42: Copperhead Interchange Road Classification**

Road Name	Road Classification
Copperhead Drive	Major Arterial
Highway 1 On- and Off- Ramps	Highway
Frontage Road	Minor Arterial
Versatile Drive	Minor Collector





**Figure 53: Copperhead Interchange Pedestrian Connectivity Gaps**

accommodation for pedestrians at the Copperhead Interchange. The pedestrian connectivity gaps shown in Figure 53 are discussed more in detail for each intersection assessment in later subsections.

Aside from pedestrian connectivity and heavy vehicle accommodation, Table 43 documents other safety review findings found at the Copperhead Interchange. Each issue is listed by observation number and described by location and image, observation description, and countermeasure recommendation.




**Table 43: Copperhead Interchange Conditions Safety Review**

Item No:	Location and Image	Observation Description	Countermeasure Recommendation
1a	 <p>Discontinuous Sidewalks – Looking East</p>	<p>Some crosswalk letdowns are crumbling. This can hinder movements for vulnerable road users, especially those with mobility restrictions (e.g. wheelchairs, scooters, strollers, etc.).</p>	<p>Consider rehabilitating crosswalk letdowns to ensure better vulnerable road user access.</p>
2a	 <p>Faded Pavement Markings</p>	<p>Pavement markings in some areas in the interchange were faded.</p>	<p>Consider repainting pavement markings at the interchange.</p>

**18.1.1.1 Copperhead Drive and Highway 1/5 WB On- and Off- Ramps**

The road safety review of the Copperhead Drive and Highway 1/5 WB On- and Off- Ramps intersection revealed that there is inadequate pedestrian connectivity and this poses increased safety risks for pedestrians using this intersection. Table 44 documents **Opus’ safety review findings for the** existing intersection. Each existing issue is listed by observation number and described by location and image, observation description, and countermeasure recommendation.




**Table 44: Copperhead Drive and HWY 1 WB On- & Off-Ramps Safety Review**

Item No:	Location and Image	Observation Description	Countermeasure Recommendation
1b	 <p>No Pedestrian Crosswalk Signage</p>	<p>There are enhanced crosswalk markings traversing Copperhead Drive on the north leg of the intersection. There is no pedestrian crossing signage to accompany the crosswalk markings, which does not meet TAC requirements.</p>	<p>Consider completing a crosswalk warrant as per <b>TAC's Pedestrian Crossing Control Guide (2012)</b> to determine the appropriate crosswalk treatment required for the existing crosswalk location.</p>
2b	 <p>Narrow Sidewalks on Overpass</p>	<p>South of the intersection on the Copperhead Drive overpass over Highway 1/5, the sidewalks are 1.15 m wide on the east side of Copperhead Drive and 1.1 m wide on the west side of Copperhead Drive.</p>	<p><b>According to CoK's Design Criteria Manual (2012)</b>, major arterial roadways (like Copperhead Drive) should have a minimum 2.0 m wide sidewalk. Consider adjusting the sidewalk width at the overpass to better accommodate pedestrian traffic.</p>
3b	 <p>Crosswalk at Northwest Corner of Intersection</p>	<p>The crosswalk traversing the southbound channelized right turn lane leads to grass/gravel and no receiving pedestrian infrastructure.</p>	<p>Consider implementing adequate pedestrian receiving infrastructure so the crosswalk leads to a functioning sidewalk or pathway. If implementing adequate pedestrian receiving infrastructure is not feasible, consider removing the crosswalk to encourage pedestrians to use alternate crossings with adequate infrastructure.</p>

**18.1.1.2 Copperhead Drive and Highway 1/5 EB On- and Off- Ramps**

Again, the road safety review of the Copperhead Drive and Highway 1/5 EB On- and Off- Ramps intersection revealed that there is inadequate pedestrian connectivity and this poses increased safety risks for pedestrians using this intersection. Table 45 documents Opus' safety review findings for the existing intersection. Each issue is listed by observation number and described by location and image, observation description, and countermeasure recommendation.





**Table 45: Copperhead Drive and Highway 1/5 EB On- and Off-Ramps Safety Review**




Item No:	Location and Image	Observation Description	Countermeasure Recommendation
1c	 <p>No Pedestrian Crosswalk Signage</p>	<p>There are enhanced crosswalk markings traversing Copperhead Drive at the HWY 1 EB On/Off Ramps. There is no pedestrian crossing signage to accompany the crosswalk markings, which does not meet TAC requirements.</p>	<p>Consider completing a crosswalk warrant as per <b>TAC's Pedestrian Crossing Control Guide (2012)</b> to determine the appropriate crosswalk treatment required for the existing crosswalk location.</p>
2c	 <p>Pedestrian-made Pathway between Sidewalk and Commercial Area Parking Lot</p>	<p>There were clear pedestrian desire lines shown by trodden pathways between the southeast corner of the intersection and the commercial area (Kamloops Travel Centre/Petro Canada Gas Station/A&amp;W) parking lot.</p>	<p>Consider installing formalized pedestrian access (e.g. stairs) between the parking lot and the sidewalk.</p>
3c	 <p>Crosswalk at Southwest Corner of Intersection</p>	<p>The crosswalk traversing the eastbound channelized right turn leads to grass/gravel and no receiving pedestrian infrastructure. Trodden pedestrian pathways show that pedestrians do use the corridor between this crosswalk and the northwest crosswalk at the Copperhead Drive and Frontage Road/Versatile Drive intersection.</p>	<p>Consider implementing adequate pedestrian receiving infrastructure so the crosswalk leads to a functioning sidewalk or pathway that leads to the Copperhead Drive/Frontage Road intersection. If implementing adequate pedestrian receiving infrastructure is not feasible, consider removing the crosswalk to encourage pedestrians to use alternate crossings with adequate infrastructure.</p>

**18.1.1.3 Copperhead Drive and Frontage Road/Versatile Drive**

Similarly, the road safety review of the Copperhead Drive and Frontage Road/Versatile Drive intersection concluded that there is inadequate pedestrian connectivity and this poses increased safety risks for pedestrians using this intersection. Table 46 documents Opus' safety review findings for the existing intersection. Each existing issue is listed by observation number and described by location and image, observation description, and countermeasure recommendation.

**Table 46: Copperhead Drive and Frontage Road/Versatile Drive**

Item No:	Location and Image	Observation Description	Countermeasure Recommendation
1d	 <p>Discontinuous Sidewalks – East Leg</p>	<p>There are no sidewalks on Versatile Drive, on the east leg of the Copperhead and Frontage/Versatile intersection. Based on visual evidence, pedestrians walk on the road shoulders or the grass/soil boulevards on both sides of the east leg.</p>	<p>Consider implementing sidewalks on both sides of the east leg to improve pedestrian connectivity to/from the Copperhead/Frontage intersection.</p>
2d	 <p>Inaccessible Transit Stop – Looking South</p>	<p>The southbound transit stop on the south leg of the Copperhead and Frontage/Versatile intersection is not adequately connected to the surrounding pedestrian network. Transit users must walk on the dirt/grass boulevard to access the transit stop.</p>	<p>Consider implementing sidewalks on west side of the south leg to allow pedestrian access to/from the southbound transit stop.</p>
3d	 <p>Tire Tracks Over Curb – Northwest Corner</p>	<p>The intersection is not designed for high percent of heavy vehicles that use the intersection. Opus personnel witnessed several heavy vehicles travelling over curbs and making wide turns negotiating tight turns.</p>	<p>Consider redesigning the intersection to accommodate heavy vehicle traffic turning movements.</p>
4d	 <p>Pedestrian-made Pathway between Sidewalk and Commercial Area Parking Lot</p>	<p>There were clear pedestrian desire lines shown by trodden pathways between the northeast corner of the intersection and the commercial area (Kamloops Travel Centre/Petro Canada Gas Station/A&amp;W) parking lot.</p>	<p>Consider installing formalized pedestrian access (e.g. stairs) between the parking lot and the sidewalk.</p>

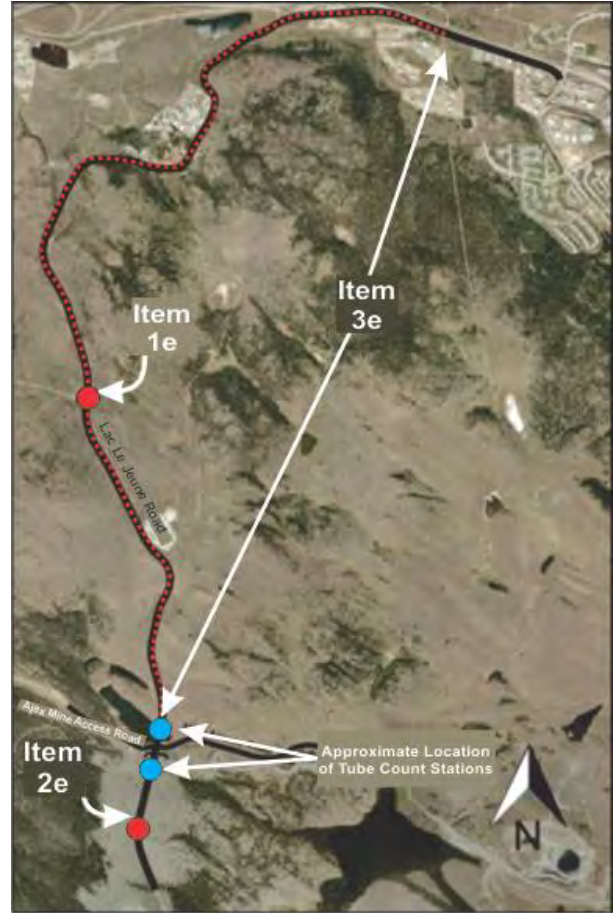
Item No:	Location and Image	Observation Description	Countermeasure Recommendation
5d	 <p>Intersection West Leg Crosswalk – NW view</p>	<p>The crosswalk traversing the southbound channelized right turn leads to grass/gravel and no receiving pedestrian infrastructure. Use is evident in the trodden pathways.</p>	<p>Consider implementing adequate pedestrian receiving infrastructure so the crosswalk leads to a functioning sidewalk or pathway.</p>
6d	 <p>Intersection West Leg Crosswalk – SW view</p>	<p>The crosswalk traversing the west leg of the intersection leads to grass/gravel and no receiving pedestrian infrastructure. Pedestrian desire lines show that the southwest corner of the intersection is well used by pedestrians.</p>	<p>Consider implementing adequate pedestrian receiving infrastructure so the crosswalk leads to a functioning sidewalk or pathway.</p>
7d	 <p>Pedestrian-made Pathway between IRL International Truck Centres Ltd. and Transit Stop</p>	<p>There were clear pedestrian desire lines shown by trodden pathways between the IRL International Truck Centres location and the southbound transit stop on Copperhead Drive.</p>	<p>Consider installing formalized pedestrian access (e.g. stairs between the business and the transit stop).</p>

### 18.1.2 Lac Le Jeune Road

The road safety review of Lac Le Jeune Road concluded that there are some geometric issues from short vertical curves for the posted speed limit (80 km/h) and that there is poor pavement condition just north of the AMAR. Figure 54 shows the extents of the safety review on LLJR (from Copperhead Drive to one kilometre south of the LLJR/AMAR intersection). Table 47 documents **the findings of Opus’ safety review**. Each existing issue is listed by observation number (location shown in Figure 54), observation description, and countermeasure recommendation.

**Table 47: Lac Le Jeune Road Safety Review**

Item No:	Observation Description	Countermeasure Recommendation
1e	For the posted speed of 80 km/h, there is a short vertical curve at the Shotgun Sports access on LLJR.	Consider reducing the speed limit on LLJR to accommodate the road geometry, or, provide warning signs, or, adjusting the road geometry to suit the speed limit.
2e	South of the AMAR, and south of the horizontal curve, there is another short vertical curve for the posted 80 km/h speed limit.	Consider reducing the speed limit on LLJR to accommodate the road geometry, or, providing warning signs, or adjusting the road geometry to suit the speed limit.
3e	The pavement on LLJR between Copperhead Drive and just north of the AMAR shows signs of age, cracking, alligating, and fatigue. Additional detail is provided in Section 7.2.4	See more in formation in the Conditions Review in Section 14.



**Figure 54: Lac Le Jeune Road Study Segment – Identified Issues**

### 18.1.3 Ajax Mine Access Road / Lac Le Jeune Road Crossing

Opus reviewed safety conditions of the existing grade-separated LLJR and AMAR intersection. The AMAR travels over LLJR via an overpass. Figure 55 shows an aerial view of the Lac Le Jeune and AMAR intersection.





The safety review of the AMAR and LLJR intersection revealed that there is inadequate signage at the overpass (overpass height and hazard marker signs), potential structural concerns with the overpass, and limited sightlines due to vertical and horizontal curvature. The sightline issues would have an impact on the LLJR and Inks Lake Road intersection located just south of the overpass. Mitigation of these safety concerns would be favourable to improve safety at the intersection. Table 48 documents Opus’ safety review findings for the LLJR and AMAR intersection.




**Figure 55: Lac Le Jeune Road and Ajax Mine Access Road**

Each issue is listed by observation number and described by location and image, observation description, and countermeasure recommendation.

**Table 48: Lac Le Jeune Road and Ajax Mine Access Road Safety Review**

Item No:	Location and Image	Observation Description	Countermeasure Recommendation
1f	 <p>Rust on Inner Overpass Walls</p>	<p>The overpass structure appeared adequate, but there was rust appearing on the inner walls.</p>	<p>Should the intersection configuration opt to retain the overpass structure, consider conducting a structural inspection on the overpass prior to opening the AMAR as a public road.</p>
2f	 <p>Haul Road Overpass – Looking South</p>	<p>There is no signage indicating the height of the overpass in both directions.</p>	<p>Should the intersection configuration opt to retain the overpass structure, consider installing an overhead sign indicating the available clearance height for both directions.</p>
3f	 <p>Hazard Marker Signage Installation</p>	<p>Potentially because repaving was underway at the time of the site visit, the hazard marker signs (WA-36-R) were not adequately secured.</p>	<p>Consider permanently installing the hazard marker signage to ensure that they cannot be easily removed or tipped.</p>
4f	 <p>Northbound Hazard Marker Signage</p>	<p>In the northbound direction, there is only one hazard marker sign on the west side of LLJR at the AMAR overpass.</p>	<p>Install a second hazard marker sign on the east side of LLJR at the AMAR overpass to notify motorists of the potential hazard.</p>

Item No:	Location and Image	Observation Description	Countermeasure Recommendation
5f	 <p>Northbound Sightlines</p>	<p>The overpass structure is in a sag vertical curve. Furthermore, further north of the AMAR, there is a horizontal curve on LLJR. The combination of this geometry creates sightline issues at the overpass, particularly for vehicles turning into/out of Inks Lake Road (just south of the AMAR).</p>	<p>Consider converting the grade separated intersection into an at-grade intersection to increase visibility for vehicles in all directions. Otherwise, consider moving the Inks Lake Road/Lac Le Jeune intersection further south to provide better sightlines.</p>

### 18.1.4 Traffic Volume and Speed

Traffic data was collected on LLJR proximal to the AMAR to establish baseline traffic volumes on LLJR. Traffic volume, classification (the type of vehicle), and speed data were collected by tube counters over five days between Thursday, July 26, 2012 and Monday, July 30, 2012 in two locations. Tube Counter ‘A’ was laid approximately 175 meters north of the AMAR overpass and Tube Counter ‘B’ was laid approximately 1200 meters south of the AMAR overpass. The purpose of laying both tube counters was to determine the amount of vehicle traffic accessing land uses in the area (Jacko Lake, Inks Lake, Sugarloaf Ranches, Mitchell McGillvary Ranches and the historic mine site). If two-way traffic volumes passing the north-most tube counter was different than the two-way traffic volumes passing the south-most tube-counter, then it could be concluded that some traffic left or entered Lac Le Jeune Road at some point between the two counters. The other purpose of the tube counters was to establish baseline traffic volumes to determine the percent increase in traffic volumes that will occur with the addition of Project generated traffic.

Typical summer conditions were observed during the traffic survey. The following sections summarize the findings from the 24-hour tube count data. The summary data is presented in an average weekday (average of data from July 26, 27, and 30) and average weekend (average of data from July 28 and 29) context.

#### 18.1.4.1 Traffic Volume Data

Traffic volume data was collected over a 24-hour period. Table 49 summarizes two-way traffic volumes at both tube count locations for southbound and northbound traffic. Daily traffic variance between the tube count locations is calculated to provide an understanding of traffic direction.

**Table 49: Lac Le Jeune Road Traffic Volume Summary**

Statistic	Thursday	Friday	Saturday	Sunday	Monday
<b>Location: Tube Counter A South of AMAR</b>					
AM Peak (7:30 – 8:30 AM)	34	38	25	29	37
PM Peak (4:30 – 5:30 PM)	44	74	68	82	63
Day (7:30 AM – 5:30 PM)	466	513	658	858	494
Total Daily Traffic	705	753	900	1072	705
Percent Day (7:30 AM – 5:30 PM) of Total Daily Traffic	66%	68%	73%	80%	70%
<b>Location: Tube Counter B North of AMAR</b>					
AM Peak (7:30 – 8:30 AM)	42	50	28	8	52
PM Peak (4:30 – 5:30 PM)	24	54	58	88	50
Day (7:30 AM – 5:30 PM)	458	466	578	820	448
Total Daily Traffic	668	650	822	1054	666
Percent Day (7:30 AM – 5:30 PM) of Total Daily Traffic	69%	72%	70%	78%	67%
<b>Daily Traffic Variance (Location B vs. A)</b>	<b>-37</b>	<b>-103</b>	<b>-78</b>	<b>-18</b>	<b>-39</b>

From the survey, daily two-way traffic volumes on this rural section of LLJR range between 650 and 1072 vehicles between weekdays and weekend days in the peak summer period. The percentage of vehicles traveling between 7:30 AM and 5:30 PM (adjacent street business hours), range between 66% and 80%. These values are broadly consistent with the rural location of the counts. The recorded volumes are a fraction of the capacity of a rural 2-lane road.

The data shows that the number of vehicle trips generated by land uses in the vicinity of Jacko Lake and Inks Lake averages about 55 per day.

### 18.1.4.2 Vehicle Type Classification

Vehicle type classification data was obtained from both tube counter locations on LLJR. There is minimal difference between the results from the two locations. The classification data from Tube Counter A is presented here as summarized in Table 50 for passenger and commercial vehicle traffic.

**Table 50: Vehicle Classification of Lac Le Jeune Road**

Direction	Vehicle Type	Average Weekday (Thursday, Friday, Monday)		Average Weekend (Saturday, Sunday)	
		No.	%	No.	%
<b>Location: Tube Counter A</b>					
Northbound	Passenger	447	97.4%	702	98.4%
	Commercial	12	2.6%	12	1.6%
Southbound	Passenger	226	97.7%	363	99.2%
	Commercial	5	2.3%	3	0.8%
<b>Combined</b>	<b>Passenger</b>	<b>673</b>	<b>97.5%</b>	<b>1065</b>	<b>98.6%</b>
	<b>Commercial</b>	<b>17</b>	<b>2.5%</b>	<b>15</b>	<b>1.4%</b>

### 18.1.4.3 Vehicle Speed

Traffic speed data was obtained at both tube counter locations on LLJR. The speed data was collected according to best practices – i.e. on level straight sections of LLJR and where most vehicles are driving at free flow speeds. Table 51 summarizes the speed data at the two count locations over the entire traffic count period. The traffic speed is measured in kilometres per hour.

**Table 51: Speed Classification Data of Lac Le Jeune Road**

Direction	Statistic	Tube Counter A	Tube Counter B
		Summary	Summary
Northbound	85th Percentile (km/h)	97	107
	Mean Speed (km/h)	84	94
Southbound	85th Percentile (km/h)	93	95
	Mean Speed (km/h)	81	84
Two-Way	85th Percentile (km/h)	95	102
	Mean Speed (km/h)	83	89
	% of Vehicles Exceeding Posted Speed Limit	59%	77%

The mean speed (defined as the statistical average of the data set) consistently exceeded the 80 kilometre per hour speed limit for both count locations and in both directions (59% of vehicles exceeded the posted speed limit at location A compared to 77% at location B). The mean speed ranges between 84 and 94 kilometres per hour for northbound traffic, and between 81 and 84 kilometres per hour for southbound traffic.

Mean and 85<sup>th</sup> percentile speed calculations inform decisions about posted speed limits, roadway design speeds, education and enforcement initiatives, and appropriate mitigation measures for road safety issues. For the purposes of this TIA, the outcome of this analysis:

- » informed recommendations about improvements to LLJR to address safety performance,
- » determined design features for AMAR because it is assumed the public behaviour will be the same on this road; and,
- » will inform the TMCP with regard to expectations of KAM employee driving behaviour.

The 85<sup>th</sup> percentile speed exceeds the mean speed by approximately 13 kilometres per hour. Most noticeably, the 85<sup>th</sup> percentile speed on the northbound direction at Tube Counter B was 107 kilometres per hour, likely due to the straight and downhill approach at the location of Tube Counter B.

## 18.2 Projected Change

The following table shows the forecast average daily traffic (ADT) volumes for 2016 on LLJR between Inks Lake Road and Sugarloaf Road, with and without the addition of mitigated Project traffic (*note: 2016 is the only year LLJR is used by Project traffic*):

**Table 52: 2016 Forecast Changes in Peak Hour Traffic Volumes**

Statistic	Base	2016 Mitigated Project Traffic	Base + Mitigated Project Traffic	% Change
AM Peak (7:30 – 8:30 AM)	49	68	117*	+139%
PM Peak (4:30 – 5:30 PM)	84	68	152*	+81%
Total Daily Traffic	805	136	941	+17%

\*Note: Typical capacity of an undivided rural 2 lane road for unimpeded operation is about 2,900 vph.

## 18.3 Impact Assessment

The Project will result in increased traffic volumes on LLJR during the six month period of the temporary access plan. Predicted traffic volumes will be within the operational capacity of the road. Impacts from the increased traffic and potential mitigation measures include:

- » Speed - exceeding the speed limit appears to be common on LLJR. KAM is committed to safe driving behaviour by its staff and contractors, and, in response to this matter KAM should

incorporate speed management principles in its Traffic Management and Control Plan. This will form part of its operational guidelines for Project staff and contractors. Speed of traffic on LLJR has also been taken into consideration in selection of the preferred form of intersection control between LLJR and the AMAR (see Section 17).

- » Sight Distances - Sight distance is inadequate at the Skeet Club Road intersection, and at the Mine Access Road culvert. To improve sight distance issues in the short term, it is recommended that KAM fund signs warning motorists of limited sight distance at both locations, in both directions. For the longer term, it is recommended that CoK change the road alignment to address the sight distance issue at Skeet Club Road as funding and priorities allow. The sight distance issues at the AMAR multi-plate culvert overpass may be addressed as part of proposed upgrades described in Section 18.1.
- » Intersection Configurations - Access between LLJR and the AMAR is not currently adequate for construction traffic, either in terms of geometry or safety. Permanent or improvement temporary access arrangements are recommended prior to the start of construction and are described in Section 18.1.3.
- » Pedestrian Safety and Connectivity - pedestrian facilities at the Copperhead Interchange were found to be out of date with current standards including signs, sidewalks, and crosswalks. Furthermore, pathways lacked connectivity. The inadequate facilities mean that pedestrians may be more vulnerable to unsafe conditions through reduced visibility and increased likelihood for taking risks (jaywalking, walking on road shoulders, etc.). These observed deficiencies require attention for existing conditions. However, the addition of predicted Project traffic is not expected to significantly alter the level of risk exposure and safety performance, and therefore mitigation is not required as part of the Project (Section 18.1).
- » Heavy Vehicle Traffic - geometrics at the Copperhead Interchange were inadequate for the size and amount of heavy vehicles using the interchange. Longer vehicles such as B-trains were observed to be unable to stay within the paved travel lanes on turning movements. These observed deficiencies require attention for existing conditions. However, the addition of predicted Project traffic is not expected to significantly alter the level of risk exposure and safety performance, and therefore mitigation is not required as part of the Project.
- » Collision Rate - The collision analysis indicates that inclement weather and winter driving conditions may increase collision risk. Also noted, there appears to be a correlation to traffic volumes with collisions appearing to increase during busier times of the day and days of the week. (Section 18.1). In response to this matter KAM should incorporate safe winter driving behaviour principles in its Traffic Management and Control Plan.

## 19 Lac Le Jeune Road Pavement Review

This chapter contains an evaluation of current network condition for existing road segments included in the Temporary Access Plan and a determination of the estimated effect that development related changes to traffic mix and volume may have on the maintenance cost and remaining pavement life of LLJR. The section of network included in this analysis consisted of LLJR between Copperhead Drive and Inks Lake Road, a total of 9km as shown in Figure 56 below.

Recommended mitigation measures to protect LLJR pavement life are presented at the end of this chapter.

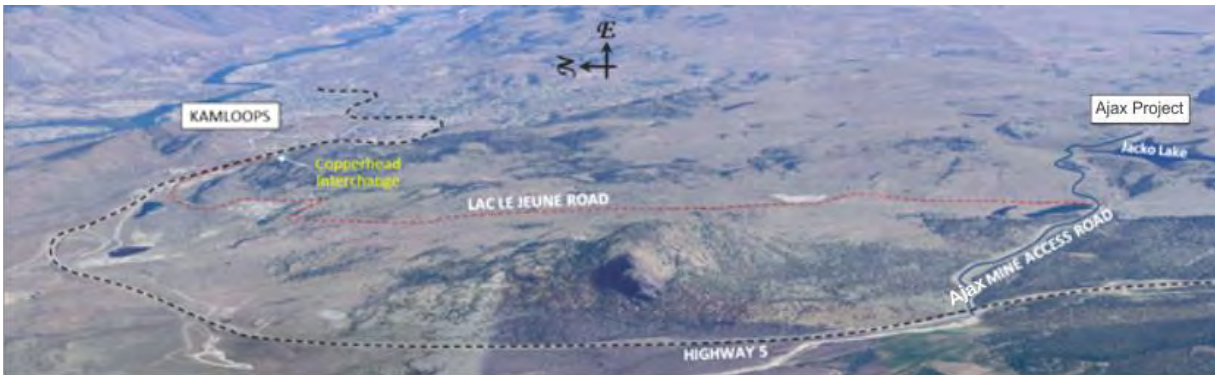


Figure 56: Pavement Survey Study Area - Lac la Jeune Road

The assessment was undertaken as follows:

- » **Site visit to evaluate the road’s laning geometry, condition of the hard surface, and subsurface conditions.** This was documented with video and notes;
- » Reviewed MoTI/CoK records to identify the maintenance classification & history;
- » Reviewed MoTI/CoK records to determine the forward works program for the road section;
- » Using recognized methodology, establish how much degradation in life span the six months of **use by vehicles will cause on the CoK’s portion of the road; and,**
- » Recommend mitigation measures.

Condition survey of the pavement surface was carried out using the rating methodology specified in the “*Ministry’s Pavement Surface Condition Rating Manual*” (Fourth edition, April 2012).

#### **19.1.1.1 Surface Condition Assessment**

The surface condition assessment is a detailed visual survey carried out using standardized rating criteria. The survey identifies the severity and density of all surface defects per survey segment. For this survey, each segment is 100m in length and covers the roadway in both directions. The scope of the pavement condition assessment was the first 9 kilometres of road from Copperhead Drive.

#### **19.1.1.2 Pavement Distress Index (PDI)**

The British Columbia Ministry of Transportation and Infrastructure has implemented a multifaceted pavement asset management program. It is built around the Roadway Pavement Management System (RPMS) application and supported by data collection procedures and asset management policies. Pavement surface condition data is a key component of the MoTI infrastructure asset management program. The Pavement Distress Index (PDI) is a composite index made up of criteria to assess pavement surface defects that are converted into a single composite statistic using a mathematical model.

The following metrics were assessed as input to the index rating.

- Transverse cracking;
- Edge cracking;
- Alligator cracking;
- Bleeding;
- Rutting, and;
- Longitudinal cracking;
- Block cracking;
- Ravelling;
- Potholes;
- Distortion.

The PDI model incorporates the severity and density ratings for each of the 10 distress types listed above and converts the data to a single rating based on a declining condition scale from 10 to 0 (10 being excellent condition and 0 having failed). The score is determined by calculating ‘deduct values’ for each distress type that is present. Starting at a perfect score of 10, deductions are made for each distress type. (*Note: ravelling, rutting, bleeding, and distortion were not recorded as part of this survey*).

Each distress type is also weighted, recognizing the type of deterioration and remedial action required. For example alligator cracking is heavily weighted since it represents a structural and safety problem with the pavement.

### 19.1.1.3 Condition States

The PDI is used to classify the pavement into five condition states. The condition states applicable to LLJR, defined as a rural arterial side road, are shown in Table 53:

**Table 53: PDI Condition States for Ministry Side Roads**

Condition States (PDI)				
Very Good	Good	Fair	Poor	Very Poor
10 to 7	7 to 6	6 to 5	5 to 3	3 to 0

## 19.2 Existing Conditions

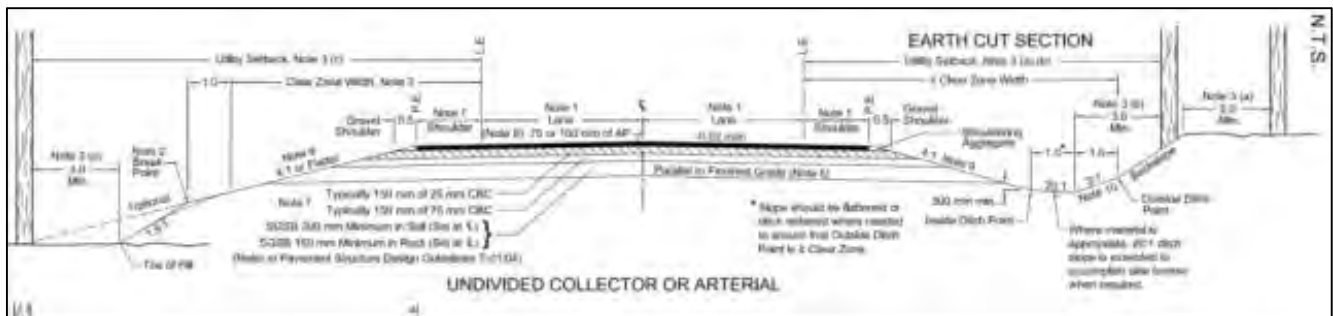
### 19.2.1 Road Inventory

LLJR is a rural arterial road that links from Copperhead Drive in Kamloops to Highway 5 at junction 336 (Wallop Interchange), and serves mostly commercial businesses near Kamloops and ranch land outside the urban area. Other traffic that would typically use the road would be for recreational access to Jacko Lake, Lac Le Jeune Lake, and the McConnell Lake and Wallop Lake Provincial Parks. This recreational use is reflected in the weekend daily traffic volumes which are typically 60% higher than average weekday traffic volume.

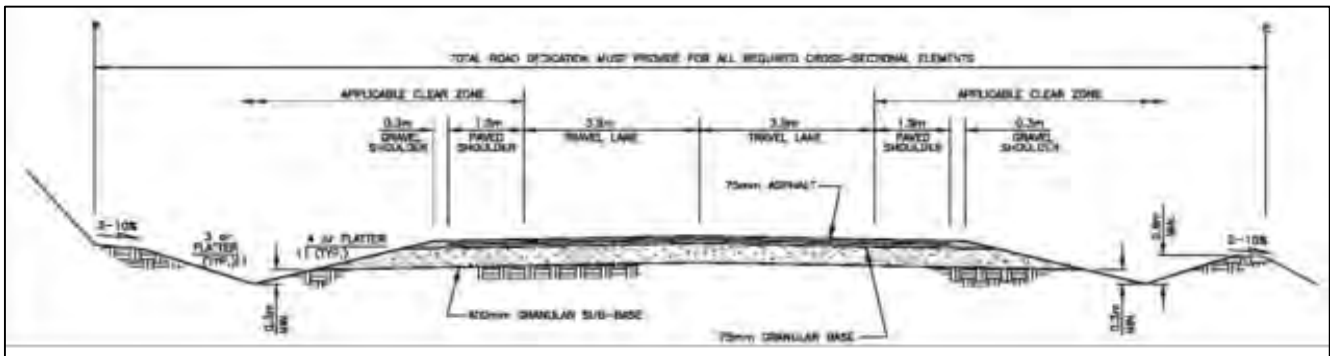
The design standards of LLJR within the study area are currently below both the MoTI and CoK desirable Levels of Service. Figure 57 and Figure 58 present current CoK and MoTI design standards. The existing Lac Le Jeune Road cross section varies between 7m to 7.6m, with the average sealed running surface being 7.5m. The gravel shoulder width varies between 1.2m to 2.6m.

**Table 54: LLJR Design Standards**

Parameter	Design Standard	LLJR As Built Value	Variance
Road Width	7.2 m	7-7.6 m	-0.2m to +0.4m
Shoulder Width	1.5m (paved)	1.2 – 2.6 m (gravel)	Surface Type



**Figure 57: BC Ministry of Transport and Infrastructure Rural Collector Road Cross Section**



**Figure 58: City of Kamloops Rural Collector Road Cross Section**

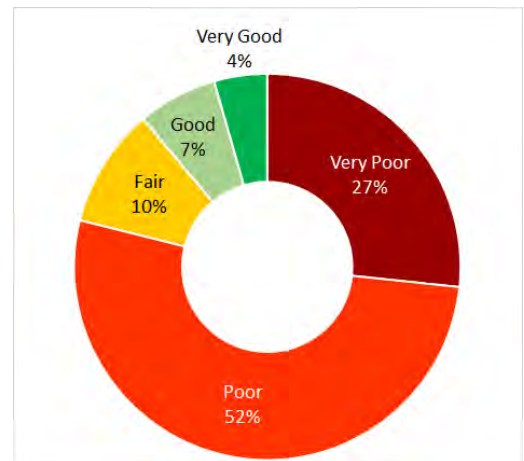
Construction records were requested from CoK but are not available. From a visual inspection by Opus, the existing road appears to have a flexible granular structural pavement with a thin asphaltic concrete running surface of 70mm to 90mm. The road has well-formed gravel shoulders and good side drains. The structural pavement shows regular slab cracking, both longitudinal and transverse, indicating a possible cement of lime granular stabilised pavement structure. The road surface exhibits frequent cracking, potholing, and pavement patch repairs but shows limited rutting, shoving, and shoulder failures, which could indicate relatively good structural strength. It should be noted that no ground truthing has been undertaken and these observations and conclusions were formed from a pavement walkover.

**19.2.2 Pavement Condition**

A detailed two-day pavement condition survey was undertaken by Insight Roadway Analysis Ltd on Tuesday, April 7<sup>th</sup> and Wednesday, April 8<sup>th</sup> of 2015. Weather conditions during the survey were dry.

The results show a range of values from 7.5 (very good) to 0 (failed), but that the majority of the pavement surface is in poor and very poor condition, as illustrated in Figure 59 (full survey results are shown in Appendix E).

The detailed results show that the major causal factors for the low overall pavement condition is high severity and high density cracking, predominantly transverse<sup>3</sup>, alligator<sup>4</sup>, and longitudinal<sup>5</sup> wheel path cracking.



**Figure 59: Lac Le Jeune Road Condition Distribution**

<sup>3</sup> **Transverse cracking** is represented by single or multiple cracks that travel across the roadway from edge to edge. They are typically caused by either shrinkage in the asphalt due to cold temperatures or hardening of the binder, or by cracks reflecting through the surface layer from below.

<sup>4</sup> **Alligator cracking** is represented as a series of interconnected cracks caused by fatigue failure of the asphalt surface under repeated traffic loading. The failure mechanism is based from heavy loading. The cracking initiates at the bottom of the asphalt layer where the tensile stress is the highest, then propagates to the surface as one or more longitudinal cracks. After repeated loading, the longitudinal cracks connect forming many-sided sharp-angled pieces that develop into a pattern resembling the back of an alligator or crocodile.

<sup>5</sup> **Longitudinal wheel path cracking** is represented by single or multiple cracks that occur purely within the wheel paths of each lane. Wheel path cracking is caused in the same way that alligator cracking is formed. There have been examples of top down cracking occurring in thicker pavements. Cracking in this case would be attributed to loading, surface age, and climatic conditions.

Figure 60 presents the condition profile of LLJR along the entire survey length:

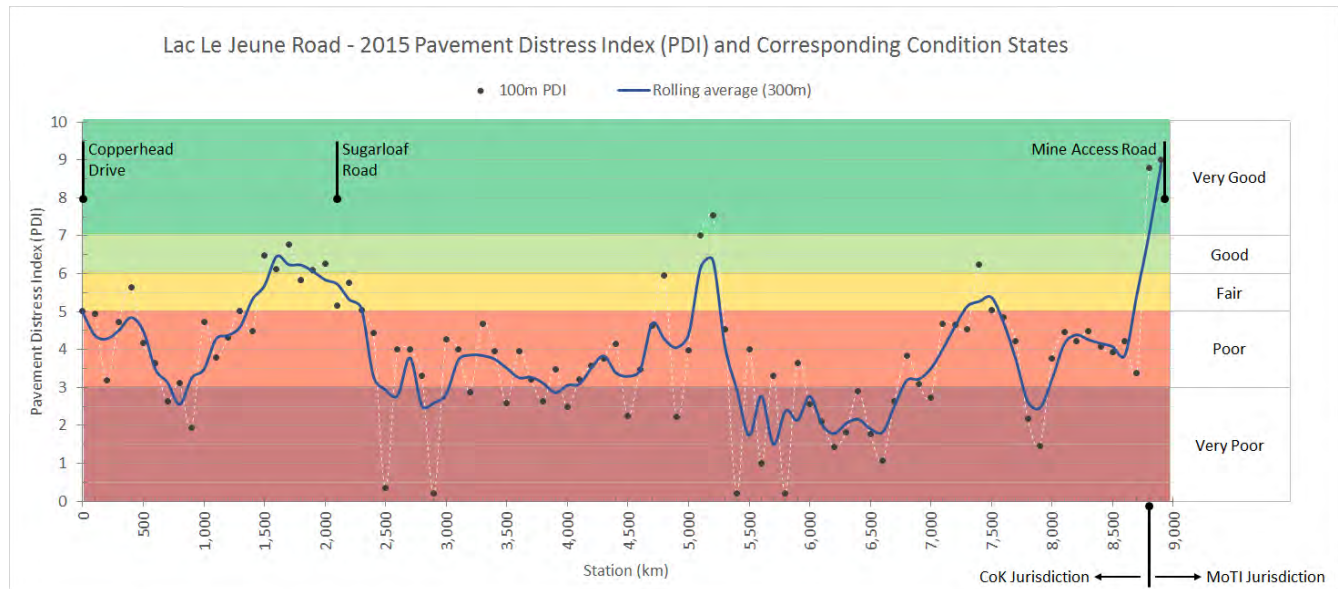


Figure 60: Lac Le Jeune Road Condition Profile

### 19.2.3 Current Treatment Need

#### 19.2.3.1 Rehabilitation Treatment Types

Condition state can be related to typical treatment types that would be used for the purposes of planning rehabilitation works. The correlation between condition state and treatment shown in the following table were developed by Opus as part of a previous pavement rehabilitation funding needs analysis with MoTI, “Funding Needs Analysis Report” (2008).

Table 55: Treatment Types against Condition States

Condition	V. Good	Good	Fair	Poor	Very Poor
PDI Value	10 to 7	7 to 6	6 to 5	5 to 3	3 to 0
Treatment	None	Routine	Minor Rehab	Major Rehab	Reconstruction
Treatment Description	N/A	Crack sealing, chip seals, and small patching	Resurfacing (full lane width), minimal base repair, typically a 50mm mill and fill treatment.	Resurfacing (full lane width), base repairs, typically a 50mm mill and fill with a 50mm overlay.	Full base and surface replacement

The corresponding recommended treatment plan for LLJR is shown approximately in Figure 61:



**Figure 61: Lac Le Jeune Road Recommended Treatment Plan**

Based upon the quantum of road in each condition state, and corresponding treatment costs, a calculation of the total cost to rehabilitate the road to current standards have been calculated, and are shown in Table 56 below. Treatment costs are taken from the Ministry’s *Construction and Rehabilitation Cost Guide* (November 2013), and are based on a unit rate per lane kilometre.

**Table 56: Current Deferred Treatment Costs**

Condition	Treatment Description	Unit Rate (Lane km)	Length (Lane Km)	Cost
<b>Very Poor</b>	Reconstruction	\$270,700	4.8	\$1,299,360
<b>Poor</b>	Mill/Fill and Overlay	\$150,000	9.4	\$1,410,000
<b>Fair</b>	Mill/Fill 50mm	\$120,700	1.8	\$217,260
<b>Good</b>	Chip Seal	\$23,700	1.2	\$28,440
<b>Very Good</b>	N/A	\$-	0.8	\$-
<b>Total</b>			<b>18.0</b>	<b>\$2,955,060</b>

The road is scheduled for **rehabilitation in City’s** forward works program in 2018/19.

## 19.3 Projected Change

### 19.3.1 Traffic Volumes

Proposed phasing and mine construction traffic volumes are discussed elsewhere in this TIA (refer to Chapters 3, 13 and 14) and it should be noted that all construction materials and heavy equipment will travel along Lac Le Jeune Road from junction 336 of Highway 5, Walloper Way Interchange to the mine access point, under the Temporary Access Plan. The southerly section of LLJR from the mine access point to Walloper Way Interchange has not been studied because it is under the jurisdiction of MoTI, and its design and construction were believed to be adequate for the anticipated volumes, size, and weight of Project traffic.

The forecast average daily traffic (ADT) volumes for 2016 on Lac Le Jeune Road between Inks Lake Road and Sugarloaf Road are as follows (Table 57) (*2012 summer tube count data with 2.8% annual growth rate applied*):

**Table 57: 2016 Forecast Average Daily Traffic Volumes**

	ADT	# Private Vehicles	# Buses	# Heavy Vehicles
Northbound	459	447	0	12
Southbound	231	226	0	5
Total	690	673 (97%)	0 (0%)	17 (3%)

The estimated traffic volumes using the mitigated 2016 trip generation scenario (refer to Section 15.4) are shown in Table 58.

**Table 58: Estimated Average Traffic Volumes**

	ADT	# Private Vehicles	# Buses	# Heavy Vehicles
Northbound	542	503	24	15
Southbound	314	282	24	8
Total	856	785 (91%)	48 (6%)	23 (3%)

These figures represent 25% increase in ADT for the 6 month period of the temporary access plan.

## 19.4 Impact Assessment

Maintenance impacts due to change of use on a road can arise from both a change in volume (the number of vehicles using the road) and a change in load (the mass of vehicles using the road).

### 19.4.1 Effect of Traffic Volumes on LLJR

Increases in traffic volume tends to impact operational costs for a road through causes such as increased:

- 1) shoulder maintenance due to vehicle over-run if the road is not wide enough
- 2) sign, railing and fence repairs due to vehicle strikes if the road is not wide enough
- 3) wear on road markings
- 4) litter collection and cleaning up after spills

Despite the existing road cross section being below current standards, the current lane width (3.5m) and shoulder provision (1.2m) is considered sufficient to accommodate the temporary increase in traffic without significantly increasing the risk of shoulder running and edge break. It should be noted that the

estimated increase in traffic will be strongly tidal and therefore not significantly increase opposing traffic conflict. Additional maintenance due to volume increase on LLJR is therefore not expected to be significant.

### 19.4.2 Effect of Traffic Loading on LLJR

Increased traffic loading tends to impact maintenance and renewal costs for a road through causes such as increased:

- 1) Short term damage from wear and tear on the pavement surface (potholes etc.). This effect is typically seen in increased reactive maintenance costs over the period that the additional traffic is using the road.
- 2) Reduced pavement life and increased long term renewal costs due to permanent damage to the road structure.

Estimated traffic volumes have been used to calculate additional loading on the pavement as a result of mine construction traffic during operation of the temporary access plan. Additional load has been calculated using the standard methodology in the current AASHTO *Guide for Design of Pavement Structures* (American Association of State Highway and Transportation Officials, 1993), results are shown in Table 59.

**Table 59: Estimated Traffic Loading Impact**

SCENARIO		Loading (ESALs <sup>6</sup> )	
		Temp. Access Plan Duration [per month]	Pavement Lifetime [30yrs <sup>7</sup> ]
<b>Base</b>	Northbound	940	339,000
	Southbound	390	141,600
	<b>Total</b>	<b>1,340</b>	<b>480,600</b>
<b>Construction</b>	Northbound	520	520
	Southbound	520	520
	<b>Total</b>	<b>1,040</b>	<b>1,040</b>
Mine Construction Traffic Impact		+78%	+0.22%

CoK has deferred maintenance on LLJR and rehabilitation is programmed for 2018/19. It is clear from the review that maintenance of LLJR has been minimal over the lifespan of the current pavement surface. Given the poor condition of the road surface, pavement strength testing using falling weight deflectometers is not considered necessary to make a fair assessment of either the level of service or financial impact from the Project construction traffic.

Based on the above:

- 1) Increased short term damage from wear and tear on the pavement surface is expected to be the equivalent of about 80% of current short term maintenance cost levels; and
- 2) Increased long term renewal costs due to reduced life of the pavement are expected to be about 0.22% of the equivalent full length pavement rehabilitation cost per month of use at the planned levels.

<sup>6</sup> The 1993 AASHTO Guide for Design of Pavement Structures states that "the damage effect of the passage of an axle of any mass (commonly called load) can be represented by a number of 18-kip equivalent single axle loads or ESAL's."

<sup>7</sup> The road has been in CoK's jurisdiction since 1988, making the pavement at least 30 years old in the planned rehabilitation year.

### 19.4.3 Cost of Impact

#### 19.4.3.1 Short Term Maintenance Costs – Safe and serviceable

CoK has not provided current road maintenance costs for LLJR. Given the current poor condition of the pavement, a reasonable estimate of maintenance is considered to be equivalent patching and crack-sealing of 5% per annum to keep the road safe and serviceable. Five percent per year is typically the amount of road network that needs immediate repair on an annual basis in any given network.

Pavement failures will be treated reactively; this includes pot hole and patching repairs which are used after failures occur. Extensive resurfacing before the Project begins is not under consideration either by KAM or by CoK. Because repairs will be carried out reactively as and when required, the treatment costs required to maintain the road to its current level of condition are difficult to calculate. The worst case would be that use of LLJR for Project construction traffic takes place between fall and spring when the ground is at its wettest and the road is subject to freeze-thaw action. Subgrade is not assumed to remain permanently frozen through the winter at this location. Subgrade strength conditions can vary significantly throughout the year. Spring and winter conditions can be as much as 50% weaker as compared with summer conditions. It is possible therefore that use during this time could double the expected maintenance impact (i.e. 80% of the typical 12 month cost).

Shown in Table 60 are estimated maintenance costs based on reactive patching on 5% of the roadway.

**Table 60: Estimated Maintenance Cost Impact**

Treatment	Unit Rate (Lane km)	Length (Lane Km)	Estimated Annual Mtee (% of Length)	Annual Cost (est.)	Maintenance Cost Impact (monthly estimate) [80% x Annual cost / 12]
Patching	\$58,000	18.0	5%	\$52,200	\$3,500

**Note:** Treatment costs for pavement patching have been sourced from Ministry’s “Construction & Rehabilitation Cost Guide”, (November 2013), and are based on a lane kilometre.

The estimated maintenance cost impact shown above is a rate per six months of use and would continue (prorated) until implementation of the permanent access plan.

#### 19.4.3.2 Long Term Rehabilitation Treatment Costs

The road has been in CoK’s jurisdiction since 1988, making the pavement at least 30 years old by the planned rehabilitation year. The only treatments that have occurred on this road are small patching and annual crack sealing works to keep it safe and serviceable. The road will be subject to some rehabilitation work by CoK in 2018/2019, the reasonable scope of which is quantified at \$2,995,060 in Table 56. The short term use of the road by mine construction traffic is not expected to significantly affect the scope or cost of this work.

From the traffic volumes listed above, the equivalent pavement consumption from the additional vehicles per month the road is used is \$6,500 (0.22% of the rehabilitation cost). This is considered an appropriate risk allowance for additional rehabilitation scope arising from short term use of the road by mine construction traffic.

#### 19.4.3.3 Fair Value of Impact

The fair value of impact on the maintenance of LLJR as a result of the mine traffic is the sum of:

- 1) Increases in Operational Costs due to added volume (\$0 per month of use)

- 2) Increases in Short-Term Maintenance Costs due to increased loading (\$3,500 per month of use)
- 3) Increases in Long-Term Rehabilitation Costs due to increased loading (\$6,500 per month of use)

Assuming that the Temporary Access Plan is in place for 6 months, the fair value of impact on the maintenance of LLJR as a result of the mine traffic is therefore assessed at \$60,000.

## **19.5 Mitigation of Residual Effect**

The existing LLJR within the study area is currently below both the MoTI and CoK desirable Level of Service design standards for this classification of road. The current condition of the road is also poor with approximately \$3 million in deferred maintenance.

Although Project traffic will not significantly impact the remaining useful life of the pavement or future rehabilitation cost, it has been shown that short term use of the road by the Project construction traffic is expected to increase reactive maintenance during the period of use. Therefore some road improvements or upgrades are warranted in proportion to the temporary safety and traffic loading impacts of the trips created by the Project traffic.

Based on the current condition of the pavement and traffic volumes that are expected to travel on Lac Le Jeune Road during construction phase, it is recommended that KAM are responsible for a risk amount for increased rehabilitation cost equal to equivalent increase in traffic loading over the life of the pavement. The total assessment of the above is \$60,000 as a one-time cost.

This funding could be used by the CoK for reactive maintenance during the use of LLJR under the Temporary Access Plan. To reduce reactive maintenance, CoK may wish to apply treatments immediately prior to the start of the Project. Given the starting condition of the road, allocating some of the anticipated maintenance costs towards early activities such as crack sealing, and, ensuring free and unobstructed side drains and culverts, could significantly reduce the risk of surface failures.

It is also recommended that the CoK consider advancing the planned rehabilitation treatment from 2018/19 to 2017/18, immediately following use by Project construction traffic. Earlier rehabilitation will minimize ongoing safety risk posed by the current poor condition of the pavement and reduce safety risk that would be increased by Project traffic impacts on the pavement conditions.

## 20 Road Conditions Summary & Recommendations

### 20.1 Road Safety Summary

The conclusions of the in-service reviews of the roads within the study area indicate the following issues at three specific locations:

- » Copperhead Interchange: pedestrian facilities were found to be out of date with current standards including signs, sidewalks, and crosswalks. Pathways lacked connectivity. Longer vehicles such as B-trains were observed to be unable to stay within the paved travel lanes on turning movements resulting in increased pedestrian/ vehicle collision risk. These observed deficiencies require attention but the addition of Project generated traffic is not expected to significantly alter the level of risk exposure and safety performance, and therefore Project specific mitigation measures or interventions are not warranted.
- » Lac Le Jeune Road: tube count data indicates that speeding may be prevalent on this road. Sight distance is inadequate at the Skeet Club Road intersection, and at the AMAR culvert. KAM traffic will increase usage on this road for six months during the construction of the Inks Lake Interchange. To address the sight distance issues in the short term, it is recommended that KAM provide signs warning motorists of limited sight distance at both locations, in both directions. For the longer term, it is recommended that CoK change the road alignment to address the sight distance issue at Skeet Club Road as funding and priorities permit. The sight distance issues at the AMAR multi-plate culvert overpass may be addressed as part of the Project works; thus, no recommendations are provided here.
- » Access between LLJR and the AMAR is not currently adequate for construction traffic, either in terms of geometry or safety. Permanent or improvement temporary access arrangements need to be in place prior to the start of mine construction.

The collision analysis indicated that inclement weather and winter driving conditions may be contributing to collision propensity. Also noted, there appears to be a correlation to traffic volumes with collisions appearing to increase during busier times of the day and days of the week.

Thus, as traffic volumes increase, it is likely that collision numbers will increase as a result of Project traffic. The premise of the recommended mitigation with respect to safety impact is to implement interventions, as necessary based on experienced engineering judgement, to ensure that the crash rate for the roads does not increase as a result of the Project. Such recommendations include signage and sight distance improvements (see above). The Project will also include road improvements at Inks Lake interchange and the LLJR/AMAR intersection and the new road AMAR and Inks lake Interchange will be designed and constructed to the most current standards. It is therefore reasonable to conclude that the residual effect of the Project will similar to or reduced collision rates on the existing roads, and, average or normal safety performance on AMAR and Inks lake Interchange.

### 20.2 Maintenance Conditions Summary

The current condition of LLJR is poor with approximately \$3M in deferred maintenance. Short term use of the road by mine construction traffic is expected to increase reactive maintenance cost during the period of use but will not significantly impact the remaining useful life of the pavement or future rehabilitation cost.

## 20.3 Recommendations

It is recommended that current issues with the layout and design of the Copperhead Interchange be examined by MoTI and revisions implemented as time and budgets allow.

Safety is a primary concern for KAM, and the TMP and the TMCP will incorporate policies, procedures, and expectations for safe driving behaviour, especially where sight distance may be less than optimal, where tendency for speeding is high, and when winter conditions may increase driving risk.

To address the sight distance issues in the short term, it is recommended that KAM provide funding for signs warning motorists of limited sight distance at both locations, in both directions. For the longer term, it is recommended that CoK change the road alignment to address the sight distance issue at Skeet Club Road as funding and priorities permit. The sight distance issues at Mine Access Road culvert will be addressed as part of the Project works; thus, no recommendations are provided here.

The existing LLJR within the study area is currently below both the MoTI and City of Kamloops desirable Level of Service design standards for this classification of Road. The current condition of the road is also poor with approximately \$3M in deferred maintenance. Road safety improvements and pavement rehabilitation are required.

However, this is an existing road and its current level of service is due in part to deferred maintenance. The MoTI and CoK standards apply to new road construction for new development but not existing roads. Therefore any road improvements or upgrades need to be in proportion to the temporary safety and traffic impacts of the trips created by Project construction.

It is therefore the recommendation of this report that a separate agreement is formed and created between the road controlling authorities and KAM specifically detailing the level of maintenance compensation and road safety upgrades. It is recommended that:

1. KAM offer CoK a one-time compensation \$60,000:
  - a. This funding be used by CoK to complete maintenance activities just prior to Project construction which will limit degradation of the pavement. Early maintenance activities includes such items as crack sealing, and, ensuring free and unobstructed side drains and culverts; and/or,
  - b. CoK use the funds to complete reactive maintenance **during KAM's use of LLJR** under the Temporary Access Plan.
  - c. CoK put the balance of the funds towards rehabilitation of the road after implementation of the Primary Access Plan.
2. KAM complete sign and delineation upgrades at the Skeet Club Road intersection; and,
3. KAM complete construction of improved access arrangements at the AMAR/ LLJR intersection prior to commencement of mine construction.

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# **Appendix A**

## **Terms of Reference**



# Terms of Reference

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## KGHM Ajax Mine TIA

DRAFT, Confidential

Opus International Consultants (Canada) Limited  
Kelowna Office  
Suite 206, 2365 Gordon Drive  
Kelowna BC V1W 3C2  
Canada

Telephone: +1 250 868 4925  
Facsimile: +1 250 868 4923

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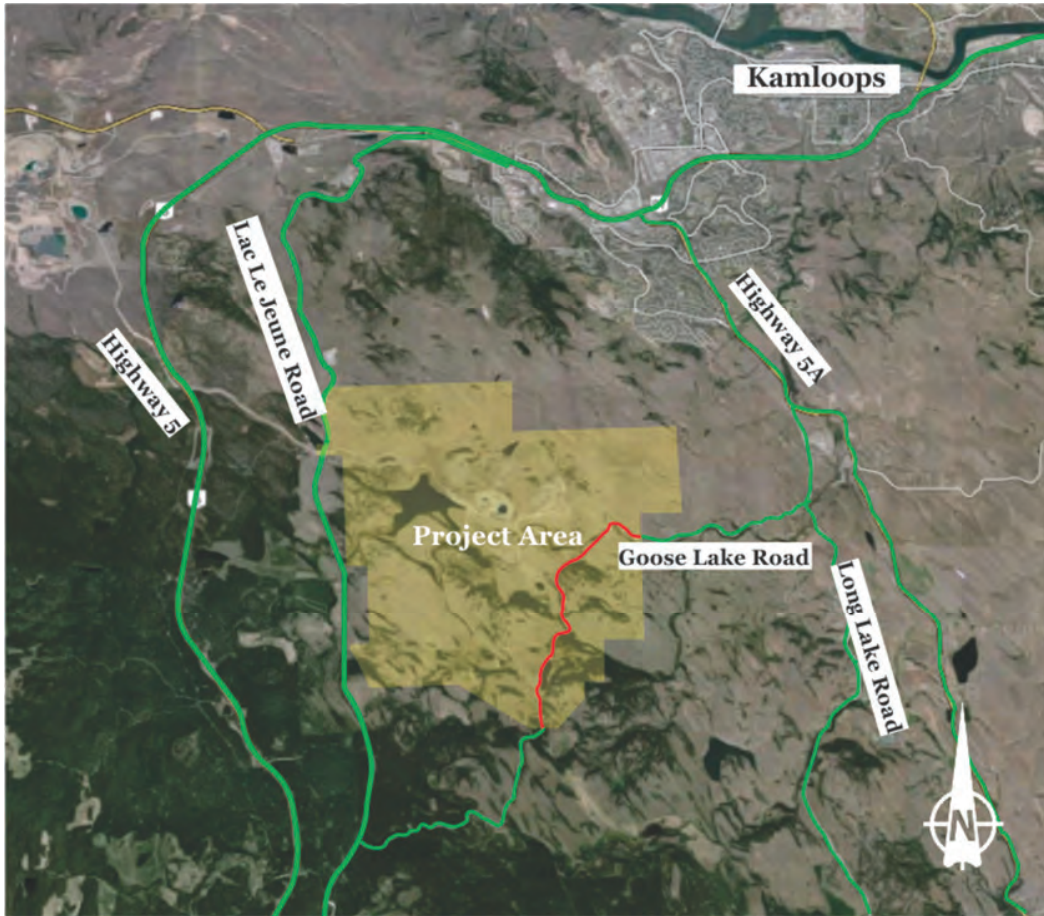
## List of Acronyms

The acronyms used in this document and their unabbreviated titles are listed alphabetically in the table below:

Acronym	Unabbreviated Title
AIR/EISG	Application Information Requirements/Environmental Impact Statement Guidelines
AM	Morning
BC	British Columbia
BCEAA	British Columbia's Environmental Assessment Act
CoK	City of Kamloops
EA	Environmental Assessment
EAO	Environmental Assessment Office
EB	Eastbound
EIS	Environmental Impact Statement
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
Hwy	Highway
ITE	Institute of Transportation Engineers
KAM	KGHM Ajax Mining Inc.
LoS	Level(s) of Service
m	Metres
MoTI	BC Ministry of Transportation and Infrastructure
MRSF	Mine rock storage facilities
NHS	National Household Survey
OD	Origin-destination
PM	Evening
SW	Southwest
TAC	Transportation Association of Canada
TDM	Transportation Demand Management
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan
TNRD	Thompson-Nicola Regional District
ToR	Terms of Reference
TSF	Tailings Storage Facility
v/c	Volume-to-capacity
VC	Valued Component(s)
WB	Westbound

# Executive Summary

KGHM Ajax Mining Inc. has proposed an open pit copper-gold mine at the historic Afton Mining Camp, south of Kamloops in the Thompson-Nicola Regional District, British Columbia. As part of the Environment Assessment requirements, the impacts of the anticipated traffic volumes must be estimated in a Traffic Impact Assessment. The general project area is shown below:



These Terms of Reference outline how the Traffic Impact Assessment will be carried out, including data collection, assumptions, methodology, conceptual road designs, safety analysis, and mitigation measures, and it describes the layout of the final report. These Terms outline every step of the process so that others, most specifically, the City of Kamloops and the BC Ministry of Transportation and Infrastructure may provide input to the process. In this way, it is planned that the concerns of BC authorities may be fully addressed, and by extension those of the stakeholders the authorities represent.

There are nine components to these Terms of Reference: background information; study parameters; construction phase conditions; operations phase conditions; mitigation strategies; project access conceptual designs; Goose Lake Road closure impacts; road safety and conditions review; and, study references.



# 1 Background Information

Opus International Consultants (Canada) Limited (Opus) has been retained by KGHM Ajax Mining Inc. (KAM) to conduct a transportation impact assessment (TIA) study of the proposed Ajax Mine (the Project), an open pit copper-gold mine at the historic Afton Mining Camp, south of the City of Kamloops (CoK), British Columbia (BC). The Project is located in the South-Central Interior of BC, southeast of the junction of the Trans-Canada Highway (Highway 1) and the Coquihalla Highway (Highway 5), within the Thompson-Nicola Regional District (TNRD). Key Project facilities include the Open Pit; four mine rock storage facilities (MRSFs); Process Plant, Tailings Storage Facility (TSF), water management ponds; and the Peterson Creek diversion. Figure 1 depicts the proposed layout and general arrangement of Project facilities. Several facilities that will be part of the operation phase but will not remain after Project closure include the:

- » Plant facilities and administration buildings;
- » Reclamation stockpiles;
- » Explosives facility;
- » Truck stop and fuel storage; and,
- » Power lines.

The mine plan for the Project predicts an operation based on a mill throughput of 65,000 tonnes of ore per day from the Ajax Pit with up to a 23 year mine life. The construction phase of the Project will be approximately two and a half years, and following the 23 year operation, the decommissioning and closure phase is expected to take up to 5 years.

Access to the Project will be provided primarily via the upgrade of existing roads supplemented by the construction of new roads and access points. The decommissioning of Goose Lake Road (public road) is proposed to accommodate the proposed location of the TSF.

This document summarizes the Terms of Reference (ToR) for the TIA.

## 1.1 Objectives

The TIA will provide input to the Environmental Assessment (EA) for the Project as defined by the information requirements set out in the Project's Application Information Requirements (AIR)/Environmental Impact Statement (EIS) Guidelines (Rev 1.b, October 9, 2014).

In BC, proposed major projects are required to obtain an Environmental Assessment Certificate (Certificate) in accordance with BC's Environmental Assessment Act (BCEAA). An Application for a Certificate (the Application) must be made by the Project Proponent to the Environmental Assessment Office (EAO), and the Application must comply with all the information requirements set out in the Application Information Requirements (AIR) formally approved and issued by the EAO. The AIR specifies the information that will be needed to conduct a provincial EA and that will be provided by KAM, in their Application for a Certificate.

The TIA will meet the requirements of the AIR by: identifying potential effects the Project generated traffic and network changes could have on identified Valued Components (VC); providing recommended

mitigation measures; and, evaluation of residual effects that may persist after the application of mitigation measures.

This ToR outlines the context for the assessment and underlying assumptions that will be used in the analysis. It includes a description of the local and regional spatial and temporal contexts relative to the VCs. The spatial extent of the regional and local study areas is shown in Figure 2, and the periods of time that will be examined, the study horizon years, are presented in Section 2.4. Table 1 outlines information the TIA will include to assess the Project related potential effects, mitigation measures, residual effects, and cumulative effects.

**Table 1: TIA Information Requirements from AIR**

Potential Effects	Means of Addressing in the TIA
Potential Effects to Infrastructure, Public Facilities and Services	Identify and analyze potential adverse effects resulting from the Project. For: <ul style="list-style-type: none"> <li>» Traffic capacity and congestion at selected study intersections resulting from trips to/from the Project.</li> <li>» Reduced road safety resulting from increased traffic volumes.</li> <li>» Impacts on properties, transportation modes, and connectivity resulting from road closures such as the Goose Lake Road closure.</li> <li>» Increased maintenance requirements due to heavy vehicles on vulnerable sections of the existing network such as Lac Le Jeune Road.</li> <li>» Reduced connectivity to/from existing road maintenance facilities and recreational areas</li> </ul>
Mitigation Measures	Mitigation measures KAM will implement to mitigate potential effects include: <ul style="list-style-type: none"> <li>» Implementation of Transportation Demand Management (TDM) strategies to ensure busing during construction and to encourage carpooling to reduce congestion.</li> <li>» Staggering worker shift start and end times to reduce volumes at peak hours.</li> <li>» Contractual requirements for contractors and employees to use specific pre-determined access routes to travel to/from the Project.</li> <li>» Road safety improvement recommendations (e.g. signage, barriers, pavement markings, geometrics).</li> <li>» Construction of new accesses to ensure safe access for Project related vehicles.</li> <li>» Improving existing network connectivity via new roads and intersections that are related to Project impacts.</li> </ul>
Residual Effects	Residual effects are those that may occur with consideration of mitigation measures. For example: <ul style="list-style-type: none"> <li>» Traffic congestion effects remain despite mitigation measures.</li> <li>» Reduced road safety due to increased volumes despite mitigation measures.</li> <li>» Increased time required for MoTI and recreational users to access the road maintenance facility and recreational areas, respectively, after implementation of mitigation measures.</li> </ul>
Cumulative Effects	Identification and description of existing or reasonably foreseeable projects or activities that have the potential to interact with the Project. Evaluate how residual effects of the Project could combine and interact with effects from other past, present, and future known projects to produce adverse cumulative effects. Cumulative effects analysis for traffic related effects include:



Potential Effects	Means of Addressing in the TIA
	<ul style="list-style-type: none"> <li>» Interactions with other development traffic at study intersections (e.g. base versus total conditions).</li> <li>» Interactions with properties and transportation modes on Goose Lake Road affected by the road closure.</li> </ul>

The information requirements addressed in the TIA are specific and detailed for the transportation planning and engineering discipline. However, specific effects assessments for additional VCs will use results from the TIA for the assessment of potential socio-economic effects.

This ToR exceeds the information requirements stipulated in the AIR to ensure that a thorough and robust assessment of potential traffic impacts is available for all stakeholders so that concerns are addressed early during Project planning. These elements include, amongst others, conceptual design arrangements and detailed analysis to support permitting requirements for new and/or improved intersections and roads.

## 1.2 Traffic Impact Assessment Basis

The base case and Project activity assumptions used as input to the TIA are described in detail in this ToR. A summary of these assumptions that is considered the assessment basis is provided in Table 2 below.

**Table 2: Summary of Project Activity Assumptions**

Assessment Input	Assumption	Comments
Construction Total Phase	Quarter 4, 2016 to Quarter 2, 2019	
Construction Peak	Quarter 4, 2017 to Quarter 3, 2018	
Operations Start	Quarter 2, 2019	
Mine Life	23 years	
Closure Duration	2 years	Start approximately 2042
Reclamation	5 years	
Temporary Access Plan	Quarter 3, 2016 to Quarter 1, 2017	
Primary Access Plan	Quarter 2, 2017 onward	
Horizon Years for Impact Assessment	2016 & 2018, Peak Construction Horizon 2024 & 2039, Operations Horizon	Operations Horizon years in line with MoTI access study
Vehicle Length: Passenger Vehicles Heavy Vehicles	7.5 meters (passenger) 25 meters for concentrate and typical operational traffic 40 meters for construction heavy equipment	

Assessment Input	Assumption	Comments
Total People On Site per day: Construction Start (2016) Construction Ramp-Up Construction Peak (2018) Construction Ramp Down Construction Complete Operations Start (2024 & 2039)	400 1200 1800 1200 800 580	
Heavy Vehicle* Loads per quarter: Construction Start (2016) Construction Ramp-Up Construction Peak (2018) Construction Ramp-Down Construction Complete Operations Start ** (2024 & 2039)	200 400 400 300 150 2100 per quarter	
Shifts: Construction Operations (Mine) Operations (Process) Operations (Maintenance) Operations (Non-Shift)	12 hrs/day, 7 days/week 12 hrs/day, 7 days/week 12 hrs/day, 7 days/week 12 hrs/day, 7 days/week 8:00 am - 6:00 pm, Mon - Fri	Staggered ½ hr, 6 – 8 am/pm Start 7:00 am/pm Start 7:00 am/pm Start 6:00 am/pm
Travel Options: Construction Workers Construction Staff Operations (Shift Workers) Operations (Staff)	Busing and Carpool/Passenger Car Carpool/Passenger Car Carpool/Passenger Car Carpool/Passenger Car	
Trip Distribution: Collection Boundary West Collection Boundary East Collection Boundary North Collection Boundary South	Tobiano Barnhartvale Heffley Creek Merritt	
On-site Camp Facilities	N/A	

\* Heavy vehicles are defined as vehicles larger than passenger vehicles that do not require overload or over length/width permits.

\*\* The expected truck traffic during operations includes the following:

- » Diesel and gasoline delivery;
- » Reagent delivery;
- » General freight;
- » Other haulage (waste, sewage, sludge, etc.); and,
- » Balls for mill delivery.



## 1.3 Proposed General Arrangement

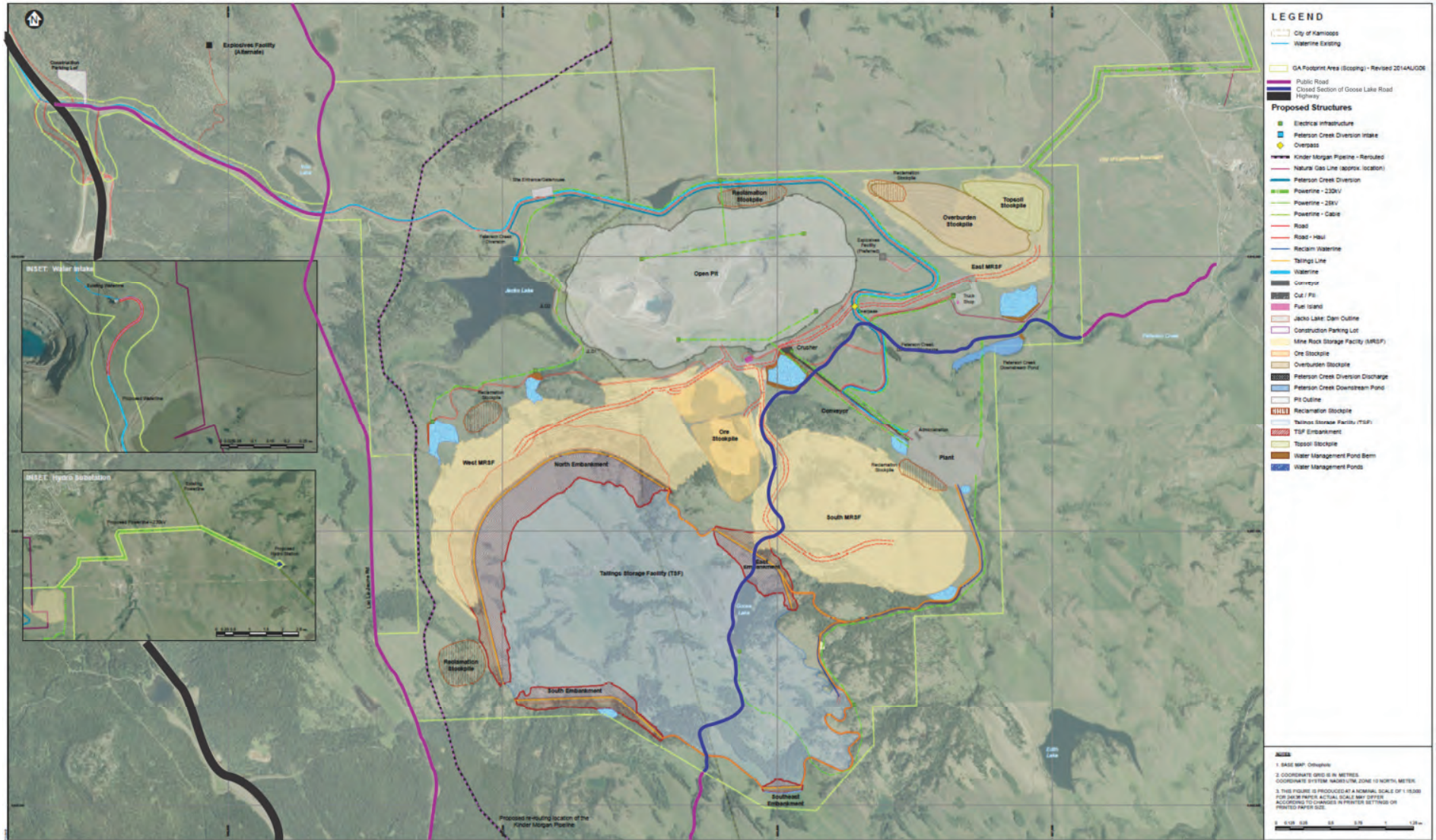


Figure 1: Proposed General Arrangement

## 1.4 Coordination with Kamloops SW Industrial Lands Access Study

KAM, MoTI, and Opus held a start-up meeting on April 23, 2014 to discuss the parameters of the ToR for this TIA. MoTI have undertaken a corridor access study along Highway 1 and Highway 5 between the Copperhead interchange to the Inks Lake interchange, called the Kamloops Southwest (SW) Industrial Lands Access Study. KAM intends to coordinate the TIA study parameters and inputs with this study for ease of area future planning.

## 1.5 Proposed TIA Format

The TIA report outline will be as follows:

1. Introduction and Background Information
2. Methodology
3. Construction Phase Conditions (2016 and 2018)
  - a. Base and Total Conditions
  - b. Mitigation Strategies
4. Operation Phase Conditions (2024 and 2039)
  - a. Base and Total Conditions
  - b. Mitigation Strategies
5. Project Access Conceptual Designs
6. Goose Lake Road Closure Analysis
7. Road Safety and Conditions Review
8. Summary

## 2 Study Parameters

### 2.1 TIA Study Area

Figure 2 shows the TIA study area for traffic capacity analysis. Traffic capacity analyses will be conducted for the following locations:

- » Inks Lake Interchange conceptual design terminals (Section 5.1.1);
- » Lac Le Jeune Road / Mine Access Road intersection conceptual design (Section 5.1.2);
  
- » Copperhead Interchange which includes the following intersections;
  - Frontage Road / Copperhead Drive Intersection;
  - Hwy 1 WB On-Off Ramps / Copperhead Drive Intersection;
  - Hwy 1 EB On-Off Ramps / Copperhead Drive Intersection;
  
- » Pacific Way Interchange which includes the following intersections;
  - Hwy 1 EB On-Off Ramps / Hugh Allan Drive Intersection;
  - Pacific Way / Hugh Allan Drive Intersection;
  - Hwy 1 WB On-Off Ramps / Pacific Way Intersection; and,



» Versatile Drive / Hugh Allan Drive Intersection.

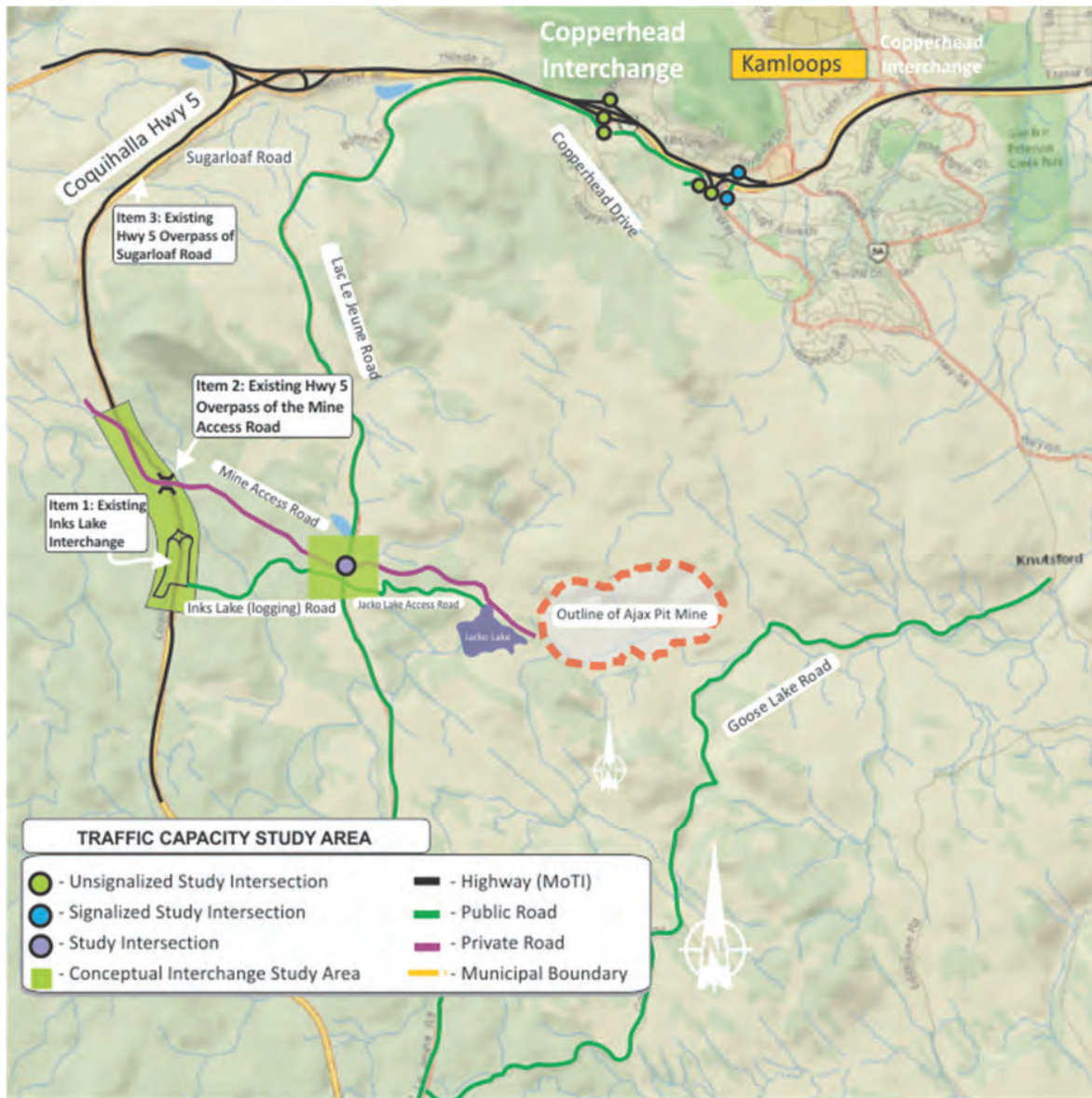


Figure 2: Study Area

The TIA report will document the existing study intersection controls and laning. Traffic analysis of these intersections will be conducted based on the parameters defined in Section 2 of this ToR.



## **2.2 Phasing Description**

KAM anticipates the Project construction phase will begin in the fourth quarter of 2016 and carry through to the second quarter of 2019. Over this two-and-a-half year period, the majority of equipment and materials will be brought onto site to construct the mining facilities and prepare for operations. The Project will be commissioned in the second quarter of 2019 and operations are expected to start by the second quarter of 2019.

Table 3 provides the estimated timeline for the construction and operations phases, and includes an estimate of the number of staff working on-site and heavy load shipments by quarter.



**Table 3: Estimated Phasing Timeline**

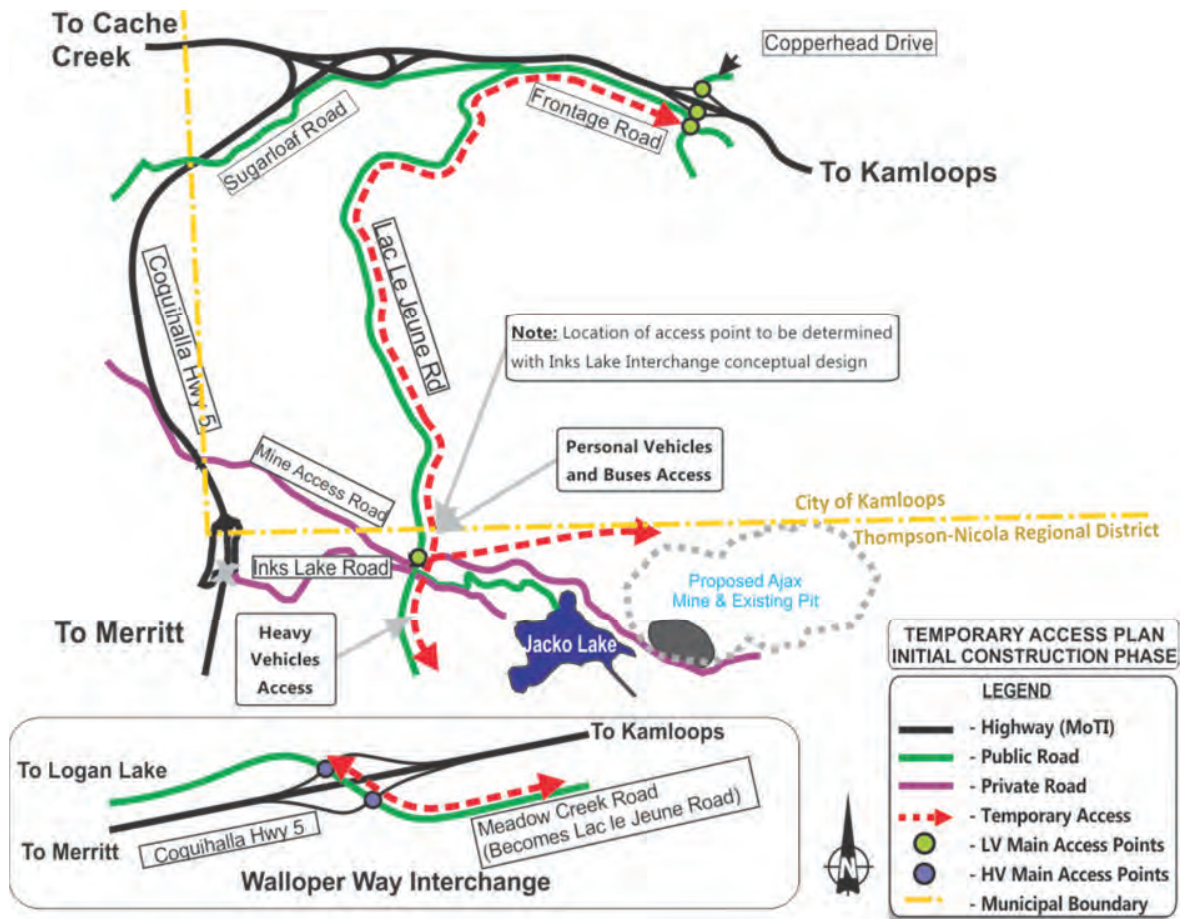
Year:	2016		2017				2018				2019	
Quarter:	Prior to Q4	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
<b>Description</b>	EA Submission and Approval of Mine	Mine on-site Construction phase starts	Construction Phase Continues	Construction Ramps Up	Peak Construction Period				Construction Ramps Down	Construction Phase Complete	Typical Mine Operations Begin	
<b>Access Plan</b>		Temporary Access Plan	Switch to Primary Access Plan	Primary Access Plan								
<b>Access Description</b>	Road Design for Inks Lake Interchange and Mine Access Road completed in Q2 and Q3 of 2015	Mine vehicle traffic routed through Copperhead Interchange. Continued Construction on Inks Lake Interchange	Upgraded Inks Lake Interchange Complete.	Mine vehicle traffic routed through upgraded Inks Lake Interchange.								
<b>Total Staff On-Site</b>		400	400	1200	1200	1800	1800	1800	1800	1200	800	580 Permanent Staff
<b>Heavy Loads per Quarter</b>		200*	200*	400	400	400	400	400	400	300	150	2100

\* Construction phase heavy vehicles access mine only via the Walloper Lake Interchange



## 2.3 Access Plan

At the beginning of construction, Project-related traffic will be contractually required to use the Copperhead Interchange and Lac Le Jeune Road, as the Temporary Access Plan shown in Figure 3. Prior to construction, KAM intends to upgrade the Lac Le Jeune Road and Mine Access Road intersection to ensure functional access to the Project site. Heavy vehicles will be required to access the Project via Lac Le Jeune Road and the Walloper Way Interchange.



**Figure 3: Temporary Access Plan for Initial Construction Phase**

While Project traffic is using the Temporary Access Plan (which is expected to be in operation for approximately 6 months), KAM will: upgrade the Inks Lake Interchange; improve the Mine Access Road to public road standards; and, reconfigure and/or rebuild the intersection at Lac Le Jeune Road and Mine Access Road, as required. These construction activities will enable the Primary Access Plan. Once upgrades and construction are complete, all mine traffic will access the Project through the upgraded Inks Lake Interchange as shown in Figure 4. The Primary Access Plan will be in effect for the remaining life of the Project with road infrastructure upgrades remaining in place post Project closure and reclamation.

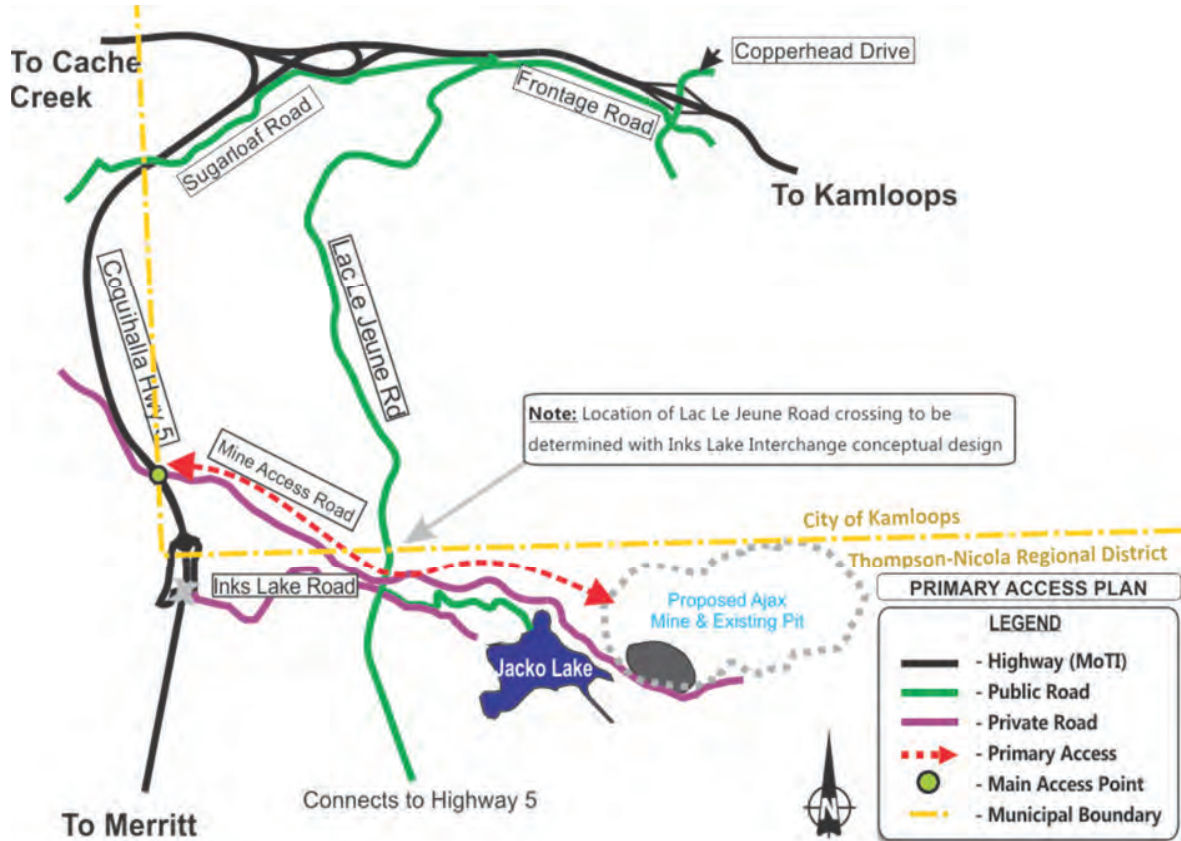


Figure 4: Primary Access Plan

## 2.4 Horizon Years

The temporal scope of the TIA is defined by the horizon years for which base traffic conditions and Project traffic conditions will be assessed and include:

- » 2016 – early construction phase horizon year (Temporary Access Plan);
- » 2018 – peak construction phase horizon year (Primary Access Plan);
- » 2024\* – typical operations phase horizon year (Primary Access Plan); and,
- » 2039\* – long-term operations phase horizon year (Primary Access Plan).

\*The 2024 and 2039 horizon years were selected to align with the horizon years used in both the MoTI Interface Study and the CoK SW Industrial Lands Access Study.

The TIA will evaluate traffic impacts during the morning (AM) and evening (PM) peak hour traffic scenarios at the study locations for these four horizon years.

## 2.5 Background Traffic Data

The TIA will include traffic data from the Ironmask - P-21-3NS – C permanent count site for mainline movements at the upgraded Inks Lake Interchange, assuming mainline volumes do

not change along the Highway segment between the Inks Lake Interchange and the Highway 1/Highway 5 Interchange. The Inks Lake Interchange terminal intersections traffic data is not currently available from MoTI. However, traffic data were collected at the Inks Lake Interchange on- and off-ramps during the midday peak period on November 4, 2014. To ensure that the results derived from the analysis are conservative, a seasonal factor to convert data from November to July and an hourly factor to convert the midday peak hour volumes to AM peak and PM peak hour data volumes will be applied.

Baseline 2011 traffic data is available from MoTI's Kamloops Highway and Local Roads Network Interface Study (Interface Study) for the Copperhead Interchange and Pacific Way Interchange study intersections.

A traffic counter is a device used to count, classify, and/or measure the speed of vehicular traffic. Counters consist of pneumatic road tubes laid across the roadway, piezo-electric sensors embedded in the roadway, inductive loops cut into the roadway, or a combination of these to detect the passing vehicles. Pneumatic road tubes are generally used for temporary studies to study a sample of traffic, while piezo-electric sensors and inductive loops are used for permanent studies which can ascertain seasonal traffic trends. Tube-counted traffic data was collected along Lac Le Jeune Road in two locations during 2012. The data was collected over 5 days from July 26 to July 30 and captured vehicle classification and speed data. Traffic during this period ranged from motorcycles (smallest vehicle) up to multi-trailers with seven or more axles (largest vehicle). Tube counter 'A' collected data approximately 175 meters north of the Mine Access Road overpass of Lac Le Jeune Road. Bicycles were not observed to be a part of the traffic recorded during the Lac Le Jeune Road traffic count.

## 2.6 Background Traffic Growth Rates

The TIA will factor up existing traffic count data using the growth rates defined below to establish background traffic volumes for future horizon years.

**Inks Lake Interchange & Mine Access Road / Lac Le Jeune Road intersection:** The TIA will include the calculation of a single growth rate for the Inks Lake Interchange terminal intersections and the Mine Access Road and Lac Le Jeune Road intersection using the permanent count station data at the Ironmask - P-21-3NS – C count site. This growth rate will be rounded up to the next 0.5 % for highway through movements only.

**Copperhead and Pacific Way Interchanges:** A 1.2% growth rate, obtained from the MoTI Interface Study, will be applied for all turning movements at the Copperhead and Pacific Way Interchange study intersections. All growth rates will be applied to 2011 background traffic volumes (provided in the Interface Study).

**Background Developments:** In addition to the 1.2% growth rate taken from the MoTI Interface Study, background trips anticipated from the Gateway Casino development will be included in the study. The Gateway Casino development, located at 1555 Versatile Drive, is expected to be completed by 2016. Predicted background trips associated with the casino have been provided by the CoK.

## 2.7 Background Network Improvements

Multiple improvements are planned for the traffic network irrespective of the Project and will be completed by others. The goal of these planned network improvements will be to improve levels of service. As per MoTI and CoK requirements, planned network improvements that will be included in the TIA base conditions and serve as model assumptions will include:

- » Hugh Allan Drive and Versatile Drive – one-lane roundabout with westbound right-turn slip lane;
- » Highway 1 eastbound on/off ramp – access restrictions to left-in and right-in/out only (all southbound left-turn traffic will turn right and U-turn at the Versatile Drive/Hugh Allan Drive roundabout);
- » Copperhead Drive and Versatile Drive – new traffic signal;
- » Copperhead Drive and Highway 1 westbound on/off-ramp – new traffic signal; and,
- » Hugh Allan Drive – addition of one westbound lane between Pacific Way and Versatile Drive.

These improvements are assumed to be constructed by the year 2016, and will be modelled using Trafficware Synchro 8 and SimTraffic for all horizon years (2016, 2018, 2024, and 2039). The background network improvement assumptions do not include other recommended improvements identified in the Interface Study or the South West Industrial Access Study.

## 2.8 Carpooling

Project employees commuting in personal vehicles are anticipated to travel to and from the site individually with some proportion carpooling. To determine a reasonable carpooling mode split for staff travel, results for Kamloops were extracted from the 2011 National Household Survey (NHS). Table 4 shows the transportation mode split for the total employed population as presented in the 2011 NHS.

**Table 4: Kamloops Transportation Mode Split**

Mode of Transportation	Percent Mode Split
Car, truck or van – as a driver	80%
Car, truck or van – as a passenger	7%
Public transit	4%
Walked	5%
Bicycle	1%
Other Methods	2%

The study assumes personal vehicle employee trips to/from the Project would generally replicate trip behaviours in Kamloops as a whole. Therefore it is assumed that without any mitigation measures (e.g. priority carpool parking), 7% of staff would travel as a passenger in another staff member's personal vehicle to/from the Project site.



## 2.9 Traffic Modelling Parameters

Trafficware Synchro 8 and SimTraffic will be used for modelling the performance of the study intersections, adopting the 2010 Highway Capacity Manual (HCM) methodology. Table 5 outlines the threshold levels for acceptable intersection approach performance as provided by MoTI and CoK. Traffic capacity evaluation methods are provided in Section 5.2.

**Table 5: Network Performance Parameter Thresholds**

Performance Indicator	Thresholds
HCM Level of Service (LoS)	<ul style="list-style-type: none"> <li>Overall LoS C or better for the overall intersection.</li> <li>LoS C or better for turning movements on Higher Order Roads intersecting with Lower Order Roads.</li> <li>LoS D or better for turning movements on Lower Order Roads Intersecting with Higher Order Roads.</li> </ul>
HCM Volume to Capacity Ratio (v/c)	<ul style="list-style-type: none"> <li><math>v/c \leq 0.80</math> for mainline (highway) through movements</li> <li><math>v/c \leq 0.85</math> for all other turning movements</li> </ul>
HCM 95 <sup>th</sup> Percentile Queue Length	MoTI left turn warrant, or if required for safety. Turn bay storage length will be determined using Synchro output for 95 <sup>th</sup> percentile queue length.

The Synchro 8 input parameters are outlined in Table 6; these parameters will be used for conducting the traffic capacity analysis.

**Table 6: Synchro Input Parameters**

Input Parameters	Value
Vehicle length for passenger vehicles	= 7.5 metres
Vehicle length for heavy vehicles	= 24 metres (maximum Synchro input)
Ideal saturated flow	= 1900 for all movements
Lost time adjustment	= 0 seconds
Leading detector	= Synchro default
Trailing detector	= 2 metres
Turning speed	= Synchro default
Lane Utilization	= Synchro default
Right turn factor	= Synchro default
Left turn factor (protected)	= Synchro default
Saturated flow rate (protected)	= Synchro default
Left turn factor (permissive)	= Synchro default
Saturate flow rate (permissive)	= Synchro default

Input Parameters	Value
Saturated flow rate (Right Turn On Red)	= Synchro default
Headway factor	= Synchro default
Conflicting pedestrians#	= Apply where available
Conflicting bikes#	= Apply where available
Peak hour factor	= Use 0.95 for AM and PM peak hour in all horizon years.
Growth factor	= 1.0 (separate from annual traffic volume growth)
Heavy vehicles	= Enter if known and from the Lac Le Jeune count data for north and south movements, and from the Interface Study. If unknown, use first principles.
Bus blockages	= Applicable when available
Link Origin-Destination volumes	= Alterations must be documented in detail
Lane group flow	= Synchro default
Vehicle clearances and existing timings	= Provided by MoTI for signalized intersections
Minimum initial main street	= Signal timing Plans, or if unknown, 20 seconds for MoTI, 10 seconds for CoK, or pedestrian time (sum of walk and pedestrian clearance), whichever is greater
Minimum initial side street	= Signal timing Plans, or if unknown, 10 seconds (7 seconds Highway 5) for MoTI, 7 seconds for CoK
Minimum initial arrows	= Signal timing Plans, or if unknown, 10 seconds (12 seconds Highway 5) for MoTI, 5 seconds for CoK
Minimum Split	= Synchro default
A recall (pedestrian or minimum) should be placed on the main street unless the intersection operates in a fixed time (pre-timed) mode.	
A recall should not be placed on the minor street or turns.	

The main body of the report will contain level of service, v/c ratio, delay, and 95<sup>th</sup> percentile queue length indicator results documented in an easily readable table format. The report will include appended Synchro printout reports and electronic Synchro files.

MoTI's generic terms of reference will be referred to for any other traffic modelling guidelines not clarified above.



## **3 Construction Phase Conditions (2016 & 2018)**

### **3.1 Proposed Accesses**

Access to the Project site will transition during the construction phase. Prior to construction, KAM intends to upgrade the Lac Le Jeune Road and Mine Access Road intersection to ensure functional access to the Project site. For the first six months of construction, Project traffic will use the Temporary Access Plan via the Copperhead Interchange and Lac Le Jeune Road. This Temporary Access Plan will be in place for quarter 4 of 2016 along with quarters 1 and 2 of 2017. During these three quarters, construction on the upgraded Inks Lake Interchange and upgraded Mine Access Road will occur. Once construction on the upgraded Inks Lake Interchange is completed, all Project traffic will be directed through this interchange, forming the Primary Access Plan.

### **3.2 Traffic Capacity Analysis**

Traffic capacity analyses will be conducted for the 2016 and 2018 horizon years to assess Project construction traffic conditions in comparison to the 2016 and 2018 base traffic conditions.

#### **3.2.1 Staff Trip Generation**

The Institute of Transportation Engineers (ITE) Trip Generation Manual 9<sup>th</sup> Edition (2012) does not contain mining land use trip data and other potential data sources are limited. Therefore, trip generation to/from the Project is based on likely trip characteristics provided by KAM.

KAM estimates a maximum of 400 total staff and contractors will work at the Project site at any one time during the 2016 horizon year, increasing to a maximum of 1,800 during the 2018 horizon year. Night shift work will not occur during the construction phase so all commuting trips to/from the site are assumed to occur during the AM and PM peak hours respectively.

Note: KAM is committed to implementing a number of contractually supported travel demand mitigation strategies during construction as necessary to reduce or eliminate significant adverse effects, including company bus transportation, car-pooling schemes and staggered shifts. As per requests by MOTI and CoK however, the base assessment of the construction traffic conditions shall not include these mitigation strategies and will therefore not necessarily provide an accurate representation of residual effects to traffic after implementation of mitigation strategies. Mitigation strategies will be added and their effectiveness evaluated in a subsequent assessment scenario as outlined in Section 5: Mitigation Strategies.

##### **3.2.1.1 2016 Trip Generation**

At the request of MOTI and CoK, the TIA will assume in the base assessment case that in 2016 all construction phase employees will travel by passenger car and that demand management

strategies which KAM is committed to providing will not be implemented, thus presenting a highly conservative worst case scenario. Table 7 shows the estimated morning (AM) and evening (PM) trip generation for the 2016 construction horizon year assuming 7% of staff will travel as passengers. The TIA assumes that an additional 10% of generated vehicles will leave in the AM peak hour and 10% will arrive in the PM peak hour to account for meetings, errands, and other miscellaneous trips.

**Table 7: Construction Phase Staff Trip Generation Estimate (2016)**

Peak Period	Mode of Transport	Staff	Vehicles*	In/Out Split	In	Out	Total
AM	Passenger Car	400	372	100/10	372	37	409
PM	Passenger Car	400	372	10/100	37	372	409

*\*The number of vehicles is based on the assumption that 7% of staff will travel as passengers.*

### 3.2.1.2 2018 Trip Generation

Similar to 2016 and also at the request of MOTI and CoK, the TIA will assume in the base assessment case that in 2018 all construction phase employees will travel by passenger car and that demand management strategies which KAM is committed to providing will not be implemented, thus presenting a highly conservative worst case scenario. Table 8 shows the estimated morning (AM) and evening (PM) trip generation for the 2018 construction horizon year assuming 7% of staff will travel as passengers. The TIA assumes 10% of generated vehicles will leave in the AM peak hour and 10% will arrive in the PM peak hour to account for meetings, errands, and other miscellaneous trips.

**Table 8: Construction Phase Staff Trip Generation Estimate (2018)**

Peak Period	Mode of Transport	Staff	Vehicles*	In/Out Split	In	Out	Total
AM	Passenger Car	1,800	1,674	100/10	1,674	167	1,841
PM	Passenger Car	1,800	1,674	10/100	167	1,674	1,841

*\*The number of vehicles is based on the assumption that 7% of staff will travel as passengers.*

### 3.2.2 Heavy Vehicle Trip Generation

The TIA will assess heavy vehicle traffic and definitions of construction vehicle equipment size and type for the construction phase. During the 2016 horizon year, it is predicted that there will be 200 loads per quarter. This equates to 67 loads per month, 17 loads per week (assuming four weeks in a month), and about two and a half, or three, loads per day (assuming they operate seven days per week). To be conservative for the traffic analysis, it is assumed that all heavy vehicles in the 2016 horizon year will enter the site in the AM peak hour and will leave during the PM peak hour. Note: this is an unlikely scenario as the majority of heavy load traffic will enter and leave the site during the late morning and early afternoon periods. Table 9 shows the breakdown of the heavy vehicle trip generation estimate:

**Table 9: Construction Phase Heavy Vehicle Trip Generation Estimate (2016)**

Peak Hour	Type of Vehicle	In	Out	Total
AM	Heavy Vehicles	3	0	<b>3</b>
PM	Heavy Vehicles	0	3	<b>3</b>

The peak in heavy vehicle traffic is estimated to occur between Q1 of 2017 and Q1 of 2018 with approximately 400 loads per quarter. Assuming heavy vehicle loads are evenly spread out over the quarter, 400 loads per quarter equates to 133 loads per month, and 33 loads per week (assuming 4 weeks per month). At 33 loads per week, this equates to five loads per day (assuming they operate seven days per week). To be conservative for the traffic analysis, it is assumed that all heavy vehicles in the 2018 horizon year will enter the site in the morning peak hour and will leave during the evening peak hour. Note: this is an unlikely scenario as the majority of heavy load traffic will enter and leave the site during the late morning and early afternoon periods. Table 10 shows the breakdown of the heavy vehicle trip generation estimate.

**Table 10: Construction Phase Heavy Vehicle Trip Generation Estimate (2018)**

Peak Hour	Type of Vehicle	In	Out	Total
AM	Heavy Vehicles	5	0	<b>5</b>
PM	Heavy Vehicles	0	5	<b>5</b>

### 3.2.3 Trip Generation Summary

Table 11 summarizes the 2016 construction phase trip generation estimates for all vehicle types entering and leaving the mine site during the adjacent street AM and PM peak hours.

**Table 11: Construction Phase Trip Generation Estimate Summary (2016)**

Peak Hour	Staff Mode of Transport	In	Out	Total
AM	Passenger Car	372	37	409
	Heavy Vehicle	3	0	3
	<b>Total</b>	<b>375</b>	<b>37</b>	<b>412</b>
PM	Passenger Car	37	372	409
	Heavy Vehicle	0	3	3
	<b>Total</b>	<b>37</b>	<b>375</b>	<b>412</b>

Table 12 summarizes the 2018 construction phase trip generation for the adjacent street AM and PM peak hours.



**Table 12: Construction Phase Trip Generation Estimate Summary (2018)**

Peak Hour	Staff Mode of Transport	In	Out	Total
AM	Passenger Car	1,674	167	1,841
	Heavy Vehicle	5	0	5
	<b>Total</b>	<b>1,679</b>	<b>167</b>	<b>1,846</b>
PM	Passenger Car	167	1,674	1,841
	Heavy Vehicle	0	5	5
	<b>Total</b>	<b>167</b>	<b>1,679</b>	<b>1,846</b>

### 3.2.4 Trip Distribution and Assignment

The analysis will assume that some employees will reside outside of the Kamloops area (15%), and the majority will travel to/from Kamloops (85%). KAM assumes that all construction phase staff and contractors will live within a 45 minute driving radius from the Project. Since each employee must have 8 hours rest between shifts, a 45 minute maximum driving radius is desired. The following are communities identified as potential living area limits for construction employees outside of the City of Kamloops, as per assessment basis:

- » West of the Project – Tobiano
- » East of the Project – Barnhartvale
- » South of the Project – Merritt
- » North of the Project – Heffley Creek

The TIA report will include figures that depict the trip distribution percentages spread across the region, and detailed trip assignment percentages by turning movement at the study intersections. Contractual obligations that require staff and contractors to access the site during the construction phase will be provided in the Traffic Management Plan (TMP) and noted in the TIA report.

### 3.3 Parking

The TIA will assess the required number of parking spaces at the Project site during each construction phase horizon year.



## 4 Operations Phase Conditions (2019 onwards)

### 4.1 Phasing Description

The Project operations phase is expected to begin in the first quarter of 2019. The current estimate of the mine life is 23 years, which would span from 2019 to 2042. Project closure is expected to take up to two years, followed by reclamation, which may take two to five years.

### 4.2 Proposed Accesses

Access to the Project during the operations phase will be via the upgraded Inks Lake Interchange and Mine Access Road (Primary Access Plan). KAM will contractually require employees and subcontractors use this interchange to access the Project during operations, closure, and reclamation.

### 4.3 Traffic Capacity Analysis

The TIA will include traffic capacity analyses for the 2024 and 2039 horizon years to assess Project operations phase traffic conditions in comparison to corresponding base traffic conditions, as required by MoTI and CoK.

#### 4.3.1 Staff Trip Generation

KAM estimates up to 580 permanent staff will be employed during any typical operations phase year. This includes four groups of staff:

- » Non-shift workers who will work Monday to Friday from 8 am to 6 pm;
- » Mine shift-staff who will work in two 12 hour shifts per day, seven days per week, from 7 am to 7 pm;
- » Process shift-staff who will work in two 12 hour shifts per day, seven days per week, from 7 am to 7 pm; and,
- » Maintenance shift-staff who will work in two 12 hour shifts per day, seven days per week, from 6 am to 6 pm.

Based on KAM operational plans, shift staff will work 12-hour day and 12-hour night shifts. On any given day, 2/3 of the total permanent staff of 580 (approximately 387) will be scheduled to work while the other third will be on their time off. Thus, about 193 staff will be scheduled for the day shift and 193 staff will be scheduled for the night shift. These staff numbers will be used as the basis for traffic estimations in the TIA.

#### Staff Vehicle Traffic

The estimated trip generation assuming 7% of staff will travel as passengers in personal vehicles is shown in Table 13. At the request of MOTI and CoK, the trip generation effect of staggering shift times and incentivising carpooling will not be included in the base assessment of the operational traffic conditions (all shift traffic will be applied to the AM and PM peak

hour models), thus presenting a highly conservative worst case scenario. Mitigation strategies will be added and their effectiveness evaluated in a subsequent assessment scenario as outlined in Section 5: Mitigation Strategies.

**Table 13: Operation Phase Staff Trip Generation Estimate**

Peak Period	Mode of Transport	Staff	Vehicles*	In/Out Split	In	Out	Total
AM	Personal Vehicle	387	360	50/50	180	180	360
PM	Personal Vehicle	387	360	50/50	180	180	360

*\*The number of vehicles is based on the assumption that 7% of staff will travel as passengers.*

### 4.3.2 Heavy Vehicle Trip Generation

Heavy vehicle traffic during the operations phase will consist of concentrate trucks and supply trucks. Concentrate trucks will deliver the raw output material from the Project to Vancouver for shipping. Supply trucks will deliver fuel, small-sized mining equipment, and general mine supplies. Heavy vehicle traffic will typically consist of B-Trains that can move a maximum payload of 35 metric tonnes.

On occasion, larger loads including 40-m vehicles will be used for delivery of special equipment. This rare occurrence will be excluded from modelling and from the TIA as there are already processes in place for the management of this type of vehicle and trip, specifically MoTI's oversize loads permitting process.

Output capacity of the Project will vary from day to day and hence the number of concentrate trucks leaving and entering the site will also vary. KAM operational plans indicate the number of heavy vehicle trips will range from 15 to 23 per day. For the TIA analysis, it will be assumed that 23 concentrate trucks arrive and depart daily, totalling 46 heavy vehicle concentrate trips in a day, 50% in and 50% out.

In addition to the concentrate trucks there will be supply vehicles arriving on the site for activities such as gasoline and diesel deliveries, reagent deliveries, general freight, etc. KAM operational plans indicate that these will range between 5 and 8 deliveries per day. For the TIA analysis, it will be conservatively assumed that 10 supply trucks arrive and depart daily, totalling 20 heavy vehicle supply trips in a day.

The total heavy vehicles trips for the purposes of the TIA will therefore equate to 33 heavy vehicles arriving and departing per day, totalling 66 trips (50% in and 50% out).

The TIA will include the assumption that 10% of the heavy vehicles arrive and depart during each peak hour, AM and PM. Using 10% of the total volumes as a peak hour assumption is consistent with typical peak hour traffic observations on average roads. This equates to approximately 8 round trips during the AM and PM peaks. The remaining trips will be made during off-peak hours.

Table 14 shows the breakdown of the heavy vehicle trip generation estimate.

**Table 14: Operation Phase Heavy Vehicle Trip Generation Estimate (2024 & 2039)**

Peak Hour	Type of Vehicle	In	Out	Total
AM	Heavy Vehicles	4	4	<b>8</b>
PM	Heavy Vehicles	4	4	<b>8</b>

### 4.3.3 Trip Generation Summary

The total trips generated in the AM and PM peak hours are shown in Table 15.

**Table 15: Summary of Operation Phase Trip Generation Estimates**

Peak Period	Type of Trips	In	Out	Total
AM	Personal Staff Vehicles	180	180	360
	Heavy Vehicles	4	4	8
	<b>Total</b>	<b>184</b>	<b>184</b>	<b>368</b>
PM	Personal Staff Vehicles	180	180	360
	Heavy Vehicles	4	4	8
	<b>Total</b>	<b>184</b>	<b>184</b>	<b>368</b>

### 4.3.4 Trip Distribution and Assignment

Similar to the construction phase, the TIA will assume that some staff will reside outside of the Kamloops area (15%), and the majority will travel to/from Kamloops (85%). The TIA report will include figures that depict trip distribution percentages spread across the region, and detailed trip assignment percentages by turning movement at the study intersections. Contractual obligations that require staff and contractors to access the site during the construction phase will be provided in the TMP and noted in the TIA report.

## 4.4 Parking

KAM will provide a total of 300 parking spaces during the operations phase and they will be spread out in various locations on site.

## 5 Mitigation Strategies

Where potential effects of the project on traffic and network operating conditions are deemed to be significant, mitigation strategies will be developed to minimize project impacts. The

following subsections describe mitigation measures which will be explored in order to reduce traffic-related effects created by the Project.

## 5.1 Base Conditions

To address adverse traffic effects in the base conditions, the network improvements provided by the CoK and MoTI will be included in the traffic modelling results at the appropriate horizon years.

## 5.2 Total Conditions

Mitigation measures for total conditions will be considered effective if:

- » The base conditions generate traffic capacity results within the CoK and MoTI thresholds (see Table 5), and, the total mitigated conditions also fall within the CoK and MoTI thresholds.

Or,

- » The base conditions generate traffic capacity results worse than the CoK and MoTI thresholds (see Table 5), and the total mitigated conditions receive:
  - Levels of service at least the same as found in the base conditions;
  - v/c ratios within 10% of v/c ratios found in the base conditions; and,
  - 95<sup>th</sup> percentile queue lengths within 10% of the 95<sup>th</sup> percentile queue lengths found in the base conditions.

### 5.2.1 Non-Asset Based Mitigation Strategies

A combination of infrastructure and non-infrastructure based mitigation strategies will be used to mitigate total conditions. The TIA will include clear assumptions and enforcement mechanisms for any non-infrastructure based mitigation strategies that may include one or all of the following options:

- » Shift start and end staggering to reduce the number of trips imposed on the network during peak hours;
- » Using buses to transport construction workers. Note: subject to permitting, KAM intends that a minimum of 85% of construction employees will be contractually required to use company provided transportation via bus (*staging approaches and locations are under development and will be addressed via subsequent permit applications*); and,
- » Carpooling incentives to increase the estimated number of carpool passengers from 7% to a higher percentage.

KAM is aware that as part of the potential bus staging mitigation strategies, CoK and MoTI may require that KAM assess the transportation impacts of individual bus staging locations within Kamloops and the surrounding area as a condition of the Project's EA certificate.



## 6 Project Access Conceptual Designs

### 6.1 Inks Lake Interchange Conceptual Design

For implementation of the Primary Access Plan, connection to Highway 5 in the vicinity of the Inks Lake Interchange is required. The existing Inks Lake Interchange (Item 1 of Figure 2) was built primarily for winter maintenance vehicles to load aggregate for dispersing on Highway 5 during winter conditions and is substandard when compared to current guidelines. Also, the underpass of Highway 5 at the existing Inks Lake interchange (Item 1) is single lane with limited vertical clearance. Due to these restrictions (Item 1), both KAM and MoTI have identified the Highway 5 overpass of the existing Mine Access Road (See Item 2 on Figure 2) as a desired access point area for the Project, linking Highway 5 to the existing Mine Access Road. Detailed structure information will be obtained and provided in the TIA to inform conceptual design options.

All reasonable and feasible options for the interchange (including an interchange at Sugarloaf) will be discussed and assessed utilizing a multi-criteria decision analysis to identify the option that achieves the best balance between cost effective access to the Project and potential effects such as safety, journey time and land use. Note: Irrespective of the assessment outcomes, KAM will continue to support the efforts of CoK and MoTI to finalize their assessment of highway access options for the proposed Southwest Industrial Development.

At the request of MoTI, the TIA will include conceptual interchange layouts for the Inks Lake Interchange. Conceptual designs will be prepared using current TAC standards and any additional design criteria provided by MoTI. The conceptual layouts will consist of simple line diagrams to indicate ramps, terminals, and other road segments connecting onto the Mine Access Road.

The TIA will include analysis of weaving and/or ramp analysis of the conceptual Inks Lake Interchange ramp merge and diverge segments using the Highway Capacity Software 2000 (HCS) when the preferred design is finalized. The TIA will also include a basic freeway segment analysis to assess weaving and report for 2018 (peak construction horizon year) and 2039 (peak operations phase horizon year).

### 6.2 Mine Access Road Design

The existing Mine Access Road corridor provides the desired line of travel between the mine site and the proposed upgraded Inks Lake Interchange. The Mine Access Road is currently a private road with a gravel surface that was originally designed for haul trucks used as part of historic operations at the site conducted by previous owners. The Mine Access Road currently connects to the Project site via an overpass at Lac Le Jeune Road; however this structure is aging and requires improvements to bring the overpass up to TAC-equivalent standards.

The Mine Access Road is currently a private road and will require upgrade from the mine access point to the upgraded Inks Lake interchange to accommodate all mine traffic that will use this connection. KAM proposes to make the Mine Access Road a public road, as required

by MoTI if directly connected to Highway 5. Since the upgrade will convert the road from private to public, the Mine Access Road will be considered a public road designed to MoTI standards. The TIA will include standard cross-section diagrams, as indicated by MoTI, from the *BC Supplement to TAC Geometric Design Guide 2007 Edition* to indicate the general cross-section required for the upgraded Mine Access Road. The existing Mine Access Road runs through both MoTI and CoK jurisdictions, therefore if the final Mine Access Road layout overlaps both jurisdictions, approval from MoTI and CoK may be required.

The TIA will also include review of the existing Mine Access Road overpass of Lac Le Jeune Road and identify grade-separated and at-grade options, including intersection controls, with a view of optimizing overall network outcomes. KAM acknowledges MoTI's requirement that if the upgraded Inks Lake Interchange and Mine Access Road are to be made public, the Mine Access Road must connect to another public road (Lac Le Jeune Road). Conceptual intersection/interchange options will be consistent with MoTI and TAC guidelines.

## 7 Goose Lake Road Closure

Currently, Goose Lake Road is a public road used for recreational purposes (photography, cycling, horseback riding, etc.), and also provides access for some land parcels. It is KAM's desire to have the section of Goose Lake Road between KAM's southern and northern property limits as shown in Figure 1 be closed by gazette or decommissioned by waiver of claim by MoTI, in order to facilitate KAM's mining operation. To assess the impacts of the Goose Lake Road closure, the TIA will include analysis of:

- » Private and government land parcels that will no longer have road access (e.g. parcels that will become "islands") as a result of the closure;
- » Private and government land parcels that already do not have road access (e.g. parcels that are already "islands");
- » Existing usage of Goose Lake Road (by collecting qualitative information from discussions with potentially affected ranchers and quantitative traffic count data if available from TNRD or MoTI);
- » How the road closure could impact each transportation mode (personal vehicles, cycling, walking, and busing if applicable); and,
- » How the road closure could impact connectivity for commuting vehicles and if the closure could increase stress on other roadways (e.g. Lac Le Jeune Road).

## 8 Road Safety and Conditions Reviews

### 8.1 Road Safety Review

The TIA will include a road safety review of relevant portions of the study area to document existing road conditions for signage, markings, road width and edging, lighting, sightline issues, seasonal maintenance, and other pertinent safety characteristics. The spatial extent of the road safety review will include:

- » Copperhead Interchange:
  - Highway 1 WB On/Off Ramps and Copperhead Drive intersection for the full length of merge/diverge lanes;
  - Highway 1 EB On/Off Ramps and Copperhead Drive intersection for the full length of merge/diverge lanes;
  - Frontage Road (Versatile Drive)/Copperhead Drive intersection for the length of 100m from intersection nexus;
- » Proposed Mine Access Road crossing location at Lac Le Jeune Road; and,
- » Lac Le Jeune Road from Versatile Drive/Copperhead Drive intersection to 1 kilometre south of the existing Mine Access Road overpass.

KAM will arrange for an independent safety audit if MoTI and the CoK disagree with the treatment options recommended in the TIA on the basis of the safety evaluation.

All permanent road works will be subject to detailed design and post-construction phase road safety audits.

## 8.2 Conditions Review

The TIA will include a conditions review of Lac Le Jeune Road and evaluation of the likely maintenance impact arising from its use in the Temporary Access Plan. The conditions review will consist of:

- » Site visit to evaluate the road's laning geometry, condition of the hard surface, and subsurface conditions. This will be documented with photos and notes;
- » Review of MOTI records to identify the maintenance classification;
- » Review of MOTI records to determine the planning classification;
- » Review of TNRD records to determine the Official Community Plan classification;
- » Review CoK classification to determine whether it has bearing on the maintenance standards;
- » Using recognized methodology\*, establish how much degradation in life span the six months usage by heavy vehicles will cause on the CoK's portion of the road; convert this usage into financial implications for KGHM's consideration; and
- » Recommend safety improvements for Lac Le Jeune Road throughout the use of the Temporary Access Plan.

\* Recognized Methodology is as follows:

- » Condition survey will solely be of the pavement surface.
- » Rating methodology will be from the "Ministry's Pavement Surface Condition Rating Manual", April 2012
- » Condition will be rated using a Pavement Distress Index ranging from 10 to 0 (10 being excellent and 0 being failed)
- » Survey Methodology:
  - Road is divided into 50 meter segments with each segment rated separately.

- Each defect is rated using a severity level (low, med, high) multiplied by the density (the length, square meters of defect within that segment) creating a percentage for each defect.
- The defects are then weighted to create a deduct value.
- The Pavement Distress Index is then calculated by taking a deduct value from 100.
- The surveys will be conducted before and after the construction phase, and the difference in condition will be assessed.
- For structural condition, it is recommended that Falling Weight Deflectometer surveys are completed at 500 meter centres in each lane before and after the construction phase.
- Any construction history and maintenance history on the highway would be beneficial to calculate existing pavement depth and assist in the calculation of any over lay treatments going forward.

This information will be included in the TIA using tables and text to describe the process, the observations, and the recommendations.



## 9 References

Highway Capacity Manual (HCM). 2010. Transportation Research Board (TRB) of the National Academies. Washington, D.C.

ITE. 2012. Trip Generation Manual, 9<sup>th</sup> Edition. Institute of Transportation Engineers, Washington, DC.

KGHM Ajax Mining Inc. 2013. Application Information Requirements / Environmental Impact Statement Guidelines for the KGHM Ajax Mining Inc. Application for an Environmental Assessment / Environmental Impact Statement for Comprehensive Study. KGHM International Inc., Kamloops, BC.

Statistics Canada. 2011. National Household Survey Profile, Kamloops, CY, British Columbia, 2011. Cited February 11, 2015. Accessed from:  
<http://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=5933042&Data=Count&SearchText=kamloops&SearchType=Begins&SearchPR=01&A1=All&B1=All&Custom=&TABID=1>

Traffic Impact Assessment, Proposed Ajax Mine Project. 2013. Opus International Consultants (Canada) Limited 2012. Kelowna, BC



# **Appendix B**

## **Conceptual Designs**

# **Inks Lake Interchange Concept Designs**

**GENERAL NOTES:**  
 -THIS IS A CONCEPT DRAWING. DETAILED ROAD GEOMETRY WILL BE DETERMINED IN PRELIMINARY AND DETAILED DESIGN AND WILL REQUIRE A TOPO/LEGAL SURVEY.  
 -GEOMETRIC IMPROVEMENTS, AND ACCESS TO MINE ACCESS ROAD, VIA EXISTING INKS LAKE ROAD INTERCHANGE.  
 -ALL NEW ROAD IS TO BE PAVED.

MINE ACCESS ROAD TO BECOME PUBLIC ROAD EAST OF THIS POINT



300 mm  
150 mm  
90 mm  
20 mm  
10 mm  
0

**INTERCHANGE RAMP NOTES:**  
 -ALL DESIGNS ARE CONCEPTUAL STAGE.  
 -ALL RAMPS TO BE SINGLE LANE OF 4.8 m WIDTH AND PARALLEL DESIGN TYPE AND ARE DESIGNED TO MID-UPPER LEVEL IN TAC STANDARDS TO ACCOUNT FOR HIGHER VOLUME TRUCK TRAFFIC.  
 -OFF-RAMPS ARE DESIGNED WITH A 130 km/h HIGHWAY DESIGN SPEED AND 70 km/h CONTROL CURVE DESIGN SPEED.  
 -ON-RAMPS ARE DESIGNED WITH A 130 km/h HIGHWAY DESIGN SPEED AND 60 km/h CONTROL CURVE DESIGN SPEED.  
 -GRADE WILL AFFECT LENGTH OF ACCELERATION/DECELERATION LANES. TO BE DETERMINED AT DETAIL DESIGN STAGE.  
 -RAMP (A) MEETS TAC STANDARD. CONTROL CURVE NEEDS TO BE 190 m, DECELERATION LENGTH NEEDS TO BE IN RANGE OF 250-385 m.  
 -RAMP (B) MEETS TAC STANDARD. ACCELERATION LENGTH NEEDS TO BE IN RANGE OF 500-845 m, 680 m MEETS STANDARD.  
 -RAMP (C) MEETS TAC STANDARD.  
 -RAMP (D) MEETS TAC STANDARD.

**DETAILED NOTES:**  
 1 -MAXIMUM ROAD GRADES TO BE 6% AS PER TAC FOR AN RCU IN ROLLING TERRAIN, (TYPICAL)  
 2 -ALL NEW INTERSECTION CORNERS TO BE SUFFICIENT GEOMETRY TO ACCOMMODATE TAC WB-20 VEHICLE (TYPICAL).  
 3 -ROADWAY TO BE 2, 3.6 m LANES WITH 1.5 m PAVED SHOULDERS AS PER BCMoT SUPPLEMENT TO TAC FOR A RURAL COLLECTOR UNDIVIDED HIGHWAY (RCU) (TYPICAL) AND HAS DESIGN SPEED OF 60 km/h.

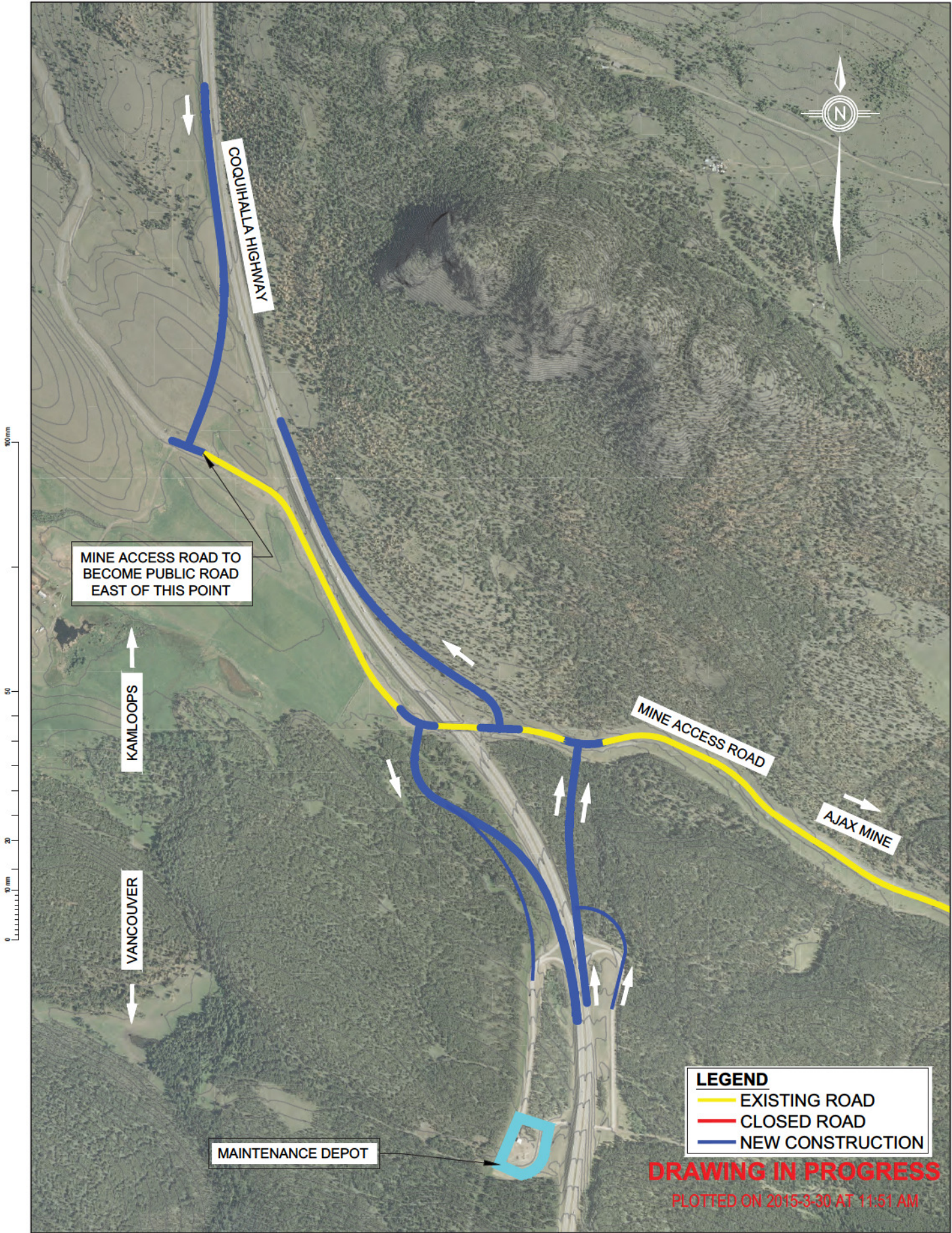
**LEGEND**  
 -EXISTING ROAD (Yellow line)  
 -CLOSED ROAD (Red line)  
 -NEW CONSTRUCTION (Blue line)

MAINTENANCE DEPOT

**DRAWING IN PROGRESS**  
 PLOTTED ON 2015-3-30 AT 10:42 AM

<p><b>CONCEPT DRAWING</b></p>		<p>Victoria Office +1 250 952 5640</p>	<p>Suite 310, 1207 Douglas St Victoria BC V8W 2E7 Canada</p>		<p>Sheet</p>	
			<p>Project No. H-90434.01</p>		<p>Sheet No. 02</p>	<p>Revision 01</p>
<p>Revision 01 DRAFT FOR REVIEW</p>		<p>Approved Date: BT MAR 2015</p>	<p>Designed: SERGE LEVESQUE</p>	<p>Approved: BARBARA THOMAS</p>	<p>Approved Date: MAR 2015</p>	
			<p>Drawn: MICHAEL BAILEY</p>	<p>Scales: 1:10000</p>	<p>Project No. H-90434.01</p>	
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AJAX MINES TIA  
 ACCESS TO HIGHWAY 5  
 OPTION 2  
 ALL NEW RAMPS AND CONNECTORS



**LEGEND**  
 — EXISTING ROAD  
 — CLOSED ROAD  
 — NEW CONSTRUCTION

**DRAWING IN PROGRESS**  
 PLOTTED ON 2015-3-30 AT 11:51 AM

**CONCEPT  
DRAWING**

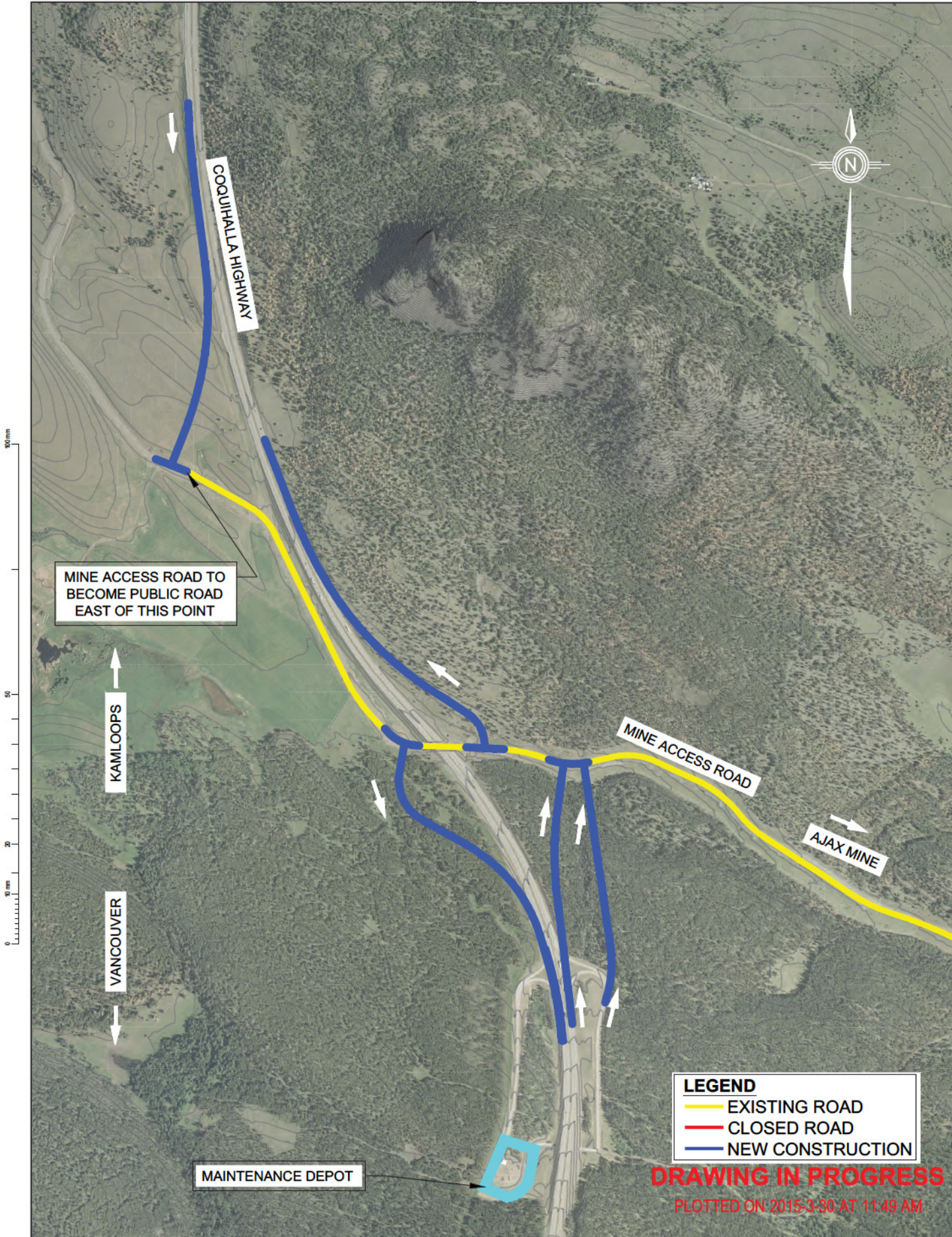


Suite 310, 1207 Douglas St  
 Victoria BC V8W 2E7  
 Canada

**AJAX MINES TIA  
ACCESS TO HIGHWAY 5**

Sheet  
**OPTION 3  
ALL NEW RAMPS (DIAMOND INTERCHANGE)**

Revision	Amendment	Approved	Date	Designed	Approved	Approved Date	Project No.	Sheet No.	Revision
01	DRAFT FOR REVIEW	BT	MAR 2015	SERGE LEVESQUE	BARBARA THOMAS	MAR 2015	H-90434.01	03	01
				MICHAEL BAILEY		1:15000			



**CONCEPT  
DRAWING**



Suite 310, 1207 Douglas St  
Victoria BC V8W 2E7  
Canada

AJAX MINES TIA  
ACCESS TO HIGHWAY 5

Sheet  
**OPTION 4**  
**ALL NEW RAMPS (DIAMOND INTERCHANGE)**

Revision	Amendment	Approved	Date	Designed	Approved	Approved Date	Project No.	Sheet No.	Revision
01	DRAFT FOR REVIEW	BT	MAR 2015	SERGE LEVESQUE	BARBARA THOMAS	MAR 2015	H-90434.01	04	01
				Drawn	Scale				
				MICHAEL BAILEY	1:15000				



MINE ACCESS ROAD TO BECOME PUBLIC ROAD EAST OF THIS POINT

MINE ACCESS ROAD

AJAX MINE

KAMLOOOPS

VANCOUVER

MAINTENANCE DEPOT

COQUIHALLA HIGHWAY

**LEGEND**

- EXISTING ROAD
- CLOSED ROAD
- NEW CONSTRUCTION

**DRAWING IN PROGRESS**

PLOTTED ON 2015-3-30 AT 1:31 PM

**CONCEPT DRAWING**



Victoria Office  
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Victoria BC V8W 2E7  
Canada

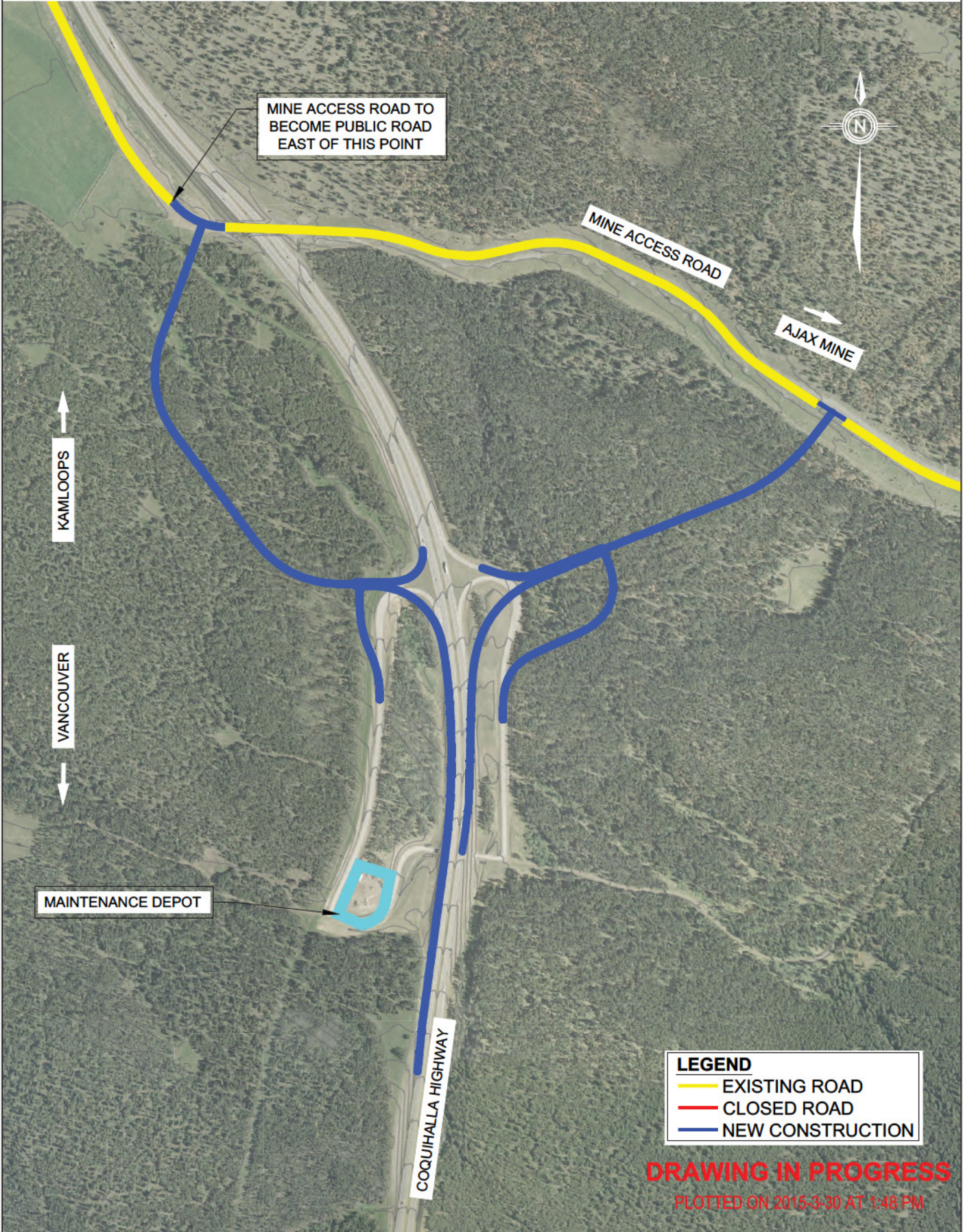
AJAX MINES TIA  
ACCESS TO HIGHWAY 5

Sheet  
**OPTION 5  
NEW CONNECTORS**

Revision	Amendment	Approved	Date	Designed	Approved	Approved Date	Project No.	Sheet No.	Revision
01	DRAFT FOR REVIEW	BT	MAR 2015	SERGE LEVESQUE	BARBARA THOMAS	MAR 2015	H-90434.01	05	01
				MICHAEL BAILEY		1:10000			



300 mm  
100 mm  
50 mm  
20 mm  
10 mm  
0



LEGEND	
<span style="color: yellow;">—</span>	EXISTING ROAD
<span style="color: red;">—</span>	CLOSED ROAD
<span style="color: blue;">—</span>	NEW CONSTRUCTION

**DRAWING IN PROGRESS**  
PLOTTED ON 2015-3-30 AT 1:48 PM

<h1>CONCEPT DRAWING</h1>		<b>OPUS</b> Victoria Office +1 250 952 5640		Suite 310, 1207 Douglas St Victoria BC V8W 2E7 Canada		AJAX MINES TIA ACCESS TO HIGHWAY 5 Sheet																					
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Revision	Amendment	Approved	Date																								
01	DRAFT FOR REVIEW	BT	MAR 2015																								
Designed	Approved	Approved Date																									
SERGE LEVESQUE	BARBARA THOMAS	MAR 2015																									
Drawn		Scales																									
MICHAEL BAILEY		1:10000																									



MINE ACCESS ROAD TO BECOME PUBLIC ROAD EAST OF THIS POINT

MINE ACCESS ROAD

→ AJAX MINE

↑ KAMLOOPS

↓ VANCOUVER

UNDERPASS TO BE MANAGED BY TRAFFIC SIGNALS OR A WIDENED CULVERT

MAINTENANCE DEPOT

COQUIHALLA HIGHWAY

**LEGEND**

- EXISTING ROAD
- CLOSED ROAD
- NEW CONSTRUCTION

**DRAWING IN PROGRESS**  
 PLOTTED ON 2015-3-30 AT 2:12 PM

**CONCEPT DRAWING**



Victoria Office  
 +1 250 952 5640

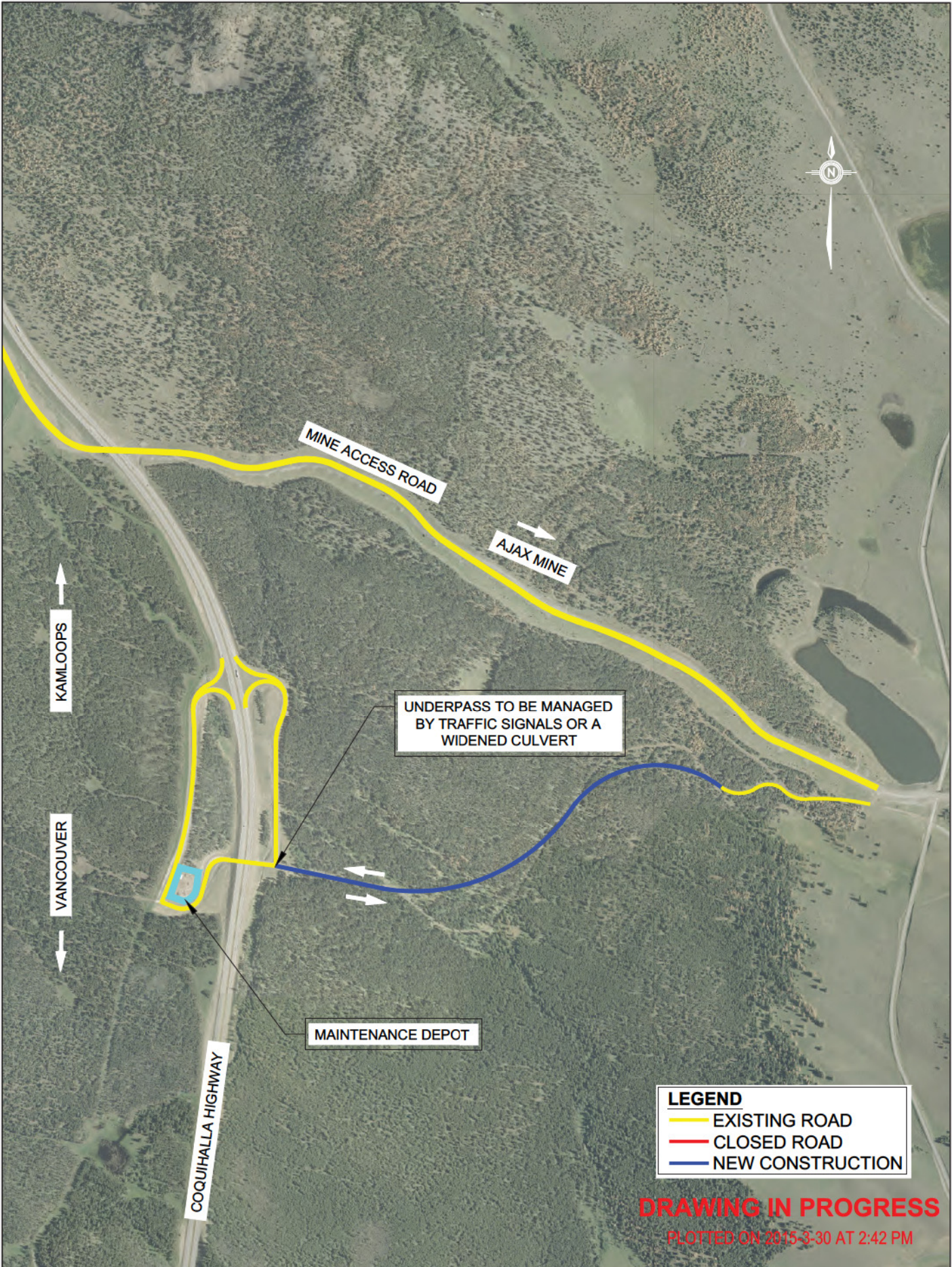
Suite 310, 1207 Douglas St  
 Victoria BC V8W 2E7  
 Canada

AJAX MINES TIA  
 ACCESS TO HIGHWAY 5

Sheet  
**OPTION 7**  
**ADD WIDER CULVERT**

Revision	Amendment	Approved	Date	Designed	Approved	Approved Date
01	DRAFT FOR REVIEW	BT	MAR 2015	KEVIN COLEMAN	BARBARA THOMAS	MAR 2015
				Drawn	Scales	
				MICHAEL BAILEY	1:10000	

Project No.	Sheet No.	Revision
H-90434.01	07	01



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PLOTTED ON 2015-3-30 AT 2:42 PM

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						<p>Sheet</p> <p><b>OPTION 8 NEW INKS LAKE ROAD</b></p>	
Revision	Amendment	Approved	Date	Designed	Approved	Approved Date	Project No.
01	DRAFT FOR REVIEW	BT	MAR 2015	LINDSAY MCCAULEY	BARBARA THOMAS	MAR 2015	H-90434.01
				Drawn	Scale		
				MICHAEL BAILEY	1:15000		
						Sheet No.	Revision
						08	01

**Lac Le Jeune Road and Mine Access  
Road Intersection  
Concept Designs**

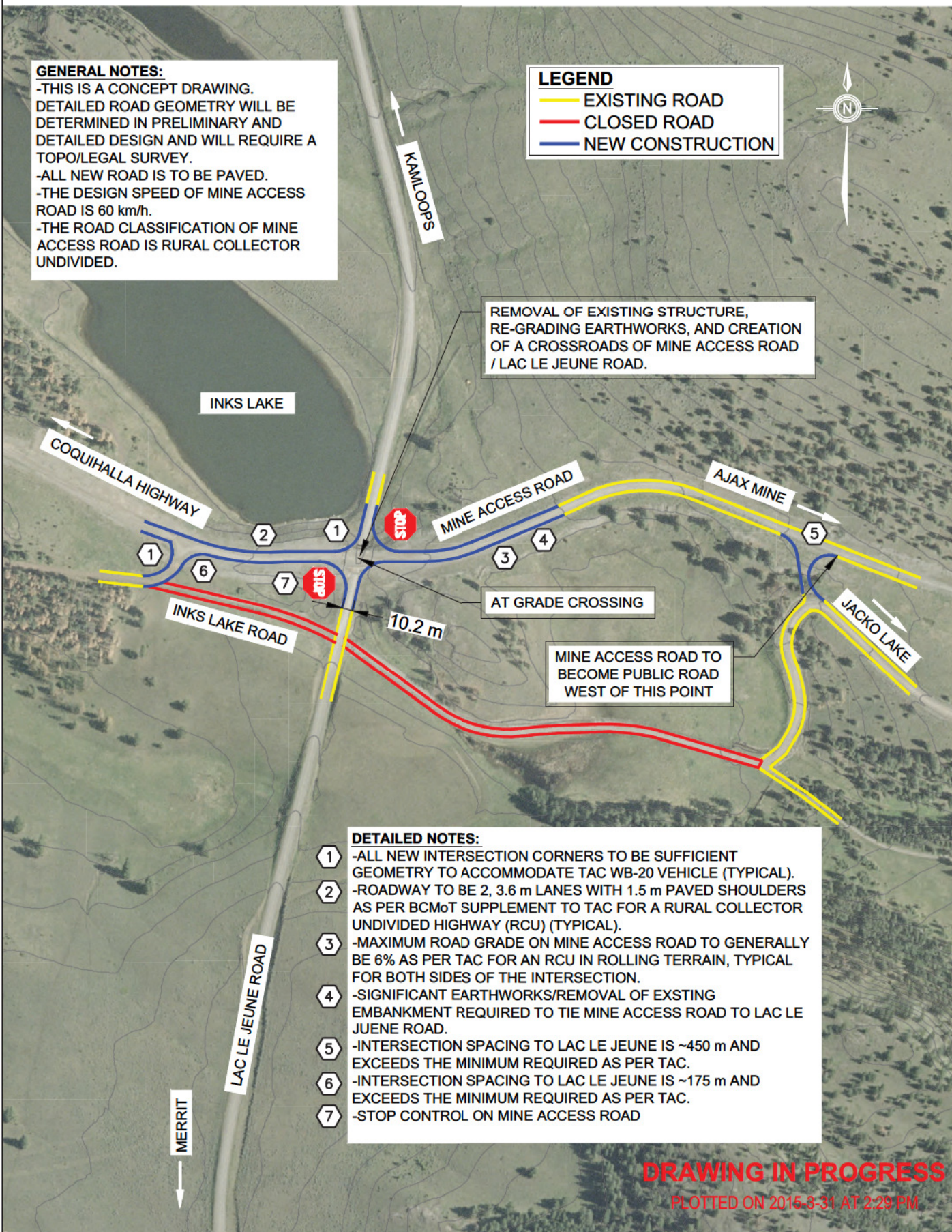
**GENERAL NOTES:**  
 -THIS IS A CONCEPT DRAWING. DETAILED ROAD GEOMETRY WILL BE DETERMINED IN PRELIMINARY AND DETAILED DESIGN AND WILL REQUIRE A TOPO/LEGAL SURVEY.  
 -ALL NEW ROAD IS TO BE PAVED.  
 -THE DESIGN SPEED OF MINE ACCESS ROAD IS 60 km/h.  
 -THE ROAD CLASSIFICATION OF MINE ACCESS ROAD IS RURAL COLLECTOR UNDIVIDED.

**LEGEND**  
 — EXISTING ROAD  
 — CLOSED ROAD  
 — NEW CONSTRUCTION



REMOVAL OF EXISTING STRUCTURE, RE-GRADING EARTHWORKS, AND CREATION OF A CROSSROADS OF MINE ACCESS ROAD / LAC LE JEUNE ROAD.

300 mm  
100 mm  
50 mm  
20 mm  
10 mm  
0



**DETAILED NOTES:**

- 1 -ALL NEW INTERSECTION CORNERS TO BE SUFFICIENT GEOMETRY TO ACCOMMODATE TAC WB-20 VEHICLE (TYPICAL).
- 2 -ROADWAY TO BE 2, 3.6 m LANES WITH 1.5 m PAVED SHOULDERS AS PER BCMoT SUPPLEMENT TO TAC FOR A RURAL COLLECTOR UNDIVIDED HIGHWAY (RCU) (TYPICAL).
- 3 -MAXIMUM ROAD GRADE ON MINE ACCESS ROAD TO GENERALLY BE 6% AS PER TAC FOR AN RCU IN ROLLING TERRAIN, TYPICAL FOR BOTH SIDES OF THE INTERSECTION.
- 4 -SIGNIFICANT EARTHWORKS/REMOVAL OF EXSTING EMBANKMENT REQUIRED TO TIE MINE ACCESS ROAD TO LAC LE JUENE ROAD.
- 5 -INTERSECTION SPACING TO LAC LE JEUNE IS ~450 m AND EXCEEDS THE MINIMUM REQUIRED AS PER TAC.
- 6 -INTERSECTION SPACING TO LAC LE JEUNE IS ~175 m AND EXCEEDS THE MINIMUM REQUIRED AS PER TAC.
- 7 -STOP CONTROL ON MINE ACCESS ROAD

DRAWING IN PROGRESS  
 PLOTTED ON 2015-8-31 AT 2:29 PM

<h1>CONCEPT DRAWING</h1>		<b>OPUS</b> Victoria Office +1 250 952 5640		Suite 310, 1207 Douglas St Victoria BC V8W 2E7 Canada		AJAX MINES TIA MINE ACCESS ROAD / LAC LE JEUNE ROAD Sheet	
Revision	Amendment	Approved	Date	Designed	Approved	Approved Date	<b>OPTION 1</b> <b>SINGLE AT GRADE INTERSECTION (STOP CONTROLLED)</b>
01	DRAFT FOR REVIEW	BT	MAR 2015	MICHAEL BAILEY	BARBARA THOMAS	NOV 2014	Project No.
				Drawn	Scale		Sheet No.
				MICHAEL BAILEY	1:5000		Revision
							01
							01

**GENERAL NOTES:**  
 -THIS IS A CONCEPT DRAWING. DETAILED ROAD GEOMETRY WILL BE DETERMINED IN PRELIMINARY AND DETAILED DESIGN AND WILL REQUIRE A TOPO/LEGAL SURVEY.  
 -ALL NEW ROAD IS TO BE PAVED.  
 -THE DESIGN SPEED OF MINE ACCESS ROAD IS 60 km/h.  
 -THE ROAD CLASSIFICATION OF MINE ACCESS ROAD IS RURAL COLLECTOR UNDIVIDED.  
 -"PREPARE TO STOP AHEAD" SIGNS WILL BE CONSIDERED FOR THE LAC LE JEUNE ROAD INTERSECTION APPROACHES

**DETAILED SIGNALIZATION NOTES:**  
 -SIGNALS RESTING AT GREEN ON LAC LE JEUNE ROAD BUT ADVANCED DETECTION ON MINE ACCESS ROAD TO AVOID STOPPING HAUL TRAFFIC.  
 -SIGNAL DETECTION WIRES LOCATED 200 m FROM LAC LE JEUNE ROAD (LLJR) INTERSECTION ON MINE ACCESS ROAD AND ALLOW FOR A 12 s ADVANCED YELLOW FOR LLJR TRAFFIC ASSUMING A 60 km/h MINE ACCESS ROAD DESIGN SPEED.

REMOVAL OF EXISTING STRUCTURE, RE-GRADING EARTHWORKS, AND CREATION OF A CROSSROADS OF MINE ACCESS ROAD / LAC LE JEUNE ROAD.

AT GRADE CROSSING

MINE ACCESS ROAD TO BECOME PUBLIC ROAD WEST OF THIS POINT

**DETAILED NOTES:**

- 1 -ALL NEW INTERSECTION CORNERS TO BE SUFFICIENT GEOMETRY TO ACCOMMODATE TAC WB-20 VEHICLE (TYPICAL).
- 2 -ROADWAY TO BE 2, 3.6 m LANES WITH 1.5 m PAVED SHOULDERS AS PER BCMoT SUPPLEMENT TO TAC FOR A RURAL COLLECTOR UNDIVIDED HIGHWAY (RCU) (TYPICAL).
- 3 -MAXIMUM ROAD GRADE ON MINE ACCESS ROAD TO BE 6% AS PER TAC FOR AN RCU IN ROLLING TERRAIN, TYPICAL FOR BOTH SIDES OF THE INTERSECTION.
- 4 -SIGNIFICANT EARTHWORKS/REMOVAL OF EXISTING EMBANKMENT REQUIRED TO TIE MINE ACCESS ROAD TO LAC LE JEUNE ROAD.
- 5 -INTERSECTION SPACING TO LAC LE JEUNE IS ~450 m AND EXCEEDS THE MINIMUM REQUIRED AS PER TAC.
- 6 -INTERSECTION SPACING TO LAC LE JEUNE IS ~175 m AND EXCEEDS THE MINIMUM REQUIRED AS PER TAC.
- 7 -SIGNALIZED INTERSECTION

**LEGEND**  
 - EXISTING ROAD (Yellow line)  
 - CLOSED ROAD (Red line)  
 - NEW CONSTRUCTION (Blue line)

**DRAWING IN PROGRESS**  
 PLOTTED ON 2015-6-1 AT 2:07 PM

**CONCEPT DRAWING**



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 +1 250 952 5640  
 Suite 310, 1207 Douglas St  
 Victoria BC V8W 2E7  
 Canada

AJAX MINES TIA  
 MINE ACCESS ROAD / LAC LE JEUNE ROAD

Revision	Amendment	Approved	Date	Designed	Approved	Approved Date	Sheet	Project No.	Sheet No.	Revision
01	DRAFT FOR REVIEW	BT	MAR 2015	MICHAEL BAILEY	BARBARA THOMAS	NOV 2014	OPTION 2 SINGLE AT GRADE INTERSECTION (SIGNALIZED)	H-90434.01	02	01
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				MICHAEL BAILEY	1:5000					

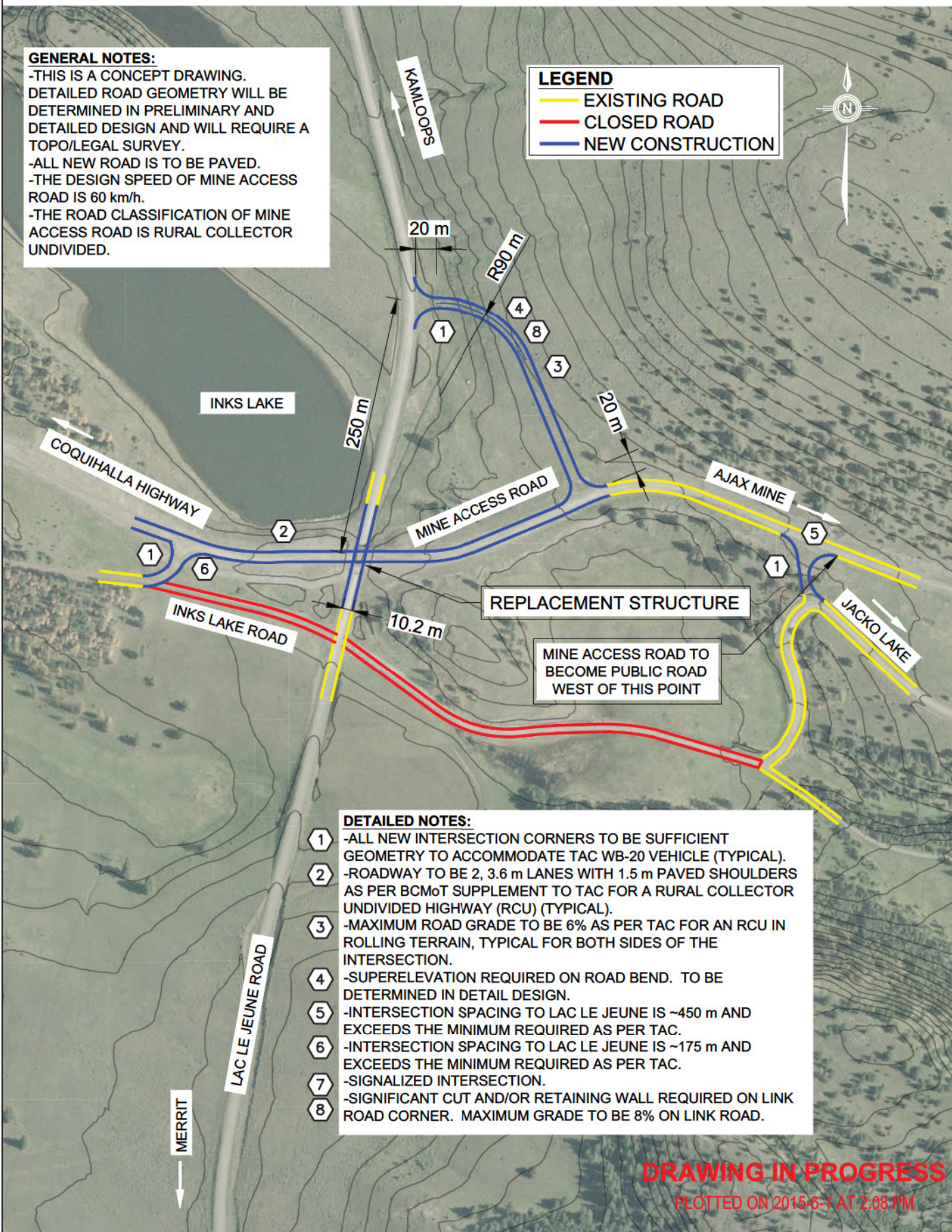
**GENERAL NOTES:**  
 -THIS IS A CONCEPT DRAWING.  
 DETAILED ROAD GEOMETRY WILL BE DETERMINED IN PRELIMINARY AND DETAILED DESIGN AND WILL REQUIRE A TOPO/LEGAL SURVEY.  
 -ALL NEW ROAD IS TO BE PAVED.  
 -THE DESIGN SPEED OF MINE ACCESS ROAD IS 60 km/h.  
 -THE ROAD CLASSIFICATION OF MINE ACCESS ROAD IS RURAL COLLECTOR UNDIVIDED.

**LEGEND**

- EXISTING ROAD
- CLOSED ROAD
- NEW CONSTRUCTION



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MINE ACCESS ROAD TO BECOME PUBLIC ROAD WEST OF THIS POINT

**DETAILED NOTES:**

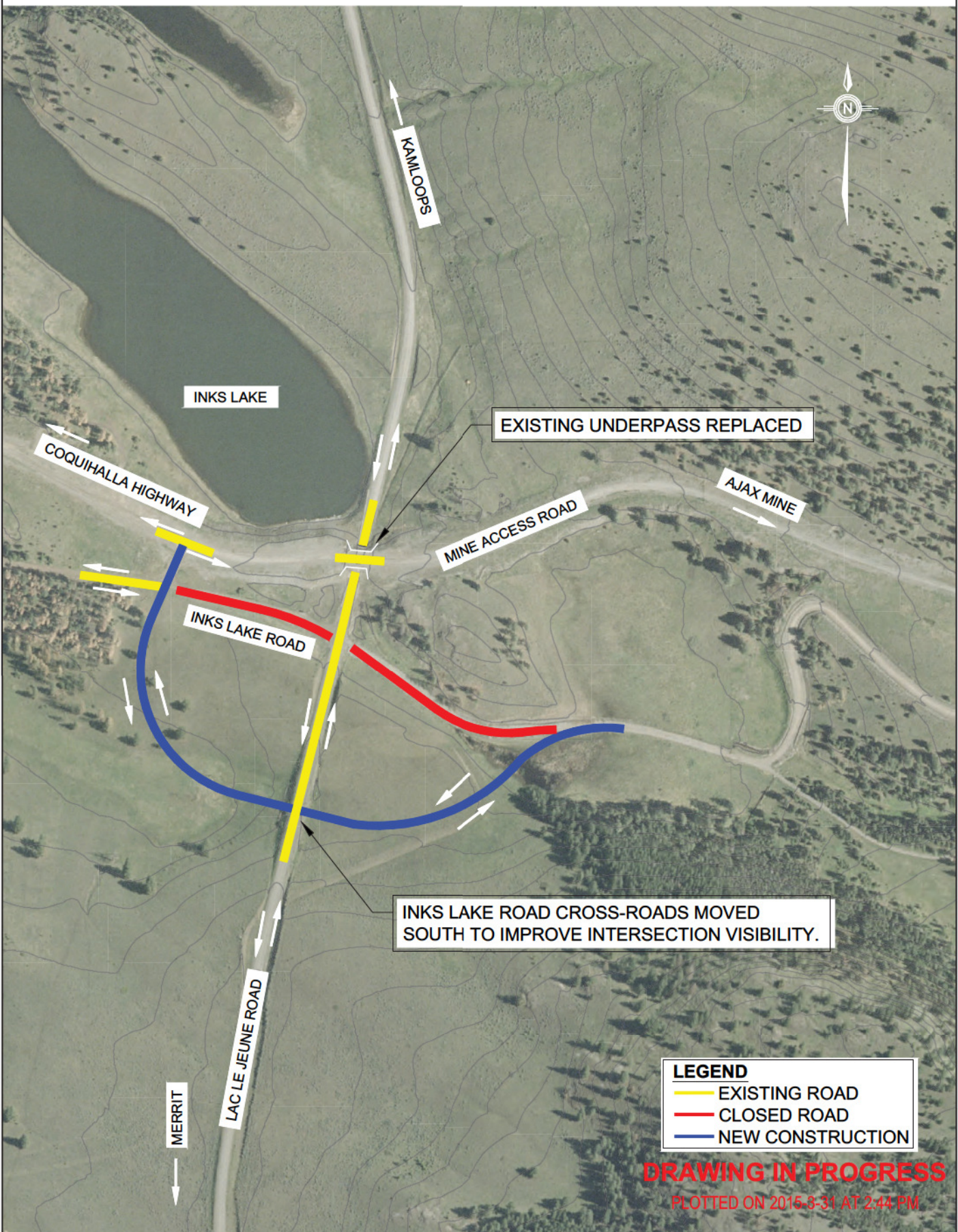
- ① -ALL NEW INTERSECTION CORNERS TO BE SUFFICIENT GEOMETRY TO ACCOMMODATE TAC WB-20 VEHICLE (TYPICAL).
- ② -ROADWAY TO BE 2, 3.6 m LANES WITH 1.5 m PAVED SHOULDERS AS PER BCMoT SUPPLEMENT TO TAC FOR A RURAL COLLECTOR UNDIVIDED HIGHWAY (RCU) (TYPICAL).
- ③ -MAXIMUM ROAD GRADE TO BE 6% AS PER TAC FOR AN RCU IN ROLLING TERRAIN, TYPICAL FOR BOTH SIDES OF THE INTERSECTION.
- ④ -SUPERELEVATION REQUIRED ON ROAD BEND. TO BE DETERMINED IN DETAIL DESIGN.
- ⑤ -INTERSECTION SPACING TO LAC LE JEUNE IS ~450 m AND EXCEEDS THE MINIMUM REQUIRED AS PER TAC.
- ⑥ -INTERSECTION SPACING TO LAC LE JEUNE IS ~175 m AND EXCEEDS THE MINIMUM REQUIRED AS PER TAC.
- ⑦ -SIGNALIZED INTERSECTION.
- ⑧ -SIGNIFICANT CUT AND/OR RETAINING WALL REQUIRED ON LINK ROAD CORNER. MAXIMUM GRADE TO BE 8% ON LINK ROAD.

**DRAWING IN PROGRESS**  
 PLOTTED ON 2015-6-1 AT 2:08 PM

<h1>CONCEPT DRAWING</h1>		<b>OPUS</b> Victoria Office +1 250 952 5640		Suite 310, 1207 Douglas St Victoria BC V8W 2E7 Canada		AJAX MINES TIA MINE ACCESS ROAD / LAC LE JEUNE ROAD Sheet																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Revision</th> <th>Amendment</th> <th>Approved</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>DRAFT FOR REVIEW</td> <td>BT</td> <td>MAR 2015</td> </tr> </tbody> </table>		Revision	Amendment	Approved	Date	01	DRAFT FOR REVIEW	BT	MAR 2015	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Designed</th> <th>Approved</th> <th>Approved Date</th> </tr> </thead> <tbody> <tr> <td>MICHAEL BAILEY</td> <td>BARBARA THOMAS</td> <td>NOV 2014</td> </tr> </tbody> </table>		Designed	Approved	Approved Date	MICHAEL BAILEY	BARBARA THOMAS	NOV 2014	OPTION 3 (PREFERRED) NEW STRUCTURE / CONNECT TO LAC LE JEUNE ROAD		Project No. H-90434.01		Sheet No. 03		Revision 01	
Revision	Amendment	Approved	Date																						
01	DRAFT FOR REVIEW	BT	MAR 2015																						
Designed	Approved	Approved Date																							
MICHAEL BAILEY	BARBARA THOMAS	NOV 2014																							



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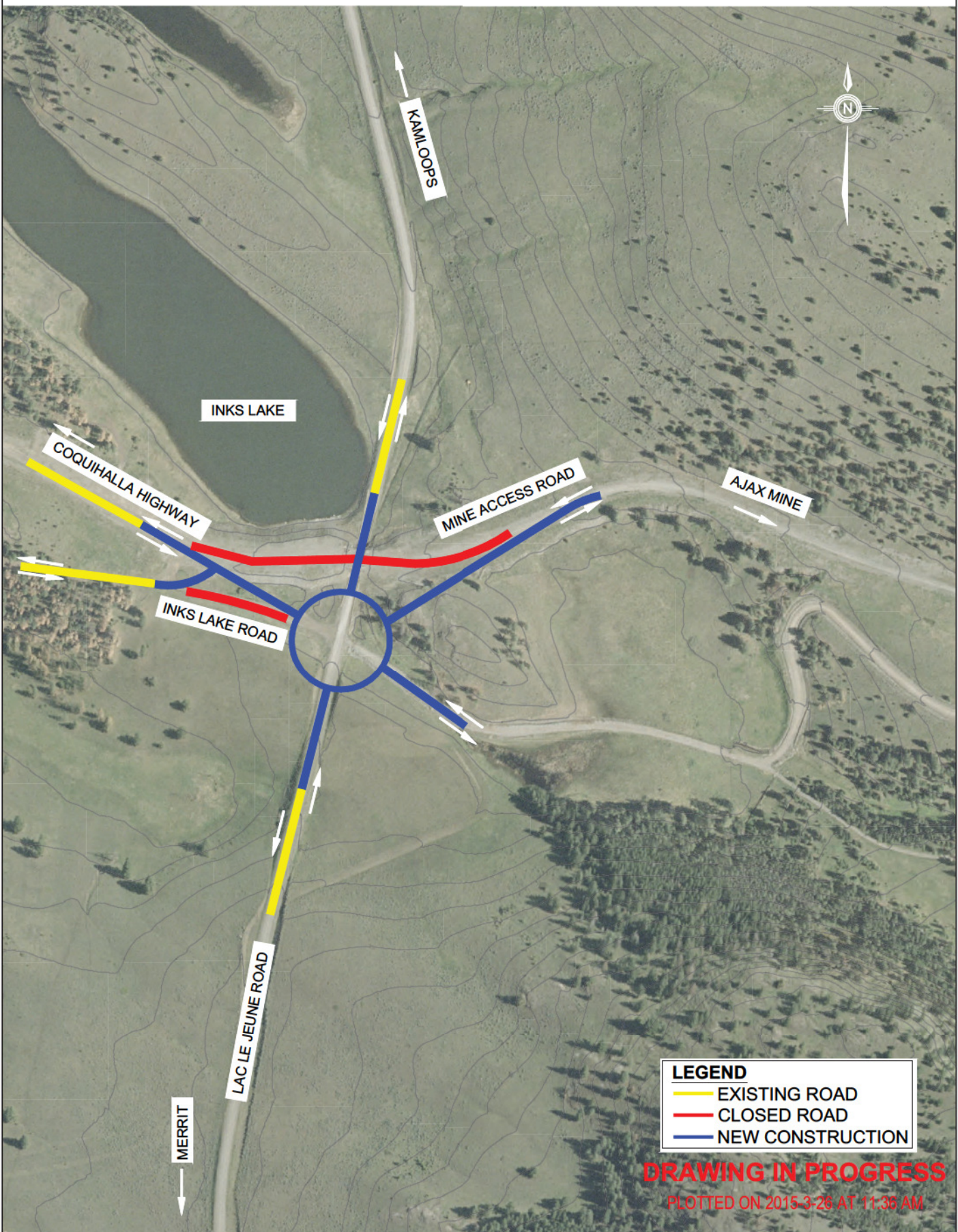
- EXISTING ROAD
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- NEW CONSTRUCTION

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Revision	Amendment	Approved	Date																		
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Designed	Approved	Approved Date																			
MICHAEL BAILEY	BARBARA THOMAS	MAR 2015																			
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**LEGEND**

- EXISTING ROAD
- CLOSED ROAD
- NEW CONSTRUCTION

**DRAWING IN PROGRESS**  
PLOTTED ON 2015-3-26 AT 11:36 AM

**CONCEPT  
DRAWING**



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Canada

AJAX MINES TIA  
MINE ACCESS ROAD / LAC LE JEUNE ROAD

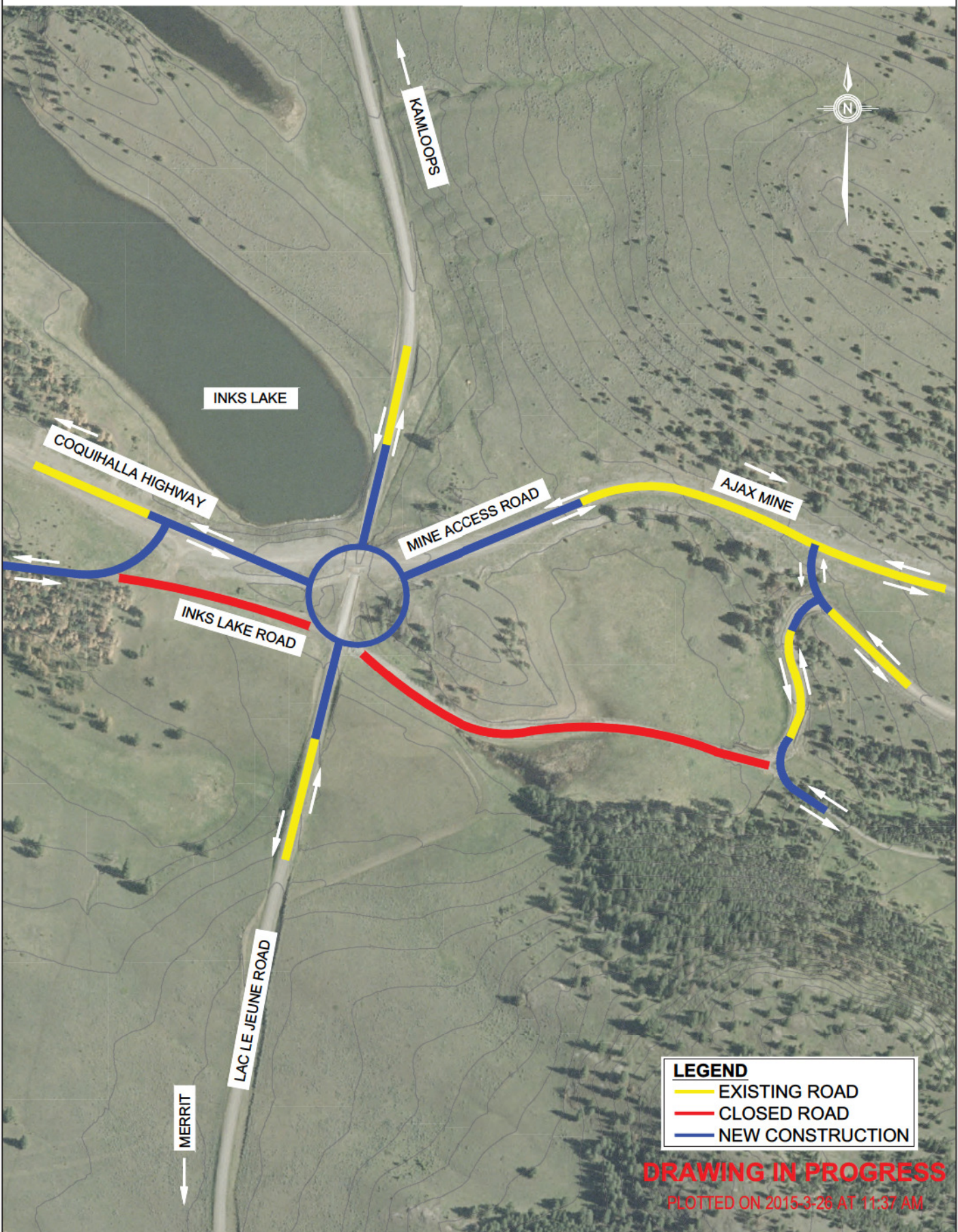
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5-LEG ROUNDABOUT**

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				MICHAEL BAILEY	1:5000	

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**LEGEND**  
 — EXISTING ROAD  
 — CLOSED ROAD  
 — NEW CONSTRUCTION

**DRAWING IN PROGRESS**  
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**CONCEPT  
 DRAWING**



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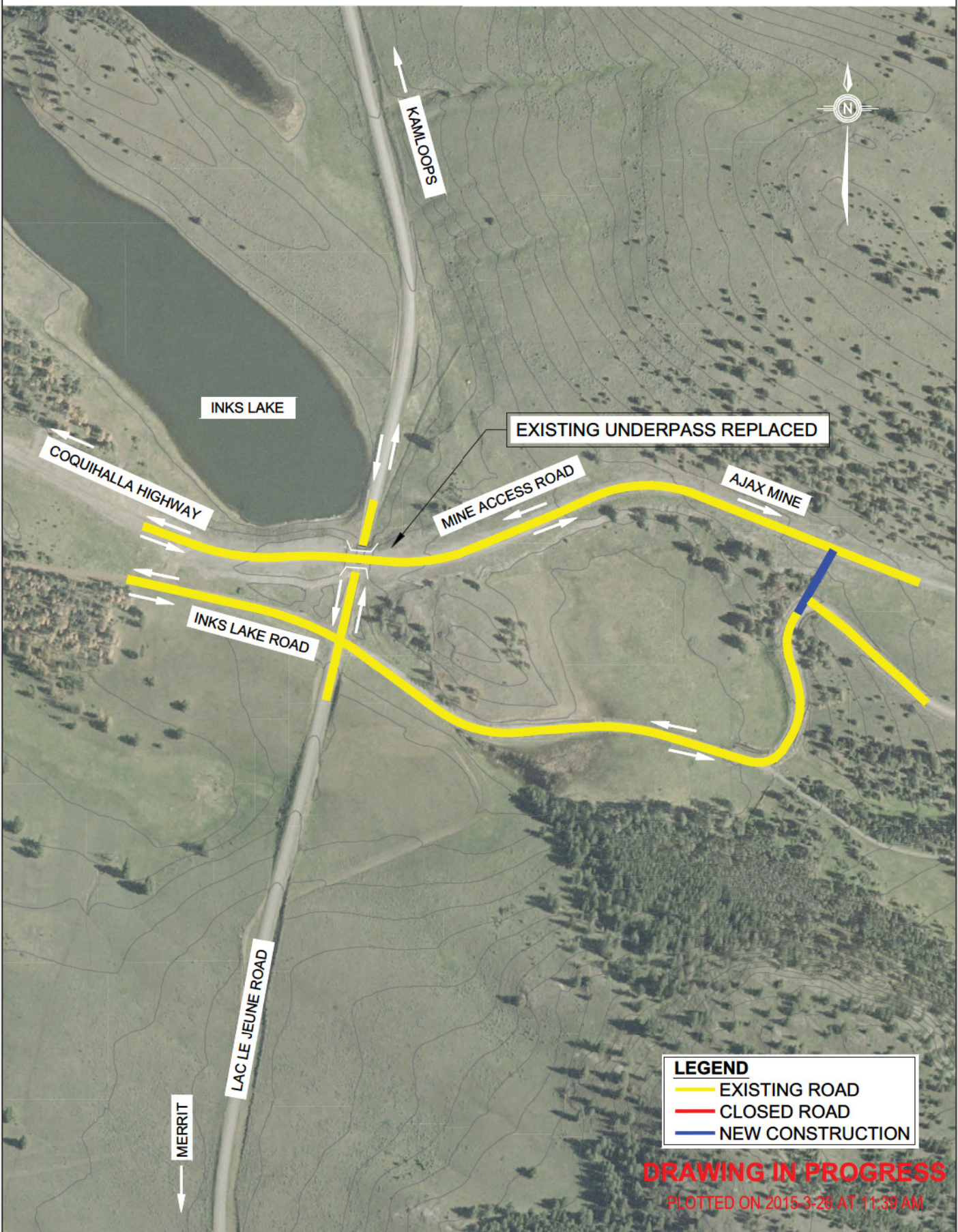
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**OPTION 6  
 4-LEG ROUNDABOUT**

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				Drawn	Scales	
				MICHAEL BAILEY	1:5000	

Project No.	Sheet No.	Revision
H-90434.01	06	01



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**LEGEND**  
 — EXISTING ROAD  
 — CLOSED ROAD  
 — NEW CONSTRUCTION

**DRAWING IN PROGRESS**  
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**AJAX MINES TIA  
 MINE ACCESS ROAD / LAC LE JEUNE ROAD**

Revision	Amendment	Approved	Date	Designed	Approved	Approved Date
01	DRAFT FOR REVIEW	BT	MAR 2015	MICHAEL BAILEY	BARBARA THOMAS	MAR 2015
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				MICHAEL BAILEY	1:5000	

Sheet		
<b>OPTION 7 REPLACING EXISTING / CONNECT TO JACKO LAKE RD</b>		
Project No.	Sheet No.	Revision
H-90434.01	07	01

# **Appendix C**

## **Traffic Input Data and Results**



*KGHMI Ajax Mining Inc.*

---

# Traffic Impact Assessment

## Traffic Input Data and Analysis Results

Prepared By	<u>LINDSAY MCCAULEY, EIT</u> Assistant Transportation Engineer	Opus International Consultants (Canada) Limited Vancouver Office 210-889 Harbourside Drive North Vancouver BC V7P 3S1 Canada
Reviewed By	<u>BARBARA THOMAS, P.ENG.</u> Transportation Engineer	Telephone: +1 604 990 4800 Facsimile: +1 604 990 4805
Approved for Release By	<u>MATTHEW RODWELL, CEng (UK) MICE</u> Project Manager	Date: April 10 2015 Reference: H-90434.01 Status: Draft

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# Traffic Analysis Acronyms

The acronyms used in the traffic analysis section of the document and their unabbreviated titles are listed in the table below:

Acronym	Unabbreviated Title
EBL	Eastbound – Left
EBT	Eastbound – Through
EBR	Eastbound – Right
EBLT	Eastbound – Left/Through
EBTR	Eastbound – Through/Right
EBLTR	Eastbound – Left/Through/Right
EBLTU	Eastbound – Left/Through/U-Turn
WBL	Westbound – Left
WBT	Westbound – Right
WBR	Westbound – Through
WBLT	Westbound – Left/Through
WBTR	Westbound – Through/Right
WBLTR	Westbound – Left/Through/Right
WBTRU	Westbound – Through/Right/U-Turn
NBL	Northbound – Left
NBT	Northbound – Right
NBR	Northbound – Through
NBLT	Northbound – Left/Through
NBTR	Northbound – Through/Right
NBLTR	Northbound – Left/Through/Right
SBL	Southbound – Left
SBT	Southbound – Right
SBR	Southbound – Through
SBLT	Southbound – Left/Through
SBTR	Southbound – Through/Right
SBLTR	Southbound – Left/Through/Right
SBLRU	Southbound – Left/Right/U-Turn

# 1 Background Data

## 1.1 2016 Base Traffic Volumes

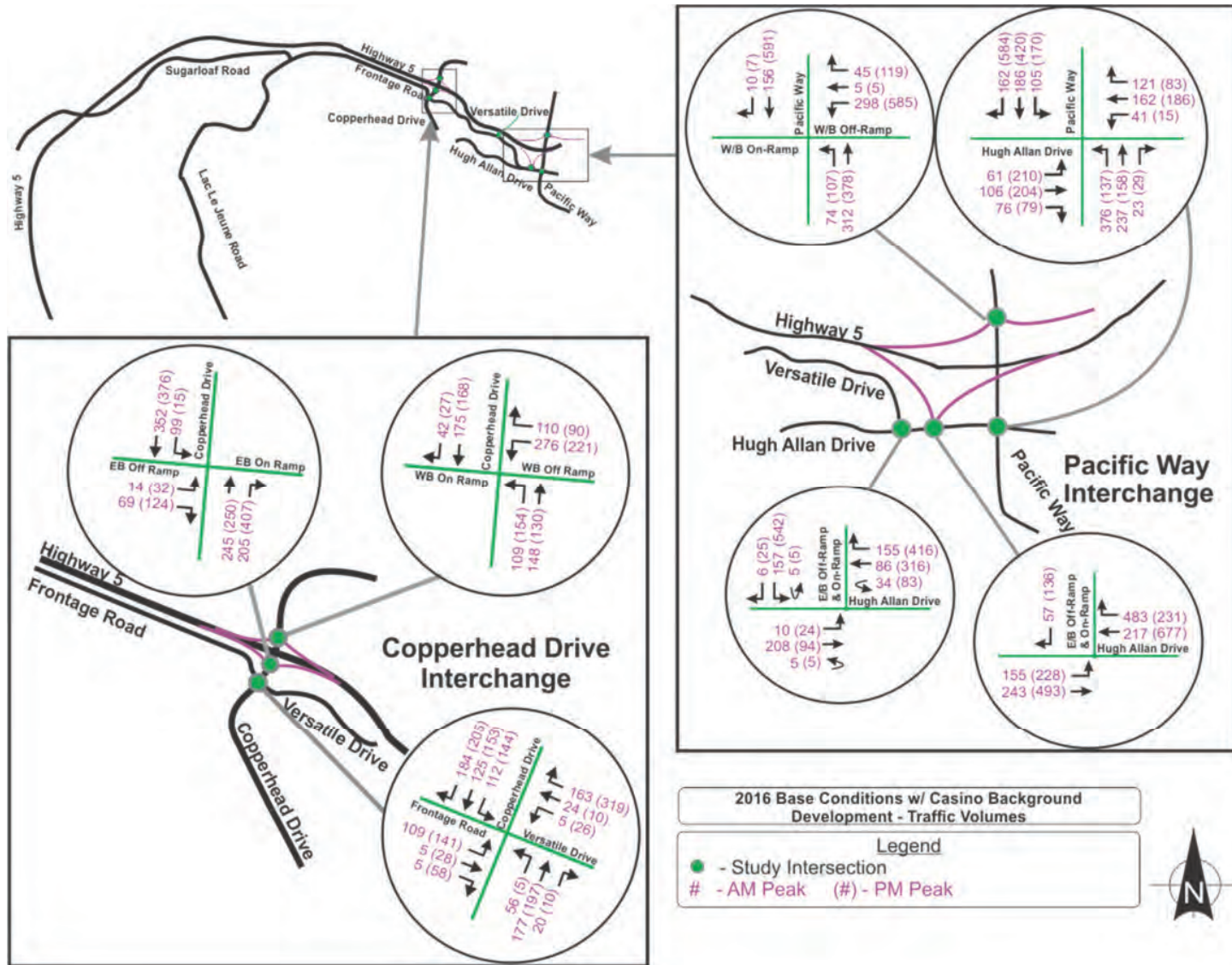


Figure 1: 2016 Base Traffic Volumes – North Intersections

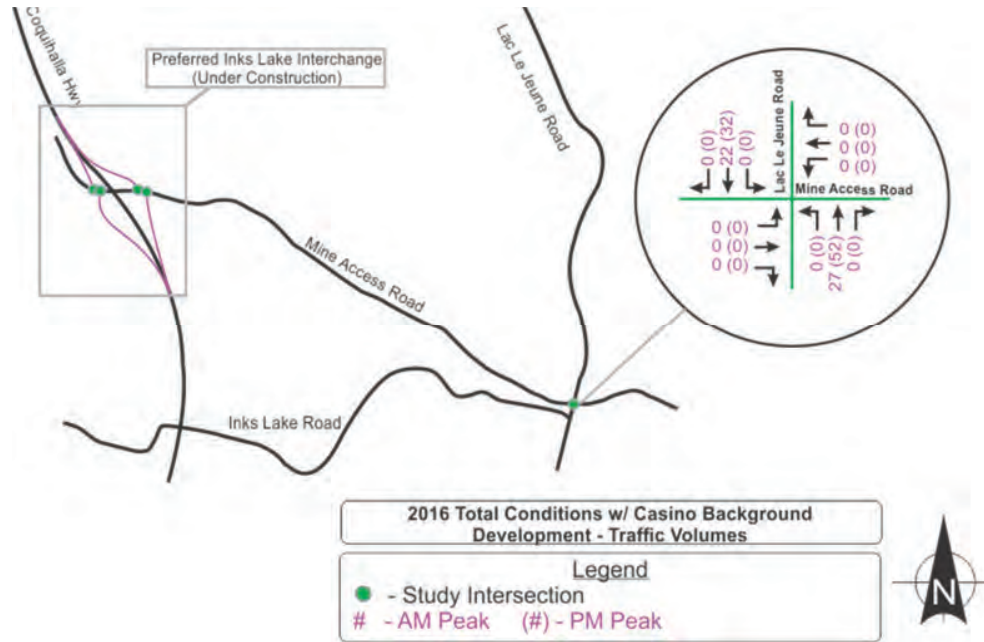


Figure 2: 2016 Base Traffic Volumes – South Intersections

## 1.2 2018 Base Traffic Volumes

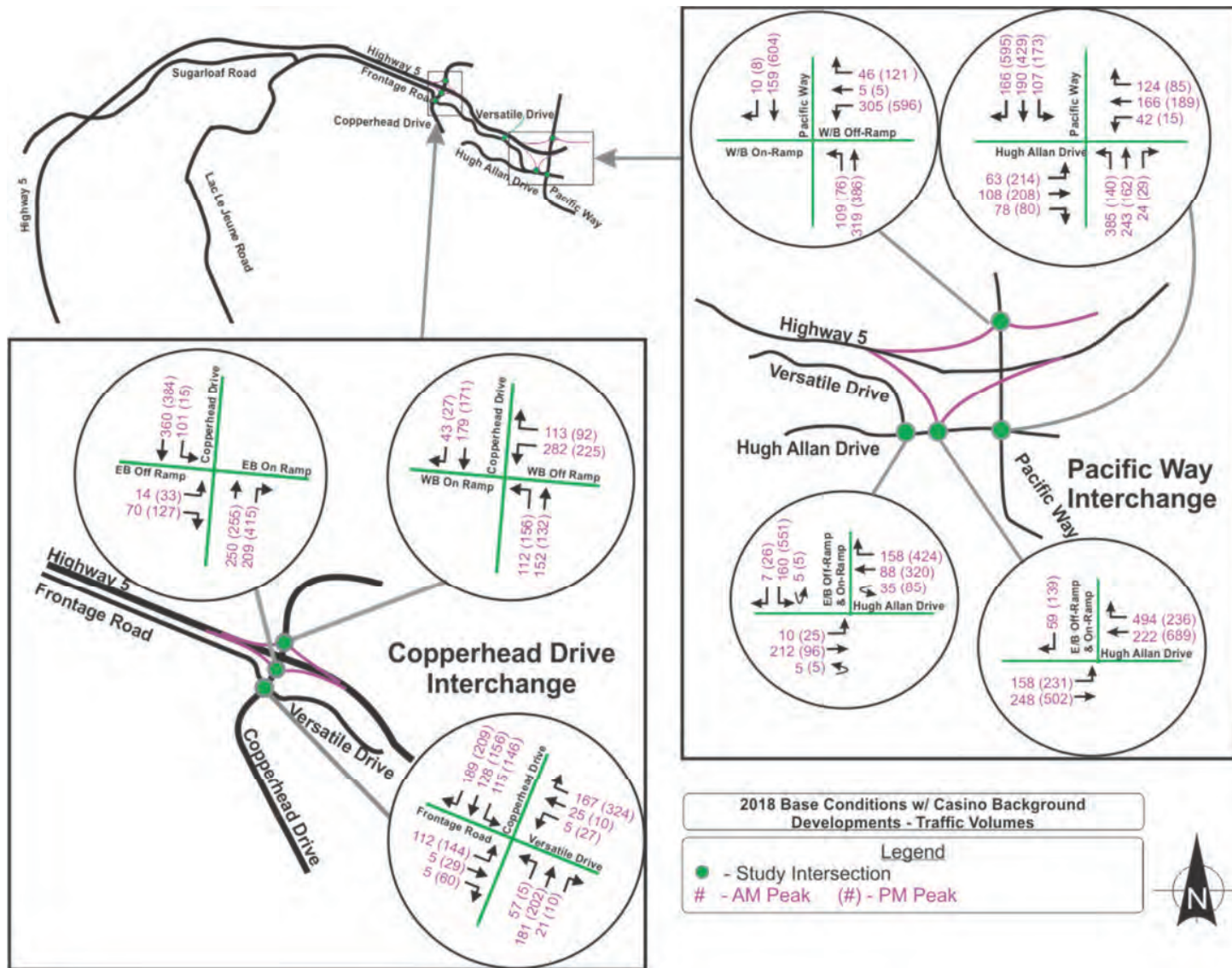


Figure 3: 2018 Base Traffic Volumes – North Intersections

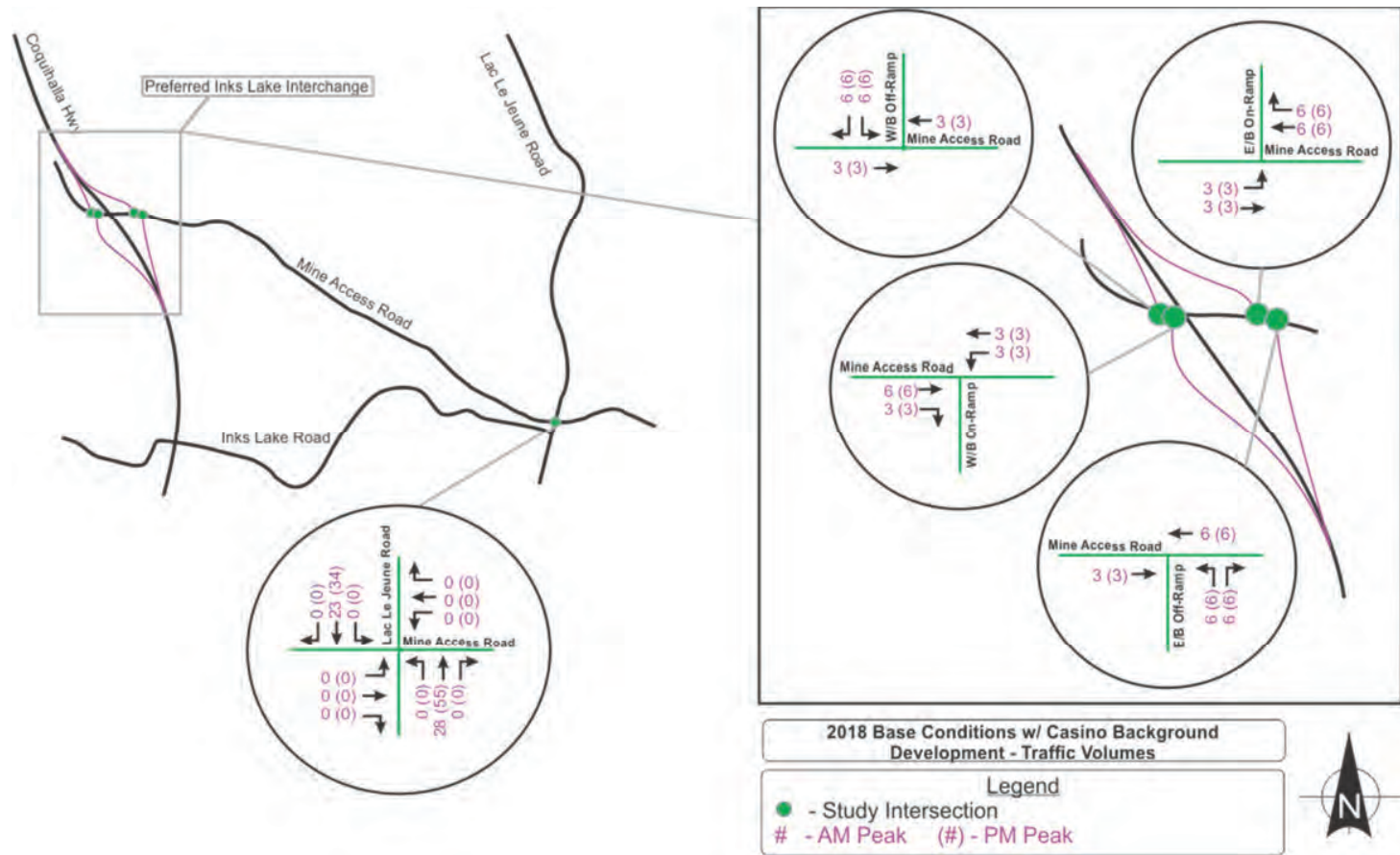


Figure 4: 2018 Base Traffic Volumes – South Intersections

### 1.3 2024 Base Traffic Volumes

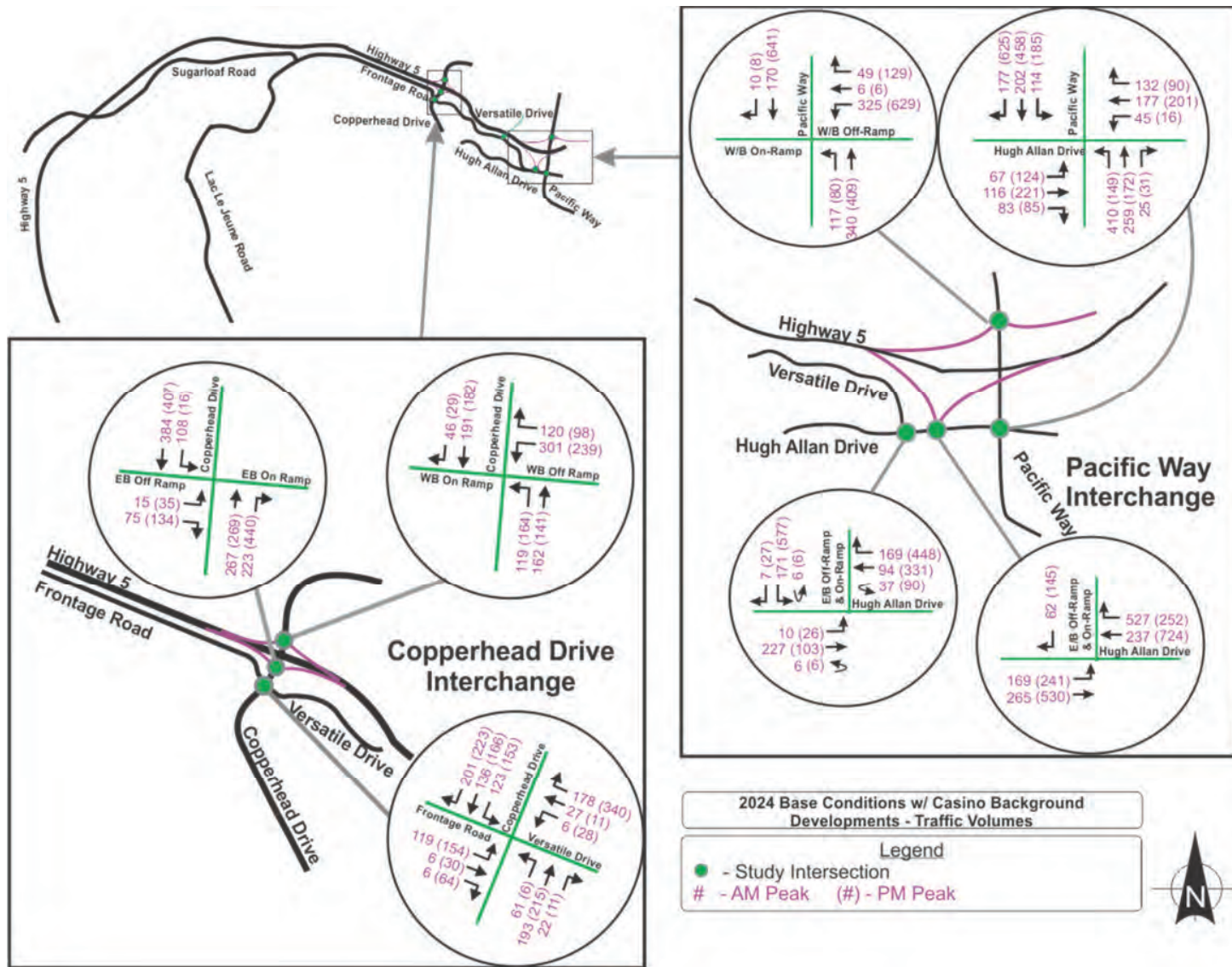


Figure 5: 2024 Base Traffic Volumes – North Intersections

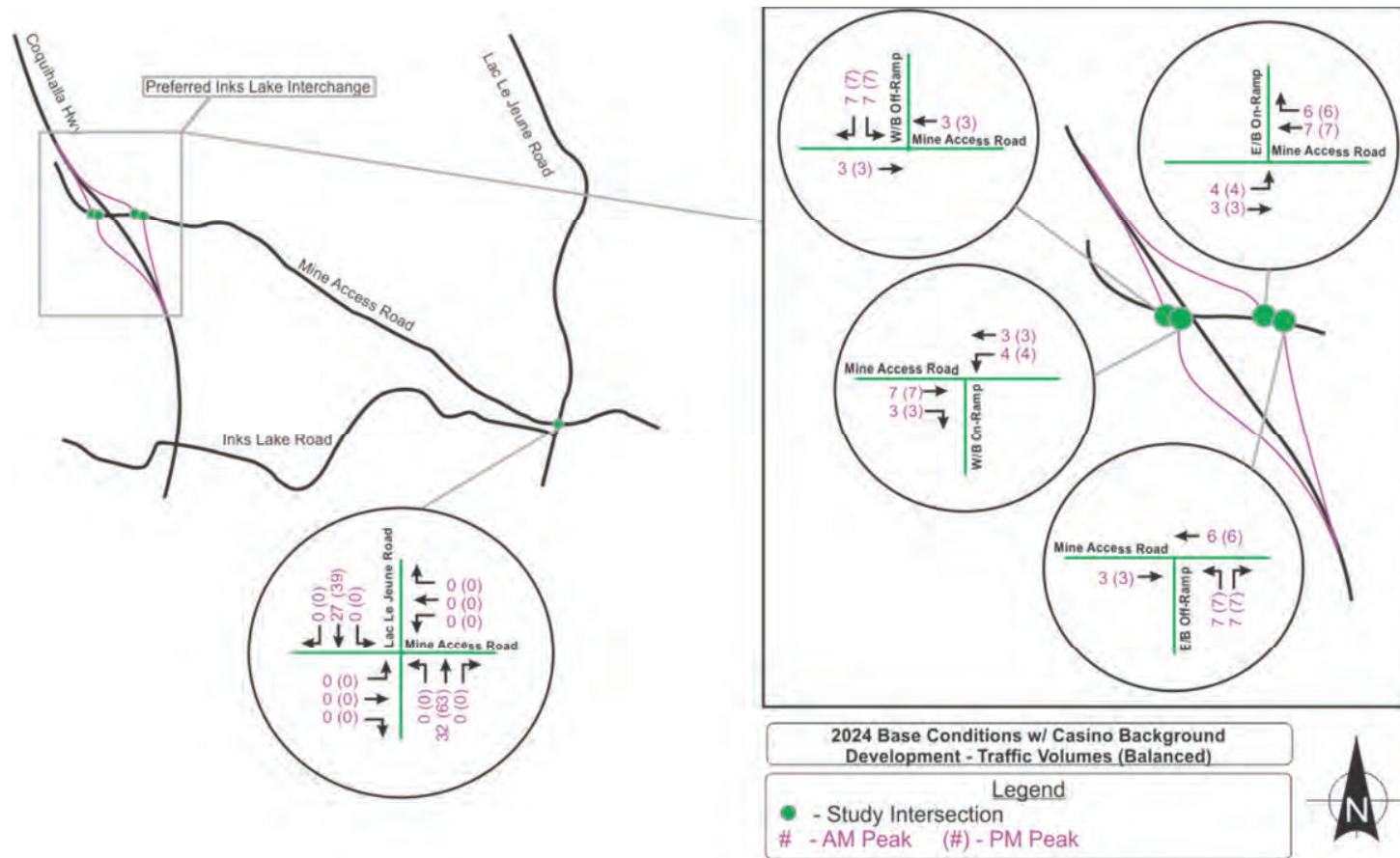


Figure 6: 2024 Base Traffic Volumes – South Intersection

## 1.4 2039 Base Traffic Volumes

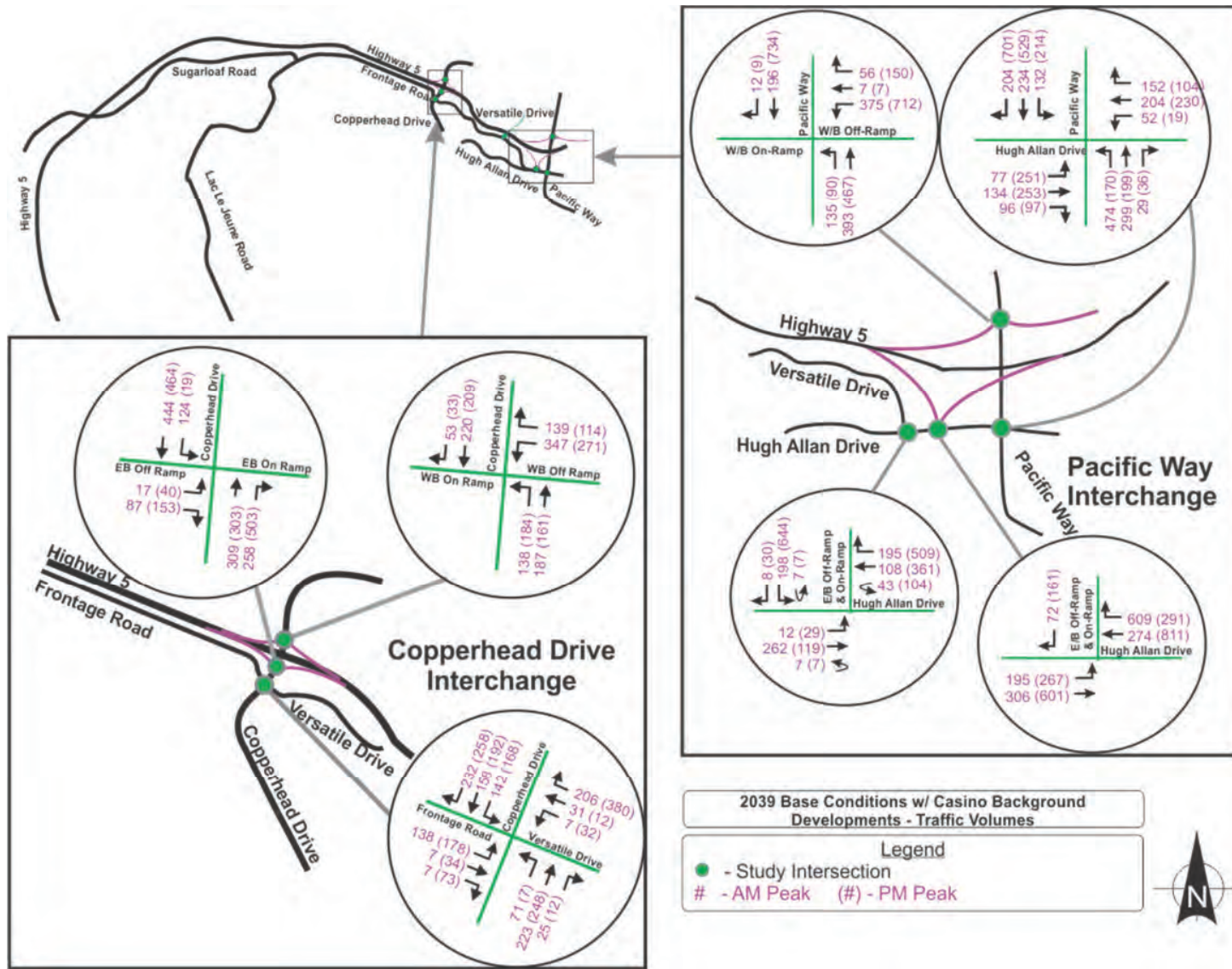


Figure 7: 2039 Base Traffic Volumes – North Intersection

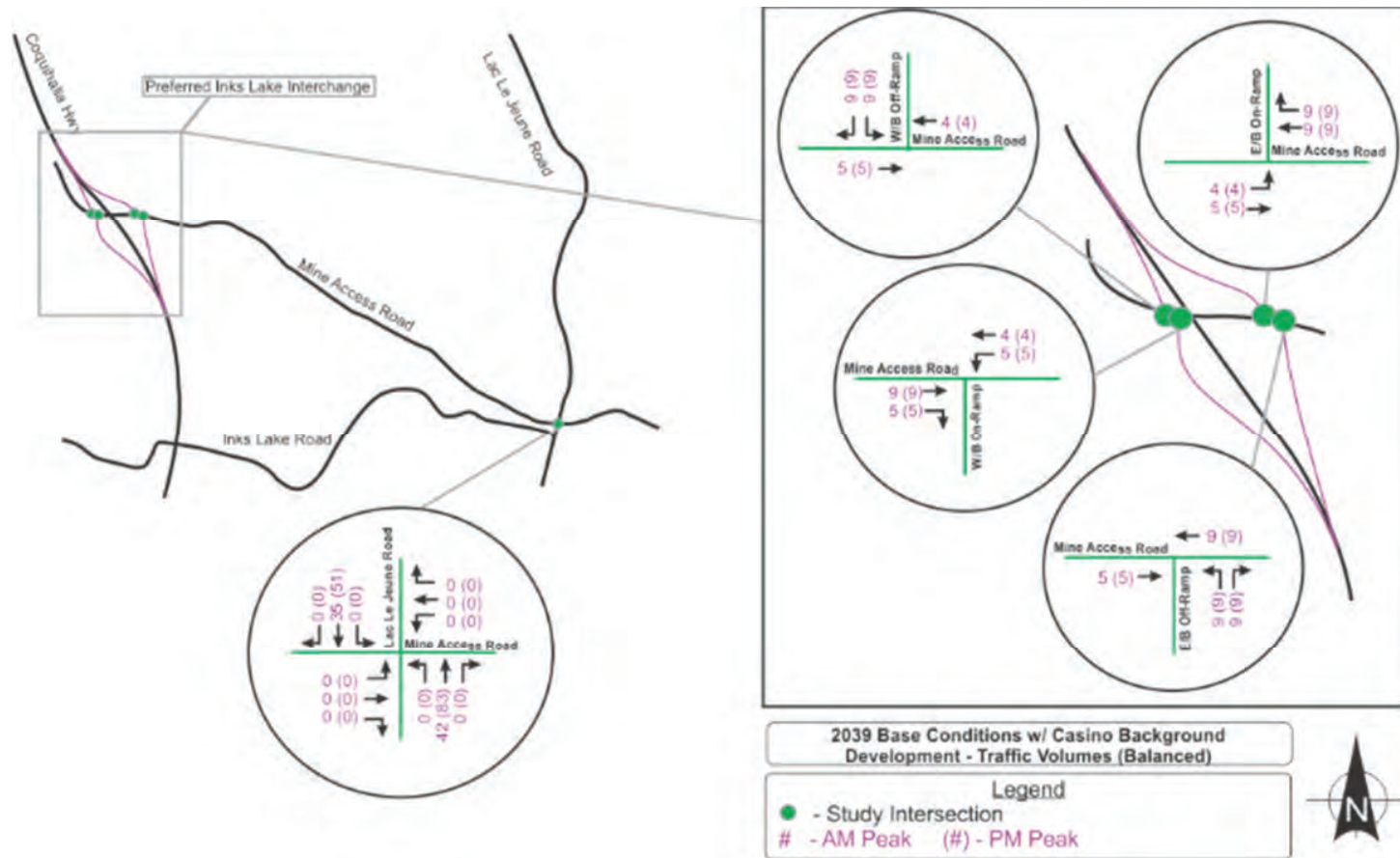


Figure 8: 2039 Base Traffic Volumes – South Intersections

## 2 Construction Phase Conditions (2016 and 2018)

### 2.1 Construction Phasing Plan

Table 1: Estimated Phasing Timeline

Year:	2016		2017				2018				2019	
Quarter:	Prior to Q4	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
<b>Description</b>	EA Submission and Approval of Mine	Mine on-site Construction phase starts	Construction Phase Continues	Construction Ramps Up	Peak Construction Period				Construction Ramps Down	Construction Phase Complete	Typical Mine Operations Begin	
<b>Access Plan</b>		Temporary Access Plan	Switch to Primary Access Plan	Primary Access Plan								
<b>Access Description</b>	Road Design for Inks Lake Interchange and Mine Access Road completed in Q2 and Q3 of 2015	Mine vehicle traffic routed through Copperhead Interchange. Continued Construction on Inks Lake Interchange	Upgraded Inks Lake Interchange Complete.	Mine vehicle traffic routed through upgraded Inks Lake Interchange.								
<b>Total Staff On-Site</b>		400	400	1200	1200	1800	1800	1800	1800	1200	800	580 Permanent Staff
<b>Heavy Loads per Quarter</b>		200*	200*	400	400	400	400	400	400	300	150	2100

\* Construction phase heavy vehicles access mine only via the Walloper Lake Interchange

## 2.2 Construction Phase Trip Generation

### 2.2.1 Staff Trip Generation

#### 2.2.1.1 Total Condition

Table 2: 2016 Construction Phase Staff Trip Generation Estimate (Total)

Peak Period	Mode of Transport	Staff	Vehicles*	In/Out Split	In	Out	Total
AM	Passenger Car	400	372	100/10	372	37	409
PM	Passenger Car	400	372	10/100	37	372	409

*\*The number of vehicles is based on the assumption that 7% of staff will travel as passengers.*

Table 3: 2018 Construction Phase Staff Trip Generation Estimate (Total)

Peak Period	Mode of Transport	Staff	Vehicles*	In/Out Split	In	Out	Total
AM	Passenger Car	1,800	1,674	100/10	1,674	167	1,841
PM	Passenger Car	1,800	1,674	10/100	167	1,674	1,841

*\*The number of vehicles is based on the assumption that 7% of staff will travel as passengers.*

#### 2.2.1.2 Total Mitigated Condition

Table 4: 2016 Mitigated Construction Phase Staff Trip Generation

Peak Hour	Mode of Transport	Staff	Vehicles*	Shift Staggering	In/Out Split	In	Out	Total
AM	Passenger Car	60	51	-	100/10	51	5	56
	Bus	340	12	60%	100/0	7	0	7
PM	Passenger Car	60	51	-	10/100	5	51	56
	Bus	340	51	40%	0/100	0	5	5

*\*The number of vehicles is based on the assumption that 15% of staff will travel as passengers.*

Table 5: 2018 Mitigated Construction Phase Staff Trip Generation

Peak Hour	Mode of Transport	Staff	Vehicles*	Shift Staggering	In/Out Split	In	Out	Total
AM	Passenger Car	270	230	-	100/10	230	23	253
	Passenger Car to/from Q3	382	325	60%	100/0	195	0	195
	Bus	1148	39		100/0	23	0	23
	Bus - Q3 to/from Mine	382	13		100/0	8	0	8
PM	Passenger Car	270	230		10/100	23	230	253
	Passenger Car to Q3	382	325	40%	0/100	0	130	130
	Bus	1148	39		0/100	0	16	16
	Bus - Q3 to/from Mine	382	13		0/100	0	5	5
*The number of vehicles is based on the assumption that 15% of staff will travel as passengers.								

### 2.2.2 Heavy Vehicle Trip Generation

Table 6: 2016 Construction Phase Heavy Vehicle Trip Generation Estimate

Peak Hour	Type of Vehicle	In	Out	Total
AM	Heavy Vehicles	3	0	3
PM	Heavy Vehicles	0	3	3

Table 7: 2018 Construction Phase Heavy Vehicle Trip Generation Estimate

Peak Hour	Type of Vehicle	In	Out	Total
AM	Heavy Vehicles	5	0	5
PM	Heavy Vehicles	0	5	5

## 2.2.3 Total Trip Generation Summary

### 2.2.3.1 Total Condition

Table 8: 2016 Total Construction Phase Trip Generation Estimate

Peak Hour	Staff Mode of Transport	In	Out	Total
AM	Passenger Car	372	37	409
	Heavy Vehicle	3	0	3
	<b>Total</b>	<b>375</b>	<b>37</b>	<b>412</b>
PM	Passenger Car	37	372	409
	Heavy Vehicle	0	3	3
	<b>Total</b>	<b>37</b>	<b>375</b>	<b>412</b>

Table 9: 2018 Total Construction Phase Trip Generation Estimate

Peak Hour	Staff Mode of Transport	In	Out	Total
AM	Passenger Car	1,674	167	1,841
	Heavy Vehicle	5	0	5
	<b>Total</b>	<b>1,679</b>	<b>167</b>	<b>1,846</b>
PM	Passenger Car	167	1,674	1,841
	Heavy Vehicle	0	5	5
	<b>Total</b>	<b>167</b>	<b>1,679</b>	<b>1,846</b>

### 2.2.3.2 Total Mitigated Condition

Table 10: Construction Phase Trip Generation Estimate Summary (2016)

Peak Hour	Staff Mode of Transport	In	Out	Total
AM	Passenger Car	372	37	409
	Heavy Vehicle	3	0	3
	<b>Total</b>	<b>375</b>	<b>37</b>	<b>412</b>
PM	Passenger Car	37	372	409
	Heavy Vehicle	0	3	3
	<b>Total</b>	<b>37</b>	<b>375</b>	<b>412</b>

Table 11: Construction Phase Trip Generation Estimate Summary (2018)

Peak Hour	Staff Mode of Transport	In	Out	Total
AM	Passenger Car	1,674	167	1,841
	Heavy Vehicle	5	0	5
	<b>Total</b>	<b>1,679</b>	<b>167</b>	<b>1,846</b>
PM	Passenger Car	167	1,674	1,841
	Heavy Vehicle	0	5	5
	<b>Total</b>	<b>167</b>	<b>1,679</b>	<b>1,846</b>

### 2.2.4 2016 Ajax Mine Trip Assignment

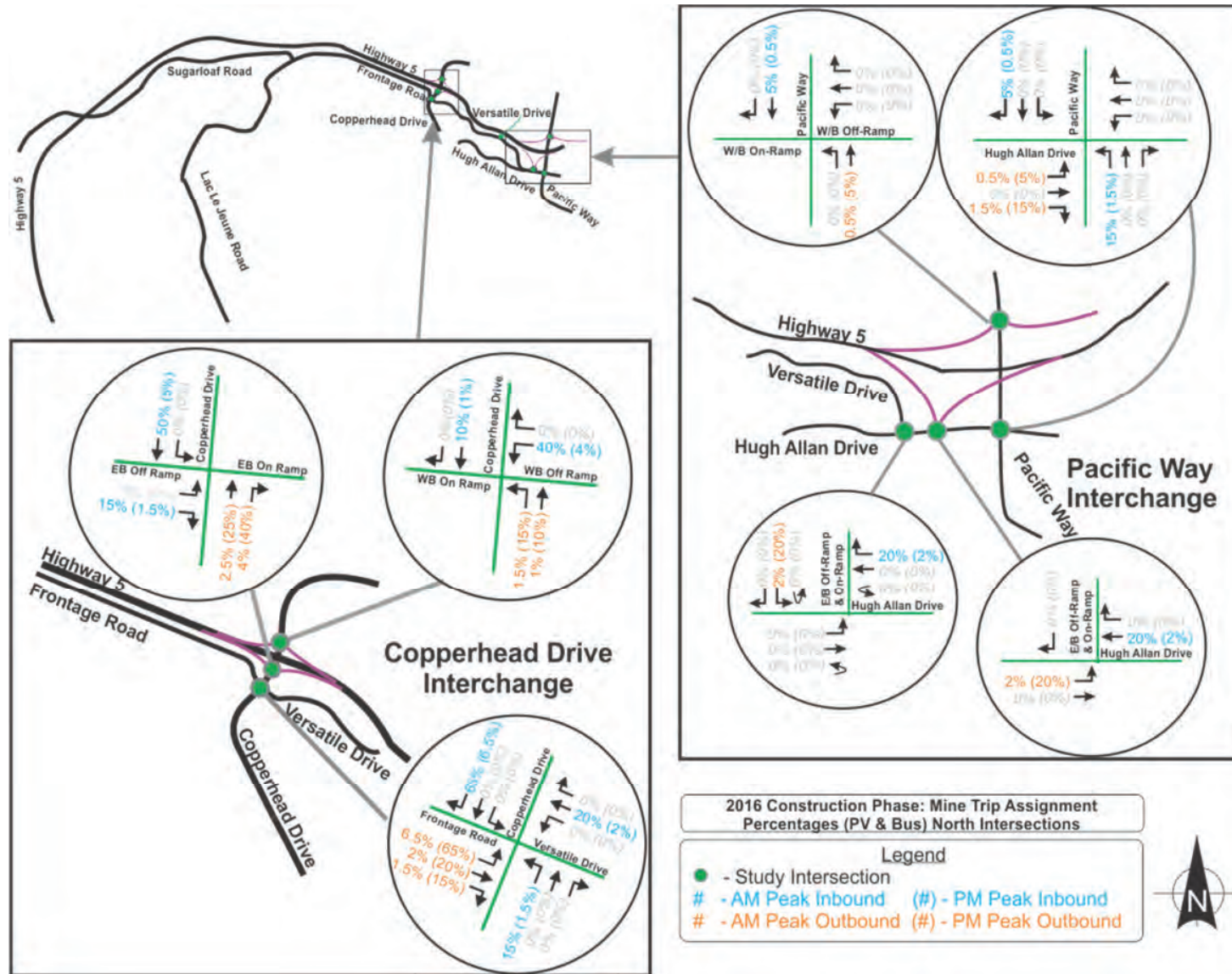


Figure 9: 2016 Ajax Mine Trip Assignment Percentages (PV & Bus) – North Intersections

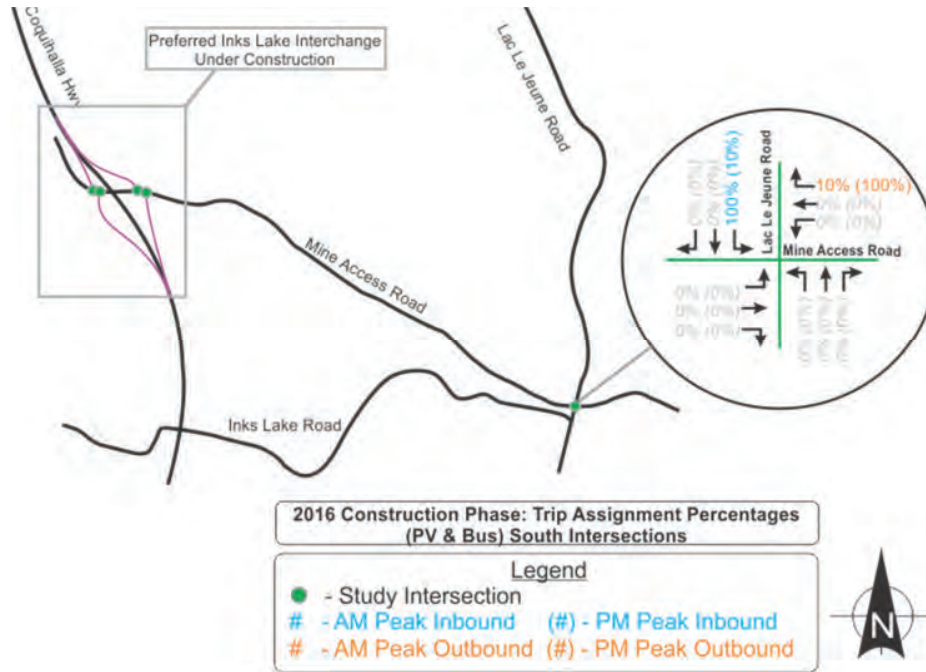


Figure 10: 2016 Ajax Mine Trip Assignment Percentages (PV & Bus) – South Intersections

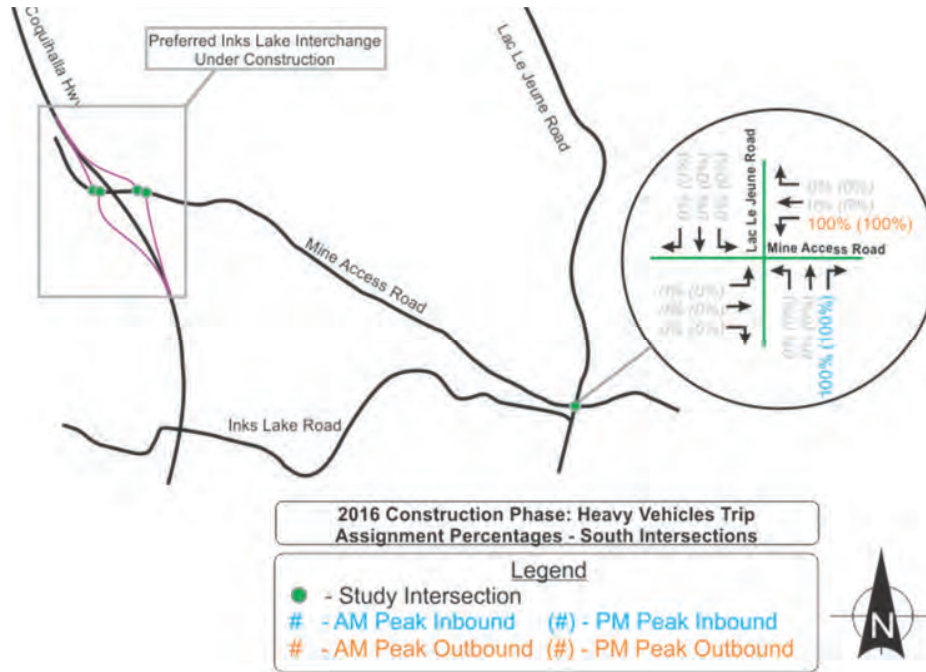


Figure 11: 2016 Ajax Mine Trip Assignment Percentages (HV) – South Intersections

### 2.2.5 2018 Ajax Mine Trip Assignment

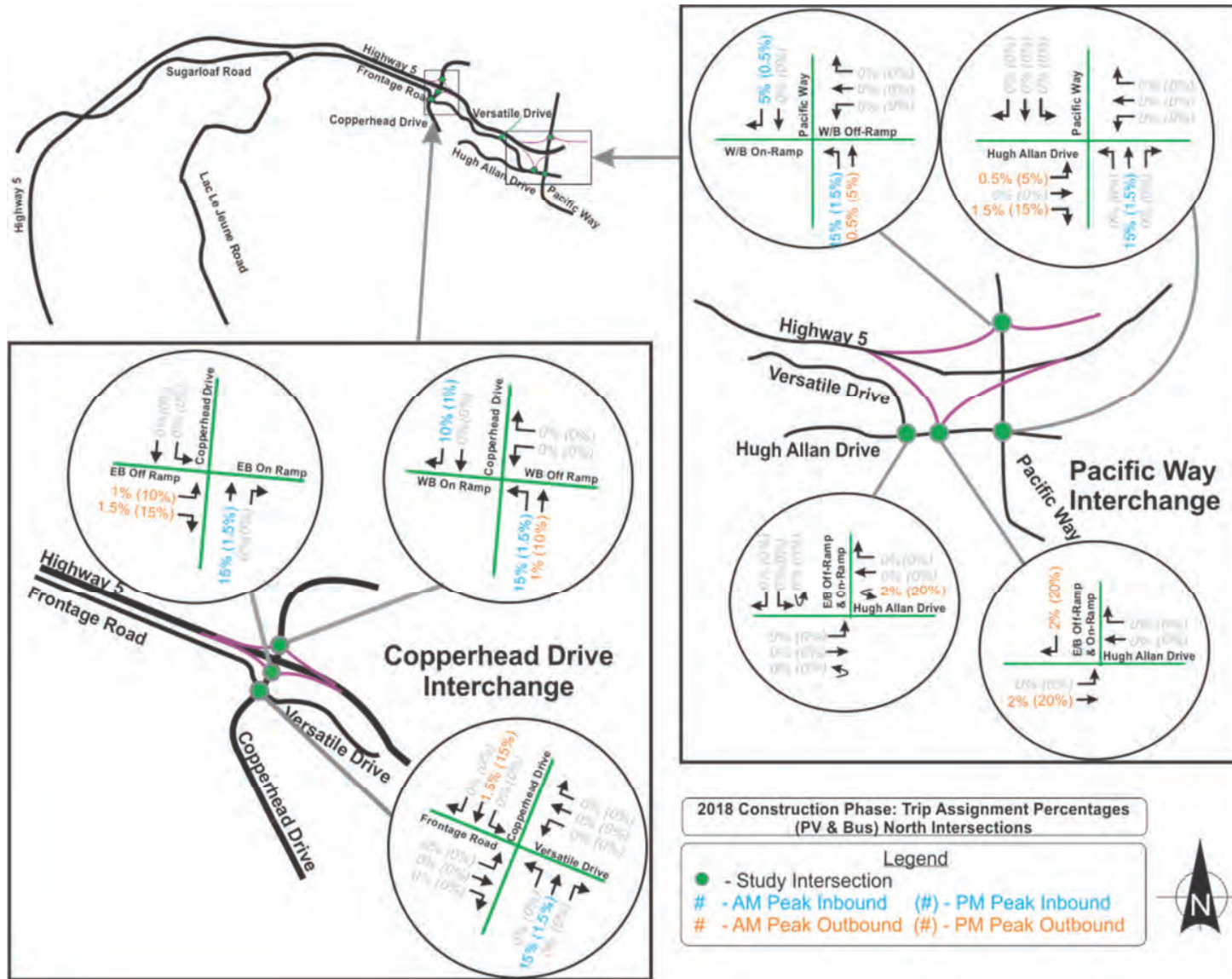


Figure 12: 2018 Ajax Mine Trip Assignment Percentages (PV & Bus) – North Intersections



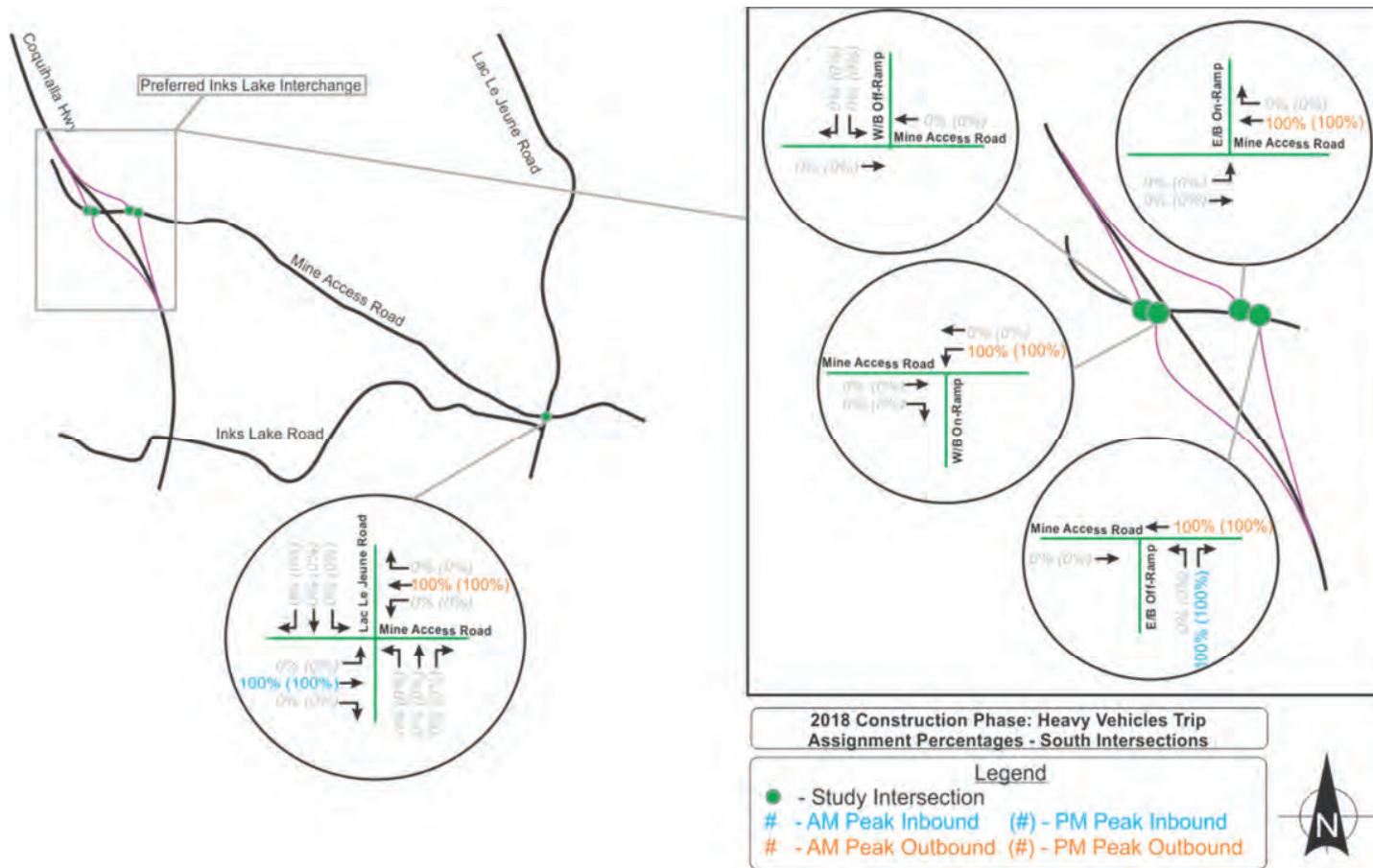


Figure 14: 2018 Ajax Mine Trip Assignment Percentages (HV) – South Intersections

## 2.3 Total Volumes

### 2.3.1 2016 Construction Phase: TOTAL Traffic Volumes

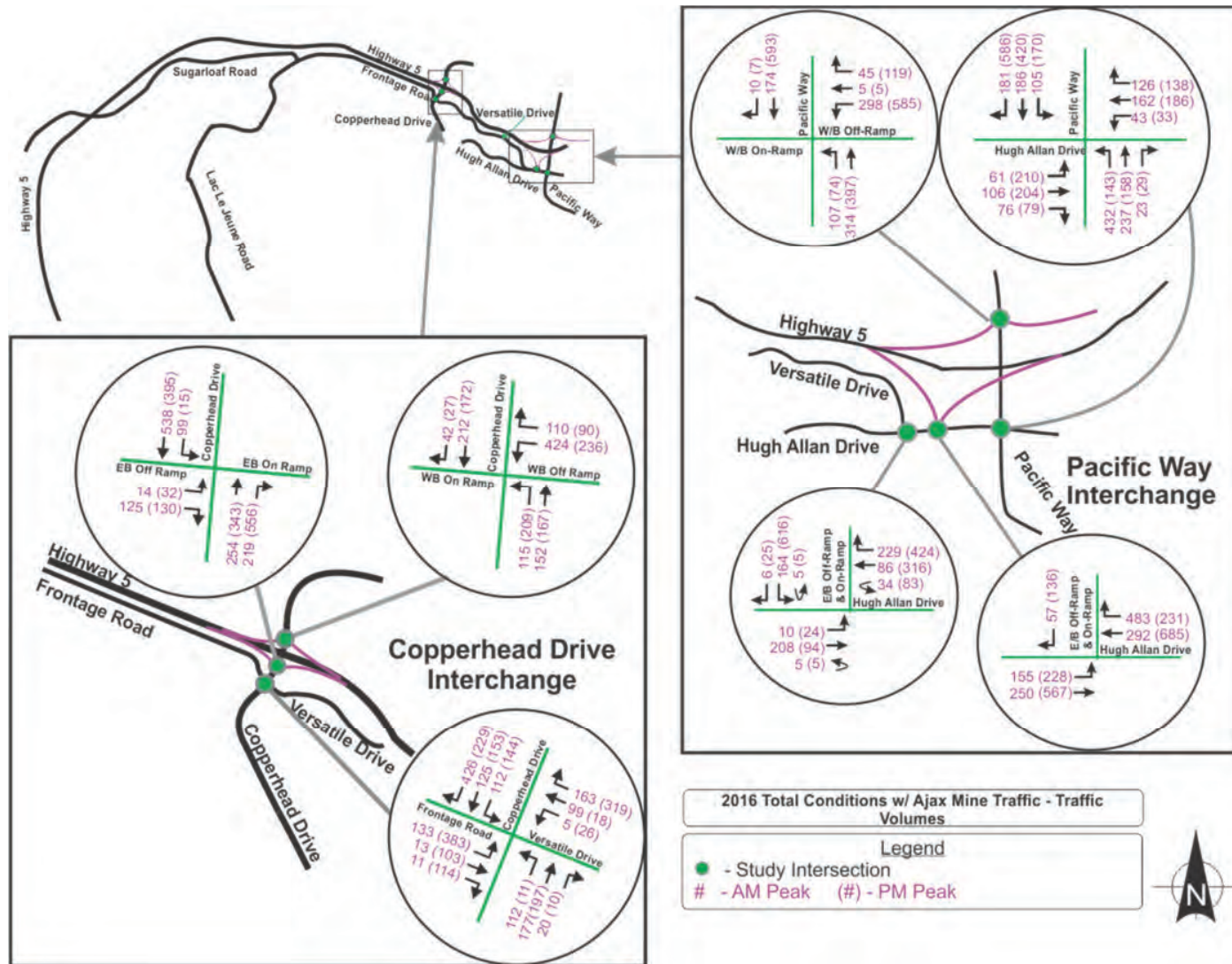


Figure 15: 2016 Total Traffic Volumes – North Intersections

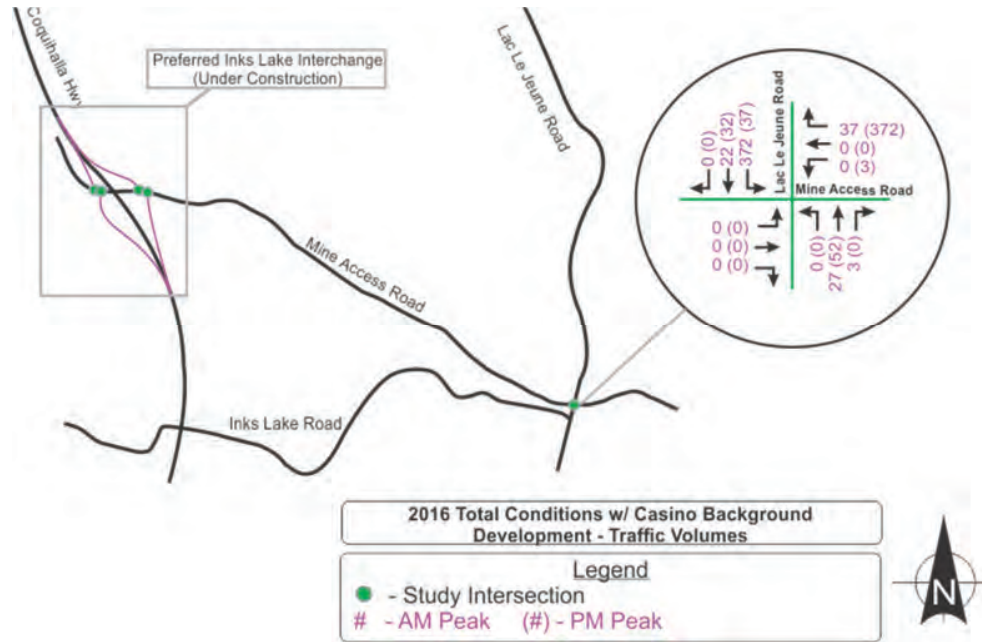


Figure 16: 2016 Total Traffic Volumes – South Intersections

2.3.2 2018 Construction Phase: TOTAL Traffic Volumes

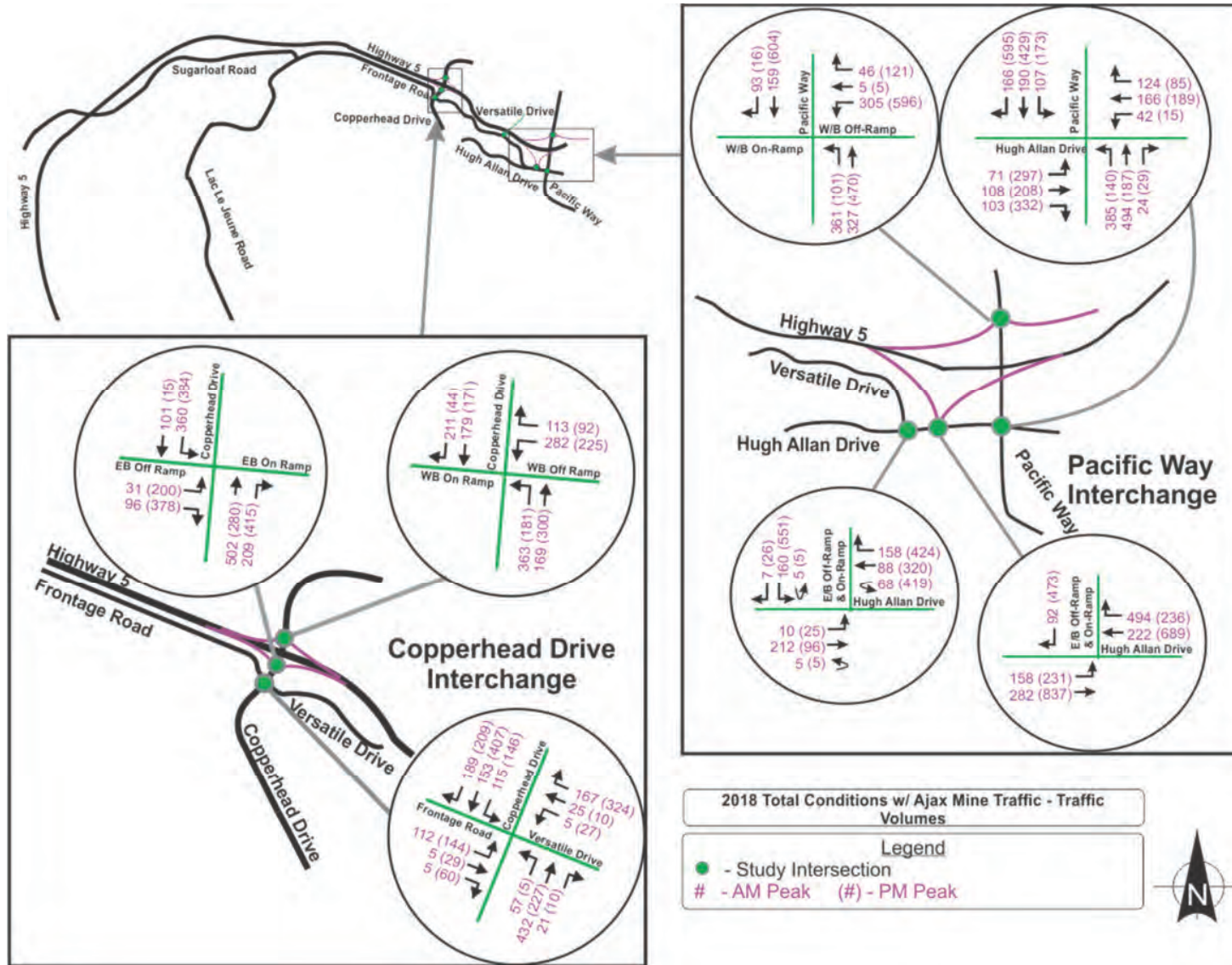


Figure 17: 2018 Total Traffic Volumes – North Intersections

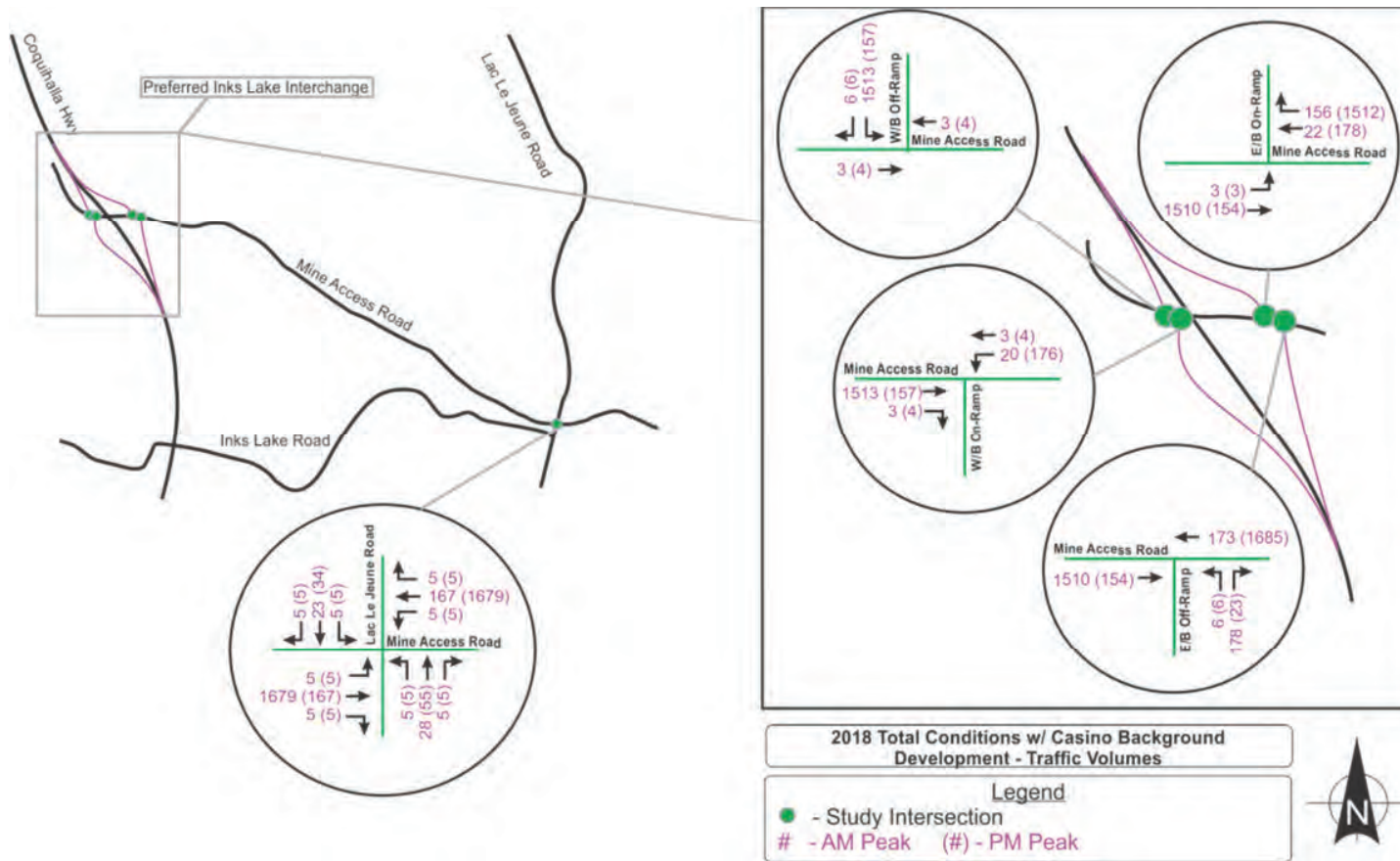


Figure 18: 2018 Total Traffic Volumes – South Intersections

## 2.4 Mitigation Strategies

### 2.4.1 2016 Construction Phase: MITIGATED Traffic Volumes

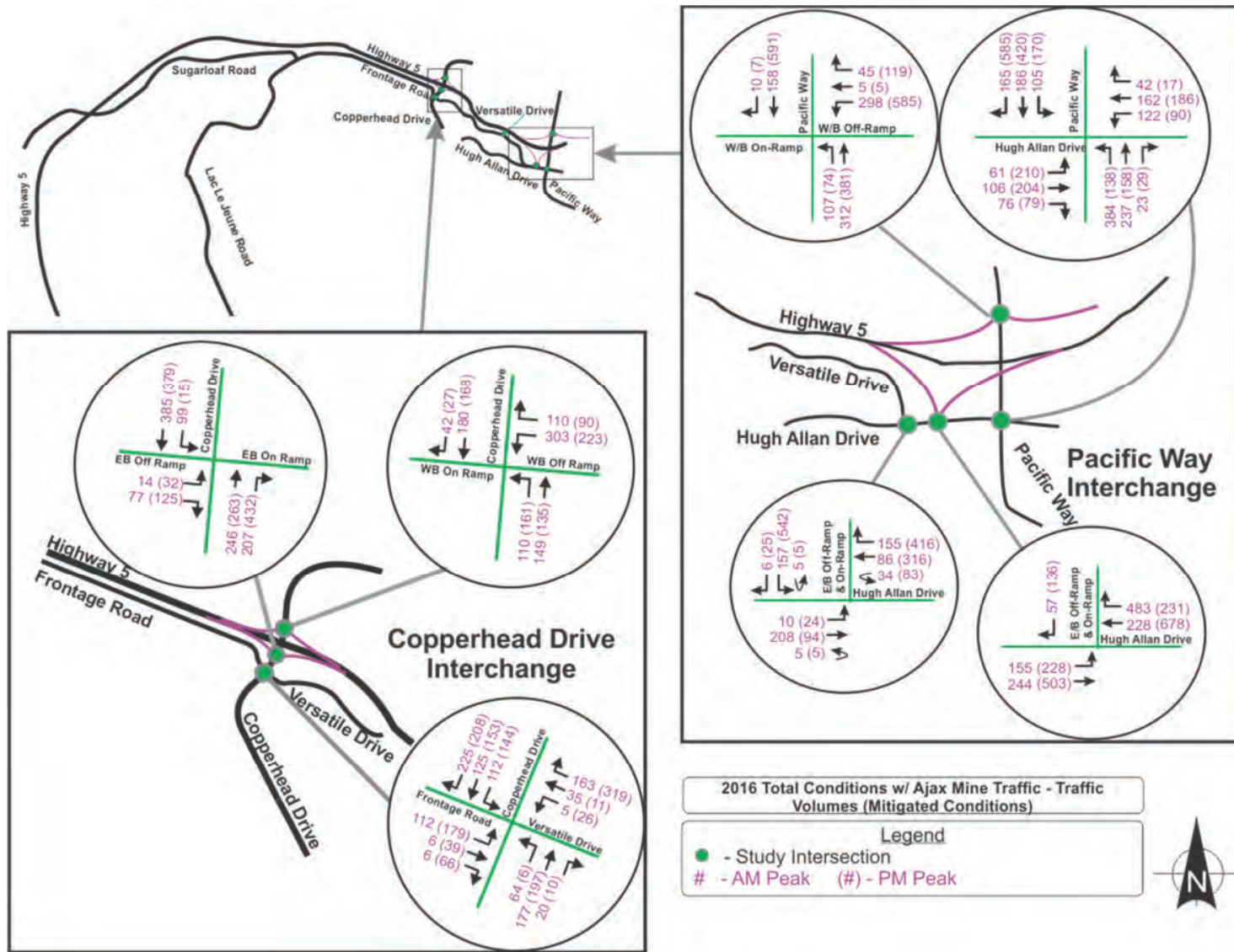


Figure 19: 2016 Mitigated Traffic Volumes – North Intersections

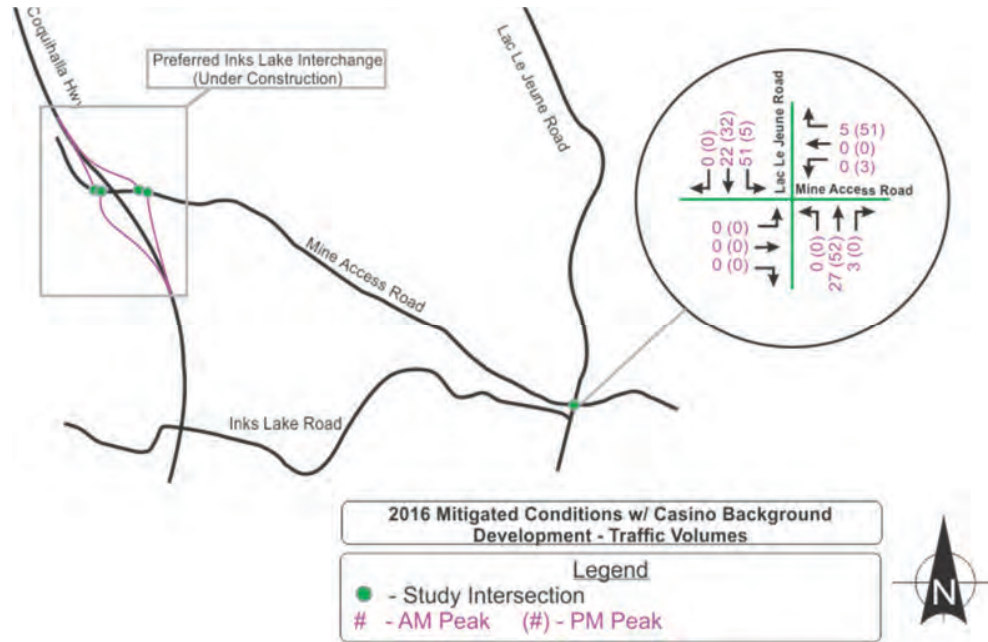


Figure 20: 2016 Mitigated Traffic Volumes – South Intersections

2.4.2 2018 Construction Phase: MITIGATED Traffic Volumes

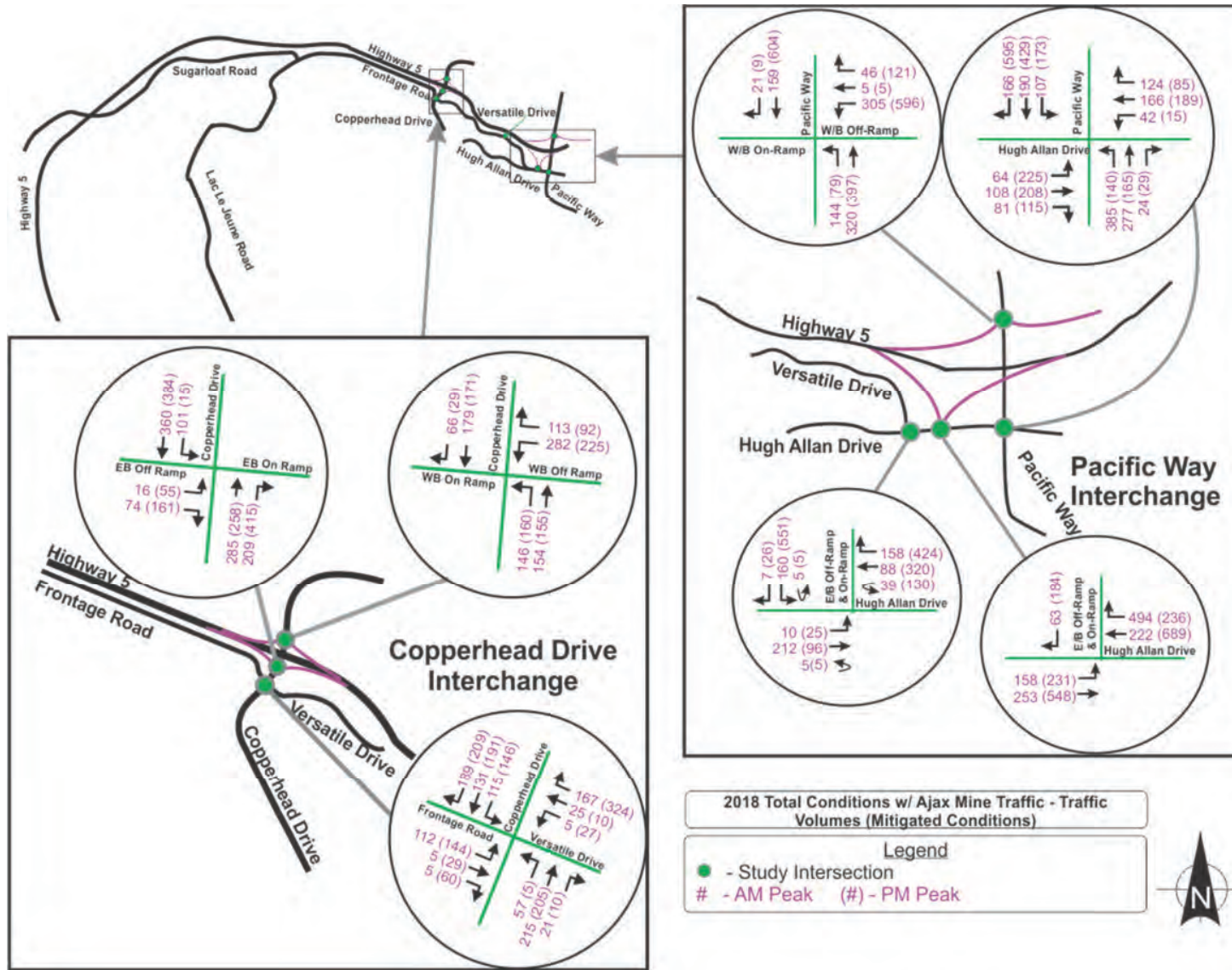


Figure 21: 2018 Mitigated Traffic Volumes – North Intersections

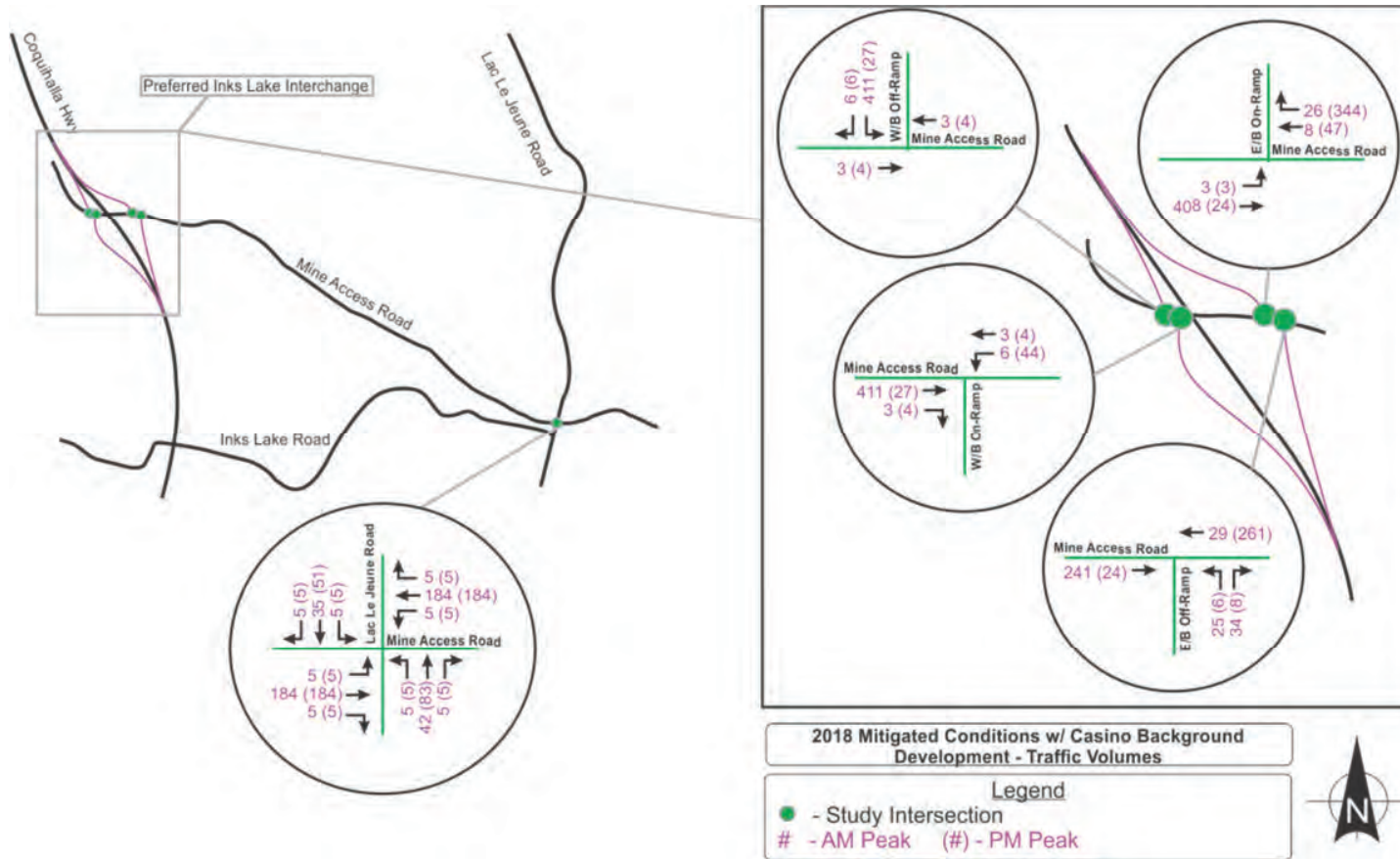


Figure 22: 2018 Mitigated Traffic Volumes – South Intersections

## 2.5 Construction Phase Traffic Analysis Results (2016 & 2018)

Table 12: Traffic Analysis Results Legend

Symbol	Definition
#	95 <sup>th</sup> percentile volume exceeds capacity, queue may be longer
m	Volume of 95 <sup>th</sup> percentile is metered by upstream signal
<b>Highlighted colour:</b> <b>Red</b> <b>Yellow</b>	Failing movement or intersection Performs below acceptable LoS

### 2.5.1 2016 Traffic Analysis Results

Table 13: 2016 Traffic Analysis Results – AM Peak

Intersection	Turning Movement	Base 2016 - AM Peak				Total 2016 - AM Peak				Mitigated 2016 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Frontage Road / Copperhead Drive	Overall I/S	A	-	-	5.9	A	-	-	6.4	A	-	-	5.9
	EBLTR	B	0.43	11.9	16.7	B	0.52	25	27.2	B	0.44	12.1	16.6
	WBLT	B	0.08	4.0	11.2	B	0.23	10.7	14.5	B	0.10	4.9	11.3
	WBR	A	0.36	6.7	5.0	A	0.34	7.9	5.8	A	0.36	6.6	4.9
	NBL	A	0.08	4.5	5.2	A	0.17	#27.4	16.0	A	0.09	5.1	5.4
	NBT	A	0.11	5.2	4.3	A	0.11	9.1	9.8	A	0.11	5.4	4.4
	NBR	-	-			-	-			-	-		
	SBL	A	0.18	8.1	5.9	A	0.19	4.2	4.8	A	0.18	8.4	6.1
	SBT	A	0.07	3.8	4.7	A	0.07	2.3	3.5	A	0.07	4.0	4.8
SBR	A	0.20	4.8	1.8	A	0.43	0.0	1.4	A	0.24	5.5	1.9	
Highway 1 EB Ramps / Copperhead Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	B	0.04	1.1	14.4	C	0.05	1.1	16.9	B	0.04	1.1	14.8
	EBR	A	0.09	3.3	9.9	B	0.19	7.7	11.4	B	0.10	3.3	10.1
	SBL	A	0.08	3.3	8.1	A	0.08	3.3	8.1	A	0.08	3.3	8.1
	SBT	-	-	-	-	-	-	-	-	-	-	-	-
	SBR	-	-	-	-	-	-	-	-	-	-	-	-
	NBL	A	-	0.0	0.0	A	-	0.0	0.0	A	-	0.0	0.0
	NBT	-	-	-	-	-	-	-	-	-	-	-	-
NBR	-	-	-	-	-	-	-	-	-	-	-	-	
Highway 1 WB Ramps / Copperhead Drive	Overall I/S	A	-	-	7.5	A	-	-	9.5	A	-	-	8.1
	WBLT	A	0.47	17.6	9.4	B	0.63	30.1	11.9	B	0.52	19.8	10.5
	WBR	A	0.18	3.7	2.6	A	0.17	3.9	2.5	A	0.19	3.9	2.6
	NBL	A	0.22	9.8	9.2	B	0.34	10.4	11.9	A	0.27	9.9	9.9
	NBT	A	0.10	5.5	7.4	A	0.14	5.5	8.4	A	0.12	5.5	7.6
		-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-
	SBT	A	0.12	6.2	7.4	A	0.20	7.3	8.6	A	0.15	6.4	7.6
SBR	A	0.06	2.8	3.6	A	0.09	2.8	4.0	A	0.08	2.8	3.7	
Overall I/S	A	-	-	5.6	A	-	-	5.6	A	-	-	5.6	
	EBLTU	A	0.27	11.0	6.9	A	0.27	11	6.9	A	0.27	11	6.9

Intersection	Turning Movement	Base 2016 - AM Peak				Total 2016 - AM Peak				Mitigated 2016 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
	WBTRU	A	0.14	11.0	4.6	A	0.14	11	4.6	A	0.15	11	4.7
	SBLRU	A	0.09	11.0	5.5	A	0.18	11	5.5	A	0.18	11	5.5
Highway 1 EB Ramps / Hugh Allan Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	A	0.12	4.4	8.1	A	0.13	5.5	8.4	A	0.13	4.4	8.2
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	-	-	-	-	-	-	-	-
	SBL	-	-	-	-	-	-	-	-	-	-	-	-
	SBR	A	0.07	2.2	9.3	A	0.07	2.2	9.6	A	0.07	2.2	9.4
Pacific Way / Hugh Allan Drive	Overall I/S	C	-	-	20.9	C	-	-	21.3	C	-	-	21
	EBL	C	0.25	14.9	30.9	C	0.25	14.9	30.9	C	0.25	14.9	30.9
	EBTR	C	0.43	33.7	29.2	C	0.43	33.7	29.2	C	0.43	33.7	29.2
	WBL	D	0.27	14.4	45.1	D	0.28	14.8	45.4	D	0.28	14.8	45.4
	WBT	E	0.67	43.2	57.4	E	0.67	43.2	57.4	E	0.67	43.2	57.4
	WBR	B	0.40	12.5	11.1	B	0.41	13.7	12.3	B	0.40	12.8	11.3
	NBL	B	0.50	53.5	12.6	B	0.56	63.8	13.6	B	0.51	55	12.7
	NBT	A	0.12	16.0	8.6	A	0.12	16	8.6	A	0.12	16	8.6
	NBR	-	-			-	-			-	-		
	SBL	C	0.24	29.3	27.0	C	0.25	31	29.7	C	0.24	29.5	27.4
	SBT	C	0.13	21.5	22.9	C	0.13	22.8	25.1	C	0.13	21.6	23.2
SBR	A	0.22	12.6	5.4	A	0.26	14	5.8	A	0.23	12.7	5.4	
Highway 1 WB Ramps / Pacific Way	Overall I/S	A	-	-	5.4	B	-	-	13.9	B	-	-	14.1
	WBL	C	0.68	37.3	27.1	C	0.68	37.3	27.1	C	0.68	37.3	27.1
	WBT												
	WBR	A	0.11	4.2	5.5	A	0.11	4.2	5.5	A	0.11	4.2	5.5
	NBL	A	0.17	12.4	9.2	A	0.18	12.5	9.3	A	0.17	12.4	9.2
	NBT	A	0.17	13.8	8.0	A	0.17	14	8	A	0.17	13.8	8
	SBT	A	0.09	7.5	7.5	A	0.10	8.3	7.8	A	0.09	7.6	7.7
SBR	A	0.01	0.0	0.0	A	0.01	0	0	A	0.01	0	0	
Inks Lake Interchange - EB Off Ramp	Overall I/S												
	EBT	N/A – Interchange Under Construction											
	WBT												
	NBL												
NBR													
Inks Lake Interchange - EB On Ramp	Overall I/S												
	EBT	N/A – Interchange Under Construction											
	EBR												
	WBL												
WBT													
Inks Lake Interchange - WB On Ramp	Overall I/S												
	EBT	N/A – Interchange Under Construction											
	EBR												
	WBL												
WBT													
	Overall I/S												
	EBT	N/A – Interchange Under Construction											

Intersection	Turning Movement	Base 2016 - AM Peak				Total 2016 - AM Peak				Mitigated 2016 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
	WBT												
	SBL												
	SBR												
Lac Le Jeune Road / New Mine Access Road	Overall I/S	A	-	-	0.0	A	-	-	2.9	B	-	-	16.6
	EBL	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	EBR	-	-	-	-	-	-	-	-	-	-	-	-
	WBL	-	-	-	-	B	0.02	2.7	16.6	A	0.00	1.5	2.4
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	A	0.0	0.0	0.1	A	0	0	0
	NBL	-	-	-	-	-	-	-	-	-	-	-	-
	NBT	A	0.02	0.0	0.0	A	0.02	3.2	2.3	B	0.02	15.2	18.9
	NBR	-	-	-	-	A	0	0	0	A	0	0	0
	SBL	-	-	-	-	A	0.31	35.2	3.1	B	0.06	28.3	17.9
	SBT	A	0.01	0.0	0.0	A	0.01	2.8	2.3	B	0.02	13.2	19.2
	SBR	-	-	-	-	-	-	-	-	-	-	-	-

Table 14: 2016 Traffic Analysis Results – PM Peak

Intersection	Turning Movement	Base 2016 - PM Peak				Total 2016 - PM Peak				Mitigated 2016 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Frontage Road / Copperhead Drive	Overall I/S	B	-	-	13.6	B	-	-	13.7	A	-	-	8
	EBLTR	B	0.59	16	15.0	C	0.83	#76.4	25.3	B	0.67	21.60	17.3
	WBLT	A	0.10	4.0	9.6	A	0.06	4.6	6.8	A	0.09	4	8.7
	WBR	A	0.51	8.0	4.6	A	0.35	7.9	2.5	A	0.48	7.9	4
	NBL	A	0.01	1.1	6.4	A	0.04	1.9	8.6	A	0.01	1.3	7
	NBT	A	0.12	6.8	5.9	B	0.23	7	10	A	0.13	7	6.6
	NBR	-	-			-	-			-	-		
	SBL	A	0.26	12.7	8.2	B	0.50	12.9	16.9	A	0.27	12.9	9.2
	SBT	A	0.09	5.5	6.1	B	0.17	5.6	10	A	0.09	5.6	6.8
	SBR	A	0.24	6.3	2.4	A	0.41	6.7	4.1	A	0.26	6.4	2.6
Highway 1 EB Ramps / Copperhead Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	B	0.07	2.2	12.5	B	0.07	2.2	13.0	B	0.07	2.2	12.6
	EBR	A	0.17	6.6	10.5	B	0.18	6.6	10.7	B	0.17	6.6	10.5
	SBL	A	0.01	0.0	7.9	A	0.01	0.0	8.1	A	0.01	0.0	7.9
	SBT	-	-	-	-	-	-	-	-	-	-	-	-
	SBR	-	-	-	-	-	-	-	-	-	-	-	-
	NBL	A	-	0.0	0.0	A	-	0.0	0.0	A	-	0.0	0.0
	NBT	-	-	-	-	-	-	-	-	-	-	-	-
Highway 1 WB Ramps / Copperhead Drive	Overall I/S	A	-	-	7.4	A	-	-	7.9	A	-	-	7.5
	WBLT	B	0.42	16.0	10.1	B	0.45	18.3	11	B	0.43	16.5	10.2
	WBR	A	0.17	3.9	3.1	A	0.17	4.2	3.3	A	0.17	4	3.1
	NBL	A	0.28	12.0	8.6	A	0.37	17.2	9.5	A	0.29	12.7	8.7
	NBT	A	0.08	4.3	6.4	A	0.10	5.5	6.4	A	0.08	4.5	6.4

Intersection	Turning Movement	Base 2016 - PM Peak				Total 2016 - PM Peak				Mitigated 2016 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
	NBR	-	-	-	-	-	-	-	-	-	-	-	-
	SBL	-	-	-	-	-	-	-	-	-	-	-	-
	SBT	A	0.10	5.3	6.4	A	0.10	5.6	6.4	A	0.10	5.4	6.4
	SBR	A	0.04	2.0	3.4	A	0.04	2.1	3.5	A	0.04	2	3.4
Versatile Drive / Hugh Allan Drive	Overall I/S	C	-	-	15.5	C	-	-	15.5	C	-	-	15.5
	EBLTU	A	0.24	11.0	9.8	A	0.24	11	9.8	A	0.24	11	9.8
	WBTRU	A	0.41	22.0	7.8	A	0.42	22	7.8	A	0.42	22	7.9
	SBLRU	D	0.43	99.0	27.7	D	0.83	99	27.7	D	0.82	99	28.6
Highway 1 EB Ramps / Hugh Allan Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	B	0.28	12.1	10.8	B	0.28	13.2	10.8	B	0.23	9.9	12.5
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	-	-	-	-	-	-	-	-
	SBL	-	-	-	-	-	-	-	-	-	-	-	-
	SBR	B	0.23	9.9	12.5	B	0.23	9.9	12.6	B	0.28	12.1	10.8
Pacific Way / Hugh Allan Drive	Overall I/S	C	-	-	24.3	C	-	-	24.6	C	-	-	24.3
	EBL	D	0.65	#47.2	38.4	D	0.65	#47.2	38.4	D	0.65	#47.2	38.4
	EBTR	C	0.52	57.8	31.4	C	0.52	57.8	31.4	C	0.52	57.8	31.4
	WBL	D	0.10	6.9	39.2	D	0.21	12	42.2	D	0.11	7.5	39.5
	WBT	E	0.70	47.9	57.0	E	0.70	47.9	57	E	0.70	47.9	57
	WBR	A	0.26	4.5	4.3	B	0.42	15.8	13.6	A	0.28	5.9	5.1
	NBL	B	0.27	18.8	12.8	B	0.28	19.7	12.9	B	0.27	19	12.8
	NBT	A	0.10	11.1	10.0	A	0.10	11.1	10	A	0.10	11.1	10
	NBR	-	-			-	-			-	-		
	SBL	C	0.36	37.1	25.3	C	0.36	37.3	25.5	C	0.36	37.1	25.4
	SBT	C	0.29	37.2	22.0	C	0.29	37.4	22.1	C	0.29	37.2	22
	SBR	B	0.71	76.7	16.5	B	0.72	77.3	16.6	B	0.71	77	16.5
Highway 1 WB Ramps / Pacific Way	Overall I/S	B	-	-	14.1	B	-	-	18.2	B	-	-	18.2
	WBL	C	0.83	#73.7	26.0	C	0.83	#73.7	26.0	C	0.83	#73.7	26.0
	WBT												
	WBR	A	0.17	5.4	2.7	A	0.17	5.4	2.7	A	0.17	5.4	2.7
	NBL	B	0.30	13.0	18.7	B	0.30	13	18.8	B	0.30	13	18.7
	NBT	B	0.29	20.8	14.4	B	0.31	21.8	14.5	B	0.30	21	14.4
	SBT	B	0.46	33.0	16.0	B	0.46	33	16	B	0.46	33	16
	SBR	A	0.01	0.0	0.0	A	0.01	0	0	A	0.01	0	0
Inks Lake Interchange - EB Off Ramp	Overall I/S		-	-							-	-	
	EBT	N/A – Interchange Under Construction											
	WBT												
	NBL												
	NBR												
Inks Lake Interchange - EB On Ramp	Overall I/S		-	-							-	-	
	EBT	N/A – Interchange Under Construction											
	EBR												
	WBL												
	WBT												
Inks Lake Interchange	Overall I/S		-	-							-	-	
	EBT	N/A – Interchange Under Construction											

Intersection	Turning Movement	Base 2016 - PM Peak				Total 2016 - PM Peak				Mitigated 2016 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
- WB On Ramp	EBR												
	WBL												
	WBT												
Inks Lake Interchange - WB Off Ramp	Overall I/S		-	-							-	-	
	EBT	N/A – Interchange Under Construction											
	WBT												
	SBL												
	SBR												
Lac Le Jeune Road / New Mine Access Road	Overall I/S	A	-	-	0.0	A	-	-	3.4	A	-	-	2.6
	EBL	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	EBR	-	-	-	-	-	-	-	-	-	-	-	-
	WBL	-	-	-	-	B	0.03	1.5	13.3	B	0.01	1.8	17
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	A	0.5	0.1	2.5	A	0.08	0	0.2
	NBL	-	-	-	-	-	-	-	-	-	-	-	-
	NBT	A	0.03	0.0	0.0	A	0.07	5.4	6	A	0.04	5.2	3.6
	NBR	-	-	-	-	A	0.01	0	0	-	-	-	-
	SBL	-	-	-	-	A	0.07	4.3	6.1	A	0.00	1.1	4
SBT	A	0.02	0.0	0.0	A	0.04	3.8	5.8	A	0.02	3.7	3.7	
SBR	-	-	-	-	-	-	-	-	-	-	-	-	

## 2.5.2 2018 Traffic Analysis Results

Table 15: 2018 Traffic Analysis Results – AM Peak

Intersection	Turning Movement	Base 2018 - AM Peak				Total 2018 - AM Peak				Mitigated 2018 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Frontage Road / Copperhead Drive	Overall I/S	A	-	-	6	A	-	-	6	A	-	-	6
	EBLTR	B	0.43	12.1	16.7	B	0.43	12.1	16.7	B	0.43	12.1	16.7
	WBLT	B	0.08	11.1	9.6	B	0.08	4.0	11.1	B	0.08	4.0	11.1
	WBR	A	0.37	5.0	4.6	A	0.37	6.8	5.0	A	0.37	6.8	5.0
	NBL	A	0.09	5.3	6.4	A	0.09	4.7	5.3	A	0.09	4.6	5.3
	NBT	A	0.11	4.4	5.9	A	0.24	11.8	5.1	A	0.13	6.2	4.5
	NBR	-	-			-	-			-	-		
	SBL	A	0.19	6.0	8.2	A	0.24	9.3	6.9	A	0.19	8.6	6.1
	SBT	A	0.07	4.8	6.1	A	0.08	4.6	4.8	A	0.07	4.0	4.8
SBR	A	0.21	1.9	2.4	A	0.21	5.0	1.9	A	0.21	5.0	1.9	
Highway 1 EB Ramps / Copperhead Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	C	0.04	1.1	16.2	C	0.09	3.3	16.1	B	0.04	1.1	14.7
	EBR	B	0.12	4.4	11.5	B	0.13	4.4	10.2	B	0.10	3.3	10.0
	SBL	A	0.09	3.3	8.2	A	0.11	3.3	9.0	A	0.09	3.3	8.2
	SBT	-	-	-	-								
SBR	-	-	-	-									

Intersection	Turning Movement	Base 2018 - AM Peak				Total 2018 - AM Peak				Mitigated 2018 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
	NBL	A	-	0.0	0.0	A	-	0.0	0.0	A	-	0.0	0.0
	NBT	-	-	-	-								
	NBR	-	-	-	-								
Highway 1 WB Ramps / Copperhead Drive	Overall I/S	A	-	-	7.5		-	-		A	-	-	7.7
	WBLT	A	0.48	18.2	9.6	B	0.54	22.1	13.5	B	0.49	20.8	10.4
	WBR	A	0.19	3.8	2.6	A	0.21	4.7	3.3	A	0.19	4.4	2.8
	NBL	A	0.23	10.0	9.2	B	0.59	#45.8	16.5	A	0.28	12.9	9.5
	NBT	A	0.10	5.5	7.4	A	0.09	6.1	6.6	A	0.10	5.6	7.1
	NBR	-	-	-	-								
	SBL	-	-	-	-								
	SBR	A	0.12	6.3	7.4	A	0.10	6.3	6.6	A	0.11	6.3	7.1
Versatile Drive / Hugh Allan Drive	Overall I/S	A	-	-	5.6	A	-	-	5.8	A	-	-	5.7
	EBLTU	A	0.27	11.0	7.0	A	0.28	11	7.3	A	0.27	11	7.1
	WBTRU	A	0.14	11.0	4.6	A	0.155	11	4.8	A	0.155	11	4.8
	SBLRU	A	0.10	11.0	5.5	A	0.19	11	5.8	A	0.184	11	5.6
Highway 1 EB Ramps / Hugh Allan Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	A	0.13	4.4	8.2	A	0.13	4.4	8.2	A	0.13	4.4	8.2
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	-	-	-	-	-	-	-	-
	SBR	A	0.07	2.2	9.4	A	0.11	4.4	9.5	A	0.08	2.2	9.4
Pacific Way / Hugh Allan Drive	Overall I/S	C	-	-	21.2	C	-	-	20.2	C	-	-	21
	EBL	C	0.26	15.1	30.7	C	0.29	16.5	31.1	C	0.26	15.4	30.7
	EBTR	C	0.44	33.9	29.0	C	0.48	36.9	28.5	C	0.44	34.4	29
	WBL	D	0.27	14.5	44.9	D	0.28	14.5	45.2	D	0.27	14.5	45
	WBT	E	0.67	44.0	57.3	E	0.67	44	57.3	E	0.67	44	57.3
	WBR	B	0.40	13.2	11.8	B	0.40	13.2	11.8	B	0.40	13.2	11.8
	NBL	B	0.51	55.8	13.0	B	0.52	56.5	13.3	B	0.5	55.9	13.0
	NBT	A	0.13	16.6	8.8	B	0.24	33.4	10	A	0.14	18.8	9
	NBR	-	-			-	-			-	-		
	SBL	C	0.25	30.3	28.0	C	0.32	31.3	29.9	C	0.26	30.6	28.4
SBT	C	0.13	22.3	23.6	C	0.13	21.5	23.2	C	0.13	22.3	23.7	
SBR	A	0.23	13.0	5.5	A	0.23	12.6	5.3	A	0.23	13	5.5	
Highway 1 WB Ramps / Pacific Way	Overall I/S	B	-	-	14.1	B	-	-	14.2	B	-	-	13.9
	WBL	C	0.69	37.6	26.9	C	0.69	37.6	26.9	C	0.69	37.6	26.9
	WBT												
	WBR	A	0.11	4.2	5.3	A	0.11	4.2	5.3	A	0.11	4.2	5.3
	NBL	A	0.18	12.9	9.4	B	0.57	#55.6	15.6	A	0.24	16.7	9.9
	NBT	A	0.18	14.4	8.2	A	0.18	14.8	8.2	A	0.18	14.4	8.2
	SBT	A	0.09	7.8	7.9	A	0.09	7.8	7.9	A	0.09	7.8	7.9
SBR	A	0.01	0.0	0.0	A	0.11	5.1	2.8	A	0.03	1.2	1.4	
Inks Lake Interchange - EB Off Ramp	Overall I/S		-	-			-	-			-	-	
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	A	0.00	0.0	0.0	A	0.00	0	0	A	-	0	0
	NBL	A	0.01	0.0	8.5	F	1.64	162.8	#384.4	B	0.09	3.3	10.5
NBR													
Overall I/S		-	-			-	-			-	-		

Intersection	Turning Movement	Base 2018 - AM Peak				Total 2018 - AM Peak				Mitigated 2018 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
	EBT	A	0.00	0.0	3.6	A	0.00	0.1	0.5	A	-	1.1	0.1
	EBR												
	WBL	A	0.01	0.0	0.0	A	0.11	0	0	A	0.02	0	0
	WBT												
Inks Lake Interchange - WB On Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.01	0.0	0.0	-	0.97	-	-	A	0.26	0	0
	EBR												
	WBL	A	0.00	0.0	3.6	B	0.06	15.4	12.9	A	0.00	1.1	5.2
WBT													
Inks Lake Interchange - WB Off Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.00	0.0	0.0	A	0.00	0	0	A	1.00	0	0
	WBT												
	SBL	A	0.01	0.0	8.5	F	1.63	953.7	299.5	B	0.45	27.5	11.5
SBR													
Lac Le Jeune Road / Mine Access Road	Overall I/S	A	-	-	0.0	F	-	-	131	A	-	-	12.6
	EBL	-	-	-	-	A	0.01	1.3	3.8	A	0.01	1.7	8.4
	EBT	-	-	-	-	F	1.28	#658.4	151.3	B	0.47	33.3	13.6
	EBR	-	-	-	-	A	0.00	0.0	0.0	A	0.01	0	0
	WBL	-	-	-	-	A	0.08	1.7	7.4	A	0.01	1.7	8.4
	WBT	-	-	-	-	A	0.13	17.1	4.4	A	0.04	4.5	8.7
	WBR	-	-	-	-	A	0.03	2.6	1.2	A	0.01	0	0
	NBL	-	-	-	-	D	0.03	5.1	45.8	B	0.01	2.6	14.2
	NBT	A	0.02	0.0	0.0	D	0.13	16.1	47.5	B	0.05	7.8	14.2
	NBR	-	-	-	-	A	0.02	0	0.2	A	0.01	0	0
	SBL	-	-	-	-	D	0.03	5.1	45.8	B	0.01	2.6	14.2
SBT	A	0.01	0.0	0.0	D	0.10	14.2	46.9	B	0.04	6.8	14.1	
SBR	-	-	-	-	A	0.02	0	0.2	A	0.01	0	0	

Table 16: 2018 Traffic Analysis Results – PM Peak

Intersection	Turning Movement	Base 2018 - PM Peak				Total 2018 - PM Peak				Mitigated 2018 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Frontage Road / Copperhead Drive	Overall I/S	B	-	-	13.9	A	-	-	7	A	-	-	7.1
	EBLTR	B	0.60	16.5	15.2	B	0.60	16.50	15.2	B	0.60	16.50	15.2
	WBLT	A	0.10	4.0	9.5	A	0.10	4.0	9.5	A	0.10	4.0	9.5
	WBR	A	0.52	7.9	4.6	A	0.52	7.9	4.6	A	0.52	7.9	4.6
	NBL	A	0.01	1.1	6.6	A	0.01	1.1	6.6	A	0.01	1.1	6.6
	NBT												
	NBR	-	-	7.1	6.0	-	-	7.8	6.0	-	-	7.2	6.0
	SBL	A	0.26	13.1	8.4	A	0.27	13.2	8.6	A	0.26	13.1	8.5
	SBT	A	0.09	5.7	6.2	A	0.23	13.2	6.5	A	0.11	6.7	6.2
	SBR	A	0.24	6.4	2.4	A	0.24	6.4	2.4	A	0.24	6.4	2.4
Highway 1 EB Ramps /	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	B	0.07	2.2	13.1	C	0.41	22.0	17.0	B	0.11	4.4	13.0
	EBR	B	0.19	7.7	11.4	B	0.50	31.9	14.1	B	0.2	8.80	10.9

Intersection	Turning Movement	Base 2018 - PM Peak				Total 2018 - PM Peak				Mitigated 2018 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Copperhead Drive	SBL	A	0.01	0.0	8.0	A	0.01	0.0	7.9	A	0.0	0.00	7.9
	SBT	-	-	-	-								
	SBR	-	-	-	-								
	NBL	A	-	0.0	0.0	A	-	0.0	0.0	A	0.00	0.00	0.0
	NBT	-	-	-	-								
	NBR	-	-	-	-								
Highway 1 WB Ramps / Copperhead Drive	Overall I/S	A	-	-	7.4	A	-	-	7.4	A	-	-	7.4
	WBLT	B	0.43	16.5	10.1	B	0.43	17.5	10.7	B	0.43	16.6	10.2
	WBR	A	0.17	4.0	3.1	A	0.17	4.2	3.3	A	0.17	4	3.1
	NBL	A	0.28	12.3	8.7	A	0.32	14.4	9	A	0.29	12.6	8.8
	NBT	A	0.08	4.5	6.4	A	0.18	8.9	6.4	A	0.09	5.1	6.4
	NBR	-	-	-	-								
	SBL	-	-	-	-								
	SBR	A	0.10	5.5	6.4	A	0.10	5.5	6.3	A	0.10	5.5	6.4
Versatile Drive / Hugh Allan Drive	Overall I/S	C	-	-	16.3	F	-	-	50.6	C	-	-	18.6
	EBLTU	B	0.25	11.0	10.1	C	0.35	22	16.4	B	0.26	11	10.7
	WBTRU	A	0.42	22.0	7.9	C	0.739	77	16.1	A	0.452	22	8.5
	SBLRU	D	0.44	99.0	29.6	F	1.209	242	138.7	E	0.885	121	37.3
Highway 1 EB Ramps / Hugh Allan Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	B	0.29	13.2	10.9	B	0.29	13.2	10.9	B	0.29	13.2	10.9
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	-	-	-	-	-	-	-	-
	SBR	B	0.23	9.9	12.6	D	0.80	86.9	29.8	B	.3.3	14.3	13.5
Pacific Way / Hugh Allan Drive	Overall I/S	C	-	-	24.6	C	-	-	29.9	C	-	-	25.1
	EBL	D	0.67	#48.9	20.4	D	0.81	#75.3	47.1	D	0.69	#54.3	40.9
	EBTR	C	0.53	58.5	16.8	D	0.88	#121.6	44.6	C	0.59	65.7	32.6
	WBL	D	0.10	6.9	21.7	D	0.19	6.9	40.1	D	0.10	6.9	39.1
	WBT	E	0.70	48.5	28.5	D	0.61	45.9	29	E	0.70	48.5	57
	WBR	A	0.26	4.7	0.8	A	0.24	4.5	3.9	A	0.26	4.7	4.5
	NBL	B	0.28	19.3	14.4	B	0.30	21.3	14.8	B	0.28	19.3	12.9
	NBT	B	0.10	11.5	10.0	B	0.12	14.3	12.1	B	0.11	11.6	10.2
	NBR	-	-			-	-			-	-		
	SBL	C	0.37	38.0	31.4	C	0.41	40.3	28.8	C	0.37	38	25.7
SBT	C	0.30	38.3	22.0	C	0.32	40.3	24.5	C	0.30	38.3	22.2	
SBR	B	0.73	81.3	13.3	B	0.76	#86.8	19.6	B	0.73	81.3	17.3	
Highway 1 WB Ramps / Pacific Way	Overall I/S	B	-	-	18.4	B	-	-	19	B	-	-	18.5
	WBL	C	0.83	#84.7	26.0	C	0.85	#92.8	29.3	C	0.83	#86.1	26.4
	WBT												
	WBR	A	0.17	5.5	2.7	A	0.18	6.1	3	A	0.17	5.6	2.7
	NBL	B	0.33	13.4	19.7	C	0.41	16	20.6	B	0.34	13.6	19.8
	NBT	B	0.31	21.0	14.7	B	0.36	23.3	14.5	B	0.31	21.3	14.7
	SBT	B	0.48	33.4	16.4	B	0.46	30.5	15.6	B	0.48	33	16.3
SBR	A	0.01	0.0	0.0	A	0.03	0.7	1.1	A	0.01	0	0	
Inks Lake Interchange - EB Off Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A	-	0.0	0.0

Intersection	Turning Movement	Base 2018 - PM Peak				Total 2018 - PM Peak				Mitigated 2018 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
	NBL												
	NBR	A	0.01	0.0	8.5	C	0.13	4.4	21.6	A	0.02	1.1	9.4
Inks Lake Interchange - EB On Ramp	Overall I/S		-	-			-	-			-	-	
	EBT	A	0.00	0.0	3.6	A	0.01	0.2	0.5	A	0.00	1.1	0.9
	EBR												
	WBL	A	0.01	0.0	0.0	A	1.08	0.0	0.0	A	0.25	0.0	0.0
	WBT												
Inks Lake Interchange - WB On Ramp	Overall I/S		-	-			-	-			-	-	
	EBT	A	0.01	0.0	1.0	A	0.10	0.0	0.0	A	0.02	0.0	0.0
	EBR												
	WBL	A	0.00	1.1	3.6	A	0.14	41.8	7.8	A	0.03	8.8	6.9
	WBT												
Inks Lake Interchange - WB Off Ramp	Overall I/S		-	-			-	-			-	-	
	EBT	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A	-	0.0	0.0
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	SBL												
	SBR	A	0.01	0.0	8.5	A	0.18	6.6	9.3	A	0.04	1.1	8.7
Lac Le Jeune Road / Mine Access Road	Overall I/S	A	-	-	0.0	F	-	-	131.6	B	-	-	12.6
	EBL	-	-	-	-	A	0.08	1.7	7.4	A	0.01	1.7	8.6
	EBT	-	-	-	-	A	0.13	17.1	4.4	A	0.04	4.5	8.9
	EBR	-	-	-	-	A	0.00	0.0	0.0	A	0.01	0.0	0.0
	WBL	-	-	-	-	A	0.01	1.3	3.8	A	0.01	1.7	8.6
	WBT	-	-	-	-	F	1.28	#658.4	151.3	B	0.45	32.0	13.6
	WBR	-	-	-	-	A	0.0	0.0	0.0	A	0.01	0.0	0.0
	NBL	-	-	-	-	D	0.0	5.1	45.8	B	0.01	2.5	13.4
	NBT	A	0.03	0.0	0.0	D	0.25	27.3	49.8	B	0.10	12.3	13.5
	NBR	-	-	-	-	A	0.02	0	0.2	A	0.01	0.0	0.0
	SBL	-	-	-	-	D	0.03	5.1	45.8	B	0.01	2.5	13.4
	SBT	A	0.02	0.0	0.0	D	0.15	18.9	47.8	B	0.06	8.6	13.4
	SBR	-	-	-	-	A	0.02	0	0.2	A	0.01	0.0	0.0

## 3 Operations Phase Conditions (2024 and 2039)

### 3.1 Operations Phase Trip Generation

#### 3.1.1 Staff Trip Generation

##### 3.1.1.1 Total Condition

Table 17: Operation Phase Staff Trip Generation Estimate

Peak Period	Mode of Transport	Staff	Vehicles*	In/Out Split	In	Out	Total
AM	Personal Vehicle	387	360	50/50	180	180	360
PM	Personal Vehicle	387	360	50/50	180	180	360

*\*The number of vehicles is based on the assumption that 7% of staff will travel as passengers.*

##### 3.1.1.2 Total Mitigated Condition

Table 18: Mitigated Operation Phase Staff Trip Generation Estimate

Peak Period	Mode of Transport	Staff	Vehicles*	Shift Staggering	In/Out Split	In	Out	Total
AM	Personal Vehicle	387	330	60%	50/50	99	99	198
PM	Personal Vehicle	387	330	40%	50/50	66	66	132

*\*The number of vehicles is based on the assumption that 15% of staff will travel as passengers.*

#### 3.1.2 Heavy Vehicle Trip Generation

Table 19: Operation Phase Heavy Vehicle Trip Generation Estimate (2024 & 2039)

Peak Hour	Type of Vehicle	In	Out	Total
AM	Heavy Vehicles	4	4	<b>8</b>
PM	Heavy Vehicles	4	4	<b>8</b>

#### 3.1.3 Total Trip Generation Summary

##### 3.1.3.1 Total Condition

Table 20: Summary of Operation Phase Trip Generation Estimates

Peak Period	Type of Trips	In	Out	Total
AM	Personal Staff Vehicles	180	180	360
	Heavy Vehicles	4	4	8
	<b>Total</b>	<b>184</b>	<b>184</b>	<b>368</b>

Peak Period	Type of Trips	In	Out	Total
PM	Personal Staff Vehicles	180	180	360
	Heavy Vehicles	4	4	8
	<b>Total</b>	<b>184</b>	<b>184</b>	<b>368</b>

### 3.1.3.2 Total Mitigated Condition

Table 21: Summary of Mitigated Operation Phase Trip Generation Estimates

Peak Period	Type of Trips	In	Out	Total
AM	Personal Staff Vehicles	99	99	198
	Heavy Vehicles	4	4	8
	<b>Total</b>	<b>103</b>	<b>103</b>	<b>206</b>
PM	Personal Staff Vehicles	66	66	132
	Heavy Vehicles	4	4	8
	<b>Total</b>	<b>70</b>	<b>70</b>	<b>140</b>

### 3.1.4 Operations Phase (2024 and 2039) Ajax Mine Trip Assignment

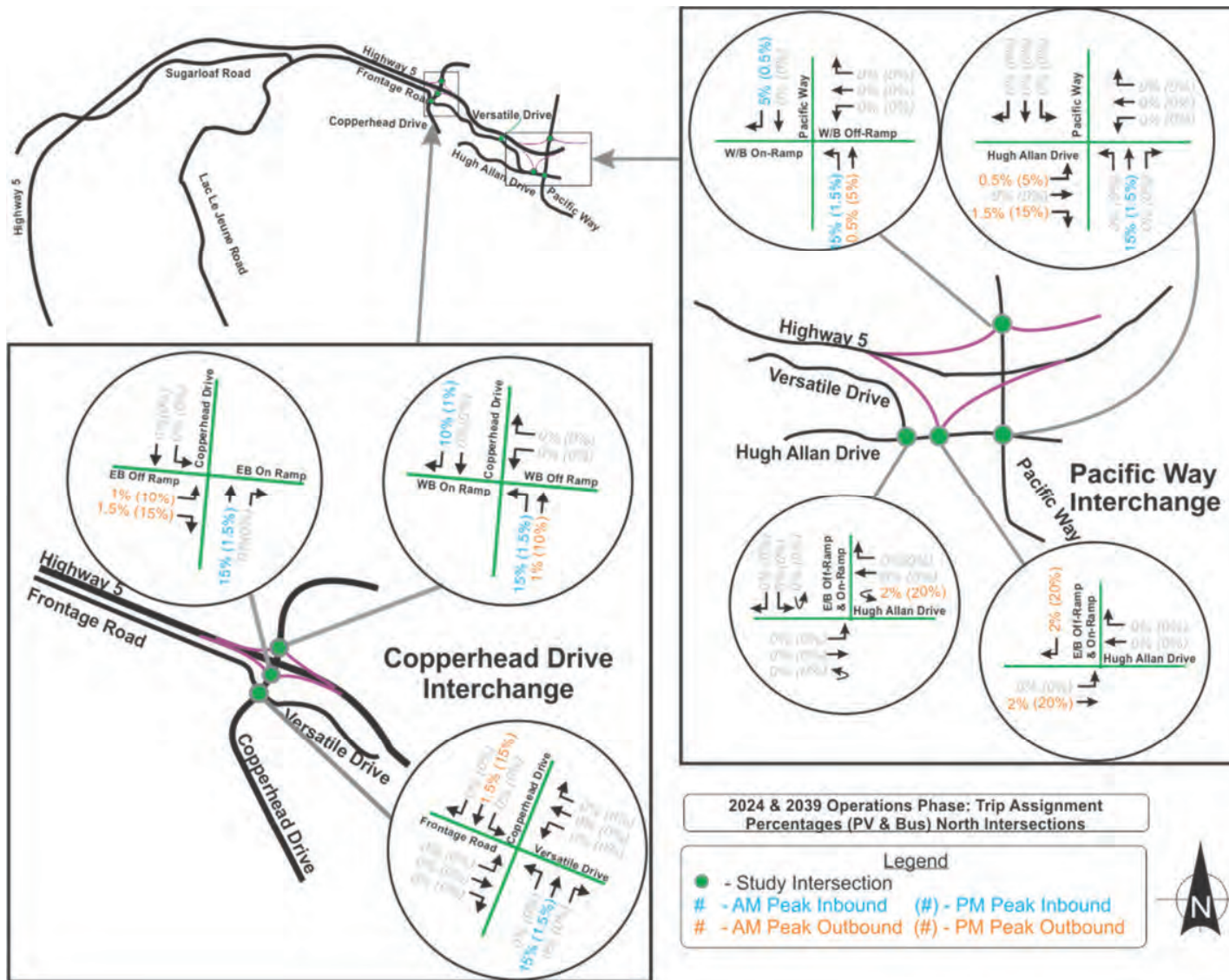


Figure 23: 2024 & 2039 Ajax Mine Trip Assignment Percentages (PV & Bus) – North Intersections

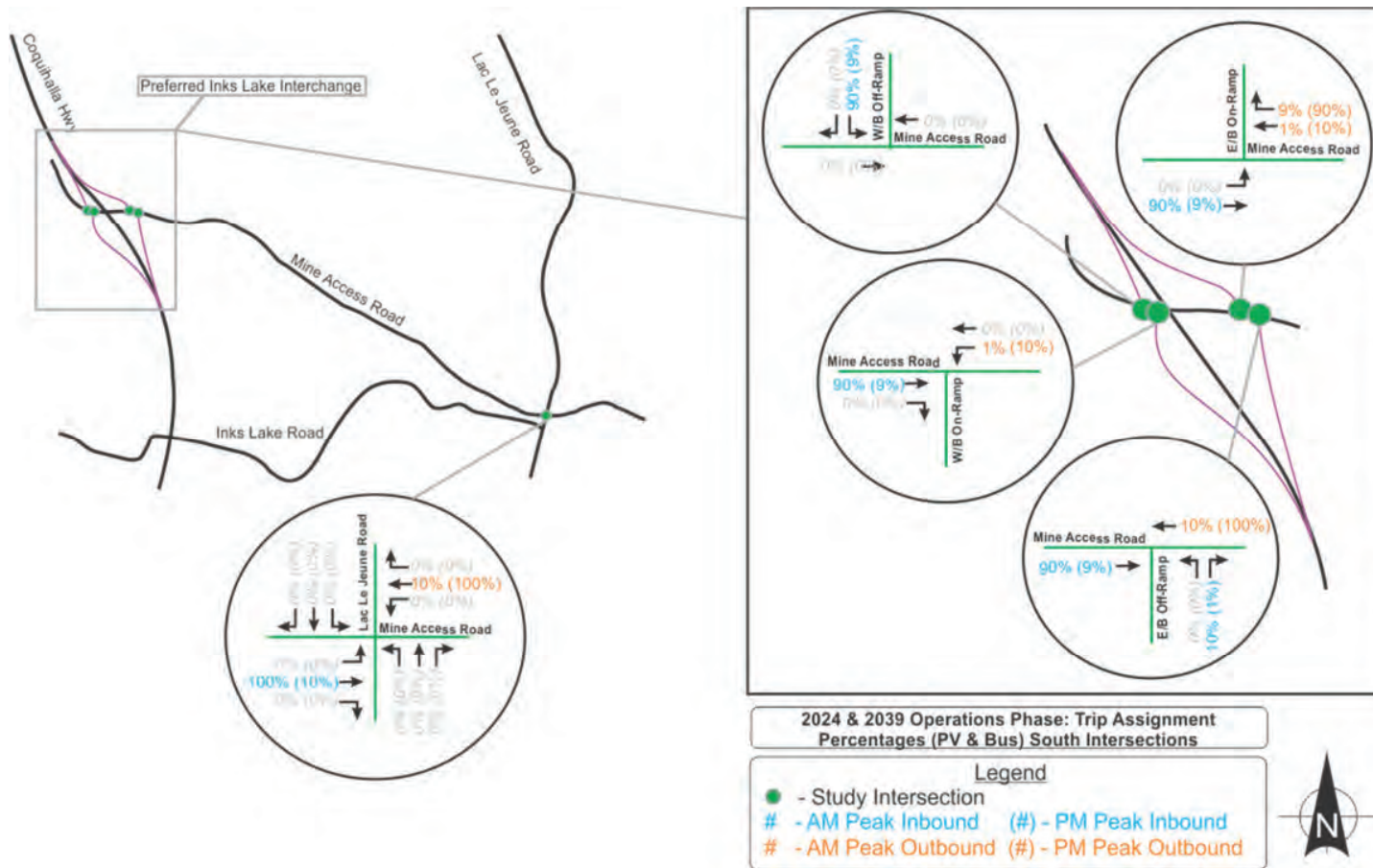


Figure 24: 2024 & 2039 Ajax Mine Trip Assignment Percentages (PV & Bus) – South Intersections

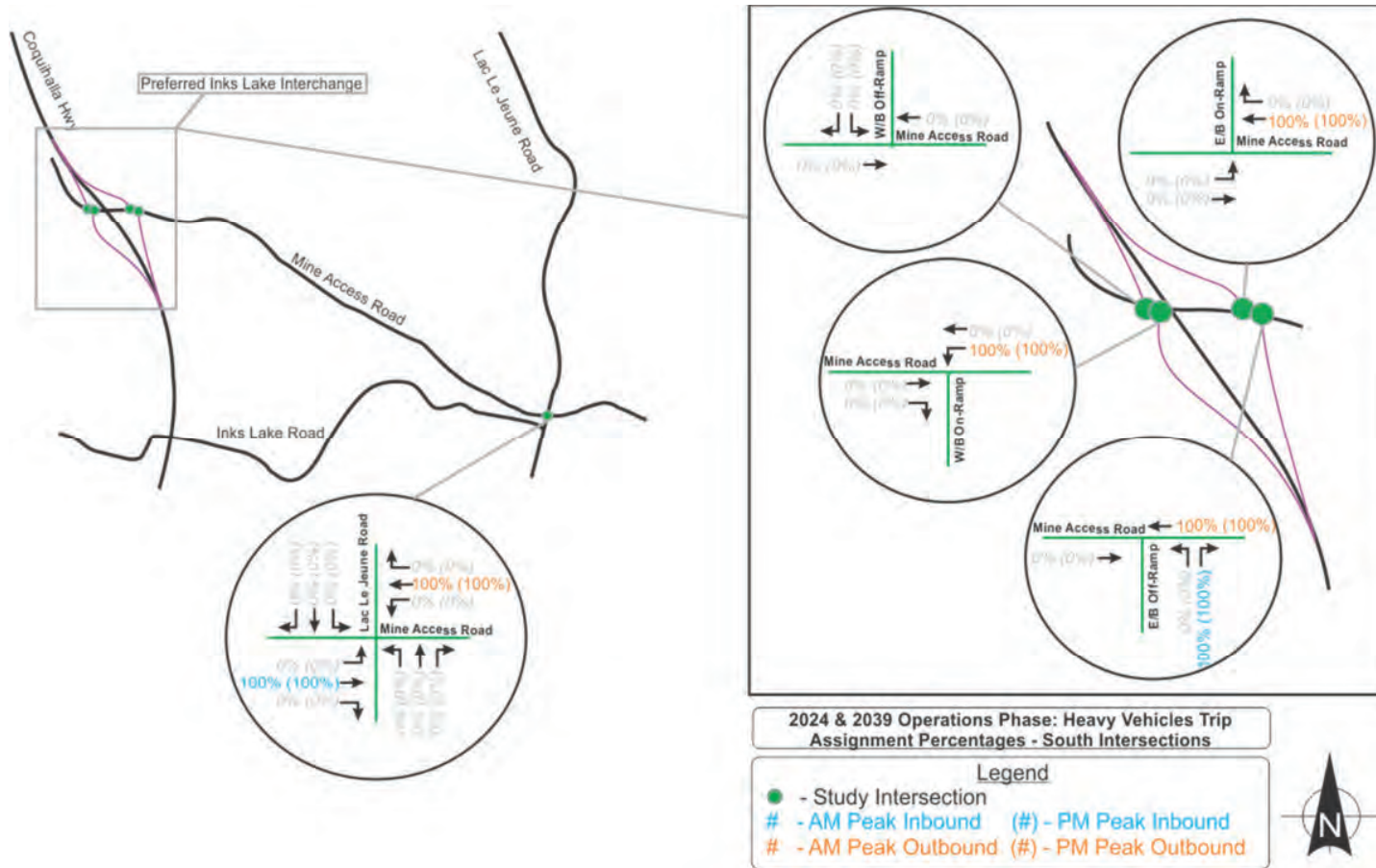


Figure 25: 2024 & 2039 Ajax Mine Trip Assignment Percentages (HV) – South Intersections

### 3.2 Total Volumes

#### 3.2.1 2024 Operations Phase TOTAL Traffic Volumes

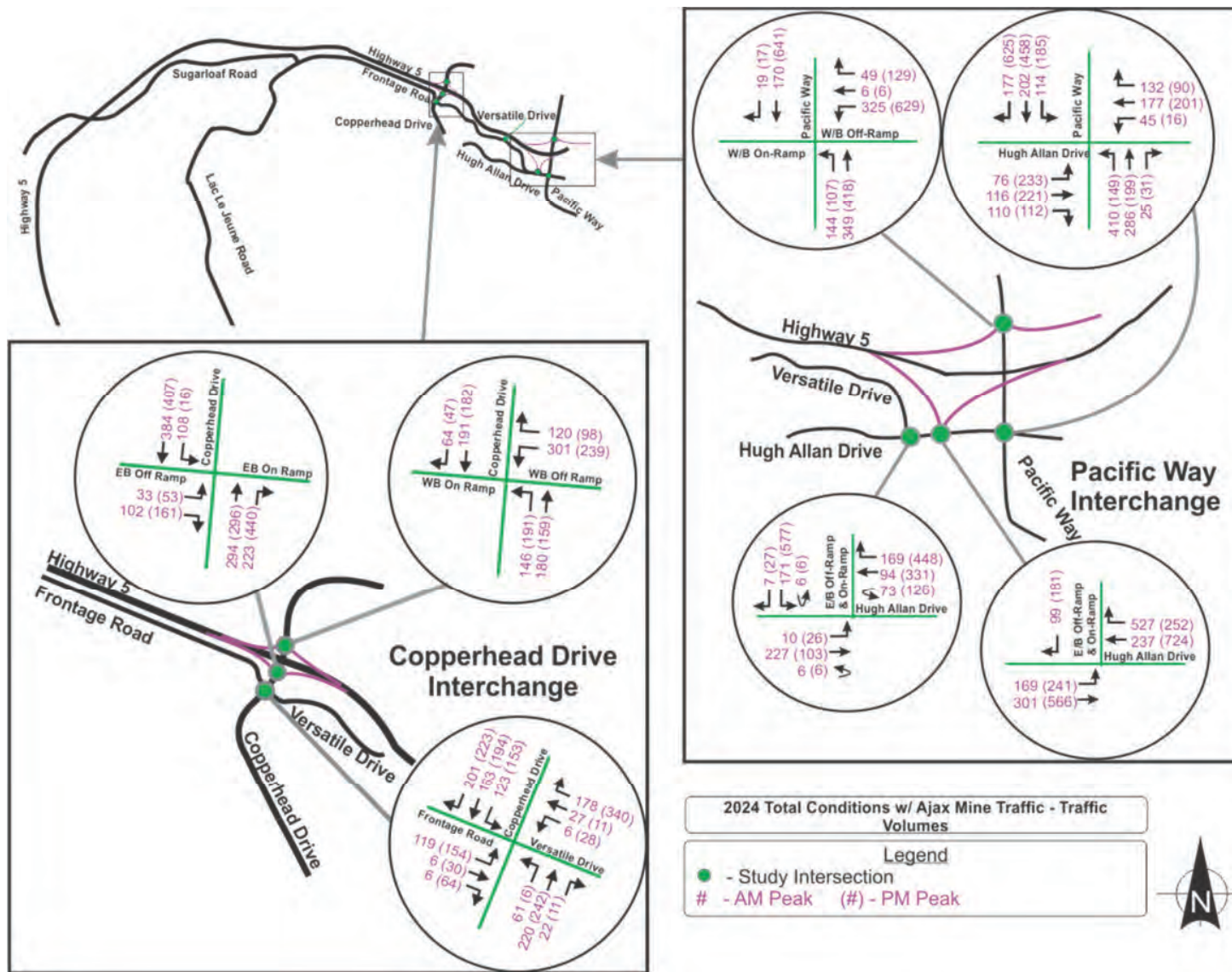


Figure 26: 2024 Total Traffic Volumes – North Intersections

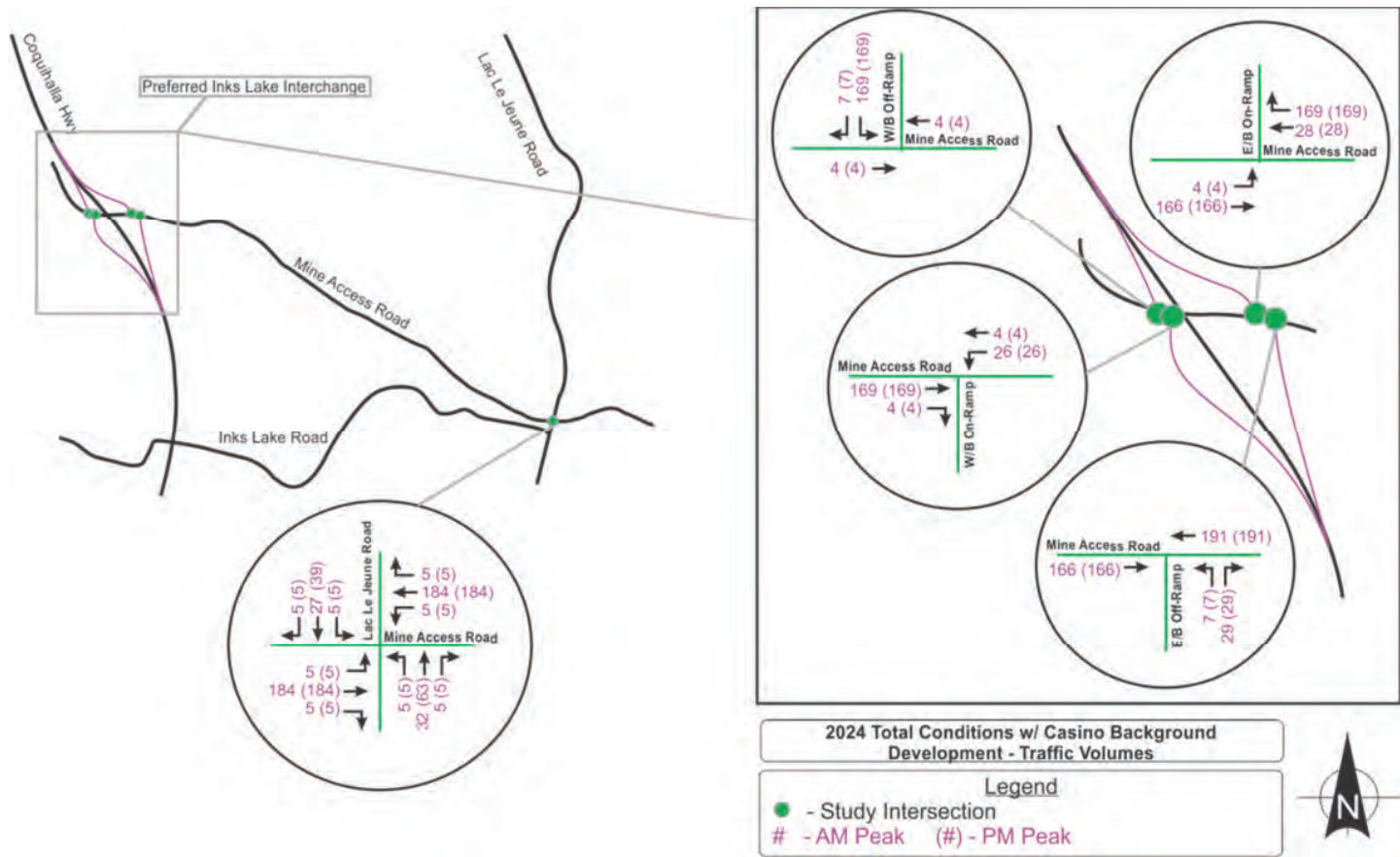


Figure 27: 2024 Total Traffic Volumes – South Intersections

3.2.2 2039 Operations Phase TOTAL Traffic Volumes

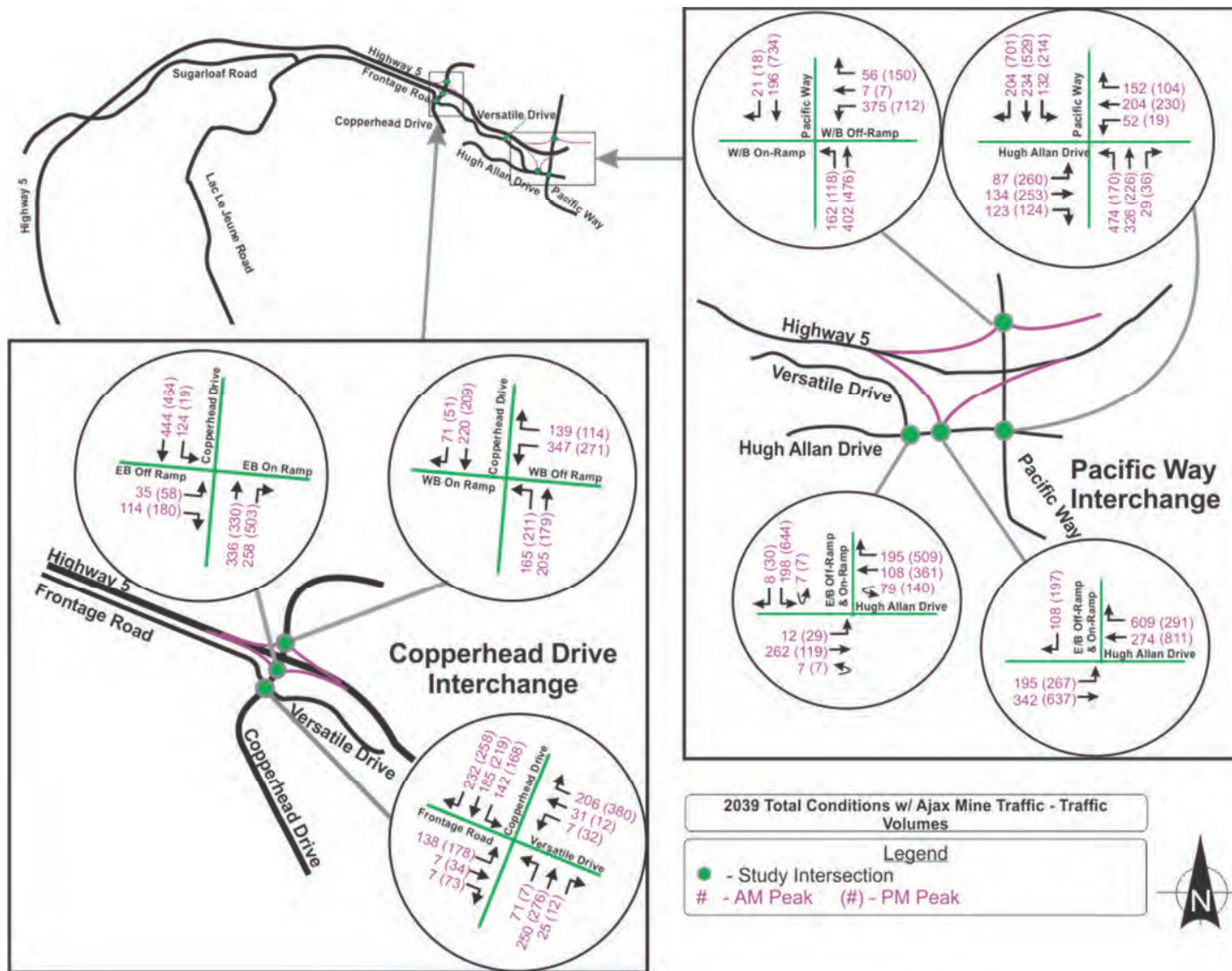


Figure 28: 2039 Total Traffic Volumes – North Intersections

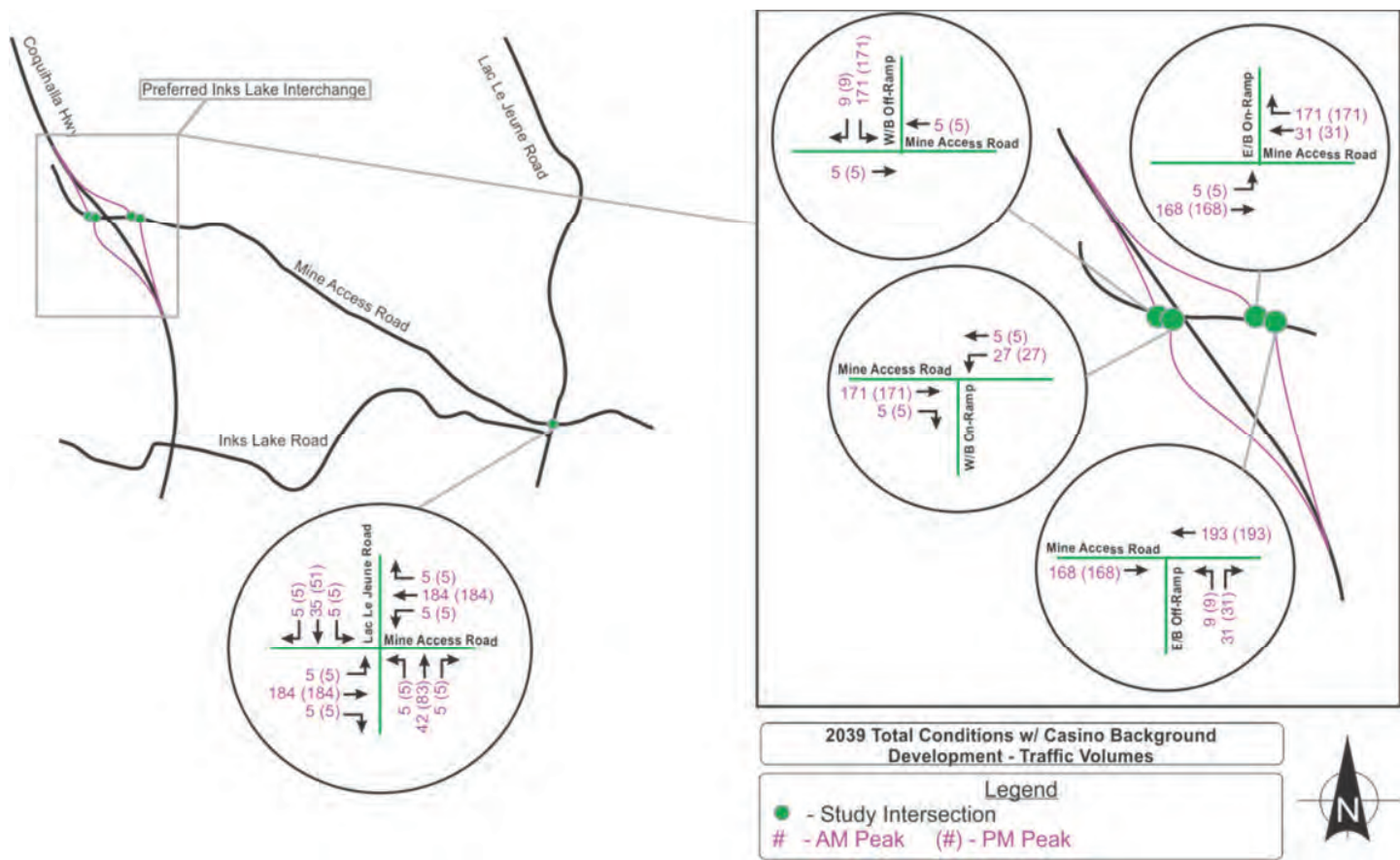


Figure 29: 2039 Total Traffic Volumes – South Intersections

### 3.3 Mitigation Strategies

#### 3.3.1 2024 Operations Phase MITIGATED Traffic Volumes

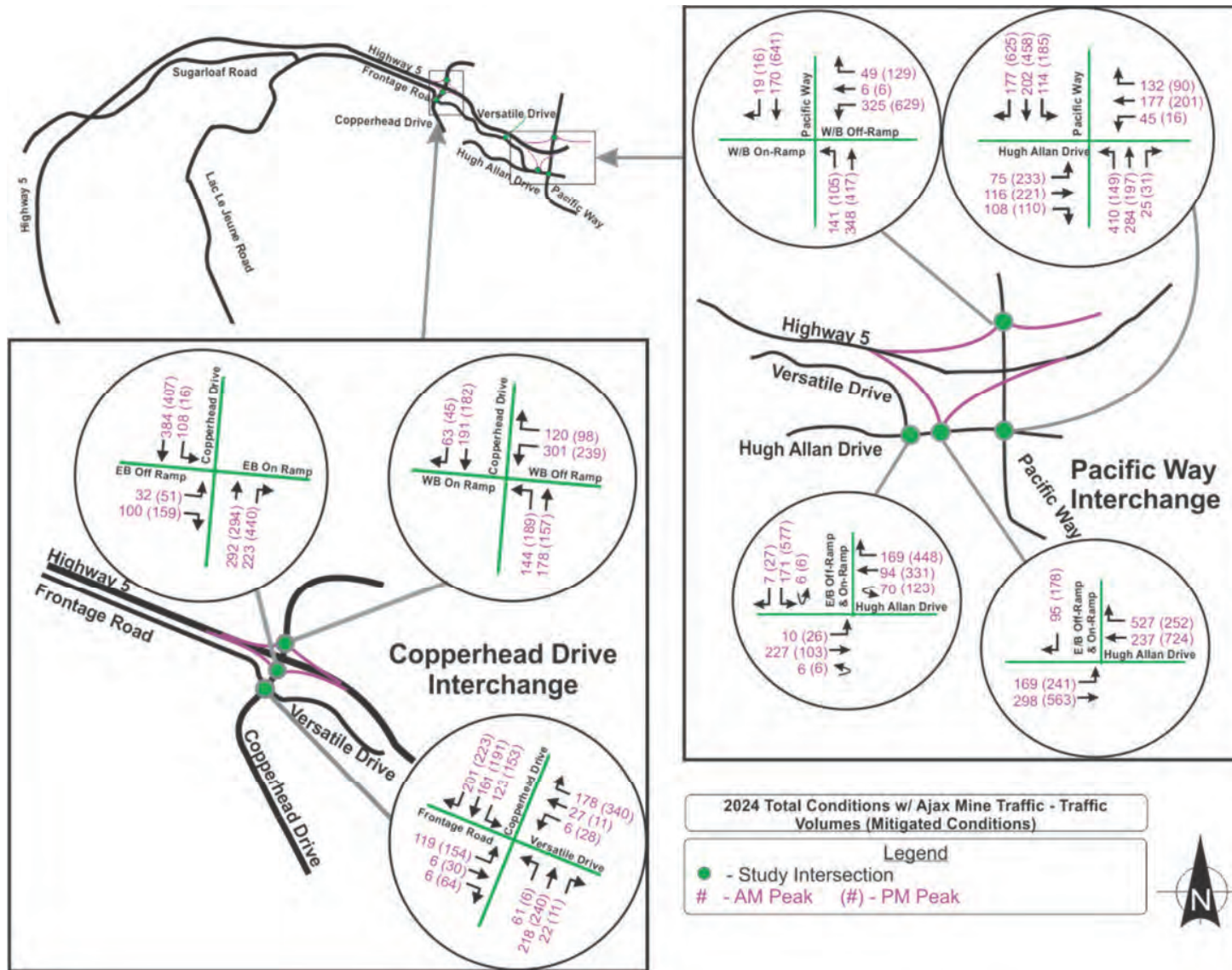


Figure 30: 2024 Mitigated Traffic Volumes – North Intersections

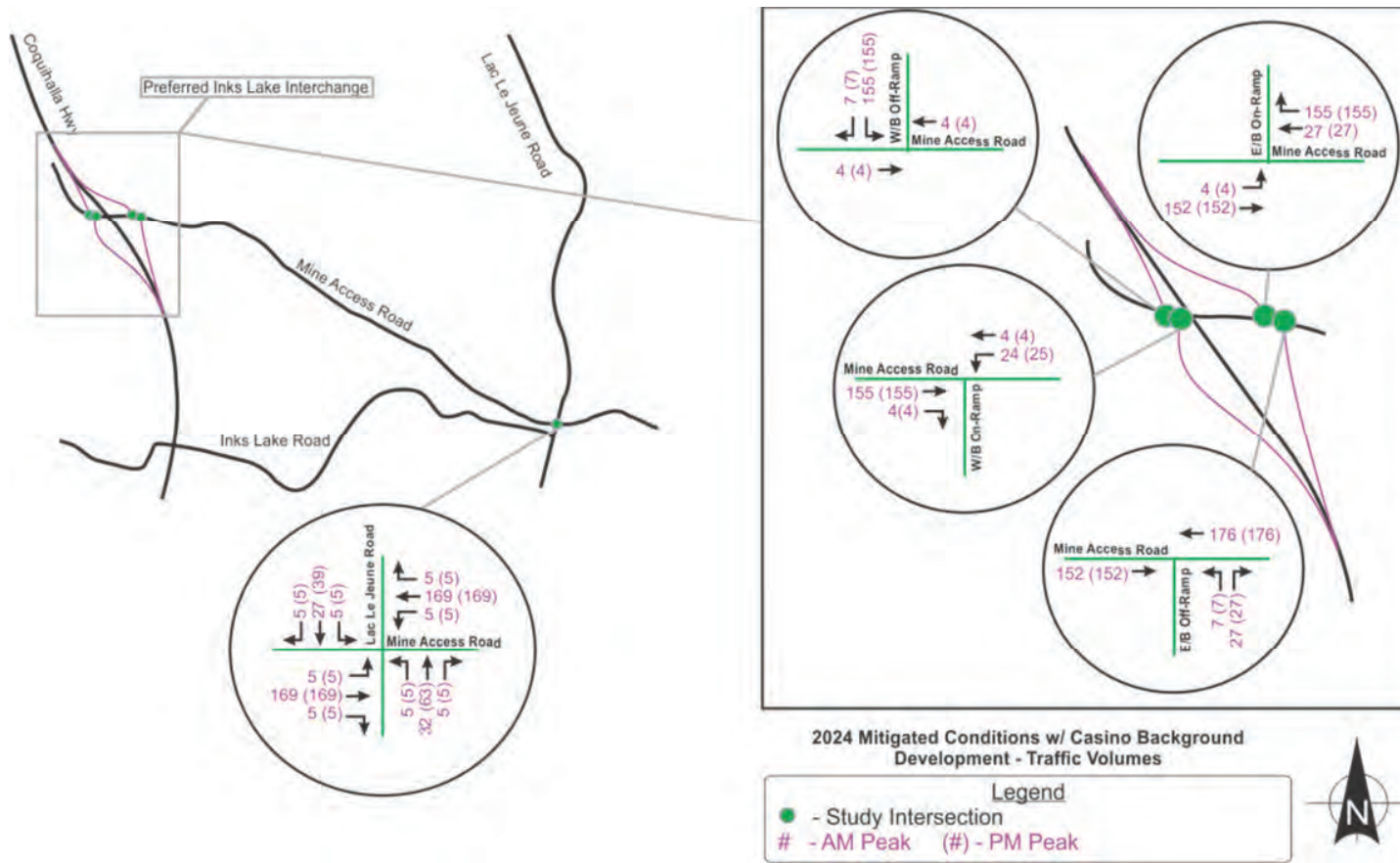


Figure 31: 2024 Mitigated Traffic Volumes – South Intersections

3.3.2 2039 Operations Phase MITIGATED Traffic Volumes

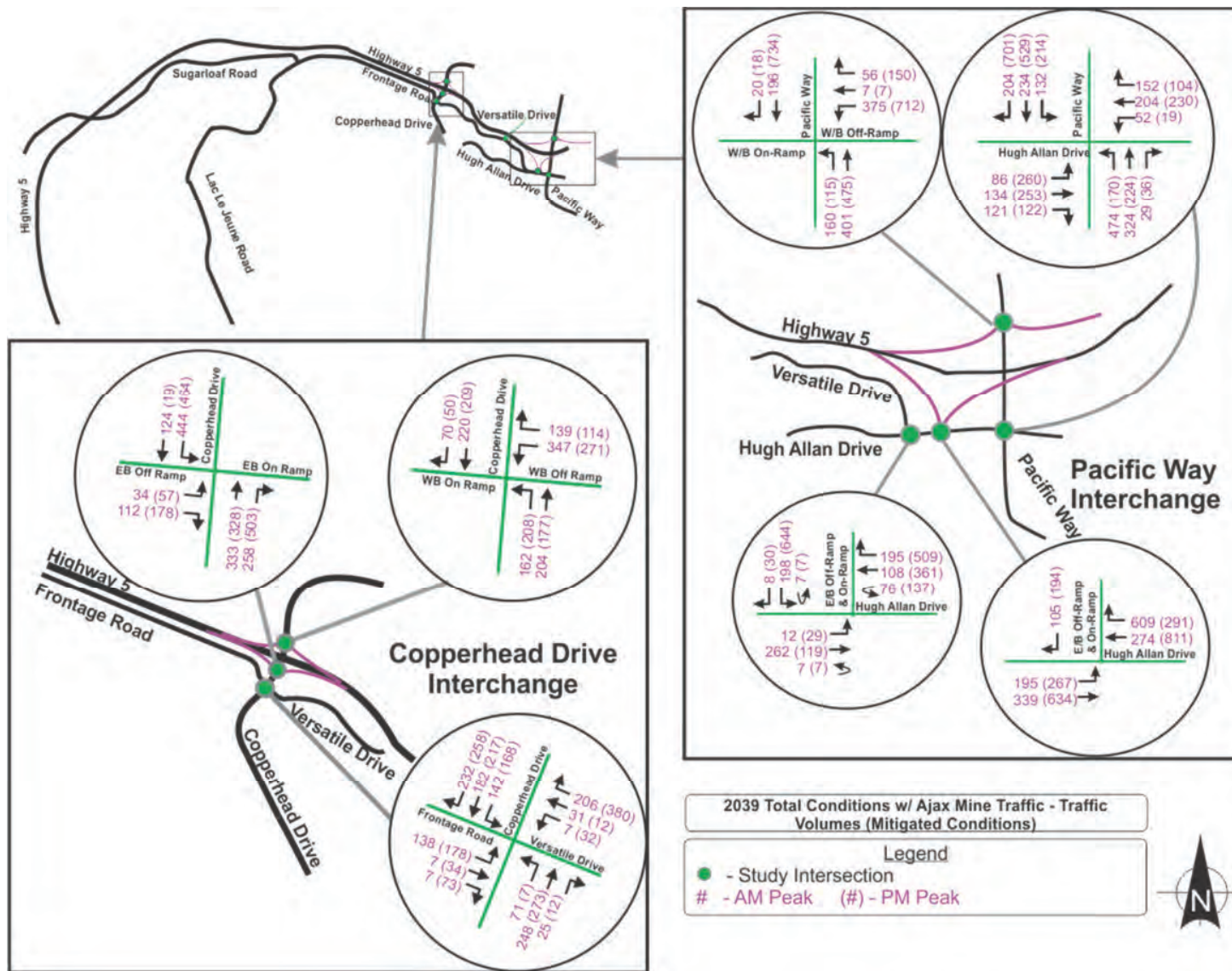


Figure 32: 2039 Mitigated Traffic Volumes – North Intersections

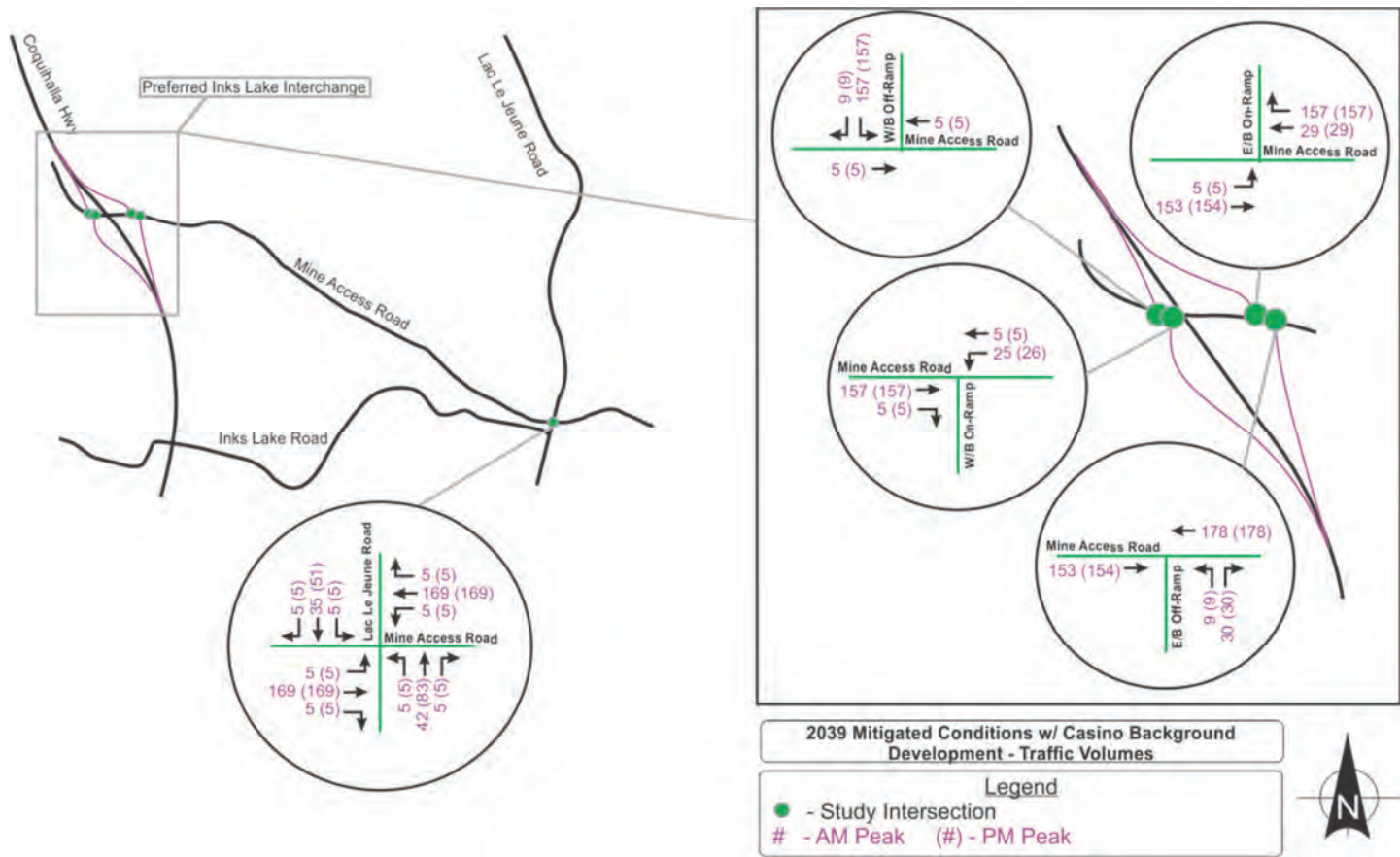


Figure 33: 2039 Mitigated Traffic Volumes – South Intersections

### 3.4 Operations Phase Traffic Analysis Results (2024 & 2039)

Table 22: Traffic Analysis Results Legend

Symbol	Definition
#	95 <sup>th</sup> percentile volume exceeds capacity, queue may be longer
m	Volume of 95 <sup>th</sup> percentile is metered by upstream signal
<b>Highlighted colour:</b> <b>Red</b> <b>Yellow</b>	Failing movement or intersection Performs below acceptable LoS

#### 3.4.1 2024 Traffic Analysis Results

Table 23: 2024 Traffic Analysis Results – AM Peak

Intersection	Turning Movement	Base 2024 - AM Peak				Total 2024 - AM Peak				Mitigated 2024 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Frontage Road / Copperhead Drive	Overall I/S	A	-	-	6.1	A	-	-	6	A	-	-	6.1
	EBLTR	B	0.45	12.5	16.7	B	0.45	12.5	16.7	B	0.45	12.5	16.7
	WBLT	B	0.09	4.2	10.9	B	0.09	4.2	10.9	B	0.09	4.2	10.9
	WBR	A	0.38	6.8	4.8	A	0.38	6.8	4.8	A	0.38	6.8	4.8
	NBL	A	0.09	5.0	5.5	A	0.10	5.1	5.6	A	0.10	5.1	5.6
	NBT	A	0.12	5.8	4.6	A	0.13	6.5	4.6	A	0.13	6.5	4.6
	NBR	-	-			-	-			-	-		
	SBL	A	0.20	9.3	6.4	A	0.21	9.4	6.5	A	0.21	9.4	6.5
	SBT	A	0.07	4.3	5.0	A	0.09	5.0	5.0	A	0.09	4.9	5.0
SBR	A	0.22	5.3	2.0	A	0.22	5.3	2.0	A	0.22	5.3	2.0	
Highway 1 EB Ramps / Copperhead Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	C	0.04	1.1	15.2	C	0.09	3.3	15.8	C	0.09	3.3	15.7
	EBR	B	0.10	3.3	10.1	B	0.14	5.5	10.3	B	0.13	5.5	10.3
	SBL	A	0.09	3.3	8.1	A	0.09	3.3	8.2	A	0.09	3.3	8.2
	SBT												
	SBR												
	NBL	A	-	0.0	0.0	A	-	0.0	0.0	A	-	0.0	0.0
	NBT												
NBR													
Highway 1 WB Ramps / Copperhead Drive	Overall I/S	A	-	-	8.1	A	-	-	8.3	A	-	-	8.3
	WBLT	B	0.52	20.3	10.7	B	0.53	22.4	11.5	B	0.53	22.4	11.5
	WBR	A	0.20	4.1	2.7	A	0.21	4.6	2.9	A	0.21	4.6	2.9
	NBL	B	0.30	10.6	10.1	B	0.35	13.0	10.5	B	0.35	12.8	10.5
	NBT	A	0.13	5.8	7.5	A	0.14	3.4	7.3	A	0.14	6.3	7.3
	NBR												
	SBL												
	SBT	A	0.16	6.7	7.6	A	0.15	6.7	7.4	A	0.15	6.7	7.4
SBR	A	0.08	3.0	3.6	A	0.11	3.6	3.2	A	0.11	3.5	3.2	
Versatile Drive / Hugh Allan Drive	Overall I/S	A	-	-	5.9	A	-	-	6.1	A	-	-	6.1
	EBLTU	A	0.30	11.0	7.4	A	0.31	11	7.8	A	0.31	11	7.8
	WBTRU	A	0.17	11.0	4.9	A	0.167	11	4.9	A	0.167	11	4.9

Intersection	Turning Movement	Base 2024 - AM Peak				Total 2024 - AM Peak				Mitigated 2024 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
	SBLRU	A	0.20	11.0	5.8	A	0.206	11	6.1	A	0.205	11	6
Highway 1 EB Ramps / Hugh Allan Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	A	0.14	5.5	8.2	A	0.14	5.5	8.2	A	0.14	5.5	8.2
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	-	-	-	-	-	-	-	-
	SBR	A	0.07	2.2	9.4	A	0.12	4.4	9.6	A	0.11	4.4	9.6
Pacific Way / Hugh Allan Drive	Overall I/S	C	-	-	22.0	C	-	-	22.1	C	-	-	22.1
	EBL	C	0.28	15.7	30.4	C	0.30	17.20	30.7	C	0.30	17.00	30.6
	EBT	C	0.45	36.0	29.3	C	0.50	39.30	29.0	C	0.50	39.10	29.0
	WBL	D	0.28	15.2	44.5	D	0.29	15.20	44.8	D	0.29	15.20	44.8
	WBT	E	0.68	46.2	57.1	E	0.68	46.20	57.1	E	0.68	46.20	57.1
	WBR	B	0.42	14.6	12.9	B	0.42	14.60	12.9	B	0.42	14.60	12.9
	NBL	B	0.55	61.9	14.1	B	0.56	62.70	14.4	B	0.56	62.70	14.4
	NBT	A	0.14	18.2	9.3	A	0.15	20.1	9.6	A	0.15	20.00	9.6
	NBR	-	-			-	-						
	SBL	C	0.28	33.4	30.5	C	0.29	33.2	30.7	C	0.29	33.2	30.7
	SBT	C	0.15	24.4	25.3	C	0.15	24.2	25.4	C	0.15	24.2	25.4
SBR	A	0.25	13.9	5.8	A	0.25	13.8	5.8	A	0.25	13.8	5.8	
Highway 1 WB Ramps / Pacific Way	Overall I/S	B	-	-	14.4	B	-	-	14.2	B	-	-	14.2
	WBL	C	0.70	39.4	26.7	C	0.70	39.4	26.7	C	0.70	39.4	26.7
	WBT												
	WBR	A	0.11	4.2	5.0	A	0.11	4.2	5.0	A	0.11	4.2	5.0
	NBL	B	0.20	14.1	10.1	B	0.24	17.2	10.5	B	0.24	16.8	10.4
	NBT	A	0.19	15.7	8.7	A	0.20	16.1	8.7	A	0.20	16.1	8.7
	SBT	A	0.10	8.5	8.3	A	0.10	8.5	8.3	A	0.10	8.5	8.3
SBR	A	0.01	0.0	0.0	A	0.02	1.0	1.3	A	0.02	1.0	1.3	
Inks Lake Interchange - EB Off Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	--	-	-	-	-	-	-	-	-	-	-	-
	WBT	A	0.00	0.0	0.0	A	0.00	0	0	A	-	0	0
	NBR	A	0.02	0.0	8.5	A	0.05	2.2	9.9	A	0.047	1.1	9.8
Inks Lake Interchange - EB On Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.00	1.1	3.6	A	0.00	0.1	0.2	A	0.00	1.1	0.2
	EBR												
	WBL	A	0.01	0.0	0.0	A	0.13	0	0	A	0.12	0	0
WBT													
Inks Lake Interchange - WB On Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.01	0.0	0.0	A	0.11	0	0	A	0.10	0	0
	EBR												
	WBL	A	0.00	1.1	3.6	A	0.02	5.5	6.8	A	0.02	5.5	6.7
WBT													
Inks Lake Interchange - WB Off Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.00	0.0	0.0	A	0.00	0	0	A	-	0	0
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	SBL	A	0.02	0.0	8.5	A	0.19	7.7	9.4	A	0.17	6.6	9.3

Intersection	Turning Movement	Base 2024 - AM Peak				Total 2024 - AM Peak				Mitigated 2024 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
	<b>SBR</b>												
Lac Le Jeune Road / Mine Access Road	<b>Overall I/S</b>	A	-	-	0.0	B	-	-	12.7	B	-	-	12.6
	<b>EBL</b>	-	-	-	-	A	0.02	1.8	10	B	0.02	1.8	10.2
	<b>EBT</b>	-	-	-	-	B	0.38	23.8	13.9	B	0.36	22.3	14
	<b>EBR</b>	-	-	-	-	A	0.01	0	0	A	0.01	0	0
	<b>WBL</b>	-	-	-	-	A	0.02	1.8	10	B	0.02	1.8	10.2
	<b>WBT</b>	-	-	-	-	B	0.38	23.8	13.9	B	0.36	22.3	14
	<b>WBR</b>	-	-	-	-	A	0.01	0	0	A	0.01	0	0
	<b>NBL</b>	-	-	-	-	B	0.01	2	10.2	A	0.01	1.9	9.6
	<b>NBT</b>	A	0.02	0.0	0.0	B	0.05	6.8	10.3	A	0.05	6.5	9.8
	<b>NBR</b>	-	-	-	-	A	0.01	0	0	A	0.01	0	0
	<b>SBL</b>	-	-	-	-	B	0.01	2	10.2	A	0.01	1.9	9.6
<b>SBT</b>	A	0.02	0.0	0.0	B	0.04	5.9	10.3	A	0.04	5.6	9.7	
<b>SBR</b>	-	-	-	-	A	0.01	0	0	A	0.01	0	0	

Table 24: 2024 Traffic Analysis Results – PM Peak

Intersection	Turning Movement	Base 2024 - PM Peak				Total 2024 - PM Peak				Mitigated 2024 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Frontage Road / Copperhead Drive	<b>Overall I/S</b>	A	-	-	7.3	A	-	-	7.2	A	-	-	7.2
	<b>EBLTR</b>	B	0.62	17.8	15.7	B	0.62	17.8	15.7	B	0.62	17.8	15.7
	<b>WBLT</b>	A	0.10	4.2	9.3	A	0.10	4.2	9.3	A	0.10	4.2	9.3
	<b>WBR</b>	A	0.52	8.2	4.5	A	0.52	8.2	4.5	A	0.52	8.2	4.5
	<b>NBL</b>	A	0.01	1.3	6.7	A	0.01	1.3	6.7	A	0.01	1.3	6.7
	<b>NBT</b>	A	0.13	7.5	6.2	A	0.15	8.3	6.2	A	0.15	8.3	6.2
	<b>NBR</b>	-	-			-	-			-	-		
	<b>SBL</b>	A	0.28	13.8	8.8	A	0.29	13.9	9.0	A	0.29	13.9	9.0
	<b>SBT</b>	A	0.10	8.0	6.4	A	0.11	6.8	6.4	A	0.11	6.7	6.4
<b>SBR</b>	A	0.26	6.6	2.5	A	0.26	6.6	2.5	A	0.26	6.6	2.5	
Highway 1 EB Ramps / Copperhead Drive	<b>Overall I/S</b>	-	-	-	-	-	-	-	-	-	-	-	-
	<b>EBL</b>	B	0.08	2.2	13.0	B	0.12	4.4	13.4	B	0.11	4.4	13.3
	<b>EBR</b>	B	0.18	7.7	10.8	B	0.2	8.8	11.0	B	0.22	8.8	11.0
	<b>SBL</b>	A	0.01	0.0	7.9	A	0.0	0.0	8.0	A	0.01	0.0	8.0
	<b>SBT</b>												
	<b>SBR</b>												
	<b>NBL</b>	A	-	0.0	0.0	A	-	0.0	0.0	A	-	0.0	0.0
<b>NBT</b>													
<b>NBR</b>													
Highway 1 WB Ramps / Copperhead Drive	<b>Overall I/S</b>	A	-	-	7.7	A	-	-	7.8	A	-	-	7.8
	<b>WBLT</b>	B	0.44	18.6	10.4	B	0.45	18.6	10.7	B	0.45	18.6	10.7
	<b>WBR</b>	A	0.18	4.4	3.1	A	0.18	4.4	3.1	A	0.18	4.4	3.1
	<b>NBL</b>	A	0.31	14.4	9.3	A	0.35	16.9	9.7	A	0.34	16.7	9.7
	<b>NBT</b>	A	0.09	5.2	6.8	A	0.09	5.7	6.6	A	0.09	5.6	6.7
	<b>NBR</b>												
<b>SBL</b>													

Intersection	Turning Movement	Base 2024 - PM Peak				Total 2024 - PM Peak				Mitigated 2024 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
	SBT	A	0.11	6.4	6.7	A	0.11	6.4	6.6	A	0.11	6.4	6.7
	SBR	A	0.04	2.4	3.6	A	0.06	2.9	3.2	A	0.06	2.9	3.2
Versatile Drive / Hugh Allan Drive	Overall I/S	C	-	-	19.4	C	-	-	21.9	C	-	-	21.6
	EBLTU	B	0.27	11.0	10.8	B	0.28	11	11.4	B	0.28	11	11.3
	WBTRU	A	0.45	22.0	8.5	A	0.46	22	8.6	A	0.456	22	8.6
	SBLRU	E	0.90	121.0	38.7	E	0.935	143	45.7	E	0.931	143	44.9
Highway 1 EB Ramps / Hugh Allan Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	B	0.31	14.3	11.3	B	0.31	14.3	11.3	B	0.31	14.3	11.3
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	-	-	-	-	-	-	-	-
	SBL	-	-	-	-	-	-	-	-	-	-	-	-
SBR	B	0.26	11.0	13.1	B	0.32	15.4	13.7	B	0.31	14.3	13.7	
Pacific Way / Hugh Allan Drive	Overall I/S	C	-	-	26.0	C	-	-	26.4	C	-	-	26.4
	EBL	D	0.73	#53.7	44.4	D	0.75	#57.6	46.2	D	0.75	#57.6	46.2
	EBTR	C	0.56	62.0	33.0	C	0.61	67.4	33.8	C	0.61	67.3	33.8
	WBL	D	0.10	7.1	38.4	D	0.10	7.1	38.5	D	0.10	7.1	38.5
	WBT	E	0.71	50.9	56.8	E	0.71	50.9	56.8	E	0.71	50.9	56.8
	WBR	A	0.27	5.8	4.9	A	0.27	5.8	4.9	A	0.27	5.8	4.9
	NBL	B	0.31	21.0	13.0	B	0.31	21	13	B	0.31	21	13
	NBT	B	0.11	12.3	10.0	B	0.12	14.1	10.5	B	0.12	14	10.4
	NBR	-	-			-	-			-	-		
	SBL	C	0.40	42.1	26.2	C	0.41	42.5	26.7	C	0.41	42.4	26.6
SBT	C	0.32	41.8	22.3	C	0.32	41.8	22.4	C	0.32	41.8	22.4	
SBR	B	0.77	#107.8	19.9	B	0.77	#107.8	19.9	B	0.77	#107.8	19.9	
Highway 1 WB Ramps / Pacific Way	Overall I/S	B	-	-	19.5	C	-	-	20.1	C	-	-	20
	WBL	C	0.85	#96.6	28.1	C	0.87	#102.2	30.5	C	0.87	#102.2	30.4
	WBT	C	0.85	#96.6	28.1	C	0.87	#102.2	30.5	C	0.87	#102.2	30.4
	WBR	A	0.18	6.0	2.8	A	0.18	6.5	3	A	0.18	6.5	3
	NBL	C	0.39	13.9	21.6	C	0.50	17.8	24.4	C	0.50	17.4	24.1
	NBT	B	0.33	21.3	15.1	B	0.33	20.3	14.6	B	0.33	20.3	14.6
	SBT	B	0.52	34.2	17.1	B	0.51	32	16.5	B	0.51	32	16.5
	SBR	A	0.01	0.0	0.0	A	0.03	0.9	1.2	A	0.03	0.7	1.1
Inks Lake Interchange - EB Off Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	A	0.00	0.0	0.0	A	0.00	0	0	A	-	0	0
	NBL	A	0.02	0.0	8.5	A	0.55	0.2	9.9	A	0.047	1.1	9.8
Inks Lake Interchange - EB On Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.00	1.1	3.6	A	0.00	0.1	0.2	A	0.00	1.1	0.2
	EBR	A	0.00	1.1	3.6	A	0.00	0.1	0.2	A	0.00	1.1	0.2
	WBL	A	0.01	0.0	0.0	A	0.13	0	0	A	0.12	0	0
Inks Lake Interchange - WB On Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.01	0.0	0.0	A	1.21	0	0	A	0.10	0	0
	EBR	A	0.01	0.0	0.0	A	1.21	0	0	A	0.10	0	0
	WBL	A	0.00	1.1	3.6	A	0.22	0.5	6.8	A	0.02	5.5	6.7

Intersection	Turning Movement	Base 2024 - PM Peak				Total 2024 - PM Peak				Mitigated 2024 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Inks Lake Interchange - WB Off Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.00	0.0	0.0	A	0.00	0	0	A	-	0	0
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	SBL	A	0.02	0.0	8.5	A	2.07	0.7	9.4	A	0.17	6.6	9.3
	SBR												
Lac Le Jeune Road / Mine Access Road	Overall I/S	A	-	-	0.0	B	-	-	12.5	B	-	-	12.4
	EBL	-	-	-	-	A	0.02	1.8	10.0	B	0.02	1.8	10.2
	EBT	-	-	-	-	B	0.38	23.8	13.9	B	0.36	22.3	14
	EBR	-	-	-	-	A	0.01	0.0	0.0	A	0.01	0	0
	WBL	-	-	-	-	A	0.02	1.8	10.0	B	0.02	1.8	10.2
	WBT	-	-	-	-	B	0.38	23.8	13.9	B	0.36	22.3	14
	WBR	-	-	-	-	A	0.01	0.0	0.0	A	0.01	0	0
	NBL	-	-	-	-	B	0.01	2.0	10.2	A	0.01	1.9	9.6
	NBT	A	0.04	0.0	0.0	B	0.1	10.9	10.5	A	0.10	10.3	9.9
	NBR	-	-	-	-	A	0.01	0.0	0.0	A	0.01	0	0
	SBL	-	-	-	-	B	0.01	2.0	10.2	A	0.01	1.9	9.6
	SBT	A	0.02	0.0	0.0	B	0.06	7.7	10.3	A	0.06	7.3	9.7
SBR	-	-	-	-	A	0.01	0.0	0.0	A	0.01	0	0	

### 3.4.2 2039 Traffic Analysis Results

Table 25: 2039 Traffic Analysis Results – AM Peak

Intersection	Turning Movement	Base 2039 - AM Peak				Total 2039 - AM Peak				Mitigated 2039 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Frontage Road / Copperhead Drive	Overall I/S	A	-	-	6.4	A	-	-	6.4	A	-	-	6.4
	EBLTR	B	0.49	13.6	16.7	B	0.49	13.6	16.7	B	0.49	13.6	16.7
	WBLT	B	0.09	4.5	10.4	B	0.09	4.5	10.4	B	0.09	4.5	10.4
	WBR	A	0.40	7.0	4.5	A	0.40	7.0	4.5	A	0.40	7.0	4.5
	NBL	A	0.12	6.1	6.2	A	0.12	6.1	6.2	A	0.12	6.1	6.2
	NBT	A	0.14	7.1	5.0	A	0.15	7.8	5.1	A	0.15	7.7	5.1
	NBR	-	-			-	-			-	-		
	SBL	A	0.25	11.6	7.4	A	0.26	11.7	7.5	A	0.26	11.7	7.5
	SBT	A	0.09	5.2	5.4	A	0.10	5.9	5.4	A	0.10	5.8	5.4
SBR	A	0.26	6.1	2.1	A	0.26	6.1	2.1	A	0.26	6.1	2.1	
Highway 1 EB Ramps / Copperhead Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	C	0.06	2.2	16.9	C	0.12	4.4	17.7	C	0.11	4.4	17.6
	EBR	B	0.12	4.4	10.5	B	0.16	6.6	10.7	B	0.16	6.6	10.7
	SBL	A	0.11	4.4	8.3	A	0.11	4.4	8.4	A	0.11	4.4	8.4
	SBT	-	-	-	-	-	-	-	-	-	-	-	-
	SBR	-	-	-	-	-	-	-	-	-	-	-	-
	NBL	A	-	0	0	A	-	0.0	0.0	A	-	0.0	0.0
NBT	-	-	-	-	-	-	-	-	-	-	-	-	

Intersection	Turning Movement	Base 2039 - AM Peak				Total 2039 - AM Peak				Mitigated 2039 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
	NBR	-	-	-	-	-	-	-	-	-	-	-	-
Highway 1 WB Ramps / Copperhead Drive	Overall I/S	A	-	-	8.7	A	-	-	8.9	A	-	-	8.9
	WBLT	B	0.58	26.2	11.9	B	0.59	27.8	12.5	B	0.59	27.8	12.5
	WBR	A	0.22	4.9	2.8	A	0.22	5.2	2.9	A	0.22	5.2	2.9
	NBL	B	0.36	12.4	11.3	B	0.42	14.9	11.9	B	0.41	14.7	11.9
	NBT	A	0.16	6.6	7.8	A	0.17	7.1	7.7	A	0.16	7.1	7.7
	NBR	-	-	-	-	-	-	-	-	-	0	-	-
	SBL	-	-	-	-	-	-	-	-	-	0	-	-
	SBR	A	0.10	3.2	3.5	A	0.12	3.7	3.2	A	0.12	3.7	3.2
Versatile Drive / Hugh Allan Drive	Overall I/S	A	-	-	6.5	A	-	-	6.7	-	-	-	-
	EBLTU	A	0.36	22.0	8.5	A	0.37	22	9	A	0.37	22	9
	WBTRU	A	0.19	11.0	5.2	A	0.193	11	5.2	A	0.193	11	5.2
	SBLRU	A	0.24	11.0	6.3	A	0.244	11	6.6	A	0.243	11	6.6
Highway 1 EB Ramps / Hugh Allan Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	A	0.17	6.6	8.5	A	0.17	6.6	8.5	A	0.17	6.6	8.5
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	-	-	-	-	-	-	-	-
	SBL	-	-	-	-	-	-	-	-	-	-	-	-
Pacific Way / Hugh Allan Drive	Overall I/S	C	-	-	23.7	C	-	-	23.9	C	-	-	23.9
	EBL	C	0.31	16.50	29.1	C	0.33	18.1	29.4	C	0.33	17.9	29.4
	EBTR	C	0.48	39.70	2.9	C	0.53	43.2	29.2	C	0.53	42.9	29.2
	WBL	D	0.30	16.60	43.2	D	0.31	16.6	43.5	D	0.31	16.6	43.5
	WBT	E	0.71	51.10	56.2	E	0.71	51.1	55.9	E	0.71	51.1	55.9
	WBR	B	0.45	18.40	15.1	B	0.45	18.4	15.1	B	0.45	18.4	15.1
	NBL	B	0.66	#83.4	19.0	B	0.67	#86.6	19.7	B	0.67	#88	19.6
	NBT	B	0.16			B	0.18			B	0.18		
	NBR	-	-	22.6	10.6	-	-	25	11.1	-	-	24.7	11
	SBL	C	0.37	35.6	34.0	C	0.39	35.5	34.7	C	0.38	35.5	34.6
SBT	C	0.19	25.4	27.3	C	0.19	25.2	27.6	C	0.19	25.2	27.6	
SBR	A	0.3	13.4	5.5	A	0.30	13.3	5.5	A	0.30	13.3	5.5	
Highway 1 WB Ramps / Pacific Way	Overall I/S	B	-	-	15	B	-	-	14.9	B	-	-	14.9
	WBL	C	0.73	23.2	26.2	C	0.73	43.2	26.2	C	0.73	43.2	26.2
	WBT												
	WBR	A	0.11	4.1	4.3	A	0.11	4.1	4.3	A	0.11	4.1	4.3
	NBL	B	0.25	17.6	11.9	B	0.30	21.1	12.4	B	0.29	20.7	12.3
	NBT	B	0.24	19.7	10.0	B	0.24	20	10.1	B	0.24	20	10.1
	SBT	A	0.12	10.4	9.5	A	0.12	10.4	9.5	A	0.12	10.4	9.5
SBR	A	0.02	0.3	0.2	A	0.03	1.3	1.7	A	0.03	1.2	1.6	
Inks Lake Interchange - EB Off Ramp	Overall I/S		-	-			-	-			-	-	
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	A	0.00	0.0	0.0	A	0.00	0	0	A	-	0	0
	NBL	A	0.02	1.1	8.5	B	0.06	2.2	10	A	0.05	2.2	9.9

Intersection	Turning Movement	Base 2039 - AM Peak				Total 2039 - AM Peak				Mitigated 2039 - AM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Inks Lake Interchange - EB On Ramp	Overall I/S		-	-			-	-			-	-	
	EBT	A	0.00	1.1	3.7	A	0.00	0.1	0.3	A	0.00	1.1	0.3
	EBR												
	WBL	A	0.01	0.0	0.0	A	0.13	0	0	A	0.12	0	0
Inks Lake Interchange - WB On Ramp	Overall I/S		-	-			-	-			-	-	
	EBT	A	0.01	0.0	0.0	A	0.11	0	0	A	0.10	0	0
	EBR												
	WBL	A	0.00	1.1	3.6	A	0.02	6.6	6.6	A	0.02	5.5	6.5
Inks Lake Interchange - WB Off Ramp	Overall I/S		-	-			-	-			-	-	
	EBT	A	0.00	0.0	0.0	A	0.00	0	0	A	-	0	0
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	SBL	A	0.02	1.1	8.5	A	0.19	7.7	9.4	A	0.18	7.7	9.3
Lac Le Jeune Road /Mine Access Road	Overall I/S	A	-	-	0.0	B	-	-	12.6	B	-	-	12.5
	EBL	-	-	-	-	A	0.02	1.8	10	B	0.02	1.8	10.2
	EBT	-	-	-	-	B	0.38	23.8	13.9	B	0.36	22.3	14
	EBR	-	-	-	-	A	0.01	0	0	A	0.01	0	0
	WBL	-	-	-	-	A	0.02	1.8	10	B	0.02	1.8	10.2
	WBT	-	-	-	-	B	0.38	23.8	13.9	B	0.36	22.3	14
	WBR	-	-	-	-	A	0.01	0	0	A	0.01	0	0
	NBL	-	-	-	-	B	0.01	2	10.2	A	0.01	1.9	9.6
	NBT	A	0.02	0.0	0.0	B	0.06	8.2	10.3	A	0.07	7.8	9.8
	NBR	-	-	-	-	A	0.01	0	0	A	0.01	0	0
	SBL	-	-	-	-	B	0.01	2	10.2	A	0.01	1.9	9.6
	SBT	A	0.02	0.0	0.0	B	0.05	7.2	10.3	A	0.05	6.8	9.7
SBR	-	-	-	-	A	0.01	0	0	A	0.01	0	0	

Table 26: 2039 Traffic Analysis Results – PM Peak

Intersection	Turning Movement	Base 2039 - PM Peak				Total 2039 - PM Peak				Total 2039 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Frontage Road / Copperhead Drive	Overall I/S	A	-	-	7.8	A	-	-	7.8	A	-	-	7.8
	EBLTR	B	0.67	21.4	17.1	B	0.67	21.4	17.1	B	0.67	21.4	17.1
	WBLT	A	0.11	4.6	9.0	A	0.11	4.6	9.0	A	0.11	4.6	9.0
	WBR	A	5.40	8.6	4.4	A	0.54	8.6	4.4	A	0.54	8.6	4.4
	NBL	A	0.01	1.4	7.0	A	0.01	1.4	7.0	A	0.01	1.4	7.0
	NBT	A	0.16	8.5	6.6	A	0.18	9.3	6.7	A	0.17	9.2	6.7
	NBR	-	-			-	-			-	-		
	SBL	B	0.34	15.5	10.0	B	0.35	15.7	10.2	B	0.34	15.7	10.2
	SBT	A	0.12	6.7	6.8	A	0.13	7.5	6.8	A	0.13	7.4	6.8
	SBR	A	0.31	7.1	2.6	A	0.31	7.1	2.6	A	0.31	7.1	2.6
Highway 1 EB Ramps /	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBL	B	0.09	3.3	13.9	B	0.14	5.5	14.4	B	0.14	5.5	14.3

Intersection	Turning Movement	Base 2039 - PM Peak				Total 2039 - PM Peak				Total 2039 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Copperhead Drive	EBR	B	0.22	8.8	11.3	B	0.26	11.0	11.6	B	0.26	11.0	11.6
	SBL	A	0.02	1.1	8.0	A	0.02	1.1	8.1	A	0.02	1.1	8.1
	SBT									-	-	-	-
	SBR									-	-	-	-
	NBL	A	-	0.0	0.0	A	-	0.0	0.0	A	-	0.0	0.0
	NBT									-	-	-	-
	NBR									-	-	-	-
Highway 1 WB Ramps / Copperhead Drive	Overall I/S	A	-	-	8.1	A	-	-	8.2	A	-	-	8.2
	WBLT	B	0.49	21.1	11.0	B	0.49	21.1	11.4	B	0.49	21.1	11.4
	WBR	A	0.20	4.7	3.1	A	0.20	4.7	3.1	A	0.2	4.7	3.1
	NBL	B	0.35	16.6	10.1	B	0.40	19.5	10.6	B	0.39	19.1	10.5
	NBT	A	0.10	5.8	6.9	A	0.11	6.3	6.8	A	0.11	6.3	6.8
	NBR									-	-	-	-
	SBL									-	-	-	-
	SBR	A	0.13	7.2	6.9	A	0.13	7.2	6.8	A	0.13	7.2	6.8
Versatile Drive / Hugh Allan Drive	Overall I/S	D	-	-	33.5	E	-	-	38.2	E	-	-	37.8
	EBLTU	B	0.34	11.0	13.1	B	0.36	22	13.9	B	0.35	22	13.8
	WBTRU	A	0.51	33.0	9.6	A	0.513	33	9.6	A	0.513	33	9.6
	SBLRU	F	1.06	198.0	75.8	F	1.096	220	89.9	F	1.093	220	88.8
Highway 1 EB Ramps / Hugh Allan Drive	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	2.9
	EBL	B	0.37	18.7	12.5	B	0.37	18.7	12.5	B	0.37	18.7	12.5
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	-	-	-	-	-	-	-	-
	SBR	B	0.33	14.3	14.2	C	0.37	18.7	15.1	C	0.37	15.1	18.7
Pacific Way / Hugh Allan Drive	Overall I/S	D	-	-	31.2	D	-	-	32.1	C	-	-	32.1
	EBL	E	0.93	#65.8	70.8	E	0.96	#70.7	77.3	E	0.96	#70.7	76.9
	EBTR	D	0.65	70.00	36.2	D	0.70	76.1	37.7	D	0.69	75.6	37.5
	WBL	D	0.11	7.80	37.2	D	0.12	7.8	37.4	D	0.12	7.8	37.3
	WBT	E	0.74	56.60	56.5	E	0.74	56.6	56.5	E	0.74	56.6	56.5
	WBR	A	0.29	8.30	6.6	A	0.29	8.3	6.6	A	0.29	8.3	6.6
	NBL	B	0.37	24.90	13.7	B	0.37	24.9	13.8	B	0.37	24.9	13.8
	NBT	B	0.13	14.9	10.3	B	0.14	16.7	10.6	B	0.14	16.6	10.6
	NBR	-	-			-	-						
	SBL	C	0.48	51.5	28.4	C	0.49	52.1	29	C	0.49	52.1	29
SBR	C	0.87	#143.7	28.1	C	0.87	#143.7	28.3	C	0.87	#143.7	28.3	
Highway 1 WB Ramps / Pacific Way	Overall I/S	C	-	-	22.8	C	-	-	24.5	C	-	-	24.3
	WBL	C	0.87	#120.8	29.4	C	0.89	#120.8	33.2	C	0.89	#120.4	32.9
	WBT												
	WBR	A	0.19	6.9	2.9	A	0.19	6.9	3	A	0.19	6.9	3
	NBL	D	0.71	#20.8	47.3	E	0.85	#28.2	64.6	E	0.83	#27.2	61.6
	NBT	B	0.44	22.7	17.0	B	0.43	23.2	16.3	B	0.43	23.1	16.4
	SBT	C	0.70	37.4	21.3	B	0.67	37.4	19.9	C	0.67	37.4	20.1
SBR	A	0.02	0.0	0.1	A	0.04	1.0	1.4	A	0.04	1.0	1.4	

Intersection	Turning Movement	Base 2039 - PM Peak				Total 2039 - PM Peak				Total 2039 - PM Peak			
		LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)	LoS	v/c Ratio	95 <sup>th</sup> Queue (m)	Delay (s)
Inks Lake Interchange - EB Off Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	A	0.00	0.0	0.0	A	0.00	0	0	A	-	0	0
	NBL	A	0.02	1.1	8.5	B	0.06	2.2	10	A	0.05	2.2	9.9
	NBR					B				A			
Inks Lake Interchange - EB On Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.00	1.1	3.7	A	0.00	0.1	0.3	A	0.00	1.1	0.3
	EBR					A				A			
	WBL	A	0.01	0.0	0.0	A	0.13	0	0	A	0.12	0	0
	WBT					A				A			
Inks Lake Interchange - WB On Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.01	0.0	0.0	A	0.11	0	0	A	0.10	0	0
	EBR					A				A			
	WBL	A	0.00	1.1	3.6	A	0.02	6.6	6.6	A	0.02	5.5	6.5
	WBT					A				A			
Inks Lake Interchange - WB Off Ramp	Overall I/S	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	A	0.00	0.0	0.0	A	0.00	0	0	A	-	0	0
	WBT	-	-	-	-	-	-	-	-	-	-	-	-
	SBL	A	0.02	1.1	8.5	A	0.19	7.7	9.4	A	0.18	7.7	9.3
	SBR					A				A			
Lac Le Jeune Road / Mine Access Road	Overall I/S	A	-	-	0.0	B	-	-	12.4	B	-	-	12.3
	EBL	-	-	-	-	A	0.02	1.8	10.0	B	0.02	1.8	10.2
	EBT	-	-	-	-	B	0.38	23.8	13.9	B	0.36	22.3	14
	EBR	-	-	-	-	A	0.01	0.0	0.0	A	0.01	0	0
	WBL	-	-	-	-	A	0.02	1.8	10.0	B	0.02	1.8	10.2
	WBT	-	-	-	-	B	0.38	23.8	13.9	B	0.36	22.3	14
	WBR	-	-	-	-	A	0.01	0.0	0.0	A	0.01	0	0
	NBL	-	-	-	-	B	0.01	2.0	10.2	A	0.01	1.9	9.6
	NBT	A	0.05	0.0	0.0	B	0.13	13.5	10.7	B	0.13	12.9	10.1
	NBR	-	-	-	-	A	0.01	0.0	0.0	A	0.01	0	0
	SBL	-	-	-	-	B	0.01	2.0	10.2	A	0.01	1.9	9.6
	SBT	A	0.02	0.0	0.0	B	0.08	9.3	10.4	A	0.08	8.9	9.8
	SBR	-	-	-	-	A	0.01	0.0	0.0	A	0.01	0	0

# **Appendix D**

## **Synchro Model Files and Output Reports**

## **Synchro Model Files and Output Reports**

Synchro model files, detailed output reports and input data calculations (summary excel tables) are not attached due to the volume of information. They have been archived electronically on the Opus server at the following location and are available on request for reference, audit or peer review.

» Synchro Model Files:

- K:\GLOBAL\JOBS\H-90434.01 - KGHM Ajax Mine TIA - Update\5.0 Technical Documents\5.5 Synchro Model Analysis

» Synchro Input Data Calculations (excel summary tables):

- K:\GLOBAL\JOBS\H-90434.01 - KGHM Ajax Mine TIA - Update\5.0 Technical Documents\5.6 Traffic Data\Traffic Volume Calculations

» Synchro Output Reports:

- K:\GLOBAL\JOBS\H-90434.01 - KGHM Ajax Mine TIA - Update\5.0 Technical Documents\5.5 Synchro Model Analysis\Synchro Reports

**Appendix E**  
**Goose Lake Road Closure Data**

Goose Lake Road Pedestrian Count

Date	time	Northbound	Southbound	comments
10-04-2015	12:00 AM			Dark
10-04-2015	12:15 AM			Dark
10-04-2015	12:30 AM			Dark
10-04-2015	12:45 AM			Dark
10-04-2015	1:00 AM			Dark
10-04-2015	1:15 AM			Dark
10-04-2015	1:30 AM			Dark
10-04-2015	1:45 AM			Dark
10-04-2015	2:00 AM			Dark
10-04-2015	2:15 AM			Dark
10-04-2015	2:30 AM			Dark
10-04-2015	2:45 AM			Dark
10-04-2015	3:00 AM			Dark
10-04-2015	3:15 AM			Dark
10-04-2015	3:30 AM			Dark
10-04-2015	3:45 AM			Dark
10-04-2015	4:00 AM			Dark
10-04-2015	4:15 AM			Dark
10-04-2015	4:30 AM			Dark
10-04-2015	4:45 AM			Dark
10-04-2015	5:00 AM			
10-04-2015	5:15 AM			
10-04-2015	5:30 AM			
10-04-2015	5:45 AM			
10-04-2015	6:00 AM			
10-04-2015	6:15 AM			
10-04-2015	6:30 AM			
10-04-2015	6:45 AM			Herd of about a dozen deer on opposite hillside.
10-04-2015	7:00 AM			
10-04-2015	7:15 AM			
10-04-2015	7:30 AM			
10-04-2015	7:45 AM			
10-04-2015	8:00 AM			
10-04-2015	8:15 AM			
10-04-2015	8:30 AM			
10-04-2015	8:45 AM			
10-04-2015	9:00 AM			
10-04-2015	9:15 AM			
10-04-2015	9:30 AM			
10-04-2015	9:45 AM			cyclist SB
10-04-2015	10:00 AM			
10-04-2015	10:15 AM			
10-04-2015	10:30 AM			
10-04-2015	10:45 AM			
10-04-2015	11:00 AM			
10-04-2015	11:15 AM			
10-04-2015	11:30 AM			
10-04-2015	11:45 AM			
10-04-2015	12:00 PM			
10-04-2015	12:15 PM			

10-04-2015	12:30 PM			
10-04-2015	12:45 PM			
10-04-2015	1:00 PM			
10-04-2015	1:15 PM			
10-04-2015	1:30 PM			
10-04-2015	1:45 PM			
10-04-2015	2:00 PM			
10-04-2015	2:15 PM			
10-04-2015	2:30 PM			
10-04-2015	2:45 PM			car stopped.
10-04-2015	3:00 PM			
10-04-2015	3:15 PM			
10-04-2015	3:30 PM	1	2	These were all the same person.
10-04-2015	3:45 PM			car arrives
10-04-2015	4:00 PM			car leaves
10-04-2015	4:15 PM			
10-04-2015	4:30 PM			
10-04-2015	4:45 PM			
10-04-2015	5:00 PM			
10-04-2015	5:15 PM			
10-04-2015	5:30 PM			
10-04-2015	5:45 PM			
10-04-2015	6:00 PM			
10-04-2015	6:15 PM			
10-04-2015	6:30 PM			
10-04-2015	6:45 PM			
10-04-2015	7:00 PM			
10-04-2015	7:15 PM			
10-04-2015	7:30 PM			
10-04-2015	7:45 PM			
10-04-2015	8:00 PM			
10-04-2015	8:15 PM			
10-04-2015	8:30 PM			
10-04-2015	8:45 PM			
10-04-2015	9:00 PM			Dark
10-04-2015	9:15 PM			Dark
10-04-2015	9:30 PM			Dark
10-04-2015	9:45 PM			Dark
10-04-2015	10:00 PM			Dark
10-04-2015	10:15 PM			Dark
10-04-2015	10:30 PM			Dark
10-04-2015	10:45 PM			Dark
10-04-2015	11:00 PM			Dark
10-04-2015	11:15 PM			Dark
10-04-2015	11:30 PM			Dark
10-04-2015	11:45 PM			Dark
11-04-2015	12:00 AM			Dark
11-04-2015	12:15 AM			Dark
11-04-2015	12:30 AM			Dark
11-04-2015	12:45 AM			Dark
11-04-2015	1:00 AM			Dark
11-04-2015	1:15 AM			Dark

11-04-2015	1:30 AM			Dark
11-04-2015	1:45 AM			Dark
11-04-2015	2:00 AM			Dark
11-04-2015	2:15 AM			Dark
11-04-2015	2:30 AM			Dark
11-04-2015	2:45 AM			Dark
11-04-2015	3:00 AM			Dark
11-04-2015	3:15 AM			Dark
11-04-2015	3:30 AM			Dark
11-04-2015	3:45 AM			Dark
11-04-2015	4:00 AM			Dark
11-04-2015	4:15 AM			Dark
11-04-2015	4:30 AM			Dark
11-04-2015	4:45 AM			Dark
11-04-2015	5:00 AM			
11-04-2015	5:15 AM			
11-04-2015	5:30 AM			
11-04-2015	5:45 AM			
11-04-2015	6:00 AM			
11-04-2015	6:15 AM			
11-04-2015	6:30 AM			
11-04-2015	6:45 AM			
11-04-2015	7:00 AM			
11-04-2015	7:15 AM			
11-04-2015	7:30 AM			
11-04-2015	7:45 AM			
11-04-2015	8:00 AM			
11-04-2015	8:15 AM			
11-04-2015	8:30 AM			
11-04-2015	8:45 AM			
11-04-2015	9:00 AM			
11-04-2015	9:15 AM			
11-04-2015	9:30 AM	1		jogger
11-04-2015	9:45 AM			
11-04-2015	10:00 AM			
11-04-2015	10:15 AM	2		a jogger and a jogger with a dog
11-04-2015	10:30 AM			
11-04-2015	10:45 AM			
11-04-2015	11:00 AM			
11-04-2015	11:15 AM			
11-04-2015	11:30 AM			
11-04-2015	11:45 AM			
11-04-2015	12:00 PM			
11-04-2015	12:15 PM			
11-04-2015	12:30 PM			
11-04-2015	12:45 PM			
11-04-2015	1:00 PM			
11-04-2015	1:15 PM			
11-04-2015	1:30 PM			
11-04-2015	1:45 PM			
11-04-2015	2:00 PM			
11-04-2015	2:15 PM			

11-04-2015	2:30 PM			
11-04-2015	2:45 PM			
11-04-2015	3:00 PM			
11-04-2015	3:15 PM			cyclist SB
11-04-2015	3:30 PM			cyclist NB (appears to be the same person)
11-04-2015	3:45 PM			
11-04-2015	4:00 PM			
11-04-2015	4:15 PM			
11-04-2015	4:30 PM			
11-04-2015	4:45 PM			
11-04-2015	5:00 PM			
11-04-2015	5:15 PM			
11-04-2015	5:30 PM			
11-04-2015	5:45 PM			
11-04-2015	6:00 PM			
11-04-2015	6:15 PM			
11-04-2015	6:30 PM			
11-04-2015	6:45 PM			
11-04-2015	7:00 PM			
11-04-2015	7:15 PM			
11-04-2015	7:30 PM			
11-04-2015	7:45 PM			
11-04-2015	8:00 PM			
11-04-2015	8:15 PM			
11-04-2015	8:30 PM			
11-04-2015	8:45 PM			
11-04-2015	9:00 PM			Dark
11-04-2015	9:15 PM			Dark
11-04-2015	9:30 PM			Dark
11-04-2015	9:45 PM			Dark
11-04-2015	10:00 PM			Dark
11-04-2015	10:15 PM			Dark
11-04-2015	10:30 PM			Dark
11-04-2015	10:45 PM			Dark
11-04-2015	11:00 PM			Dark
11-04-2015	11:15 PM			Dark
11-04-2015	11:30 PM			Dark
11-04-2015	11:45 PM			Dark
Total		4	2	Total 6 pedestrians.

# *Peak Traffic Technology Ltd.*

PeaK Traffic Technology Ltd  
665 Brentwood Ave

Kamloops, British Columbia, Canada V2B 1P4  
250-819-2527 paul@peaktraffic.ca

Count Name: Goose Lake Road  
Site Code: 1  
Start Date: 2015/04/10  
Page No: 1

## Direction (Southbound)

Start Time	Motorcycles	Cars	Light Goods Vehicles	Buses	Single-Unit Trucks	Articulated Trucks	Bicycles on Road	Total
2015/04/10 12:00 AM	0	0	0	0	0	0	0	0
12:15 AM	0	1	0	0	0	0	0	1
12:30 AM	0	0	0	0	0	0	0	0
12:45 AM	0	0	0	0	0	0	0	0
01:00 AM	0	0	0	0	0	0	0	0
01:15 AM	0	0	0	0	0	0	0	0
01:30 AM	0	0	0	0	0	0	0	0
01:45 AM	0	0	0	0	0	0	0	0
02:00 AM	0	0	0	0	0	0	0	0
02:15 AM	0	0	0	0	0	0	0	0
02:30 AM	0	0	0	0	0	0	0	0
02:45 AM	0	0	0	0	0	0	0	0
03:00 AM	0	0	0	0	0	0	0	0
03:15 AM	0	0	0	0	0	0	0	0
03:30 AM	0	0	0	0	0	0	0	0
03:45 AM	0	0	0	0	0	0	0	0
04:00 AM	0	0	0	0	0	0	0	0
04:15 AM	0	0	0	0	0	0	0	0
04:30 AM	0	0	0	0	0	0	0	0
04:45 AM	0	0	0	0	0	0	0	0
05:00 AM	0	0	0	0	0	0	0	0
05:15 AM	0	0	0	0	0	0	0	0
05:30 AM	0	0	0	0	0	0	0	0
05:45 AM	0	0	0	0	0	0	0	0
06:00 AM	0	0	0	0	0	0	0	0
06:15 AM	0	0	0	0	0	0	0	0
06:30 AM	0	0	0	0	0	0	0	0
06:45 AM	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0
07:15 AM	0	1	0	0	0	0	0	1
07:30 AM	0	0	0	0	0	0	0	0
07:45 AM	0	1	0	0	0	0	0	1
08:00 AM	0	0	1	0	0	0	0	1
08:15 AM	0	1	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0
09:00 AM	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0
09:30 AM	0	1	0	0	0	0	0	1

09:45 AM	0	0	0	0	0	0	1	1
10:00 AM	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0
10:30 AM	0	1	0	0	0	0	0	1
10:45 AM	0	1	0	0	0	0	0	1
11:00 AM	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0
11:45 AM	0	0	1	0	0	0	0	1
12:00 PM	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0
01:00 PM	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0
02:45 PM	0	2	0	0	0	0	0	2
03:00 PM	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0
03:30 PM	0	2	1	0	0	0	0	3
03:45 PM	0	0	2	0	0	0	0	2
04:00 PM	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0
05:45 PM	0	0	1	0	0	0	0	1
06:00 PM	0	0	0	0	0	0	0	0
06:15 PM	0	0	1	0	0	0	0	1
06:30 PM	0	1	0	0	0	0	0	1
06:45 PM	0	1	0	0	0	0	0	1
07:00 PM	0	0	0	0	0	0	0	0
07:15 PM	0	0	0	0	0	0	0	0
07:30 PM	0	1	0	0	0	0	0	1
07:45 PM	0	0	0	0	0	0	0	0
08:00 PM	0	0	0	0	0	0	0	0
08:15 PM	0	0	0	0	0	0	0	0
08:30 PM	0	0	0	0	0	0	0	0
08:45 PM	0	0	0	0	0	0	0	0
09:00 PM	0	0	0	0	0	0	0	0
09:15 PM	0	0	0	0	0	0	0	0
09:30 PM	0	0	0	0	0	0	0	0
09:45 PM	0	0	0	0	0	0	0	0
10:00 PM	0	1	0	0	0	0	0	1
10:15 PM	0	0	0	0	0	0	0	0
10:30 PM	0	0	0	0	0	0	0	0



11:45 AM	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0
12:15 PM	0	1	0	0	0	0	0	1
12:30 PM	0	1	0	0	0	0	0	1
12:45 PM	0	1	0	0	0	0	0	1
01:00 PM	0	0	0	0	1	0	0	1
01:15 PM	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0
02:15 PM	0	1	0	0	0	0	0	1
02:30 PM	0	3	0	0	0	0	0	3
02:45 PM	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	1	1
03:30 PM	0	0	0	0	0	0	0	0
03:45 PM	0	0	1	0	0	0	0	1
04:00 PM	0	1	0	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0
04:30 PM	0	2	0	0	0	0	0	2
04:45 PM	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0
05:15 PM	0	0	2	0	0	0	0	2
05:30 PM	0	0	0	0	0	0	0	0
05:45 PM	0	1	0	0	0	0	0	1
06:00 PM	0	1	0	0	0	0	0	1
06:15 PM	0	1	0	0	0	0	0	1
06:30 PM	0	0	0	0	0	0	0	0
06:45 PM	0	2	0	0	0	0	0	2
07:00 PM	0	0	1	0	0	0	0	1
07:15 PM	0	0	0	0	0	0	0	0
07:30 PM	0	0	0	0	0	0	0	0
07:45 PM	0	0	0	0	0	0	0	0
08:00 PM	0	0	0	0	0	0	0	0
08:15 PM	0	0	0	0	0	0	0	0
08:30 PM	0	1	0	0	0	0	0	1
08:45 PM	0	0	0	0	0	0	0	0
09:00 PM	0	0	0	0	0	0	0	0
09:15 PM	0	1	0	0	0	0	0	1
09:30 PM	0	0	0	0	0	0	0	0
09:45 PM	0	1	0	0	0	0	0	1
10:00 PM	0	0	0	0	0	0	0	0
10:15 PM	0	0	0	0	0	0	0	0
10:30 PM	0	0	0	0	0	0	0	0
10:45 PM	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0	0	0
11:15 PM	0	0	0	0	0	0	0	0
11:30 PM	0	0	0	0	0	0	0	0
11:45 PM	0	0	0	0	0	0	0	0
Total	0	37	12	0	1	0	2	52
Total %	0.0	71.2	23.1	0.0	1.9	0.0	3.8	100.0
AM Times	12:00 AM	07:00 AM	06:00 AM	12:00 AM	12:00 AM	12:00 AM	09:00 AM	07:15 AM

AM Peaks	0	2	0	0	0	0	1	3
PM Times	12:00 PM	01:45 PM	03:00 PM	12:00 PM	12:15 PM	12:00 PM	02:45 PM	12:15 PM
PM Peaks	0	4	3	0	1	0	1	4



09:45 AM	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0
10:30 AM	0	2	0	0	0	0	0	2
10:45 AM	0	0	0	0	0	0	0	0
11:00 AM	0	0	1	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0
12:45 PM	0	1	1	0	0	0	0	2
01:00 PM	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0
02:15 PM	0	1	0	0	0	0	0	1
02:30 PM	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0
04:30 PM	0	0	1	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0
06:00 PM	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0
07:00 PM	0	0	0	0	0	0	0	0
07:15 PM	0	0	0	0	0	0	0	0
07:30 PM	0	1	0	0	0	0	0	1
07:45 PM	0	1	0	0	0	0	0	1
08:00 PM	0	0	0	0	0	0	0	0
08:15 PM	0	0	0	0	0	0	0	0
08:30 PM	0	0	0	0	0	0	0	0
08:45 PM	0	0	0	0	0	0	0	0
09:00 PM	0	0	0	0	0	0	0	0
09:15 PM	0	0	0	0	0	0	0	0
09:30 PM	0	0	0	0	0	0	0	0
09:45 PM	0	0	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0	0	0
10:15 PM	0	0	0	0	0	0	0	0
10:30 PM	0	0	0	0	0	0	0	0



11:45 AM	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0
12:30 PM	0	1	0	0	0	0	0	1
12:45 PM	0	2	0	0	0	0	0	2
01:00 PM	0	1	0	0	0	0	0	1
01:15 PM	0	0	0	0	0	0	0	0
01:30 PM	0	1	1	0	0	0	0	2
01:45 PM	0	2	0	0	0	0	0	2
02:00 PM	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0
02:30 PM	0	2	0	0	0	0	0	2
02:45 PM	0	1	0	0	0	0	0	1
03:00 PM	0	0	0	0	0	0	0	0
03:15 PM	0	0	1	0	0	0	0	1
03:30 PM	0	0	0	0	0	0	1	1
03:45 PM	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0
05:00 PM	0	1	1	0	0	0	0	2
05:15 PM	0	1	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0
06:00 PM	0	0	0	0	0	0	0	0
06:15 PM	0	1	0	0	0	0	0	1
06:30 PM	0	0	1	0	0	0	0	1
06:45 PM	0	0	0	0	0	0	0	0
07:00 PM	0	1	0	0	0	0	0	1
07:15 PM	0	0	0	0	0	0	0	0
07:30 PM	0	0	0	0	0	0	0	0
07:45 PM	0	0	0	0	0	0	0	0
08:00 PM	0	0	0	0	0	0	0	0
08:15 PM	0	0	1	0	0	0	0	1
08:30 PM	0	0	1	0	0	0	0	1
08:45 PM	0	0	0	0	0	0	0	0
09:00 PM	0	0	0	0	0	0	0	0
09:15 PM	0	1	0	0	0	0	0	1
09:30 PM	0	0	0	0	0	0	0	0
09:45 PM	0	2	0	0	0	0	0	2
10:00 PM	0	0	0	0	0	0	0	0
10:15 PM	0	1	0	0	0	0	0	1
10:30 PM	0	0	0	0	0	0	0	0
10:45 PM	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0	0	0
11:15 PM	0	0	0	0	0	0	0	0
11:30 PM	0	0	0	0	0	0	0	0
11:45 PM	0	0	0	0	0	0	0	0
Total	0	30	12	0	0	0	1	43
Total %	0.0	69.8	27.9	0.0	0.0	0.0	2.3	100.0
AM Times	12:00 AM	07:00 AM	06:00 AM	12:00 AM	12:00 AM	12:00 AM	09:00 AM	07:15 AM

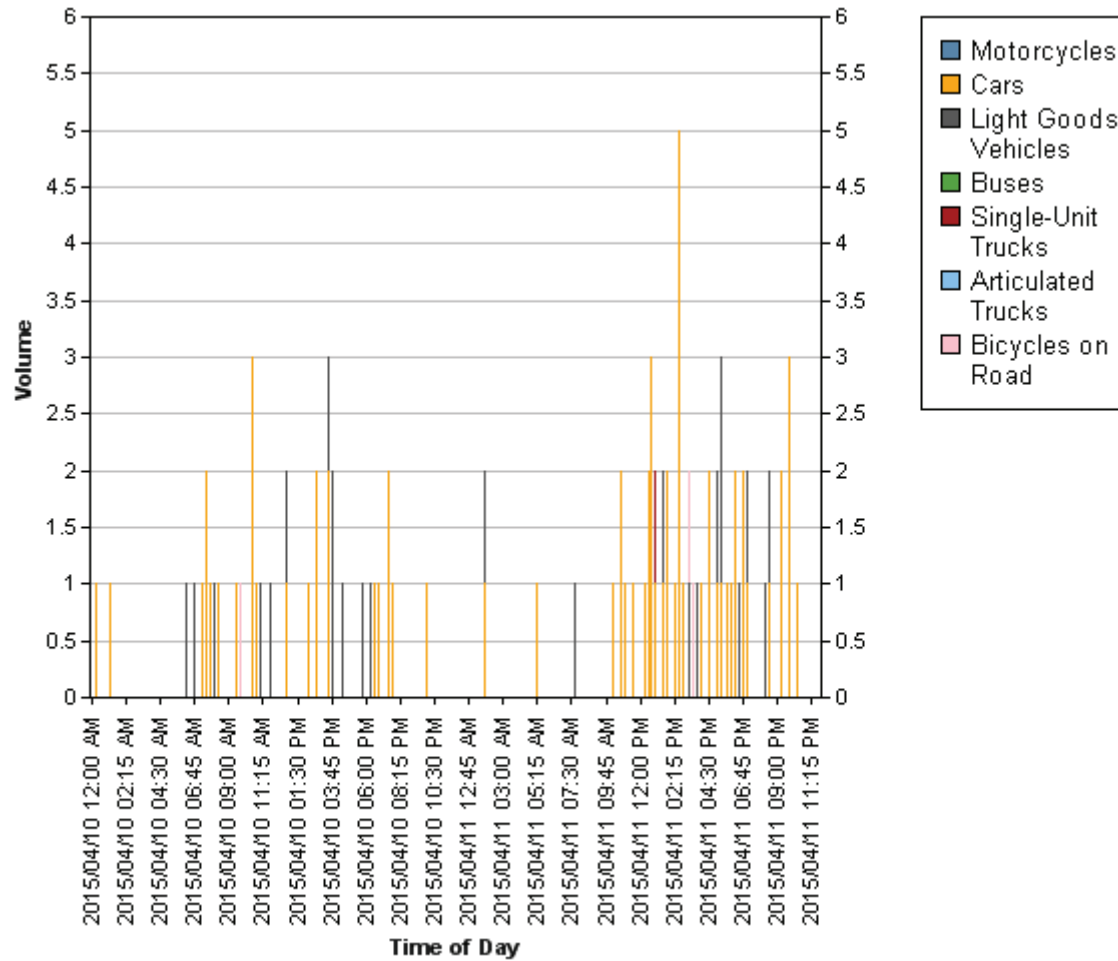
AM Peaks	0	2	2	0	0	0	0	2
PM Times	12:00 PM	01:45 PM	03:00 PM	12:00 PM	12:15 PM	12:00 PM	02:45 PM	12:15 PM
PM Peaks	0	4	0	0	0	0	1	4

# Peak Traffic Technology Ltd.

PeaK Traffic Technology Ltd  
665 Brentwood Ave

Kamloops, British Columbia, Canada V2B 1P4  
250-819-2527 paul@peaktraffic.ca

Count Name: Goose Lake Road  
Site Code: 1  
Start Date: 2015/04/10  
Page No: 11



***PeaK Traffic Technology Ltd.***

PeaK Traffic Technology Ltd  
665 Brentwood Ave

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Count Name: Goose Lake Road  
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Does not include pedestrians or horse and rider.



**Appendix F**  
**Lac Le Jeune Pavement Survey**  
**Data**

<b>Distress Type</b>	<b>Code</b>	<b>Severity Levels</b>	<b>Density Measure</b>	<b>Basis for Calculation and Acceptable Density Values</b>
Longitudinal Wheel Path Cracking	LWT	L-M-H	Linear	Total combined length of cracking measured in each wheel path divided by the segment length x2
Longitudinal Joint Cracking	LJC	L-M-H	Linear	Total length of cracking measured divided by the segment length
Pavement Edge Cracking	PEC	L-M-H	Linear	Total length of cracking measured divided by the segment length
Meandering Longitudinal Cracking	MLC	L-M-H	Linear	Total length of cracking measured divided by the segment length
Bleeding	BLD	M-H	Linear	Total length of bleeding measured in each wheel path over combined 200m wheel path length divided by the segment length
Transverse Cracking	TC	L-M-H	Number	0% - No transverse cracking is present
				5% - Few (1 to 2 cracks)
				35% - Frequent (3 to 10 cracks)
				90% - Throughout (>10 cracks)
Potholes	POT	L-M-H	Number	0% - None
				5% - Few (1 to 2 potholes)
				35% - Frequent (3 to 9 potholes)
				90% - Throughout (> 10 potholes)
Alligator Cracking	AC	M-H	Area	0% - None
				5% - Few
				15% - Intermittent
				35% - Frequent
				65% - Extensive
90% - Throughout				
Rutting	RUT	L-M-H	Segment	0% - neither wheel path rut depths are > 3mm
				35% - Only one wheel path rut depths are > 3mm
				90% - Both wheel path ruts depths are > 3mm

Start	End	LWT		LJC		PEC		TC		MLC		AC		POT		RUT		DST		BLD		Segment
m	m	Sev	Den	Sev	Den	Sev	Den	Sev	Den	Sev	Den	Sev	Den	Sev	Den	Sev	Den	Sev	Den	Sev	Den	PDI
0	100					3	2	3	3	1	1			3	2							5.0
100	200			1	3	3	4	3	3	3	1			2	2							4.9
200	300			2	3			3	5	1	1	2	1	1	1							3.2
300	400	2	3	2	1	2	3	3	3	2	1			2	2							4.7
400	500					3	3	3	3					3	1							5.6
500	600			1	1	2	3	3	3	2	2	2	1	2	3							4.2
600	700			1	4	3	3	3	3					3	3							3.6
700	800	2	1	2	3	3	1	3	3	2	1	2	1	3	3							2.6
800	900			1	2			3	5	1	1	2	1	1	2							3.1
900	1000			1	2			3	5	2	2	2	1	3	2							1.9
1000	1100	2	2	3	2			3	3	2	2	2	1	1	1							4.7
1100	1200	3	1	2	2	1	1	3	3	2	1	2	1	3	2							3.8
1200	1300	3	1	2	1	1	1	3	3	1	1	2	1	2	2							4.3
1300	1400	2	1	3	4	2	1	3	3	3	1											5.0
1400	1500	2	1	3	2	2	1	3	3	2	2	2	1									4.5
1500	1600							3	3	2	1											6.5
1600	1700							3	3			2	1									6.1
1700	1800							3	3													6.8
1800	1900					2	1	3	3	3	1											5.8
1900	2000					2	1	3	3	1	1											6.1
2000	2100							3	3	3	1											6.3
2100	2200			2	1	3	1	3	3			2	1	1	1							5.1
2200	2300			2	1			3	3	2	2											5.8
2300	2400			3	1	2	1	3	3	2	1	2	1									5.0
2400	2500	2	2	3	2	3	2	3	3	2	1	2	1	2	1							4.4
2500	2600	2	3	3	3	2	2	3	3	3	3	2	3	3	1							0.3
2600	2700	3	2	2	2	3	2	3	3	3	2	2	1	2	1							4.0
2700	2800	3	3	2	2	3	4	3	3	3	2	2	1	2	1							4.0
2800	2900	2	3	3	1	3	3	3	3	3	3	2	2									3.3
2900	3000	3	3	3	4			3	3	3	3	3	3	2	2							0.0
3000	3100	3	2	3	4	2	3	3	3			2	2									4.3
3100	3200	3	1	3	3	2	1	3	3	2	3	2	1	2	1							4.0
3200	3300	3	3	3	3	2		3	3	2	2	3	2									2.9
3300	3400	3	2	3	2	3	1	3	3			3	1									4.7
3400	3500	3	2			3	2	3	3	3	3	2	1	2	1							4.0
3500	3600	3	1	3	2	2	2	3	3	3	4	2	1	2	1							2.6
3600	3700	2	1	3	2			3	3	3	3	2	1	2	1							4.0
3700	3800	3	2	3	1	3	4	3	3	3	2	3	1	3	2							3.2
3800	3900	3	2	3	3	3	3	3	3	3	2	3	2									2.6
3900	4000	3	2	3	3	1	1	3	3	3	1	3	1	3	2							3.5
4000	4100			3	2	3	2	3	3	3	4	3	1	3	1							2.5
4100	4200	3	1	3	3	3	3	3	3	3	2	3	1	3	2							3.2
4200	4300	3	2	3	4	3	3	3	3	2	3	3	1	3	1							3.6
4300	4400	3	2	3	2	2	2	3	3	2	4	3	1									3.8
4400	4500	3	1			2	1	3	3	2	3	3	1	2	1							4.2
4500	4600	3	1	3	1	3	2	3	3	3	3	3	2									2.3
4600	4700	3	2	3	3	3	3	3	3	3	3	3	1	2	1							3.5
4700	4800			3	4	3	1	3	3	2	2	3	1									4.6
4800	4900	3	1	3	3	3	1	2	1	3	2	3	1									6.0
4900	5000	3	2	3	4	3	3	3	3	3	4	3	1	2	2							2.2
5000	5100	3	3	3	4	2	1	3	3			2	1	3	2							4.0





**Opus International Consultants  
(Canada) Limited**  
210-889 Harbourside Drive  
North Vancouver BC V7P 3S1  
Canada

t: +1 604 990 4800  
f: +1 604 990 4805  
w: [www.opusinternational.ca](http://www.opusinternational.ca)