Noise Study Traffic Report

For the Dewdney Mountain Farms Quarry Haul Route

Municipality of Trent Lakes
County of Peterborough

Prepared by:
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Prepared for:
Dewdney Mountain Farms Ltd.
March, 2020

March 3, 2020

Dewdney Mountain Farms Ltd.
1503 Flos Road # 8 East
Elmvale, ON L0L 1P0

Attn: Mr. Paul Ritchie

Dear Sir:

RE: ***Noise Study Traffic Report for The Dewdney Mountain Farms Quarry, Ledge/Quarry Road, Township of Trent Lakes, County of Peterborough***

1.0 BACKGROUND

Tranplan Associates is pleased to submit the following traffic report in support of the Noise Study Analyses now being completed as part of the planning approval process for the *Dewdney Mountain Farms Quarry* (DMQ). Tranplan Associates completed two earlier traffic studies for this future quarry in 2011 and 2012. These two studies were reviewed and found acceptable to the approving agencies. Additional Tranplan Associates support was provided with expert witness testimony at a subsequent Ontario Municipal Board Hearing.

During the approval process, noise from trucks on the haul route became an issue. Therefore, the application is being revised to limit the number of trucks on the haul route. This in turn will result in lower noise levels and eliminate the need for noise mitigation measures. As part of the revision process, a new Noise Study has been completed. The study has assessed noise levels along the DMQ haul route that will be comprised of Ledge Road and Quarry Road accessing County Road (CR) 36 (see *Exhibit 1- Dewdney Mountain Farms Quarry Haul Route).* The focus of this traffic study has been the development of detailed daily profiles by hour, by vehicle type and by trip destination for direct input to the noise study analyses. The following sections of the report describe the development of these profiles and extraction of individual peak hour periods for use in the Noise Model analyses.

2.0 THE TRAFFIC VOLUME PROFILES

There are four specific components of traffic travelling long the study haul route:

- Haul Route Background traffic accessing residences and hunt camps along Ledge Road.
- Haul Route Background traffic accessing residences along Quarry Road.
- Traffic travelling to/from DMQ
- Traffic travelling to/from the *Emerald Group Quarry (EGQ)* located just east of the haul route on Ties Mountain Road.

Individual daily traffic profiles were developed for each of these 4 sources of haul route traffic. Individual forecasts were prepared for the inbound and outbound directions for each traffic source since the noise analyses must account for the impact of haul route grades by direction. A 2030 planning horizon was used for the forecasts as required for the Noise Study Analyses. The forecasting processes for each source are described following:

2.1 Haul Route Background Traffic

Background traffic travelling on the haul route will be almost entirely traffic travelling to/from residences and hunt camps along the haul route. As part of the Noise Study analyses, detailed data were collected on the location of each of these residences and hunt camps. The study identified 8 residences and 4 hunt camps along Ledge Road as well as 8 residences located along Quarry Road. To account for potential future new residences that might be constructed by 2030, one new residence was added to each of Ledge Road and Quarry Road. The 2030 total development is assumed to consist of 9 residences plus 4 hunt camps on Ledge Road and 9 residences on Quarry Road.

The 2030 trips generated by the residences were calculated using the trip generation rates taken from the current Institute of Transportation Engineers (ITE) *Trip Generation Manual* (TGM) for detached residences (LU 210). Forecasting relationships taken from the TGM provided AM and PM peak hour volumes as well as total daily volumes. In addition, the TGM provided a 24 hour percent distribution of the daily traffic to allow for the distribution of the daily residential traffic over a typical weekday. No specific forecasting relationships are available for the hunt camps so they were assumed to generate trips at the rate of 25% of the residential traffic. This likely overstates the hunt camp trip generation given their recreational/seasonal use. Detailed summaries of the Ledge Road and Quarry Road background traffic that were derived from the ITE relationships are contained in the *Technical Appendix – Traffic Profiles.*

As part of the original traffic studies, representative weekday peak hour traffic counts were carried out at the CR 36/Quarry Road intersection[1]. Based on data assembled for the Noise Study, the additional new residences have been added to the haul route corridor since the 2011-12 traffic studies. The 2011 Quarry Road count data were compared to the 2030 peak period volumes generated from the ITE sources used in this study and found to be in reasonable agreement. A summary of the residential trip generation and comparison to the 2011 volumes is contained in the *Technical Appendix – Traffic Profiles*

[1] See *Exhibit 4*, Dewdney Mountain Quarry Addendum Traffic Study, Tranplan Associates, June, 2012

2.2 Dewdney Mountain Quarry Traffic Profile

A daily traffic profile was developed for DMQ based on a detailed review of the daily quarry operations. The review considered type and volume of truck traffic, number of employees, equipment used to load the trucks and service deliveries to the quarry. During peak summer operations the quarry is planned to operate over a 12 hour day from 7 AM until about 7 PM. However, trucks and employees will begin arriving on-site during the hour preceding the opening of operations at 7 AM.

To account for the noise impact of the various vehicle types, individual daily profiles were developed for cars/pickup trucks, medium trucks such as service vehicles, and heavy trucks that will be carrying quarry product. It was assumed that one school bus would travel the haul route during the morning and evening peak hour. For the purposes of noise analyses, a school bus was considered to be a medium truck. A medium truck was assigned to the DMQ medium truck haul route/profile to represent a school bus travelling the full length of the haul route. The resulting 3 vehicle-type DMQ daily volume profiles are contained in the *Technical Appendix – Traffic Profiles*.

2.3 The Emerald Group Quarry Traffic Profile

The EGQ is a small quarry located just east of the haul route on Ties Mountain Road (see *Exhibit 1*). It operates with a "B" Licence as a dimension stone quarry and is assumed to ship 15,000 to 20,000 metric tonnes per year. During a representative summer day it is assumed to ship 3 heavy (flatbed) truckloads of dimension stone typical of the trucks hauling such loads from this part of the County.

As in the case of DMQ, 3 profiles by vehicle type were developed for the EMQ. The employee traffic was based on quarry staffing required to extract product and operate the equipment to load the flat-bed trailers normally used to ship dimension stone. The resulting EGQ profiles are included in the *Technical Appendix – Traffic Profiles*.

3.0 HAUL ROUTE CORRIDOR VOLUMES

Five specific volume scenarios are required for the noise analyses as follows:

- The peak night-time hour Volumes during the hours preceding 7 AM
- The AM Peak Hour Volumes
- The PM Peak Hour Volumes
- The 16 Hour Day-Time Volumes (7AM to 11 PM)
- The 8 Hour Night-Time Volumes (11 PM to 7 AM)

The individual peak period volumes were extracted from each of the four daily volume profiles by direction (see *Technical Appendix – Traffic Profiles*). The Ledge Road volumes were taken directly from the profiles for the DMQ traffic and the background traffic. The Quarry Road volumes included all Ledge Road traffic plus the EGQ traffic and the background traffic generated along the Quarry Road corridor. The resulting corridor volumes are illustrated in the following exhibits:

- Exhibit 2 – Peak Hour Night Traffic (6 AM – 7AM)
- Exhibit 3 – AM Peak Hour Traffic (7 AM – 8 AM)
- Exhibit 4 – PM Peak Hour Traffic (4 PM – 5 PM)
- Exhibit 5 – 16 Hour Day Traffic (7AM – 11 PM)
- Exhibit 6 – 8 Hour Night Traffic (11 PM – 7 AM)

4.0 2030 TRAFFIC IMPACTS

The original 2012 Traffic Study completed by Tranplan Associates determined that DMQ traffic generated by an extraction rate of 1.2 million metric tonnes for a 2021 planning horizon would have an acceptable traffic impact on the CR 36/Quarry Road intersection. The traffic study report was reviewed by the County of Peterborough and the Municipality of Trent Lakes as the approving agencies. The traffic report was found acceptable. Since the completion of the original 2012 traffic study, there have been only 2 new residences added to the haul route corridor. Based on discussions with the study team, it is understood that there has been no new development north of DMQ on Ledge Road or to the northeast on Ties Mountain Road. No additional haul route traffic beyond that in the "profiles" was added to weekday peak hour background volumes at the CR 36/Quarry Road intersection. This forecast haul route traffic and reduced DMQ annual shipping rate means that future quarry traffic will have an acceptable impact on the CR 36/Quarry Road intersection. However, the planning horizon for the noise study has been moved to 2030 from the original 2021 used in the traffic study analyses. It is expected that there will be some growth in traffic along the CR 36 corridor over this extended 9 year planning horizon (2021-2030).

To assess any potential traffic operational issues that might arise from increased CR 36 traffic growth to the 2030 planning horizon, Tranplan Associates completed a 2030 intersection capacity review of the CR 36/Quarry Road intersection. The review was based on CR 36 background traffic projected from 2021 using an assumed growth rate of 2% per year (compounded). This background traffic was then combined with 2030 weekday haul route corridor PM peak hour volumes developed for the Noise Study. This provided the total 2030 PM peak hour intersection volumes. This forecasting process was done through the following steps:

- The original 2021 forecasted Total PM Peak Hour volumes developed for the 2012 traffic study were selected as the base set of traffic volumes for the intersection analysis (see *Exhibit 6* of the 2012 traffic report).
- The Quarry Road corridor traffic volumes were stripped from the total 2021 intersection volumes to get 2021 "background" volumes at the CR 36/Quarry Road intersection.
- The 2021 "background" volumes were then expanded at 2% per year for 9 years to the 2030 planning horizon.
- The total 2030 Quarry Road PM peak hour haul route volumes (see *Exhibit 4*) developed for the noise study were assigned to the CR 36/Quarry Road intersection based on the assumed trip distribution to the CR 36 corridor as developed for the 2012 traffic analyses.
- The haul route volumes were then combined with the 2030 "background" volumes at the intersection to get the total 2030 PM peak hour traffic travelling through CR 36/Quarry Road intersection.

The resulting 2030 PM peak hour intersection volumes and the original 2021 PM peak hour intersection volumes are illustrated in *Exhibit 7*. In reviewing the exhibit it will be noted that forecasted Quarry Road volumes have dropped as a result of the reduction in product to be shipped from DMQ. However, there has been some additional growth in CR 36 background traffic from 2021 to 2030.

An intersection capacity analysis was carried out for the 2030 PM peak hour period applying the volumes illustrated in *Exhibit 7*. The analysis was done based on current Highway Capacity Manual criteria using *Trafficware's Synchro 10* intersection capacity analyses software. During the 2030 PM peak hour, the critical movement at the CR 36/Quarry Road intersection is forecasted to operate at Level of Service[2] (LoS) "B". This is considered to be a very good LoS for peak hour conditions. Drivers accessing the CR 36 corridor will face little delay. There will be considerable residual capacity for future growth in traffic at this intersection beyond the 2030 planning horizon. A detailed printout from the *Synchro* analysis is contained in the *Technical Appendix – Intersection Capacity Analysis.*

5.0 CONCLUSIONS

Much of the traffic analyses in support of the Noise Study have focussed on developing daily profiles broken out by hour for specific vehicles travelling along the haul route. The DMQ profiles have been developed through considerable discussion with the proponent. These discussions included future quarry operation measured in terms of employee assignments, rates of loading trucks and the size/capacity of the trucks. This information was combined with data assembled from Tranplan Associates files for similar quarry studies to develop the forecasted 2030 traffic profiles for the DMQ. The results of these

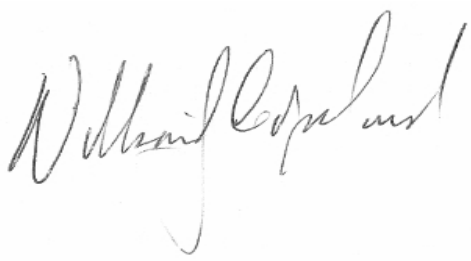
[2] See the Technical Appendix – *Intersection Capacity Analysis* for detailed definitions of Levels of Service

analyses are the detailed daily traffic profiles that will provide the specific data required for the Noise Study.

The residential background traffic trip generation and profiles have been taken directly for ITE sources. The resulting traffic forecasts/profiles are in reasonable agreement with the observed 2011 “background” traffic data. The traffic profiles that will be applied to the Noise Study analyses are based on a solid set of empirical data and as such should provide an appropriate data set for input to the Noise Study analyses.

With the reduction in future DMQ annual shipping rates, there will be fewer vehicles travelling along the haul route corridor than had been originally forecasted in the 2012 traffic study. An assessment of the 2030 PM peak hour CR 36/Quarry Road intersection has determined that the 2030 volumes of future *Dewdney Mountain Farms Quarry* traffic will have an acceptable impact on the CR 36/Quarry Road intersection. Additional details on the study process and analyses are available in study working papers. Such information, subject to client approval, can be provided upon request.

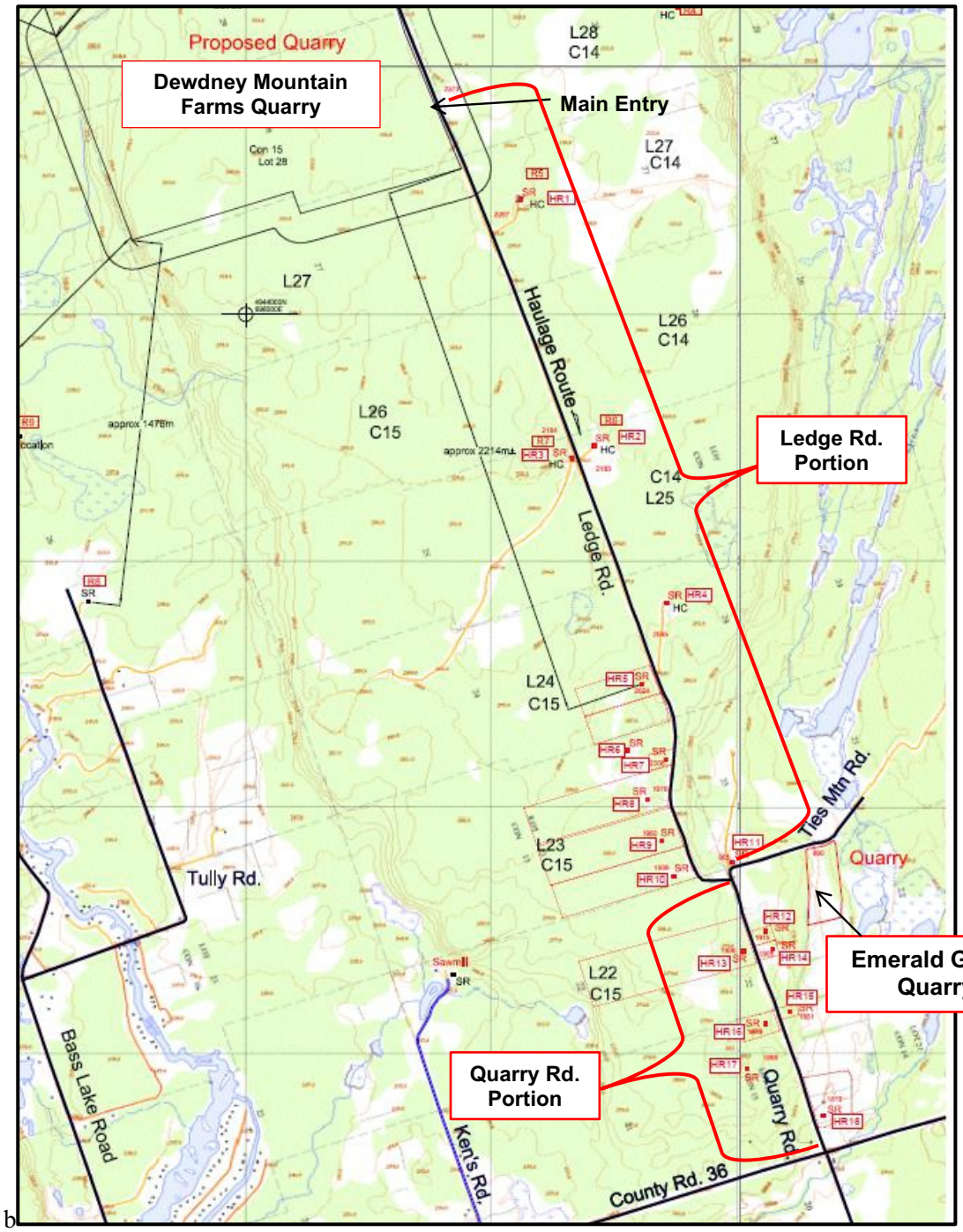
Yours truly,



William Copeland, P.Eng.
Principal,
Tranplan Associates

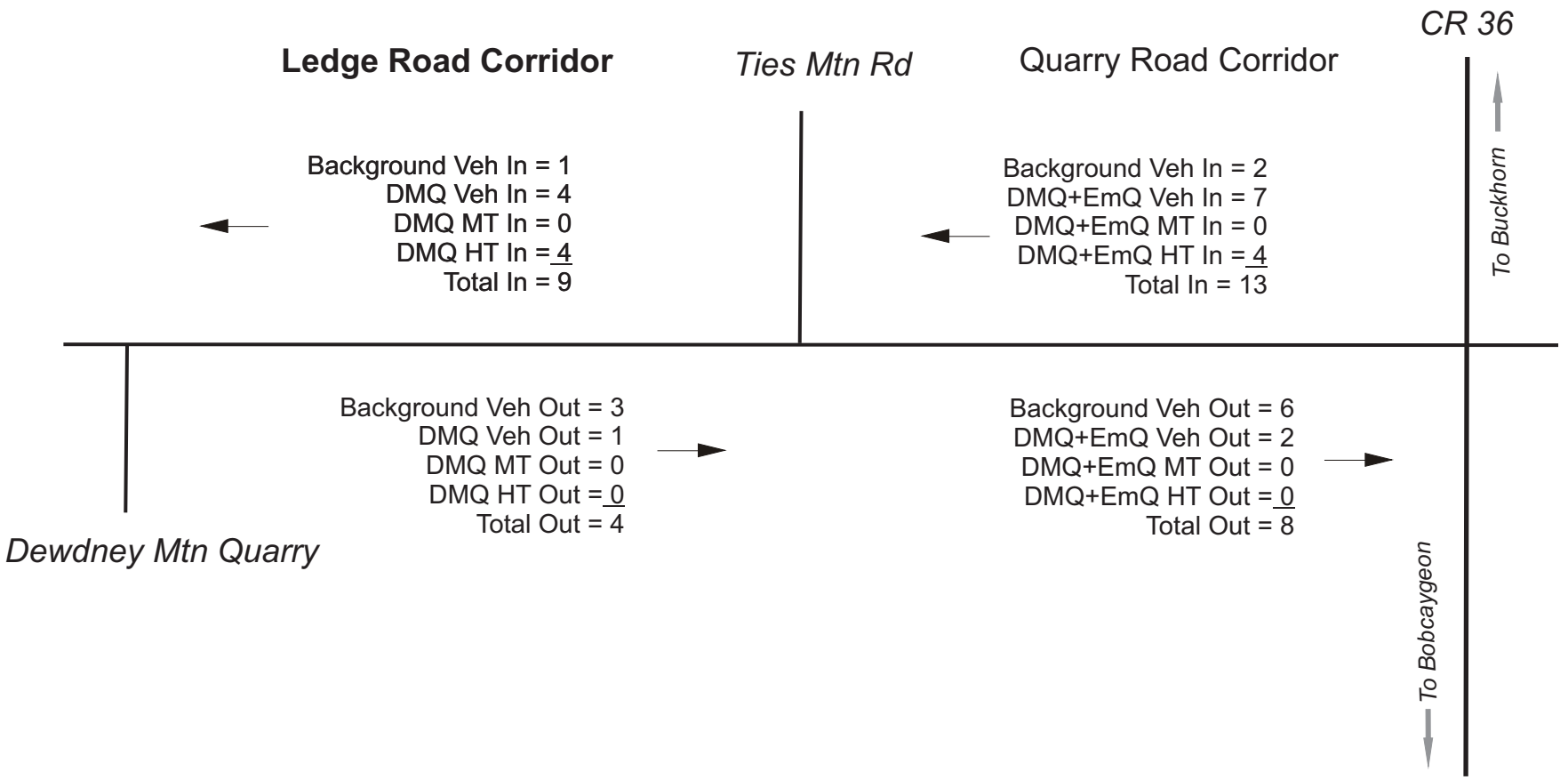
REPORT EXHIBITS

Exhibit 1
Dewdney Mountain Farms
Quarry Haul Route



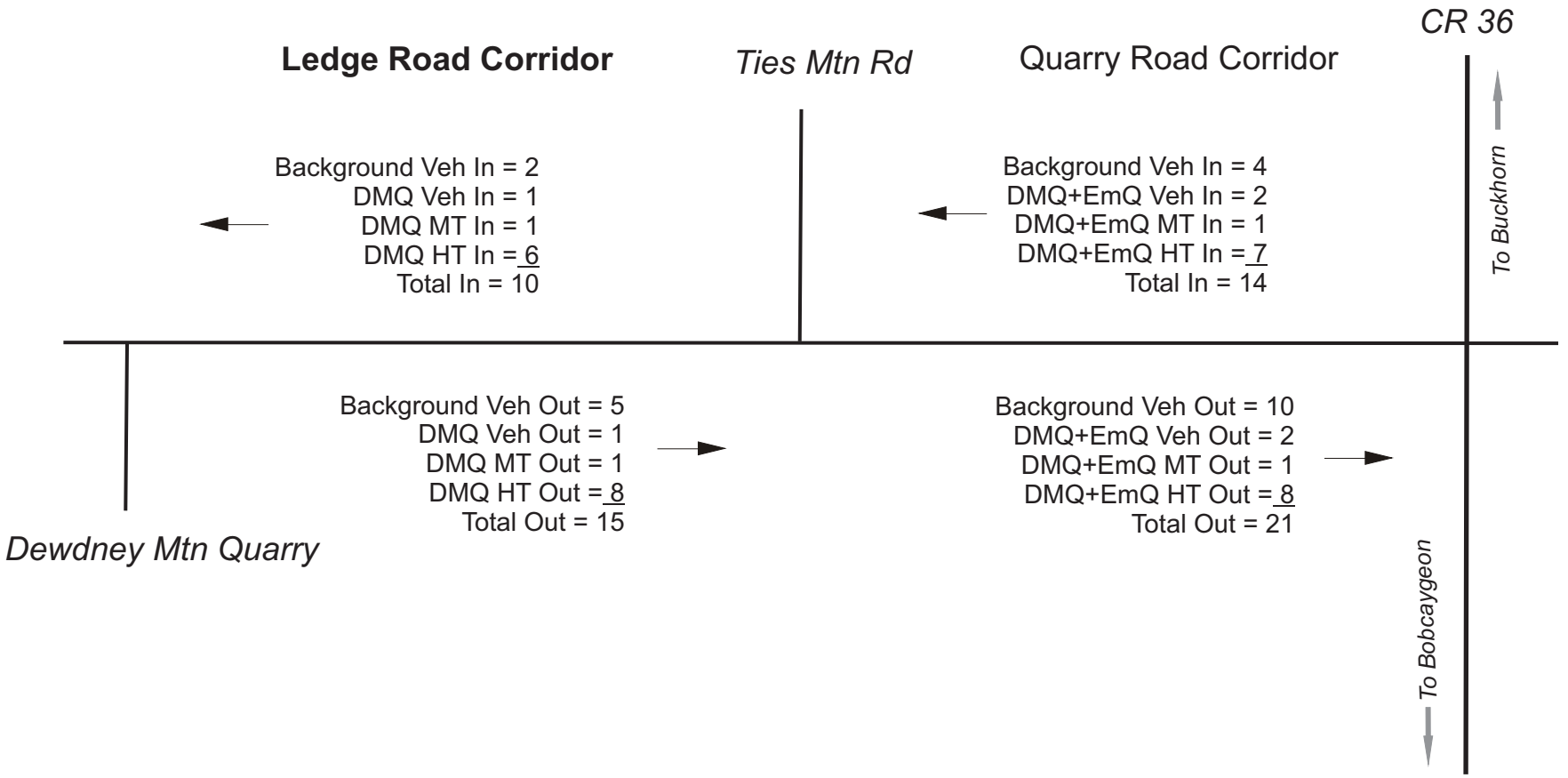
Grid spacing: 1 km X 1 km

Exhibit 2
2030 Night Peak Hour (6 - 7 AM)
Traffic Stream - Ledge/Quarry Corridors



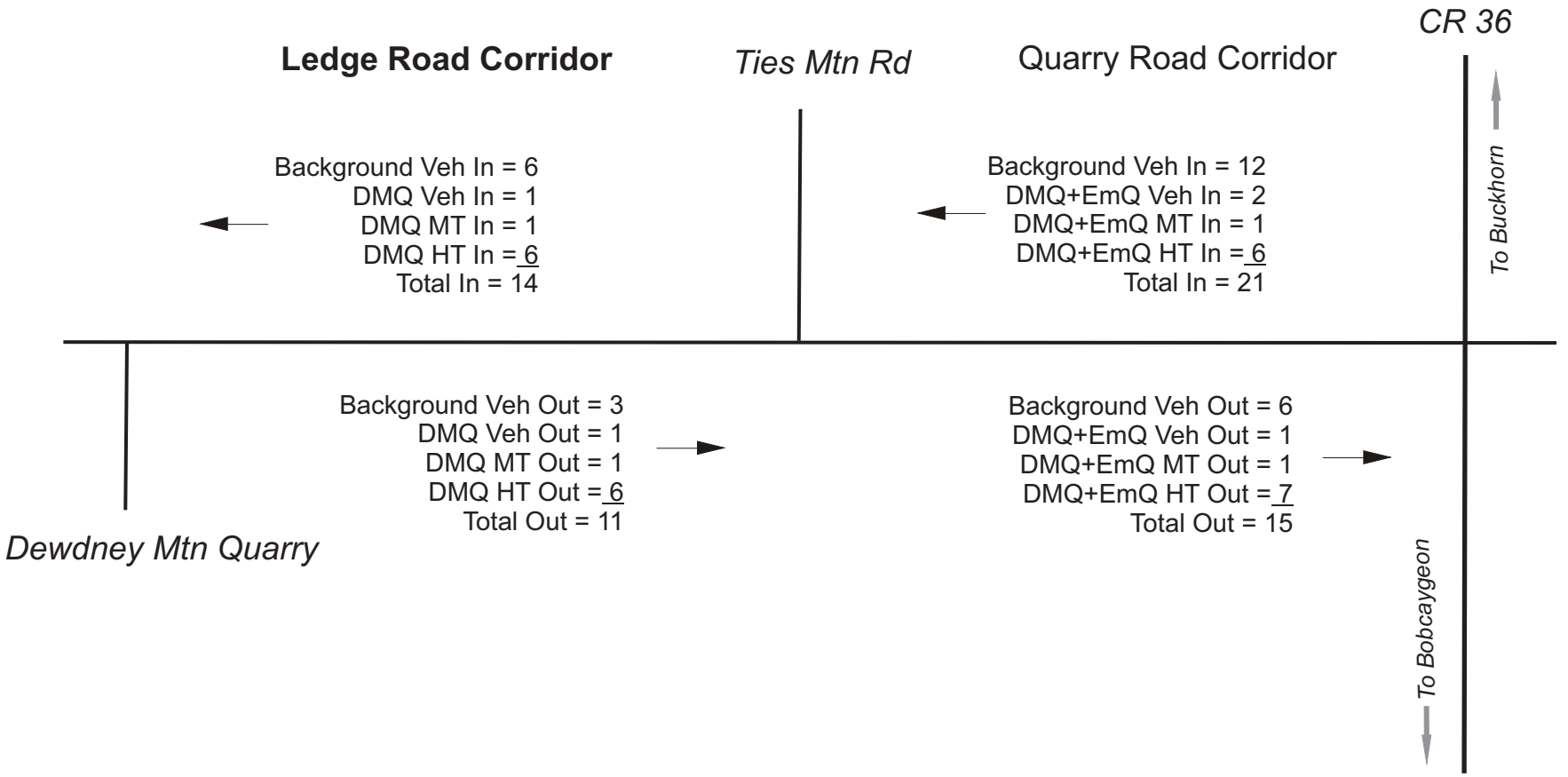
Veh - Cars + PU Trucks
MT - Medium Trucks + School Buses
HT - Heavy Trucks

Exhibit 3
2030 AM Peak Hour (7 - 8 AM)
Traffic Stream - Ledge/Quarry Corridors



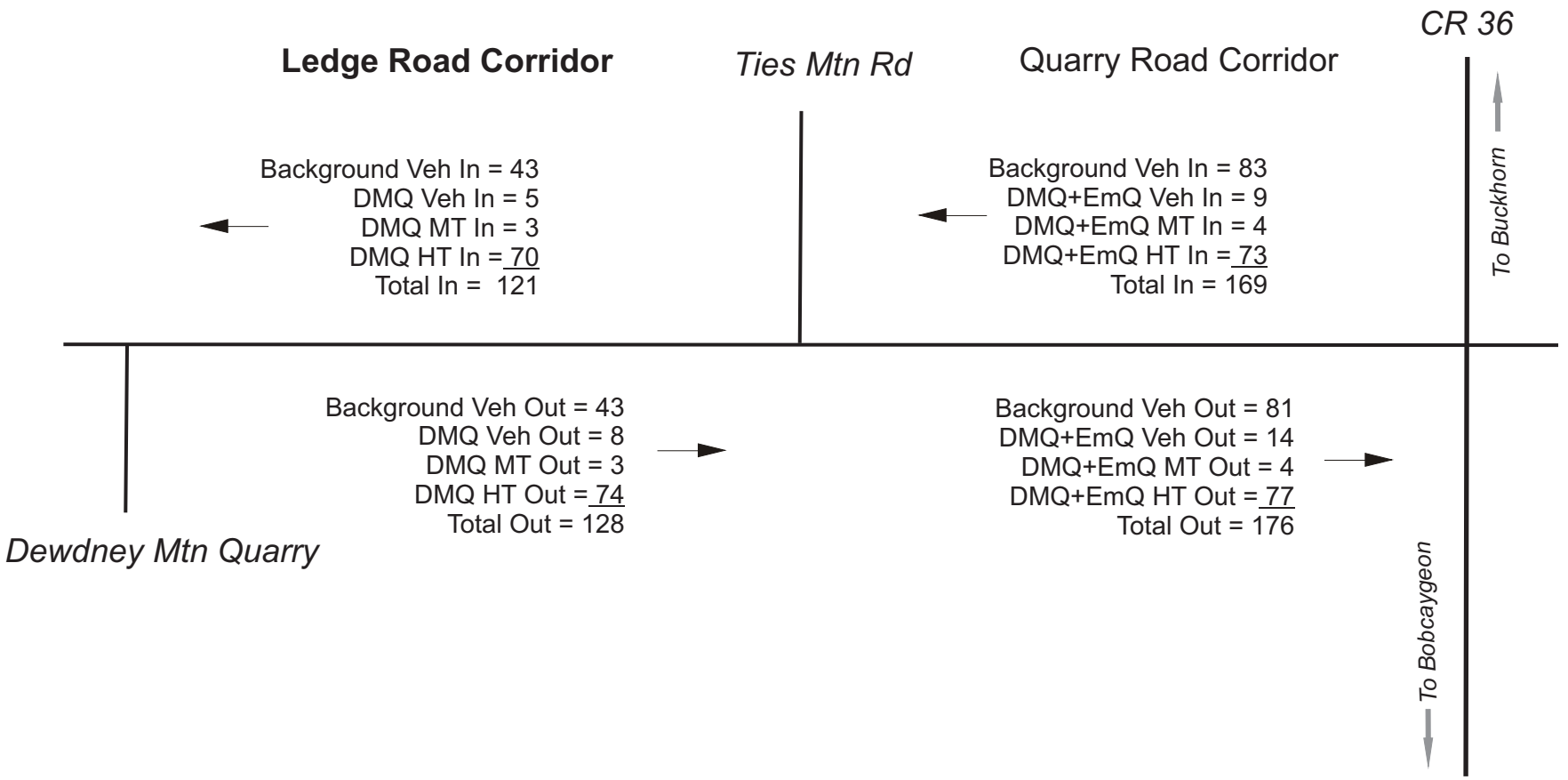
Veh - Cars + PU Trucks
MT - Medium Trucks + School Buses
HT - Heavy Trucks

Exhibit 4
2030 PM Peak Hour (4 - 5 PM)
Traffic Stream - Ledge/Quarry Corridors



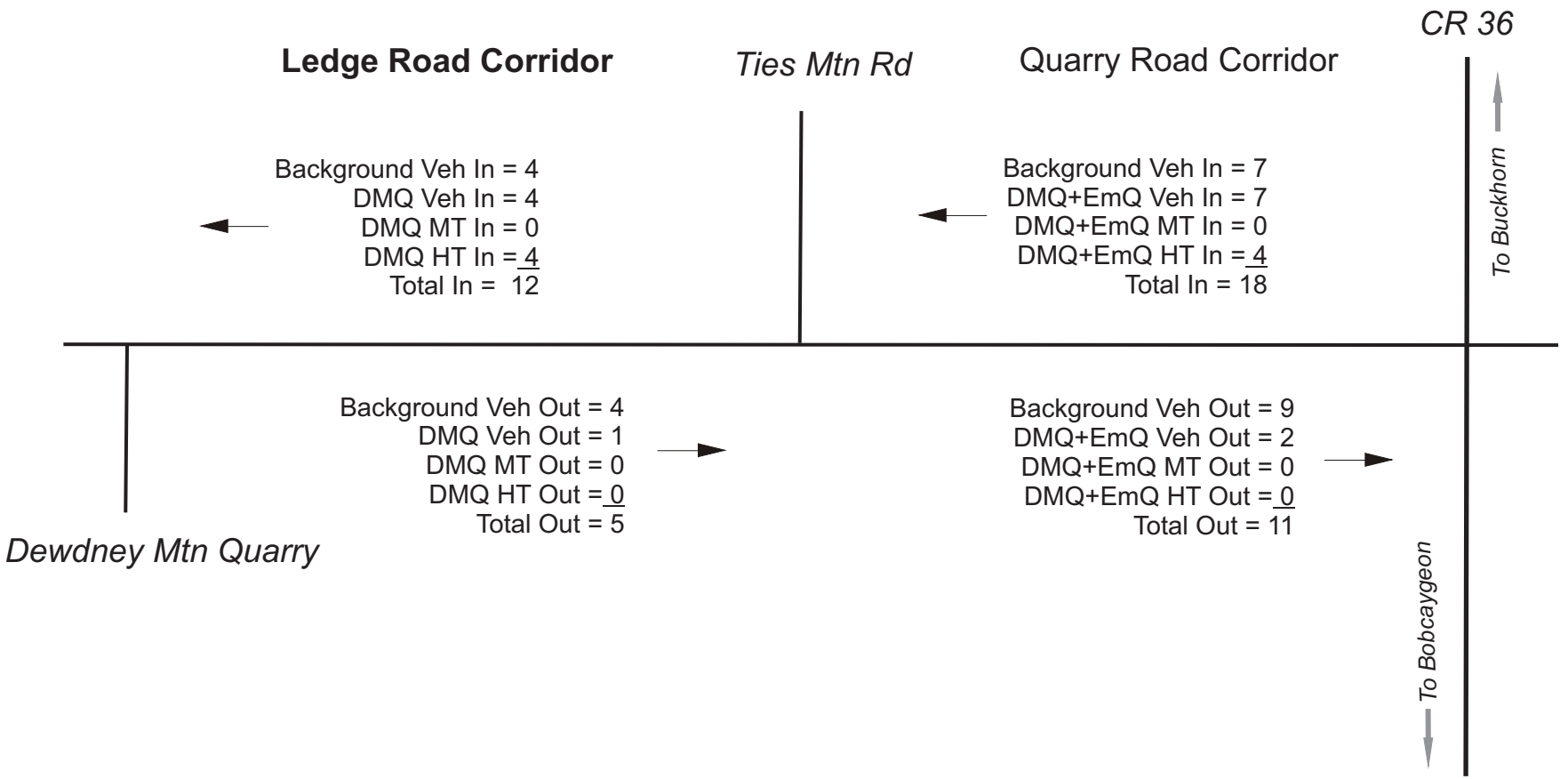
Veh - Cars + PU Trucks
MT - Medium Trucks + School Buses
HT - Heavy Trucks

Exhibit 5
2030 16 Hr Day Total (7 AM - 11 PM)
Traffic Stream - Ledge/Quarry Corridors



Veh - Cars + PU Trucks
MT - Medium Trucks + School Buses
HT - Heavy Trucks

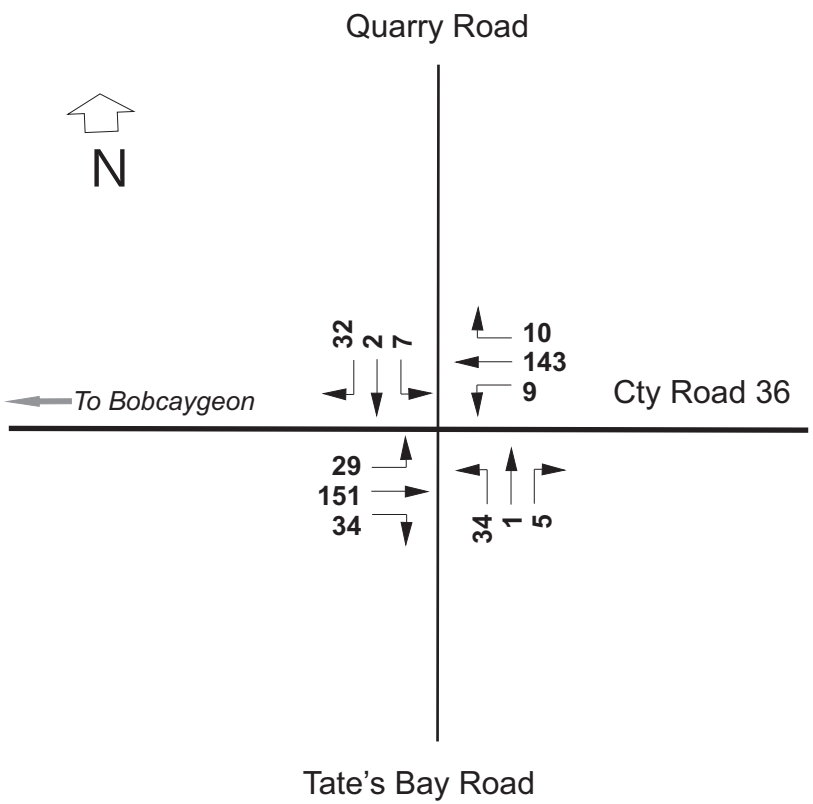
Exhibit 6
2030 8 Hr Night Total (11 PM - 7 AM)
Traffic Stream - Ledge/Quarry Corridors



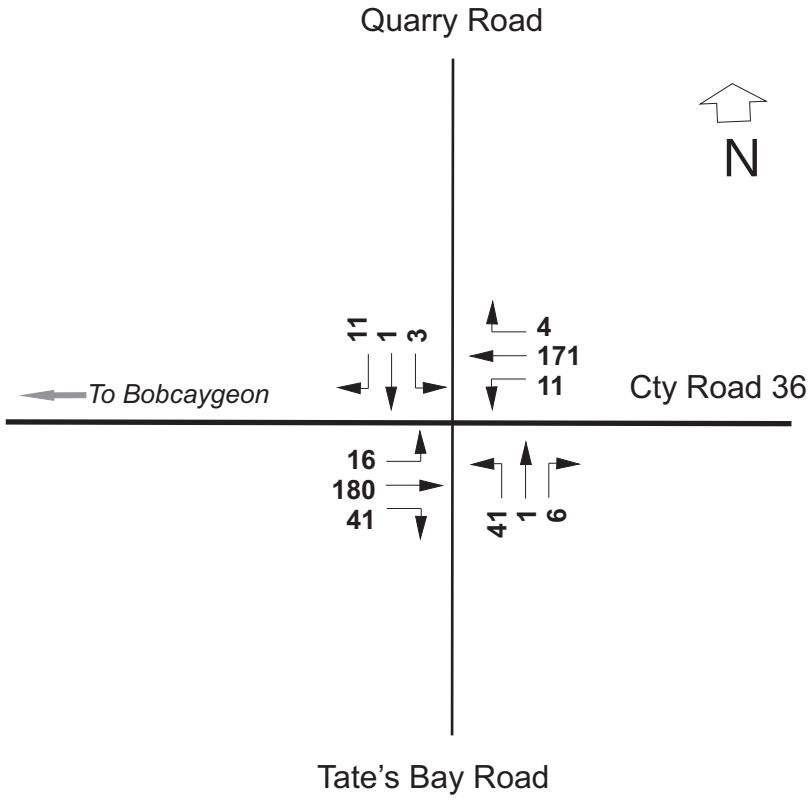
Veh - Cars + PU Trucks
MT - Medium Trucks + School Buses
HT - Heavy Trucks

Exhibit 7
CR 36 & Quarry Road Intersection

2021 PM Peak Hour Volumes
(Exh 6 - 2012 Traffic Study)



2030 PM Peak Hour Volumes
(DMQ Noise Study)



TECHNICAL APPENDIX

Traffic Profiles

Dewdney Mountain Quarry Noise/Traffic Study

Peak Hour Trip Generation by Corriodor

Based on ITE LU 210 Trip Generation Rates

Peak Hour	Rate	% In	% Out
AM	0.74	25%	75%
PM	0.99	63%	37%
24 Hr	9.44	50%	50%

Ledge Rd Component		10	Res Units	
Peak Hr	Total	In	Out	Ckq Tot
AM	7	2	5	7
PM	10	6	4	10
24 Hr	94	47	47	94

Quarry Rd Component		9	Res Units	
Peak Hr	Total	In	Out	Ckq Tot
AM	7	2	5	7
PM	9	6	3	9
24 Hr	85	43	43	86

2011 Tranplan TIS

2011 Ledge Rd

Peak Hr	Total	In	Out
AM	4	2	2
PM	7	5	2

2011 Quarry Rd + Ledge Rd

Peak Hr	**Total**	In	Out
AM	11	5	6
PM	17	9	8

2030 Quarry Rd + Ledge Rd

Peak Hr	**Total**	In	Out
AM	14	4	10
PM	19	12	7

24 Hour Distribution of Background Ledge Road Traffic

Ledge Rd

Hour	% Total	% In	% Out	Hr Tot	In	Out	
12-1 AM	0.25%	90%	10%	**1**	**1**	0	
1-2 AM	0.20%	90%	10%	0	0	0	
2-3 AM	0.10%	80%	20%	0	0	0	
3-4 AM	0.30%	50%	50%	0	0	0	
4-5 AM	0.83%	40%	60%	1	**1**	0	
5-6 AM	1.93%	30%	70%	2	1	1	
6-7 AM	**4.78%**	**25%**	**75%**	**4**	**1**	**3**	
7-8 AM	**7.30%**	**25%**	**75%**	**7**	**2**	**5**	
8-9 AM	5.48%	25%	75%	**6**	**2**	4	
9-10 AM	4.30%	30%	70%	4	1	3	
10-11 AM	4.90%	30%	70%	5	1	3	
11-12 PM	5.05%	45%	65%	5	2	3	
12-1 PM	5.60%	50%	50%	5	3	3	
1-2 PM	6.03%	50%	50%	6	3	3	
2-3 PM	6.75%	55%	45%	6	3	3	
3-4 PM	8.08%	60%	40%	8	5	3	
4-5 PM	**9.90%**	**63%**	**37%**	**9**	**6**	**3**	
5-6 PM	8.40%	63%	37%	8	5	3	
6-7 PM	6.82%	60%	40%	6	4	3	
7-8 PM	4.80%	50%	50%	5	2	2	
8-9 PM	4.20%	50%	50%	**3**	2	**1**	
9-10 PM	2.40%	60%	40%	2	1	1	
10-11 PM	1.20%	80%	20%	1	1	0	
11PM-12	0.40%	90%	10%	0	0	0	
24 Hr Tot	100.00%			94	47	47	94

**** Adjusted Number to Account for Rounding**

Ledge Road			**Total**	**In**	**Out**
	Daily	7AM-11 PM	86	43	43
	Night	11 PM-7 AM	8	4	4
		Total	**94**	**47**	**47**

24 Hour Distribution of Background Quarry Road Traffic

Quarry Rd

Hour	% Total	% In	% Out	Hr Tot	In	Out	
12-1 AM	0.25%	90%	10%	0	0	0	
1-2 AM	0.20%	90%	10%	0	0	0	
2-3 AM	0.10%	80%	20%	0	0	0	
3-4 AM	0.30%	50%	50%	0	0	0	
4-5 AM	0.83%	40%	60%	1	0	1	
5-6 AM	1.93%	30%	70%	2	1	1	
6-7 AM	**4.78%**	**25%**	**75%**	4	1	3	
7-8 AM	**7.30%**	**25%**	**75%**	**7**	2	**5**	
8-9 AM	5.48%	25%	75%	5	1	4	
9-10 AM	4.30%	30%	70%	4	1	3	
10-11 AM	4.90%	30%	70%	4	1	3	
11-12 PM	5.05%	45%	65%	4	2	**2**	
12-1 PM	5.60%	50%	50%	5	3	**2**	
1-2 PM	6.03%	50%	50%	5	3	**2**	
2-3 PM	6.75%	55%	45%	6	3	3	
3-4 PM	8.08%	60%	40%	7	4	3	
4-5 PM	**9.90%**	**63%**	**37%**	9	6	3	
5-6 PM	8.40%	63%	37%	7	4	3	
6-7 PM	6.82%	60%	40%	6	4	2	
7-8 PM	4.80%	50%	50%	**3**	2	**1**	
8-9 PM	4.20%	50%	50%	**3**	2	**1**	
9-10 PM	2.40%	60%	40%	2	1	1	
10-11 PM	1.20%	80%	20%	1	1	0	
11PM-12	0.40%	90%	10%	**1**	**1**	0	
24 Hr Tot	100.00%			86	43	43	**86**

**** Adjusted Number to Account for Rounding**

Quarry Road		**Total**	**In**	**Out**
Daily	7AM-11 PI	78	40	38
Night	11 PM-7 A	8	3	5
	Total	**86**	**43**	**43**

Dewdney Mountain Quarry Noise Study

16 Hr Trip Generation Profiles

Based on 16 Hour Day

DMQ 16 Hr Vehicle Trip Generation Profile

		Vehicle Trip Generation			Medium Truck Trip Generation			Heavy Truck Trip Generation			Total DMQ Trip Generation			
	Peak Hr	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
	6-7AM	4	1	5	0	0	0	4	0	4	8	1	9	**Nite Pk Hr**
1	**7-8 AM**	**1**	**1**	**2**	**1**	**1**	**2**	**6**	**8**	**14**	**8**	**10**	**18**	**AM Pk Hr**
2	8-9 AM	0	0	0	0	0	0	6	6	12	6	6	12	
3	9-10 AM	0	0	0	0	0	0	6	6	12	6	6	12	
4	10-11 AM	1	1	2	0	0	0	6	6	12	7	7	14	
5	11-12 PM	0	0	0	0	0	0	6	6	12	6	6	12	
6	12-1 PM	1	1	2	0	0	0	6	6	12	7	7	14	
7	1-2 PM	0	0	0	1	1	2	6	6	12	7	7	14	
8	2-3 PM	0	0	0	0	0	0	6	6	12	6	6	12	
9	3-4 PM	0	0	0	0	0	0	6	6	12	6	6	12	
10	**4-5 PM**	**1**	**1**	**2**	**1**	**1**	**2**	**6**	**6**	**12**	**8**	**8**	**16**	**PM Pk**
11	5-6 PM	1	2	3	0	0	0	6	6	12	7	8	15	
12	6-7 PM	0	2	2	0	0	0	4	6	10	4	8	12	
13	7-8 PM	0	0	0	0	0	0	0	0	0	0	0	0	
14	8-9 PM	0	0	0	0	0	0	0	0	0	0	0	0	
15	9-10 PM	0	0	0	0	0	0	0	0	0	0	0	0	
16	10-11 PM	0	0	0	0	0	0	0	0	0	0	0	0	
	16 HrTotal	**5**	**8**	**13**	**3**	**3**	**6**	**70**	**74**	**144**	**78**	**85**	**163**	
	Daily Total	**9**	**9**	**18**	**3**	**3**	**6**	**74**	**74**	**148**	**86**	**86**	**172**	***Daily Total Traffic Accessing DMQ***

6

Emerald Quarry 16 Hr Profile

		Vehicle Trip Generation			Medium Truck Trip Generation			Heavy Truck Trip Generation			Total Emerald Trip Generation			
	Peak Hr	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
	6-7AM	**3**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**1**	**4**	**Nite Pk Hr**
1	**7-8 AM**	**1**	**1**	**2**	**0**	**0**	**0**	**1**	**0**	**1**	**2**	**1**	**3**	**AM Pk Hr**
2	8-9 AM	0	0	0	0	0	0	0	0	0	0	0	0	
3	9-10 AM	0	0	0	0	0	0	0	1	1	0	1	1	
4	10-11 AM	0	0	0	0	0	0	1	0	1	1	0	1	
5	11-12 PM	0	0	0	0	0	0	0	0	0	0	0	0	
6	12-1 PM	1	2	3	0	0	0	0	1	1	1	3	4	
7	1-2 PM	0	0	0	1	1	2	1	0	1	2	1	3	
8	2-3 PM	0	0	0	0	0	0	0	0	0	0	0	0	
9	3-4 PM	0	0	0	0	0	0	0	0	0	0	0	0	
10	**4-5 PM**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**2**	**PM Pk**
11	5-6 PM	1	2	3	0	0	0	0	0	0	1	2	3	
12	6-7 PM	0	1	1	0	0	0	0	0	0	0	1	1	
13	7-8 PM	0	0	0	0	0	0	0	0	0	0	0	0	
14	8-9 PM	0	0	0	0	0	0	0	0	0	0	0	0	
15	9-10 PM	0	0	0	0	0	0	0	0	0	0	0	0	
16	10-11 PM	0	0	0	0	0	0	0	0	0	0	0	0	
	16 HrTotal	**4**	**6**	**10**	**1**	**1**	**2**	**3**	**3**	**6**	**8**	**10**	**18**	
	Daily Total	**7**	**7**	**14**	**1**	**1**	**2**	**3**	**3**	**6**	**11**	**11**	**22**	***Daily Total Traffic Accessing Emerald Q***

Intersection Capacity Analyses

DEFINITION OF LEVELS OF SERVICE
Automobile Mode

UNSIGNALIZED INTERSECTIONS

Analysis of the Level of Service for unsignalized intersections is based on the ***Highway Capacity Manual*** *(HCM 2010)* procedures using current software for unsignalized intersections. The Level of Service for intersections is based on *Control Delay*. At two way stop controlled intersections (TWSC), *Control Delay* is the total elapsed time from a vehicle joining the queue until its departure from the stopped position at the head of the queue. The *Control Delay* includes the time required to decelerate to a stop and to accelerate to the free-flow speed.

The analysis of individual movements at TWSC intersections can also include the estimate of the ratio of volume or demand to available capacity for the movements. This is commonly know as the (v/c) ratio. The v/c ratio provides some indication of how well these individual intersection movements will function during peak hour periods.

Level of Service definitions for unsignalized intersections as defined by the ***Highway Capacity Manual*** are summarized in the table below.

Definition of Level of Service for Unsignalized Intersections
(see Exhibit 19-1, Highway Capacity Manual 2010)

Level of Service	Average Delay (seconds)
A	0 - 10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	More than 50s and/or v/c > 1

Level of Service (LoS) for a TWSC intersection is determined by the computed or measured *Control Delay* and is defined for each minor movement at the intersection. LoS is not defined for the major street approaches or the intersection as a whole. LoS "F" is considered to be undesirable for design or planning purposes. However, many individual turning movements at TWSC intersections and commercial entrances along urban arterial corridors operate at LoS "F" during peak hour periods.

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	16	180	41	11	171	4	41	1	6	3	1	11
Future Vol, veh/h	16	180	41	11	171	4	41	1	6	3	1	11
Conflicting Peds, #/hr	2	0	2	2	0	2	2	0	2	2	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-3	-	-	0	-	-	2	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	40	15	5	5	15	40	5	5	5	40	40	40
Mvmt Flow	17	196	45	12	186	4	45	1	7	3	1	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	192	0	0	243	0	0	476	471	223	473	491	192
Stage 1	-	-	-	-	-	-	255	255	-	214	214	-
Stage 2	-	-	-	-	-	-	221	216	-	259	277	-
Critical Hdwy	4.5	-	-	4.15	-	-	7.55	6.95	6.45	7.5	6.9	6.6
Critical Hdwy Stg 1	-	-	-	-	-	-	6.55	5.95	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.55	5.95	-	6.5	5.9	-
Follow-up Hdwy	2.56	-	-	2.245	-	-	3.545	4.045	3.345	3.86	4.36	3.66
Pot Cap-1 Maneuver	1183	-	-	1306	-	-	469	462	799	444	427	761
Stage 1	-	-	-	-	-	-	722	672	-	709	660	-
Stage 2	-	-	-	-	-	-	756	701	-	669	617	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1181	-	-	1304	-	-	450	448	796	429	414	758
Mov Cap-2 Maneuver	-	-	-	-	-	-	450	448	-	429	414	-
Stage 1	-	-	-	-	-	-	708	659	-	696	652	-
Stage 2	-	-	-	-	-	-	734	693	-	650	605	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.5	13.5	10.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	476	1181	-	-	1304	-	-	627
HCM Lane V/C Ratio	0.11	0.015	-	-	0.009	-	-	0.026
HCM Control Delay (s)	13.5	8.1	0	-	7.8	0	-	10.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.1