TECHNICAL MEMORANDUM

DATE January 10, 2018 **Project No.** Doc715-18102671

TO Ryan Vanengen
Agnico Eagle Mines Limited

CC Andrea Ortega, Kelly Bourassa, Corey De La Mare

FROM Corey De La Mare **EMAIL corey_delamare@golder.com**

PROPOSED MELIADINE WINDFARM – TERRESTRIAL BASELINE REPORT

1.0 INTRODUCTION

Agnico Eagle Mines Ltd (Agnico Eagle) requested support from Golder Associates Ltd. (Golder) to understand the environmental constraints for siting a proposed wind power project at the Meliadine Mine (the Mine) based on current regulatory requirements and environmental conditions. Golder completed the field portion of the land cover, vegetation, and wetlands work from July 23 to 28 and wildlife reconnaissance June 22 and 23, 2018 under a Master Services Agreement between Agnico Eagle and Nuqsana Golder, consistent with all other monitoring programs at the Mine in 2018.

2.0 VEGETATION

2.1 Objective

The objective of the land cover, vegetation, and wetland surveys was to verify the accuracy of the remote desktop wetland and land cover mapping and to understand the distribution and classification of the wetlands and other land cover types in the Project Local Study Area (LSA). In addition, incidental listed and invasive plant incidental surveys were completed to inform the design process and identify potential areas with environmental sensitivities and constraints for avoidance and minimization.

2.2 Field Methods

- In addition to desktop review, land cover surveys were completed on foot in each of the proposed Windfarm areas (hereafter PWAs). A GPS unit and ArcGIS Collector software were used to navigate within 1 km of the PWAs centre point while travelling between wetlands.
- Land cover types were noted and delineated during the field surveys, and photographs and GPS points were taken at each survey location. The land cover field survey was conducted in conjunction with the wetlands survey.
- A list of potential non-native and invasive plants was obtained from the Endangered Species Conservation Council List (CESCC 2010) and reviewed prior to the field surveys. Listed, non-native, and invasive species meander searches were completed on foot while travelling between wetlands within the PWAs.

Golder Associates Ltd.
102, 2535 - 3rd Avenue S.E., Calgary, Alberta, T2A 7W5, Canada T: +1 403 299 5600 F: +1 403 299 5606

- At each assessed wetland, the wetland classification and delineation were evaluated and updated, as required, and dominant plant species were noted. Soils were assessed as needed to determine wetland boundaries, and desktop wetland delineations were adjusted using a Global Positioning System (GPS) track file, if necessary. The presence of weed species and any current wetland impacts associated with human activities were noted, as applicable, and photographs were taken at each wetland.
- Following the field assessment, the delineations of field verified wetlands were revised and questionable wetland areas that were ultimately determined to be upland were removed, as needed, to reflect direct assessment in the field.

2.3 Results

Land Cover Types

- The LSA covers 11,001 ha and is classified into 10 plant community types, including 4 heath vegetation classes, 3 wetland classes and 3 un-vegetated classes (Figure 1, Appendix A).
- Heath vegetation encompasses 5,672 ha (52%) of the LSA, with the heath tundra community type dominating the landscape at 4,272 ha (39%). Wetlands are distributed over 2,791 ha (25%) of the LSA and are predominately comprised of the sedge community, which accounts for 2,472 ha (22%). The remaining 2,537 ha (23%) of the LSA are classified as un-vegetated (Appendix A).
- un-vegetated units that are predominantly composed of waterbodies and rivers (Figure 1, Appendix A). A total of three land cover types were identified in the LSA, with water being the most dominated un-vegetated type occupying 2,356 ha (23%) of the LSA.

Listed, non-native and invasive plants

- Listed plants were not observed in the LSA during 2018 surveys.
- Non- native and invasive plants were not observed LSA during 2018 surveys. However, a few occurrences of flixweed (*Descurainia sophia*) were observed while traveling between PWAs on existing disturbed areas.

Siting Constraints and Data Gaps

- The Federal Wetland Policy (Government of Canada 1991) promotes the conservation of Canada's wetlands to sustain their ecological and socio-economic function. Any development with the potential to alter wetlands should adhere to this policy. Opportunities for wetland avoidance and mitigation will be identified during the project layout design, when possible and the Federal Wetland Policy will be followed, as much as practical.

3.0 WILDLIFE

3.1 Objective

The objective of the wildlife surveys was to understand the general wildlife use and habitat potential of the Proposed Wind Areas (PWAs). Emphasis was placed on species with direct interactions with wind turbines including waterfowl, shorebirds, songbirds and raptors (i.e., distribution and abundance, daily flyways, nesting, etc.). Information on birds was captured primarily through Avian Use Surveys (AUS), which describe bird species presence and abundance and flight characteristics (i.e., flight height, flight direction, etc.). Additional wildlife information, primarily pertaining to caribou sign observations, was completed through a general reconnaissance survey (i.e., wildlife sweep) to gather information on the distribution and habitat use of other wildlife species.

3.2 Methods

- Three AUS surveys were conducted in each of the proposed Windfarm areas (hereafter PWAs). Locations were selected to maximize coverage of the areas while minimizing overlap between survey points (Figure 2, Appendix A). Surveys were 30 minutes in length and were conducted in the early morning from sunrise until 09:00, and then repeated in the afternoon from 13:00 until 18:00, on June 22 and 23 in 2018. All birds identified using the aerial space during the survey (i.e., seen flying within 800 m of survey point) were recorded to species, number of individuals, height of flight, and direction of travel.
- Wildlife sweeps were conducted, on foot, in both PWAs. A GPS unit was used to navigate within 2 km of the PWA centre point while conducting a random walk through the area. Evidence of wildlife in the area was recorded by taking a waypoint on a handheld GPS unit. We prioritized sweeping areas that had high potential for evidence of caribou, such as lichen and moss-covered uplands; as well as areas that had high potential for nesting raptors, such as elevated rocky outcrops and cliffs. Handheld GPS units recorded tracks which illustrate the exact areas we were able to cover (Figure 3, Appendix A)

3.3 Results

AUS Surveys

- A total of 418 birds from 109 flocks were detected in the AUS surveys (Table 2). A total of 21 species were detected, none of which are federally listed species (Table 2). The most common species was Canada goose (*Branta canadensis*), representing 53% of all individuals observed (223/418), followed by sandhill crane (*Grus canadensis*) with 4.5% of individuals observed (19/418). Just one species of raptor was detected during AUS surveys: a rough-legged hawk (*Buteo lagopus*) in the north PWA.
- The average flight height for all species combined was 10.0 meters (m) (Table 3). The rough-legged hawk (*Buteo lagopus*) had the highest average flight height of 35.0 m, while three species had an average flight height of just 1.0 m: long-tailed duck (*Clangula hyemalis*), savannah sparrow (*Passerculus sandwichensis),* and willow ptarmigan (*Lagopus lagopus*).
- The average flight bearing for all observations (note that flocks have equal weighting to individual birds in this calculation) was 212°, or southwest.

Wildlife Sweeps

- The most frequently recorded wildlife observations in both PWAs was caribou sign. No actual caribou were seen during the surveys, likely due to time of year, but many instances of scat, bones, and trails were observed.
- Arctic ground squirrel colonies were abundant throughout both PWAs, and incidental observations of active colonies were recorded to generate a baseline of their distribution and relative abundance.
- Some evidence of Arctic Hare and Arctic Fox were found in both PWAs, including a fox observed in the north PWA.
- We found evidence of a Rough-legged Hawk roost site, not believed to be a nesting site. The site is a large boulder on the tundra covered with white wash and pellets, believed to have been active within the past month. Feathers were recovered in the area which support the identification of the bird using this site as a

Rough-legged Hawk. The boulder itself is located about 10 m outside the north PWA 2 km buffer, so it is highly likely any hawk using this roost site will also use the Windfarm area.

- No Peregrine Falcons were observed in the PWAs, or on the mine site itself during the two-week survey period. However, one nest was found several kilometres south of the south PWA. That nest is located at 15V 544729 6979991 and is on a west facing cliff edge.

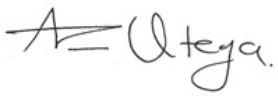
Species at Risk and Incidental Observations

- Only one species at risk was identified during our time at Meliadine. This is the Peregrine Falcon nest located at 15V 544729 6979991.

Siting Constraints and Data Gaps

- Assessment of caribou movement and habitat use during their migration through the Meliadine mine area. This can be covered off primarily through the on-site environmental staff and caribou migration protocols in 2018 and past years observations.

GOLDER ASSOCIATES LTD.



Andrea Ortega, B.Sc., P.Biol.
Terrestrial Biologist

Corey De La Mare, P.Biol.
Principal, Senior Ecologist

Kelly Bourassa, B.Sc.
Biologist

AO/CDM/vm/tt

https://golderassociates.sharepoint.com/sites/34725g/technical work/2000 feis assessment/appendices/appendix g wildlife baseline/doc693_18102671_meliadine proposed windfarm vegetation_wildlife_baseline_20181217.docx

References

Canadian Endangered Species Conservation Council List (CESSCC 2010). Non-Native Species and Invasive Species in Nunavut. Available at: https://www.gov.nu.ca/sites/default/files/brochure_english_jan31-4_1.pdf

Government of Canada. 1991. Federal Policy on Wetland Conservation. Environment Canada. Canada Wildlife Service. Ottawa. ON. 15p.

National Wetlands Working Group. 1997. Canadian Wetland Classification System. Second Edition. Warner, B.G. and C.D.A. Rubec (eds), Wetlands Research Centre, University of Waterloo, Waterloo, ON, Canada. 68 p

APPENDIX A

Figures

PATH: Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\18102671\02_PRODUCTION\7000\MXD\Report\Baseline\18102671_7000_Fig_01_Vegetation.mxd PRINTED ON: 2019-01-10 AT: 1:01:32 PM

535000 540000 545000 550000 555000

6990000 6985000 6980000 6975000 6970000 6965000

Meliadine Camp

Iqalugaarjuup Nunanga Park

Rankin Inlet

LEGEND

BOUNDARIES_NRCAN_GEOGRAPHIC_NAMES
FOOTPRINT
WINDFARM FOOTPRINT
ALL-WEATHER ACCESS ROAD (AWAR)
ROAD - NEW
ROAD - EXISTING
WATERCOURSE
WATERBODY
TERRITORIAL PARK
TERRESTRIAL LSA

PLANT COMMUNITY CLASSIFICATION
BIRCH SEEP
DISTURBED
HEATH TUNDRA COMMUNITY
LICHEN-HEATH (CETRARIA LICHEN)
LICHEN-HEATH (HAIR LICHEN)
LICHEN-ROCK COMMUNITY
RIPARIAN WILLOW OR BIRCH
SEDGE COMMUNITY
UNVEGETATED (SAND)
WATER

0 2 4
1:100,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED AND NATURAL RESOURCES CANADA.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED

CONSULTANT
GOLDER

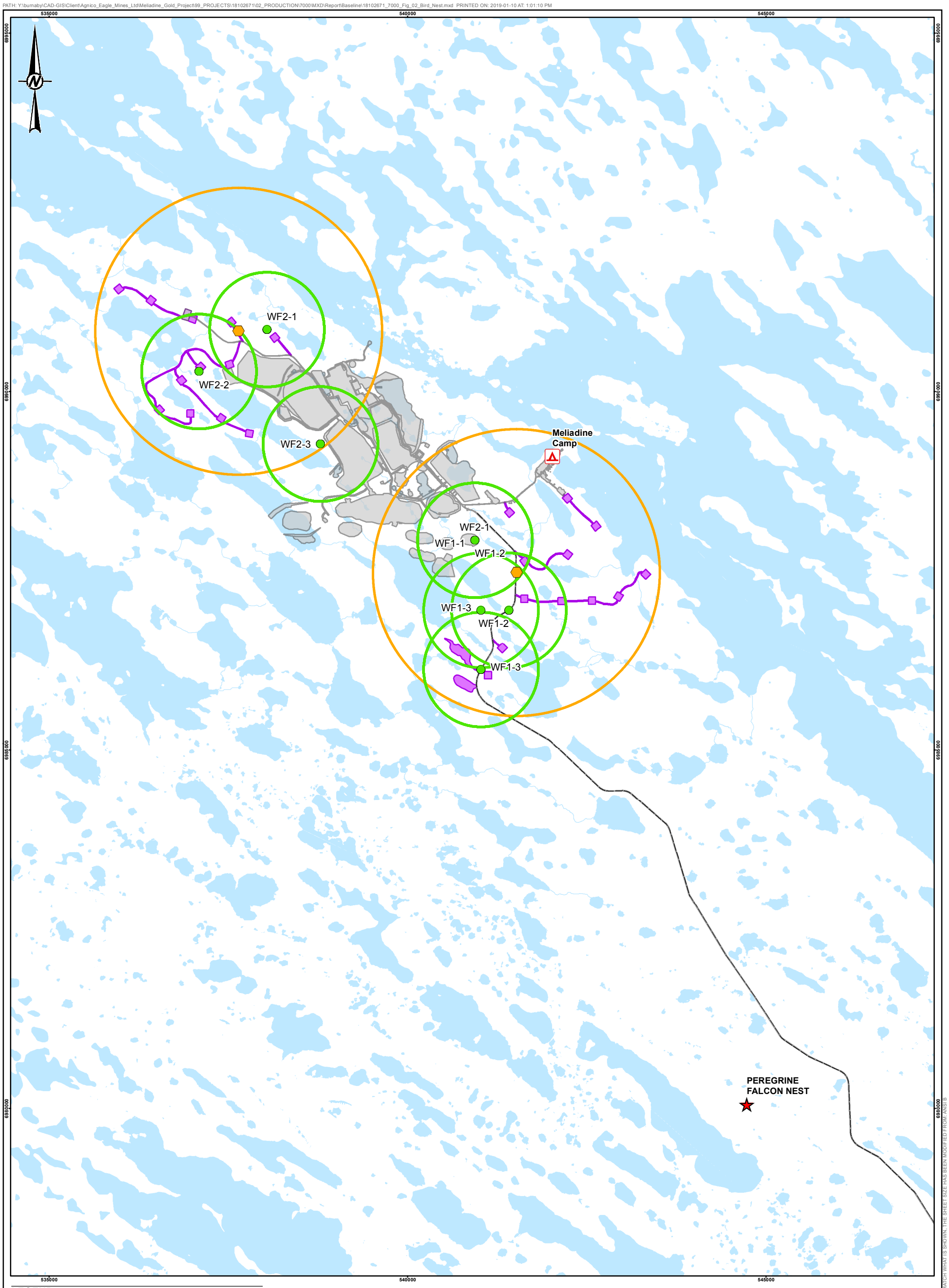
YYYY-MM-DD	2019-01-10
DESIGNED	KB
PREPARED	MH
REVIEWED	KB
APPROVED	CD

PROJECT
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
VEGETATION

PROJECT NO.	CONTROL	REV.	FIGURE
18102671	7000	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B
25mm
0



LEGEND

- PEREGRINE FALCON NEST
- FUTURE MELIADINE WIND FARM
- AVIAN USE STUDY (AUS) SURVEY LOCATION
- WINDFARM AREA (2 km RADIUS)
- AVIAN USE STUDY (AUS) SURVEY LOCATION (800 m RADIUS)
- FOOTPRINT
- WINDFARM FOOTPRINT
- ALL-WEATHER ACCESS ROAD (AWAR)
- WATERCOURSE
- WATERBODY

0 1 2

1:50,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED AND NATURAL RESOURCES CANADA.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED

PROJECT
MELIADINE GOLD PROJECT
NUNAVUT

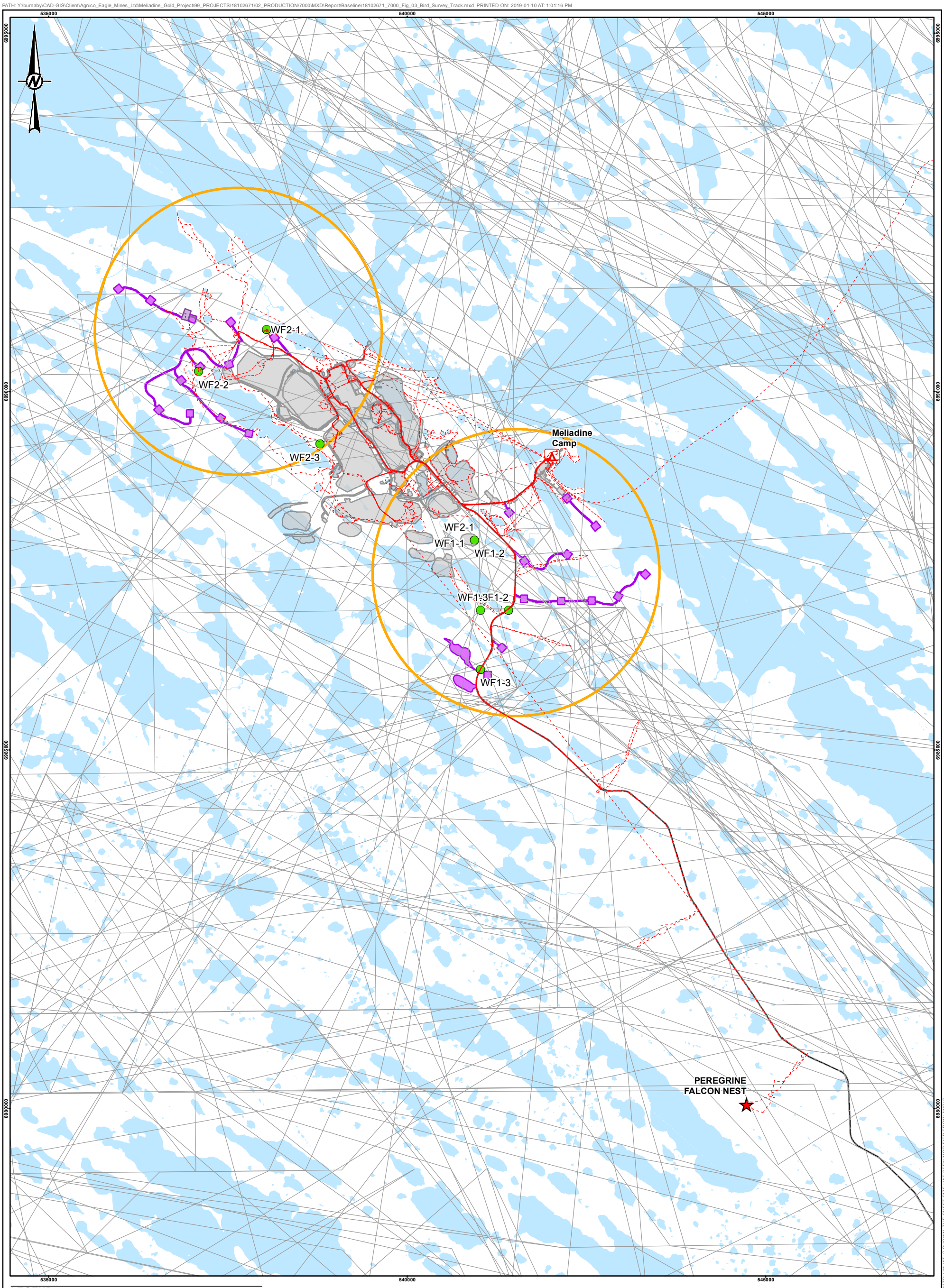
CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-10
DESIGNED	KB
PREPARED	MH
REVIEWED	KB
APPROVED	CD

TITLE
BIRD SURVEYED

PROJECT NO.	CONTROL	REV.	FIGURE
18102671	7000	0	2

PATH: Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\18102671\02_PRODUCTION\7000\MXD\Report\Baseline\18102671_7000_Fig_03_Bird_Survey_Track.mxd PRINTED ON: 2019-01-10 AT: 1:01:16 PM



LEGEND

- PEREGRINE FALCON NEST
- AVIAN USE STUDY (AUS) SURVEY LOCATION
- WILDLIFE TRACK
- CARIBOU PATH
- WINDFARM AREA (2 km RADIUS)
- FOOTPRINT
- WINDFARM FOOTPRINT
- WATERBODY
- WATERCOURSE
- ALL-WEATHER ACCESS ROAD (AWAR)

0 1 2

1:50,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED AND NATURAL RESOURCES CANADA.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED

PROJECT
MELIADINE GOLD PROJECT
NUNAVUT

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-10
DESIGNED	KB
PREPARED	MH
REVIEWED	KB
APPROVED	CD

TITLE
BIRD SURVEYED TRACK

PROJECT NO.	CONTROL	REV.	FIGURE
18102671	7000	0	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

APPENDIX B

Tables

Table 1: Total Area and Percent Cover of Plant Community Types within Local Study Area

Plant Community Type	Plant Community Type Description	Total Area of LSA (ha)	Total Percent of LSA (%)
Heath			
Lichen-Rock Community	characterized by crustose lichens growing on the boulders or rocks that predominate on eskers or rocky plateaus	233	2
Lichen-Heath (*Cetraria* Lichen)	occurs on lower slope positions, often below the lichen-health – hair lichen community, on more rapidly drained sandy substrates	565	5
Lichen-Heath (Hair Lichen)	occurs almost exclusively on the higher ridges of slopes and on drumlin and esker crests, where the ground cover consists of a high percentage of black and green hair lichens	601	5
Heath Tundra Community	occurs on uplands and slopes of most ridges characterized by gently rolling to undulating terrain with rapidly to well-drained soils	4,274	39
	Heath subtotal	*5,672*	*52*
Wetland/Riparian			
Birch Seep	occurs on imperfectly poor to poorly drained soils such as the edges of solifluction lobes, on the slopes of some eskers, in stream valleys and along transitions to some sedge associations	307	3
Sedge Community	occurs adjacent to lakes and streams on very poorly drained soils and in low-lying areas	2,472	22
Riparian Willow or Birch	typically occurs along the banks of stream courses; characterized by imperfectly drained, nutrient enriched soils	12	<1
	Wetland/Riparian subtotal	2,791	25
Un-vegetated			
Disturbed	cleared areas and access roads associated with the Project as well as various natural disturbance features	<1	<0.01
Unvegetated (Sand)	associated with steep sandy slopes and the margins of rivers and lakes; limited to no vegetation cover	182	2
Water	associated with waterbodies and watercourses	2,356	21
	un-vegetated subtotal	2,537	23
	Total	**11,001**	**100**

(a) Desktop and field verified wetlands were classified following the Canadian Wetland Classification System (National Wetlands Working Group 1997)

Table 2: Species and Species Groups Observed during the Avian Use Surveys

Species[(a)]	Individuals			Flocks		
	North	South	Total	North	South	Total
Grouse and Allies	**1**	**0**	**1**	**1**	**0**	**1**
willow ptarmigan	1	0	1	1	0	1
Gulls, Terns and Allies	**3**	**16**	**20**	**3**	**11**	**14**
herring gull	1	5	6	1	4	5
unidentified gull	2	11	13	2	7	9
Passerines	**30**	**20**	**50**	**24**	**16**	**40**
American pipit	6	1	7	5	1	6
common raven	2	1	3	2	1	3
common redpoll	5	4	9	4	3	7
horned lark	6	7	13	5	6	11
Lapland longspur	7	7	14	5	5	10
savannah sparrow	4	0	4	3	0	3
Raptors	**1**	**0**	**1**	**1**	**0**	**1**
rough-legged hawk	1	0	1	1	0	1
Waterbirds	**12**	**8**	**20**	**5**	**4**	**9**
Pacific loon	1	0	1	1	0	1
sandhill crane	11	8	19	4	4	8
Waterfowl	**186**	**141**	**327**	**18**	**26**	**44**
cackling goose	0	16	16	0	4	4
Canada goose	102	121	223	10	19	29
greater white-fronted goose	0	2	2	0	1	1
long-tailed duck	2	0	2	1	0	1
northern pintail	2	2	4	2	2	4
red-breasted merganser	2	0	2	1	0	1
snow goose	16	0	16	1	0	1
tundra swan	2	0	2	2	0	2
unidentified goose	60	0	60	1	0	1
Totals:	**233**	**185**	**418**	**52**	**57**	**109**

Table 3: Mean Flight Height of Flying Birds Observed During Avian Use Surveys

Common Name	Mean Flight Height (m)		
	South Windfarm	North Windfarm	Combined
American pipit	-	5.75	5.75
cackling goose	3.25	-	3.25
Canada goose	14.33	23.58	18.49
common raven	22	7.5	12.33
common redpoll	10	15.6	14.00
greater white-fronted goose	3	-	3.00
herring gull	6.5	4	6.08
horned lark	1	1.67	1.31
Lapland longspur	2.83	6.07	4.58
long-tailed duck	-	1	1.00
northern pintail	18.5	4.75	11.63
Pacific loon	-	12.5	12.50
red-breasted merganser	-	20	20.00
rough-legged hawk	-	35	35.00
sandhill crane	5.875	3.91	4.74
savannah sparrow	-	1	1.00
snow goose	-	7	7.00
tundra swan	-	8	8.00
unidentified goose	-	30	30.00
unidentified gull	9.68	7.5	9.35
willow ptarmigan	-	1	1.00
Totals:	**8.82**	**10.31**	**10.00**