



Meliadine Gold Mine

Caribou Behaviour Monitoring

April 2020

Project No.: 0544016-WP4

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1. INTRODUCTION

Agnico Eagle Mines Ltd. (Agnico Eagle) would like to determine whether caribou behaviour changes in response to Project activities such as: 1) having roads largely closed in 2020 due to the COVID-19 outbreak vs. open in 2021, 2) passing vehicles and 3) other activities such as predators or mine operations. This monitoring program is designed to collect baseline data on caribou behaviour using standardized, scientifically-defensible methods. The data will be used to monitor project effects and as part of predicting the effects of future expansions during permitting.

Monitoring is to be carried out by on-site technicians as part of normal monitoring operations. The objective for the 2020 season is to collect observations on at least 100 groups of caribou; ideally 25 groups in each of the four group size categories (1-2; 3-25; 26-50; >50).

2. STUDY AREA

The study area for behaviour monitoring is anywhere that caribou may interact with the Project, including the All Weather Access Road (AWAR), and the Meliadine Mine site.

3. STANDARD OPERATING PROCEDURES

The purpose of caribou behaviour surveys is to provide information to characterize the effects of the physical road and mine-related activities on caribou behaviour, including the All Weather Access Road (AWAR). The overall method for the surveys is to identify caribou groups visible from the road, to select some groups for observation, and to record the behaviour of individuals in groups of different sizes including their responses without any disturbance and to both mine-related activities and natural factors.

Notes to guide the work include:

- Systematic surveys will be conducted along all Project roads during spring and fall migration periods.
- The survey team will consist of a driver/observer and a second observer when available.

Surveys should be performed:

- Every day that caribou may be in the Project area, and
- At least an hour before convoy deployment so that the potential effect of the passing convoy can be recorded on caribou.

3.1 General Field Data

For each survey day, the appropriate general field data will be recorded onto field data sheets supplied in Appendix A and B. A new data sheet will be used for each survey, including additional sheets as necessary to record all observations. General information includes:

- Survey date and start and end times.
- Field personnel (full names on the data sheet header and initials thereafter).
- Weather conditions during and prior to sampling (e.g., snow in the last 24 hours, current wind conditions).
- Site description: provide location and description (GPS coordinates, road name and distance marker).
- Photographs (if a high resolution camera is available):
 - Take a photo of the caribou every time an observation is recorded so that the observations can be verified by another biologist.
 - For any photographs taken, record the picture IDs in the comments field on the field data sheet.
 - Write descriptions of any photos taken for specific reasons.
- General observations/notes of the environment/sampling procedures.
- Any deviation from the SOPs outlined below.

Note: When in doubt take pictures and make field notes explaining the situation, your response or consequent changes in methods. It is better to have more data/notes than not enough when interpreting the results later on.

3.2 General Equipment List

- A GPS unit with waypoints of road km markings.
- Field data sheets (Appendix A and B), clipboard, pencils, or iPad with data form.
- A timer capable of alarm setting for repeat time intervals (i.e., can be set to go off every three minutes, e.g., a phone).
- Binoculars or spotting scope.
- Compass (or use compass function on GPS unit).
- Portable weather station (temperature and wind speed).
- Camera.

3.3 Field Methods

3.3.1 Group Selection

The survey day will begin with a reconnaissance survey to determine how many caribou groups are present near the road, how large they are, and where they are. This will be accomplished by driving from the mine site to the end of the road and noting relevant information about the groups and their sizes along the way (Appendix A). At the end of the road, the observers will have a list of the total number of groups present and the group sizes.

Allow approximately one hour to survey each group. If the length of the survey day permits all groups to be surveyed then they should all be surveyed. If there are more groups to survey than the time in the day, then do the following:

1. Look at how many of each group size (bullet list below) have been surveyed to date. If one of them is under-represented and there is a group of that size on the road, then go survey that group. If there is more than one group of that size, choose it randomly using the procedure in step 2.
 - a. 1 or 2 caribou
 - b. 3 to 25 caribou
 - c. 26 to 50 caribou
 - d. >50 caribou
2. For the remainder of groups, use the random number table in Appendix C to select which groups to survey.
 - a. Start with the number of groups of caribou on the road. For example, if there are 9 groups of caribou on the road, but the team can only survey 6 of them in a day.
 - b. Close your eyes and point at the random number table.
 - c. From where your finger lands, read the numbers sequentially to the right until you land on a number that is less than 9 (the number of groups on the road). If that number is #3, then write that down. Repeat that method until you have 6 groups identified (the number you can survey in a day). If there are 10 or more groups then use two digits at a time on the table (for group numbers less than 10 they need a zero in front of them, e.g., group 3 would be chosen when the two digits are "03").
 - d. If you get a repeat number or a number bigger than the number of groups you have, ignore it and move to the next number.

Drive back along the road, surveying the groups that you identified in the procedure above.

3.3.2 Selection of an Observation Site

Find a safe parking location and follow site safety protocols. The observation location may be the vehicle itself or a safe location off the road. If observers exit the vehicle, the observation location should be chosen where observer activity is not likely to influence caribou behaviour and where the observer can remain comfortable for a period of approximately 45 minutes without needing to move. Ideally, the vehicle should be stopped a minimum of ~250-300 m from the caribou – adapt this distance as needed. If the animals are staring at the truck or moving away, then the truck is too close.

3.3.3 Data Recording

Allow 15 minutes between arrival and the time at which behavioural observations begin. This is to allow animals to return to behaviour that may have been interrupted by the arrival of observers. In the time before recording behaviour, fill in the top portion of the form with location, weather, and group size information.

After 15 minutes, begin recording data in the form in Appendix B. The start time to record is the time that observations begin.

3.3.3.1 Location

Collect a waypoint of the location from which the observations will be made. Note the waypoint number and the UTM coordinates on the data sheet. Estimate the distance to the group (see data sheet for distance categories) and, using a compass or the GPS unit compass feature, record the bearing (0° to 360°) to the group being observed.

At each time interval during the survey, observers should record the number of individuals in the group exhibiting behaviour in each category. For clarity, observers should record zero values for behaviours not observed.

Note if the group is on the east or west side of the road. At the end of the 30 minute observation period return to the top of the form and record (Y or N) if the group crossed the road during the survey period.

3.3.3.2 Weather Conditions

Use the portable weather station to record:

- Air temperature;
- Wind speed;
- Wind direction; and
- Humidity (if the weather station has this function).

3.3.3.3 Road Structure

At the location of the caribou group, record the road characteristics:

- Height of the road above the tundra (m);
- Slope of the road side (with of the slope in m);
- Approximate height of snow bank (m); and
- Any structures, such as bridges, present.

3.3.3.4 *Caribou Behaviour*

Individuals in the group being observed will be categorized when the survey starts and at three minute intervals. Standardized behaviour categories will be used (Section 3.3.3). The standardization of behaviour is necessary for clarity and data analysis. If the observed behaviour does not fit within any of the categories then observers have the option of noting other behaviour in the comments field. However, this should be used only rarely as most behaviour should fit in the primary categories listed below.

The data to record at each three-minute interval are the numbers of individuals in the group exhibiting each behaviour at that time. Do not attempt to characterize the behaviour that occurred during the interval. If the group is too large to be counted in each interval, choose an identifiable subset of the group, count the individuals exhibiting each behaviour at each time interval, and add a comment that a subset of the group was sampled. Indicate the total group size at the top of the data form, not the size of the subset whose behaviour was recorded.

Practically, the easiest way to do this is to have the observer scan across the group of caribou from Left to Right, calling out the behaviour of each animal, while the recorder adds tick marks to the data sheet. When complete, count up the tick marks.

3.3.3.5 *Disturbance Events*

Caribou behaviour is expected to vary in response to some disturbance events. 2020 is being used as a control year with few disturbance events, to be compared to 2021, when road use returns to normal. The bottom of the data form should be used to record any potential disturbance events evident to the observer regardless of whether caribou respond to them. The main categories of events are included in the data sheet:

- Light truck;
- Haul truck;
- Road maintenance vehicle (e.g., grader);
- ATV or skidoo;
- Aircraft; and
- Predator (note species).

Record the number and approximate speed of the vehicle.

Record the time of the disturbance event (0:00 to 30:00 of the survey), indicate which type of disturbance was observed in the appropriate column. Record any additional comments and records of photographs taken in the final column.

3.3.4 Behaviour Classification

With the exception of Alert behaviour, the primary behaviour categories and their definitions follow GNWT (2017) classifications. The categories appear as columns on the data form, with descriptions on the reverse of the form. The behaviour categories are:

- **Feeding** – standing or walking posture, with the muzzle touching or nearly touching the ground; can be ingesting food or not; head down or moving from side to side.
- **Lying down** – bedded on the ground, either upright or lying on its side, in a resting or ruminating position.
- **Standing** – stationary in an upright, standing posture with head elevated above the ground, and usually above the knees; if cow is nursing, if possible record the time spend nursing.
- **Alert** – head up scanning horizon or focused on a source of disturbance (e.g., vehicle, predator, human).
- **Walking** – similar to standing posture but moving at a slow gait (<5 km/h).
- **Trotting/running** – similar to standing posture but moving rapidly in symmetrical or asymmetrical gait.

Other behaviours that may be observed (record in comments field on form) are:

- **Nursing** – calf is suckling cow.
- **Sparring** – two males in contact.
- **Insect response behavior** – twitching, stamping, tossing head.

In the comments, record if any animals are moving towards the road, parallel or away from the road.

4. REFERENCES

GNWT-ENR. 2017. *Caribou behaviour monitoring field protocols*. Government of the Northwest Territories Environment and Natural Resources, 10 page unpublished document. Yellowknife, NT.

Appendix A Data Sheet for Recording All Groups of Caribou along the Road

Pre-survey caribou reconnaissance.

Date:

Group Number	Road km marker	Group size	East or West of Road?
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
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35			

Appendix B Meliadine Gold Mine: Caribou Behaviour Monitoring Data Sheet

Date:		Time (24 hr [00:00 to 24:00]) Start:		End:			
Observers:							
Location Waypoint number:		UTM Easting:	UTM Northing:		Road name and distance marker:		
Distance from caribou to observer location. Circle one: 0-50 m 51-100 m 100- 300 m 300-1000 m >1000 m Bearing: _____°							
Is group location East or West of the Road at start of survey? Circle one: E W			Did the group cross the road during the survey? Circle one: Y N				
Caribou group size: Exact count when possible: _____ Estimated size (for larger groups). Circle one: 50-100 101-200 201-500 501-1000 >1000							
Temperature: _____°C Wind speed: _____km/h Wind direction: _____° Humidity: _____% Days since last snow or wind event: _____							
Weather observations:							
Road Height:		Road Side Width:		Structures Present:			
Observation time from start of survey	Number of animals exhibiting each behaviour type					Comments and photo numbers (Note if any caribou crossed road or travelled along road since previous observation)	
	Feeding	Lying Down	Standing	Walking	Alert		Trotting or running
0 minutes							
3 minutes							
6 minutes							
9 minutes							
12 minutes							
15 minutes							
18 minutes							
21 minutes							
24 minutes							
27 minutes							
30 minutes							
Observed disturbance events (record time from start of survey and check type of disturbance)							
Time from start of survey	Light truck	Haul Truck	Road maintenance vehicle (e.g., grader)	ATV	Aircraft	Predator (note species)	Comments and photo numbers. Note other disturbances here

Categories and definitions of behaviour¹:

- **Feeding** – standing or walking posture, with the muzzle touching or nearly touching the ground; can be ingesting food or not; head down or moving from side to side.
- **Lying down** – bedded on the ground, either upright or lying on its side, in a resting or ruminating position.
- **Standing** – stationary in an upright, standing posture with head elevated above the ground, and usually above the knees; if cow is nursing, if possible record the time spend nursing.
- **Alert** – head up scanning horizon or focused on a source of disturbance (e.g., vehicle, predator, human).
- **Walking** – similar to standing posture but moving at a slow gait (<5 km/h).
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Other behaviours that may be observed (record in comments field on form) are:

- **Nursing** – calf is suckling cow.
- **Sparring** – two males in contact.
- **Insect response behavior** – twitching, stamping, tossing head.

¹ Primary source: GNWT-ENR 2017 caribou behaviour monitoring field protocols, courtesy of GNWT Yellowknife, NT.

Appendix C Random Number Table to Select Groups to Survey

13962	70992	65172	28053	02190	83634	66012	70305	66761	88344
43905	46941	72300	11641	43548	30455	07686	31840	03261	89139
00504	48658	38051	59408	16508	82979	92002	63606	41078	86326
61274	57238	47267	35303	29066	02140	60867	39847	50968	96719
43753	21159	16239	50595	62509	61207	86816	29902	23395	72640
83503	51662	21636	68192	84294	38754	84755	34053	94582	29215
36807	71420	35804	44862	23577	79551	42003	58684	09271	68396
19110	55680	18792	41487	16614	83053	00812	16749	45347	88199
82615	86984	93290	87971	60022	35415	20852	02909	99476	45568
05621	26584	36493	63013	68181	57702	49510	75304	38724	15712
06936	37293	55875	71213	83025	46063	74665	12178	10741	58362
84981	60458	16194	92403	80951	80068	47076	23310	74899	87929
66354	88441	96191	04794	14714	64749	43097	83976	83281	72038
49602	94109	36460	62353	00721	66980	82554	90270	12312	56299
78430	72391	96973	70437	97803	78683	04670	70667	58912	21883
33331	51803	15934	75807	46561	80188	78984	29317	27971	16440
62843	84445	56652	91797	45284	25842	96246	73504	21631	81223
19528	15445	77764	33446	41204	70067	33354	70680	66664	75486
16737	01887	50934	43306	75190	86997	56561	79018	34273	25196
99389	06685	45945	62000	76228	60645	87750	46329	46544	95665
36160	38196	77705	28891	12106	56281	86222	66116	39626	06080
05505	45420	44016	79662	92069	27628	50002	32540	19848	27319
85962	19758	92795	00458	71289	05884	37963	23322	73243	98185
28763	04900	54460	22083	89279	43492	00066	40857	86568	49336
42222	40446	82240	79159	44168	38213	46839	26598	29983	67645
43626	40039	51492	36488	70280	24218	14596	04744	89336	35630
97761	43444	95895	24102	07006	71923	04800	32062	41425	66862
49275	44270	52512	03951	21651	53867	73531	70073	45542	22831
15797	75134	39856	73527	78417	36208	59510	76913	22499	68467
04497	24853	43879	07613	26400	17180	18880	66083	02196	10638
95468	87411	30647	88711	01765	57688	60665	57636	36070	37285
01420	74218	71047	14401	74537	14820	45248	78007	65911	38583
74633	40171	97092	79137	30698	97915	36305	42613	87251	75608
46662	99688	59576	04887	02310	35508	69481	30300	94047	57096
10853	10393	03013	90372	89639	65800	88532	71789	59964	50681
68583	01032	67938	29733	71176	35699	10551	15091	52947	20134
75818	78982	24258	93051	02081	83890	66944	99856	87950	13952
16395	16837	00538	57133	89398	78205	72122	99655	25294	20941
53892	15105	40963	69267	85534	00533	27130	90420	72584	84576
66009	26869	91829	65078	89616	49016	14200	97469	88307	92282
45292	93427	92326	70206	15847	14302	60043	30530	57149	08642
34033	45008	41621	79437	98745	84455	66769	94729	17975	50963
13364	09937	00535	88122	47278	90758	23542	35273	67912	97670
03343	62593	93332	09921	25306	57483	98115	33460	55304	43572
46145	24476	62507	19530	41257	97919	02290	40357	38408	50031
37703	51658	17420	30593	39637	64220	45486	03698	80220	12139
12622	98083	17689	59677	56603	93316	79858	52548	67367	72416
56043	00251	70085	28067	78135	53000	18138	40564	77086	49557
43401	35924	28308	55140	07515	53854	23023	70268	80435	24269
18053	53460	32125	81357	26935	67234	78460	47833	20496	35645