APPENDIX 1-C

Highway 37 and 37A Traffic Impact Study

Highways 37 and 37A
Traffic Impact Study

Red Mountain Underground Gold Project

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GLOSSARY AND ABBREVIATIONS

Term	Definition
AADT	Annual Average Daily Traffic
CPM	Collision Prediction Model
FLNRO	Forest, Lands and Natural Resource Operations
ICBC	Insurance Corporation of British Columbia
IDM	IDM Mining Ltd.
MOTI	Ministry of Transportation and Infrastructure
PDO	Property Damage Only

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

IDM Mining Ltd. (IDM) is proposing to develop and operate the Red Mountain Underground Gold Project (the Project). The Project is a proposed underground mine in the Bitter Creek Valley near Stewart, British Columbia. The Project will extract high-grade gold and silver ore that will be processed on site.

Traffic-related concerns raised during pre-application discussions by the Nisga'a Lisims Government, the Ministry of Forest, Lands and Natural Resources Operations (FLNRO), Regional District of Kitimat-Stikine, and Northern Health can be grouped into several categories:

- Impacts to infrastructure (e.g., public roads and highways);
- Impacts to human health and safety (e.g., accidents and collisions, air and water quality);
- Impacts to wildlife (e.g., collisions, noise disturbance); and
- Impacts to sediment and water quality, including associated impacts on fish and aquatics.

1.2 STUDY OBJECTIVES

The Project Traffic Study Area focuses on the impacts associated with public roads and highways, and includes Highway 37 from Kitwanga to Meziadin Junction and Highway 37A from Meziadin Junction to the District of Stewart. Within this Study Area, EcoLogic designed this traffic study to achieve three objectives in support of the Project:

1. Assess current traffic volume and incident frequency in the Study Area;
2. Quantify Project-related traffic for the first two and busiest phases of project development: construction (20 months), and operations (6 years); and
3. Quantify potential increase in traffic volume and incident frequency.

2. CURRENT AND PROJECTED TRAFFIC VOLUMES

2.1 HIGHWAYS 37 AND 37A TRAFFIC VOLUMES

EcoLogic selected a 13-year window (2004 to 2016) for the assessment of existing traffic volumes within the Study Area. This window was deemed appropriate for several reasons:

- Data availability without data gaps of more than three years;
- Consistency with traffic studies for other proposed and active projects in the region; and
- A noted decrease in regional traffic volumes in the 2000s compared to the 1990s.

EcoLogic acquired average annual daily traffic (AADT) data from the BC Ministry of Transportation and Infrastructure (BC MOTI) Traffic Data Program (BC MOTI 2017). 2014 is the most current year for which data are available for this region (Table 1).

Table 1. Average annual daily traffic in Red Mountain Underground Gold Project Traffic Study Area

Year	Highway 37 (trips/day)	Highway 37A (trips/day)
2004	918	
2005	816	298
2006	795	
2007	838	
2008	740	249
2009	760	
2010	709	190
2011	828	
2012		
2013	655	
2014	532	287
Average	759	256

2.2 PROJECTED TRAFFIC VOLUMES

2.2.1 Construction Phase

During the Construction Phase, equipment, materials, supplies, and personnel will move to the Project location using both Highways 37 and 37A (Table 2). Most personnel will be housed in a camp in Stewart,

and will be transported to the Project using buses, thereby minimizing increases to traffic volumes along Highway 37A between Stewart and the mine access road.

Table 2. Total average annual one-way trips for construction of the Red Mountain Underground Gold Project

Vehicle Type	Cargo	Highway 37/37A (Kitwanga to Meziadin Junction to Project)	Highway 37A (Stewart to Project)
Legal Freight Load	Miscellaneous	159	1
Oversize Freight Load	Miscellaneous	27	1
Fuel Truck	Diesel Fuel (10,000 L)	0	250
Passenger Bus	Staff	0	1,225
Passenger Car	Staff	0	555
TOTAL Annual one-way trips		186	2,032
Average Annual Daily Traffic		0.51	5.57
Hazardous Materials Average Trips per Day		0.07	0

2.2.2 Operations Phase

Equipment and materials required to operate the Project will be transported along Highways 37 and 37A (Table 3). Personnel will live in home residences in Stewart, and will be transported to the Project using buses, thereby minimizing increases to traffic volumes along Highway 37A between Stewart and the mine access road.

Mineral processing will occur on the Project site. Processed doré bars will be transported by truck to Stewart, and then to a domestic or international refinery. The decision to use on-site processing reduces the traffic volume associated with concentrate product transfer.

Table 3. Total average annual one-way trips for operation of the Red Mountain Underground Gold Project

Vehicle Type	Cargo	Highway 37/37A (Kitwanga to Meziadin Junction to Project)	Highway 37A (Stewart to Project)
Legal Freight Load	Miscellaneous	357	156
Oversize Freight Load	Miscellaneous	2	1
Fuel Truck	Diesel Fuel (10,000 L)	0	166
Passenger Bus	Staff	0	1,720
Passenger Car	Staff	0	516
TOTAL Annual one-way trips		359	2,559
Average Annual Daily Traffic		0.98	7.01
Hazardous Materials Average Trips per Day		0.07	0

2.2.3 Project-related Traffic Increases

Available MOTI traffic data were collected inconsistently along both studied routes during the selected study period; however, they are the best available data to evaluate traffic-related patterns associated with the construction and operation of the Project.

Based on available data, Project-related traffic is expected to have a maximum of a 3.12% increase in overall traffic rates (Table 4); the bulk of this traffic increase will be experienced during operations along Highway 37A between the mine access road and Stewart.

Table 4. Summary of predicted daily traffic volume changes associated with the Red Mountain Underground Gold Project

	Highway 37		Highway 37A	
	Construction	Operations	Construction	Operations
Current Traffic	759	759	256	256
Project Traffic	0.51	0.98	6.08	7.99
Total	759.51	759.98	262.08	263.99
Projected Increase	0.06%	0.13%	2.38%	3.12%

3. VEHICLE ACCIDENTS AND COLLISION PREDICTION

3.1 HIGHWAYS 37 AND 37A VEHICLE ACCIDENT STATISTICS

Available accident data are derived from police reports and do not include accidents for which police were not notified. The Insurance Corporation of British Columbia (ICBC) does collect broader collision data; however, the quality of these data is dependent on the quality of the initial driver reports and is not recorded at a spatial scale suitable for inclusion in this study.

During the period of 1996 to 2016, 187 accidents have been reported on Highway 37 between Kitwanga and Meziadin Junction (114 Severe, 73 PDO). During the same period, 44 accidents have been reported on Highway 37A (24 Severe, 20 PDO; collision data provided by MOTI-Smithers).

3.2 COLLISION PREDICTION MODELLING

3.2.1 Methodology and Limitations

EcoLogic developed Collision Prediction Models (CPMs) to assess the contribution of Project-related traffic, across all four project phases, to predicted accidents along Highways 37 and 37A. EcoLogic followed CPM methodology developed for the BC MOTI (2009) by Sayed and de Leur (2008). CPMs require three pieces of information: highway classification, traffic volumes (Section 2.2), and historic collision data (Section 3.1). Highways 37 and 37A are both classified as Rural Arterial Undivided Two-lane (RAU2) highways (BC MOTI 2009).

EcoLogic developed two preliminary CPMs, one for Highway 37 from Kitwanga to Meziadin Junction and one for Highway 37A from Meziadin Junction to Stewart. Both models follow Sayed and de Leur (2008):

$$E = \alpha_0 V_1^{\alpha 1} L_1^{\alpha 2}$$

where E = collision frequency, V = segment AADT, L = highway segment length, and α_0, α_1, α_2 = model parameters (Table 5).

EcoLogic then refined the preliminary CPMs using an empirical Bayesian (EB) approach to incorporate the historical accident data. The EB refinements follow Sayed and de Leur (2008):

$$EB = (\alpha * E) + ((1- \alpha)*observed)$$

where EB = refined collision frequency, $\alpha = k/(k+E)$, k = model dispersion parameter (Table 5), E = collision frequency from preliminary CPM, and *observed* = historical collision data.

Table 5. Collision prediction model variables for Rural Arterial Undivided Two-lane Roads

Collision Type	Model Variables			
	α_0	α_1	α_2	k
Severe	0.005242	0.7279	0.9403	5.02
Property Damage Only	0.005706	0.7523	0.9222	2.90

Source: Sayed and de Leur (2008)

All models contain inherent limitations (e.g., quality and accuracy of input data) and CPM year-to-year accuracy can be influenced by factors known to influence accident frequency that cannot be modelled (e.g., driver error). Despite these limits, however, CPMs are reliable predictors of mean accident frequency over time.

3.2.2 Results

Based on available data, increases to incident frequencies are expected to be negligible (i.e., no more than 1%) along Highway 37 (Table 6) and Highway 37A (Table 7).

Table 6. Predicted number of collisions (refined estimate) per year for Highway 37 associated with Red Mountain Underground Gold Project

	Current	Construction (% change)	Operations (% change)
Severe	111.5	111.5 (0)	111.5 (0)
PDO	73.4	73.4 (0)	73.5 (0.1)
Total	184.9	184.9 (0)	185.0 (0.1)

Table 7. Predicted number of collisions (refined estimate) per year for Highway 37A associated with Red Mountain Underground Gold Project

	Current	Construction (% change)	Operations (% change)
Severe	21.4	21.5 (0.5)	21.6 (1.0)
PDO	19.5	19.5 (0)	19.5 (0)
Total	40.9	41.0 (0.2)	41.1 (0.5)

4. SUMMARY

The Project is not predicted to result in a substantial increase in traffic along Highways 37 and 37A. The largest predicted increase is 3.12%, the bulk of which will be restricted to between the mine access road and Stewart along Highway 37A.

This overall low traffic impact is reflected in the negligible predicted increases in collision frequency resulting from the overall traffic increase resulting from the Project. The largest predicted increase in collision frequency was 1% along Highway 37A.

LITERATURE CITED

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