KIGGIAK - EBA

September 11, 2012

ISSUED FOR USE
FILE: V23201487
Via Email: eirb@jointsec.nt.ca

Environmental Impact Review Board
204-107 Mackenzie Road
P.O. Box 2121, Inuvik, NT X0E 0T0

Attention: Eli Nasogaluak, Environmental Assessment Coordinator

Dear Mr. Nasogaluak,

Subject: Revised Response to Technical Session IRs – Material Sources

On behalf of the Government of the Northwest Territories – Department of Transportation, Town of Inuvik and Hamlet of Tuktoyaktuk, Kiggiak-EBA Consulting Ltd. is pleased to submit this Revised Response to Technical Session IRs – Material Sources. The document is attached and forms part of this letter.

The Revised Response to Technical Session IRs – Material Sources updates and replaces the document entitled "Response to Technical Session IRs – Material Sources – 2012-09-04" which currently appears on the registry.

We ask that you include his letter and attached document in the overall information for consideration of the proposed Inuvik to Tuktoyaktuk Highway in this project.

Material Source PW2 is no longer included as a primary material source for construction and operation of the proposed Highway project.

Information presented regarding material source PW2, as presented in the following reports and supplemental filings, is not to be considered within the scope the scope of the proposed Highway project.

- Inuvik – Tuktoyaktuk Highway Baseline Data Acquisition Program: Wildlife Habitat Potential Mapping, Supplemental Maps
- Inuvik – Tuktoyaktuk Highway Baseline Data Acquisition Program: Vegetation Mapping and Rare Plant Surveys, Final Report
- Inuvik – Tuktoyaktuk Highway – Terrain and Permafrost Field Verification Program, Final Report
- Supplemental Filing: Vegetation and Wildlife Habitat Suitability Calculations – Inuvik to Tuktoyaktuk Highway

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We trust this information meets your present requirements. If you have any questions or comments, please contact the undersigned.

Sincerely,
Kiggiak-EBA Consulting Ltd.

Robyn V. McGregor, M.Sc., P.Eng.
Senior Transportation Engineer and Principal Consultant
Circumpolar/Arctic
Direct Line: 403.723.3269
Email: rmcgregor@eba.ca

Attachment: Revised Response to Technical Session IRs – Material Sources

Hamlet of Tuktoyaktuk, Town of Inuvik
Government of Northwest Territories

ISSUED FOR USE

RESPONSE TO INFORMATION REQUESTS RELATIVE TO MATERIAL SOURCES RAISED AT TECHNICAL SESSIONS; AUGUST 22 AND 23, 2012 FROM THE ENVIRONMENTAL IMPACT REVIEW BOARD FOR CONSTRUCTION OF THE INUVIK TO TUKTOYAKTUK HIGHWAY, NWT

EIRB FILE NO. 02/10-05

Revised September 10, 2012

ACRONYMS

EIS	Environmental Impact Statement
GNWT	Government of the Northwest Territories
IR	Information Request

The Developers of the proposed Inuvik to Tuktoyaktuk Highway are pleased to provide these responses to the Environmental Impact Review Board's Information Requests raised at the Technical Sessions held in Inuvik on August 22 and 23, 2012 relative to material sources.

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.

IR Number: TS-1

Source:	**Environmental Impact Review Board**
To:	**GNWT Department of Transportation, Town of Inuvik, Hamlet of Tuktoyaktuk**
Subject:	**Methodology to Determine Granular Estimates in Material Sources and Methods for Protection of Massive Ice Layers within Material Sources**

Preamble

The Board would like to confirm the accuracy of the granular resources amounts as reported for the 7 borrow pits investigated, but in particular, Source 170 and 314/325 which are the only 2 proposed to be used for construction/maintenance of the Highway. In some borrow sources (e.g., Source 170), it appears that there is massive ice (or at least substantial thickness of ice) within the source. The Board wants to know whether there will be any measures to protect the degradation of this ice, for example by leaving it covered with granular material.

Request

1. Provide detailed methodology (step by step), that explains the process for using borehole log information to determine granular estimates for the entire source. This would include methods for "interpolating" between boreholes, classifying overburden, accounting for ice, etc..
2. Where ice was encountered at depth in the boreholes (e.g., 170-102 and others at 170), was granular material overlying the ice used to calculate the granular volume of the deposit?
3. What measures will be used to protect the degradation of massive ice at depth within borrow sources?

Developer Response: TS-1.1

The boreholes were drilled using an approximate spacing of 100 m on a grid pattern across the selected borrow areas, with the intent that each borehole was representative of the soils on a 50 m radius around the borehole location. As such, the volumes of material were calculated using the radius of 50 m.

Where boreholes were spaced greater than 100 m apart, the radius of only 50 m was still used. Where boreholes were drilled closer than 100 m apart, the reduced radius was used (i.e. if the boreholes were drilled 90 m apart, the radius used in volume estimation for those boreholes was 45 m).

At each borehole, the depth and thickness of each stratum was logged. To estimate the volumes (quantities) of materials present in the borehole, it was inferred that these strata extended horizontally outwards from the borehole for a radius of 50 m (or smaller as described above) around the borehole. The volumes (quantity) of material present at each borehole location were calculated from the thickness of each stratum using the radius of 50 m (or smaller as required) to provide a 'column' of soil at each borehole location. Table TS-1-1 provides an example from borehole 170-1-1.

Table TS-1-1: Calculation of Soil Volume at Borehole 170-1-1 (Surface Elevation 39.4 m)

Soil Description	Soil Stratum Starting Elevation (m)	Soil Stratum Ending Elevation (m)	Soil Stratum Thickness (m)	Borehole Coverage Area (based on 50 m radius) (m^2)	Estimated Soil Volume (m^3)
Sand & Gravel	39.4	33.9	5.50	Area = $\pi(50\ m)^2$ = 7,850	Volume = 5.50 x 7,850 = 43,175
Gravel	33.9	32.5	1.40	7,850	10,990

Materials described on the logs as a mixture of soils and ice (i.e. Ice & Sand) were not included in the estimated material quantities. Only those soils logged with the predominant material types of Sand, Sand & Gravel, or Gravel were included in the material quantity estimates.

The estimated quantities provided are a bulk summation of all layers of aggregate (Sand, Sand & Gravel, Gravel) encountered in the boreholes per borrow source using this 'column' approach.

The overburden quantities noted are a summation of the volumes of any non-aggregate materials (organics, silt, etc) present at surface over aggregate deposits in the order of at least 1 m thickness.

Figure TS-1-1 provides a summary of soil volumes calculated from each borehole at borrow source 170.

It is understood that some areas of the borrow sources may not be developed due to the presence of the unsuitable materials for economic or construction constraints; however, the details pertaining to borrow source pit development are yet to be finalized as they are currently being developed and are to be provided within the pit management plans for the borrow sources.

It is envisioned that all mine operations (excavation) will occur in the winter months, and that any areas with massive ice exposed at the base of the excavation could be covered with overburden and organics during reclamation at the end of the winter mining season to minimize thaw settlement during the summer months.

Figure TS-1-1: Soil volumes used to calculate aggregate volumes at borrow source 170

BORE HOLE CO-ORDINATE TABLE									
NORTHING	EASTING	ELEV.	BOREHOLE	STARTING ELEV. (m)	END ELEV. (m)	THICKNESS (m)	SOIL DESCRIPTION	Borehole Coverage Area (50 m radius)	Estimated Soil Volume (m3)
7673927.6	575942.7	39.4	BH ASB - 170-1-1	39.40	33.90	5.50	SAND AND GRAVEL	7850	43175
				33.90	32.50	1.40	GRAVEL	7850	10990
7673819.7	576028.9	40.5	BH ASB - 170-1-2	40.50	40.20	0.30	SAND AND GRAVEL	7850	2355
				40.20	36.40	3.80	SAND	7850	29830
				36.40	33.80	2.60	ICE	7850	20410
7673858.0	575919.2	40.3	BH ASB - 170-1-3	40.30	40.10	0.20	ORGANICS	7850	1570
				40.10	39.10	1.00	SAND	7850	7850
				39.10	35.10	4.00	SILT	7850	31400
				35.10	33.40	1.70	ICE	7850	13345
7673715.7	576070.3	36.7	BH ASB - 170-1-4	36.70	36.10	0.60	SILT	7850	4710
				36.10	29.50	6.60	ICE	7850	51810
7673723.2	575968.9	38.9	BH ASB - 170-1-5	38.90	38.40	0.50	ORGANICS	7850	3925
				38.40	31.70	6.70	ICE	7850	52595
7673756.5	575905.2	40.3	BH ASB - 170-1-6	40.30	37.60	2.70	SAND	7850	21195
				37.60	36.60	1.00	ICE	7850	7850
				36.60	34.70	1.90	SAND	7850	14915
				34.70	33.40	1.30	ICE	7850	10205
7673655.3	576035.1	39.5	BH ASB - 170-1-7	39.50	38.00	1.50	GRAVEL	7850	11775
				38.00	32.60	5.40	ICE	7850	42390
7673664.7	575972.7	40.7	BH ASB - 170-1-8	40.70	39.60	1.10	SAND AND GRAVEL	7850	8635
				39.60	38.40	1.20	ICE	7850	9420
				38.40	34.90	3.50	SAND	7850	27475
				34.90	33.50	1.40	ICE	7850	10990
7673654.4	575867.0	40.0	BH ASB - 170-1-9	40.00	38.80	1.20	SAND AND GRAVEL	7850	9420
				38.80	36.20	2.60	SILT	7850	20410
				36.20	34.50	1.70	SAND	7850	13345
				34.50	32.80	1.70	ICE	7850	13345
7673569.8	575943.4	33.7	BH ASB - 170-1-10	33.70	33.40	0.30	ORGANICS	7850	2355
				33.40	32.30	1.10	ICE	7850	8635
				32.30	25.30	7.00	SAND AND GRAVEL	7850	54950
7673583.0	575834.9	37.4	BH ASB - 170-1-11	37.40	30.40	7.00	SAND AND GRAVEL	7850	54950
7673503.1	575867.0	36.6	BH ASB - 170-1-12	36.60	34.20	2.40	GRAVEL	7850	18840
				34.20	31.10	3.10	SAND	7850	24335
				31.10	29.90	1.20	ICE	7850	9420
7673420.5	575893.4	34.7	BH ASB - 170-1-13	34.70	31.80	2.90	SAND AND GRAVEL	7850	22765
				31.80	28.60	3.20	ICE	7850	25120
7673417.3	575822.6	37.6	BH ASB - 170-1-14	37.60	37.00	0.60	SILT	7850	4710
				37.00	32.10	4.90	SAND	7850	38465
				32.10	27.70	4.40	SAND AND GRAVEL	7850	34540
7673351.8	575878.2	38.6	BH ASB - 170-1-15	38.60	37.20	1.40	SILT	7850	10990
				37.20	34.60	2.60	SAND	7850	20410
				34.60	32.50	2.10	ICE	7850	16485
7673242.4	575957.4	38.2	BH ASB - 170-1-16	38.20	37.90	0.30	ORGANICS	7850	2355
				37.90	35.50	2.40	SAND	7850	18840
				35.50	33.30	2.20	ICE	7850	17270
				33.30	32.70	0.60	SAND	7850	4710
				32.70	31.30	1.40	ICE	7850	10990
7673218.4	575881.4	39.7	BH ASB - 170-1-17	39.70	37.40	2.30	SILT	7850	18055
				37.40	34.80	2.60	ICE	7850	20410
7673283.1	575838.7	40.2	BH ASB - 170-1-18	40.20	40.10	0.10	ORGANICS	7850	785
				40.10	37.90	2.20	SILT	7850	17270
				37.90	35.00	2.90	ICE	7850	22765
				35.00	34.70	0.30	SILT	7850	2355
				34.70	33.30	1.40	ICE	7850	10990
7673257.2	575791.0	39.4	BH ASB - 170-1-19	39.40	37.00	2.40	GRAVEL	7850	18840
				37.00	32.50	4.50	ICE	7850	35325
7673182.7	576035.0	33.8	BH ASB - 170-1-20	33.80	33.20	0.60	ORGANICS	7850	4710
				33.20	31.50	1.70	SILT	7850	13345
				31.50	29.40	2.10	SAND	7850	16485
				29.40	26.90	2.50	ICE	7850	19625
7673126.6	575879.4	34.6	BH ASB - 170-1-21	34.60	33.10	1.50	SAND	7850	11775
				33.10	28.50	4.60	ICE	7850	36110
7673165.3	575833.2	38.0	BH ASB - 170-1-22	38.00	36.60	1.40	SAND AND GRAVEL	7850	10990
				36.60	31.10	5.50	ICE	7850	43175
7673188.9	575766.8	37.6	BH ASB - 170-1-23	37.60	37.40	0.20	ORGANICS	7850	1570
				37.40	36.70	0.70	SILT	7850	5495
				36.70	35.20	1.50	SAND	7850	11775
				35.20	30.70	4.50	GRAVEL	7850	35325
7673089.2	576055.2	35.3	BH ASB - 170-1-24	35.30	35.00	0.30	ORGANICS	7850	2355
				35.00	33.90	1.10	SAND	7850	8635
				33.90	28.40	5.50	ICE	7850	43175
7673104.2	575983.3	35.1	BH ASB - 170-1-25	35.10	34.50	0.60	ORGANICS	7850	4710
				34.50	32.80	1.70	SAND	7850	13345
				32.80	29.00	3.80	ICE	7850	29830
7673096.8	575834.5	34.0	BH ASB - 170-1-26	34.00	33.20	0.80	SILT	7850	6280
				33.20	24.00	9.20	SAND	7850	72220
7673029.2	575792.1	32.7	BH ASB - 170-1-27	32.70	31.80	0.90	SAND	7850	7065
				31.80	27.20	4.60	ICE	7850	36110
7673036.8	575722.2	31.2	BH ASB - 170-1-28	31.20	29.10	2.10	ICE	7850	16485
				29.10	26.60	2.50	SAND	7850	19625
				26.60	21.20	5.40	SAND AND GRAVEL	7850	42390
7673009.5	575665.3	29.8	BH ASB - 170-1-29	29.80	28.30	1.50	SAND	7850	11775
				28.30	27.40	0.90	SAND AND GRAVEL	7850	7065
				27.40	22.80	4.60	SAND	7850	36110
				22.80	21.70	1.10	GRAVEL	7850	8635
7673056.8	575561.6	25.7	BH ASB - 170-1-30	25.70	23.90	1.80	SAND AND GRAVEL	7850	14130
				23.90	23.30	0.60	GRAVEL	7850	4710
				23.30	18.80	4.50	ICE	7850	35325
7673070.0	575490.5	25.9	BH ASB - 170-1-31	25.90	22.90	3.00	SAND AND GRAVEL	7850	23550
				22.90	20.60	2.30	GRAVEL	7850	18055
7672947.8	575709.1	29.7	BH ASB - 170-1-32	29.70	28.50	1.20	SAND AND GRAVEL	7850	9420
				28.50	26.80	1.70	SAND	7850	13345
				26.80	22.80	4.00	ICE	7850	31400
7672830.1	575747.7	24.2	BH ASB - 170-1-33	24.20	23.60	0.60	GRAVEL	7850	4710
				23.60	22.10	1.50	SAND	7850	11775
				22.10	20.20	1.90	GRAVEL	7850	14915
				20.20	19.60	0.60	SILT	7850	4710
				19.60	18.70	0.90	ICE	7850	7065
7672823.3	575597.6	28.8	BH ASB - 170-1-34	28.80	27.90	0.90	SAND	7850	7065
				27.90	26.40	1.50	GRAVEL	7850	11775
				26.40	24.20	2.20	ICE	7850	17270
7672868.5	575577.3	29.6	BH ASB - 170-1-35	29.60	29.30	0.30	ORGANICS	7850	2355
				29.30	24.30	5.00	ICE	7850	39250
7672841.5	575515.5	27.3	BH ASB - 170-1-36	27.30	26.40	0.90	ICE	7850	7065
				26.40	25.80	0.60	SAND AND GRAVEL	7850	4710
				25.80	24.90	0.90	SAND	7850	7065
				24.90	23.00	1.90	GRAVEL	7850	14915
				23.00	20.40	2.60	ICE	7850	20410
7672843.2	575439.3	24.3	BH ASB - 170-1-37	24.30	23.70	0.60	SILT	7850	4710
				23.70	22.20	1.50	SAND AND GRAVEL	7850	11775
				22.20	20.80	1.40	SAND	7850	10990
				20.80	18.50	2.30	ICE	7850	18055
7672968.4	576054.3	30.9	BH ASB - 170-1-38	30.90	30.80	0.10	ORGANICS	7850	785
				30.80	30.30	0.50	SAND AND GRAVEL	7850	3925
				30.30	29.40	0.90	GRAVEL	7850	7065
				29.40	27.40	2.00	SAND	7850	15700
				27.40	24.00	3.40	ICE	7850	26690
7672885.2	576039.4	32.2	BH ASB - 170-1-39	32.20	32.10	0.10	ORGANICS	7850	785
				32.10	31.90	0.20	GRAVEL	7850	1570
				31.90	29.80	2.10	SAND	7850	16485
				29.80	28.20	1.60	GRAVEL	7850	12560
				28.20	27.30	0.90	SAND	7850	7065
				27.30	25.20	2.10	SAND AND GRAVEL	7850	16485
				25.20	22.20	3.00	SAND	7850	23550
7672822.3	576009.4	29.6	BH ASB - 170-1-40	29.60	29.30	0.30	ORGANICS	7850	2355
				29.30	29.00	0.30	GRAVEL	7850	2355
				29.00	27.20	1.80	SILT	7850	14130
				27.20	25.60	1.60	ICE	7850	12560
				25.60	23.80	1.80	SILT	7850	14130
7672744.5	576008.6	27.9	BH ASB - 170-1-41	27.90	27.80	0.10	ORGANICS	7850	785
				27.80	21.00	6.80	SILT	7850	53380
7672650.0	576055.4	34.7	BH ASB - 170-1-42	34.70	34.60	0.10	ORGANICS	7850	785
				34.60	34.10	0.50	SAND	7850	3925
				34.10	27.80	6.30	ICE	7850	49455
7672574.0	576102.9	36.2	BH ASB - 170-1-43	36.20	35.60	0.60	ORGANICS	7850	4710
				35.60	34.70	0.90	SAND	7850	7065
				34.70	33.50	1.20	ICE	7850	9420
				33.50	32.50	1.00	SAND	7850	7850
				32.50	28.90	3.60	SAND AND GRAVEL	7850	28260
				28.90	27.10	1.80	SAND	7850	14130
7673802.3	575958.6	41.6	BH ASB - 170-1-44	41.60	40.20	1.40	SAND	7850	10990
				40.20	39.50	0.70	ICE	7850	5495
				39.50	37.60	1.90	SAND	7850	14915
				37.60	34.40	3.20	ICE	7850	25120

Estimated Total Sand Volume	602,095	(m^3)
Estimated Total Gravel Volume	95,770	(m^3)
Estimated Total Sand & Gravel Volume	348,540	(m^3)
Estimated Total Ice Volume	938,860	(m^3)
Estimated Total Silt Volume	226,080	(m^3)
Estimated Total Organics Volume	36,895	(m^3)

Developer Response: TS-1.2

Yes. Aggregates present overlying ice are included in the estimated quantities. The estimated quantities provided are a bulk summation of all layers of aggregate (Sand, Sand & Gravel, and Gravel) encountered in the boreholes per borrow source. No separation or discounting of material was undertaken relative to presence of massive ice above or below the materials encountered.

Developer Response: TS-1.3

At the end of each winter open faces and areas of operation will be reclaimed in accordance with the pit management plan, permit conditions and relevant guidelines. Areas of ice will be left with 1 to 2 m of cover. If sufficient volume of overburden material is available from the initial stripping operation, this overburden will be used as cover for the ice. Where sufficient volume of overburden material is not available, borrow material will be left in-situ to a depth that is sufficient to achieve the necessary cover when the available overburden material is placed. Estimates of available material quantities have been adjusted from those provided in the borrow source investigation reports (Kavik-Stantec 2012) to account for borrow material to be left in place.

IR Number: TS-2

Source: **Environmental Impact Review Board**
To: **GNWT Department of Transportation, Town of Inuvik, Hamlet of Tuktoyaktuk**
Subject: **Estimated Material Requirements and Primary Material Sources**

Preamble

The Board would like to confirm the estimated material requirements for construction and operations of the Highway over the 50 year operational period. A table of estimated material requirements was presented at the Technical Session on August 23, 2012, but the estimate of total material requirements shown in that table appears to differ from estimates previously provided. The Board would also like to confirm the material sources to be used for construction and operations given the prospect of adjusting estimates of available material in the borrow sources due to the need to retain a cover over natural ice layers. A greater understanding of the potential area where development is likely to occur for each material source will also aid in the assessment.

Request

1. Confirm the estimated material requirements for construction and operations of the Highway over the 50 year operational period.
2. Confirm the material sources to be used for construction and operations, and the estimated volume of material to be taken from each.
3. Provide airphotos for each material source showing an outline of the area where development is likely to occur.

Developer Response: TS-2.1

Table TS-2-1 shows the estimated materials requirements for construction and operations of the Highway over the 50 year period. The total estimated quantity shown for construction and operations is the same as the total presented in the Technical Session on August 23, 2012. The estimated quantities are for the preferred alignment - Alternative 3, 2010 Minor Realignment. Estimated quantities for construction of Alternative 3 were first shown in Table IR2-1 of the Developer's response to January 16, 2012 Information Requests. A minor correction has been made in the quantity estimates and the total estimated material requirements for construction are presented in the table below.

Estimated quantities for operation of the Highway (maintenance and rehabilitation) for the 50 year period were previously presented in Developer's response to IR 90.2 (March 2012, page 4, Table 1) and the estimated quantities shown at that time were for a 137 km alignment. Alternative 3 is 135.5 km in length. The amount of material estimated for operation of the 135.5 km of highway of the 50 year period for 135.5 km is slightly lower. The total estimated material requirements for operation of the Highway over the 50 year period is presented in the table below. The quantity of material

required for years 1 to 20 is greater than that required for years 21 to 40 (for common) as the majority of the compaction and consolidation is anticipated to occur in the first 20 year period.

Table TS-2-1: Estimated material requirements for the 50-year period

Source	Construction Embankment (m^3)	Construction Surfacing (m^3)	Operational Common & Crush - Year 1 to 20 (m^3)	Operational Common & Crush - Year 21 to 40 (m^3)	Operational Common & Crush - Year 41 to 50 (m^3)	Estimated Total Requirement (m^3)	Estimated Amount Available in Source (m^3)
325/314	1,094,750	82,300	558,750	300,000	89,000	2,124,800	2,124,800[1]
309	979,000	82,300	220,000	175,000	-	1,456,300	1,500,000[2]
174	1,141,500	82,400	900,000	687,250	296,500	3,107,650	3,280,000[3]
170	562,750	-	-	-	-	562,750	672,540[4]
177	677,000	-	238,500	100,000	-	1,015,500	1,510,000[5]
Totals	4,455,000	247,000	1,917,250	1,262,250	385,500	8,267,000	9,087,340

Notes:

[1] The reference for this source is Kavik-Stantec Inc., 2012. Inuvik - Tuktoyaktuk Highway 2012 Borrow Source Investigation, Borrow Source 314/325 Summary Report. Prepared for E Gruben's Transport Ltd. July 2012. The estimated amount available in the source has been adjusted to account for material left in-situ over massive ice.

[2] Ripley, Klohn & Leonoff International Limited , 1972. Granular materials inventory, Zone III. Prepared for Department of Indian Affairs and Northern Development. 1972.

[3] R.M Hardy & Associates Ltd., 1977. Granular Materials Inventory, Tuktoyaktuk, Northwest territories. Prepared for Department of Indian and Northern Development. August 1977.

[4] The reference for this source is Kavik-Stantec Inc., 2012. Inuvik - Tuktoyaktuk Highway 2012 Borrow Source Investigation, Borrow Source 170 Summary Report. Prepared for E Gruben's Transport Ltd. July 2012. The estimated amount available in the source has been adjusted to account for material left in-situ over massive ice.

[5] The reference for this source is R.M Hardy & Associates Ltd., 1977. Granular Materials Inventory, Tuktoyaktuk, Northwest territories. Prepared for Department of Indian and Northern Development. August 1977. The estimated amount of available material source reported is

1,910,000 m^3. This amount has been adjusted to account for the 400,000 m^3 used to construct the access road from Tuktoyaktuk to Source 177.

Developer Response: TS-2.2

The material sources to be used for construction and operation of the proposed highway, and the estimated amount of material to be taken from each source is provided in the table above.

The next steps for the material sources listed include:

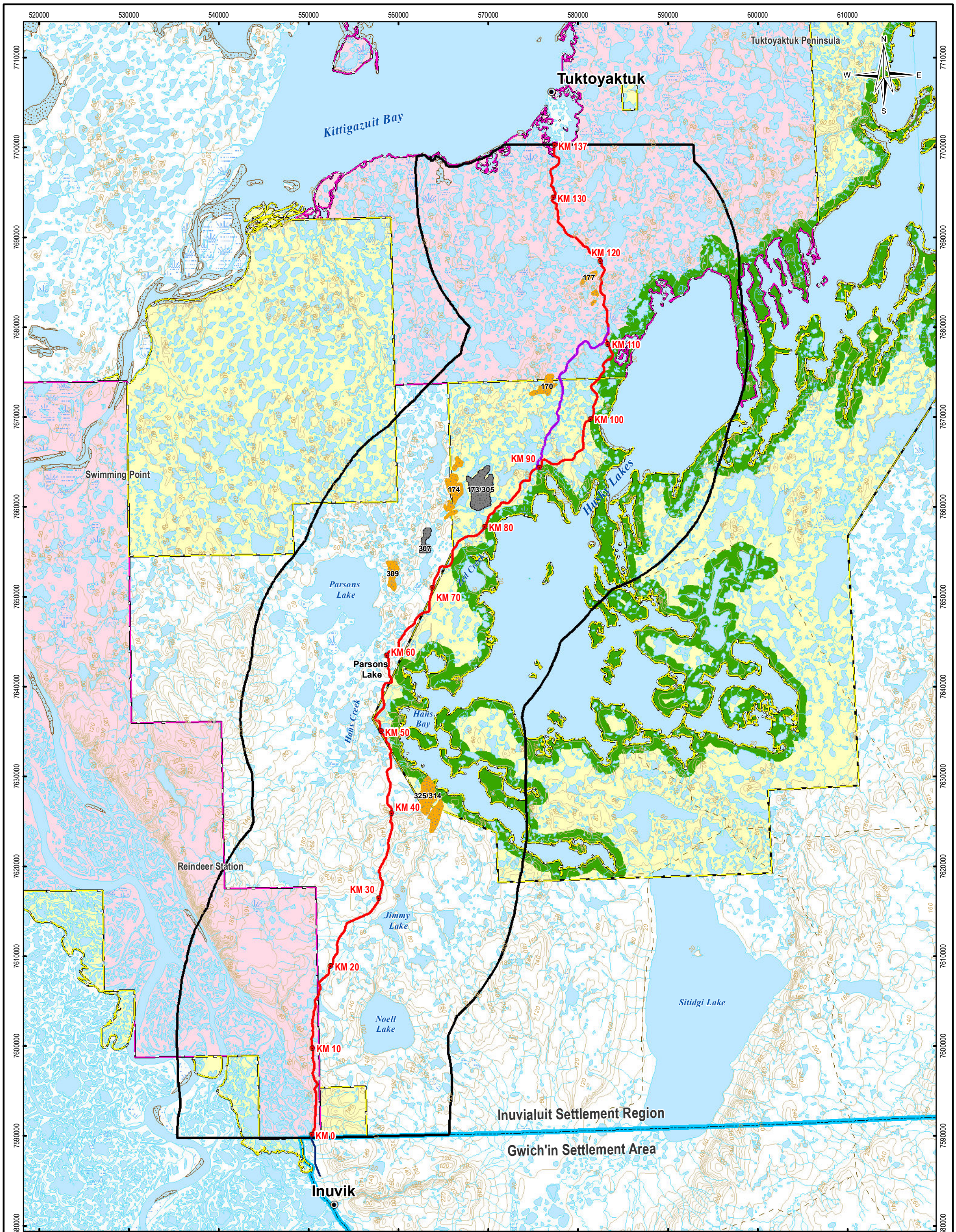
- Investigation (drilling) of Sources 309, 174, 177 to confirm material quantity and quality estimates and conduct site-specific studies, as needed, to support the regulatory approvals process (land use and quarry permits).
- Develop Pit Management Plans and secure Land Use and Quarry Permits for all material sources prior to construction.

Sources 173/305 and 307 are included as secondary sources for construction and operation of the Highway. The estimated available in these sources is 1,890,000 m^3 (Kavik-Stantec 2012). With an adjustment for cover over ice in the pit the estimated available in these sources could be 1,700,500 m^3 (additional to the available volume shown in Table TS-1-1). It is not anticipated that any material will be extracted from these sources, but they are retained in consideration should one of the primary sources be found during the investigation noted above, to not have the quantity of material currently estimated. If needed, Pit Management Plans will be developed for these two secondary sources, and Land Use and Quarry Permits will be secured prior to construction.

Developer Response: TS-2.3

Airphotos of each of the primary sources showing the area within which development of the source will occur are attached. Similar airphotos for the secondary sources are included in the borrow source investigation reports submitted previously (Kavik-Stantec 2012).

Q:\Vancouver\GIS\ENVIRONMENTAL\V232\V23201322_TukRoad_EIS\Maps\TechnicalSessions\V23201322_TS2_Map001_BorrowSources_v2.mxd modified 9/10/2012 by morgan.zondervan



LEGEND

- Regional Study Area (15 km buffer)
- Primary 2009 Route
- Alternative 3 (2010 Minor Realignment, Preferred Alignment)
- Navy Road
- Inuvialuit 7(1)(a) Lands
- Inuvialuit 7(1)(b) Lands
- Gwich'in / Inuvialuit Boundary
- Primary Highway Borrow Source
- Secondary Highway Borrow Source
- Husky Lakes 1000m Setback
- Trail
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES

Base data source: NTS 1:250,000

Borrow Sources, ILA Lands, Husky Lakes 1000m Setback: Inuvialuit Land Administration

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Primary and Secondary Borrow Sources Considered for Highway

PROJECTION: UTM Zone 8	DATUM: NAD83		
Scale: 1:400,000 (5 2.5 0 5 10 Kilometres)			
FILE NO.: V23201322_TS2_Map001_BorrowSources_v2.mxd			
PROJECT NO.: V23201322	DWN: MEZ	CKD: TS	REV: 1
OFFICE: EBA-VANC	DATE: September 10, 2012		

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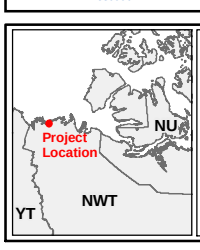
Figure 1



Inuvik – Tuktoyaktuk Highway, Baseline Studies

Borrow Source 177 North
1:10,000
Area at Borrow Source: 149.82 hectares (Land)

Acknowledgements: Original Drawing by KAVIK-STANTEC LTD

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Northwest Territories Transportation

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KAVIK-STANTEC

FIGURE NO.
1 of 8

Last Modified: August 26, 2012 By: jpetho

581000 581500 582000 582500 583000

7685000 7684500 7684000 7683500 7683000 7682500 7682000

N

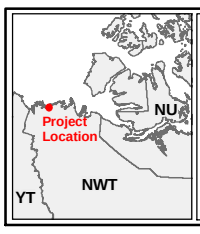
KP116
KP117
KP115
KP116
KP114
KP115
KP113

177
177

Preferred Route Kilometre Post
Preferred Route
Alternate Route Kilometre Post
Alternate Route
ITH Borrow Sources

0 100 200 300 400
Metres - 1:10,000

123510689-020



Inuvik – Tuktoyaktuk Highway, Baseline Studies

Borrow Source 177 South
1:10,000
Area at Borrow Source: 149.82 hectares (Land)

Acknowledgements: Original Drawing by KAVIK-STANTEC LTD

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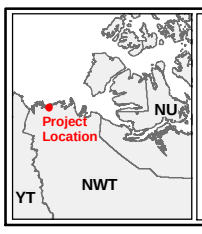
FIGURE NO.
2 of 8

Last Modified: August 26, 2012 By: jbetho



Inuvik – Tuktoyaktuk Highway, Baseline Studies

Borrow Source 170
1:10,000
Area at Borrow Source: 43.30 hectares (Land)

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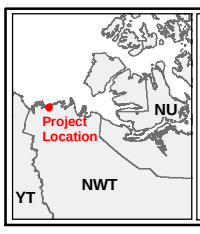
FIGURE NO.
3 of 8

Last Modified: August 26, 2012 By: jpetho



Inuvik – Tuktoyaktuk Highway, Baseline Studies

Borrow Source 174 North
1:10,000
Area at Borrow Source: 521.72 hectares (Land)

Acknowledgements: Original Drawing by KAVIK-STANTEC LTD

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FIGURE NO.
4 of 8

Last Modified: August 26, 2012 By: jpetho

565000 565500 566000 566500 567000

7662000 7661500 7661000 7660500 7660000 7659500 7659000

N

174

174

Preferred Route Kilometre Post

Preferred Route

Alternate Route Kilometre Post

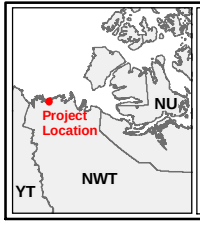
Alternate Route

ITH Borrow Sources

0 100 200 300 400

Metres - 1:10,000

123510689-020



Inuvik – Tuktoyaktuk Highway, Baseline Studies

Borrow Source 174 South
1:10,000
Area at Borrow Source: 521.72 hectares (Land)

Acknowledgements: Original Drawing by KAVIK-STANTEC LTD

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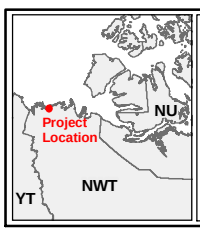
PREPARED FOR KAVIK-STANTEC

FIGURE NO. 5 of 8

Last Modified: August 26, 2012 By: jpetho



Inuvik – Tuktoyaktuk Highway, Baseline Studies

Borrow Source 309
1:10,000
Area at Borrow Source: 216.96 hectares (Land)

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FIGURE NO.
6 of 8

Last Modified: August 26, 2012 By: jpetho

562500 563000 563500 564000 564500

7627500 7627000 7626500 7626000 7625500 7625000 7624500

N

314/325

Preferred Route Kilometre Post
Preferred Route
Alternate Route Kilometre Post
Alternate Route
ITH Borrow Sources

0 100 200 300 400

Metres - 1:10,000

123510689-020

Project Location
NU
NWT
YT

Inuvik – Tuktoyaktuk Highway, Baseline Studies

Borrow Source 314/325
1:10,000
Area at Borrow Source: 329.17 hectares (Land)

Acknowledgements: Original Drawing by KAVIK-STANTEC LTD

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FIGURE NO. 7 of 8

Last Modified: August 26, 2012 By: jpelho

Map 8 of 8 left intentionally blank