2009 Dillon Feasibility Study for Water Licence S04L8-013

WATER LICENCE AMENDMENT APPLICATION

Water Licence #S04L8-013
Mackenzie Valley Winter Road

TULITA DISTRICT, SAHTU SETTLEMENT AREA, NORTHWEST TERRITORIES

Submitted To:

SAHTU LAND AND WATER BOARD
FORT GOOD HOPE , NORTHWEST TERRITORIES

By

DEPARTMENT OF TRANSPORTATION
Government of the Northwest Territories
May, 2009

Table of Contents

FIGURES

TABLES

APPENDIX A

APPENDIX B

APPENDIX C

APPENDIX D

APPENDIX E

SAHTU Land and Water Board
Water License Application

Northwest Territories Waters Regulation SCHEDULE III
(Subsection 6(1))

APPLICATION FOR LICENCE, AMENDMENT OF LICENCE, OR RENEWAL OF LICENCE

APPLICATION/LICENCE NO: **S04L8-013**
(amendment or renewal only)

1. NAME AND MAILING ADDRESS OF APPLICANT

Rod Gunderson
District Superintendent
Highway Operations, Fort Simpson Region
Department of Transportation
Government of the Northwest Territories
PO Box 86
Fort Simpson NT X0E 0N0

TELEPHONE: 867-695-2478
FAX: 867-695-3029

2. ADDRESS OF HEAD OFFICE IN CANADA IF INCORPORATED

TELEPHONE: _____
FAX: _____

3. LOCATION OF UNDERTAKING (describe and attach a map, indicating watercourses and location of any proposed waste deposits)

Department of Transportation's Mackenzie Valley Winter Road (Highway No. 1) and the Colville Lake Winter Road and further described as follows:

1) **Mackenzie Valley Winter Road (HWY #1)** – km 800 to km 1173 (Fort Good Hope) in the Tulita Land District within the Sahtu Settlement Area, Northwest Territories.

   Min. 63°58'00"N 124°09'50"W
   Max. 66°16'12"N 128°37'40"w

4.2.3 Current Water Withdrawal Practices

Water is extracted from the sources listed in current Water Licenses #S04L8-013 and # S04L8-014 (issued in 2004) and will be potentially extracted from additional water body sources applied for in this amendment (Table 1 and Figure 1).

Water extraction occurs from waterbodies and watercourses via water trucks equipped with vacuum pumps with an in-line rotary flow measuring device. Water is distributed onto the winter road by truck, discharging water on to the road at an application rate of approximately 100 cubic meters of water per linear kilometer during each operational season (year).

In 2005 and 2006, the DOT obtained stream survey information including instantaneous flow rates for approved streams in the Water Licenses. Stream survey information was also collected by the Mackenzie Gas Pipeline in 2004. The above information was reported in the *Mackenzie Valley Winter Road Water Use Study – Sahtu Region, Assessment of Winter Conditions from Potential Water Extraction Sources* (Golder, 2006). Information on watercourses included: location, depth, width, bank description, substrate type, in-water and riparian vegetation, photos of the stream location, instantaneous flow rates and survey date.

Golder Consultants conducted watercourse instantaneous flow rate measurements where accessibility permitted in December, 2007. However, a majority of the sites had no data (streams were frozen to bottom). For this reason, for the 2008-2009 construction season contractors were instructed to use averages of previous seasons instantaneous flow rate information prior to water withdrawal. To ensure water withdrawal rates do not exceed 5% of the instantaneous flow, measured instantaneous flow rates have been converted to approximate time to fill a 10m^3 water truck.

Also, in September 2007, Golder conducted bathymetric surveys on additional proposed watersource extraction sites (Table 1). Bathymetric information is included in Appendix A and 10% maximum winter withdrawal amounts are depicted in Table 1.

As required under the existing Terms and Conditions for the Water Licenses, documentation of the flow rates, extraction/withdrawal rates, extraction dates, extraction volumes and pump types, ratings and specifications are maintained for each water source and a copy of this information is forwarded to the (Sahtu Land and Water Board and the Department of Fisheries and Oceans at the end of each operation season approximately by the end of May).

4.2.4 Amendment Rationale

The *Protocol for Water Withdrawal in the Northwest Territories* (Department of Fisheries and Oceans, 2006) stipulates that water withdrawal allowances for watercourses are limited to 5% of the instantaneous flow rate immediately prior to the time of extraction and 10% of winter availability from lakes.

Since Water License #S04L8-013 was issued in 2004, DOT has endeavored to fulfill monitoring and water withdrawal protocol requirements, however DOT has encountered several barriers to this including the following: lack of human resources, lack of financial resources, and the seasonal nature of road construction.

2) **Dissolved Oxygen**

The SLWB license requires that for both lakes and streams, pre-extraction dissolved oxygen levels and temperature readings for water sources are required twice a year prior to extraction and at the end of the winter road season. In 2008, discussions with DFO confirmed that this method of evaluation to assess overwintering fish habitat is not a suitable replacement for conducting bathymetric surveys.

Since the *Protocol for Water Withdrawal in the Northwest Territories* (DFO) does not require dissolved oxygen measurements and since the utility of dissolved oxygen readings as a qualifying criterion for suitability for extraction does not apply, **DOT requests that the requirement for a dissolved oxygen profile taken twice a year (Part E, section 10) be removed.**

Attached is a Department of Fisheries and Oceans letter with recommendation in support of this amendment (Appendix B).

3) **Watercourses**

The MVWR is a winter seasonal ice road with a construction and operational season extending from approximately late November to early March. The purpose of instantaneous flow readings is to determine the maximum water withdrawal rate from an ice-covered watercourse to conform to the *"DFO Protocol for Water Withdrawal in the Northwest Territories"* (2008). The measurement of flow rate is to be confirmed at the start of each water withdrawal season immediately prior to water withdrawal commencing.

Since safe access along the entire length of the MVWR is usually not possible until January/early February, taking stream measurements at the start of each construction season prior to actual water withdrawal and construction of the road is not feasible. Difficult logistics due to remote accessibility and extreme weather conditions are also factors that provide challenges to execution of the water license requirements.

Due to the above difficulties in timing and co-ordination for data gathering, **DOT requests that Part C, section 7 be amended to:**

a) **Allow to use the average of the instantaneous flow rates collected in previous years during open water conditions (Table 2) to estimate allowable 5% instantaneous flow rates until a functional general compliance monitoring program can be initiated.**

DOT is currently investigating the possibility and feasibility of applying regional analysis and modeling techniques as alternatives to direct field measurements (Appendix C). Modeling or regional analysis would require data collection in the field during the open-water season. The data would be used to develop a model/regional analysis of each creek which can be used to predict stream flow at each site based on ice thickness and water level. In this way flow measurements could be easily accomplished by the water truck operator immediately prior to winter water withdrawal and accurately represent flow condition. Currently, the license program functions to collect data that does not accurately represent flow conditions at time of initial water extraction.

8. WASTE DEPOSITED (quantity, quality, treatment and disposal)

N/A

9. OTHER PERSONS OR PROPERTIES AFFECTED BY THIS UNDERTAKING (give name, mailing address and location; attach list if necessary)

N/A

10. PREDICTED ENVIRONMENTAL IMPACTS OF UNDERTAKING AND PROPOSED MITIGATION

DOT contracted Dillon Consultants Limited to prepare an *Environmental Impact Statement* (2004), relating to the construction and maintenance of the winter road through the Sahtu Settlement area (Appendix D). Impacts related to construction and maintenance of winter roads posses the potential to affect surface water, ground water, vegetation, wildlife, and soils. While the majority of these can be mitigated with little or no residual effects, spills of hazardous materials can potentially have moderate residual effects due to the remoteness of the project area and reduced efficiency in responding to spills due to extreme weather.

The SCP submitted with the original license application specifies measures to reduce potential environmental impacts and these will also apply to work undertaken at any additional water sources.

Potential impacts to other valued environmental components can be effectively mitigated using proven measures presented in the existing Water Licenses' "*Environmental Impact Statement*" document, with little or no residual effects. These measures will also be incorporated into work carried out at the proposed additional sites.

Socio-Economic Benefits

No changes to the Socio-Economic Benefits discussed in the original application package are anticipated .

Archeological, Protected and Historical Sites

Information on existing archeological, protected and historical sites has been obtained from the Prince of Wales Northern Heritage Centre, GNWT and was included in the original application package. Impacts upon existing sites were not identified.

water extraction activities by community members. Records of those consultations and the issues discussed are located in Appendix E.

11. CONTRACTOR AND SUB-CONTRACTORS (names, addresses and functions)

The Department uses community based private contractors throughout the Sahtu and Deh Cho Regions to construct and maintain these winter roads. The MVWR is divided into eight Zones to allow for manegeable lengths of maintenance and administration and (Figure 2).

The Department of Transportation Tenders out contracts to perform construction and maintenance activities for the Mackenzie Valley Winter Road and the Colville Lake Winter Access Road. The list of Contractor and contact person along with the description and work area are listed in Table 3.

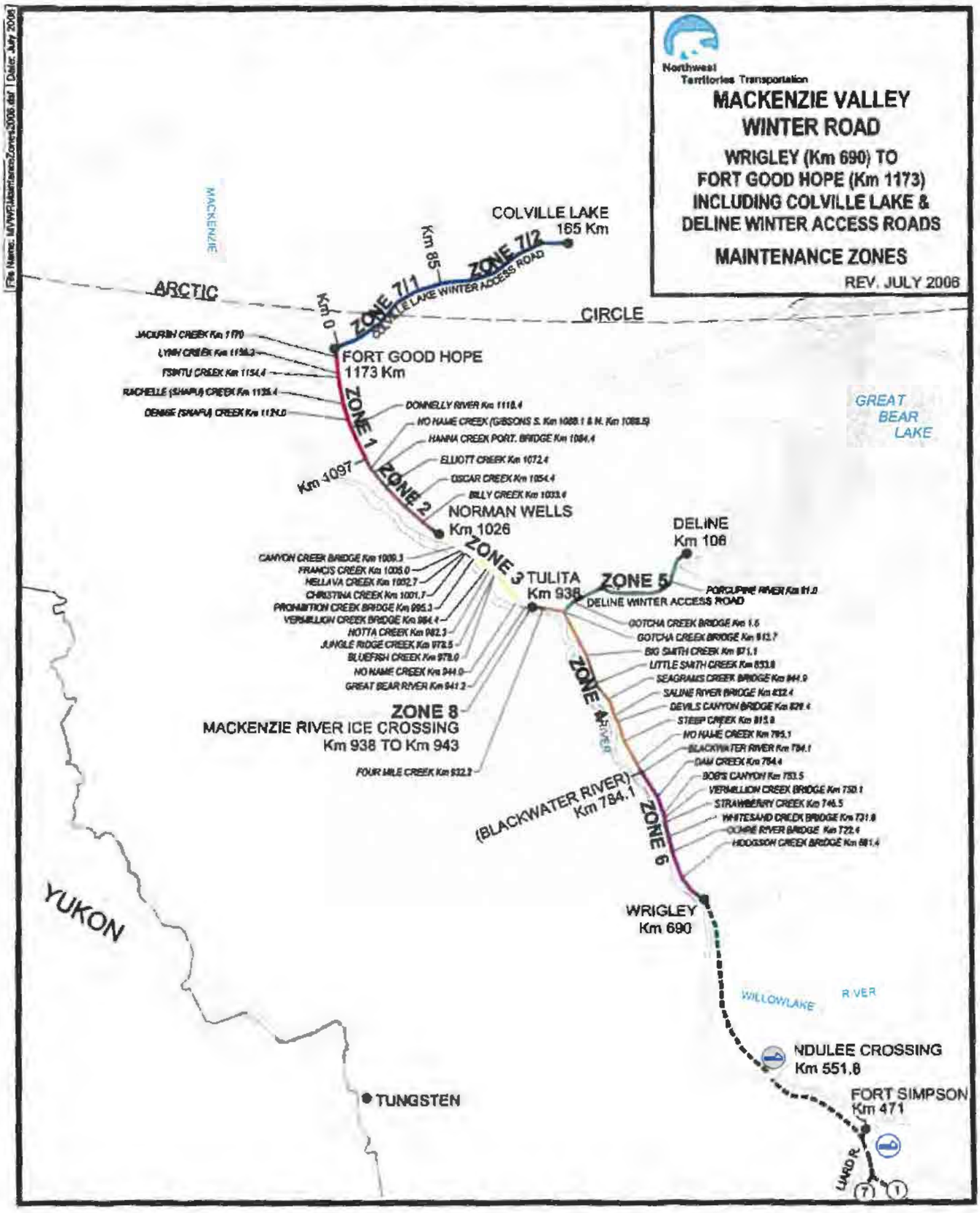
12. STUDIES UNDERTAKEN TO DATE (attach list if necessary)

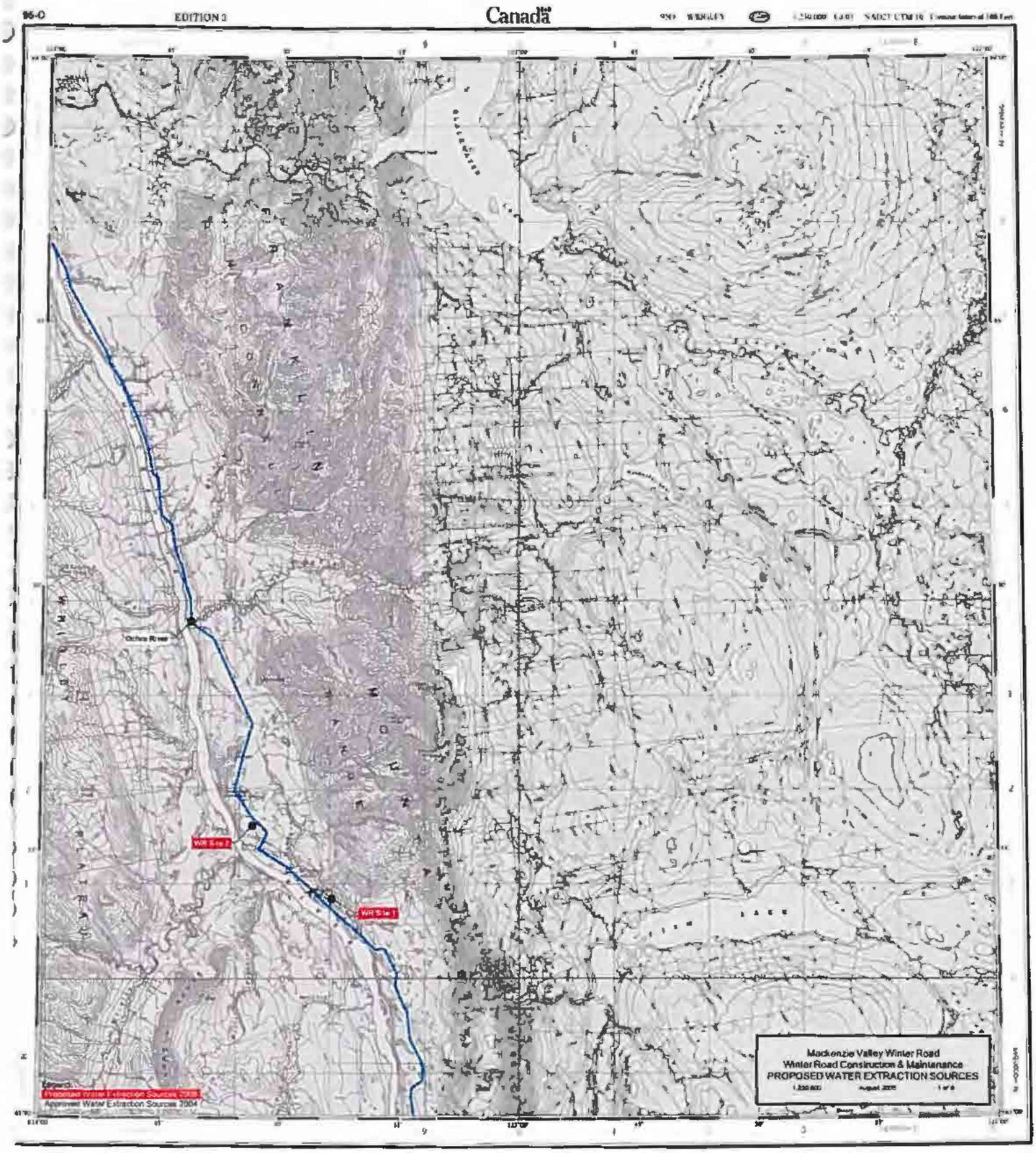
- Department of Transportation, Government of the Northwest Territories (2004). *Mackenzie Valley Winter Road Biophysical Components.*
- Dillon Consulting Limited (2004). *Environmental Impact Statement.*
- GeoNorth (2004). *Traditional Ecological Knowledge in Support of an application for a Water License for the Construction of the Mackenzie Valley Winter Road.*
- Golder Consultants Limited (2006). *Mackenzie Valley Winter Road Water Use Study Sahtu Region, NWT. Assessment of Winter Conditions from Potential Water Extraction Sources.*
- Northern EnviroSearch Limited (2008). *Environmental Protection Plan for the Fort Good Hope to Colville Lake Winter Access Construction and Maintenance Program*

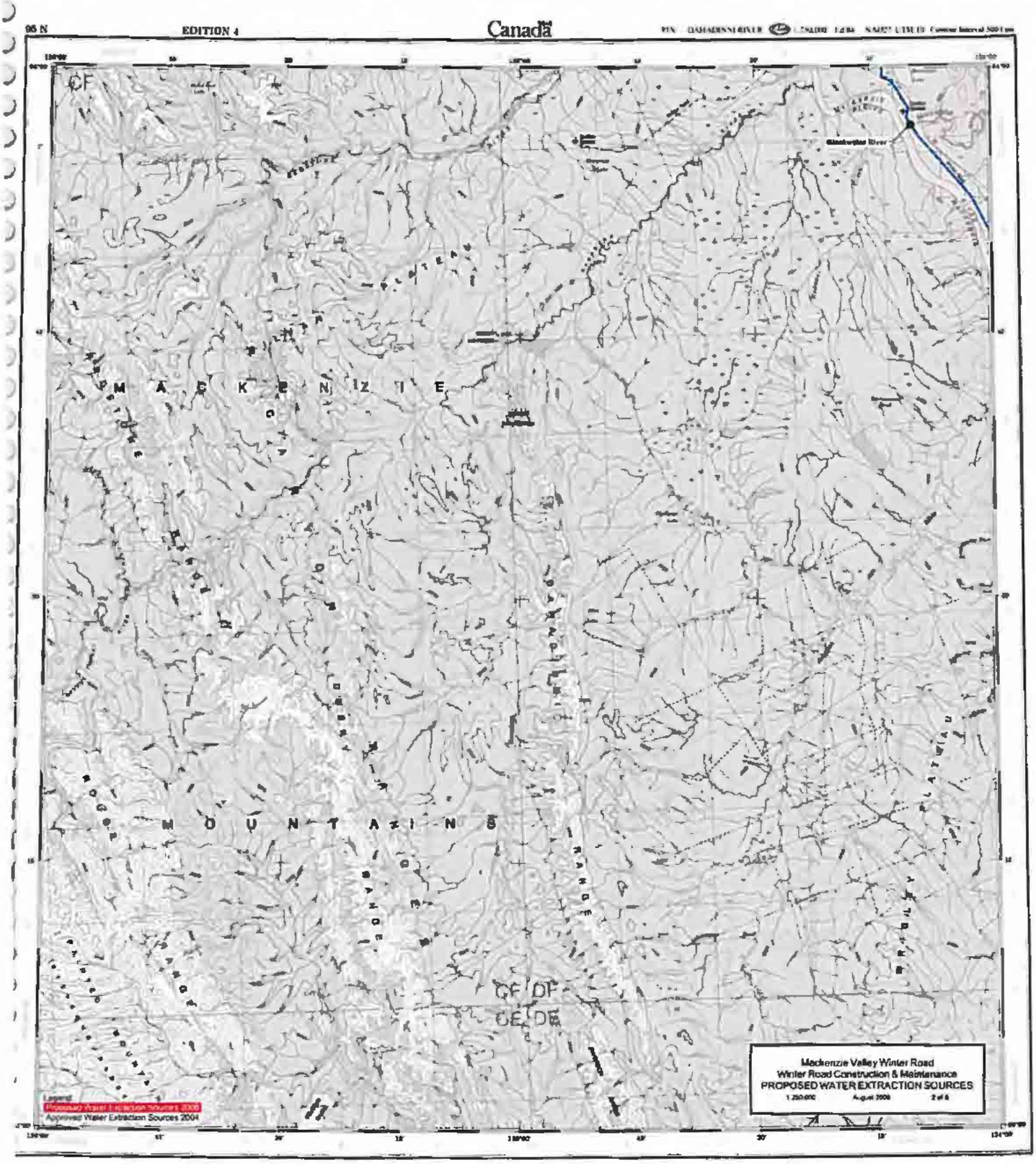
13. PROPOSED TIME SCHEDULE

Start date: annually November 30th Completion date: annually March 31st

Figures


File Name: M:\WR\Maintance\Zones\2006.dgn | Date: July 2006
Northwest Territories Transportation
MACKENZIE VALLEY WINTER ROAD
WRIGLEY (Km 690) TO FORT GOOD HOPE (Km 1173) INCLUDING COLVILLE LAKE & DELINE WINTER ACCESS ROADS
MAINTENANCE ZONES
REV. JULY 2006
MACKENZIE
COLVILLE LAKE 165 Km
Km 85
ZONE 7/2
ZONE 7/1
COLVILLE LAKE WINTER ACCESS ROAD
ARCTIC CIRCLE
Km 0
FORT GOOD HOPE 1173 Km
JACQUEIN CREEK Km 1170
LYNN CREEK Km 1159.2
TSINTU CREEK Km 1154.4
RACHELLE (SHAPU) CREEK Km 1135.4
DENISE (SHAPU) CREEK Km 1124.0
DONNELLY RIVER Km 1118.4
NO NAME CREEK (GIBSONS S. Km 1088.1 & N. Km 1086.5)
HANNA CREEK PORT. BRIDGE Km 1084.4
ELLIOTT CREEK Km 1072.4
OSCAR CREEK Km 1054.4
BILLY CREEK Km 1033.4
ZONE 1
Km 1097
ZONE 2
NORMAN WELLS Km 1026
ZONE 3
CANYON CREEK BRIDGE Km 1009.3
FRANCIS CREEK Km 1005.0
HELLAVA CREEK Km 1002.7
CHRISTINA CREEK Km 1001.7
PROHIBITION CREEK BRIDGE Km 995.3
VERMILLION CREEK BRIDGE Km 984.4
NOTTA CREEK Km 982.3
JUNGLE RIDGE CREEK Km 978.5
BLUEFISH CREEK Km 978.0
NO NAME CREEK Km 944.0
GREAT BEAR RIVER Km 941.2
ZONE 8
MACKENZIE RIVER ICE CROSSING
Km 938 TO Km 943
FOUR MILE CREEK Km 932.2
TULITA Km 938
ZONE 5
DELINE Km 106
DELINE WINTER ACCESS ROAD
PORCUPINE RIVER Km 91.0
GOTCHA CREEK BRIDGE Km 1.5
GOTCHA CREEK BRIDGE Km 913.7
BIG SMITH CREEK Km 871.1
LITTLE SMITH CREEK Km 853.8
SEAGRAMS CREEK BRIDGE Km 844.9
SALINE RIVER BRIDGE Km 832.4
DEVILS CANYON BRIDGE Km 826.4
STEEP CREEK Km 815.8
NO NAME CREEK Km 795.1
BLACKWATER RIVER Km 784.1
DAM CREEK Km 784.4
BOB'S CANYON Km 753.5
VERMILLION CREEK BRIDGE Km 750.1
STRAWBERRY CREEK Km 746.5
WHITESAND CREEK BRIDGE Km 731.8
OOMPE RIVER BRIDGE Km 722.4
HODGSON CREEK BRIDGE Km 681.4
ZONE 4
(BLACKWATER RIVER) Km 784.1
ZONE 6
WRIGLEY Km 690
WILLOWLAKE RIVER
NDULEE CROSSING Km 551.8
FORT SIMPSON Km 471
LIARD R.
7
1
GREAT BEAR LAKE
YUKON
TUNGSTEN


95-O
EDITION 3
Canada
Ochre River
WR Site 2
WR Site 1
Legend:
Proposed Water Extraction Sources 2005
Approved Water Extraction Sources 2004
Mackenzie Valley Winter Road
Winter Road Construction & Maintenance
PROPOSED WATER EXTRACTION SOURCES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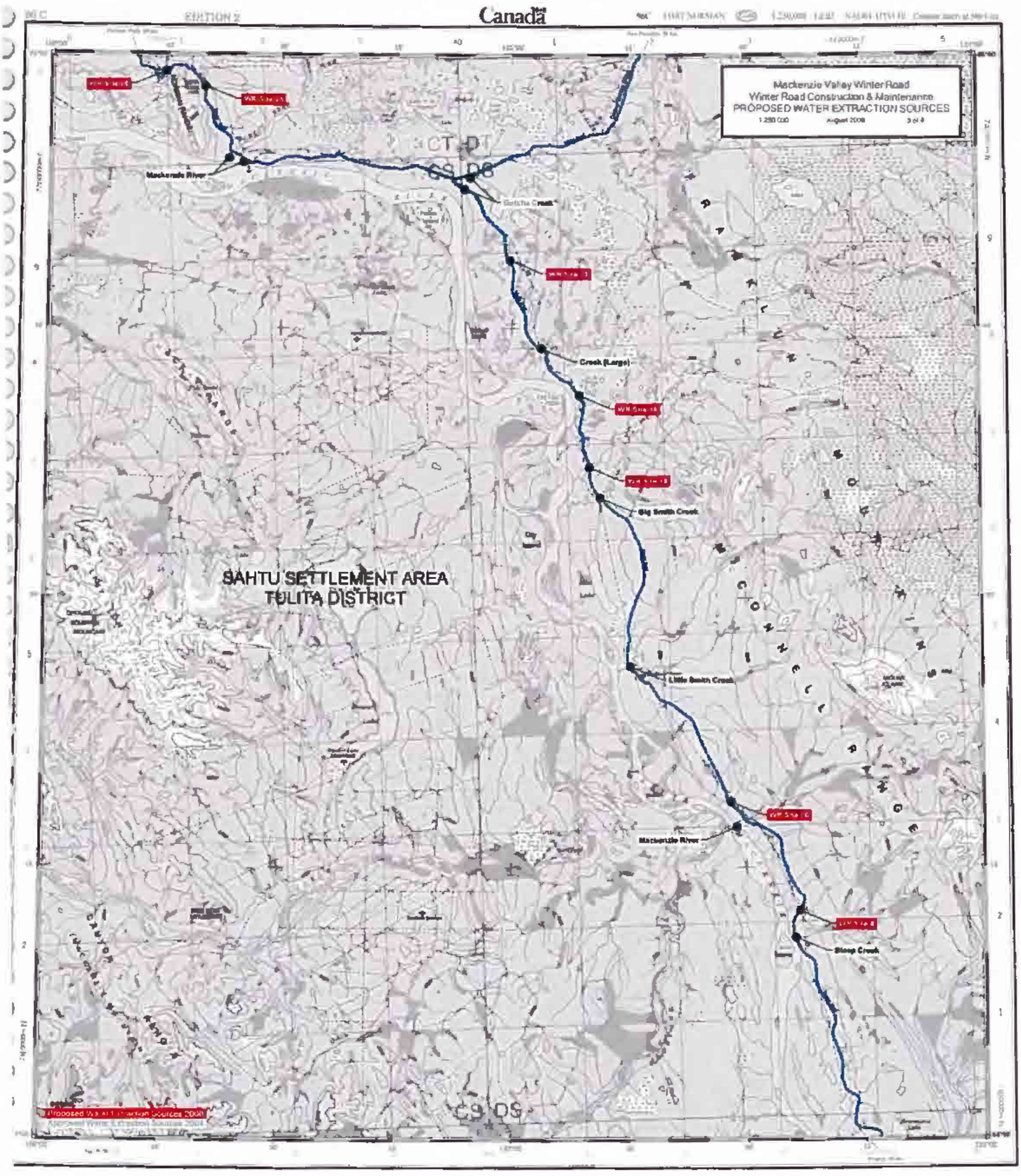
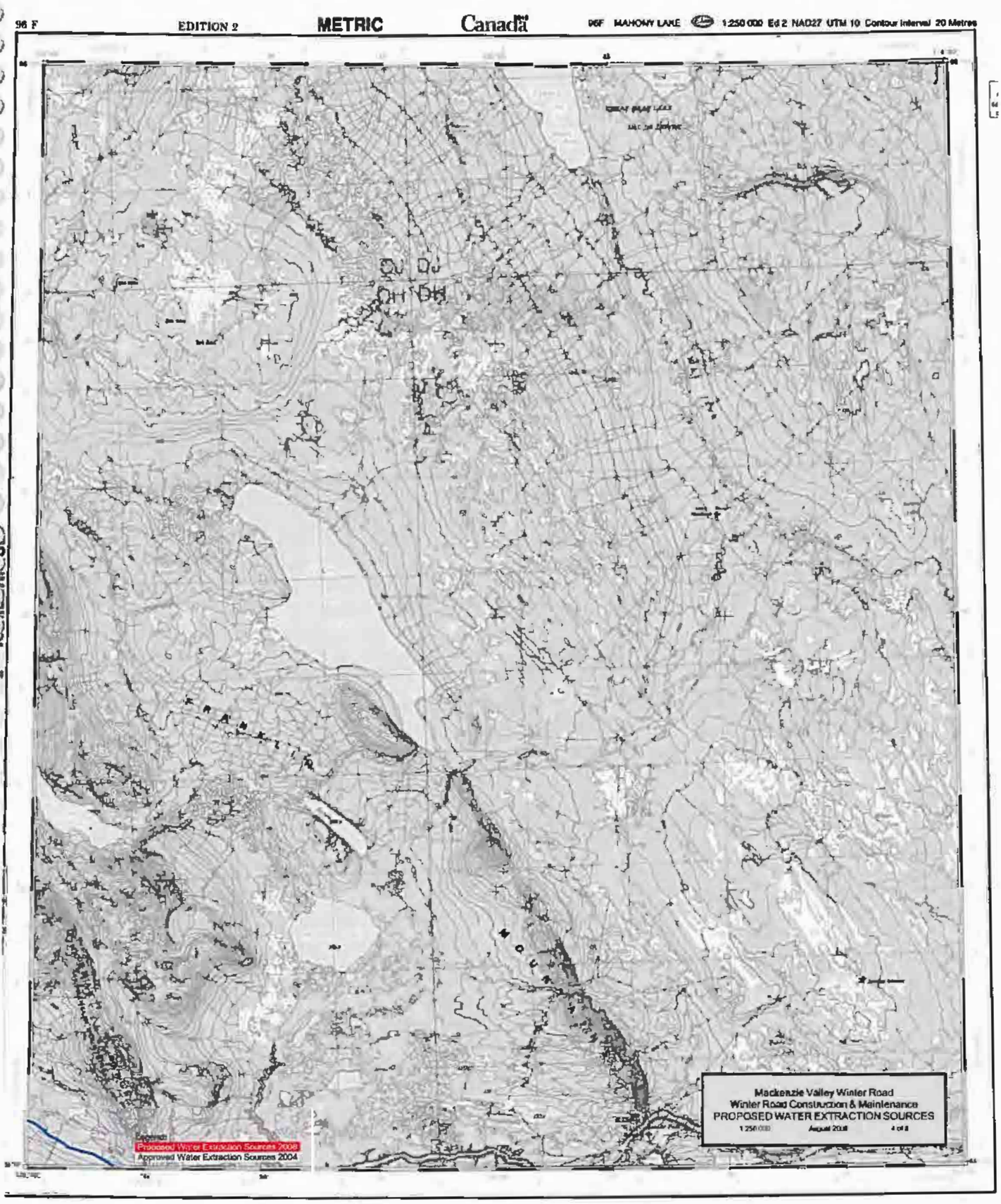
Canada
MACKENZIE
MOUNTAINS
Mackenzie Valley Winter Road
Winter Road Construction & Maintenance
PROPOSED WATER EXTRACTION SOURCES
Legend
Proposed Water Extraction Sources 2008
Approved Water Extraction Sources 2004


Canada
Mackenzie Valley Winter Road
Winter Road Construction & Maintenance
PROPOSED WATER EXTRACTION SOURCES
1:250 000
August 2008
3 of 8
Mackenzie River
Creek (Large)
Big Smith Creek
Little Smith Creek
Mackenzie River
Stone Creek
SAHTU SETTLEMENT AREA
TULITA DISTRICT
Proposed Water Extraction Sources 2008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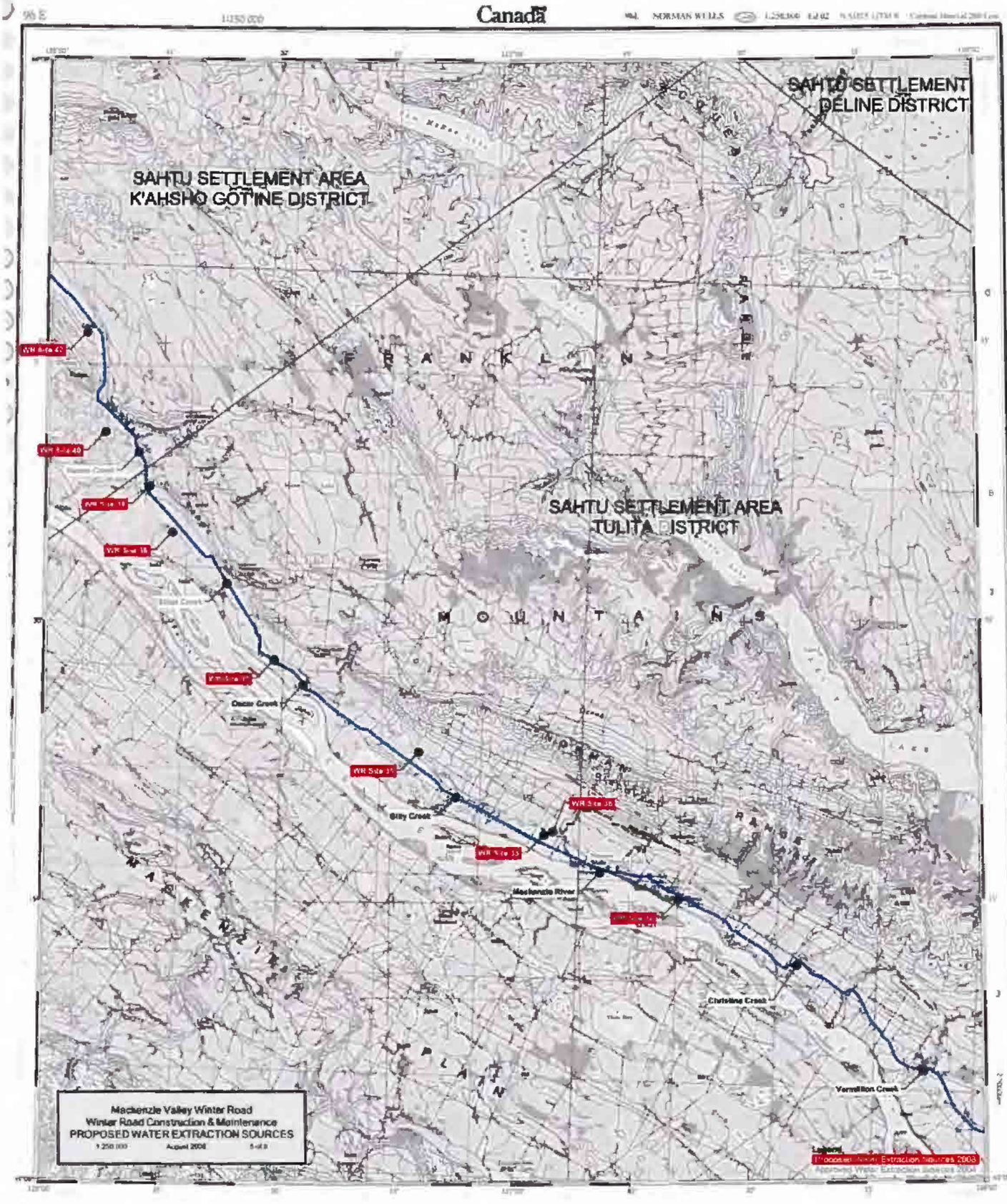
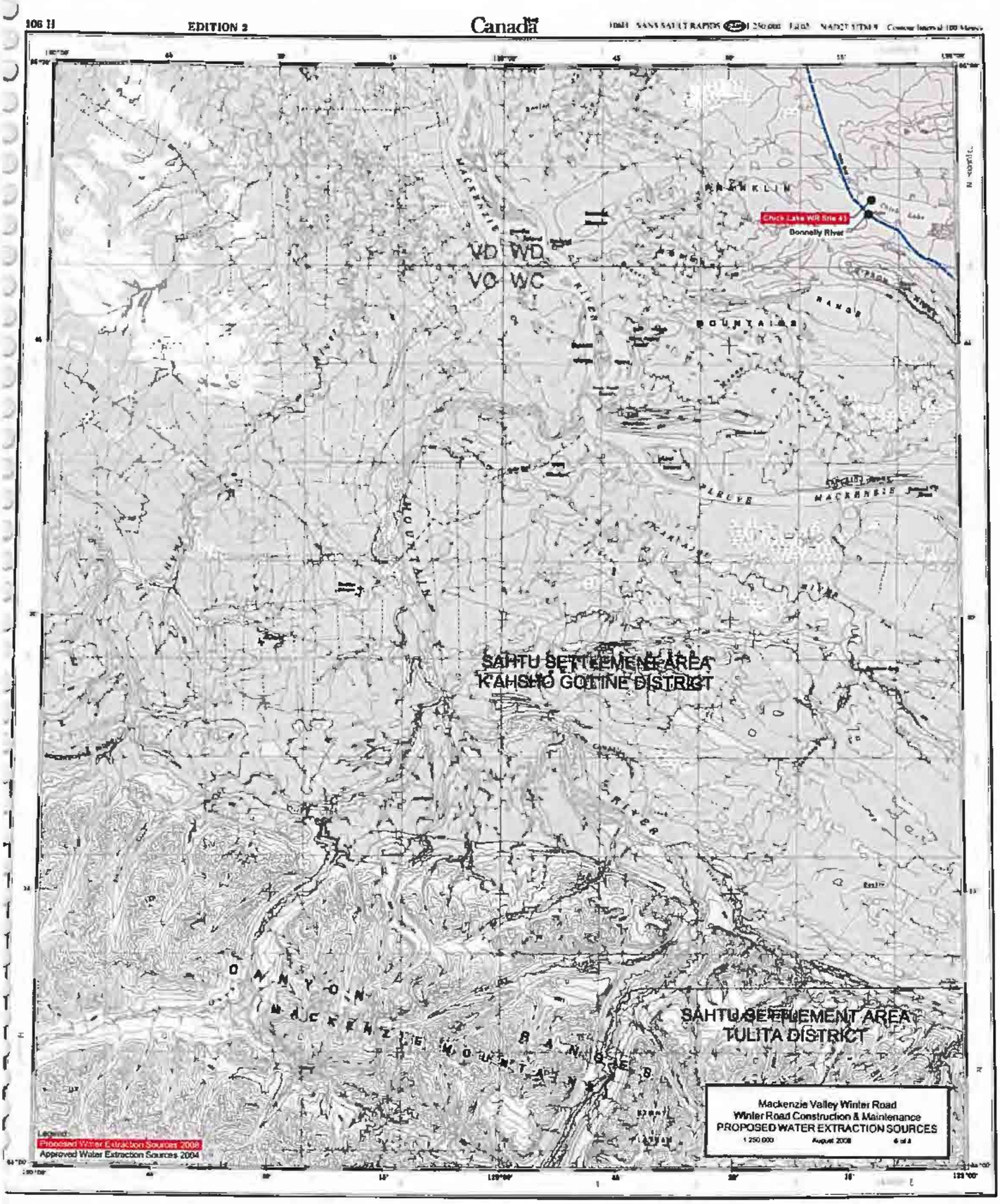
Proposed Water Extraction Sources 2008
Approved Water Extraction Sources 2004
Mackenzie Valley Winter Road
Winter Road Construction & Maintenance
PROPOSED WATER EXTRACTION SOURCES
1:250 000
August 2008
4 of 8


Canada
SAHTU SETTLEMENT AREA
K'AHSHO GOT'INE DISTRICT
SAHTU SETTLEMENT
DELINE DISTRICT
SAHTU SETTLEMENT AREA
TULITA DISTRICT
F R A N K L I N
M O U N T A I N S
Oscar Creek
Billy Creek
Mackenzie River
Christine Creek
Vermillion Creek
Mackenzie Valley Winter Road
Winter Road Construction & Maintenance
PROPOSED WATER EXTRACTION SOURCES
August 2008


106 H
EDITION 2
Canada
MACKENZIE
Chick Lake WR Site 43
Donnelly River
VD WD
VC WC
MACKENZIE MOUNTAINS
SAHTU SETTLEMENT AREA
K'AHSHO GOTINE DISTRICT
SAHTU SETTLEMENT AREA
TULITA DISTRICT
CANYON
MACKENZIE MOUNTAINS
Legend:
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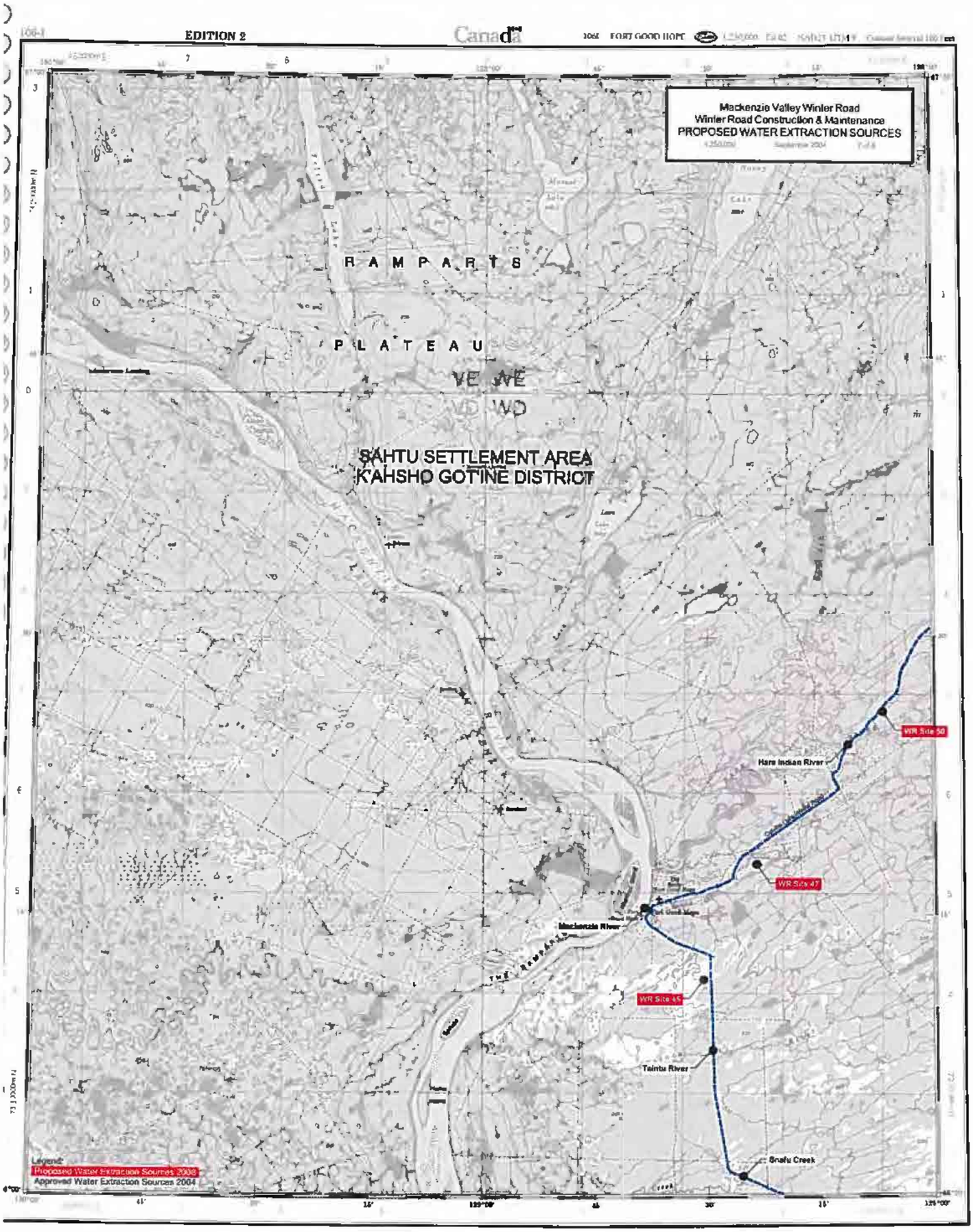
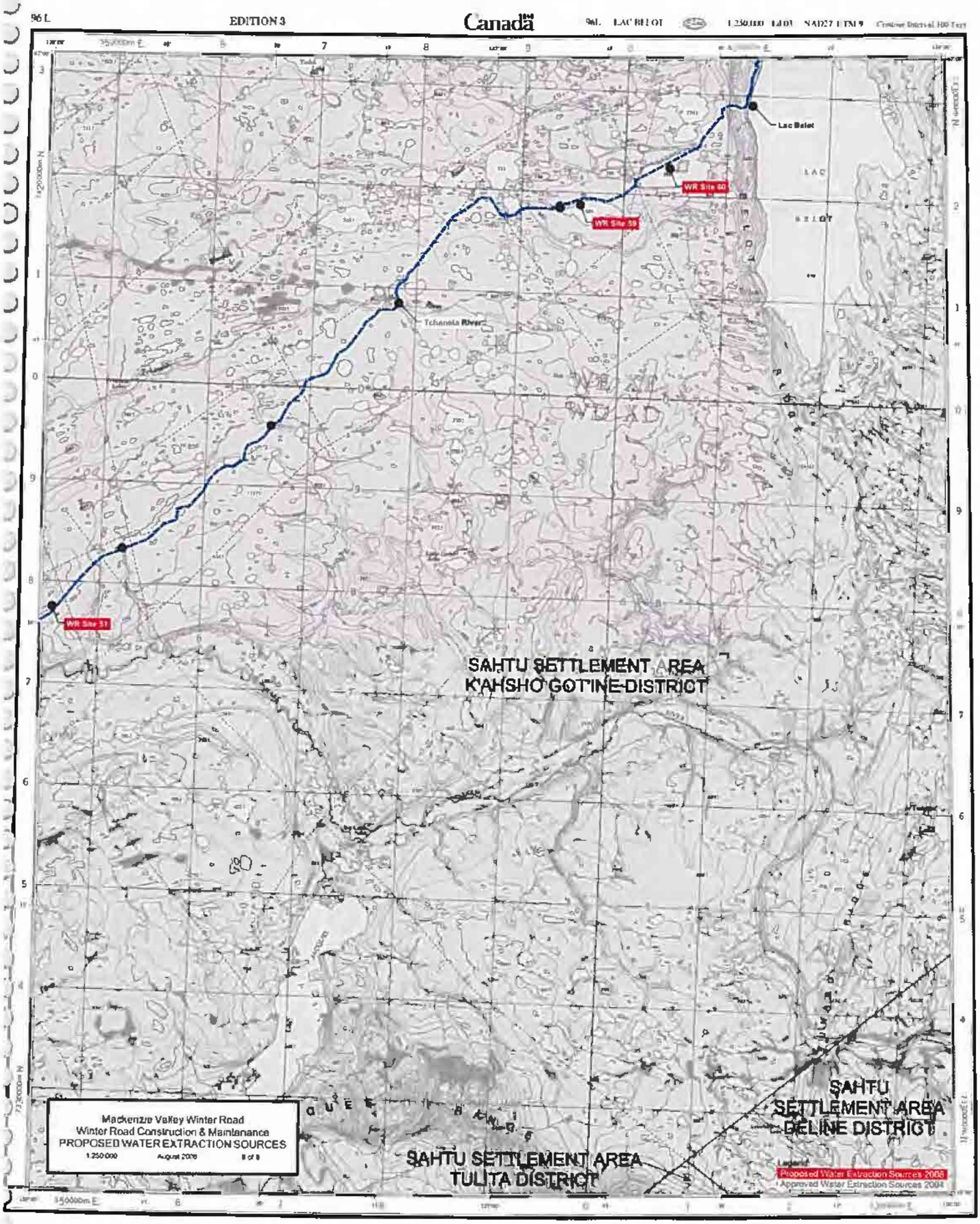
Mackenzie Valley Winter Road
Winter Road Construction & Maintenance
PROPOSED WATER EXTRACTION SOURCES
1:250,000
August 2008
6 of 8


EDITION 2
Canada
106 FORT GOOD HOPE
Mackenzie Valley Winter Road
Winter Road Construction & Maintenance
PROPOSED WATER EXTRACTION SOURCES
RAMPARTS
PLATEAU
SAHTU SETTLEMENT AREA
K'AHSHO GOTINE DISTRICT
WR Site 50
Hare Indian River
WR Site 47
Mackenzie River
WR Site 45
Tsintu River
Snafu Creek
Legend:
Proposed Water Extraction Sources 2004
Approved Water Extraction Sources 2004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1:250,000 MD3 NAD27 UTM 9
Lac Belot
WR Site 60
WR Site 59
Tchaneta River
WR Site 51
SAHTU SETTLEMENT AREA
K'AHSHO GOT'INE DISTRICT
SAHTU
SETTLEMENT AREA
DELINE DISTRICT
SAHTU SETTLEMENT AREA
TULITA DISTRICT
Mackenzie Valley Winter Road
Winter Road Construction & Maintenance
PROPOSED WATER EXTRACTION SOURCES
1:250,000 August 2008 8 of 8
Proposed Water Extraction Sources 2008
Approved Water Extraction Sources 2004

Tables

Table 1. Proposed Water Source Extraction Sites Information

Lake ID (WR)	km	Max Depth (m)	Mean Depth (m)	Winter Volume (m^3)	10% Max Withdrawal Volume (m^3)	Bathymetry completed	UTM Zone	Easting	Northing
1	679	8.5	1.2	272 500	27 250	2004 Golder	10W	479737	7008833
2	693	5.12	1.14	42 770	4 277	2003 AAR	10W	472036	7016389
8	818	15.2	6.3	1 265 534	126 553	2007 Golder	10W	433668	7120640
10	835	15.1	3.3	30 844	3 084	2007 Golder	10W	425896	7132328
16	882	4.9	2.1	48 991	4 899	2007 Golder	10W	411677	7171746
18	892	9.3	2.8	229 369	22 937	2007 Golder	10W	407963	7179438
19	902	1.96	1.13	4 733	473	2003 AAR, 2007 Golder	10W	404789	7188854
25	951	21.7	8.2	3 163 813	316 381	2007 Golder	10W	373663	7208213
28	947	14.83	6.63	746 860	74 686	2003 AAR	10W	370015	7210416
32	1018	1.2	0.6	0	0	2004 Golder	9W	610184	7238529
33	1025	1	0.5	0	0	2004 Golder	9W	596483	7244326
35	1040	3.2	1	17 300	1730	2004 Golder	9W	583446	7252711
36	1047	1	0.7	0	0	2004 Golder	9W	596858	7244361
37	1059	3.1	1.5	311 300	31 130	2004 Golder	9W	568806	7261495
38	1076	1.2	0.8	0	0	2004 Golder	9W	558414	7273794
39	1080	7.8	2.73	91 652	9 1652	2003 AAR	9W	556046	7277959

Water Sources Historical Data

4L8-013

: WHERE (x m3/s) X 0.05 = x m3/s (5% instantaneous flow rate) AND (m3/s) X (60s/min) = x m3/min AND 10 m3 / (x m3/min) = time to fill truck in minutes

Source	Steep Creek	Little Smith Creek	Big Smith Creek	Creek Large km 890 (Golder ID 3-UNK)	Gotcha Creek	Vermillion Creek	Christina Creek	WR Lake No. 1	Billy Creek	WR Lake No. 2 (Golder ID WR 37)	Oscar Creek	
	816	853	871	890	914	984	1002	1032	1033	1050	1054	
MGP	0.5											
MGP	0.73	1.95		0.07	0.54	0.45	0.04				6.41	
MGP	0.5	3.16		0.23	0.81	0.53	0.1				7.18	
MGP	1.66	7.31				0.63	0.07		too deep to measure		5.73	
MGP	0.92					0.43	0.01				1.16	
MGP												
MGP	1.02	flow under ice	1.33	stagnant under ice		0.29	frozen to bottom		stagnant under ice		0.17	
McCart											0.12	
Apache								3882 (w)		199 038 (w)		
McCart											0.04	
McCart											22.8	
DOT	0.989	2.767		photos and visual reconnaissance only	0.324	0.376	photos and visual reconnaissance only		too deep to measure		3.576	
Golder	0.5-1	0.05	N/A			0.2-0.3					0.1	
Golder				N/A due to unsafe ice conditions		0.18	frozen to bottom		no under ice flow		depth under ice inadequate to measure velocities	
Golder	N/A	N/A	N/A	N/A		0.1		no previous date but was signed in March 2008	0.06	1 279 800 (s), 311 300 (w)	frozen	

Water Sources Historical Data

IL8-013 cont.

	Steep Creek	Little Smith Creek	Big Smith Creek	Creek Large km 890 (Golder ID 3-UNK)	Gotcha Creek	Vermillion Creek	Christina Creek	WR Lake No. 1	Billy Creek	WR Lake No. 2 (Golder ID WR 37)	Oscar Cre
nstant. flow rate	0.05	0.138	0.0665 (based on April 2004 reading)	0.01 (based on August 2002 reading)	0.0162	0.019	0.0035		0.003		0.1
truck (minutes)	3.4	1.2	2.5	16	10	8.8	48		55		1
Lake Max Depth								3.12		3.1	
Withdrawal (m^3)								388		31 130	
2009/09 action	Y - contin ue use	Y - continu e use	Y - continue use	N - Use this season	N - Use this season	Y - continue use	N - Use this season	N - Do not use	N - Use this season	N - Use this season	Y - contin u

Table 3. The Department of Transportation Contractor List for MVWR 2008/2009

Contractor Contact Person	Contract Description / Area of Work
Sahtu Contractor's Ltd Danny McNeely, President Ph #867-587-2518	Winter Road Const. & Maintenance-Zone 2 Km.1097 -1023, HWY #1 Norman Wells area
Sahtu Contractor's Ltd Danny McNeely, President Ph #867-587-2518	Winter Road Const. & Maintenance. -Zone 3 Km 1026 -943, HWY #1 Norman Wells area
Red Dog Mountain Contracting Ltd. Eddy MacPherson Ph #8670588-4918 FAX -4921	Winter Road Construction & Main. -Zone 4 Km 938 -784, HWY #1 Tulita area
MYB Construction Ltd. Bob McPherson Ph.-867-588-3049 FAX-	Winter Road Construction & Main. -Zone 5 &8 Km 0 -105 Deline Access Rd. Deline area
Nogha Enterprises/Pehdzeh Ki First Nation Gordy Heron Ph #867-581-30183505 FAX	Winter Road Construction & Maintenance -Zone 6 Km 690 -784, HWHY #1 &Km 550 to 690, Hwy #1 Wrigley area
Rowes Construction/Nogha Enterprises Owen Rowe/Harold Burrill Ph *#867-695-3243/2908* FAX *867-695-2815/2908*	Km 550 to 411, HWY #1 N'Dulle/Checkpoint Km 254 to 202, HWY #7 Birch River to Check Point Fort Simpson area
Beaver Enterprises John Gonet Ph #867-770-3361 FAX -3362	Km 0 to 202, HWY #7 Fort Liard area
Tthenaago Development Corporation Don Hardisty Ph #867-602-2010 FAX -2910	Winter Road Construction/Maintenance &Airport Maintenance. Km 0 to 23 Nahanni Butte
Sambaa K'e Dev. Corp. Rick Pneuf • Band Manager Ph #867-206-2800 FAX -2828	Winter Road Const. & Maintenance. Trout Lake Winter Rd. Km 0 to 126
Jean Marie River First Nation Tammy Neil, Band Manager, Stanley San, Chief Ph #867-809-2000 FAX -2002	Maintenance Km 0 27 Jean Marie Access Rd.

Appendix A

Proposed Water Extraction Sources Bathymetry

Golder Associates Ltd.

9 – 4905 – 48th Street
Yellowknife, Northwest Territories,
Canada X1A 3S3
Telephone (867) 873-6319
Fax (867) 873-6379

March 10, 2008

07-1328-0036

Department of Transportation, GNWT
2nd Floor Lahm Ridge Tower
4501 Franklin Avenue
Yellowknife, NT, X1A 2L9

Attention: Rhonda Batchelor, Environment Manager

RE: Final Report **"Bathymetric Surveys of Potential Water Extraction Sources"**

In response to the recent water withdrawal guidelines for the NWT (DFO 2006), the Department of Transportation was required to provide volume estimates for all lakes to be used as water extraction sources for winter road construction and maintenance. Based on previous investigations the Department of Transportation has provided the Department of Fisheries and Oceans Canada with bathymetric information from 23 of the lakes used for water extraction. The examination of the data collected during the 2005-06 "Mackenzie Valley Winter Road Water Use Study", however, identified 12 additional lakes that required volume estimates before they could be used again as water extraction sources (Golder 2006). To minimize the potential impact on fish overwintering at these lakes, Department of Fisheries and Oceans Canada (2006) guidelines dictate that a maximum of 10% of the total volume can be removed during winter. To comply with these guidelines, the Department of Transportation was required to complete bathymetric surveys and associated volume estimates, prior to their use for water withdrawal during future winter road construction seasons.

The following report details the methodologies used and the results of the bathymetric surveys and volumetric estimates from each of the 12 lakes.

If you have any questions concerning this report, please do not hesitate to call the undersigned. We appreciated the opportunity to work with the Department of Transportation on this interesting and challenging project.

Yours very truly,

GOLDER ASSOCIATES LTD.

Scott MacNeill, B.Sc. (Hons), M.Sc. P.Biol.
Arctic Fisheries Ecologist
SM/GC

Grant Clarke, M.A.
Managing Associate

INTRODUCTION

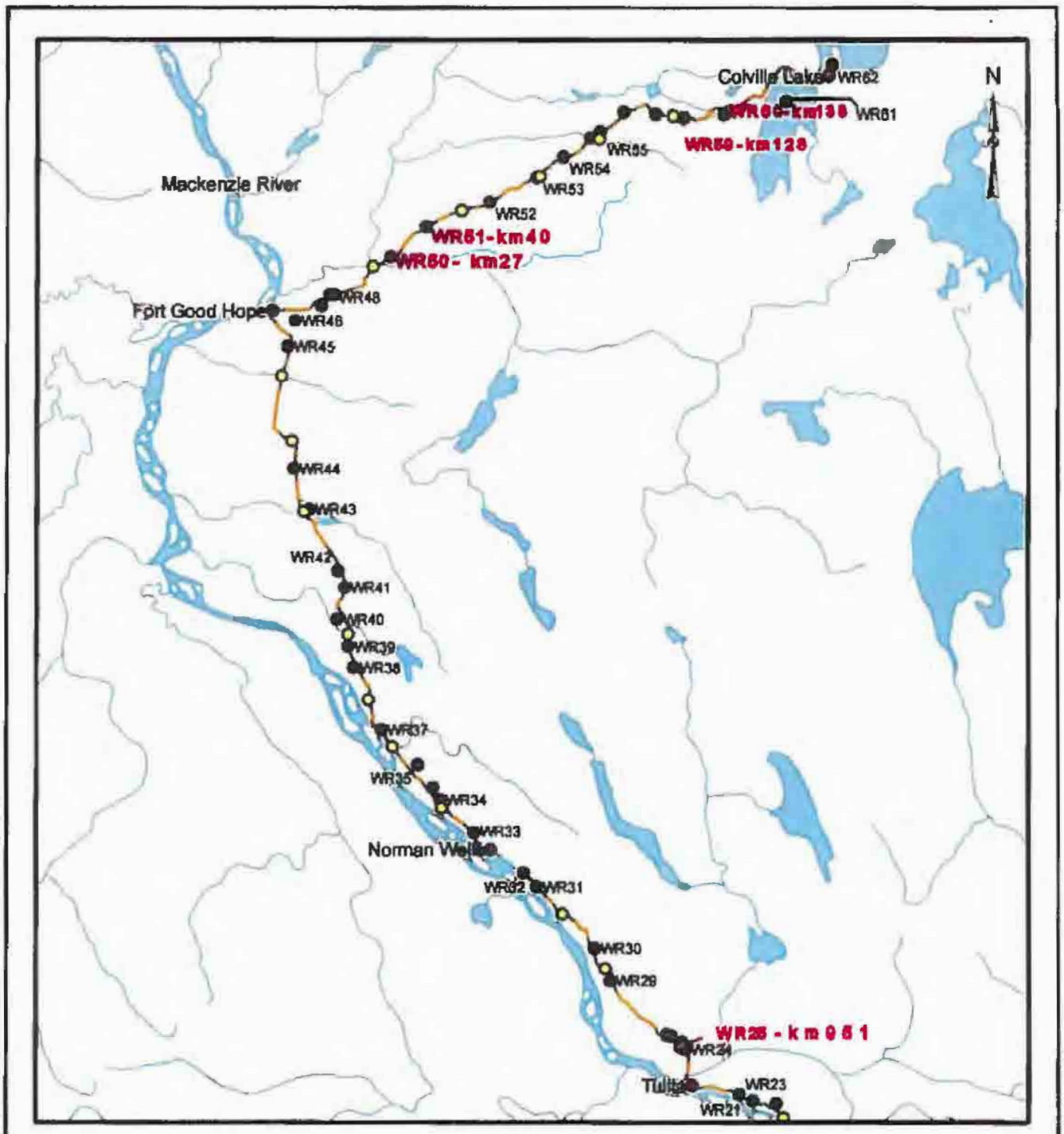
Golder Associates Ltd. (Golder) is pleased to submit this report detailing the results of the 2007 "Bathymetric Surveys of Potential Water Extraction Sources used for Mackenzie Valley Winter Road (MVWR) Construction and Maintenance – Sahtu Region, Northwest Territories", for the Government of the Northwest Territories (GNWT) Department of Transportation (DoT).

General

The GNWT DoT is responsible for the planning, design, construction, and maintenance of safe transportation infrastructure, capable of meeting user needs in the Northwest Territories (NWT). DoT builds and maintains facilities to serve the NWT's needs in the road, marine and air transportation sectors.

In order to facilitate oil and gas exploration and other developments in the Sahtu and Deh Cho regions of the NWT, it became necessary for DoT to upgrade conditions and extend the operational window of winter roads on the MVWR system connecting Wrigley, Tulita, Deline, Norman Wells, Fort Good Hope and Colville Lake. During previous years, less than 100 m^3/day of water was required by DoT to construct the road. However, during the 2004-05 season, it was necessary to exceed this amount in order to accelerate road construction and increase load capacity. As a result of this increase in water usage, DoT was required to obtain a Type B water license, under the NWT Water Act. In response to this regulatory requirement, DoT retained Golder to document early and late winter conditions in each potential water withdrawal site (Golder 2006). Investigated sites included watershed systems and lakes (Figures 1.1 - 1.2) found along the winter road right-of-way.

In addition to fulfilling the requirements outlined in the NWT Water Act, in 2006 DFO released a "Protocol for Winter Water Withdrawal in the Northwest Territories" (DFO 2006). These new water withdrawal guidelines stipulated that DoT must also provide volumetric estimates from each waterbody used for water extraction, where winter water withdrawal levels will exceed 100 m^3 (DFO 2006). The 2006 guidelines were developed by DFO to protect the loss of overwintering fish habitat at water extraction sites along the Mackenzie Valley. Studies have demonstrated that the withdrawal of excessive amounts of under-ice water can result in oxygen depletion, which has made water withdrawal a critical issue (DFO 2006).



LEGEND

- Approximate Winter Road Alignment
- Communities
- Potential Water Sources
- Stream Crossings
- WR 2007 Bathymetry Study

30 0 30 Kilometers

SCALE 1:1,250,000

REFERENCE

Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 10

PROJECT
Mackenzie Valley Winter Road Water Use Study

TITLE
Potential Water Sources - Tulita to Colville Lake

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 05-1373-026			SCALE AS SHOWN / REV. 0
DESIGN	KB	Dec. 2006	FIGURE: 1.2
DRAWN	DP	Jan. 2006	
CHECK	SM	Jan. 2006	
REVIEW	SM	Jan. 2006	

Golder designed this study to aid DoT in providing Sahtu Land and Water Board (SLWB) and DFO with the remaining information required to meet the water withdrawal guidelines, for each of these 12 lakes prior to the 2007-08 MVWR construction season. The following report provides DoT with:

- bathymetric map and volumetric estimate from 12 lakes that have the potential to be approved by DFO to serve as water extraction sources; and
- in situ water quality information from each visited site.

This assignment has allowed us to combine our extensive environmental assessment experience in the Northwest Territories, particularly in the Mackenzie Valley, with recent experience and knowledge obtained through our ongoing involvement with the GNWT.

FIELD INVESTIGATION

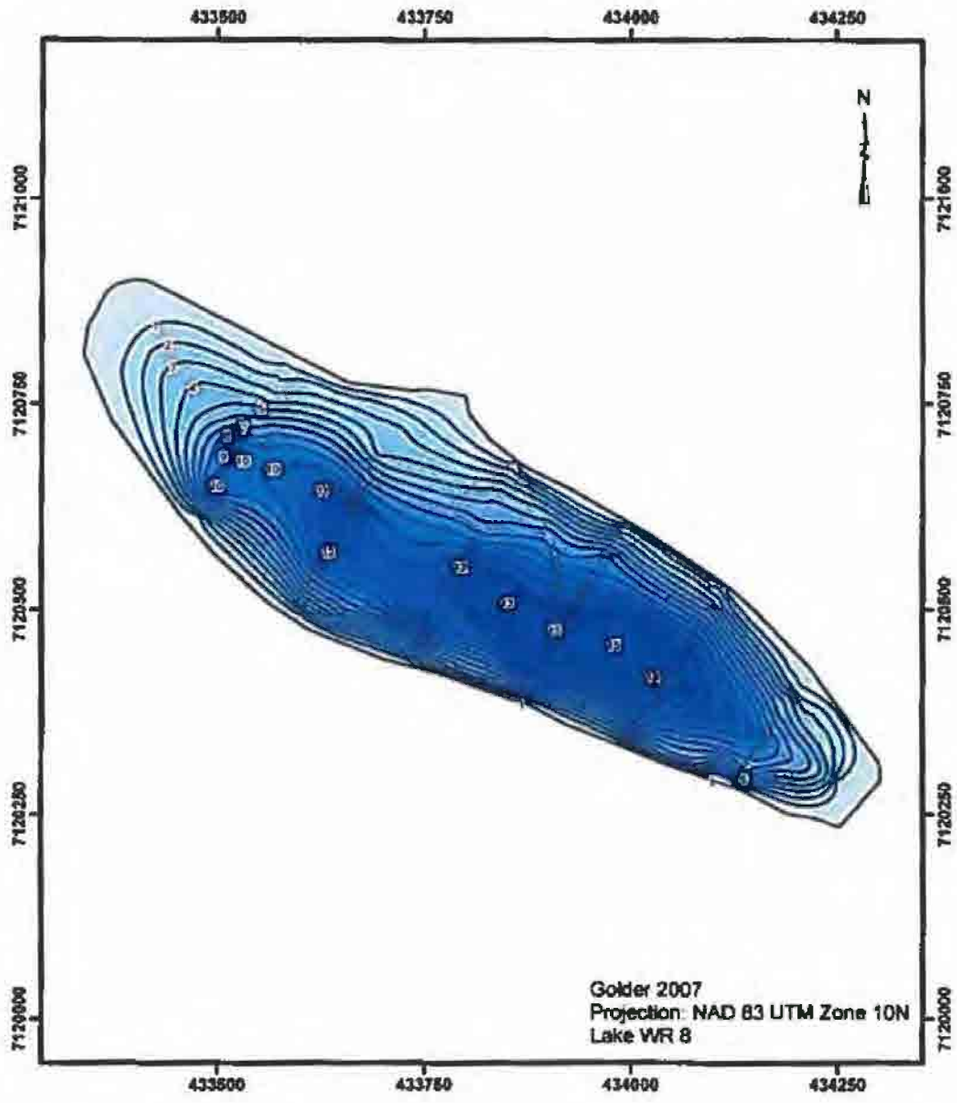
Methods

Bathymetric data was collected from the following 12 lakes: WR8, WR10, WR12, WR14, WR16, WR18, WR19, WR25, WR50, WR51, WR59 and WR60.

The depth data was collected using a Garmin 168 depth sounder, during September 2007. The sounder provided continuous (i.e., at 1 or 2 s intervals) depth recordings, geo-referenced with a Global Positioning System (GPS). Prior to use, the depth readings were calibrated with a manual sounding line reading at each lake and appropriate adjustments made on the instrument to account for the depth of the transducer (i.e., offset depth). The data was logged and stored as MapSource™ files on weather-resistant Toughbook™ computers.

The spacing of the bathymetric transects was dependent on the size of each lake and the irregularity of the lake bottom. In general, one longitudinal transect, connecting the two farthest shorelines, was surveyed. Subsequent cross transects (i.e., perpendicular to the longitudinal transect) were then evenly spaced along the longitudinal transect, following the recommendation outlined in DFO (2006).

The digital data collected during the bathymetric surveys was processed using Golder-designed software, which uses an ArcGIS 8.2 ANUDEM routine to interpolate depth information and generate contour lines on a bathymetric map of each lake. The software automatically calculates area and volume parameters, and is very cost-effective compared to conventional mapping techniques. Golder used the same field and data analyses procedures to produce the bathymetric maps found in the Golder (2006) report.

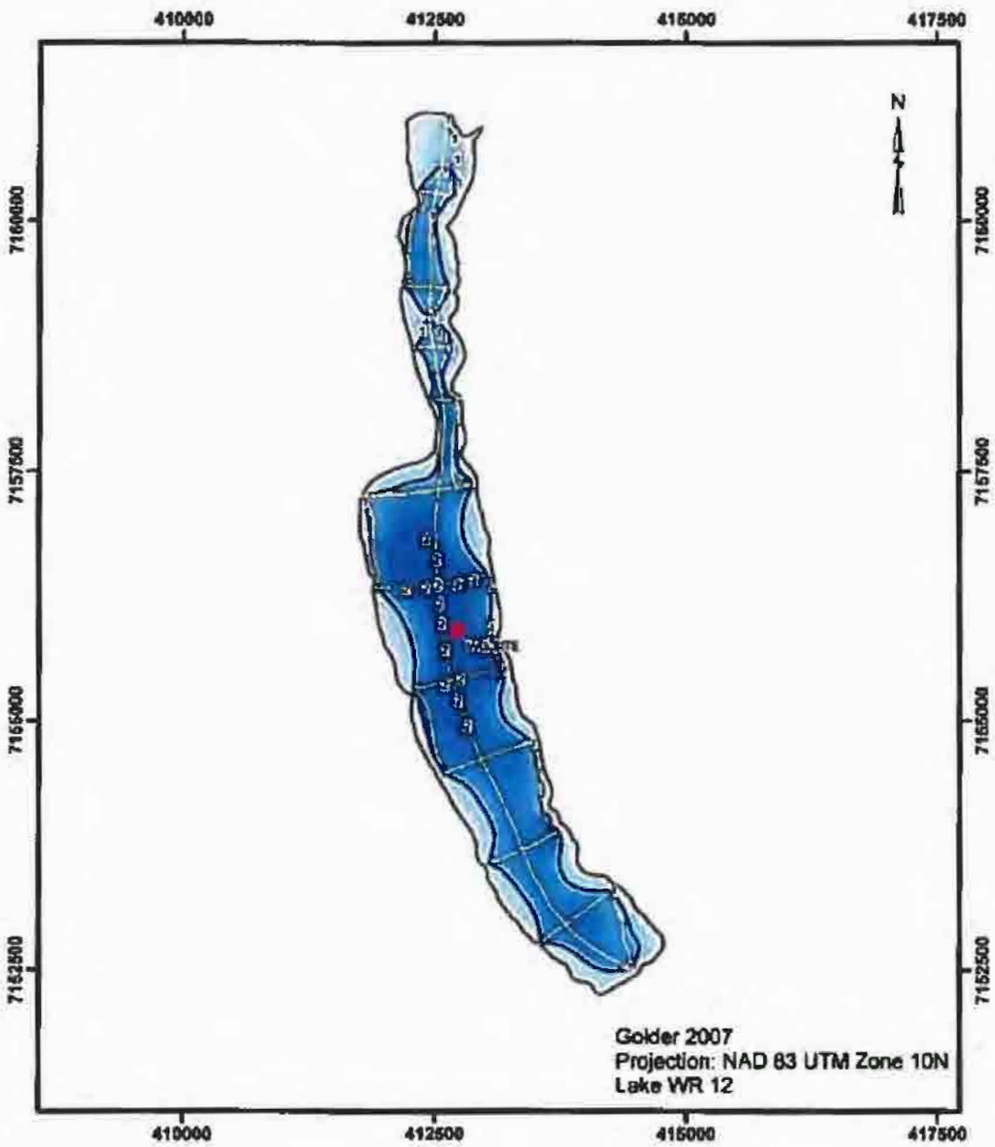


Lake ID: WR8 Region: Sahtu UTM: 10W 433668 7120640 Km: 818

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp (°C)	Cond (µS/cm)	pH
03-Dec-05	0.0	0.4	10.5	1.5	12.4	89	1.5	338	8.1
	0.0	0.4	10.5	9.0	11.8	88	1.8	339	8.0
08-Mar-06	0.21	0.8	10.2	1.8	12.0	84	0.8		7.7
	0.21	0.8	10.2	9.2	8.6	61	2.0		
23-Sep-07	NA	NA	15.6	2.0	9.4	80	8.0	348	7.5
	NA	NA	15.6	15.0	0.5	4	4.0		

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
Sep 2007	1005	251 743	15.2	6.3	1 604 238	1 265 534	DFO Approved site, 2008

[1] Assuming 1.5 m ice thickness

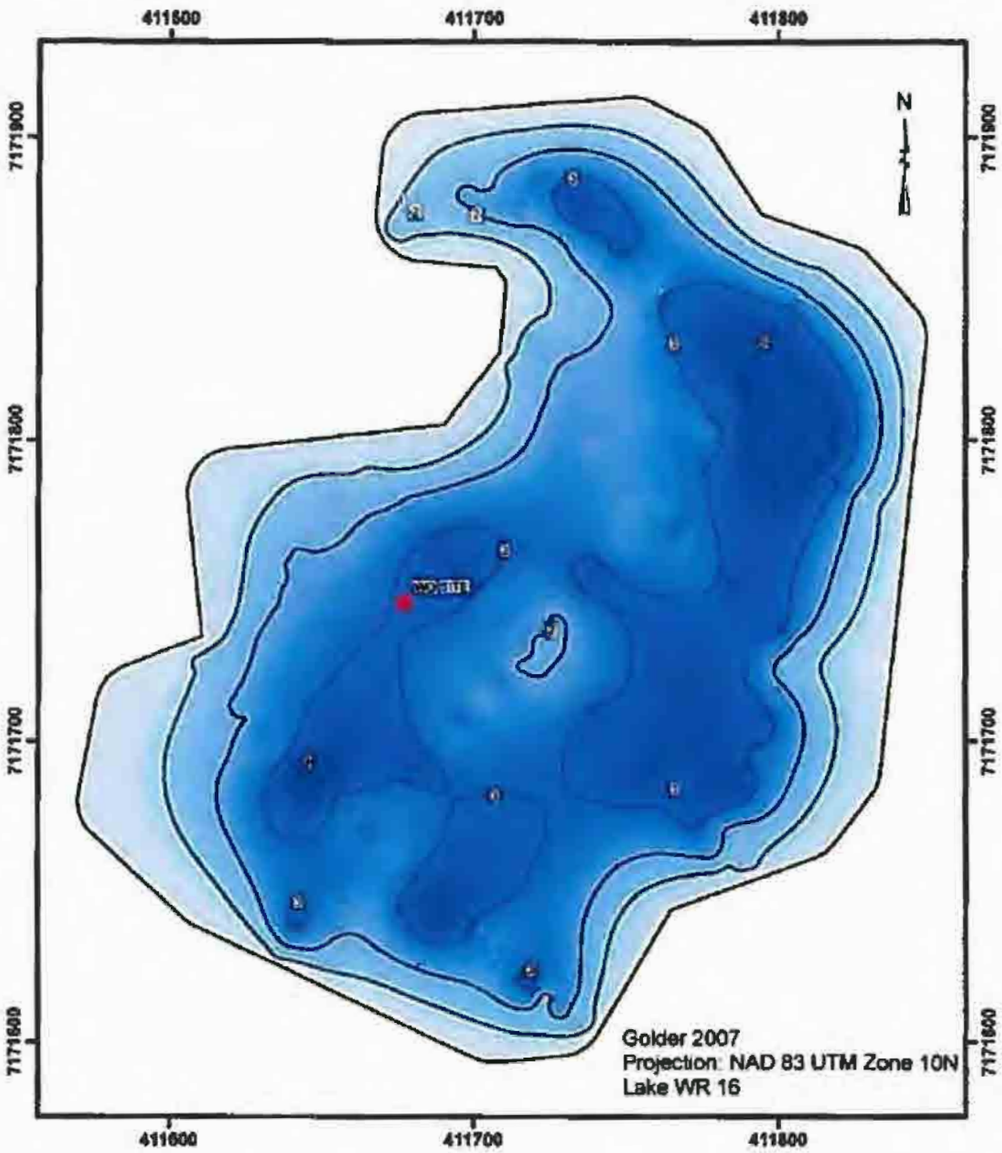


Lake ID: WR12 (Mio Lake) Region: Sahtu UTM: 10W 412714 7155905 Km: 866

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp. (°C)	Cond. (µS/cm)	pH
03-Dec-05	0.0	0.55	2.0	1.5	8.0	53	2.6	360	7.9
09-Mar-06	Unable to sample on foot due to distance from MVWR								
23-Sep-07	NA	NA	2.0	1.0	11.9	93	4.4	340	7.6

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
Sep 2007	8900	7520267	2.3	1.2	9144746	987269	Not Approved – High Potential

[1] Assuming 1.5 m ice thickness

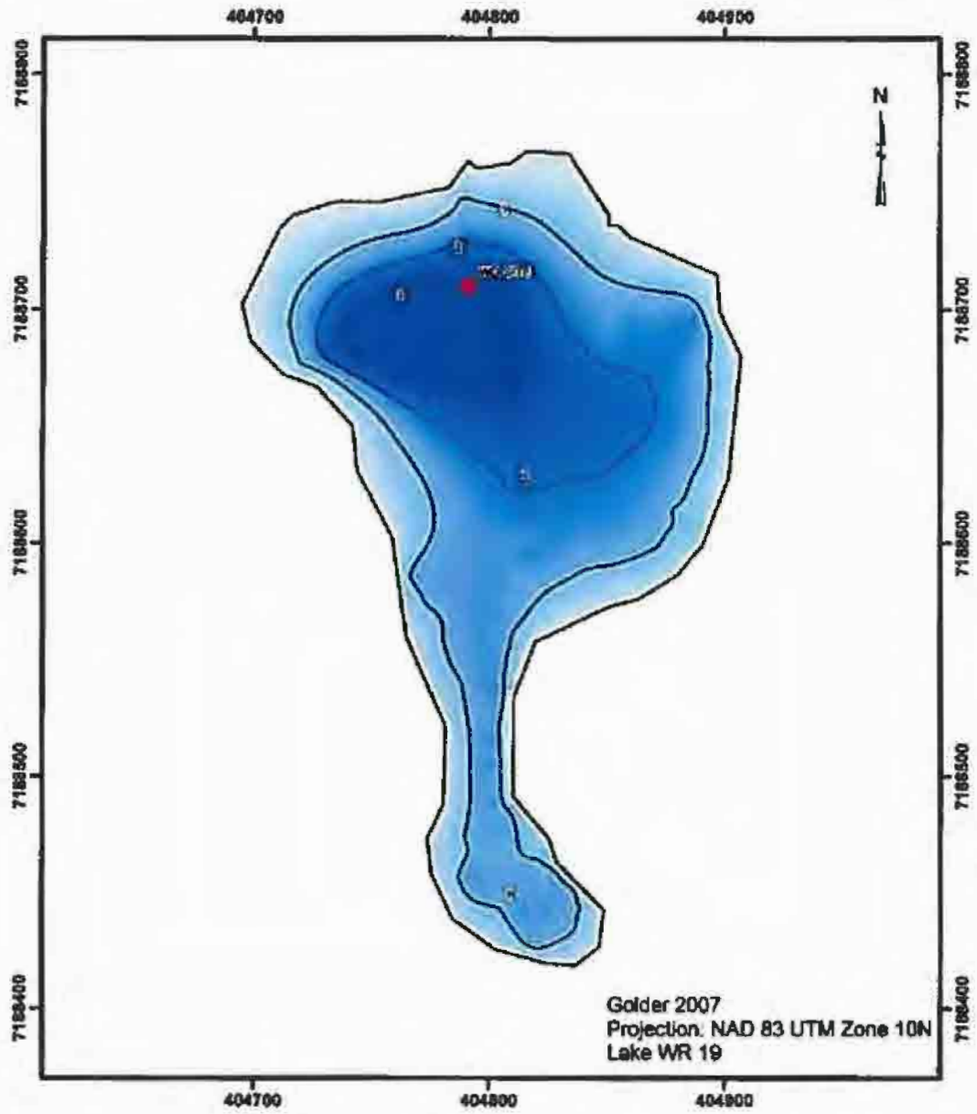


Lake ID: WR16 Region: Sahtu UTM: 10W 411677 7171746 Km: 882

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp. (°C)	Cond. (µS/cm)	pH
03-Dec-05	0.15	0.4	2.6	1.5	4.2	29	2.9	129	7.0
09-Mar-06	0.21	0.6	3.2	1.5	0.4	2	1.5		
23-Sep-07	NA	NA	4.9	2.0	9.4	76	5.9	223	6.7

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
Sep 2007	330	56 631	4.9	2.1	120 505	48 991	Not Approved, Moderate Potential

[1] Assuming 1.5 m ice thickness

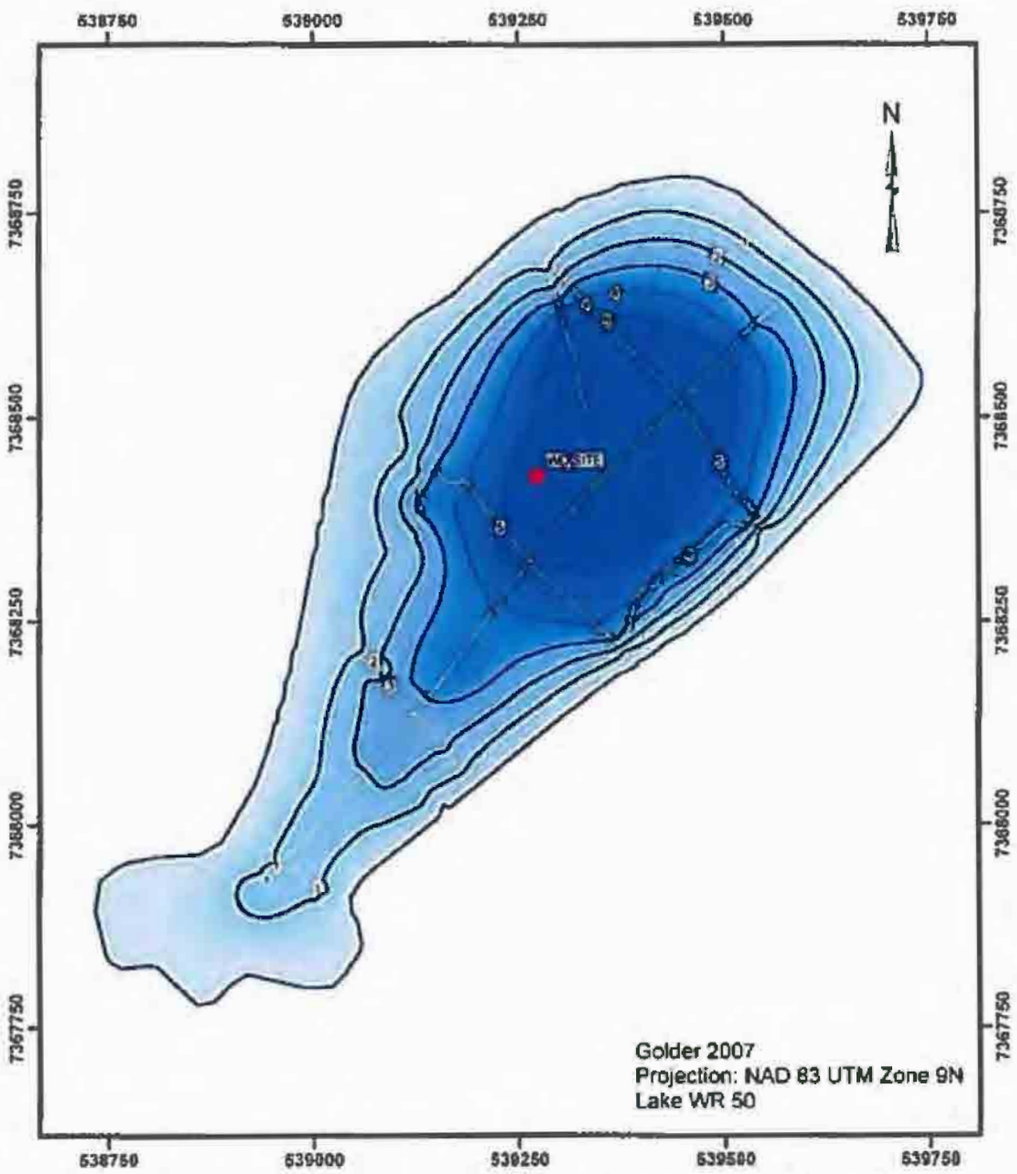


Lake ID: WR19 **Region: Sahtu** **UTM: 10W 404789 7188854** **Km: 890**

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp. (°C)	Cond. (µS/cm)	pH
03-Dec-05	Not completed due to safety concerns (overflow on lake)								
10-Mar-06	0.23	0.63	4.0	1.5	0.9	6	0.0		
	0.23	0.63	4.0	3.0	0.1	1	3.1		
21-Sep-07	NA	NA	3.8	2.0	11.2	91	6.0	152	6.87

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
Sep 2007	870	35 950	3.8	1.4	51 306	11 811	Not DFO Approved, Low Potential

[1] Assuming 1.5 m ice thickness

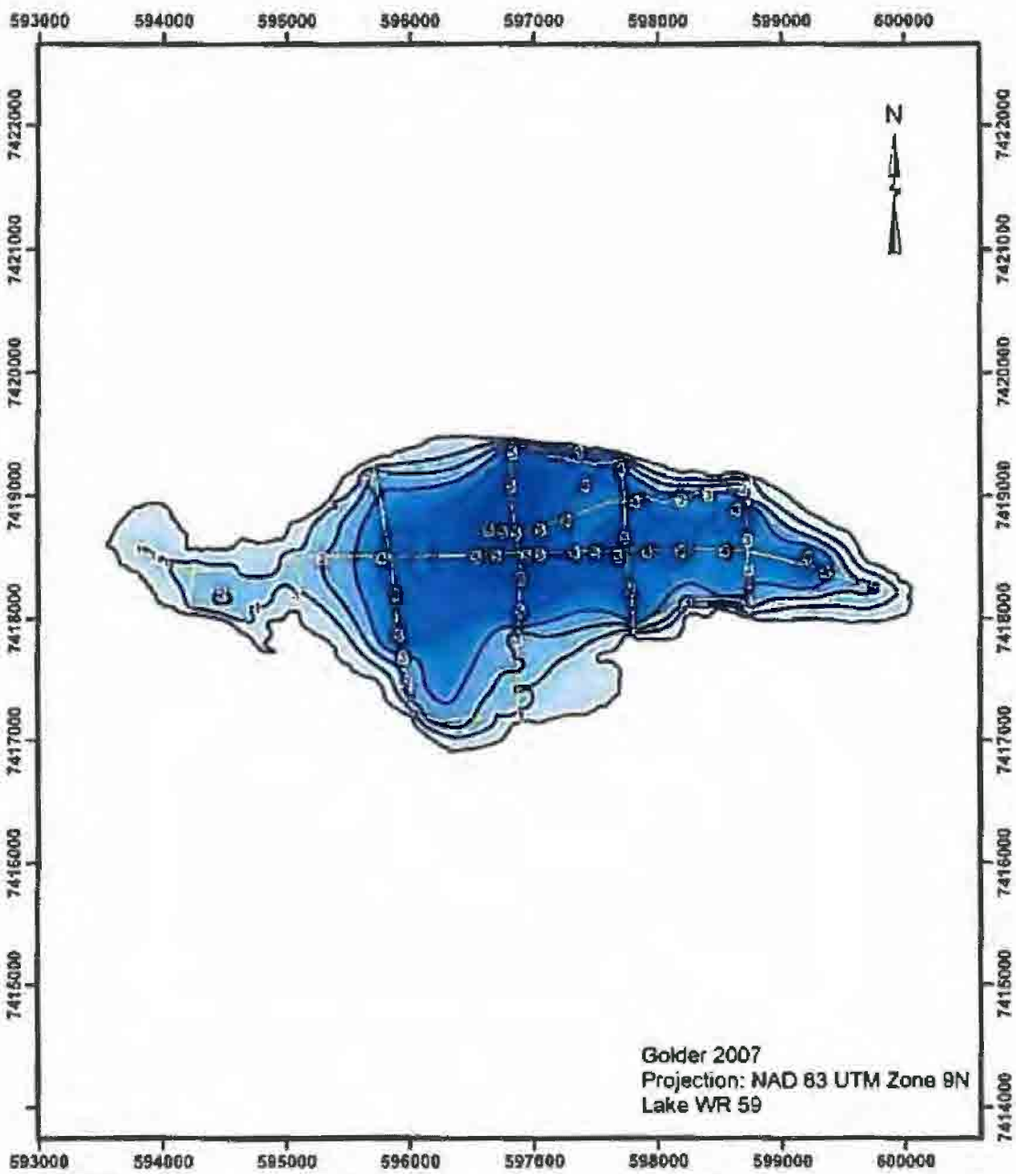


Lake ID: WR50 Region: Sahtu UTM: 9W 539273 7368427 KM: 27

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp (°C)	Cond (µS/cm)	pH
06-Dec-06	0.2	0.45	5.2	1.5	12.4	88	1.8	327	8.1
	0.2	0.45	5.2	4.0	7.0	48	2.8	341	7.9
15-Mar-06	0.3	0.74	5.2	1.5	7.8	54	1.2		7.6
	0.3	0.74	5.2	4.2	0.8	6	3.0		
18-Sep-07	NA	NA	5.9	2.0	11.3	100	7.1	348	7.5
	NA	NA	5.9	5.0	11.0	100	7.1		

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
Sep 2007	1230	431 372	5.9	2.4	1 031 072	555 656	DFO Approved Site

[1] Assuming 1.5 m ice thickness



Lake ID: WR59 **Region: Sahtu** **UTM: 9W 595505 7418927** **KM: 128**

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp. (°C)	Cond. (µS/cm)	pH
05-Dec-05	0.3	0.3	1.0	0.8	12.8	91	1.0	243	8.2
05-Dec-05[1]	0.2	0.4	1.7	1.0	13.2	92	0.7	240	8.2
16-Mar-06	0.3	0.8	2.8	1.5	10.0	68	0.4		7.0
19-Sep-07	0.0	0.0	5.5	1.0	12.8	105	4.3	239	7.24
	0.0	0.0	5.5	5.0	5.6	49	4.7	239	7.24
17-Dec-07		0.49	1.5	1.0	11.4				

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
September 2007	6510	8 603 148	6.5	2.6	22 503 535	11 800 327	DFO Approved Site

[1] Assuming 1.5 m ice thickness

REFERENCES

Fisheries and Oceans Canada. (DFO). 2006. Interventions on the Mackenzie Gas Project. 51 pp.

Golder Associates Ltd. 2006. Assessment of winter conditions in potential water extraction sources along the Mackenzie Valley winter road, Sahtu Region, NWT. Prepared for the Department of Transportation, GNWT. Golder Report No. 06-1373-023: 180 pp.

APPENDIX A

Aerial photos of each surveyed lake

Aerial Photo Lake WR12 (Mio Lake), September 23, 2007.

Aerial Photo Lake WR14, September 23, 2007.

Aerial Photo Lake WR19, September 21, 2007. Note MVWR in background.

Aerial Photo Lake WR25, September 21, 2007. Note MVWR to right.

Aerial Photo Lake WR59, September 19, 2007.

Aerial Photo Lake WR60, September 20, 2007. Note MVWR to bottom.

Appendix B

Water License #S04L8-013
Department of Fisheries and Oceans Correspondence

SAHTU Land & Water Board
P.O. Box 1
Fort Good Hope, NT
X0E 0H0

December 24, 2004

Mr. Rod Gunderson
District Superintendent
Highway Operations
Dept. of Transportation, GNWT
P.O. Box 86
Fort Simpson, NT X0E 0N0

Our File: S04L8-013, S04L8-014
Your File:

Dear Mr. Gunderson;

Re: **GNWT-DOT Mackenzie Valley Winter Road**
Construction and Maintenance
K'asho Gotine District – S04L8-014
Tulita District – S04L8-013
Licence Approvals

Please find enclosed the originals of Water Licence S04L8-013 and S04L8-014, including Terms & Conditions for construction & maintenance on the Mackenzie Valley Winter Road in the Tulita and K'asho Gotine Districts. Copies will be forwarded to the DIAND Resource Management Officers in Norman Wells and Inuvik, to the Tulita and K'asho Gotine District Land Corporations, and to our Public Registry.

If you have any questions, please do not hesitate to contact our office at (867) 598-2413.

Yours truly,
SAHTU Land & Water Board

Patricia McNeely
Clerk, Licences/Permits

Cc: Gordon Yakeleya, President, Tulita District Land Corporation
Arthur Tobac, President, K'asho Gotine District Land Corporation
Kevin Glowa, Water Licence Inspector, DIAND
Steve Deshene, Land Use Permit Inspector, DIAND

SAHTU Land and Water Board
Water Licence

Pursuant to the Mackenzie Valley Resource Management Act, the Northwest Territories Waters Act and Regulations, the SAHTU Land and Water Board, hereinafter referred to as the Board, hereby grants to

GNWT/Department of Transportation, Highway Operations
(licensee)

of P.O. Box 86, Fort Simpson, NT, X0E 0N0
(Mailing Address)

hereinafter called the Licencee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Mackenzie Valley Resource Management Act, the Northwest Territories Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this licence.

Licence Number	S04L8-013
Licence Type	"B"
Location	Located from approximately km 794 to km 1083 of the Mackenzie Valley Winter Road in the Tulita District
Purpose	The use of water for the construction and maintenance of the Mackenzie Valley Winter Road.
Effective Date of Licence	December 24, 2004
Expiry Date of Licence	December 23, 2014

This Licence issued and recorded at Fort Good Hope includes and is subject to the annexed conditions.

SAHTU Land and Water Board

Witness

Chairman

This Licence and conditions shall be kept on site.
If you have any questions please call the SAHTU Land & Water Board at (867) 598-2413

c) Compliance with the Terms and Conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation.

2. **Definitions**

In this Licence: S04L8-013

"***Act***" means the Mackenzie Valley Resource Management Act and/or Northwest Territories Waters Act.

"**Board**" means the SAHTU Land and Water Board established under Section 60 of the Mackenzie Valley Resource Management Act.

"**Inspector**" means an Inspector designated by the Minister under Section 35(1) of the Northwest Territories Waters Act.

"**Licensee**" means the holder of this Licence.

"**Minister**" means the Minister of Indian Affairs and Northern Development.

"**Modification**" means an alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion.

"**Ordinary High Water Mark**" means of a body of water the limit or edge of its bed and, in the case of non-tidal waters, it may be called "the bank" or "the limit of the bank".

"**Regulations**" means Regulations proclaimed pursuant to Section 33 of the Northwest Territories Waters Act.

"**Waste**" means waste as defined by Section 2 of the Northwest Territories Waters Act.

"**Watercourse**" means a natural watercourse, body of water or water supply, whether usually containing water or not, and includes groundwater, springs, swamps, and gulches, as defined in the Northwest Territories Waters Regulations.

"**Water Licence Inspector**" means an Inspector designated by the Minister under Section 35(1) of the *Northwest Territories Waters Act.*

"**Waters**" means any inland waters, whether in a liquid or frozen state, on or below the surface of the land as defined in Part 3, Section 51 of the Mackenzie Valley Resource Management Act.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall ensure that any fuels, chemicals, or Waste(s) associated with this undertaking do not enter any Watercourse.

2. The Licensee shall not, under this Water Licence, deposit solid or liquid waste on the winter road or winter road right-of-way.

3. The Licensee shall not deposit raw, untreated sewage on the land surface.

PART E: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all water for miscellaneous undertakings, for the construction and maintenance of a winter ice road and associated activities, as described in the Water Licence application, excluding the Blackwater River. The winter ice road shall be constructed and maintained utilizing the water sources as identified in Part A of the Terms and Conditions and approved by the Board.

2. Water obtained for miscellaneous undertakings includes water for construction and maintenance of a winter ice road and associated activities.

3. Total quantities of water involved are approximately as follows:

LOCATION DESCRIPTION	DISTANCE (km)	WATER VOLUME (m^3)
km 795 to km 1083 MVWR*	288	28,800
Deline Winter Access Road km 0 to 45	45	4,500
Total Distance and Water Use	333	33,300

*Mackenzie Valley Winter Road

4. The Licensee shall erect and maintain permanent conspicuous signage at all approved water sources. The signage shall be erected at or near the point where land and water interface nearest to the water intake location.

5. Signage erected at all approved water sources shall include the following information: the words "Water Intake Site", the Water Licence file designation "S04L8-013", the approved nomenclature for the water source as indicated in Part A: Scope, Item (1), (b).

6. The Licensee shall maintain water uptake logs for all utilized sources. The water uptake logs shall include the following information: identification of water source, volume of water withdrawn per trip in cubic meters, cumulative uptake per source, time of uptake, date of uptake, and contractor and employee identification.

7. The water intake hose used on the water pumps shall be equipped with a screen of a mesh size of (2.54) mm sufficient to ensure no entrainment of fish.

8. Any waterbody with a maximum expected ice thickness that is greater than, or equal to, its maximum depth is exempt from the (5)% maximum withdrawal limit, so long as it is not connected to other Watercourse(s).

PART G: CONDITIONS APPLYING TO CONTINGENCY PLANNING

1. The Licensee shall ensure that petroleum products, hazardous material and other wastes associated with the project do not enter any Waters.

2. The Licensee shall review the Spill Contingency Plan annually and revise the Plan as necessary to reflect changes in regulations, operations and technology. Any proposed revisions shall be submitted to the Board for approval.

3. If, during the period of this Licence, an unauthorized discharge of Waste occurs, or if such a discharge is foreseeable, the Licensee shall:

    a.) employ the appropriate Spill Contingency Plan;

    b.) report the incident immediately via the (24) Hour NWT Spill Report Line. Currently the number is (867) 920-8130;

    c.) report the unauthorized discharge of Waste to the Board and the Water Licence Inspector within (24) hours; and

    d.) submit to the Board and the Water Licence Inspector, a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.

PART H: CONDITIONS APPLYING TO THE UNDERTAKING

1. The Licensee shall ensure all refueling, and storage of fuels, chemicals or deleterious substances are located a minimum of (100) metres from the Ordinary High Water Mark of any Watercourse.

2. The Licensee shall ensure that all project activities are confined to locations as described in the Water Licence application.

3. The Licensee shall ensure that the undertaking conforms to a Letter of Advice as issued by the Department of Fisheries and Oceans.

4. No materials cleared from the site shall be disposed of in any Watercourse. All materials shall, if necessary, be disposed of above (100) metres from the Ordinary High Water Mark of the Watercourse, and in such a manner to prevent entry into the Watercourse.

5. The Licensee shall erect and maintain silt fences at Watercourse crossings, if necessary, to prevent sediment from entering a Watercourse, and shall be maintained in any manner at the request of a Water Licence Inspector.

6. The Licensee shall not erect any camps or store materials on the surface ice of any Watercourse during winter road activities. Any temporary winter crossings of the river required shall be constructed of clean snow and/or ice only.

7. All sites affected by winter road activities shall be stabilized, groomed, reseeded and landscaped as necessary, and suitable erosion control measures implemented to minimize sediment deposition into a Watercourse.

Fisheries and Oceans
Fish Habitat

Pêches et Océans
Gestion de l'habitat du poisson

Fish Habitat Management
101 5204-50th Ave
Yellowknife, NT X1A 1E2

March 12, 2008

Terri Bugg
Environmental Analyst
Planning & Policy – Environmental Affairs
Department of Transportation, GNWT
Box 1320
Yellowknife, NT X1A 2L9

Dear Ms. Bugg:

Re: Water Withdrawal Sources Mackenzie Valley Winter Road.

Fisheries & Oceans Canada (DFO) has been working cooperatively with the Department of Transportation (DOT) with respects to the identification of water sources along the Mackenzie Valley Winter Road that minimize impacts to fish and fish habitat. Fisheries and Oceans Canada, Habitat Protection (DFO-HP) has a legal obligation to protect fish and fish habitat. Carrying out any project or activity that could harmfully alter, disrupt or destroy fish habitat by chemical, physical or biological means may constitute an offence under the federal *Fisheries Act*. It is widely accepted that water withdrawal can impact fish and fish habitat.

The goal shared by both DFO and DOT is to facilitate the annual construction of the winter road with minimal impacts to fish and fish habitat. The DFO Protocol for Winter Water Withdrawal in the Northwest Territories has been forwarded to DOT for use in the consideration of potential water sources.

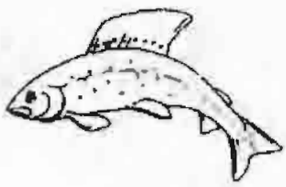
Through this cooperative process a number of water sources have been identified as acceptable, assuming the approved volumes of water slated for extraction are not exceeded, these include the following:

- WR 1 UTM: 10V 479737 7008833
- WR 2 UTM: 10V 472036 7016389
- WR 8 UTM: 10W 433668 7120640
- WR 10 UTM: 10W 425896 7132328
- WR 16 UTM: 10W 411677 7171746
- WR 18 UTM: 10W 407963 7179438
- WR 19 UTM: 10W 404789 7188854
- WR 25 UTM: 10W 373663 7208213
- WR 28 UTM: 10W 370015 7210416
- WR 32 UTM: 9W 610184 7238529
- WR 33 UTM: 9W 596483 7244326
- WR 35 UTM: 9W 583446 7252711
- WR 36 UTM: 9W 596858 7244361
- WR 37 UTM: 9W 568806 7261495
- WR 38 UTM: 9W 558414 7273794
- WR 39 UTM: 9W 556046 7277959
- WR 40 UTM: 9W 551562 7283464
- WR 42 UTM: 9W 549402 7293182
- WR 43 UTM: 9W 538030 7306494
- WR 45 UTM: 9W 522334 7341564
- WR 47 UTM: 9W 527114 7353025
- WR 50 UTM: 9W 539273 7368427
- WR 51 UTM: 9W 545271 7377597
- WR 59 UTM: 9W 557703 7387268
- WR 60 UTM: 9W 601859 7421962

Attach: 3 previous communications from DFO to DOT dated Oct 8, 2004, Dec 9, 2004 and Feb 2, 2005.

Cc: Rick Walbourn, SATU Land and Water Board
Rod Gunderson, DOT
Larry Purka, DOT
Rhonda Batchelor, DOT
Sheena Majewski, DFO
Derrick Moggy, DFO
Gerald Fillatre, DFO

Fisheries and Oceans / Pêches et Océans



DFO Protocol for Winter Water Withdrawal In the Northwest Territories

Water Source Identification

1. Proposed primary and secondary access routes for all project activities, with proposed water source and crossing locations clearly identified on a map, with geographical coordinates (latitude/longitude and/or UTMs) included.
2. Documented watercourse connectivity (permanently flowing and/or seasonal) between the proposed water source and any other waterbody or watercourse.
3. Aerial photos or satellite imagery of the water sources if available.
4. Estimated total water withdrawal requirement for work or activity and estimated total water withdrawal per water source (in m^3).

Bathymetric Survey Results

1. For all waterbodies: One longitudinal transect, connecting the two farthest shorelines, is to be conducted regardless of waterbody size. **Note: a longitudinal transect may be straight or curved in order to accommodate the shape of a lake (see Figure 1).**
2. For waterbodies equal to or less than 1km in length: a minimum of one longitudinal transect and two perpendicular transects are to be conducted. Perpendicular transects should be evenly spaced on the longest longitudinal transect, dissecting the lake into thirds (Figure 1).
3. For lakes greater than 1km in length: a minimum of one longitudinal transect is to be conducted. Perpendicular transects (min. of 2) should be evenly spaced on the longest longitudinal transect at maximum intervals of 500m.
4. Additional transects should be run as required to include irregularities in waterbody shape such as fingers or bays (Figure 1).
5. All longitudinal and perpendicular transects are to be conducted using an accurate, continuous depth sounding methodology, such as open water echo sounding, that provides a continuous depth recording from one shore to the farthest opposing shore (Figure 1). Any alternative technology should be reviewed by DFO prior to implementing for bathymetric surveys.

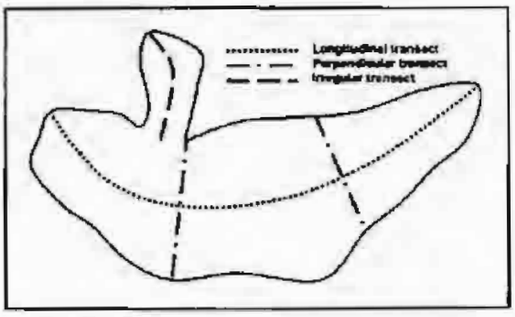


Figure 1. Minimum transect layout for a lake that is less than 1 km in length, with an irregularity.

Volume Calculations

1. Document the methods used to calculate surface area. If aerial photos or satellite imagery were used, provide the date (day/month/year) taken, as surface area may change depending on the time of year. If maps were used, provide the year that they were surveyed.
2. Detail the methods used to determine the total volume of free water, incorporating the relevant bathymetric information.
3. Calculate the available water volume under the ice using the appropriate maximum expected ice thickness, i.e. *Total Volume* $_{lake}$ – *Ice Volume* $_{max\ thickness}$ = *Available Water Volume* (see Table 1 for maximum ice thickness).
4. For programs where ice-chipping is used, the total ice volume to be removed from the waterbody should be converted to total liquid volume and incorporated into the estimate of total water withdrawal requirement per water source.

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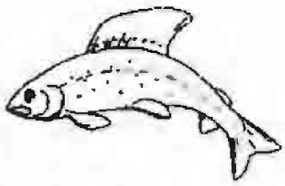

DFO Protocol for Winter Water Withdrawal In the Northwest Territories

A brief project summary report documenting and confirming total water volume used per water source, withdrawal rates, flow rates per source and corresponding dates should be submitted to DFO within 60 days of project completion. Information should be provided in the following format (this information would also be useful as part of the project description):

Lake ID	**number and/or name**
Coordinates	**latitude and longitude and/or UTM coordinates**
Surface area	**in m^2**
Total Lake Volume	**in m^3**
Under Ice Volume	**in m^3 (based on max ice thickness for region)**
Max expected ice thickness value used	**in m**
Calculated 5% Withdrawal volume	**in m^3**
Total required water volume extracted	**in m^3**
Photograph of waterbody	
Bathymetric Map(s) of waterbody	

Any requests deviating from the above must be submitted to DFO and will be addressed on a site-specific basis.

Please note that adherence to this protocol does not release the proponent of the responsibility for obtaining any permits, licences or authorizations that may be required.

For more information contact DFO at (867) 669-4900.

Appendix C

Workplan Proposal to Improve MVWR compliance program

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CONSULTING

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February 23, 2009

Government of the Northwest Territories
Department of Transportation
4501, 50 Avenue
Lahm Ridge Tower, 2nd Floor
Yellowknife, NT
X1A 2L9

Attention: Ms. Terri Bugg
Environmental Analyst
Planning, Policy and Environment

Re: Proposed Work Plan for Hydrologic Analysis of Water Crossings on the Mackenzie Valley Winter Road

Dear Ms. Bugg:

We are pleased to provide to you for your consideration the following proposal which was discussed and requested during our final project meeting on Friday February 13, 2009.

Upon completion of the Water Withdrawal Under-Ice Water Flow Site Assessment field program for the Mackenzie Valley Winter Road (MVWR), Dillon Consulting Ltd. identified several potential approaches that could improve the current compliance program for the Water Licenses for water-taking along the MVWR. The current field program is a complicated, logistically challenging and a potentially costly undertaking, estimated at $50,000 or more per year. The combination of the remote location of the project, extreme winter weather conditions and the unreliability of under-ice stream flow rating curves present Department of Transportation (DOT) staff with the challenge of meeting the requirements of its two water licenses that permit the DOT to take water from the approximately 25 - 30 creeks and rivers required to build the MVWR.

It is our intent, as detailed in the proposal, to provide DOT with a solution that will reduce the challenges of their compliance program, save resources and reduce overall costs in the long run by developing a monitoring program method that will require only simple field measurements that can be obtained by a DOT employee or contractor.

SOLUTIONS

The license stipulation of obtaining an instantaneous flow rate immediately presents a challenge to DOT because it implies that the stream flow is to be measured and calculated at the time of water withdrawal. There are only two ways that this can be achieved. The first is to take a stream flow measurement immediately prior to water withdrawal during the winter road construction period and the second typical method is to develop a relationship between water level and stream flow.

Direct Stream flow Measurements

The taking of direct stream flow measurements are complicated by the extreme conditions of the project study area. Access to the sites at the time of water withdrawal (late-Nov to mid-Dec) is limited given that the road is under construction and not built. Access to the sites by helicopter is possible however the ice cover at this time of year is still forming presenting some safety issues for field staff. According to the maintenance supervisor (Per. Comm) for Zones 1, 2, 7/1 and 7/2, the ice is usually broken by an axe to access water for withdrawal, which probably means that the field team would encounter a high number of sites that are essentially inaccessible due to thin ice or that the field team would be required to clear ice to access a cross-section and sample by wading. The combination of sampling difficulty and presumably high costs associated with accessing the sites at this time of year suggests that another approach would likely be preferred by DOT.

Direct Stream flow Measurements and Rating Curves

Developing a relationship between water level and stream flow is called a rating-curve. The rating curve is built by making a series of discharge measurements at different times of the year that correspond to a range of water levels. For example, a spring discharge measurement provides stream flow at the upper ranges of water level and a late-summer or fall discharge measurement provides a measurement under a low water-level condition. Once a reliable rating curve is established, then instantaneous stream flow can be estimated by simply taking a water level measurement and reading the stream flow from the established rating curve.

Developing a rating curve for each potential water withdrawal site would be the preferred approach if the water takings happened during open-water conditions. Developing a rating-curve for each site under open-water conditions is relatively straightforward. If the channel is very active the rating-curve is more difficult to establish and yearly updates are

Regional Analysis

The second alternative is to perform a regional analysis based on Water Survey of Canada (WSC) stations located in the region. A regional analysis is an accepted method of predicting flow for un-gauged basins and is basically a method to extend records geographically. This approach would depend on developing a relationship between each of the 25 – 30 water courses included on the DOT water license and either a group of or a specific WSC stream flow gauge. According to the WSC in Yellowknife, a number of stations have been established relatively recently in the area.
They are not currently published but the analysis is close to complete and there may be an opportunity for the DOT to access the data. In the case of this alternative the DOT would access the WSC gauges as close to the date of withdrawal and calculate the available volume of water at each water taking site based on a set of relationships developed between each site and the WSG gauge(s). While developing this work plan proposal Dillon has been in contact with Environment Canada (EC) scientists in Yellowknife, Vancouver and Saskatoon. Environment Canada has focused some effort on the Mackenzie Valley in recent years and EC staff have already provided to Dillon staff valuable insight into the implementation of a regional analysis approach and they support such an approach calibrated with a field program. Dillon would continue to work closely with these experts as this work unfolded.

It is our opinion that a simple hydraulic model with measurements taken in-situ at the time of withdrawal will best serve DOT's needs. However, to scope the work required to achieve such a solution will require much of what is outlined in the following work plan. In addition, the proposed investigation into the watershed characteristics and regional analysis will provide valuable data for calibration and confirmation of future predicted stream flows. Therefore, this work plan serves twofold: it provides an analysis of the suitability of different approaches and lays the groundwork to implement whichever solution is preferred.

WORK PLAN PROPOSAL

This work plan consists of several components which include the compilation of existing/historic data and a preliminary investigation to assess the approach which best fits DOT's overall requirements to meet water license compliance. It is proposed that the best approach will be identified by DOT and Dillon staff working together to identify the significance of certain assessment variables such as site-suitability, accuracy, timeliness, cost, and applicability.

Task 4 – WSC Data Review

The WSC has recently established a number of water flow monitoring gauges in the MVWR region. The stations and their watersheds will be analysed to assess if they can be used to produce a synthetic stream flow time series for the creeks and streams on the DOT license.

Task 5 – Site Assessment, Selection Criteria and Recommendations

Each water withdrawal stream site will be assessed to determine which approach is most suitable based on a set of criteria that will reflect accuracy, ease of use, site-suitability etc. At sites where a modelling approach is appropriate, Dillon will work with DOT to develop a sampling method that will be easy to use in the field by DOT and road construction personnel and that will yield the level of accuracy required to satisfy Water License conditions.

Deliverable: ***Recommendation report that summarizes the feasibility of applying regional analysis and modelling techniques to provide DOT with an accurate and functional water license compliance program and work plan to implement these recommendations.***

LOOKING FORWARD

Once the various tasks of this work plan have been completed the next step of the process will be to plan a field program. It is anticipated that both the regional analysis and the modelling exercise will require data to be collected in the field during the open-water season. This data will be used to calibrate the predicted stream flows, using the 'desk top' methodologies, with actual measured flows. Once the work proposed in this work plan is complete a field program will be developed that is strategic in its use of resources and data collection. Once the collected field data is analysed, the two remaining tasks of the overall work plan will be to develop the models or perform the regional analysis to predict stream flow at each site. Once the approach to determine stream flow at each of the water withdrawal sites has been identified and developed into a general compliance monitoring program Dillon staff will work with DOT staff and field operators to make the application of the program as useful and realistic as possible.

stormwater management and planning, erosion and sedimentation control, and revetment designs for rivers, coasts and reservoirs. Project scopes have ranged from feasibility studies, baseline and environmental impact assessments, computer modelling and analysis, and preliminary and detailed designs.

Emma McKennirey, Water Resources Engineer
Emma is a civil engineer specializing in water resources. She has worked on projects in Ontario, British Columbia, Northwest Territories, Yukon and Nunavut. Emma has acted as hydrology discipline leader on a number of environmental monitoring projects in Northern and Western Canada. Emma has worked on a number of projects to predict stream flow in un-gauged basins using a variety of hydrologic and hydraulic techniques. She is well versed in remote field work, water licensing, water balance applications, water management plans, groundwater-surface water interaction investigations, and planning and implementing groundwater and surface water field programs. Emma is familiar with the Mackenzie Valley Winter Road and recently completed the under ice stream flow sampling as part of DOT's current water license compliance program.

COST

The total estimated cost to complete the work plan is approximately $25,000. A detailed cost break down by task and project team member is provided in the attached table.

Yours sincerely,

DILLON CONSULTING LIMITED

Craig J. Thomas
Senior Environmental Specialist
Northern Projects

CJT/

Appendix D

Environmental Impact Statement (Dillon, 2004)

TABLE OF CONTENTS

TABLES

1.3 Document Overview

The EIA assesses the potential environmental impacts of construction and maintenance activities of the expansion of the Mackenzie Valley Winter Road system, and describes methods to mitigate potential effects. Specifically, the EIA report includes the following:

- Background, context and project objectives (Section 1.0);
- An assessment of the potential environmental impacts, recommended mitigation and anticipated residual effects (Section 2.0);
- A discussion of cumulative effects pertaining to the project (Section 3.0);
- A summary of information gaps (Section 4.0);
- A summary section, including major conclusions to the EIA (Section 5.0); and
- A reference section (Section 6.0).

Table 1: List of Proposed DoT Water Extraction Sites and Potential Impacts

Name	Location (Km Post)[1]	Potential Impact of Water Extraction
Blackwater River	784.1	Little impact on river flows due to size and proximity to Mackenzie River. Potential sedimentation of stream due exposed toe of bank slope.
Steep Creek	815.8	Moderate potential impact; potential insufficient winter flows.
Mackenzie River	832.4	Minimal potential impact (due to volume of flow).
Little Smith Creek	853.8	Moderate potential impact; potential insufficient winter flows.
Big Smith Creek	871.1	Minimal to moderate potential impact, as stream is shallow, but sufficient water appears to be present.
Creek (Large)	~890	No information available.
Gotcha Creek (South)	913.7	Moderate potential impact; potential insufficient winter flows.
Gotcha Creek (North)	1.5 (Deline Winter Road)	Moderate potential impact; potential insufficient winter flows.
Mackenzie River (2)	~932.2	Minimal potential impact (due to volume of flow).
Vermilion Creek North	984.4	Minimal potential impact, as stream is spring-fed.
Christina Creek	1001.7	Moderate potential impact; potential insufficient winter flows.
Mackenzie River (Norman Wells)	1023.4	Minimal potential impact (due to volume of flow).
Billy Creek	1033.4	No information available.
Oscar Creek	1054.4	Minimal potential impact, as stream is lake-fed.
Elliot Creek	1072.4	No information available.
Hanna Creek	1084.4	No information available.
Donnelly River	1118.4	Minimal-moderate potential impact, as stream is open year-round (spring-fed) and may be impacted by any sedimentation arising during water extraction.
Snafu Creek	1124	No information available.
Tsintu Creek	1135.4	No information available.
Mackenzie River (Fort Good Hope)	1172.2	Minimal potential impact (due to volume of flow).
Hare Indian River	Colville Lake Winter Road	Minimal potential impact assumed as this stream is a major tributary to the Mackenzie River.
Unnamed Streams (2)	Colville Lake Winter Road	Minimal-moderate potential impact; streams are connected to lake chains and therefore may have sufficient water in winter.
Tchaneta River	Colville Lake Winter Road	Minimal-moderate potential impact; stream is connected to a chain of lakes and therefore may have sufficient water in winter.
Unnamed Lake	Colville Lake Winter Road	Minimal potential impact (due to size of lake).
Lac Belot (2)	Colville Lake Winter Road	Minimal potential impact (due to size of lake).
Colville Lake	Colville Lake Winter Road	Minimal potential impact (due to size of lake).

[1] Kilometre posts refer to Mackenzie Valley Winter Road unless otherwise noted.

It is expected that road construction will have the potential to generate the following impacts (Table 2):

le 3: Potential Effects, Proposed Mitigation and Residual Effects of Construction Activities

Effects and Description	Proposed Mitigation	Anticipated Residual Effects
Water Quality		
es, such as oil and grease can enter fuel spills or leaks from machinery. on of oxygenated water from lakes en content of the remaining water[2]. from streams can result in sediment pump intake screen comes into am substrate.	Restrict refueling activities to areas located at least 100m away from any watercourse. Ensure that machinery is leak-free before use near a watercourse. Ensure a spill containment kit is onsite and crew is trained in its use. In order to prevent deoxygenation of remaining lake water, water should be withdrawn at a depth >1m below the ice surface. Ensure that lakes have a depth that is >1.5m greater than their maximum ice thickness, and no more than 5% of available water volume is withdrawn in any one year[1]. Ensure pump intakes do not disturb the stream bottom sediments during water withdrawal.	Potential water quality issues controlled by on-site mitigation with *no residual effect.*
ntation		
introduced into watercourses as a snow fill containing dirt or debris, erodible materials present at the igs	Use of snow fill containing minimal amounts of dirt and debris. Relocate crossings or crossing structures away from highly erodible sites or use bank protection (e.g., rip-rap) or silt screens[2].	Potential sedimentation issues controlled by on-site mitigation with *no residual effect.*
e to Aquifers		
water required to accelerate road ncrease load capacity, additional upon local aquifers. This may flow conditions, which in turn can of habitat available to aquatic	Assess the recharge capacity of various waterbodies along the Winter Road route to determine which of these can accommodate increased water withdrawal without major effects on local aquifers. Then, restrict increased water withdrawals to these aquifers. Assess whether a waterbody is connected to other waterbodies. Where possible, restrict water removal to isolated waterbodies. Where possible, restrict water removal to non fish-bearing watercourses. Ensure that water withdrawal does not exceed 5% of a watercourse's instantaneous flow rate[1].	Potential impacts to groundwater resources controlled by on-site mitigation with *minimal residual effect.*

Effects and Description	Proposed Mitigation	Anticipated Residual Effects
ion and Disturbance		
urbance (e.g., rutting, compaction, :ur due to the soil not being uring construction.	Ensure that site preparation begins under frozen soil conditions and an adequate layer of compacted snow is present before road opening.	Localized soil erosion controlled by on-site mitigation with *no residual effect.*
ur during snow collection adjacent	Ensure that ground surface is not disturbed when collecting snow. Ensure that a 5 m buffer is maintained between the snow collection area and the stream edge[3].	
ary Impact with Respect to		
s may occur due to unnecessary when no longer in use.	Appropriate construction equipment selection to minimize exhaust emissions. Appropriate equipment maintenance and operational methods (e.g., shut off machinery when no longer in use.	Localized temporary air quality impacts controlled by on-site mitigation with *no residual effect.*

D), 2004.
2003) and BP-TEC (2002, 2003).

Potential Effects, Proposed Mitigation and Residual Effects of Site Operations and Maintenance

Effects and Description	Proposed Mitigation	Anticipated Residual Effects
on Water Quality tances, such as oil and grease ourse during fuel spills or leaks	Develop a contingency plan for hazardous materials spills, including details of the spill containment and clean-up procedures that will be in place, availability of equipment and supplies (e.g., sorbent pads), contacts for initial response, and reporting procedures.[1] Post flagging to warn transport drivers of dangerous conditions ahead, which may precipitate accidental spills[2]. Training to ensure safe operation of vehicles, adherence to speed restrictions, etc. The key is avoidance of accidents that could result in the potential release of delcterious substances to the environment.	Potential water quality issues controlled by on-site mitigation with *minimal to moderate residual effects*, depending on location of spill and efficiency of response.
mentation e introduced into watercourses use of snow fill containing dirt ition, the presence of snow fill ad closure may lead to excess n channel, which could lead to mbed erosion.	Use of snow fill containing minimal amounts of dirt and debris. Removal of snow fill after road closure ensures a free conveyance of water in the stream channel during the thaw period.	Potential sedimentation issues controlled by on-site mitigation with *no residual effect.*

Effects and Description	Proposed Mitigation	Anticipated Residual Effects
rosion and Disturbance		
d disturbance (e.g., rutting, ixing) may occur due to the sufficiently frozen during specially during beginning and eason).	Monitor winter road conditions to ensure that soil is sufficiently frozen to prevent rutting, compaction, or admixing.	Localized soil erosion controlled by on-site mitigation with *no residual effect.*
tream Crossings		
winter flow is evident could and streambanks.	Install seasonal culverts at sites with winter flow.	Disturbance of steam crossings is controlled by on-site mitigation with *minimal residual effect.*

Ltd. (2000)
ıd Sentar Consultants Ltd. (1993)

3.3 Potential Cumulative Effects

3.3.1 Effects on Water Quality and Hydrology

Impacts to water quality can occur during both the construction and the operation phases of the project. During construction, improper procedures for equipment refuelling and fuel storage, and oil and grease leaking from machinery can negatively impact water quality. During operation, spills of fuels and other hazardous substances may occur as a result of accidents. While impacts can be effectively mitigated with appropriate precautions during the construction period, spills occurring during the operation period may be more difficult to contain effectively, even when appropriate mitigation mechanisms are in place. This is due to the remoteness of the area and potentially long response times for clean-up efforts (Westworth Associates Environmental Ltd., 2000). Major spills could affect water quality and aquatic organisms downstream of the spill and could also affect groundwater resources. These effects would be cumulative to potential spills of hazardous substances and sedimentation effects from the operation of the Mackenzie Highway and the construction of the Deh Cho Bridge to the south (if approved).

Impacts to hydrology can occur during the construction of the Winter Road, as water is withdrawn from local waterbodies for use in the road construction process. However, these impacts are mainly related to alterations in available living space for fishes in waterbodies affected by water withdrawal (Alaska Bureau of Land Management, 1998). As noted previously, a detailed discussion of potential impacts to aquatic organisms is beyond the scope of this assessment.

3.3.2 Effects on Habitat Fragmentation

The Mackenzie Valley Winter Road alignment is located within the boreal woodland caribou and moose ranges. However, boreal woodland caribou wintering areas are not located in the vicinity of the road (Deh Cho Land Use Planning Committee, 2003). Moose, on the other hand, do winter close to the Winter Road (Deh Cho Land Use Planning Committee, 2003), and therefore have the potential to be impacted.

The Interprovincial Pipeline (IPL) was identified as having a right-of-way that runs parallel to several winter road crossings. There also exists an old right-of-way for the Canadian National Telecommunications (CNT) Line. One particular Winter Road crossing (Big Smith Creek) has evidence of both of these linear features nearby, including abandoned lengths of telephone cable (Golder & GeoNorth 2000). There is also reference to an old winter road right-of-way in the area. When combined, these linear features may contribute to habitat fragmentation or alteration for wildlife.

However, in light of the seasonal use aspect of the Winter Road, the incremental effect of the project on habitat loss or fragmentation in the Mackenzie Valley is likely to be minor.

5 CONCLUSIONS

5.1 Summary of Potential Impacts

5.1.1 Potential Construction Impacts

Potential impacts related to construction may affect surface water, ground water, vegetation, wildlife, air quality and soils (as noted in the introductory section, aquatic receptors were not part of the scope of this study). All of these potential impacts can be effectively mitigated using the measures presented in this document, with little or no residual effects.

5.1.2 Potential Operational and Maintenance Impacts

Potential impacts related to construction may affect surface water, ground water, vegetation, wildlife, and soils. While the majority of these potential impacts can be mitigated with little or no residual effects, spills of hazardous materials can potentially have moderate residual effects due to the remoteness of the project area and reduced efficiency in responding to spills due to extreme weather.

5.2 Recommendations

The following environment-related recommendations are presented for consideration by DoT:

- Restrict refueling activities to areas located at least 100m away from any watercourse. Ensure that machinery is leak-free before use near a watercourse;
- Develop a contingency plan for hazardous materials spills, including details of the spill containment and clean-up procedures that will be in place, availability of equipment and supplies;
- Where highly erodible materials are present at lake or stream approaches, consider installing bank protection and silt fencing or relocation of crossing;
- Where possible, restrict water removal to isolated waterbodies. Where possible, restrict water removal to non fish-bearing watercourses;
- Determine winter volumes and depths of lakes and winter instantaneous stream flows before extraction of water;
- For lakes, extract water only if water depth is 1.5m greater than ice thickness, and with draw water at a depth greater than 1 m below the ice surface to ensure oxygenated surface water is not removed from lake. Extract no more than 5% of lake volume during any one season;
- For streams, ensure that only up to 5% of instantaneous flow is removed at any given time;

6 REFERENCES

Alaska Bureau of Land Management. 1998. Northeast National Petroleum Reserve Alaska Final Integrated Activity Plan/ Environmental Impact Statement. Fairbanks, AK.

BP-TEC Engineering Group Ltd. 2003. Blackwater River Bridge, Mackenzie Valley – Report on Construction Techniques and Hydrotechnical Review. Edmonton, AB.

BP-TEC Engineering Group Ltd. 2002. Preliminary Engineering Assessment of 22 Stream Crossings – Mackenzie Valley Winter Road – Wrigley to Fort Good Hope. Edmonton, AB.

Bryant Environmental Consultants Ltd. 2003. Environmental Assessment Overview of Bridge Crossing at Blackwater River, NT. Report prepared for the Department of Transportation, GNWT. Yellowknife, NT.

Deh Cho Land Use Planning Committee. 2003. Deh Cho Atlas. On internet at: http://www.dehcholands.org/atlas/atlas.htm

DFO. 2004. Draft - DFO Protocol for Winter Water Withdrawal in the Northwest Territories. (Current to June 2004) Yellowknife, NT.

DoT. 1997a. Deline Winter Road Operational and Environmental Management Plan – Gotcha Creek North River, km 1.5 to Porcupine River, km 81.0.

DoT. 1997b. Mackenzie Valley Winter Road Operational and Environmental Management Plan – Hodgson Creek, km 691.4 to Saline River, km 832.4.

DoT. 1997c. Mackenzie Valley Winter Road Operational and Environmental Management Plan – Saline River, km 832.4 to Norman Wells, km 1023.4.

DoT. 1997d. Mackenzie Valley Winter Road Operational and Environmental Management Plan – Norman Wells , km 1023.4 to Gibson Gap, km 1093.4.

DoT. 1997e. Mackenzie Valley Winter Road Operational and Environmental Management Plan – Gibson Gap, km 1093.4 to Fort Good Hope, km 1172.2.

DoT. 2004. Mackenzie Valley Winter Road – Winter Road Construction and Maintenance: Proposed Water Extraction Sources (Eight 1:250,000 scale mapsheets).

Appendix E

Traditional Ecological Knowledge
Community Consultations

Final Report

For a

Traditional Ecological Knowledge Study

in support of an Application for a Water License for Construction of the

Mackenzie Valley Winter Road

Submitted To

The Project Manager
Department of Transportation, Government of the Northwest Territories
PO Box 1320
Yellowknife, NT X1A 2L9

by

GeoNorth Limited

October 2004

Introduction

Background

The Department of Transportation (D.o.T.), Government of the Northwest Territories (GNWT) is responsible for the planning, design, construction, and maintenance of safe transportation infrastructure, capable of meeting user needs in the Northwest Territories (NWT). The Department builds and maintains facilities to serve the NWT's needs in the road, marine and air transportation sectors. To facilitate oil and gas exploration and development projects in the Sahtu and Deh Cho regions, D.o.T. needs to upgrade and extend the operational window of winter roads on the Mackenzie Valley Winter Road system connecting Wrigley, Tulita, Deline, Norman Wells, Fort Good Hope and Colville Lake.

Specifically within the Sahtu, D.o.T. has indicated a need to improve the surface of the winter road between the Blackwater River and Colville Lake by means of snow-making and spraying procedures. This work is being carried out to make the winter road able to withstand the increased traffic anticipated over the next few years along the Mackenzie Valley. In order to get enough water to undertake the improvement of the driving surface, D.o.T. will need to extract water from larger water bodies along the winter road alignment. To facilitate these activities, two Water Licenses will be sought from the Sahtu Land and Water Board: one for the work in the Tulita District of the Sahtu Settlement Area, and a second for work in the K'ahsho Got'ine District.

GeoNorth Ltd. was contracted by the D.o.T. to gather traditional ecological knowledge (TEK) as part of their requirement in preparing a Water License application for construction of the Mackenzie Valley Winter Road. Due to the short time-frame available GeoNorth agreed to make a 'best effort' to meet the requirements for D.o.T.'s water license application to the SLWB, but stated that it cannot guarantee outcomes.

This report is composed of the following components:

- an overview of the process involved in the gathering of TEK; and
- the actual information that was gathered which will be compiled with earlier TEK data collected by D.o.T. As well, relevant information will be added from the *Technical Report: An Environmental Information Update for Selected Stream Crossings along the Mackenzie Valley Winter Road* which was prepared for the Department of Transportation, GNWT by GeoNorth and Golder Associates Ltd. in March 2000.

1. Process Overview

Thursday, September 23rd, 2004

GeoNorth and D.o.T. met and discussed TEK requirements for the Mackenzie Valley winter road's water license application. A verbal understanding was reached and GeoNorth was asked to develop a proposal and budget for consideration by D.o.T.

At this time, Joe Grandjambe of Fort Good Hope stated that outside consultants were not welcome in Fort Good Hope and that any TEK work done on K'ahsho Got'ine lands should be done by local people and kept within the borders of the area. In response, GeoNorth stated that TEK work was an evolving process and enquired about the availability of a TEK database in the Fort Good Hope area. This was made in reference to information that a local person was working on the creation of such a database.

Wednesday, September 29th, 2004

GeoNorth met with Edna Tobac, Land Technician, with the Sahtu Land and Water Board, and brought forward Joe Grandjambe's statements of the previous day. GeoNorth was encouraged to go ahead and try and conduct interviews and to compile previous information already gathered regarding the winter road.

A meeting was held with Roger Boniface, President of the Fort Good Hope RRC, and it was agreed that GeoNorth would go ahead and interview the people he had previously made arrangements with. Four people were interviewed.

In Colville Lake, Jimmy Tutcho of the Behdzi Ahda First Nation Band arranged for an evening meeting with four community members. Many concerns and recommendations were made regarding the building of the winter ice road.

Thursday, September 30th, 2004

Due to inclement weather, the plane was late in arriving to Colville Lake. Because of the delay, GeoNorth was unable to hold additional interviews in Norman Wells.

Friday, October 1st, 2004

Two additional interviews were conducted in Norman Wells.

GeoNorth returned on the afternoon flight to Yellowknife having met with close to thirty people regarding the D.o.T.'s application for water licenses within the Sahtu area. Below is a table summarizing the interviews/meetings that were held and or attended.

Summary of Interviews/Meetings Held for TEK regarding the application for a water license for the 2004 Mackenzie Valley Winter Road

Monday September 27	Tuesday September 28	Wednesday September 29	Thursday September 30	Friday October 1
Norman Wells: Ed Hodgson John Hodgson	**Tulita:** David Etchinelle	**Fort Good Hope:** Roger Boniface organized a meeting with: Charlie Barnaby Alexis Chinna Bart Cotchilly	**Weathered in**	**Norman Wells:** Norm Hodgson Larry Tourangeau

The following TEK was gathered in support of the D.o.T.'s application for a water license of the construction of the 2004 Mackenzie Valley Winter Road. The sources for this information include:

- September/October 2004 TEK interviews in the communities of Norman Wells, Tulita, Fort Good Hope and Colville Lake;
- Interviews D.o.T. conducted in 2003 related to the installation of bridges along the winter road; and
- TEK gathered within a technical report titled: *An Environmental Information Update for Selected Stream Crossings along the Mackenzie Valley Winter Road* prepared for D.o.T. in March 2000 by GeoNorth and Golder Associates Ltd.

For ease of reading, the following information has been organized around the proposed water extraction sources for the 2004 Winter Road License. However, because so many general as well as specific recommendations were made by people in the area, a section on general comments and recommendations has been included.

Area Trends

Global warming has had a noticeable effect on season changes. It is making overland access much shorter than it used to be. There are later freeze-ups and earlier thaws. The seasons are also unpredictable from year to year.

This year water levels are shallow everywhere. This could be because the permafrost is melting. Water used to stay on the surface but over the last three years, the rain water just goes into the ground right away. As well, in the winter time, there used to be less snow covering the ground so the lakes, rivers and ground would freeze hard. There would be a lot of water on the ground and on the muskeg in the spring. Now, the ground doesn't freeze hard. The snow is deeper so that the ground is not getting as cold and it melts right away into the ground.

All the creeks are drying out. All summer long most all the creeks can be driven up with a quad. The majority of creeks in the area overflow in the wintertime. Overflow occurs when creeks have frozen all the way to the ground.

Water from most creeks is drinkable. It is clean water. It is still new to industry. Water is always highest in the spring. With the exception of Big Smith Creek, Blackwater River and Oscar Creek, all the water stays within the banks of the creeks/rivers during break-up. Water is cold year round but is warmer in the summer than in the winter. The taste of it only changes in the spring with all the run-off.

There are two different types of water sources for creeks: muskeg and mountain/spring fed streams. Muskeg water freezes fast but it is not a deep freeze because it is soft water. All mountain water comes out of rock so it is hard water. The presence of these minerals making the water hard is evident when doing laundry. More soap has to be added to get clothes clean. Creeks that are fed from underground springs or from mountains don't freeze really hard; one can always find open water. They usually have overflow maybe because of all the minerals. The sources that D.o.T. wants to extract water from are a mixture of muskeg and spring fed

overflow in the winter, but overall the quality of the water is known to be excellent and it can be drunk all year round.

The water source for Blackwater River is Blackwater Lake and from water flowing from the muskeg. A number of little creeks feed into the Blackwater River. The water rises fast in the rain because of all the little creeks. As you head up the Blackwater River toward Blackwater Lake, there is a kind of rapids, which you must portage if you are in a boat.

There is a trail on the side of the Blackwater River which goes up to Blackwater Lake. At the Lake there used to be a camp of five-six houses. It was still there in 1953 when Maurice Mendo trapped in the area, but people moved into Déline and Tulita in the 1960's. Traditionally, people used to go from Blackwater Lake down to the Mackenzie River. As well, people came from Wrigley to trap in the area. The area around Blackwater Lake is still used by people from Wrigley to trap for:

- Martin
- Beaver
- Wolverine
- Mink
- Lynx

However, people do not really travel the trail from the mouth of Blackwater Lake to the Mackenzie River anymore.

Birch trees and other trees are found in the area. There is no visible soil along the river only rocks. Birds are in the area but don't necessarily stay in the area. Caribou can be found at Blackwater Lake.

There are a lot of moose in the backcountry of Blackwater River and along the Mackenzie River banks. Last year there were lots of moose in the area- about forty. Now (September 2004), they are moving around, so there are fewer.

There are no known beaver dams along the Blackwater River. This is because the lake and river are too big for a dam. Beavers only need about three feet of water. Beavers like to dam up the small creeks that feed into the main river. As well, beavers are usually found in small lakes because they can control the water depth.

Fishing for grayling occurs right near the mouth of the Blackwater River where it meets the Mackenzie River. The water is clear and because of its depth, there is a strong likelihood that this would be a spawning area. There is trout on Blackwater Lake, but not in the river.

In terms of areas of significance, the following story was related by both Maurice Mendo and David Etchinelle in separate interviews:

> Along the Blackwater River there used to be a big rock. It used to be around the Saline River but it moved. Apparently, a lady passed away a long time ago. She was ill and people couldn't help her get well so she told everybody to move. People left and then came back for her. She had turned into a stone. Now people come to the rock for

Crossings along the Mackenzie Valley Winter Road

The Saline River has natural salt in it- there is natural salt in the area. Traditionally, people would use it for medicine. Sometimes caribou and moose lick the salt in the area.

The river is not very fast moving except in the spring time when in might be three feet deep with the water melting and running from the hills. The river varies in terms of width and in terms of depth. You cannot travel up it by boat. There is a lot of gravel. You can drive up the creek bed by quad up to the mountain in the summer. In the fall, the water is very low – depending on the weather. There has been no rain this year.

When there is lots of snow, like four or five feet, there will not be much water in the spring because the ground won't freeze hard. When there is not much snow, the ground freezes hard, so there is lots of run-off in the spring. If there is a hard freeze, there is lots of water everywhere and it drains straight down into the Mackenzie River. The river does freeze but it always gets overflow.

In the winter, people drink snow water. In the summer, you can drink the water from the Mackenzie River near Saline River, but it tastes salty.

There used to be a cabin right on the Mackenzie River. Three people are buried on the hill above the river bank- you can still see the crypt. On the other side of the river, Maurice Mendo's uncle is buried. He died while travelling in the area in 1930.

There are no fish in the Saline River but there are grayling at the mouth of the Saline River and they lay their eggs in the fall.

A variety of birds travel around and through the area, but hawks and eagles live in the area.

Caribou do not stay in the area, they just move around. There are a lot of moose in the area.

There are trails on this side of the Mackenzie River near Saline River that go up to Blackwater Lake. People used to go up the trails to hunt beaver in the 1960's. In the 1970's and 1980's, people still trapped there. Even today people are still trapping in the area.

No other important sites in the area were known.

The area is recognized as habitat for moose, diving ducks and geese.

Little Smith Creek (km 853) – NTS 96C
Sources: Maurice Mendo, Tulita
David Etchinelle, Tulita
Technical Report: *An Environmental Information Update for Selected Stream Crossings along the Mackenzie Valley Winter Road*

difficult to pack a canoe in the area because there are steep rock cliffs. When the water goes down, like in the spring and fall, you can walk right up the creek.

In the winter, the water is maybe sixteen inches deep. There are no hot spots on this creek. Overflow occurs in the winter. When the Mackenzie River breaks up, the ice sometimes backs up into the creek about two hundred feet. It overflows on the ground.

There are a lot of beaver on the creek in the spring. A lot of little lakes offshoot the lake above Big Smith Creek. There are jackfish/northern pike in the creek. As well, there are moose in the area.

This area is recognized as good habitat for moose, diving ducks and as well as geese. It is a traditional harvesting area for moose.

Large Creek (km 890)-NTS 96C

The creek is unknown, at least by this name. Questions were raised as to whether this was the same creek as Probation Creek.

Gotcha Creek (km 914)- NTS 96C
Sources: Maurice Mendo, Tulita
David Etchinelle, Tulita

Gotcha Creek is a muskeg fed stream. It is very shallow and slow moving except in the spring when everything is coming to life. The water is clear and tastes good. Water levels vary depending on the year, but it is too shallow to boat up. In the spring, people make tea from the water while waiting for beaver. This spring there were no beaver.

Above the creek, there is a lake just like Big Smith Lake. People would travel to this lake by a trail that goes way up from the Mackenzie River on the right side of Gotcha Creek. Traditionally, people trapped up by the lake for otter, mink and beaver. People also used the trail in the spring and winter for caribou and moose hunting. It is still used by people going up to spring hunt for beavers. Not as many people use it any more, but it is still used. Nowadays, some people use the trail for crossing the winter road instead of accessing the road from the Mackenzie River.

There are no fish in Gotcha Creek

Way up the creek, about ten miles back from the Mackenzie River, there are beaver dams. However, there are no dams close to the Mackenzie River. People had no concern with beavers contaminating the water because the water dissolves any waste.

Mackenzie River (Tulita- km 941) – NTS 96C
Sources: Maurice Mendo, Tulita
David Etchinelle, Tulita

Because the water is so low this year, the water just runs into the rock on the creek bed. The creek is all gravel with rocks. People didn't think D.o.T. would be able to extract water from here as the water is so low.

There is the odd fish in the creek, but they do not spawn here as the water is too shallow. Because a winter bridge exists, there is less concern with this area. The creation of ice bridges does not have to happen.

There are no beavers on the creek. The odd moose and caribou are in the area as well as marten, lynx and rabbit. There are fewer rabbits now as they like to move around. Old Timers say that rabbits move fast and turn into ptarmigans. You have to look after rabbits or they move around. There are woodland caribou back in the hills.

There are trapping trails all over this area. Joe Blondin used to trap on McMillan Creek above Vermillion Creek. People don't really use the trails any more – just recreationally.

On the right hand side of Vermillion Creek close to the mountain there is a big hole which is between a hundred to three hundred feet deep and a hundred feet across. There is water in the bottom. It has been there a long time. It is about a mile from the winter road. It is a large sinkhole and it is thought to have been made during the ice age.

Also of note in the area is a capped oil well on the south side of Vermillion Creek about a half mile south and a half mile in off the winter road. Ranger Oil drilled it about five years ago.

All people interviewed felt that it would be hard for D.o.T. to get water from this creek as water levels are so low this year. It was suggested that maybe D.o.T. will need to go to the Mackenzie River at Norman Wells and get water from the dock and then truck it out to make the ice. In this way, another water permit wouldn't be needed. Less water will be needed now that a bridge has been put in here. It used to be hard to cross the creek on the winter road.

Christina Creek (km 1002) – NTS 96E
Sources: David Etchinelle, Tulita
Winter Lennie, Norman Wells, D.o.T. interview August 2003
Larry Tourangeau, Norman Wells
Norm Hodgson, Norman Wells

Christina Creek is a little skinny creek which is about six inches deep. It is similar to Vermillion Creek in that it is a small creek with a rock bottom. People drink the water. For some people, this creek is unknown by this name. A question arose as to whether this creek was the same one as Probation Creek.

The creek freezes and gets overflow. Because it takes so long to freeze up, it is thought there may be sulphur in the water. It doesn't freeze hard. It might be a good idea to put ice on the culvert and freeze/flood it. There is a permanent bridge now at the site.

Billy Creek (km 1033)-NTS 96E
Sources: Ed Hodgson, Norman Wells, D.o.T. interview January 2003
Norm Hodgson, Norman Wells- D.o.T. interview January 2003
Wilfred McDonald, Norman Wells, D.o.T. interview January 2003
Larry Tourangeau, Norman Wells
Norm Hodgson, Norman Wells

This creek was named by Joe Blondin and has a flat area on either side. Most of the time the water is about two to three feet below the bank of the creek and the water is about eight feet deep. The creek runs steady and doesn't freeze to the bottom.

Some people felt water levels were higher in the spring, while others stated that the water level was consistent year round. The source of the water is Jackfish Lake and it is good drinking water. It might have sulphur in it which is noticeable when the water isn't flowing freely.

There are a lot of mature trees around Billy Creek. The forest is pretty thick there. As you move farther inland, more muskegs and bogs can be found, and the forest isn't as mature. There are some very tall and straight trees down by the mouth of Billy Creek. There aren't too many like that inland.

Near the mouth of Billy Creek, shale is everywhere along the creek channel. There might be silty sand and a bit of clay up at the crossing area. There is some sandy clay material at the mouth of the creek. Clay sheds water and retains frost. The soil is mostly sandy clay. Sandy gravel is found beneath a layer of mud.

There is permafrost in the area, but it is not right at the creek crossing because it's too wet there. Wherever there is moss, there is permafrost.

Because of global warming, the freeze is harder to predict. Billy Creek ice doesn't usually start going out until the end of April.

There are many beavers in the area and they dam the water up.

Blueberries and cranberries grow in the area, but not too many people go out there to pick them. The area is mostly shrubs and scrub bush. There is a lot of muskeg.

There are moose in the area as well as woodland caribou. But there are more moose out towards the islands than right in the creek area.

There is an old trail that used to pass near Billy Creek, but not right at the site. It went from near the Blondins' cabin at Jackfish Lake through the mountains. The Blondins haven't used that cabin in a long time. Also, Pat Tourangeau at one time used that trail for his trapline, but not anymore. People in the oil industry also at one time made use of the trail: they got locals to take them out on the land to different sites.

The land around Oscar Creek is all forest and muskeg, lots of muskeg. There is permafrost in pockets all across the area, but not right at the creek because it's too wet there. Wherever there is moss away from the creeks, there is permafrost. Because of the forest fire in the area in 2003, the moss is gone. All the permafrost will be disturbed through there for probably ten to fifteen years until the moss grows back. The area is also known for its big trees-birch, white spruce and so forth.

If you see birch and poplar trees growing, there is not likely to be permafrost beneath the soil. You can be pretty sure because the moss doesn't grow near those types of trees, and without the moss, permafrost can't stay insulated very well.

There is sandy gravel beneath a layer of mud at Oscar Creek.

Oscar Pass is the route of the old winter road. Five to six years ago, a new route was cut. However, there is an old road through Oscar Gap which is still used. The route that the winter road follows in the area goes through Gibson's Gap. This route was pushed through in the winter of 1954 by Americans, who were likely coming up to establish the DEW line. It wasn't the best choice, but they were in a hurry. With this route being used by the winter road, people travelling between the communities started to use this road.

Most of the trails around Oscar Creek have been pretty much abandoned to the animals. Some people come out to hunt sometimes, but Wilfred MacDonald lives at Oscar Creek year round. Todd McCauley might use the area too.

There used to be an old cabin from the 1920's south of Oscar Creek, but it is all collapsed now. It is about two-three thousand feet from the winter road.

Maurice Mendo used to spring hunt in the area for beaver. People would follow a trail for six to seven miles up to a mountain and then to a lake. They would pack a canoe up the trail. Once they were finished hunting, they would paddle down the river with the beavers in the boat.

On the left hand side of Oscar Creek, Walter Grandin used to have a cabin. It caved in around 1953.

There used to be a lot of blueberries in the area, but there are not as many around anymore. There are high bush cranberries and rose bushes.

It is thought that this creek is probably a good grayling nursery area. Suckers, jackfish, and whitefish can also be found in the creek. They spawn up by the mountain in the spring. The fish activity is pretty much limited to the runs in the spring. At the mouth, grayling, jackfish and loche can be found.

Along the banks of the Mackenzie River, fish camps used to be set up because these are spawning areas.

Hanna Creek (km 1084) – NTS 96E
Sources: Wilfred McDonald, Norman Wells, D.o.T. interview August 2003
Charlie Barnaby, Fort Good Hope
Bart Cotchilly, Fort Good Hope
John Cotchilly, Fort Good Hope
Alexis Chinna, Fort Good Hope
Technical Report: *An Environmental Information Update for Selected Stream Crossings along the Mackenzie Valley Winter Road*

Please refer to notes made under Oscar Creek as the terrain is similar.

This is a beaver creek. The water is clean and is used for drinking. The water freezes. It is about three feet deep and can be traveled up by boat. There are jackfish and grayling in the water.

There are lots of mink, otter and muskrats in the creeks in the winter time.

The lakes in the area have less water. There used to be muskeg lakes in the area, but in the last ten years they have dried up. This may be due to more dams being creating in southern Canada which is causing the water levels in the Mackenzie to drop.

The entire region around Hanna Creek is good habitat for geese and marten. Geese have traditionally been harvested in the area. There are traditional travel routes in the area, mostly in the lower elevations west of the stream crossing for the winter road.

Donnelly River (km 1118) – NTS 106H
Sources: Charlie Barnaby, Fort Good Hope
Bart Cotchilly, Fort Good Hope
John Cotchilly, Fort Good Hope
Alexis Chinna, Fort Good Hope
Michel Paper, Tulita SRRB meeting, resident of Fort Good Hope
Frank and Adeline Pierrot, D.o.T. interview August 2003
Technical Report: *An Environmental Information Update for Selected Stream Crossings along the Mackenzie Valley Winter Road*

The Donnelly River is about a foot and a half deep and the water depth is consistent year round. It is fast moving water but a person could walk across it. The water is not deep enough to boat in. The Donnelly River doesn't freeze until maybe January. It has areas that are open all year. In the years that it does freeze, it may stay frozen for about three weeks. This may be due to the presence of sulphur in the water. This sulphur gives off an odor of sewage which is most noticeable in the winter months. The odor can be detected where the winter road crosses.

There is a beaver lodge north of Donnelly River. This would be affected by the water going down. It was also noted that last year D.o.T. was getting water from Donnelly Creek, Colville Lake and Hareskin River. There was talk of some beavers in the lake. They would have

Tsintu River (km 1154) – NTS 1061
Sources: Charlie Barnaby, Fort Good Hope
Bart Cotchilly, Fort Good Hope
John Cotchilly, Fort Good Hope
Alexis Chinna, Fort Good Hope

There are beavers and lodges all along the various rivers and creeks in the area. See notes under the Donnelly River.

Mackenzie River (Fort Good Hope- km 1173) – NTS 1061

Due to time constraints, this area was not covered.

Colville Lake Winter Road

The people interviewed had a thorough knowledge of the area and stressed a great need for respect. Richard Kochon stated that there is a large difference between how white and Dene people mark distances. For example, every five white miles is equivalent to one Dene mile. This is one simple illustration in how perspectives differ. Because so many of the water extraction sources selected by D.oT. in this area are deemed unsuitable, follow-up with Chief Richard Kochon is needed. In this way, suitable water sources will be selected that will create the least damage to the area. In general, local involvement and monitoring needs to occur when extracting water from the sites. As well, there is a need for signage in the area.

Hare Indian River (km 22.5) – NTS 1061
Sources: Ed Hodgson, Norman Wells
Maurice Mendo, Tulita
Alexis Blancho, Colville Lake
Richard Kochon, Colville Lake
Wilbert Kochon, Colville Lake
Joe Martin Oudzi, Colville Lake

The water in the Hare Indian River is maybe three to four feet deep. It is fed by many creeks and is a very fast moving river. In the spring is around six to seven feet deep where the winter road crossing is. There are fish in the river. It does freeze over but there is still water on the bottom. If water is pumped out, the river could potentially freeze right to the bottom. If water is taken out for the winter road, D.o.T. will need to monitor the flow of the water.

Large Creek (km 48) – NTS 96L
Sources: Alexis Blancho, Colville Lake
Richard Kochon, Colville Lake
Wilbert Kochon, Colville Lake
Joe Martin Oudzi, Colville Lake

This is very shallow. Water should not be taken from this.

Do not take water from Colville Lake as it is a fish lake and is used for drinking water. Colville Lake has dropped thirty to forty feet.

3. Recommendations and Observations

NORMAN WELLS RECOMMENDATIONS

Ed Hodgson, Norman Wells

Mr. Hodgson stated that he felt water put on the winter road has no where to go. All it is doing is settling into the moss and damaging it. D.o.T. might want to put lighter loads/lighter sprays at the beginning of the winter road season until a sufficient crust is built up to carry trucks. Consideration must be given to not break through the existing permafrost. If the crust is not damaged during the construction of the winter road, chances are that in the spring, the water will just disperse.

A study needs to be done to take a look at where roads have been flooded at an accelerated pace i.e. between Norman Wells and Fort Good Hope. In this way, D.o.T. can ensure that no damage is done. In areas where there is poor drainage, the water just goes into the muskeg and could crack the permafrost. Mr. Hodgson said that he brought this concern up last year. There is a need for follow-up on recommendations that are made.

When snow bridges are constructed, it is helpful to put a light cover of snow on and then flood this with water. This will need to be repeated several times so that the natural flow of the water is not disturbed. With regard to the Saline and Hare Indian Rivers, make the ice bridge wide so that it has more buoyancy to carry equipment.

Mr. Hodgson said with regard to creek crossings, based on his experience, he would recommend that D.o.T. put in a regular culvert with a one inch pipe for water drainage. If the pipe freezes up, a steam truck could be brought in to allow the water to flow again. This procedure could be done as needed over the winter.

Mr. Hodgson stated that the ground would be frozen enough to support heavy equipment by December 15th. He felt that it was possible for D.o.T. to do the work without damage if his suggestions are followed. The road should be constructed with either lighter watering at the beginning or else be opened later in December. Alternatively, if D.o.T. wanted to spray and speed up the construction process, they could use a helicopter to draw buckets of water from the Mackenzie River. This would ensure that the terrain is not chewed up by heavy equipment before the ground is frozen.

Mr. Hodgson also felt it important that no garbage i.e. pop cans/cigarettes be left on public roads.

SRRB Meeting, Tulita

There is concern that there is not enough water around and, if there is enough water, what effect is taking all this water having?

This year the water is lower than any other year. Information is needed about current water levels.

Most locations for water extraction are picked during the summer. But most creeks will be frozen/dry when the time comes to extract water.

Advice is needed from the scientific community on fish – fish are not in the creeks in the winter, but it is their habitat. There is a need to know what effect taking the water is having on fish habitat.

Maurice Mendo, Tulita

Because water levels are so low, if water is pumped out from beneath the ice, it may create hollow areas and the ice could cave in.

It's okay to take water from the creeks if enough water can be found. The Mackenzie River has a lot of water.

The winter road is not a new project so as long as it is kept clean near the creeks, it is okay. Water travels a long way. Once at Willow Lake an airport was built on the lake. A truck was parked and oil spilled. A lot of fish died and when fish were caught, oil could be tasted in the fish.

If an oil spill occurs, some sort of insulator/absorbent stuff needs to be used to soak up the spills. As well, fines need to be issued if there is a spill.

In the spring does the water from the ice road go back into the river? Does it drain into the river? Right now, the water is draining straight into the ground. Where does the extra water go?

David Etchinelle, Tulita

There is a lot of muskeg along the winter road. Water can be taken right along the winter road. Sometimes fuel is leaked from the trucks on the ice. David would like extreme care to be taken because people use the water along the Mackenzie River for drinking and the water that is used from the ice road drains down into the river. He also noted that birds and rabbits are disappearing where holes are being drilled. He noted that it is hard for people to say their concerns as nothing changes. Water is very important: it keeps everything alive. It must be protected for the future. He doesn't want to see things destroyed. Sometimes there are fish in the creeks in the winter time – the ice doesn't freeze all the way to the bottom.

ago, there was always caribou within thirty kilometres of Fort Good Hope. Now, they do not come in the area. The Elders have been suggesting this at various meetings.

When D.o.T. is selecting sites for water extraction it would be wise to involve a local person from Fort Good Hope and travel the area by helicopter. In this way, concerns can be shared before construction begins and sites can be selected that will have the least impact on the land and wildlife. Even now would be a good time to do this because beavers are building their lodges.

Water should be extracted from muskeg lakes- they have no trees around them and hence, there are no beavers in these lakes.

When a creek runs between two lakes, and has both lakes as its water source, do not pump water out of one of the lakes because fish are going to be pumped out. Find alternative water sources.

Comments from D.o.T. Community Consultation Meeting in Fort Good Hope

Water licenses stipulate that only 5% of water can be taken from a lake. But if you have four contractors with four different water licenses, a lot of water is being taken out. Cumulative effects are a big concern. There is a need to monitor the amount of water coming out of lakes/streams. Contractors such as Apache and the GNWT need to share this information with Band Councils. There is a need to keep a running total of how much water is coming out. Colville Lake suggested putting in a community monitor but communities have no money to hire monitors. Does highways have money? There is a request in with both Apache and GNWT for water monitoring as well as road monitoring.

We need to learn from last year's mistakes.

Involve elders and have them pick the winter road route. A new route may need to be cut.

Safety is a major concern. Maybe there needs to be a check stop.

There is a need to have TEK work done internally. Information has to be collected within the community and used only within the community.

COLVILLE LAKE RECOMMENDATIONS

Water flow in the lakes needs to be checked in the summer. Involve community members.

Right now, D.o.T. has a chance to select feasible water sources by bringing people out from the Colville Lake RRC to select water sources. Water can be taken from the smaller lakes near Lac Belot and Colville Lake.

Northwest Territories Transportation

Minutes of Public Community Consultation

Date: August 14, 2008

Attendees: **Colville Lake Community**

Linda Manuel	Economic Development Trust B.A.F.N 867 709 2200
Martha Stewart	Economic Development Trust B.A.F.N 867 709 2200
Barbara Blancho	Economic Development Trust B.A.F.N 867 709 2200
Wilbert Kochon	Land and Water Board 867 709 2700
Ryan Kochon	Land and Water Board 867 709 2700
Alexie Blancho	
Sara Kochon	
Johnny Blancho	
Madeline Blancho	
Philip Codzi	
Hyacinth Kochon	
Marie Kochon	
Jerry Huculak	
Translator:	Wilbert Kochon

Department of Transportation, GNWT

Terri Bugg, Environmental Analyst
Mickey Hempler, Maintenance Supervisor, Ft. Simpson region

Location: Community Gym, Colville Lake, NWT

Subjects: 1) Community consultations and traditional knowledge gathering for Mackenzie Valley Winter Road to support proposed Water Licenses amendments for: #S04L8-013 and #S04L8-014

2) Community consultations and traditional knowledge gathering for Colville Lake Winter Road proposed Land Use Permit for Operations & Maintenance application.

Query: Just on the Colville Lake portion?

Answer: All the way down, they have lake names, stream names, hills, every little corner (sic). It would be educational for all the young people, you could find some extra money, which would be good because they're not going to be around for long, because they said they wanted signs in their language.

Query: I'll just open up to questions, if anyone has questions about the CLWR, land use questions, construction, anything to do with the winter road. Any questions or comments?

Answer: Again we request traditional names of sites to be recorded.

Answer: The area needs to be cleaned up, the entire ROW – Garbage. To do clean up before winter season. All types of garbage – Need to do when visible, like now. I'll tell you about the names, it's part of the traditional knowledge. Also, to keep it clean the road, if you could find a way.

Comment: (Mickey Hempler) Yep, in the summer time, in the winter time it's all covered up, like today you can see especially by the game warden's cabin, there's a lot of garbage out there. And there's a tent frame, I can't remember where it is, it'll be on the left hand side on a cutline, just off the winter road, there's a tent frame with an upturned sleigh and there's lots of garbage around.

Answer: Maybe clean on both sides, that way you don't have to do the whole road.

Comment: (Mickey Hempler) They mean clean the whole right-of-way. Something we have to look at.

Query: A summer/fall cleanup?

Answer: Yeah, before the snow.

Query: What type of garbage are they seeing?

Answer: All types of garbage.

Comment: (Mickey Hempler) Also there is a fridge, a fridge way out in the middle of nowhere.

Comment: We are concerned about the lakes that have fish and beaver. We should test for oxygen or to see if they exist.

Comment: There's beaver lakes and fish lakes, before they even start the winter road they should check the lakes, what chance there's beavers in them. Some of them are fish lakes too, you're going to have to be testing them all the time for oxygen

Query: Have people been finding negative effects, from taking water out of the lakes where fish and beavers are?

lake I used to drive by, one year it was full, one year it was dry. Now it's getting water again. I don't know if anybody's watching them when they draw water, even though they say they're keeping track, there's so many trucks I don't know how they keep track.

Query: Are there many users taking from one water hole?
Answer: No, it's just one company, how can you keep track, some of them are what, 20 miles apart, how can you keep track?

Comment: (Terri Bugg): Because of the change this year, our intention is to hire somebody from the DOT to supervise and monitor the contractors now. To be with them in the field and make sure what they take out of the lake.

Comment: (Mickey Hempler): Sure, this is the thing, if you guys are working for us, you have one water truck and you're hauling from here to there or there and then you record it. Then the oil company comes in and puts two more water trucks on and you're drawing from the same lake as us and everybody thinks that you're drawing all the water, but it's the resource companies that are drawing too.

Query: (from community member) That's what I'm saying, who is monitoring?
Answer: (Mickey Hempler) That's the thing, who is monitoring those guys?

Comment: People are getting permits for the same lake, that's what I'm talking about.

Comment: (Terri Bugg) The Sahtu Land and Water Board, who grants these permits, their view is that it's our responsibility to coordinate with other companies. So that is a huge undertaking and we have to get more organized with that. I know that the DFO is trying to come up with a database to keep track of lakes and names, because right now there's so many lakes and so many users, and it is unorganized. So I'm going to keep track of the DFO that they do that and coordinate with other companies.

Answer: We want to start monitoring ourselves. What we're going to do is start monitoring ourselves instead of waiting on government.

Comment: (Mickey Hempler) Exactly, if you take water and record it in your log for DOT on the road and buddy down the road then takes ten cubes, or Paramount, it's easy enough for you to do, but if we can get all the contractors to do that then, just like these culverts, who the heck put them in? We didn't.

Comment: This winter road, you get so many people watching the lake, how much water they take out of the lakes. There is an example that we know of creeks and lakes that now are dry and lower.

Comment: We want our own community monitor to watch the land.

Answer: You could extend the maintenance a bit longer, because the road needs to freeze a bit longer, it stays colder on this side a lot longer.

Comment: (Mickey Hempler) You're going to need so much money in your contract for that , the next time you redo your contract that's something you'll have to put in there. Once the contract is up, that's it, there's no more maintenance and the road is at risk.

Comment: DOT needs to communicate more with the community about the road.

Query: (from community member) What about getting an inspector from both communities? DOT doesn't come around this way, he phones in and asks how's the road?

Query: (DOT) If there was a community monitor, what would be the best way to select the community monitor?

Answer: The Band Office should be contacted to find a community monitor

Comment: (Mickey Hempler) What you want is someone who can monitor the water usage and the road. And someone who knows a beaver lake from a no beaver lake. In the past, they hired a young guy, and all he wanted was a paycheque, they know absolutely nothing about the maintenance, they don't know a beaver lake from a fish lake.

Comment: The winter road, it's good to have a meeting ahead of time, with the community and Transportation, you end up half the time with no communication, the oil companies they come around and take too much water from one lake and transportation too. You have to meet with them, everybody has to be involved. Sometimes they take water from small lakes, I don't know why they do that. There should be a way to stop that from happening again. Transportation shouldn't be able to take whatever they need, they need to talk to the community. We'll work good side by side.

Comment: We want a monitor from the community. I wonder where they take the water out, they could watch out for that with a monitor from the community. Transportation and the oil companies, that's what we need to watch out for. We'd like to have somebody from here and not Good Hope.

Comment: (Terri Bugg): Yes, we still have to discuss that with our department, we would take back these concerns from the community and see what we can do about it. It sounds like a good idea to have someone from the community, someone from Colville Lake for this section of the road. It would be up to the community to decide who would have the best knowledge, someone who knows traditional use, traditional fish use and who knows the land.

Answer: Transportation should work with the oil companies and us for better communication, should know and write us a letter to let us know what is going on.

Answer: If the oil companies are going to work here, they have to meet with Transportation and the community before they came, they need better communications. Transportation should write a letter to the small companies, Petro Canada and Paramount. That way we know which lake they want to take water from.

Query: I see. Does anyone have any more questions or concerns about the land or water along the MVWR?

Answer: Road is to windy, need to be re-routed. In some places, like we want to cut straight through and not detour so the route is shorter.

Query: (from community member) How about some rerouting, a right-of-way that's more straighter?

Answer: (Mickey Hempler) As long as we stay in our right-of-way, we can straighten out what we need to, some of the doglegs could be straightened, and you got 200 feet from the centre line.

Comment: It just needs to be straighter. Signs, need more signs. Because of the hills and steep areas, for safety.

Comment: Some of those hills are too steep.

Comment: (Mickey Hempler) That's what I was talking about before you came, we're going to do the Hareskin and the Rigosho (sp?)

Comment: We need more signs, sometimes you're coming up over a hill and you don't know if a truck is coming.

Query: (from community member) What about job opportunities?

Answer: I'm not sure at this time.

Comment: There is a lot of history to this trail with lean-tos and places along the MVWR, like special trees that we would like to keep that others would not know about.

Comment: He was talking about the trail, there's a lot of history, where the food is, some lean-tos, it mustn't be touched. It's part of history. If you really looked you'd probably see, places where you can see the old stumps, it's a place where you can see what they done. Long time ago they just had an axe, no saw, nothing. Colville Lake people cleared from here to Rabbitskin we traditionally cleared the land by hand for ourselves

Colville Lake Consultation Comments Summary by Subject

Land

- The area needs to be cleaned up, the entire ROW – Garbage. To do clean up before winter season. All types of garbage – Need to do when visible, like now
- We would like to have the CLWR have traditional names for places, lakes, hills areas.
- We are requesting traditional names of all sites.
- Maybe the first few trips the elders can show the person where the special places are. This is recommended to have a walking through. Can include young people, can be a good traditional use description and for naming sites.
- Check Sahtu Land Use Planning what their traditional information is.
- Can go in summer, and is a good idea to clean the road at the same time, can fly and/or walk through.
- The Colville Lake elders know this land better than the Fort Good Hope community side.
- We have traditional trails that we use for winter & summer that are not connected to the MVWR.
- A lot of history to this trail with lean-tos and places along the MVWR, like special trees that we would like to keep that others would not know about.
- Colville Lake people cleared from here to Rabbitskin we traditionally cleared the land by hand for ourselves.
- We always listen to our elders.

Wildlife

- The lakes are not as high anymore, also now more dangerous to go on. Also, no more beavers in many of the lakes.

Operations

- There is a big difference in weather, seems warmer now, some years the lakes dry out, how do you know how to keep track of all the water trucks?
- On the ROW, if you can put slash down (the contractors can put it in blocks so that people can take it) in orderly way rather than just throwing on ground wherever. This way the people can come and take the slash and use it.
- Extend the maintenance longer so that the road stays open longer, since now it stays colder longer on this side, colder
- DOT needs to communicate with the community about the road.
- DOT needs to work more with us to talk with us about what is going on.
- Transportation should work with the oil companies and us for better communication, we should know and you should write us a letter to let us know what is going on.

Traditional Knowledge Gathering on the Mackenzie Valley Winter Road

Attendees: Colville Lake Elders

Alexis Blancho
Philip Codzi
John Blancho
Sarah Kochon
Madeline Blancho
Hyacinth Blancho
Marie Kochon
Joe Martin Oudzi
J. B. Gully
Translator: Marie Rose Drybone

Department of Transportation, GNWT
Terri Bugg, Environmental Analyst

Location: Community Gym, Colville Lake, NWT

Date: August 14, 2008

Comment: (Terri Bugg) I'm just going to be asking some questions about traditional land use in the area, anything else you would like to bring up about the MVWR and the surrounding area, we can talk about that as well.

Query: I was wondering if you could tell me what the land is like around the area, is it swampy, forest hilly? Please describe the area around Colville Lake, around the MVWR.

Answer: There's mountains, they're not mountains but hills, muskeg area. On that hill, that's a high hill outside the community that mountain is named after a fish lake called Tweed Lake.

Answer: There's a big hill a big high hill, it goes a long way out that way, that's the one they call Berahje Neni, it's just a big hill, solid ground.

Query: Is it a special place, do people use it or stay there?

Answer: A long time ago the people went over it and there's a lot of traditional trails and people travelled over it. And it's also known for trapper areas and fish lakes, lots of fish lakes. Hunting area for musk-ox, caribou, and moose.

Query: Is it on that map?

they look at things like that. For us native people, we will keep that in mind, we will notice an increase, or a decrease.

Answer: Where we stay there's a lot of fish lakes around the area, so they catch all different types of fish: Whitefish, trout, pike, jack, coney, sucker, pickerel, grayling. Not far from here there's lots of grayling so the lakes are very rich with fish.

Query: Are there more lakes with fish than lakes without fish?

Answer: It's the same, big lakes to small lakes it's the same. There seems to be a lot, an increase in fish in some of the fish lakes because a long time ago they used to use dog teams to travel, that's why there's a lot of fish in the fish lakes because not as many dogs now to eat the fish in the lakes.

Answer: In 1953, there was about 200 dogs in this community, there were dog teams for transportation and fish was the main diet for dogs, so they don't use dogs anymore so that makes more fish.

Answer: Maybe there's an increase because people used to eat fish and meat, they ate even more food than now, but there's no dog teams so that's why there's an increase.

Answer: There is a decrease in ptarmigans and rabbits in the area, since white people and development came around. Because of white people whatever they do around the area, there's a change in the area. There's hardly any rabbits and ptarmigan.

Query: Is there a specific reason for that?

Answer: Probably because of the development around.

Answer: We are setting up nets and get lots of fish, we respect our land to be in good condition. We also set limits, because there's so many fish, because we really respect and love our lakes and land. We really keep our land and our water. Whatever fish we catch we share with one and other, this keeps the fish coming. We just don't throw the fish away if we catch too much, we share. This couple here, they have their dogs so they'll feed their dogs fish. This elder here, someone just gave him two fresh fish. You don't just set a net for fun, you gotta be thankful for it.

Answer: We didn't waste our fish, we set net to take to be thankful and share.

Query: What do you use the water for when you are out on the land, for drinking, washing, do you drink the water around the winter road area?

Answer: The water is very important for the animals, the birds and all the animals on the land, if the lakes were to dry up they can't survive, they need the water as much as we do.

Query: Where does the community get their drinking water?

Answer: We use Colville Lake to drink out of.

Answer: We really, really protect the water so it's not to be contaminated like in southern places. We really restrict too many people coming here because we really love and protect our water. We want to protect it from getting

Query: Do you have a reason why this is?

Answer: Before it rained not so much, now there's more rain. The weather changes so fast now, not like before.

Answer: Before it rained once in a while, and if it wanted to it would rain again later. But now, like last night it rained, it'll rain again fast. A few sunshine, then rain again quickly, it doesn't stay the same.

Answer: There are changes, now it is cold in August in spring now will come early or maybe but weather is not stable. Even the ice condition is different, lots of snow on lakes, there is more snow on the lakes than ice.

Query: Is spring coming earlier?

Answer: A long time ago it used to be varied and changes. It's fall time now and it's cold, it didn't used to be like that, spring will come early or it may not. Even the ice condition too, it like you don't see pure black ice, it used to be like that on the top of the ice, smooth. Now we get lots of snow on the lake, so they don't see the black ice, like you always get lots of snow on the ice.

Answer: We don't see black ice anymore (deep freezing of the lakes).

Answer: Sometime after December or New Years a long time ago we used to get a big, big wind, it would just knock down church steeples and everything, that hasn't happened for a long time.

Answer: About the snow, that changes year to year, like it could be less snow this year, next year there could be more, the snow could be deep, really deep. My uncle said that last year, he went for wood and the snow was so deep he got sunk in the snow and it took him almost the whole day to get out. And other times the snow might not be deep.

Query: And that changed, it's not as consistent, it used to be the same every year?

Answer: Yeah, every year is different, even the different times of the year.

Answer: The snow changes from year to year not like before, was consistent.

Answer: A long time ago the sign of spring was when our skin turned dark, complexion just dark, practically black, now spring comes and that doesn't happen anymore. If someone stays in town all year, then they stay white, but the ones who go out, they're the ones who get black. Some people in the past had gotten dark and wind burned, but some people would be out on the land and they would never get dark. Something to remember, something to keep, because it's like news where you were.

Answer: We are a landworkers, always healthy, strong, to go hunting/trapping active, and are always on the land.

Answer: The people from Colville Lake in the past and now we're a very, very hard working people, we were hard workers, we would never say I'm sick. We are always willing to go, go, hunting and trapping, very strong people dedicated to what they were doing, their way of life. When we go to Good Hope and everybody is white, and they look at the Colville Lake people and they're just dark.

Answer: The reason they stopped walking to Good Hope was by then they had planes. And then the store came up, a fur trader set up a store, the new things started coming here so they stopped walking. The fur trader came before Bern Brown. Bern Brown was the priest here before. Even though there was a fur trader and he came here and set up a store, it didn't prohibit the people from doing the traditional walk to Fort Good Hope, it was a lot of hard work, but they would just go and take their time.

Answer: They started their walk around June 25th, but when they went they didn't rush, they could take a long time because they probably go hunting and make a raft, they could stay in one place for maybe a couple of days. If they found a fish lake and caught fish, they would stop for a couple of days and make dry fish. And then they go again so they have a supply of dry fish. Very happy, energetic, nobody thought about sickness. Everything that they did, they sang, even if they cut wood they sang.

Answer: A long time ago if someone saw something new, they never ate it because that's where they said your cold or cough or flu came from, they would never get excited over something they see, they never even knew candy, they didn't even know what it was. Look at all of us, we were all packed, when we went for our walks, their dad or mom had packed them on that trail too. All of them. They only got a supply of flour, sugar and cheese. They called that white man food. The supplies may have lasted, but it might run out by Christmas. All of us were born in a tent on the land and all raised on traditional food.

Comment: (Terri Bugg) Thank you for your time. Masi Cho.

2) Community consultations and traditional knowledge gathering for Colville Lake Winter Road proposed Land Use Permit for Operations & Maintenance application

A community member opens up the floor by stating the Hareskin River is starting to get washed out. and the Hill needs to be fixed.

Comment: (Mickey Hempler) It will be assessed by helicopter the next day. There will be money next year to fix the hill properly, the last time we got stopped by the permafrost. Last year DOT tried to fix but not enough funds

Query: What is happening at the Hareskin?
Answer: There was a washout in the spring time.

Query: Has this affected land use?
Answer: Bank is being washed out in springtime, contractors fill eroded slope with snow and CLWR blind spots is an issue that we can't see around corners
Comment: (Mickey Hempler) Brushing will occur this season.

Query: Any other comments?
Answer: There are still a lot of blind spots.
Comment: (Mickey Hempler) We're going to do a bunch more brushing on it, when we built it, the Colville band said they didn't want it too wide, next year we'll get the money to do that.

Comment: Lots of boulders on road right before game warden's cabin. Boulders are in the way, people running over them dangerous for trucks and skidoos.

Comment: (Mickey Hempler) We had a local guy here, but he didn't turn out too good,

Comment: Slavey translation - Road signs always covered with snow so that people couldn't see

Comment: (Mickey Hempler) From Colville Lake to Norman Wells, they will do this year, to have proper signage on road – Advance warning and visible in winter

Comment: Windrows - ~500m breaks should be put into for wildlife

Comment: Jackfish Creek – should not even be considered

Query: (from community member) Also someone should be hired near end of season to pickup garbage so not left there – Anytime to clean up the road. Who is the foreman this year?

Comment: Animals need to move across the land, strategic positions where windrows can be placed. E.g. b/w here to Colville Lake where there is muskeg, wooded areas, drainage areas

Comment: About 10 miles from the Mackenzie River helicopter refuelling in the middle of road – from resource companies. Should not refuel on MVWR. This is a common occurrence. Need staging area because this interferes with domestic travel. This should be in our (DOT) access permits. Should be in policies.

Query: (Terri Bugg) Is this [refuelling in middle of road] common?
Answer: Yes.

Comment: (Mickey Hempler) We'll find out who did that, it's like the sumps, we never authorized that either.

Comment: (Frank T'sele) Elders have mentioned that they need to be consulted; there are all sorts of fish lakes that developers don't know about.

Comment: ROW too small, needs to be wider, people couldn't see around corners

Comment: (Mickey Hempler) That's something we can look at when we do the breaks and windrows, we can make it so someone can pull off the road.

Comment: Land is running out of water, lots of fish and lakes going dry

Comment: Pumping water outside of winter road where beavers are, disturbing beaver lodges, never know what will happen to beavers.

Comment: (Mickey Hempler) We're going to start drawing water out of the Mackenzie and places that we know have lots of water.

Comment: Along the CLWR there are signs along the road near the lakes, that say: waterhole 1, waterhole 2 etc.

Query: Are they orange?
Answer: Yes

Query: Do you know who they belong to?
Answer: Could be Paramount/Apache/Petrocan. There's a lake that they used to pump water out of and now there's no water, it's all mud now. There's a Slavey name, but no English name, it is 40 miles past that big ridge (Rigoshoh?).

Comment: (Terri Bugg) It's our intention to eventually somehow coordinate with the companies to keep track of where we take water for water sources being used by multiple users. We have to keep track and communicate when too much water is being taken out.

Query:	(from community member) In the past we had agreements with the exploration companies, they kept the roads smooth, are the resources there to keep it up?
Answer:	(Mickey Hempler) No. Some numbers: you're looking at a million dollars just to water the road from here to Tulita, every year it's extra.
Comment:	(Terri Bugg) This will be the first year that we'll be monitoring the water coming out of the lakes, when we reach a certain point, we have to say stop. If we're limited as to how much water we can take, the quality of the road may be affected. In the past we had support or sharing with resource companies, we don't know if that will continue.
Comment:	(Mickey Hempler) The reason the road was so good last year was because an oil company gave us about a million dollars of water truck and grader time. Without their money, we couldn't talk the people into giving us more money. We're meeting with the oil companies to find out their plans for the winter road.
Query:	(from community member) From the south pass to Norman Wells and beyond not maintained well. How often is the road maintained? (Arctic Circle, Sahtu Contractors)
Answer:	(Mickey Hempler) It depends on the weather.
Comment:	The road wasn't well maintained, there was snow on it a lot of the time.
Comment:	(Mickey Hempler) We'll have to look into that, why Danny wasn't out there - there was no extra money for that stretch of the road, and he would have done one pass every week.
Comment:	North of the pass road was well maintained. The guys the DOT hired to look after the roads are more important - the foreman has to be watching the contractors
Comment:	(Mickey Hempler) That's right, our foreman has to be on those contractors and if they're not doing their job then they have to go and get another contractor. We can terminate them.
Query Answer:	(from community member) How often are the roads inspected? (Mickey Hempler) Every other day.
Comment:	(Terri Bugg) If a community member has a concern with a contractor, they should relay those concerns directly to me or Mickey, we need to know what is going on.
Comment:	Contractors can do whatever they want.
Query:	(from community member) Length of time the Winter Road is open – what about climate change – is it changing from year to year?

Query: (from community member) What about water samples because others contaminate the water, affects us and our health? A monitor could do this yearly.

Comment: The monitors would know where there is no fish, why wasn't this done before. There are lots of lakes to take water from as long as there are no fish or beaver in them. A monitor would know this and would be the best idea – on site – go around creek habitat.

Answer: (Terri Bugg) That's what we're trying to do: listen to the community, talk to the SLWB to find out how much we can take, we hope to stop taking when it's too much and not take from sites we shouldn't.

Comment: (from community member) Any new water source should have plan, how to access new sources to describe – Monitors should guide contractors to water sources and to monitor them so we know how much everyone is using, we have used this system for companies, DOT should follow the same standard. And need a database to track this, working with a plan over time to see long term effects.

Comment: We encourage the use of the SRRB, SLWB to improve the planning of the use of these sources. There was a spill 2 years ago, there was no clear plan, no one stepped up, no one was at fault, these things should be worked out. Rules of the road etc.

Comment: Make a list of potential water sources to give to monitor at SRRB so they can review.

Comment: DOT needs to coordinate with oil companies because they bring out all their equipment and it's no good, need to get funds from oil companies

Answer: (Mickey Hempler) Usually they send a pilot car that'll warn people that a rig is coming down, that has worked pretty well.

Comment: We need a monitor that knows about the land, they can take the contractors around the land

Comment: (Terri Bugg) We're hearing a lot that we should have a monitor from the community.

Comment: 2-5 years ago there was an oil spill – we should have our own rules to deal with that, we have to be involved with this

Comment: We wanted to check it out with axes and shovels, to see how far is spread, it never happened. When people put bridges in – fuel spills happen, and no safety vests.

Answer: (Terri Bugg) I'll mention that to the supervisor.

Fort Good Hope Traditional Ecological Knowledge Gathering

Attendees: Thomas Manual, Gabriel Kochon
Translator: Alphonsine's Interpreting & Consulting

Department of Transportation, GNWT
Terri Bugg, Environmental Analyst

Location: Community Hall, Fort Good Hope, NWT

Date: August 13, 2008

Query: I'll just start with the land, how would you describe the land?
Answer: The land is life, it supports all the rodents, mice, squirrels, that survives, martens, minks, weasels all the same, also caribou, everything is there.

Query: What about caribou and large animals like that?
Answer: Everything survives on our land.
Answer: Like the bear lives off of the berries where it's fat is created to survive, if no berries it wouldn't live through winter. The bear eats wild carrots, fish, anything that's growing on the land
Answer: Everything, even the birds, even the mice put food away for the winter, things from the land, so they can survive throughout the year. Everything depends on the land, they all make all the food from the land
Answer: Lots of times we talk about water, there is dead water and live water. Where the dead water goes is the ones helps the plants and land to grow.

Query: What do you mean by dead water?
Answer: Dead water has no creeks attached to it, water that does not move. If you leave a pond for one week, that water becomes completely dead water. All life, even now they look for new growth on and that is what they survive on. If the water is dead, it may cause whatever is growing on it to not be good for anything.
Answer: This is why we need to sample the water, if the water is safe then they can use it, but if it's not safe they shouldn't use it for the ice road.

Query: Does the dead water look different?
Answer: That's why they should send it to the lab. That's what Thomas is after to get the water sent to the lab, but they don't listen.
Answer: Everything is contaminated except for Jackfish Lake.
Answer: If they use dead water to put on the road, it goes all around and affects the land. If there is water from a lake/stream then that is good water

Query: Have you noticed any changes in the kinds of plants that grow here or the condition of the animals?

Answer: The permafrost is affected how it's going down; this is what strengthening the roots of trees keeps everything strong. It is losing its strength. Maybe a hundred years from now, we don't know.

Answer: Most of the creeks and rivers are drying up because of the permafrost going down, and the landslides, if you travel along the Mackenzie River. If there is no permafrost, then no trees, grass, willows everything will dry up because of permafrost, that's where the moist comes from. and the landslide, creeks cave in and dry up. Permafrost is so important to everything

Query: So you're saying because it's going down, it's causing the land to fall in and the land is drying up?

Answer: This is why the creeks cave in. All our ancestors tell us to know this.

Query: The creeks drying up and the perma frost, how has that affected your lifestyles? The animals to hunt, the fish to eat, has this been affected?

Answer: 500 or 1000 years from now, the people that live off the land, we're going to be the first to go. Towards the end the animals will be wiped out, that's what I think. And that's what is going to happen. Everything is still stable and in a healthy state. Everything is still sterilized and in a healthy state but in 500 years or so we will be gone. If the permafrost continues to decline it will stop the growth of the land and the animals will decline and will affect humans as well

Answer: We were just talking about down south, you might have a piece of land, a pasture where the animals are living. Their piss and manure it keeps them healthy, it keeps them healthy eating. If that happens to us, it's not good for us, we'll keep getting diarrhoea. The southern people keep using the same land, the government should get them new land and demolish this, that's where we're eating everything. The manure goes into the ground and the plants grow out of it and the animals eat it, our animals we can eat, but if you guys send us chicken, beef, we'll get sick.

Answer: We live life different than people in the south on farms, this life, but this life we cannot have because we didn't use the same piece of land over and over – but we cannot use this process, we get sick from southern animals. The wildlife around us eat healthy, so we are healthy

Answer: You guys, right from day one the government has been controlling you guys, they just tell you what to do and give you a big fine if you break the law, that's what we don't want to happen here, I don't want the government sticking its nose in my land and tell me what to do.

Answer: Before civilization came here this land was the medicine. We did not need doctors the land was the pharmacy

the resources out of the land, there's going to be no more money, it'll be real desolation. Our children don't even know how to live off the land.

Query: I share your concerns, I was born in Yellowknife and it concerns me. I'm very concerned about the environment here because it's very sensitive.

Answer: Also during the depression, a lot of people didn't survive it, but our people here survived because they lived off the land, they didn't depend on the government, no stores or money, the land was their way of life, so they survived the thirties, but now with all this modern stuff if anything happens to our land and it comes to that they won't survive because they don't know how to live off the land. They don't know the traditional skills.

Query: Why is that? They want to go to the big city?

Answer: Well nobody is into that now, not like long ago, now we have stores, fast food. Before we didn't have electricity, hot water. Everyone was active, we come from very healthy people, strong people, like your people a hundred years ago, they didn't have machines and look how strong they were, this is what I'm talking about. We have a whole big area, we want to protect the whole area. The whole inside.

Query: Which area needs to be protected?

Answer: The protected area by the ramparts.

Query: Is that a government protected area?

Answer: No, it's from the beneficiaries down south, they wanted to protect their area, they formed a group trapping area, that's the one. The trappers did it for future generations. We were the only ones who created a boundary for our future, just Fort Good Hope.

Query: Do you have to go to the federal government to get it protected? How does that work?

Answer: We were self government a long time ago, we didn't have anybody to tell us what to do, we just did what we had to do. Until everything started happening , everything started to happen slowly, they opened the liquor to the treaty people in 1959 I think, in that area, that's when they had the settlement council they took little chunks out of us until today we're under government law, you live in a house, you have to pay this much, you have to buy this fuel, everything, slowly the government started taking over. In the first place, we didn't ask for this, it's the government. They said you should have running water, your kids should go to school. The rent was five dollars, it started at three dollars and kept going up, look at you and Gabe, your married and the rent is up to $2700. Do they think about our kids? If it's less money then they're shopping more.

- The community knows the wildlife, and are careful when out on the land, and know where the dens are.
- In summer and fall, all the beavers need a specific water level, if there is no water then the beaver lodge will be lost.
- If the water freezes then no water for beavers, the locals can recognize fewer beaver lodges out there.
- No-one is monitoring lakes for beavers and wildlife, there are animals that exist here as well that live with the locals.
- There are lots of lakes to take water from as long as there are no fish or beaver in them.
- Breaks nead to be constructed in windrows every 500m so wildlife can move.

Operations

- DOT foreman for this season should be identified.
- Proper signage needs to be put up throughout the road.
- Equipment noise – sometimes there is lots of noise. Road signs are always covered with snow so that people cannot see and dangerous.
- Mickey stated that from Colville Lake to Norman Wells, they will do this year, to have proper signage on road to ensure that driver's have advance warning of road conditions and to also ensure that signs are visible in winter.
- About 10 miles from the Mackenzie River there is helicopter refuelling in the middle of road – from resource companies. There should not be refuelling activities on MVWR. This is actually common occurrence for people to refuel anywhere on the road. There needs to be a staging area since refuelling interferes with domestic travel. DOT should have this in their access permits for companies to follow.
- Mushrooms on the blades of the Cats are needed so DOT operations do not cut into the land, strips top off soil, causes erosion, damages land.
- Hare Indian is too steep, people slide down and very dangerous.
- The snow banks are too high, needs windbreaks.
- Every year our trucks get wore down on the winter road, the road is so rough that it affects vehicles.
- Maintenance – South on the FGH the road is not maintained well (Arctic Circle, Sahtu Contractors).
- From the south pass to Norman Wells and beyond not maintained well, but north of the pass road was well maintained
- The guys that DOT hires to look after the roads are more important - the foreman has to be watching the contractors since right now contractors can do whatever they want and do not listen the community.
- ROW is too small, needs to be wider, people couldn't see around corners.
- Broken down contractor equipment just sits there all winter, doesn't look nice, camps, fuel, needs to be monitored who is doing this responsible party can remove it.

- In the Colville Lake area, there are lots of lakes that have some fish in them. It's not right that the DOT is taking water out wherever they feel like. To do this without consulting the people is not right, it is important what we think, what we know, for our future.
- The community likes the idea of the winter road, but DOT must be careful about harming the fish and wildlife, also there is permafrost and the lake water drying up.
- Jackfish Creek – should not even be considered as a water area to use.
- No dynamite should be used either, since it affects fish.
- The land is running out of water, lots of fish and lakes going dry.
- Jackfish Lake/Creek cannot be a proposed water source
- Lac Belot/Colville Lake - everything is flowing from underground from Belot Lake that feeds this area, flows right into the Mackenzie River from Hareskin River.
- DOT needs to watch the amounts to take out of Lac Belot/Colville Lake, but otherwise ok – didn't take too much water out of before.
- It is also very important that the fish are not harmed.

2009 Dillon Feasibility Study for WL S04L8-014

GNWT Department of Infrastructure, 2022

WATER LICENCE AMENDMENT APPLICATION

Water Licence #S04L8-014
Mackenzie Valley Winter Road

K'ASHO GOTINE DISTRICT, SAHTU SETTLEMENT AREA, NORTHWEST TERRITORIES

Submitted To:

SAHTU LAND AND WATER BOARD
FORT GOOD HOPE, NORTHWEST TERRITORIES

By

DEPARTMENT OF TRANSPORTATION
Government of the Northwest Territories
May, 2009

Table of Contents

FIGURES

TABLES

APPENDIX A

APPENDIX B

APPENDIX C

APPENDIX D

APPENDIX E

SAHTU Land and Water Board
Water License Application

Northwest Territories Waters Regulation SCHEDULE III
(Subsection 6(1))

APPLICATION FOR LICENCE, AMENDMENT OF LICENCE, OR RENEWAL OF LICENCE

APPLICATION/LICENCE NO: **S04L8-014**
(amendment or renewal only)

1. NAME AND MAILING ADDRESS OF APPLICANT

Rod Gunderson
District Superintendent
Highway Operations, Fort Simpson Region
Department of Transportation
Government of the Northwest Territories
PO Box 86
Fort Simpson NT X0E 0N0

TELEPHONE: 867-695-2478
FAX: 867-695-3029

2. ADDRESS OF HEAD OFFICE IN CANADA IF INCORPORATED

TELEPHONE: _____
FAX: _____

3. LOCATION OF UNDERTAKING (describe and attach a map, indicating watercourses and location of any proposed waste deposits)

Department of Transportation's Mackenzie Valley Winter Road (Highway No. 1) and the Colville Lake Winter Road and further described as follows:

1) **Colville Lake Winter Road**- km 0 (Fort Good Hope area) to km 165 (Colville Lake) in the K'asho Gotine District, Sahtu Settlement Area, Northwest Territories.

   Min. 66°16'10"N 128°32'03"W
   Max. 67° 02'16"N 126°05'30"W

4.2.3 Current Water Withdrawal Practices

Water is extracted from the sources listed in current Water Licenses #S04L8-013 and # S04L8-014 (issued in 2004) and will be potentially extracted from additional water body sources applied for in this amendment (Table 1 and Figure 1).

Water extraction occurs from waterbodies and watercourses via water trucks equipped with vacuum pumps with an in-line rotary flow measuring device. Water is distributed onto the winter road by truck, discharging water on to the road at an application rate of approximately 100 cubic meters of water per linear kilometer during each operational season (year).

In 2005 and 2006, the DOT obtained stream survey information including instantaneous flow rates for approved streams in the Water Licenses. Stream survey information was also collected by the Mackenzie Gas Pipeline in 2004. The above information was reported in the *Mackenzie Valley Winter Road Water Use Study – Sahtu Region, Assessment of Winter Conditions from Potential Water Extraction Sources* (Golder, 2006). Information on watercourses included: location, depth, width, bank description, substrate type, in-water and riparian vegetation, photos of the stream location, instantaneous flow rates and survey date.

Golder Consultants conducted watercourse instantaneous flow rate measurements where accessibility permitted in December, 2007. However, a majority of the sites had no data (streams were frozen to bottom). For this reason, for the 2008-2009 construction season contractors were instructed to use averages of previous seasons instantaneous flow rate information prior to water withdrawal. To ensure water withdrawal rates do not exceed 5% of the instantaneous flow, measured instantaneous flow rates have been converted to approximate time to fill a $10m^3$ water truck.

Also, in September 2007, Golder conducted bathymetric surveys on additional proposed watersource extraction sites (Table 1). Bathymetric information is included in Appendix A and 10% maximum winter withdrawal amounts are depicted in Table 1.

As required under the existing Terms and Conditions for the Water Licenses, documentation of the flow rates, extraction/withdrawal rates, extraction dates, extraction volumes and pump types, ratings and specifications are maintained for each water source and a copy of this information is forwarded to the (Sahtu Land and Water Board and the Department of Fisheries and Oceans at the end of each operation season approximately by the end of May).

4.2.3 Amendment Rationale

The *Protocol for Water Withdrawal in the Northwest Territories* (Department of Fisheries and Oceans, 2006) stipulates that water withdrawal allowances for watercourses are limited to 5% of the instantaneous flow rate immediately prior to the time of extraction and 10% of winter availability from lakes.

Since Water Licenses #S04L8-014 was issued in 2004, DOT has endeavored to fulfill monitoring and water withdrawal protocol requirements, however DOT has encountered several barriers to this including the following: lack of human resources, lack of financial resources, and the seasonal nature of road construction.

2) Dissolved Oxygen

The SLWB license requires that for both lakes and streams, pre-extraction dissolved oxygen levels and temperature readings for water sources are required twice a year prior to extraction and at the end of the winter road season. In 2008, discussions with DFO confirmed that this method of evaluation to assess overwintering fish habitat is not a suitable replacement for conducting bathymetric surveys.

Since the *Protocol for Water Withdrawal in the Northwest Territories* (DFO) does not require dissolved oxygen measurements and since the utility of dissolved oxygen readings as a qualifying criterion for suitability for extraction does not apply, **DOT requests that the requirement for a dissolved oxygen profile taken twice a year (Part E, section 10) be removed.**

Attached is a Department of Fisheries and Oceans letter with recommendation in support of this amendment (Appendix B).

3) Watercourses

The MVWR is a winter seasonal ice road with a construction and operational season extending from approximately late November to early March. The purpose of instantaneous flow readings is to determine the maximum water withdrawal rate from an ice-covered watercourse to conform to the *"DFO Protocol for Water Withdrawal in the Northwest Territories"* (2008). The measurement of flow rate is to be confirmed at the start of each water withdrawal season immediately prior to water withdrawal commencing.

Since safe access along the entire length of the MVWR is usually not possible until January/early February, taking stream measurements at the start of each construction season prior to actual water withdrawal and construction of the road is not feasible. Difficult logistics due to remote accessibility and extreme weather conditions are also factors that provide challenges to execution of the water license requirements.

Due to the above difficulties in timing and co-ordination for data gathering, **DOT requests that Part C, section 7 be amended to:**

a) **Allow to use the average of the instantaneous flow rates collected in previous years during open water conditions (Table 2) to estimate allowable 5% instantaneous flow rates until a functional general compliance monitoring program can be initiated.**

DOT is currently investigating the possibility and feasibility of applying regional analysis and modeling techniques as alternatives to direct field measurements (Appendix C). Modeling or regional analysis would require data collection in the field during the open-water season. The data would be used to develop a model/regional analysis of each creek which can be used to predict stream flow at each site based on ice thickness and water level. In this way flow measurements could be easily accomplished by the water truck operator immediately prior to winter water withdrawal and accurately represent flow condition. Currently, the license program functions to collect data that does not accurately represent flow conditions at time of initial water extraction.

10. PREDICTED ENVIRONMENTAL IMPACTS OF UNDERTAKING AND PROPOSED MITIGATION

DOT contracted Dillon Consultants Limited to prepare an *Environmental Impact Statement* (2004), relating to the construction and maintenance of the winter road through the Sahtu Settlement area (Appendix D). Impacts related to construction and maintenance of winter roads posses the potential to affect surface water, ground water, vegetation, wildlife, and soils. While the majority of these can be mitigated with little or no residual effects, spills of hazardous materials can potentially have moderate residual effects due to the remoteness of the project area and reduced efficiency in responding to spills due to extreme weather.

The SCP submitted with the original license application specifies measures to reduce potential environmental impacts and these will also apply to work undertaken at any additional water sources.

Potential impacts to other valued environmental components can be effectively mitigated using proven measures presented in the existing Water Licenses' "*Environmental Impact Statement*" document, with little or no residual effects. These measures will also be incorporated into work carried out at the proposed additional sites.

Socio-Economic Benefits

No changes to the Socio-Economic Benefits discussed in the original application package are anticipated .

Archeological, Protected and Historical Sites

Information on existing archeological, protected and historical sites has been obtained from the Prince of Wales Northern Heritage Centre, GNWT and was included in the original application package. Impacts upon existing sites were not identified.

Traditional Ecological Knowledge (TEK)

The Department of Transportation acquired the services of GeoNorth to collect and compile TEK as part of the requirements for the 2004 Water Licence Application for the on-going construction and maintenance of the Mackenzie Valley Winter Road and the Deline Winter access Road. Interviews were held in the communities of Colville Lake, Fort Good Hope, Norman Wells and Tulita between September 27 and October 1, 2004. The proposed water extraction sources for the winter road activities fall within wildlife and migratory bird habitat and traditional food harvesting areas.

Much concern was expressed about the low water levels in the water bodies and courses throughout the area over the past couple of years, and more specifically this fall. People are in favour of the winter road; however, there may not be sufficient water in all of the identified water extraction sources for extraction purposes. The report titled "*Traditional Ecological Knowledge Study in Support of an Application for Water License for Construction of the Mackenzie Valley*

12. STUDIES UNDERTAKEN TO DATE (attach list if necessary)

- Department of Transportation, Government of the Northwest Territories (2004). *Mackenzie Valley Winter Road Biophysical Components.*
- Dillon Consulting Limited (2004). *Environmental Impact Statement.*
- GeoNorth (2004). *Traditional Ecological Knowledge in Support of an application for a Water License for the Construction of the Mackenzie Valley Winter Road.*
- Golder Consultants Limited (2006). *Mackenzie Valley Winter Road Water Use Study Sahtu Region, NWT. Assessment of Winter Conditions from Potential Water Extraction Sources.*
- Northern EnviroSearch Limited (2008). *Environmental Protection Plan for the Fort Good Hope to Colville Lake Winter Access Construction and Maintenance Program*

13. PROPOSED TIME SCHEDULE

Start date: annually November 30th Completion date: annually March 31st

Figures

Tables

Table 1. Proposed Water Source Extraction Sites Information

Golder Lake ID (WR)	km	Max Depth (m)	Mean Depth (m)	Winter Volume (m^3)	10% Max Withdrawal Volume (m^3)	Bathymetry completed	UTM Zone	Easting	Northing
40	1089	3.8	0.9	12 300	1 230	2004 Golder	9W	551562	7283464
42	1102	5.08	1.42	654 171	65 417	2003 AAR	9W	549402	7293182
43	1118	1.2	0.6	0	0	2004 Golder	9W	538030	7306494
45	1135	0.9	0.5	0	0	2004 Golder	9W	522334	7341564
47	10.7	5.7	3.1	5 247 100	524 710	2004 Golder	9W	527114	7353025
50	27	5.9	2.4	555 656	55 566	2004 Golder	9W	539273	7368427
51	39.9	3.8	1.2	213 185	21 319	2007 Golder	9W	545271	7377597
59	128	6.5	2.6	11 800 327	1 180 033	2007 Golder	9W	595505	7418927
60	138	17	4.2	51 928 198	5 192 820	2007 Golder	9W	601859	7421962

Table 2. Permitted Water Sources Historical Data

Water Licence #S04L8-014

Lakes = m3
Creeks= m3/s
Time to fill truck calculations: WHERE (x m3/s) X 0.05 = x m3/s (5% instantaneous flow rate) AND (m3/s) X (60s/min) = x m3/min
AND 10 m3 / (x m3/min) = time to fill truck in minutes

	Date (year)	Date (month)	Source	Hanna Creek	WR Lake No. 4	Donnelly River	WR Lake No. 5 (Chick Lake Golder ID WR 43)	WR Lake No. 6 (Golder ID WR44)	Snafu River	Tsintu River	Hare Indian River	Creek Large km 48 (Golder ID 15-UNK)	Creek Large km 70 (Golder ID 16-UNK)	Tchaneta River	Creek Large km 110 (Golder ID 18-UNK)	Lac Belot (Golder ID WR 60, 61)	Colville Lake (Golder ID WR 62)
KM				1084	1102	1118	1118	1128	1124	1154	22.5	48	70	90	110	134, 145	160
	2002	June	MGP	1.33													
		August	MGP	4.83		4.25			0.21	0.38							
		Sept	MGP	3.33		5.99			1.62	1.94							
	2003	August	MGP	1.01						0.02							
	2004	April	MGP	0.18		1.18											
		Sept	Apache		56 129 (w)		6 606 (w)	207 837 (w)									
	2005	Sept	DOT	0.847						0.82	>11	0.011	0.104				
		Dec	Golder	<0.2		~1.0			stagnant	low	~10	frozen		stagnant			
	2006	March	Golder				13 648 8000 (s), 0 (w)	1 439 900 (s), 130 202 (w)	0.04	0.07	12.09			0.07	0.041	75 056 505 (S), 51 928 198 (W)	
	2007	Dec	Golder	0.2	N/A	N/A			N/A	N/A	N/A	frozen	frozen	0.04			
Maximum 5% Instantaneous flowrate				**0.01**		**0.3**			**0.01 (based on August 2002)**	**0.041**	**0.55**	**0.00055**	**0.0052**	**0.0035 (based on March 2006 reading)**	**0.0021 (based on March 2006 reading)**		
Time to fill $10m^3$ truck (minutes)				**17**		**0.5**			**17**	**4**	**0.3**	**333 = 5.5 hours and not feasible, do not use this site**	**32**	**48**	**80**		

Table 2. Permitted Water Sources Historical Data

Water Licence #S04L8-014 cont.

	Hanna Creek	WR Lake No. 4	Donnelly River	WR Lake No. 5 (Chick Lake Golder ID WR 43)	WR Lake No. 6 (Golder ID WR44)	Snafu River	Tsintu River	Hare Indian River	Creek Large km 48 (Golder ID 15-UNK)	Creek Large km 70 (Golder ID 16-UNK)	Tchaneta River	Creek Large km 110 (Golder ID 18-UNK)	Lac Belot (Golder ID WR 60, 61)	Colville Lake (Golder ID WR 62)
Lake Max Depth		3.03		2.99 (Apache, 2004) 1.2 (Golder, 2006)	5.11 (Apache, 2004), 2.11 (Golder)									
Maximum 10% Lake Withdrawal		5 613		660	13 020								5 192 820	
DOT historical use and 2009/09 action	N - Use this season	N - Use this season	Y - continue use	N - Use this season	N - Use this season	Y - continue to use	N - Use this season	N - Use this season	N - Do not use	N - Use this season	N - Not feasible	N - Not feasible	N - Use this season	

Table 3. The Department of Transportation Contractor List for #S04L8-014 (MVWR 2008/2009)

Contractor Contact Person	Contract Description / Area of Work
Arctic Circle Enterprises Ltd Jack, Heather, Robert Bourassa Ph #867-598-2018 FAX -2029	Winter Road Const. &Maintenance-Zone 1 Km.1172 -1097, HWY #1 Fort Good Hope area
Behdzi Ada First Nation Jerry Houlka, Manager Ph #867-709-2999 FAX-2997	Winter Road Canst. & Maintenance-Zone 7-2 Colville Lake Winter Road, Km 85 to 165 Colville lake area
North Ridge Ventures Pascal Audit Ph #867-587-2050	Winter Road Const. &Maintenance -Zone 7-1 Colville lake Winter Road, Km 0 to 85 Colville Area

Appendix A

Proposed Water Extraction Sources Bathymetry

BATHYMETRIC SURVEYS OF POTENTIAL WATER EXTRACTION SOURCES SUMMARY REPORT – FINAL

MACKENZIE VALLEY WINTER ROAD WATER USE STUDY SAHTU REGION, NWT

SERVICE CONTRACT #791524

Submitted to:
Rhonda Batchelor
Environment Manager
Department of Transportation
Government of the Northwest Territories
2nd Floor Lahm Ridge Tower
4501 Franklin Avenue
Yellowknife, NT
X1A 2L9

Prepared by:
Golder Associates Ltd
9 – 4905 48th Street
Yellowknife, NT

Golder Associates Ltd.

9 – 4905 – 48th Street
Yellowknife, Northwest Territories,
Canada X1A 3S3
Telephone (867) 873-6319
Fax (867) 873-6379

March 10, 2008

07-1328-0036

Department of Transportation, GNWT
2nd Floor Lahm Ridge Tower
4501 Franklin Avenue
Yellowknife, NT, X1A 2L9

Attention: Rhonda Batchelor, Environment Manager

RE: Final Report **"Bathymetric Surveys of Potential Water Extraction Sources"**

In response to the recent water withdrawal guidelines for the NWT (DFO 2006), the Department of Transportation was required to provide volume estimates for all lakes to be used as water extraction sources for winter road construction and maintenance. Based on previous investigations the Department of Transportation has provided the Department of Fisheries and Oceans Canada with bathymetric information from 23 of the lakes used for water extraction. The examination of the data collected during the 2005-06 "Mackenzie Valley Winter Road Water Use Study", however, identified 12 additional lakes that required volume estimates before they could be used again as water extraction sources (Golder 2006). To minimize the potential impact on fish overwintering at these lakes, Department of Fisheries and Oceans Canada (2006) guidelines dictate that a maximum of 10% of the total volume can be removed during winter. To comply with these guidelines, the Department of Transportation was required to complete bathymetric surveys and associated volume estimates, prior to their use for water withdrawal during future winter road construction seasons.

The following report details the methodologies used and the results of the bathymetric surveys and volumetric estimates from each of the 12 lakes.

If you have any questions concerning this report, please do not hesitate to call the undersigned. We appreciated the opportunity to work with the Department of Transportation on this interesting and challenging project.

Yours very truly,

GOLDER ASSOCIATES LTD.

Scott MacNeill, B.Sc. (Hons), M.Sc. P.Biol.
Arctic Fisheries Ecologist
SM/GC

Grant Clarke, M.A.
Managing Associate

TABLE OF CONTENTS

SECTION PAGE

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

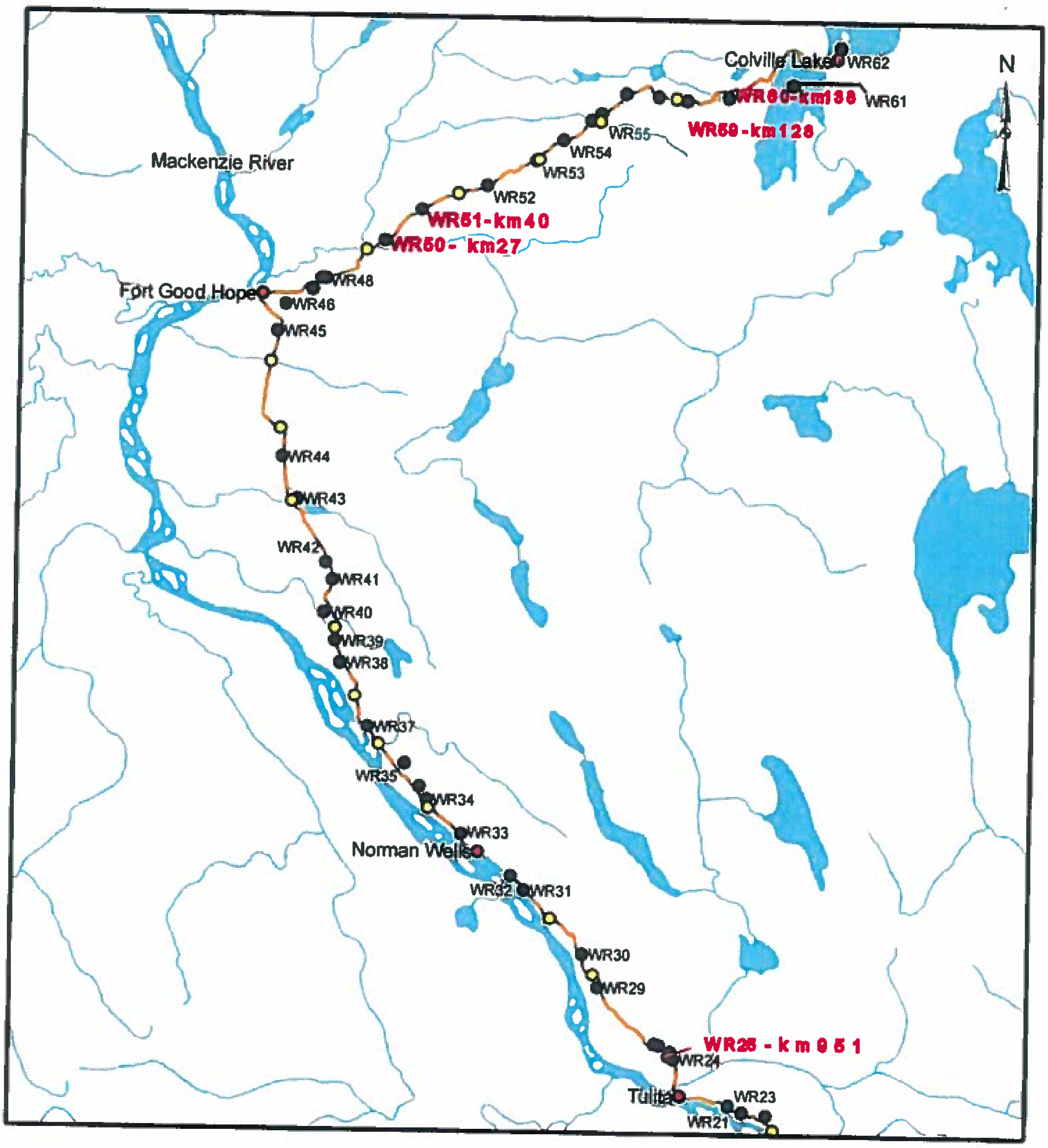
Golder Associates Ltd. (Golder) is pleased to submit this report detailing the results of the 2007 "Bathymetric Surveys of Potential Water Extraction Sources used for Mackenzie Valley Winter Road (MVWR) Construction and Maintenance – Sahtu Region, Northwest Territories", for the Government of the Northwest Territories (GNWT) Department of Transportation (DoT).

General

The GNWT DoT is responsible for the planning, design, construction, and maintenance of safe transportation infrastructure, capable of meeting user needs in the Northwest Territories (NWT). DoT builds and maintains facilities to serve the NWT's needs in the road, marine and air transportation sectors.

In order to facilitate oil and gas exploration and other developments in the Sahtu and Deh Cho regions of the NWT, it became necessary for DoT to upgrade conditions and extend the operational window of winter roads on the MVWR system connecting Wrigley, Tulita, Deline, Norman Wells, Fort Good Hope and Colville Lake. During previous years, less than 100 m^3/day of water was required by DoT to construct the road. However, during the 2004-05 season, it was necessary to exceed this amount in order to accelerate road construction and increase load capacity. As a result of this increase in water usage, DoT was required to obtain a Type B water license, under the NWT Water Act. In response to this regulatory requirement, DoT retained Golder to document early and late winter conditions in each potential water withdrawal site (Golder 2006). Investigated sites included watershed systems and lakes (Figures 1.1 - 1.2) found along the winter road right-of-way.

In addition to fulfilling the requirements outlined in the NWT Water Act, in 2006 DFO released a "Protocol for Winter Water Withdrawal in the Northwest Territories" (DFO 2006). These new water withdrawal guidelines stipulated that DoT must also provide volumetric estimates from each waterbody used for water extraction, where winter water withdrawal levels will exceed 100 m^3 (DFO 2006). The 2006 guidelines were developed by DFO to protect the loss of overwintering fish habitat at water extraction sites along the Mackenzie Valley. Studies have demonstrated that the withdrawal of excessive amounts of under-ice water can result in oxygen depletion, which has made water withdrawal a critical issue (DFO 2006).



LEGEND

- Approximate Winter Road Alignment
- Communities
- Potential Water Sources
- Stream Crossings
- WR 2007 Bathymetry Study

30 0 30 Kilometers

SCALE 1:1,250,000

REFERENCE

Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 10

PROJECT

Mackenzie Valley Winter Road Water Use Study

TITLE

Potential Water Sources - Tulita to Colville Lake

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 05-1373-026		SCALE AS SHOWN	REV 0
DESIGN	KB	Dec. 2005	
GIS	DP	Jan. 2006	
CHECK	SM	Jan. 2006	
REVIEW	SM	Jan. 2006	

FIGURE: 1.2

Golder designed this study to aid DoT in providing Sahtu Land and Water Board (SLWB) and DFO with the remaining information required to meet the water withdrawal guidelines, for each of these 12 lakes prior to the 2007-08 MVWR construction season. The following report provides DoT with:

- bathymetric map and volumetric estimate from 12 lakes that have the potential to be approved by DFO to serve as water extraction sources; and
- in situ water quality information from each visited site.

This assignment has allowed us to combine our extensive environmental assessment experience in the Northwest Territories, particularly in the Mackenzie Valley, with recent experience and knowledge obtained through our ongoing involvement with the GNWT.

FIELD INVESTIGATION

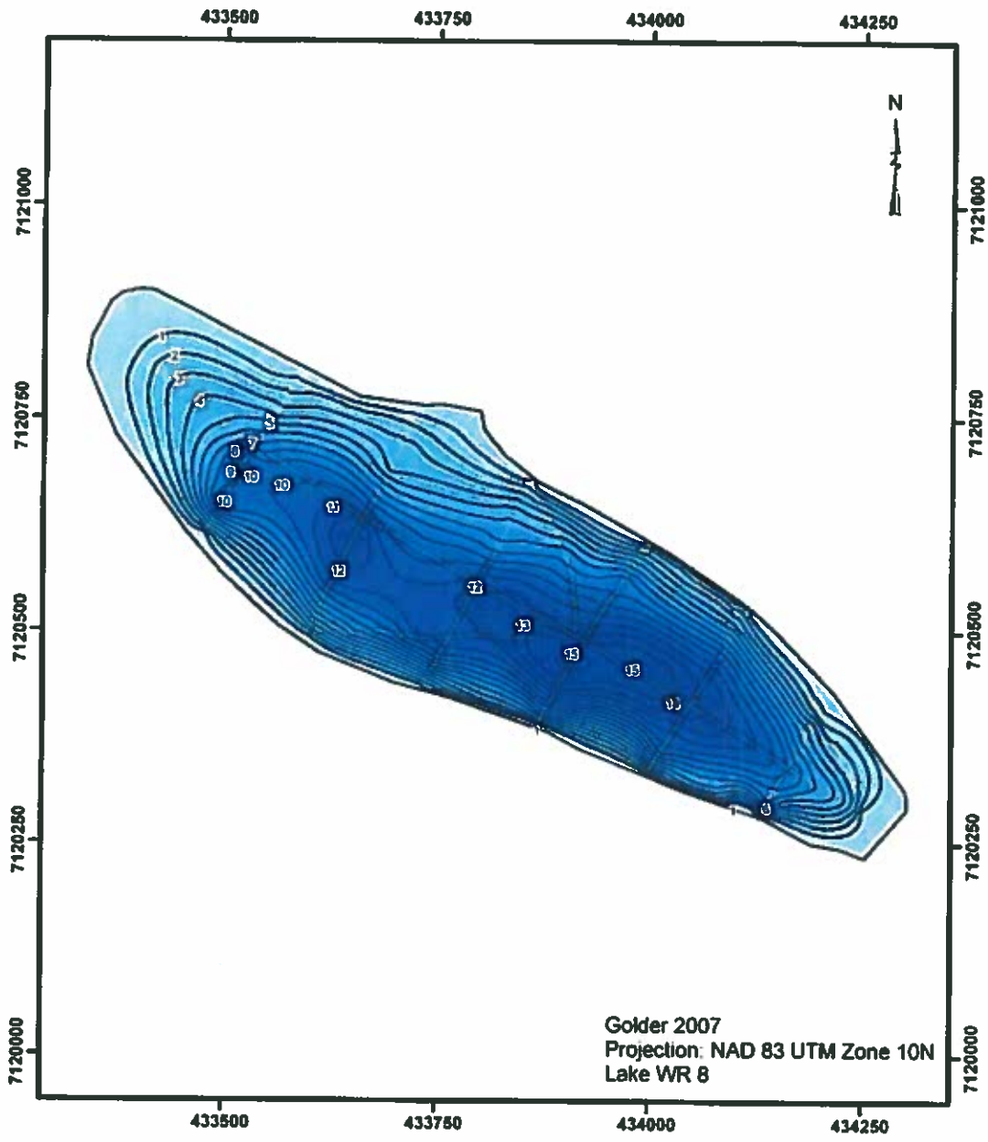
Methods

Bathymetric data was collected from the following 12 lakes: WR8, WR10, WR12, WR14, WR16, WR18, WR19, WR25, WR50, WR51, WR59 and WR60.

The depth data was collected using a Garmin 168 depth sounder, during September 2007. The sounder provided continuous (i.e., at 1 or 2 s intervals) depth recordings, geo-referenced with a Global Positioning System (GPS). Prior to use, the depth readings were calibrated with a manual sounding line reading at each lake and appropriate adjustments made on the instrument to account for the depth of the transducer (i.e., offset depth). The data was logged and stored as MapSource™ files on weather-resistant Toughbook™ computers.

The spacing of the bathymetric transects was dependent on the size of each lake and the irregularity of the lake bottom. In general, one longitudinal transect, connecting the two farthest shorelines, was surveyed. Subsequent cross transects (i.e., perpendicular to the longitudinal transect) were then evenly spaced along the longitudinal transect, following the recommendation outlined in DFO (2006).

The digital data collected during the bathymetric surveys was processed using Golder-designed software, which uses an ArcGIS 8.2 ANUDEM routine to interpolate depth information and generate contour lines on a bathymetric map of each lake. The software automatically calculates area and volume parameters, and is very cost-effective compared to conventional mapping techniques. Golder used the same field and data analyses procedures to produce the bathymetric maps found in the Golder (2006) report.

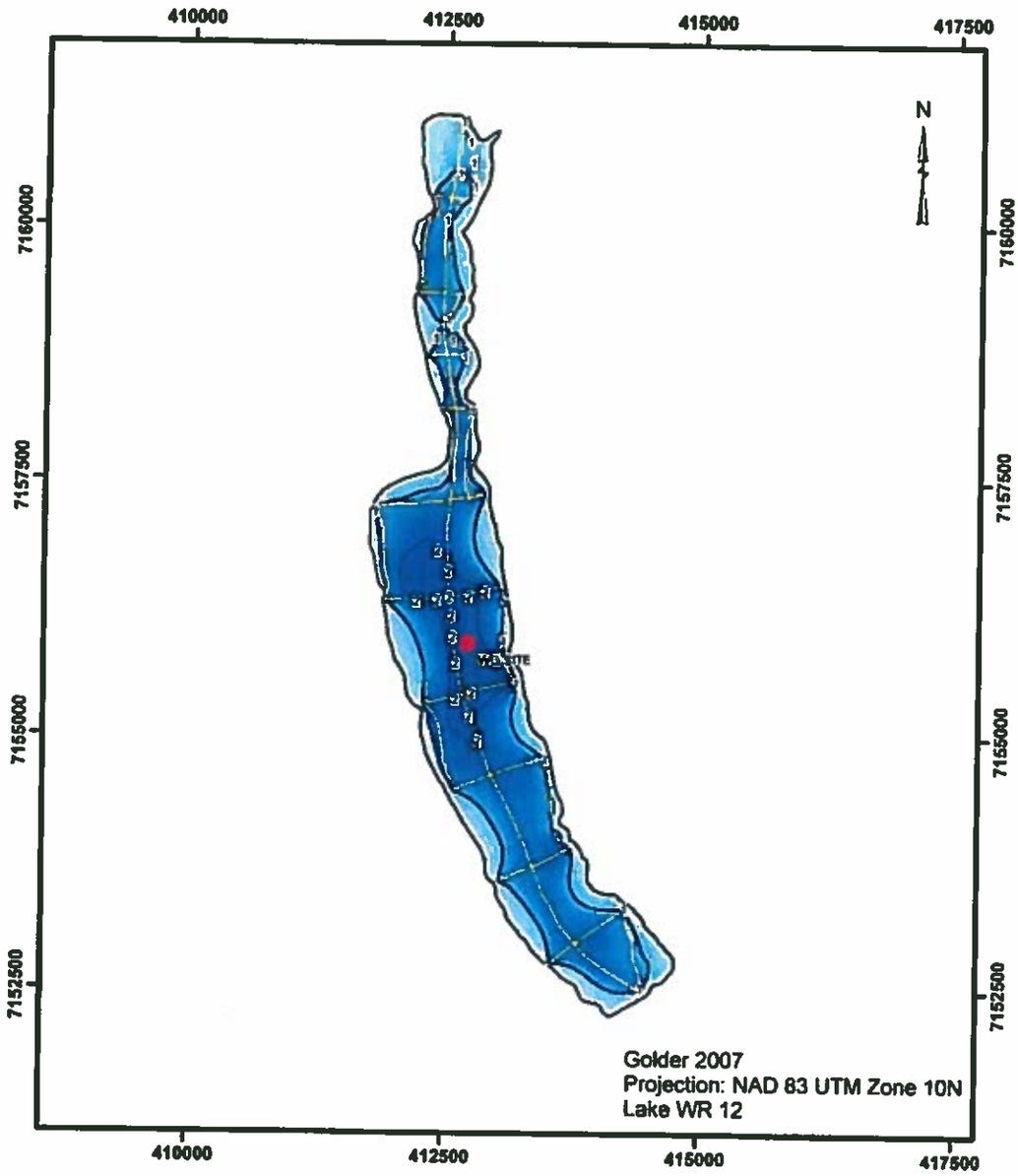


Lake ID: WR8 Region: Sahtu UTM: 10W 433668 7120640 Km: 818

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp (°C)	Cond (µS/cm)	pH
03-Dec-05	0.0	0.4	10.5	1.5	12.4	89	1.5	338	8.1
	0.0	0.4	10.5	9.0	11.8	88	1.8	339	8.0
08-Mar-06	0.21	0.8	10.2	1.8	12.0	84	0.8		7.7
	0.21	0.8	10.2	9.2	8.6	61	2.0		
23-Sep-07	NA	NA	15.6	2.0	9.4	80	8.0	348	7.5
	NA	NA	15.6	15.0	0.5	4	4.0		

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
Sep 2007	1005	251 743	15.2	6.3	1 604 238	1 265 534	DFO Approved site, 2008

[1] Assuming 1.5 m ice thickness

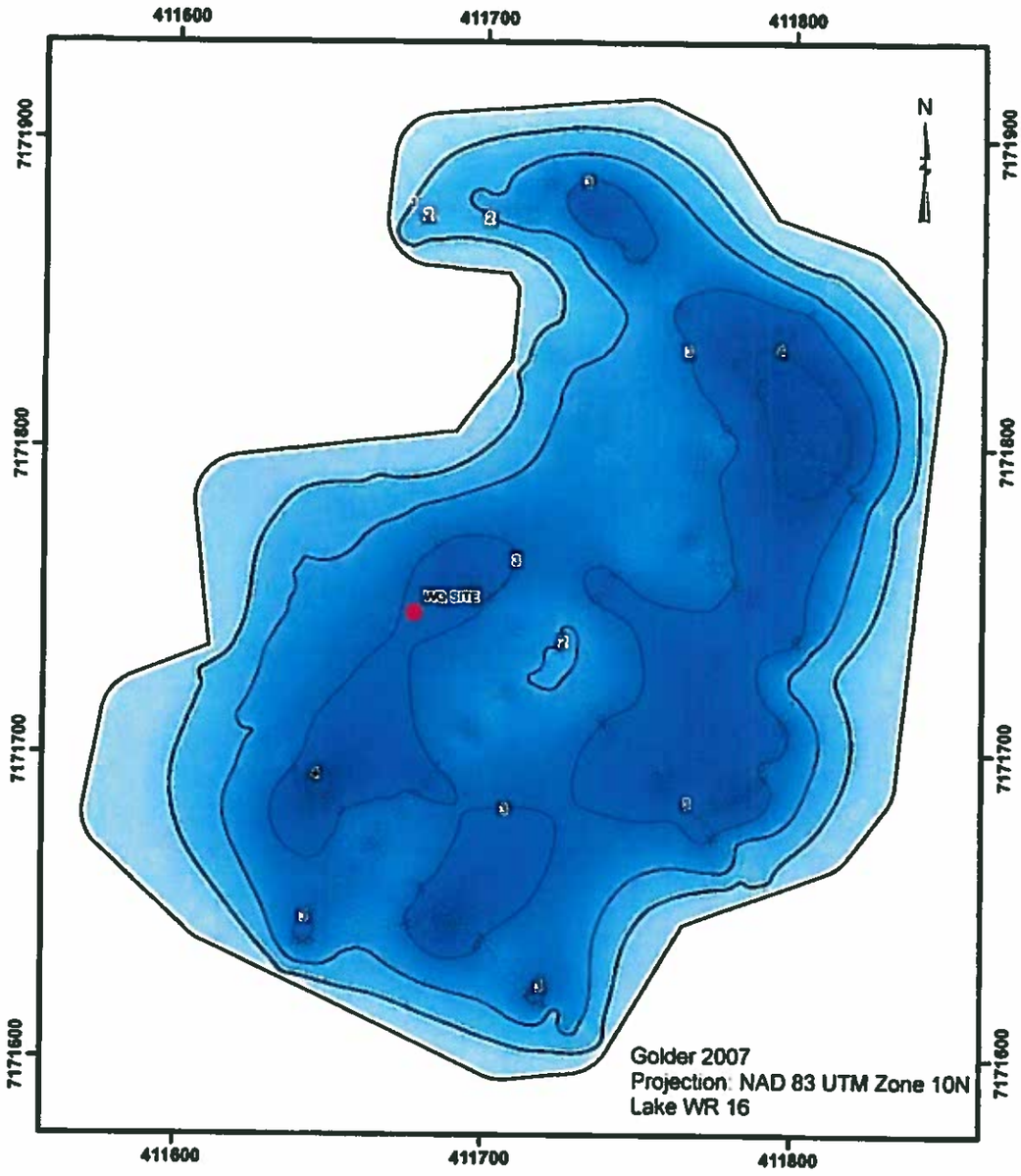


Lake ID: WR12 (Mio Lake) Region: Sahtu UTM: 10W 412714 7155905 Km: 866

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp. (°C)	Cond. (µS/cm)	pH
03-Dec-05	0.0	0.55	2.0	1.5	8.0	53	2.6	360	7.9
09-Mar-06	Unable to sample on foot due to distance from MVWR								
23-Sep-07	NA	NA	2.0	1.0	11.9	93	4.4	340	7.6

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class.
Sep 2007	8900	7520287	2.3	1.2	9144746	987269	Not Approved – High Potential

[1] Assuming 1.5 m ice thickness

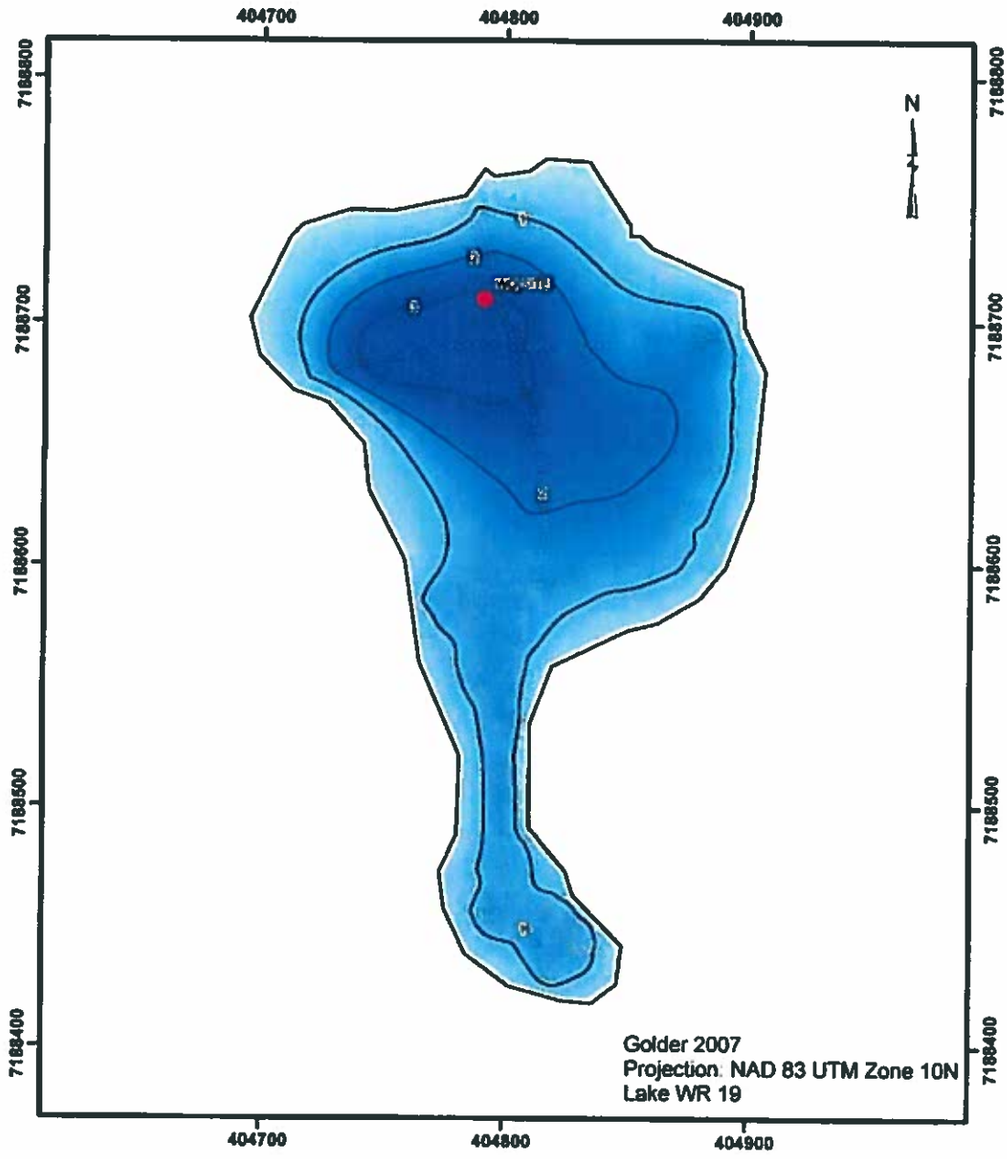


Lake ID: WR16 **Region: Sahtu** **UTM: 10W 411677 7171746** **Km: 882**

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp. (°C)	Cond. (µS/cm)	pH
03-Dec-05	0.15	0.4	2.6	1.5	4.2	29	2.9	129	7.0
09-Mar-06	0.21	0.6	3.2	1.5	0.4	2	1.5		
23-Sep-07	NA	NA	4.9	2.0	9.4	76	5.9	223	6.7

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
Sep 2007	330	56 631	4.9	2.1	120 505	48 991	Not Approved, Moderate Potential

[1] Assuming 1.5 m ice thickness

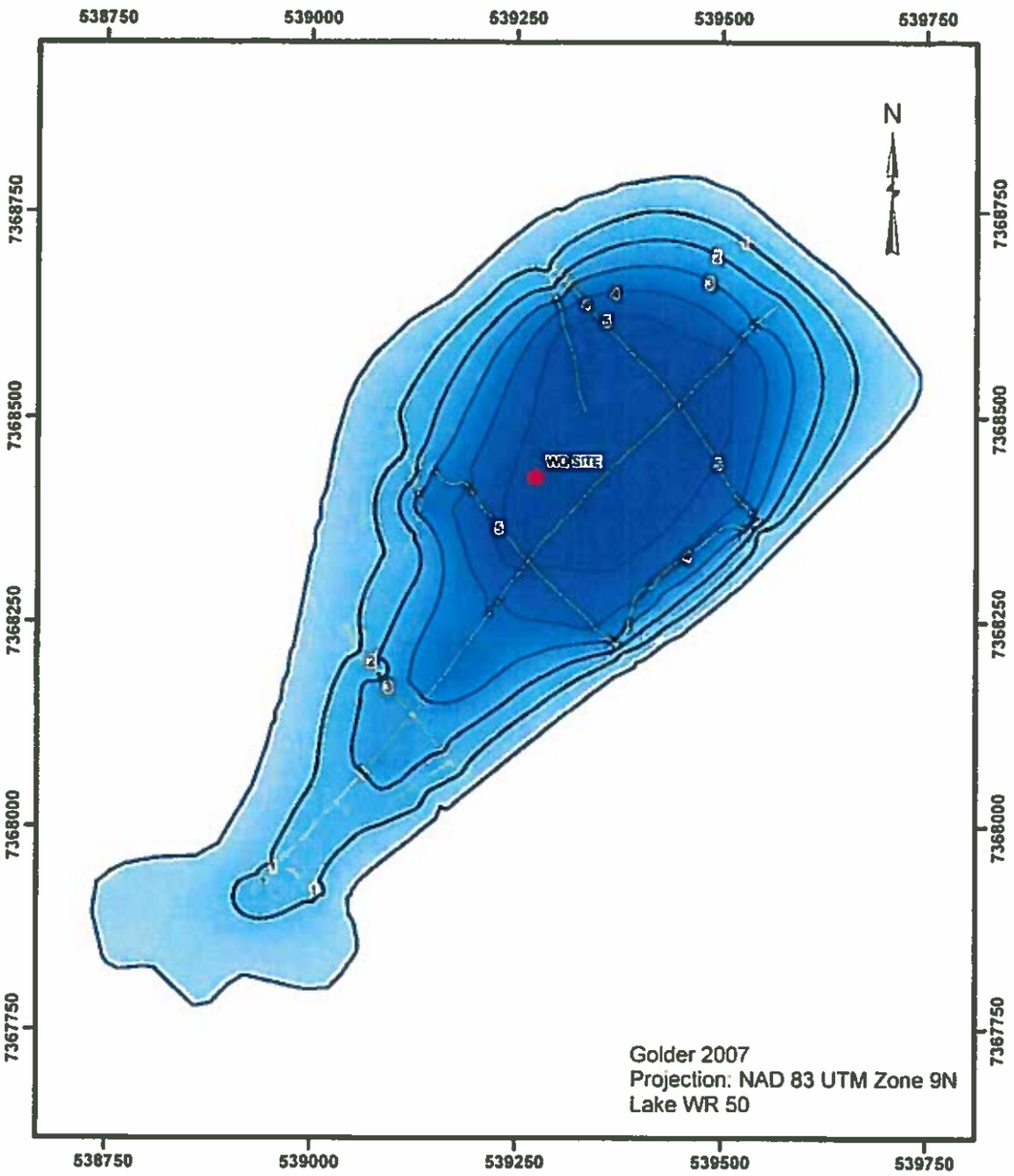


Lake ID: WR19 **Region: Sahtu** **UTM: 10W 404789 7188854** **Km: 890**

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp. (°C)	Cond. (µS/cm)	pH
03-Dec-05	Not completed due to safety concerns (overflow on lake)								
10-Mar-06	0.23	0.63	4.0	1.5	0.9	6	0.0		
	0.23	0.63	4.0	3.0	0.1	1	3.1		
21-Sep-07	NA	NA	3.8	2.0	11.2	91	6.0	152	6.87

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
Sep 2007	870	35 950	3.8	1.4	51 306	11 811	Not DFO Approved, Low Potential

[1] Assuming 1.5 m ice thickness

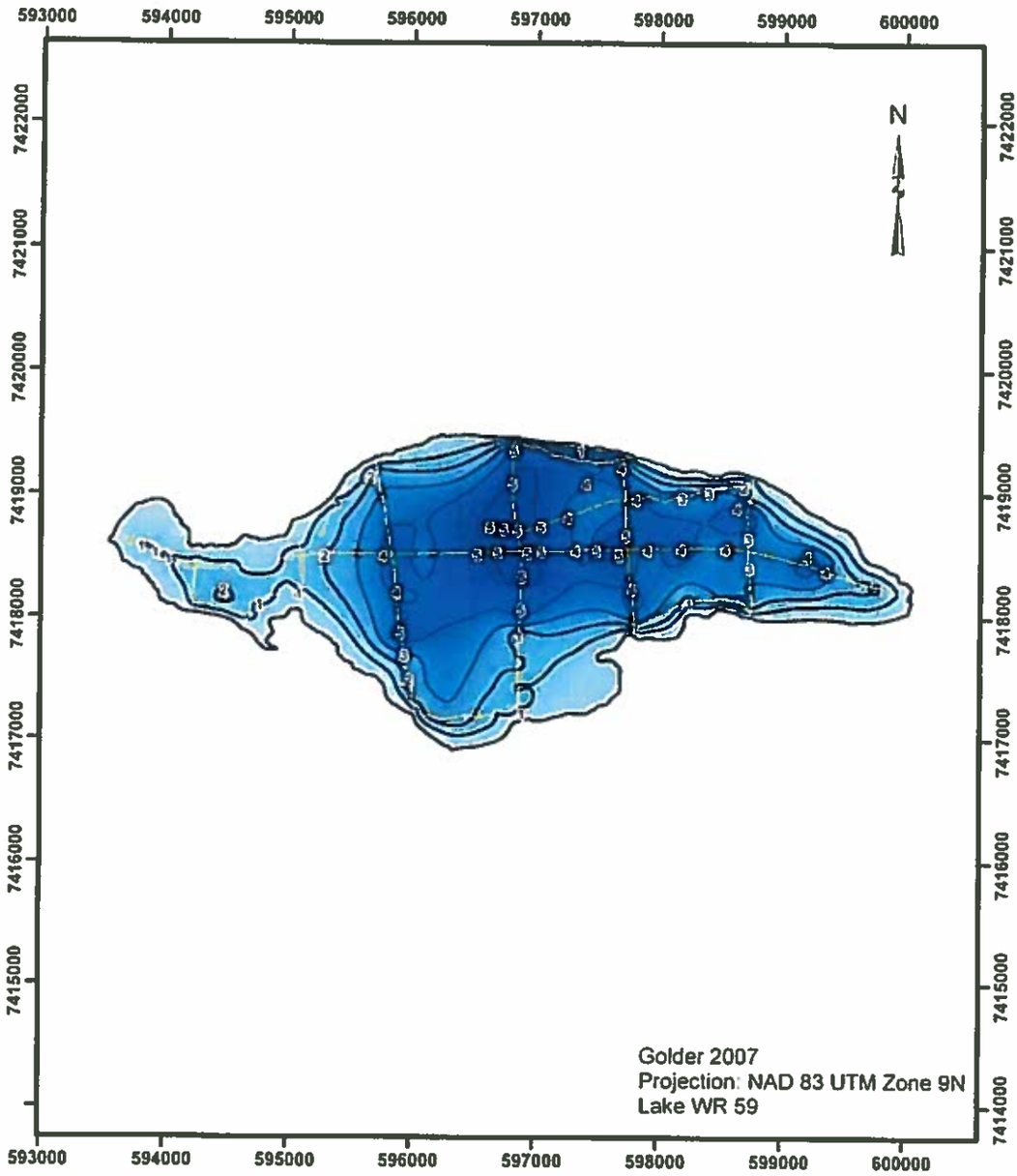


Lake ID: WR50 **Region: Sahtu** **UTM: 9W 539273 7368427** **KM: 27**

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp. (°C)	Cond. (µS/cm)	pH
06-Dec-06	0.2	0.45	5.2	1.5	12.4	88	1.8	327	8.1
	0.2	0.45	5.2	4.0	7.0	48	2.8	341	7.9
15-Mar-06	0.3	0.74	5.2	1.5	7.8	54	1.2		7.6
	0.3	0.74	5.2	4.2	0.8	6	3.0		
18-Sep-07	NA	NA	5.9	2.0	11.3	100	7.1	348	7.5
	NA	NA	5.9	5.0	11.0	100	7.1		

Sampling Date	Length Long Axis (m)	Lake Area (m^2)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
Sep 2007	1230	431 372	5.9	2.4	1 031 072	555 656	DFO Approved Site

[1] Assuming 1.5 m ice thickness



Lake ID: WR59 **Region: Sahtu** **UTM: 9W 595505 7418927** **KM: 128**

Sampling Date	Snow Depth (m)	Ice Thickness (m)	Water Depth (m)	Sampling Depth (m)	DO (mg/L)	% Sat.	Temp. (°C)	Cond. (µS/cm)	pH
05-Dec-05	0.3	0.3	1.0	0.8	12.8	91	1.0	243	8.2
05-Dec-05[1]	0.2	0.4	1.7	1.0	13.2	92	0.7	240	8.2
16-Mar-06	0.3	0.8	2.8	1.5	10.0	68	0.4		7.0
19-Sep-07	0.0	0.0	5.5	1.0	12.8	105	4.3	239	7.24
	0.0	0.0	5.5	5.0	5.6	49	4.7	239	7.24
17-Dec-07		0.49	1.5	1.0	11.4				

Sampling Date	Length Long Axis (m)	Lake Area (m^3)	Max. Depth (m)	Mean Depth (m)	Summer Volume (m^3)	Winter Volume[1] (m^3)	Withdrawal Class
September 2007	6510	8 603 148	6.5	2.6	22 503 535	11 800 327	DFO Approved Site

[1] Assuming 1.5 m ice thickness

REFERENCES

Fisheries and Oceans Canada. (DFO). 2006. Interventions on the Mackenzie Gas Project. 51 pp.

Golder Associates Ltd. 2006. Assessment of winter conditions in potential water extraction sources along the Mackenzie Valley winter road, Sahtu Region, NWT. Prepared for the Department of Transportation, GNWT. Golder Report No. 06-1373-023: 180 pp.

APPENDIX A

Aerial photos of each surveyed lake

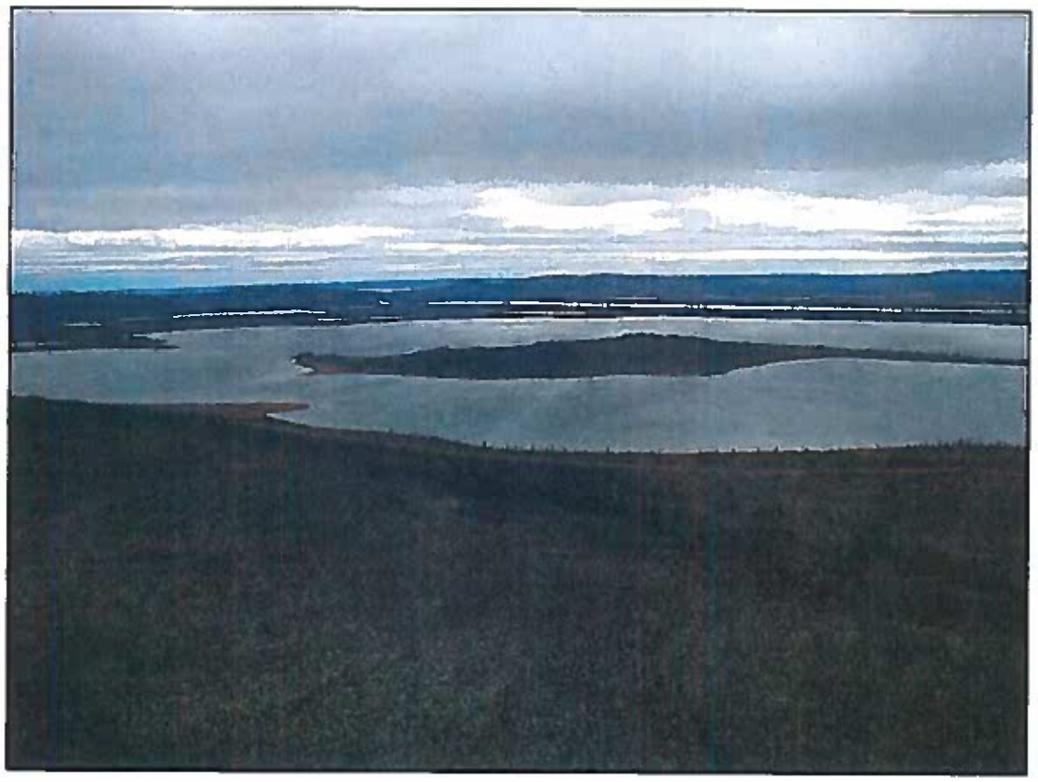
Aerial Photo Lake WR12 (Mio Lake), September 23, 2007.

Aerial Photo Lake WR14, September 23, 2007.

Aerial Photo Lake WR19, September 21, 2007. Note MVWR in background.

Aerial Photo Lake WR25, September 21, 2007. Note MVWR to right.

Aerial Photo Lake WR59, September 19, 2007.



Aerial Photo Lake WR60, September 20, 2007. Note MVWR to bottom.

Appendix B

Water License #S04L8-014
Department of Fisheries and Oceans Correspondence

SAHTU Land & Water Board
P.O. Box 1
Fort Good Hope, NT
X0E 0H0

December 24, 2004

Mr. Rod Gunderson
District Superintendent
Highway Operations
Dept. of Transportation, GNWT
P.O. Box 86
Fort Simpson, NT X0E 0N0

Our File: S04L8-013, S04L8-014
Your File:

Dear Mr. Gunderson;

Re: GNWT-DOT Mackenzie Valley Winter Road
Construction and Maintenance
K'asho Gotine District – S04L8-014
Tulita District – S04L8-013
Licence Approvals

Please find enclosed the originals of Water Licence S04L8-013 and S04L8-014, including Terms & Conditions for construction & maintenance on the Mackenzie Valley Winter Road in the Tulita and K'asho Gotine Districts. Copies will be forwarded to the DIAND Resource Management Officers in Norman Wells and Inuvik, to the Tulita and K'asho Gotine District Land Corporations, and to our Public Registry.

If you have any questions, please do not hesitate to contact our office at (867) 598-2413.

Yours truly,
SAHTU Land & Water Board

Patricia McNeely

Patricia McNeely
Clerk, Licences/Permits

Cc: Gordon Yakeleya, President, Tulita District Land Corporation
Arthur Tobac, President, K'asho Gotine District Land Corporation
Kevin Glowa, Water Licence Inspector, DIAND
Steve Deshene, Land Use Permit Inspector, DIAND

SAHTU Land and Water Board
Water Licence

Pursuant to the Mackenzie Valley Resource Management Act, the Northwest Territories Waters Act and Regulations, the SAHTU Land and Water Board, hereinafter referred to as the Board, hereby grants to

GNWT/Department of Transportation, Highway Operations
(licensee)

of P.O. Box 86, Fort Simpson, NT, X0E 0N0
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Mackenzie Valley Resource Management Act, the Northwest Territories Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this licence.

Licence Number	S04L8-014
Licence Type	"B"
Location	Located from approximately km 1083 to km 1172 of the Mackenzie Valley Winter Road in the K'asho Gotine District and from km 0 (Fort Good Hope) to km 165 (Colville Lake)
Purpose	The use of water for the construction and maintenance of the Mackenzie Valley Winter Road and of an ice road from Fort Good Hope to Colville Lake.
Effective Date of Licence	December 24, 2004
Expiry Date of Licence	December 23, 2014

This Licence issued and recorded at Fort Good Hope includes and is subject to the annexed conditions.

SAHTU Land and Water Board

Witness

Chairman

This Licence and conditions shall be kept on site.
If you have any questions please call the SAHTU Land & Water Board at (867) 598-2413

2. **Definitions**

In this Licence: S04L8-014

"Act" means the Mackenzie Valley Resource Management Act and/or Northwest Territories Waters Act.

"Board" means the SAHTU Land and Water Board established under Section 60 of the Mackenzie Valley Resource Management Act.

"Inspector" means an Inspector designated by the Minister under Section 35(1) of the Northwest Territories Waters Act.

"Licensee" means the holder of this Licence.

"Minister" means the Minister of Indian Affairs and Northern Development.

"Modification" means an alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion.

"Ordinary High Water Mark" means of a body of water the limit or edge of its bed and, in the case of non-tidal waters, it may be called "the bank" or "the limit of the bank".

"Regulations" means Regulations proclaimed pursuant to Section 33 of the Northwest Territories Waters Act.

"Waste" means waste as defined by Section 2 of the Northwest Territories Waters Act.

"Watercourse" means a natural watercourse, body of water or water supply, whether usually containing water or not, and includes groundwater, springs, swamps, and gulches, as defined in the Northwest Territories Waters Regulations.

"Water Licence Inspector" means an Inspector designated by the Minister under Section 35(1) of the *Northwest Territories Waters Act*.

"Waters" means any inland waters, whether in a liquid or frozen state, on or below the surface of the land as defined in Part 3, Section 51 of the Mackenzie Valley Resource Management Act.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall ensure that any fuels, chemicals, or Waste(s) associated with this undertaking do not enter any Watercourse.

2. The Licensee shall not, under this Water Licence, deposit solid or liquid waste on the winter road or winter road right-of-way.

3. The Licensee shall not deposit raw, untreated sewage on the land surface.

PART E: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all water for miscellaneous undertakings, for the construction and maintenance of a winter ice road and associated activities, as described in the Water Licence application. The winter ice road shall be constructed and maintained utilizing the water sources as identified in Part A of the Terms and Conditions and approved by the Board.

2. Water obtained for miscellaneous undertakings includes water for construction and maintenance of a winter ice road and associated activities.

3. Total quantities of water involved are approximately as follows:

LOCATION DESCRIPTION	DISTANCE (km)	WATER VOLUME (m^3)
km 1083 to km 1172 MVWR*	89	8,900
Colville Lake Winter Road km 0 to 165	165	16,500
Total Distance and Water Use	254	25,400

*Mackenzie Valley Winter Road

4. The Licensee shall erect and maintain permanent conspicuous signage at all approved water sources. The signage shall be erected at or near the point where land and water interface nearest to the water intake location.

5. Signage erected at all approved water sources shall include the following information: the words "Water Intake Site", the Water Licence file designation "S04L8-014", the approved nomenclature for the water source as indicated in Part A: Scope, Item (1), (b).

6. The Licensee shall maintain water uptake logs for all utilized sources. The water uptake logs shall include the following information: identification of water source, volume of water withdrawn per trip in cubic meters, cumulative uptake per source, time of uptake, date of uptake, and contractor and employee identification.

7. The water intake hose used on the water pumps shall be equipped with a screen of a mesh size of (2.54) mm sufficient to ensure no entrainment of fish.

8. Any waterbody with a maximum expected ice thickness that is greater than, or equal to, its maximum depth is exempt from the (5)% maximum withdrawal limit, so long as it is not connected to other Watercourse(s).

9. No more than (5)% of available under ice water volume of approved waterbodies or (5)% of the instantaneous flow of approved Watercourse(s) shall be removed per water source per winter season.

PART G: CONDITIONS APPLYING TO CONTINGENCY PLANNING

1. The Licensee shall ensure that petroleum products, hazardous material and other wastes associated with the project do not enter any Waters.

2. The Licensee shall review the Spill Contingency Plan annually and revise the Plan as necessary to reflect changes in regulations, operations and technology. Any proposed revisions shall be submitted to the Board for approval.

3. If, during the period of this Licence, an unauthorized discharge of Waste occurs, or if such a discharge is foreseeable, the Licensee shall:

    a.) employ the appropriate Spill Contingency Plan;

    b.) report the incident immediately via the (24) Hour NWT Spill Report Line. Currently the number is (867) 920-8130;

    c.) report the unauthorized discharge of Waste to the Board and the Water Licence Inspector within (24) hours; and

    d.) submit to the Board and the Water Licence Inspector, a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.

PART H: CONDITIONS APPLYING TO THE UNDERTAKING

1. The Licensee shall ensure all refueling, and storage of fuels, chemicals or deleterious substances are located a minimum of (100) metres from the Ordinary High Water Mark of any Watercourse.

2. The Licensee shall ensure that all project activities are confined to locations as described in the Water Licence application.

3. The Licensee shall ensure that the undertaking conforms to a Letter of Advice as issued by the Department of Fisheries and Oceans.

4. No materials cleared from the site shall be disposed of in any Watercourse. All materials shall, if necessary, be disposed of above (100) metres from the Ordinary High Water Mark of the Watercourse, and in such a manner to prevent entry into the Watercourse.

5. The Licensee shall erect and maintain silt fences at Watercourse crossings, if necessary, to prevent sediment from entering a Watercourse, and shall be maintained in any manner at the request of a Water Licence Inspector.

6. The Licensee shall not erect any camps or store materials on the surface ice of any Watercourse during winter road activities. Any temporary winter crossings of the river required shall be constructed of clean snow and/or ice only.

7. All sites affected by winter road activities shall be stabilized, groomed, reseeded and landscaped as necessary, and suitable erosion control measures implemented to minimize sediment deposition into a Watercourse.

Fisheries and Oceans
Fish Habitat

Pêches et Océans
Gestion de l'habitat du poisson

Fish Habitat Management
101 5204-50th Ave
Yellowknife, NT X1A 1E2

March 12, 2008

Terri Bugg
Environmental Analyst
Planning & Policy – Environmental Affairs
Department of Transportation, GNWT
Box 1320
Yellowknife, NT X1A 2L9

Dear Ms. Bugg:

Re: Water Withdrawal Sources Mackenzie Valley Winter Road.

Fisheries & Oceans Canada (DFO) has been working cooperatively with the Department of Transportation (DOT) with respects to the identification of water sources along the Mackenzie Valley Winter Road that minimize impacts to fish and fish habitat. Fisheries and Oceans Canada, Habitat Protection (DFO-HP) has a legal obligation to protect fish and fish habitat. Carrying out any project or activity that could harmfully alter, disrupt or destroy fish habitat by chemical, physical or biological means may constitute an offence under the federal *Fisheries Act*. It is widely accepted that water withdrawal can impact fish and fish habitat.

The goal shared by both DFO and DOT is to facilitate the annual construction of the winter road with minimal impacts to fish and fish habitat. The DFO Protocol for Winter Water Withdrawal in the Northwest Territories has been forwarded to DOT for use in the consideration of potential water sources.

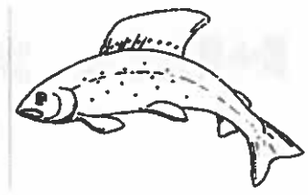
Through this cooperative process a number of water sources have been identified as acceptable, assuming the approved volumes of water slated for extraction are not exceeded, these include the following:

WR 1 UTM: 10V 479737 7008833
WR 2 UTM: 10V 472036 7016389
· WR 8 UTM: 10W 433668 7120640
· WR 10 UTM: 10W 425896 7132328
· WR 16 UTM: 10W 411677 7171746
· WR 18 UTM: 10W 407963 7179438
· WR 19 UTM: 10W 404789 7188854
· WR 25 UTM: 10W 373663 7208213
WR 28 UTM: 10W 370015 7210416
WR 32 UTM: 9W 610184 7238529
WR 33 UTM: 9W 596483 7244326
WR 35 UTM: 9W 583446 7252711
WR 36 UTM: 9W 596858 7244361
WR 37 UTM: 9W 568806 7261495
WR 38 UTM: 9W 558414 7273794
WR 39 UTM: 9W 556046 7277959
WR 40 UTM: 9W 551562 7283464
WR 42 UTM: 9W 549402 7293182
WR 43 UTM: 9W 538030 7306494
WR 45 UTM: 9W 522334 7341564
WR 47 UTM: 9W 527114 7353025
· WR 50 UTM: 9W 539273 7368427
· WR 51 UTM: 9W 545271 7377597
· WR 59 UTM: 9W 557703 7387268
· WR 60 UTM: 9W 601859 7421962

Attach: 3 previous communications from DFO to DOT dated Oct 8, 2004, Dec 9, 2004 and Feb 2, 2005.

Cc: Rick Walbourn, SATU Land and Water Board
Rod Gunderson, DOT
Larry Purka, DOT
Rhonda Batchelor, DOT
Sheena Majewski, DFO
Derrick Moggy, DFO
Gerald Fillatre, DFO

Fisheries and Oceans | Pêches et Océans



DFO Protocol for Winter Water Withdrawal In the Northwest Territories

Rationale

In the Northwest Territories, winter activities such as access road construction, exploratory drilling and camp operations often require large amounts of water. Excessive amounts of water withdrawn from ice covered waterbodies or watercourses can lead to oxygen depletion, loss of over-wintering habitat and/or reductions in littoral habitat. The potential for such negative impacts to over-wintering fish and fish habitat has made winter water withdrawal a critical issue for the Department of Fisheries and Oceans (DFO) in the Northwest Territories. To address the issue of water withdrawal, and to provide standardized guidance to water users, including volume limits for certain water source types, DFO has developed this protocol in conjunction with industry and other regulators.

This protocol pertains to works and activities where a total water volume greater than or equal to (≥) 100m^3 is required from any given waterbody or watercourse during one ice-covered period.

This protocol will **not** apply to the following:

- Winter water withdrawal from the Mackenzie River;
- Any other waterbody or watercourse that is exempted by DFO (i.e. Great Bear Lake, Great Slave Lake, Gordon Lake, and others as and when determined by DFO), and;
- Any waterbody (not including watercourses) from which less than 100m^3 is to be withdrawn over the course of one ice-covered period.

Water Withdrawal from Waterbodies:

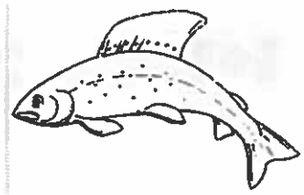
For the purposes of this protocol, a **waterbody** is defined as any water-filled basin that is potential fish habitat. A waterbody is defined by the ordinary high water mark of the basin, and excludes connecting **watercourses** (see definition in **Water Withdrawal from Watercourses** below). In order to establish a winter water withdrawal limit for a given waterbody, the following criteria must be adhered to:

1. In one ice-covered season, total water withdrawal from a single waterbody is not to exceed 5% of the available water volume calculated using the appropriate maximum expected ice thickness provided in Table 1.
2. In cases where there are multiple users withdrawing water from a single waterbody, the total combined withdrawal volume is not to exceed 5% of the available water volume calculated using the appropriate maximum expected ice thickness provided in Table 1. Therefore, consistent and coordinated water source identification is essential.
3. Only waterbodies with maximum depths that are ≥1.5m deeper than their corresponding maximum expected ice thickness should be considered for water withdrawal (Table 1). Waterbodies with less than 1.5m of free water beneath the maximum ice are considered to be particularly vulnerable to the effects of water withdrawal.
4. Any waterbody with a maximum expected ice thickness (Table 1) that is greater than, or equal to, its maximum depth (as determined from a bathymetric survey) is exempt from the 5% maximum withdrawal limit.

To further mitigate the impacts of water withdrawal, water is to be removed from deep areas of waterbodies (>2m below the ice surface) wherever feasible, to avoid the removal of oxygenated surface waters that are critical to over-wintering fish. The littoral zone should be avoided as a water withdrawal location. Water intakes should also be properly screened with fine mesh of 2.54 mm (1/10") and have moderate intake velocities to prevent the entrainment of fish. Please refer to the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO, 1995) which is available upon request, or at the following internet address: www.dfo-mpo.gc.ca/Library/223669.pdf.

In order to determine the maximum water withdrawal volume from an ice-covered waterbody and thereby conform to this protocol, the following information must be provided to DFO for review and concurrence, prior to program commencement.

Fisheries and Oceans | Pêches et Océans



DFO Protocol for Winter Water Withdrawal In the Northwest Territories

Table 1. Maximum expected ice thickness, and corresponding water depth requirements, for different regions in the Northwest Territories.

Area	Maximum Expected Ice Thickness (m)	Minimum Waterbody depth Required for 5% Water Withdrawal (m)
Above the Tree Line	2.0	≥3.5
Below the Tree Line - North of Fort Simpson	1.5	≥3.0
Deh Cho –South of Fort Simpson	1.0	≥2.5

Water Withdrawal from Watercourses:

For the purposes of this protocol, a **watercourse** is defined as a channel through which water flows and is potential fish habitat. A watercourse is defined by the ordinary high water mark of the channel, and excludes connecting waterbodies or watercourses. In order to establish a winter water withdrawal limit for a given watercourse, the following criteria must be adhered to:

1. Total water withdrawal for all activities is not to exceed 5% of the instantaneous flow rate of a single watercourse at the time of withdrawal.
2. In cases where there are multiple users withdrawing water from a single watercourse, the total combined withdrawal rate is not to exceed 5% of the instantaneous flow rate at the time of withdrawal. Therefore, consistent and coordinated water source identification is essential.

To further mitigate the impacts from water withdrawal, water intakes should be properly screened with fine mesh of **2.54 mm (1/10")** and have moderate intake velocities to prevent the entrainment of fish. Please refer to the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO, 1995) which is available upon request, or at the following internet address: www.dfo-mpo.gc.ca/Library/223669.pdf.

In order to determine the maximum water withdrawal rate from an ice-covered watercourse and thereby conform to this protocol, the following information must be provided to DFO for review and concurrence, prior to program commencement. DFO will only consider watercourses to be used as water sources if no suitable alternatives exist.

Water Source Identification

1. Proposed primary and secondary access routes for all project activities, with proposed water crossings and water source locations clearly identified on a map, with geographical coordinates (latitude/longitude and/or UTMs) included.
2. Aerial photos or satellite imagery of the water sources if available.
3. Estimated total water withdrawal requirement for work or activity, and estimated total water withdrawal per water source (in m^3).

Stream Survey Requirements

1. Location and date of survey (day, month, and year).
2. Photos of the stream location where withdrawal is to occur.
3. An accurate measurement of flow rate (to be confirmed immediately prior to water withdrawal commencing).
4. Stream survey should include; profile (minimum of ten evenly spaced points), depth, width, and flow rate.
5. Survey effort should reflect channel width: <2m wide, three vertical stations; 2-10m, 10 vertical stations; >10m, 20 vertical stations.
6. Pump specifications (type, model, horsepower, and max discharge rate).
7. Information on substrate type, in-water vegetation, riparian vegetation, and bank description is also requested.

Appendix C

Workplan Proposal to Improve MVWR compliance program

DILLON
CONSULTING

February 23, 2009

Government of the Northwest Territories
Department of Transportation
4501, 50 Avenue
Lahm Ridge Tower, 2nd Floor
Yellowknife, NT
X1A 2L9

Attention: Ms. Terri Bugg
Environmental Analyst
Planning, Policy and Environment

Re: Proposed Work Plan for Hydrologic Analysis of Water Crossings on the Mackenzie Valley Winter Road

Dear Ms. Bugg:

We are pleased to provide to you for your consideration the following proposal which was discussed and requested during our final project meeting on Friday February 13, 2009.

Upon completion of the Water Withdrawal Under-Ice Water Flow Site Assessment field program for the Mackenzie Valley Winter Road (MVWR), Dillon Consulting Ltd. identified several potential approaches that could improve the current compliance program for the Water Licenses for water-taking along the MVWR. The current field program is a complicated, logistically challenging and a potentially costly undertaking, estimated at $50,000 or more per year. The combination of the remote location of the project, extreme winter weather conditions and the unreliability of under-ice stream flow rating curves present Department of Transportation (DOT) staff with the challenge of meeting the requirements of its two water licenses that permit the DOT to take water from the approximately 25 - 30 creeks and rivers required to build the MVWR.

It is our intent, as detailed in the proposal, to provide DOT with a solution that will reduce the challenges of their compliance program, save resources and reduce overall costs in the long run by developing a monitoring program method that will require only simple field measurements that can be obtained by a DOT employee or contractor.

4920
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Telephone
(867) 920-4555
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Dillon Consulting
Limited

SOLUTIONS

The license stipulation of obtaining an instantaneous flow rate immediately presents a challenge to DOT because it implies that the stream flow is to be measured and calculated at the time of water withdrawal. There are only two ways that this can be achieved. The first is to take a stream flow measurement immediately prior to water withdrawal during the winter road construction period and the second typical method is to develop a relationship between water level and stream flow.

Direct Stream flow Measurements

The taking of direct stream flow measurements are complicated by the extreme conditions of the project study area. Access to the sites at the time of water withdrawal (late-Nov to mid-Dec) is limited given that the road is under construction and not built. Access to the sites by helicopter is possible however the ice cover at this time of year is still forming presenting some safety issues for field staff. According to the maintenance supervisor (Per. Comm) for Zones 1, 2, 7/1 and 7/2, the ice is usually broken by an axe to access water for withdrawal, which probably means that the field team would encounter a high number of sites that are essentially inaccessible due to thin ice or that the field team would be required to clear ice to access a cross-section and sample by wading. The combination of sampling difficulty and presumably high costs associated with accessing the sites at this time of year suggests that another approach would likely be preferred by DOT.

Direct Stream flow Measurements and Rating Curves

Developing a relationship between water level and stream flow is called a rating-curve. The rating curve is built by making a series of discharge measurements at different times of the year that correspond to a range of water levels. For example, a spring discharge measurement provides stream flow at the upper ranges of water level and a late-summer or fall discharge measurement provides a measurement under a low water-level condition. Once a reliable rating curve is established, then instantaneous stream flow can be estimated by simply taking a water level measurement and reading the stream flow from the established rating curve.

Developing a rating curve for each potential water withdrawal site would be the preferred approach if the water takings happened during open-water conditions. Developing a rating-curve for each site under open-water conditions is relatively straightforward. If the channel is very active the rating-curve is more difficult to establish and yearly updates are

Regional Analysis

The second alternative is to perform a regional analysis based on Water Survey of Canada (WSC) stations located in the region. A regional analysis is an accepted method of predicting flow for un-gauged basins and is basically a method to extend records geographically. This approach would depend on developing a relationship between each of the 25 – 30 water courses included on the DOT water license and either a group of or a specific WSC stream flow gauge. According to the WSC in Yellowknife, a number of stations have been established relatively recently in the area.
They are not currently published but the analysis is close to complete and there may be an opportunity for the DOT to access the data. In the case of this alternative the DOT would access the WSC gauges as close to the date of withdrawal and calculate the available volume of water at each water taking site based on a set of relationships developed between each site and the WSG gauge(s). While developing this work plan proposal Dillon has been in contact with Environment Canada (EC) scientists in Yellowknife, Vancouver and Saskatoon. Environment Canada has focused some effort on the Mackenzie Valley in recent years and EC staff have already provided to Dillon staff valuable insight into the implementation of a regional analysis approach and they support such an approach calibrated with a field program. Dillon would continue to work closely with these experts as this work unfolded.

It is our opinion that a simple hydraulic model with measurements taken in-situ at the time of withdrawal will best serve DOT's needs. However, to scope the work required to achieve such a solution will require much of what is outlined in the following work plan. In addition, the proposed investigation into the watershed characteristics and regional analysis will provide valuable data for calibration and confirmation of future predicted stream flows. Therefore, this work plan serves twofold: it provides an analysis of the suitability of different approaches and lays the groundwork to implement whichever solution is preferred.

WORK PLAN PROPOSAL

This work plan consists of several components which include the compilation of existing/historic data and a preliminary investigation to assess the approach which best fits DOT's overall requirements to meet water license compliance. It is proposed that the best approach will be identified by DOT and Dillon staff working together to identify the significance of certain assessment variables such as site-suitability, accuracy, timeliness, cost, and applicability.

Task 4 – WSC Data Review

The WSC has recently established a number of water flow monitoring gauges in the MVWR region. The stations and their watersheds will be analysed to assess if they can be used to produce a synthetic stream flow time series for the creeks and streams on the DOT license.

Task 5 – Site Assessment, Selection Criteria and Recommendations

Each water withdrawal stream site will be assessed to determine which approach is most suitable based on a set of criteria that will reflect accuracy, ease of use, site-suitability etc. At sites where a modelling approach is appropriate, Dillon will work with DOT to develop a sampling method that will be easy to use in the field by DOT and road construction personnel and that will yield the level of accuracy required to satisfy Water License conditions.

Deliverable: ***Recommendation report that summarizes the feasibility of applying regional analysis and modelling techniques to provide DOT with an accurate and functional water license compliance program and work plan to implement these recommendations.***

LOOKING FORWARD

Once the various tasks of this work plan have been completed the next step of the process will be to plan a field program. It is anticipated that both the regional analysis and the modelling exercise will require data to be collected in the field during the open-water season. This data will be used to calibrate the predicted stream flows, using the 'desk top' methodologies, with actual measured flows. Once the work proposed in this work plan is complete a field program will be developed that is strategic in its use of resources and data collection. Once the collected field data is analysed, the two remaining tasks of the overall work plan will be to develop the models or perform the regional analysis to predict stream flow at each site. Once the approach to determine stream flow at each of the water withdrawal sites has been identified and developed into a general compliance monitoring program Dillon staff will work with DOT staff and field operators to make the application of the program as useful and realistic as possible.

stormwater management and planning, erosion and sedimentation control, and revetment designs for rivers, coasts and reservoirs. Project scopes have ranged from feasibility studies, baseline and environmental impact assessments, computer modelling and analysis, and preliminary and detailed designs.

Emma McKennirey, Water Resources Engineer
Emma is a civil engineer specializing in water resources. She has worked on projects in Ontario, British Columbia, Northwest Territories, Yukon and Nunavut. Emma has acted as hydrology discipline leader on a number of environmental monitoring projects in Northern and Western Canada. Emma has worked on a number of projects to predict stream flow in un-gauged basins using a variety of hydrologic and hydraulic techniques. She is well versed in remote field work, water licensing, water balance applications, water management plans, groundwater-surface water interaction investigations, and planning and implementing groundwater and surface water field programs. Emma is familiar with the Mackenzie Valley Winter Road and recently completed the under ice stream flow sampling as part of DOT's current water license compliance program.

COST

The total estimated cost to complete the work plan is approximately $25,000. A detailed cost break down by task and project team member is provided in the attached table.

Yours sincerely,

DILLON CONSULTING LIMITED

Craig J. Thomas
Senior Environmental Specialist
Northern Projects

CJT/

Appendix D

Environmental Impact Statement (Dillon, 2004)

TABLE OF CONTENTS

TABLES

1.3 Document Overview

The EIA assesses the potential environmental impacts of construction and maintenance activities of the expansion of the Mackenzie Valley Winter Road system, and describes methods to mitigate potential effects. Specifically, the EIA report includes the following:

- Background, context and project objectives (Section 1.0);
- An assessment of the potential environmental impacts, recommended mitigation and anticipated residual effects (Section 2.0);
- A discussion of cumulative effects pertaining to the project (Section 3.0);
- A summary of information gaps (Section 4.0);
- A summary section, including major conclusions to the EIA (Section 5.0); and
- A reference section (Section 6.0).

Table 1: List of Proposed DoT Water Extraction Sites and Potential Impacts

Name	Location (Km Post)[1]	Potential Impact of Water Extraction
Blackwater River	784.1	Little impact on river flows due to size and proximity to Mackenzie River. Potential sedimentation of stream due exposed toe of bank slope.
Steep Creek	815.8	Moderate potential impact; potential insufficient winter flows.
Mackenzie River	832.4	Minimal potential impact (due to volume of flow).
Little Smith Creek	853.8	Moderate potential impact; potential insufficient winter flows.
Big Smith Creek	871.1	Minimal to moderate potential impact, as stream is shallow, but sufficient water appears to be present.
Creek (Large)	~890	No information available.
Gotcha Creek (South)	913.7	Moderate potential impact; potential insufficient winter flows.
Gotcha Creek (North)	1.5 (Deline Winter Road)	Moderate potential impact; potential insufficient winter flows.
Mackenzie River (2)	~932.2	Minimal potential impact (due to volume of flow).
Vermilion Creek North	984.4	Minimal potential impact, as stream is spring-fed.
Christina Creek	1001.7	Moderate potential impact; potential insufficient winter flows.
Mackenzie River (Norman Wells)	1023.4	Minimal potential impact (due to volume of flow).
Billy Creek	1033.4	No information available.
Oscar Creek	1054.4	Minimal potential impact, as stream is lake-fed.
Elliot Creek	1072.4	No information available.
Hanna Creek	1084.4	No information available.
Donnelly River	1118.4	Minimal-moderate potential impact, as stream is open year-round (spring-fed) and may be impacted by any sedimentation arising during water extraction.
Snafu Creek	1124	No information available.
Tsintu Creek	1135.4	No information available.
Mackenzie River (Fort Good Hope)	1172.2	Minimal potential impact (due to volume of flow).
Hare Indian River	Colville Lake Winter Road	Minimal potential impact assumed as this stream is a major tributary to the Mackenzie River.
Unnamed Streams (2)	Colville Lake Winter Road	Minimal-moderate potential impact; streams are connected to lake chains and therefore may have sufficient water in winter.
Tchaneta River	Colville Lake Winter Road	Minimal-moderate potential impact; stream is connected to a chain of lakes and therefore may have sufficient water in winter.
Unnamed Lake	Colville Lake Winter Road	Minimal potential impact (due to size of lake).
Lac Belot (2)	Colville Lake Winter Road	Minimal potential impact (due to size of lake).
Colville Lake	Colville Lake Winter Road	Minimal potential impact (due to size of lake).

[1] Kilometre posts refer to Mackenzie Valley Winter Road unless otherwise noted.

It is expected that road construction will have the potential to generate the following impacts (Table 2):

Table 3: Potential Effects, Proposed Mitigation and Residual Effects of Construction Activities

VEC/Issue	Potential Effects and Description	Proposed Mitigation	Anticipated Residual Effects
Surface Water Resources	**Adverse Effects on Water Quality** Deleterious substances, such as oil and grease can enter watercourse during fuel spills or leaks from machinery. In addition, extraction of oxygenated water from lakes can reduce the oxygen content of the remaining water[2]. Extraction of water from streams can result in sediment resuspension if the pump intake screen comes into contact with the stream substrate.	Restrict refueling activities to areas located at least 100m away from any watercourse. Ensure that machinery is leak-free before use near a watercourse. Ensure a spill containment kit is onsite and crew is trained in its use. In order to prevent deoxygenation of remaining lake water, water should be withdrawn at a depth >1m below the ice surface. Ensure that lakes have a depth that is >1.5m greater than their maximum ice thickness, and no more than 5% of available water volume is withdrawn in any one year[1]. Ensure pump intakes do not disturb the stream bottom sediments during water withdrawal.	Potential water quality issues controlled by on-site mitigation with *no residual effect.*
	Increase in Sedimentation Sediment could be introduced into watercourses as a result of the use of snow fill containing dirt or debris, or due to highly erodible materials present at the stream or lake landings	Use of snow fill containing minimal amounts of dirt and debris. Relocate crossings or crossing structures away from highly erodible sites or use bank protection (e.g., rip-rap) or silt screens[2].	Potential sedimentation issues controlled by on-site mitigation with *no residual effect.*
Groundwater Resources	**Decreased Recharge to Aquifers** With the increase in water required to accelerate road construction and increase load capacity, additional stresses will be put upon local aquifers. This may affect winter stream flow conditions, which in turn can affect the quantity of habitat available to aquatic organisms	Assess the recharge capacity of various waterbodies along the Winter Road route to determine which of these can accommodate increased water withdrawal without major effects on local aquifers. Then, restrict increased water withdrawals to these aquifers. Assess whether a waterbody is connected to other waterbodies. Where possible, restrict water removal to isolated waterbodies. Where possible, restrict water removal to non fish-bearing watercourses. Ensure that water withdrawal does not exceed 5% of a watercourse's instantaneous flow rate[1].	Potential impacts to groundwater resources controlled by on-site mitigation with *minimal residual effect.*

VEC/Issue	Potential Effects and Description	Proposed Mitigation	Anticipated Residual Effects
Soils	**Localized Soil Erosion and Disturbance** Soil erosion and disturbance (e.g., rutting, compaction, admixing) may occur due to the soil not being sufficiently frozen during construction. Soil erosion may occur during snow collection adjacent to river.	Ensure that site preparation begins under frozen soil conditions and an adequate layer of compacted snow is present before road opening. Ensure that ground surface is not disturbed when collecting snow. Ensure that a 5 m buffer is maintained between the snow collection area and the stream edge[3].	Localized soil erosion controlled by on-site mitigation with *no residual effect.*
Air	**Localized Temporary Impact with Respect to Exhaust Emissions** Excessive emissions may occur due to unnecessary idling of machinery when no longer in use.	Appropriate construction equipment selection to minimize exhaust emissions. Appropriate equipment maintenance and operational methods (e.g., shut off machinery when no longer in use.	Localized temporary air quality impacts controlled by on-site mitigation with *no residual effect.*

Source:

[1] Department of Fisheries and Oceans (DFO), 2004.
[2] Bryant Environmental Consultants Ltd. (2003) and BP-TEC (2002, 2003).
[3] DoT (1997a-e).

Table 5: Potential Effects, Proposed Mitigation and Residual Effects of Site Operations and Maintenance

VEC/Issue	Potential Effects and Description	Proposed Mitigation	Anticipated Residual Effects
Surface Water Resources	**Adverse Effects on Water Quality** Deleterious substances, such as oil and grease can enter watercourse during fuel spills or leaks from vehicles.	Develop a contingency plan for hazardous materials spills, including details of the spill containment and clean-up procedures that will be in place, availability of equipment and supplies (e.g., sorbent pads), contacts for initial response, and reporting procedures.[1] Post flagging to warn transport drivers of dangerous conditions ahead, which may precipitate accidental spills[2]. Training to ensure safe operation of vehicles, adherence to speed restrictions, etc. The key is avoidance of accidents that could result in the potential release of deleterious substances to the environment.	Potential water quality issues controlled by on-site mitigation with *minimal to moderate residual effects*, depending on location of spill and efficiency of response.
	Increase in Sedimentation Sediment could be introduced into watercourses as a result of the use of snow fill containing dirt or debris. In addition, the presence of snow fill material after road closure may lead to excess material in stream channel, which could lead to bank and/or streambed erosion.	Use of snow fill containing minimal amounts of dirt and debris. Removal of snow fill after road closure ensures a free conveyance of water in the stream channel during the thaw period.	Potential sedimentation issues controlled by on-site mitigation with *no residual effect.*

VEC/Issue	Potential Effects and Description	Proposed Mitigation	Anticipated Residual Effects
Soils	**Localized Soil Erosion and Disturbance** Soil erosion and disturbance (e.g., rutting, compaction, admixing) may occur due to the soil not being sufficiently frozen during operation (e.g., especially during beginning and end of operating season).	Monitor winter road conditions to ensure that soil is sufficiently frozen to prevent rutting, compaction, or admixing.	Localized soil erosion controlled by on-site mitigation with *no residual effect.*
	Disturbance of Stream Crossings Sites at which winter flow is evident could erode the roadbed and streambanks.	Install seasonal culverts at sites with winter flow.	Disturbance of steam crossings is controlled by on-site mitigation with *minimal residual effect.*

Sources:

[1] Westworth Associates Environmental Ltd. (2000)
[2]Stanley Associates Engineering Ltd. and Sentar Consultants Ltd. (1993)

3.3 Potential Cumulative Effects

3.3.1 Effects on Water Quality and Hydrology

Impacts to water quality can occur during both the construction and the operation phases of the project. During construction, improper procedures for equipment refuelling and fuel storage, and oil and grease leaking from machinery can negatively impact water quality. During operation, spills of fuels and other hazardous substances may occur as a result of accidents. While impacts can be effectively mitigated with appropriate precautions during the construction period, spills occurring during the operation period may be more difficult to contain effectively, even when appropriate mitigation mechanisms are in place. This is due to the remoteness of the area and potentially long response times for clean-up efforts (Westworth Associates Environmental Ltd., 2000). Major spills could affect water quality and aquatic organisms downstream of the spill and could also affect groundwater resources. These effects would be cumulative to potential spills of hazardous substances and sedimentation effects from the operation of the Mackenzie Highway and the construction of the Deh Cho Bridge to the south (if approved).

Impacts to hydrology can occur during the construction of the Winter Road, as water is withdrawn from local waterbodies for use in the road construction process. However, these impacts are mainly related to alterations in available living space for fishes in waterbodies affected by water withdrawal (Alaska Bureau of Land Management, 1998). As noted previously, a detailed discussion of potential impacts to aquatic organisms is beyond the scope of this assessment.

3.3.2 Effects on Habitat Fragmentation

The Mackenzie Valley Winter Road alignment is located within the boreal woodland caribou and moose ranges. However, boreal woodland caribou wintering areas are not located in the vicinity of the road (Deh Cho Land Use Planning Committee, 2003). Moose, on the other hand, do winter close to the Winter Road (Deh Cho Land Use Planning Committee, 2003), and therefore have the potential to be impacted.

The Interprovincial Pipeline (IPL) was identified as having a right-of-way that runs parallel to several winter road crossings. There also exists an old right-of-way for the Canadian National Telecommunications (CNT) Line. One particular Winter Road crossing (Big Smith Creek) has evidence of both of these linear features nearby, including abandoned lengths of telephone cable (Golder & GeoNorth 2000). There is also reference to an old winter road right-of-way in the area. When combined, these linear features may contribute to habitat fragmentation or alteration for wildlife.

However, in light of the seasonal use aspect of the Winter Road, the incremental effect of the project on habitat loss or fragmentation in the Mackenzie Valley is likely to be minor.

5 CONCLUSIONS

5.1 Summary of Potential Impacts

5.1.1 Potential Construction Impacts

Potential impacts related to construction may affect surface water, ground water, vegetation, wildlife, air quality and soils (as noted in the introductory section, aquatic receptors were not part of the scope of this study). All of these potential impacts can be effectively mitigated using the measures presented in this document, with little or no residual effects.

5.1.2 Potential Operational and Maintenance Impacts

Potential impacts related to construction may affect surface water, ground water, vegetation, wildlife, and soils. While the majority of these potential impacts can be mitigated with little or no residual effects, spills of hazardous materials can potentially have moderate residual effects due to the remoteness of the project area and reduced efficiency in responding to spills due to extreme weather.

5.2 Recommendations

The following environment-related recommendations are presented for consideration by DoT:

- Restrict refueling activities to areas located at least 100m away from any watercourse. Ensure that machinery is leak-free before use near a watercourse;
- Develop a contingency plan for hazardous materials spills, including details of the spill containment and clean-up procedures that will be in place, availability of equipment and supplies;
- Where highly erodible materials are present at lake or stream approaches, consider installing bank protection and silt fencing or relocation of crossing;
- Where possible, restrict water removal to isolated waterbodies. Where possible, restrict water removal to non fish-bearing watercourses;
- Determine winter volumes and depths of lakes and winter instantaneous stream flows before extraction of water;
- For lakes, extract water only if water depth is 1.5m greater than ice thickness, and with draw water at a depth greater than 1 m below the ice surface to ensure oxygenated surface water is not removed from lake. Extract no more than 5% of lake volume during any one season;
- For streams, ensure that only up to 5% of instantaneous flow is removed at any given time;

6 REFERENCES

Alaska Bureau of Land Management. 1998. Northeast National Petroleum Reserve Alaska Final Integrated Activity Plan/ Environmental Impact Statement. Fairbanks, AK.

BP-TEC Engineering Group Ltd. 2003. Blackwater River Bridge, Mackenzie Valley – Report on Construction Techniques and Hydrotechnical Review. Edmonton, AB.

BP-TEC Engineering Group Ltd. 2002. Preliminary Engineering Assessment of 22 Stream Crossings – Mackenzie Valley Winter Road – Wrigley to Fort Good Hope. Edmonton, AB.

Bryant Environmental Consultants Ltd. 2003. Environmental Assessment Overview of Bridge Crossing at Blackwater River, NT. Report prepared for the Department of Transportation, GNWT. Yellowknife, NT.

Deh Cho Land Use Planning Committee. 2003. Deh Cho Atlas. On internet at: http://www.dehcholands.org/atlas/atlas.htm

DFO. 2004. Draft - DFO Protocol for Winter Water Withdrawal in the Northwest Territories. (Current to June 2004) Yellowknife, NT.

DoT. 1997a. Deline Winter Road Operational and Environmental Management Plan – Gotcha Creek North River, km 1.5 to Porcupine River, km 81.0.

DoT. 1997b. Mackenzie Valley Winter Road Operational and Environmental Management Plan – Hodgson Creek, km 691.4 to Saline River, km 832.4.

DoT. 1997c. Mackenzie Valley Winter Road Operational and Environmental Management Plan – Saline River, km 832.4 to Norman Wells, km 1023.4.

DoT. 1997d. Mackenzie Valley Winter Road Operational and Environmental Management Plan – Norman Wells , km 1023.4 to Gibson Gap, km 1093.4.

DoT. 1997e. Mackenzie Valley Winter Road Operational and Environmental Management Plan – Gibson Gap, km 1093.4 to Fort Good Hope, km 1172.2.

DoT. 2004. Mackenzie Valley Winter Road – Winter Road Construction and Maintenance: Proposed Water Extraction Sources (Eight 1:250,000 scale mapsheets).

Appendix E

Traditional Ecological Knowledge Community Consultations

Final Report

For a

Traditional Ecological Knowledge Study

in support of an Application for a Water License for Construction of the

Mackenzie Valley Winter Road

Submitted To

The Project Manager
Department of Transportation, Government of the Northwest Territories
PO Box 1320
Yellowknife, NT X1A 2L9

by

GeoNorth Limited

October 2004

Disclaimer

It is recognized that the knowledge in this report is the property of the holders of the knowledge, and that it is not the property of D.o.T., the SLWB or GeoNorth. It has been gathered with the consent and cooperation of the Sahtu knowledge holders and community RRCs for the express purpose of obtaining a water licence for construction and operation of the winter road. It should not be used for other purposes without prior consent of the community RRCs.

Friday, September 24th, 2004

GeoNorth prepared a tentative community schedule and flight schedule for the week of September 27th to October 1st in order to ensure that time was spent meaningfully for the collection of TEK related to the winter road. The communities to be visited include Fort Good Hope, Norman Wells, Tulita and Colville Lake. GeoNorth assigned Leslie Wilson to conduct the required interviews. GeoNorth confirmed the travel itinerary with D.o.T. and received maps of each stream crossing where water was going to be extracted from in order to accelerate the construction of the winter road. As well, D.o.T. provided a 'backgrounder' on the project for sharing with potential interviewees.

Jody Snortland of the Sahtu Renewable Resource Board (SRRB) in Tulita was contacted for an updated list of Renewable Resource Council (RRC) board members for each of the communities being visited. Then the Norman Wells RRC was contacted in order to start booking interviews for Monday, September 27th. As GeoNorth was informed that representatives from all Sahtu RRCs would be in Tulita that week for SRRB meetings GeoNorth enquired about the availability of RRC members in Tulita for TEK interviews regarding the water license application.

Edna Tobac, Land Technician with the Sahtu Land and Water Board was contacted and briefed on the background of the project, and GeoNorth received advice from her. Contact was made with each RRC to make tentative arrangements for interviews.

Monday, September 27th, 2004

Two interviews were conducted at the Norman Wells RRC.

A meeting was held with ten members of Sahtu RRCs attending the SRRB meeting in Tulita. At this time, they indicated that the proper process to gather TEK was to contact each RRC office and get direction for names of people to interview. GeoNorth noted that, as representatives from the Tulita, Colville Lake, Norman Wells, and Fort Good Hope RRCs were all gathered together in Tulita, it was an opportunity for GeoNorth to get direction. Although interviews per se were not held, meaningful input into D.o.T.'s proposed water extraction sources was given.

That evening one Tulita interview was conducted.

Tuesday, September 28th, 2004

A second Tulita interview was conducted before departing for Fort Good Hope.

D.o.T. was holding a community consultation meeting in Fort Good Hope regarding their water license application through the Sahtu Land and Water Board in the K'ahsho Got'ine Land District. When GeoNorth arrived at 4:50 p.m., the meeting was in progress with six community members in attendance. GeoNorth took notes on the concerns that were expressed. As the meeting wrapped up D.o.T. introduced GeoNorth and the TEK work they was contracted to do regarding the winter road.

		John Cotchilly		
Tulita: Sahtu Regional Resource Council Meeting: Charlie Kochon, Colville Lake Boniface Ayah, Tulita RRC Wilfred Lennie, Tulita RRC, Alfred Lenny, Tulita RRC Lisa McDonald, Norman Wells RRC Winter Lennie, Norman Wells RRC Michel Lafferty, Fort Good Hope RRC Harry Harris, Fort Good Hope RRC Lucy Jackson, Interpreter Fort Good Hope	**Fort Good Hope:** D.o.T. community consultation meeting regarding the winter ice road: Community members: David Cook Joe Grandjambe Scott Hardisty Everett Kakfwi Bruno Ritias Arthur Tobac D.o.T. representatives: Michael Brown Rhonda Batchelor Don Hardisty	**Colville Lake:** Alexis Blancho, RRC Richard Kochon, RRC Wilbert Kochon, Interpreter Joe Martin Oudzi, RRC		
Tulita: Maurice Mendo				
Daily Total: 12	**7**	**9**	**0**	**2**
Grand Total of Interviews/Meetings held: 30				

2. Traditional Ecological Knowledge

streams. Mountain fed streams have a good flow in March/April. The muskeg water makes the snow water softer in the spring.

In the winter, trappers drink snow as it is a softer water than the water that flows from the creeks. Snow water gives a trapper energy whereas mineral water makes a trapper sleepy.

When the snowfall is deep, it insulates the creeks so that ice doesn't freeze on the sides.

Proposed Water Extraction Sources for the Winter Road License and TEK

TULITA DISTRICT-
Ed Hodgson, Norman Wells, D.o.T. interview August 2003
Ed Hodgson, Norman Wells, interview September 2004
Compilation of all interviews

The soils in this area are a combination of gravel, loam and a little clay. Although each creek has it's own specific mix, it's pretty much the same in general terms all along the area. Because the clay is what retains the water the most, drainage should be carefully attended to whenever it's present.

There are no beaver dams on the main creeks. There are more on the lake creeks. You might see beaver tracks when travelling through the bush, particularly in the spring time which is when they move around a lot – for mating and so forth. Beavers control the water flow in creeks by building dams. In the winter, if the water gets too shallow, they will just open the dam.

No known spills of any significance have occurred within the Tulita District. This is because the area is still relatively new to industry.

Blackwater River (km 784)- NTS 95 N
Sources: Maurice Mendo, Tulita
David Etchinelle, Tulita
Ed Hodgson, Norman Wells
Tulita SRRB members
Technical Report: *An Environmental Information Update for Selected Stream Crossings along the Mackenzie Valley Winter Road*

The Blackwater River is a large, fast moving river. It is usually about three to four feet deep but in the last couple of years it has been shallow and lots or rocks are showing. A jet boat could not make it up the river except perhaps in the spring when the water is deeper. When the water freezes, overflow occurs. When the Mackenzie River breaks up in the spring time, the ice backs up the Blackwater River and then goes back down to the Mackenzie.

This year the water level is especially low. The water is clean, kind of brown in the summertime and is used for drinking. Sometimes the taste is a bit different in the spring because of the melt, but overall it is good. No people knew of anyone getting sick from drinking the water. It was mentioned that the odd person might get an upset stomach from drinking the

comfort. Gifts and offerings are given. The stone is greased. The stone is supposed to be near the winter road on the left side of the Blackwater River.

People from Wrigley are familiar with this story and both Maurice Mendo and David Etchinelle are looking to find the rock as it has moved.

No spills or contamination of the area or the water are known. Perhaps there may have been spills related to the construction of the winter road or caused by the Norman Wells pipeline which runs through this area, but no known spills have occurred.

With regard to water being extracted from this river for the building of the winter road, responses ranged from no concern, to wondering how the river will be impacted by taking water out to deep concern that there wasn't enough water to be found anywhere as water levels all over the Valley have been dropping so drastically over the past years.

Steep Creek (km 816-NTS) 96C
Sources: Maurice Mendo, Tulita
David Etchinelle, Tulita
Technical Report: *An Environmental Information Update for Selected Stream Crossings along the Mackenzie Valley Winter Road*

The area around Steep Creek has habitat suitable for geese, diving ducks and moose. Harvesting of moose and beaver occur mostly along the Mackenzie River in the vicinity of the outlet from Steep Creek. The area along the shore of the Mackenzie River near the Steep Creek outlet is a traditional fishing area. Being located close to the Mackenzie River, the vicinity of the stream crossing is an area of traditional travel routes. There is also a cabin located about 500 m northwest of the crossing. The winter road crossing is only about 300 m from the outlet.

Steep Creek is a mountain fed, fast moving stream which is open year round. It has about eight inches of water and is kind of like a hot spring. Perhaps that is why it doesn't freeze. It can get as deep as a foot and a half in the spring. People state that it is good water to drink. It is noted that the water is particularly low this year.

There are a lot of moose in the area. Below the creek, there is an island where people hunt.

There are no fish in the creek but at the mouth there are grayling.

There is a trail that goes from Steep Creek over the mountain to Blackwater Lake. There used to be an old cabin right beside the winter road but it is torn down now.

Mackenzie River (near Saline River) (km 832) – NTC 96C
Sources: Ed Hodgson, Norman Wells
Maurice Mendo, Tulita
David Etchinelle, Tulita
Technical Report: *An Environmental Information Update for Selected Stream*

Little Smith Creek is across from the Keele River. There are no fish and very little water in Little Smith Creek. The water level is similar to the depth of the Saline River. A long time ago, people used to paddle up the creek, but now it is too low. No one has paddled up it for about fifty years. Now, the water levels vary yearly depending on the weather.

At this time of year, the creek is still moving but there is not much water. All the creeks are drying up with this summer being the worst in terms of dryness. Maurice Mendo thought that this could be attributed to the permafrost melting.

There is no muskeg in the area. It only rained a few times this summer. When the snow melts, the water is gone.

People used to fish for grayling in the area. Grayling lay their eggs in the area in the fall.

In the spring, beavers are in the area as they are travelling on the Mackenzie River after break-up.

Sometimes there are woodland caribou in the area, but not many. Ducks rest in the area but do not stay.

There is a trail from Little Smith Creek that goes up to Clark Mountain. Maurice Mendo used it in 1955. He walked up from the creek in the summer up to a big, high mountain. From there he could see Déline and Tulita. People used this trail to hunt moose. Nowadays, some people ski-doo the trail but most people use cut lines for ski-dooing.

There is a cabin down by the Mackenzie River bank. Archie Lennie and Jim Wrigley have a house there and use it for hunting. Sometimes they stay there for a month.

This area is recognized habitat for geese, diving ducks and moose. Immediately north of the winter road stream crossing there is beaver habitat. Moose has been noted as a major wildlife resource in the area that is harvested.

Big Smith Creek (km 853) – NTS 96C
Sources: Maurice Mendo, Tulita
David Etchinelle, Tulita
Technical Report: *An Environmental Information Update for Selected Stream Crossings along the Mackenzie Valley Winter Road*

Elders have a name for Big Smith Creek. It is called (*a-dop-a-nee*). Above where the winter road crosses, people hunt for beaver. About a hundred to a hundred and fifty feet below the crossing, there is a waterfall. Traditionally people would canoe up the creek until the waterfall and then they would have to portage.

In the spring time, the water is around four feet deep. It is deep enough to go up the creek from the Mackenzie River with a kicker until the waterfall. People still do this. It is

The water in the Mackenzie River near Tulita is clean and can be used for drinking. In the spring and fall, the water changes to a muddy brownish color. This will last until the end of July. Kids from Tulita swim in the Mackenzie River all summer.

In the winter, the river water is clearer because no creeks are running into it and the water is not stirred up by the sandbars. Sometimes, when you cut a hole in the ice, you can see frozen bubbles.

The time of freeze up is varying. The river is freezing up later and breaking up earlier. It is now freezing up between November 20-30th and breaking up between May 1-30. In the last five or six years it has started breaking up in the earlier part of May.

In February, the frozen ice starts to get thinner from the bottom up. At break-up, the ice jams and pushes up on shore. Some years, the ice just flows by. The ice used to be about five feet thick but now, depending on the year, it is between three or four feet thick. In contrast, around 1969/1970, the ice was about seven or eight feet thick.

All kinds of boats travel along the Mackenzie River. These include boats, rafts, and barges. Where the Bear and Mackenzie Rivers meet there used to be big boats coming down the stream in the 1950's. They used to be able to dock their big boats right near the shore as there was about ten feet of water. People could also set fish nets right off the shore. Now, there are only a couple of inches of water and lots of sandbars.

Fish species in the area include trout, coney, jackfish, grayling, whitefish, Dolly Varden, loche, bluefish, grayling and pickerel. Recently, five salmon were caught. The last time salmon were seen in the area was in 1950 when one was seen.

No known spills or accidents have occurred in this area.

Vermillion Creek (km 984) – NTS 96E
Sources: Ed Hodgson, Norman Wells
Norm Hodgson, Norman Wells
Larry Tourangeau, Norman Wells
Maurice Mendo, Tulita
David Etchinelle, Tulita

Vermillion Creek is a spring and mountain fed stream. The water sources for the creek are a lake on top of the mountain above Vermillion Creek and underground springs. The water is clear. People don't drink the water from here as it is kind of salty.

Water levels in the spring are between two to three feet deep for a day. In the evening, there is high water and low water in the morning. Normally, the creek has about a foot of water so it is too shallow to boat up. In August 2004, it had about a foot and a half of water in it. Because it is so shallow, there is a quick freeze up starting now – October. The creek overflows in the winter.

Soils in the area are a combination of gravel and sandy silt and clay. At this creek, there is mostly silty soil. Smaller creeks such as Christina might have bedrock beneath the soil at some depth but the depth is not known. There is a discontinuous permafrost regime within the area.

There is a pronounced valley evident at this creek – typical of river valleys.

There are many old trails – cut lines, seismic lines, dog trails in the area but no one uses them anymore. For the most part, they are game trails. This is a general usage area, where people might use tents with frames but not build a cabin or a house and it is not restricted to one family. The area is used for hunting and recreational purposes.

There are no fish in the creek.

Animals in the Christina Creek area include moose, mink, marten, bear and wolves. These all appear to be strong in numbers. There are moose trails around the mouth of the creek. Moose don't avoid the right-of-way corridor and the Christina Creek area is good moose habitat.

Caribou are seen in the area. The Boreal Woodland Caribou aren't a migratory species like the barren land caribou are. There are small numbers of them roaming fairly extensive grazing ranges. It has already been determined that it is a threatened species. It is likely that they will be designated as needing protection in the near future. These animals avoid cut lines and trails, so new developments should take that into account.

Because conditions have changed in the area due to recent forest fires, there is a much larger potential for erosion under burned conditions than there might be otherwise. It has been recommended that D.o.T. make careful provisions for erosion prevention.

It was felt that it would be doubtful whether D.o.T. would be able to get water from here for making the winter road as the creek is so shallow.

Mackenzie River (Norman Wells- km 1026) – NTS 96E
Sources: SRRB meeting, Tulita
Maurice Mendo, Tulita
Larry Tourangeau, Norman Wells
Norm Hodgson, Norman Wells

Water levels have been dropping all summer. There hasn't been enough rain. It is dry. The Coast Guard ship couldn't make it past Norman Wells as the water was too low and it had to turn around.

Every year the river is getting shallower. Water levels are going down.

D.o.T. may need to take all their water from here. Because it is such a large body of water, Larry and Norm felt that the water needed by D.o.T. wouldn't make much difference if it was taken from here.

There is an old dog trail that used to be near the creek but it is really about three miles back of Billy Creek and goes through the Franklin Range for hunting at Kelly Lake. Since snowmobiles have been in use though, no one uses that trail anymore except the animals. It is a good game trail.

Hammer Nelson, a prospector who came down the river to live around Norman Wells, once had a cabin between Norman Wells and Billy Creek too, but that's not too close to the bridge site. The Grandins and Joe Dillon were also out there at one time. Most of the families have left though. There are fewer of them around all the time, especially the elders.

There is now a bridge here. There are old beaver dams above and below the bridge. Wilfred McDonald, who lives year round at Oscar Creek, used to make a winter bridge here all the time.

People commented that it would be okay for D.o.T. to extract water from where the bridge is.

A lot of people ski-doo in the area.

Oscar Creek (km 1054)- NTS 96E
Sources: Wilfred McDonald, Norman Wells, D.o.T. interview April 2003
Maurice Mendo, Tulita
Tulita SRRB meeting
Larry Tourangeau, Norman Wells
Norm Hodgson, Norman Wells

The water in Oscar Creek is usually about three to four feet deep. It doesn't freeze to the bottom. Water has been taken out in March. In the spring, Oscar Creek can get up to fifteen feet high right where D.o.T. selected to put their bridge. Every three or four years in the spring, the ice on the Mackenzie River will block the mouth of the Oscar and water levels will go up fifteen feet or more. The water can come so high that even some of the trees right around Wilfred McDonald's place are surrounded by water. The ice is sometimes four feet thick. If the water is high and flowing fast and then there is ice on top of all that, you'll find the ice will come right up to the area where the bridge is. That ice will take out anything built there.

Freeze up has changed over the years: it's taking longer to freeze and it's not freezing up as hard. Overflow is pretty much always around now, all winter, and the overflow volumes are higher. This can be a dangerous situation.

A lot of banks around Oscar Creek are all eroded and lots of the bank faces are completely without grass because of the water and ice moving through here.

Sulphur water ends up in Oscar Creek sometimes, but it is most noticeable in the summer. The water is used for drinking.

There is good moose hunting around the creek, especially where there is willow and birch since this is what moose prefer to eat. There is less wildlife than in the old days. It is known that there are fewer martens. Out of sixty traps set in 2003, Wilfred McDonald trapped two marten. Bear can be found in the area.

Beavers live in the bank of Oscar Creek towards the mouth of the river on the inside of the bank.

It was noted that water levels are low this year and there might not be enough water for D.o.T. to extract.

Elliot Creek (km 1072) – NTS 96E
Sources: Wilfred McDonald, Norman Wells, D.o.T. interview August 2003
Tulita SRRB meeting
Larry Tourangeau, Norman Wells
Norman Hodgson, Norman Wells

Please see notes for Oscar Creek as the area is similar.

Elliot Creek is a mountain fed stream which is about two feet deep. It is fed from a lake and by another little creek that is about two hundred feet away. It overflows in the winter.

There is a beaver dam above the winter bridge and then there is a good drop for fifteen to twenty feet.

There are always potholes on the winter road in this area. There is a need for D.o.T. to ice the road more as it is so rough. It's okay for big trucks to travel on but not for little trucks. This roughness is also noted past Little Smith Creek.

Because water levels are so low, it was felt that D.o.T. would be lucky to find enough water in the creek to extract.

K'AHSHO GOT'INE DISTRICT

The proposed water extraction sources for the winter road all fall within prime beaver habitat. Much concern was expressed about ensuring that beaver are not harmed as there are lodges and dams all over the creeks/rivers in the area. People were in favor of the winter road as long as the water extraction sources were taken from sources listed in the Recommendations section. The mouths of the creeks are a source of grayling so there is a need to ensure that the water is kept clean and no garbage is left.

The various creeks and rivers usually freeze but the timing is unpredictable due to climate change. Freeze-ups haven't been as hard.

Mackenzie Valley Winter Road

been affected by the water extraction. There is a genuine concern that when water is being taken out of beaver lakes, beaver lodges and fish lakes are being harmed.

There are a lot of beaver in the Donnelly River. There's also marten, mink, moose, black bears and foxes.

There is a lot of gravel in the area with rocks at the creek.

Traditionally, people would use a painted canvas canoe to travel around and up the Donnelly River. When it came time to portage or leave the river or lake, then they could just take the canvas off the wooden frame, fold it up and go. Then only a frame would need to be built for the next trip. There are scows and speedboats around now and maybe now and then a hunting canoe from the Northern store, but the Donnelly isn't a good river for that sort of traveling because there are two sets of rapids downriver of the crossing spot.

The water source for the Donnelly River is Chick Lake and from the mountains. There are trails all around Chick Lake which people still actively use. There are frogs, muskrats and lots of beaver at the end of Chick Lake. There are also suckers and jackfish/pike. There are a lot of moose. As well, in the last ten years, there has been musk-ox on the Fort Good Hope side of Chick Lake.

There is a cabin at Chick Lake that is used for spring hunting. It is not clear whether this is the same cabin that Frank and Adeline Pierrot have at the south end of of Chick Lake, which is known by the Pierrot's as Sucker Lake. There is an Indian Trail to Chick Lake from Fort Good Hope which goes all the way to the Anderson River. From all the creeks in the area, you can connect with this trail. At the mouth of all the creeks, grayling can be found.

There is a burial site at one end of Chick Lake where people drowned.

People liked the fact that last year Kolt KBR had a local wildlife monitor for two to three months.

Snafu River (km 1124) – NTS 1061
Sources: Charlie Barnaby, Fort Good Hope
Bart Cotchilly, Fort Good Hope
John Cotchilly, Fort Good Hope
Alexis Chinna, Fort Good Hope

This is a Slavey name. People paddle up the river to where the winter road crosses.

As all rivers/creeks in the area connect to Chick Lake, please read the details under the Donnelly River section. This river doesn't freeze hard. It is similar to the Donnelly River.

It was difficult to focus on this particular river as there were so many concerns expressed about the area in general. These have been included in the Recommendations section.

Large Creek (km 70) – NTS 96L
Sources: Alexis Blancho, Colville Lake
Richard Kochon, Colville Lake
Wilbert Kochon, Colville Lake
Joe Martin Oudzi, Colville Lake

This creek overflows in the winter so it seems like it is deep. If water is taken out it will dry up. Do not take water from this creek.

Tchaneta River(km 90) – NTS 96L
Sources: Alexis Blancho, Colville Lake
Richard Kochon, Colville Lake
Wilbert Kochon, Colville Lake
Joe Martin Oudzi, Colville Lake

Do not take water from Tchaneta River. Use Tchaneta Lake instead because in the last two years the creek has been pumped dry for winter road building. After Christmas last year, the whole ice dropped and beaver were found dead.

Large Creek (km 110) – NTS 96L
Sources: Alexis Blancho, Colville Lake
Richard Kochon, Colville Lake
Wilbert Kochon, Colville Lake
Joe Martin Oudzi, Colville Lake

This creek is shallow, but the bottom is soft. There will be a need for thickening the ice on this creek because the source is a muskeg lake.

Lac Belot (km 134) – NTS 96L
(km 145) – NTS 96L
Sources: Alexis Blancho, Colville Lake
Richard Kochon, Colville Lake
Wilbert Kochon, Colville Lake
Joe Martin Oudzi, Colville Lake

This water is okay for drinking. Water extraction should not occur from this lake for the construction of the winter road because it is a fish lake. Water levels have been dropping every year for the past twenty years. It is better to use muskeg lakes for water sources.

Colville Lake (km 160)
Sources: Alexis Blancho, Colville Lake
Richard Kochon, Colville Lake
Wilbert Kochon, Colville Lake
Joe Martin Oudzi, Colville Lake
Charlie Kochon, Colville Lake at the Tulita SSRB meeting

Because so much heavy traffic occurs on the road, there is a need to have someone monitor the speed limit. He has heard of big trucks travelling from Norman Wells to Fort Good Hope in three hours. This is much too fast and is a safety concern as ski-doos pulling sleighs are travelling down the road. These sleighs could whip around and cause serious harm. Truckers need to slow down and show consideration.

Ski-doo crossings need to be marked.

Trucks drivers should have an orientation to the road. They need to be sufficiently dressed. This is a safety precaution.

Freeze up is later than it once was. Spring thaw is earlier and far less predictable than it used to be. You can see the effect of this change in all the leaning trees and the areas that have landslides. The permafrost is changing. The change in freeze-up/spring thaw is especially noticeable in the muskeg drainage areas inland from the Mackenzie River. These drain into the creeks. This sort of change makes drainage a very important issue along the winter road and at the crossings, especially now that the winter road is being flooded to extend the operational season of the road.

Drainage along the winter road is something that has been either overlooked or done incorrectly for a very long time. Now when ditches are even put in, they're put in right next to the road, when really they need to be put at a distance from the driving surface of the road. If they're too close, the road is going to destabilize the permafrost beneath the road and cause even bigger difficulties over time. To prevent problems from coming up, holes could be drilled at strategic spots in the frozen surface to improve drainage, and prevent erosion from all the water rushing away at once.

A lot of the current road alignment goes across terrain at low elevations, which isn't good. Quite a bit of the old federal alignment was laid out on higher terrain, which also has good drainage. That's the ideal kind of location.

John Hodgson, Norman Wells

John Hodgson expressed concern that streams are kept clean as they are used for drinking. Where creek crossings occur, D.o.T. needs to ensure that no drums or any contaminated materials are left within half a mile either side of the creek to ensure cleanliness. As well, do not refurbish equipment at creek sites. Keep drums away from these areas. Note: John expressed satisfaction with the work D.o.T. has done to date. These suggestions are brought up as a precaution.

Larry Tourangeau, Norman Wells

More icing is needed on the roads near Elliot Creek and Little Smith Creek as these areas are very rough to drive on. They are full of potholes.

TULITA RECOMMENDATIONS

FORT GOOD HOPE RECOMMENDATIONS

Harry Harris, Fort Good Hope RRC at Tulita SRRB

Last year a request was put forward for a land monitor between Norman Wells and Fort Good Hope. This was asked for because local knowledge of right-of-ways is extremely beneficial as the bridges are being built.

Bart Cotchilly, Fort Good Hope

Permanent bridges should be built between Tulita and Norman Wells.

Fort Good Hope RRC meeting

Last year, a big truck went across the lake with fuel. It could have made a detour. Three days later, there was a fuel spill. Oil companies need to monitor Little Beaver Lake.

Some beavers are moving away because the lakes are getting lower.

Near the game warden's cabin, the ice dropped because of the beavers being affected in the area. The Department of Fisheries didn't even check. The Sahtu Land and Water Board needs to be out on the land.

No water should be taken from fish lakes.

A key concern is Chick Lake which is the source of everything. Garbage is being thrown on the land from moving vehicles.

There is a need for monitoring when rigs are being moved. Do not have airstrips on fish lakes. Use a helicopter to mark places.

Identify beaver lakes and do not take water from them.

We are not saying don't build a winter road, we are saying there is a need for signs, indicating wildlife in the area. For example, if it is a beaver lake, have a sign indicating it is a beaver lake and do not take water from it. The 2nd lake from Rabbitskin would be okay to take water from. Signs could indicate where no water is to come from.

There is a need for monitors to ensure that water is coming from okay sources.

Roger Boniface, Fort Good Hope, President RRC

No heavy equipment should be travelling between Fort Good Hope and Colville Lake until after Christmas. This is the time of the Bluenose West caribou migration in the area and it is important that it not be disrupted. Prior to the winter road to Colville being built three years

A question was raised as to how the fee structure works for water extraction. How does it work? Who gets paid? Apache and Paramount flooded the whole winter road last year. Two community monitors were hired but they reported only to Apache. There is a need for public information.

There is a great need for monitoring – either through band or government financing or a combination of both.

Along the winter road, there is a need for a wildlife path. Animal crossings or wind rows to be created every five to ten kilometres. Caribou trails go way up the side of the road – they will not cross for very long distances unless an opening is created.

Where ski-doo trails are, a large sign indicating animal crossings every five to ten kilometres could be posted.

There is a need for strictness because of the wildlife in the area.

Between Fort Good Hope and Colville Lake there are Slavey names for all the lakes. It would show respect to have Slavey signs in the area indicating the various names. There is a great need for respect of the land. The point was made that in the old days, people would not travel from one area to another without eating some sort of plant in order to protect themselves from pollution in the new area. With all the big equipment and heavy machinery being used today, this basic respect is being lost. In terms of perspective, every five white miles is equivalent to one Dene mile. When people crossed Lac Belot to go to Fort Good Hope by dog team, it was considered sweventeen miles. If English signs are put along the road, use Dene mileage to show respect for the traditional people of the area.

Sometimes in the winter, diesel has been smelled even though there is no longer equipment in the area. In the spring, when wood was going to be chopped, there was a diesel smell in the air. There is a great need to be careful and show respect for the land.

Truck drivers coming to Colville Lake must drive slowly. Elders drive by ski-doo on both the left and right hand sides of the road. They do not know the rules of the road. And sometimes they are towing sleds. About half way between Fort Good Hope and Colville Lake, truckers must slow down. There is community travel daily on this road.

There are many curves, downhills, dips and blind hills on this road. About twenty-five miles this side of Fort Good Hope there is a double hill/valley and you can't see the top of what is coming. You can't hear anything either in this area. There is a need to travel slowly.

Last year there were two accidents involving eighteen wheelers. An RCMP truck and a local person's truck were totalled. There needs to be signs indicating curves, slower speeds and signs indicating ski-doos on the road.

Even between Norman Wells and Fort Good Hope there is a lot of community travel.

Northwest Territories Transportation

Minutes of Public Community Consultation

Date: August 14, 2008

Attendees: **Colville Lake Community**

Linda Manuel	Economic Development Trust B.A.F.N 867 709 2200
Martha Stewart	Economic Development Trust B.A.F.N 867 709 2200
Barbara Blancho	Economic Development Trust B.A.F.N 867 709 2200
Wilbert Kochon	Land and Water Board 867 709 2700
Ryan Kochon	Land and Water Board 867 709 2700
Alexie Blancho	
Sara Kochon	
Johnny Blancho	
Madeline Blancho	
Philip Codzi	
Hyacinth Kochon	
Marie Kochon	
Jerry Huculak	
Translator:	Wilbert Kochon

Department of Transportation, GNWT

Terri Bugg, Environmental Analyst
Mickey Hempler, Maintenance Supervisor, Ft. Simpson region

Location: Community Gym, Colville Lake, NWT

Subjects: 1) Community consultations and traditional knowledge gathering for Mackenzie Valley Winter Road to support proposed Water Licenses amendments for: #S04L8-013 and #S04L8-014

2) Community consultations and traditional knowledge gathering for Colville Lake Winter Road proposed Land Use Permit for Operations & Maintenance application.

Query: Just on the Colville Lake portion?

Answer: All the way down, they have lake names, stream names, hills, every little corner (sic). It would be educational for all the young people, you could find some extra money, which would be good because they're not going to be around for long, because they said they wanted signs in their language.

Query: I'll just open up to questions, if anyone has questions about the CLWR, land use questions, construction, anything to do with the winter road. Any questions or comments?

Answer: Again we request traditional names of sites to be recorded.

Answer: The area needs to be cleaned up, the entire ROW – Garbage. To do clean up before winter season. All types of garbage – Need to do when visible, like now. I'll tell you about the names, it's part of the traditional knowledge. Also, to keep it clean the road, if you could find a way.

Comment: (Mickey Hempler) Yep, in the summer time, in the winter time it's all covered up, like today you can see especially by the game warden's cabin, there's a lot of garbage out there. And there's a tent frame, I can't remember where it is, it'll be on the left hand side on a cutline, just off the winter road, there's a tent frame with an upturned sleigh and there's lots of garbage around.

Answer: Maybe clean on both sides, that way you don't have to do the whole road.

Comment: (Mickey Hempler) They mean clean the whole right-of-way. Something we have to look at.

Query: A summer/fall cleanup?

Answer: Yeah, before the snow.

Query: What type of garbage are they seeing?

Answer: All types of garbage.

Comment: (Mickey Hempler) Also there is a fridge, a fridge way out in the middle of nowhere.

Comment: We are concerned about the lakes that have fish and beaver. We should test for oxygen or to see if they exist.

Comment: There's beaver lakes and fish lakes, before they even start the winter road they should check the lakes, what chance there's beavers in them. Some of them are fish lakes too, you're going to have to be testing them all the time for oxygen

Query: Have people been finding negative effects, from taking water out of the lakes where fish and beavers are?

lake I used to drive by, one year it was full, one year it was dry. Now it's getting water again. I don't know if anybody's watching them when they draw water, even though they say they're keeping track, there's so many trucks I don't know how they keep track.

Query: Are there many users taking from one water hole?
Answer: No, it's just one company, how can you keep track, some of them are what, 20 miles apart, how can you keep track?

Comment: (Terri Bugg): Because of the change this year, our intention is to hire somebody from the DOT to supervise and monitor the contractors now. To be with them in the field and make sure what they take out of the lake.

Comment: (Mickey Hempler): Sure, this is the thing, if you guys are working for us, you have one water truck and you're hauling from here to there or there and then you record it. Then the oil company comes in and puts two more water trucks on and you're drawing from the same lake as us and everybody thinks that you're drawing all the water, but it's the resource companies that are drawing too.

Query: (from community member) That's what I'm saying, who is monitoring?
Answer: (Mickey Hempler) That's the thing, who is monitoring those guys?

Comment: People are getting permits for the same lake, that's what I'm talking about.

Comment: (Terri Bugg) The Sahtu Land and Water Board, who grants these permits, their view is that it's our responsibility to coordinate with other companies. So that is a huge undertaking and we have to get more organized with that. I know that the DFO is trying to come up with a database to keep track of lakes and names, because right now there's so many lakes and so many users, and it is unorganized. So I'm going to keep track of the DFO that they do that and coordinate with other companies.

Answer: We want to start monitoring ourselves. What we're going to do is start monitoring ourselves instead of waiting on government.

Comment: (Mickey Hempler) Exactly, if you take water and record it in your log for DOT on the road and buddy down the road then takes ten cubes, or Paramount, it's easy enough for you to do, but if we can get all the contractors to do that then, just like these culverts, who the heck put them in? We didn't.

Comment: This winter road, you get so many people watching the lake, how much water they take out of the lakes. There is an example that we know of creeks and lakes that now are dry and lower.

Comment: We want our own community monitor to watch the land.

Answer: You could extend the maintenance a bit longer, because the road needs to freeze a bit longer, it stays colder on this side a lot longer.

Comment: (Mickey Hempler) You're going to need so much money in your contract for that , the next time you redo your contract that's something you'll have to put in there. Once the contract is up, that's it, there's no more maintenance and the road is at risk.

Comment: DOT needs to communicate more with the community about the road.

Query: (from community member) What about getting an inspector from both communities? DOT doesn't come around this way, he phones in and asks how's the road?

Query: (DOT) If there was a community monitor, what would be the best way to select the community monitor?

Answer: The Band Office should be contacted to find a community monitor

Comment: (Mickey Hempler) What you want is someone who can monitor the water usage and the road. And someone who knows a beaver lake from a no beaver lake. In the past, they hired a young guy, and all he wanted was a paycheque, they know absolutely nothing about the maintenance, they don't know a beaver lake from a fish lake.

Comment: The winter road, it's good to have a meeting ahead of time, with the community and Transportation, you end up half the time with no communication, the oil companies they come around and take too much water from one lake and transportation too. You have to meet with them, everybody has to be involved. Sometimes they take water from small lakes, I don't know why they do that. There should be a way to stop that from happening again. Transportation shouldn't be able to take whatever they need, they need to talk to the community. We'll work good side by side.

Comment: We want a monitor from the community. I wonder where they take the water out, they could watch out for that with a monitor from the community. Transportation and the oil companies, that's what we need to watch out for. We'd like to have somebody from here and not Good Hope.

Comment: (Terri Bugg): Yes, we still have to discuss that with our department, we would take back these concerns from the community and see what we can do about it. It sounds like a good idea to have someone from the community, someone from Colville Lake for this section of the road. It would be up to the community to decide who would have the best knowledge, someone who knows traditional use, traditional fish use and who knows the land.

Answer: Transportation should work with the oil companies and us for better communication, should know and write us a letter to let us know what is going on.

Answer: If the oil companies are going to work here, they have to meet with Transportation and the community before they came, they need better communications. Transportation should write a letter to the small companies, Petro Canada and Paramount. That way we know which lake they want to take water from.

Query: I see. Does anyone have any more questions or concerns about the land or water along the MVWR?

Answer: Road is to windy, need to be re-routed. In some places, like we want to cut straight through and not detour so the route is shorter.

Query: (from community member) How about some rerouting, a right-of-way that's more straighter?

Answer: (Mickey Hempler) As long as we stay in our right-of-way, we can straighten out what we need to, some of the doglegs could be straightened, and you got 200 feet from the centre line.

Comment: It just needs to be straighter. Signs, need more signs. Because of the hills and steep areas, for safety.

Comment: Some of those hills are too steep.

Comment: (Mickey Hempler) That's what I was talking about before you came, we're going to do the Hareskin and the Rigosho (sp?)

Comment: We need more signs, sometimes you're coming up over a hill and you don't know if a truck is coming.

Query: (from community member) What about job opportunities?

Answer: I'm not sure at this time.

Comment: There is a lot of history to this trail with lean-tos and places along the MVWR, like special trees that we would like to keep that others would not know about.

Comment: He was talking about the trail, there's a lot of history, where the food is, some lean-tos, it mustn't be touched. It's part of history. If you really looked you'd probably see, places where you can see the old stumps, it's a place where you can see what they done. Long time ago they just had an axe, no saw, nothing. Colville Lake people cleared from here to Rabbitskin we traditionally cleared the land by hand for ourselves

Colville Lake Consultation Comments Summary by Subject

Land

- The area needs to be cleaned up, the entire ROW – Garbage. To do clean up before winter season. All types of garbage – Need to do when visible, like now
- We would like to have the CLWR have traditional names for places, lakes, hills areas.
- We are requesting traditional names of all sites.
- Maybe the first few trips the elders can show the person where the special places are. This is recommended to have a walking through. Can include young people, can be a good traditional use description and for naming sites.
- Check Sahtu Land Use Planning what their traditional information is.
- Can go in summer, and is a good idea to clean the road at the same time, can fly and/or walk through.
- The Colville Lake elders know this land better than the Fort Good Hope community side.
- We have traditional trails that we use for winter & summer that are not connected to the MVWR.
- A lot of history to this trail with lean-tos and places along the MVWR, like special trees that we would like to keep that others would not know about.
- Colville Lake people cleared from here to Rabbitskin we traditionally cleared the land by hand for ourselves.
- We always listen to our elders.

Wildlife

- The lakes are not as high anymore, also now more dangerous to go on. Also, no more beavers in many of the lakes.

Operations

- There is a big difference in weather, seems warmer now, some years the lakes dry out, how do you know how to keep track of all the water trucks?
- On the ROW, if you can put slash down (the contractors can put it in blocks so that people can take it) in orderly way rather than just throwing on ground wherever. This way the people can come and take the slash and use it.
- Extend the maintenance longer so that the road stays open longer, since now it stays colder longer on this side, colder
- DOT needs to communicate with the community about the road.
- DOT needs to work more with us to talk with us about what is going on.
- Transportation should work with the oil companies and us for better communication, we should know and you should write us a letter to let us know what is going on.

Traditional Knowledge Gathering on the Mackenzie Valley Winter Road

Attendees: Colville Lake Elders

Alexis Blancho
Philip Codzi
John Blancho
Sarah Kochon
Madeline Blancho
Hyacinth Blancho
Marie Kochon
Joe Martin Oudzi
J. B. Gully
Translator: Marie Rose Drybone

Department of Transportation, GNWT
Terri Bugg, Environmental Analyst

Location: Community Gym, Colville Lake, NWT

Date: August 14, 2008

Comment: (Terri Bugg) I'm just going to be asking some questions about traditional land use in the area, anything else you would like to bring up about the MVWR and the surrounding area, we can talk about that as well.

Query: I was wondering if you could tell me what the land is like around the area, is it swampy, forest hilly? Please describe the area around Colville Lake, around the MVWR.

Answer: There's mountains, they're not mountains but hills, muskeg area. On that hill, that's a high hill outside the community that mountain is named after a fish lake called Tweed Lake.

Answer: There's a big hill a big high hill, it goes a long way out that way, that's the one they call Berahje Neni, it's just a big hill, solid ground.

Query: Is it a special place, do people use it or stay there?

Answer: A long time ago the people went over it and there's a lot of traditional trails and people travelled over it. And it's also known for trapper areas and fish lakes, lots of fish lakes. Hunting area for musk-ox, caribou, and moose.

Query: Is it on that map?

they look at things like that. For us native people, we will keep that in mind, we will notice an increase, or a decrease.

Answer: Where we stay there's a lot of fish lakes around the area, so they catch all different types of fish: Whitefish, trout, pike, jack, coney, sucker, pickerel, grayling. Not far from here there's lots of grayling so the lakes are very rich with fish.

Query: Are there more lakes with fish than lakes without fish?

Answer: It's the same, big lakes to small lakes it's the same. There seems to be a lot, an increase in fish in some of the fish lakes because a long time ago they used to use dog teams to travel, that's why there's a lot of fish in the fish lakes because not as many dogs now to eat the fish in the lakes.

Answer: In 1953, there was about 200 dogs in this community, there were dog teams for transportation and fish was the main diet for dogs, so they don't use dogs anymore so that makes more fish.

Answer: Maybe there's an increase because people used to eat fish and meat, they ate even more food than now, but there's no dog teams so that's why there's an increase.

Answer: There is a decrease in ptarmigans and rabbits in the area, since white people and development came around. Because of white people whatever they do around the area, there's a change in the area. There's hardly any rabbits and ptarmigan.

Query: Is there a specific reason for that?

Answer: Probably because of the development around.

Answer: We are setting up nets and get lots of fish, we respect our land to be in good condition. We also set limits, because there's so many fish, because we really respect and love our lakes and land. We really keep our land and our water. Whatever fish we catch we share with one and other, this keeps the fish coming. We just don't throw the fish away if we catch too much, we share. This couple here, they have their dogs so they'll feed their dogs fish. This elder here, someone just gave him two fresh fish. You don't just set a net for fun, you gotta be thankful for it.

Answer: We didn't waste our fish, we set net to take to be thankful and share.

Query: What do you use the water for when you are out on the land, for drinking, washing, do you drink the water around the winter road area?

Answer: The water is very important for the animals, the birds and all the animals on the land, if the lakes were to dry up they can't survive, they need the water as much as we do.

Query: Where does the community get their drinking water?

Answer: We use Colville Lake to drink out of.

Answer: We really, really protect the water so it's not to be contaminated like in southern places. We really restrict too many people coming here because we really love and protect our water. We want to protect it from getting

Query: Do you have a reason why this is?

Answer: Before it rained not so much, now there's more rain. The weather changes so fast now, not like before.

Answer: Before it rained once in a while, and if it wanted to it would rain again later. But now, like last night it rained, it'll rain again fast. A few sunshine, then rain again quickly, it doesn't stay the same.

Answer: There are changes, now it is cold in August in spring now will come early or maybe but weather is not stable. Even the ice condition is different, lots of snow on lakes, there is more snow on the lakes than ice.

Query: Is spring coming earlier?

Answer: A long time ago it used to be varied and changes. It's fall time now and it's cold, it didn't used to be like that, spring will come early or it may not. Even the ice condition too, it like you don't see pure black ice, it used to be like that on the top of the ice, smooth. Now we get lots of snow on the lake, so they don't see the black ice, like you always get lots of snow on the ice.

Answer: We don't see black ice anymore (deep freezing of the lakes).

Answer: Sometime after December or New Years a long time ago we used to get a big, big wind, it would just knock down church steeples and everything, that hasn't happened for a long time.

Answer: About the snow, that changes year to year, like it could be less snow this year, next year there could be more, the snow could be deep, really deep. My uncle said that last year, he went for wood and the snow was so deep he got sunk in the snow and it took him almost the whole day to get out. And other times the snow might not be deep.

Query: And that changed, it's not as consistent, it used to be the same every year?

Answer: Yeah, every year is different, even the different times of the year.

Answer: The snow changes from year to year not like before, was consistent.

Answer: A long time ago the sign of spring was when our skin turned dark, complexion just dark, practically black, now spring comes and that doesn't happen anymore. If someone stays in town all year, then they stay white, but the ones who go out, they're the ones who get black. Some people in the past had gotten dark and wind burned, but some people would be out on the land and they would never get dark. Something to remember, something to keep, because it's like news where you were.

Answer: We are a landworkers, always healthy, strong, to go hunting/trapping active, and are always on the land.

Answer: The people from Colville Lake in the past and now we're a very, very hard working people, we were hard workers, we would never say I'm sick. We are always willing to go, go, hunting and trapping, very strong people dedicated to what they were doing, their way of life. When we go to Good Hope and everybody is white, and they look at the Colville Lake people and they're just dark.

Answer: The reason they stopped walking to Good Hope was by then they had planes. And then the store came up, a fur trader set up a store, the new things started coming here so they stopped walking. The fur trader came before Bern Brown. Bern Brown was the priest here before. Even though there was a fur trader and he came here and set up a store, it didn't prohibit the people from doing the traditional walk to Fort Good Hope, it was a lot of hard work, but they would just go and take their time.

Answer: They started their walk around June 25th, but when they went they didn't rush, they could take a long time because they probably go hunting and make a raft, they could stay in one place for maybe a couple of days. If they found a fish lake and caught fish, they would stop for a couple of days and make dry fish. And then they go again so they have a supply of dry fish. Very happy, energetic, nobody thought about sickness. Everything that they did, they sang, even if they cut wood they sang.

Answer: A long time ago if someone saw something new, they never ate it because that's where they said your cold or cough or flu came from, they would never get excited over something they see, they never even knew candy, they didn't even know what it was. Look at all of us, we were all packed, when we went for our walks, their dad or mom had packed them on that trail too. All of them. They only got a supply of flour, sugar and cheese. They called that white man food. The supplies may have lasted, but it might run out by Christmas. All of us were born in a tent on the land and all raised on traditional food.

Comment: (Terri Bugg) Thank you for your time. Masi Cho.

2) Community consultations and traditional knowledge gathering for Colville Lake Winter Road proposed Land Use Permit for Operations & Maintenance application

A community member opens up the floor by stating the Hareskin River is starting to get washed out. and the Hill needs to be fixed.

Comment: (Mickey Hempler) It will be assessed by helicopter the next day. There will be money next year to fix the hill properly, the last time we got stopped by the permafrost. Last year DOT tried to fix but not enough funds

Query: What is happening at the Hareskin?
Answer: There was a washout in the spring time.

Query: Has this affected land use?
Answer: Bank is being washed out in springtime, contractors fill eroded slope with snow and CLWR blind spots is an issue that we can't see around corners
Comment: (Mickey Hempler) Brushing will occur this season.

Query: Any other comments?
Answer: There are still a lot of blind spots.
Comment: (Mickey Hempler) We're going to do a bunch more brushing on it, when we built it, the Colville band said they didn't want it too wide, next year we'll get the money to do that.

Comment: Lots of boulders on road right before game warden's cabin. Boulders are in the way, people running over them dangerous for trucks and skidoos.

Comment: (Mickey Hempler) We had a local guy here, but he didn't turn out too good,

Comment: Slavey translation - Road signs always covered with snow so that people couldn't see

Comment: (Mickey Hempler) From Colville Lake to Norman Wells, they will do this year, to have proper signage on road – Advance warning and visible in winter

Comment: Windrows - ~500m breaks should be put into for wildlife

Comment: Jackfish Creek – should not even be considered

Query: (from community member) Also someone should be hired near end of season to pickup garbage so not left there – Anytime to clean up the road. Who is the foreman this year?

Comment:	Animals need to move across the land, strategic positions where windrows can be placed. E.g. b/w here to Colville Lake where there is muskeg, wooded areas, drainage areas
Comment:	About 10 miles from the Mackenzie River helicopter refuelling in the middle of road – from resource companies. Should not refuel on MVWR. This is a common occurrence. Need staging area because this interferes with domestic travel. This should be in our (DOT) access permits. Should be in policies.
Query:	(Terri Bugg) Is this [refuelling in middle of road] common?
Answer:	Yes.
Comment:	(Mickey Hempler) We'll find out who did that, it's like the sumps, we never authorized that either.
Comment:	(Frank T'sele) Elders have mentioned that they need to be consulted; there are all sorts of fish lakes that developers don't know about.
Comment:	ROW too small, needs to be wider, people couldn't see around corners
Comment:	(Mickey Hempler) That's something we can look at when we do the breaks and windrows, we can make it so someone can pull off the road.
Comment:	Land is running out of water, lots of fish and lakes going dry
Comment:	Pumping water outside of winter road where beavers are, disturbing beaver lodges, never know what will happen to beavers.
Comment:	(Mickey Hempler) We're going to start drawing water out of the Mackenzie and places that we know have lots of water.
Comment:	Along the CLWR there are signs along the road near the lakes, that say: waterhole 1, waterhole 2 etc.
Query:	Are they orange?
Answer:	Yes
Query:	Do you know who they belong to?
Answer:	Could be Paramount/Apache/Petrocan. There's a lake that they used to pump water out of and now there's no water, it's all mud now. There's a Slavey name, but no English name, it is 40 miles past that big ridge (Rigoshoh?).
Comment:	(Terri Bugg) It's our intention to eventually somehow coordinate with the companies to keep track of where we take water for water sources being used by multiple users. We have to keep track and communicate when too much water is being taken out.

Query: (from community member) In the past we had agreements with the exploration companies, they kept the roads smooth, are the resources there to keep it up?

Answer: (Mickey Hempler) No. Some numbers: you're looking at a million dollars just to water the road from here to Tulita, every year it's extra.

Comment: (Terri Bugg) This will be the first year that we'll be monitoring the water coming out of the lakes, when we reach a certain point, we have to say stop. If we're limited as to how much water we can take, the quality of the road may be affected. In the past we had support or sharing with resource companies, we don't know if that will continue.

Comment: (Mickey Hempler) The reason the road was so good last year was because an oil company gave us about a million dollars of water truck and grader time. Without their money, we couldn't talk the people into giving us more money. We're meeting with the oil companies to find out their plans for the winter road.

Query: (from community member) From the south pass to Norman Wells and beyond not maintained well. How often is the road maintained? (Arctic Circle, Sahtu Contractors)

Answer: (Mickey Hempler) It depends on the weather.

Comment: The road wasn't well maintained, there was snow on it a lot of the time.

Comment: (Mickey Hempler) We'll have to look into that, why Danny wasn't out there - there was no extra money for that stretch of the road, and he would have done one pass every week.

Comment: North of the pass road was well maintained. The guys the DOT hired to look after the roads are more important - the foreman has to be watching the contractors

Comment: (Mickey Hempler) That's right, our foreman has to be on those contractors and if they're not doing their job then they have to go and get another contractor. We can terminate them.

Query (from community member) How often are the roads inspected?

Answer: (Mickey Hempler) Every other day.

Comment: (Terri Bugg) If a community member has a concern with a contractor, they should relay those concerns directly to me or Mickey, we need to know what is going on.

Comment: Contractors can do whatever they want.

Query: (from community member) Length of time the Winter Road is open – what about climate change – is it changing from year to year?

Query: (from community member) What about water samples because others contaminate the water, affects us and our health? A monitor could do this yearly.

Comment: The monitors would know where there is no fish, why wasn't this done before. There are lots of lakes to take water from as long as there are no fish or beaver in them. A monitor would know this and would be the best idea – on site – go around creek habitat.

Answer: (Terri Bugg) That's what we're trying to do: listen to the community, talk to the SLWB to find out how much we can take, we hope to stop taking when it's too much and not take from sites we shouldn't.

Comment: (from community member) Any new water source should have plan, how to access new sources to describe – Monitors should guide contractors to water sources and to monitor them so we know how much everyone is using, we have used this system for companies, DOT should follow the same standard. And need a database to track this, working with a plan over time to see long term effects.

Comment: We encourage the use of the SRRB, SLWB to improve the planning of the use of these sources. There was a spill 2 years ago, there was no clear plan, no one stepped up, no one was at fault, these things should be worked out. Rules of the road etc.

Comment: Make a list of potential water sources to give to monitor at SRRB so they can review.

Comment: DOT needs to coordinate with oil companies because they bring out all their equipment and it's no good, need to get funds from oil companies

Answer: (Mickey Hempler) Usually they send a pilot car that'll warn people that a rig is coming down, that has worked pretty well.

Comment: We need a monitor that knows about the land, they can take the contractors around the land

Comment: (Terri Bugg) We're hearing a lot that we should have a monitor from the community.

Comment: 2-5 years ago there was an oil spill – we should have our own rules to deal with that, we have to be involved with this

Comment: We wanted to check it out with axes and shovels, to see how far is spread, it never happened. When people put bridges in – fuel spills happen, and no safety vests.

Answer: (Terri Bugg) I'll mention that to the supervisor.

Fort Good Hope Traditional Ecological Knowledge Gathering

Attendees: Thomas Manual, Gabriel Kochon
Translator: Alphonsine's Interpreting & Consulting

Department of Transportation, GNWT
Terri Bugg, Environmental Analyst

Location: Community Hall, Fort Good Hope, NWT

Date: August 13, 2008

Query: I'll just start with the land, how would you describe the land?
Answer: The land is life, it supports all the rodents, mice, squirrels, that survives, martens, minks, weasels all the same, also caribou, everything is there.

Query: What about caribou and large animals like that?
Answer: Everything survives on our land.
Answer: Like the bear lives off of the berries where it's fat is created to survive, if no berries it wouldn't live through winter. The bear eats wild carrots, fish, anything that's growing on the land
Answer: Everything, even the birds, even the mice put food away for the winter, things from the land, so they can survive throughout the year. Everything depends on the land, they all make all the food from the land
Answer: Lots of times we talk about water, there is dead water and live water. Where the dead water goes is the ones helps the plants and land to grow.

Query: What do you mean by dead water?
Answer: Dead water has no creeks attached to it, water that does not move. If you leave a pond for one week, that water becomes completely dead water. All life, even now they look for new growth on and that is what they survive on. If the water is dead, it may cause whatever is growing on it to not be good for anything.
Answer: This is why we need to sample the water, if the water is safe then they can use it, but if it's not safe they shouldn't use it for the ice road.

Query: Does the dead water look different?
Answer: That's why they should send it to the lab. That's what Thomas is after to get the water sent to the lab, but they don't listen.
Answer: Everything is contaminated except for Jackfish Lake.
Answer: If they use dead water to put on the road, it goes all around and affects the land. If there is water from a lake/stream then that is good water

Query: Have you noticed any changes in the kinds of plants that grow here or the condition of the animals?

Answer: The permafrost is affected how it's going down; this is what strengthening the roots of trees keeps everything strong. It is losing its strength. Maybe a hundred years from now, we don't know.

Answer: Most of the creeks and rivers are drying up because of the permafrost going down, and the landslides, if you travel along the Mackenzie River. If there is no permafrost, then no trees, grass, willows everything will dry up because of permafrost, that's where the moist comes from. and the landslide, creeks cave in and dry up. Permafrost is so important to everything

Query: So you're saying because it's going down, it's causing the land to fall in and the land is drying up?

Answer: This is why the creeks cave in. All our ancestors tell us to know this.

Query: The creeks drying up and the perma frost, how has that affected your lifestyles? The animals to hunt, the fish to eat, has this been affected?

Answer: 500 or 1000 years from now, the people that live off the land, we're going to be the first to go. Towards the end the animals will be wiped out, that's what I think. And that's what is going to happen. Everything is still stable and in a healthy state. Everything is still sterilized and in a healthy state but in 500 years or so we will be gone. If the permafrost continues to decline it will stop the growth of the land and the animals will decline and will affect humans as well

Answer: We were just talking about down south, you might have a piece of land, a pasture where the animals are living. Their piss and manure it keeps them healthy, it keeps them healthy eating. If that happens to us, it's not good for us, we'll keep getting diarrhoea. The southern people keep using the same land, the government should get them new land and demolish this, that's where we're eating everything. The manure goes into the ground and the plants grow out of it and the animals eat it, our animals we can eat, but if you guys send us chicken, beef, we'll get sick.

Answer: We live life different than people in the south on farms, this life, but this life we cannot have because we didn't use the same piece of land over and over – but we cannot use this process, we get sick from southern animals. The wildlife around us eat healthy, so we are healthy

Answer: You guys, right from day one the government has been controlling you guys, they just tell you what to do and give you a big fine if you break the law, that's what we don't want to happen here, I don't want the government sticking its nose in my land and tell me what to do.

Answer: Before civilization came here this land was the medicine. We did not need doctors the land was the pharmacy

the resources out of the land, there's going to be no more money, it'll be real desolation. Our children don't even know how to live off the land.

Query: I share your concerns, I was born in Yellowknife and it concerns me. I'm very concerned about the environment here because it's very sensitive.

Answer: Also during the depression, a lot of people didn't survive it, but our people here survived because they lived off the land, they didn't depend on the government, no stores or money, the land was their way of life, so they survived the thirties, but now with all this modern stuff if anything happens to our land and it comes to that they won't survive because they don't know how to live off the land. They don't know the traditional skills.

Query: Why is that? They want to go to the big city?

Answer: Well nobody is into that now, not like long ago, now we have stores, fast food. Before we didn't have electricity, hot water. Everyone was active, we come from very healthy people, strong people, like your people a hundred years ago, they didn't have machines and look how strong they were, this is what I'm talking about. We have a whole big area, we want to protect the whole area. The whole inside.

Query: Which area needs to be protected?

Answer: The protected area by the ramparts.

Query: Is that a government protected area?

Answer: No, it's from the beneficiaries down south, they wanted to protect their area, they formed a group trapping area, that's the one. The trappers did it for future generations. We were the only ones who created a boundary for our future, just Fort Good Hope.

Query: Do you have to go to the federal government to get it protected? How does that work?

Answer: We were self government a long time ago, we didn't have anybody to tell us what to do, we just did what we had to do. Until everything started happening , everything started to happen slowly, they opened the liquor to the treaty people in 1959 I think, in that area, that's when they had the settlement council they took little chunks out of us until today we're under government law, you live in a house, you have to pay this much, you have to buy this fuel, everything, slowly the government started taking over. In the first place, we didn't ask for this, it's the government. They said you should have running water, your kids should go to school. The rent was five dollars, it started at three dollars and kept going up, look at you and Gabe, your married and the rent is up to $2700. Do they think about our kids? If it's less money then they're shopping more.

- The community knows the wildlife, and are careful when out on the land, and know where the dens are.
- In summer and fall, all the beavers need a specific water level, if there is no water then the beaver lodge will be lost.
- If the water freezes then no water for beavers, the locals can recognize fewer beaver lodges out there.
- No-one is monitoring lakes for beavers and wildlife, there are animals that exist here as well that live with the locals.
- There are lots of lakes to take water from as long as there are no fish or beaver in them.
- Breaks need to be constructed in windrows every 500m so wildlife can move.

Operations

- DOT foreman for this season should be identified.
- Proper signage needs to be put up throughout the road.
- Equipment noise – sometimes there is lots of noise. Road signs are always covered with snow so that people cannot see and dangerous.
- Mickey stated that from Colville Lake to Norman Wells, they will do this year, to have proper signage on road to ensure that driver's have advance warning of road conditions and to also ensure that signs are visible in winter.
- About 10 miles from the Mackenzie River there is helicopter refuelling in the middle of road – from resource companies. There should not be refuelling activities on MVWR. This is actually common occurrence for people to refuel anywhere on the road. There needs to be a staging area since refuelling interferes with domestic travel. DOT should have this in their access permits for companies to follow.
- Mushrooms on the blades of the Cats are needed so DOT operations do not cut into the land, strips top off soil, causes erosion, damages land.
- Hare Indian is too steep, people slide down and very dangerous.
- The snow banks are too high, needs windbreaks.
- Every year our trucks get wore down on the winter road, the road is so rough that it affects vehicles.
- Maintenance – South on the FGH the road is not maintained well (Arctic Circle, Sahtu Contractors).
- From the south pass to Norman Wells and beyond not maintained well, but north of the pass road was well maintained
- The guys that DOT hires to look after the roads are more important - the foreman has to be watching the contractors since right now contractors can do whatever they want and do not listen the community.
- ROW is too small, needs to be wider, people couldn't see around corners.
- Broken down contractor equipment just sits there all winter, doesn't look nice, camps, fuel, needs to be monitored who is doing this responsible party can remove it.

- In the Colville Lake area, there are lots of lakes that have some fish in them. It's not right that the DOT is taking water out wherever they feel like. To do this without consulting the people is not right, it is important what we think, what we know, for our future.
- The community likes the idea of the winter road, but DOT must be careful about harming the fish and wildlife, also there is permafrost and the lake water drying up.
- Jackfish Creek – should not even be considered as a water area to use.
- No dynamite should be used either, since it affects fish.
- The land is running out of water, lots of fish and lakes going dry.
- Jackfish Lake/Creek cannot be a proposed water source
- Lac Belot/Colville Lake - everything is flowing from underground from Belot Lake that feeds this area, flows right into the Mackenzie River from Hareskin River.
- DOT needs to watch the amounts to take out of Lac Belot/Colville Lake, but otherwise ok – didn't take too much water out of before.
- It is also very important that the fish are not harmed.