6.0 DESCRIPTION OF EXISTING ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS

This chapter provides analysis of the environmental and socio-economic baseline conditions without the Project, focusing on the following topics:

- Approach and Methodology
- Environmental Conditions
- Socio-economic Conditions

6.1 APPROACH AND METHODOLOGY

As reviewed in Chapter 3, the baseline analysis reviews current and evolving future VC conditions without the Project, as affected by past, current and other future projects included in the cumulative effects assessment (other than any future projects dependent on the Project).

The analysis focuses on VCs relevant, or necessary, to assess potential effects of the Project. It reflects the scoping of the assessment as set out generally in Chapter 3, including the following:

- The overall consideration of specific VCs within broad environmental and socio-economic component groupings consistent with YESAA and the YESAB Guides.
- Determination of VCs using the methods described in Section 3.3.1, focusing on only those environmental and socio-economic components that may potentially be affected by the Project after consideration of potential effects pathways linking the VC with Project activities during each phase (construction, operation or decommissioning).
- Temporal scoping for potential Project effects (e.g., time period for Stage One (2007-2008) and Stage Two (2008-2009) Project construction, and the operations period (after about 3rd quarter 2008 for Stage One); decommissioning is examined only for the MS development (assumed to occur as early as 2017).
- Geographic study area boundaries for potential Project effects (e.g., general Project Study Region Figure 2.2-1), the Route Study Area used for selecting Project routes[1], and the Site Study Area (ultimate ROW and footprint areas for the Project).
- Consideration of past, current and other future projects considered in the cumulative effects assessment (Section 3.4).

Sources of information used in describing the environmental and socio-economic conditions are referenced throughout the chapter and include:

[1] The Route Study Area is the area defined to guide the selection of a preferred route and Project Site Area for the Project. It consists of conceptual 500m wide study areas for the CS development route running generally along the Klondike Highway from Carmacks to Stewart Crossing and a similar conceptual study area for the MS development generally alongside the existing access road to the Minto Mine.

1. Public, government and other technical documents;
2. Published statistical information;
3. Project-specific field studies, including key-person interviews conducted for the socio-economic assessment;
4. Comments obtained during the public involvement consultation process (Chapter 4).

The assessment recognizes that the environmental and socio-economic condition is not static, but rather continuously evolving. Therefore, the examination of the environmental and socio-economic conditions considers not only present day characteristics, but also historical developments, as well as trends and plans that may influence their evolution in the future.

6.2 ENVIRONMENTAL CONDITIONS

This section provides a description of the environmental conditions of the Project Study Region without the Project and reflects the requirements of the Proponent's Guide to Information Requirements for Executive Committee Project Proposal Submission (YESAB, 2005). The following biophysical environments are examined:

- **Physical Environment**: includes general physiography, surficial geology/soils, terrain hazards, and climate/air quality.
- **Terrestrial Environment**: includes vegetation, historic wildfires, and wildlife.
- **Aquatic Environment**: includes water resources (hydrology, water quality, hydrogeology) and aquatic ecosystems and resources (including fish and fish habitat).

This section generally focuses only on those components of the biophysical environment that are of particular concern in the region and that may potentially be affected by the Project.

Following the Assessor's Guide, at the initial stages of the assessment regional environmental issues of concern relevant to the Project were identified, along with Project-specific issues, in order to delineate and characterize VCs and associated Project effects. This analysis included consideration of potential sources of effects from the Project on the physical, terrestrial and aquatic biophysical environments (effects pathways).

For the biophysical environments, potential Project effects of construction, operation and decommissioning tend, in many instances, to be restricted to the Project Site Area footprint and areas in close proximity to this footprint. Mitigation measures to be adopted for the Project, including the route selection process, are also expected to minimize or prevent adverse effects in many instances, including such effects on the aquatic environment. In the case of terrestrial wildlife with natural habitat areas ranging throughout the Project Study Region as well as the Route Study Area, it will be relevant to consider potential Project effects on the overall regional population of specific species.

Table 6.2-1 provides a summary of environmental VCs considered for assessment of the Project.

Table 6.2-1
Environmental VCs Considered for Assessment of the Project

Valued Component (VC)	Identified by[1]:	Characterization of Effect
Environmental VCs: Physical Environment		
Sensitive Terrain: • **OZ-** organic-rich material with ice-rich permafrost • **OW**-organic-rich poorly drained material • **OWZ**- organic-rich, ice-rich and poorly drained areas • **OW:FA**-organic and/or silt, poorly drained and subject to regular flooding • **VS:R**-very steep slopes, mainly in colluvium covered bedrock or rock • **VS:G**-very steep slopes, in mainly gravely soil	FN, G, OP	Line cutting and operation of heavy equipment in sensitive terrain can remove soil fixing vegetation and may increase the likelihood of mass movement, localized erosion, and disturbance of soils. Disturbance of poorly drained soils may alter localized drainage path and cause soil erosion. Auguring and excavation activities, pole stabilization, travel along route and decommissioning may affect permafrost soils causing soil instability and erosion during construction, operations and decommissioning.
Air Quality	FN, OP	Equipment use affects local air quality during construction, operations and decommissioning. Reduced use of existing diesel generation plants will reduce emissions and effects to climate change.
Environmental VCs: Terrestrial Environment		
Vegetation	FN, G, OP	Project development will create and maintain cleared areas through different types of vegetation, including sections of natural boreal forest.
Rare Plants:	OP	Proposed route crosses areas where the potential for rare plants have been identified. Pole installation and access trail construction may disturb possible rare plant communities.

Valued Component (VC)	Identified by[1]:	Characterization of Effect
Environmental VCs: Terrestrial Environment (continued)		
Mule Deer	G, OP	A small portion of Mule deer habitat and food source will be removed where the transmission line crosses the Mule Deer Wildlife Key Area near Carmacks. Enduring access indirectly increases hunting.
Moose	FN, G, OP	Construction, maintenance and decommissioning may directly affect habitat and movement. Enduring access indirectly increases hunting.
Woodland Caribou (Tatchun & Ethel Lake herds)	FN, G, OP	Construction, maintenance and decommissioning may directly affect habitat and movement. Enduring access indirectly increases hunting.
Small Furbearing Mammals	FN, G, OP	Direct effect during construction, maintenance and decommissioning through line clearing and habitat disturbance. Indirect positive effects through habitat alteration.
Migratory Waterfowl	FN, G, OP	Direct effect during operation (potentially a hazard during migration periods).
Peregrine Falcon	G, OP	Construction of transmission line may affect hunting success and prey availability.
Environmental VCs: Aquatic Environment		
Riparian Zones and Wetlands (Yukon, Pelly and Stewart Rivers; Tatchun, McGregor, McCabe, Von Wilczek, Willow, Crooked, Big and Minto Creeks)	FN, G, OP	Proposed transmission line corridor, or construction activities will not occur within 30m of the high water level at any stream or stream crossing. No direct or indirect effects to water course or immediate riparian areas. Follow Department of Fisheries and Oceans guidelines for stream crossings. Construction, operation and decommissioning activities may affect wetlands areas.
Salmon and other Fish Species	FN, G, OP	Salmon and other fish species will not be affected due to absence of in-stream work.

[1] Identified by: **FN = First Nation, G = Government, OP = Other Public**

6.2.1 Physical Environment

This section considers the existing Physical Environment in the Project Study Region without the Project including general physiography, superficial geology/soil, terrain hazards and climate/air quality. Following the guidance provided in the Proponents Guide, the study area extends beyond the immediate footprint of the Project activities, where applicable for efficiency, and it is consistent with the area to be analyzed in the cumulative effects analysis. (YESAB, 2006)

6.2.1.1 General Physiography

The Project Study Region follows the existing Klondike Highway and Minto mine road access corridors and extends across a variety of landscapes. The Project Study Region is characterized as the Boreal Cordillera ecozone which is physiographically characterized by mountain ranges containing several high peaks, extensive plateaus, and intermontane planes (Lands Directorate, 1986).

The Project falls within the Yukon Plateau Central ecoregion and Northern Yukon Plateau ecoregion (Figure 6.2-1).

- The Yukon Plateau Central ecoregion covers terrain from Lake Laberge to Stewart River and is composed of groups of rolling hills and plateaus separated by deep, broad valleys (Yukon Ecoregions Working Group, 2004); the communities of Pelly Crossing and Carmacks are found in this ecoregion.
- The Yukon Plateau North ecoregion features rolling uplands, small mountain groups and level table lands dissected by deep-cut, broad and U-shaped valleys (Yukon Ecoregions Working Group, 2004). The communities of Stewart Crossing and Mayo fall within this ecoregion.

Figure 6.2-1
Terrestrial Ecozones and Ecoregions of the Yukon Territory

(Source: Government of Yukon, Department of Environment Geomatics)

The Route Study Area falls within the Yukon River Major Drainage Area which comprises approximately 66% of the Territory and is its largest drainage area. Draining into the Bering Sea via Alaska, the major tributaries to the Yukon River include the Stewart River and the Pelly River in the Project Study Region, as well as the Klondike River, the Donjek River and the White River. There are also many large lakes in the watershed outside the Project Study Region including Teslin Lake, Tagish Lake, Bennett Lake, Kluane Lake and Lake Laberge (Scudder, 1997).

6.2.1.2 Surficial Geology / Soils

Table 6.2-2 summarizes the various types of soils and terrain encountered along the Route Study Area.[2]

Table 6.2-2
Terrain Units along the Route Study Area

Classification / Map Symbol	Terrain Unit Description	Comments
Soils		
OZ	Organic-rich material with ice-rich permafrost	Possibly thicker than 4 metres. Gravel may be present at depth
OW	Organic-rich, poorly drained material	High water table. Gravel may be present at depth greater than 4 metres
OWZ	Organic-rich, ice-rich, and poorly drained areas	High silt and ice content. High water table. Gravel may be present at depth greater than 4 metres
OW:FA	Organic and/or silt, poorly drained, subject to regular flooding	High water table, flooding risk, proximity to stream.
OZ/G	Organic-rich material with ice-rich permafrost over gravel	Gravel may be present within 3 metres of surface
OW/G	Organic-rich, poorly drained material over gravel	High water table. Gravel may be present within 3 metres of the surface
OWZ/G	Organic-rich, ice-rich, and poorly drained areas over gravel	High silt and ice content. Gravel may be present within 3 metres of the surface
F	Fluvial silt and sand/gravel	Water table could be near surface
Gradient		
VS:G	Very steep slope, mainly in gravelly soil	Slopes are greater than 60%
VS:R	Very steep slope, mainly in colluvium-covered bedrock or rock	Slopes are greater than 60%
S:G	Steep slopes, mainly in gravelly soil	Slopes are greater than 40% and less than 60%
S:R	Steep slopes, mainly in colluvium-covered bedrock or rock	Slopes are greater than 40% and less than 60%
S:M	Steep slope in silty gravel, moraine	Slopes are greater than 40% and less than 60%
Water bodies		
ST	Stream/wetland: Creek bottom including steams and adjacent wetlands	Environmentally sensitive areas
RI	River	River
WET	Wetland, variable water table near or at surface, silt, organic, sand or gravel	Environmentally sensitive areas

[2] The locations of these terrain units and soil types are set out in Appendix 6A-1 and the Map Folio CD (Maps Series from Mougeot GeoAnalysis and ACG).

Terrain Modifiers: Modifiers that may be used as additional descriptors of terrain units	
(-K)	Thermokarst
(-S)	Slow Mass Movement
(-CL)	Colluvium and Landslide

(Source: Mougeot GeoAnalysis, 2001).

The landscape in the Project Study Region has been shaped by a combination of volcanic activity and glaciations. A broadly rolling till plain forms the dominant glacial landform and isolated pockets of fluvial and glaciofluvial sands and gravels, glaciolacustrine silts and organic deposits mantle the subdued till. The surface till in the Project Study Region is variable in color, moderately stony and has a silty, sandy matrix. Volcanic ash forms a veneer from 5 to 30 cm thick in various locations throughout the area. (Western Silver Corporation, 2005).

Processes of erosion and deposition have continued in the Project Study Region in post-glacial time. Colluvial materials are common to sloping ground in the region and are easily transported by gravity, while angular bedrock fragments with interstitial sand and silt are ever-present on ridge crests and upper and mid-slope positions in the area.

Fluvial erosion and lateral and vertical cutting through existing surface materials is an ongoing but generally imperceptible process that is usually most dynamic in steeper-gradient channels and where unstable bank material exists. This has resulted in the accumulation of fluvial sediments and organic materials on floodplains, fans and adjacent valley lowlands. Some areas of sloping terrain continue to be modified by rapid, mass movement processes such as landslides and debris flows.

Permafrost tends to occur on many north-facing slopes and where surficial deposits are overlain by a blanket of organic materials. In these areas, ground ice has been encountered at depths of 40 to 50 cm. (Western Silver Corporation, 2005).

Much of the Project Study Region is underlain by glacial till and glaciofluvial deposits left during the activities of the Pleistocene Epoch. These sediments are usually poorly sorted and unstable when they are found on a slope. High percentages of gravel and low silt content in the soil present at surface will increase the percolation of water through the ground and reduce the chance of soil liquefaction. Poorly drained, organic-rich soils (units OZ, OW, OWZ) can change stability over time and permit the formation of ice. Freeze-thaw processes can produce unstable conditions by opening voids in the soil.
The Preliminary Terrain Analysis maps identify a terrain class (S:R) described as colluvial-covered bedrock which consists of steep slopes with gravelly soils. Evidence of this type of terrain can be found on slopes opposite the town of Carmacks on the Northern bank of the Yukon River.

6.2.1.3 Terrain Hazards

Terrain hazards are naturally occurring geologic and geomorphic processes and unstable conditions that present a risk to life and property (Ryder and McClean, 1980). This may include hazards caused by mass movement processes such as landslides and debris flows, hazards related to permafrost and thermokarst, and hazards related to fluvial processes such as flooding or other catastrophic, natural phenomena. The Preliminary Terrain Analysis maps (Appendix 6A-1, Mougeot GeoAnalysis; Appendix 6A-2, Access

Consulting Group (ACG)) identify several potential hazards in the Route Study Area including thermokarst topography, slow mass movement and colluvium.

A large portion of the surficial geology in the Project Study Region consists of glaciofluvial sediments and discontinuous blankets of till (Jackson, L.E. Jr. 1997(a), (b) and (c)). Glaciofluvial material is material deposited by rivers flowing under a glacier, while glacial till is the unsorted mixture of coarse- and fine-grained material deposited by a glacier (United States Geological Survey, 2006). Where portions of the proposed route follow a major waterway or encounter a river bank, till and glaciofluvial deposits are frequently encountered on steep to very-steep, south-west facing slopes. Slopes can become more extreme and landslides may occur in close proximity to the Yukon, Stewart and Pelly Rivers due to incision by these major rivers over time. This may produce linear, exposed units that fall sub-parallel to the river valley. Wetlands, such as bogs, fens and swamp deposits tend to form in areas where the water table intersects the surface and there are finely-grained soils on gentle slopes or plateaus that allow the collection of surface water. These are typically some of the most productive habitats and plant producing areas within the Project Study Region.

Permafrost and thermokarst topography are typically found on north-facing slopes. Vegetation present in the area tends to be small with stubby, sparse tree cover. Permafrost units can become hazardous when disturbed by heavy equipment which causes exposed, frozen soil to melt and become very unstable. The vegetative covering provides an insulating blanket over these sensitive soils.

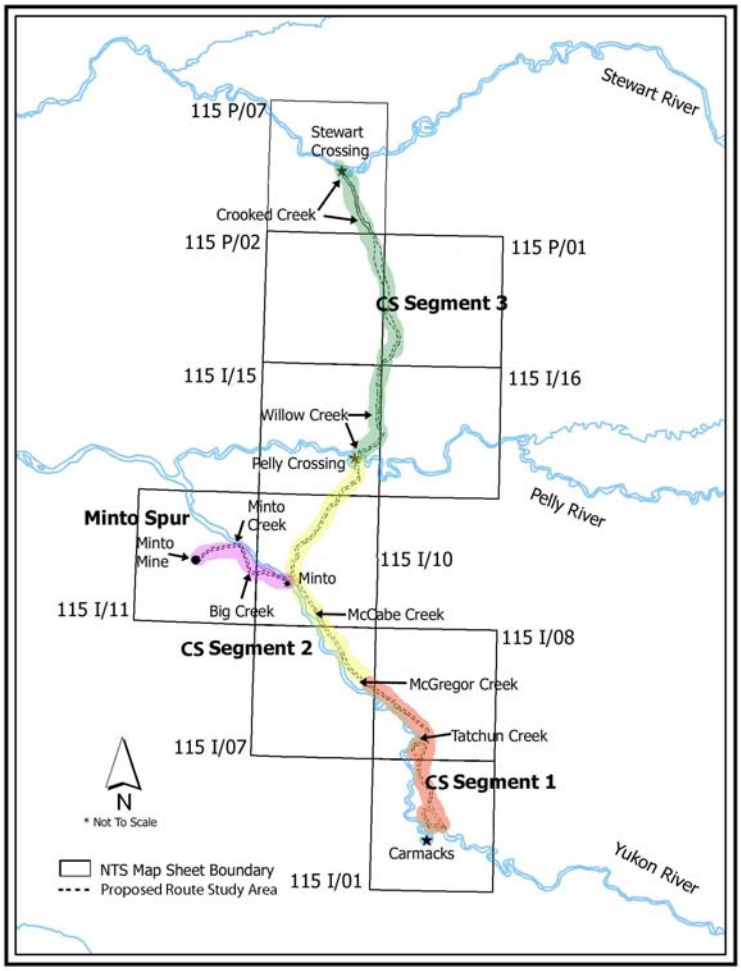
The MS Route Study Area follows the existing access road for the majority of its length. The route travels over material similar to that which has been described above. Prior to Big Creek, the majority of the route trends west, sub-parallel to the Yukon River, and falls on shallow-sloping floodplain regions. After Big Creek, the route trends north-west and as it approaches a crossing at Minto Creek it passes close to the Yukon River. At the Minto Creek crossing, the route bends to the west again and proceeds to the north of Minto Creek. The topography here is more steeply sloped as the route enters a narrow river valley where it is flanked by scree slopes on either side of Minto Creek.

Potential hazards near the Project Study Region were identified by air photo interpretation with terrain survey analysis provided by Mougeot GeoAnalysis (see maps in Appendix 6A-1). The assessment of terrain begins in the southern portion of the Project Study Region with an analysis of the terrain by Project Segments indicating the **National Topographic System** (**NTS**) Map Sheet numbers as outlined in Figure 6.2-2. While potential terrain hazards have been identified along most of the Route Study Area this does not imply that the entire route is impassable due to hazardous terrain. Almost all of the terrain hazards are either linear features or small localized features. There are also many gaps between the potential terrain hazards within which a transmission line can be located. Mougeot's (2000) preliminary terrain survey stated:

> "Reconnaissance level work along the highway corridor indicates that most of the terrain adjacent to the Klondike Highway is composed of well-drained gravely loam. In places, a thin silt to sandy silt veneer covers coarser material, and occasionally organic blankets up to 60 cm thick overlay these two units. Overall, the terrain and topography are suitable for the establishment of a power line corridor over most of the highway route."

Mougeot concludes by stating that "the review confirms that a 66 kV transmission line can be constructed and operated within the proposed corridor subject to minor refinements which will solve a few topographic, physical and terrain conflicts." A 66 kV transmission line would have similar ROW requirements to the proposed 138 kV transmission line.

Figure 6.2-2
NTS Map Sheet Areas for the Route Study Area



CS Line Segment 1: Carmacks to McGregor Creek

Table 6.2-3 below outlines the potential terrain hazards that are associated with Segment 1 of the CS transmission line Route Study Area. The most sensitive terrain locations include wetland and creek crossings in the Tantalus Butte area (map sheet 115I/01 (Appendix 6A-1 Map 6A-1-1 and Appendix 6A-2 Map 6A-2-1)) and the approach to and over Tatchun Creek which is characterized by colluvial deposits on steep slopes. Between Tantalus Butte and Tatchun Creek there are areas with potential terrain hazards on either side of the Klondike Highway. The most prominent terrain hazard is a long steep slope on the east side of the Klondike Highway just south of Yukon Crossing to McGregor Creek; however, there is

sufficient space between the highway ROW and the slope to allow for the transmission line ROW. (Map sheet 115I/08 (Appendix 6A-1 Map 6A-1-2))

Regions where the proposed corridor intersects steep slopes show colluvium covered bedrock, and it is anticipated that colluvial deposits and landslide activity will occur in areas where a stream's cut-bank has eroded into hills producing slopes that exceed 30 degrees (or 60%) which consist of poorly consolidated soils of the type found in glaciofluvial sediments. However, there is sufficient space between the slopes or on the top of the slopes to place poles and span sensitive terrain areas where necessary.

The terrain analysis delineates steep to very-steep, gravelly slopes covering bedrock as the main terrain hazards present in the area north of Tatchun Creek on the east side of the Klondike Highway. Moving north-west, units of very-steep sloping colluvium-covered bedrock become interrupted by thin and strip-like trending steep slopes of gravel near where the proposed route crosses McGregor Creek. This section of the Route Study Area is characterized by long stretches of relatively flat terrain between the Klondike Highway ROW and the slopes to the east. This area has more than sufficient space for the CS transmission line ROW (Map sheet 115I/08 (Appendix 6A-1 Map 6A-1-2)).

Table 6.2-3
Potential Terrain Hazards for CS Line Segment 1 (Carmacks to McGregor Creek)

NTS Map Sheet	Location of Terrain Unit	Route Option	Terrain Unit (s)
115 I/ 01	1-3.5 km[1](Highway 4)	1B Tantalus West	S:G-ST
115 I/ 01	1.2-3.1 km[1]	1B Tantalus West	VS:R, S:R, S:R(-CL)
115 I/ 01	6.9-10.5 km[1]	NA	OW, VS:R, S:R, VS:R-VS, S:G
115 I/ 01	10.5- 13.1 km[1]	NA	OW, S:G
115 I/ 01	16.2-17.7 km[1]	NA	OW, S:M
115 I/ 08	1.5 km^2 south	2B Tatchun Creek West	OW
115 I/ 08	0.2-1.2 km^2 south	2B Tatchun Creek West	VS:G
115 I/ 08	NA	2A Tatchun Creek East	OW, S:M, OW/G, VS:G
115 I/ 08	0.4-5.6 km^2 north	NA	VS:G, OW:G
115 I/ 08	6.9-10.4 km^2 north	NA	OW, S:M, OWZ(-K):G, VS:R
115 I/ 08 and 115 I/07	10.3-20.6 km^2 north	NA	VS:G, S:M, VS:R

[1] Approximate location, measurements are taken starting from the intersection of the Klondike Highway and Highway 4.
[2] Approximate location, measurements are taken starting from Tatchun Creek crossing on the Klondike Highway.

CS Line Segment 2: McGregor Creek to Pelly Crossing

Table 6.2-4 below outlines the potential terrain hazards that are associated with Line Segment 2 of the CS transmission line Route Study Area. Preliminary Terrain Survey Map 115I/07 (Appendix 6A-1 Map 6A-1-3) delineates steep to very-steep, gravelly slopes covering bedrock as the main terrain hazards present beginning immediately north of McGregor Creek. This continues in three long sections up to a point adjacent to Minto Landing. Preliminary Terrain Survey Map 115I/10 (Appendix 6A-1 Map 6A-1-4)

delineates surficial geology which is mainly very steep, gravely slopes with colluvium-covered bedrock. Units of north by north-west trending, very steeply sloped gravel and colluvium-covered bedrock are found to the north of the Route Study Area along the south-west facing hillside for approximately 7 km. There is a unit of high water table and poor drainage to the east of the Project Study Region where the route bends to the north-east. The Route Study Area also crosses a unit of very steeply sloped gravel at this location.

Where the Route Study Area nears Von Wilczek Creek, an area of scattered wetland contains organic-rich, ice-rich and poorly drained soil. This area is about 1 km north along the corridor from the north-east bend, and Preliminary Terrain Survey Map 115I/10 (Appendix 6A Map 6A-1-4) indicates that units around this area have gravel at depth. There are units of organic-rich and poorly drained material opposite the Von Wilczek Lakes with small streams on the east side of the proposed corridor. The majority of the potential terrain hazards associated with this section of the Route Study Area are on the east side of the Highway. Units of very steeply sloping, colluvium-covered rock and bedrock are found to the west of the Route Study Area at this location. Organic-rich and poorly drained areas with high water table and high silt and ice content are most prevalent on the north shore of the northern most Von Wilczek Lake. On the west side of the Route Study Area there are very steep, colluvium-covered rock and bedrock. Moving from the Von Wilczek Lakes to the northern edge of the map sheet there are scattered units of organic-rich and poorly drained material along the corridor, with the water table near the surface.

Preliminary Terrain Survey Map 115I/15 (Appendix 6A-1 Map 6A-1-5) delineates scattered units of fluvial material and units of colluvium-covered rock or bedrock, on steep slopes in and around wetland and lake environments. The units appear to become more gravel-rich around Six Mile Lake, where organic-rich, poorly drained soils with gravel at depth occur more regularly. Terrain analysis maps, created by Mougeot, depict organic-rich and ice-rich soils with gravel within 3 metres of the surface approximately 5 km south of Pelly Crossing along the Route Study Area.

As the Project proceeds towards, and travels through the town of Pelly Crossing (Route Option through Pelly) both the Mougeot terrain analysis and ACG terrain analysis delineate fluvial and organic-rich, poorly drained materials. Route Option Pelly West encounters units of organic-rich, ice-rich and poorly drained areas including areas of permafrost followed by steep slopes in both gravelly soils and colluvium covered bedrock in the area north of Willow Creek. Route Option Pelly East would encounter very steep slopes in gravelly soil south of the Pelly River, as well as a small area of organic-rich material with ice-rich and poorly drained soils north of the Pelly Airfield.

Table 6.2-4
Potential Terrain Hazards for CS Line Segment 2 (McGregor Creek to Pelly Crossing)

NTS Map Sheet	Location of Terrain Unit	Route Option	Terrain Unit (s)
115 I/ 07	0-9.1 km[3] north	NA	VS:R, VS:G-OW, VS:G, S:G
115 I/07 & 115 I/10	9.1-17.3 km[3] north	NA	VS:R-VS:G
115 I/10	17.3-19.1 km[3] north	NA	S:G, VS:G, S:M
115 I/10	19.1-25.3 km[3] north	NA	VS:R
115 I/10	25.3-27.2 km[3] north	NA	VS:G
115 I/10	28.6-31 km[3] north	NA	VS:G, OW
115 I/10	31.2-37.3 km[3] north	NA	OWZ/G, OW, OW-ST, OW/G
115 I/10	38.4-40.3 km[3] north	NA	VS:R
115 I/10	40.3-43.2 km[3] north	NA	OW, OWZ
115 I/10	44.1-48.3 km[3] north	NA	OWZ. OW/G, VS:R, OW
115 I/15	48.3-53.4 km[3] north	NA	OW/G, OWZ, OWZ/G
115 I/15	55-57.9 km[3] north	3B through Pelly	S:G, OW
115 I/15	55-57.9 km[3] north	Pelly West	S:R, OZ/G, OWZ/G, S:G
115 I/15	55-57.9 km[3] north	Pelly East	OWZ, VS:G, S:G

[3] Approximate location measurements are taken starting from the North side of the McGregor Creek crossing on the Klondike Highway.

CS Line Segment 3: Pelly Crossing to Stewart Crossing

Table 6.2-5 below outlines the potential terrain hazards that are associated with Line Segment 3 of the CS transmission line Route Study Area. Preliminary Terrain Survey Map 115I/15 (Appendix 6A-1 Map 6A-1-5) delineates scattered units of poorly drained, organic-rich and potentially ice-rich soils occurring around 3 to 4 km north of Pelly Crossing. To the north, there are units of organic-rich, poorly drained material with gravel present at depth. These units appear to follow river banks and surround surface water bodies. Willow Creek, a long linear feature west of the Klondike Highway from Pelly Crossing to a location just south of Jackfish Lake, is a significant wetland area (CPAWS, 2005).

Much of Preliminary Terrain Survey Map 115I/16 (Appendix 6A-1 Map 6A-1-6) and Preliminary Terrain Survey Map 115I/15 (Appendix 6A-2 Map 6A-2-2) delineates units of organic-rich material with permafrost over gravel present west of the Route Study Area. Organic-rich and/or silt-rich areas subject to regular flooding are present to the east, running sub-parallel to the corridor for the majority of the route depicted on this map sheet. West of the proposed corridor and opposite Diamain Lake, there are patches of organic-rich and poorly drained material with gravel present around 3 metres from the surface. At the northern extent of the corridor on this sheet there is a large area of organic-rich, poorly drained material with high silt and ice content and a potentially high water table.

Preliminary Terrain Survey Map 115P/01 (Appendix 6A-1 Map 6A-1-7) delineates a linear unit of organic-rich material with ice-rich permafrost and possibly some gravel at depth, east of the Route Study Area

and running sub-parallel to the route. West of the route and north of the Selkirk First Nation Settlement Parcel on Preliminary Terrain Survey Map 115P/01 (Appendix 6A-1 Map 6A-1-7), there are patchy wetlands underlain with organic material with ice-rich permafrost. To the north of the westerly situated wetlands, surface material becomes more gravelled, steeply sloping, and rockier with some colluvium-covered bedrock and rock units indicated. West of the route in Preliminary Terrain Survey Map 115P/02 (Appendix 6A-1 Map 6A-1-8) there are regions of organic–rich, gravelly soils with permafrost and poor drainage around several small bodies of water. To the west of the Project Study Region, slopes appear to be gentler than those to the east. Units occurring around surface water display poor drainage and ice-rich permafrost over gravel. Gravel in these areas could be present within 3 metres of the surface. There are units of steeply sloping, gravelly soils in the northern portions of this map sheet area to the east of the Route Study Area.

Beginning in the south of Preliminary Terrain Survey Map 115P/07 (Appendix 6A-1 Map 6A-1-9), there are units of steeply sloped gravel present to the east and west of the Project Study Region, within the edges of the Route Study Area. Units of organic–rich, poorly drained soil with ice-rich permafrost are found in units to the north of Crooked Creek.

Proceeding north into Stewart Crossing, the Project passes through an area of shallowly sloping topography. Mougeot terrain analysis indicates units of organic-rich and poorly drained soils to the east and west of the Route Study Area with evidence of thermokarst activity. There are scattered wetlands throughout the areas to the south of town. Areas with gravel present within 3 metres of the surface tend to be found at the headwaters of creeks. These units are indicated as being rich in organics and can sometimes have permafrost.

Linear units of steeply gravelled material follow the route from its southern extent on this map sheet area into Stewart Crossing. These units intersect with the Route Study Area twice at approximately 2 km and 1 km south of the Stewart Crossing Bridge. At Stewart Crossing, there is a large flood plain which comprises much of the southern bank of the Stewart River. The Stewart River shows evidence of organic-rich, poorly drained material with gravel present at depth. Areas in close proximity to the Stewart River are subject to regular flooding.

Table 6.2-5
Potential Terrain Hazards for Line CS Segment 3 (Pelly Crossing to Stewart Crossing)

NTS Map Sheet	Location of Terrain Unit	Route Option	Terrain Unit (s)
115 I/15	0-22.4 km[4] north	NA	OW-ST
115 I/15	0-1.9 km[4] north	NA	S:G
115 I/15	5.5-10.4 km[4] north	NA	OWZ, OWG, OZ/G, OW, SG
115 I/15	11.6-18 km[4] north	NA	OW/G, OZ/G-OW, OZ/G
115 I/15 and 119 P/01	18-23.9 km[4] north	NA	OWZ/G-S:G
115 P/01	23.9-27 km[4] north	NA	OZ-OWZ/G
115 P/01	27.7-29.3 km[4] north	NA	OZ/G
115 P/01	30.2-34.5 km[4] north	NA	OZ, OZ/G, OWZ/G
115 P/01	34.5-42.3 km[4] north	NA	OWZ/G, OW/G, OZ/G, OWZ, VS:G, VS:R, OW, WZ(-K)
115 P/01	41.1-54 km[4] north	NA	OZ/G-WET
115 P/01	47.9-52.6 km[4] north	NA	S:G, OWZ
115 P/07	53-58.7 km[4] north	NA	S:G, OW-ST, OWZ, OWZ-WET
115 P/07	58.7-66.2 km[4] north	NA	OZ/G, OWZ(-K)-WET, S:G, OWZ
115 P/07	66.2-70 km[4] north	NA	OW, S:G, OW:FA, OW:FA-WET

[4] Approximate location, measurements are taken starting from the north side of the Pelly River on the Klondike Highway.

Minto Spur Line Segment

Table 6.2-6 below outlines the potential terrain hazards that are associated with the Minto Spur Segment of the Route Study Area. Proceeding west, away from the CS Route Study Area and towards the MS Route Study Area, Preliminary Terrain Survey Map 1151/10 and 115I/11 (Appendix 6A-2 Map 6A-2-3) delineates a unit of steeply sloping terrain which consists of mainly colluvial material that covers bedrock lying opposite Minto Landing on the South bank of the Yukon River. The proposed MS Route Study Area intersects this unit of terrain at this location. As the MS Route Study Area proceeds west, the above noted unit runs into a unit of steeply sloping terrain consisting of mainly gravelly soils. The area between the Yukon River and the MS Route Study Area contains units of colluvium. The proposed route along the Minto Mine access road travels over flood plain regions on the south side of the Yukon River

Units of fluvial material are found at the location of the proposed Big Creek crossing. These sedimentary units are noted for approximately 1 km in the upstream and downstream direction from the crossing point. Additional units of fluvial sediments are noted at a location about 2 km northwest from the Big Creek crossing in the MS Route Study Area. This area is also a wetland area (noted as ST on the Terrain Map (Appendix 6A-2, Map 6A-2-3), and stretches between this additional unit of fluvial sediments to the Minto Creek area. On the north side of the bridge across Big Creek the contours indicate a narrower flood plain with the creek bed and surrounding area consisting of fluvial silt and sand/gravel.

Units of steeply sloping terrain are noted to the south of the MS Route Study Area and less than 500 metres before the Minto Creek crossing. These units are mainly in colluvial-covered bedrock or rock. At this location fluvial material is found between the road and the Yukon River. Steep slopes, mainly in gravelly soils, are noted on both sides of the road about 1 kilometre west from the Minto Creek crossing. There is also a small section of steep slope in silty gravel, Moraine west of the Minto Creek crossing. The Minto Creek valley is characterized by areas of permafrost on north facing slopes (Minto Explorations Limited and Hallam Knight Piésold Ltd., 1995).

ACG terrain analysis notes a large unit of steeply sloping material, mainly in colluvial-covered bedrock, which lies to the south of the access road and Route Study Area for approximately 4 km. This unit stretches across the access road and Route Study Area and continues towards the north; the unit continues to occur in the Route Study Area for approximately 2-3 kilometres east of the camp.

Table 6.2-6
Potential Terrain Hazards for the Minto Spur Line Segment

NTS Map Sheet	Location of Terrain Unit	Route Option	Terrain Unit (s)
115 I/10 and 115 I/11	0-3.2 km[5]	NA	S:R, S:G,
115 I/10 and 115 I/11	7.2-7.9 km[5] (Big Creek)	NA	F
115 I/10 and 115 I/11	9.6-10.5 km[5]	NA	F, -ST
115 I/10 and 115 I/11	14.3-15.8 km[5] (near Minto Creek)	NA	F, S:R, -ST
115 I/10 and 115 I/11	15.8-17.5km[5]	NA	S:G, S:M
115 I/10 and 115 I/11	17.5-24.4 km[5]	NA	S:R,

[5] Approximate location measurements are taken starting from the west side of the Yukon River on the Minto Mine access road.

6.2.1.4 Climate and Air Quality

Yukon has a sub-arctic climate featuring cold, dark winters and summers with mild, long, sunny days. When data from Whitehorse and Mayo is taken into consideration, the monthly mean temperature distribution varies between -28.6° C and 14.8° C. The summer mean temperature is about 12° C, while the winter mean is approximately -19°C. The region is relatively dry year-round with total precipitation ranging from 250 mm in valleys to 600 mm in the mountains. While there is more precipitation in winter than in summer, the average depth of winter snow is only 50-70 cm, much lower than many parts of southern Canada (Government of Yukon, 2005).

Project Area Climate

There is no long-term meteorological station located in the Route Study Area. Since the climate in this area is similar to the climate in the Whitehorse and Mayo areas, data from the Whitehorse and Mayo meteorological stations (available since 1971) has been used in this section.

The Whitehorse Airport station is located at latitude 60º 42' N, longitude 135º 4' W and at an elevation of 706.20 m. The Mayo Airport station is located at latitude 63º 37' N, longitude 135º 52' W and at an elevation of 503.80 m (Environment Canada, 2004(a)). The communities of Carmacks and Pelly Crossing are located between these two airport stations: Carmacks is located at latitude 62º 06' N, longitude 136º 18' W and at an elevation of 525 m (Indian and Northern Affairs Canada, 2006(a)) and Pelly Crossing is located at latitude 62º 49' N, longitude 136º 54' W and at an elevation of 454.2 m (Indian and Northern Affairs Canada, 2006(a)). Environment Canada has recently installed a meteorological station at Carmacks, but there is no data available for providing averages, means and extremes prior to 1999.

The three tables set out in Reference Materials 6R-1 provide a detailed breakdown of the average climate data for Whitehorse and Mayo over a twenty-nine year period. These tables provide an overview of the anticipated climate conditions over a twelve month cycle.

The data that has been recorded at the Town of Carmacks indicates annual temperatures that may climb as high as 6º C in January and 35º C in June and fall to -57.8º C in January and -1.1 in July. The greatest single rainfall recorded was 31.4 mm while the greatest single snowfall recorded was 23 cm on February 25, 1987. The greatest recorded snow depth to accumulate was 28 cm in December 1990. The mean daily temperature remains below 0º C from October through February. It may be predicted that sub-zero temperatures will occur later in the spring; however, historic mean daily temperature data for those months was not available from Environment Canada (Yukon Executive Council Bureau of Statistics, 1997).

For Whitehorse, the data indicates that the temperature may climb as high as 9º C in January and as high as 34.4º in June. The temperature can fall to -0.5º C in July and as low as -52.2º C in January. The largest single rainfall recorded was 44.9 mm, while the greatest single snowfall recorded was 27.2 cm. The greatest snow depth recorded was 94 cm. The winds average 12.7 km/h and generally blow in a SE direction. Maximum sustained winds have been recorded at 72 km/h with gusts reaching 106 km/h (Environment Canada, 2004). The mean daily temperature in the area remains below 0º C from October 18 through to April 15 for 179 days of winter (Yukon Executive Council Bureau of Statistics, 1997).

At Mayo Airport, the data indicates that the temperature may climb to 10.1º C in January and 36.1º in June. The temperature may fall to lows of -2.8º C in July and -62.2º C in February. The largest single rainfall was 31.8 mm, while the greatest single snowfall was 35.6 cm. The greatest snow depth recorded was 117 cm. The winds average 6.6 km/h and generally blow in a N direction. Maximum sustained winds have been recorded at 72 km/h with gusts reaching 126 km/h (Environment Canada, 2004). In the Mayo area, the mean daily temperature remains below 0º C from October 8 through to April 17 for 191 days of winter (Yukon Executive Council Bureau of Statistics, 1997).

Climate Change

Most climate scientists have concluded that global temperatures are rising and that warming in the past 50 years has been accelerated by human activities that release greenhouse gases into the atmosphere. (Government of Yukon Climate Change Strategy, 2006)

The effects of climate change are becoming more apparent in the Yukon and throughout the circumpolar north. In Yukon, it is predicted that climate change will result in a moderate warming of the average annual temperature by 2º C to 3º C by the mid-twenty first century in the Yukon Interior, as compared with average temperature recorded from 1970-2000 (Natural Resources Canada, 2006(a)). This moderate warming may be accompanied by more snow in the winter as well as a greater number of severe storms in both winter and summer, which include heavy summer rainfall and more intense thunder and lightning. (Yukon Government, 1999) The warmer temperatures will have an impact on the discontinuous permafrost in the Route Study Area, and as the permafrost thaws, slopes will become less stable and sloughing and settlement of the ground surface will occur (Natural Resources Canada, 2006(b)). This process will also occur where trees and brush are removed, causing changes at the micro-climate level. The effects of climate change will impact on both the biophysical environment and the socio-economic environment and may threaten the structural integrity of buildings and highway infrastructure as well as impact on traditional ways of life, damage heritage sites and increase the risks, costs and impacts of forest fires. (Government of Yukon Climate Change Strategy, 2006 at p. 1)

The Government of Yukon has recently published a Climate Change Strategy which sets out key goals and strategies with regard to developing a response to climate change in Yukon. This strategy includes a consideration of climate change goals and measures to reduce the levels of greenhouse gas emissions in Yukon. This includes undertaking actions to stabilize concentrations of greenhouse gases in the atmosphere by reducing the volume of greenhouse gases discharged. The Climate Change Strategy states that one means of accomplishing this goal is to increase energy efficiency, shift from high carbon to low carbon fuels and increase the use of renewable energy sources. (Government of Yukon Climate Change Strategy, 2006 at p.2)

The Government of Yukon strategy on climate change suggests that greenhouse gas emissions in Yukon may be reduced in the short term through making improvements in efficiency and undertaking measures related to infrastructure replacement which will provide long term benefits, including the development of alternatives to diesel for electricity generation in Yukon (Government of Yukon Climate Change Strategy, 2006 at p. 7).

Air Quality

Since there are fewer industrial activities and smaller dispersed populations, air quality in the Project Study Region is very good compared to southern towns and cities across Canada. The primary source of current air emissions in this region is vehicle traffic on the North Klondike Highway; traffic levels and consequent emissions tend to increase during summer tourist season. Home heating (oil and woodstoves) in the communities also contributes to air emissions, but in amounts relative to a very small population base.

Both Carmacks and Stewart Crossing are connected to an existing power supply grid. The Village of Carmacks is supplied by the WAF transmission line, while Stewart Crossing is connected to the MD Transmission Line.

There is a small diesel generation facility (installed capacity 975 kW) in Pelly Crossing, which contributes to local air emissions (such as carbon monoxide, carbon dioxide, and nitrogen oxides). Historically, the peak has not exceeded 445 kW (personal communication, YECL, July 27, 2006). Generation over the past five years in Pelly Crossing was approximately 2.08 million kW.h/year with a fuel consumption of about 563,000 litres/year. Generators currently in use at the Pelly Crossing facility include: a Caterpillar® (model 3406), a Caterpillar® (model 3412) and a Detroit Diesel (model S-60 D-deck). Each Caterpillar® generator set provides approximately 400 kW of power, and the Detroit Diesel model makes up the remaining installed power.

YECL operates 12 diesel fuelled generation plants which had a net generation of 22 GWh/yr in 2004 and which are estimated by YECL to produce 16,480 tonnes of CO_2 in that year[3] (YECL website, 2006).

New mines in the Project Study Region are also planned to use on-site diesel generation until such time as the Project can deliver grid power supplies:

- **Minto Mine**: At least three Caterpillar 3516 diesel generators are planned at the site with a continuous rating of 1600 kW per generator. Annual power generation is projected currently at 24.6 GW.h in the first 12 months of operation (starting in spring/summer 2007) and at 32.5 GW.h when full production levels occur (i.e., for at least the following six years of operation).
- **Carmacks Copper Mine**: Based on earlier feasibility studies, over 9 MW of diesel generation capacity would be needed at this site during production, with annual power loads of about 48 GW.h. The earliest possible production would be in 3rd quarter of 2008; mine life has been estimated at about 8 years.

The Minto mine at full production anticipates utilizing 32.5 GWh of electrical energy in a year; using diesel generators this power load would require about eight to nine million litres diesel fuel per year. Based on an average production of 2.73 kg/l of CO_2 for diesel fuel (Environment Canada, 2002) the total output of CO_2 would be approximately 23, 000 tonnes per year. This is almost one and a half times the amount of CO_2 produced by all of YECL's diesel generators in one year. If Carmacks Copper Mine goes into production, the CO_2 emissions from that mine would be about 1.5 times those of Minto mine.

In the past, the availability of grid power has created benefits in terms of cleaner energy options for communities and for industrial operations that has helped to reduce CO_2 emissions and greenhouse gases. Past development of the Mayo Dawson transmission line contributed to a reduction in CO_2 production through making grid power available and allowing 15 GWhs/yr of diesel generation to be retired.

In addition to CO_2 gases, Nitrogen Oxides (NOx) are a group of highly reactive gases composed of varying amounts of nitrogen and oxygen (United States Environmental Protection Agency, 2006). Examples of typical NOx emissions include emissions produced from automobile use, electrical utilities and other industrial, commercial and residential sources that burn fuels. A typical "uncontrolled" diesel

[3] This includes Watson Lake and smaller isolated diesel served communities served by YECL (including Pelly Crossing).

generator set is expected to release 10 – 14 grams of NOx per horsepower depending on the unit's horsepower rating (Houston Advanced Research Center, 2003). Appendix 6B illustrates a summary of estimated emissions for a typical diesel generation facility, similar to those in use in Pelly Crossing, or what may be used at Minto mine or Carmacks Copper mine.

The Annual Yukon Development Corporation Progress Reports describe the results of efforts taken to reduce greenhouse gas in operations across the Territory. This represents the contributions by the Yukon Territory to a national effort to reduce the production of greenhouse gasses across Canada. According to the 2005 Yukon Development Corporation Progress Report, the total greenhouse gas emissions released for 2004 were as follows: 1,288,814,545 g of CO_2, 2,732 g CH_4 and 5,920 g of N_2O (Yukon Development Corporation, 2005). Since these emissions are only measured by the Yukon Territorial Government in Whitehorse and at industrial sites, specific levels of emissions for the some of the communities along the Route Study Area are not known.

6.2.2 Terrestrial Environment

This section considers the existing Terrestrial Environment in the Project Study Region, focusing on vegetation, incidence of historic wildfires, and wildlife found in the Project Study Region.

6.2.2.1 Vegetation

Most of the Route Study Area falls within the Yukon Plateau (Central) Ecoregion; only the final approximately 20 km of the CS line in the Stewart Crossing area fall within the Yukon Plateau (North) Ecoregion. The vegetation along the Route Study Area is shown on the Vegetation Maps (Appendix 6C)[4].

The very dry south-facing and west-facing slopes that support extensive grassland communities are notable features of the Yukon Plateau (Central) Ecoregion. These steep, grassland slopes sometimes extend from the valley floor to the alpine. Typical species of these grasslands are sagewort, rose, juniper, kinnikinnick and a number of grasses.

Lodgepole pine often invade burnt over areas, but are in competition with deciduous trees (such as aspen) on moist to wet sites. Mixed deciduous and coniferous forests exist in areas where fire has not occurred for many years. The tree canopy may include lodgepole pine and trembling aspen, with white spruce slowly prevailing in the understory overtime. These areas may include a shrub layer of willow, alder, highbush cranberry, wild rose, and Labrador tea. Bog blueberry, red bearberry, crowberry and lingonberry may also occur. A continuous moss layer, dominated by feathermoss with some sphagnum moss is present.

Black spruce forests are prevalent on undisturbed, colder, north-facing slopes with permafrost. The communities are dominated by black spruce have an understory of scrub, willow, Labrador tea, birch, willow, and shrubby cinquefoil. These are also areas where bog blueberry, crowberry, read bearberry, cloud berry, and lousewort can occur. There is usually extensive moss cover in these areas, typically dominated by sphagnum moss and feathermoss.

[4] These are a series of seven maps which include forest cover and potential locations for rare plants and are based on NTS map sheet numbers. For consistency and brevity, these maps will be referred to as Vegetation Maps.

Aspen grows on sites with finer soils on steep south-facing slopes. Typically, as the soil quality becomes poorer, the understory in such areas becomes less dense. Where favourable conditions exist, willow, wild rose, Labrador tea, and soapberry are often present. Groundcover is comprised of variable amounts of lingonberry, kinnikinnick and moss.

Environment Yukon's Conservation Data Centre prepared a short list of rare plant species possibly occurring in this region, which are summarized by Table 6.2-7. The list includes grassland, wetland and forest edge species.

Table 6.2-7
Potential Rare Plants in the Project Study Region

Family	Species	Common Name	Habitat	Rarity Ranking
Polypodiaceae	*Polypodium sibiricum*	wall fern	forest edge	G5 S1
Ruppiacea	*Ruppia spiralis*	ditch grass	wetland	G5 S3
Alismataceae	*Saggitaria cuneata*	arrowhead	wetland	G5 S2
Poaceae	*Koeleria asiatica*	June grass	grassland	G4 S2
Poaceae	*Koelaria macrantha*	June grass	grassland	G5 S2
Poaceae	*Muhlenbergia richardsonis*	mat muhly	grassland	G5 S2
Poaceae	*Scolochloa festucaceae*	sprangletop	wetland	G5 S1
Poaceae	*Glyceria borealis*	northern manna grass	wetland	G5 S3
Poaceae	*Helictotrichon hookeri*	spike oat	grassland	G5 S2
Cyperaceae	*Carex viridula* ssp. *viridula*	green sedge	wetland	G5 S2
Cyperaceae	*Trichophorum pumilum*	tufted bulrush	wetland	G4 S2
Iridacea	*Sisyrinchium montanum*	blue-eyed grass	grassland	G5 S2
Orchidaceae	*Cypripedium guttatum*	spotted lady's-slipper	forest edge	G5 S2
Hydrophyllaceae	*Phacelia mollis*	scorpion weed	grassland	G3 S2
Apiaceae	*Cicuta maculata* var. *angustifolia*	spotted water-hemlock	wetland	G5 S2
Apiaceae	*Sium suave*	water-parsnip	wetland	G5 S2
Santalaceae	*Comandra umbellata*	pale comandra	grassland	G4 S2
Violaceae	*Viola langsdorfii*	Alaska violet	forest edge	G4 S3
Caryophyllaceae	*Silene williamsii*	campion	talus slope	G5 S2
Rosaceae	*Rosa woodsii*	western rose	grassland	G5 S2
Rosaceae	*Geum triflorum*	prairiesmoke	forest edge	G5 S1
Asteraceae	*Haplopappus macleanii*	haplopappus	grassland	G2 S2
Asteraceae	*Antennaria microphylla*	rosy pussytoes	grassland	G5 S2
Asteraceae	*Artemisia laciniata*	wormwood	grassland	G5 S1

Table 6.2-7 Notes:

Global Rankings

G1 Critically imperilled globally
G2 Imperilled globally
G3 Either very rare and local throughout its range or found locally in a restricted range
G4 Apparently secure globally
G5 Demonstrably secure globally

Regional Rankings

S1 Critically imperilled in territory because of extreme rarity or because of some factors making it especially vulnerable to extirpation from the territory (1-6 locations)
S2 Imperilled in territory because of its rarity or because of some factors making it very vulnerable to extirpation from the territory (7-20 locations)
S3 Rare or uncommon in the territory (21-100 locations)
S4 Apparently secure in the territory, with many occurrences (100+ locations)
S5 Demonstrably secure in the territory, with many occurrences

(Source: B.A. Bennett on behalf of NatureServe Yukon - June 9, 2006)

Several sites along the Route Study Area were identified through air photo interpretation as having the potential for rare plant occurrences (Vegetation Maps – Appendix 6C). In the Project Site Area these locations include wetlands (14 potential sites), creek crossings (4 potential sites) and grassland areas (5 potential sites).

There is limited forest cover in the Route Study Area. The Vegetation Maps located in Appendix 6B are used to provide only approximate values of types of vegetative cover in the Route Study Area. Using mapping tools and measuring the areas of vegetative cover for the Route Study Area delineated on the Vegetation Maps, the following provides rough estimates which suggest percentages of the forest cover types for the Route Study Area:

- 54% forest cover
- 36% not sufficiently regenerated from forest fires
- 6% non-productive
- 4% wetlands

Estimated Volume Potential Maps produced by Yukon Forest Management Branch (Maps 6-1 and 6-2 on Map Folio CD) for the CS transmission line suggest that the majority of the area has either low timber potential, or has not recovered from forest fires. Yukon Forest Management Branch is unable to provide information with regard to forest cover where Category A and Category B Settlement Lands are located, thus where the Route Study Area intersects Category A or Category B Settlement Lands there is no available information with regard to timber potential (with the exception of knowledge on recently burnt areas). The Yukon Forest Management Branch maps suggest that approximately six percent of the Route Study Area has medium timber potential, while only three percent has high timber potential.

CS Line Segment 1: Carmacks to McGregor Creek

According to rough estimates taken from the Vegetation Maps (Appendix 6C) there are 21 km of forested land, 10 km of non-productive land and 0.5 km of wetland in the Route Study Area in CS Line Segment 1 extending from Carmacks to McGregor Creek.

While much of the area around Carmacks is comprised of forest cover, the vicinity around Tantalus Butte has some non-productive land. Vegetation Maps (Appendix 6C) delineate one small area of rare plant potential in the vicinity of Tantalus Butte and near the Yukon River, and another small area of rare plant potential intersected by the Route Study Area east of Tantalus Butte and just north of the Carmacks airfield. Estimated Volume Potential Maps (Maps 6-1 and 6-2 on Map Folio CD) also delineate that the area north of Carmacks airfield has some low greenwood volume potential.

North of the Tantalus Butte area the Estimated Volume Potential Map (Map 6-1 on Map Folio CD) notes areas of medium greenwood potential with three small areas of high greenwood potential located east of the Klondike Highway and within the Route Study Area. As the Route Study Area nears Tatchun Creek[5], the estimated volume potential map (Map 6-1 on Map Folio CD) delineates areas of mostly low and medium greenwood potential in the Route Study Area, as well as areas of non-productive land. At Tatchun Creek there are three small areas of high greenwood potential south of the Klondike Highway as it bends to the east in the vicinity of Tatchun Creek and east of the highway as it bends north, which are delineated on the Estimated Volume Potential Map before the Route Study Area intersects settlement land on the north side of Tatchun Creek (Map 6-1 on Map Folio CD). There is no data available with regard to estimated volume potential once the route intersects settlement land.

Where the route proceeds through the Tatchun Creek area it also intersects various small creek crossings. In this area there is a cluster of four sites where rare plants may potentially be found, located mostly in creek crossing areas. As the route proceeds north from Tatchun there is an area of wetland located outside the Route Study Area. From Tatchun to McGregor Creek the Route Study Area is comprised mostly of forest cover with some small areas of non-productive land. Between Tatchun and McGregor Creek, Vegetation Maps 115 I/07 and /08 (Appendix 6C, Map 6C-2) indicate two areas where rare plants may be located.

Estimated Volume Potential Maps (Maps 6-1 and 6-2 on Map Folio CD) indicate that as the Route Study Area emerges from settlement land and continues northwest towards McGregor Creek it intersects mostly medium and low volume potential greenwood and some areas of non-productive land. As the route approaches McGregor Creek there are three areas of high volume potential greenwood located east of the Klondike Highway.

CS Line Segment 2: McGregor Creek to Pelly Crossing

According to rough estimates taken from the Vegetation Maps (Appendix 6C) there are 22 km of forest cover, 0.5 km of lake or river, 1 km of wetland and 34 km of not sufficiently regenerated land in the

[5] Tatchun Creek, on some maps, may also be referred to as the Tatchun River.

Route Study Area (resulting from the 1995 forest fire near Pelly Crossing) in CS Line Segment 2 extending from McGregor Creek to Pelly Crossing.

McGregor Creek to Lhutsaw

In the immediate vicinity of the McGregor Creek crossing there are areas of mostly low and medium volume greenwood potential. Vegetation Map 115 I/07 and /08 (Appendix 6C Map 6C-2), delineates two areas within the Route Study Area from McGregor Creek to Minto Landing where rare plants may be found. Although the area around McGregor Creek is mainly forested, starting four miles north of this location, and continuing north towards Minto, most of the Route Study Area crosses through non-productive land with some isolated pockets of low and/or medium greenwood volume potential. The Route Study Area intersects settlement land at McCabe Creek and no further greenwood volume potential data is available for most of the areas from this location until the route passes the Minto area (see Estimated Volume Potential Maps 6-1 and 6-2 on Map Folio CD).

It is recognized that a large proportion of the area around Minto Landing is not sufficiently regenerated from previous forest fire activity. As the route proceeds directly north just past Minto Airfield, there is an area where rare plants may be found on the eastern edge of the Route Study Area in the vicinity of Von Wilczek Creek.

Lhutsaw Wetland Protection Area

Vegetation Map 115I/10 (Appendix 6C Map 6C-3) delineates that as the Route Study Area proceeds from Minto north-east towards Six Mile Lake it passes the Lhutsaw Wetland Habitat Protection Area and intersects land that is mostly not sufficiently regenerated from past forest fire activity. There are two areas of wetland located east of the Route Study Area as it approaches the Lhutsaw Wetland Habitat Protection Area[6]. West of these two wetland areas and within the Route Study Area there is an area where rare plants may potentially be found; Vegetation Map 115 I/10 (Appendix 6C Map 6C-3) indicates another area where rare plants may be found in the Route Study Area west of the Lhutsaw Wetland Habitat Protection area as the route proceeds north-east towards Six Mile Lake.

As the Route Study Area exits settlement land and proceeds towards the north-east extent of the Lhutsaw Wetland Habitat Protection Area, it intersects mainly forest cover that may be characterized as mostly non-productive land with low greenwood volume potential. (see Estimated Volume Potential Maps 6-1 and 6-2 on Map Folio CD).

In the vicinity of No Name Lake and Six Mile Lake, Vegetation Maps delineate two areas where rare plants may be located and which partially fall within the Route Study Area (Vegetation Map 115I/15 and 115I/16 (Appendix 6C Map 6C-5)). As the Route Study Area proceeds north towards Pelly Crossing there is an area where rare plants may be located one kilometre to the east of the Route Study Area (Vegetation Map 115 I/15 and 115I/16 (Appendix 6C Map 6C-5)).

[6] Listed in the Yukon Gazetteer as Von Wilczek Lakes, but locally referred to, and designated as a habitat protection area as Lhutsaw Wetland.

Six Mile Lake to Pelly Crossing

Approximately one to two kilometres from Pelly Crossing, Vegetation Map 115I/15 and 115I/16, (Appendix 6C Map 6C-5) indicates an area of wetland east of the Route Study Area which runs parallel to the Pelly River. At a creek crossing between one and two kilometres south from where the route crosses the Pelly River there is an area where rare plants may be located. Just after crossing Pelly River, there is another area with potential rare plants to the northwest of the Route Study Area (Vegetation Map 115I/15 and 115I/16 (Appendix 6C Map 6C-5)). The Route Study Area re-enters settlement land again just before Pelly Crossing and in the area of Pelly Crossing no further information on estimated greenwood volume potential is available.

CS Line Segment 3: Pelly Crossing to Stewart Crossing

According to rough estimates taken from the Vegetation Maps (Appendix 6C) there are 53 km of forest cover, 8 km of not sufficiently regenerated land, 5 km of wetland and 3 km of non-productive land in the Route Study Area in CS Line Segment 3 extending from Pelly Crossing to Stewart Crossing.

Starting from Pelly Crossing the Route enters into settlement land and data on greenwood volume potential is unavailable. Where the Route Study Area emerges from settlement land, there are isolated pockets of low volume greenwood potential (see Map 6-2 on Map Folio CD).

From Pelly Crossing to Stewart Crossing the Route Study Area crosses through mostly forest cover. Approximately five kilometres from Pelly Crossing the Route Study Area intersects an area of not sufficiently regenerated land. The route proceeds through this area for roughly three kilometres, before proceeding north towards Stewart Crossing through mostly forest cover. Vegetation Map 115I/15 and 115I/16 (Appendix 6C Map 6C-5) delineates that the Route Study Area crosses an area of wetland for about one kilometre. In this area of wetland cover, there are two areas where the Route Study Area intersects locations where rare plants may be found. These are indicated at the northern extent of Vegetation Map 115I/15 and 115I/16 (Appendix 6C Map 6C-5).

As the Route Study Area proceeds north towards Stewart Crossing it intersects mostly forested area; however, Vegetation Map 115I/15 and I/16, (Appendix 6C Map 6C-5) indicates that the route will cross some wetland areas which extend from the west of Diamain Lake, into the Route Study Area, running parallel to the Route Study Area as it proceeds North toward Stewart Crossing. North of this wetland location, Vegetation Map, 115P/01 and 115P/02 (Appendix 6C Map 6C-6) notes a large area of wetland that is located mostly to the west of the Route Study Area. This same Vegetation Map indicates seven small locations where rare plants may be found that are intersected by the Route Study Area as it runs north towards Stewart Crossing.

Vegetation Map 115P/07 (Appendix 6C Map 6C-7) indicates that the Route Study Area crosses mainly forest cover as it approaches Stewart Crossing; however it does cross a small pocket of not sufficiently regenerated area near North Crooked Creek. The Route Study Area also intersects two areas of non-productive land. There are two areas where rare plants may be found in the vicinity of Stewart Crossing located on the western edge of the Route Study Area on the south side of the Stewart River.

Estimated Volume Potential Maps (Maps 6-1 and 6-2 on Map Folio CD) indicate some areas of high volume greenwood potential on the eastern side of the Route Study Area and east of the Klondike Highway where it runs parallel to Crooked Creek. Proceeding north towards Stewart Crossing the Route Study Area passes through mostly non-productive land and areas of low volume greenwood potential, with two smaller areas of medium volume greenwood potential. At Stewart Crossing there is an area of high volume greenwood potential west of the Klondike Highway.

Minto Spur Line

Those areas around Minto Landing that are not covered by settlement land are comprised of mostly non-productive land (Map 6-1 on Map Folio CD). According to rough estimates taken from Vegetation Map 115I/11 (Appendix 6C Map 6C-4) there are 27 km not sufficiently regenerated land, 5 km of forest cover and 1 km of wetland in the Minto Spur Route Study Area.

While, most of the MS Route Study Area crosses through not sufficiently regenerated land, there is a large area of forest cover west of the Klondike Highway and south of the MS Route Study Area. There is also a small area of forest cover where the MS Route Study Area intersects the Yukon River. As the MS Route Study Area proceeds west there is another small area of forest cover in the vicinity of Big Creek. There is also an area of wetland around Big Creek and another area of wetland where Minto Creek intersects the MS Route Study Area near the Yukon River. Vegetation Maps 115I/10 (Appendix 6C Map 6C-3) and 115I/11 (Appendix 6C Map 6C-4) indicate no potential for rare plants in or near the MS Route Study Area.

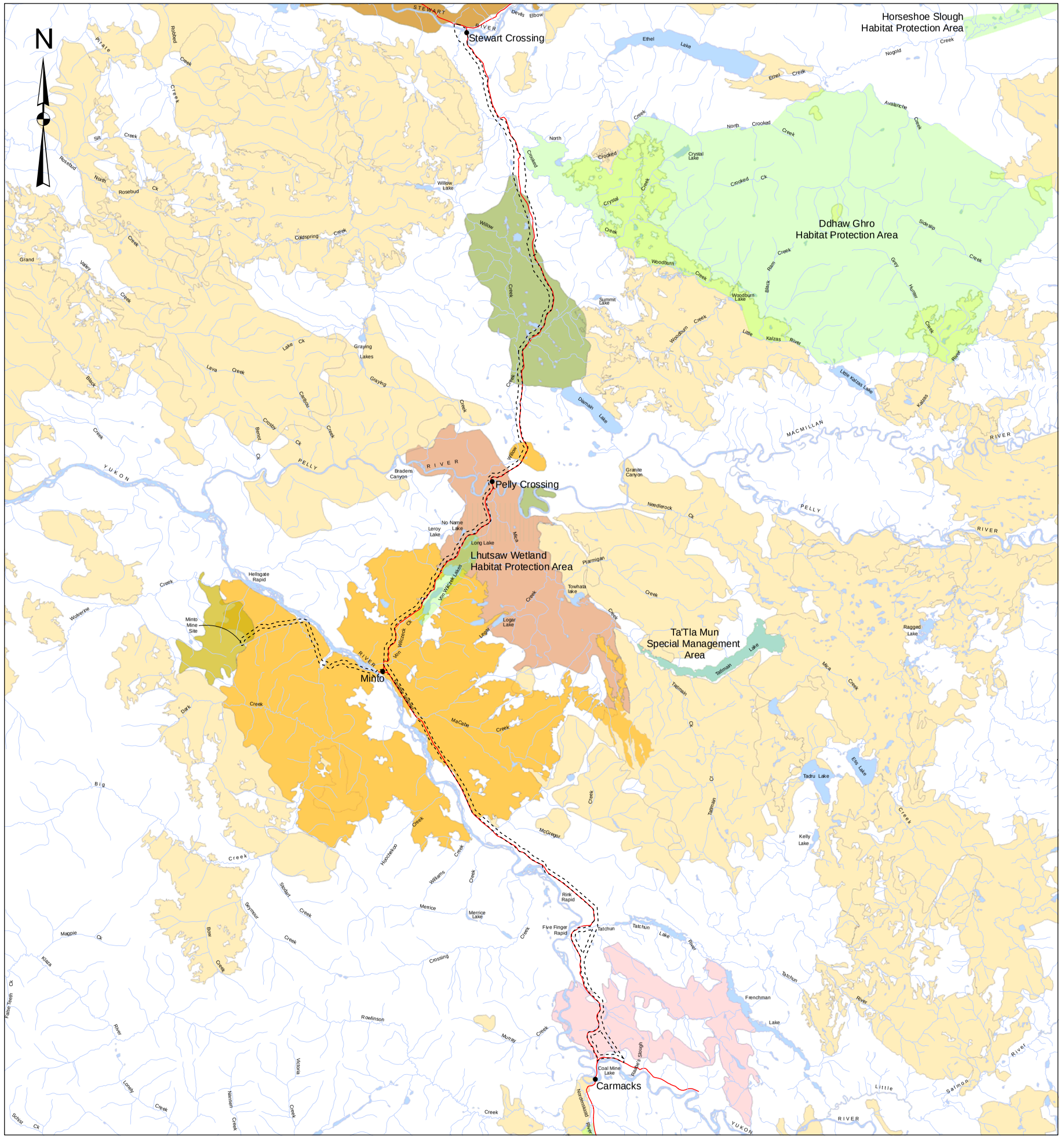
6.2.2.2 Historic Wildfires In Project Study Region

Several wildfires have occurred in the area both surrounding and intersecting the proposed transmission line routes. Figure 6.2-3 presents a map of the burned areas.[7] The following list describes the year the fires occurred, the locations of the fires and the total hectares burned:

- The earliest fire noted occurred in 1950 around the northern shores of Diamain Lake; the burned area extends to the north on both sides of the Klondike Highway for 25,897 hectares (63,992 acres). It is intersected by the proposed CS route.
- In 1951, a fire was recorded near Stewart Crossing and a burned area of 40,178 hectares (99,280 acres) lies mainly on the north side of the Stewart River. The proposed route extends to within 250 metres of the burned area but does not intersect it.
- A 1958 fire occurred north of Carmacks with a burn area of 25,402 hectares (62,770 acres), extending to the east of the proposed corridor; it is intersected by the CS route.
- In 1969, a fire burned an area of 44,174 hectares (109,154 acres) on both sides of the Klondike Highway between Lhutsaw Wetland Habitat Protection Area up to just north-west of Pelly Crossing. The burned region is oriented in a northwest-southeast direction. The CS route crosses through this 1969 burn.

[7] Source: Yukon Fire History Data acquired from Wildland Fire Management, Protective Services Branch, Government of Yukon, December 2005.

- In 1980, a fire burned a 7,236 hectare (17880 acre) area west of Minto Creek and south of the Yukon River. This area surrounds the Minto Mine site.
- In 1983, a 3,048 hectare (7530 acre) fire occurred west of the Yukon River, and approximately 11 kilometres south by south-east of Minto Landing.
- In 1995, three fires were recorded for the Project Study Region. A 1,194 hectare (2950 acre) fire burned across the Klondike Highway and the proposed transmission corridor north of Pelly Crossing. A 55,521 hectare (137,193 acre) area south of Minto Landing and a 58,852 hectare (145,423 acre) area east of the Yukon River in the same region were also burned in 1995. The CS Route Study Area crosses through this Minto Burn area from north of McGregor Creek all the way to the Lhutsaw Wetland Habitat Protection area; and the MS Route Study Area crosses through the Minto Burn area west of the Yukon River for the majority of its length.



Carmacks-Stewart/ Minto Spur Transmission Project

YUKON ENERGY

Legend

- Town
- Route Study Area
- Road
- Water Course
- Water Body
- Parks and Protected Areas

Areas Impacted by Fire (by Year)

- 1950
- 1951
- 1958
- 1969
- 1980
- 1995
- Other Fire Years

Digital Data Source:

Yukon Fire History Data aquired from Wildland Fire Management, Protective Services Branch, Government of Yukon December 2005.

Parks and Protected Areas data downloaded (January 2006) from Yukon Department of Environment website: http://environmentyukon.gov.yk.ca/geomatics/govdata.html Source: Geomatics, Environment, Yukon Government

National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:250,000. Reproduced under license from © Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Route study area obtained from YEC, 2006.

NTS Sheets 115I, 115P, 105L, 105M
UTM Zone 8 NAD83

Fire History

Scale: 1:275,000
(when plotted at 24"x28", orginal map on cd provided with final document)

0 2.5 5 10 15 20 25 km

Drawn By: HD
Checked By: DC/NL
Date: August 2006

InterGroup CONSULTANTS
ACCESS CONSULTING GROUP

Our File: D:\Project\AllProjects\YEC-05-01 CarmStewTransLine\gis\mxd\YESAA_Report\Fall2006\Environmental\FireHistory.mxd

6.2.2.3 Wildlife

There are a wide variety of habitats for a large number of mammals, migratory and other birds, and fish in Yukon. This section reviews **Wildlife Key Areas** (**WKAs**) in the Project Study Region, and non-aquatic wildlife VCs under the following headings:

- **Large Mammals** (mule deer, moose, woodland caribou, mountain sheep, grizzly bear, wood bison)
- **Small Furbearing Mammals**
- **Migratory Waterfowl**
- **Raptors**
- **Other MS development wildlife**

Mammals present in Yukon are divided into carnivores, hoofed mammals, rodents and other animals.

- Carnivores may be described as any mammal whose primary food source is the tissue of other animals. Carnivores found throughout the Yukon include arctic and red foxes; black, grizzly and polar bears; coyotes; fishers; lynx; martens; mink; river otters; weasels and wolverines.
- The hoofed mammals group includes caribou, elk, moose, mountain goats, mule deer, muskox, thin-horn sheep and wood bison.
- The Yukon Government Department of the Environment indicates that rodents present in the territory include beavers; least chipmunks; lemmings; deer mice and jumping mice; hoary marmots; wood rats; arctic, ground, northern and red squirrels; voles and woodchucks.
- The category of other mammals includes little brown bats, snowshoe hares, collared pikas, seals, and shrews.

(WKA's)

WKA's are known, important habitats for primarily avian and terrestrial wildlife species indigenous to the region. The data base has not been upgraded for some time (Personal communication, Environment Yukon, July 10, 2006) and key areas are subject to revision as new information is made available. The definition of WKA's is consequently an expanding and continuing work in progress. Tables 6.2-8 to 6.2-11 provide a brief description of the species in the Project Study Region, and further details on the WKA's listed can be found in Reference Materials 6R-3. Figure 6.2-4 presents a map of WKA's.

Table 6.2-8
Wildlife Key Areas in the Project Study Region
CS Line Segment 1: Carmacks to McGregor Creek

WKA #	Species	Season	Function	Source	General Location
1088	Mule Deer	winter (Oct-Apr)	range	anecdotal	Carmacks
1925	Bison	year round	all functions	anecdotal	Carmacks
1347	Bald Eagle	summer(Jun-Aug)	reproduction (birth, nest)	field survey[2] (May 31, 1991)	Carmacks
1347	Golden Eagle	summer (Jun-Aug)	reproduction (birth, nest)	field survey[2] (May 31, 1991)	Carmacks
1936	Woodland Caribou	winter (Oct-Apr)	range	field survey[2] (Nov. 22, 1994)	Tatchun River
1926	Bison	year round	all functions	anecdotal	Tatchun Lake
1348	Bald Eagle	summer (Jun-Aug)	reproduction (birth, nest)	field survey[2] (May 31, 1991)	Tatchun Lake

Table 6.2-9
Wildlife Key Areas in the Project Study Region
CS Line Segment 2: McGregor Creek to Pelly Crossing

WKA #	Species	Season	Function	Source	General Location
1900	Duck[1]	fall (Aug-Oct)	stage	field survey[2] (Mar. 20, 1994)	Von Wilczek Lakes
1900	Duck[1]	summer (Jun-Aug)	moult	field survey[2] (Mar. 20, 1994)	Von Wilczek Lakes
1900	Duck[1]	summer (Jun-Aug)	reproduction (birth, nest)	field survey[2] (Mar. 20, 1994)	Von Wilczek Lakes
1350	Alpine Raptor	summer (Jun-Aug)	reproduction (birth, nest	field survey[2] (Nov. 12, 1990)	McCabe Creek
1345	Riparian Raptor	summer (Jun-Aug)	reproduction (birth, nest)	field survey[2] (Nov. 12, 1990)	Legar Lake
1344	Golden Eagle	summer (Jun-Aug)	reproduction (birth, nest)	field survey[2] (May 31, 1991)	Hoochekoo Creek

Table 6.2-10
Wildlife Key Areas in the Project Study Region
CS Line Segment 3: Pelly Crossing to Stewart Crossing

WKA #	Species	Season	Function	Source	General Location
987 and 988	Duck[1]	fall (Aug-Oct)	stage	field survey[2] (Apr. 1, 1991)	Willow Creek
987 and 988	Duck[1]	spring (Apr-Jun)	stage	field survey[2] (Apr. 1, 1991)	Willow Creek
1934	Woodland Caribou	winter (Oct-Apr)	range	field survey[2] (Nov. 22, 1994)	Ethel Lake
104	Black Bear	spring (Apr-Jun)	range	anecdotal	Stewart Crossing

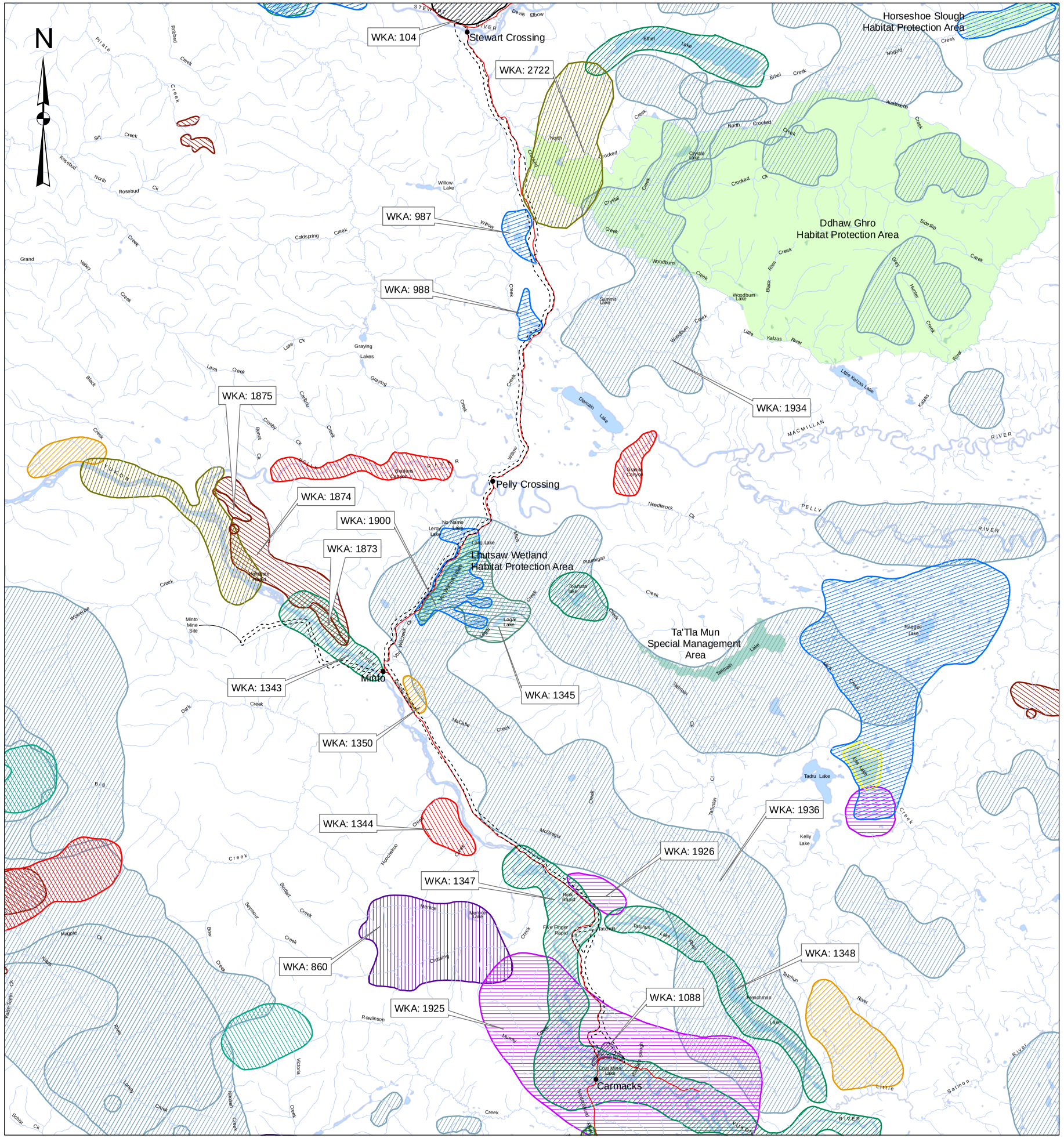
Table 6.2-11
Wildlife Key Areas in the Project Study Region
Minto Spur Line Segment

WKA #	Species	Season	Function	Source	General Location
1343	Bald Eagle	summer (Jun-Aug)	reproduction (birth, nest)	field survey[2] (May 31, 1991)	Minto
1343	Golden Eagle	summer (Jun-Aug)	reproduction (birth, nest)	field survey[2] (May 31, 1991)	Minto
1343	Peregrine Falcon	summer (Jun-Aug)	reproduction (birth, nest)	field survey[2] (May 31, 1991)	Minto

1 Species description as described in Yukon Wildlife Key Areas – Summary of Wildlife Values. No further species detail breakdown is currently available from the Habitat and Endangered Species Management Section, Department of Environment, Government of Yukon.

2 Field Survey Data - Habitat and Endangered Species Management Section, Department of Environment, Government of Yukon

(Source: Yukon Wildlife Key Area Application, July 10, 2006)



Carmacks-Stewart/ Minto Spur Transmission Project

YUKON ENERGY

Legend

- Town
- Route Study Area
- Road
- Water Course
- Water Body
- Parks and Protected Areas

Wildlife Key Area

Alpine Raptor	Duck	Muskrat
Bald Eagle	Golden Eagle	Peregrine Falcon
Beaver	Gyrfalcon	Riparian Raptor
Bison	Moose	Thinhorn Sheep
Black Bear	Mule Deer	Woodland Caribou

Wildlife Key Areas compiled by Habitat & Endangered Species Management, Yukon Department of Renewable Resources (December 2005), against 1:250,000 NTDB from various data sources. Key Areas are based on observed locations of wildlife at key times of the year, not on habitat capacity. Boundaries and designations of Key Areas are subject to revision as new information becomes available. It is important to remember that the Key Area database includes only those areas that the Yukon Department of Renewable Resources knows about, and that this knowledge base is constantly changing. At any time, it is likely that there are other areas that should be included in the database. Furthermore, Key Areas are not the only important areas for wildlife. If you have questions or would like to contribute to the Yukon Wildlife Key Area database, please contact the Yukon Department of Renewable Resources (email: wka@gov.yk.ca).

Digital Data Source:

Wildlife Key Area data and application downloaded from Yukon Department of Environment website: http://www.environmentyukon.gov.yk.ca/geomatics/data/wildlife-key-area.html (version December 2005) Source: NatureServe, Environment, Yukon Government

Parks and Protected Areas data downloaded (January 2006) from Yukon Department of Environment website: http://environmentyukon.gov.yk.ca/geomatics/govdata.html Source: Geomatics, Environment, Yukon Government

Route study area obtained from YEC, 2006.

NTS Sheets 115I, 115P, 105L, 105M
UTM Zone 8 NAD83

Wildlife Key Areas

Scale: 1:275,000
(when plotted at 24"x28", orginal map on cd provided with final document)

0 2.5 5 10 15 20 25 km

Drawn By: HD
Checked By: DC/NL
Date: August 2006

InterGroup CONSULTANTS
ACCESS CONSULTING GROUP

Our File: D:\Project\AllProjects\YEC-05-01 CarmStewTransLine\gis\mxd\YESAA_Report\Fall2006\Environmental\WildlifeKeyAreas.mxd

Large Mammals

A definition regarding what constitutes a large or small mammal is relative to the sample area. Examples of large mammals found in the Project Study Region are grizzly bear, moose, mountain sheep, mule deer, wood bison and woodland caribou. Both herbivorous and carnivorous large animals are indicators of ecosystem health. Large predators are usually top predators and depend upon the success of species lower on the food chain. Large herbivores provide food for a number of large predators and the remains of these kills provide smaller carnivores and scavengers with sustenance.

Each of the above mentioned Large Mammals is described in detail below. Details noted are general habitat, **Committee on the Status of Endangered Wildlife in Canada** (**COSEWIC**) status (COSEWIC, 2006) and some key regional notes and available survey information.

Mule Deer:

- COSEWIC status: No entry
- Yukon Wildlife Act status: Specially Protected (at risk in the Yukon but not elsewhere)

Mule deer can be found in the southern Yukon, as far north as the Pelly River; their populations also extend to the east as far north as the Ross River. Mule deer frequent mountainous terrain, open woodlands and grassy areas broken by dense stands of aspen. Habitats must contain an adequate supply of plant food combined with an escape route into moderately thick tree cover. Mule deer summer at higher elevations and winter in lower, less snowy areas.

Referring to the Wildlife Key Areas Map, Figure 6.2-4, mule deer populations (WKA 1088) may be found at the southern extent of the proposed Route Study Area, just north of Carmacks.

Empirical population and demographic information on mule deer is virtually non-existent. M. Hoefs(2001), provides a considered guess of 500 to 800 mule deer in suitable habitats in the southern Yukon. Despite their Yukon Species-at-Risk status, the Government of Yukon, with approval of the Game Management Board, has implemented a limited hunt for ten male mule deer for the 2006 hunting season.

WKA 1088, located on the south slope of Tantalus Butte, is the only such notation in proximity to the Project. The small area indicated is misleading, and mule deer are known to range at least as far as the mouth of Little Salmon River (Grant Lortie, personal observation, June 2001) and as far north as Minto Landing (Grant Lortie, personal observation, July 2003). At lower density they are known to range as far north as Stewart Crossing (Hoefs, 2001).

Further, occasional mule deer observation along the Free Gold Road, west of the Yukon River in the Murray Creek area, (Personal communication, Environment Yukon, July 28, 2006) reveals their populations may extend, sporadically, as far west as Upper Big Creek near Prospectors Mountain (P. Percival, personal. communication., July 15, 2006). These range extensions do not imply a continuous distribution, but suggest an increasing population expanding into suitable pockets of habitat.

Moose:

- COSEWIC status: not at risk
- Yukon Wildlife Act status: not at risk

Moose inhabit the entire Yukon, but are most numerous in the south. Yukon Fish and Wildlife Branch estimate that, "approximately 65,000 to 70,000 moose live within the boundaries of the Yukon Territory (Environment Yukon, 2006). Moose in the Yukon can be found at treeline, in shrub areas and sub-alpine environments. Moose can also be found in marshy regions and along the edge of slow flowing rivers.

Moose occupy the entire Project Study Region at average densities (approximately 150/1000 sq km) east of the Klondike Highway, and at below average densities west of the highway (40-145/1000 sq km).

Survey Area 17 (Carmacks West) last surveyed in 2003:

- Density: 40/1000 sq km
- Population Trend: unknown
- Population Estimate: 215

Survey Area 23 (Pelly River) last surveyed in 2000:

- Density: 150/1000 sq km
- Population Trend: stable to increasing
- Population Estimate: 3062

Survey Area 28 (Lower Stewart River) last surveyed 2001:

- Density 115/1000 sq km
- Population Trend: Stable
- Population Estimate: 653

Survey Area 29 (Upper Klondike Highway) last survey 2002:

- Density: 145/1000 sq km
- Population Trend: unknown
- Population Estimate: 846

Survey Area 18 (Mayo) last surveyed 1998:

- Density: 155/1000 sq km
- Population Trend: unknown
- Population Estimate: 319

(Source: Personal Communication, Environment Yukon, June 28, 2006).

Wildlife Key Area 860 to the west of the Yukon River (see Figure 6.2-4) has been identified as being in proximity to the Project. Riparian areas including islands along the Yukon River and major tributaries are important calving and early rearing habitat in May and June.

Woodland Caribou:

- COSEWIC status: species of special concern
- Yukon Wildlife Act status: not listed

In winter months the woodland caribou occupy coniferous forests near wetland environments and in summer months herds may be found in areas recovering from logging activities or fire. Woodland caribou in northern mountain regions may be found in lower–altitude, mature lodge-pole pine stands, feeding on both terrestrial lichen and tree lichen or, at higher elevations on windswept slopes where terrestrial lichen is available (Environment Canada, 2006(a))

The Project intersects the winter ranges of two woodland caribou populations: the Ethel Lake herd southeast of Stewart Crossing and the Tatchun Herd north east of Carmacks.

Tatchun Caribou Herd:

A population estimate of 300 made in 1995 (Department of the Environment, Fish and Wildlife Branch, 1996) has been upgraded to 500 animals in more recent surveys (Personal communication, Environment Yukon, June 28, 2006). Perhaps as a result of this population increase, a recent extension of mapped, winter range (WKA 1936) into the area east of the Klondike Highway between Mt. Milton and Lower Tatchun Creek has been documented. This winter range extension is confirmed by telemetry data (Personal communication, Environment Yukon, June 28, 2006 and Personal communication, Environment Yukon, June 27, 2006). Summer range, calving and post-calving areas, and rut areas are all seasonal activities occurring well to the east of the Route Study Area.

WKA 1936 (see Figure 6.2.4) crosses the Klondike Highway and the proposed hydro line ROW north of Minto Landing and overlaps the Lhutsaw Wetland Habitat Protection area. Burned in the summer of 1995, this area is not used as winter range as frequently in post fire years (Personal communication, Environment Yukon, July 27, 2006); however some use of the area can be expected with infrequent crossings from October through April. In 1998, three sub-adult males were observed west of the road in early May (Grant Lortie, personal observation, 1998).

Ethel Lake Herd:

Numbering 300 animals in a 1995 Yukon Government Wildlife Survey (Department of the Environment, Fish and Wildlife Branch, 1996), this small, stable population winters in WKA 1934 east of the Route Study Area and North of Pelly Crossing; however, there has been a recent winter range extension stretching west across the Klondike Highway and the proposed CS Route Study Area and into the wetland complex identified as WKA 987 (Personal communication, Environment Yukon, June 27, 2006). If these

caribou continue to use this wetland during the winter, crossings of this corridor can be expected from October through April.

Approximately 40% of the Ethel Lake caribou winter range was burned in 2004 and the range extensions into WKA 987 may be a direct consequence of this fire. If this proves correct, further exploratory expansion west of the CS Route Study Area and into the Willow Creek Wetland Complex (including WKA 988) may be anticipated.

Mountain Sheep**:**

- COSEWIC status: not listed
- Yukon Wildlife Act status: not listed

Mountain sheep can be found enduring harsh environmental conditions at extreme altitudes. Females, lambs and rams summer separately in alpine meadows. In late fall to early winter, flocks descend to less snowy regions. Winter regions include south-facing grassy slopes.

WKA's 1873, 1874, and 1875 (see Figure 6.2-4), identified as sheep winter range, lie to the west of the CS Route Study Area and Minto Landing on the east side of the Yukon River. Demographics and pattern timing of movements of this sheep population (approximately 65 animals) is not completely understood. It is known that some of these sheep occasionally cross the highway and the proposed CS Route Study Area from June through August. This may, or may not, be a regular movement, but sheep have been observed east of the Klondike Highway on the west-facing slopes and breaks south toward McCabe Creek (Personal communication, Environment Yukon, June 27, 2006)

Grizzly Bear:

- COSEWIC status: species of special concern.
- Yukon Wildlife Act status: species of special concern

Grizzly bears possess a varied, omnivorous diet and occupy a variety of habitats ranging from coastal plains to alpine environments. In spring, grizzly bears descend from their dens to earlier–producing, lower regions to consume vegetation and then return to higher elevations in early to mid-summer. Government sources state that, "suitable grizzly habitat must provide an adequate food supply, appropriate denning sites, and isolation from human disturbance" (Environment Canada, 2006(a))

There is very little empirical information available on grizzly bears in the area and management guidelines have been suspended (Personal communication, Environment Yukon, July 12, 2006). A crude density estimate would be 1 bear/50 sq miles, with local, higher numbers as bears exploit seasonal food sources (i.e., soap and blueberry patches, salmon runs, etc.). No WKA's were found in or near the Route Study Area.

Wood Bison:

- COSEWIC status: threatened
- Yukon Wildlife Act status: threatened

Wood bison can be found in open spaces mainly treed by aspen stands. Surficial conditions include large, "wet meadows and slight depressions" caused by lacustrine environments. (Environment Canada, 2006(a)). It is stated that, "the population in the Mackenzie Bison Sanctuary (NWT) uses wet meadows and willow savannas in summer and winter and forests in the fall" (Environment Canada, 2006(a)).

WKA's 1925 and 1926 (see Figure 6.2-4) represent older bison sightings prior to 1994. Small groups of four and between three and fourteen animals were reported anecdotally. There is no enduring record of wood bison consistently occupying these areas. Introduced into the Upper Nisling River watershed between 1984-1988, these animals wandered extensively with sight records all over the south-western Yukon. One bull wandered as far west as Tok, Alaska. Estimated at approximately 700 animals, the population is expanding rapidly and venturing into new areas of suitable habitat (Personal communication, Environment Yukon, April 2006).

Several years ago, a limited entry hunt was initiated to maintain the population near 500 animals which was the target population for the Recovery Program (Personal communication, Environment Yukon, April 2006). In recent years, hunt regulations have been liberalized in an attempt to stabilize the population.

Small Furbearing Mammals

The Yukon Northern Plateau and the Yukon Central Plateau (Eco-regions 175 and 176) are regions of small mountain groups, rivers, lakes, valleys, hills and alpine tundra. Wholly located in the Yukon Territory, both regions are home to a wide range of furbearing mammal species and critical habitat. Furbearers inhabiting these regions include: shrews, bats, hares, pikas, voles, lemmings, muskrat, beavers, woodrats, mice, porcupines, marmots, squirrels, woodchucks, chipmunks, coyotes, wolves, foxes, cougars, lynx, wolverine, otters, martin, ermine, mink, and bears. This section presents information on small furbearing mammals with relevance to the Project Study Region communities' trapping activities. Additional information on numerous species can be found in Reference Materials 6R-4.

Three types of squirrels found in these ecoregions are the Northern Flying squirrel, the Red squirrel and the Arctic Ground squirrel or gopher. The Northern Flying squirrel inhabits densely forested areas with mature trees and preferably low elevations. The Red squirrel occurs in forests to the edge of the Alpine and Arctic Tundra in evergreens, spruce, pine, aspen and poplar trees. The Arctic Ground squirrel can be found in eskers, moraines, mountains, river flats, sandbanks, lake shores, tundra ridges and soil/gravel areas with good drainage.

The Snowshoe hare inhabits areas where shrub and forest amalgamate, especially preferring willow thickets and burn areas with growing pine, spruce and aspen where they can obtain nourishment.

Although quite limited in the southern Yukon, muskrats can be seen in abundance in the north. This species inhabits streams, rivers, potholes, shallow lakes, and shallow wetlands with sufficient supply of aquatic plants. Muskrats can also be spotted in slow moving marshy stretches and any shallow productive waters of beaver country where they share beaver houses and ponds.

The beaver can be found in forested and sub-alpine regions. Beaver colonies inhabit ponds, small lakes, and slow-moving streams with the highest densities occurring in burn areas with aspen poplar and willow. Areas close to water bodies with aspen or balsam poplar are prime habitat for beavers where pointed stumps, dome shaped lodges, dams, canals and trails are indicators of their presence.

The porcupine inhabits areas all over the Yukon, being most numerous in northern and central parts of the territory extending as far north as the Arctic Coast. Porcupine dens can be found in caves, hollows among tree roots, culverts and other natural cavities. In winter, porcupines stay close to spruce and pine trees where they can obtain the main portion of their diet.

Being scavengers, coyotes are often sited close to communities but also make homes in riversides, forest burns and farmland. Coyotes prefer to use existing holes or natural cavities rather than building their own dens. In winter, coyotes take cover under overhanging tree limbs where they are sheltered from snow. Coyotes tend to thrive where habitats intersect and there is an abundance of prey, such as the Snowshoe hare.

The Gray wolf tends to avoid human populations in boreal forest habitats. Wolves inhabit rough and hilly areas as well as open tundra and forest regions. The Gray wolf does not use shelter, with the exception of maternity dens for their young. These dens are located on high grounds near water and usually found in hollow logs, caves and underneath tangled tree roots. The same den location may be used for a number of years.

The three main habitat types of the Red fox include white spruce forests, sub-alpine areas of willow and soapberry and alpine tundra. Foxes make their dens away from coyote habitat on brush-covered slopes with sandy soil. The range of the fox seems to be restrained by competition with coyotes for food and territory.

Lynx inhabit the whole of the Yukon except for the Arctic Coastal Plain. This species may be found in large groups when lynx population numbers are high. Lynx prefer to occupy white spruce, lodge pole pine, aspen and willow, and coniferous-deciduous forest areas. Species numbers tend to fluctuate due to their dependence on Snowshoe hare for survival. After they are born, lynx kittens are sheltered under brush piles or tree roots in remote areas of dense, spruce forests. Although cougars have been sited in the Yukon, the lynx is the territories' only resident feline and can often be seen hunting along shorelines or resting under riverside stands of spruce.

Wolverine are found throughout northern North America but are considered endangered in many of these areas. Although the wolverine is generally a rare mammal, it is quite common in Yukon. In areas such as B.C, Yukon, Ontario and Nunavut, the wolverine is considered of "Special Concern" because of its

sensitivity to human activity and natural events. This species occurs in all habitats extending from forested valleys to alpine and arctic tundra and is most abundant in population in mountainous regions where there is variety of habitat and plentiful prey. Wolverine can be sited along open ridges, alpine slopes, frozen rivers or glaciers.

It is thought that the River otter is widely distributed throughout forested areas in the Yukon; however, the River otter is not largely abundant in Yukon and no population studies have been conducted. Although in other parts of Canada and the U.S. otters have been wiped out by polluted waterways, Yukon otters have been unaffected by water pollution. Because otter habitat must include sufficient size and depth waterways to support fish populations, the range of River otters in the Yukon is mainly confined to larger river systems and their lakes. The River otter population is thought to be highest in the salmon bearing Yukon River System. The River otter can most likely be seen by remote waterways, inter-connected marshes, meandering streams or small lakes.

The ermine, the Least weasel and the marten are three species of the weasel family that inhabit the Yukon as well as other northern countries around the world. Both the ermine and the Least weasel occur throughout the territory and are most abundant in areas such as forest perimeters, meadows, brushy areas, marshes, bogs and tundra. In Yukon, ermine are quite abundant in population. The Least weasel is uncommon but not endangered. Both weasel species avoid the depths of mature forests. While the ermine hunts larger voles in meadows, boggy or shrubby habitats, the Least weasel prefers to hunt mice and voles in forested habitats. The marten makes its home in mature forests where the Northern Red-Backed vole is abundant. In Yukon, marten inhabit spruce stands as far north as Old Crow Flats.

Mink can be found throughout the Yukon in forested areas near ponds, streams and lakes. Since the muskrat is the mink's main food source, this species can be found in high density in the Old Crow Flats area due to the large amount of muskrat that also inhabit that area. Mink are able to pursue prey such as muskrat and fish by traveling in air pockets under the ice of ponds and streams. Mink occupy abandoned burrows or naturally formed den sites for shelter and for raising their young. Mink often take over empty beaver lodges or muskrat dens hidden by dense vegetation.

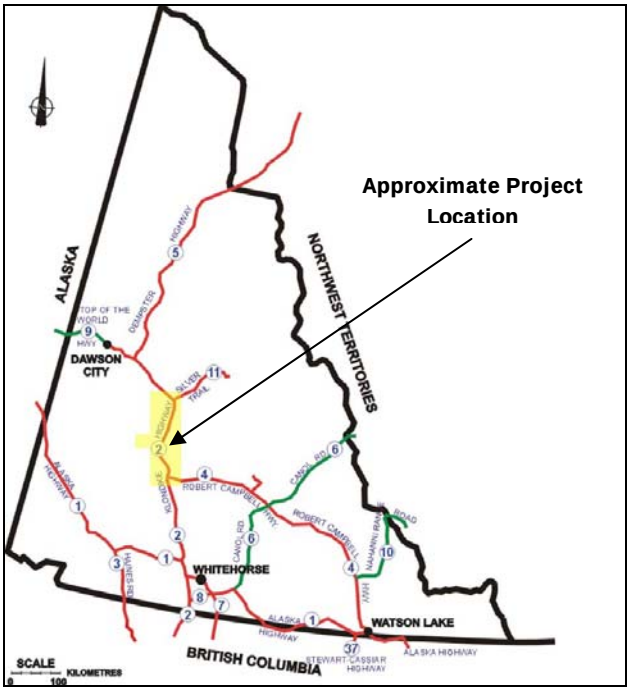
Migratory Waterfowl

Migratory waterfowl and birds navigate (most often north-south movements) from winter habitats to nesting areas and return to their post-nesting habitat (Lincoln, 1979). The U**nited States Geological Survey** (**USGS**) and the **Canadian Wildlife Service** (**CWS**) conduct an annual survey of North American breeding bird populations (United States Geological Survey/Canadian Wildlife Service, 2005). The USGS/CWS Breeding Bird Database was queried for those bird species having migratory routes near the Route Study Area. A species list for select migratory routes may be found in Reference Materials 6R-5. A USGS/CWS map of breeding bird routes in the Yukon is set out below with the approximate Project Study Region indicated (Figure 6.2-5).

To identify any species of concern, the COSEWIC database was queried for bird species that may potentially migrate through, or live in, the Yukon Territory. A COSEWIC list of birds found in the Yukon

can be found in Reference Materials 6R-5. The COSEWIC species listing of birds found in the Yukon Territory lists the American coot, Double-crested cormorant, Red-necked grebe, Common and Yellow-Billed loons, Red-necked grebe, and Trumpeter swan. COSEWIC lists these species has having populations in the Yukon; however, they are not currently considered to be at risk. As of April 2006, Rusty blackbirds are mentioned as a species of special concern to COSEWIC (Committee on the Status of Endangered Wildlife in Canada, 2006).

Figure 6.2-5
Yukon Breeding Bird Survey Routes



(Source: http://www.hpw.gov.yk.ca/images/roadmap.gif)

The CWS describes the possible habitats for breeding birds as grasslands, scrub or edge habitat, urban or suburban, wetlands and woodlands. All of the above noted habitats can be found within the Project Study Region.

Raptors

The description of raptors (or birds of prey) provided by Environment Canada includes falcons, hawks, eagles, vultures, ospreys, and owls (Environment Canada, 2006(b)). Raptors in Prairie and Northern Canada may be grouped into the following four different families: hawks, falcons, vultures and owls (Environment Canada, 2006(b)).

The species of raptors identified by COSEWIC include: eagles (Bald and Golden), goshawk, gyrfalcon, hawk (Red-tailed, Rough-legged, Sharp-shinned), Peregrine falcons, owls (Boreal, Great Grey, Northern Hawk, Short-eared, Snowy), merlin and Northern harrier. The Short-eared owl is currently given the

status of special concern. The Peregrine falcon was moved from a lower risk category to "Special Concern" in April 1992 and re-assessed in May 2000 with no change in status. The status for the species as of July 2006 is "Threatened".

WKA 2722, (see Wildlife Key Areas Map, Figure 6.2-4) immediately east of the CS Route Study Area, includes a Peregrine falcon eyrie in the Crooked Creek drainage. The precise location of the nest site is not known, but further inquiry may provide suitable options for mitigation if this is required.

WKA 1350 (Alpine Raptor Nest Site), lying north of McCabe Creek and one-half km east of the proposed CS Route Study Area, is in close proximity to the most southern MS route option for crossing the Yukon River. WKA 1350, which encompasses nest sites of three raptor species (the locations of which have not been determined), was last updated in 1990 and its current status is not known.

The MS Route Study Area intersects WKA 1343 west of the Yukon River at two locations: the fist six kilometres of the Route Study Area and approximately seven kilometres in the Minto Creek Drainage. Data on WKA 1343 has not been updated since 1991, and the current status of the Breeding Pairs (Golden Eagle, Bald Eagle and Peregrine falcon) is not known at this time.

6.2.2.4 Other MS Route Study Area Wildlife

A number of WKAs have been identified peripheral to the MS Route Study Area. However, except as noted above (raptors), all of these WKAs are not relevant to the areas that are expected to be affected by the Project.

One noted wildlife location is a Sharp tailed grouse lek, located east of the Klondike Highway and directly across from the Minto Airstrip access road.

6.2.3 Aquatic Environment

This section considers the aquatic environment in the Project Study Region as it exists without the Project and includes an examination of hydrology, water quality, hydrogeology and aquatic ecosystems and resources for each drainage area potentially affected by the Project.

The *Proponent's Guide* requires that, where it is relevant, a baseline examination of hydrology should include a detailed description and characterization of the project's watersheds, water courses and drainages as well as a description of the existing water quality in the project area, including seasonal variability and water quality variables focusing on water characteristics that may be modified by the project during any phase. Where relevant, the baseline is expected to describe geological elements and processes affecting the hydrogeology of the project area watersheds.

The assessment of the existing aquatic environment includes consideration of existing water resources and existing aquatic ecosystems and resources in this drainage area with particular emphasis on identified VCs (see Table 6.2-1). In general, planned mitigation measures are expected to prevent or minimize Project effects on the aquatic environment and this consideration has guided the level of description provided in this section.

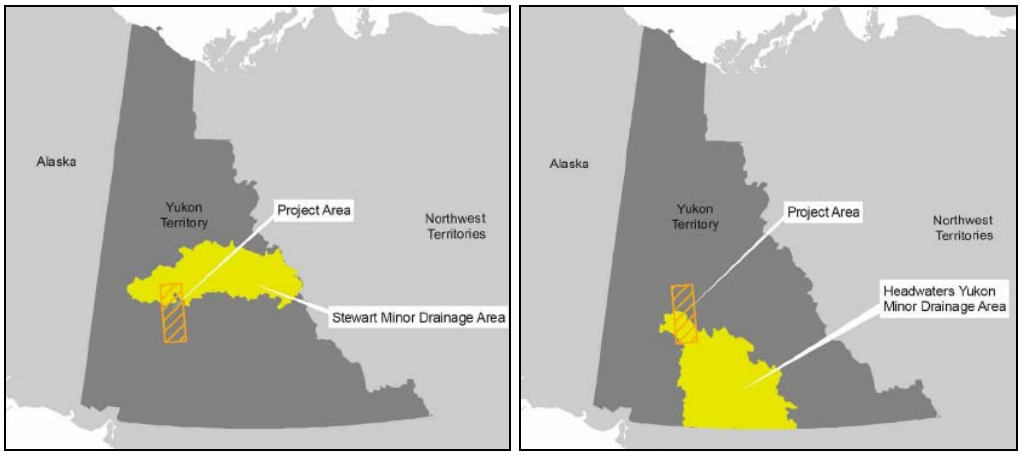
6.2.3.1 Hydrology

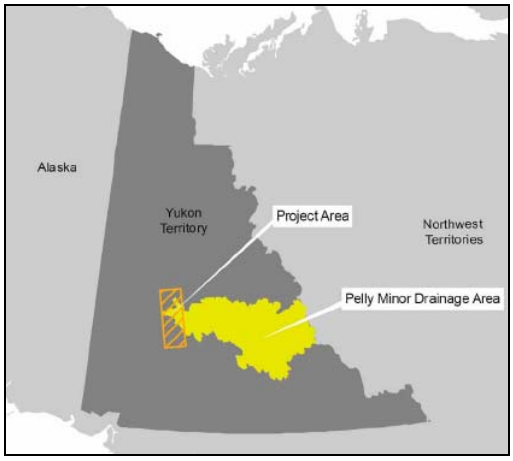
This hydrology section addresses the CS development drainage areas, the MS development drainage areas, and wetlands.

CS Development Drainage Areas

The proposed CS development falls within the Yukon River Major Drainage Area which collects surface water from as far east as the Yukon - North West Territories border and from as far south as Atlin Lake, British Columbia, with an upper limit at around 100 miles north of Dawson City, YT. Water collected in the drainage area empties into the Pacific Ocean, while water collected in the Arctic Drainage Area, to the east, empties into the Arctic Ocean. The CS Route Study Area falls within three Minor Drainage Areas, each named for the river being supplied: Yukon Headwaters, Pelly and Stewart. Three maps displaying the locations of each Minor Drainage Area as well as significant streams and water bodies relative to the CS Route Study Area may be found in Reference Materials 6R-6 Maps 6R-6-1, 6R-6-2 and 6R-6-3. . These figures also show the locations of Environment Canada Hydrometric Monitoring Stations referred to later in this section. An index map in Figure 6.2-6 shows the location of the minor drainage area in the Yukon Territory.

Figure 6.2-6
Index Map of Minor Drainage Areas for CS Development





The Project Route Study Area crosses the Yukon River and two of its major tributaries: the Pelly and Stewart Rivers. Along with these major rivers, the CS Route Study Area also crosses a number of minor tributaries which supply the Yukon River; these tributaries are the Tatchun, McGregor and McCabe Creeks. Major settlements in the area include the village of Carmacks, located on the shores of the Yukon River; Pelly Crossing, located on the Pelly River; and Stewart Crossing, located on the Stewart River near the northern extent of the proposed CS transmission line.

Major water bodies near the CS Route Study Area include Tatchun Lake, Merrice Lake and the Von Wilczek Lakes which supply the Yukon River in the Headwater Yukon Minor Drainage Area. The major lakes supplying the Pelly River are Willow Lake and Diamain Lake. Other notable water bodies located near the CS Route Study Area in the Stewart Minor Drainage Area include: the Reid Lakes west of Stewart Crossing and Crystal and Ethel Lakes to the east.

Hydrological information was based on information taken from the Water Survey of Canada (Environment Canada, 2004(b)). Monitoring station locations within the CS Route Study Area between Carmacks and Stewart Crossing are:

Station Name	Station Number	Longitude (DMS)	Latitude (DMS)
Yukon River at Carmacks	09AH001	136 ° 34′ 50″	69° 49′ 47″
Pelly River at Pelly Crossing	09BC001	136° 16′ 18″	62° 05′ 45″
Stewart River at Stewart Crossing	09DD002	136 ° 40′ 59″	63° 22′ 56″

The maximum rate of mean monthly flow recorded at the Carmacks monitoring station on the Yukon River between 1951 and 1997 was 2690 m^3/s in July, 1962. The minimum mean monthly flow recorded was 142 m^3/s in March, 1951. Annually, for the sample period, the maximum flow was 966 m^3/s, the minimum was 526 m^3/s and the mean rate of flow was 756 m^3/s. Historical data shows a trend of higher rates of flow from May through September. Rate of flow seems to be at the lowest and most consistent level from December through April. A hydrograph for the sample period discussed above, along with a monthly mean summary report, can be found in Reference Materials 6R-7.

Hydrologic station data at Pelly Crossing, recorded between 1951 and 2003, describes a maximum monthly flow of 2840 m^3/s in June of 1964 and a minimum monthly flow of 28.9 m^3/s in March of 1974. The annual mean, maximum and minimum monthly flows were 388 m^3/s, 575 m^3/s and 261 m^3/s respectively (Environment Canada, 2004(c)). The historic data collected suggests a significantly higher flow from May through September. The time period with the steadiest and the least flow rate appears to fall from November through April. A hydrograph for the sample period discussed above, along with a monthly mean summary report can be found in Reference Materials 6R-7.

Stream data was collected between 1960 and 1973, by a monitoring station on the Stewart River at Stewart Crossing. The data displays an historic trend of a high rate of flow between the months of May through October. The maximum flow was 3150 m^3/s recorded in June of 1964 and the minimum rate of flow was 28.9 m^3/s recorded in March, 1969. For the sample period, the mean annual flow was 415 m^3/s, with a maximum of 605 m^3/s and a minimum of 285 m^3/s. Flow rates are relatively low and appear to remain stable from November through April. A hydrograph for the sample period discussed above, along with a monthly mean summary report can be found in Reference Materials 6R-7

MS Development Drainage Areas

The MS Route Study Area crosses the Yukon River at Minto Landing. Major stream crossings intersecting with the proposed MS Route Study Area include Big Creek and Minto Creek. Both Big and Minto Creeks are tributaries of, and flow north-west to the Yukon River. Hydrometric data was acquired from the Canadian Hydrologic Data Collection Station near the mouth of Big Creek. Data at Big Creek was collected for the years 1974 through 2003. There is currently no hydrologic data available for Minto Creek. The Station Name, Station Number and geographic coordinates are noted below.

Station Name	Station Number	Longitude (DMS)	Latitude (DMS)
Big Creek near the mouth	09AH003	137° 00′ 58″	62° 34′ 07″

The hydrologic station near Big Creek indicates that there is a marked increase in cubic metres of discharge per second at the mouth of Big Creek between the months of April and September. In May 1990, the maximum average monthly rate of flow is recorded as 76.8 m^3/s. In April 1996, the minimum average monthly rate of flow was recorded as 0.003 m^3/s. In 1998, the minimum annual flow rate was 2.17 m^3/s; in 2000, the maximum was 17.2 m^3/s and the average annual rate of flow was 8.07 m^3/s. A hydrograph for the sample period discussed above, along with a monthly mean summary report can be found in Reference Materials 6R-7.

6.2.3.2 Water Quality

Specific information on water quality is not readily available for major rivers in the Route Study Area. An overview of basic factors affecting river sediment loads in this area is provided below.

The type of river that will form is dictated by the surface material geology present as well as the change in elevation in the region. The rivers and streams present in the Project Study Region take on meandering geometries as they wind their way through the sediments. This is indicative of high

sediment loads and little change in elevation over the meandering reaches of the stream. The Yukon, Pelly and Stewart Rivers all take on a meandering pattern around the Route Study Area.

Historic data suggests an increase in stream flow for the spring and summer months. Snow storage in the winter followed by snowmelt in the spring re-distributes six to ten months of precipitation during the brief snowmelt period (Yukon Energy Mines and Resources, 2004). This is expected in spring melt conditions and during the warmer temperatures of the summer months. Referring to the climate data in section 6.2.1.4, it can be noted that there is a significant increase in precipitation for Carmacks, Pelly Crossing and Stewart Crossing between the months of May and October. This can result in higher surface water runoff and eroding conditions in regions of increased gradient that are underlain, silt-rich material. This activity will transport greater amounts of sediment into waterways and increase the total suspended solids and conductivity present.

6.2.3.3 Hydrogeology

The water table makes contact with the surface at river, stream and lake locations. Ground water flows more freely through soils with high percolation potential. Percolation potential for loosely packed material is good mainly due to the high pore space. The surficial geology present in the area ranges from loose, glacial till with mixed grain-size, to well-sorted (i.e. more sorted according to grain-size), well-bedded strata. Inclined areas underlain by loosely packed, well-sorted material will transport contaminants, along with ground water, away from the site in the direction of ground water flow. This will occur more rapidly than in areas underlain by more dense soils with a greater amount of fine particles filling interstitial space. Therefore, during and shortly after rainfall events spring fed streams in the vicinity will swell.

Historic flood data for Carmacks, Pelly Crossing, and Stewart Crossing is not currently available from government and municipal sources. Stream level data is not collected at the Pelly Crossing and Stewart Crossing hydrographic stations. As mentioned above, flow data suggests a significant increase in discharge in the spring and summer months. "In the Yukon River Basin, annual high flows for most of the major rivers occur during the summer rainy season. However, on the main stem of the Yukon, flooding commonly occurs from ice jams in the spring (USGS, 2000)."

6.2.3.4 Aquatic Ecosystems and Resources

Riparian Zones and Wetlands

Riparian Zones and Wetlands are considered together as one VC which represents the environment surrounding rivers, creeks and wetland areas in the Project Study Region.

Wetlands are "lands permanently or temporarily submerged or permeated by water, and characterized by plants adapted to saturated-soil conditions" (Natural Resources Canada, 2003). Natural Resources Canada's website goes on to describe the value of wetlands:

> Wetlands are the only ecosystem designated for conservation by international convention because they absorb the impact of hydrologic events, filter sediments and toxic substances,

supply food and essential habitat for many species, provide products for food, energy, and building material, and are valuable recreational areas. Some wetlands help recharge groundwater, while others receive groundwater discharge. Wetlands are vulnerable to climatic variations and extreme events.

Wetlands are typically found in regions of shallow to steeply sloping terrain and on floodplains in close proximity to surface waters.

Riparian zones are associated with water bodies and wetland areas. A riparian zone is the interface between land and a water body. They are typically characterized by hydrophilic vegetation and are often subject to flooding. Riparian zones are significant in ecology, environmental management and civil engineering due to their role in soil conservation, their biodiversity and the influence they have on aquatic ecosystems. The riparian zones surrounding the large wetland areas (Lhutsaw and Willow Creek) in the Project Study Region are associated with high quality habitat for many Yukon animal and bird species.

Yukon State of the Environment Report (2002) indicates that only 3% of Yukon's land base is made up of wetlands and that "54 wetlands have been identified as significant, based largely on their value to migratory birds". The Canadian Parks and Wilderness Society (2005) identifies two key wetland areas within the Project Study Region: Lhutsaw Wetland Habitat Protection Area and Willow Creek. Additionally, there are a number of small wetland features along the Route Study Area that have been identified in the Preliminary Terrain Survey.

CS Line Segment 1: Carmacks to McGregor Creek

From Carmacks north to McGregor Creek, Preliminary Terrain Survey Maps 115I/01 (Appendix 6A-1 Map 6A-1-1) and 115I/08 (Appendix 6A-1 Map 6A-1-2) delineate no wetlands adjacent to or in proximity to the proposed Route Study Area. However a number of organic-rich and poorly drained soil areas are associated with small creeks and small ponds in this area. These may have small wetland areas associated with them.

CS Line Segment 2: McGregor Creek to Pelly Crossing

Preliminary Terrain Survey Map 115I/07 (Appendix 6A Map 6A-1-3) notes wetland regions which are encountered approximately 2 km north of McGregor Creek, to the east of the Route Study Area. These small wetland regions are in proximity to areas where the CS route has been proposed to be located, and are found within a unit of gravely soil on sloping terrain.

Preliminary Terrain Survey Map 115I/10 (Appendix 6A Map 6A-1-4) notes discontinuous wetlands on the lake shores around the Von Wilczek Lakes. This is within and in close proximity to the Lhutsaw Wetland Habitat Protection Area (Yukon Parks, 2006). This protected area is 31 km^2 and can be seen south of Pelly Crossing to the east of the Klondike Highway. In this area, the proposed CS route will be located west of the Klondike Highway where no wetlands are located. North of the Lhutsaw area, wetlands

continue sporadically until reaching Pelly Crossing on Preliminary Terrain Survey Map 115I/15 (Appendix 6A Map 6A-1-5). As delineated by Mougeot's terrain analysis, these are small lakes and poorly drained areas located to the east and west of the Route Study Area.

CS Line Segment 3: Pelly Crossing to Stewart Crossing

Directly north of Pelly Crossing (Appendix 6A-1 Map 6A 1-5), no wetlands are identified on the map; however, the community identified Willow Creek as having wetland characteristics throughout its course and CPAWS (2005) has identified this as one of fifty important wetlands in the Yukon. Preliminary Terrain Survey Map 115P/01 (Appendix 6A-1 Map 6A-1-7) identifies wetlands to the west of the Klondike Highway, in units of poorly drained, ice-rich and organic-rich surface material, while the proposed CS route in this area is located to the east. The northern end of Map 115P/01 (Appendix 6A-1 Map 6A-1-7) marks the start of the Ddhaw Ghro Habitat Protection Area, located to the east of the Klondike Highway. In this area, the proposed CS route remains outside this Protection Area.

Preliminary Terrain Survey Map 115P/07 (Appendix 6A-1 Map 6A-1-9) notes wetland regions on a plateau to the west of the proposed CS Route Study Area. The wetland is located in a unit of poorly drained, ice-rich and organic-rich soil above a linear outcrop of steeply sloped, gravelly material. Moving north along the proposed Route Study Area, wetlands are located to the southeast of Stewart Crossing, while the CS Route Study Area remains west of the community. The area surrounding Crooked Creek, just south of the community, has been identified by members of NND as an important wetland area. There are several minor wetlands outside the Route Study Area to the east and west along the shore of the Stewart River. These are delineated in units of organic-rich, silty material (Appendix 6A-1 Map 6A-1-9).

Minto Spur Line Segment

Preliminary Terrain Survey Maps 115I/10 (Appendix 6A-1 Map 6A-1-4) and 115I/10 and 11 (Appendix 6A-2 Map 6A-2-3), note that there are two areas of riparian/ wetland regions. One area of wetland is located on Preliminary Terrain Survey Map 115I/10 and /11 (Appendix 6A-2 Map 6A-2-3) where Big Creek intersects the Route Study Area. This area of fluvial sand and gravel may be described as a riparian zone that is intermittently wet and thus may also be characterized as wetland. The second area of wetland is located where the Minto Creek intersects the MS Route Study Area near the Yukon River. This is characterized as a riparian zone with wetland characteristics. In total there is roughly 1 km of wetland/ riparian area in the Minto Spur segment of the Route Study Area.

Salmon and Other Fish Species

Salmon was chosen as a VC after public consultation with communities and resource councils indicated that there were concerns that the Project could affect salmon and salmon habitat; this species is an important domestic, sport and commercial resource for First Nation members, local residents and visitors to the region.

Water bodies throughout the Yukon Territory provide spawning areas and habitat for a variety of fish species and "in the Yukon, feisty northern species like Arctic grayling, northern pike and lake trout crowd the eddies and outflows of icy streams and abound in our pristine lakes. Lesser known but highly prized fish like the inconnu and Arctic char navigate wild rivers that flow through one of the world's most remote and extraordinary landscapes (Yukon Department of Tourism & Culture, 2006)." Species of fish that can be found in Yukon water include arctic char, arctic greyling, burbot, dolly varden, inconnu, kokanee, lake trout, bull trout, pike, rainbow trout/steelhead salmon, salmon (Chinook, chum, coho and sockeye) and whitefish (broad, lake (humpback), pigmy and round).

A desktop survey of applicable fisheries information for the Route Study Area was undertaken using the Yukon Fisheries Information Summary System (FISS), an online compendium of fisheries information for the Yukon provided by the Oceans Habitat and Enhancement Branch (HEB) of the Department of Fisheries and Oceans Canada. For the purposes of the Project Proposal, only watercourses that the Route Study Area crosses that contain fish caught for sport or human consumption are being considered based on the criteria used by Fisheries and Oceans Canada to define a fish-bearing stream.

The Project Route Study Area crosses or potentially affects eleven known fish-bearing watercourses. Moving north along the Route Study Area these nine watercourses are as follows: Yukon River, Tatchun Creek, McGregor Creek, McCabe Creek, Von Wilczek Creek, Pelly River, Willow Creek, Crooked Creek, Stewart River, Big Creek and Minto Creek. Each of these streams is a known spawning or rearing area for salmonids, some combination of Chinook salmon, chum salmon arctic grayling, or whitefish.

- The Route Study Area does not cross Willow Creek, but Willow Creek has been included because the Route Study Area crosses three of its tributaries which may be fish-bearing.
- The Route Study Area also crosses Von Wilczek Creek and two of its tributaries which have no fisheries information in FISS, but may also be fish-bearing.

Table 6.2-12 shows the streams with fisheries values that the Route Study Area crosses or potentially affects and the known or documented fish in that stream.

Table 6.2-12
Fisheries Varieties for Streams Crossed by the Carmacks-Stewart / Minto Spur Transmission Project

Watercourse	Mapsheet	Descriptive Position	Intersection Coordinates (UTM)		Known or Documented Fish Species
			Easting	Northing	
Yukon River East Shore South of Option 1	115-I-1 115-I-7 115-I-8 115-I-10	Flows northwest past Carmacks north to Minto Landing, turning west/northwest	404350	6947000	Arctic Grayling, Burbot, Chinook Salmon, Chum Salmon, Coho Salmon, Inconnu, Northern Pike, Sockeye Salmon, Whitefish
Tatchun Creek Bridge	115-I-08	Flows southwest and northwest into the Yukon River, north of Carcross, crosses the Klondike Highway north of Carcross	433600	6906600	Arctic Grayling, Burbot, Chinook Salmon, Chum Salmon, Northern Pike, Whitefish
McGregor Creek	115-I-07	Flows southwest into the Yukon River between Carmacks and Minto, crosses the Klondike Highway	419350	6919600	Arctic Grayling, Chinook Salmon, Whitefish
McCabe Creek	115-I-10	Flows southwest into the Yukon River south of Minto, crosses the Klondike Highway south of Minto	409200	6935250	Arctic Grayling, Chinook Salmon, Whitefish

Watercourse	Mapsheet	Descriptive Position	Intersection Coordinates (UTM)		Known or Documented Fish Species
			Easting	Northing	
Von Wilczek Creek	115-I-10	Flow southwest into the Yukon River near Minto, flows along the East side of the Klondike River, crosses near Minto	405700	6942750	Arctic Grayling, Chinook Salmon
South side of Pelly River	115-I-15	Flows west past Pelly Crossing	457100	6967500	Arctic Grayling, Burbot, Chinook Salmon, Inconnu, Northern Pike, Whitefish
Willow Creek	115-I-15, 115-P-02	Flows south and southwest into the Pelly River, northwest of Pelly Crossing, flows along the west of the Klondike Highway			Arctic Grayling, Burbot, Chinook Salmon, Northern Pike, Whitefish
Crooked Creek	115-P-07	Flows north into the Stewart River, west of Stewart Crossing, flows along the west of the Klondike Highway, crosses Klondike Highway	South(next to Klondike Highway Crossing 420550 North crossing (South of Stewart River) 414550	South(next to Klondike Highway Crossing 7017050 North crossing (south of Stewart River) 7025900	Arctic Grayling, Burbot, Chinook Salmon, Northern Pike, Whitefish

Watercourse	Mapsheet	Descriptive Position	Intersection Coordinates (UTM)		Known or Documented Fish Species
			Easting	Northing	
Stewart River (south shore)	115-P-7	Flows west at Stewart Crossing into the Yukon River	414300	7029450	Arctic Grayling, Burbot, Chinook Salmon, Chum Salmon, Northern Pike, Whitefish
Big Creek	115-I-11	Flows north into the Yukon River	396626	6442600	Chum Salmon, Chinook Salmon, Arctic Grayling and Whitefish
Minto Creek	115-I-11	Flows north into the Yukon River	392350	6948250	Arctic Grayling, slimy sculpins, Whitefish

6.3 SOCIO-ECONOMIC CONDITIONS

This section provides a description of the socio-economic conditions of the Project Study Region without the Project and reflects the requirements of the *Proponents Guide to Information Requirements for Executive Committee Project Proposal Submissions* (YESAB, 2005).[8] The following socio-economic components are examined:

- **Overview of Project Study Region Communities**: includes a brief overview of the specific communities and populations in the Project Study Region.
- **Resource use**: includes use by people of the land and resources in the Project Study Region for traditional and domestic land and resource use (trapping, hunting, fishing, collection of plants, timber harvesting, protected areas, outdoor recreation) and commercial land use (tourism, outfitting, commercial fishing, agriculture, mineral and aggregate extraction, and oil and gas extraction).
- **Economy**: includes economic components and activities in the Project Study Region including the labour force (employment, income, education), local economy and business, government, and utility ratepayers.
- **Social Context**: includes the social and cultural context of the Project Study Region, including population demographics, community infrastructure and services, community and family life, recreation and leisure, public health, aesthetics, heritage resources, and past experience with similar projects.

[8] This guide references description of the economic and social setting which focuses "…on providing a background on individuals, families, communities, businesses, and/or government potentially affected as a result of the project activities" The *Guide to Socio-economic Effects Assessment* (YESAB, 2006, p.4)) defines socio-economic effects to include "effects on economies, health, culture, traditions, lifestyles, and heritage resources" and socio-economic effects assessment as including the likely effects of a proposed project "on the day-to-day life of individuals, families, communities, businesses and/or governments whose reality may be affected by a proposed project'; this guide uses the term "community" to refer "to both place-based communities, which can be defined geographically, and interest-based communities defined by a common interest or activity, also sometimes referred to as a 'stakeholder' group".

The **Socio-Economic Effects Assessment** (**SEEA**) focuses on people and communities affected by the proposed Project. These effects can be both positive and negative in nature. For those people and communities who are affected, it is recognized that the effects experienced may involve more than one of the identified socio-economic components (and that these effects may be positive in some aspects and negative in other aspects for the same people or communities).

Source of effects on people and communities from the Project can follow different pathways (see Figure 6.3-1), including

- **Direct effects from Project activities:** Effects on people and communities can accumulate directly from the Project (such as direct local employment and training opportunities and local business expenditures during Project construction, operation and decommissioning and supply of lower costs grid electricity supplies to displace diesel electricity generation during Project operation, and aesthetics changes resulting from the Project's presence that affect people).

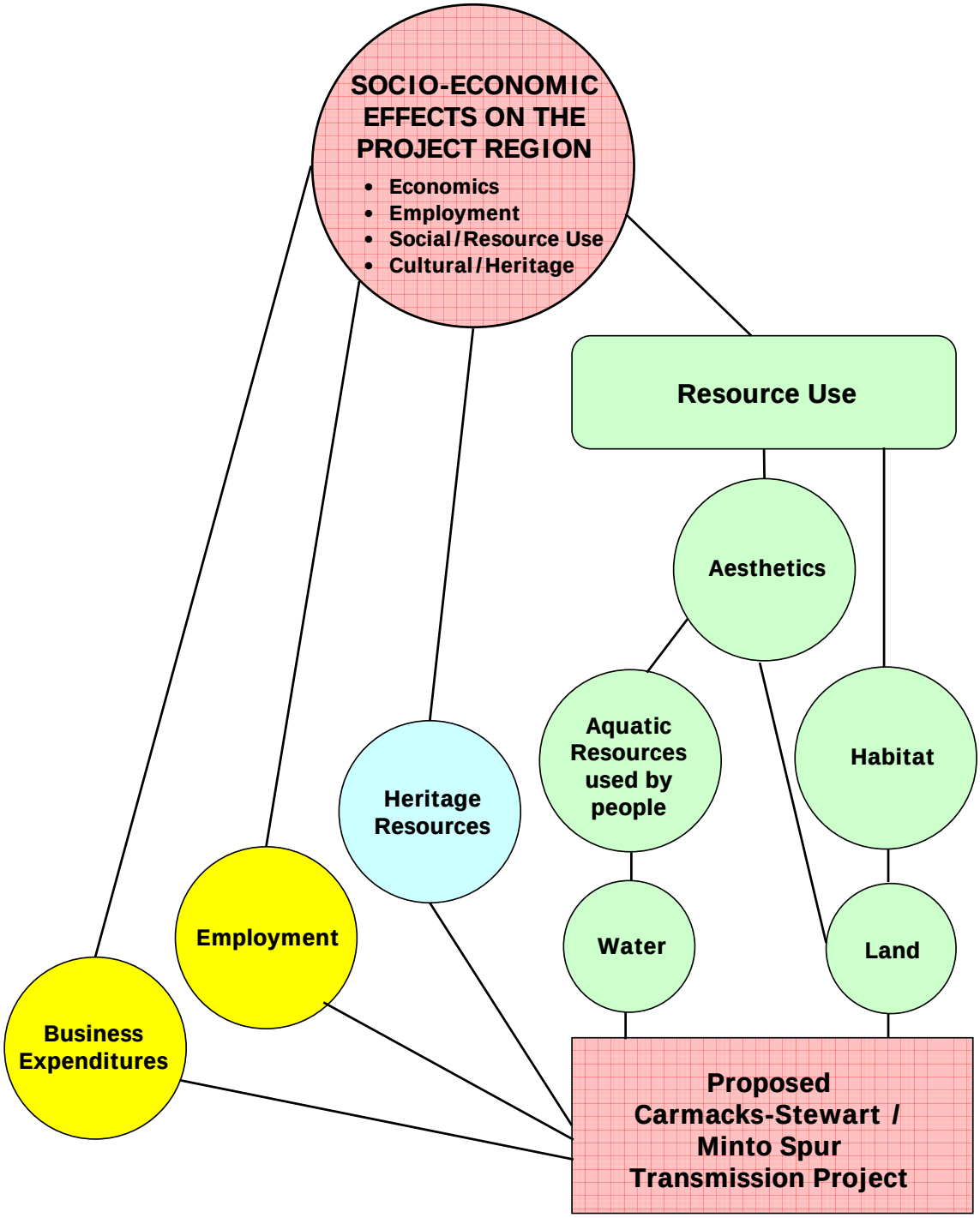
- **Indirect effects from Project-related changes to the land and resources:** Effects on people and communities can also accumulate indirectly through changes in the biophysical environment (land, water, and air physical environments and associated terrestrial and aquatic life) resulting from the Project. In some cases, people depend upon the biophysical environment for income, as well as a way of life and culture. As such, the SEEA, in many instances, relies upon the results of assessments to the environmental components.

- **Overall effects on people and communities:** All of the specific socio-economic effects from the Project through different pathways accumulate on the affected people and communities. The results can be described overall as resource use effects, economic effects, and social effects.

This section generally focuses on those components of the socio-economic environment that are of particular concern in the Project Study Region and that may be potentially affected by the Project based on the above noted effects pathways.

For the socio-economic components, potential Project effects of construction, operation and decommissioning often extend beyond the Project Site Area footprint and the areas in close proximity to this footprint, reflecting the mobility of people and the location of the communities in which they reside. Some effects of the Project on the economy (e.g., construction expenditure effects and utility ratepayer effects) can extend beyond the Project Study Region to affect the overall Yukon economy in particular (and in some instances economies outside Yukon).

Figure 6.3-1
Socio-Economic Pathways of Effects



VCs were determined after consideration of the above factors, and consultation with interested parties. Table 6.3-1 identifies the socio-economic VCs considered for the assessment.

Table 6.3-1
Socio-Economic VCs Identified for Assessment of the Project

Valued Component (VC)	Identified by[1]:	Characterization of Potential Effect
Socio-Economic VCs: Resource Use		
Trapping	FN, G, OP	Clearing and other construction activities, periodic brushing during operation, and future decommissioning may affect wildlife and traplines. Cleared areas may affect access to trapping areas.
Hunting	FN, G, OP	Construction, operation, and decommissioning activities may affect hunting in the Project Study Region.
Fishing	FN, G, OP	The Project transmission lines will cross various streams and rivers. It is expected that fishing will not be affected due to the mitigation measures, including the absence of in-stream work.
Collection of Plants	FN, OP	Berry picking and medicinal plant areas in the Project Site Area may be affected by clearing and other construction activities, periodic brushing during operation, and future decommissioning.
Timber Harvesting	FN, G, OP	Access to potential merchantable timber and fuel wood will result from the construction of the Project right-of way.
Protected Areas	FN, G, OP	Effects on protected areas to be avoided if possible by route selection.
Outdoor Recreation	FN, G, OP	Concerns expressed over conflict with use of recreation sites, particularly Tatchun Creek campground
Tourism	FN, G, OP	Project activities may have an effect on tourist traffic and use.
Outfitting	G, OP	Concerns that Project activities may have an effect on outfitting activities related to local wilderness areas.
Agriculture	F, OP	Construction, pole placement and maintenance may affect agricultural activities in the Project Site Area.
Mining	G	The Project facilitates the development of mining in the Project Study Region through improved access to grid electricity.
Aggregate Sites	G	Some substations may be located in EMR reserves. Transmission lines will span or run adjacent to other aggregate sites. Negotiated agreements and permits will be used in these locations.

Valued Component (VC)	Identified by[1]:	Characterization of Potential Effect
Socio-Economic VCs: Economic		
Local Employment and Training	FN, G, OP	Clearing during construction and periodic brushing during operations will result in opportunities for local employment, and possible training needs.
Local Business	OP, FN	Local businesses (including FN businesses) to provide brushing, clearing and services ancillary to line construction, and decommissioning.
Government Fiscal Flows	G	There may be direct expenditures incurred, and increases in direct and indirect tax and/or royalty revenue.
Utility Ratepayers	OP	Improve system capacity and reliability for existing and future customers, reduce diesel fuel generation costs, provide lower cost power to mines and provide increased utility revenue from use of otherwise surplus hydroelectric generation.
Socio-Economic VCs: Social Context		
Community and Family Life	FN, OP	May have an effect on activities on the land such as hunting, fishing and trapping, among others.
Community Infrastructure and Services	G	Carmacks, Pelly Crossing, and Mayo have gravel airstrips and Minto has a grass airstrip for irregular use and emergency needs; routing will be selected to avoid effects on use of these airstrips.
Public Health	FN	Potential concerns with health and safety during construction and decommissioning, and electrical effects during operation.
Aesthetics	FN, G, OP	Locations with exceptional views and/or wilderness experience may be altered within the Route Study Area by the presence of the transmission line.
Heritage Resources	FN, OP	Known valued sites will be avoided where feasible by route selection and other mitigation measures during construction.

[1] Identified by: FN = First Nation, G = Government, OP = Other Public

Preliminary data for the community baseline was obtained from published sources and readily available statistics. Upon determination of the VCs, the socio-economic baseline compiled to understand the Project Study Region conditions was expanded to focus on the identified VCs. Further collection of data ensued, including personal communication with individuals from the potentially effected communities, other publics, and government.

The level of effort devoted to the description of the socio-economic environment is "commensurate with the size, cost, and degree of expected effects of the proposed project" (YESAB, 2006). It also reflects the fact that the population of the Project Study Region is quite small and in many instances only limited statistical and empirical information was readily available for analysis.

6.3.1 Overview of Project Study Region Communities

The indigenous inhabitants of the Project Study Region are a part of the Northern Tutchone Cultural and Language group. The spatial limits of the Northern Tutchone territory encompass the Pelly, Macmillan, Stewart and Ross river drainages as well as the Yukon River from its confluence with the Teslin to its confluence with the White River. The Northern Tutchone have in the past recognized a close political and cultural affinity with the Southern Tutchone, although the neighbouring groups were distinct inasmuch as their languages were mutually unintelligible (McClellan, 1975). Today, the principal language spoken in the Project Study Region Community is English. The second language spoken continues to be Northern Tutchone.

The residents closest to the Route Study Area are those living in several small communities along the Klondike Highway (Carmacks, Pelly Crossing and Stewart Crossing); the Village of Mayo is also included in the Project Study Region. There are currently about 1,100 people residing in these Project Study Region communities, of whom about 70% are members of the three NTFNs. Some additional population is located in or near the Route Study Area, but outside these specific communities. The following First Nation communities are part of the Project Study Region[9]:

- **Little Salmon / Carmacks First Nation**: currently approaching 600 members, located primarily at the Village of Carmacks (close to 70% of Carmacks population is LSCFN members);
- **Selkirk First Nation**: currently about 500 members, located largely at Pelly Crossing but also at Minto Landing (about 85% of Pelly Crossing residents are members of SFN); and
- **First Nation of Nacho Nyak Dun**: currently about 460 members, located primarily in the Village of Mayo (NND accounts for 60-70% of the population of Mayo) but also at the northern settlement of Stewart Crossing.

The Village of Carmacks, with a 2005 population of just over 400, has served many functions over the years; it has been a campsite, a trading post and a coal mining community. Today it is a service centre on the Klondike Highway (No. 2) and the home of the LSCFN. It is located at the confluence of the Yukon and Nordenskiold Rivers, 180 kilometres north of Whitehorse (Yukon Community Profiles, 2004).

There is a small population of SFN members at Minto Landing, which was their traditional home; however, in the 1950's the community was relocated to Pelly Crossing in an attempt to centralize services. There are a handful of cabins at Minto Landing which are used seasonally by SFN; and Minto Resorts (campground for day-use), a boat launch and a barge landing are also located in the area.

Pelly Crossing, with a 2005 population of about 290, is located on the Klondike Highway in between Whitehorse and Dawson City. Pelly Crossing was originally used by the Selkirk people as a campsite along the Ta'Tla Mun (formerly Tatlmain Lake). The area later developed as a ferry crossing over the Pelly River and then was later used as a construction camp for the workers building the Klondike Highway in the

[9] Population estimates are reviewed in section 6.3.4; sources include Yukon Bureau of Statistics (2005a), Statistics Canada (2001a and 2001b), and INAC, 2006b.

1970s. The highway brought changes to the communities of the area as river-based posts became unnecessary (Yukon Community Profiles, 2004).

Stewart Crossing, with a population of 40 people reported in 2001, acts largely as a service station stop at the junction of the North Klondike Highway and the Silver Trail Highway. There is also a Department of Transportation & Highways service yard, gas station/store and RV Park and Restaurant located immediately south of the bridge. Several members of NNDFN live in the community.

The NNDFN accounts for 60 to 70 percent of the population of the Village of Mayo (overall 2005 population of about 400), and falls within NNDFN's traditional territory. The silver and gold mines around Mayo once drove the Yukon economy. Located along the Silver Trail, or Highway 11, the community currently serves as a distribution centre for the surrounding area (Yukon Community Profiles, 2004).

Given the small population in the Project Study Region, only limited statistical and empirical information was readily available for analysis. In some instances, information is not available because it was suppressed for confidentiality reasons; in these circumstances, specific details on resources use, the economy and the social and cultural context have not included. All Statistics Canada data are subject to confidentiality measures, a copy of which can be viewed in Appendix 6D.

6.3.2 Resource Use

This section considers resource use in the Project Study Region for traditional and domestic land and resource use (trapping, hunting, fishing, collection of plants, timber harvesting, protected areas, outdoor recreation) and commercial land use (tourism, outfitting, commercial fishing, agriculture, mineral and aggregate extraction, and oil and gas extraction). It addresses the socio-economic components identified in the *Proponents Guide* (see Reference Material 1R-1) to:

> Provide information and the historic and current land use and resource use for purposes by First Nation persons, as well as commercial and recreational use by First Nations and non-First Nations persons.

Resource use is integral to the economic fabric and well-being of the Project Study Region communities, and is part of the day-to-day lives of many individuals and families. Data on resource use are often not reported specifically for the Project Study Region or the Route Study Area.

6.3.2.1 Traditional and Domestic Land and Resources Use

Traditional and domestic land and resources use in the Project Study Region include a wide range of activities that are undertaken by both First Nation and non-First Nation individuals and families. These include activities that contribute not only to the local economy but in many instances help to maintain a traditional lifestyle associated with deep rooted connections to the land. Activities considered in this section include trapping, hunting, fishing, collection of plants, timber harvesting, and recreation activities. Those activities considered as VCs, or with anticipated Project-related effects (particularly in the Route Study Area), are described in greater detail (where feasible) than activities that are unlikely to be affected.

Trapping

Trapping is a way of life, with strong cultural roots and social ties, and it is considered the foundation on which the nation of Canada was built. First Nation peoples were trapping and trading long before the arrival of Europeans, and as the fur trade has evolved over centuries, so have the practices of trapping reflecting increased knowledge and the application of conservation principles (Fur Institute of Canada, 2003). Today, trapping continues to provide a livelihood for many Yukon residents, both women and men alike.

The Yukon is home to 14 furbearing mammals that are trapped for their pelts including beaver, coyote, fisher, coloured fox, Arctic fox, lynx, marten, mink, muskrat, otter, squirrel, weasel, wolf and wolverine. Both First Nation and non-First Nation trappers are required to follow the regulations set forth by Environment Yukon (2005(b)). Trappers are required to report their catch to the government and provide information regarding how it was used; however, this does not occur in all cases. Given that many trappers keep catch information confidential, complete data on trapping is difficult to ascertain. The data available from the Yukon Government represents only partial information and does not present the complete value of trapping to the project area communities.

The trapping data available from the Yukon Government can be found in Table 6.3-2; it is included to provide a rough indication of the types of species trapped and only a rough estimate of the relative volumes of species typically trapped in the Project Study Region. Table 6.3-2 is not to be read as an accurate accounting of the numbers of species trapped on the traplines in the Project Study Region. In fact, for all years the numbers of species trapped may exceed the numbers represented on Table 6.3-2. Factors that may impact on the accuracy of the data include the fact that many trappers do not report their catch or only report the catch that they sell. Table 6.3-2 illustrates that over the years the numbers of species trapped declines dramatically. This may be due to non-reporting of catch or it may reflect, in part, recent changes in the fur market.

Table 6.3-2
Yukon Government Trapping Data for the Project Area Traplines

Year	Beaver	Coyote	Red Fox	Lynx	Marten	Mink	Muskrat	Otter	Squirrel	Weasel	Wolf	Wolverine
1980-1981	33	5	68	217	50	35	40		776	4	2	2
1981-1982	20	3	65	259	73	28	41	2	907	5	2	7
1982-1983	12	8	46	101	118	3	1	1	849	11	2	17
1983-1984	56		21	33	60	5	9	1	1446	3	3	2
1984-1985	23	5	32	65	135	14		1	651	19	3	14
1985-1986	17		14	63	142	6	47		213	30	2	5
1986-1987	24		15	50	150	11	6		354	18	3	12
1987-1988	36	4	10	98	226	11	16	1	663	26	1	3
1988-1989	15		5	120	186	9	54		394	2	1	5
1989-1990		1	2	134	135					2	4	2
1990-1991	12		2	48	26	3			13		2	3
1991-1992	9		7	36	101	6			43	2	1	13
1992-1993		3	3	21	33			1				8
1993-1994	6		6	4	147	4			162	27	2	16
1994-1995	6		14	2	97	4			53	3	7	5
1995-1996	5		8	15	176	2			6	5		7
1996-1997	11		6	20	150	3			83	4	2	7
1997-1998	1	1	6	45	124	3			109		4	7
1998-1999	19	1	3	37	29	1					2	1
1999-2000		1		33	39	1				1	2	4
2000-2001	15	5	10	68	68	6					3	6
2001-2002		1		1								3
2002-2003	16			15							2	2
2003-2004	3		3	12	2						6	6
2004-2005	2		7	23	5						1	

(*Source: Yukon Government, Department of the Environment. Rolled up trapping Statistics 19*)

Notes: 1. Data are the results of reported catches from Registered Trapping Concessions 74, 75, 76, 77, 136, 137, 139, 142, 143, 144, 146, 147, 151, 153, plus four others to help ensure confidentiality.

2. Data are incomplete.

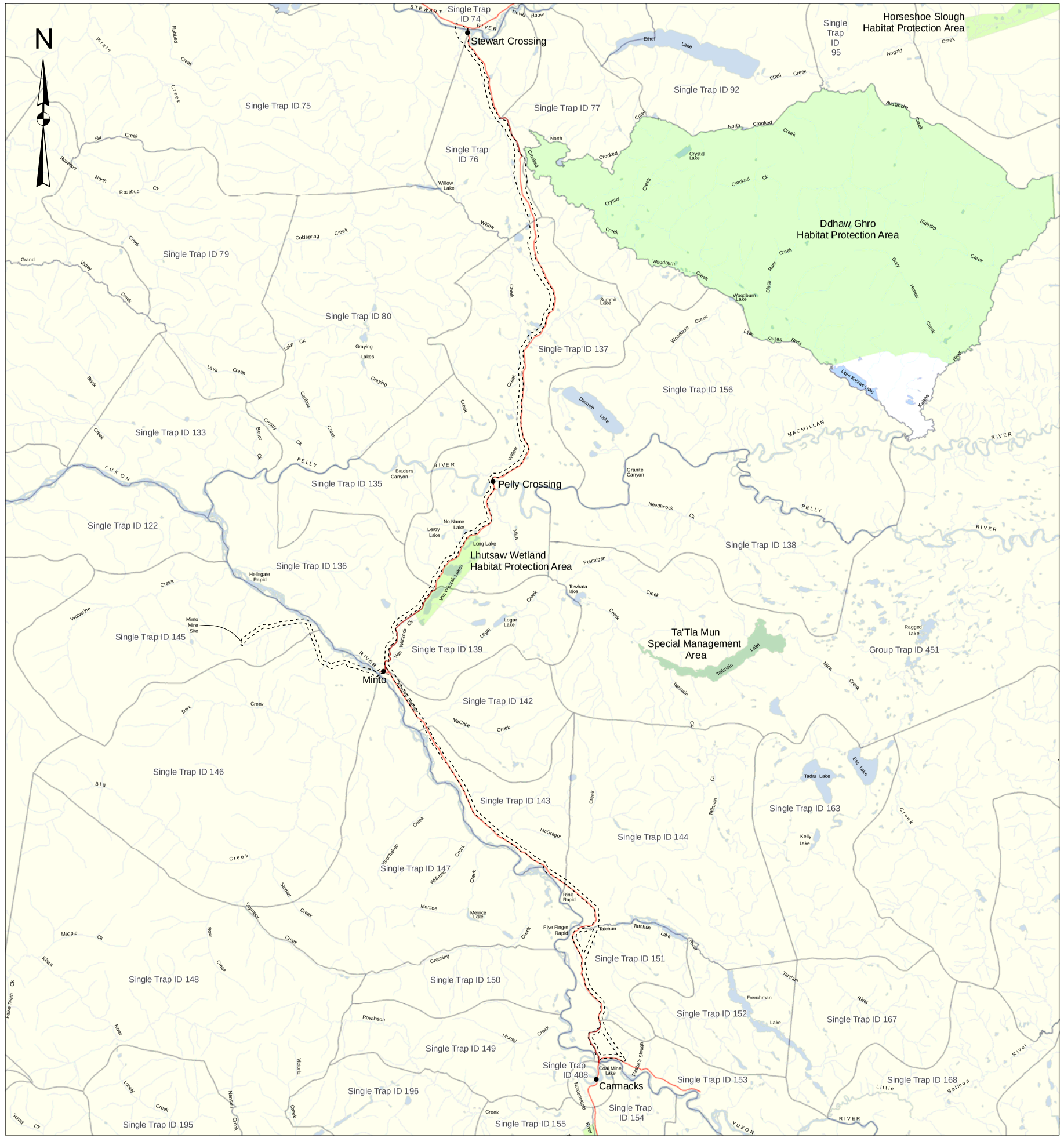
Over 400 Yukoners hold trapping licences. Most of these individuals hold registered trapping concessions and the remainder are trapping assistants. Approximately 50% of Yukon trappers are First Nation members.

A concession holder is given exclusive rights to harvest furbearing animals in their concession. There are 352 registered trapping concessions in the Yukon and 16 of these are in the general vicinity of the Project. The CS Route Study Area will intersect 11 of these concessions, while the MS Route Study Area will cross three registered trapping concessions (see Figure 6.3-2). Table 6.3-3 provides a list of trapline concessions and their affiliation with relevant First Nations.[10]

Table 6.3-3
Trapline Concessions

Trapline #	Affiliation
153	LSCFN
151	LSCFN
147	LSCFN
146	SFN
145	Non-beneficiary trapline
144	LSCFN
143	LSCFN
142	SFN
139	SFN
136	SFN
137	Non-beneficiary trapline
76	NND
75	NND
74	NND

[10] Trapline concession statistics are held by each trapline holder. The only publicly available data are rolled up statistics which have been included in Table 6.3-2. This data represents only partial statistics as not all trapline holders report details on their trapping activities.



Carmacks-Stewart/ Minto Spur Transmission Project

YUKON ENERGY

Legend

- Town
- Route Study Area
- Road
- Water Course
- Water Body
- Parks and Protected Areas
- Registered Trapping Concession

Digital Data Source:

Registered Trapping Concession data downloaded (August 2005) from Geomatics Yukon website: http://environmentyukon.gov.yk.ca/geomatics/envydata.html
Source: Geomatics, Environment, Yukon Government

Parks and Protected Areas data downloaded (January 2006) from Yukon Department of Environment website: http:/environmentyukon.gov.yk.ca/geomatics/govdata.html Source: Geomatics, Environment, Yukon Government

Parks and Protected Areas data downloaded (January 2006) from Yukon Department of Environment website: http:/environmentyukon.gov.yk.ca/geomatics/govdata.html Source: Geomatics, Environment, Yukon Government

National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:250,000. Reproduced under license from © Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Route study area obtained from YEC, 2006.

NTS Sheets 115I, 115P, 105L, 105M
UTM Zone 8 NAD83

Registered Trapping Concessions

Scale: 1:275,000
(when plotted at 24"x28", orginal map on cd provided with final document)

0 2.5 5 10 15 20 25 km

Drawn By: HD
Checked By: DC/NL
Date: August 2006

InterGroup CONSULTANTS
ACCESS CONSULTING GROUP

Our File: D:\Projects\AllProjects\YEC-05-01 CarmStewTransLine\gis\mxd\YESAA_Report\Fall2006\Environmental\Trapping.mxd

A typical trapping concession would be held by an individual, although numerous trapping assistants may also trap in the area. Trapping assistants are granted licences through the local area Conservation Officer. In some cases, it is the trapping assistant and not the registered concession holder that undertakes the majority of activity in an area.

It is difficult to determine the level of harvest activity on each concession from year to year and a variety of factors may contribute to fluctuations in activity. Examples that affect trapping activities include:

- limited access to trapping areas due to late freeze-up of water bodies;
- low snow levels making travel difficult;
- wildlife population cycles changing due to weather, or the availability of food; or
- socio-economic conditions such as low fur prices, high fuel costs, better earnings from other opportunities, personal reasons, etc. (Personal communication, Environment Yukon, August 9, 2006).

The wildfire that burned in the area near Pelly Crossing in 1995 had a major effect on the habitat, wildlife and access to trapping areas for several years. One trapper with a concession affected by the fire indicated that he and the other users of the area took three to four years off from trapping; however, after that time certain species started to return to the area. The trapper indicated that moose are beginning to return to the area now, along with various predator species. Other species, like marten, will require more forest re-growth before they reappear (Personal communication, Trapper, August 9, 2006).

A trapper will use a series of trails within their concession and alternate the use of trails from year to year in order to encourage species to return to an area that was previously trapped. New trails may be created to adapt to a change in species movement (Personal communication, Trapping Assistant, July 13, 2006). On average a concession will have 73 kilometres of trapping trails and use an average 38 kilometres of trapping trails in one year (Government of Yukon, 1997). Trails are generally accessible from the highway, although many can also be accessed from local communities. Some trapping trails are dependent on freeze-thaw cycles as they are located across water bodies with no road access.

Trapping activity occurs primarily in the winter months, with open season for each species varying slightly. A summary of the trapping season for each species is provided in Table 6.3-4. Each trapper has their own preference for travel in the winter, with some working their trails by foot or by snowshoe and others relying on snowmobiles. Traplines are also used for other purposes throughout the year. They may act as locations for, or access points to activities such as berry picking, hunting and fishing (Personal Communication, Trapping Assistant, July 13, 2006).

Table 6.3-4
Open Trapping Season by Species

Species	Open Season
Beaver	Oct 1 - May 31
Fisher	Nov 1 - Feb 29
Fox - red, cross, silver	Nov 1 - Mar 10
Fox - arctic	Nov 1 - Mar 31
Lynx	Nov 1 - Mar 10
Marten	Nov 1 - Feb 29
Mink	Nov 1 - Feb 29
Muskrat - S. of Arctic Circle	Oct 1 - May 31
Otter	Nov 1 - Mar 31
Squirrel	Nov 1 - Mar 31
Weasel	Nov 1 - Mar 31
Wolverine	Nov 1 - Mar 10
Wolf	Nov 1 - Mar 10
Wolf - neck snare only	Nov 1 - Mar 31
Coyote	Nov 1 - Mar 10

(Source: Environment Yukon, 2005b)

Trapping is an important activity in the Yukon, with an economic value that has fluctuated from $250,000 to $1 million annually over the past two decades (Government of Yukon, 2005). It is an important source of revenue for many communities, including those which fall within the project area. Many community members that engage in trapping sell their furs to the **Yukon Trapper's Association** (**YTA**). The YTA provides a choice of three auction houses and fur markets for the raw skins and furs that are trapped. As the agent to the three auction houses, the YTA can provide advance money to trappers prior to the sale of their furs. This system can be advantageous to the trapper, especially early in the season, as it provides working capital for trapping supplies, food, fuel, etc.

The international fur market has fluctuated regularly in recent years, with external factors such as the strength of the Canadian dollar and the demand (or lack thereof) for fur in the fashion industry, influencing the overall outcome of a trapping season's cash value. Given that the demand is constantly changing, trapping activities are often geared towards the species that will fetch the best price. A summary of fur prices per species over the past 10 years is provided in Appendix 6E.

Given that fur prices have fluctuated, and in some cases are considered low, a local fur market has evolved in Project Study Region communities over the years. By way of example, many trappers will catch wolves, have them tanned locally, and then deal directly with a buyer or a store, consequently receiving a better price. Many pelts are tanned locally and used for items such as garments, dolls and

paintbrushes (Personal Communication, D. Bradley, July 12, 2006). The value of these products is often greater than the price of the pelt alone.

Other uses of the animals trapped vary from trapper to trapper. Some trappers will eat certain species (e.g., beaver, gopher) and many will use the meat as dog food or as bait for future traps. Certain species also have medicinal and cultural values to the First Nations in the region.

The multitude of ways that trapped species are used helps to reinforce the fact that trapping has significance beyond the economic income it provides. It is considered as a significant component of life to many Yukoners. A 1996 survey completed by the Yukon Territorial Government found that 50% of trappers see trapping as a way of life: 37% consider trapping their winter job and 12% view trapping as a form of recreation (Yukon Government, 1997). It is also an activity that is passed on from generation to generation, especially in First Nation communities.

Hunting

Hunting is an activity undertaken by Yukon First Nations, Yukon residents, and non-residents for a host of reasons ranging from subsistence to sport. Recent land claims agreements allow First Nation members to hunt within their traditional territory with no restrictions (such as bag limits or seasonal limitations); although a licence and/or written permission from another First Nation (if the activity takes place in their traditional territory) is required if they choose to hunt outside of their traditional territory. Yukon-residents and non-residents require a licence for hunting and non-residents must be accompanied by a registered Yukon outfitter or a resident holding a Special Guiding Licence. Additionally, written permission for non-First Nation hunters is required for hunting activities on all Category A settlement lands (Environment Yukon, 2005(a)).

The Yukon is divided into a series of Game Management Zones and Game Management Areas. The Route Study Area crosses 3 zones and 6 areas (Figure 6.3-3). Regulations for hunting apply to each zone. The zones are:

- Zone 4: on the east side of the Klondike Highway between Carmacks and Stewart Crossing;
- Zone 3: beginning near Minto and including the area west of the Klondike Highway to Stewart Crossing; and
- Zone 2: the area north west of and including Stewart Crossing.

Each of these zones has licence requirements, seasonal restrictions and bag limits for all non-First Nation hunters. In Zone 4 there are additional restrictions that apply to the Route Study Area; this includes moose hunting restrictions near Ethel Lake and no hunting permitted in the Ddhaw Ghro Habitat Protection Area. Further, there is a voluntary no-hunting request for the Ethel Lake Caribou herd, which includes voluntary compliance on behalf of NND and SFN.

Hunted species across the Yukon can be classified as big game (moose, caribou, grizzly bear, black bear, polar bear, wood bison, mountain sheep, mountain goat, wolves, wolverines and coyotes), small game

(snowshoe hare, arctic ground squirrel, porcupine, grouse and ptarmigan), and migratory birds (ducks, geese, rails, coots, sandhill cranes and snipe). Other species not listed are either protected or, in the case of certain small fur bearing animals, could require a trapping licence.

The hunting traditions of First Nation peoples in the Yukon have evolved out of their intimate relationship with the land. It is noted that, "[t]hrough wise use of local resources, the first people of the Yukon were able to feed, cloth, and shelter themselves while developing rich communities and cultures" (Yukon Environment, 2005(a)). While the equipment used for hunting has significantly changed over the past 200 years, the ways in which the harvest is used has remained the same. Wildlife are respected and given thanks and as much of the animal is used as possible, whether it be eaten or otherwise. There is a "general understanding of sharing the resource and people taking only what they (need)" (LSCFN Lands & Resources Department, 2002).

Hunting activities in the Yukon were assessed in the *Hunter Effort Survey* (Department of Renewable Resources and the Yukon Bureau of Statistics, 2000). The survey asked questions to determine what species were hunted and where, how hunting was accomplished, and how much money was spent on the activity. Moose was considered as the most important species to 72% of the hunters surveyed and it was also the most commonly hunted species (by 90% of hunters). While Caribou was hunted by 60% of the hunters surveyed, it was only considered the most important species by 10% of hunters. The methods of hunting depend on the species sought, with almost two-thirds of respondents reporting that they generally used a boat to hunt. Hiking and driving were the hunters' second and third preferred methods. The majority of hunters (86%) hunted with a partner(s), and 83% of that number had intentions to share the animal. The survey found that hunters reported spending an estimated $2.2 million to go hunting, with an average of $610 per hunter.

Fishing

Fishing is a popular activity in the Yukon and includes commercial, domestic, aboriginal and recreational activities. Within the Project Study Region, there are several fish-bearing water bodies which are used regularly. A summary of these water bodies and the species typically fished (according to the Yukon Fishing website) is provided in Table 6.3-5.

Table 6.3-5
Fishing Locations and Species Found in the Project Study Region

Water Body	Species Fished
Tatchun Lake	Northern pike
Tatchun Creek	Arctic grayling, Chinook salmon spawning area in September
McGregor Creek	Arctic grayling, Chinook salmon, Whitefish
McCabe Creek	Arctic grayling, Chinook salmon, Whitefish
Von Wilczek Creek	Northern pike
Crooked Creek	Arctic grayling
Stewart River	Salmon
Pelly River	Arctic grayling, Chinook salmon
Yukon River	Arctic grayling, Chinook salmon
Big Creek	Arctic grayling
Minto Creek	Arctic grayling

(Source: Environment Yukon, Fishing in the Yukon, 2006).

The Tatchun Creek area between the Yukon River and Tatchun Lake is a known chinook salmon spawning area. This creek is closed to all fishing from August 1 to September 30 of each year. The area around the mouth of Tatchun Creek is one of the most popular sport fishing locations in the Yukon Territory, accounting for over 80% of the chinook salmon caught in the Upper Yukon (Yukon Salmon Committee, 2002).

Other fished species in the Project Study Region include Arctic grayling, whitefish, inconnue, burbot, Northern pike (in lakes), and Long-nosed sucker. The Arctic grayling, Long-nosed sucker and the Northern pike generally spawn in the spring and the whitefish spawn in the fall to early winter (Finster, 2003).

Historically, salmon was one of the most important sources of food for the First Nations in the Project Study Region, and fish were traditionally caught in fish traps or by strategically placing fish wheels in large streams and rivers. Fish were then dried and smoked and stored in order to outlast the winter months. (LSCFN Lands and Resources Department, 2002)

Minto, near the current location of Minto Landing, was considered a key dog (chum) salmon camp for the Selkirk people (Government of Yukon, Tourism and Culture, 2002),. The Little Salmon River, the Nordenskiold River and Tatchun Creek were significant locations for fishing by the LSCFN. The mouth of the Stewart River was the site of a traditional fish camp for the NNDFN. As indicated earlier, when the salmon run arrives in late July entire communities vacate and move to fishing camps and cabins.

First Nation members fishing within their traditional territory do not require a fishing licence; however, fishing is subject to regulation by each First Nation. Fishing in areas outside of one's traditional territory requires a licence. Separate rules apply for salmon fishing which is dealt with separately under the Final

Agreement. An example of First Nation led regulations is a Salmon Doo'Li completed by the LSCFN in 2002 (see Reference Materials 6R-8).

It is a common concern among the First Nations in the Project Study Region, and throughout the Yukon, that catch-and-release management of fish stocks can hurt and kill fish (Little Salmon Carmacks First Nation et. al, 2004; Nacho Nyak Dun et. al, 2002). The use of barbless hooks is now recommended by Environment Yukon as per a recommendation based on public consultation from the Yukon Fish and Wildlife Management Board (YFWMB, 2002); however, there are still concerns in First Nation traditional territory, especially with regard to live angling practices. Generally speaking, First Nations feel that fish that are taken should be kept and eaten.

Collection of Plants

In the past, collection of various plants and berries was an important component of the subsistence lifestyle led in the Project Study Region. Plants regularly consumed in the past include certain roots (e.g. bear root), berries (e.g. soapberries, high bush cranberries, blueberries, raspberries), young leaf shoots and mushrooms (Yukon Government, 2002). Today, berries continue to be a commonly harvested plant, with blueberries, raspberries and high bush cranberries topping the list of most commonly consumed (Receveur et. al, 1998). Transmission line corridors were identified as a location for excellent blueberry growing conditions.

Many plants were also used for medicinal purposes by the First Nations in the Project Study Region. For example, white spruce buds, when first grown, can be made into a tea with general antiseptic properties (personal communication, LSCFN member, June 22, 2006). Tea from the bark of high bush cranberry can be used to relieve menstrual and stomach cramps (Yukon Government, 2002). Most of the medicinal plants commonly used in the Project Study Region are commonly found throughout the boreal forest. Much of the information related to the subject today is held as traditional knowledge by the various First Nations.

As wild fires are an inevitable aspect of the Yukon's boreal forests, there is potential to grow the morel mushroom industry in the Project Study Region. Morels tend to grow in abundance in burned areas in the spring following a summer fire. The morel has a steady demand in European and Japanese cuisine and the Yukon stands to become a part of the morel-exporting industry. At present morel pickers come generally from outside of the Yukon, although there is opportunity for local employment and production capacity in the future (Yukon Economic Development, 2005).

Timber Harvesting

The majority of merchantable forests in the Yukon are located south of the 61st parallel (i.e., well south of the Project Study Region), as most of the forested lands north of this line are influenced by cold soils, poor drainage and aggressive fire regimes (Energy, Mines and Resources, 2006d). Thus, there are limited timber harvesting activities within the project area. Maps identifying forest cover within the Project Study Region are located in Appendix 6C.

There are 3 timber (or commercial) permits within the Project Study Region, two of which are considered as active (Personal communication, Forest Management Branch, June 2006). These permits are for volumes less than 1000m^3 and are aimed to supply local business needs such as firewood sales, saw-milling, house building or other small ventures.

Personal use timber permits are far more common in the Project Study Region. This allows an individual to cut 25 cords of wood for personal use. Typical harvest methods for personal use involve a chainsaw and a pickup truck and many of the burned areas in the Project Study Region are popular harvesting sites (Personal communication, Forest Management Branch, June 2006). Home heating is typically accomplished by fuel wood burning, and as such, personal timber harvesting is a common-place activity. All of the Project Study Region communities have small milling capabilities.

The communities in the Project Study Region expressed interest in having access to the merchantable and fuel-wood timber that would be removed during the construction phase of the Project.

Protected Areas

There are two protected areas and one Park Reserve in the Project Study Region: the Lhutsaw Wetland Habitat Protection Area, The Ddhaw Ghro Habitat Protection Area, and the Jackfish Lake Park Reserve.

The Lhutsaw Wetland Habitat Protection Area is located southwest of Pelly Crossing in the central Yukon. The area covered is approximately 15 km in length and 2.5 km across and consists of a series of freshwater lakes, ponds, and lands. The Lhutsaw Wetland Area was established as a special management area under the Selkirk First Nation Final Agreement, and the management plan for the area delineates a series of recommendations for various land uses in the habitat protection area. It includes the maintenance of both the natural and cultural environment (Selkirk First Nation Government and Government of Yukon, 2006).

The Ddhaw Ghro Habitat Protection Area is an isolated mountain range in the central Yukon covering approximately 1600 km^2 between the Pelly and Stewart Rivers. Meaning "many peaks" in Northern Tutchone, the Ddhaw Ghro area had important cultural and spiritual values to the First Nations in the region. The area has been managed by traditional law for many generations. The Ddhaw Ghro area was identified to become a Habitat Protection Area under the NNDFN and SFN Final Agreements, and a draft management plan is currently under public review. The vision for Ddhaw Ghro is to leave it as a natural area that remains untouched by industrial development (Ddhaw Ghro Habitat Protection Area Steering Committee, 2006).

Jackfish Lake Park Reserve is not a designated parkland area under The Yukon Parks & Land Certainty Act and it is not actively maintained parkland. The Jackfish Lake Park Reserve is located west of the Klondike Highway, approximately 30 kilometres north of Pelly Crossing. It is a 73.8 ha parcel of forested land reserved "for campground purposes". It is primarily comprised of aspen and spruce and has been reduced from the original 206 ha due to a Selkirk First Nation's site specific claim to the north. Rough and unmaintained road access is available to Jackfish Lake.

Outdoor Recreation

Residents in the Project Study Region are able to participate in multiple wilderness activities. There are many access points for hiking, snowmobiling, and boating. Additionally, hunting, fishing and trapping activities are still very important components of community life (Yukon Community Profiles, 2004).

Summer is when most people spend time out on the land together in the Project Study Region. When the salmon run occurs in mid-summer most of the residents of Carmacks and Pelly Crossing vacate the community and move to cabins and fish camps near the river.

6.3.2.2 Commercial Land Use

The Project Study Region falls in an area with limited existing commercial land uses. The primary activities considered in this section include tourism, outfitting, commercial fishing, agriculture, mineral and aggregate extraction and oil and gas extraction.

Tourism

Tourists in the Yukon may experience a variety of opportunities ranging from scenic drives, to wildlife viewing, to wilderness canoeing, to visiting historic sites. Visitor exit surveys indicate that the majority of tourists come to view natural attractions, visit museums and historic sites and shop. Other activities include experiencing First Nation Culture, walking/hiking/backpacking, wildlife watching, and gold panning (Department of Tourism and Culture and the Yukon Bureau of Statistics, 2006). Estimated annual tourism revenues in the Yukon exceed $124 million annually and at least 70% of all private sector industries report some level of tourism-related revenue. An estimated 2000 tourism-related jobs exist at approximately 1180 Yukon businesses (Yukon Government, 2000). In the Project Study Region, there are several forms of tourism that contribute to the economy, including recreational touring, wilderness tourism, and outfitting.

The Project Study Region falls within two tourism areas as identified by Yukon Department of Tourism, with the majority of the area falling in the Campbell Region and the Silver Trail Region beginning at Stewart Crossing. Both areas have a long history of mining and are associated with a rich Aboriginal history extending back more than 10,000 years. Both areas are part of scenic driving routes in the Yukon, and account for a large proportion of tourism activities in the area. Further detail on the Campbell and Silver Trail regions can be found in Reference Materials 6R-9. The CS Route Study Area traverses the Campbell Region and terminates at the start of the Silver Trail Region.

Aside from scenic drives, tourists can also experience Yukon's vast wilderness through an assortment of activities. Aside from the campgrounds at Carmacks, Tatchun Creek, Pelly Crossing and Stewart Crossing, the Project Study Region offers opportunities for canoeing, dog sledding and outfitting.

Canoeing primarily takes place on the Yukon River, although the campground at Pelly Crossing is a common exit point for river trips originating further east. The Yukon River's blend of scenery, wildlife and history, ease of access and easy paddling make it the most popular canoe route in the Territory for

guided and self-guided river trips. The River has many campsites, visible relics of Yukon's gold rush, river travel history, and visible evidence of ancient and current Yukon First Nation use of the River. Most canoe trips take place between Whitehorse and Dawson (~ 14 days), while shorter trips may start or stop in Carmacks (Personal Communication, Department of Tourism and Culture, May 2006). The MS Route Study Area crosses the Yukon River south of the barge landing at Minto.

Between 1999 and 2004, 13-18 licensed operators guided 225-300 clients on multi-day canoe trips on the Yukon River. Over 25 different companies market Yukon River trips each year. In addition, self-guided travelers rent or bring their own canoes. The Yukon River Survey (Yukon Government, 1997) found that over 60% of river travelers (including Yukon residents) used rental canoes. In 2004, 1,245 tourists rented canoes for their Yukon River trip. From 2000 to 2004, 3-4 operators guided 5-30 clients on multi-day canoe trips on the Pelly River (150-350 user days). Self-guided data is not available (Personal Communication, Department of Tourism and Culture, May 2006).

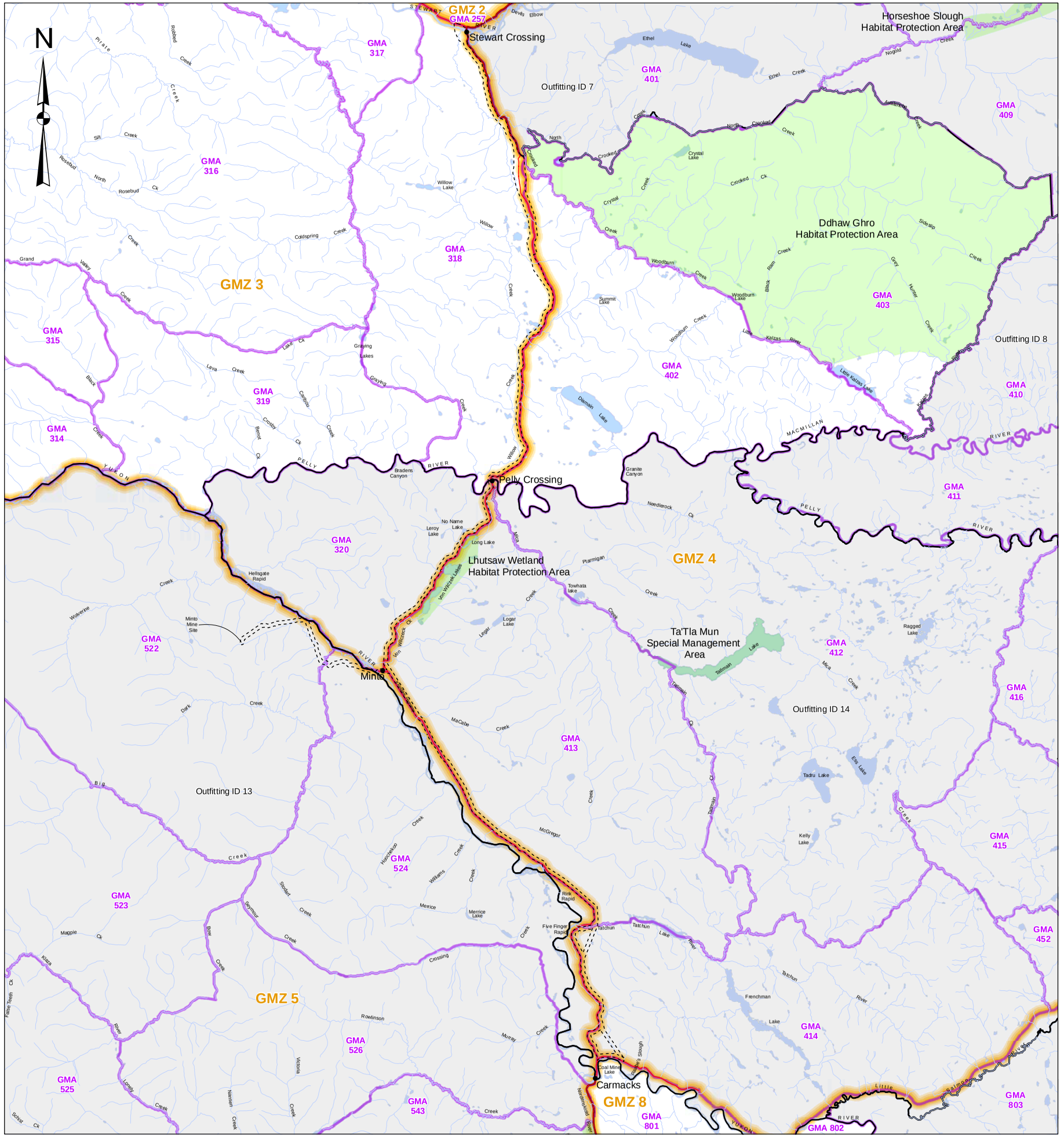
In the winter, dog sledding offers tourists a unique wilderness experience. The Project Study Region is in the vicinity of a section of the Yukon Quest Trail which, aside from being a world class dog sledding race course, is also open for tourism purposes. The race course covers 1,000 miles between Whitehorse and Fairbanks, Alaska during a two week period in February and has been described as the "Toughest dog sled race in the World" (Yukon Quest International, 2006). The race course varies slightly from year to year and requires a 4-foot wide trail to be set several weeks before the race (Personal Communication, Yukon Quest, June 2, 2006). Nine Yukon-based operators market winter trips along the Yukon Quest Trail (Personal Communication, Department of Tourism and Culture, May 2006). In the Project Study Region the trail follows the west side of the Yukon River between Carmacks and Pelly Crossing, crossing the river north of McCabe Creek. The course then deviates from the general vicinity of the Project and follows the Dawson Overland Trail onwards towards Alaska.

Outfitting

Outfitting is a stable, long term component of Yukon hunting and accounts for a proportion of tourist traffic to the region. Guided trips of non-residents are recorded as far back as 1912. In 1958, the present system of outfitting concessions was established (Yukon Outfitters Association, 2006). There are three outfitting concessions in the Project Study Region:

- Trophy Stone Safaris (generally on east side of Yukon River between Carmacks and Pelly Crossing),
- Mervyn's Yukon Outfitting (generally on west side of Yukon River, including area of the MS development), and
- Rogue River Outfitters Ltd. (generally west side of Yukon River north of Ddhaw Ghro Habitat Protection Area and up to Stewart Crossing).

The location of the outfitting concessions is provided in Figure 6.3-3. A summary of the activities within these outfitting concessions is provided in Table 6.3-6.



Carmacks-Stewart/ Minto Spur Transmission Project

YUKON ENERGY

Legend

- Town
- Route Study Area
- Road
- Water Course
- Water Body
- Parks and Protected Areas
- Game Management Area (GMA)
- Game Management Zone (GMZ)
- Outfitting Concession

Digital Data Source:

Outfitting Concession data downloaded (July 2005) from Geomatics Yukon website:
http://environmentyukon.gov.yk.ca/geomatics/envydata.html
Source: Geomatics, Environment, Yukon Government

Game Management Area data downloaded (July 2005) from Geomatics Yukon website:
http://environmentyukon.gov.yk.ca/geomatics/envydata.html
Source: Geomatics, Environment, Yukon Government

Parks and Protected Areas data downloaded (January 2006) from Yukon Department of Environment website:
http://environmentyukon.gov.yk.ca/geomatics/govdata.html Source: Geomatics, Environment, Yukon Government

Route study area obtained from YEC, 2006.

NTS Sheets 115I, 115P, 105L, 105M
UTM Zone 8 NAD83

Outfitting Concessions and Game Management Zones and Areas

Scale: 1:275,000
(when plotted at 24"x28",
orginal map on cd provided with final document)

0 2.5 5 10 15 20 25 km

Drawn By: HD	InterGroup Consultants / Access Consulting Group
Checked By: DC/NL	
Date: August 2006	

Our File: D:\Project\AllProjects\YEC-05-01 CarmStewTransLine\gis\mxd\YESAA_Report\Fall2006\Environmental\Outfit_GameMng.mxd

Table 6.3-6
Outfitter's Activities in the Project Study Region

Outfitter	Concession Number	Species Hunted	Other Activities	General methods
Trophy Stone Safaris	14	Stone Sheep, Alaska/Yukon Moose, Mountain Caribou, Grizzly Bear, Black Bear, Ptarmigan, Wolf and Wolverine	Fishing can be found in many lakes and rivers throughout the hunting area.	Hunters fly-in to the camp. Hunts are conducted with one guide assigned to each hunter and are conducted by horseback
Mervyn's Yukon Outfitting	13	Moose, Mountain grizzlies, Wood Bison, Dall sheep and Mountain Caribou.	Mervyn's does not focus on wolf, wolverine and black bears, however any or all of these animals may be seen during the hunt, and are included during regular fall hunts. In addition to hunting, this area has some excellent fishing. Some fishing trips are also offered in the summer.	Hunters will fly-in to the camp and then be guided by horseback.
Rogue River Outfitters Ltd	7	Trophy moose, caribou, grizzly bear, black bear and sheep.	While hunting other big game species, hunters may also have a chance to take a wolf or wolverine. While in the area hunters may also fish for the many species of fish found in the lakes and streams.	Fly-in to the base camp and then hunt by horseback or boat

(Source: Mervyn's Yukon Outfitting, 2006. Rogue River Outfitters, Ltd 2006. Trophy Stone Safaris, 2006)

The Yukon Outfitter's Association indicated that activities undertaken by their members occur largely in remote areas. Hunters come to the Yukon for the experience of being the only party in a given location; the Yukon is also attractive to hunters because the perception of wilderness is paramount. As such, the areas used by the Project Study Region outfitters fall far from the Study Route Area, which parallels the Klondike Highway (Personal communication, Yukon Outfitter's Association, June 7, 2006).

Commercial Fishing

The species of greatest economic importance include the chinook and chum salmon. Fisheries generally target the chinook and chum salmon runs on the Yukon River. The portion of the catch that is allocated to fisheries is dependent upon the size of the salmon run crossing the Yukon/Alaska border. The fishery is regulated by the joint Canada and United States "Yukon River Salmon Agreement". According to the Agreement, "Both countries agree to manage their salmon fisheries to ensure enough spawning salmon are available to meet escapement requirements and to provide for harvests, when possible, according to harvest sharing agreements" (Yukon River Drainage Fisheries Association and the Yukon River Panel, 2005). An important component of this agreement is maintaining salmon habitat in the Yukon River watershed. In the Project Study Region this includes spawning habitat and rearing habitat. Along with the chinook and chum salmon species there are also smaller numbers of coho salmon harvested. Table 6.3-7 provides summarized data on Mainstem Yukon River Harvest for the commercial, domestic, Aboriginal and sport fishery by decade.

Table 6.3-7
Commercial, Domestic, Aboriginal and Sport Harvest Data of Chinook and Chum Salmon

	Canada						
	CHINOOK Mainstem Harvest				CHUM (FALL) Mainstem Harvest		
Year	Commercial Harvest	Domestic Harvest	Aboriginal Fishery	Sport Harvest	Commercial Harvest	Domestic Harvest	Aboriginal Fishery
Total # Harvested							
1961-1970	25,831	n/a	44,661	n/a	22,119	0	29,375
1971-1980	38,824	6,958 [2]	31,659	300 [3]	38,573	14,293 [2]	21,645 [6]
1981-1990	108,709	3,411	68,898	3,350 [4]	238,644	4211 [4]	24,087
1990-2000	74,332 [1]	2,086 [1]	71,845	4,097 [1]	166,647	n/a	24,061
2001-2005	12,582	416	33,534	1,142	33,589	3 [5]	11,733
Overall total	*260,278*	*12,871*	*250,597*	*8,889*	*499,572*	*18,507*	*110,901*
Average Annual							
1961-1970	2,583	0	4,466	0	2,212	0	2,938
1971-1980	3,882	696	3,166	30	3,857	1,429	2,165
1981-1990	10,871	341	6,890	335	23,864	421	2,409
1990-2000	7,433	209	7,185	410	16,665	0	2,406
2001-2005	2,516	83	6,707	228	6,718	1	2,347
overall avg	*5,784*	*286*	*5,569*	*198*	*11,102*	*411*	*2,464*

Notes:
1. 2000 data is missing
2. 1971-1973 data is missing
3. Data is only for 1980.
4. 1998 data is missing
5. Data is only for 2001.
6. 1972 data is missing.

(Source: Yukon River Joint Technical Working Group Database 1977-2004)

The total catch for the commercial and domestic fisheries (U.S. and Canada) has been declining over the last three decades, while the aboriginal fishery has remained fairly stable (Yukon River Joint Technical Committee Data, 1997-2004). There is one commercial fishing licence in the Project Study Region which covers an area upstream of the White River to 800 metres downstream of the confluence of Tatchun Creek and the Yukon River (Personal communication, DFO, July 2006).

The economic significance of commercial Yukon salmon fisheries is estimated to be approximately $126,000 in recent years (Personal communication, DFO, October 10, 2006).

Agriculture

Less than 2% of the Yukon's total area is suitable for agricultural development due to limitations presented by geography, soils and climate. Soil-based agriculture is largely limited to major river valleys such as the Yukon, Pelly and Stewart rivers. Yukon soils tend to be low in organic material content as well as deficient in nitrogen and phosphorus. The sub-arctic, continental climate limits the number of frost-free days; however, long daylight hours in the summer help to promote rapid summer growth and compensate for the shorter growing season and cooler temperatures (Yukon Agriculture, 2004).

The total area of titled agricultural land in the Yukon is 12,370 hectares. Utilization of this land includes natural lands for pasture (35%), seeded pasture (4%), crops (23%), summer fallow (2%) and various other purposes (36%). Most agricultural applications are located in the vicinity of major communities and over 70% of all farms are located within 100 kilometres of Whitehorse (Yukon Agriculture, 2004).

Immediately adjacent to the CS Route Study Area, there are three applications (which would constitute two parcels of land) (Energy, Mines and Resources, 2006(a)). It is our current understanding that one of the applications located at McGregor Creek is currently being challenged by LSCFN. There is also an agricultural holding listed as an Agreement for Sale, a portion of which falls within the CS Route Study Area near McCabe Creek. Of the active agricultural holdings, there are a variety of agricultural production activities. This includes production of vegetables, forage crops and livestock such as pork, beef, poultry (including eggs) and other special meats (Energy, Mines and Resource, 2006(b)).

Mineral and Aggregate Extraction

The Yukon has a long history of mining activities which have been the cornerstone of the economy since the gold rush of 1896-1898 although prospecting activities date back even further. The territory has experienced several boom-and-bust cycles associated with the rise and fall of metal prices over the years. The Yukon is a mineral-rich area, host to significant deposits of gold, copper, iron, lead, tungsten, zinc, coal and silver. Mining activities in the territory are regulated by the Yukon government, Mineral Resources Branch (Energy, Mines and Resources, 2006). A brief history of mining in the Project Study Region can be found in Reference Materials 6R-9, along with further details on the economic development of the Central Yukon as provided in the Heritage Resources Inventory in Appendix 6H.

The current active claims in the region date back to the early 1970s; however, there is no record of mining, except for gravel and coal, within the Route Study Area. Currently the Tantulus Butte property is licensed by Cash Resources Ltd. and the company lists it as "coal exploration concessions" (Cash Minerals Ltd., 2005). Yukon Geological Survey (2005) lists the deposits as inactive with production shifted to the surface following the 1978 fire (Yukon Geological Survey, 2005, p. 14). It has been reported locally that the coal is still burning underground, and steam, accompanied by strong gases, has been observed escaping from Tantalus Butte in the winter (Personal communication, Carmacks community member, June 22, 2006). It is not clear if the above-ground access to the coal is active or not; however, there has been recent exploration work on Tantalus Butte by Cash Resources Ltd. (Cash Minerals Ltd., 2006). There is also an inactive coal mine called South Tantalus located 2 km SE of Carmacks which is licensed by Archer, Cathro and Associates (1981) Limited (Yukon Geological Survey, 2005 p. 13).

Western Copper Corporation holds "240 quartz claims, quartz claim fractions, quartz leases and quartz lease fractions" in the Dawson Range. This is approximately "38 km northwest of the town of Carmacks" (Cavey, Gunning, and Clegg, 2006, p. 2). This site is accessed from Carmacks 33 km down a gravel road (the Freegold Road) followed by 12 km of exploration road (Yukon Geological Survey, 2005).

The Minto Mine project is owned by Sherwood Copper Corporation. This property is located 76 km NNW of Carmacks in the upper reaches of the Minto Creek watershed; access is facilitated by barge from Minto Landing across the Yukon River to a gravel access road that leads to the mine site.

The Minto claims are anticipated to come into production in 2007 and to benefit directly from Stage One of the Project when it is developed in 2008. The Carmacks Copper mine (Williams Creek claims) is another possible near-term development that could potentially benefit from the CS Project development (subject to development of a 138 kV spur line in future from the Carmacks Copper mine to the CS development in the McGregor Creek area).

There is a small group of six active quartz mining claims between the Minto claims area and the Western Copper claims area called Spring 1-6. The claims are owned by Shawn Ryan, a well known prospector out of the Dawson area (Energy Mines and Resources, 2006(c)).

Table 6.3-8 summarizes other known deposits in the Project Study Region. None of the known mineral reserves are active mines at this time.

Table 6.3-8
Known Mineral Deposits in the Project Study Region

Deposit Name	Mineral	Location	Status	Discovery date
Williams Creek (Carmacks Copper)	Copper, Gold	36 km NNW of Carmacks	EA/licensing stage	1970
Minto	Copper, Silver, Gold	76 km NW of Carmacks	construction and site preparation stage	1971
Nucelus	Gold	61 km NW of Carmacks	active exploration site	1968
Laforma	Gold	48 km NW of Carmacks	inactive past producer	1931
Tinta Hill	Silver, Lead, Zinc, Copper, Gold	43 km NW of Carmacks	active exploration site	1930
Cash	Copper, Molybdenum	79 km NW of Carmacks	Deposit, withdrawn from staking. SFN settlement lands	1969

(Source: Yukon Geological Survey, 2005)

In addition to mineral extraction, aggregate materials are mined throughout the Project Study Region. The Yukon Government Department of Highways has 23 notations related to aggregate materials in the project region (see Reference Materials 6R-9), which are used for a variety of purposes including active gravel quarry pits, stockpiles, reserves and maintenance yards. The First Nations also use various locations for aggregate extraction in their settlement land areas but these locations are not catalogued. The Project will cross seven gravel pits; however, ongoing consultation on route refinement with the Department of Highways will ensure no adverse effects will occur on activities at those locations.

Oil and Gas Extraction

The first recorded active petroleum exploration was in the 1950s. Exploration was ongoing sporadically, until 1981, consisting largely of evaluation of the stratigraphic sections for petroleum prospectivity. Since 1981, no permits have been issued for the Project Study Region. There are currently no active oil or gas developments in the Project Study Region.

Studies of the Whitehorse Trough (see Reference Materials 6R-9) over the last fifty years have indicated that this is an "immature, mainly gas-prone basin containing an estimated 25,000-116,000 million cubic metres (0.9-4.1 Tcf) of gas (although no petroleum wells have been drilled)" (Lowey, 2004). The Whitehorse Trough extends a short distance north of Carmacks where there are known coal deposits. These coal deposits have "potential for gas from coal methane" (Energy, Mines and Resources, 2005). "During 2004 a two dimensional seismic survey was jointly funded by Yukon Geological Survey and

Geological Survey of Canada across the northern part of the Trough. Results from the survey are still pending" (Energy, Mines and Resources, 2005).

6.3.3 Economy

This section considers the economic components and activities in the Project Study Region including the local economy (local employment and training, and local business) and the regional economy (government fiscal flows and utility ratepayers). It addresses the socio-economic components set out in the *Guide to Socio-Economic Effects Assessments*, which states:

> To characterize the relevant economic baseline, the assessor should describe the current economic setting in the project area from the perspectives of a) individuals, b) businesses, and c) government, and in the context of the selected VESECs and socio-economic variables.

The sources of information relied upon include a review of existing data sources and key person interviews. Statistics Canada data presented in tables in this section has been suppressed for confidentiality reasons (see Appendix 6D for detail).

6.3.3.1 Local Economy

Baseline information is provided for two local economy VCs:

- Local Employment and Training
- Local Business

Local Employment and Training

Baseline information on local labour force characteristics are reviewed below, including labour force participation, employment and unemployment, income and education.

The 2001 Census provides limited labour force information regarding the local communities (Carmacks, Pelly Crossing, Stewart Crossing and Mayo) in the Project Study Region. More recent updated information is typically not available for this region.

Labour Force Participation, Employment and Unemployment

Key labour force characteristics[11] in 2001 from the Census are summarized below for the Project Study Region communities (details for each community are provided in Appendix 6F):

[11] The active labour force for the Census is defined by Statistics Canada (2001) as the number of people in the potential labour force who were either employed, or unemployed and looking for work, in the week prior to the Census day. Typically, individuals not considered to be part of the active labour force include full-time students, homemakers, retired workers, seasonal workers in an "off-season" who are not looking for work and individuals with disabilities or illnesses that preclude them from being able to work.

- **Unemployment rate**[12]: averaged about 21.7% in 2001 for these communities (well above the Yukon average of 11.6%) and ranged from 9.3% in Mayo to 26.7-30% in Carmacks and Pelly Crossing and 50% in Stewart Crossing.
- **Employment rate**[13]: averaged about 55% for these communities (well below the Yukon average of 70.6%), and ranged from 64.9% in Mayo to 54-57% in Carmacks and Pelly Crossing and 42.9% in Stewart Crossing. Relatively little work in the area is full-time and year-round, reflecting the lack of long term job opportunities and the seasonal nature of many jobs.
- **Participation rate**[14]: compared to the Yukon average of 79.8%, ranged from 81.6% in Pelly Crossing to 73.8-75.4% in Carmacks and Mayo and 57.1% in Stewart Crossing.

Recent reports from the Yukon Bureau of Statistics (2006) indicate that the unemployment rate across the Yukon is now at 4.9%, and thus well below the 2001 Census estimate of 11.6%. Updated statistics for each community were not available from the Bureau.

Income

Income information for 2000 from the 2001 Census is summarized below for the three major Project Study Region communities (details for each community are provided in Appendix 6F):

- **Median total income per capita**: averaged about $17,600 in these Project Study Region communities (ranging from $16,277 at Pelly Crossing to $19,051 at Mayo), below the overall Yukon average at $26,488.
- **Average earnings (all persons with earnings (e.g., wages or salaries))**: averaged about $22,008 in these Project Study Region communities (ranging from $19,697 at Pelly Crossing to $24,273 at Mayo), below the overall Yukon average at $31,526.
- **Government transfers as % of income**: averaged about 15.6% in these Project Study Region communities (ranging from 16.5% at Pelly Crossing to 14.3% at Mayo), well above the overall Yukon average at 8.6%.

Education

Education level is another factor that influences an individual's participation in the labour force as well as their level of income. Education information from the 2001 Census for the three major Project Study Region communities indicates the following for the population between the ages of 20-34, 35-44 and 45-64 (details on the highest level of schooling completed for various age groups for each community are provided in Appendix 6F):

[12] The unemployment rate is the percentage of person's unemployed in the labour force in the week.

[13] The employment rate refers to the number of persons employed in the week (Sunday to Saturday) and is expressed as a percentage of the population 15 years and over.

[14] The participation rate refers to the labour force available in the week (Sunday to Saturday), and it is expressed as a percentage of the population 15 years of age and over.

- these age groups in these communities have lower education levels than the rest of the Yukon;
- they are also less likely to complete high school, or to achieve a university certificate, degree or diploma; but
- they are more likely to complete college certificate or diploma programs when compared with other Yukon residents. Part of this may be attributed to satellite campuses of Yukon College in each of the communities.
- Generally speaking, females in these communities are more educated than their male counterparts and they are more likely to attain a university education.

Local Business

Baseline information on local industry labour force and the local traditional economy is reviewed below.

Overview of Industry Labour Force

The economy in the Project Study Region is somewhat limited in range of industry employment opportunities. A summary of experienced labour force by industry sector in 2001 (from the Census) is provided for each community in Table 6.3-9.

In Carmacks, Pelly Crossing and Mayo, health, education and other services, which include government, account for the largest proportion of industry labour force. The exception to this is Stewart Crossing, which acts primarily as a service station along the Klondike Highway, with a Yukon Government Department of Highways service yard.

Carmacks acts as one of the few supply stops along the Klondike Highway and it is also becoming a re-supply point for boating trips from Whitehorse to Dawson. This helps to account for a large proportion of people working in the service industry. Government and social services provides the bulk of employment for the people of Carmacks and the LSCFN. Tourism is becoming a sizeable part of the local economy; however, it provides largely seasonal employment opportunities. Mining and mineral exploration also provide various seasonal opportunities (Yukon Community Profiles, 2004). Businesses with licences to operate in Carmacks, in 2006, include Carmacks Towing, Mukluk Manor (bed and breakfast), Berdoe Enterprises, G&A Welding and Cartage, Sunrise Service Centre, Carmacks Development Corporation, THWT Enterprises, Kando Enterprises Ltd, Carmacks Hotel, Tatchun Centre, Gold Panner Restaurant and Roydom Campgrounds among others (Village of Carmacks, 2005).

Pelly Crossing's economy is based on a narrow range of activities, of which government, education and health services provide the majority of opportunities. The main employer is the SFN. It is not uncommon for residents who normally live in Pelly Crossing to move elsewhere for part of the year in order to find work. Fort Selkirk provides seasonal opportunities for employment through restoration and maintenance projects for the historic site and campground. The SFN also owns Minto Resorts at Minto Landing; this is a campground used by tour groups as a rest stop which receives between 10,000-12,000 lunchtime visitors per year (Personal communication, Minto Resorts, August 9, 2006). The types of businesses and

services in Pelly Crossing include a gas station, Heritage centre, a seasonal fast food outlet called Penny's, Selkirk Development Corporation and Selkirk Groceries (Yukon Community Profiles, 2004).

As stated earlier, Stewart Crossing acts largely as a highway rest stop and Yukon Government Department of Highways maintenance station, and it has an assortment of businesses geared towards these ends. The businesses and services available in Stewart Crossing include Country Crafts, Crooked Creek Wilderness Tours, Paul Martin Contracting, Stewart Crossing Shell and Whispering Willows RV Park & Restaurant (Village of Mayo, 2006).

Table 6.3-9
Industries in the Project Study Region Communities - Experienced Labour Force (2001)

Industry	Carmacks			Pelly Crossing			Mayo			Stewart Crossing		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total - Experienced labour force	220	110	105	195	100	95	210	125	85	20	15	10
Agriculture and other resource-based industries	15	10	0	10	10	0	30	20	10	0	0	0
Manufacturing and construction industries	20	20	0	25	25	0	40	35	10	10	10	0
Wholesale and retail trade	10	0	0	10	0	10	10	10	0	0	10	0
Finance and real estate	10	0	0	0	0	0	0	0	0	0	0	0
Health and education	45	0	40	35	10	25	35	10	30	0	0	0
Business services	45	25	15	30	20	15	20	10	10	0	0	0
Other services	85	40	40	85	40	45	65	40	30	10	0	10

(Source: Statistics Canada, 2001a) Note that numbers by industry are rounded in the source to nearest "5"; totals therefore may not add.

In the community of Mayo government services, including First Nation and territorial administration, provide about a third of the employment in the community. Tourism, accounting for 15% of the local employment, is considered as a growing segment of the economy, with options in accommodation, food services, recreation services (such as guiding and outfitting) and retail outlets catering to tourists. Mayo also acts as a distribution centre for mining operations and exploration, although mining does not account for the bulk of employment opportunities (Yukon Community Profiles, 2004). Business and services available in the community include the Bedrock Motel, K.P. Auto, Kris's Small Repairs, Mayo Laundromat, Mayo Bigway Foods, Mayo Petroleum, Mayo Chinese Restaurant, North Star Motel (Village of Mayo, 2006) Ewing Transportation and Wilf's Contracting (Personal communication, Village of Mayo, 2006).

Traditional Economy

Traditional activities continue to be important in the economy and lifestyle of the NTFN, along with many others residing in the communities of Carmacks, Pelly Crossing, Stewart Crossing and Mayo. This includes both traditional activities that result in cash income (e.g., fur sales from trapping as reviewed in Section 6.3.2) and activities that supply local needs (e.g., subsistence from hunting and fishing as reviewed in Section 6.3.2). The social and cultural context of a subsistence economy is discussed further in Section 6.3.4.

Traditionally, the Northern Tutchone group is believed to have followed land use patterns and seasonal economies that consisted of an annual cycle of a wide variety of hunting and trapping activities. In winter, most of the Northern Tutchone would disperse throughout their territory in highly mobile groups to trap fur bearing animals as well as hunt for moose and caribou. In early spring, people dispersed into smaller family groups and continued harvesting and trapping in valley bottoms. Others would move to northern pike spawning grounds at various lakes and streams. Summer would be spent in large fish camps on the Yukon River and its tributaries using fish nets in larger rivers and spears or taps in the smaller streams. Salmon would be dried for winter caches (Gotthardt, 1987). Autumn was an important time for big game hunting as animals were healthy and in prime condition for use in making clothing (McClellan, 1975).

In mid-to-late summer, the Southern Tutchone and Tlingit traders would arrive at trade rendezvous, in locations such a Tatchun Creek, McGregor Creek, McCabe Creek, and VonWilzcek Creek. Tutchone trade goods were tanned moose and caribou hides, goat hides (hair fibres could be used for blankets), furs, animal sinew, large game meat and a variety of fungi. Such items were traded for eulachon grease, shell ornaments, sea weed, various types of clothing or blankets, copper goods and Sitka spruce roots, hats and baskets. European goods also entered the mix during the fur trade era (Gotthardt, 1987; Legros, 1981). (For more details on the history and way of life of the Northern Tutchone people, please see Appendix 6H).

6.3.3.2 Regional Economy

Baseline information is provided for two regional economy VCs:

- Government Fiscal Flows
- Utility Ratepayers

Government Fiscal Flows

Scoping for potential government-related economic effects from the Project focuses on Yukon Government fiscal flows (revenues and expenditures) and local government activities.

The Yukon Government has provided infrastructure funding ($450,000) to date for CS development planning and Yukon Energy has projected that additional Yukon Government funding will be required if the CS development in its entirety is to be developed at this time. The Yukon Government has near-term fiscal revenue interests related to Project capital expenditures and also related to mine sector developments (e.g., Minto mine and potentially Carmacks Copper mine) that would be able to secure lower electricity costs due to the Project (and thus provide higher income tax revenues to the Yukon Government). Longer-term Yukon Government interests relate to developing electric grid connection and extension infrastructure to support ongoing industrial and other economic development in the Project Study Region and to enhance overall WAF and MD system reliability, economic efficiency and flexibility in power supply resource use. The Project will also serve to reduce diesel generation emissions and related ongoing economic leakages from Yukon related to purchase of diesel fuel from outside Yukon, thereby facilitating overall Yukon Government environmental and economic objectives.

Local governments in the Project Study Region are reviewed below. The names and appointment dates for all of the local Mayor and Councils and First Nations' Chief and Councils are provided in Reference Materials 6R-10.

The Village of Carmacks was established as a municipal corporation effective November 1, 1984, by Order–in-Council 1984/309, and it is governed by a Mayor and Council.

The LSCFN gained self-governance in 1997. Through their Land Claim and Self-Government, the First Nation now owns approximately 1,000 sq. miles of land and will receive $15,568,239 over a period of 15 years (Village of Carmacks, 2004; Village of Carmacks, 2005). The LSCFN has returned to a more traditional form of government and now only holds elections for the office of Chief; the members of the Council are selected by the respective Crow and Wolf moieties. Included on the council are an elder and a youth member selected by their respective councils (Council of Yukon First Nations, 2006).

In the case of Pelly Crossing, there is no village council, only the SFN Chief and Council. The SFN concluded its land claim and self-government negotiations in 1997. The First Nation owns approximately 2,900 square kilometres of settlement land and will receive $16,604,860 over 15 years. The SFN has

turned to a modified form of traditional government in that the Chief is elected and the councillors are selected by their respective Wolf and Crow clans (Council of Yukon First Nations, 2006).

There is no elected local government in Stewart Crossing. Some community members are a part of NNDFN and are represented by the Chief and Council based in Mayo.

Mayo was incorporated as a village in 1984 and is governed by a Mayor and Council. It is home to many of the members of the NNDFN who have settlement lands in the area. The First Nation was very active in the Land Claims movement and was the first to sign an agreement in 1993. Under the agreement, the First Nation owns over 2,900 square kilometres and will receive $14,554,654 over 15 years. The First Nation has been actively involved in the affairs of the Mayo community, attempting to promote a better, healthier lifestyle for community members (Council of Yukon First Nations, 2006).

Utility Ratepayers

As the major generator and transmitter of electrical power in the Yukon region, Yukon Energy plans for the capacity and energy requirements of all Yukoners, particularly those supplied on the WAF and MD grids.

Under regulations applicable to utility rates for both Yukon Energy and Yukon Electrical (YECL), cost efficiencies in generation and transmission are in principle passed on the ratepayers (rather than absorbed by the utility shareholder) through regulated rates designed to collect sufficient revenues to cover a utility's annual revenue requirement as approved by the YUB. In addition, in any one geographic area in Yukon and for either utility, rate savings to reflect utility efficiencies are generally shared by all residential, general service and industrial ratepayers served by Yukon Energy and YECL throughout Yukon.

At the current time, the Yukon Government funds a Rate Stabilization Fund (RSF) subsidy for most Yukon residential, municipal and general service business electricity ratepayers, and accordingly any utility rate savings at this time also directly benefit the Yukon Government through reduced RSF subsidy costs[15].

Given past shutdowns of major mines on both girds, there is today material surplus hydroelectric generation on both grids (WAF surplus is about 90 GW.h/year, and MD surplus is about 17 GW.h.year, each assessed at long-term average water flows). Unlike many southern jurisdictions with export connections, Yukon Energy cannot secure any economic value from surplus hydroelectric generation capability on the WAF or MD grids (beyond some lower value interruptible secondary sales) since it does not have grid interconnections with external markets. Use of this surplus hydro to supply new firm power loads would therefore provide net added revenues that could directly benefit current ratepayers throughout Yukon (as well as the Yukon Government through reduced RSF costs). Due to rate

[15] The current Order-in Council direction for the RSF (OIC 2005-49) expires on March 31, 2007. The RSF was initiated in 1998 for the period to April 1, 1999, and has been extended by three subsequent OICs. Current RSF costs approximate $4.65 million annually, based on rates in place as of June 2006.

equalization throughout Yukon, all Yukon residential and other non-government ratepayers can potentially benefit from new sales of surplus hydro, even those in diesel-served communities.

Yukon Energy has recently filed a 20-Year Resource Plan (the Resource Plan) with the YUB addressing major electrical generation and transmission requirements in Yukon during the 2006 to 2025 period. Key observations in the Resource Plan include:

1. **Benefits today from past hydro and transmission infrastructure development:** Hydro generation in the Yukon was developed in the past by the Northern Canada Power Commission in response to load developments in Yukon, particularly mine-related loads at Faro, Keno and Whitehorse. Yukon Energy acquired these hydro assets in 1987 as a result of the NCPC transfer. Today, these hydro systems are the key factor causing Yukon power costs to be lower than those found in Alaska or the Northwest Territories. Without such facilities, Yukon utilities probably would have relied almost entirely on diesel generation with its associated higher costs.

2. **Hydroelectric energy surplus:** Without major new industrial loads, the WAF and MD hydroelectric energy surpluses could remain for most of the current 20 year planning period.

3. **Capacity shortfall to meet WAF peak winter loads**: Yukon Energy is facing a shortfall today in WAF generation capacity needed to serve winter peak loads. This shortfall is due to pending retirement of some Whitehorse diesel units, load growth and the adoption of new capacity planning criteria. The Resource Plan Base Case forecasts a near term WAF capacity shortfall in 2012 of 18.7 MW without new mines, and 21.5 MW if the new Minto and Carmacks Copper mines were to be connected by that time to the WAF grid (without the full CS development to interconnect the WAF and MD grids).

4. **Potential new industrial loads**: Potential new industrial development during the next several years may absorb the WAF hydro energy surplus and create opportunities once again to develop new infrastructure. Near term mine development opportunities at Minto and Carmacks Copper are noted as particular opportunities that may occur in the next few years, providing new energy loads that during the life of these two mines could absorb most (but not all) of the current WAF hydroelectric energy surplus. Major industrial customers (load exceeds 1 MW) connected to the integrated power system in Yukon must be charged rates, as a customer class, that are sufficient to cover costs of service to that class (Yukon Government OIC 1995/90).[16] New industrial customers are also in effect required to pay all costs to connect them (including any new transmission) such that existing customers are not adversely impacted by providing connection facilities.

[16] In contrast, under the same OIC, major industrial customer loads not interconnected with electrical service to other customers and served by Yukon Energy or YECL must be charged rates in conformance with contracts between the customer and the utility, and the costs and revenues related to such contracts may not be considered by the YUB when establishing rates for other customers.

There are currently no primary industrial loads on either the WAF or MD grids, though Yukon Energy's Rate Schedule 39 for Primary Industrial customers is available and approved on an interim basis. Yukon Energy also provides electric utility distribution services in and around Mayo, Dawson and Faro (on the MD and WAF grids respectively).

YECL purchases wholesale power supplies from Yukon Energy and provides electric utility distribution services in Whitehorse, Carmacks, Stewart Crossing and various other WAF and MD communities. YECL also serves the Pelly Crossing community (isolated diesel generation community, where YECL provides both generation as well as distribution services).

Firm electricity rates (i.e., rates for service not normally subject to interruption) for residential and general service customers are categorized by government or non-government customers, and hydro grid or diesel[17] sourced generation.

The YUB is directed by OIC 1995/90 to set non-government firm retail rates equal throughout Yukon within each of the residential and general service customer classes without variation between Yukon Energy and YECL customers. This direction is subject to a further direction to set a run off rate block for each of these customer classes for all consumption in excess of a specified level per billing period, such specified level per customer not to be less than 1,000 kW.h/month for residential non-government customers and 2,000 kWh/month for general service non-government customers (these levels of use are typically referred top as first rate block use for each class). The YUB is directed to set run-off rates on the basis of rate design principle to promote economy and efficiency, and separate run-off rates may be allowed for customers in different communities or rate zones. In practice, the result is that Pelly Crossing customers are charged a run-off rate reflecting average incremental diesel generation costs for "small diesel" rate zone communities (based on rates last set for 1997).

Firm rates approved by the YUB for electric utility customers are currently also affected by two rate riders:

- **Rider F (Fuel Adjustment Rider):** Rider F is applicable to all electric service and all customer classes throughout the Yukon, with the exception of Secondary Energy (Schedule 32) and Maintenance Energy (Schedule 40). This rider is to cover cost changes paid by the utilities since the last YUB approval of retail rates due to adjustments in diesel fuel prices from those last approved by the YUB (which currently for YECL was for 1997, and for Yukon Energy was for 2005). An adjustment of 1.28 cents per kWh applied as of June 2006. Reductions in diesel fuel use for utility generation reduce the impact of this rider.

- **Rider J (Revenue Shortfall Rider):** The Revenue Shortfall Rider J was approved in 1998 initially to recover the approved ongoing revenue shortfall resulting from the Faro Mine closure in January of 1998. This rider has fluctuated over time and currently is 14.93% charged to all customers rates, except Industrial Primary and Secondary energy and Rider F.

[17] Only "small diesel rates" apply in Pelly Crossing. Other diesel rates for large diesel generation communities or Old Crow are applicable to areas outside the Project Study Region. Carmacks, Stewart Crossing and Mayo are all now hydro grid communities.

> Absent overall YUB review and adjustment of retail rates, this rider might be expected in future to change in response to YUB review of utility revenue requirements relative to available rate revenues.

As noted earlier, the RSF was established in 1998 by the Yukon Government to subsidize the impact of firm rate increases to residential and general service non-government customers and municipal government customers resulting from closure of the Faro Mine. The RSF provides a Yukon Government subsidy which generally freezes eligible first rate block use electrical bills at a maximum of 9% above January 1997 bill levels.

In addition to the firm rate schedules and subsidies, a rate schedule for interruptible Secondary Energy is available to industrial or general service customers on WAF and MD, based on the availability of surplus hydro on these grids. The rate is available (when surplus hydro generation is available) for space or process heating in areas where surplus distribution system capacity exists at the time the customer is connected and where the customer has an alternative fuel source capable of providing the same quantity of space heating in the event of an interruption to secondary energy supply. The price of this secondary energy is currently set at approximately two-thirds the cost of providing an equivalent amount of heat energy from oil. The price of oil is determined quarterly using the oil price index reported by the Yukon Bureau of Statistics[18]. Secondary energy sales would be interrupted on either grid if and when new industrial loads, or other factors, remove the current hydroelectric energy surplus. Conversely, to the extent that secondary energy remain available, new industrial loads may elect to use this service to reduce fuel purchases for heating loads.

6.3.4 Social Context

This section describes the social context of the Project Study Region, and includes baseline information on people's personal, family and community life. It addresses the requirements set forth in the *Proponent's Guide*, which states:

> Information should focus on providing a background on individuals, families, communities… potentially affected as a result of project area activities.

The social context of the Project Study Region is shaped by many factors that contribute to the quality of people's lives and experiences. Such factors include indicators of economic well-being, physical well-being, social well-being and the environment. Personal, family and community life can be affected by the accumulated impacts of many different Project-related effects and the experience of these changes can vary for individuals, for families and for communities as a whole. The social context describes the following items:

- Social Context Background (Population Demographics and Past Experience with Similar Projects)

[18] Further details available in Yukon Energy Rate Schedule 32 – Secondary Energy, available at: http://www.yukonenergy.ca/customer/commercial/schedules/

- Community and Family Life
- Community Infrastructure and Services
- Recreation and Leisure
- Public Health
- Aesthetics
- Heritage Resources

Sources of information included a review of existing data sources and key person interviews. Certain Statistics Canada data for the specific Project Study Region communities is suppressed for confidentiality reasons (see Appendix 6D for details).

6.3.4.1 Social Context Background

Social context background for the Project Study Region is provided below for the following:

- Population Demographics
- Past Experience with Similar Projects

Population Demographics

The Yukon Bureau of Statistics (2006) indicated that the population of the Yukon Territory, as of December 2005, was 31,587. This is higher than the last Canadian Census report, completed in 2001, which indicated a total of 28,675 inhabitants and slightly lower than was reported by the Bureau in 2005 (31,765). Statistics Canada in 2001 reported that 21.3% of the Yukon population was of Aboriginal decent.

In the Project Study Region, there are four communities identified by Statistics Canada, including the Village of Carmacks, the settlement of Pelly Crossing, the settlement of Stewart Crossing and the Village of Mayo. A summary of these communities' total 1996, 2001 and 2005 populations and number of Aboriginal community members in 2001 is provided in Table 6.3-10. Each of the communities has a significantly higher proportion of Aboriginal people than the remainder of the Yukon. Details on the total registered First Nation members in the Project Study Region are provided in Appendix 6G.

Table 6.3-10
Population Profiles of the Project Area Communities

	Carmacks	Pelly Crossing	Stewart Crossing	Mayo	Yukon
Statistics Canada					
1996	470	240	40	325	30,765
2001	431	328	40	366	28,675
Aboriginal Population Profile					
2001	295	280	15	230	6,545
Yukon Bureau of Statistics					
2005	408	291	n/a	400	31,765

(Sources: Statistics Canada, 1996. Statistics Canada, 2001(a). Statistics Canada 2001(b). Yukon Bureau of Statistics. 2005(a))

Gender distribution in the Project Study Region reflects the distribution of Yukon, with a slightly higher proportion of males to females. Both Carmacks and Pelly Crossing have a younger population than the remainder to the territory, with close to 25%-30% of the population under the age of 15 years. Age and gender distribution for each community is provided in Appendix 6G.

The Yukon Bureau of Statistics (2005(b)) has calculated several population growth scenarios for the territory (see Appendix 6G). The Project will not likely have a material effect on these population projections. Similar projections are not available for the Project Study Region.

- The low-growth scenario (fertility rate decrease of 10%, constant mortality rates, net migration of -300) would suggest that the non-Aboriginal population in Yukon would decrease by 7.3%, and the Aboriginal Population would decrease by 2.4%.
- In the medium growth scenario (fertility rates are constant, mortality rates are constant, and net migration from the territory each year is zero) the non-Aboriginal population in Yukon would increase by 4.2%, while the Aboriginal population would increase by 5.2%.
- The high-growth scenario (fertility rate increases by 10%, mortality rates decrease 10%, and net migration is +300 each year) would increase the non-Aboriginal population in Yukon by 16.3%, and the aboriginal population by 13.0%.

Past Experience with Similar Projects

Communities in the Project Study Region are generally familiar with the WAF and MD grids as operating facilities. Particularly with the WAF grid (which was developed decades ago and is of the same voltage as proposed for the CS development), communities are aware of the facility's image on the landscape, ongoing operation brushing needs, potential firebreak benefits, and other operation attributes.

The most recent experience with construction development similar to the Project was the construction of the MD Project. While NNDFN is the only Project Study Region First Nation community with a direct involvement in the MD Project, the problems encountered throughout the MD project's development have

resonated with all of the consulted First Nations as well as with other publics. During the public consultation process, community members have raised concerns related to the construction of the MD project. These are reflected in Section 4.4.1 of the PIP chapter.

The MD project was approved for construction by the Yukon Energy Board of Directors in 2000 and was completed in 2003. The transmission project covered a distance of 223 kilometres between Dawson City and Mayo and was justified on the basis of a long-term reduction of electrical rates through the improved use of the hydro station in Mayo, displacing the use of diesel generation in Dawson City. The initial environmental assessment process and consultations for the MD project had taken place years prior under a screening for the Environmental Assessment and Review Process (EARP) in 1992 and later by a Canadian Environmental Assessment Act (CEAA) screening (as it pertained to The Department of Indian Affairs and Northern Development (DIAND) permitting) after 1995.

A workshop conducted to review the MD project experience found that the First Nations in the area were concerned with "the lapse of time between the environmental impact assessment of the project and its actual construction, communication about the consultation on the project, the type and timing of the issuance of permits and authorizations for the project and trespass issues" (W.J. Klassen and Associates Ltd., 2002).

The problems encountered in the implementation of the MD project were those most frequently cited in the public consultation. These included instances where trespassing occurred on First Nation lands, lack of clarity in advance as to where the route was going, issues related to the timber permit released for the MD project and unsatisfactory design of the line. The most commonly cited community concerns related to the effects of the ROW created by the transmission line. In many instances, it was felt that the buffer between the MD project ROW and the road ROW was inadequate leaving the remaining vegetation susceptible to weathering. Additionally, the proximity of the MD ROW to the road was thought to create a corridor for wildlife that was easily accessible to the opportunistic hunter.

In general, the most recent planning and construction experience the Project Study Region communities had with a similar project was not positive. One NGO consulted summarized the situation in saying that the Mayo-Dawson experience has resulted in a lack of public confidence in Yukon Energy. Yukon Energy has responded to these concerns with a number of measures, including the MOU to guide planning of the Project (including the route selection process) with the NTFN communities in the Project Study Region

6.3.4.2 Community and Family Life

Traditionally, the Northern Tutchone society organized itself on a number of levels. Regional groups of five to ten nuclear families sharing close kinship ties and occupying a certain geographic area would share a common chief. Although not living together throughout the year, these groups would stay in close contact, meeting for social and economic functions. Within the greater society, people divided themselves into moieties (or clans) called the *Tsehk'i* or *Handay* for the Crow moiety and *Egay* or *Egunde* for the Wolf moiety. Moieties define how people married, where they could hunt and fish, who they could trade with, and who they could go to for help in times of need (McClellan, 1975). The Crow and Wolf moieties continue to be represented by the First Nation councils in the Project Study Region today.

Each Project Study Region community has an assortment of characteristics that help to define community life. For example, in Carmacks, the LSCFN holds regular community kitchens at the Heritage Hall where youth and elders have an opportunity to interact over a meal. In Pelly Crossing, the traditional game of stick-gambling has been revived and local teams practice and compete in Yukon-wide events. In all of the communities, fishing and hunting camps are a regular activity for people to spend time together on the land.

Aside from some of the examples presented above, the following section presents certain elements, both statistical and anecdotal, that provide some insight to community and family life in the Project Study Region.

Family structure in the Project Study Region communities varies somewhat from the rest of the territory. In each of these communities there are proportionately less people who are married than in the remainder of the territory, while divorce rates are comparable (see Appendix 6G). Living with a common-law partner is more common in these communities than in the rest of the territory and in some of the communities it is more prevalent than marriage. There are a higher proportion of single-parent families in the Project Study Region communities (between 29% and 35%), than in the rest of the Yukon, which has a total of 24% single parents. It is more common for females to be a single-parent than males.

The extended family in First Nation communities plays an important role and the responsibility of caring and nurturing is often extended over a large network of grandparents, aunts, uncles and cousins (Brant Castellano, 2002). Elders are seen as important sources of knowledge and are often consulted on matters affecting the community.

Personal security can be considered by looking at crime statistics for an area. The Yukon Bureau of Statistics provides crime statistics on an annual basis for incidents involving violence, property, drugs and other criminal offences. A summary of these statistics for the Project Study Region communities between 1999 and 2003 is provided in Appendix 6G. With few exceptions, the statistics suggest that crime rates in these communities over the five-year period have been higher than the remainder of the Yukon. On average, the community of Pelly Crossing had the highest rates of reported incidents while the community of Mayo had rates closer to, or lower than, the territorial average.

6.3.4.3 Community Infrastructure and Services

A summary of the facilities available in each of the communities is provided in Table 6.3-11. Carmacks and Mayo have the broadest range of facilities, Pelly Crossing has no hotel and Stewart Crossing has limited facilities due to the small size of the population and overall function of its location.

Table 6.3-11
Facilities in the Project Study Region Communities

	School (up to grade 12)	Health Centre	Hotel	Camp-ground	Store	Gas Station
Carmacks	✔	✔	✔	✔	✔	✔
Pelly Crossing	✔	✔	x	✔	✔	✔
Mayo	✔	✔	✔	✔	✔	✔
Stewart Crossing	x	x	x	✔	✔	✔

(Source: Yukon Community Profiles, 2004)

Carmacks, Pelly Crossing and Mayo all have schools in the community which provide education up to Grade 12. School aged children from Stewart Crossing must travel daily to Mayo for schooling. Additionally, the Yukon College offers remote campuses in all three locations offering classroom space, computers (and internet), televisions, VCRs, small resources libraries and access to distance education. Courses offered include academic upgrading, college preparation, pre-trades training, employment skills, computer skills and locally developed programs (Yukon College, 2005).

Services available in each community such as emergency response, utilities and transportation are summarized in Table 6.3-12. Aside from police services provided by the RCMP, emergency response services for fire and ambulance rely on volunteers. Stewart Crossing must rely on RCMP, fire and ambulance services from Mayo. Hydro power from the WAF or MD grids is provided by Yukon Energy, and it is distributed by YECL in Carmacks and Stewart Crossing (Yukon Energy distributes MD hydro power in Mayo). Pelly Crossing relies on local diesel power supplied and distributed by YECL. All communities have telephone services provided by Northwest Tel and the Yukon Territorial Government recently announced the expansion of cellular services for the entire territory (Yukon Government, 2005). There is no regular bus or air services to any of the communities, although Carmacks, Pelly Crossing and Mayo all have gravel air landing strips. Minto Landing has a grass airstrip.

Table 6.3-12.
Services Available in the Project Study Region Communities

	RCMP	Fire	Ambulance	Power Supply	Telephone	Air services
Carmacks	2 constables	Volunteer	Volunteer	Hydro (WAF)	Northwest Tel	Gravel air strip & helipad. No regular service
Pelly Crossing	1 corporal, 2 constables	Volunteer	Volunteer	Diesel generators	Northwest Tel	Gravel airstrip. No regular service.
Mayo	1 corporal, 2 constables	Volunteer	Volunteer	Hydro (MD)	Northwest Tel	Gravel air strip and terminal building. No regular service. Float plane base.
Stewart Crossing	No	From Mayo	From Mayo	Hydro (MD)	Northwest Tel	No

(Sources: Yukon Community Profiles, 2004. RCMP, 2005. Northwest Tel, 2006)

There are approximately 455 houses located within the Project Study Region communities (Statistics Canada, 2001(a)) (see Appendix 6G for further detail on housing). Further, there are several homes associated with agricultural applications; cottages in the McCabe Creek and Jackfish Lake area and trappers' cabins throughout the Project Study Region.

Recreation and leisure opportunities are other factors that contribute to individual and community well-being. The communities in the Project Study Region have access to an array of recreation and leisure opportunities. Although the communities of Carmacks, Pelly Crossing and Mayo are relatively small in size, there are numerous recreation facilities available in each. For example, in 2004 each community had a curling rink, skating rink, baseball diamond, swimming pool (seasonal) and youth centre (Yukon Community Profiles, 2004).

6.3.4.4 Public Health

Public Health is affected by a complex array of factors related to both medical and non-medical determinants that reflect the overall well-being of the community. Determinants of health are interdependent and can be influenced by things such as income, employment and education, along with social and physical environments, which are discussed in other sections of this chapter. Given the complexity involved in determining the overall well-being of communities, this information presents only an indication of the health status in the Project Study Region. It presents a combination of both medical and non-medical determinants of health. Given the small size of the Project Study Region communities, information is largely available only at a territorial level. Data for individual communities is presented when possible.

Medical Determinants of Health:

- **Death Rate:** The death rate for the Yukon Territory had increased over the last number of years from a rate of 3.9 deaths per 1,000 persons in 1991 to a rate of 4.4 deaths per 1,000 persons in 2001. While this could be indicative of a decrease in population health, it might also be a reflection of an aging population.
- **Life Expectancy:** Life expectancy in the Yukon is lower than the remainder of Canada, at a total of 76.8 years compared to the national rate of 79.5 years.
- **Birth rates:** The birth rate is higher in the Yukon than in the remainder of the country at a rate of 11.2 births per 1,000 persons, compared to 10.5 births per 1,000 nationally (Statistics Canada, 2001(c)).
- **Potential Years of Life Lost (PYLL):** A measure used to quantify premature mortality, or the number of years lost before a person dies before the age of 75. The PYLL is significantly higher in the Yukon, at a rate of 6,513.5 premature deaths per 100,000 people, compared to the national rate of 5,101.5 per 100,000. The rate is markedly higher for males (8,970 per 100,000 compared to a national rate of 6,328.5) and closer for females (3,961.2 per 100,000 compared to 3,862.8 nationally) (see Appendix 6G).
- **Diseases:** Residents of the Yukon surpass Canadian rates for circulatory diseases and respiratory diseases and have rates that are excessively higher for unintentional injuries and suicide/self-inflicted injuries (Statistics Canada, 2001(c))
- **Diabetes:** The prevalence of diabetes in the Yukon remains lower than the rest of Canada, although there has been a slow but steady increase in recent years (see Appendix 6G).

Non-Medical Determinants of Health:

- **Smoking:** Linked to a variety of cancers, heart disease, Sudden Infant Death Syndrome and diabetes. Smoking rates are slightly higher in the Yukon than the remainder of the country, with 29.1% of males and 26% of females reporting being daily or occasional smokers, compared to a national rate of 25% of males and 20.9% (Statistics Canada, 2003).
- **Alcohol:** Implicated in motor vehicle accidents, homicides, suicides, fires and drowning as well as a potential for fetal alcohol spectrum disorders if consumed during pregnancy. Alcohol consumption in the Yukon is only slightly higher than the national average with an average of 2.98 drinks per person per week compared to 2.88 drinks per week across the country. Males drink considerably more than females, at a total of 4.17 drinks per week compared to 2.88 drinks respectively (Yukon Bureau of Statistics, 2000).
- **Physical Activity:** Reported physical activity rates are higher in the Yukon Territory, with 59.6% of people reporting being physically active or moderately physically active during their leisure time. Yukon Females report a slightly higher rate of physical activity at 59.5%, compared to males who report a physical activity rate of 58.9% (Statistics Canada, 2003).
- **Diet:** A study of 10 First Nations across the Yukon, including the communities of Carmacks and Mayo, found that diets were rich in traditional food, resulting in a variety of benefits including a better quality diet, increased physical activity, socio-cultural benefits and economic offsets for the high cost of food in northern communities (Receveur et. al, 1998).

Traditional food consumption was found to be the greatest during the summer, with more than half of the people consuming salmon, trout, whitefish, arctic grayling, spruce grouse, blueberries, raspberries and moose. In the winter months traditional food use decreased, with a lower frequency of consumption reported and only moose and salmon listed as consumed by more than half of the people (Receveur et. al, 1998).

6.3.4.5 Aesthetics

The Project Study Region is located along the Klondike Highway on the Yukon Plateau. Featuring rolling hills, extensive plateaus, several high peaks and deep, broad valleys, the aesthetic character can be experienced from the highways, the rivers and the communities in the area. Several locations have been identified as having particular aesthetic qualities, including the view points at Five Finger Rapids (Figure 6.3-4), Yukon Crossing, and Crooked Creek.

Figure 6.3-4
View at Five Finger Rapids

As a personal construct, the aesthetic value of the Project Study Region overall is difficult to qualify or quantify. Similarly, the perception of wilderness associated with the landscape is difficult to ascertain. Aesthetic values pertain more usefully to specific sites or an area within the Project Study Region that may be affected or visually changed by the Project, as well as the perspectives of specific groups about such sites or areas. Wherever possible, the Project was designed to avoid locations identified as having aesthetic value that communities thought would be adversely affected by the Project.

6.3.4.6 Heritage Resources

Heritage resources are protected and managed under Chapter 13 of the Umbrella Final Agreement and under the *Historic Resources Act*. The heritage resources in the Route Study Area were surveyed for any localities with moderate to high potential for the presence of historic or archaeological sites. A location with elevated potential is considered as a site that is close to a water body and occupies an elevated hill or terrace or well-drained and level habitation surface. For the complete details on the approach taken and results of the *Project Heritage Resource and Impact Assessment*, see Appendix 6H.

A total of 63 locations were tested for the presence of heritage sites, many of which were previously identified stream crossings and potential landform features interpreted by orthographic photos. The test sites were based on all route alternatives, as a preferred route had not been identified at the time of evaluation. Table 6.3-13 to 6.3-16 presents a summary of the positive site locations and their findings. Sites may be one of several categories, including:

1. a site or, an area, place or parcel of land which contains heritage resources;
2. an historic site which contains heritage resources that are greater than 45 years in age and have been abandoned (the historic period beginning with the arrival of the Hudson's Bay Company mid-19th century); and
3. archaeological sites which generally date to before European contact and are found on, or under, the ground surface and consist of the remains of ancient camps, hearths, animal bone and stone tools and debris.

Table 6.3-13
Positive Heritage Site Locations in the Route Study Area
CS Line Segment 1: Carmacks to McGregor Creek

Reporter #	Site Type	Description
CS7	Historic	Coal shoot
CS7A	Historic	Mine adit
CS7B	Historic	Building foundation
CS8	Archaeological	Lithic flaking station, likely a lookout site
CS9	Historic	Various features related to coal mining
KbVa-29	Archaeological	Buried lithic scatters. Likely fish camp.
CS12	Archaeological	Flake scatters on high terrace overlooking valley. Likely look-out site and possible travel route
CSA25	Archaeological	Isolated scatter of lithic flakes on loess and till terrace. Buried context.
CSA26	Historic	Roadway with minor scatter of degraded plank artifacts

Table 6.3-14
Positive Heritage Site Locations in the Route Study Area
CS Line Segment 2: McGregor Creek to Pelly Crossing

Reporter #	Site Type	Description
CSA19	Archaeological	Flake scatter on low terrace. Dense scatter with no formed tools
CSA20	Archaeological	Scatter of lithic tools on high terrace. Lookout and travel camp
CSA21	Archaeological	Scatter of lithic tools on high terrace. Lookout and travel camp
CSA23	Archaeological	Single flake recovered in buried context on high terrace

Table 6.3-15
Positive Heritage Site Locations in the Route Study Area
CS Line Segment 3: Pelly Crossing to Stewart Crossing

Reporter #	Site Type	Description
CSA10	Archaeological	Recovered two lithic flakes in surface. No intact buried remains
CSA15	Archaeological	Lithic flakes. No intact remains. 75% of site disturbed
CSA17	Archaeological	Lithic flaking station, likely lookout site
CSA18	Archaeological	Lithic flaking station, likely lookout site
CSA29A	Historic	Semi-collapse Cabin and 2 plank frame for shack/tent
CSA31	Historic	Dwelling site consisting of plank frame wall tent base. Scattered artifacts.
KeVb-1	Archaeological	Lithic flaking station

Table 6.3-16
Positive Heritage Site Locations in the Route Study Area
Minto Spur Line Segment

Reporter #	Site Type	Description
KdVc-2	Archaeological/Historic	Scatter of lithic tools and flakes, hearths. Known fish camp. Historic remains from Klondike stampede (1896) to the construction of the road (1950's).

In the Carmacks area, an historic era coal mine site, abandoned in the 1960's or 1970's was found, although based on artifacts found may not fall under the Historic Resources Act. Other sites in the area produced isolated scatter of lithic debitage, along with scatters of industrial features related to coal mining.

Between Tatchun Creek and McCabe Creek, several small finds of chert flakes, lithic flakes, and historic wood planks occurred. The Tatchun Creek Campground, assessed in 1992 by the Government of Yukon Heritage Branch, once demonstrated potential for heritage resources (finds of fire cracked rock, flake cores, and deitage), but has since been sealed with gravel pads. The area likely represents the remains of hunting or fishing camps.

Minto Landing is a site of importance in terms of heritage resources, as it was once home to the SFN, now located at Pelly Crossing. The site contains stone tools and flakes, as well as old hearths noted in an eroding piece of riverbank. Scatter of lithics and bone fragments have also been found. Aside from its traditional use as a fishing camp, the area was once a town site that served as a fuel wood stop, road house, store location and Northwest Mounted Police post that were established during the late 1890's after the Klondike gold strike.

In the Von Wilzcek Creek drainage area, several lithic flakes and scatter were found, although most test sites were determined to have limited potential heritage value. In one location, artifacts such as a chert end scraper and flake/blade core brace rejuvenation tablet were found. The moderate amount of artifacts found at this site suggests further archaeological deposits may be present.

Near Pelly Crossing, several sites produced single lithic flakes. Near the Mica Creek drainage system, a trail was checked for archaeological and historic sites, and although none were observed, the area could be considered as a heritage trail as it was used to access areas of economic, cultural, and spiritual importance by the SFN.

South of the Jackfish Lake Park Reserve, a small site with a semi-collapsed log cabin is present. Artifacts suggest that the locality was in use until recently (1980's) and as such will not fall under management criteria of the Historic Resources Act. Similarly, artifacts not considered as historic resources including remains of a plank tent frame, dog houses, and discarded artifacts were found near Stewart Crossing.