Hamlet of Tuktoyaktuk, Town of Inuvik
Government of Northwest Territories

ISSUED FOR USE

RESPONSE TO THE MARCH 8, 2012 INFORMATION REQUESTS (ROUND 2 – #114 AND #117) FROM THE ENVIRONMENTAL IMPACT REVIEW BOARD FOR CONSTRUCTION OF THE INUVIK TO TUKTOYAKTUK HIGHWAY, NWT

EIRB FILE NO. 02/10-05

April 27, 2012

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ACRONYMS

CEAA	Canadian Environmental Assessment Act
CSA	Canadian Standards Association
DFO	Department of Fisheries and Oceans
DOT	Department of Transportation (GNWT)
EIRB	Environmental Impact Review Board
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
ENR	Environment and Natural Resources
GNWT	Government of the Northwest Territories
GTC	Gwich'in Tribal Council
HTC	Hunters and Trappers Committee
IFA	Inuvialuit Final Agreement, as Amended April 2005
IR	Information Request
ILA	Inuvialuit Land Administration
ISR	Inuvialuit Settlement Region
LSA	Local Study Area
NWT	Northwest Territories
OS	Operational Statements
PDR	Project Description Report
RSA	Regional Study Area
TAC	Transportation Association of Canada
VEC	Valued Ecological Component
VSC	Value Socio-economic Component
ZOI	Zone of Influence

1.0 Introduction

The Developers of the proposed Inuvik to Tuktoyaktuk Highway are pleased to provide the two remaining responses to the Environmental Impact Review Board's second round of Information Requests (IRs) dated March 8, 2012. The Developers' responses are included after each information request and are organized into the following sections:

Section 5.0 (IR 114 and117) – Environment Canada

Please note that new tables or figures, created for the most recent information requests, have been numbered according to their respective IR Number. Any tables or figures from the EIS or previous response documents have retained their original number.

2.0 Environment Canada

IR Number: 114

Source: **Environment Canada**
To: **GNWT Department of Transportation, Town of Inuvik, Hamlet of Tuktoyaktuk**
Subject: **Cumulative effects assessment for species at risk**

Preamble

Section 10.1.5 of the Terms of Reference (TOR) for the EIS stipulates that all direct, indirect and cumulative effects should be considered for species at risk listed on Schedule 1 of SARA and those designated at risk by COSEWIC. Section 11 of the TOR directs the Developer to identify and assess the cumulative environmental and socio-economic effects of the project in combination with other past, present or reasonably foreseeable projects and/or activities within the Study Area(s). Specifically, the Developer is required to identify the sources of potential cumulative effects and to specify other projects or activities that have been or will be carried out that could produce effects on each selected VEC or VSC within the boundaries defined, and whose effects would act in combination with the residual effects of the project.

The Developer has identified an area extending from the westerly shores of the Husky Lakes to the eastern side of the Mackenzie River as the spatial boundary for their cumulative effects assessment (Response to EIRB IR 49). Potential future projects/activities that are considered in the cumulative effects assessment include the Mackenzie Gas Project, the Parsons Lake gas field, associated infrastructure and gathering pipeline, the Tuktoyaktuk Harbour Project and Husky Lakes Development.

As highlighted by the EIRB in their Information Request #48 to the Developer, the cumulative effects assessment is very qualitative in nature, and currently does not provide a quantitative assessment of the potential cumulative direct and indirect impacts of these potential future projects/activities. This includes the assessment for cumulative effects on species at risk.

Under paragraph 16(1)(a) of CEAA, every environmental assessment must consider "*the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out*" (Environment Canada and Parks Canada, 2010, pg. 39).

Since the definition of "environmental effect" includes any change a project may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, it is important that cumulative environmental effects on listed wildlife species are considered in the environmental assessment process (Environment Canada and Parks Canada, 2010, pg. 39).

SARA establishes no explicit obligations to address cumulative environmental effects on listed wildlife species. However, many listed wildlife species are at risk precisely because of cumulative environmental effects that have occurred in the past, such as gradual loss of habitat (Environment Canada and Parks Canada, 2010, pg. 39).

Thus, it is implicitly important in the cumulative environmental effects analysis that environmental assessments always consider the potential for cumulative environmental effects on listed wildlife species, the residences of their individuals and their critical habitat, in the context of the combined past threats the species have faced, as well as any additional present or future threats that can reasonably be expected to occur (Environment Canada and Parks Canada, 2010, pg. 39).

The following species at risk were identified as potentially occurring within the Regional Study Area:

Terrestrial Species at Risk	COSEWIC Designation	Schedule of SARA	Government Organization with Lead Management Responsibility[1]
Horned Grebe (Western population)	Special Concern	Pending	EC
Eskimo Curlew[2]	Endangered	Schedule 1	EC
Rusty Blackbird	Special Concern	Schedule 1	GNWT
Peregrine Falcon (*anatum-tundrius* complex[3])	Special Concern	Schedule 1 - Threatened (*anatum*)	GNWT
Short-eared Owl	Special Concern	Schedule 3	GNWT
Woodland Caribou (Boreal population)	Threatened	Schedule 1	GNWT
Grizzly Bear	Special Concern	Pending	GNWT
Polar Bear	Special Concern	Schedule 1	GNWT
Wolverine (Western population)	Special Concern	Pending	GNWT

1 Environment Canada (EC) has a national role to play in the conservation and recovery of Species at Risk in Canada, as well as responsibility for management of birds described in the *Migratory Birds Convention Act* (MBCA). Day-to-day management of terrestrial species not covered in the MBCA is the responsibility of the Territorial Government. Populations that exist in National Parks are also managed under the authority of the Parks Canada Agency.

2 Eskimo Curlew could potentially occur within the project area. However, there have been no reliable sightings of Eskimo Curlew since 1998 and the National Recovery Team for this species has determined that recovery is not feasible at this time. It is EC's view that, in light of its current status, there is no need for further action with respect to Eskimo Curlew. An appropriate mitigation and monitoring plan will be developed with the Proponent if it is established that this species does occur in the area.

3 The *anatum* subspecies of Peregrine Falcon is listed on Schedule 1 of SARA as threatened. The *anatum* and *tundrius* subspecies of Peregrine Falcon were reassessed by COSEWIC in 2007 and combined into one subpopulation complex. This subpopulation complex was listed by COSEWIC as Special Concern.

The Developer's cumulative effects assessment is currently inadequate to satisfy the requirements of CEAA subsections 16(1)(a), particularly with respect to species at risk.

A precautionary approach to predicting cumulative effects suggests that it would be conservative to assume that the Mackenzie Gas Project will proceed and that the associated Parsons Lake Gas Field and associated infrastructure and gathering lines will be built. Given that the MGP has already undergone an in-depth review, information is available on the area and location of the direct footprint of the Parsons Lake facilities and gathering pipelines as well as the projected zone of influence due to sensory disturbance from these features. It should therefore be possible to provide a quantitative estimate of the cumulative area of habitat for each species at risk within the spatial boundaries selected for the cumulative effects assessment that will be directly or indirectly affected by infrastructure proposed for the MGP, in combination with the proposed HWY and other existing development.

The Developer has also identified a number of programs to collect further baseline data during the summer and fall of 2012 (summarized in response to EIRB IR#15) that may help to improve the prediction, mitigation and monitoring of cumulative effects to species at risk. It is currently unclear how this information will be integrated into the environmental assessment given the proposed review timeline, or how it will be integrated into refining the design of the project or in refining mitigative measures, and whether regulators will have the opportunity to review and comment on the information collected prior to the board issuing its decision on the project.

Reference

Environment Canada and Parks Canada, 2010, "Addressing Species at Risk Considerations under the Canadian Environmental Assessment Act for Species Under the Responsibility of the Minister Responsible for Environment Canada and Parks Canada". Available at: www.ec.gc.ca/nature/default.asp?lang=En&n=132ADBFC-1&parent=0C1743A2-4D49-4183-AC5F-1DE909D2FEB1

Request

For the Developer to provide:

1. A quantitative summary of the direct footprints and indirect effects on habitat quality due to sensory disturbance (e.g. dust, noise, light) of existing and foreseeable projects within the spatial boundaries selected for the cumulative effects assessment. The projected footprints should be broken down by habitat type and expressed as a total proportion of each habitat type available in the cumulative effects assessment study area.
2. An assessment of the potential impact of cumulative direct habitat loss and indirect changes in habitat quality due to sensory disturbance for each species at risk likely to occur in the cumulative effects study area, using knowledge of current distribution and habitat associations of each species at risk to inform the impact assessment.
3. Where current data is insufficient to provide an adequate assessment of the potential impact on each species at risk, provide an outline of how future baseline data collection programs will address these deficiencies, how the information obtained will be shared with the EIRB, regulators and other interested parties, and how it will be used to refine mitigation and monitoring plans.

Developer Response: 114.1

The Developer has prepared the following figures and calculations for the direct footprint and indirect effects on habitat based on a revised cumulative effects study area. This study area now follows the east side of the Mackenzie River and coast along Kittigazuit Bay to the Hamlet of Tuktoyaktuk. As the extent of effects on different species is different, the Developer has calculated the direct footprint of the Highway and future MGP project in the area as well as buffers at the following distances: 100 m, 500 m, 1 km and 5 km. Other Project calculations for a 15 km buffer can be found in the EIS (see Table 3.1.8-4). This buffer distance is less relevant to indirect effects and is not re-analysed in this response.

As discussed on page 189 of the EIS, the spatial distribution of vegetation types within the Inuvik to Tuktoyaktuk Highway study area draws from broad ecological mapping of the area by the Earth

Observation for Sustainable Development of Forests (EOSD) initiative of the Canadian Forest Service (Wulder et al. 2004). The EOSD uses a 25 m cell size (see Figure 3.1.8-3 of the EIS).

The GNWT was provided access to shapefiles submitted by the Mackenzie Gas Project (MGP) Proponents in 2006. However, the Developer notes the MGP Proponents had not completed their detailed engineering design nor had they completed their selection of borrow sources. The MGP Proponents provided a 50 m wide corridor within a 1 km wide study area. However, the Proponents had not selected their centre for the gathering system nor made final determinations for the Parsons Lake development. As a result, the direct habitat impact calculations are based on the footprint shape files and do not represent the actual footprint. Furthermore, the timing of construction of the MGP is not known. At this time, the MGP Proponents are scheduled to make a decision to construct in December 2013. The current schedule for construction of Parsons Lake North and the Gathering System is between 2015 to 2018. Based on this schedule and the potential Inuvik to Tuktoyaktuk construction schedule, it is highly likely that the Parsons Lake development approach could be modified to take advantage of the all season road. The Parsons Lake anchor field is expected to last 25 to 30 years after the start of production. On the current schedule it would be reclaimed by 2043 or 2048.

This response applied the EOSD to develop the following tables. This will not be directly comparable to the vegetation calculations provided by the MGP Proponents as they prepared a vegetation map using Landsat imagery and their own plant community classification. The Inuvialuit Settlement Region Vegetation Map was requested from the Proponents in 2010 and again in early 2011 but this map was not available to the Developer. Although the EIS provided a table comparing the two vegetation classifications, only the EOSD is used for this response. The future vegetation map of the Developer will be used for fine scale habitat calculations (i.e., 1 km LSA corridor) in the summer of 2012.

The following figures and tables illustrate and quantify the disturbance footprints and buffer areas. Anthropogenic disturbances include: Alternative 1 and Alternative 3 of the Inuvik to Tuktoyaktuk Highway; Mackenzie Gas Project, Ikhil Gas Pipeline, Navy Road and Tuktoyaktuk to Source 177 Access Road. The revised northern range of the boreal caribou is also shown (see Developer Response #117.1).

It is important to note that:

- each table also contains the Cumulative Effects Area, broken down by habitat type;
- each element has been broken down by habitat type and expressed as a total proportion of each habitat type available in the Cumulative Effects Area; and
- the footprint elements provided on each table, as well as the additional buffers, may overlap and as such, their areas should not be summed together.

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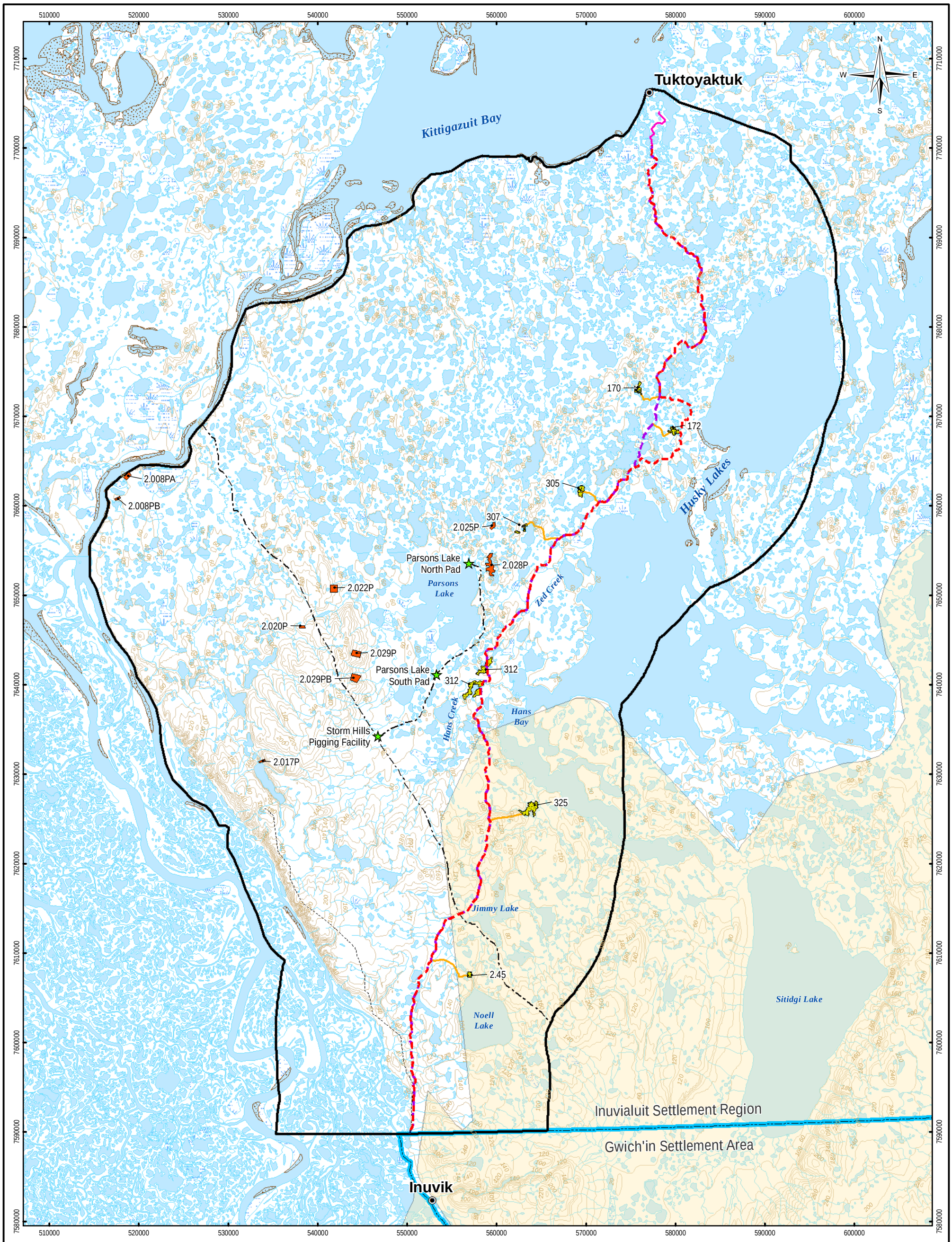

LEGEND

- Alternative 1 (2009 Minor Realignment)
- Alternative 3 (2010 Minor Realignment)
- ITH Borrow Source Access Road
- ITH Borrow Source
- MGP Infrastructure Location
- Mackenzie Gas Pipeline
- MGP Borrow Source
- IKHIL Gas Pipeline
- Navy Road
- Tuk to 177 Access Road
- Cumulative Effects Study Area
- Boreal Caribou Northern Range
- Gwich'in / Inuvialuit Boundary
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. Base data source: NTS 1:250,000
2. ITH Borrow Sources, ITH Borrow Source Access Roads, Mackenzie Gas Pipeline and MGP Borrow Sources provided by GNWT (2012).
3. MGP Infrastructure location and size estimated from the MGP EIS (2004).
4. Boreal Caribou Northern Range: NWT Species at Risk Committee Draft. March 2012.

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PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Disturbance Footprints in the Cumulative Effects Study Area

PROJECTION: UTM Zone 8	DATUM: NAD83
Scale: 1:400,000 (5 2.5 0 5 10 Kilometres)	
FILE NO.: V23201322_IR2_Map007_Disturbance.mxd	
PROJECT NO.: V23201322	DWN: SL / CKD: TS / REV: 0
OFFICE: EBA-VANC	DATE: April 23, 2012

Figure 1

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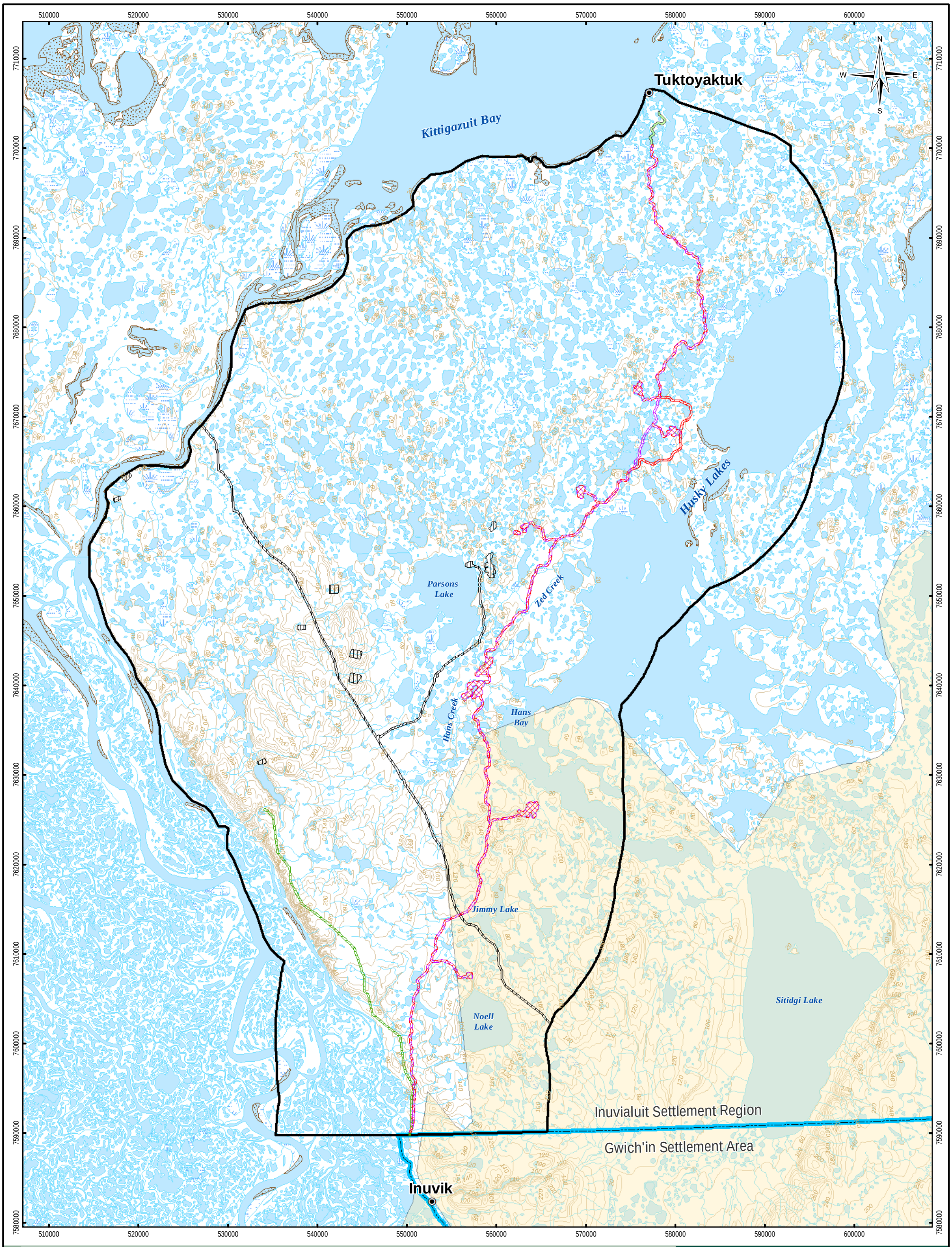

LEGEND

- 100 m Disturbance Buffer
- Alternative 1
- Alternative 3
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Navy Road
- Tuk to 177 Access Road
- Cumulative Effects Study Area
- Boreal Caribou Northern Range
- Gwich'in / Inuvialuit Boundary
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. Base data source: NTS 1:250,000
2. Mackenzie Gas Project buffer includes the pipeline, MGP infrastructure and MGP borrow sources.
3. Alternative 1 and 3 buffers include the respective alignment, the ITH borrow sources and the ITH borrow source access roads.
4. Some buffer areas overlap, as noted by the cross-hatching.
5. Disturbance buffers are 100 m on either side of the respective project footprint.
6. Boreal Caribou Northern Range: NWT Species at Risk Committee Draft. March 2012.

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

100 m Disturbance Buffers in the Cumulative Effects Study Area

PROJECTION: UTM Zone 8	DATUM: NAD83		
Scale: 1:400,000 (5 2.5 0 5 10 Kilometres)			
FILE NO.: V23201322_IR2_Map008_Disturb100m.mxd			
PROJECT NO.: V23201322	DWN: SL	CKD: TS	REV: 0
OFFICE: EBA-VANC	DATE: April 23, 2012		

Town of Inuvik
Northwest Territories
KIGGIAK - EBA

Figure 2

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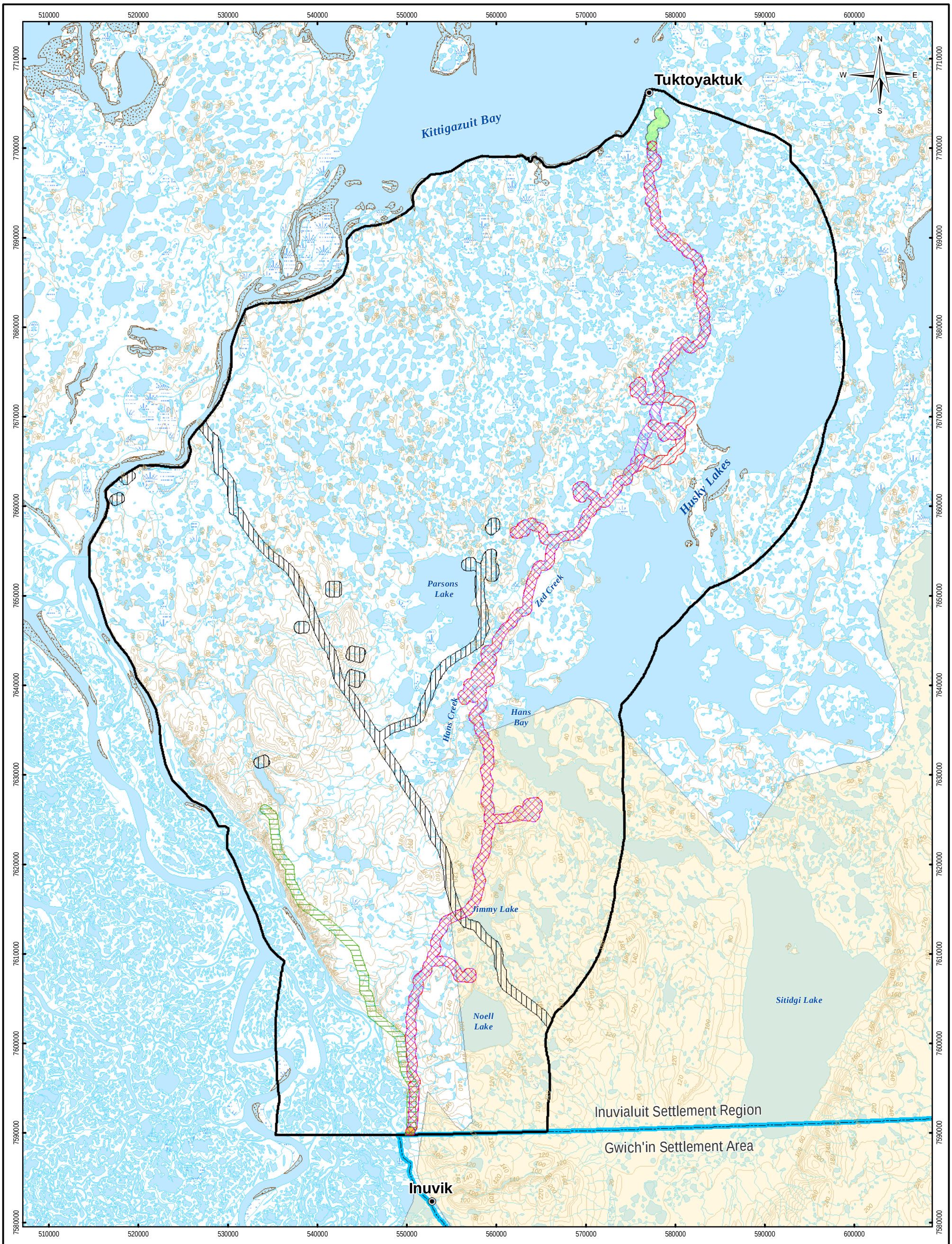

LEGEND

- 500 m Disturbance Buffer
- Alternative 1
- Alternative 3
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Navy Road
- Tuk to 177 Access Road
- Cumulative Effects Study Area
- Boreal Caribou Northern Range
- Gwich'in / Inuvialuit Boundary
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. Base data source: NTS 1:250,000
2. Mackenzie Gas Project buffer includes the pipeline, MGP infrastructure and MGP borrow sources.
3. Alternative 1 and 3 buffers include the respective alignment, the ITH borrow sources and the ITH borrow source access roads.
4. Some buffer areas overlap, as noted by the cross-hatching.
5. Disturbance buffers are 500 m on either side of the respective project footprint.
6. Boreal Caribou Northern Range: NWT Species at Risk Committee Draft. March 2012.

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PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

500 m Disturbance Buffers in the Cumulative Effects Study Area

PROJECTION: UTM Zone 8	DATUM: NAD83		
Scale: 1:400,000 (5 2.5 0 5 10 Kilometres)			
FILE NO.: V23201322_IR2_Map009_Disturb500m.mxd			
PROJECT NO.: V23201322	DWN: SL	CKD: TS	REV: 0
OFFICE: EBA-VANC	DATE: April 23, 2012		

Town of Inuvik
Northwest Territories
KIGGIAK - EBA

Figure 3

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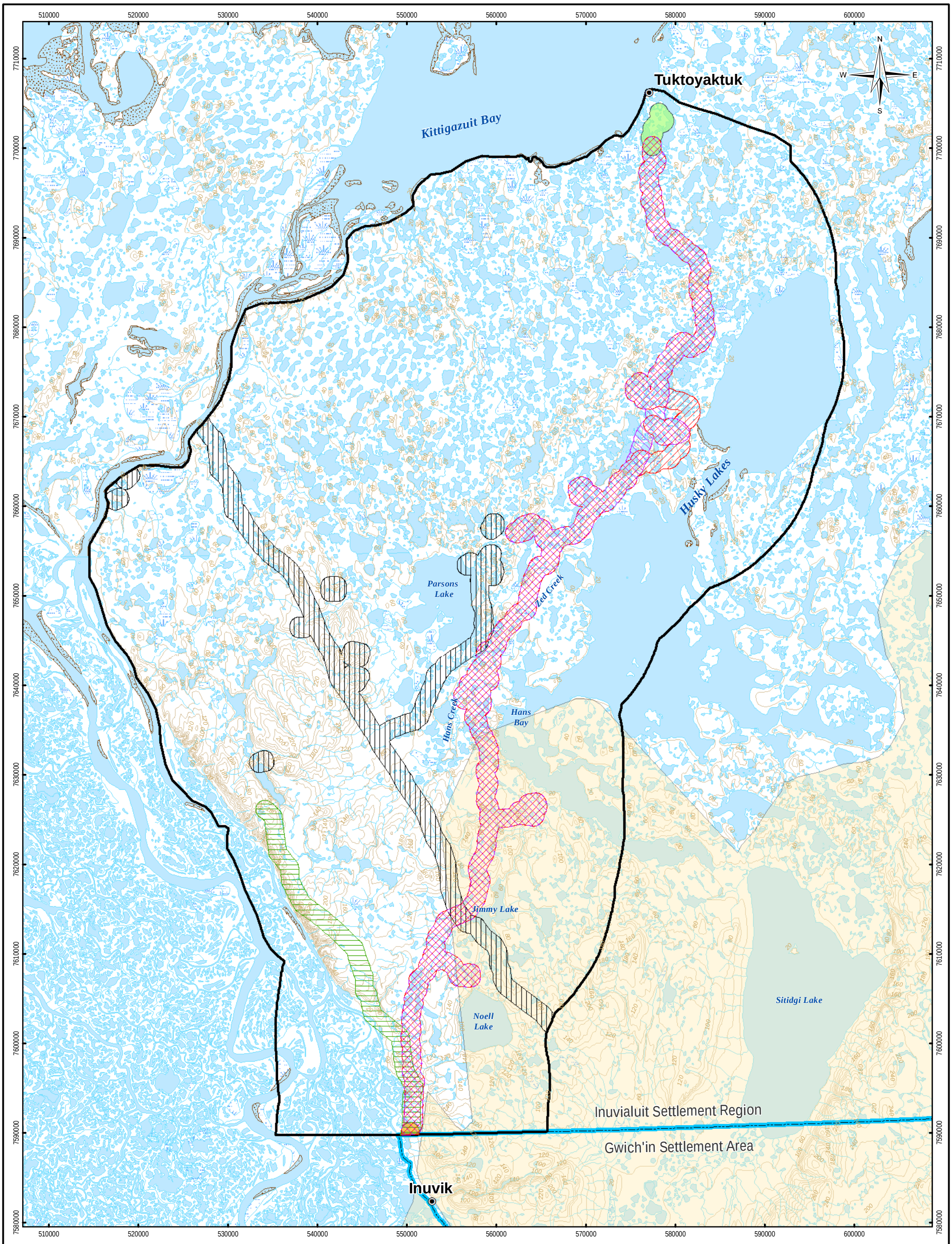

LEGEND

1 km Disturbance Buffer
- Alternative 1
- Alternative 3
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Navy Road
- Tuk to 177 Access Road

- Cumulative Effects Study Area
- Boreal Caribou Northern Range
- Gwich'in / Inuvialuit Boundary

- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. Base data source: NTS 1:250,000
2. Mackenzie Gas Project buffer includes the pipeline, MGP infrastructure and MGP borrow sources.
3. Alternative 1 and 3 buffers include the respective alignment, the ITH borrow sources and the ITH borrow source access roads.
4. Some buffer areas overlap, as noted by the cross-hatching.
5. Disturbance buffers are 1 km on either side of the respective project footprint.
6. Boreal Caribou Northern Range: NWT Species at Risk Committee Draft. March 2012.

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PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

1 km Disturbance Buffers in the Cumulative Effects Study Area

PROJECTION: UTM Zone 8	DATUM: NAD83
Scale: 1:400,000	5 2.5 0 5 10 Kilometres
FILE NO.: V23201322_IR2_Map010_Disturb1km.mxd	
PROJECT NO.: V23201322	DWN: SL / CKD: TS / REV: 0
OFFICE: EBA-VANC	DATE: April 23, 2012

Figure 4

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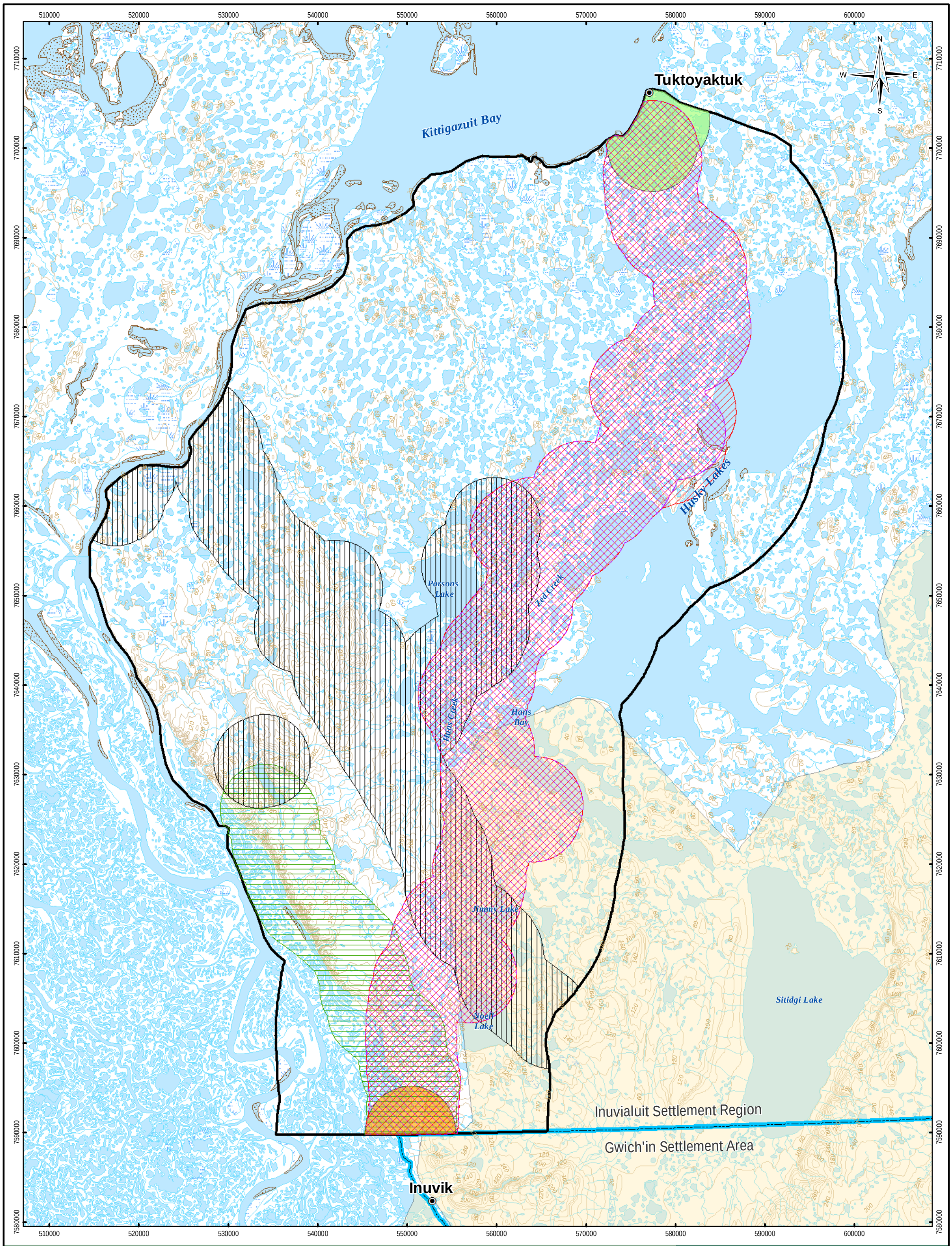

LEGEND

5 km Disturbance Buffer
- Alternative 1
- Alternative 3
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Navy Road
- Tuk to 177 Access Road

- Cumulative Effects Study Area
- Boreal Caribou Northern Range
- Gwich'in / Inuvialuit Boundary

- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. Base data source: NTS 1:250,000
2. Mackenzie Gas Project buffer includes the pipeline, MGP infrastructure and MGP borrow sources.
3. Alternative 1 and 3 buffers include the respective alignment, the ITH borrow sources and the ITH borrow source access roads.
4. Some buffer areas overlap, as noted by the cross-hatching.
5. Disturbance buffers are 5 km on either side of the respective project footprint.
6. Boreal Caribou Northern Range: NWT Species at Risk Committee Draft. March 2012.

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PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

5 km Disturbance Buffers in the Cumulative Effects Study Area

PROJECTION: UTM Zone 8	DATUM: NAD83
Scale: 1:400,000	
5 2.5 0 5 10 Kilometres	
FILE NO.: V23201322_IR2_Map011_Disturb5km.mxd	
PROJECT NO.: V23201322	DWN: SL / CKD: TS / REV: 0
OFFICE: EBA-VANC	DATE: April 23, 2012

Figure 5

TABLE 1: ALTERNATIVE 1 FOOTPRINT

	Alternative 1 (28 m)		Borrow Sources		Borrow Source Access Roads (28 m)		Total Alternative 1 Footprint		Cumulative Effects Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	24.13	0.31	0.00	0.00	0.00	0.00	24.13	0.31	7,839.53	1.34
Broadleaf Open	5.33	0.20	0.31	0.01	0.31	0.01	5.95	0.23	2,636.80	0.45
Bryoids	132.40	0.11	201.63	0.17	17.30	0.01	349.91	0.29	121,865.61	20.76
Not Classified	0.06	0.00	0.00	0.00	0.00	0.00	0.06	0.00	4,480.70	0.76
Coniferous Dense	0.48	0.01	2.46	0.04	0.28	0.01	3.22	0.06	5,524.19	0.94
Coniferous Open	2.82	0.03	16.73	0.20	0.80	0.01	20.05	0.24	8,398.39	1.43
Coniferous Sparse	15.97	0.06	9.16	0.03	4.51	0.02	29.57	0.11	27,816.67	4.74
Exposed/Barren Land	19.72	0.08	9.50	0.04	2.12	0.01	31.24	0.13	24,530.40	4.18
Herbs	8.46	0.07	33.29	0.28	1.61	0.01	43.26	0.36	11,948.96	2.04
Mixedwood Dense	11.90	0.10	1.19	0.01	2.57	0.02	15.66	0.13	11,683.16	1.99
Mixedwood Open	0.78	0.04	2.66	0.15	0.01	0.00	3.41	0.20	1,734.62	0.30
Rock/Rubble	3.23	0.10	6.23	0.19	1.29	0.04	10.75	0.34	3,208.02	0.55
Shrub Low	120.14	0.13	227.21	0.25	23.38	0.03	368.51	0.41	90,253.20	15.38
Shrub Tall	36.58	0.09	150.98	0.36	6.81	0.02	192.21	0.45	42,520.72	7.24
Water	0.42	0.00	1.84	0.00	0.00	0.00	2.27	0.00	183,237.79	31.22
Wetland-Herb	3.76	0.02	8.06	0.04	0.08	0.00	11.90	0.06	20,174.71	3.44
Wetland-Shrub	10.83	0.07	7.60	0.05	0.23	0.00	18.48	0.12	15,005.99	2.56
Wetland-Treed	0.23	0.01	1.14	0.03	0.00	0.00	1.37	0.03	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00
Total	**397.23**	**0.07**	**679.99**	**0.12**	**61.29**	**0.01**	**1,131.93**	**0.19**	**587,002.91**	**100.00**

*Alternative 1 and Borrow Source Access Roads were assigned a 28 m width

*Borrow Sources included were the 7 provided by Kavik-Stantec (via GNWT)

TABLE 2: ALTERNATIVE 1 ADDITIONAL BUFFERS

	100 m Buffer		500 m Buffer		1 km Buffer		5 km Buffer		Cumulative Effects Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	183.00	2.33	637.68	8.13	1,247.68	15.92	5,026.74	64.12	7,839.53	1.34
Broadleaf Open	47.58	1.80	197.38	7.49	377.91	14.33	1,341.98	50.89	2,636.80	0.45
Bryoids	1,420.20	1.17	4,780.59	3.92	8,615.07	7.07	30,464.49	25.00	121,865.61	20.76
Not Classified	3.18	0.07	69.81	1.56	174.41	3.89	978.69	21.84	4,480.70	0.76
Coniferous Dense	20.77	0.38	90.51	1.64	188.46	3.41	1,055.07	19.10	5,524.19	0.94
Coniferous Open	74.74	0.89	259.32	3.09	467.35	5.56	1,666.42	19.84	8,398.39	1.43
Coniferous Sparse	193.36	0.70	832.05	2.99	1,548.45	5.57	7,170.55	25.78	27,816.67	4.74
Exposed/Barren Land	210.14	0.86	860.53	3.51	1,558.38	6.35	7,432.44	30.30	24,530.40	4.18
Herbs	152.86	1.28	544.88	4.56	987.75	8.27	3,222.05	26.97	11,948.96	2.04
Mixedwood Dense	129.88	1.11	514.22	4.40	982.40	8.41	3,999.52	34.23	11,683.16	1.99
Mixedwood Open	9.86	0.57	31.92	1.84	57.01	3.29	247.00	14.24	1,734.62	0.30
Rock/Rubble	40.73	1.27	149.79	4.67	255.00	7.95	725.33	22.61	3,208.02	0.55
Shrub Low	1,364.01	1.51	4,251.43	4.71	7,618.60	8.44	26,243.80	29.08	90,253.20	15.38
Shrub Tall	583.92	1.37	1,760.33	4.14	3,101.47	7.29	10,430.38	24.53	42,520.72	7.24
Water	142.94	0.08	2,749.41	1.50	6,268.42	3.42	44,666.66	24.38	183,237.79	31.22
Wetland-Herb	111.68	0.55	623.18	3.09	1,174.23	5.82	4,737.78	23.48	20,174.71	3.44
Wetland-Shrub	134.18	0.89	585.34	3.90	1,080.43	7.20	4,154.28	27.68	15,005.99	2.56
Wetland-Treed	18.28	0.44	108.33	2.61	183.91	4.44	699.32	16.88	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.00	0.00	0.94	100.00	0.94	0.00
Total	**4,841.33**	**0.82**	**19,046.70**	**3.24**	**35,886.95**	**6.11**	**154,263.44**	**26.28**	**587,002.91**	**100.00**

*all buffers were calculated from either side of the highway footprint and the areas given include those of the footprint

TABLE 3: ALTERNATIVE 3 FOOTPRINT

	Alternative 3 (28 m)		Borrow Sources		Borrow Source Access Roads (28 m)		Total Alternative 3 Footprint		Cumulative Effects Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	24.13	0.31	0.00	0.00	0.00	0.00	24.13	0.31	7,839.53	1.34
Broadleaf Open	5.33	0.20	0.31	0.01	0.31	0.01	5.95	0.23	2,636.80	0.45
Bryoids	119.34	0.10	201.63	0.17	17.30	0.01	336.85	0.28	121,865.61	20.76
Not Classified	0.06	0.00	0.00	0.00	0.00	0.00	0.06	0.00	4,480.70	0.76
Coniferous Dense	0.48	0.01	2.46	0.04	0.28	0.01	3.22	0.06	5,524.19	0.94
Coniferous Open	2.82	0.03	16.73	0.20	0.80	0.01	20.05	0.24	8,398.39	1.43
Coniferous Sparse	15.54	0.06	9.16	0.03	4.51	0.02	29.14	0.10	27,816.67	4.74
Exposed/Barren Land	18.45	0.08	9.50	0.04	2.12	0.01	29.97	0.12	24,530.40	4.18
Herbs	9.39	0.08	33.29	0.28	1.61	0.01	44.16	0.37	11,948.96	2.04
Mixedwood Dense	11.90	0.10	1.19	0.01	2.57	0.02	15.66	0.13	11,683.16	1.99
Mixedwood Open	0.78	0.04	2.66	0.15	0.01	0.00	3.41	0.20	1,734.62	0.30
Rock/Rubble	3.23	0.10	6.23	0.19	1.29	0.04	10.75	0.34	3,208.02	0.55
Shrub Low	117.18	0.13	227.21	0.25	23.38	0.03	365.48	0.40	90,253.20	15.38
Shrub Tall	36.46	0.09	150.98	0.36	6.81	0.02	192.04	0.45	42,520.72	7.24
Water	0.25	0.00	1.84	0.00	0.00	0.00	2.09	0.00	183,237.79	31.22
Wetland-Herb	3.50	0.02	8.06	0.04	0.08	0.00	11.64	0.06	20,174.71	3.44
Wetland-Shrub	9.70	0.06	7.60	0.05	0.23	0.00	17.35	0.12	15,005.99	2.56
Wetland-Treed	0.20	0.00	1.14	0.03	0.00	0.00	1.34	0.03	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00
Total	**378.73**	**0.06**	**679.99**	**0.12**	**61.29**	**0.01**	**1,113.28**	**0.19**	**587,002.91**	**100.00**

*Alternative 3 and Borrow Source Access Roads were assigned a 28 m width

*Borrow Sources included were the 7 provided by Kavik-Stantec (via GNWT)

TABLE 4: ALTERNATIVE 3 ADDITIONAL BUFFERS

	100 m Buffer		500 m Buffer		1 km Buffer		5 km Buffer		Cumulative Effects Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	183.00	2.33	637.68	8.13	1,247.65	15.91	5,026.71	64.12	7,839.53	1.34
Broadleaf Open	47.58	1.80	197.38	7.49	377.92	14.33	1,341.98	50.89	2,636.80	0.45
Bryoids	1,349.08	1.11	4,525.97	3.71	8,158.92	6.70	30,302.55	24.87	121,865.61	20.76
Not Classified	3.18	0.07	69.81	1.56	174.41	3.89	978.64	21.84	4,480.70	0.76
Coniferous Dense	20.77	0.38	90.51	1.64	188.46	3.41	1,055.06	19.10	5,524.19	0.94
Coniferous Open	74.74	0.89	259.32	3.09	467.34	5.56	1,667.41	19.85	8,398.39	1.43
Coniferous Sparse	189.14	0.68	822.92	2.96	1,524.44	5.48	7,161.80	25.75	27,816.67	4.74
Exposed/Barren Land	201.62	0.82	831.27	3.39	1,517.15	6.18	7,381.86	30.09	24,530.40	4.18
Herbs	158.41	1.33	526.47	4.41	953.35	7.98	3,201.73	26.80	11,948.96	2.04
Mixedwood Dense	129.88	1.11	514.22	4.40	982.42	8.41	3,999.51	34.23	11,683.16	1.99
Mixedwood Open	9.86	0.57	31.92	1.84	57.01	3.29	246.99	14.24	1,734.62	0.30
Rock/Rubble	40.79	1.27	149.75	4.67	253.33	7.90	725.36	22.61	3,208.02	0.55
Shrub Low	1,315.90	1.46	4,030.78	4.47	7,212.49	7.99	25,899.92	28.70	90,253.20	15.38
Shrub Tall	585.42	1.38	1,744.00	4.10	3,050.08	7.17	10,389.11	24.43	42,520.72	7.24
Water	131.37	0.07	2,685.12	1.47	6,083.69	3.32	43,025.28	23.48	183,237.79	31.22
Wetland-Herb	107.30	0.53	598.90	2.97	1,130.25	5.60	4,725.21	23.42	20,174.71	3.44
Wetland-Shrub	121.84	0.81	542.91	3.62	1,008.92	6.72	4,115.73	27.43	15,005.99	2.56
Wetland-Treed	18.27	0.44	108.70	2.62	183.52	4.43	698.71	16.87	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.00	0.00	0.94	100.00	0.94	0.00
Total	**4,688.14**	**0.80**	**18,367.63**	**3.13**	**34,571.36**	**5.89**	**151,944.51**	**25.88**	**587,002.91**	**100.00**

*all buffers were calculated from either side of the highway footprint and the areas given include those of the footprint

TABLE 5: MACKENZIE GAS PIPELINE FOOTPRINT

	Mackenzie Gas Pipeline*		Borrow Sources**		MGP Infrastructure^		Total MGP Footprint		Cumulative Effects Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7,839.53	1.34
Broadleaf Open	0.18	0.01	0.31	0.01	0.00	0.00	0.49	0.02	2,636.80	0.45
Bryoids	19.29	0.02	196.87	0.16	6.40	0.01	222.56	0.18	121,865.61	20.76
Not Classified	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,480.70	0.76
Coniferous Dense	0.08	0.00	0.91	0.02	0.00	0.00	0.99	0.02	5,524.19	0.94
Coniferous Open	0.66	0.01	3.69	0.04	0.54	0.01	4.89	0.06	8,398.39	1.43
Coniferous Sparse	3.30	0.01	19.56	0.07	0.31	0.00	23.18	0.08	27,816.67	4.74
Exposed/Barren Land	4.30	0.02	25.13	0.10	1.50	0.01	30.93	0.13	24,530.40	4.18
Herbs	1.09	0.01	25.43	0.21	1.56	0.01	28.08	0.24	11,948.96	2.04
Mixedwood Dense	1.02	0.01	2.72	0.02	0.00	0.00	3.74	0.03	11,683.16	1.99
Mixedwood Open	0.07	0.00	1.07	0.06	0.00	0.00	1.15	0.07	1,734.62	0.30
Rock/Rubble	0.28	0.01	8.72	0.27	0.19	0.01	9.18	0.29	3,208.02	0.55
Shrub Low	8.59	0.01	82.09	0.09	10.00	0.01	100.68	0.11	90,253.20	15.38
Shrub Tall	3.19	0.01	44.78	0.11	9.10	0.02	57.07	0.13	42,520.72	7.24
Water	0.04	0.00	6.37	0.00	0.00	0.00	6.42	0.00	183,237.79	31.22
Wetland-Herb	0.31	0.00	27.88	0.14	0.25	0.00	28.44	0.14	20,174.71	3.44
Wetland-Shrub	0.45	0.00	2.96	0.02	0.00	0.00	3.42	0.02	15,005.99	2.56
Wetland-Treed	0.06	0.00	1.84	0.04	0.00	0.00	1.90	0.05	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00
Total	**42.91**	**0.01**	**450.35**	**0.08**	**29.84**	**0.01**	**523.09**	**0.09**	**587,002.91**	**100.00**

*Parsons Lake Lateral Route was assigned a footprint of 1 m wide; all other routes were assigned a footprint of 5 m wide

**Borrow Sources included originated from Imperial Oil and were provided by GNWT

^Infrastructure includes estimated footprints for Storm Hills Pigging Facility and Parsons Lake North and South Pads, based on the MGP EIS (2004)

TABLE 6: MACKENZIE GAS PIPELINE ADDITIONAL BUFFERS

	100 m Buffer		500 m Buffer		1 km Buffer		5 km Buffer		Cumulative Effects Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	1.44	0.02	7.83	0.10	28.01	0.36	287.93	3.67	7,839.53	1.34
Broadleaf Open	8.96	0.34	49.88	1.89	102.45	3.89	482.97	18.32	2,636.80	0.45
Bryoids	1,218.49	1.00	4,836.44	3.97	9,213.66	7.56	40,566.34	33.29	121,865.61	20.76
Not Classified	0.00	0.00	0.25	0.01	1.61	0.04	178.41	3.98	4,480.70	0.76
Coniferous Dense	7.29	0.13	41.40	0.75	81.03	1.47	645.19	11.68	5,524.19	0.94
Coniferous Open	47.31	0.56	215.23	2.56	412.58	4.91	2,117.71	25.22	8,398.39	1.43
Coniferous Sparse	160.04	0.58	712.75	2.56	1,497.27	5.38	8,085.56	29.07	27,816.67	4.74
Exposed/Barren Land	220.70	0.90	867.05	3.53	1,629.17	6.64	7,350.13	29.96	24,530.40	4.18
Herbs	106.69	0.89	408.29	3.42	779.70	6.53	3,492.60	29.23	11,948.96	2.04
Mixedwood Dense	41.30	0.35	225.20	1.93	455.46	3.90	2,199.78	18.83	11,683.16	1.99
Mixedwood Open	9.09	0.52	29.23	1.69	57.15	3.29	346.99	20.00	1,734.62	0.30
Rock/Rubble	34.08	1.06	156.06	4.86	284.26	8.86	1,214.88	37.87	3,208.02	0.55
Shrub Low	621.68	0.69	2,488.23	2.76	4,791.25	5.31	22,827.24	25.29	90,253.20	15.38
Shrub Tall	307.02	0.72	1,156.15	2.72	2,198.64	5.17	10,735.07	25.25	42,520.72	7.24
Water	58.90	0.03	1,319.10	0.72	3,597.20	1.96	23,001.78	12.55	183,237.79	31.22
Wetland-Herb	82.86	0.41	376.11	1.86	736.64	3.65	3,743.89	18.56	20,174.71	3.44
Wetland-Shrub	59.16	0.39	305.08	2.03	595.69	3.97	3,057.33	20.37	15,005.99	2.56
Wetland-Treed	11.42	0.28	65.21	1.57	151.27	3.65	749.76	18.10	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00
Total	**2,996.43**	**0.51**	**13,259.49**	**2.26**	**26,613.02**	**4.53**	**131,083.56**	**22.33**	**587,002.91**	**100.00**

*all buffers were calculated from either side of the MGP footprint and the areas given include those of the footprint

TABLE 7: IKHIL PIPELINE FOOTPRINT AND ADDITIONAL BUFFERS

	IKHIL Pipeline (1 m)		100 m Buffer		500 m Buffer		1 km Buffer		5 km Buffer		Cumulative Effects Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.33	0.00	139.41	1.78	759.13	9.68	1,506.44	19.22	5,344.71	68.18	7,839.53	1.34
Broadleaf Open	0.22	0.01	54.14	2.05	230.74	8.75	424.25	16.09	1,146.56	43.48	2,636.80	0.45
Bryoids	0.87	0.00	152.58	0.13	688.68	0.57	1,321.53	1.08	7,660.34	6.29	121,865.61	20.76
Not Classified	0.56	0.01	109.43	2.44	514.78	11.49	951.99	21.25	2,709.72	60.48	4,480.70	0.76
Coniferous Dense	0.01	0.00	1.73	0.03	30.85	0.56	95.67	1.73	1,763.71	31.93	5,524.19	0.94
Coniferous Open	0.04	0.00	5.94	0.07	28.51	0.34	82.14	0.98	734.00	8.74	8,398.39	1.43
Coniferous Sparse	0.75	0.00	111.07	0.40	483.68	1.74	943.71	3.39	3,625.62	13.03	27,816.67	4.74
Exposed/Barren Land	0.27	0.00	43.44	0.18	179.63	0.73	353.18	1.44	1,844.17	7.52	24,530.40	4.18
Herbs	0.02	0.00	6.93	0.06	89.47	0.75	220.61	1.85	867.61	7.26	11,948.96	2.04
Mixedwood Dense	0.44	0.00	80.27	0.69	390.95	3.35	766.68	6.56	3,584.07	30.68	11,683.16	1.99
Mixedwood Open	0.00	0.00	0.00	0.00	5.01	0.29	43.74	2.52	449.93	25.94	1,734.62	0.30
Rock/Rubble	0.01	0.00	1.04	0.03	2.05	0.06	5.09	0.16	117.65	3.67	3,208.02	0.55
Shrub Low	0.67	0.00	118.66	0.13	546.31	0.61	1,029.95	1.14	3,492.58	3.87	90,253.20	15.38
Shrub Tall	0.08	0.00	27.12	0.06	182.16	0.43	382.85	0.90	1,855.36	4.36	42,520.72	7.24
Water	0.00	0.00	0.64	0.00	96.91	0.05	286.30	0.16	7,890.56	4.31	183,237.79	31.22
Wetland-Herb	0.00	0.00	0.19	0.00	18.79	0.09	73.68	0.37	1,192.80	5.91	20,174.71	3.44
Wetland-Shrub	0.01	0.00	4.02	0.03	47.63	0.32	117.42	0.78	1,005.81	6.70	15,005.99	2.56
Wetland-Treed	0.00	0.00	0.26	0.01	15.60	0.38	84.43	2.04	903.55	21.81	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00
Total	4.28	0.00	**856.87**	**0.15**	**4,310.89**	**0.73**	**8,689.64**	**1.48**	**46,188.78**	**7.87**	**587,002.91**	**100.00**

*IKHIL pipeline was assigned a footprint of 1 m wide

*all buffers were calculated from either side of the IKHIL footprint and the areas given include those of the footprint

TABLE 8: NAVY ROAD FOOTPRINT AND ADDITIONAL BUFFERS

	Navy Road (28 m)		100 m Buffer		500 m Buffer		1 km Buffer		5 km Buffer		Cumulative Effects Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.07	0.00	2.19	0.03	26.91	0.34	71.60	0.91	1,074.24	13.70	7,839.53	1.34
Broadleaf Open	0.00	0.00	0.37	0.01	5.64	0.21	16.00	0.61	264.77	10.04	2,636.80	0.45
Bryoids	0.00	0.00	0.00	0.00	0.00	0.00	5.89	0.00	68.67	0.06	121,865.61	20.76
Not Classified	0.97	0.02	6.76	0.15	43.59	0.97	106.90	2.39	228.75	5.11	4,480.70	0.76
Coniferous Dense	0.00	0.00	0.12	0.00	0.13	0.00	0.38	0.01	250.53	4.54	5,524.19	0.94
Coniferous Open	0.00	0.00	0.01	0.00	0.06	0.00	2.20	0.03	69.85	0.83	8,398.39	1.43
Coniferous Sparse	0.10	0.00	0.69	0.00	1.94	0.01	9.96	0.04	347.23	1.25	27,816.67	4.74
Exposed/Barren Land	0.00	0.00	0.00	0.00	0.00	0.00	2.43	0.01	215.55	0.88	24,530.40	4.18
Herbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.75	0.06	11,948.96	2.04
Mixedwood Dense	0.00	0.00	0.88	0.01	3.67	0.03	19.63	0.17	599.94	5.14	11,683.16	1.99
Mixedwood Open	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.87	1.49	1,734.62	0.30
Rock/Rubble	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,208.02	0.55
Shrub Low	0.00	0.00	0.00	0.00	0.00	0.00	1.60	0.00	64.28	0.07	90,253.20	15.38
Shrub Tall	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.61	0.06	42,520.72	7.24
Water	0.00	0.00	0.00	0.00	0.00	0.00	1.49	0.00	820.95	0.45	183,237.79	31.22
Wetland-Herb	0.00	0.00	0.00	0.00	0.00	0.00	0.89	0.00	119.04	0.59	20,174.71	3.44
Wetland-Shrub	0.00	0.00	0.00	0.00	0.00	0.00	2.16	0.01	101.60	0.68	15,005.99	2.56
Wetland-Treed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.46	0.93	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00
Total	1.13	0.00	**11.02**	**0.00**	**81.94**	**0.01**	**241.12**	**0.04**	**4,322.08**	**0.74**	**587,002.91**	**100.00**

*Navy Road was assigned a footprint of 28 m wide

*all buffers were calculated from either side of the road footprint and the areas given include those of the footprint

TABLE 9: TUKTOAYKTUK TO SOURCE 177 ACCESS ROAD FOOTPRINT AND ADDITIONAL BUFFERS

	Tuktoyaktuk to 177 Access Road (28 m)		100 m Buffer		500 m Buffer		1 km Buffer		5 km Buffer		Cumulative Effects Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7,839.53	1.34
Broadleaf Open	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,636.80	0.45
Bryoids	0.95	0.00	21.72	0.02	68.78	0.06	130.34	0.11	1,294.00	1.06	121,865.61	20.76
Not Classified	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	4,480.70	0.76
Coniferous Dense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5,524.19	0.94
Coniferous Open	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8,398.39	1.43
Coniferous Sparse	0.02	0.00	2.02	0.01	9.27	0.03	19.21	0.07	208.10	0.75	27,816.67	4.74
Exposed/Barren Land	11.03	0.04	57.28	0.23	214.74	0.88	356.88	1.45	1,262.37	5.15	24,530.40	4.18
Herbs	0.00	0.00	0.26	0.00	1.50	0.01	3.99	0.03	49.05	0.41	11,948.96	2.04
Mixedwood Dense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,683.16	1.99
Mixedwood Open	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,734.62	0.30
Rock/Rubble	0.60	0.02	1.77	0.06	6.02	0.19	9.69	0.30	35.80	1.12	3,208.02	0.55
Shrub Low	0.99	0.00	16.36	0.02	48.31	0.05	89.61	0.10	1,235.44	1.37	90,253.20	15.38
Shrub Tall	0.14	0.00	5.94	0.01	17.76	0.04	35.10	0.08	572.28	1.35	42,520.72	7.24
Water	0.07	0.00	10.78	0.01	217.32	0.12	610.26	0.33	3,372.21	1.84	183,237.79	31.22
Wetland-Herb	1.56	0.01	9.76	0.05	26.54	0.13	49.45	0.25	315.34	1.56	20,174.71	3.44
Wetland-Shrub	0.05	0.00	3.11	0.02	17.15	0.11	29.79	0.20	256.25	1.71	15,005.99	2.56
Wetland-Treed	0.00	0.00	0.06	0.00	0.25	0.01	0.44	0.01	3.25	0.08	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.88	93.33	0.88	93.33	0.94	100.00	0.94	0.00
Total	15.42	0.00	**129.04**	**0.02**	**628.53**	**0.11**	**1,335.64**	**0.23**	**8,605.08**	**1.47**	**587,002.91**	**100.00**

*Tuktoyaktuk to 177 Access Road was assigned a footprint of 28 m wide

*all buffers were calculated from either side of the road footprint and the areas given include those of the footprint

Developer Response: 114.2

The Project TOR Section 10.1.5 and Section 11 list the requirement for cumulative effects assessments of SARA schedule 1 and COSEWIC assessed species. The requirement includes the need to assess the Project in combination with other past, present or reasonably foreseeable projects and/or activities with the Study Area(s). This requirement relates only to those "effects [which] would act in combination with the residual effects of the Project". The *Canadian Environmental Assessment Act*, paragraph 16(1)(a), also requires a panel to consider the "environmental effects of malfunctions or accidents".

The Developer has reviewed the table of species at risk (including the COSEWIC-assessed species) to determine which species should be assessed for cumulative direct habitat loss and indirect changes to habitat quality. To assist in this review the Developer acquired additional observational information from Environment Canada, GNWT Environment and Natural Resources (ENR) and the MGP Proponents.

Three factors also considered when determining the necessity of a cumulative effects assessment include:

1. the likelihood of the presence of a species in the local study area or regional study area;
2. the likelihood of a residual effect of the project; and
3. the availability of information on residual effects of others (i.e., future developments).

Eskimo Curlew - Extinct

The known range of this extinct species is located well to the east of Husky Lakes according to range maps issued by GNWT ENR (2012). GNWT ENR reports that Eskimo Curlew had only two known breeding locations in the Northwest Territories: at the base of Bathurst Peninsula in the Anderson River area and in the region of Amundsen Gulf-Coronation Gulf-Coppermine River. While the IR request indicates Eskimo Curlew could potentially occur within the Project area, there is no basis for including the Project area as hypothetical range. As Environment Canada also stated that "in it's view, in light of its current status, there is no need for further action with respect to Eskimo Curlew", a cumulative effects assessment is not required.

Woodland Caribou (Boreal population) – Threatened

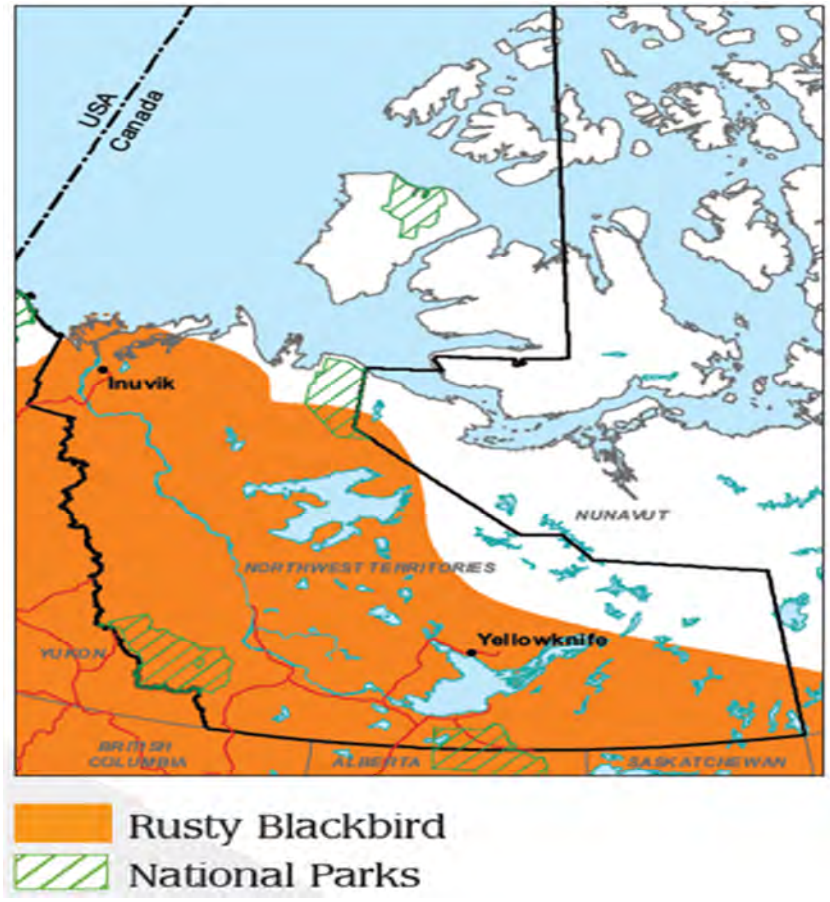
Boreal caribou were included in the EIS because of the potential overlap of the Project for a small portion of their range. The most recent range map for this species was issued for review by the NWT Species at Risk Committee in March 2012 (as shown on Figures 1-5 above). The new map indicates about 25 km of the Highway alignment (approximately KM 26 to KM 49) crosses boreal caribou range. Although the NWT Species at Risk Committee (SARC) reports "scattered woodland caribou are seen on the barrens every year, the majority of which are males, and they are sometimes mixed with barren-ground caribou" there is minimal to no overlap with the Parsons Lake development or MGP Gathering System in the Project's Cumulative Effects Area. As there is little to no overlap, the Developer concludes there will not be residual effects and, therefore, a cumulative effects assessment is not required. However, additional information on the Project effects are provided in the Developer's Response to IR 117.

Polar Bear – Special Concern

The range of the Polar bear is mapped by the GNWT ENR (2012) as including the coastal portion of the NWT. Polar bears generally hunt on annual sea ice along coastlines from early winter until sea ice break-up, but may range more than 200 km offshore. Maternal denning sites are generally located on land in snowdrifts near the coast but have been found on sea ice. The Developer provided a complete review of Polar bears in Response to Conformity Request #1 (pp 31-39). As demonstrated in this review, recent denning maps from Environment Canada and telemetry for Polar bears shows no overlap of the Project with the geographic areas actually used by Polar bears. As the Project is considered to have no effect on Polar bears, there can be no residual effect. A cumulative effects assessment is not required for this species.

Rusty Blackbird – Special Concern

The range of the Rusty Blackbird is mapped by the GNWT ENR as including much of the NWT below treeline (Figure 6). The habitat is considered to be restricted to the boreal forest, in wetland areas during spring, summer, and fall with breeding habitat as being near open water in treed wetlands (e.g., bogs, fens, swamps), often in loose colonies (GNWT ENR 2102). Ward (1975) found 74% of birds were in black spruce muskeg.



Source: GNWT ENR (2012)

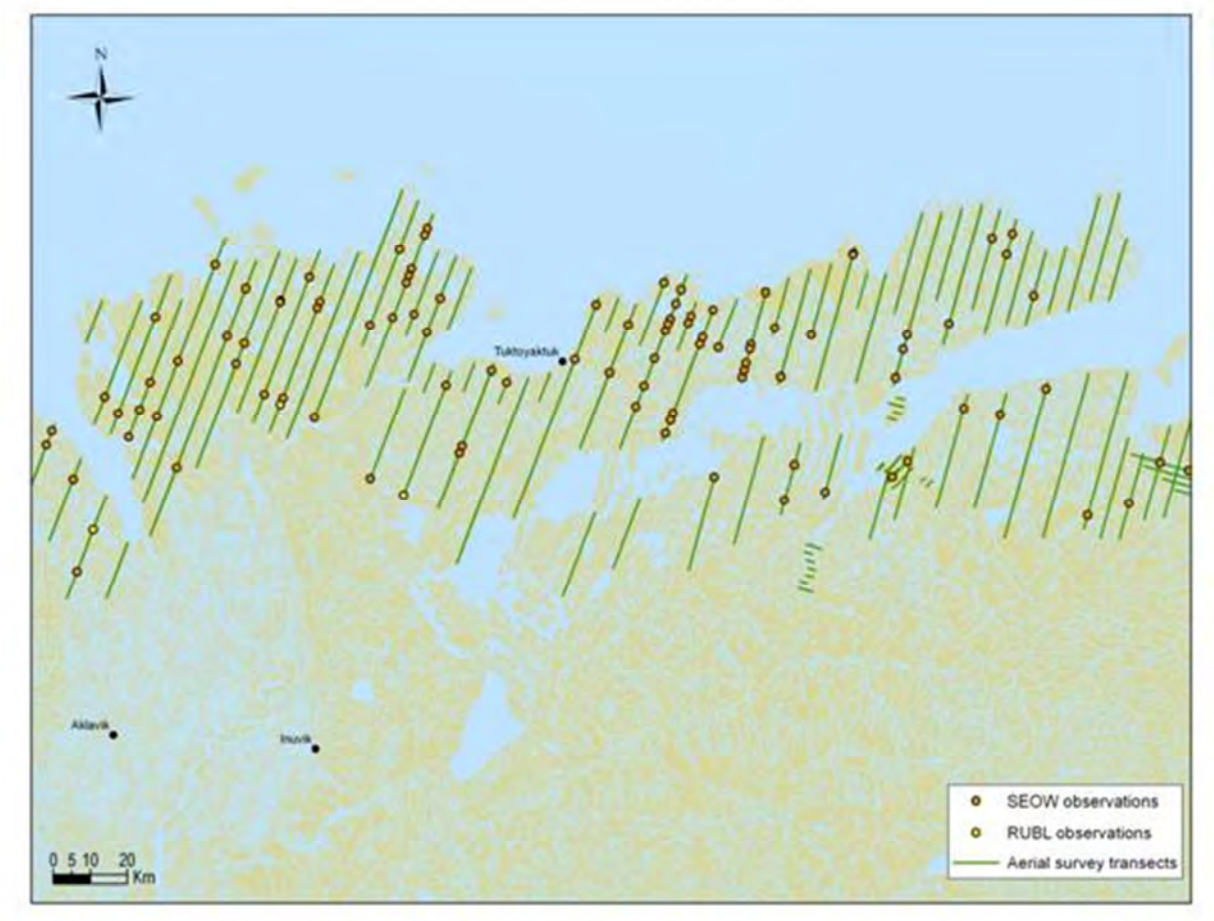
Figure 6. Rusty Blackbird range in the Northwest Territories.

COSEWIC (2006) states:

> The northern limit of the Rusty Blackbird's breeding range in Canada is delineated by the Old Crow region in northern Yukon; the Mackenzie River delta, Great Bear Lake and Great Slave Lake in the Northwest Territories (NWT); the Thelon and Arviat rivers in Nunavut; the south shore of Hudson Bay from Churchill, Manitoba, to central Ontario; Guillaume-Delisle Lake and Kuujjuaq in northern Québec; Davis Inlet in Labrador; and the north coast of Newfoundland (Cadman et al. 1987; Erskine 1992; Gauthier and Aubry 1995; Norment et al. 1999; Manitoba Avian Research Committee 2003; Sinclair et al. 2003; J. Richards, Pers. Comm.).
>
> The breeding range of the Rusty Blackbird corresponds closely to the boreal forest and taiga terrestrial ecozones (Godfrey 1986; Cadman et al. 1987; Erskine 1992; Semenchuk 1992; Avery 1995; Gauthier and Aubry 1995; Campbell et al. 1997; Sinclair et al. 2003). Within these biomes, Rusty Blackbird habitat is generally characterized by conifer forest wetlands (Erskine 1977; Gunn et al. 1977; DesGranges and Houde 1989; Gauthier and Aubry 1995). The Rusty Blackbird is **generally absent from wetlands in regions above the tree line, such as the alpine tundra and Arctic tundra**, and it is not abundant in high mountain wetlands (DesGranges and Houde 1989; Campbell et al. 1997)."

The MGP Proponents provided their summer observation records (i.e., bird surveys and casual observation records) to GNWT ENR. A review of these observation records provided no sightings at all for any part of their Project in the NWT.

The GNWT ENR on behalf of the Developer, acquired observational data from Environment Canada and pooled it with other records in WMIS. Environment Canada provided observations recorded during helicopter aerial surveys for breeding waterfowl during 1989-1993, 1995-1998, and 2002-2008 (Figure 7). One observation was recorded north of Parsons Lake on the edge of the 15 km buffer. These surveys were not specifically designed to detect Rusty Blackbird and as such should not be used to make inferences about their abundance or areas where they are absent within the larger area covered by the surveys. Other observations are known from around Inuvik and on Richards Island.



Source: Environment Canada (2012)

Figure 7. Rusty blackbird observations made during helicopter aerial surveys for breeding waterfowl during 1989-1993, 1995-1998, and 2002-2008.

More recently, Machtans et al. (2007) revisited a number of sites originally sampled in the early 1970s during baseline studies for a northern pipeline in the Mackenzie Valley (Patterson et al. 1977). They concluded that "Rusty Blackbird occurrence does not appear to have changed significantly in the past 33 yrs in the Mackenzie Valley. We conclude with a qualitative discussion that supports the notion that declines in the southern parts of their range may be a large factor in the observed rates of population decline."

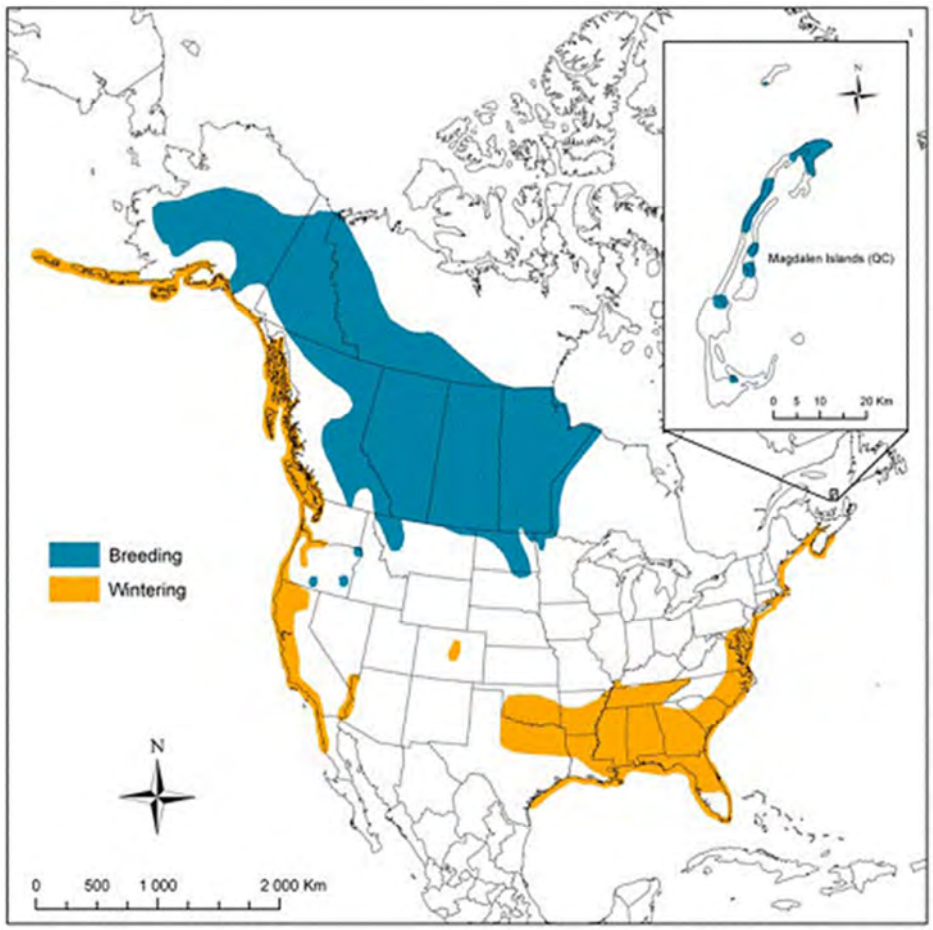
This species was not included as a Valued Component by the Mackenzie Gas Project Proponents. In response to JRP IR EC 1.2005, the MGP Proponents indicated that "the project's potential effects on two landbirds of concern, the short-eared owl (*Asio flammeus*) and the rusty blackbird (*Euphagus carolinus*) are addressed by analyzing effects from vegetation clearing and sensory disturbance on their corresponding umbrella species (VCs)." For Rusty Blackbird, the surrogate species cited was moose (JRP IR EC 2.005 and JRP 1.33) although lynx was discussed as an additional proxy with similar habitat requirements.

While there is no prediction of any loss of breeding habitat for this species, this will be confirmed from the planned vegetation mapping and field sampling (see Developer Response #114.3. As the Project will be constructed predominantly in the winter months, there is no potential for direct effect on any breeding birds (e.g., no disturbance of nests or eggs) should any breeding areas be discovered during 2012 surveys. As indicated in Developer Response #114.1, the Highway alignment must avoid wetland habitats.

Given this prediction of no effects or residual impacts, the Developer does not believe a cumulative effects assessment is required. Depending on the habitat modelling and wildlife field review in spring 2012, the Developer will incorporate relevant mitigations if new information and discussions with GNWT ENR and/or Environment Canada indicates a need.

Horned Grebe (Western population) – Special Concern

The Horned Grebe breeds primarily in temperate zones such as the Canadian Prairies, but can also be found in more boreal and subarctic zones. In the Northwest Territories, the Horned Grebe nests in low densities throughout much of the boreal and subarctic regions (COSEWIC 2009). Horned Grebes arrive in the Northwest Territories in May (GNWT ENR 2012). They lay five to seven eggs that hatch in mid-June and July. Adults leave the Northwest Territories by mid-August and young leave by early September. Figure 8 illustrates the breeding and winter ranges of the Horned Grebe.



Source: Adapted from Stedman (2000).

Figure 8. Breeding and winter ranges of the Horned Grebe (*P. auritus*) in North America.

Horned Grebe generally nest in freshwater and occasionally in brackish water on small permanent or semi-permanent ponds which last until autumn, but it also uses marshes and shallow bays on lake borders. These water bodies are found in both open and forested areas. Breeding ponds must contain areas of open water and beds of emergent vegetation that provide nest material, concealment and anchorage, and protection for the young. The Horned Grebe is generally a solitary nester, but up to 20 pairs may nest in the same pond if it is sufficiently large and there are abundant food resources.

The Horned Grebe will use a broad range of pond sizes (0.24 to 18.2 ha) but generally prefers ponds ranging from 0.30 to 2 ha (Fournier and Hines 1999; Gingras and Beyersbergen 2003; Gingras and Beyersbergen unpublished data). Ponds must contain areas of open water (i.e., over 40%) and beds of emergent vegetation (Faaborg 1976; Sugden 1977; Godfrey 1986; Ulfvens 1988).

The highest documented densities (>4 birds/km^2) have been observed in the southern NWT. Average grebe population densities throughout the rest of the boreal and subarctic NWT are apparently much lower (probably less than 0.1 bird/km^2 overall) (Stotts 1988; Fournier and Hines 1999; Canadian Wildlife Service (CWS) 2007a). In the NWT, only approximate numbers are

available from the 1980-1982 Waterfowl Breeding Ground Surveys. Stotts (1988) analyzed non-waterfowl birds data from these surveys and has estimated the Horned Grebe population at 23,042 birds for the 707,592 km^2 area covered.

No horned grebes were found during ground and aerial surveys by the MGP Proponents. The GNWT ENR on behalf of the Developer, recently acquired observational data from Environment Canada and pooled it with other records in WMIS. One observation was recorded in 1975 at the north end of Noell Lake. Other observations were near Inuvik or south of Inuvik in the Mackenzie River Delta.

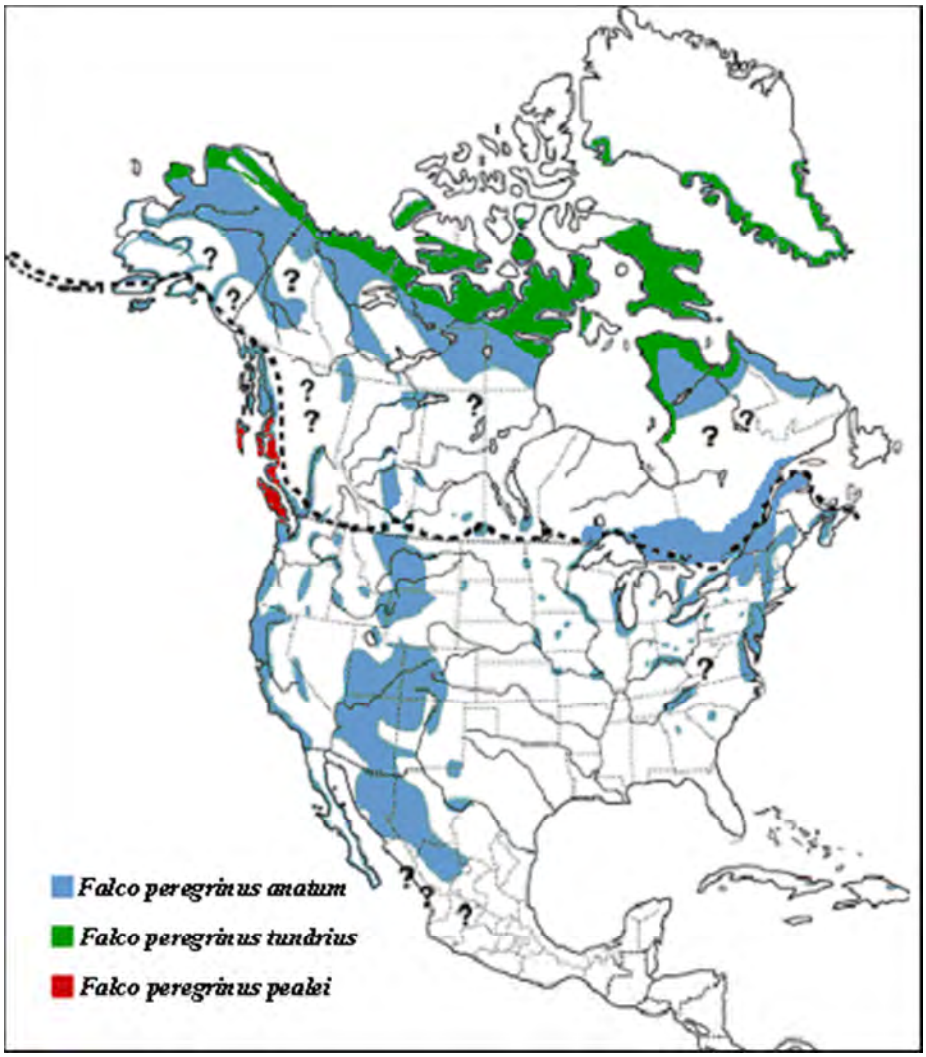
Given this prediction of no effects or residual impacts, the Developer does not believe a cumulative effects assessment is required. Depending on the habitat modelling and wildlife field review in spring 2012, the Developer will incorporate relevant mitigations if new information and discussions with GNWT ENR and/or Environment Canada indicates a need.

Peregrine Falcon (*anatum-tundrius* complex) – Special Concern

COSEWIC (2007) reports the Anatum Peregrine Falcon breeds from the interior of Alaska, across northern Canada to southern Greenland, then south through continental North America to northern Mexico, except for the coastal Pacific Northwest from Washington north. Tundrius Peregrine Falcons breed from the north slope of the Yukon east across the low Arctic islands and Nunavut north to Baffin Island, Hudson Bay, Ungava and northernmost Labrador (Figure 1; White and Boyce 1988). In all areas, suitable nest sites are patchily distributed on the landscape level, but can be locally common. Extensive areas of Canada, where Peregrine Falcons are absent, appear to lack suitable nest sites or, if nest sites are present, lack sufficient prey.

Most Peregrine Falcons nest on cliff ledges or crevices near good foraging areas. Cliffs ranging from 50–200 m high are preferred (Cade 1960; White and Cade 1971). Other nest sites include: tops of pingos in tundra, cuts for roadbeds, Common Raven *(Corvus corax*) nests on electric-transmission towers, stone quarries, and open-pit mines (Frank 1994; Bell et al. 1996; Cade et al. 1996). Tundrius Peregrine Falcons in Rankin Inlet nest in south- or southwest-facing vertical coastal cliffs (Court et al. 1988a), or in rocky bluffs in inland tundra areas (Court et al. 1988b).

Figure 9 illustrates the breeding distribution of the Peregrine Falcon in North America.



Source: Birds of North America Inc.

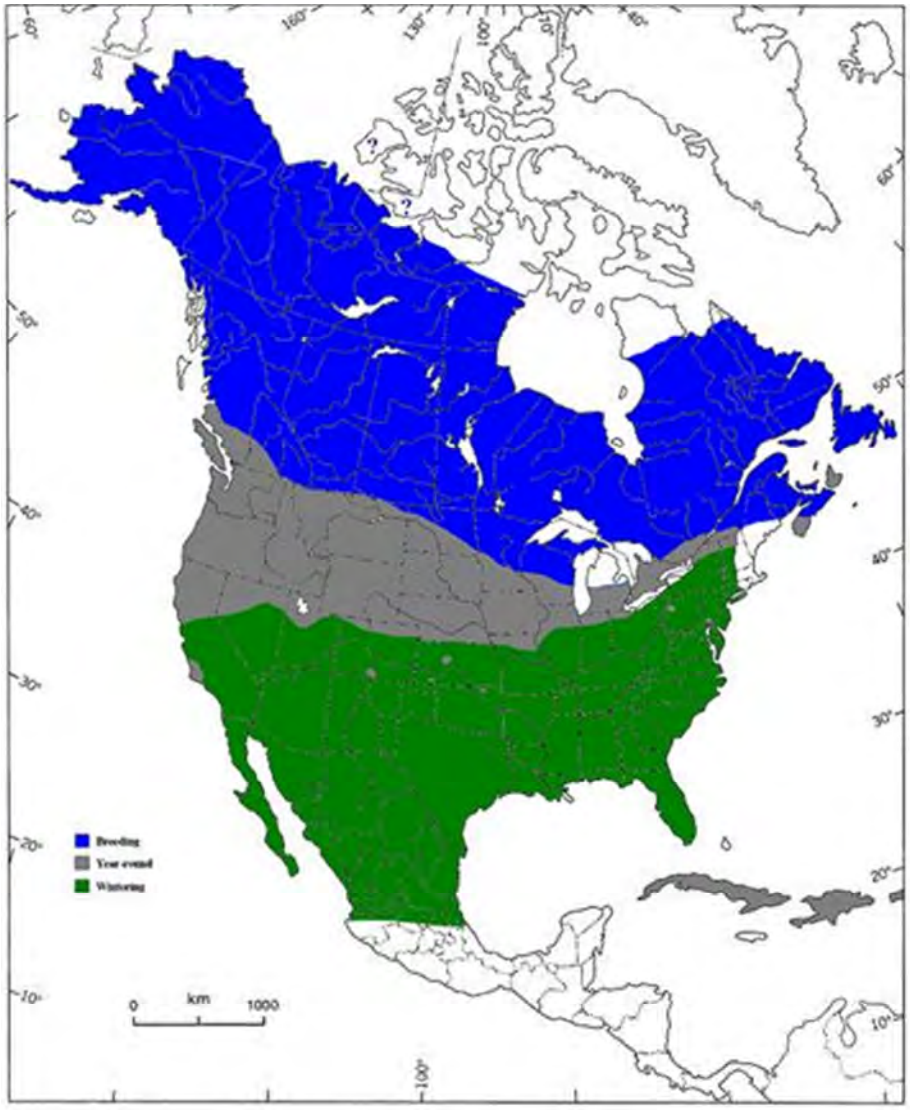
Figure 9. Breeding distribution of the Peregrine Falcon in North America. Birds typically winter south of the dashed line.

GNWT ENR reviewed the proposed Highway alignment in 2011 and indicated there were no known nest sites within 1.5 km of the alignment (S. Matthews, Pers. Comm., 2011). The MGP Proponents did not observe Peregrine falcons during aerial or ground surveys in the regional study area (RSA) for the Inuvik to Tuktoyaktuk Highway. At this time, based on the terrain analysis conducted by the Developer, GNWT ENR does not expect that any suitable nesting habitat occurs in the Project area (S. Carriere, Pers. Comm., 2012). The Developer intends to carry out predictive mapping of the local study area (LSA) to confirm this prediction. Given this prediction of no effects or residual impacts, the Developer does not believe a cumulative effects assessment is required. Depending on the habitat modelling and wildlife field review in spring 2012, the Developer will incorporate relevant mitigations if new information and discussions with GNWT ENR indicates a need.

Short-eared Owl – Special Concern

Short-eared Owls are most common in the Prairie provinces (i.e., Alberta, Saskatchewan and Manitoba) and along the Arctic coast (COSEWIC 2008). The Short-eared Owl probably arrives in the Northwest Territories during April or May. They lay an average of seven eggs by mid-June and the owlets hatch in early July. Short-eared Owls probably leave the Northwest Territories by late October (GNWT ENR 2012).

Figure 10 illustrates the range of Short-eared Owls in North America. Note that within the broad range depicted, Short-eared Owls are highly nomadic, nesting and wintering in areas with local outbreaks of Microtus voles and other small rodents, and largely avoiding forested areas. Short-eared Owls are absent from forested and mountainous areas of the map.

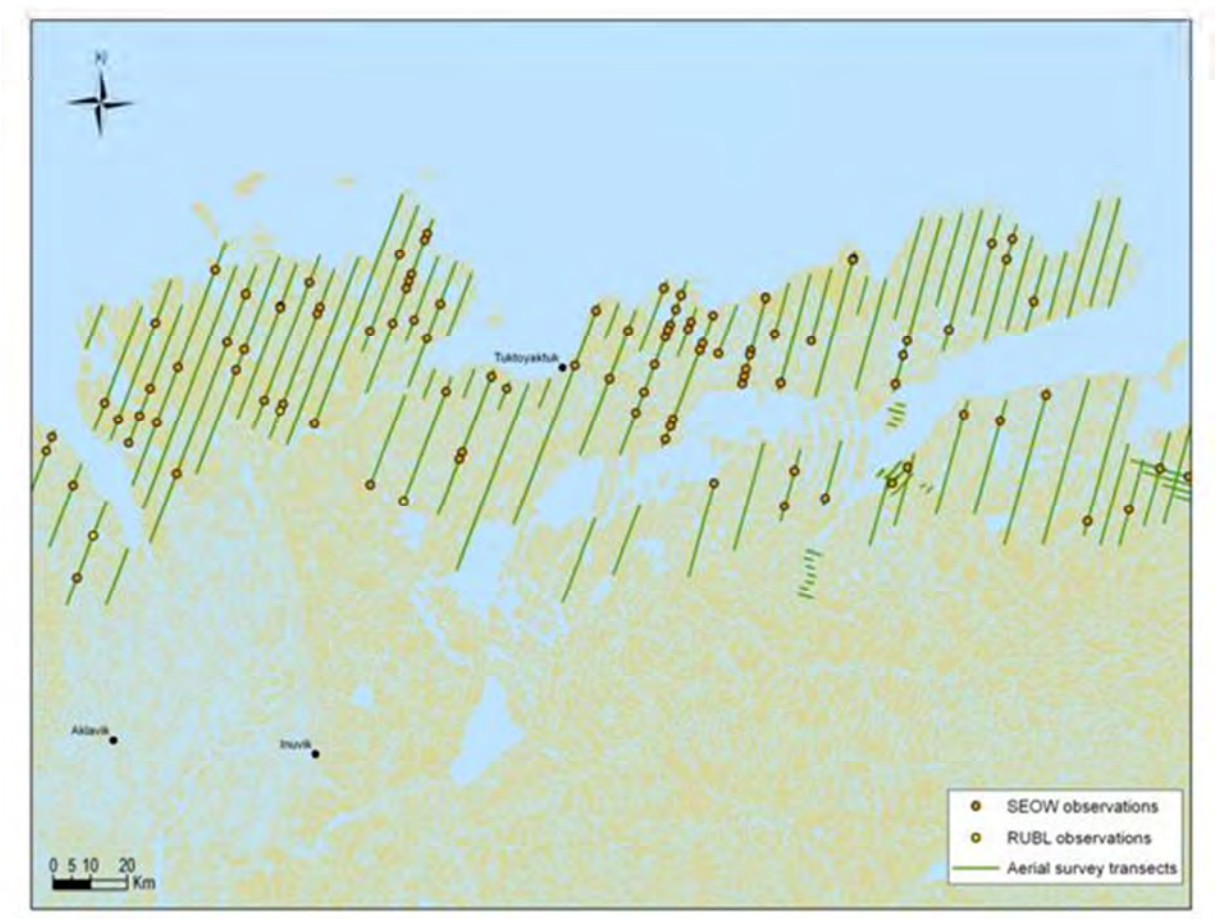


Source: Modified from Wiggins et al. 2006

Figure 10. Range of the Short-eared Owl in North America.

Short-eared Owls breed in a large number of open habitats. In the NWT these include Arctic tundra, taiga, bogs, and marshes. Although they may breed in suitable habitat throughout the NWT, these are likely most common in areas of tundra with areas of small willows (Jehl 2004). However, as with habitat selection in general, the primary factor determining Short-eared Owl nest site choice is likely proximity to a reliable source of small mammal prey. No population status or trend information is available for the NWT.

The GNWT ENR on behalf of the Developer recently requested data from Environment Canada's Canadian Wildlife Service for Short-eared Owls. Environment Canada provided observations recorded during helicopter aerial surveys for breeding waterfowl during 1989-1993, 1995-1998, and 2002-2008 (Figure 11). These surveys were not specifically designed to detect Short-eared Owl and as such should not be used to make inferences about their abundance or areas where they are absent within the larger area covered by the surveys.



Source: Environment Canada (2012)

Figure 11. Short-eared Owl observations made during helicopter aerial surveys for breeding waterfowl during 1989-1993, 1995-1998, and 2002-2008.

These data and GNWT ENR WMIS and Environment Canada's NWT/Nunavut Bird Checklist indicate observations of the species is widespread; however, few observations were made of nesting owls. Given the limited observations within the Project's RSA or boundaries of future projects, it is not feasible to conduct a cumulative effects assessment beyond the habitat calculations provided in Developer Response #114.1. The Inuvik to Tuktoyaktuk Project and the MGP Project will both be constructed in the winter, which eliminates direct effects on nests or eggs. The Developer intends to carry out predictive mapping of the LSA to confirm this prediction. Given this prediction of no effects or residual impacts, the Developer does not believe a cumulative effects assessment is required. Depending on the habitat modelling and wildlife field review in spring 2012, the Developer will incorporate relevant mitigations if new information and discussions with GNWT ENR indicates a need.

Wolverine (Western Population) – Special Concern

Wolverine are considered to be widespread across the NWT. Although the population of wolverines in the NWT is unknown; GNWT ENR estimate there are 1.6 to 3.7 wolverine per 1,000 km^2 (GNWT ENR 2011c). COSEWIC (2003a), quoting Kelsall (1981), report that "[Wolverine] habitat is probably best defined in terms of an adequate year-round food supply in large, sparsely inhabited wilderness areas, rather than in terms of particular types of topography or plant association…the animals are most abundant where large ungulates are common, and where carrion is abundant in winter from hunter kills, predation and natural mortality." The COSEWIC (2003a) range map (Figure 12) indicates moderate populations on tundra areas compared to taiga and mountainous regions. This is supported by Traditional Knowledge as the Community of Tuktoyaktuk et al. (2008), indicate relatively few wolverine are present in the Mackenzie Delta region.

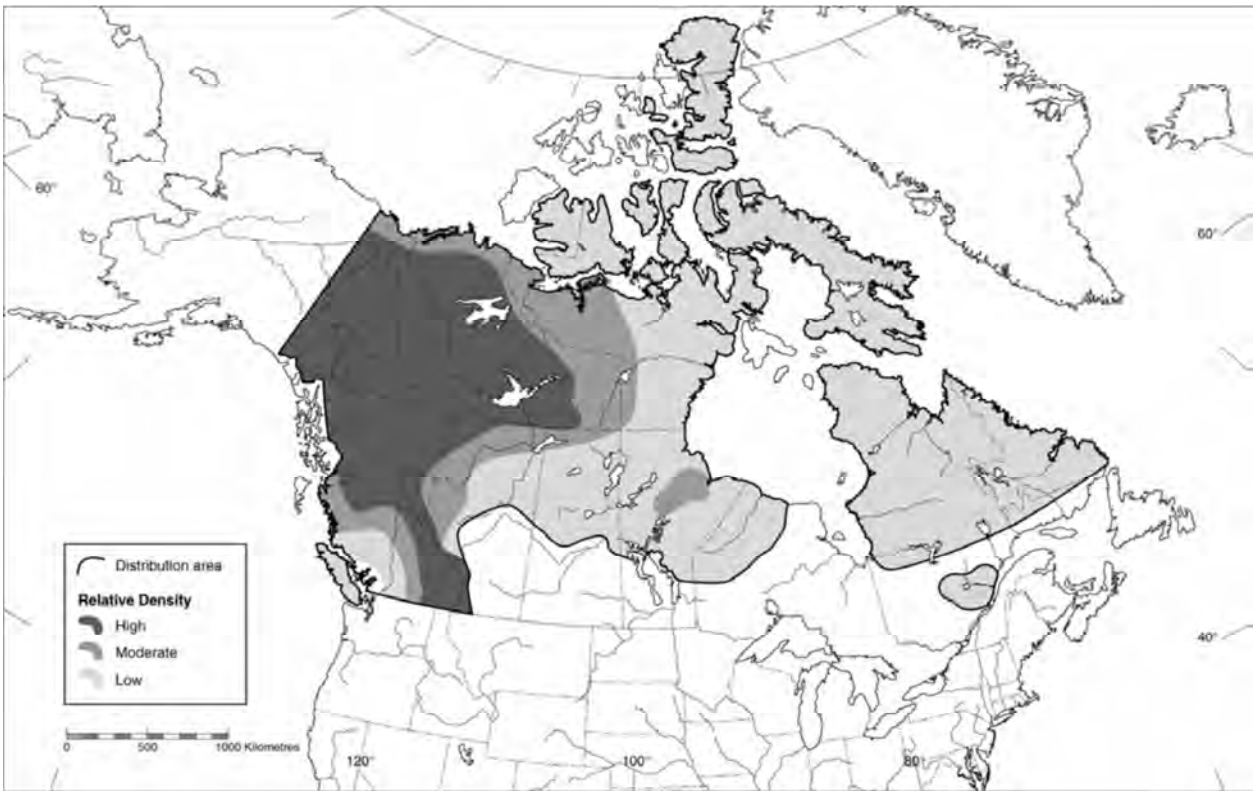
Although the habitat loss resulting from the Inuvik to Tuktoyaktuk Highway (ITH) Project and other projects in the cumulative effects study area are shown in the Developer Response #114.1, habitat is considered to be less of a factor for consideration for wolverine. Johnson et al. (2005) states that

> "simple removal of resources is only meaningful when animals are strongly dependent on discrete irreplaceable features of the landscape and their life-history provides little opportunity for adaptation. Natural or anthropogenic disturbances may lead to a reduction in the availability of a resource, but the species of concern may have considerable plasticity in foraging habits that allow adaptations to an altered environment (Mattson et al. 1991; Kasbohm et al. 1998). Ultimately, we should strive to identify the mechanistic relationships between habitats and population productivity (Boyce and McDonald 1999). An understanding of such linkages may allow us to detect thresholds of disturbance after which we can expect an unacceptable risk to population viability, decrease in distribution or decline in population productivity."

Based on this, the key cumulative effects of projects on wolverine are increased mortality from harvest or problem animal control at camps, changes in prey or carrion availability, and avoidance of human developments.

Increased Mortality - The likelihood of wolverine mortality occurring while protecting property is minimal for the ITH Project. The MGP Proponents committed to mitigation measures to avoid

attraction of wolverine to camps and elimination of short term dens. Although the MGP Proponents did not assess wolverine as a VC and stated their mitigation measures for grizzly bear would also mitigate effects on wolverine, the operator of the primary development at Parsons Lake, ConocoPhillips, prepared a draft mitigation plan for both grizzly bears and wolverine for its anchor field development. This pathway of effect was considered to be negligible. Similarly, the Developer of the Inuvik to Tuktoyaktuk Highway has provided mitigation commitments to negate the attraction of wolverine to its camps.



Source: COSEWIC (2003a)

Figure 12. Range of the wolverine in Canada.

Changes in Large Herbivores - Seasonal changes in prey are important as well as long term changes. Johnson et al. (2005), in their cumulative effects assessment for radio-collared wolverine in the Slave Geologic Province, separated the seasons for wolverine according to the presence or absence of caribou across their range. For the ITH Project cumulative effects study area, the areas of caribou and annual changes are shown in the EIS and further discussed in the GNWT Response to IR 73. Caribou from the Cape Bathurst and Tuktoyaktuk Peninsula herds are largely absent from the cumulative effects study area from mid April to early October. The herds undergo fluctuations in population over time and the herds modify their use of winter range between years. These factors likely have an influence on the density of populations in the Tuktoyaktuk Peninsula and Mackenzie Delta. No assessment of the effects of changes in caribou numbers using the cumulative effects areas on wolverine populations is possible. Significant natural change occurs already. The limited overlap of future MGP development is not expected to lead to effects on the portion of the Cape Bathurst caribou wintering in the Parsons Lake area.

Harvesting - Harvest pressures on wolverines have been increasing and are influenced by factors such as increased pelt prices and easier access into areas where hunting and trapping can occur (GNWT ENR 2011a). The Inuvialuit have exclusive rights to harvest wolverine and in recent years have allowed guided sport hunts of wolverines. The ITH Project, once it is open to public traffic, is the only project, other than the existing Navy and Source 177 roads, likely to lead to an increase in harvester access to remote wolverine range. This could potentially increase the harvest of wolverine. COSEWIC (2003a) indicates the reproductive rate and, hence, the population resiliency of wolverines is relatively low. Hunters have been providing carcasses to GNWT ENR from harvested animals for a number of years (M. Branigan, Pers. Comm., 2011). Information and samples are being analyzed but no reports are yet available (R. Mulders, Pers. Comm., 2012).

Grizzly Bear (Northwestern Population) – Special Concern

COSEWIC (2003b) assessed the grizzly bear (Northwestern Population) as Special Concern. It's proposed inclusion on Schedule 1 of SARA is under extended public consultation.

The average home range sizes for barren-ground grizzly bear varies with sex, age, age class and reproductive status of individual bears (Nagy 1983). Nagy (1983) reported the home range for females varies from 238.7 km^2 for females with cubs to 725.5 km^2 for females with two-year old young. For adult males the average range was 828.8 km^2 (Nagy 1983). A later study (Edwards et al. 2009), based on the home ranges of 36 grizzly bears studied from April 1 to November 30 between 2003 and 2006, indicates annual home range estimates for males and females were 1,215 km^2 (range: 1,475 km^2 to 6,735 km^2) and 680 km^2 (range: 80 km^2 to 4,965 km^2), respectively. The location of the arithmetic mean centre of 54 annual home ranges for 36 bears is shown on Figure 3.1.9-16. The study identified the actual distances between mean daily locations, 12-months apart, and grouped into spring, summer, and fall seasons, but found no significant difference in fidelity among the seasons.

Harding and Nagy (1980) reported active avoidance and disruption of bear foraging activities from 100 m up to 4 km from northern industrial developments (predominantly oil and gas exploration activities on Richards Island). The figures and tables in Developer Response #114.1 provide estimates of direct and indirect habitat loss for the ITH Project, existing projects and the MGP. This includes indirect losses for 100 m, 500 m, 1 km and 5 km.

In the EIS for the MGP, the Proponents indicated its Parsons Lake development would reduce the amount of effective barren-ground grizzly habitat. The EIS indicated, as a result of construction at the Parsons Lake LSA, a reduction in effective denning habitat of 1,638 ha, spring foraging by 414 ha and fall foraging by 286 ha. The MGP Proponents, citing J. Nagy (Pers. Comm., 2003), stated that since denning habitat is not a limiting factor in the region, these effects would have little effect on the grizzly bear population. During operation of Parsons Lake, the Proponents anticipated the effects of visual/ auditory disturbances from vehicles and aircraft would be less but the reduction in effective denning habitat would remain. The MGP Proponents indicated disturbance of denning grizzly bears would also not have an effect on the population as any bears lost would be subtracted from the annual harvest limits (i.e., in any year the harvest quota would not be exceeded).

Harvesting - Nagy and Branigan (1998) estimated 1,000 grizzly bears aged two or older in the ISR. IOL et al. (2004) reported a density estimate of 7 to 8 bears/1,000 km^2 (based on J. Nagy, Pers. Comm., 2003). The harvest of grizzly bears is managed through a tag system and is set at approximately 4 % of the population (currently 13 bears in I/GB/04 and 9 bears in I/GB/03). Problem animals that are killed are deducted from the total tags for harvesters. The increased access

to the Project area could increase the harvest and/or change the harvest pressure on the two subpopulations overlapping the Project area. However, the current harvest is often less than the allowable harvest which limits the potential for this type of impact.

Cumulative Effects of Denning Disturbance – Grizzly bears begin to dig winter dens in mid to late August and enter dens in the Tuktoyaktuk Peninsula in mid to late September up to early October. Bears emerge from the dens in late April to mid May. The MGP Proponents determined that the disturbance of a denning grizzly bear during construction of the gathering system or Parsons Lake would not affect the overall population as it would merely reduce the harvest. As a result there would not be a cumulative effect. The ITH Developer also has provided mitigations to avoid disturbing denning bears including conducting a fall survey by GNWT ENR. The Developer is now scheduling additional "predictive" mapping of moderate and high potential denning habitat. As the small population of bears is dispersed over a large landscape, and the construction of the highway over three winters, the number of bears that would likely be in the vicinity of Highway construction activities in any given season of construction is low.

As a result, the Developer does not expect a cumulative effect other than the avoidance of the Highway right of way or Parsons Lake anchor field for denning by 100 m to 500 m during operations (i.e., the Ikhil and MGP gathering system are buried and not considered to cause an effect to grizzly bears once constructed). Similarly, the ITH Developer expects grizzly bear to reduce use of available habitat by 1 km to 5 km depending on the extent of other human activities. These calculations are provided in Developer Response #114.1. However, the Developer does not expect the Highway or buried pipelines to result in a barrier effect given the large movements undertaken by bears required to cover the large home ranges.

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Patterson, L. A., W. R. Koski, and C. E. Tull. 1977. Ground surveys of terrestrial breeding bird populations along the Cross Delta Gas pipeline route, Yukon Territory and Northwest Territories, June and July, 1975. Chapter 4 in W. W. H. Gunn, C. E. Tull, and T. D. Wright, editors. Ornithological studies conducted in the area of the proposed gas pipeline route: northern Alberta, Northwest Territories, Yukon Territory and Alaska, 1975. Arctic Gas Biological Report Series Volume 35. Prepared by L.G.L. Limited, Environmental Research Associates, Edmonton, Alberta, Canada.

Ward, J. 1975. Continuing surveys of terrestrial bird populations in the Mackenzie Valley, June, 1974. Chapter 4 in W. W. H. Gunn, W. J. Richardson, C. E. Tull, and T. D. Wright, editors. Ornithological studies conducted in the area of the proposed gas pipeline route: Northwest Territories, Yukon Territory and Alaska, 1974. Arctic Gas Biological Report Series Volume 30. Prepared by L.G.L. Limited, Environmental Research Associates, Edmonton, Alberta, Canada.

Developer Response: 114.3

Vegetation

The Developer has completed a terrain analysis for the LSA and submitted a copy to the EIRB. As outlined previously, the Developer is preparing a vegetation base map for the LSA. The preliminary vegetation cover classification and mapping based on desktop review is now complete.

The preliminary mapping assigned a vegetation type to each terrain mapping polygon (2,095 terrain polygons were delineated with an average polygon size of 9 ha except for critical landscape features as small as 1 ha). The terrain polygons often contained more than one vegetation type. For the preliminary mapping, one vegetation type was chosen as the most characteristic of the polygon except for common upland vegetation where two co-dominant types were assigned (i.e., dwarf shrub heath and upland shrub). The air photo interpretation did not identify vegetation cover types that were sufficiently different from MGP vegetation types that they could not be classified using the existing nine MGP vegetation types included in the EIS. This excludes vegetation communities of small extent that may be associated with small features such as thaw slumps or persistent snow banks.

The remaining scope of the vegetation study[1] includes the following:

- Confirm the appropriateness of the vegetation classification system previously used in a portion of the study area;
- Visually assign vegetation cover classifications to polygons mapped as part of terrain study; and
- Summarize the vegetation cover distribution along the highway alignment.

The vegetation cover classification and mapping will be finalized after a field verification in July 2012. The program will be designed to collect vegetation cover data used to confirm and/or further refine the vegetation cover types as assigned during preliminary mapping, and to conduct a rare plant survey. Wildlife habitat modeling requirements will be reviewed with the survey and modeling wildlife biologists to ensure the vegetation mapping will be sufficient for their purposes.

A final vegetation cover map atlas will be produced at a scale of 1:10,000, depicting vegetation cover classes and rare plant locations as appropriate. The final vegetation report and maps will be available by August 31, 2012.

Wildlife

The Developer is amending its original wildlife field program after discussions with biologists from Environment Canada and GNWT ENR. Environment Canada biologists felt they had sufficient inventory and distribution information for the Inuvialuit Settlement Region and, as a result, the scheduled May/June surveys would not assist with the environmental assessment. The Developer will now use vegetation/terrain mapping, LiDAR imagery and existing data (e.g., from CWS, MGP and GNWT ENR) to:

- Complete a desktop study and baseline data review of SARA-listed birds (Rusty Blackbird, Horned Grebe, Short-eared Owl) and waterfowl species in the study area (including distribution, habitat preferences, and life history characteristics);
- Map habitat suitability for Rusty Blackbird, Horned Grebe, Short-eared Owl along the LSA of the identified alignment and specific borrow source sites;
- Use vegetation/terrain mapping and other data sources to identify waterfowl breeding sites (including their size and distance from the proposed alignment) to be used for the development of specific waterfowl metrics;
- Identify potential habitat features (raptors, wolves); and
- Identify low/moderate/high potential grizzly bears denning habitat.

The Developer will also undertake a wildlife survey in June/July 2012 to:

- Complete targeted surveys to assist calibration of the habitat suitability ratings for Rusty Blackbird, Horned Grebe and Short-eared Owl;
- Undertake an aerial survey to determine the distribution of Short-eared Owls along the identified alignment; and
- Undertake an aerial survey to determine waterfowl species distribution and density in waterbodies and wetlands along the LSA of the identified alignment.

[1] A more complete description of the vegetation study parameters is contained in KAVIK-STANTEC. 2012. Inuvik to Tuktoyaktuk Highway – Baseline Data Acquisition Program: Preliminary Vegetation Mapping. Prepared for GNWT DOT April 12, 2012.

Table 10 identifies the revised program to be conducted by KAVIK-STANTEC, which is intended to provide data/mapping to the GNWT Department of Transportation (DOT), Environment Canada and GNWT ENR to assist with mitigation planning for the Inuvik to Tuktoyaktuk Highway. KAVIK-STANTEC will focus the field studies on SARA-listed birds and waterfowl as well as providing mapping to identify grizzly bear denning habitat potential. The Developer expects to confirm its expectations of the absence of habitat suitable for species at risk for which it has not conducted a cumulative effects assessment (i.e., the project will have no effect and, therefore, there are no residual effects to assess with other existing or reasonably foreseeable projects).

TABLE 10: PROPOSED WILDLIFE TASKS/ SURVEYS

Proposed Wildlife Tasks/Surveys	Description	Timing
Development of Bird Species Habitat Maps	• Complete a desktop study and baseline data review of SARA-listed birds (Rusty Blackbird, Horned Grebe, Short-eared Owl, Peregrine Falcon) and waterfowl species in the study area (including distribution, habitat preferences, and life history characteristics) • Using CWS updated species range distribution maps for the NWT, as well as historical data, LiDAR imagery, vegetation/terrain mapping and results of the data/literature review, habitat suitability maps will be developed for: - Rusty Blackbird - Short-eared Owl - Horned Grebe - Peregrine Falcon • Habitat suitability maps will be used to assist potential mitigation and monitoring requirements • Habitat suitability will be mapped along the LSA of the identified alignment and specific borrow source sites • Use vegetation/terrain mapping and other data sources to identify waterfowl breeding sites (including their size and distance from the proposed alignment) to be used for the development of specific waterfowl metrics for mitigation/monitoring planning	Preliminary Map: May 2012 Final Map: July/August 2012
Waterfowl/Raptor Breeding (Aerial)	• Identification and location of potential forage/nesting/rearing areas for waterbirds/waterfowl (distribution and density) • Identification and location of active and historical raptor nesting sites • Aerial transects will be flown within the LSA • Wetlands/lakes with waterfowl breeding activity will be identified and mapped	June/July 2012
Confirmatory Surveys (Bird Species Habitat Maps)	• Breeding bird point counts/transects will be placed throughout the LSA in order to assess a variety of habitat types for breeding potential • Information will be used to assist determination of habitat capability of target species or species groups • Aerial survey transects for short-eared owl will be flown within the LSA • Suitable habitat for rusty blackbird and horned grebe will be ground-truthed within the LSA	June/July 2012

A summary report of the vegetation and wildlife field results is expected by late summer. The report and any required additional analysis (minus confidential data) will be filed with the EIRB as well as GNWT ENR and Environment Canada.

The Developer has filed its current mitigations with the EIRB (see Round 1 IR Responses). The Developer is currently discussing construction phase wildlife mitigation and monitoring plan and intends to expand this plan, in consultation with Environment Canada, to include species under the management of Environment Canada. The Developer expects parties to review (some of these parties may also be regulators) and wildlife co-management groups to receive the report through the EIRB website or directly from its consultants.

Data collected will be provided to GNWT ENR for entry into WMIS or to Environment Canada, Yellowknife.

The results of the project will be to confirm the adequacy of mitigation measures for the construction and operations phase and follow up monitoring requirements. These will be incorporated into the Developer's construction phase Wildlife Mitigation and Monitoring Plan and/or operations phase Wildlife Mitigation and Monitoring Plan. These plans will be reviewed and discussed with co-management groups such as the Hunter and Trapper Committees and the Wildlife Management Advisory Committee as the development of the plans proceeds.

IR Number: 117

Source: **Environment Canada**

To: **GNWT Department of Transportation, Town of Inuvik, Hamlet of Tuktoyaktuk**

Subject: **Potential habitat disturbance within the boreal woodland caribou range**

Preamble

The Developer has noted that the southern end of the proposed HWY may overlap with the northern limit of the range of boreal woodland caribou. Boreal woodland caribou are listed as Threatened on Schedule 1 of the federal Species at Risk Act.

Environment Canada posted a proposed "Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada" on the Species at Risk Public Registry on August 26, 2011. National recovery strategies for federal Species at Risk are planning documents that must identify a species' critical habitat, to the extent possible, and approaches to stop or reverse the decline of the species. The intent of the SARA is to protect critical habitat from being destroyed wherever it occurs.

The proposed recovery strategy for boreal caribou identifies two local population ranges in the Northwest Territories (NWT). The southern end of the proposed highway may overlap with the northern limit of the NWT North boreal woodland caribou range identified in the proposed national recovery strategy.

Maps of the NWT North boreal caribou local population, range attributes and a description of the biophysical attributes of critical habitat, are provided in Appendix F-1 of the proposed Recovery Strategy available at: httpliwww.sararegistry.gc.ca/document/default_e.cfm?docurnentID=2253

The proposed national recovery strategy considers the total disturbed area in a local population range as the area of the anthropogenic footprint plus a 500 m buffer around the perimeter of the footprint (for linear features this equates to the width of the feature plus a 500 m buffer on either side), plus areas where a fire has occurred in the past 40 years (no buffer applied). EC has made the range boundaries and disturbance data (shapefiles) for boreal caribou available online at:

http://www.data.go,ca/default.asp?lang=En&n=5176A6F0-&xs1=datacataloguerecord&metaxsi=datacataloguerecord&formid=F34DCB32-4845-4E88- B125-5ACO3CGE4A7F,°/020F34DCB32-4845-4E88-B125-5ACO3C6E4A7F

Shapefiles are provided for both the buffered anthropogenic disturbance and unbuffered fires within each boreal caribou local population range across Canada.

Request

For the developer to:

1. Provide a map showing whether the proposed highway alignments overlap with the NWT North boreal caribou range.
2. Calculate the area of new disturbance that the highway corridor will cause, including a 500 m buffer on either side of the direct footprint from the highway right of way, if a portion of any of the proposed routes lies within the NWT North boreal caribou range.

Developer Response: 117.1

Environment Canada requested a map showing whether the Highway alignments overlap with the NWT North boreal caribou range identified in the proposed "Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada" (2011). The Developer performed this overlay and determined the Highway alignment did not overlap the NWT North boreal caribou range.

However, the GNWT ENR advised the Developer that it has prepared a revised boundary for the range of species. This revised boundary has been issued for review by the Northwest Territories Species at Risk Committee in the "Species Status Report: Woodland Caribou (Boreal Population) (*Rangifer tarandus caribou*) in the Northwest Territories" (Draft for Review, March 2012). The Developer was requested by GNWT ENR to also overlay the revised boundary as that department is currently in discussion with Environment Canada regarding range boundaries.

Two figures have been produced. Figure 13 shows the portion of the NWT SARC range boundary and the project footprint (i.e., alignment, borrow source winter access roads, and borrow sources) and forest fires (since 1968) within the cumulative effects study area. Forest fire data provided by Environment Canada do not show any fires occurring in the cumulative effects area. However, fire data provided by GNWT, and previously shown in Figure 3.1.8-5 of the EIS, are included in Figures 13 and 14.

Figure 14 shows the Project footprint, forest fires and a 500 m buffer on either side of the Project footprint (see also Developer Response #114.1).

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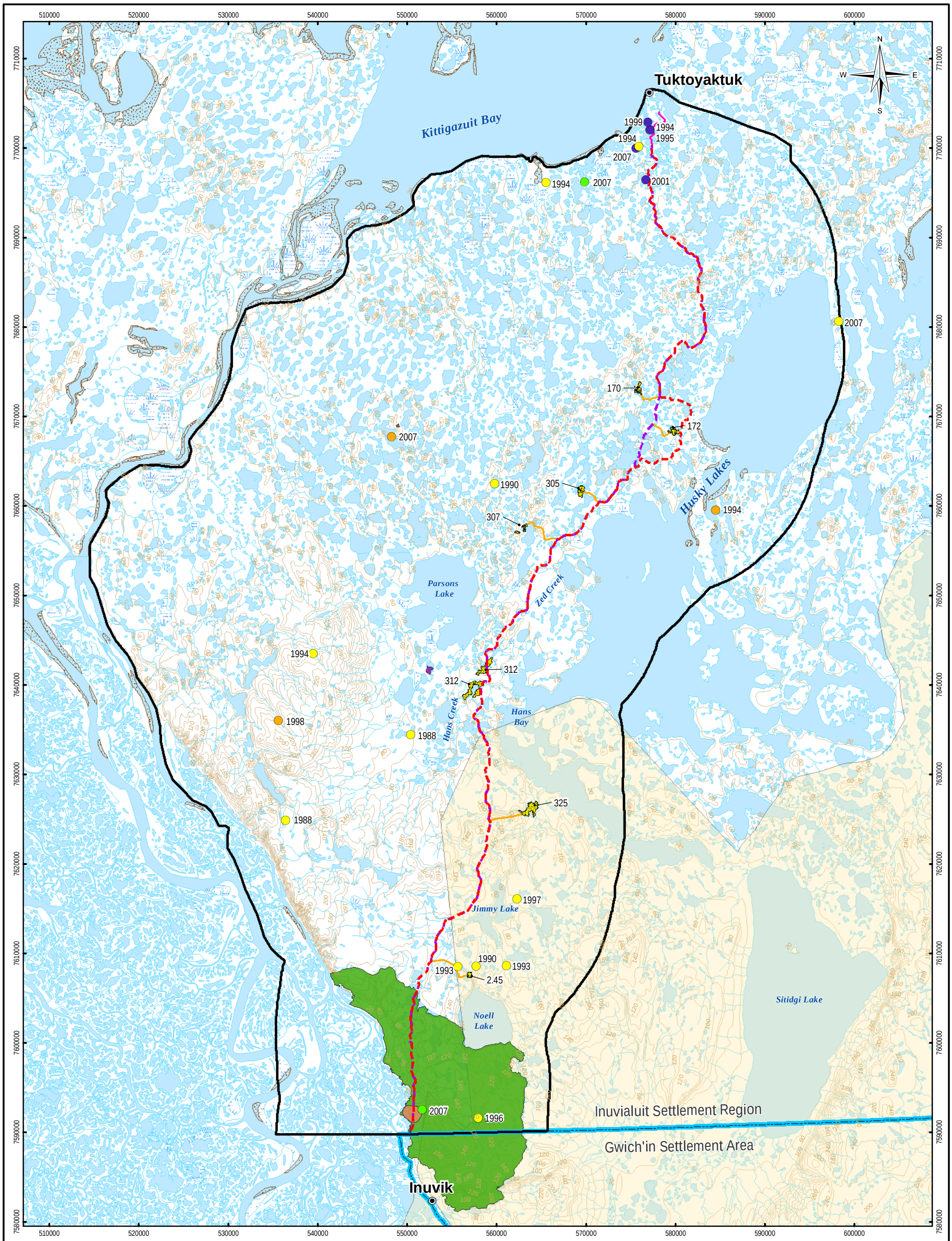

LEGEND

- Alternative 1 (2009 Minor Realignment)
- Alternative 3 (2010 Minor Realignment)
- ITH Borrow Source Access Road
- ITH Borrow Source
- Navy Road
- Tuk to 177 Access Road
- Cumulative Effects Study Area
- Boreal Caribou Northern Range
- Gwich'in / Inuvialuit Boundary

Fire Ignition Cause
- Lightning
- Recreation
- Resident
- Unknown

Historical Fires
- 1968
- 1974
- 2007

- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. Base data source: NTS 1:250,000
2. ITH Borrow Sources, ITH Borrow Source Access Roads provided by GNWT (2012).
3. Boreal Caribou Northern Range: NWT Species at Risk Committee Draft. March 2012.
4. Fire Ignition and Historical Fires: GNWT ENR - FMD, February 2011.

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Disturbance Footprints in the NWT North Boreal Caribou Range

PROJECTION	DATUM
UTM Zone 8	NAD83

Scale: 1:400,000
5 2.5 0 5 10
Kilometres

FILE NO.: V23201322_IR2_Map012_DisturbCaribou.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE	DATE
EBA-VANC	April 25, 2012

Figure 13

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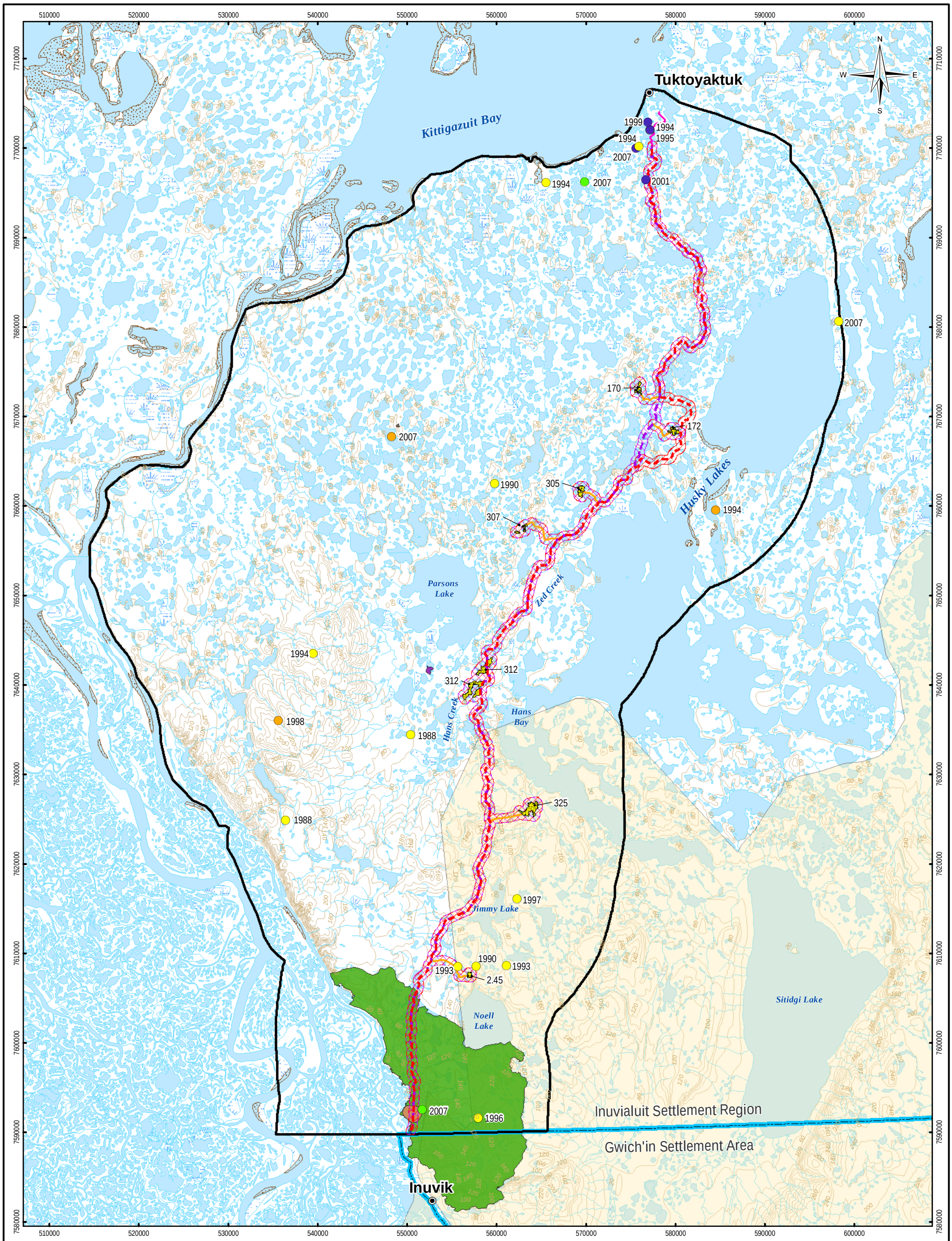

LEGEND

- Alternative 1 (2009 Minor Realignment)
- Alternative 3 (2010 Minor Realignment)
- ITH Borrow Source Access Road
- ITH Borrow Source
- 500 m Disturbance Buffer
  - Alternative 1
  - Alternative 3
- Navy Road
- Tuk to 177 Access Road
- Cumulative Effects Study Area
- Boreal Caribou Northern Range
- Gwich'in / Inuvialuit Boundary

Fire Ignition Cause
- Lightning
- Recreation
- Resident
- Unknown

Historical Fires
- 1968
- 1974
- 2007

- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. Base data source: NTS 1:250,000
2. ITH Borrow Sources, ITH Borrow Source Access Roads provided by GNWT (2012).
3. Boreal Caribou Northern Range: NWT Species at Risk Committee Draft. March 2012.
4. Fire Ignition and Historical Fires: GNWT ENR - FMD, February 2011.

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

500 m Disturbance Buffers in the NWT North Boreal Caribou Range

PROJECTION	DATUM
UTM Zone 8	NAD83

Scale: 1:400,000
5 2.5 0 5 10
Kilometres

FILE NO.: V23201322_IR2_Map013_DisturbCaribou2.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE	DATE
EBA-VANC	April 25, 2012

Figure 14

Developer Response: 117.2

Environment Canada requested a calculation of a 500 m buffer around the perimeter of the footprint and stipulated that, for linear features, this equates to the width of the feature plus a 500 m buffer on either side, plus areas where a fire has occurred in the past 40 years (no buffer applied). As mentioned in 117.1, as the Highway alignment does not overlap the current NWT North boreal caribou range in the proposed national recovery strategy, the calculations were performed for the new NWT SARC range boundary (see also Developer Response #114.1).

Figure 7 indicates that about 25 km of the Highway (approximately KM 26 to KM 49) crosses boreal caribou range. The total area of historical fires within the boreal caribou range of the cumulative effects area is 6,827 ha, compared to 20,098 ha within the cumulative effects area. The total area of the Highway disturbance buffer (i.e., footprint plus 500 m buffer) within the boreal caribou range is 3,590 ha.

Table 11 identifies the area of the each route alternative's footprint and 500 m buffer based on each EOSD category.

TABLE 11: AREA OF HIGHWAY FOOTPRINT AND 500 M BUFFER WITHIN THE BOREAL CARIBOU RANGE

	Highway (Footprint + 500 m Buffer)
	Area (ha)
Broadleaf Dense	5.23
Broadleaf Open	18.93
Bryoids	1,428.04
Not Classified	0.43
Coniferous Dense	28.11
Coniferous Open	62.26
Coniferous Sparse	219.35
Exposed/Barren Land	319.75
Herbs	123.23
Mixedwood Dense	94.37
Mixedwood Open	4.27
Rock/Rubble	97.97
Shrub Low	629.52
Shrub Tall	260.54
Water	129.91
Wetland-Herb	106.41
Wetland-Shrub	37.44
Wetland-Treed	24.39
Snow/Ice	0.00
Total	**3,590.16**