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Appendices

1. Introduction

The City of Whitehorse has begun the planning process for the development of a full-service, sustainable subdivision on the Porter Creek Bench, as outlined in the City of Whitehorse's Official Community Plan (OCP). The environmental background data necessary to support a public charrette to develop a community design is presented in this report.

2. Project Location

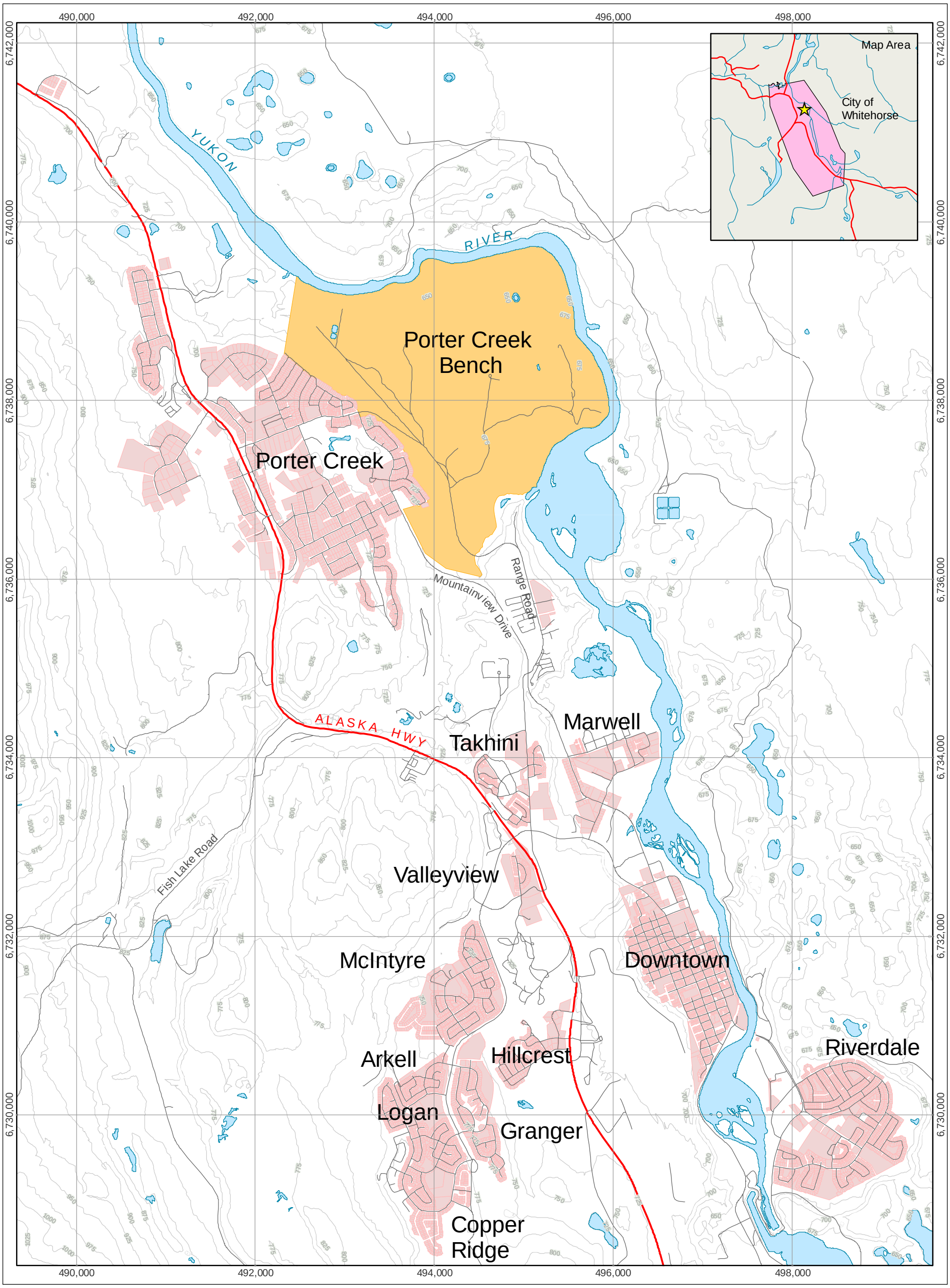
The Porter Creek Bench is north of the City of Whitehorse's downtown core and between Range Road and the Yukon River (Figure 1). The site is located within the Whitehorse Assessment District of Yukon Environmental and Socio-Economic Assessment Board (YESAB) and includes First Nation settlement and non-settlement land. The Porter Creek Bench is located between 492 000 and 496 000 and 6 736 000 to 6 740 000 UTM.

2.1 Land Use Plans

The Porter Creek Bench falls within the City of Whitehorse and is therefore within the City's Official Community Plan (OCP). Given the Bench's proximity to the Yukon River, it is also included in The Yukon River Corridor Plan. The Official Community Plan has designated the Porter Creek Bench for residential development since 1987. Both the Yukon River Corridor Plan and the Official Community Plan address the importance of environmentally sensitive or significant areas, wildlife habitat, riparian areas and linkages between natural areas. The Official Community Plan also addresses environmental sustainability. The policies of the OCP as they relate to the environmental setting of the Porter Creek Bench are presented in Table 1. In addition to these Environmental policies, the OCP also details policies regarding Parks and Recreation, the Social Environment, Residential Development, and Economic Development that are pertinent to the design of the Porter Creek Bench sustainable community.

Table 1. Summary of Official Community Plan Environmental Policies Pertaining to the Porter Creek Bench

OCP Section and Title	Policies Pertaining to the Porter Creek Bench	Summary / Key Features
4.1 Natural Areas and Steep Slopes	4.1.1 – 4.1.8	4.1 Identifies steep slopes as sensitive areas that should be developed with restrictions. The policies provide a set-back of 15 m from toes and tops of cliffs to protect development. Interpretive opportunities are to be placed in areas most resilient to increased traffic. The policies identify clay cliffs as environmentally sensitive and recommend that development be directed away from the cliffs. Building and grading are discouraged from slopes > 30%.
4.3 Wildlife and Environmentally Sensitive Areas	4.3.1 – 4.3.3, 4.3.5 – 4.3.8, 4.3. 10	A riparian setback of 30 m is stipulated. These areas can be used for trails, recreation and interpretation in a responsible way.
4.4 The Yukon River	4.4. - 1, 4, 7	These policies ensure that impact on the Yukon River is mitigated. No non-site-specific set back is cited. Day use areas are allowed given certain conditions. Interpretative opportunities should be explored; these may include heritage interpretation, and cooperation with First Nations.
4.5 Wildfire Protection	4.5.1-4.5.4	Attention should be paid to fire prevention, including setback from forested areas. New subdivisions should include a fire management plan.
4.7 Environmental Sustainability	4.7.1 – 4.7.9	These policies support the principles of sustainable development: efficiency of resources, mixed-use communities, alternative energy sources and transportation options.



Legend

- Highway
- Road
- Contour (Index)
- Watercourse
- Waterbody
- Study Area
- Titled Land

N W E S

0 0.5 1 1.5 2 km

Scale 1:40,000

Porter Creek Bench

Environmental and Special Places Report

Location of Porter Creek Study Area
City of Whitehorse

Date: September 27, 2006

Sources:
Base data provided by the City of Whitehorse at 1:20,000 scale, and
Triathlon Mapping Corporation, based on 1994 aerial photography

Created by: GS **Reviewed by:** EM

Project: 60708

Gartner Lee

Figure: **1**

3. Environmental Characteristics of Porter Creek Bench and Surroundings

An understanding of the environmental features and functions of an area provides important insight into the design of a sustainable community. The following section describes the various environmental features of the Porter Creek Bench: geology, climate, air quality, surface water, groundwater, ecosystems, and wildlife. The information is presented in the context of a broader regional setting.

3.1 Geology

The Whitehorse area is made up of a complex sequence of materials left by glaciers, glacial rivers (glaciofluvial) and glacial lakes (glaciolacustrine). Most of the City's low-lying development has been on fluvial deposits (Figure 2). The developments at higher elevations such as McIntyre, Logan, Granger and Copper Ridge are located on glacial till. The Porter Creek Bench is glaciolacustrine terrace overlain by a thin glaciofluvial layer and a veneer of sand of varying thickness (Figure 3), similar to the deposit on which the airport is located (Figure 2). Deposits of Aeolian (wind-formed) lie over these main deposits, and colluvial deposits have collected along steep slopes (Figure 3).

The glaciolacustrine deposit that makes up most of the Porter Creek Bench is a result of the Glacial Lake Champagne. Glacial lakes commonly formed when glaciers blocked drainage outlets. When the meltwater entered the glacial lake, coarse sand and gravel was deposited rapidly. Fine sand, silt and clay were carried further into the lake and deposited as alternating layers called varves, which make up the glaciolacustrine deposit. Much of the Yukon River Valley floor is composed of glaciolacustrine sediments over 40 m thick, which are overlain in turn with glaciofluvial or fluvial materials (Figure 2).

Once Glacial Lake Champagne drained, the valley drainage systems were re-established through downcutting to modern day river gradients by the Yukon River. The steep escarpments at the mouth of McIntyre Creek are an example of this downcutting. The creeks and river eroded the soft glaciolacustrine silts and clays and deposited sediments in their channels. Exposures of glaciolacustrine sediments are familiar to all Whitehorse residents. They form most of the cliffs along the Yukon River around the downtown area and around the Porter Creek Bench. Generally, in the Whitehorse area, sediment thickness ranges from 20 to 60 m. At the Bench the glaciolacustrine layer has been recorded to be 110m thick in places.

Silt and clay are much more tightly packed than sand and gravel . Therefore, when rain falls on the Bench the water infiltrates through the sand and flows along the top of the clay surface, eventually reaching the exposed cliffs. Additional water flowing out of the cliffs, due to increased infiltration could result in increased erosion.

485,000 490,000 495,000 500,000 505,000

6,745,000 6,740,000 6,735,000 6,730,000 6,725,000 6,720,000 6,715,000

Map Area

City of Whitehorse

Hidden Valley
MacPherson
YUKON
Porter Creek
Takhini
Marwell
RIVER
Valleyview
McIntyre
Downtown
Arkell
Hillcrest
Riverdale
Logan
Granger
Copper Ridge
Lobird
City of Whitehorse
Hidden Lakes
Chadden Lake
Chadburn Lake
McRae
Pine Ridge
Wolf Creek
Cowley Creek
Mary Lake

O	Organic Deposits
E	Eolian Deposits
C	Colluvial Deposits
F	Fluvial Deposits
GL	Glaciolacustrine
FG	Glaciofluvial Deposits
M	Morainal Till Deposits
R	Bedrock
A	Anthropogenic or Urban

Legend

- Highway
- Road
- Watercourse
- Waterbody
- Porter Creek Bench

N W E S

0 1 2 3 4 Km

1:90,000

Porter Creek Bench

Environmental and Special Places Report
Regional Setting: Surficial Geology
City of Whitehorse

Date: September 27, 2006

Sources:
Sources: Basedata (Triathalon Mapping Corporation, based on 1994 aerial photography). Surficial Geology (Mougeot Geoanalysis)

Created by: GS **Reviewed by:** EM

Project: 60708

Gartner Lee

Figure: **2**

492,400 493,300 494,200 495,100 496,000 496,900

6,741,000 6,740,000 6,739,000 6,738,000 6,737,000 6,736,000 6,735,000

Map Area

City of Whitehorse

FG

F

Potholes left by melting ice blocks

E

GL

glaciolacustrine layer underlies most of fluvial deposit

steep slope creates colluvial deposits

Sand Dune

O

C

Porter Creek

U

W

YUKON RIVER

Range Road Dump

A

ALASKA HWY

M

Mountainview Drive

Range Road

O	Organic Deposits
E	Eolian Deposits
C	Colluvial Deposits
F	Fluvial Deposits
GL	Glaciolacustrine
FG	Glaciofluvial Deposits
M	Morainal Till Deposits
R	Bedrock
A	Anthropogenic or Urban

Legend

Highway
Road
Contour 20m
Contour 5m
Watercourse
Waterbody
Study Area

N W E S

0 0.5 1 1.5 Km

Scale 1:20,000

Porter Creek Bench

Environmental and Special Places Report
Porter Creek Bench: Surficial Geology
City of Whitehorse

Date: October 3, 2006

Sources:
Sources: Basedata (Triathalon Mapping Corporation, based on 1994 aerial photography). Surficial Geology (Mougeot Geoanalysis)

Created by: GS **Reviewed by:** EM

Project: 60708

Gartner Lee

Figure: 3

In the area around Whitehorse, the ice front paused and possibly advanced and retreated several times generating a more complex series of deposits. Sand and gravel may be found deep below ground surface in several places, including close to the Porter Creek subdivision on both sides of the river (Mougeot 1999).

Due to the thick silt and clay of the Bench, there is likely little groundwater flow. Groundwater will most likely be found perched in the sand above the glaciolacustrine clay or in the underlying bedrock

Occasionally, blocks of ice broke off from the main glacier and were buried by glacial sediments. During the following hundreds of years, the buried ice blocks melted from within the sediments leaving holes or kettles. The resulting terrain is evident around Chadburn and Long Lakes and on a much smaller scale on the Porter Creek Bench. The lakes themselves, and the area on which the Riverdale residential subdivision is built, are probably large depressions with the same origin (GLL 1999, p.8-9). (Figure 2).

The colluvial deposits identified in Figure 3 are the result of steep slopes. Colluvial deposits such as those that result from erosion of a steep slope, are deposits sorted by gravity.

There are two different kinds of wind formed sand deposits in the Whitehorse area and on the Porter Creek Bench: loess and sand dunes. Loess is a very thin layer of silt deposited by winds that were driven by large changes in temperature. The winds reworked the loose material left by the glacier and its outwash. Silt and fine sand were transported appreciable distances by the wind and deposited as well sorted massive blankets. In the Yukon River Valley, discontinuous loess (silty Aeolian material) up to 15 cm thick is very common on glaciofluvial and glaciolacustrine deposits, such as the Porter Creek Bench.

A second Aeolian feature are sand dunes. The dunes are usually composed of well-sorted fine to medium –grained sands. The topography is hummocky, and the dunes can have a rough crescent shape pointing downwind, like the dune fields located north and east of the Livingstone Trail Environmental Control Facility as shown at the very top of Figure 3. A large sand dune of this type is found in the centre of Porter Creek Bench (Figure 3). This sand dune has the classic crescent shape pointing downwind (Figure 3) and is covered by spruce-feathermoss and pine-bearberry forest. Very localized Aeolian deposits exist in areas immediately above exposed bluffs throughout the study area. These active cliff-top dunes are composed of silt and sand, similar to the small field of dunes above the Riverdale area. In these cases, strong winds pick up fine grained material from the cliff wall and deposit it on top of the bluff. (GLL 1999). Such localized sand

The pothole depressions on the Bench are approximately 30 m deep with very steep slopes and centres of small, closed drainage basins. These are some of the only wet areas on the Bench and therefore home to a higher diversity of ecosystems than other areas on the Bench. Diversity in ecosystems leads to more valuable habitat.

dunes are also on the Bench, located on the top of the cliffs in southeast corner of the Bench where the Yukon River narrows.

Each kind of geological deposit has its own geotechnical properties, which in turn determine road, foundation and other infrastructure design. It is assumed that these properties are presented in the Porter Creek Bench Geotechnical Report.

Typically, vegetative communities on sand dunes are fragile and sand dunes are easily reactivated when the vegetation is disturbed. As a result they can erode quickly if subject to even recreational traffic. Should they be disturbed during development, effort should be taken to re-vegetate and stabilize them as soon as possible. However, sand may be in demand during construction and the sand dune may be an excellent resource.

3.2 Climate

Whitehorse is located in the Upper Yukon – Stikine Basin Climatic Division (Wahl *et al.,* 1987). The region is a relatively high plateau between the St. Elias Coast Mountains to the West-Southwest and the Cassiar Pelly Mountains to the East. The plateau is characterized by deeply incised river valleys, disorganized mountains and very low precipitation (annual average around 300 mm) due to the rain shadow cast by the St. Elias Coast Mountains. The temperature regime is mainly continental and fluctuates widely both on a seasonal and daily basis. (Wahl *et. al.,* 1987).

Some key climate normals for 1971-2000 as published by Environment Canada for the climate station at the Whitehorse airport (Whitehorse A) are summarized in Table 2. A climate normal is defined as a 30-year average for a climate station with at least 15 years of data within that 30-year time span.

Table 2. Summary of Climate Normals at Whitehorse A (1971-2000)

Parameter	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Daily Avg. Temp (°C)	-17.7	-13.7	-6.6	0.9	6.9	11.8	14.1	12.5	7.1	0.6	-9.4	-14.9
Precipitation total(mm)	16.7	11.4	10.4	7	15.2	30.3	41.4	39.4	34.1	23.8	19.2	18.5
Rainfall (mm)	0.2	0.1	0	1.3	13	29.7	41.4	38.5	29.3	8.8	0.7	0.3
Snowpack depth at month end (cm)	31	32	25	2	0	0	0	0	0	5	15	24
Extreme Daily Precipitation (mm)	9.5	10.4	10.4	14.2	12.6	44.9	23.2	30.7	25.2	23.6	11.4	18.7
Wind Speed (km/h)	12.9	13.5	12.7	12.7	12.6	11.5	10.4	11.1	13	14.7	14.1	13.9
Most Frequent Wind Direction	S	S	SE	SE	SE	SE	SE	SE	SE	SE	S	S

Meteorological Survey of Canada, 2006.

3.2.1 Temperature Inversions

The climate in Whitehorse has two primary drivers:the warm air masses coming in from the coast over the St. Elias mountains and the cold arctic air masses coming down from the north. Temperature inversions are common phenomena in the Yukon. An inversion is "a reversal of the normal vertical temperature profile," (Wahl *et al.,* 1987 p. 87). An Arctic inversion hangs over the Yukon for most of the winter The cold arctic air traps beneath it the warmer air coming off the coastal mountains and up from the south.(Meteorological Service of Canada, pers.comm., 2006).

Inversions can restrict he movement of air and therefore reduce air mixing. This means that any particles hanging in the air might linger close to their source. This is common throughout Whitehorse.

At a smaller scale, slightly higher temperatures have been recorded on the Porter Creek Bench compared to those measured at the airport. Although the microclimate on the Porter Creek Bench has not been studied as extensively as that at the Whitehorse Airport, some work was conducted by G.J. Bull & Associates in 2004 and 2005. A Campbell Scientific climate station, which measured air temperature, relative humidity, wind speed and direction, was established at the CBC tower enclosure in October 2003 and collected data for the following time periods:

- October 23 – November 3, 2003
- January 23 – November 11, 2004
- April 22 – May 31, 2005

G.J. Bull & Associates (2005) took an inversion to be a difference in temperature of >0.5°C for more than 1 hr, when the temperature at the airport was lower than that on the Bench. Their findings included:

a) the temperature differences between the Porter Creek Bench and the Whitehorse Airport ranged from 0.5°C to 10.8°C (G.J. Bull & Associates, pg. 17);

b) for every month in which data was collected, more than 70% of the measured days experienced daily inversions, which lasted on average 8 hrs/day, with an average temperature difference of 2.5°C; and

c) typically the inversions last from midnight until around noon.

These findings are similar to trends generally observed in the Whitehorse area.

3.2.2 Wind Speed and Direction

The Whitehorse Airport is the most consistently windy location of the sites monitored within the Upper Yukon – Stikine Basin. (Whal *et. al.*, p 36). When the wind speed and direction on the Bench was monitored by G.J. Bull & Associates there was a notable difference between the speeds measured on the Bench compared to those measured at the airport.

Conclusions from the G.J. Bull & Associates measurements include:

a) very low wind speeds, typically classified as “calm” or “light air.”;
b) wind direction was generally SSW to ESE;
c) wind speed appears to be relatively constant over the year; and
d) wind speed appears to peak with temperature over the course of a day – but given that wind is so light it is difficult to draw that conclusion with confidence.

The lower wind speeds on the Porter Creek Bench can be attributed to Whitehorse topography. Wind, like water, moves faster through constricted areas and slows in wider, open areas. The river valley by the airport narrows where Grey Mountain produces a pinching effect. As the wind blows by the end of Grey Mountain, the valley opens and the wind slows. (Meteorological Service of Canada, pers.comm., 2006).

3.2.3 Ice Fog

Ice fog occurs in the City of Whitehorse during most winters, typically along the Yukon River at lower elevations. Ice fog is created when water vapour encounters very cold air, typically around -35ºC. The water vapour freezes into tiny suspended ice particles, which do not fall out of the air until the temperature goes back above -35ºC. Ice fog is formed naturally from open water and can also be due to anthropogenic sources such as vehicle emissions.

3.2.4 Air Quality

There have been two air-quality issues identified during public consultation regarding the Porter Creek Bench: wood smoke from Porter Creek and odour events from the City Livingstone Lagoons located north of the study area across the river. In 2005, on behalf of the City, G.J. Bull & Associates, in association with Pottinger Gaherty Environmental Consultants, produced a report to address these concerns. Both air quality concerns are partially the result of temperature inversions and light winds on the Bench, both of which act to retard air mixing. Therefore, given that the issue is a result of the natural climatic conditions on the Bench, particular effort should be made to reduce and control air emissions from sources such as wood stoves, wood fireplaces and vehicle traffic. The City of Whitehorse now requires that all new wood stoves meet the American or Canadian performance standards for solid-fuel burning stoves. As such, wood smoke related air quality issues in Whitehorse have been reduced since By-Law 97-01 went into effect in 1997, followed subsequently by By-Law 99-56. For a more complete discussion of air quality of the Porter Creek Bench please refer to Appendix A.

Odours from the sewage lagoons near Porter Creek Bench have been reported, especially when a Northerly wind is blowing. However, the prevailing wind direction on the Bench is South or South East

3.3 Water Resources

3.3.1 Surface Water

The City of Whitehorse is located on the shores of the Yukon River's upper reaches. Deglaciation features such as kettle topography and meltwater channels characterize the surface water flow patterns in the Yukon River Valley. The City's Surface Water Inventory (GLL, 2001) identifies 30 watersheds. The Porter Creek Bench is unequally divided between three of these watersheds: drainage to the Yukon River, McIntyre Creek and MaCauley Creek. (Figure 4).

Eleven of the City's watersheds are closed systems that drain into some central depression such as those found in the hummocky kettle topography like that found in the Chadburn Lake and Long Lake areas. The remaining watersheds eventually flow into the Yukon River. Most developed areas within the City of Whitehorse drain directly into the river (Figure 4).

McIntyre Creek's headwaters are in one of the City's largest wetland complexes. The creek and its surrounding riparian zone provides one of the longest green corridors in the City. The mouth of the creek has been identified as habitat for wildfowl and other wildlife.

Old meltwater channels control many of the watersheds with surface outflow. The meltwater channels are remnants from glacial outflow and are often far larger than the streams running through them today. Often, these surface features have detoured the water away from old patterns, which means that the groundwater flow regime may not follow the surface drainage patterns (GLL, 2001).

On a smaller scale, the Porter Creek Bench exhibits a similar drainage pattern (Figure 5). The Bench is relatively flat and dry. Six drainage areas have been delineated for the Porter Creek Bench from available topographical data. Three of these are closed systems with no outlet, two of which drain into small, pot-hole depressions. Another very small pothole is the only one area that retains water throughout the open water season, and it is located at the edge of the 16th hole of the Mountainview golf course. (Personal Interview, Regan and Associates, Adrienne). However, its catchment area is smaller than the scale used to establish the drainage areas.

Approximately 15% of the Bench drains directly into the Yukon River directly, while the remaining drainage areas drain into either McIntyre or McCauley Creeks, which also drain into the Yukon River. The mouth of McIntyre Creek is at the southern edge of the study area and McCauley creek meets the Yukon River in the northwestern corner of the study area. Other thanMcIntyre

485,000 490,000 495,000 500,000 505,000

6,745,000 6,740,000 6,735,000 6,730,000 6,725,000 6,720,000 6,715,000

Map Area

Hidden Valley
MacPherson
Takhini River
Yukon River North
Little Takhini River
Nine Mile Creek
YUKON
Porter Creek Bench
Porter Creek
MacCauley Creek
Porter Creek
RIVER
Croucher Creek
Takhini
Marwell
Valleyview
Long Lake Complex
McIntyre
Downtown
Hillcrest Meltwater Channel
Arkell
Hillcrest
Riverdale
Logan
Granger
Copper Ridge
City of Whitehorse
McIntyre Creek
Hidden Lakes
Lobird
Chadburn Lake Complex
Chadden Lake
Canyon Creek
Chadburn Lake
Yukon River South
Copper Creek
McRae
McLean Lake Creek
Basalt Creek
Pine Ridge
Wolf Creek
MacRae Creeks
MacRae Creeks
Wolf Creek
Cowley Creek
Cowley Creek
Mary Lake

Legend

Highway
Road
Watercourse
Study Area
Waterbody

N W E S

Porter Creek Bench

Environmental and Special Places Report
Regional Setting: Watershed
City of Whitehorse

0 1 2 3 4 Km

Scale 1:90,000

Date: September 27, 2006

Sources:
Base data provided by the City of Whitehorse at 1:20,000 scale, and
Triathlon Mapping Corporation, based on 1994 aerial photography

Created by: GS **Reviewed by:** EM

Project: 60708

Gartner Lee

Figure: 4

492,400 493,300 494,200 495,100 496,000

6,740,000 6,739,000 6,738,000 6,737,000 6,736,000

Map Area

City of Whitehorse

Yukon River

1
194.4ha

2
67ha

3
141ha

4
96ha

5
222ha

6
90.7ha

650 675 700 725 750

Legend

- Study Area
- Waterbody
- Wetland
- Watercourse
- Highway
- Road
- Contour 20m
- Contour 5m
- Drainage direction

N W E S

0 0.25 0.5 0.75 1 Km

Scale 1:15,000

Porter Creek Bench

Environmental and Special Places Report
Porter Creek Bench: Drainage Basins
City of Whitehorse

Date: October 3, 2006

Sources:
Base data acquired from the
City of Whitehorse at 1:20,000 scale.
Drainage basins delineated by Gartner Lee Limited.

Created by: SM **Reviewed by:** LG

Project: 60708

Gartner Lee

Figure: **5**

Creek, catchment area #5 in Figure 5 is the only other drainage on the Bench with an evident stream. It is likely that Hidden Lake in Porter Creek, which does not have a surface outlet, recharges the groundwater and eventually makes its way down into the ravine at the north end of the Study Area. Evidence of an ephemeral stream was noted in the ravine during field work, and a small stream was found further towards McCauley Creek.

By retaining natural drainage paths and catchment areas post-development, impact on receiving water bodies can be reduced.

3.3.2 Precipitation

The precipitation on the bench is estimated to be the same as that at the airport. The precipitation normals for the airport are presented in Table 3.

Table 3. Summary of Precipitation Normals and Extremes at Whitehorse A (1971-2000)

Parameter (units)	Date (extremes only)	Value
Normal Total Annual Rainfall (mm)	N/A	163.3
Normal Total Annual Precipitation (mm)	N/A	283.4
Extreme Daily Rainfall (mm)	June 27, 1985	44.9
Extreme Daily Snowfall (cm)	March 8, 1967	27.2
Extreme Snow Depth (cm)	Feb 16, 1972	94

Meteorological Survey of Canada, 2006.

A monthly breakdown of volume of water that falls every month on the Bench is provided in Table 4.

Table 4. Total Monthly Volume of Water on Porter Creek Bench (m^3)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Total Volume (m^3)	121910	83220	75920	51100	110960	221190	302220	287620	248930	173740	140160	135050
% of Annual	6%	4%	4%	3%	6%	11%	15%	15%	13%	9%	7%	7%
Snow on Ground (cm)	28	33	31	13	0	0	0	0	0	1	10	20

Meteorological Survey of Canada, 2006.

From the above, it is evident that almost 30% of the annual precipitation runs off during the month of April, even though April receives only 3% of the annual precipitation.

Runoff in developed areas is typically increased because water that would naturally infiltrate into the ground is channelled down paved driveways, sidewalks and streets into culverts, which empty into the streams or rivers. This extra peak volume of water can increase erosion, which is detrimental to fish habitat. By controlling our stormwater runoff we can protect fish.

The Porter Creek Bench is a very dry area. By building houses with traditional lawns that need additional watering through the summer months, the existing conditions will be disrupted. Additional infiltration to the groundwater flow system could increase erosion of the clay cliffs and inundate the small meadows.

3.3.3 Surface Water Quality

There is limited surface water quality data available for the lower portion of McIntyre Creek that is of use. Over the past 20 years there have been several different investigations in the area, which included some water quality monitoring, however any such studies included only one-time or short-term sampling. The Fish Rearing Station, operated by Environment Canada, collects water quality data on McIntyre Creek, and although that data has not been made available to date it may available at a later date (J. MacKenzie-Grieve, pers.comm., 2006). The Fish Rearing station is located upstream of the study area.

3.3.4 Groundwater

Municipal groundwater exploration in the Porter Creek Area has been minimal and has had limited success. Groundwater is primarily developed from either bedrock or granular deposits immediately overlying the bedrock. The thickness and lateral extent of these aquifers is often limited. Development of groundwater supplies from bedrock in this area has not been well explored, however it is anticipated that the bedrock would not produce quantities of groundwater adequate to meet municipal demand. Overall, groundwater potential in this area is thought to be suitable for meeting local, or limited domestic demands, but not suitable for significant municipal water extraction.

The daily water demand per capita in Whitehorse is 715 L/day. However, only a small percentage of this is for drinking and washing.

The known groundwater development for municipal and residential use that has been identified in the reviewed materials consists of study by Hydrogeological Consultants (HC). They drilled five test holes (TH 1-76 to TH5-76) in the northern part of the City, three of these wells (TH 3-76, TH 4-76 and TH 5-76) wherein the Porter Creek Bench Area (HC, 1976a, HC, 1976b). Wells TH 3-76 and TH 4-76 encountered bedrock at a depth of 108 to 62 m. Test hole TH 4-76, located close to the Porter Creek subdivision, encountered approximately 30 m of clay and till immediately above the bedrock surface. TH 4-76 was screened in sand and gravel from 35.3 to 35.6 m and had a transmissivity of 900 m^2/day (6 x 10^4 igpd/ft).

Groundwater on the Bench is likely found only in a shallow system in the overlying sands or at depth in the bedrock.

Only one private well, belonging to Mr. A. Heiland, is known to be currently operational. The well is located on his property approximately in the middle of the study area. The well is reported to be approximately 117 m deep with static water level at 28 m below ground surface, which is higher than the Yukon River. The well was drilled to bedrock surface at 117 m. There was reportedly a layer of glacial till 15 ft thick overlying bedrock. The well was drilled in 1985 by Fred Sucaroft and has provided clear water at suitable domestic flow rates since its installation (Heiland, A. pers. comm., 2006).

Conclusions from the available data are:

a) Sandy outwash blankets cap glaciolacustrine deposits over most of the Porter Creek Bench (Gartner Lee 2001). The surface glaciofluvial outwash is primarily sand.

b) The Porter Creek Bench lies on a thick layer of glaciolacustrine silt and clay that limits groundwater flow and recharge under the site.

c) Based on regional static water levels, groundwater is interpreted to flow from the Porter Creek subdivision towards the Yukon River in a Northeasterly direction (Gartner Lee 2001).

d) Bedrock is estimated to be on the order of 100 m below ground surface. The type of bedrock beneath the site is currently unknown but at on location limestone was reported.

e) Irrigation of the Mountainview Golf Course course may represent a source of recharge to the shallow groundwater system during the summer season. Groundwater beneath the golf course likely flows to the Yukon River.

f) Porter Creek flows into Hidden Lake, which then has no surface water outlets. Hidden Lake is a significant source of groundwater recharge as water from Hidden Lake infiltrates into the ground. It is interpreted that groundwater flowing from Hidden Lake might discharge in the ravine located at the north end of the study area.

g) Environment Canada and DFO have suggested that there are likely zones of groundwater discharge along the northern edge of the Study Area, on the south bank of the Yukon River. It has been observed that the river rarely freezes at that location and that some seeps have been observed along the bank during winter. This is also thought possibly to be an important area for fish habitat however this has not been confirmed in any of the reviewed documents (A. vonFinster, DFO, pers. comm.). Additionally, during public consultation, this area was also identified as being well-used by waterfowl. Waterfowl usually seek out the first open water in the spring: this could be due to groundwater discharge in the area.

h) No groundwater quality data was found during the research for this report.

3.3.5 Ground Source Heat Potential

Ground Source Heat Pumps are a space heating technology that derives heat from the ground in a very efficient and environmentally sustainable fashion. Ground source heat energy can be developed using two types of systems:

1. Groundwater heat pumps (GWHPs) – often called open loop systems
2. Ground coupled heat pumps (GCHPs) – closed loop system

It is possible, and often more efficient in the long-term, to install communal or district ground source heat systems. Groundsource and electric heat would reduce the amount of emissions in the air from oil or wood fired space heating.

The Porter Creek Bench is likely to relatively low potential for GWHP (open loop systems) due to deep drilling depth and lack of known high yield groundwater resources. Conversely, closed loop systems (GCHPs) would likely be more successful due to the some 100 m of silt and clay underlying the site. These materials are relatively easy to drill and install vertical loop heat exchangers.

3.4 Ecosystems

3.4.1 Background of Ecosystem Mapping

Traditional approaches to wildlife and vegetation inventory have generally focused on long periods of systematic observation and data collection. Techniques such as animal track counts, pellet transects, songbird call stations, browse surveys and detailed vegetation plots are all traditional methods for quantifying and characterizing our natural world. However, these techniques do not necessarily look at the entire environment and the complex relationships between vegetation, soils and terrain. Also, none of this work has been completed in the past on the Porter Creek Bench. An excellent alternative to traditional inventories is ecosystem mapping.

The areas of most complex and varied ecosystems are associated with the pothole depressions and the riparian areas along the Yukon River and McIntyre Creek.

One of the underlying philosophies behind plant and landscape ecology is that abiotic factors (terrain conditions, soil conditions, elevation gradients, etc.) create environmental gradients, which influence the growth and distribution of vegetation. In the boreal forest of northwest Canada, vegetation responds to terrain conditions and topographic gradients in relatively predictable ways, producing the concept of vegetation associations/communities and ecosystem units. These communities and land units will occur in generally predictable patterns, which are governed by topography (i.e. warm and cool aspects) and soil properties (i.e. nutrient and moisture gradients) (AEM 2000). The mapping philosophy behind Ecosystem Mapping relies on the identification of these distinct landscape (or ecosystem) units and their associated attributes. This procedure results in the development of a "terrain-based" mapping system, which allows a better understanding of the relationships between terrain, soil, landscape position and vegetation communities than traditional vegetation or forest cover mapping (AEM 2000).

Ecosystem mapping has been completed for approximately 80% of the City of Whitehorse at a 1:20 000 scale (Figure 6). The areas excluded from the ecosystem mapping project were mountainous terrain. Ecosystem mapping for the Porter Creek Bench was completed at a 1:5000 scale (Figure 7). GLL and Applied Ecosystems Management, which has since merged with

GLL, has performed all City ecosystem mapping to-date and therefore the two maps are continuous in their ecosystem definitions and methodology. A complete description of each ecosystem can be found in Appendix B.

3.4.2 Ecosystems of Porter Creek Bench and City of Whitehorse

The City of Whitehorse is located in the boreal zone of the Yukon Southern Lakes Ecosystem. The region is mainly an upland forest but contains some alpine and sub-alpine environments. The upland forest is primarily lodgepole pine, white spruce and minor amounts of trembling aspen in mid to mature seral stages (40 to 120 years) (GLL, 1999).

Figure 6 shows the spatial distribution of the City's ecosystems. As outlined in the figure, there are three predominant ecosystems: Pine-Bearberry and Spruce Feathermoss, along with Aspen Bear-Berry, all which are forested ecosystems. The ecosystems on the Porter Creek Bench were mapped for this project at a finer scale (1:5,000) (Figure 7). These three city-wide predominant ecosystems are also prevalent on the Bench as is shown in Figure 7. The numerical distribution of ecosystems within the City of Whitehorse is also very similar to the distribution of ecosystems along the Yukon River Corridor. The distribution of both areas as well as the Porter Creek Bench are presented in Figure 8. As is evident Figure 8, the upland forest is the dominant ecosystem type for all three areas: City of Whitehorse, Yukon River Corridor and Porter Creek Bench. Within the upland forests, there are a limited number of small, non-contiguous wetlands and meadows. In conjunction with the upland forests, these habitats create diversity of ecological conditions over small geographic distances. These areas, along with low-lying riparian zones, generally provide for the largest diversity of plant and animal species within the City (AEM 1999).

High density of different ecosystems leads to higher value wildlife habitat. Therefore, the area around McIntyre Creek is of particular value.

485,000 490,000 495,000 500,000 505,000

6,745,000 6,740,000 6,735,000 6,730,000 6,725,000 6,720,000 6,715,000

Map Area

Hidden Valley
MacPherson
YUKON
RIVER
Porter Creek
Takhini
Marwell
Valleyview
McIntyre
Downtown
Riverdale
Arkell
Hillcrest
Logan
Granger
Copper Ridge
Lobird
Hidden Lakes
Chadden Lake
Chadburn Lake
McRae
Pine Ridge
Wolf Creek
Cowley Creek
Mary Lake
City of Whitehorse

Legend

Ecosystem classification

- AN/UR- Anthropogenic Disturbance, Urban
- CL - Cliff / Rock
- ES - Erodable Slope - Steep
- GB - Gravel Bar / Sand
- RO - Rock Outcrop
- GG - Golfcourse Grass (Maintained)
- GG - Golfcourse Grass (Unmaintained)
- GS - Grass - Sage
- PB - Pine / Bearberry
- FE - Sedge Fen
- AB - Trembling Aspen-Bearberry
- SP - White Spruce - Balsam Poplar Riparian
- SF - White Spruce - Feathermoss
- SW - White Spruce - Willow
- WA - Willow - Alder
- WB - Willow - Shrub Birch
- ME - Meadow
- PL - Pine - Lichen
- MR - Marsh
- SL - White Spruce - Lichen - Grass
- PG - Lodgepole Pine - Grass
- AG - Agriculture
- PC - Lodgepole Pine - Canoe (Paper) Birch
- CF - Cultivated Field
- RB - Recent Burn
- ST - White/Black Spruce - Labrador Tea
- LL, LS, OW, RI - Lakes, Large, Small / River / Open Shallow Water

Legend

- Highway
- Road
- Porter Creek Bench

Porter Creek Bench

N W E S

Environmental and Special Places Report
Regional Setting: Ecosystems
City of Whitehorse

0 1 2 3 4 Km

Scale 1:90,000

Date: October 20, 2006

Sources:

Base data provided by the City of Whitehorse at 1:20,000 scale, and Triathlon Mapping Corporation, based on 1994 aerial photography. 1:5,000 scale ecosystem mapping compiled by Gartner Lee Limited.

Created by: GS **Reviewed by:** EM

Project: 60708

Gartner Lee

Figure: 6

492,400 493,300 494,200 495,100 496,000

6,741,000 6,740,000 6,739,000 6,738,000 6,737,000 6,736,000 6,735,000

Map Area

City of Whitehorse

Legend

Ecosystem classification

- AN/UR- Anthropogenic Disturbance, Urban
- CL- Cliff / Rock
- ES - Erodable Slope - Steep
- GB - Gravel Bar / Sand
- RO - Rock Outcrop
- GG - Golfcourse Grass (Maintained)
- GG - Golfcourse Grass (Unmaintained)
- GS - Grass - Sage
- PB - Pine / Bearberry
- FE - Sedge Fen
- AB - Trembling Aspen-Bearberry
- SP - White Spruce - Balsam Poplar Riparian
- SF - White Spruce - Feathermoss
- SW - White Spruce - Willow
- WA - Willow - Alder
- WB - Willow - Shrub Birch
- ME - Meadow
- PL - Pine - Lichen
- MR - Marsh

Legend

- Porter Creek Bench Study Area
- Highway
- Road

N W E S

0 0.25 0.5 0.75 1 Km

Scale 1:20,000

Porter Creek Bench

Environmental and Special Places Report
Porter Creek Bench: Ecosystems
City of Whitehorse

Date: October 3, 2006

Sources:
Base data acquired from the
City of Whitehorse at 1:20,000 scale.
Ecosystem mapping conducted by Gartner Lee Limited,
at 5,000 and 20,000 scales.

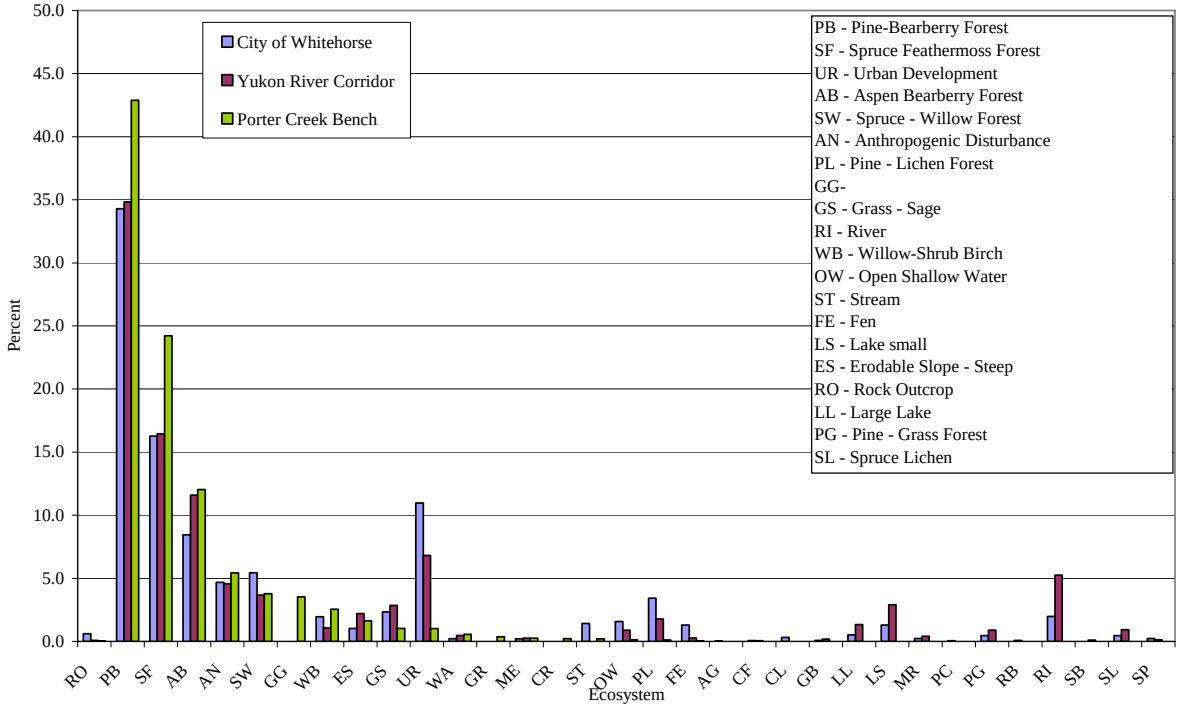
Created by: SM **Reviewed by:** EM

Project: 60708

Gartner Lee

Figure: 7

Figure 8. Comparison of Ecosystem Distributions in the City of Whitehorse, Yukon River Corridor and Porter Creek Bench



The other communities limited in the City of Whitehorse are well-drained, non-forested communities such as grass-sage (GS) ecosystems. The GS communities are found on steeply-sloping, warm aspects and are often found in combination with Aspen-Bearberry Forest (AB) and Erodable Slopes (ES). These communities provide visual breaks in the landscape and have heavy recreational use. They also usually provide excellent views of the surrounding area. However, these sites are very sensitive to erosion (AEM, 1999).

One of the potholes contains a very small fen, which is not a common wetland ecosystem in the region.

3.5 Wildlife Value Habitat and Environmentally Sensitive Areas

Over the past approximately 10 years, the City of Whitehorse and Applied Ecosystems Management (AEM), have developed a systematic, spatial method for identifying significant wildlife areas (SWA) and environmentally sensitive areas. The definitions of the different classifications are presented in Table 5.

McIntyre Creek Valley and the ravine leading to the McCauley creek provide green, semi-continuous corridors

Table 5. Classification Definitions

Classification	Definition
Significant Wildlife Area (SWA)	An area in a largely natural state that receives high levels of wildlife use and provides significant seasonal values to wildlife through either suitable habitat and/or providing travel corridors with adequate connectivity to the surrounding landscape
High Wildlife Values	Ecosystem units that provide high value wildlife habitat and are important to the long-term, continued use of the area by wildlife
High Environmental Sensitivity	Areas with low tolerance to human disturbance where slight alterations would result in functional or structural changes to the ecosystem unit with potentially negative impacts on wildlife or visual aesthetics

Note: AEM 2000

During the city-wide exercise to identify important areas the above definitions were created and identified at the 1:20 000 scale. At this scale, the only SWA within the Study Area is Lower McIntyre Creek – Yukon River (Figure 9) and the small ravine to the North of the Study Area which eventually leads to a tributary of McCauley Creek. The entire McIntyre Creek Corridor was also identified as a separate SWA. The McIntyre Creek Corridor represents the "largest

485,000 490,000 495,000 500,000 505,000

6,745,000 6,740,000 6,735,000 6,730,000 6,725,000 6,720,000 6,715,000

Map Area

Hidden Valley
MacPherson
YUKON
Porter Creek
RIVER
Marwell
Takhini
Valleyview
McIntyre
Downtown
Riverdale
Arkell
Hillcrest
Logan
Granger
ALASKA
HWY
Copper Ridge
Lobird
Hidden Lakes
Chadden Lake
Chadburn Lake
McRae
Pine Ridge
Wolf Creek
Cowley Creek
Mary Lake
City of Whitehorse

Wildlife Potential
- High
- Low

485,000 490,000 495,000 500,000 505,000

Legend
- Highway
- Road
- Watercourse
- Waterbody
- Study Area
- Developed Areas

N W E S

0 1 2 3 4 Km

Scale 1:95,000

Porter Creek Bench

Environmental and Special Places Report
Regional Setting: Significant Wildlife Areas
City of Whitehorse

Date: October 6, 2006

Sources:
Base data provided by the City of Whitehorse at 1:20,000 scale, and
Triathlon Mapping Corporation, based on 1994 aerial photography

Created by: GS **Reviewed by:** EM

Project: 60708

Gartner Lee

Figure: **9**

contiguous (sic) Significant Wildlife Area within the City of Whitehorse" (AEM 2000 p. 39). Therefore, when considering the significance of the Lower McIntyre Creek, its connection to the wetlands upstream must be kept in mind.

The Lower McIntyre Creek – Yukon River area is comprised of the lower-most reach of McIntyre Creek, from Mountain View Drive to the confluence with the Yukon River. The wildlife species groups that have been documented in the area are presented in Table 6.

The Bench has been cleared by humans and fire over the past 100 years. Any pockets of forest that have outlived this disruption are not common. The one area with an old stand is the small patch of White-Spruce Feathermoss located at the south end of the meadow in the southern center of the area..

Table 6. Wildlife Values and Species Groups Represented in Lower McIntyre Creek – Yukon River (from AEM 2000)

Group	Species Group	{Observations}**
Birds	*Avian Predators*	➢ Shallow river channels and gravel bars in the Yukon River are used for hunting and scavenging spawned salmon carcasses ➢ Shoreline forests are used for roosting and possibly nesting ➢ Surrounding ES bluffs are used for roosting. Of special significance are the bluffs above Eagle Bay. The steep ES bluffs below Mountain View Golf Course are well known for the large number of ravens which congregate
	Forest Birds/ Neotropical Migrants	➢ Lowland spruce forests (SW, SF) and shrub areas (WB) in the Lower McIntyre Creek basin
	Water Birds (waterfowl and shorebirds)	➢ Shallow, sheltered side channels along the west bank of the Yukon River (RI) and at the McIntyre Creek confluence (open shallow water – OW) ➢ Islands, gravel bars, marshes and shorelines of the Yukon River (GB, MR, WA)
Mammals*	*Microtine Mammals*	➢ Surrounding steep, ES bluffs
	Ungulates	➢ Moose have been observed sporadically in the area, especially on the east bank of the river. The landscape-level connectivity of this site is probably most responsible for the occasional presence of ungulates.
Fish	*Fish*	➢ Areas surrounding the small groups of islands within the Yukon River were identified as containing salmon and other fish spawning/rearing habitat. ➢ Spawned out salmon carcasses provide an important food source for many species during fall.s

Notes: * *semi-aquatic mammals (beavers and muskrats) probably also use this area. Bears may also use the east bank of the Yukon River.*
** *the ecosystems identified by their two-letter ID are defined in Appendix B and are presented in Figures 6 & 7*

The same, systematic approach was applied to the Porter Creek Bench once the 1:5000 ecosystem mapping was completed (Figure 10). Figure 10 identifies significant wildlife areas as wells as environmentally sensitive areas. The identification of wildlife areas is based on the original city-wide work. That same project identified the following ecosystems to provide important wildlife habitat:

a) water;
b) shoreline;
c) non-forested meadows;
d) shrub communities and wetlands; and
e) mature-old lowland riparian forest stands.

The high wildlife, low sensitivity area identified in Figure 10 is the area of trees that are older than the rest of the area. Because this stand is a more mature forest it provides a higher value habitat for wildlife.
Birders have also identified Lower McIntyre Creek to be an area of interest. Specifically, the species that have been observed in the area are:

a) impressive diversity of waterfowl during the spring migration including Tundra and Trumpeter Swans, geese and Eurasian Wigeon (occasional); and
b) regular avian predators include Northern Harrier, Red-tailed Hawk, and Gyrfalcon.

Other observed species include:

a) Townsend's Solitaire;
b) Mountain Bluebird;
c) Herring Gulls;
d) Mew Gulls;
e) Northern Shrike; and
f) Glaucous and Glaucous-Winged Gull.

(Eckhart 2001)

According to public input, moose, bears and coyotes also use the Bench.

491,300 492,600 493,900 495,200

6,741,000 6,739,500 6,738,000 6,736,500 6,735,000

Map Area

City of Whitehorse

Yukon River

HS HWHS MS HWMS HWLS

Wildlife Land Classes

- HS- High Environmental Sensitivity
- Moderate Environmental Sensitivity
- HWHS- High Wildlife Values, High Environmental Sensitivity
- HWMS- High Wildlife Values, Moderate Environmental Sensitivity
- HWLS- High Wildlife Values, Low Environmnetal Sensitivity

Legend

- Porter Creek Bench Study Area
- Paved Road
- Rough Road

N W E S

0 0.25 0.5 0.75 1 Km

Scale 1:20,000

Porter Creek Bench

Environmental and Special Places Report
Porter Creek Bench: Environmentally Sensitive Areas
Whitehorse

Date: October 3, 2006

Sources:
Base data acquired from the City of Whitehorse at 1:20,000 scale. Significant Wildlife Land Classes defined by Gartner Lee Limited.

Created by: SM **Reviewed by:** EM

Project: 60708

Gartner Lee

Figure: **10**

3.6 Fish and Fish Habitat

The Yukon River is a salmon-bearing river with three major tributaries in the City of Whitehorse: McIntyre Creek, Croucher Creek and Wolf Creek. Chinook salmon have been documented to spawn in the lower reaches of McIntyre Creek, and spawning habitat typically ranges from the confluence with the Yukon to upstream reaches near the Alaska Highway (GLL 2004).

Fish are sensitive to changes in water quality and quantity. By mimicking the natural drainage patterns within a development the changes to existing water quality and flow can be drastically reduced.

There are two culverts at each of the three major road crossings along McIntyre Creek: Range Road, Mountain View Drive and the Alaska Highway. The lowest of these is Range Road, which is in the Porter Creek Bench study area. None of these culverts present a complete barrier to the upstream migration of adult salmon (AEM 2003). However, juvenile Chinook salmon have been documented to use McIntyre Creek as a rearing habitat from the confluence with the Yukon River to the culverts at Range Road. The perched culverts beneath Range Road limit the migration of juvenile Chinook salmon to reaches further upstream (GLL 2004).

Freshwater fish have been known to be found in McIntyre Creek, including: arctic grayling, round whitefish, lake trout, long nose suckers, slimy sculpin, burbot and rainbow trout.(AEM 2003).

Spawning salmon are very sensitive to the total suspended solids (TSS) in the water. Increased erosion, due to increased runoff, can increase the TSS in a stream. In conventional developments erosion is increased due to an increase in a stream's peak flows. On the Porter Creek Bench increased erosion of the clay cliffs could also contribute TSS concentrations.

4. Land Use and Special Places

4.1 Special Places

Currently, the primary use of the Porter Creek Bench is recreation. A golf course, horse riding facility and an extensive network of trails are located on the Bench. In addition, there are a small number of areas of historical interest. In order to collect information regarding special places, GLL interviewed many technical experts and stakeholders from the Whitehorse area in order to identify any places with significant ecological functions, and to identify any further sources of data. Interviewees included the Yukon Bird Club, Yukon Environment, Ta'an Kwach'an Council and City of Whitehorse Department of Parks and Recreation. At the Sept 12, 2006 Public Kick-Off Meeting, GLL offered the opportunity for attendees to identify their special places on either paper or electronic maps and to talk to GLL representatives. Finally, GLL participated in the "Take Your Planner For a Walk" outing on September 16, 2006, in order to gather more data regarding special places. The data collected from these exercises are presented in Figure 12.

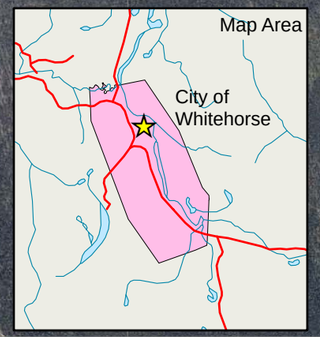
4.1.1 Trails

There is currently an extensive network of trails on the Porter Creek Bench (Figure 11). During this study, the City of Whitehorse recognized that many Bench trails had not been captured in the City's existing trail map. Therefore GLL conducted additional mapping of the trails on the Bench. GLL used satellite imagery interpretation and field work. The field staff biked the trails while equipped with a GPS unit outfitted with ArcInfo, in order to collect as much trail data as quickly as possible. The field staff also accompanied residents during the "Take Your Planner for a Walk" exercise in order to capture trails the field staff may have missed initially. While it is possible that more trails exist than have been catalogued to-date, it was of popular opinion among attendees of the Public Kick-Off Meeting and the walking tour that the map captured all of the important trails on the Bench.

According to the existing City Trail Plan, the City does not have any official plans for the trails in the Porter Creek Bench area (Hnatiuk, D. pers.comm., 2006). However, the Trail Plan is in the process of being updated. During the course of the preliminary public consultation some values regarding trails were identified: loops, the choice between long and short loops and commuter trails.

492,400 493,300 494,200 495,100 496,000 496,900

6,740,000 6,739,000 6,738,000 6,737,000 6,736,000



Legend

- Porter Creek Bench Study Area
- Roads, driveable
- Trail

Date: October 30, 2006

Sources:

Base data acquired from the City of Whitehorse at 1:20,000 scale.Trail mapping conducted by Gartner Lee Limited.

Created by: SM **Reviewed by:** EM

Project: 60708

Porter Creek Bench

Environmental and Special Places Report Porter Creek bench: Trail Mapping City of Whitehorse

N W E S

0 0.25 0.5 0.75 1 Km

Scale 1:17,000

Gartner Lee

Figure: **11**

492,400 493,300 494,200 495,100 496,000

6,740,000 6,739,000 6,738,000 6,737,000 6,736,000

Map Area

City of Whitehorse

City Monitoring for Lagoons

Area for netting fish (FN)

Drainage from McDonald Rd. Industrial Area

Great winter snowshoeing trails

Pipeline crossing

Lots of swans, birds in general

Seeps, river not completely frozen in Winter

Proposed Mountainview Golfcourse Expansion Area

Water intake for Golf Course

Old Fish/ Tourism Camp

Old Porter Creek Sewage Lagoon (De-commissioned, 1996)

Ta'an Kwach'an C-9B

CBC Tower Lease

Jet Power toboggan hill

Loop great for dog walking. Also well used by Pedestrians and ATV's

Popular dog walking area

Yukon Horse and Rider's Association

Heiland Farm

Mountainview Golfcourse

Slump instability

Trail to River

Kwanlin Dun C-43B

Picnic Spot

Sacred viewing place of mountains and plateau

NavCanada

Magnificent Vista Area and Wildlife Viewing

Snowmobile crossing

Peaceful place to sit

Great views for painting and wildlife viewing

Lots of Waterfowl

Commuter trails

Old Barge Wreck

Ravens and Eagles

Kwanlin Dun C-15B

- Bird Issues
- Other areas of interest
- Special Interest
- Historic Area
- Cadastral
- Kwanlin Dun First Nation
- Ta'an Kwach'an Council

492,400 493,300 494,200 495,100 496,000

Legend

- Rough Road
- Paved Road
- Trail
- Watercourse
- Lakes
- Study Area

N W E S

0 0.25 0.5 0.75 1 Km

Scale 1:15,000

Porter Creek Bench

Environmental and Special Places Report
Porter Creek Bench: Special Places
City of Whitehorse

Date: October 3, 2006

Sources:
Base data acquired from the City of Whitehorse at 1:20,000 scale and Triathalon Mapping Corporation, based on 1994 aerial photography.
Trail mapping conducted by Gartner Lee Limited.

Created by: SM **Reviewed by:** LG

Project: 60708

Gartner Lee

Figure: **12**

4.1.2 Areas of Historical Interest

It is anticipated that these areas are identified more thoroughly in the Heritage Report. However, through our research GLL has identified three sites of historical interest (Figure 12):

a) First Nations Cluett Fox Farm and Wood Camp;

b) Cluett wood camp (Ryder Wood Camp #3) across the river from the south end of the golf course Yukon River Corridor Plan; and

c) The Prospector wreck in Yukon River just south of McIntyre Creek mouth. (GLL, 1999)

4.2 Land Use

The Government of Yukon most of entire Porter Creek Bench area except: Transport Canada Lands, Heiland Farm, the City of Whitehorse parcel which is leased to the Horse and Rider's Association and two First Nation Land Claims. The following section outlines the various parcels of land the interests of the lease holder/ owners with respect to the Porter Creek Bench Development (Figure 12).

Table 7. Existing Land Use and Approximate Site Areas

Existing Land Use/Stakeholder	Tenure	Site Area (hectares)	% of Total
Mountainview Golf Course	Leased by YTG	137	*19*
Proposed Golf Course Expansion	Leased by YTG	52	*7*
Transport Canada Transmitter	Federal Land	21	3
CBC Transmitter	Leased by YTG	19	3
Heiland Farm	Owned	8	1
Ta'an Kwach'an Council	Land Claim	20	3
Kwanlin Dün First Nation	Land Claim	17	2
Yukon Horse & Riders Association	Leased by City of Whitehorse	6	1
Porter Creek Sewage Lagoons	City of Whitehorse	1	0.1
Vacant Commissioners Land	N/a	449	*62*
Total		**730 ha**	**100%**

4.2.1 Transport Canada

Transport Canada owns a 21-ha parcel of land on the Bench, which it leases by a 60-year lease to Navigation Canada. Transport and Navigation Canada periodically review their land holdings to identify any surplus. The Whitehorse parcel was recently reviewed and was kept. The tower and transmitter on the parcel is used by all planes approaching the Whitehorse Airport. The cost of relocating the tower could be high due to the details involved in re-locating the navigational aid, as opposed to the cost of physically relocating the tower. The City is currently in discussion with Transport and Navigation Canada to determine the options available to all three agencies (Gau, pers.comm., 2006)

4.2.2 Mountainview Golf Course

The Mountainview Golf Course is located along the Yukon River on the east edge of the Bench. The golf course has 18 holes, but has an additional lease of land that extends along the north -east portion of the Bench. The current lease expires in 2013.

4.2.3 Land Claims

1. Parcel C-9B – Ta'an Kwach'an Council

The Ta'an Kwach'an Council is beginning to develop their land claim properties. They have developed a very small parcel on Takhini Hot Springs Road, but the parcel (20 ha) on the Porter Creek Bench will be the largest claim they develop within city limits and in co-operation with other agencies. First Nations cannot sell their lands but they can lease the property for any length of time they specify in the lease. The First Nation hopes the property will be an opportunity to provide housing or business opportunities for their First Nation as well as bring in income that will be used to fund their programs. The First Nation is particularly interested in mixed-use possibilities and high-density housing. The First Nation did not identify any special places on the Bench, however the reasons for the claim and the ensuing negotiations were never documented by the First Nation, and therefore were not available to this project team. (J. Pattimore, pers.comm.., 2006). An interview with the elders of the First Nation may reveal more information regarding the significance of the parcel on the Porter Creek Bench.

2. Parcel C-43 – Kwanlin Dün First Nation

The Kwanlin Dün First Nation owns a 17-ha parcel, which is adjacent to the Yukon River. The City of Whitehorse held a stakeholder interview with the First Nation at which some environmental concerns were identified:

a) habitat connectivity,
b) wildlife corridor along and across the Yukon River,
c) cumulative impacts, and,
d) preservation of water quality and wildlife.

In addition, the First Nation identified the importance of access to water and the potential impact of increased use of the Kwanlin Dün parcel.

While the First Nation may, one day, develop the parcel on the Bench, the planning process within the First Nation has not yet progressed to the development stage. However, there is an interest to ensure that the current development is compatible with future uses by the First Nation (Gau, pers.comm. 2006). An interview with the elders of the First Nation could reveal more information regarding the significance of the parcel on the Porter Creek Bench.

4.2.4 CBC

The City is currently negotiating with CBC to re-locate their transmitting tower off the Bench (Gau, pers.comm., 2006)

4.2.5 Heiland Property

The Heilands have lived on Porter Creek Bench for approximately 30 years. They have a positive opinion regarding the development of the Porter Creek Bench and wish to sub-divide their property. (Heiland V & A., pers.comm., 2006)

4.2.6 Yukon Horse and Riders' Association

For at least the past 20 years, the Yukon Horse and Riders' Association has leased a six-acre parcel of land from the City of Whitehorse on 3-year leases. Recently, the lease was extended to ten years. However, the City can cancel the lease with a one-year notice. The Association hosts an annual show, which attracts approximately 100 horse and rider teams from Alaska and Western Canada. In addition, the Association hosts other events throughout the summer, and the grounds are used extensively for training and recreation. The Association has a number of ideas for further development of their facility, however they are continually hampered by the non-permanence of their lease. Currently, the property has no permanent buildings or running water because of the risk associated in investing in a short-term lease property. Every year, the Association clears more of its property because non-treed space is essential to store horses during shows. During the rest of the year, the open space is a popular place for families with small children and dogs as there is short grass as compared to the forest or shrub complexes covering the rest of the Bench (L.Dixon, , 2006).

4.2.7 Porter Creek Sewage Lagoons

A small, 3-cell, sewage lagoon facility is located in the Northwest corner of the study area. The facility was decommissioned in 1996 (J.McLeod, pers.comm.., 2006). The de-commissioning protocol (by City Engineering Department) is conducive to future recreational uses but not necessarily to residential uses. (Nairne, 1994). A sludge pit at the facility is treated and aerated at intervals and will need to be rehabilitated prior to the site development (McLeod, pers.comm., 2006).

5. Summary

To complete the Environmental and Special Places Background Report, Gartner Lee Ltd. reviewed existing data, conducted interviews with local experts and participated in public consultation. The Porter Creek Bench is very similar to the rest of the City of Whitehorse in its geology, water resources and ecosystems. The following are some characteristics of the Porter Creek Bench.

- The Porter Creek Bench is a wooded area located on a thick silt and clay glaciolacustrine deposit on the banks of the Yukon River. There are a few pothole depressions in the north end of the study area.
- The clay cliffs along much of the Porter Creek Bench are subject to erosion, which could be increased if infiltration is increased.
- The climate is in keeping with the rest of the City of Whitehorse: dry, often cold, and subject to temperature inversions during the winter months. The predominant wind direction on the Porter Creek Bench is southerly, as it is at the Whitehorse Airport, however, wind speed on the Bench appears to be lower than that at the airport.
- The thick clay deposit underneath the Porter Creek Bench precludes large amounts of groundwater flow. Some shallow groundwater movement takes place in a thin sandy layer overlying the clay, and there is a deeper groundwater system in the bedrock, approximately 100 m below ground surface.
- The ecosystems found on the Porter Creek Bench are similar to those found throughout the City of Whitehorse. The forest is spruce-feathermoss, pine-bearberry and aspen-bearberry. The Bench has a few small meadows located in the wetter areas. There are some shrub communities, found often in conjunction with the meadows.
- There are two creeks found in the study area: McIntyre Creek and a small tributary of McCauley Creek. The areas surrounding the creeks and the pothole depressions represent the most diverse ecosystem areas and highest habitat areas.
- Wildlife have been observed to use the area. Specifically ungulates, bear and coyotes as well as an array of birds including avian predators.
- McIntyre Creek provides salmon habitat.

6. References

6.1 Documents Reviewed

Applied Ecosystem Management Ltd., 2000a:

Defining Ecologically Based Significant Wildlife Areas for the City of Whitehorse. Prepared for City of Whitehorse Planning Department and YTG Department of Renewable Resources, Wildlife Viewing Program,

Applied Ecosystems Management Ltd., October, 2000b:

A Users Guide to City of Whitehorse Ecosystem Mapping (ver. 2d). .

Applied Ecosystems Management Ltd., 1999:

Ecological Resources of the Yukon River Corridor. Prepared for City of Whitehorse Planning Department.

City of Whitehorse, 1997:

Porter Creek Wood Smoke Monitoring Study.

David Nairne and Associates Ltd., November 1994:

Lower Porter Creek Concept Plan. Prepared for City of Whitehorse.

Eckert, C.D., 2001:

Ten Great Places to go Birding in Whitehorse Yukon Bird Club, (pamphlet).

Environment Canada, 2006:

Biomonitoring Information System for the Yukon. From Internet 2006 *(http://www.pyr.ec.gc.ca/bisy/launch.asp?lang=_e)*

Environment Canada, 1980:

Environmental Protection Service The Chemical and Bacteriological Effects of Municipal Discharges on the Yukon River From the City of Whitehorse, 1977-1980.

G.J. Bull & Associates Inc, in association with Pottinger Gaherty Environmental Consultants Ltd. July 2005:

Porter Creek Lower Bench Proposed Development Preliminary Climate and Air Quality Assessment Final Report. Prepared for Yukon Government.

Gartner Lee Limited, 2004:

City of Whitehorse Detailed Salmon Habitat Management Plan. CRE-71N-03.

Gartner Lee Limited, 2005:

Historical Summary of Municipal Groundwater Development within the City of Whitehorse. Prepared for The City of Whitehorse, Engineering

Gartner Lee Limited, 2001:

Surface Water Inventory of the City of Whitehorse,. for Environment Canada Northern Affairs Program, Water Resources.

Gartner Lee Limited, December 2003:

Yukon Groundwater and Ground Source Heat Potential Inventory, , prepared for Energy Solution Centre Inc.

Gartner Lee Limited, 1999:

Yukon River Corridor Plan. prepared for City of Whitehorse, November 1999.

Hydrogeological Consultants Ltd., 1976:

City of Whitehorse 1976 Warm Groundwater Exploration Program, December `976.

Hydrogeological Consultants Ltd., 1976:

Warm Groundwater for the Northern Part of the City of Whitehorse. A Preliminary Report, July 1976.

Intera Environmental Consultants Ltd., 1975:

Groundwater Management Study for the Yukon Territory.

Meteorological Survey of Canada. From Internet 2006:

(http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html)

Mougeot, 1999:

Soil and Terrain Features of the Yukon River Corridor. Prepared for the City of Whitehorse, Planning Department

Stanley Associates Engineering Ltd., 1992:

Detailed Subsurface Investigation Range Road Dump.

UMA and Environmental Dynamics, 2003:

City of Whitehorse, Watershed Management Plan Vol. 1: Foundations – Background Status Report, June 2003.

UMA, with Applied Ecosystems Management, Mougeot Geoanalysis and C. McLaren, 2000:

A Planning Foundation and Vision for the City of Whitehorse: A Background Report for the new Official Community Plan, August 2000.

Wahl, H.E., D.B. Fraser, R.C Harvey and J.B Maxwell, 1987:

Climate of Yukon. Climatological Studies No. 40. Environment Canada, Atmospheric Environment Services, Minister of Supply and Services Canada.

6.2 Personal Communication

Arell, S., 2006:
Environment Canada., Personal Communication, Interview with M. Guilbeault, July 21, 2006

Bennett, B, 2006:
Yukon Territorial Government, Environment Wildlife Viewing, Personal Communication, Telephone Conversation with E. McKennirey, August 2006

Davidge, , D.:
Environment Canada. Personal Communication, Interview with M. Guilbeault,

Dixon, L., 2006:
Horse & Rider Association, Personal Communication with E. McKennirey, Sept 17, 2006

Eckart, C., 2006:
Yukon Bird Club, Personal Communication, Interview with E. McKennirey, August, 2006

Enns, V., 2006
Environment Canada, Personal Communication, Interview with M. Guilbeault, July 21, 2006

Gau, M., 2006:
City of Whitehorse, Planning and Environmental Services, Personal Communication, July – October, 2006

Heiland, A., 2006:
Personal Communication with E. McKennirey and M. Guilbeault, Aug & Sept 2006

Heiland, V., 2006:
Participant “Take Your Planner for a Walk,” with E. McKennirey, Sept 17, 2006

Hnatiuk, D., 2006:
City of Whitehorse, Parks and Recreation, Personal Communication, Interview with E. McKennirey, August 8, 2006

McIvaney, A., 2006:
Personal Communication, interview with E. McKennirey, August 14, 2006

McLeod, J., 2006:
Manager, City of Whitehorse Maintenance and Operations, Personal Communication, Interview with E. McKennirey , Aug 8 & October 6, 2006

Pattimore, J., 2006:
Planner, Ta’an Kw’achan First Nation, Personal Communication, Interview with E. McKennirey and H. Mills, August 10, 2006

Thomson, S., 2006:
Yukon Territorial Government, Wildlife, Personal Communication, Interview with M. Guilbeault, July 31, 2006

Truelson , B., 2006:

Yukon Territorial Government, Environment, Personal Communication with M. Guilbeault, August 8, 2006

von Finster, A., 2006:

Department of Fisheries and Oceans, Personal Communication, Interview with M. Guilbeault, July 25, 2006

Wayne, E., 2006:

Horse & Rider Association, Personal Communication with E. McKennirey, August 18 & Sept 17 &