EAGLE GOLD PROJECT

ENVIRONMENTAL CHARACTERIZATION REPORT

MARCH 2015

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

List of Tables

List of Figures

List of Acronyms and Abbreviations

%	percent
~	approximately
<	less than
>	greater than
AP	acid potential in kg $CaCO_3$/t equivalent
ARD	acid rock drainage
ARSA	Access Road Study Area
asl	above sea level
BC	British Columbia
BGC	BGC Engineering Ltd.
CBA	Cooperation and Benefits Agreement
cm	centimeter
DOC	dissolved organic carbon
FNNND	First Nation of Na-Cho Nyäk Dun
GMZ	Game Management Zone
ha	hectares
HCR	Haggart Creek Road
HRIA	Heritage Resource Impact Assessment
km	kilometers
km^2	square kilometers
LAA	Local Assessment Area
LSA	Local Study Area
masl	meters above sea level
m	meters
m^3	cubic meters
mg/L	milligrams per liter
m^3/ha	cubic meters per hectare

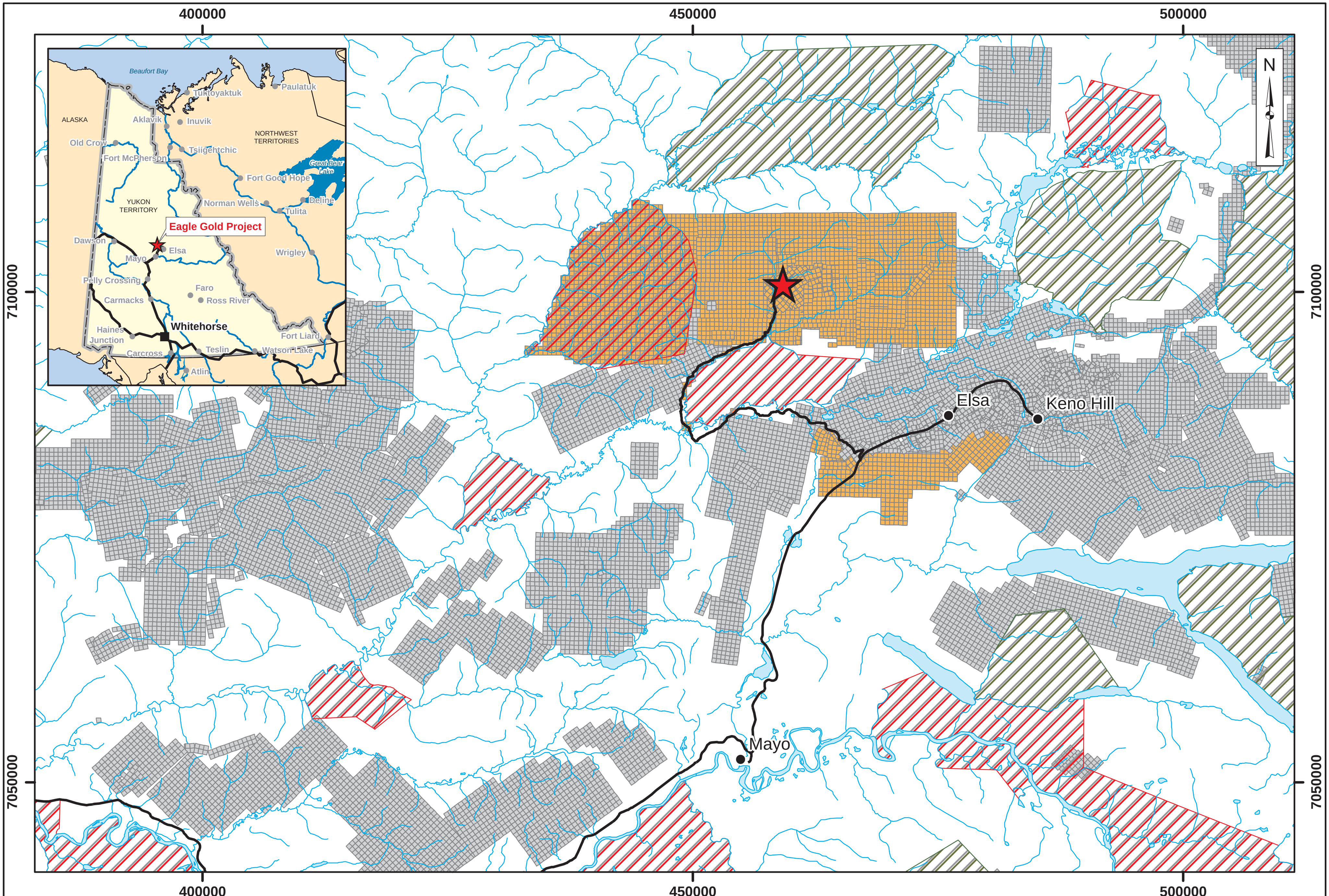
ML .... metal leaching
mm .... millimeter
m/s .... meters per second
N/A .... not applicable
Non-PAG .... Non-potentially acid generating
NP .... neutralization potential in kg $CaCO_3$/t equivalent
NP/AP .... neutralization potential to acid potential ratio
PAG .... Potential Acid Generation
pH .... potential of hydrogen (measure of acidity)
Project .... Eagle Gold Project
RAA .... Regional Assessment ARea
RCSA .... road corridor study area
RSA .... Regional Study Area
RTC .... Registered Trapline Concession
SARA .... Species at Risk Act
SARPR .... Species at Risk Public Registry
SGC .... StrataGold Corporation
SRK .... SRK Consulting (Canada) Inc.
SWE .... Snow Water Equivalent
TEM .... Terrestrial Ecosystem Mapping
TK .... traditional knowledge
TOC .... total organic carbon
TSS .... total suspended solids
UTM .... Universal Transverse Mercator
VGC .... Victoria Gold Corp.
VWB .... Vibrating Wire Piezometer
WKA .... Wildlife Key Area
yrs .... years
YT .... Yukon Territory

THIS PAGE INTENTIONALLY LEFT BLANK

1 INTRODUCTION

The Eagle Gold Project (the Project) is located in central Yukon, approximately 350 km north of Whitehorse and approximately 85 km north-northeast of the village of Mayo (Figure 1.1-1). The Project is accessible via the Silver Trail and the South McQuesten and Haggart Creek Roads.

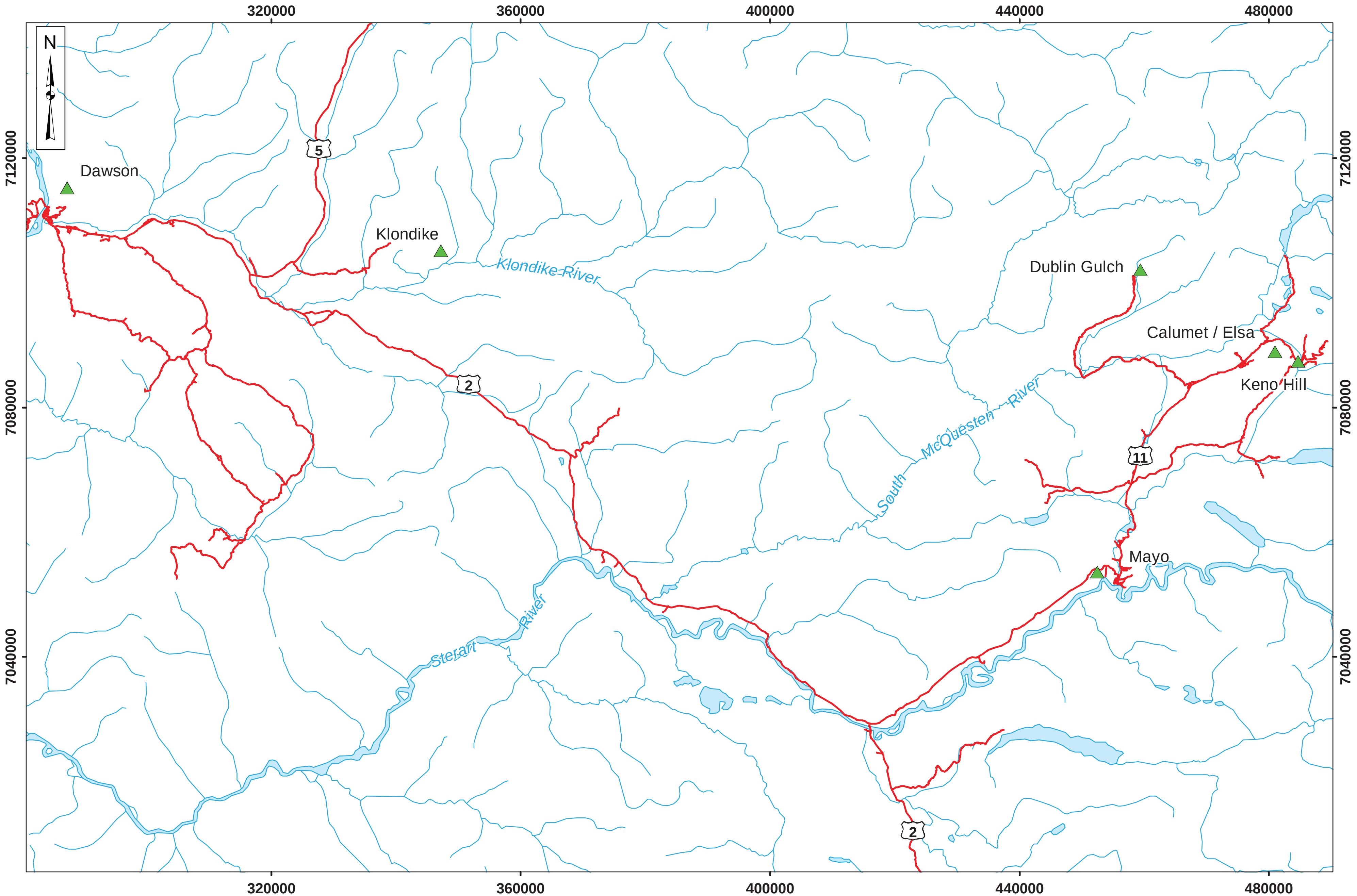
The Project is located within the Boreal Cordillera ecozone, which comprises much of the southern Yukon and a large portion of northern British Columbia, and more specifically within the Yukon Plateau-North ecoregion. The Boreal Cordillera ecozone is broadly characterized by the presence of several mountain ranges that trend in the northwesterly direction and include extensive plateau regions. The plateaus consist of flat or gently rolling upland terrain separated by broad valleys and lowlands. The climate is characterized by long, cold, dry winters and short, warm, wet summers, with conditions varying according to altitude and aspect. Regional climatic data are available from several stations in the area which provide a long term database (Figure 1.1-2).



Legend:

- ★ Eagle Gold Project
- ● Town
- — Road
- Watercourse
- StrataGold Claims
- Other Claims
- First Nations Settlement Land - Catagory A
- First Nations Settlement Land - Catagory B
- Waterbody

	Projection: NAD83 UTM Zone 8N	Drawn By: SS	**EAGLE GOLD PROJECT YUKON TERRITORY**
0 2.5 5 10 Kilometres Scale = As Shown	Date: 2014/03/26	Figure: 1.1-1	**Project Location**



Legend:

- Climate Data Location
- Waterbody
- Road
- Watercourse

0 10 20
Kilometres
Scale = As Shown

Projection: NAD83 UTM Zone 8N

Drawn By: SS

Date: 2014/03/26

Figure: 1.1-2

EAGLE GOLD PROJECT
YUKON TERRITORY

Regional Climate Station Location

2 CLIMATE

Site specific climate data has been collected and analyzed from two climate stations that were established on the Project site from 1993 – 1996 and again in 2007 and 2009. One station was installed in the area commonly known as Potato Hills (1,420 m asl) in August 2007, while a second station was installed near the camp (823 m asl) in August 2009. These sites were the same locations established by a prior operator in the Project area from 1993 – 1996. The lower Camp station was re-located to a nearby site (778 m asl) in September 2010 due to construction of new camp facilities. The second station was installed to characterize climatic conditions in the upper and lower elevations of the study area which exhibit significant variability due to elevation and physiography (Figure 2.1-1).

The Dublin Gulch area is characterized by a “continental” type climate with moderate annual precipitation and a large temperature range. Summers are short and can be hot, while winters are long and cold with moderate snowfall. Rainstorm events can occur frequently during the summer and may contribute between 30 to 40% of the annual precipitation. Lower elevations are typically snow free by early May, whereas the higher elevations are typically snow free by mid-June. Frost action may occur at any time during the summer or fall.

2.1 TEMPERATURE

2.1.1 Regional Temperature

Regional climate stations in proximity to the project area are summarized in Table 2.1-1. The mean annual temperature values of the five regional stations (Keno Hill, Klondike, Elsa, Mayo A and McQuesten) range from -2.9°C to -5.3°C.

Table 2.1-1: Regional Climate Stations

Station	Station ID	Years of Record	Start Year	End Year	Latitude	Longitude	Elevation (m)	Mean Annual Precipitation (mm)	Mean Annual Temperature (°C)
Keno Hill	2100677	9	1974	1982	N 63°56'	W 135°12'	1473	572	-3.8
Klondike	2100679	45	1966	2010	N 64°27'14"	W 138°12'56"	973	498	-5.3
Elsa	2100500	42	1948	1989	N 63°55'	W 135°29'	814	444	-2.9
Mayo A	2100700	88	1925	2012	N 63°37'	W 135°52'	504	304	-3.3
McQuesten	2100719	26	1986	2011	N 63°36'	W 137°31'	457	346	-3.3
Calumet (Snow Station)	09DD-SC1	38	1975	2012	N 63°54'60"	W 135°24'00"	1310	-	-

Note: 1. Regional temperature data obtained from Environment Canada's national climate data and information archive.

For the period of record at Mayo, daily temperatures have ranged from 36.1°C to -62.2°C for a total range of 98.3°C. The other regional stations tend to have smaller temperature ranges compared to Mayo. For example, the mean annual temperature range at Keno Hill station is 71.6°C. This same trend has been noted at the Project area (Stantec, 2010a). The reason for the lower temperature range is attributed to the higher elevations at the Project area which tend to limit maximum daytime summer temperatures and night-time inversions that occur at higher elevations in the winter, which keep higher elevations warmer than valley locations. These trends and the similar physiography suggest the study area and Keno Hill have similar climatic regimes. The mean January temperature for the regional stations is -22.1°C and the mean July temperature for the regional stations is 13.3°C, indicative of the cold winters and moderate summers in the region.

Mean monthly temperature summaries for the regional stations are provided in Table 2.1-2. Spring thaws begin in April when daily maximum temperatures exceed 0°C, although daily mean temperatures may not rise above freezing until May. Temperatures begin to recede from summer highs during September. However, daily minimums may drop below freezing at night during August.

Table 2.1-2: Mean Monthly Temperatures at Regional Climate Stations

MSC Station Name	Elev (m)	Period of Record	Temperature (°C)												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Keno Hill	1473	1974-1982	-14.5	-13.8	-11.0	-5.6	2.2	7.7	10.5	9.6	3.6	-4.6	-12.2	-17.7	-3.8
Klondike	973	1966-2010	-22.1	-17.5	-14.2	-5.8	3.7	9.9	11.6	8.4	2.1	-6.0	-15.8	-17.7	-5.3
Elsa	814	1948-1989	-18.6	-17.2	-10.7	-2.1	6.5	12.9	14.7	11.6	5.1	-4.5	-14.1	-18.1	-2.9
Mayo A	504	1925-2012	-25.4	-19.2	-10.6	0.0	8.1	13.7	15.3	12.5	6.5	-2.2	-15.5	-22.3	-3.3
McQuesten	457	1986-2011	-25.2	-18.4	-10.8	0.9	8.2	13.7	15.3	12.2	5.7	-3.6	-16.6	-20.9	-3.3

Note: 1. Regional temperature data obtained from Environment Canada's national climate data and information archive.

2.1.2 Local Temperatures

The recorded mean annual temperatures have ranged from -2.0°C to -5.1°C. July is typically the warmest month with mean July temperatures at the Camp station ranging from 12.6°C to 13.6°C and from 8.1°C to 11.6°C at the Potato Hills station during the period of record. The coldest temperatures are generally experienced in January and the Camp station recorded a range of monthly mean temperatures from -17.1°C to -25.2°C and the Potato Hills station recorded a range of monthly mean temperatures of -15.5°C to -19.8°C for the month of January.

During the period in which the Potato Hills and Camp stations have collected data simultaneously, the higher Potato Hills station has generally reported colder temperatures than the lower Camp station; however, autumn and winter temperature inversions do occur at the site as is common in mountainous regions, and the Camp station has a much larger range in recorded temperature. The maximum recorded temperature on site was 29.3°C in August 2010 at the Camp station and the minimum recorded temperature was -42.8°C in January 2012 also at the Camp station.

Table 2.1-3 summarizes the mean temperatures recorded at the Camp and Potato Hills climate stations.

Table 2.1-3: Project Site Mean Monthly Temperatures

Month	Mean Temperature °C									
	Potato Hills Station (1,420 m asl)						Camp Station (782m asl)			
	2007	2008	2009	2010	2011	2012	2009	2010	2011	2012
January	-	-17.7	-19.3	-14.5	-15.5	-19.8	-	-17.1	-22.9	-25.2
February	-	-17.2	-17.2	-9.7	-18.3	-11.1	-	-10.8	-21.3	-12.2
March	-	-11.3	-16.7	-9.4	-13.9	13.4	-	-6.9	-15.9	-13.4
April	-	-4.8	-4.4	-1.8	-5.6	-11.2	-	1.1	-3.2	0.4
May	-	3.3	-	5.2	4.8	-	-	8.3	7.7	5.9
June	-	8.7	8.5	8.8	8.8	12.0	-	12.1	11.5	13.3
July	-	8.1	11.6	10.5	10.3	10.9	-	13.6	12.8	12.6
August	10.8	5.3	-	9.7	7.0	10.5	9.4	12.1	9.2	10.5
September	1.0	1.9	3.2	2.3	4.1	4.2	6.2	4.4	5.1	5.0
October	-6.9	-7.7	-5.3	-5.3	-5.7	-8.4	-2.6	-3.4	-2.8	-8.4
November	-9.9	-10.8	-12.8	-11.7	-18.0	-18.8	-13.6	-13.5	-20.7	-23.5
December	-18.6	-18.6	-11.9	-18.2	-13.1	-19.4	-17.3	-24.1	-15.3	-25.9
Annual	-	-5.1	-	-2.9	-4.6	-	-	-2.0	-4.6	-5.1

Note: 1. The Potato Hills station has missing temperature data in May 2009, August 2009 and May 2012 due to sensor malfunction.

2.2 PRECIPITATION

Long-term estimates of precipitation relied on analyses of regional climate data from stations in Mayo, Dawson, Klondike, Elsa and Keno Hill (Stantec, 2010a). Comparison of Project site data to Mayo data indicated that the Potato Hills station received approximately 1.3 times more monthly precipitation. This reflects an orographic effect and is evident in the Project site precipitation estimates. The estimated mean annual precipitation at the Project site ranges from 357 mm and 652 mm for the Camp and Potato hills stations respectively as shown in Table 2.2-1. Rainfall, snowfall, and surface lying moisture and snow are natural dust suppressants and as such, the area is not prone to prolonged dusty periods.

Based on the regional and local data, monthly precipitation totals are highest in July and lowest in February. Snowfall typically begins in late September and continues until May.

Table 2.2-1: Project Site Precipitation Estimates

Location	Elevation (m)	May to September Rainfall (mm)	Mean Annual Snowpack in SWE (mm)	Sublimation (mm)	April Precipitation (mm)	Mean Annual Precipitation (mm)	Mean Annual Rain (mm)	Mean Annual Snow (mm)	% Rain	% Snow
Camp Station	782	152	101	86	18	357	152	205	43%	57%
Potato Hills Station	1420	220	313	86	33	652	220	432	34%	66%

Note: 1. The April precipitation values were computed as 5% of the Mean Annual Precipitation and considered to fall as snow, according to regional patterns.

2.3 SNOW DEPTH

Snowpack surveys have been conducted at the Project site on 2009 (April 21), 2010 (March 31), 2011 (March 28), 2012 (March 20 and April 20), and 2013 (February, March, April, and May). The snowpack surveys were conducted near each climate station and sampled information included snow depth, snow density and snow water equivalent (SWE). In 2013, an additional snow survey station was established on the south-facing slopes near Ann Gulch. Field methods followed the survey techniques according to Yukon Environment (2009) and Ministry of Environment of British Columbia (MOE, 1981). All snow survey data is summarized in Table 2.3-1.

Table 2.3-1: Snow Survey Data

Climate Station	Elevation (m)	Date of Data	Depth (cm)	Density (%)	SWE (mm)
Camp Station	782	April-21-09	69	16%	110
		March-31-10	50	20%	99
		March-28-11	55	17%	93
		March-20-12	78	21%	160
		April-20-12	56	14%	79
		March 2-13	61	18%	107
		April 2-13	59	18%	108
		May 3-13	58	18%	106
Snow Course Survey #2	1005	March-20-12	99	24%	237
Potato Hills Station	1420	April-21-09	126	33%	410
		March-31-10	103	27%	278
		March-28-11	105	24%	251
		April-20-12	117	23%	262
		February 28-13	96	19%	184
		April 3-13	90	21%	190
		May 5-13	117	14%	167

Note: 1. Snow course survey #2 located in Dublin Gulch basin at UMT 0460570 mW 7101490mN. Elevation approximated from Google Earth

2.4 WIND SPEED AND DIRECTION

Wind speed and direction are measured on-site at the Potato Hills and Camp climate stations at 15-minute intervals and data are available for the period from August 2007 through December 2012 and August 2009 through December 2012, respectively. The Project site wind speed data are presented in Table 2.4-1.

The mean annual wind speed for Potato Hills and Camp is 2.5 m/s (9 km/hr) and 1.3 m/s (4.7 km/hr), respectively. The mean monthly wind speeds for both stations are higher in the spring, summer and autumn and lower in the winter. The maximum wind gust speed recorded was 24 m/s for the Potato Hills station and 18.2 m/s for the Camp station (Knight Piesold, 2013a). The predominant wind direction for Potato Hills and Camp is from the west-northwest and north to north-northwest, respectively.

Table 2.4-1: Project Site Monthly Wind Speed

Month	Wind Speed (m/s)											
	Potato Hills Station (1,420 m asl)							Camp Station (782m asl)				
	2007	2008	2009	2010	2011	2012	Average	2009	2010	2011	2012	Average
January	-	2.8	3.2	2.1	2.0	0.8	2.2	-	1.2	0.6	0.9	0.9
February	-	3.7	2.5	2.1	3.2	1.5	2.6	-	1.1	1.2	1.2	1.2
March	-	3.6	3.2	3.9	3.4	1.9	3.2	-	2.2	1.3	1.6	1.7
April	-	3.6	3.0	3.6	3.2	2.8	3.3	-	2.0	1.8	1.4	1.7
May	-	3.6	3.1	2.7	3.4	-	3.2	-	1.9	1.7	1.9	1.8
June	-	3.1	2.7	2.0	2.0	2.1	2.4	-	1.5	1.5	1.6	1.5
July	-	3.1	2.9	2.6	1.8	1.9	2.4	-	1.4	1.3	1.4	1.4
August	2.3	3.2	2.0	2.7	2.3	2.0	2.4	1.4	1.3	1.2	1.3	1.3
September	2.3	1.7	2.0	3.0	1.2	2.9	2.2	1.2	1.5	1.4	1.5	1.4
October	3.0	1.3	3.4	2.8	0.3	2.5	2.2	1.2	1.2	0.9	1.1	1.1
November	2.3	2.6	2.3	1.5	2.2	2.6	2.3	1.1	0.7	0.9	1.3	1.0
December	1.6	3.1	2.1	1.0	0.4	0.7	1.5	0.7	1.0	0.2	0.7	0.7
Annual	**-**	**2.9**	**2.7**	**2.5**	**2.1**	**-**	**2.5**	**-**	**1.4**	**1.2**	**1.3**	**1.3**

Note: 1. The Potato Hills station has missing wind speed data in May 2012 due to sensor malfunction.

2.5 RELATIVE HUMIDITY

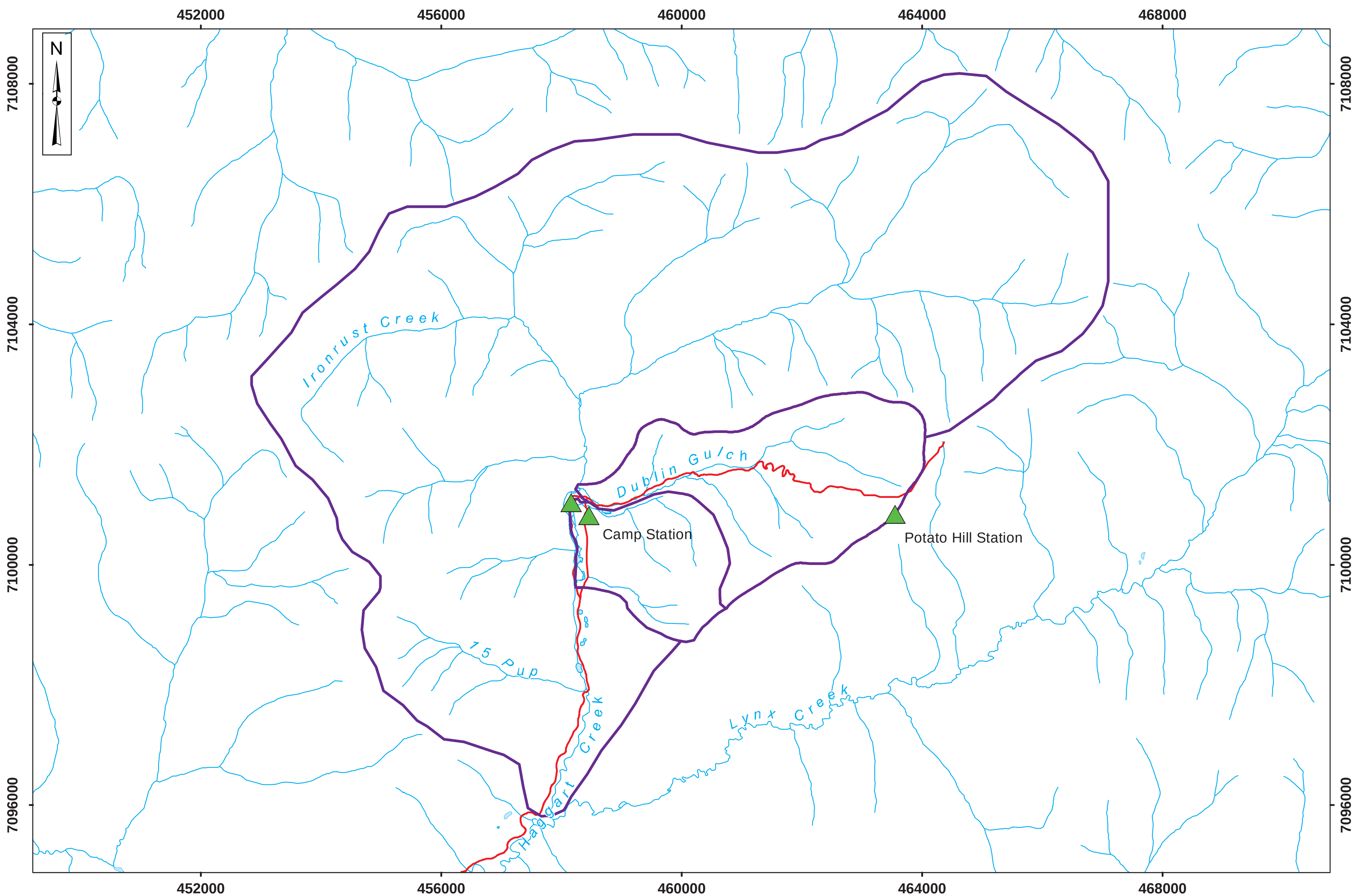
Relative humidity is measured on-site at the Potato Hills and Camp site climate stations and data are available for the period from August 2007 through December 2012 and August 2009 through December 2012, respectively. Monthly summaries of relative humidity can be found in Knight Piesold (2013a). The mean annual relative humidity for Potato Hills and Camp is 77% and 69%, respectively. The mean monthly relative humidity values for Potato Hills are lowest in the spring (61% to 75% in the months of March through May) and higher throughout the rest of the year (66% to 88% in the months of June through February). The mean monthly relative humidity values for Camp are lowest in the spring (54% to 63% in the months of March through May) and higher throughout the rest of the year (63% to 77% in the months of June through February).

2.6 BAROMETRIC PRESSURE

Barometric pressure is measured on-site at the Potato Hills and Camp site climate stations and data are available for the period from August 2007 through December 2012 and August 2009 through December 2012, respectively. Average barometric pressure data are collected on hourly increments at each of the project climate stations. These data are summarized as monthly averages by Knight Piesold (2013a). Barometric pressure tends to be highest in summer (May through August) with 86.0 kPa and 92.2 KPa recorded at the Potato Hills and Camp stations respectively and lowest during November, with 83.4 kPa and 90.1 kPa recorded at Potato Hills and Camp stations, respectively.

2.7 SOLAR RADIATION

Solar radiation is measured on-site at the Potato Hills and Camp site climate stations and data are available for the period from August 2007 through December 2012 and August 2009 through December 2012, respectively. Monthly average solar radiation values are summarized in Knight Piesold (2013a).



Legend:

- Climate Station
- Drainage Area
- Road
- Watercourse
- Waterbody

StrataGold Corporation

Scale: 0 1 2 Kilometres
Scale = As Shown

Projection: NAD83 UTM Zone 8N	Drawn By: SS	**EAGLE GOLD PROJECT YUKON TERRITORY**
Date: 2014/03/26	Figure: 2.1-1	**Project Climate Station Locations**

3 GEOLOGY AND SOILS

3.1 PHYSIOGRAPHY

The Project is situated within the Yukon Plateau North Ecoregion. Nearly all terrain in the ecoregion lays above 900 masl, with the majority between 1,200 and 1,700 masl. The majority of the Project site lies within the Dublin Gulch watershed which flows into Haggart Creek and eventually feeds into the McQuesten River. Elevations in the vicinity of the Project range from approximately 730 masl near the confluence of 15 Pup and Haggart Creek, to about 1,525 masl at the summit of the Potato Hills which forms the eastern boundary of the Dublin Gulch watershed. The Ecoregion is broken into tablelands by a network of deeply cut broad valleys. While some of these tablelands are remarkably level and non-dissected, with streams flowing at relatively gentle gradients in open valleys, the areas north of the McQuesten River, do not share these features. Instead the majority of the Project area was un-glaciated during the last glacial period (Bostock 1965), and has not been glaciated for more than 200,000 years (Figure 3.1-1). Much of the Project area displays physiographic characteristics of the unglaciated areas of the region, with narrow, V-shaped valleys and rounded upland surfaces. The valleys are deep and narrow to the head of streams, where they rise steeply and end abruptly.

Despite the extensive time since glaciations, evidence of glacial–ice action is still visible. This historic glaciation is responsible for the formation of the tributaries of Dublin Gulch with cirque-like headwaters, including from east to west, Cascallen, Bawn Boy, Olive, Ann, Stewart, Eagle, Suttles and Platinum Gulches (Figure 3.1-1). Within these gulches the post-glacial terrain has been modified by gravity, water, and freeze-thaw mechanics, as evidenced by many headscarps of ancient landslides, and observed rock and debris slides. While most of the mass wasting is historic, there are a few areas of ongoing rock fall that continue to modify the terrain, particularly in the Stewart, Bawn Boy, and Olive Gulches. These active areas of rock fall exist generally in the eastern portion of the Local Study Area and outside of the Project area.

3.2 SURFICIAL GEOLOGY AND SOILS

3.2.1 Surficial Geology

The surficial geology of the Project area has been substantially affected by historic glaciation over 200,000 years ago, including two major glaciation episodes in the Quaternary period; the pre-Reid (~2.5Ma-400ka BP) and the Reid (~200 ka BP) (Bond 1997; 1998a; b). Glacial limits are provided in Figure 3.1-1. In each case, ice likely originated from the Ogilvie and Wernecke Mountains, with glaciations being more extensive during the pre-Reid period.

Preservation of pre-Reid glacial deposits and landforms is rare. A few intact deposits and diorite erratics at high elevations are the only records left (Bond 1998a). Glacial deposits from the Reid glaciation are moderately preserved. Colluvium, alluvium, and small areas of shallow organics drape the Reid glacial sediments and the interglacial sediments throughout the area.

Dominant surficial materials within the Local Study Area (LSA) are weathered bedrock and colluvium. Competent bedrock outcrops are rare, as sufficient geologic time has passed to allow extensive weathering of exposed rock. In the larger RSA, the dominant material is colluvium, while along the McQuesten Road sections of the RSA, some of the surficial materials are largely coarse-textured fluvial deposits due to the proximity of the road to the river.

3.2.2 Soils

The largest influence on soil development in the area of the Project is climate, and the resulting permafrost which is discontinuous throughout the area. Despite over 200,000 years of soil development, pedogenic processes have been slow due to the cold climate and to the short growing season for vegetation, resulting in a predominance of ice-affected and relatively undeveloped soils (Cryosols and Brunisols).

Non-frozen soils encountered in the area of the Project include Brunisols, minor areas of Luvisols (on fine-textured till), and Gleysols (on poorly and imperfectly drained materials). The majority of the soil textures in the area are sandy-silt to silty-sand loam matrix with angular or tabular coarse fragments ranging from gravels to boulders.

Soil in the Project area is limited for reclamation suitability primarily by high coarse-fragment content, due to development of soils from weathered bedrock. Rooting depths are on average 50 cm, but can reach depths of over 120 cm. Baseline arsenic levels are naturally high in the soil, but do not limit soil reclamation suitability.

3.2.3 Permafrost

The project site is located in a region of widespread discontinuous permafrost (Brown, 1979). On the regional scale, permafrost distribution is typically controlled by mean annual temperature and precipitation, whereas on a local scale it is controlled by vegetation, surface sediments, soil moisture, slope aspect, and snow depth. Within the project area, frozen ground occurs typically on north- and east-facing slopes at higher elevations, and within poorly drained areas lower in the valleys. The distribution and thickness of frozen ground is highly variable across the site.

Frozen ground, when observed, is generally encountered immediately below the organic cover. Ground temperatures have been measured with thermistors installed on site in 1995-1996, and 2009-2012. The measured ground temperatures showed the frozen ground to be relatively warm when observed, typically between 0°C and -1°C.

Detailed investigations into the presence, distribution, thickness and temperature of permafrost across the project site and in specific areas where development could occur were conducted in 1995 (Knight Piesold 1996a and 1996b), 1996 (Sitka Corp, 1996), and from 2009 to 2013. Results of these more recent studies are described and summarized in BGC (2010, 2011, 2012a, 2012b, 2012c and 2012d).

3.3 BEDROCK GEOLOGY

3.3.1 Regional Geology

The Eagle Gold deposit is located within the Tintina Gold Province, an area of more than 150,000 km^2 covering parts of Alaska and the Yukon (Figure 3.3-1). The TGP is defined by more than 15 individual gold belts and districts traditionally mined for their placer resources and more recently recognized for their lode gold potential. Technological advances in heap leach mining have allowed for economically successful recovery of gold at sub-arctic operations such as Fort Knox and Brewery Creek (SRK 2014). The geology of the Eagle Gold Project is provided in a number of references including that of Brown et al. (2001), Goldfarb et al. (2007), Wardrop (2009).

The Project is underlain by Proterozoic to Lower Cambrian-age Hyland Group metasediments and the Cretaceous intrusive Dublin Gulch granodioritic stock. The granodiorite stock is elongate, measuring approximately 5 km in length and trends 070°. It has a maximum width of approximately 2 km. The long axis of the stock is coincident with the axis of the interpreted Dublin Gulch anticline. Sheet-like sills of granodiorite extend from the stock and cut the metasedimentary strata at low angles (Figure 3.3-2).

The stock has been dated at approximately 93 million years, and is therefore a member of the Tombstone Plutonic Suite. The Hyland Group is composed of interbedded quartzites and phyllitic metasedimentary rocks. The quartzites are variably gritty, micaceous, and massive. Phyllitic metasediments are composed of muscovite-sericite and chlorite. Limestone units are a relatively minor constituent of this stratigraphic sequence and are not significant in the contact zone around the Eagle deposit. The metasedimentary rocks dip at various angles, although all generally dip to the North. Hyland Group rocks take on a more easterly and steeper dipping orientation north of an as yet undefined structure, probably a fault, which runs along the course of Dublin Gulch. Some vein associated mineralisation is found in the Hyland Group but again not in significant amounts in the area local to the Eagle Zone.

The Dublin Gulch stock is comprised of four phases, the most significant of which is granodiorite. Quartz diorite, quartz monzonite, leucogranite and aplite comprise younger intrusive phases that occur predominantly as dikes and sills and cut both the granodiorite and surrounding country rocks. The stock has intruded the Hyland Group metasediments near their contact with the underlying Upper Schist.

Mineralisation in the Eagle Zone consists of sheeted quartz vein systems of differing densities which host gold. Additional to this, disseminated, lower grade gold is found throughout the intrusive body and is associated with arsenopyrite mineralisation, with minor pyrite/pyrrhotite. A model for the mineralisation style was published by Craig Hart in 1999 which describes a ‘Reduced Intrusion-Related Gold System (RIRGS) which also applies to the Fort Knox deposit in Alaska.

3.3.2 Deposit Geology

Geologically the deposit can be simplified and described as an intrusive suite, predominantly granodiorite in composition, emplaced within a metasediment package, predominantly phyllitic in nature. The granodiorite has been subdivided into three units, an oxidized unit, an altered unit, and an unaltered unit. Alteration tends to be dominated by albite, potassium feldspar, sericite, carbonate and chlorite and only occurs very locally around veining. While mineralization is associated with the intrusive stock, it is not spatially limited to the intrusive. Gold-bearing veins are found in all of the main geological units including the metasediments.

Gold occurs primarily as pure gold in association with very small amounts of metallic bismuth (Bi) and arsenopyrite (FeAsS). Other vein minerals include pyrite/marcasite (FeS_2) > pyrrhotite ($Fe_{1-x}S$) >>sphalerite ([Zn,Fe]S), chalcopyrite ($CuFeS_2$), galena (PbS), molybdenite (MoS_2) and iron oxides/hydoxides as well as metallic bismuth, Pb-Sb-(Cu,Zn) sulphosalts (e.g. bournonite ($PbCuSbS_3$) and boulangerite ($Pb_5Sb_4S_{11}$) and tetrahedrite ($Cu_{12}Sb_4S_{13}$).

3.3.3 Geochemical Characterization

Bedrock

Acid rock drainage and metal leaching (ARD/ML) evaluations to support the environmental assessment and water licensing processes were initiated by SGC in 2007 and are described and summarized by SRK (2013 and 2014). Previous to that, a comprehensive characterization program was conducted by New Millennium Mining Ltd to support a Feasibility Study in 1995/1996 (Lawrence 1997).

The objectives of the characterization program were to provide an assessment of the geochemical behaviour of proposed facilities (i.e., waste rock piles, pit walls, and heap leach facility) associated with the Project and to support engineering decisions and mitigation measures as required. Specifically, for each of these site components, the program focused on the quantification, description and assessment of:

- acid generation and neutralization potential,
- solids metal chemistry,
- mineralogy,
- metal leaching potential,
- rate of sulphide mineral oxidation,
- rate of depletion of neutralization potential,
- relative rate of depletion of neutralization potential compared to acid potential, and
- release rates of elements for input into water quality predictions.

Table 3.3-1: Summary of Testing Program by Material Type

Sample Type	Estimate Tonnage (Million Tonnes)		Number of Samples
	Waste	Ore	
Metasediment	64	7	96
Oxidized Granodiorite	21	32	88
Unaltered Granodiorite	23	42	39
Altered Granodiorite	5	11	56
Quarry and Borrow Materials	-	-	40
Road Alignment	-	-	32

Characterization of the metasediments and granodiorite indicated that carbonates, predominantly calcite, were generally well in excess of sulphides. Calcite content was generally 1 to 4% (from X-ray diffraction) whereas sulphur was most often less than 0.5% (from Leco S and ICP-S). Static testing showed a strong propensity towards non-acid generating conditions with the large majority of samples tested having a neutralization potential to acid potential ratio above 4. Acid rock drainage, or ARD, is therefore not anticipated for the Project.

Kinetic testing based on humidity cell testing and a field barrel program indicate that, although pH conditions are expected to be neutral, some metal leaching may still occur. This may include leaching of sulphate, arsenic, cadmium, manganese, antimony, selenium and uranium, and potentially fluoride, iron, lead, molybdenum, and zinc.

Construction Materials

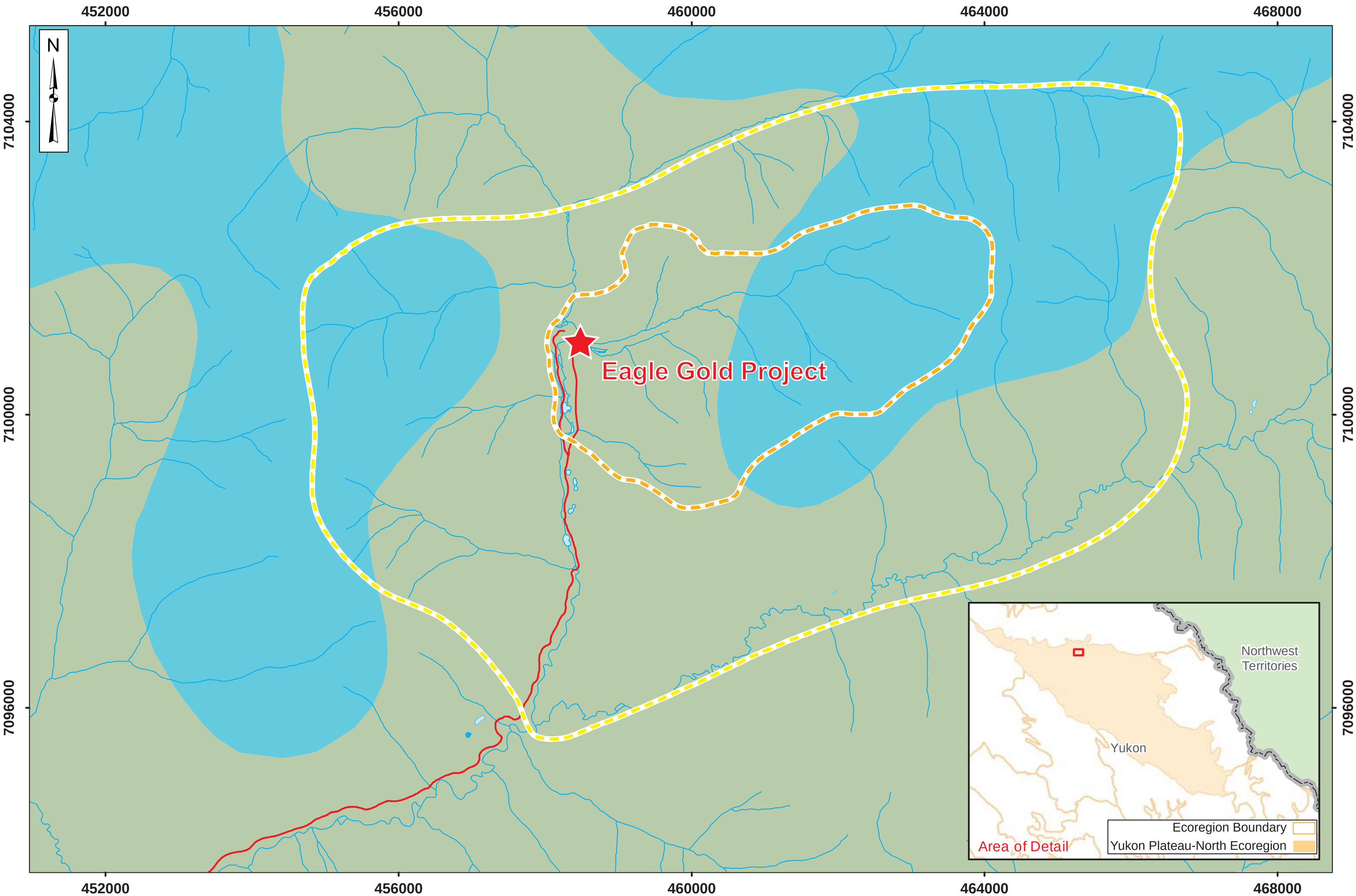
In total, 72 samples were collected and analyzed for characterizing the geochemistry of proposed excavation areas and borrow sources. This included 32 samples from the proposed site roads, 19 from placer tailings and alluvium borrow sources, and 19 from potential cut and fill (excavation) areas. Most of these samples (n=66) were from surficial materials, five were from metasedimentary bedrock, and one was from a granodiorite outcrop.

The paste pH for the samples ranged from 4.6 to 8.6 (median values of 6.6). The samples typically had low sulphur and low NP and TIC levels. This is in contrast to the characterization work from the deposit area that states NP in the form of carbonate minerals was present in modest amounts throughout the deposit area (SRK 2010). Based on having a sulphur content of <0.02%, 65% of samples were considered non-reactive. For the remaining samples, based on NP/AP or TIC/AP ratios, 7 to 14% were PAG, 11 to 14% had an uncertain potential for ARD, and 10 to 14% were non-PAG.

The majority of these samples represent surficial materials such as soils, weathered bedrock (colluvium), or gravels (alluvium or placer tailings). These differ from blasted rock from rock quarries or mine workings because their particle surfaces have already been exposed to air and water. Therefore, whether these remain in situ or are moved to a new location, they will continue to weather and oxidize at rates comparable to current weathering rates, which are likely quite slow. Additionally, it is likely the sulphides present in these materials were largely encapsulated within larger gravel to cobble size particles and would be unavailable for reaction. The result of moving these materials and using them for construction is not expected to result in any change relative to their current locations. In other words, while 7 to 14% of samples are PAG, and an additional 11 to 14% are classified as having an uncertain ARD potential, these materials still pose a relatively low risk for ARD potential and are considered suitable for use as construction material.

There were five metasedimentary rock samples from excavation areas that were beyond the limits of the open pit. Three of these samples were non-reactive or non-PAG, while two were PAG by either or both NP/AP ratios and TIC/AP ratios. These results were in contrast to the much more extensive set of results available for metasedimentary samples from the open pit, which indicated that the majority of samples from this unit were non-PAG (SRK 2014). However, the number of samples from these other areas is relatively small, and may not adequately represent typical characteristics of the metasedimentary unit in these other excavation areas.

Rock from the proposed pre-strip area within the footprint of the open pit was subjected to extensive geochemical characterization. The results of those programs indicate that the majority of rock from the open pit is non-PAG, and is therefore suitable for construction.



Legend:

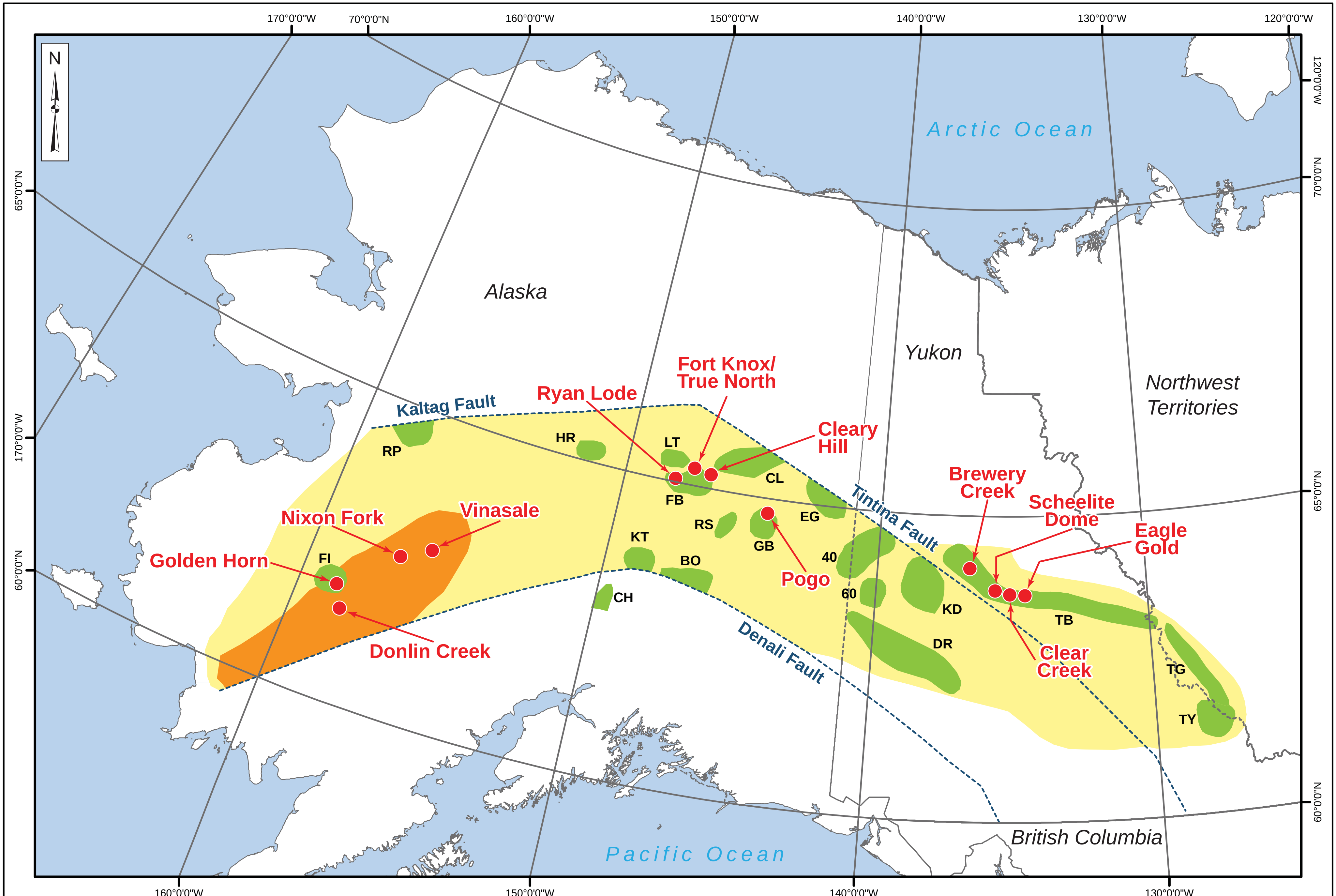
- 200 k Years Ago (Reid Glaciation)
- 3 Million Years Ago (Pre-Reid Glaciation)
- Waterbody
- Soils and Vegetation Local Study Area
- Soils and Vegetation Regional Study Area
- Road
- Watercourse

Glacial Limits (Duk-Rodkin 1999)

StrataGold Corporation

0 1 2
Kilometres
Scale = As Shown

Projection: NAD83 UTM Zone 8N	Drawn By: SS	**EAGLE GOLD PROJECT YUKON TERRITORY**
Date: 2014/03/26	Figure: 3.1-1	**Regional and Local Study Areas with Glacial Limit Extents**



Legend:

- Major Mineral Deposit
- Tintina Gold Belt
- Kuskokwim Basin
- Mining or Placer District
- Major Geologic Fault System

StrataGold Corporation

0 100 200
Metres
Scale = As Shown

Projection: NAD83 UTM Zone 8N

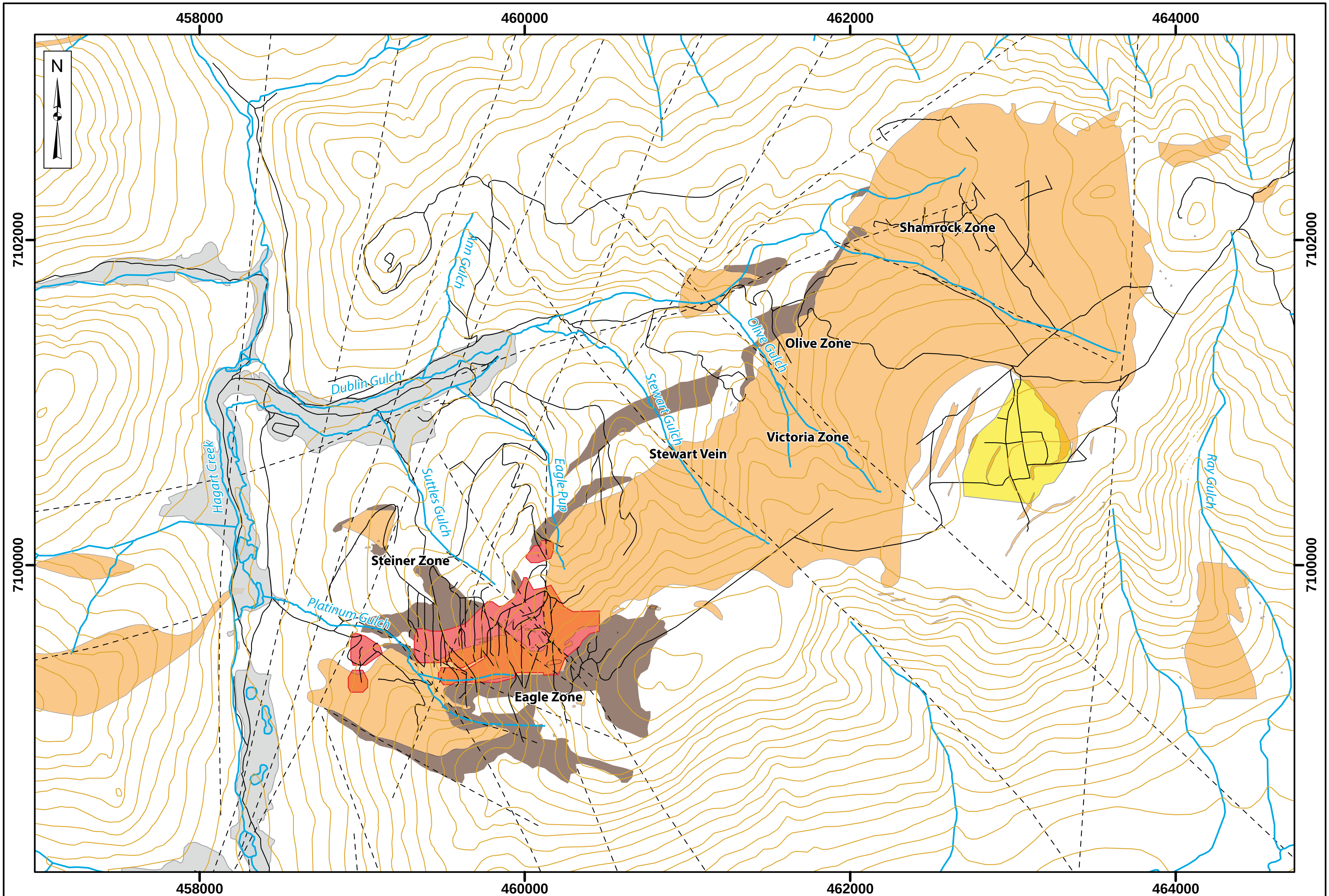
Drawn By: SS

Date: 2014/03/26

Figure: 3.3-1

EAGLE GOLD PROJECT YUKON TERRITORY

Main Gold Districts of the Tintina Gold Province



Legend:

Granodiorite	Placer Workings
Hornfels	Wolf Tungsten Deposit
Eagle Deposit	Inturpreted Geologic Fault
Contour (100ft Interval)	

StrataGold Corporation

0 0.5 1
Kilometres
Scale = As Shown

Projection: NAD83 UTM Zone 8N

Drawn By: SS

Date: 2014/03/26

Figure: 3.3-2

EAGLE GOLD PROJECT
YUKON TERRITORY

Eagle Gold Project
Property Geology

4 SURFACE WATER HYDROLOGY

4.1 BASELINE DATA COLLECTION PROGRAM

The current surface water baseline data collection program commenced in 2007 and has included up to 23 streamflow monitoring stations (Figure 4.1-1). The locations, and data collection and monitoring frequency of the program within the Project area has evolved somewhat since 2007 due primarily to changing program objectives associated with the requirements of environmental assessment and water licensing processes and the continuing development of the project. Previous to 2007, baseline surface water field studies were conducted between 1993 and 1996 for New Millennium Mining Ltd to support an environmental assessment and Feasibility Study of the Dublin Gulch project. Table 4.1-1 provides a summary of automated and manual streamflow monitoring stations, as well as the year or years in which streamflow data were collected.

Table 4.1-1: Summary of Streamflow Monitoring Stations

Drainage Basin	Monitoring Site	Type of Station	Year(s) of Record
Haggart Creek	W4 - DS Dublin Gulch	Automatic	2007 - ongoing
	W5 - US Lynx Creek	Automatic	2007 - ongoing
	W22 - US Dublin Gulch	Automatic	2007 - ongoing
	W23 - DS Lynx Creek	Manual	2007 - 2012
	W29 - DS Eagle Creek	Automatic	2011 - ongoing
Eagle Creek	W27 - Midway	Automatic	2007 - ongoing
	W45 - US Haggart Creek	Manual	2012, 2013
	W61 - US Suttles Gulch	Manual	2009 - 2011
	W62 - DS Suttles Gulch	Manual	2009 - 2011
	WECP - Eagle Creek Pond	Manual Automatic	2009, 2010 2011 - ongoing
	W10 - Suttles Gulch	Manual	2010, 2011
Dublin Gulch	W1 - US Stewart Gulch	Automatic	2007-ongoing
	W21 - Dublin Gulch near mouth	Manual	2007 - 2013
	W32 - Ann Gulch	Manual	2010, 2011
	W26 - Stewart Gulch at flume	Manual Automatic	2007 - 2011 2010, 2012-ongoing
	W36 - Stewart Gulch	Manual	2009
	W31 - Olive Gulch	Automatic	2009-2010
	W52 - Dublin US Olive	Manual	2009
	W51 - Dublin DS Cascallen	Manual	2009
	W20 - Bawn Boy Gulch	Manual	2007, 2008 2009

Drainage Basin	Monitoring Site	Type of Station	Year(s) of Record
		Automatic	
	W30 - Cascallen Gulch	Manual	2009
Lynx Creek	W6 - Lynx Creek US Haggart	Automatic	2007 - ongoing
	W13 - Lynx Creek midway	Automatic	2007

Note: 1. Automated stations are not continuous through the winter

Stantec (2010b and 2012b) provide a comprehensive review of regional data and a baseline hydrology data summary for the project site through 2011, including a detailed freshet photo-monitoring program during freshet 2011. Knight Piésold (2013b) provides a baseline hydrology data summary for the project site through 2012 with a comprehensive analysis of water level (stage) and discharge measurements used to develop stage-discharge relationships for the project site streamflow gauging stations, including detailed analyses to correlate to regional data and the development of a 31-year long-term synthetic record for three key project monitoring stations (W4, W5 and W6).

4.1.1 Monitoring Methods

The continuous streamflow monitoring stations noted in Table 4.1-1 consist of a permanent staff gauge, pressure transducer and datalogger that record water level continuously at 15 minute intervals. Discharge measurements were conducted during periodic station visits and related to the corresponding water level at time of measurement from which stage-discharge rating curves were developed. The continuous streamflow gauging stations are typically installed prior to the spring freshet and removed at the end of the open-water season in late October or early November to avoid damage from winter freeze.

4.2 HYDROLOGY

The hydrology of the region is generally characterized by large snowmelt runoffs during freshet in May, which quickly taper off to low summer stream flows interspersed with periodic increases in stream flow associated with intense rainfall events during July and August. The pattern of low stream flows punctuated by high stream flows associated with rain fall events continues throughout the summer to autumn when freeze up beings in October. In larger streams, baseflows are maintained below river/creek ice throughout the winter by groundwater contributions. Smaller streams tend to dry up during the late summer or fall, as flow generally goes subsurface when the groundwater table drops to seasonally low levels. Aufeis (or overflow) ice may build in certain places of these streams if groundwater emerges from the channel during winter.

4.2.1 Waterbodies Watercourses, and Drainage Basins

The hydrology LSA is located in the Dublin Gulch, Eagle Creek, and Haggart Creek (above the Lynx Creek confluence) drainage basins (Figure 4.1-1). The basin areas of these water bodies are 10.4 km^2, 4.7 km^2, and 98 km^2 respectively. The basins are characterized by high relief (750 to 800 m), steep gradients (mean gradient of 18%), and well-vegetated slopes. Summary data for each sub-basin in the LSA are provided in Stantec (2010b and 2012b) and Knight Piésold (2013b).

Placer mining has been conducted in both Haggart Creek and the Dublin Gulch basins over the past century. In addition to the complete removal of the vegetation and overturning of the riparian area, the outcome of these operations has also resulted in the diversion of Eagle Pup and Suttles Gulch drainages from the Dublin Gulch drainage basin, and the formation of Eagle Creek. Eagle Creek originates on the south side of the Dublin Gulch valley from groundwater seeps in placer deposits upstream of Eagle Pup, and then is joined by Eagle Pup and Suttles Gulch before entering the Haggart Creek valley. Eagle Creek discharges directly to Haggart Creek approximately 2.0 km downstream of the confluence of Dublin Gulch and Haggart Creek.

Dublin Gulch, Eagle Creek, and Haggart Creek are all perennial streams. Several of the tributaries in the Project area are intermittent streams (i.e., the stream becomes dry at sections along the water course where flow goes subsurface) or ephemeral streams (i.e., the stream channel has little to no groundwater storage and flow is in response to snowmelt of heavy rains). The upper sections of Platinum Gulch are channelized with sections of perennial stream flow; however, the lower sections of Platinum Gulch are dry during the summer months. Suttles Gulch appears to be dry for most of the year, although more continuous flow occurs in some reaches due to permafrost melting from the adjacent slopes. Ann Gulch is a dry channel during most of the summer: in-channel observations of flow during and just after freshet indicate that the channel is wet in the late spring (e.g. May to June) as a result of snowmelt runoff.

4.2.2 Stream Flows

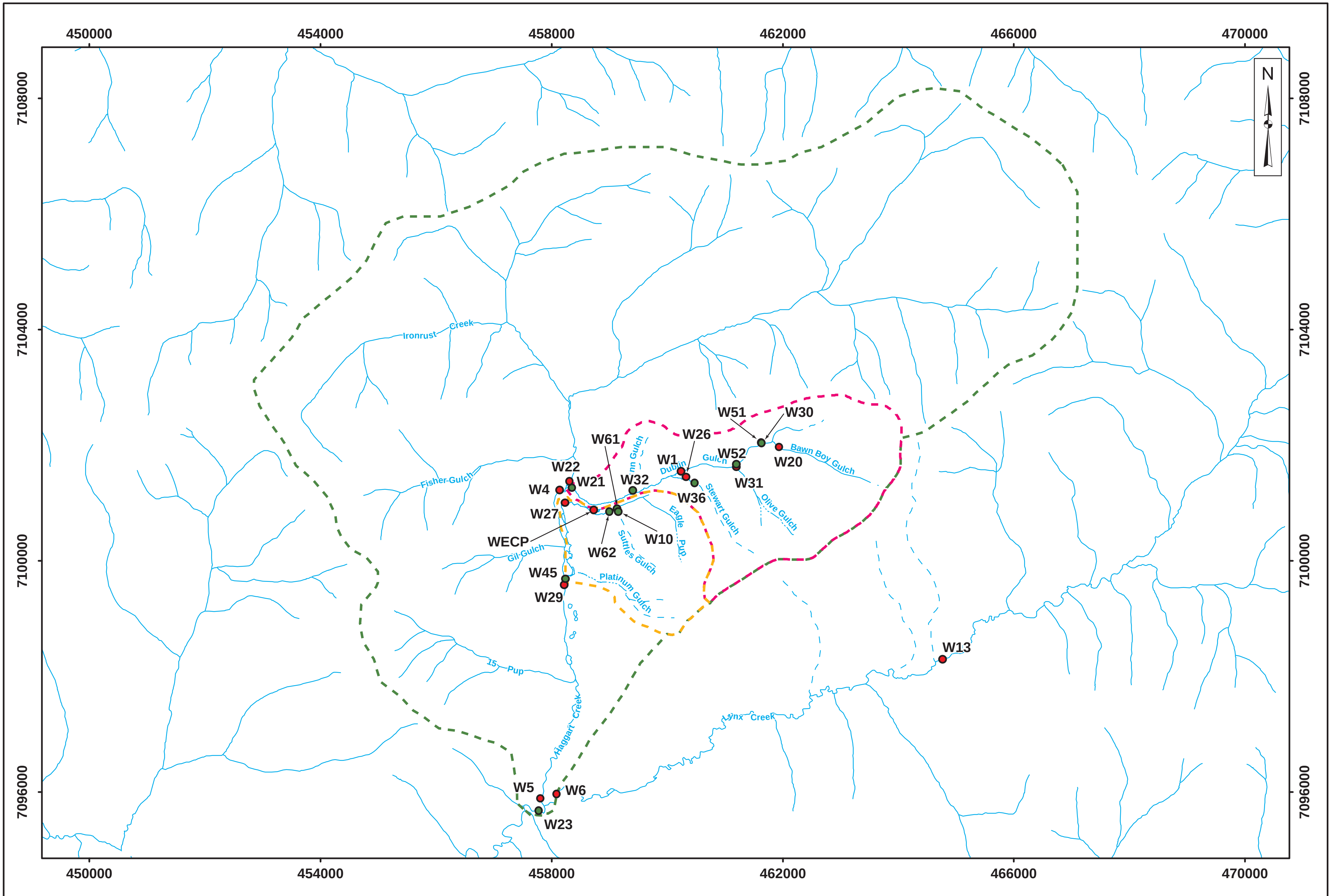
The open-water season pattern is characterized by freshet-generated peak flow in May to early June, followed by a relatively rapid recession to low base flow throughout July and August. Heavy rain events caused short-term increases in stream flow with storm-event recessions being generally rapid in the late summer and fall, both reflective of low groundwater storage capacity of the basins. Winter flows, though not continuously gauged, have been measured and observed by field personnel in Haggart Creek and lower Dublin Gulch and are the lowest flows of the year reflective of base flow contributions. These seasonal changes are represented in the hydrograph for Haggart Creek at station W4 (Figure 4.2-1). Monthly summaries and hydrographs for all the gauged streams are provided in Stantec (2010b, 2012b) and Knight Piesold (2013b).

Knight Piesold (2013c) outlines a regional regression analyses used to develop a 31-year long-term synthetic flow series for each of the three key project streamflow gauging stations: W4 and W5 on Haggart Creek and W6 on Lynx Creek. Streamflow statistics for station W4 based on these analyses for mean annual and monthly discharge and unit runoff are provided in Table 4.2-1.

Table 4.2-1: Long-Term Mean Monthly Discharge and Runoff

Station	Drainage Area (km^2)	Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Haggart Creek below Dublin Gulch (W4)	76.9	Discharge (m^3/s)	0.1	0.1	0.1	0.1	2.0	1.5	0.8	0.7	0.7	0.4	0.2	0.1	0.6
		Runoff ($L/s/km^2$)	1.4	1.2	1.1	1.8	26.1	18.9	10.2	8.7	8.8	4.6	2.6	1.8	7.3
Haggart Creek above Lynx Creek (W5)	97.5	Discharge (m^3/s)	0.1	0.1	0.1	0.2	2.3	1.7	0.9	0.8	0.8	0.5	0.3	0.2	0.7
		Runoff ($L/s/km^2$)	1.5	1.3	1.2	2.0	23.3	17.1	9.7	7.7	7.9	5.0	2.8	2.0	6.8

Station	Drainage Area (km^2)	Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Lynx Creek above Haggart Creek (W6)	100.9	Discharge (m^3/s)	0.2	0.1	0.1	0.2	2.1	2.0	0.7	0.7	0.9	0.6	0.3	0.2	0.7
		Runoff ($L/s/km^2$)	1.6	1.4	1.3	2.2	21.2	20.2	6.8	7.4	8.8	6.2	3.2	2.2	6.9



Legend:

- Water Survey Site (Automatic)
- Water Survey Site (Manual)
- Watercourse (perennial)
- Watercourse (intermittent)
- Watercourse (ephemeral)
- Eagle Creek Basin Boundary
- Dublin Gulch Basin Boundary
- Upper Haggart Creek Basin Boundary
- Waterbody

StrataGold Corporation

0 0.5 1 1.5 2
Kilometres
Scale = As Shown

Projection:	Drawn By:	
NAD83 UTM Zone 8N	SS	**EAGLE GOLD PROJECT YUKON TERRITORY**
Date: XXX	Figure: 4.1-1	**Locations of Streamflow Monitoring Stations**

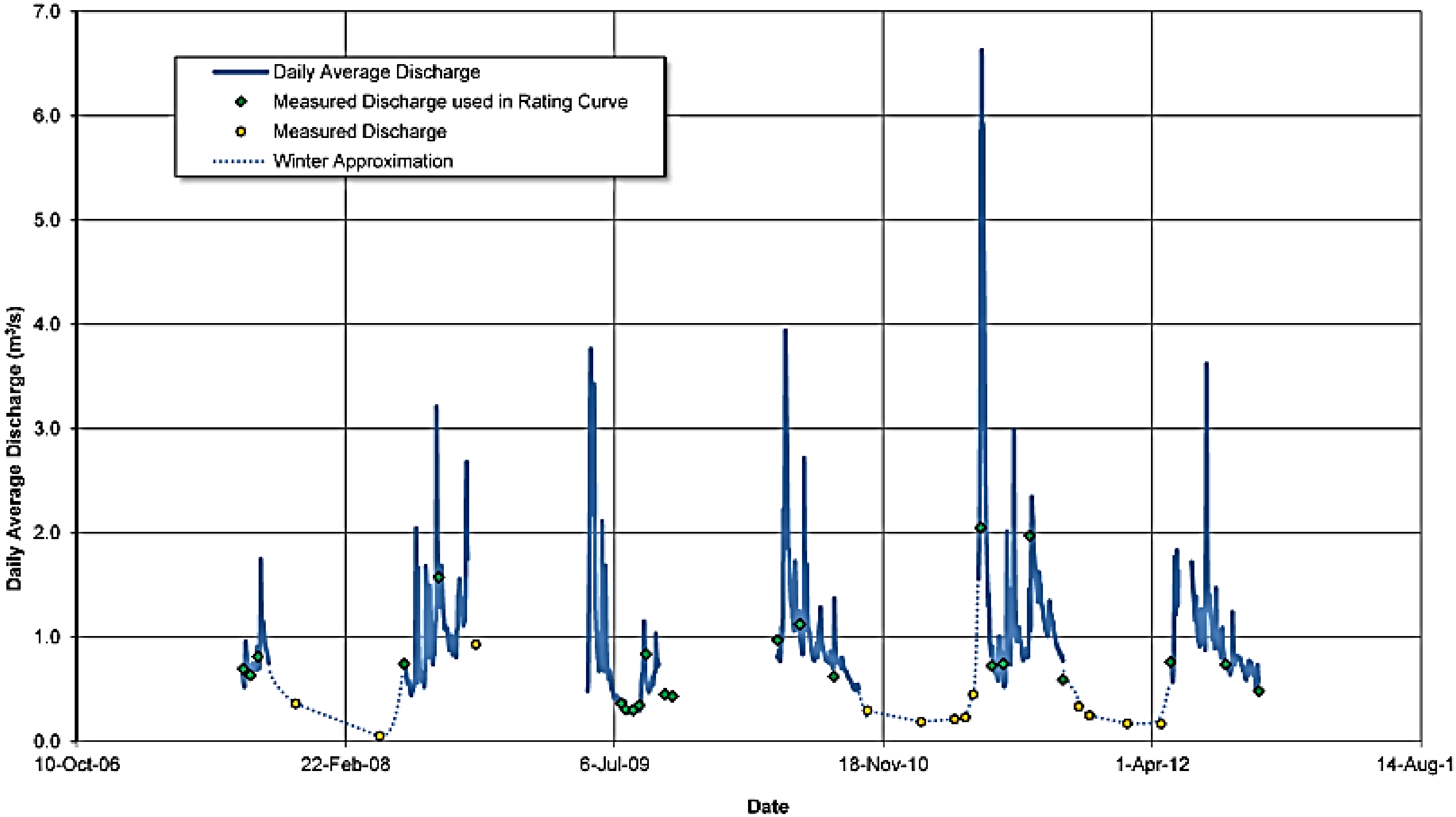


Figure 4.2-1: Haggart Creek (W4) Hydrograph

5 SURFACE WATER QUALITY AND AQUATIC BIOTA

The current water quality and aquatic biota baseline program began in 2007. Details on sample locations, sampling methods and frequency, and detailed summaries of results are provided by Stantec (2010c) and Lorax (2013). Water quality characterization has occurred every year since 2007 and is ongoing. Sediment samples were collected in 2007, 2009 and 2010; periphyton samples were collected in 2007; and benthic invertebrate samples were collected in 2007, 2009, and 2010. Historical data (1976/1977 for sediment only and 1993 – 1996 for surface water, sediment, and biota) are provided in Stantec (2010c).

5.1 WATER QUALITY

This section characterizes water quality in receiving environment watercourses that may be affected by project development. In addition, baseline water quality in Lynx Creek, which is unaffected by project development and therefore serves as a reference stream, is also characterized. The study area includes the Haggart Creek, Dublin Gulch, Eagle Creek basins, which have been subject to placer mining in the past and Lynx Creek basin, which has not been subject to placer mining (Figure 5.1-1 and Figure 5.1-2). For the period of 2007 to 2012, a total of 21 monitoring stations were sampled within the study area (Table 5.1-1 and Table 5.1-2). Sites within the Haggart Creek, Dublin Gulch, and Eagle Creek drainage basins were selected upstream and downstream of the proposed Project footprint, where possible. Lynx Creek drains a large catchment to the south of the Project area that will be unaffected by development activities (Figure 5.1-2).

Table 5.1-1: Water Quality Sampling Locations and Rationale by Drainage

Site	Location	Site Type	Rationale	Coordinates	
				North	East
Haggart Creek Drainage					
W22	Haggart above Dublin Gulch	Reference	Above Project influence	7101377	458319
W4	Haggart below Dublin Gulch	Exposure	Below Project influence	7101223	458144
W68	Haggart upstream of Gill Gulch	Exposure	Below Project influence	7100482	458175
W29	Haggart below Eagle Cr	Exposure	Below Project influence	7099583	458225
W5	Haggart above Lynx Cr	Exposure	Below Project influence	7095887	457815
W23	Haggart below Lynx Cr	Exposure	Below Project influence	7095682	457790
W39	Haggart above S. McQuesten	Far Field	Below Project influence	7086504	449780
Dublin Gulch Drainage					
W20	Bawn Boy Gulch	Reference	Above Project influence	7101961	461945
W1	Dublin above Stewart Gulch	Reference	Above Project influence	7101545	460249
W26	Stewart Gulch	Reference	Above Project influence	7101443	460331
W32	Ann Gulch	Exposure	Below Project influence	7101211	459412
W21	Dublin above Haggart Cr	Exposure	Below Project influence	7101261	458359
Eagle Creek Drainage					
W9	Eagle Pup	Exposure	Below Project influence	7101052	459630

Site	Location	Site Type	Rationale	Coordinates	
				North	East
W10	Suttles Gulch	Exposure	Below Project influence	7100841	459161
W61	Eagle Creek below Suttles	Exposure	Below Project influence	7100895	459139
W27	Eagle Creek midway	Exposure	Below Project influence	7100997	458235
W67	Platinum Gulch at Road	Exposure	Below Project influence	7099624	458896
W45	Eagle above Haggart Cr	Exposure	Below Project influence	7099684	458243
Lynx Creek Drainage					
W13	Lynx above Ray Cr	Reference	No Project influence	7098295	464770
W6	Lynx above Haggart Cr	Reference	No Project influence	7095964	458099
LC1[a]	Upper basin of Lynx	Reference	No Project influence	7103295	470813
LC2[a]	Upper basin of Lynx	Reference	No Project influence	7101698	469571
LC3[a]	Upper basin of Lynx	Reference	No Project influence	7101702	469572
LC4[a]	Upper basin of Lynx	Reference	No Project influence	7099942	467979
LC5[a]	Upper basin of Lynx	Reference	No Project influence	7099927	467974
LC6[a]	Upper basin of Lynx	Reference	No Project influence	7099997	467888
LC7[a]	Upper basin of Lynx	Reference	No Project influence	7104354	471115
South McQuesten River Drainage					
W49	S. McQuesten below Haggart	Far Field	Below Project influence	7085495	449221

Note: a: One-time Upper Lynx Creek sampling (7 stations) collected on August 20, 2012 to provide additional water quality characterization of reference stream

Table 5.1-2: Number of Samples Collected During Baseline Water Quality Sampling Program

Site	Location	Total Number of Samples Collected (2007-2012)
Haggart Creek Drainage		
W22	Haggart above Dublin Gulch	45
W4	Haggart below Dublin Gulch	38
W68	Haggart upstream of Gill Gulch	1
W29	Haggart below Eagle Cr	38
W5	Haggart above Lynx Cr	27
W23	Haggart below Lynx Cr	29
W39	Haggart above S. McQuesten	6
Dublin Gulch Drainage		
W20	Bawn Boy Gulch	10
W1	Dublin above Stewart Gulch	47
W26	Stewart Gulch	24
W32	Ann Gulch	1
W21	Dublin above Haggart Cr	42

Site	Location	Total Number of Samples Collected (2007-2012)
Eagle Creek Drainage		
W9	Eagle Pup	33
W10	Suttles Gulch	10
W61	Eagle Creek below Suttles	12
W27	Eagle Creek midway	42
W67	Platinum Gulch at Road	2
W45	Eagle above Haggart Cr	11
Lynx Creek Drainage		
W13	Lynx above Ray Cr	3
W6	Lynx above Haggart Cr	22
LC1 to LC7[a]	Upper basin of Lynx	7
South McQuesten River Drainage		
W49	S. McQuesten below Haggart	12

Note: a: One-time Upper Lynx Creek sampling (7 stations) collected on August 20, 2012 to provide additional water quality characterization of reference stream

Procedures for collecting data and information on conditions in streams of the study area have used methods consistent with environmental assessment standards under Yukon and federal legislation. Water samples have been collected midstream following methods outlined in the BC Freshwater Biological Sampling Manual (BC Ministry of Water, Land Air Protection 2003). Grab samples were collected from just below the surface, facing upstream and using narrow mouth bottles. Samples requiring filtration and/or preservation were dealt with as soon as possible after returning to shore. All samples and blanks were kept in coolers with ice packs until arrival at the laboratory. In situ measurements were also taken on each sampling date for pH, temperature, conductivity and dissolved oxygen.

5.1.1 Dublin Gulch Drainage

Baseline water quality in Dublin Gulch is characterized using monitoring data from stations W1 and W21 (Figure 5.1-2). Data from station W20 in the upper reaches of Dublin Gulch in Bawn Boy Gulch is also considered as it strongly influences trace element concentrations in Dublin Gulch, in particular the arsenic signature throughout the stream. Station W26 in Stewart Gulch is also discussed as naturally elevated As concentrations exist and contribute to the overall As loading in Dublin Gulch.

5.1.1.1 Major Ions

Dublin Gulch is characterized by soft to moderately hard waters, with monthly mean hardness values ranging from 30 to 66 mg/L at station W1 and 53 mg/L to 145 mg/L at station W21. Values for conductivity, hardness, and alkalinity demonstrate pronounced seasonal fluctuations, with minima coinciding with freshet periods in May and June. Conductivity, hardness and alkalinity at both sites exhibit an approximate two- to three-fold increase in concentration between freshet and other times of the year. Overall, such trends in stream salinity reflect varying proportions of snow-melt driven surface runoff (lower ionic strength) and groundwater inputs (higher ionic strength) as driven by the seasonal water balance. Values at W21 are typically higher than values at W1, and may reflect the contribution from groundwater discharges at lower elevations in the catchment.

The pH in Dublin Gulch remains relatively uniform throughout the year with values generally ranging between 7.0 and 8.0. The neutral to slightly basic pH conditions can be linked to bicarbonate alkalinity. All pH values reported to date have remained within the BC freshwater chronic criterion range for pH of 6.5 to 8.5.

Baseline concentrations for sulphate in Dublin Gulch are generally low, and exhibit a pronounced seasonal signature as observed for other salinity proxies. Sulphate minima during high flow can be attributed to the influence of low ionic strength melt waters, while higher values during the low-flow periods likely reflect an increased proportion of groundwater inputs. Mean monthly sulphate values at W1 and W21 range from freshet minima of approximately 6.0 mg/L and 20 mg/L, respectively to maximum mean values observed during winter low flows of 19 mg/L and 65 mg/L, respectively.).

Unlike the dissolved ions, elevated TSS concentrations in Dublin Gulch generally coincide with the peak snowmelt month of May or during intense rainfall events. At most other flow periods of the year, TSS values in Dublin Gulch were generally below the analytical detection limit of 3.0 mg/L. Peak TSS values measured at W1 and W21 for the period of 2007 to 2012 were 50 mg/L (August 2011) and 40 mg/L (May 2011), respectively.

5.1.1.2 Nutrients

Nutrients quantified in Dublin Gulch include nitrate (NO_{3-}), nitrite (NO_{2-}), ammonia (NH_3), total phosphate (T-PO_4^{3-}), and dissolved orthophosphate (D-o-PO_4^{3-}). In overview, nutrient parameters show low values in Dublin Gulch. Ammonia-N concentrations in Dublin Gulch are low with mean monthly values ranging from <0.005 mg/L to 0.028 mg/L at W1 and W21. Ammonia-N concentrations are expected to remain low in Dublin Gulch due to the low persistence of ammonia in fully oxygenated freshwaters at neutral pH.

Similar to ammonia, the majority of nitrite-N values have occurred near or below the detection limit value. Baseline nitrate-N concentrations in Dublin Gulch are also low, with mean monthly values ranging from approximately 0.006 to 0.2 mg/L. Minima are evident during high flow periods, reflecting melt water influences. During lower flow periods, Dublin Gulch is characterized by higher nitrate-N concentrations, again likely reflective of a greater proportion of groundwater derived flow.

Primary productivity in freshwaters is typically limited by available phosphorus. Accordingly, measurements of phosphorus compounds in surface waters can provide an indication of trophic status (i.e., productivity regime). Baseline concentrations for dissolved orthophosphate in Dublin Gulch are low, ranging from approximately <0.0020 to 0.005 mg/L.

Total organic carbon (TOC) reflects a combination of dissolved organic carbon (DOC) and particulate phases associated with both aquatic and terrestrial organic matter. Highest values of TOC and DOC are typically observed during high flow periods, likely reflecting contributions of particulate carbon associated with terrestrial runoff and within-stream re-suspension. In contrast, low and uniform values prevail during low flow conditions, during which time TOC is predicted to be present primarily as dissolved phases. Mean monthly baseflow TOC levels in Dublin Gulch are lowest at W1 (1.0 mg/L) and slightly higher at W21 (1.4 mg/L). Freshet flow TOC levels are higher and typically exceed 10 mg/L.

5.1.1.3 Trace Elements

Baseline trace element concentrations in Dublin Gulch were derived from data collected from August 2007 to December 2012. In general, mean monthly concentrations of total and dissolved trace elements are low (e.g., Sb, Cu, Co, Cr, Pb, Hg, Se, Tl and Zn). However, Dublin Gulch is characterized by elevated total and dissolved As concentrations throughout its reaches with generally consistent concentrations throughout all flow conditions. This is described in greater detail below.

Total Al and total Cd are also observed to be elevated during peak flow months; higher total concentrations are associated with elevated TSS levels. Total and dissolved Al values correlate positively with flow (as inferred from TSS), with dissolved Al reaching a mean monthly maximum of 0.14 mg/L in May at both stations. The correlation between dissolved and total fractions strongly suggests that the dissolved Al fraction is governed by colloidal Al hydroxides that are able to pass through a 0.45 μm filter membrane. During non-peak flow periods, dissolved Al concentrations in Dublin Gulch are typically an order of magnitude lower than total concentrations.

As stated, Dublin Gulch hosts a significant inventory of arsenic, with little difference between total and dissolved fractions. Arsenic concentrations at station W1 and W21 are elevated with mean monthly concentrations narrowly ranging between 0.028 mg/L and approximately 0.04 mg/L. While As concentrations are approximately 25% higher in the summer than the winter, mean total As for W1 (0.036 mg/L) and W21 (0.034 mg/L) are not significantly different ($P < 0.05$).

It has been speculated that elevated As concentrations in Dublin Gulch are, in part, attributable to historical placer mining disturbance within the Dublin Gulch valley. As discussed in Lorax (2013), the current As monitoring data do not support this posit. Station W21 is located at the mouth of Dublin Gulch and downstream of all placer disturbances in the valley (Figure 5.1-2). Conversely, station W1 is much further upstream in Dublin Gulch, and while some very minor placer disturbance is noted upstream of W1, by far the majority of placer disturbance is between W1 and W21 at the mouth. Despite the historical placer activity, As concentrations do not increase with increasing distance downstream in Dublin Gulch, suggesting that existing disturbances do not contribute significant additional As loadings to Dublin Gulch.

One of the primary sources of As in Dublin Gulch occurs in its headwaters in Bawn Boy Gulch. Station W20 (Figure 5.1-2) monitored water quality in Bawn Boy Gulch during the period of August 2007 to October 2009. Total and dissolved As at W20 ranged from 0.051 mg/L to 0.076 mg/L (total) and from 0.047 mg/L to 0.074 mg/L (dissolved).

The lower arsenic concentrations observed at W1/W21 reflect the influence of streams (primarily Olive Gulch and Stewart Gulch) with somewhat lower but still elevated As concentrations. For example Stewart Gulch (W26) is naturally elevated in As, with concentrations typically on the order of 0.02 mg/L. As such, the elevated baseline arsenic concentrations in Dublin Gulch reflect As-mineralization in the project area and do not appear to be exacerbated by historical placer disturbance in the drainages.

5.1.2 Eagle Creek Drainage

Baseline water quality in Eagle Creek is characterized using monitoring data from stations W9 in Eagle Pup and W27 (Figure 5.1-2). Baseline monitoring data from station W9 is important as the largest waste rock facility produced during mining of the Eagle Gold deposit will occupy the Eagle Pup valley. Data from station W27 reflects influences from primarily Eagle Pup and Suttles Gulch (W10) with other minor sources contributing along the drainage. The latter had a significant influence on TSS levels observed in lower Eagle Creek as well as total concentrations of trace elements.

5.1.2.1 Major Ions

The major ion chemistry of Eagle Pup and Eagle Creek is described with respect to conductivity, hardness, alkalinity, sulphate and pH. Eagle Pup is characterized by moderately hard to hard waters, with monthly mean hardness values ranging from 90 to 285 mg/L at station W9. Hardness values in lower Eagle Creek are slightly lower but are characterized as moderately hard to hard with monthly mean hardness ranging from 93 mg/L to 209 mg/L at station W27. Like the other project area streams, values for conductivity, hardness, and alkalinity demonstrate pronounced seasonal fluctuations, with minima coinciding with freshet periods in May and June during peak periods of snowmelt runoff.

The pH in Eagle Creek remains relatively uniform throughout the year with values generally ranging between 7.5 and 8.4. Alkalinity values in excess of 140 mg/L are typical and represent significant buffering capacity and dissolution of carbonate mineral phases in the catchment.

Baseline concentrations for sulphate in Eagle Creek are notably higher (e.g., ~60 mg/L during non-freshet flow conditions) than observed in Dublin Gulch (~20 mg/L) for corresponding flow periods. The higher sulphate concentrations in the Eagle Creek drainage likely reflect the presence and weathering of the low-sulphide Eagle Gold deposit.

TSS concentrations observed in the Eagle Creek drainage were highly variable depending upon location in the catchment. The seasonal TSS signature at station W9 was similar to that observed in Dublin Gulch, exhibiting higher concentrations in peak freshet months and much lower concentrations during lower flow periods. Conversely, at station W27, the highest mean monthly TSS concentrations corresponded to freshet as well as summer (e.g. July and August) flow periods. Elevated TSS measurements were documented in Suttles Gulch (W10) during 2010 and 2011, and were related to meltwater that originated from the disturbance of permafrost (associated with geotechnical and exploration activities). The meltwater initially developed during summer 2010 and became more extensive during summer 2011. The elevated TSS concentrations in Eagle Creek at station W27 had a significant influence on total trace element concentrations as described below.

5.1.2.2 Nutrients

Nutrient parameters show low values in the Eagle Creek drainage. Ammonia-N concentrations in are low with mean monthly values ranging from <0.005 mg/L to 0.011 mg/L at W9 and <0.005 mg/L to 0.059 mg/L at W27. The majority of nitrite-N values have occurred near or below the detection limit value. Baseline nitrate-N concentrations in Eagle Creek are higher (e.g. ~0.30 mg/L) than observed in Dublin Gulch (e.g. 0.1 mg/L).

Baseline concentrations for dissolved orthophosphate in Eagle Creek are low, ranging from approximately <0.0020 to 0.005 mg/L.

Mean monthly baseflow TOC levels in Eagle Creek are typically 1.0 mg/L to 2.0 mg/L, while freshet flow TOC levels are on the order of 15 to 20 mg/L.

5.1.2.3 Trace Elements

Baseline trace element concentrations in upper Eagle Creek at station W9 were derived from data collected from July 2009 to December 2012. Characterization of baseline water quality in lower Eagle Creek at station W27 was developed using data collected from August 2007 to December 2012. Because of the influence of disturbance in Suttles Gulch, the data from W9 and W27 will be described initially individually below.

Eagle Pup (W9)

In general, mean monthly concentrations of total and dissolved trace elements in the upper Eagle Creek basin are low, with concentrations of key parameters of interest (e.g. Cd, Cu, Co, Cr, Pb, Hg, Ni, Se, Tl and Zn) measured at, or below, their respective analytical detection limit. However, total and dissolved arsenic concentrations are naturally elevated in the head waters of Eagle Creek. During low flow conditions, total and dissolved As concentrations are similar and typically range between 0.016 mg/L and 0.025 mg/L with dissolved As accounting for over 95% of total As.

Episodic periods of higher flow and elevated TSS values result in elevated total As values that have been observed to range from approximately 0.033 mg/L to values approaching 0.06 mg/L. These brief periods of elevated total As do not translate into higher dissolved As concentrations which show decreased dissolved As concentrations during freshet months (e.g. 0.012 mg/L) and near consistent low flow dissolved concentrations of approximately 0.02 mg/L. The dissolved data suggest that solid-phase As associated with higher TSS is primarily responsible for peak concentrations observed. Although not graphically presented, the periods of elevated TSS also result in higher concentrations of trace elements, namely Al, Cd, Mn and Ag).

Eagle Creek (W27)

Lower Eagle Creek has experienced periods of very elevated TSS since mid-2010 to present. These periods of elevated TSS result in elevated concentrations of total trace elements, in particular Al, As, Cd, Cu, Pb, Hg, Mn, Ni, Ag and Zn. Total As concentrations during these elevated TSS events can exceed 0.200 mg/L and is directly attributable to solid-phase As in suspended sediments.

Conversely, dissolved As concentrations, while higher than observed in the upper reaches of Eagle Creek at W9, remain consistently between 0.02 mg/L (e.g. during winter low flow) and 0.045 mg/L during summer flow periods. It is important to note that the winter low flow As concentration at W27 is not significantly different from the winter low flow As concentration at W9, suggesting that baseflow As concentration in the Eagle Creek basin is approximately 0.02 mg/L.

5.1.3 Haggart Creek Drainage

Haggart Creek is the largest project affected stream and the primary receiving environment stream for the Project. The main monitoring stations on Haggart Creek are shown on Figure 5.1-2 and include stations W22 (upstream of all potential project activities), W4 (immediately downstream of the confluence with Dublin Gulch), W29 (downstream of Dublin Gulch, Eagle Creek, Gil Gulch and Platinum Gulch confluences), W5 and W23 (immediately upstream and downstream, respectively of the confluence with Lynx Creek).

5.1.3.1 Major Ions

The major ion chemistry of upper Haggart Creek is described with respect to conductivity, hardness, alkalinity, sulphate and pH. Haggart Creek at stations W22, W4 and W29 are characterized by moderately hard to hard waters, with monthly mean hardness values ranging from approximately 60 to 230 mg/L. Like the other project area streams, values for conductivity, hardness, and alkalinity demonstrate pronounced seasonal fluctuations, with minima coinciding with freshet periods in May and June during peak periods of snowmelt-driven runoff.

Haggart Creek at W29 is characterized as moderately hard to hard water. In general, hardness values and alkalinity are slightly higher at station W29 relative to W22 and W4 upstream in Haggart Creek; the greater alkalinity and hardness at W29 is a result of Ca, Mg inputs from Eagle Creek.

The pH in Haggart Creek at W22, W4 and W29 remain relatively uniform throughout the year with values generally ranging between 7.2 and 8.1. Alkalinity values at W22 are typically in excess of 85 mg/L suggesting a well-buffered system. Alkalinity values at W4 and W29 are lowest in the high flow periods (e.g. approximately 40 mg/L) and greatest low flow periods (e.g. approximately 130 mg/L).

Baseline concentrations for sulphate in upper Haggart Creek (W22) are notably higher (e.g., ~60 to 90 mg/L) during non-freshet flow conditions as compared to peak snowmelt periods where values typically less than 40 mg/L sulphate are observed. Sulphate concentrations at W4 are slightly lower than observed at W22 as a result of the addition of low sulphate loadings from Dublin Gulch. The lowest sulphate concentrations are observed during May and June (e.g. 20 mg/L to 45 mg/L); higher sulphate concentrations are measured during non-freshet flow conditions (e.g. 60 mg/L to 85 mg/L). Sulphate concentrations in Haggart Creek downstream of Eagle Creek (W29) are slightly higher than observed at W4 for the low flow months (e.g. January to April) and reflect higher sulphate loadings from Eagle Creek. During peak flow periods sulphate concentrations in Haggart Creek from W22 down to W29 are not significantly different and typically range from approximately 25 mg/L to 58 mg/L.

TSS concentrations in upper Haggart Creek exhibit freshet maxima, generally coinciding with the peak snowmelt month of May. Peak TSS values measured at W22 for the period of 2007 to 2012 were approximately 80 mg/L. TSS concentrations in Haggart Creek at W4 are similar to those observed at W22 with the exception that higher TSS values at W4 occur as a result of suspended solids loadings from Dublin Gulch during peak snowmelt months of May and June. TSS concentrations in Haggart Creek at W29 are higher than those observed at W22 and W4 during the peak flow periods and likely reflect the higher TSS loadings associated with Eagle Creek, particularly since 2010. At most other flow periods of the year, TSS values at W22, W4 and W29 are generally below the analytical detection limit of 3.0 mg/L with the exception of episodic summer rainfall events that increase suspended sediments loads in the Eagle Creek drainage and as a result to a lesser extent at W29.

5.1.3.2 Nutrients

Nutrient parameters show low values at all stations in Haggart Creek. Ammonia-N concentrations are low with mean monthly values ranging from <0.005 mg/L to 0.028 mg/L. Similar to ammonia, the majority of nitrite-N values have occurred near or below the detection limit value. Baseline nitrate-N concentrations in Haggart Creek are also low, with mean monthly values ranging from approximately 0.04 to 0.16 mg/L. Minima are evident during high flow periods, reflecting melt water influences.

Like other project area streams, baseline concentrations for dissolved orthophosphate at all stations in Haggart Creek are low, ranging from approximately <0.0010 to 0.0015 mg/L.

Mean monthly baseflow TOC levels at all stations in Haggart Creek are low and generally less than 1.0 mg/L. Freshet flow TOC levels are much higher at approximately 20 mg/L, reflecting the addition of terrestrial-derived runoff and organic detritus.

5.1.3.3 Trace Elements

In general, in upper Haggart Creek at W22 mean monthly concentrations of total and dissolved trace elements are low for all parameters monitored with the exception of Al, Mn and to a lesser extent Cd during the peak freshet month of May. Most parameters are present at concentrations at or below their respect analytical detection limit. Unlike Dublin Gulch and Eagle Creek drainages, arsenic concentrations in upper Haggart Creek at W22 are low; mean monthly concentrations range from a high of 0.002 mg/L during freshet periods to values typically less than 0.0008 mg/L for the remaining flow periods.

Trace element concentrations in Haggart Creek at W4 are very similar to those observed at station W22 with the sole exception of As. Arsenic concentrations at W4 are roughly four times that observed at W22. The increased As concentrations at W4 is due to significant natural As loadings entering from Dublin Gulch. Winter low flow mean monthly As concentrations range from 0.0013 mg/L to 0.0018 mg/L (December to March) to summer flow concentrations of approximately 0.0045 mg/L. 95th percentile values for total As at W4 for the same winter low flow and summer low flow conditions range from 0.0015 mg/L to 0.0025 mg/L and from 0.004 mg/L to 0.0063 mg/L, respectively.

Water quality in Eagle Creek has a notable influence on trace metal concentrations in Haggart Creek at W29. The high TSS loadings occurring in Eagle Creek, particularly during freshet conditions, result in elevated concentrations of total trace elements, in particular Al, As, Cd, Cu, Pb, and Mn. The most significant trace metal increases are associated with total arsenic. As shown by Lorax (2013), total As concentrations are typically greater at W29 as compared to W4 during most flow periods of the year and can be particularly elevated during peak flow events. As with the other trace metal parameters, the elevated total As concentrations are a result of increased TSS loadings derived from Eagle Creek.

5.1.4 Lynx Creek Drainage

Lynx Creek is an undisturbed catchment that drains into Haggart Creek downstream of the project area. Monitoring in Lynx Creek has occurred primarily at station W6, at the mouth of Lynx Creek and immediately prior to entering Haggart Creek (Figure 5.1-2). Results from a one-time sampling event at several locations in upper Lynx basin is also presented.

5.1.4.1 Major Ions

The major ion chemistry of Lynx Creek is described with respect to conductivity, hardness, alkalinity, sulphate and pH. Lower Lynx Creek at station W6 is characterized by moderately hard to hard waters, with monthly mean hardness values ranging from approximately 67 to 200 mg/L. Like the other streams described, values for conductivity, hardness, and alkalinity demonstrate pronounced seasonal fluctuations, with minima coinciding with freshet periods in May during peak periods of snowmelt-driven runoff.

Baseline concentrations for sulphate in lower Lynx Creek are approximately ~55 to 80 mg/L during non-freshet flow conditions as compared to peak snowmelt periods where values of between 20 and 40 mg/L sulphate are observed.

TSS concentrations in Lynx Creek are generally lower than observed in the Haggart Creek and Dublin Gulch catchments, even during peak flow conditions. During most flow periods of the year TSS values in Lynx Creek were generally below the analytical detection limit of 3.0 mg/L.

5.1.4.2 Trace Elements

In general, mean monthly concentrations of total and dissolved trace elements are low for all parameters monitored with most parameters present at concentrations at or below their respect analytical detection limit; arsenic is however an exception. Detectible arsenic concentrations at W6 in lower Lynx Creek range from values of 0.0058 mg/L to 0.0076 mg/L; these values are consistent with concentrations observed at station W29 in Haggart Creek. Although no anthropogenic disturbances occur in the Lynx watershed, the presence of arsenic in drainage waters indicates that arsenic mineralization in the broader project area is prevalent and not just limited to the Dublin Gulch catchment. This posit is supported by extensive sampling of individual drainages in the upper Lynx watershed that occurred in August 2012. Some tributaries in upper Lynx Creek showed elevated dissolved As concentrations (values ranging from 0.0012 to 0.0086 mg/L). Lorax (2013) provides a summary of the As concentrations measured at each station. Sampling locations are indicated on Figure 5.1-2 and include stations LC1 to LC7.

5.1.5 Comparison of Recent Data to Historical Data

Analytical results for 2007 – 2012 were generally within the range observed during the 1993 – 1996 period for general chemistry, nutrients, and organic carbon; including pH, alkalinity, hardness, conductivity, sulphate, nitrate, dissolved ortho-phosphate, and total dissolved solids. However, variability was generally higher for the historical data than for the more recent data.

Total suspended solids and some metals, including aluminum, arsenic, copper, iron, and lead, were up to an order of magnitude higher in 1995 and 1996 than other years, exceeding CCME guidelines in many cases. The percentages of samples exceeding guidelines for arsenic, copper, iron, and lead generally show high similarity between the sampling periods on a watershed basis (exceptions for total iron, higher in 1993 – 1996 for Haggart and Eagle basins and lower for Lynx basin). Higher concentrations coincided with elevated TSS levels at these sites.

5.2 AQUATIC BIOTA

Sediment, periphyton, and benthic invertebrate characteristics of watercourses in the project area were studied during 1993-1996 and during 2007-2011. The objectives of the studies were to:

- obtain baseline data on water quality and sediment to assess potential Project impacts,
- identify parameters that may be present at elevated levels, and to use this information if needed to propose site-specific water quality objectives,
- provide baseline data that could be used to support biological monitoring programs,

- measure abundance and diversity of the periphyton and benthic invertebrate communities for comparison to future levels.

Since 1993, aquatic biota samples have been collected from 29 sites in the four drainage basins in the Project area (Figure 5.2-1). A total of 52 sediment, 22 periphyton, and 35 benthic invertebrate samples (not including replicates) were collected as shown in Table 5.2-1.

Table 5.2-1: Aquatic Biota Sample Locations and Rationale by Drainage

Site	Location	Site Type	Rationale	Number of Samples		
				Sediment	Periphyton	Benthic Invertebrates
Haggart Creek Drainage						
W2	Haggart Above Ironrust Creek	Reference	Above Project influence	2	1	1
W3	Lower Ironrust Creek	Reference	Above Project influence	1	1	1
W7	Haggart above Fisher Gulch	Reference	Above Project influence	1	1	1
W11	Lower Fisher Gulch	Reference	Above Project influence		1	1
W22	Haggart above Dublin Gulch	Reference	Above Project influence	6	1	3
W4	Haggart below Dublin Gulch	Exposure	Below Project influence	6	2	2
W29	Haggart below Eagle Creek	Exposure	Below Project influence	2		2
W5	Haggart above Lynx Creek	Exposure	Below Project influence	5	2	4
W23	Haggart below Lynx Creek	Exposure	Below Project influence	1	1	2
W74	Inlet of Pond Haggart Creek	Exposure	Below Project influence	1		
W75	Outlet of Pond Haggart Creek	Exposure	Below Project influence	1		
Dublin Gulch Drainage						
W20	Bawn-Boy Gulch	Exposure	Above Project influence	3	1	
W30	Lower Cascallen Gulch	Reference	Above Project influence	1		
W51	Below Bawn-Boy Gulch	Exposure	Above Project influence	1		
W8	Below Olive Gulch	Exposure	Below Project influence	2	1	1
W1	Above Stewart Gulch	Exposure	Below Project influence	3	2	4
W36	Upper Stewart Gulch	Exposure	Below Project influence	1		
W26	Lower Stewart Gulch	Exposure	Below Project influence	2		2
W21	Above Haggart Creek	Exposure	Below Project influence	3	1	3
Eagle Creek Drainage						
W9	Lower Eagle Pup	Exposure	Below Project influence		2	2
W10	Suttles Gulch	Exposure	Below Project influence		1	1
W27	Eagle Creek midway	Exposure	Below Project influence	3		2
W72	Inlet pond Eagle Creek	Exposure	Below Project influence	1		
W73	Outlet pond Eagle Creek	Exposure	Below Project influence	1		
Lynx Creek Drainage						
W62	Lynx above Skate Creek	Reference	No Project influence	1		
W63	Lynx below Skate Creek	Reference	No Project influence	1		

Site	Location	Site Type	Rationale	Number of Samples		
				Sediment	Periphyton	Benthic Invertebrates
W13	Lynx above Ray Creek	Reference	No Project influence	1	2	1
W64	Lynx below Ski Creek	Reference	No Project influence	1		
W6	Lynx above Haggart Creek	Reference	No Project influence	1	2	2

Stantec (2010c) provides details on sample locations, sampling methods and frequency, and detailed summaries of results.

5.2.1 Sediment

Metals were analyzed in sediment, within the fine fraction (< 63 µm). High levels of arsenic were reported at all sites sampled (higher than the CCME Probable Effects Level). Levels were highest in Dublin Gulch (particularly near the confluence with Haggart Creek) and lower in Haggart, Lynx and Eagle Creeks. In Haggart Creek, arsenic levels were higher downstream of the Dublin-Haggart confluence than at other sites in that stream. Nickel concentrations were higher than the BC Interim Sediment Quality Guidelines at all sites sampled (there is no CCME guideline). Cadmium, chromium, copper, lead, mercury, and zinc were higher than their sediment quality guidelines at some sites.

5.2.2 Periphyton

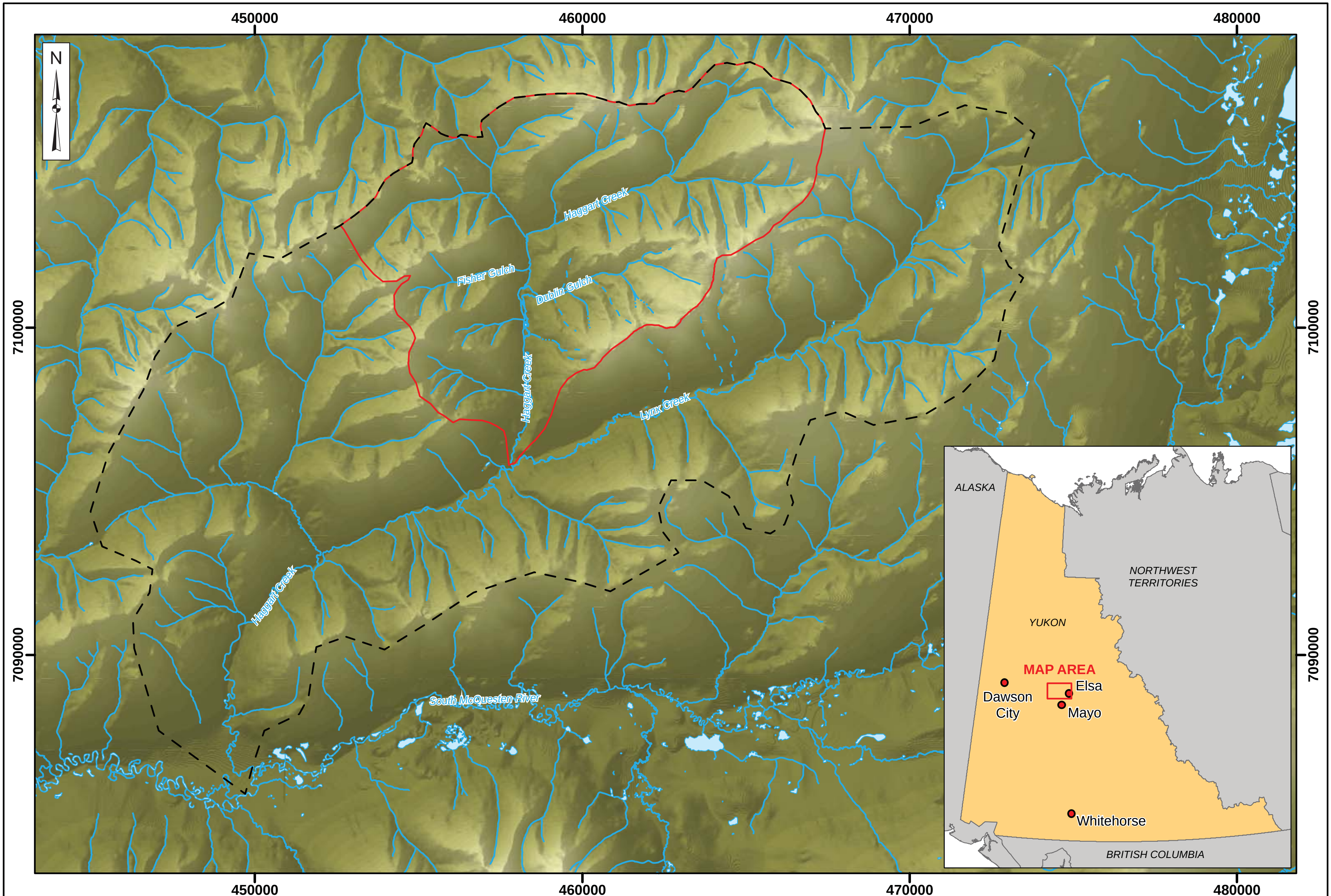
Materials consulted to complete the baseline study of periphyton in the Project area include the 1995 study (Hallam Knight Piésold 1996a) and 2007 study (Jacques Whitford-AXYS 2008). The 1995 and 2007 sampling programs followed conventional guidance to sample riffle habitat in late summer, after peak flows have subsided and maximum development of the periphyton community had occurred (MWLAP 2003). In August 1995, periphyton samples were collected from 11 sites (Hallam Knight Piésold 1996a). In August 2007, periphyton samples were collected from 11 sites, some of which had been sampled in 1995. The sites were co-located with selected water, sediment, and benthic invertebrate sampling locations. Detailed descriptions of the field and laboratory methods, including QA/QC protocols, used to characterize periphyton are provided in Stantec (2010c).

Chlorophyll *a* levels suggest oligotrophic conditions in the streams, as indicated by nutrient chemistry. Taxonomic richness, diversity, and evenness indices were highest at sites in Haggart Creek, suggesting better conditions for growth there than in Dublin Gulch and Eagle Creek, or in Lynx Creek. This could be related to a number of factors, alone or in combination, including water quality, habitat conditions, and stream order (more opportunity for colonization from upstream communities than in smaller and headwater streams). Haggart Creek communities were dominated by diatoms and blue-green algae, whereas those in Dublin, Eagle and Lynx Creeks consisted mainly of blue-green algae.

5.2.3 Benthics

Materials consulted to complete the baseline study include data collected in 1995 (Hallam Knight Piésold (1996a), 2007 (Jacques Whitford AXYS 2008), 2009 and 2010 (Stantec 2010c). Samples were collected during the late summer low flow period in 1995 (11 sites), 2007 (11 sites), 2009 (7 sites), and 2010 (7 sites). Samples were collected from riffle habitat to target the preferred habitat of the more sensitive benthic invertebrate species. Detailed descriptions of the field and laboratory methods, including QA/QC protocols, used to characterize benthic invertebrates are provided in Stantec (2010c).

Benthic invertebrate communities in all streams monitored had abundant pollution sensitive benthic invertebrate taxa that are common prey for fish. There were differences in abundance and community composition among sites and years, related to the range of habitat characteristics, baseline water quality and fish presence (predators). In general, total abundance was lower in Haggart Creek sites, which had lower abundance and higher taxonomic richness and diversity than did sites in Dublin, Eagle or Lynx Creeks. High abundance and numbers of taxa of Ephemeroptera, Plecoptera and Trichoptera (mayflies, stoneflies and caddisflies or EPT) is generally considered an indicator of good water quality and of food for fish. All sites (except Eagle Creek in 2010) contained several EPT taxa and abundant mayflies and/or stoneflies, as well as pollution insensitive organisms such as Chironomidae (midges) and Oligochaeta (aquatic worms). Sites in Haggart Creek tended to have higher numbers of EPT taxa compared to those in the Eagle and Lynx basins and some sites in the Dublin basin. In Eagle Creek, the benthic community shifted between 2009 and 2010, with a decrease in number of taxa, diversity, evenness and number of pollution sensitive organisms and an increase in proportion of pollution insensitive organisms, consistent with the observed differences in water quality (higher TSS and total metals levels in 2010 compared to 2009).



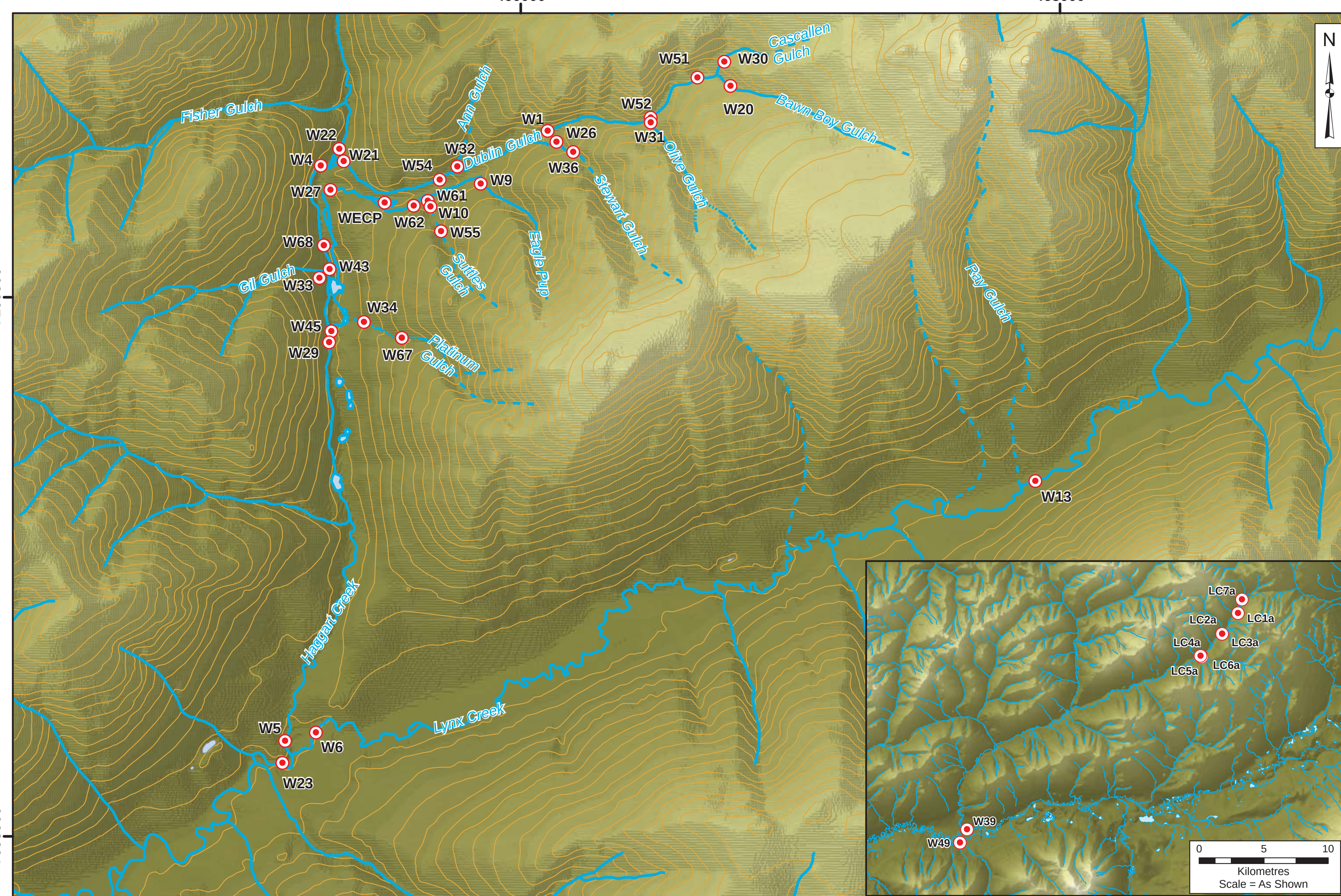
Legend:

- Watercourse (perennial)
- Watercourse (intermittent)
- Watercourse (ephemeral)
- Water Quality Regional Assessment
- Water Quality Local Assessment
- Waterbody

StrataGold Corporation

0 2.5 5
Kilometres
Scale = As Shown

Projection: NAD83 UTM Zone 8N	Drawn By: SS	EAGLE GOLD PROJECT YUKON TERRITORY
Date: XXX	Figure: 5.1-1	Baseline Water Quality LAA and RAA



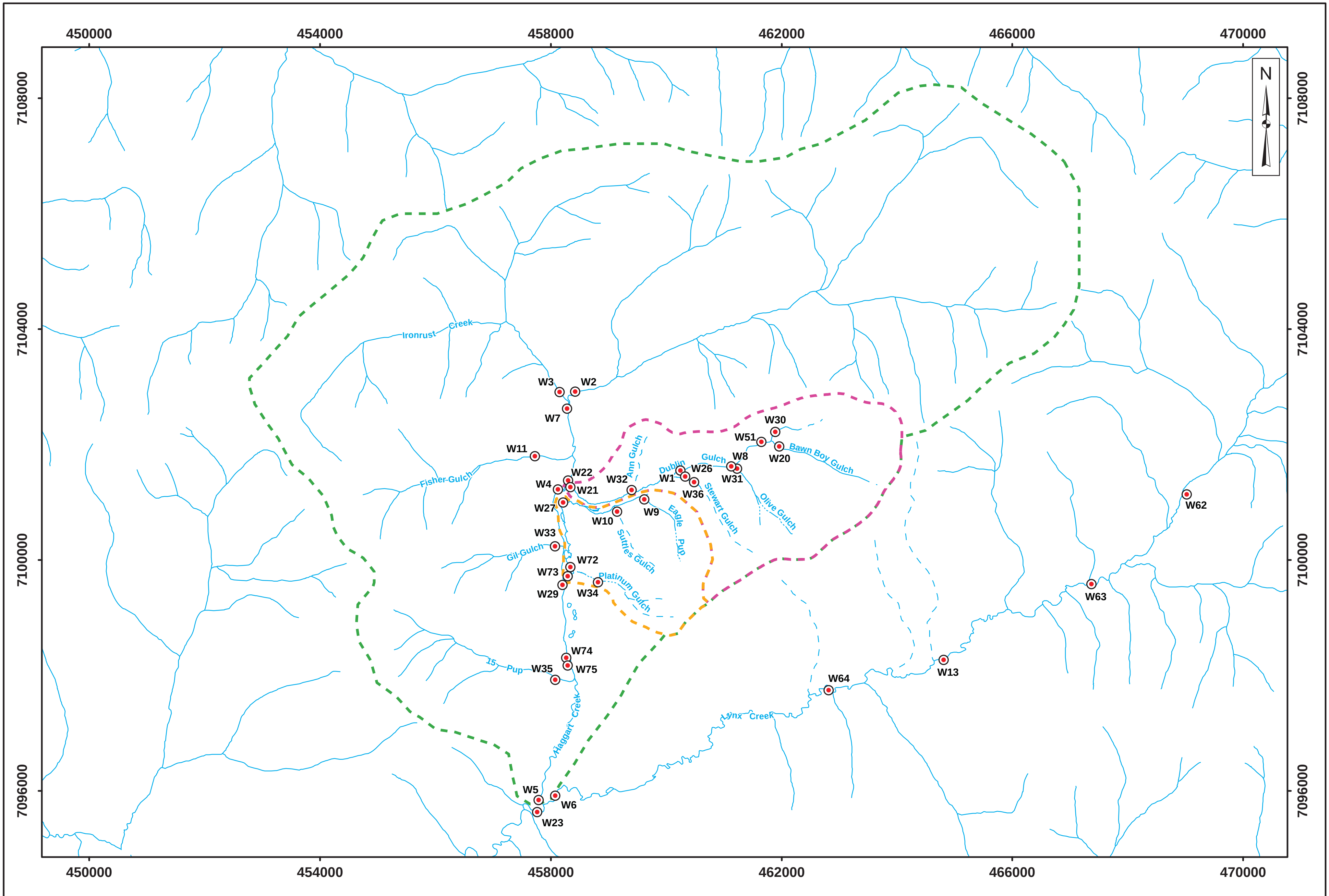
Legend:

- Water Survey Site
- Watercourse (perennial)
- Watercourse (intermittent)
- Watercourse (ephemeral)
- Contour (100ft)
- Waterbody

StrataGold Corporation

0 0.75 1.5
Kilometres
Scale = As Shown

Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
NAD83 UTM Zone 8N	SS	
Date:	Figure:	Surface Water Quality Monitoring Stations
XXX	5.1-2	



Legend:

- Aquatic Biota Monitoring Site
- Watercourse (perennial)
- Watercourse (intermittent)
- Watercourse (ephemeral)
- Eagle Creek Basin Boundary
- Dublin Gulch Basin Boundary
- Upper Haggart Creek Basin Boundary
- Waterbody

StrataGold Corporation

0 0.5 1 1.5 2
Kilometres
Scale = As Shown

Projection: NAD83 UTM Zone 8N	Drawn By: SS	**EAGLE GOLD PROJECT YUKON TERRITORY**
Date: 2014/03/26	Figure: 5.2-1	**Aquatic Biota Monitoring Sites**

6 GROUNDWATER

The LSA for hydrogeology is the same as that described above for hydrology. Hydrogeologic baseline characterization studies conducted from 2009 to 2012 are described and summarized in Stantec (2011a and 2012c) and BGC (2013a). Previous hydrogeologic investigations conducted in 1995 and 1996 (GeoViro 1996 and Knight Piesold 1996a, 1996b, and 1996c) are also summarized in Stantec (2011a and 2012c) and BGC (2013a). Material property data available for the Project comprises results of packer tests, slug tests and pumping tests from drilled bore holes and wells at site. Hydraulic head data (instantaneous and continuous[1]) has been collected from 104 monitoring wells, standpipe piezometers, vibrating wire piezometers, and aquifer test wells located across eight different sub-basins that include Bawn Boy Gulch, Olive Gulch, Stewart Gulch, Eagle Pup, Suttles Gulch, Platinum Gulch, Dublin Gulch, and Ann Gulch. In addition, since 2009 water quality data has been collected on a regular basis from 18 of the site monitoring wells in these same sub-basins. The groundwater level and groundwater quality data collection program that began in 2009 is still on-going.

The data obtained has been used to identify local groundwater recharge and discharge zones, groundwater flow patterns, characterize groundwater quality and to conduct a numerical hydrogeological model (BGC, 2014).

6.1 HYDROGEOLOGIC SETTING

There are two principal water-bearing units in the LSA: deeper relatively low permeability bedrock and the near-surface moderately permeable surficial deposits. Surficial material at the Project site consists of a thin veneer of organic soils underlain by colluvium (i.e., a loose heterogeneous mass of soil material), glaciofluvial (i.e., originating from rivers associated with glaciers) deposits, or till (a glacial deposit). Below these clastic (or transported broken fragments of rock) units are either metasedimentary or granodiorite bedrock, which is deeply weathered in places. The elongated granodiorite stock (ore bearing unit) has intruded the surrounding host metasediment. The surficial material thickness and physical properties varies significantly throughout the area. Recorded depths to bedrock in the Project area range from 0 m to greater than 20 m.

The Dublin Gulch valley contains large amounts of fluvial (i.e., river deposited) materials that were considerably reworked by placer mining operations. Extensive stockpiles of placer deposits comprised of sub-rounded metasediment and granodiorite clasts, ranging in size from sands to boulders, and fine-grained material (i.e., that are located in former placer settling ponds) are present adjacent to the Dublin Gulch and Eagle Creek watercourses. A till blanket covered with a colluvial veneer is located along the south valley wall in Dublin Gulch valley and extends southward in the Haggart Creek valley. A recent alluvial (i.e., a water-laid clastic deposit) fan is present where Dublin Gulch meets Haggart Creek. Discontinuous permafrost is also present, especially on the north-facing slopes and affects the connectivity between the deep and shallow water-bearing zones in places.

[1] In addition to the four to five months in 2010, continuous hydraulic head has been collected from nine wells since May 2011

Further details of the spatial distribution and characteristics of these materials are found in Stantec (2010d) and BGC (2014).

6.2 GROUNDWATER OCCURRENCE

Generally groundwater has been observed deeper (approximately >6 m below ground) at higher elevations and shallow to artesian in lower elevations and in valley bottoms. Springs and seeps have been observed in a few locations where valley bottoms have narrowed. These are typically associated with the re-emergence of a stream from channel deposits (i.e., a gaining reach). In these instances (e.g., Eagle Pup, Stewart Gulch), thin alluvium overlying shallow bedrock is the likely cause of the emergence. Groundwater levels within the lower Dublin Gulch valley have been observed to have seasonally delayed trends due to higher groundwater levels during spring freshet and/or associated with rainstorms and lower groundwater levels during dry summer periods.

Groundwater elevation data from the 2009, 2010, 2011, and 2012 groundwater monitoring periods exhibit common seasonal trends in all monitored locations, characterized by relatively high water levels corresponding to spring freshet and fall precipitation events, and relatively low water levels related to dry summer and frozen winter conditions. Small but discernible responses to precipitation events were observed in all monitoring well records.

Hydraulic head observations were available from 24 vibrating wire piezometers (VWP) installed at 13 locations and 79 monitoring wells, pumping wells or standpipe piezometers installed between 1995 and 2012, for a total of 104 measurement locations (Figure 6.2-1). Dataloggers were installed at 16 of the VWPs (8 locations) and at nine of the monitoring wells. Data collection at a portion of these locations is still ongoing, both manually and with dataloggers.

Based on the available data, the water table is generally shallow (within 10 m of ground surface) at low elevations near the valley bottoms and along creeks and gulches. At ridge tops within the Project area the water table is typically deeper with measured water depths up to 40 m below ground surface. The interpreted piezometric surface appears to generally mimic the surface topography.

The measured values indicate that seasonal fluctuations in groundwater elevation range from less than 2 m near creeks (e.g., MW10-DG6, MW09-DG4, VWP nest BH-BHC11-68), gulches and at low elevations in the valleys, and up to 4 to 15 m in higher elevation ridges (e.g., MW96-9b, VWP nest BH-BGC11-73).

Continuous head data indicate that groundwater elevations decline through the winter and spring (i.e. November to April), and are highest during the summer and fall quarter (i.e. June to September). The seasonal variation in groundwater levels is consistent with the seasonal precipitation and temperature trends.

6.3 GROUNDWATER FLOW

Groundwater flow in the bedrock occurs in fractures and fault zones, while preferentially flowing through more permeable (and porous) sediments within the surficial deposits. General orientation of groundwater flow contours mimic the topography of the site as groundwater flows from the highest areas to lowest. Throughout most of the LSA the groundwater divides of each sub-basin approximately coincide with the surface water divides (i.e., groundwater from the Eagle Pup and Suttles Gulch drain to Eagle Creek, while groundwater from

Ann and Stewart Gulch Basins drain to Dublin Gulch). In the lower Dublin Gulch valley the groundwater divide between the Eagle Creek and Dublin Gulch basins in the placer tailings is not clearly defined. Field observations suggest that at times the divide migrates across the valley so that groundwater from the Dublin Gulch basin may flow towards Eagle Creek. This shifting is seasonal and also due in part to the variability in the timing of the freshet and/or rainfall events across the entire watershed.

Groundwater recharge occurs at higher elevations throughout the Dublin Gulch-Eagle Creek drainage basin and ultimately discharges to surface water (in some cases as seeps and springs) at lower elevations in the valley or directly to surface streams, or ultimately into Haggart Creek. The main groundwater flow in conjunction with the highest groundwater elevations is expected to occur during the snowmelt in late spring (e.g., May to June) after thawing of the shallow sediment.

Data is available for 11 nested well pairs or VWP nests of 2 to 3 piezometers at the site. Two VWP nests are installed in the lower reaches of Dublin Gulch where upward or near neutral gradients are observed. Several of the VWP nests and well pairs are installed at high elevations in the upper reaches of Bawn Boy, or in the Open Pit area and a mix of near neutral, downward and upward gradients are observed. The gradient plots for BH-BGC11-68, BH-BGC11-70, and BH-BGC11-73 indicate both positive and negative gradients exist within the same profile, which may be due to anisotropy within the bedrock, and/or possible fracture controls on groundwater flow.

6.4 SURFACE WATER - GROUNDWATER CONNECTIVITY

Base flow values represent the groundwater contributions to streams. Groundwater contributes to stream flows where the groundwater table elevation intersects the ground surface, typically these intersections are located in stream channel inverts (e.g., Eagle Pup appears in mid-channel where the valley is well confined by bedrock); however, they also appear as seepage from slopes within the placer deposits of the lower Dublin Gulch valley. Groundwater from the lower Dublin Gulch valley likely contributes a measureable portion of the baseflow to Haggart Creek. The baseflow contributions to the streams maintain flow in the larger creeks during the drier months of the year (including winter flows). The connectivity between surface water and groundwater is described and evaluated in detail in the numerical hydrogeologic model.

6.5 GROUNDWATER FLOW PROPERTIES

During both the 1995 – 1996 and 2009 – 2012 field programs, hydraulic recovery tests were performed in monitoring wells completed in both the bedrock and surficial deposits to estimate hydraulic conductivity (or the ease with which water can move through pore spaces or fractures in saturated rock). Hydraulic conductivities ranged from 10^{-3} m/s to 10^{-7} m/s in the surficial material, and from 10^{-5} m/s to 10^{-8} m/s in the bedrock. The hydraulic conductivity of the colluvial, alluvial, and till deposits was generally higher than that of the placer material, and the variable hydraulic conductivity seen in the bedrock is typical of fractured crystalline rock, which showed decreasing hydraulic conductivity with depth. The test data did not demonstrate a measureable difference in the hydraulic conductivities of granodiorite and metasedimentary rock. This suggests that the flow properties of both rock types are similar.

The bedrock hydraulic conductivity dataset includes over 80 packer tests and slug tests conducted in over 50 boreholes and six pumping tests; two 24-hour duration tests carried out in the Open Pit area and in the upper reaches of Bawn Boy Gulch in 1996 (GeoViro, 1996), two pumping tests (a 7-day test in the lower Dublin Gulch valley and a 5-day test in the Open Pit area) carried out in 2011 (BGC, 2012e and 2012f), and a 10-day test in the lower Dublin Gulch valley in 2012 (BGC, 2013b). Results of the pumping tests are typically considered to be more representative of the larger scale (bulk) hydraulic conductivity of the rock mass. Results of the two GeoViro pumping tests at MW96-11 and MW96-19, conducted at depths less than 55 m yielded hydraulic conductivity values ranging from $3x10^{-7}$ m/s to $5x10^{-7}$ m/s. Mean results of the two pumping tests conducted in 2011 by BGC were $8x10^{-6}$ m/s in the lower valley (at PW-BGC11-01) and $9x10^{-8}$ m/s in the Open Pit area (at PW-BGC11-02) at depths up to 100 m and 140 m below ground, respectively. Results from the 2012 testing of PW-BGC12-04 in the lower Dublin Gulch valley bedrock aquifer are about an order of magnitude higher ($9.0x10^{-5}$ m/s) than results from 2011 testing; however, these results are specific to an 18 m thick zone targeted by the well, whereas the 2011 well was tested over a thicker (37 m) zone.

Generally, the hydraulic conductivity of the intrusive units and metasediments is similar and tends to decrease with depth, although considerable variation in results is apparent for each unit at any given depth. The general trend of decreasing hydraulic conductivity is common in bedrock settings as described by Rutqvist and Stephansson (2003).

6.6 GROUNDWATER QUALITY

The groundwater quality data suggests that the chemical composition of groundwater in the LSA depends on the local and up gradient rock-types. Groundwater quality data were collected in 1995, 1996, 2009, 2010, 2011 and 2012 for many areas of the site including in Eagle Pup, Dublin, Suttles, Ann, Stewart, Olive, Bawn Boy and Platinum Gulches. The parameters analyzed included dissolved and total metals, nutrients, anions and other general parameters. All groundwater quality data were compared to Federal, Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the protection of Aquatic Life (CCME 2007), and to the British Columbia Contaminated Sites Regulation (CSR) Schedule 6 Generic Numerical Water Standards for the protection of Freshwater Aquatic Life (British Columbia Ministry of Environment [BCMOE] 2006).

The following parameters exceeded the CCME and/or CSR guidance parameters in the Project area: aluminum, arsenic, cadmium, copper, iron, lead, molybdenum, nickel, selenium, silver, and/or zinc. The CSR guideline values apply to both surface and groundwater, whereas the CCME guidelines only apply to surface water. However, as groundwater ultimately discharges to surface water bodies, the CCME guideline values are included here for reference.

The groundwater samples were classified based on their major ion chemical composition, taking into account the major anions and cations. Calcium is the dominating cation in most groundwater samples from the site; however, some sampling locations magnesium concentrations exceeded calcium. Carbonate was the dominating anion in all samples, and was particularly high in some samples.

Comparison of 2011–2012 groundwater quality data to current Yukon CSR AW standards identified dissolved arsenic exceedances in all Project sub-basins. Arsenic concentrations in Ann Gulch (MW10-AG5), Suttles Gulch (MW09-STU2) and Eagle Pup (MW96-13b) were 3 to 70 times higher than the CSR AW standard; whereas, arsenic concentrations in Platinum Gulch (MW10-PG1 and MW96-23) were 160 to 200 times higher than the CSR AW standard.

The highest dissolved arsenic concentrations reported in the LSA during 2011–2012 occurred consistently in Platinum Gulch monitoring well MW10-PG1 and ranged from 7.98 mg/L (November 2011) to 9.62 mg/L (December 2012). These concentrations were approximately two times higher than dissolved arsenic values reported in Dublin Gulch MW09-DG6, which ranged from 0.938 mg/L to 3.64 mg/L during 2011–2012, and approximately ten to one hundred times higher than concentrations reported in all other LSA sub-basins.

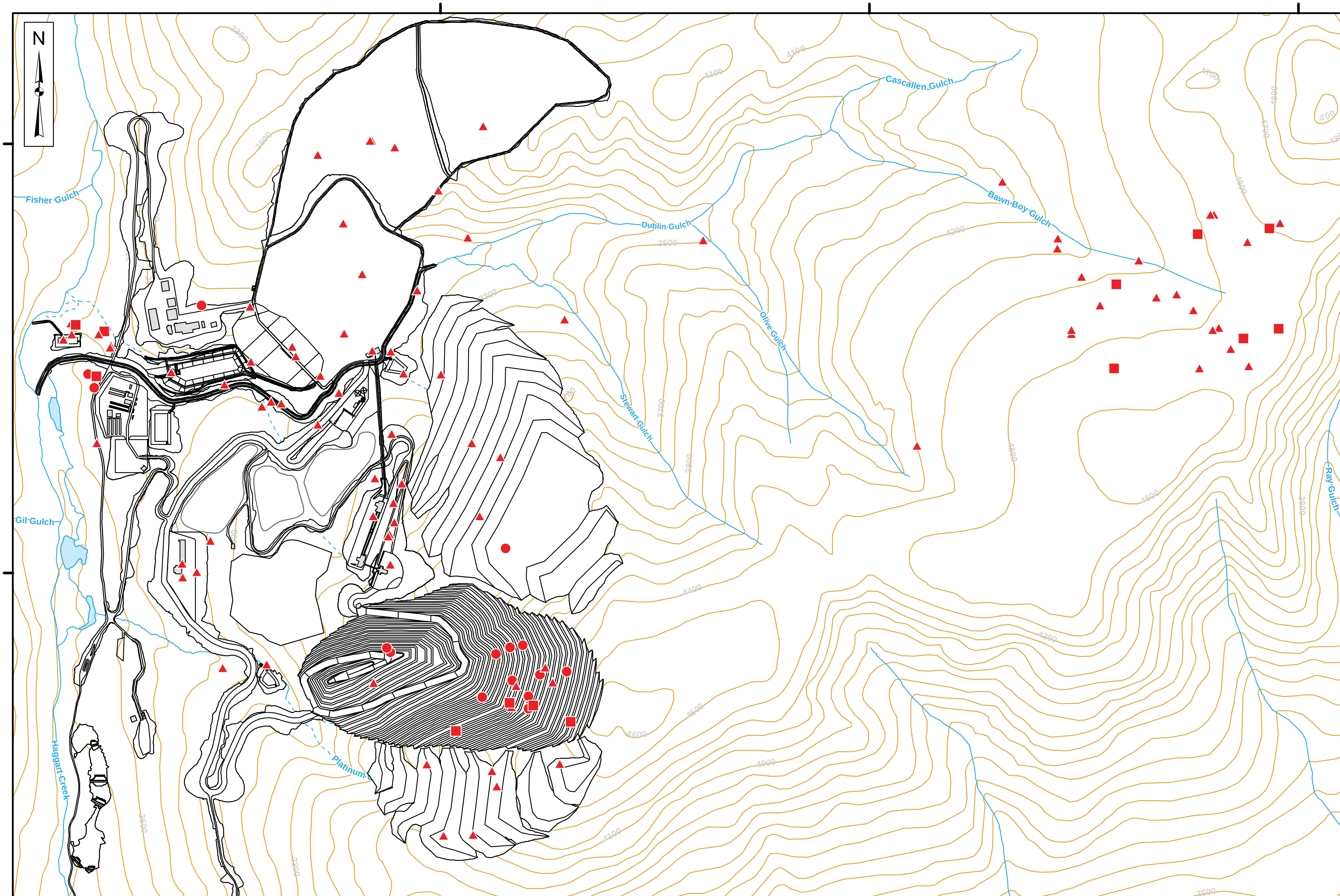
Dissolved cadmium concentrations in all 2011 and 2012 samples from MW10-AG5 exceeded the CSR AW standard and either exceeded or approached the dissolved zinc standard. Both parameters exhibited relatively little variation, ranging from 0.00118 mg/L to 0.00175 mg/L (dissolved cadmium) and 0.105 mg/L to 0.104 mg/L (dissolved zinc). Exceedances of either the dissolved cadmium or the dissolved zinc CSR AW standard were not reported in other LSA monitoring wells during the 2011-2012 sampling program.

Discernible seasonal trends, variations or correlations were not apparent in 2011-2012 groundwater chemistry data for parameters exceeding the CSR AW standard (i.e., arsenic, cadmium and zinc) or parameters present at concentrations below the CSR AW standards.

No discernible correlations were interpreted between dissolved metals and geological strata. CSR AW dissolved arsenic exceedances were reported in monitoring wells screened in both unconsolidated sediments and bedrock. Dissolved metals concentrations were generally highest in bedrock monitoring wells; however, an exception was Suttles Gulch monitoring well MW09-STU2, which reported several dissolved metals parameter concentrations exceeding those reported for bedrock monitoring wells MW96-23 (Platinum Gulch) and MW96-13b (Eagle Pup Gulch).

The exceedances do not imply that the groundwater at the site is currently contaminated; only that background concentrations of these parameters are higher than typically found in other natural sites in Canada, and merely reflect the natural geologic and hydrogeologic conditions within these specific areas of the LSA.

Comparison of the multiple years of groundwater data indicated that groundwater quality parameters were generally in the same range and that seasonal trends were not apparent over the years sampled.



Legend:

Pumping Well	Watercourse	Watercourse (diverted)
Standpipe Piezometer	Contour (50ft)	Building
Vibrating Wire Piezometers	Watercourse	Waterbody

StrataGold Corporation

0 250 500
Metres
Scale = As Shown

Projection: NAD83 UTM Zone 8N

Drawn By: SS

Date: 2014/03/26

Figure: 6.2-1

EAGLE GOLD PROJECT
YUKON TERRITORY

Site Plan with Ground Water Monitoring Locations

7 FISH AND FISH HABITAT

Baseline fish and fish habitat information was gathered from existing consultant reports, government databases, and the results of field studies conducted for the Project prior to SGC's claim ownership. Field studies were completed for watercourses located within the local Project area to obtain biophysical habitat data, determine fish presence and abundance, and characterize fish populations (i.e., size, age, and tissue metal concentrations). The fish and fish habitat study area includes:

- All watercourses in the Dublin Gulch watershed and lower Haggart Creek (below Dublin Gulch)
- Reference watercourses that would be uninfluenced by flows from the Dublin Gulch watershed (i.e., Ironrust Creek, Lynx Creek, and upper Haggart Creek [above Dublin Gulch])
- All watercourses that are crossed by or approach within 30 m of the site access road, which parallels Haggart Creek.

Although placer mining has occurred throughout the upper Haggart Creek watershed, including Dublin Gulch, it has not occurred in two of the selected reference watercourses: Ironrust and Lynx Creeks.

Field studies within the study area were completed over four sampling periods (August 2007, October 2007, April 2008, and July 2009) and included 59 sample sites, located on 28 mapped or field identified watercourses (Figure 7.1-1 to 7.1-3). Results from the 2007-2009 Environmental Baseline Report: Fish and Fish Habitat are provided in Stantec (2010e).

Sampled watercourses were characterized as fish-bearing unless:

- Fish were not captured, despite the application of appropriate capture methods, during at least two different sampling periods
- The watercourse had physical characteristics that could explain fish absence (i.e., gradient >20% or a permanent barrier to upstream fish passage where no perennial fish habitat exists upstream of the barrier).

Fish density per unit area was estimated for fish-bearing sites sampled in Dublin Gulch, Ironrust Creek, Lynx Creek, and a subset of sites in Haggart Creek, using electrofishing via multiple pass removal methods.

7.1 WATERCOURSE FISH-BEARING STATUS

Of the 26 watercourses sampled in the study area, 14 were identified as fish-bearing or potentially fish-bearing and 12 were as non-fish-bearing (Table 7.1-1). The 14 fish-bearing watercourses were:

- Haggart Creek, lower reaches of Dublin Gulch, and the lower reaches of Eagle Pup (including a pond created for historic placer mining operations and its tributary stream)
- Two watercourses sampled as reference watercourses—Lynx Creek and Ironrust Creek
- Nine additional watercourses crossed by the site access road including: North Star, Bighorn, Cadillac, and Secret creeks; the South McQuesten River, one unnamed tributary of Haggart Creek, and two unnamed tributaries of the South McQuesten River.

A summary of the data collected for all identified fish-bearing watercourses is presented in Table 7.1-2. The 12 watercourses identified as non-fish-bearing were as follows:

- Two watercourses with barriers to upstream fish passage—Upper Dublin Gulch (a gradient barrier located 1.5 km upstream of the confluence with Haggart Creek) and Upper Eagle Pup (a perched culvert located 1.9 km upstream of the confluence with Haggart Creek)
- Six tributaries to the non-fish-bearing upper reaches of Dublin Gulch and Eagle Pup—Suttles Gulch, Ann Gulch, Bawn Boy Gulch, Stewart Gulch, Olive Gulch, Cascallen Gulch
- Four watercourses with fish passage barriers that were located outside the Dublin Gulch and Eagle Pup watersheds: Platinum Gulch and three un-named watercourses crossed by the access road (sample site numbers RC1, RC13, and RC16).

Table 7.1-1: Summary of Biophysical Habitat Characteristics for Fish-bearing Watercourses

Watercourse (Site)	Mean Channel Width (m)	Mean Residual Pool Depth (m)	Mean Gradient (%)	Substrate (dominant/ subdom.)	Total Cover	Fish Species Captured or Observed
Reference Watercourses						
Ironrust Creek (IR2)	4.1	0.13	4	C, G	M	GR, CCG
Lynx Creek (L1, L4)	6.0 - 8.0	0.39 - 1.14	1	G, C	M - A	GR, CCG
Dublin Gulch, Haggart Creek, and Eagle Pup Watercourses						
Dublin Gulch - below gradient barrier (DG1, DG1.1, DG1.2, DG1.3)	3.6 – 7.9	0.1 – 0.31	4 – 9	C, B	M – A	GR, CCG
Eagle Pup Placer Pond 1	N/A	N/A	N/A	N/A	N/A	GR, CCG
Tributary to Eagle Pup Placer Pond 2	0.75	0.05	12	C, F	A	CCG
Eagle Pup Placer Pond 2	N/A	N/A	N/A	N/A	N/A	GR
Haggart Creek (HC1)	11.3	0.78	3	C, G	N/A	GR, CCG
Haggart Creek (HC2)	9.2	0.2	2	C, G	N/A	GR, CCG
Haggart Creek (HC3)	6.47	0.63	2	C, B	A	GR, CCG
Haggart Creek (HC4)	8.2	0.11	2.5	C, B	M	NFS
Haggart Creek (HC5)	17.7	0.63	1	F, G	M	GR,CCG, BB
Road Encroachment						
Haggart Creek Road Encroachments (RE1-RE12)	8.2 – 19.8	0.08 – 0.8	1 – 3	C, G	T – A	NFS
Watercourses Crossed by the Access Road						
Unnamed Wetland Crossed by Culvert (RC3)	–	–	0	O, F	A	NFS
Haldane Creek (RC5)	6.65	0.43	2	C, G	A	GR
North Star Creek (RC6)	0.98	0	0.5	O, F	A	NFS
Unnamed Wetland Crossed by Culvert (RC8)	–	–	0	O, F	M	NFS

Watercourse (Site)	Mean Channel Width (m)	Mean Residual Pool Depth (m)	Mean Gradient (%)	Substrate (dominant/ subdom.)	Total Cover	Fish Species Captured or Observed
Bighorn Creek (RC 10)	2.6	0.37	3.5	C, G	A	NFS
South McQuesten River (RC11)	38.8	1.08	1	G, F	A	CH, GR, BB, CCG, LSU
Cadillac Creek (RC12)	8.4	0.1	8	C, G	T	NFS
Secret Creek (RC14)	28.6	0.4	1	F, O	T	GR
Unnamed Culvert (RC15)	1.2	0.05	2	F, O	T	NFS
Haggart Creek (RC24)	12	0.18	2	C, G	T	GR

Table 7.1-2: Summary of Biophysical Habitat Characteristics for Fish-bearing Watercourses

Watercourse (Site)	Mean Estimated Arctic Grayling Density (standard error) fish/100m^2	Mean Estimated Slimy Sculpin Density (standard error) fish/100m^2	Spawning Habitat Quality	Rearing Habitat Quality	Over wintering Habitat Quality
Reference Watercourses					
Ironrust Creek (IR2)	0.2 (-)	0.7 (-)	Moderate	Good	Poor
Lynx Creek (L1, L4)	1.0(0.3)	1.9 (-)	Moderate - Good	Good - Excellent	Moderate - Excellent
Dublin Gulch, Haggart Creek, and Eagle Pup Watercourses					
Dublin Gulch - below gradient barrier (DG1, DG1.1, DG1.2, DG1.3)	2.2 (0.15)	1.5 (-)	Poor	Moderate	Poor
Eagle Pup Placer Pond 1	N/A	N/A	Poor	Moderate	Poor
Tributary to Eagle Pup Placer Pond 2	N/A	N/A	Poor	Moderate	Nil
Eagle Pup Placer Pond 2	N/A	N/A	Poor	Moderate	Poor
Haggart Creek (HC1)	4.5 (-)	6.0 (-)	Moderate	Excellent	Good
Haggart Creek (HC2)	0.4 (-)	4.3 (-)	Moderate	Moderate	Moderate
Haggart Creek (HC3)	1.1 (-)	a	Moderate	Excellent	Good
Haggart Creek (HC4)	N/A	N/A	Nil	Poor	Nil
Haggart Creek (HC5)	N/A	N/A	Moderate	Moderate	Poor
Road Encroachment					
Haggart Creek Road Encroachments (RE1-RE12)	N/A	N/A	Good	Good – Excellent	Poor – Excellent
Watercourses Crossed by the Access Road					
Unnamed Wetland Crossed by Culvert (RC3)	N/A	N/A	Nil	Poor	Nil
Haldane Creek (RC5)	N/A	N/A	Good	Excellent	Good

Watercourse (Site)	Mean Estimated Arctic Grayling Density (standard error) fish/100m^2	Mean Estimated Slimy Sculpin Density (standard error) fish/100m^2	Spawning Habitat Quality	Rearing Habitat Quality	Over wintering Habitat Quality
North Star Creek (RC6)	N/A	N/A	Nil	Good	Good
Unnamed Wetland Crossed by Culvert (RC8)	N/A	N/A	Nil	Poor	Nil
Bighorn Creek (RC 10)	N/A	N/A	Good	Excellent	Moderate
South McQuesten River (RC11)	N/A	N/A	Excellent	Excellent	Excellent
Cadillac Creek (RC12)	N/A	N/A	Poor	Poor	Nil
Secret Creek (RC14)	N/A	N/A	Good	Moderate	Moderate
Unnamed Culvert (RC15)	N/A	N/A	Nil	Poor	Nil
Haggart Creek (RC24)	N/A	N/A	Excellent	Moderate	Poor

NOTES:

O = organics
——— = not applicable
GR = Arctic grayling
T = trace (<5%)
C = cobble
B = boulder

A = abundant (>20%)
F = fines
N/A = data not available
CCG = slimy sculpin
BB = burbot
LSU = longnose sucker

CH = Chinook salmon
M = moderate (5-20%)
G = gravel
NFS = no fish sampling
a = estimates could not be calculated from catch data

7.2 FISH SPECIES DISTRIBUTION

At least 11 fish species are known to occur in the South McQuesten River watershed, including Chinook salmon (*Oncorhynchus tshawytscha*), Arctic grayling (*Thymallus arcticus*), northern pike (*Esox lucius*), longnose sucker (*Catostomus catostomus*), Arctic lamprey (*Lampetra camtschatica*), burbot (*Lota lota*), slimy sculpin (*Cottus cognatus*), round whitefish (*Prosopium cylindraceum*), inconnu (*Stenodus leucichthys*), lake whitefish (*Coregonus clupeaformis*), and rainbow trout (*Oncorhynchus mykiss*) (DFO 2010). No freshwater fish species on Schedules 1 or 2 of the Federal *Species at Risk Act* (SARA) are present in the South McQuesten River watershed or the entire Yukon Territory (Government of Canada 2012). Haggart and Lynx creeks are both known to contain five fish species: Chinook salmon, Arctic grayling, round whitefish, burbot, and slimy sculpin (DFO 2010). Ironrust Creek, Dublin Gulch and Eagle Pup are known to be inhabited by Arctic grayling and slimy sculpin (Hallam Knight Piésold 1996b, DFO 2010).

The field program for this Project captured five fish species from ten different watercourses (Table 7.1-1). Arctic grayling were captured in nine watercourses and slimy sculpin were captured in seven. Burbot were captured in the South McQuesten River and lower Haggart Creek. Chinook salmon and longnose sucker were observed in the South McQuesten during the July 2009 snorkel survey.

Previous studies reported the presence of Chinook salmon (*Oncorhynchus tshawytscha*) in Haggart and Lynx creeks (Madrone 2006; Hallam Knight Piésold 1995, 1996b, 1996c; DFO 2010). In the 2007 to 2009 Dublin Gulch sampling programs, Chinook salmon were not captured at any of the Haggart and Lynx creek sites. Previous studies also reported the presence of Chinook salmon in the South McQuesten River, which was confirmed by the sighting of juvenile Chinook (est. age 1+) during a snorkel survey of the South McQuesten River at the access road crossing on July 23, 2009. No adult Chinook spawners or evidence of spawning were observed in the South McQuesten River during the July 2009 survey. However, Chinook spawners were observed in August 2009 adjacent to the South McQuesten River Bridge immediately downstream of the mouth of Haggart Creek by Stantec personnel (Gardner 2010, pers. comm.).

7.3 FISH RELATIVE ABUNDANCE

Arctic grayling and slimy sculpin were the only species caught during electrofishing depletion surveys, which were completed in Ironrust Creek, Haggart Creek, Lynx Creek, and in Dublin Gulch. Both species were present in low densities in these watercourses. There were no consistent differences in estimated Arctic grayling densities among the waterbodies sampled.

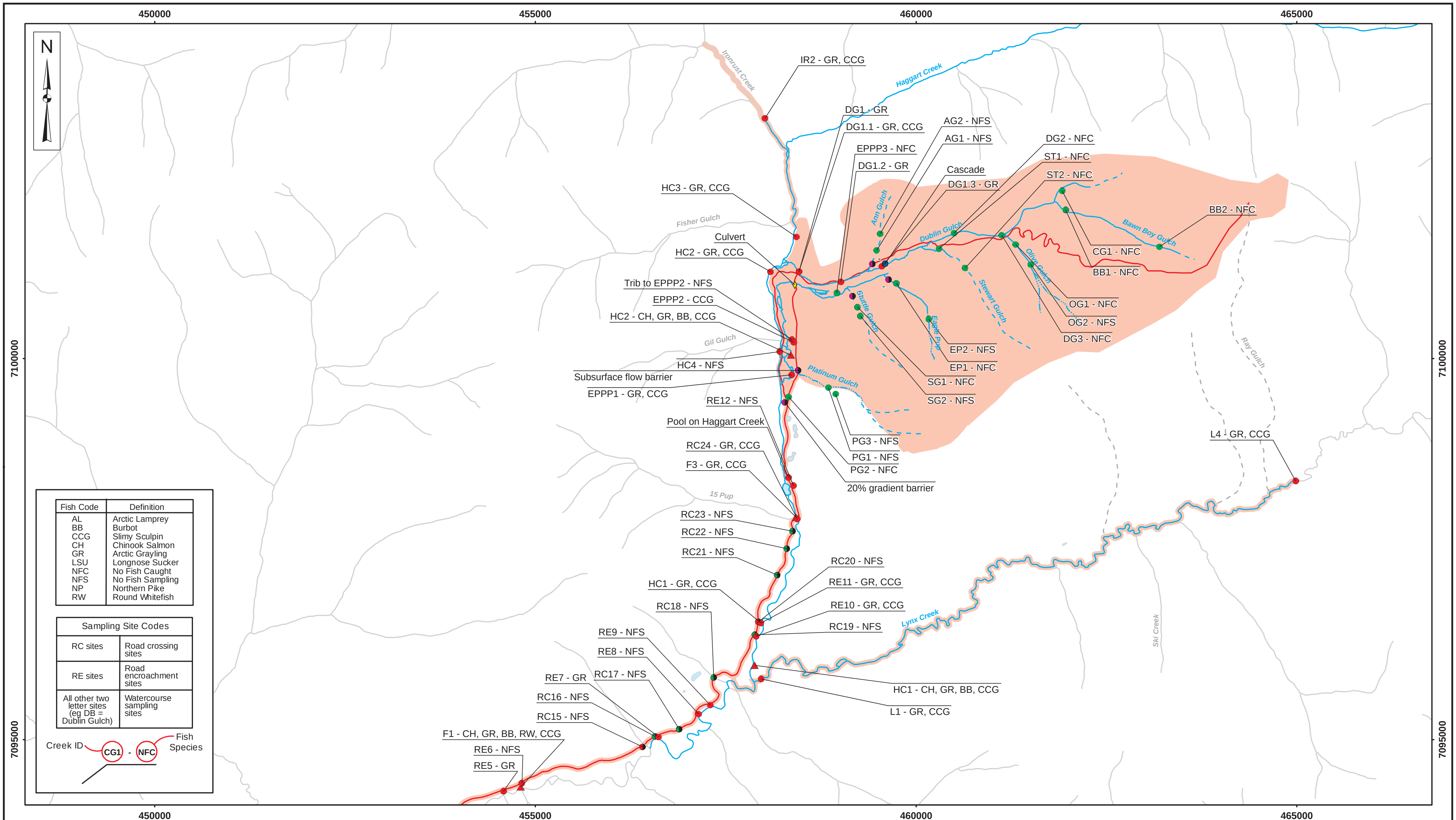
7.4 HABITAT USAGE

The majority of Arctic grayling in the Project area are thought to overwinter in the South McQuesten River and migrate into Haggart Creek and its tributaries to rear during summer (Pendray 1983). The summer migration into Lynx Creek has been observed to occur during June and early July (Pendray 1983). The timing of outmigration to overwintering areas has not been observed for the Project Area; however, baseline assessment for this Project demonstrated that densities of Arctic grayling in Dublin Gulch were similar during July, August, and October, even though anchor ice was beginning to form on the stream margins during the October sampling program. This suggests that significant outmigration may not occur from Dublin Gulch until after October.

The documented capture of juvenile Arctic grayling in Haggart Creek during May, at a location 19 km upstream from the South McQuesten River (Pendray 1983), suggests that some Arctic grayling may overwinter in the Haggart Creek watershed. The baseline assessment documented potential overwintering habitat (i.e., with residual pool depth ≥0.8 m) at sample sites in Lynx and Haggart creeks (Table 7.1-2). Furthermore, a large number of Arctic grayling were captured from a large pool on Haggart Creek in April 2008 (i.e., after freeze up but before breakup). It is assumed that this unnaturally large pool (1 ha in area and over 10 m deep) was created by placer mining operations and was not present during fish studies conducted in the early 1980's (Pendray 1983) or 1996 (Hallam Knight Piésold 1996b, 1996c). This pool created by placer mining and the South McQuesten River likely represent important overwintering habitat for Arctic grayling in the study area. The quality of potential overwintering habitat in fish-bearing streams within the Project footprint (i.e., Dublin Gulch and Eagle Pup) is poor (Table 7.1-2) due to residual pool depths ≤0.3 m that most likely freeze to the bottom in winter.

Pendray (1983) observed that spawning by Arctic grayling in this region occurred predominantly in the South McQuesten River during the last two weeks of May. He also identified a small area at the mouth of Haggart Creek as a probable spawning site. Since spawning occurs in late May, immediately after ice breakup, Arctic grayling that winter in the Haggart Creek watershed might also spawn in the Haggart watershed. The baseline fisheries assessment for the Project identified areas of good to excellent quality potential spawning habitat for Arctic grayling—with modest currents (0.5 – 1.0 m/s), depths of 0.1 – 0.4 m, and 2 – 4 cm diameter gravel (McPhail 2007)—in Lynx, Haldane, Secret, and Haggart creeks. The quality of potential spawning habitat provided by Dublin Gulch and Eagle Pup within the mine site footprint was poor, primarily due to lack of suitable gravel (Table 7.1-2).

As the majority of Arctic grayling in the study area are thought to overwinter and spawn in the South McQuesten River (Pendray 1983), Arctic grayling primarily use study area streams as summer rearing habitat. Good to excellent rearing habitat was present at sample sites in the South McQuesten River, Bighorn Creek, Haggart Creek, Haldane Creek, Lynx Creek, Ironrust Creek, and North Star Creek (Table 7.1-2). The quality of potential rearing habitat provided by the fish-bearing streams Dublin Gulch and Eagle Pup was moderate (Table 7.1-2), primarily due to lack of cover, high stream gradients, or insufficient channel depths.



LEGEND

Hallam Knight Piesold Ltd. Sampling (1996)
- Fish bearing
- Non fish bearing

Stantec Sampling
- Fish bearing
- Fish bearing (inferred)
- Non fish bearing
- Non fish bearing (inferred)
- Cascade barrier
- Culvert barrier
- Gradient barrier

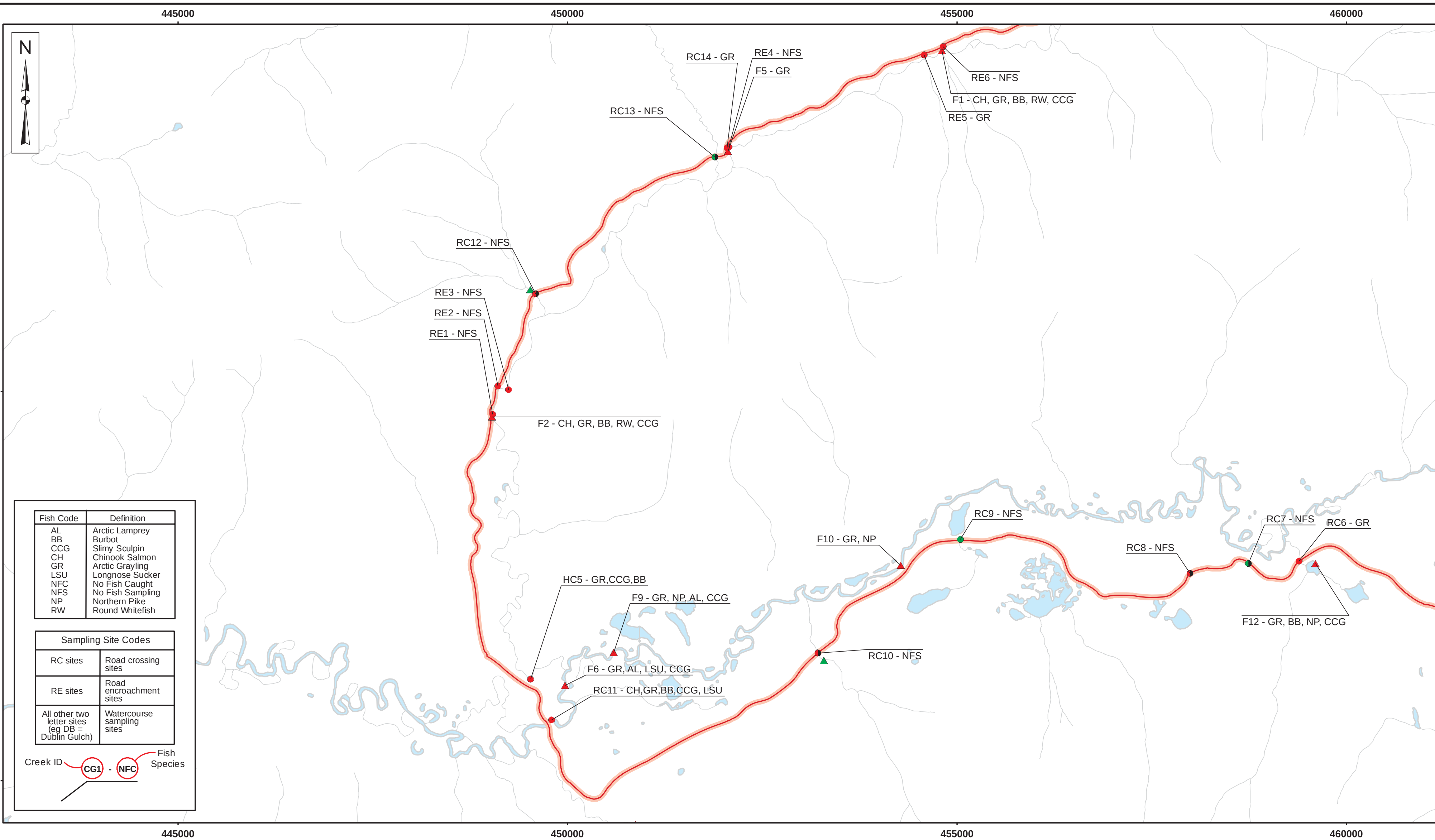
Watercourse
- Fish bearing (perennial)
- Non-fish bearing (perennial)
- Non-fish bearing (intermittent)
- Non-fish bearing (ephemeral)
- Unsampled (perennial)
- Unsampled (ephemeral)

- Fish and Fish Habitat Local Study Area
- Road - Gravel
- Waterbody

StrataGold Corporation

0 1 2
Kilometres
Scale = As Shown

PROJECTION	DRAWN BY	EAGLE GOLD PROJECT YUKON TERRITORY
NAD83 Zone 8N	SS	
DATE	FIGURE	FISH AND FISH HABITAT STUDY AREA SHEET 1 OF 3
2014/03/26	7.1-1	



Fish Code	Definition
AL	Arctic Lamprey
BB	Burbot
CCG	Slimy Sculpin
CH	Chinook Salmon
GR	Arctic Grayling
LSU	Longnose Sucker
NFC	No Fish Caught
NFS	No Fish Sampling
NP	Northern Pike
RW	Round Whitefish

Sampling Site Codes	
RC sites	Road crossing sites
RE sites	Road encroachment sites
All other two letter sites (eg DB = Dublin Gulch)	Watercourse sampling sites

Creek ID CG1 - NFC Fish Species

LEGEND

Hallam Knight Piesold Ltd. Sampling (1996)
- Fish bearing
- Non fish bearing

Stantec Sampling
- Fish bearing
- Fish bearing (inferred)
- Non fish bearing
- Non fish bearing (inferred)

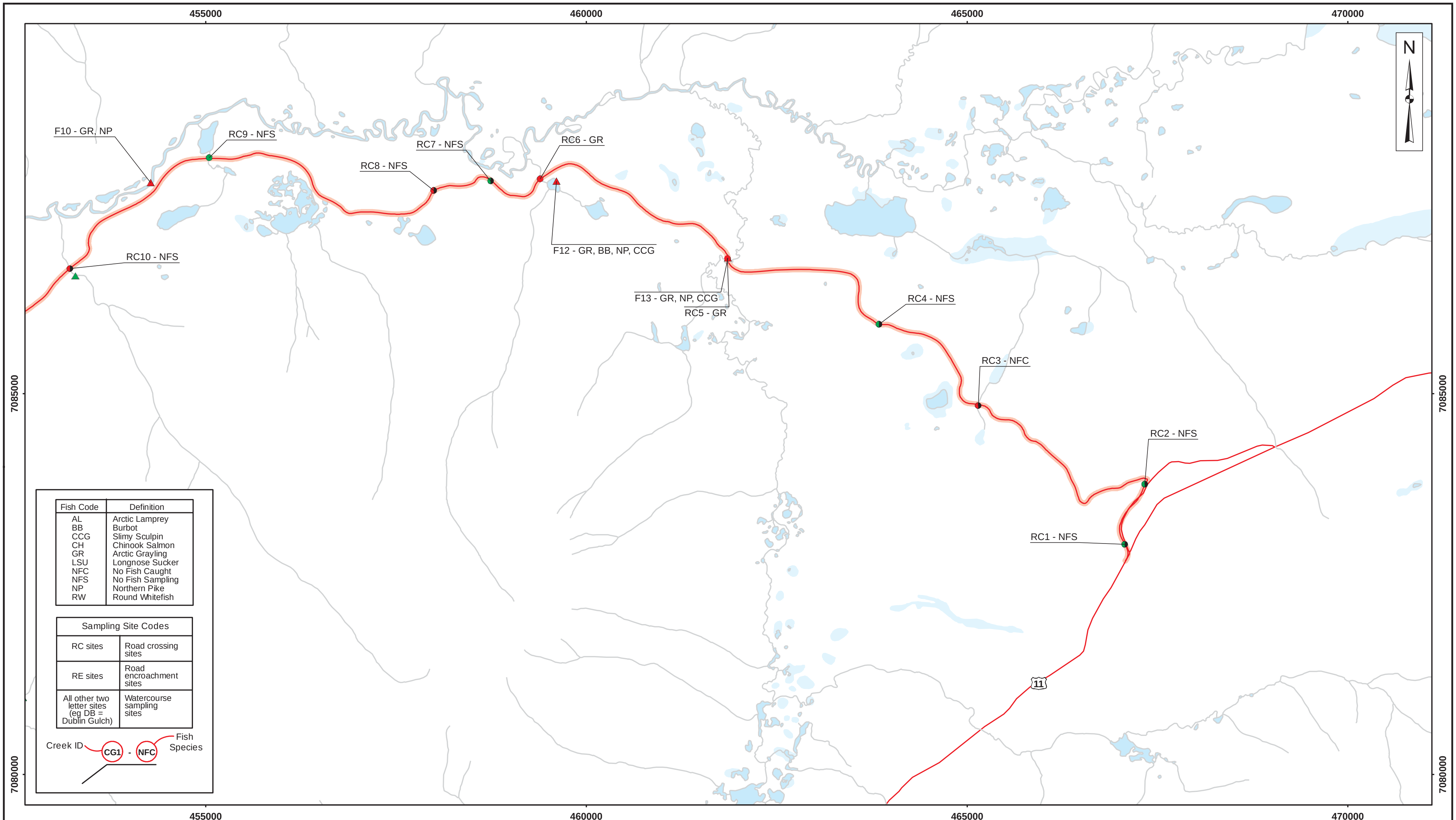
Watercourse
- Unsampled (perennial)

- Fish and Fish Habitat Local Study Area
- Road - Gravel
- Waterbody

StrataGold Corporation

0 1 2
Kilometres
Scale = As Shown

PROJECTION	DRAWN BY	EAGLE GOLD PROJECT YUKON TERRITORY
NAD83 Zone 8N	SS	
DATE	FIGURE	FISH AND FISH HABITAT STUDY AREA SHEET 2 OF 3
2014/03/26	7.1-2	



Fish Code	Definition
AL	Arctic Lamprey
BB	Burbot
CCG	Slimy Sculpin
CH	Chinook Salmon
GR	Arctic Grayling
LSU	Longnose Sucker
NFC	No Fish Caught
NFS	No Fish Sampling
NP	Northern Pike
RW	Round Whitefish

Sampling Site Codes	
RC sites	Road crossing sites
RE sites	Road encroachment sites
All other two letter sites (eg DB = Dublin Gulch)	Watercourse sampling sites

LEGEND

Hallam Knight Piesold Ltd. Sampling (1996)
- Fish bearing
- Non fish bearing

Stantec Sampling
- Fish bearing
- Fish bearing (inferred)
- Non fish bearing
- Non fish bearing (inferred)

Watercourse
- Unsampled (perennial)

- Fish and Fish Habitat Local Study Area
- Road
- Waterbody
- Waterbody

StrataGold Corporation

0 1 2
Kilometres
Scale = As Shown

PROJECTION	DRAWN BY
NAD83 Zone 8N	SS
DATE	FIGURE
2014/03/26	7.1-3

EAGLE GOLD PROJECT
YUKON TERRITORY

FISH AND FISH HABITAT STUDY AREA SHEET 3 OF 3

8 WILDLIFE AND WILDLIFE HABITAT

Background information, methods, and results for the baseline wildlife studies conducted for the project are provided in Stantec (2011b).

8.1 WILDLIFE STUDY AREAS

8.1.1 Local Study Area

The Local Study Area (LSA) consists of an approximately 18 km^2 area encompassing the proposed Project site and a surrounding buffer ranging from 0.5 to 1 km as shown in Figure 8.1-1. The LSA was chosen to encompass the area in which direct effects on wildlife could occur.

8.1.2 Access Road Study Area

The Access Road Study Area (ARSA) is designed to assess the potential effects associated with the access road. The ARSA was created by buffering the South McQuesten Road and the Haggart Creek Access Road by 500 m on each side up to the existing Eagle Gold camp site. The ARSA is approximately 44.8 km in length and 45.8 km^2 (Figure 8.1-1). The access road study area is intended to provide a baseline for potential disturbance to wildlife resources that may occur due to realignment of the Project access road and use of the road during the Project.

8.1.3 Regional Study Area

The Regional Study Area (RSA) consists of a 23 km by 21 km (483 km^2) area surrounding the Project site (Figure 8.1-1). This area was chosen because it is large enough to potentially encompass a grizzly bear home range, raptor nest sites (e.g., cliff habitat), and movement corridors (riparian drainages). It includes the Lynx Creek watershed to the south (which is relatively undisturbed when compared to the majority of the placer-mined drainages in the area), the McQuesten River watershed to the north, and the major habitat types present in the region

8.2 ABUNDANCE AND DISTRIBUTION OF HABITAT TYPES

The wildlife Regional Study Area (RSA) contains two ecological zones:

- The forested zone ranges from 600 m asl elevation to 1,225 m asl and includes the valley bottoms and the slopes of the mountains below the tree line. In the valley bottoms, forests are dominated by open canopy stands of black spruce (*Picea mariana*) with white spruce (*Picea glauca*) found along creeks and rivers. Lower forested habitats adjacent to riparian corridors are areas with high potential to support wildlife. In particular, both moose (*Alces alces*) and grizzly bear (*Ursus arctos*) are likely to use these areas seasonally at differing levels of intensity when forage opportunities are most abundant (e.g., seasonally ripe berries, newly emerged vegetation) or when shelter and insulation from winter weather is required. On the mid to lower slopes, continuous stands of subalpine fir (*Abies lasiocarpa*) occur along with minor components of white spruce, Alaska birch (*Betula neoalaskana*), trembling aspen

(*Populus tremuloides*), and black spruce. On the upper slopes and up to tree line, open subalpine fir stands are predominant with trees becoming smaller and more spread out with increasing elevation.

- The subalpine zone occurs on the ridge tops and high plateaus above 1,225 m asl. Here tree cover is discontinuous or absent and the vegetation is dominated by scrub birch (*Betula glandulosa*), willows (*Salix* sp.), ericaceous shrubs, herbs, as well as mosses and lichens. The tree and shrub layers found in the subalpine zone are used by moose to support both feeding and cover from spring through fall. Elevations above 1,500 m asl are dominated by ecosystems containing a mixture of shrubs, graminoids, herbs, bryophytes, and lichens.

Terrestrial ecosystem mapping was completed for the LSA following standard methods (Resource Inventory Committee [RIC] 2002). A total of 21 vegetated ecosystem units and nine non-vegetated units were mapped in the LSA. A description of the site characteristics and dominant species for these ecosystems is provided in Stantec (2011c).

Coniferous forest habitat dominates the LSA, covering 66% of the area. It is composed of primarily subalpine fir, white spruce, and black spruce. Dwarf birch (*Betula nana*) dominated ecosystems cover a smaller portion of the LSA (11%). They are represented by dwarf birch, alpine herbs and lichens. Little deciduous forest habitat occurs, covering only seven percent of the LSA. It is dominated by trembling aspen, Alaska birch, and balsam poplar (*Populus balsamifera*). These patterns influence the distribution of wildlife species, as described in the following sections.

8.3 HABITATS OF SPECIAL INTEREST

The Yukon Government has identified Wildlife Key Areas (WKAs), which are used by wildlife for critical life functions (Environment Yukon 2009). The nearest WKA to the Project lies outside the RSA in the South McQuesten River and McQuesten Lake area. It includes summer nesting habitat for ducks in the wetlands upstream of McQuesten Lake; for Peregrine Falcon (*Falco peregrines anatum/tundrius*), Osprey (*Pandion haliaetus*), and Bald Eagle (*Haliaeetus leucocephalus*) on McQuesten Lake; and for Gyrfalcon (*Falco rusticolus*) and Golden Eagle (*Aquila chrysaetos*) immediately north of McQuesten Lake. Based upon local knowledge (Environment Yukon 2009), late-winter moose range is identified approximately 55 kilometres northwest of the Project site, outside of the RSA. No WKA is recorded in the RSA or LSA (Environment Yukon 2009). Information obtained via the Traditional Knowledge and Use Study (Stantec 2010f) indicated that FNNND Settlement Lands south of the Project site and adjacent to the access road and the area north of the Project site near the Potato Hills provide important moose habitat at various seasons.

A number of important habitat types are present within the LSA (Figure 8.3-1). They are considered important based upon their relative scarcity within the LSA and their importance for wildlife species that are specialized or considered habitat type obligates. These habitats include:

- Old growth Forest
- Wetlands
- Riparian corridors
- Areas previously disturbed by fire

Approximately 2,077 ha, or 18% of the LSA, is comprised of old growth coniferous forest. These forests consist of ecosystems dominated by white or black spruce at lower elevations and ecosystems dominated by subalpine fir at higher elevations. Old growth forest habitat is important for wildlife species such as American marten (*Martes americana*). Bears may use these areas for hibernation, with dens dug beneath the root wads of large trees. Moose may also seek out mature coniferous forest primarily for warmth in winter.

Wetlands are uncommon and account for approximately 6% of the LSA. They include sphagnum bogs, sedge fens, marshes, ponds, and areas of open water. The majority of wetlands in the LSA are adjacent to the access road, and are associated with the poorly drained valley bottoms along Lynx Creek, Haggart Creek, and portions of the South McQuesten River. While no wetlands have been identified as WKAs within the RSA or LSA, these ecosystems still play important roles for animals that frequent the RSA and LSA, such as preferred feeding habitat for moose and grizzly bear as well as other wildlife species such as Rusty Blackbird (*Euphagus carolinus*). The access road, particularly along the first approximately 20 km leading from the Silver Trail Highway, parallels the South McQuesten River and associated wetlands. This area is known locally as an important calving and rutting area for moose (O'Donoghue 2010a, pers. comm.).

Riparian corridors and drainages account for approximately 10% of the LSA. They are used as travel corridors for many species (including moose and grizzly bear) moving within and between habitat types. Riparian corridors are often attractive to these species as they provide food resources, protective cover, and relatively homogeneous topography, facilitating energy efficient movement. This is particularly true of riparian corridors found in the lower valley bottoms including Lynx Creek, Haggart Creek, and the South McQuesten River. Moose and grizzly bear may move between upper and lower elevation habitats seasonally as well as regular daily movements between forage resource areas and protective cover habitat. Helicopter-based wildlife surveys completed for the Project identified wildlife trails connecting forest habitat and distinct riparian and wetland habitats. Many of these appeared to have long term use, particularly by moose, and appeared to form connections between alpine or sub alpine habitats and lower elevation valley bottoms.

A relatively recent fire (<15 years) occurred on the south facing slope above Lynx Creek within the LSA. This area occupies 481 ha, or 4% of the LSA. Burned areas usually develop early successional vegetation (shrubs and herb species) preferred by grizzly bear and ungulates during early spring and summer. Other species, such as Olive-sided Flycatcher (*Contopus cooperi*), may use the abundance of dead snags for perching and foraging from and adjacent forest habitats for nesting.

8.4 WILDLIFE RESOURCES

The RSA provides habitat for a wide range of wildlife species that typically inhabit the central Yukon area. In addition to those mentioned above, species which have been documented in the RSA and LSA include mammals such as woodland caribou (*Rangifer tarandus caribou)*, black bear (*Ursus americanus*), grizzly bear, wolverine (*Gulo gulo*), grey wolf (*Canis lupus*), red fox (*Vulpes vulpes*), American marten, snowshoe hare (*Lepus americanus*), and red squirrel (*Tamiasciurus hudsonicus*). Game bird species include Spruce Grouse (*Canachites Canadensis*), Dusky Grouse (*Dendragapus Obscures*), Ruffed Grouse (*Bonasa Umbellus*), and three species of ptarmigan (*Lagopus* sp). Raptors present may include Golden Eagle, Red-tailed Hawk (*Buteo jamaicensis*), Northern Hawk Owl (*Surnia Ulula*), Great Gray Owl (*Strix Nebulosa*), and Gyrfalcon (*Falco Rusticolus*). A variety of passerine or songbird species are also present. They include Dark-eyed Junco (*Junco Hyemalis*), Gray Jay (*Perisoreus Canadensis*), Tree Swallow (*Tachycineta Bicolor*), and Townsend's Solitaire

(*Myadestes Townsendi*). Waterfowl species include Trumpeter Swan (*Cygnus Buccinators*), Mallard (*Anas Platyrhynchos*), and Canada Goose (*Branta Canadensis*).

8.5 SPECIES AT RISK

Species at risk that may occur in the RSA are listed in Table 8.5-1. In Canada, the status of each species is provided by the *Species at Risk Act* (SARA); Species at Risk Public Registry (Government of Canada 2010) or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010).

Table 8.5-1: Species at Risk

Species	SARA*	COSEWIC
Mammals		
Grizzly bear *Ursus arctos*	No Status	Special Concern
Woodland caribou – northern mountain population *Rangifer tarandus caribou*	Special Concern	Special Concern
Wolverine *Gulo gulo*	No Status	Special Concern
Birds		
Canada Warbler *Wilsonia Canadensis*	Threatened	Threatened
Common Nighthawk *Chordeiles Minor*	Threatened	Threatened
Eskimo Curlew *Numenius Borealis*	Endangered	Endangered
Horned Grebe *Podiceps Auritus*	No Status	Special Concern
Olive-sided Flycatcher *Contopus Cooperi*	Threatened	Threatened
Peregrine Falcon *Falco Anatum* *Falco Tundrius*	Special Concern Special Concern	Threatened Special Concern
Red Knot Calidris Canatus Roseri type	Threatened	Threatened
Rusty Blackbird *Euphagus Carolinus*	Special Concern	Special Concern
Short-eared Owl *Asio Flammeus*	No Status	Special Concern

NOTES:

* SARA listed species are those considered on Schedule 1 of the Species at Risk Act.

The Yukon Wildlife Act lists species as ―specially protected‖, including cougar, Gyrfalcon, Peregrine Falcon and Trumpeter Swan (Yukon Government 2010b). These species are afforded protection under the *Yukon Wildlife Act* because they are considered particularly susceptible to hunting pressure.

While the ranges of species listed in Table 8.5-1 overlap the LSA, species specific habitat requirements may not be met within the LSA. For example, there is little or no cliff nesting-habitat for Peregrine Falcon or tall grass habitat for Short-eared Owl in the LSA.

8.6 ABUNDANCE AND DISTRIBUTION OF MAJOR WILDLIFE SPECIES

Baseline surveys confirmed the presence of 31 species of wildlife within the RSA. Information on species of management concern is summarized below.

8.6.1 Moose

While moose are not a species at risk, they are hunted and therefore important to both the FNNND and Environment Yukon.

Moose are recognized as an important species for harvest by local First Nations and are consistently reported within the LSA and portions of the RSA. Important calving and rutting areas within these areas have also been identified. Densities of moose in the Mayo area are close to 200 animals for every 1,000 km^2, which is above the Yukon average (Yukon Government 2003a). Farther north in the FNNND Traditional Territory, local knowledge acquired via the TKU Study and professional opinion suggest that moose densities are closer to 50 to 100 animals per 1,000 km^2 (Yukon Government 2003a). One participant in the TKU Study indicated that Haggart Creek and other creeks in the Project area provide food and shelter for moose in the springtime.

Moose were the most commonly detected species during baseline surveys. Moose were detected across all surveys and in the widest range of habitat types indicating a relatively strong presence within the RSA. The majority of moose detections from late summer were in lower elevation forested habitat zones. Moose utilize low-elevation forested vegetation types in the RSA during much of the year, particularly in the winter. During the winter period (mid-December through late-April), moose requirements for suitable thermal and foraging habitat becomes increasingly important in order to survive harsh weather conditions. As such, winter thermal and winter feeding habitat life requisites are the focus for habitat modeling conducted for moose.

In winter, moose are more likely to migrate to low elevation forest habitats and riparian areas associated with valley bottoms for optimal thermal shelter, ease of movement via lower snow accumulations in these areas and associated feeding opportunities. Habitats with closed canopies and south-facing slopes accumulate less snow, providing favorable thermal conditions (Moose Management Team 1996). Riparian forests with tall shrub vegetation provide winter browse, including woody twigs of poplar, birch, alder and willow.

During spring through fall, moose are more widely distributed and can occur in any of the vegetation types found in the RSA. In general, ideal habitat conditions contain a mosaic of habitat types, providing a combination of shelter, forage, or reproduction opportunities (Moose Management Team 1996).

One Game Management Zone (GMZ 2, Subzone 2-62) overlaps the RSA. Harvest records between 1999 and 2008 for this subzone indicate a total reported average harvest of 2.1 moose annually within the management zone. Adjacent GMZ subzones report slightly higher harvest rates with an overall average of 3.65 moose per GMZ Subzone per year. No harvest data for the RSA were available from the FNNND.

8.6.2 Woodland Caribou

The northern mountain population of woodland caribou was listed as a species of special concern under Schedule 1 of SARA in 2002 (Government of Canada 2010); however they are not included in the list of specially protected species by the Yukon Government.

All information suggests that the RSA receives low levels of caribou use and does not provide important habitat for this species. The closest woodland caribou herd to the Project is the Clear Creek Herd, followed by the Hart River and Bonnet Plume Herds (Environment Yukon 2009b). No WKAs for caribou occur within the RSA. Discussions with Yukon Environment staff familiar with the area noted that while woodland caribou are wide ranging, telemetry data indicate that the LSA is peripheral to the range of the Clear Creek herd (approximately 900 individuals) which is largely located on the opposite side of the North McQuesten River (O'Donoghue 2010, pers. comm.). Hunting records between 1999 and 2008 indicate there were no caribou harvests in GMZ Subzone 2-62, which overlaps with the RSA.

Field surveys support the conclusion that caribou are present at low densities within the LSA. Only three caribou detections were recorded when combining all past and present data. All detections occurred within subalpine habitat types within the RSA. One scat detection in the LSA was likely linked to a single individual moving beyond typical herd boundaries. The FNNND report overall declines in the presence of caribou since the 1950s, although they were previously abundant in the Proctor Lake area.

8.6.3 Grizzly Bear

While grizzly bears in Canada have no status under SARA or the Yukon Government (Government of Canada 2010), they have been listed special concern by COSEWIC (2010). A species of special concern is stable but vulnerable to decline from inherent conditions such as a low reproductive rate, and vulnerabilities to human activities such as attraction to non-natural food sources that can result in mortality.

Grizzly bears are a wide ranging species that seasonally use a variety of habitat types. The RSA provides a variety of potentially attractive habitats for grizzly, including forested riparian gullies, marsh habitats and subalpine areas. Grizzly bears are omnivorous and opportunistic feeders, using a variety of foods according to seasonal accessibility. Spring and fall feeding were selected as the critical life requisites used for grizzly bear habitat modeling as part of the assessment of Project effects.

Baseline data documented four detections of grizzly bear. Only one of these detections was in the LSA. The remaining three detections occurred in the larger RSA. The LSA at baseline does reflect a modest disturbance regime with exploration activities, drilling, and the creation and maintenance of a secondary road. Additionally, the LSA specifically was not found to contain a seasonally attractive magnet food resource, such as spawning salmon or highly productive berry patches that tend to attract grizzly bears.

Harvest records for Game Management Subzone 2-62 indicate no grizzly bears were reported harvested in the RSA between 1999 and 2008. For the overall region, grizzly bear is the least harvested wildlife species with an annual average rate of 0.1 bears per GMZ Subzone per year.

8.6.4 American Marten

The American marten is not listed as a species-at-risk by either Yukon Government or SARA (Government of Canada 2010). Although they are not a species of direct conservation concern, American marten provides significant economic and cultural value to local citizens, including the FNNND.

Marten in the northern boreal forest are closely associated with late successional coniferous stands, especially those dominated by spruce and fir, with complex structure near the ground (i.e., coarse woody debris) (Slough 1989; Buskirk and Powell 1994). Marten typically forage on small mammal species such as red-backed voles (*Clethrionomys rutilus*), birds and bird eggs, crowberries (*Empetrum nigrum*), and occasionally on grouse, ptarmigan, snowshoe hare and moose or caribou carrion when food becomes more scarce (Environment Yukon 2009b). Commonly reported refuge sites include ground burrows, rock piles and crevices, downed logs, stumps, snags, brush or slash piles and squirrel middens (Mech and Rogers 1977; Steventon and Major 1982; Buskirk and Powell 1994).

The FNNND identifies marten as present in, or in the vicinity of the RSA, concentrated in low elevational areas adjacent to riparian corridors. FNNND citizens report recent declines in the local marten population but suggest it might be part of a naturally fluctuating cycle for marten in the region (Stantec 2010f). There were no marten detections during 2009 baseline surveys, however past data (Hallam Knight Piésold Ltd. 1994; 1996a) provided a total of ten detections not linked to any specific habitat type or precise locations.

The LSA contains habitat typically associated with this species. Old growth coniferous forest accounts for approximately 2,077 ha, or 18% of the LSA.

8.6.5 Olive-sided Flycatcher

Olive-sided Flycatcher is listed as Threatened on Schedule 1 of SARA (Government of Canada 2010) because of a widespread and consistent population decline over the past 30 years (COSEWIC 2007b). The rate of decline for the Yukon population is estimated at -0.2% per year between 1998 and 2008, lower than the -3.1% estimated national decline for the same period (Environment Canada 2009a).

Olive-sided Flycatcher range within the Yukon extends north to include the Yukon Plateau-North ecoregion (Yukon Government 2010b). Across its range, the flycatcher typically occurs in coniferous and mixed-coniferous forest (Altman and Sallabanks 2000, COSEWIC 2007b, Kotliar 2007). Clear-cuts and other young (0 to 10 years old) forests are used if they contain snags or residual live trees for singing and foraging perches (Altman and Sallabanks 2000, COSEWIC 2007). Similarly, recent (0 to 30 years old) burns are considered important habitat (Boreal Avian Monitoring Project [BAMP] 2009), likely because of the creation of forest openings and edge habitat, as well as availability of snags and live trees (Altman and Sallabanks 2000; COSEWIC 2007b; Kotliar 2007). Deciduous forests are generally avoided.

A relatively recent fire (<15 years) occurred on the south facing slope above Lynx Creek. The area is approximately 481.5 ha in size and represents potential preferred habitat for this species within the LSA.

Breeding has been confirmed in the region, including four Olive-sided Flycatcher detections in the period 2006 – 2010 on the annual Mayo Landing breeding-bird survey route (US Geological Survey [USGS] 2010). No Olive-sided Flycatchers were detected within the RSA during baseline surveys completed in 2009. However, these surveys were completed outside the breeding-bird nesting period.

8.6.6 Rusty Blackbird

Rusty Blackbird is listed as a species of Special Concern on Schedule 1 of SARA (Government of Canada 2010) because of a significant long-term and severe population decline (Savignac 2006). The national rate of decline for Rusty Blackbird is estimated at -6.9% annually during 1988 through 2008. The species appears to be declining faster in Yukon with population declines estimated at -9.1% annually for the same period (Environment Canada 2009b).

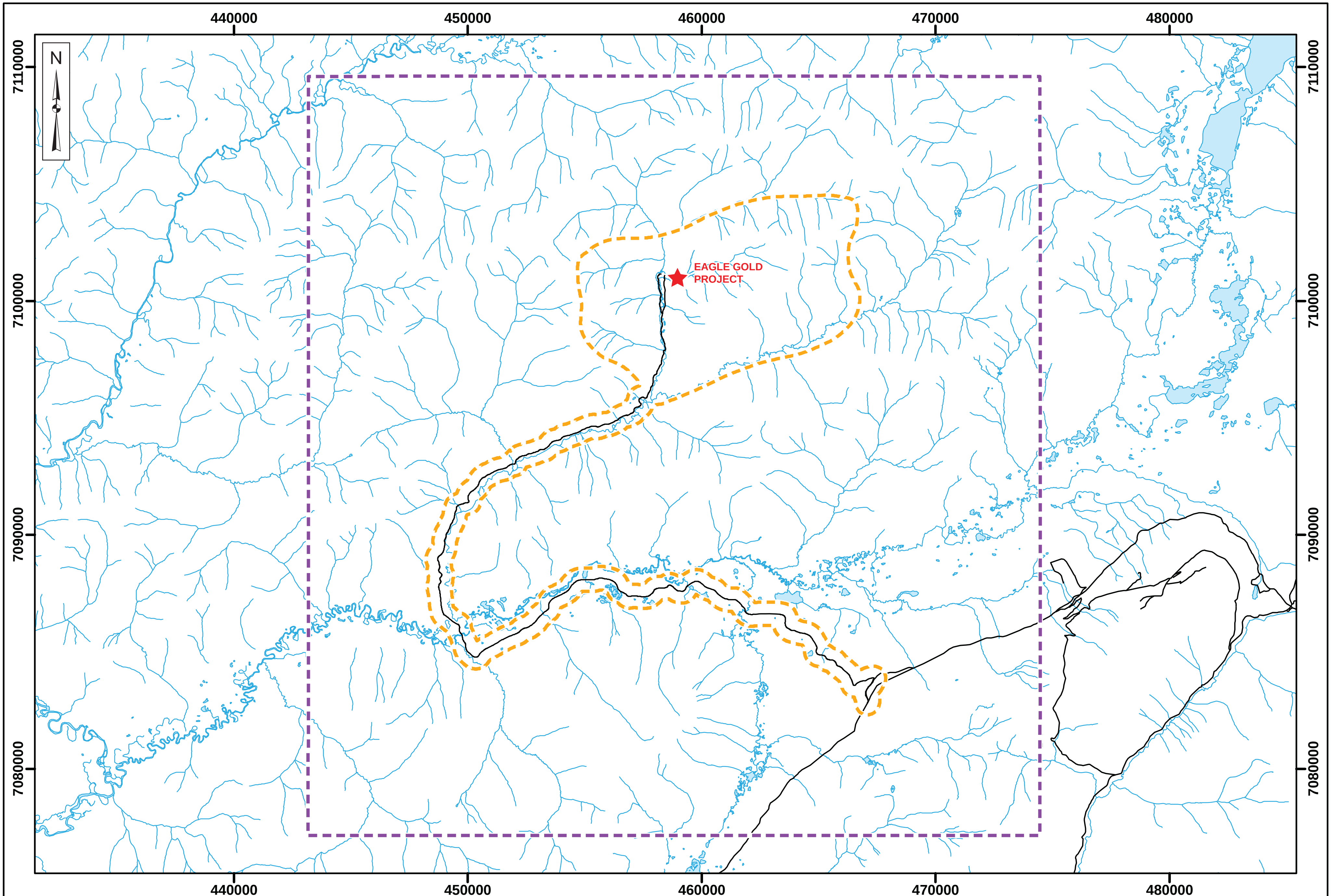
Rusty Blackbird is present in the Yukon primarily during the breeding season (early May through late August), although migrants and non-breeding birds may be present until late October and into winter (Semenchuk 1992; Federation of Alberta Naturalists [FAN] 2007). Its range extent includes the Yukon Plateau-North ecoregion, overlying both the LSA and RSA.

In Yukon, Rusty Blackbird nesting locations are closely associated with conifer forest wetlands, including bogs (with or without ponds), fens, muskegs, swamps and wet shrubby meadows (Yukon Government 2007, Avery 1995, Savignac 2006, Shaw 2006). It also uses shrubby riparian areas along the margins of lakes, beaver ponds, rivers, and creeks in coniferous and mixed wood forests (Semenchuk 1992, Avery 1995, Savignac 2006, FAN 2007). Wetlands and riparian areas combined account for approximately 15% of the LSA, or 1,818 ha of habitat potentially suitable for this species. Estimated Rusty Blackbird densities (Avery 1995) suggest this amount of potentially suitable habitat may support less than one Rusty Blackbird bird.

Two Rusty Blackbirds were observed most recently during the annual breeding-bird survey conducted at Mayo Landing in 2004 (USGS 2010). There were no recorded observations of Rusty Blackbirds during 2009 baseline surveys within the LSA or RSA, although as mentioned above, these surveys were completed after the nesting period.

8.6.6.1 2011 Breeding-bird Surveys

Breeding-bird point-count surveys were conducted June 16 – 22, 2011. A total of 605 individuals, consisting of 46 species, were recorded during the surveys. An additional three species were observed incidental to the point-count surveys, bringing the total number of species recorded to 49. Ten Olive-sided Flycatcher were observed within the LSA and along the access road. Three Rusty Blackbirds were observed adjacent to wetland areas along the access road. No other species at risk, raptors, or stick nests were observed.



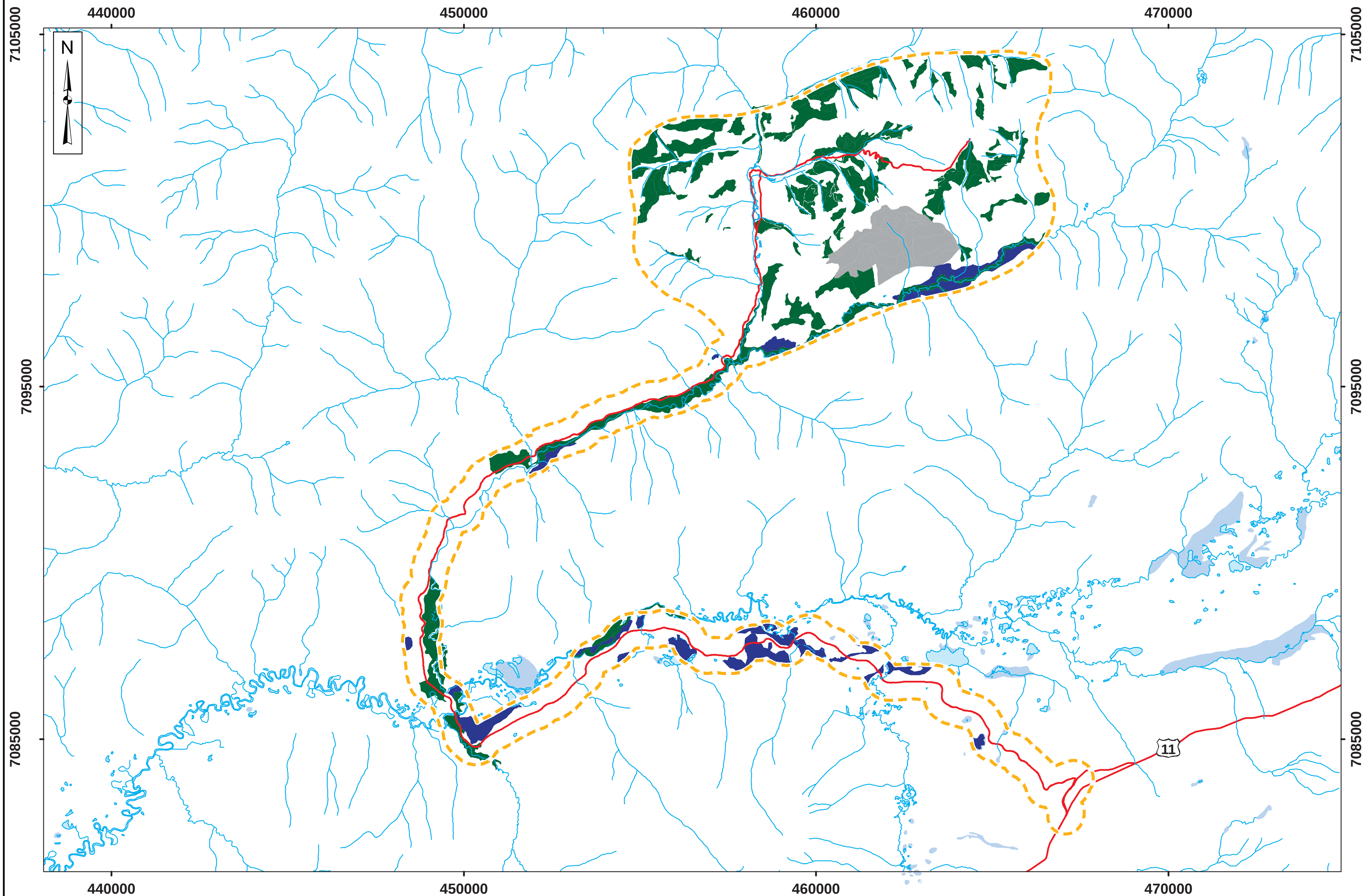
Legend:

- Watercourse
- Wildlife Regional Assessment Area
- Wildlife Local Assessment Area
- Road
- Waterbody

StrataGold Corporation

0 2.5 5
Kilometres
Scale = As Shown

Projection:	Drawn By:	
NAD83 UTM Zone 8N	SS	**EAGLE GOLD PROJECT YUKON TERRITORY**
Date: 2014/03/26	Figure: 8.1-1	**Wildlife Local and Regional Study Areas**



Legend:

- Burn Area
- TEM Old Forest
- Wetland Ecosystem
- Wildlife Local Study Area
- Road - Paved
- Watercourse
- Waterbody
- Wetland

StrataGold Corporation

0 1 2
Kilometres
Scale = As Shown

Projection: NAD83 UTM Zone 8N	Drawn By: SS	**EAGLE GOLD PROJECT YUKON TERRITORY**
Date: 2014/03/26	Figure: 8.3-1	**Wildlife Habitats of Special Interest Within the Local Study Area**

9 VEGETATION

The information below summarizes Stantec (2011c). Vegetation baseline study areas are the same as those used for the Surficial Geology, Soils, and Terrain baseline study, which consist of a LSA, a RSA, and a RCSA. For the purposes of the vegetation assessment, the RSA and RCSA have been combined to form the Regional Assessment Area (RAA), while the Local Assessment Area (LAA) includes the baseline LSA and a buffered area adjacent to the proposed transmission line and access road.

9.1 LAND COVER (ECOSYSTEM MAPPING)

Terrestrial ecosystem mapping (TEM) was completed for an area of approximately 7,538 ha surrounding the proposed Project. This includes 1:10,000 scale mapping of the 1,606 ha LSA covering the area where Project disturbances are expected and the 7,538 ha RSA. The 1:20,000 RSA mapping is used to provide regional context. Ecosystem mapping (1:20,000) was also prepared for the one kilometre wide Road Corridor Study Area (RCSA) along the 44.8 km long access road (4,580 ha). A Project specific ecosystem classification system, based on field data collected in 2009 and literature review, was developed for the study areas. A completed description of the TEM methodology is provided in Stantec (2011c). The area occupied by each of the vegetated and non-vegetated ecosystem units summarized by ecological zone (i.e., Forested and Subalpine) for the study areas is provided in Table 9.1-1. The table also presents the area covered by disturbances such as main roads, exploration trails, seismic lines, and mining activity such as placer, trenching or drilling. A total of 21 vegetated ecosystem units and nine non-vegetated units were mapped.

Two ecological zones were delineated in the baseline study areas: the Subalpine zone and the Forested (Boreal) zone. The majority of Project activities occur in the Forested zone. The Subalpine zone, which covers 1,502 ha in the RSA, occurs on the ridge tops and high plateaus above approximately 1,225 masl. Tree cover is discontinuous or absent at this elevation, and the vegetation is dominated by dwarf birch, willows, ericaceous shrubs, herbs, mosses, and lichens. The highest points within the three study areas is 1,520 masl. These upper elevations are dominated by dwarf-shrub, heath and lichen communities.

The Forested zone (11,450 ha), which is part of the northern boreal forest (Boreal Cordillera Ecoregion), includes the valley bottoms, and the slopes of the mountains below the treeline. The elevation range of this zone in the three study areas is 600 masl up to the Subalpine zone, about 1,225 masl. Open canopy stands of black spruce are generally present on moist sites and on the lower portions of north facing slopes. However, coniferous dominated forests consisting of white and black spruce are found along creeks and rivers and on well drained sites. Ericaceous shrubs and feather mosses are most common in the understory of the coniferous forests. On the upper slopes, open subalpine fir stands are predominant with trees becoming smaller and more spread out with increasing elevation; the cover of willows, dwarf birch and ericaceous shrubs increase as the canopy opens. Mixed forests, consisting of white spruce, trembling aspen, and Alaska birch are also present on warm aspects or near-mesic sites that have been disturbed by forest fire. Small deciduous stands dominated by aspen (warm aspects) and Alaska birch are also occasionally present in the study area.

Table 9.1-1: Summary of Mapped Ecosystem Units

Ecological Zone	Map Code	Eagle Gold Ecosystem Name	LSA (ha)	RSA (ha)	RCSA (ha)	Totals (ha)
Forested	AK	Aspen – Kinnikinnick	13.7	63.0	47.7	124.4
Forested	AW	Alaska birch-White spruce-Willow	30.3	383.3	280.1	693.7
Forested	BL	Dwarf birch-Lichen	10.4	31.6	0.1	42.1
Forested	BS	Black spruce-Sphagnum	-	163.1	319.6	482.7
Forested	CL	Cliff	-	0.3	-	0.3
Forested	ES	Exposed Soil	2.7	0.3	-	3.0
Forested	FC	Subalpine fir-Cladina	353.6	1,363.7	59.7	1,777.0
Forested	FF	Subalpine fir-Feathermoss	95.9	729.8	41.5	867.2
Forested	FM	Subalpine Fir-Labrador tea	93.9	1,012.7	116.8	1,223.4
Forested	FP	Subalpine fir–Dwarf birch-Crowberry	61.6	128.7	0.4	190.7
Forested	GB	Gravel Bar	0.1	0.1	16.1	16.3
Forested	MA	Marsh	-	0.5	19.5	20.0
Forested	OW	Open Water	-	-	66.2	66.2
Forested	PD	Pond	-	-	1.9	1.9
Forested	PH	Balsam poplar-Horsetail	-	-	16.0	16.0
Forested	PM	Placer Mine	5.1	14.6	18.0	37.7
Forested	RI	River	0.1	30.2	75.4	105.7
Forested	RO	Rock Outcrop	3.1	23.2	0.4	26.7
Forested	SA	Dwarf birch-Northern rough fescue	35.3	93.4	-	128.7
Forested	SC	Black spruce-Cladina	-	18.0	401.5	419.5
Forested	SF	White spruce-Feathermoss	4.6	-	374.9	379.5
Forested	SH	White spruce-Horsetail	25.0	139.4	423.8	588.2
Forested	SL	Black spruce-Labrador Tea-Feathermoss	166.7	852.7	1,989.8	3,009.2
Forested	TA	Talus	4.4	5.6	-	10.0
Forested	WG	Willow-Groundsel	28.1	70.1	11.3	109.5
Forested	WH	Willow-Horsetail	10.5	-	35.8	46.3
Forested	WM	Willow-Mountain sagewort	-	67.3	-	67.3
Forested	WS herb stage	Willow-Sedge	0.4	8.3	15.1	23.8
Forested	WS shrub stage	Willow-Sedge	-	-	38.3	38.3
Subalpine	BL	Dwarf birch-Lichen	60.8	151.2	–	212.0
Subalpine	ES	Exposed Soil	0.1	0.4	–	0.5
Subalpine	FP	Subalpine fir–Dwarf birch-Crowberry	56.4	232.4	–	288.8
Subalpine	MM	Mountain heather meadow	4.0	33.8	–	37.8
Subalpine	MW	Mountain avens – Dwarf willow	7.3	32.6	–	39.9

Ecological Zone	Map Code	Eagle Gold Ecosystem Name	LSA (ha)	RSA (ha)	RCSA (ha)	Totals (ha)
Subalpine	RO	Rock Outcrop	–	11.1	–	11.1
Subalpine	SA	Dwarf birch-Northern rough fescue	249.2	176.7	–	425.9
Subalpine	TA	Talus	3.5	26.1	–	29.6
Subalpine	WG	Willow-Groundsel	11.8	–	–	11.8
Subalpine	WM	Willow-Mountain sagewort	25.9	0.3	–	26.2
Subtotals			**1,364.7**	**5,853.7**	**4.370.1**	**11,588.5**
Disturbances			241.3	78.4	210.5	530.2
Totals			**1,606.0**	**5,932.1**	**4,580.5**	**12,118.6**

9.2 FOREST PRODUCTIVITY AND TIMBER VOLUME

Forest productivity is measured by site index and was estimated for the forested portions of the LSA and RSA. Site index is based on the height and age of dominant trees making up the forest stand or site unit (i.e., ecosystem unit) (Natural Resources Canada 2009). In British Columbia, site index is a classification of dominant species given height potential (in metres) at a given reference age (typically 50 years). A site index estimate was prepared for each of the forested site units mapped in the LSA and RSA, and summarized into classes for interpretation. The site index classes are:

- Nil: 0 (generally the non-forested ecosystems)
- Very Low: <5
- Low: 5 - 10
- Medium: 11 - 14
- High: 15+

The site index number reflects the anticipated (or potential) tree height for the leading species at 50 years of age.

The estimated forest productivity of the LSA and RSA are present in Table 9.2-1. Moderate and low productivity forested sites are most common classes in the LSA and RSA. High productivity sites occupied only a small portion (2%) of both study areas. Non-forested ecosystems (i.e., nil productivity for commercial tree species) occupy about 36% and 30% of the LSA and RSA, respectively.

Table 9.2-1: Estimated Hectares by Site Index Class

Site Index Class	RSA		LSA	
	(ha)	(%)	(ha)	(%)
High (15+)	168	2%	27	2%
Moderate (11 - 14)	2,504	35%	463	34%
Low (5 - 10)	2,371	33%	378	28%
Very low (<5)	0	0%	0	0%
Nil (0)	2,175	30%	494	36%

Total[1]	**7,218**	**100%**	**1,362**	**100%**

NOTE: 1 Area totals exclude the existing disturbances; RSA total includes the area within the LSA.

Timber volume of the forested ecosystem units were approximated based on mensurational and ecological data collected during 2009 field surveys and from literature for similar forest types. This information was combined with the ecosystem mapping database to approximate gross volume per hectare estimates within the mapping areas. The gross timber volumes were classified for interpretative purposes into volumes classes.

- Nil = 0-10 m^3/ha (includes the non-forested ecosystems)
- Very low = 11 – 74 m^3/ha
- Low = 75 – 174 m^3/ha
- Moderate = 175 – 289 m^3/ha
- High ≥290+ m^3/ha.

The approximations of gross timber volume by volume class for the LSA and RSA are presented in Table 9.2-2. The low volume class occupies 50 and 51% of the LSA and RSA, respectively. The nil class also occupies a substantial portion of both study areas—30% for the RSA and 36% for the LSA. This class is composed of non-forested ecosystems, including the subalpine area. The high volume class only occupies about 2% of each study area.

Table 9.2-2: Estimated Hectares by Timber Volume Class

Volume Class	RSA		LSA	
	(ha)	(%)	(ha)	(%)
High	155	2%	27	2%
Moderate	915	13%	122	9%
Low	3,671	51%	684	50%
Very low	303	4%	35	3%
Nil	2,175	30%	494	36%
Total[1]	**7,218**	**100%**	**1,362**	**100%**

NOTE: [1] Area totals may vary from actual sums due to rounding.

Gross estimates of timber volumes, based on dominant trees species, canopy density (i.e., sparse, open, and dense) and stand age were estimated for each of the ecosystem units mapped within the LSA and RSA. A summary of gross timber volume estimates for the study areas is provided in Table 9.2-3. Average timber volume per hectare is approximately seven times greater in the RSA (138 m^3/ha) than in the LSA (18 m^3/ha). Per hectare volume estimates are lower in the LSA due to the greater proportion of this area being occupied by subalpine zone (non-forested units) and by a greater proportion of existing disturbances than found in the RSA as a whole. Total gross timber volume in the LSA is estimated at 28,699 m^3 over 1,112 ha.

Table 9.2-3: Summary of Estimated Timber Volume by Study Area

Study Area	Total Timber Volume (m^3)	Total Non-forested Area (ha)	Forested Area (ha)	Total Area (ha)	Average Volume/ha (m^3/ha)	Volume for Forested Areas (m^3/ha)
LSA	28,699	494	1,112	1,606	18	26
RSA	817,280	2,175	3,757	5,932	138	218
Totals	**845,979**	**2,669**	**4869**	**7,538**	**Avg: 112**	**Avg: 174**

A detailed discussion of the methods used to calculate site productivity and timber volumes as well as the study results is provided in Stantec (2011c).

9.3 METALS IN VEGETATION

To characterize baseline levels of trace metal concentrations in vegetation, samples were collected and analyzed for a full suite of metals at nine locations in and around the LSA during the ecological mapping field survey. Samples consisting of leafy branches or stems and/or leaves were collected from willows species and graminoids at each site. All samples were analyzed using inductively coupled plasma mass spectrometry (ICP-MS) at CANTEST in Richmond, BC. Mercury concentrations were determined using Cold Vapour Atomic Absorption Spectrophotometry or Cold Vapour Atomic Fluorescence Spectrophotometry.

Results of the analysis were compared to dietary tolerances of cattle based on thresholds outlined in Puls (1994). Tolerances of cattle were used since the dietary tolerance of wild ungulates is generally not known. All elements were below toxic levels for dietary intake by cattle for all sites and species sampled based on dietary guidelines. Barium concentration was high, but not toxic/excessive, in grasses at one site and willows at another. Phosphorus and potassium concentrations were deficient for all sites and all plant species.

9.4 PLANT COMMUNITIES AND ASSEMBLAGES

The area occupied by ecosystem units was summarized by various land cover types (or patches) for the study areas (Table 9.4-1). Coniferous dominated forest is the most common land cover type found in the LSA (45%), RSA (67%) and RCSA (65%). Dwarf birch dominated ecosystems are the next most common land cover type in the LSA and RSA. They occupy about 29 and 14% of these areas, respectively. These ecosystems dominate the ridge top and plateau found in the Subalpine zone. Disturbances, associated with exploration and previous mining activities cover about 15% of the LSA compared to about 1% of the RSA overall and 5% of the RCSA. Riparian areas (7%) and deciduous forest (3%) are the next most common land cover types in the LSA. Riparian areas are associated with Haggart Creek, Dublin Gulch and ephemeral streams found throughout the LSA. Wetlands are uncommon in the both the local and regional study areas, however they are the second most abundant cover type in the RCSA. Non-vegetated units such as rock, talus and exposed soil and dwarf shrub land-cover types each occupy less than one percent of the LSA. The dwarf shrub ecosystem types are found in the Subalpine ecozone.

Table 9.4-1: Ecosystem Category Summaries

Ecosystem Category	Map Codes	LSA		RSA		RCSA	
		(ha)	(%)	(ha)	(%)	(ha)	(%)
Conifer forest	FC, FF, FM, SC, SF, SL	714.8	45	3,976.9	67	2,984.2	65
Dwarf birch dominated	BL, FP, SA	473.8	29	813.8	14	0.5	<1
Riparian areas*	GB, PH, RI, SH, WG, WM	120.6	7	399.2	7	664.4	15
Deciduous forest	AK, AW, PH	44.0	3	446.3	8	343.8	8
Wetlands	BS, MA, OW, PD, WH, WS	10.8	<1	161.5	3	495.5	11
Rivers	RI	0.1	<1	30.2	<1	75.4	2
Rock/talus/exposed soil	CL, ES, RO, TA	13.8	<1	67.0	1	0.4	<1
Dwarf shrub	MM, MW	11.3	<1	66.4	1	0	0
Mining areas	PM	5.1	<1	14.6	<1	18.0	<1
Disturbances	Na	241.3	15	78.4	1	210.5	5

NOTE: Only riparian ecosystems are listed in the table, although other ecosystems and non-vegetated units are present within the riparian corridors.

Old forest patches occupy about 14% of the LSA. These consist of ecosystems dominated by white or black spruce at lower elevations and ecosystems dominated by subalpine at higher elevations.

Rare plant surveys were conducted in 2009 and 2010 within the local study area and along specific sections of the road in 2010. One rare plant species, island purslane (*Koenigia islandica* L.), was identified at a single location in the LSA. A relatively small patch of this plant, covering about 2 m x 2 m was found in Bawn Boy Gulch.

9.5 WETLANDS

Wetlands are uncommon in the LSA. These shrub and herb dominated wetlands cover about 10.8 ha (<1%) of the area.

Wetlands are more common in the RSA (3%). These wetlands are associated with the Lynx and Haggart Creek valley bottoms. The nearest major wetland complex identified by Smith, et al. (2004) is located at McQuesten Lake, approximately 25 to 30 km to the east-northeast of the Project. Wetlands are most common in the RCSA (11%) largely due to the fact the access road is located in valley bottoms.

10 SOCIAL ENVIRONMENT

10.1 FIRST NATION OF NA-CHO NYÄK DUN

The FNNND (which translates as Big River People) represents the most northerly community of the Northern Tutchone language and culture group in the Yukon. In the Northern Tutchone language, the Stewart River is called Na Cho Nyäk, meaning Big River. The FNNND is culturally affiliated with the Northern Tutchone people of the Pelly Selkirk, and the Carmacks Little Salmon First Nations; these three First Nations form the Northern Tutchone Tribal Council. The FNNND constitutes much of the community of Mayo, and their Traditional Territory covers 162,456 km^2 of land (131,599 km^2 in Yukon and 30,857 km^2 in Northwest Territories). Under the 1993 land claims agreement, the First Nation owns 4,739.68 km^2 of settlement lands.

Traditionally, FNNND citizens lived and trapped throughout the area surrounding Mayo.

FNNND citizens moved from the McQuesten area to the Old Village (located just west of the Mayo town site, two miles downstream on the Stewart River in the early 1900s (Mayo Historical Society 1999; Bleiler, et al. 2006). In the 1950s, residents of the Old Village began moving into the village of Mayo, which is located within FNNND traditional territory.

As a self-governing First Nation (under the FNNND Final Agreement and Self-Government Agreements), the FNNND has the ability to make laws on behalf of their citizens and their lands.

The FNNND assumed self-government responsibility for program service delivery in several areas (e.g., housing, infrastructure). In June 2009, the FNNND signed an Intergovernmental Relations Accord with the Government of the Yukon, which states the identification of opportunities for cooperative health and social service delivery as a shared priority for fiscal year 2009 – 2010 (Intergovernmental Relations Accord 2009). A comprehensive 5-Year Capital Plan was prepared for the NND in 1995 by David Nairne & Associates. A situational analysis for a 2008 – 2013 Capital Plan was conducted for the FNNND by Inukshuk Planning & Development Ltd., in association with N.A. Jacobsen (Inukshuk and Jacobsen 2008). An Integrated Community Sustainability Plan (FNNND 2008) describes FNNND's vision and values, goals, and existing service agreements. The ICSP also provides inventories of skills and assets related to capital projects, social, health and cultural services, economy, environment, and capacity building and training.

Under their Final Agreement, FNNND owns the minerals under all Category A Settlement Lands, and receives royalties from any mining on this land. For mining activity elsewhere in the FNNND Traditional Territory, including on Category B Settlement Lands, the FNNND Government shares in a portion of any mineral royalties collected by the Yukon Government.

10.1.1 Comprehensive Cooperation and Benefits Agreement

VGC and the FNNND signed a comprehensive Cooperation and Benefits Agreement (CBA) on October 17, 2011. The CBA replaced an earlier Exploration Cooperation Agreement and applies to the Eagle Gold Mine development and exploration activities conducted by VGC (including subsidiaries) anywhere in FNNND Traditional Territory located south of the Wernecke Mountains.

The objectives of the CBA are to:

- Promote effective and efficient communication between VGC and the FNNND in order to foster the development of a cooperative and respectful relationship and FNNND support of VGC's exploration activities and the Project.
- Provide business and employment opportunities, related to the Project, to the FNNND and its citizens and businesses in order to promote their economic self-reliance.
- Establish a role for the FNNND in the environmental monitoring of the Project and the promotion of environmental stewardship.
- Set out financial provisions to enable the FNNND to participate in the opportunities and benefits related to the Project.
- Establish a forum for VGC and the FNNND to discuss matters related to the Project and resolve issues related to implementation of the CBA.

10.2 VILLAGE OF MAYO

The Village of Mayo is located 407 km north of Whitehorse and 235 km east of Dawson City. Mayo is situated at the confluence of the Mayo and Stewart Rivers within the traditional territory of the FNNND. Historically, the site of Mayo was used as a traditional camp by the FNNND.

Prior to becoming a service centre for significant mining activity in the area, Mayo was established as a river settlement as it was the farthest navigable point up the Mayo and Stewart rivers by steamboat. The permanent community of Mayo Landing was established in 1903 (Bleiler, et al. 2006), and was incorporated as a village in 1984.

The administration of the Village of Mayo consists of a mayor, a Chief Administrative Officer, and four councillors. For planning purposes, the Village of Mayo uses a population of 466 persons (although this figure includes those who live outside the village boundaries). This figure also includes both the Aboriginal population (FNNND citizens and other Aboriginal people) and the non-Aboriginal population. In 2010, the village had an annual budget of approximately $3.4 million and employed seven full-time and two part-time staff. In the summer season, as many as 12 to 15 other individuals are employed by the village, including students.

Municipal priorities include completion of water line looping, establishing additional building lots, relocating and improving the recycling centre, and improving the landfill to meet new government requirements.

A new municipal building has been constructed, linked to a gymnasium, stage, kitchen facility, meeting hall, and curling rink.

Property taxes and grants in lieu provided by other levels of government comprise some of the municipal revenue of the Village of Mayo.

10.3 EMPLOYMENT AND ECONOMIC OPPORTUNITIES

10.3.1 Local and Regional Economic Overview

10.3.1.1 Mining

The Mayo area, including the FNNND and the Village of Mayo, has a long-term history of resource development activity, including several boom and bust cycles associated with mining (Mayo Historical Society 1999; Aho 2006; Bleiler, et al. 2006). An initial wave of gold-related activities struck the Stewart River – Mayo River area in the 1880s and the early 1900s. Dublin Gulch, the location of the Project, was first placer mined in 1899 (Mayo Historical Society 1999). For a period in World War II, scheelite (tungsten bearing mineral) was recovered in the Dublin Gulch area to support the war effort. Placer mining continued at Dublin Gulch for a number of years. Throughout the 1980s and 1990s a number of exploration and mining companies explored Dublin Gulch.

Silver was of primary interest in subsequent surges in the 1920s, and during the 1950s – 80s. The Keno Hill silver camp was one of Canada‘s largest primary silver producers during its time from 1946 to 1989.

There are a number of quartz mining claims, exploration projects, and proposed mining projects in the region. Minerals of interest include gold, silver, zinc, lead, and copper. Recently, the Mayo area has experienced a surge in mineral exploration and development (e.g., Alexco Resource Corporation‘s proposed Bellekeno Mine [silver] and other Keno Hill Silver District interests; ATAC Resources‘ Rau Gold Project), and the Elsa Reclamation and Redevelopment Company‘s (a subsidiary of Alexco Resource Corp.) reclamation and closure of historical mines in the district.

Placer mining continues to be a major contributor to the economy of the area. The majority of Mayo area placer mining operations are family-run, some for three or more generations. Extensive placer workings are found in the area surrounding the Project on the Dublin Gulch and Haggart Creek drainages.

The placer gold production rate has been relatively stable with placer gold production lows reported in 2006 and 2008. Placer gold production has been concentrated in the Duncan and Lightning Creek watersheds (Zanasi and Research Northwest 2010).

Following the mining downturn in the 1980s, it was realized that diversification to include tourism, outfitting, recreation, and other economic activities would reduce Mayo‘s reliance on a mineral-based economy.

10.3.1.2 Outfitters and Tourism

In the Project area, Midnight Sun Outfitting Ltd. occupies Concession #4, which covers approximately 31,000 km^2 and includes the watersheds of the McQuesten, Wind, Hart, and Little Wind rivers. Guided hunting trips are conducted from late July to early October; fishing and other wilderness adventures such as canoeing, rafting, and heli-hiking are also offered.

Tourism in the Silver Trail Tourism Region is a component of the local economy, but to a lesser extent than mining or government services. The area‘s natural beauty, mining history, and outdoor activities attract visitors from elsewhere in Yukon, Canada, and beyond. The number of tourists to Mayo varies between 1,000 and 2,000 people annually (Village of Mayo 2010). Substantially more visitors may use the Silver Trail Region and visit Keno City, Stewart Crossing, and the area.

Tourist services in and around Mayo include two motels, several bed and breakfasts, three campgrounds, a restaurant, two service stations, a store, and various businesses catering to wilderness tours and fishing. Helicopter, float-plane, and taxi services are also available. The floatplane base on the Stewart River serves as the access point to the Peel River watershed, which includes the Snake and Wind Rivers, as well as a Canadian Heritage river—the Bonnet Plume. This area attracts large numbers of wilderness travelers from around the world, as well as Yukoners.

There are opportunities for First Nations-based cultural and experiential tourism that have yet to be developed. The FNNND has plans to develop a cultural workspace in the former Legion Hall building on Front Street in Mayo and to eventually develop a cultural center to promote Northern Tutchone culture (FNNND 2007).

10.3.1.3 Commercial Trapping

There are 333 Registered Trapline Concessions (RTCs) in the Yukon. The Project lies within Registered Trapline Concession (RTC) 81; the Haggart Creek Road bisects the RTC. RTC 84 and RTC 85 are located so the south of the Project and portions of these two RTCs are traversed by the South McQuesten Road. Access to many of the RTCs in the site vicinity is by the South McQuesten Road, using snowmobiles or dog sled.

The most commonly harvested species for fur is marten.

10.3.1.4 Commercial Fishing

Commercial fishing accounts for less than 10% of the fish harvested in Yukon, and is concentrated in the Dawson City area. There is no commercial fishing in the Mayo area or in the vicinity of the Project site

10.3.1.5 Forestry and Agriculture

The Project area was historically used for fuel wood harvesting for the early Keno Hill mine operation. Personal use permits are provided by Energy, Mines, and Resources (Yukon Government). There are no permits issued for the area at this time, but any fuel wood harvesting would be associated with small-scale mine and exploration activities rather than for residential and personal use.

Minimal agricultural activity occurs in the area of the Project, although Minto Bridge Farms is located north of Mayo on the Silver Trail. The farm is a mixed operation and produces fresh vegetables, root crops, herbs, chickens, geese, ducks, and eggs.

10.3.1.6 Oil and Gas

There are several sedimentary basins in Yukon with potential for oil and gas deposits; however, none are within or adjacent to the Project area. As such, there is little potential for oil and gas development in the area, and there are no current licences or leases.

10.3.1.7 Local Services and Businesses

Mayo's economy is beginning to focus on the provision of various services, including government services, to its residents and to individuals living in the surrounding area (Village of Mayo 2006). Tourism is becoming a growing segment of the local economy.

There are currently approximately 42 businesses in Mayo and the surrounding area. The services offered include contracting, accommodations, and food services.

The Village of Mayo currently has the following government services and facilities:

- The Yukon Liquor Corporation
- Department of the Environment Office
- Energy, Mines and Resources Office
- YESAB District Office
- Post Office.

10.3.2 Economic Development – First Nation of Na-Cho Nyäk Dun

The Na-Cho Nyäk Dun Development Corporation is involved with a number of enterprises including the Mayo grocery store and restaurant, and a number of joint ventures and relationships with various companies that provide services to mining facilities. The joint ventures that service mining companies are well established and include services offered by ESS Support Services, a part of the larger Compass Group. ESS Support Services provides turnkey camp supply, camp management, and catering in remote locations (Zanasi and Research Northwest 2010). Shuttle service between Elsa and Mayo has been provided to Alexco Resources.

The FNNND currently has a regional partnership with other Northern Tutchone partners—the Selkirk, and the Carmacks Little Salmon First Nations. In addition to partnerships or joint ventures, the government of the NND sees value in encouraging individual entrepreneurs or individuals interested in starting their own businesses and joint ventures.

10.4 TRADITIONAL ACTIVITIES AND CULTURE

The FNNND has prepared a 5-year strategic heritage development plan (FNNND 2007) that identifies priorities relating to traditional knowledge, language, heritage sites and special places, a cultural centre, governance policy and guidelines development. An implementation plan was also prepared. While FNNND staff noted that the plan is somewhat dated, it is still used as a planning guide by FNNND.

10.4.1 Subsistence Harvesting

At community meetings, FNNND citizens noted the importance of several areas in the vicinity of the Project for traditional activities including hunting, fishing, trapping, and gathering. FNNND elders and staff indicated that citizens still rely on traditional foods–berries, fish, moose, deer, small game, and birds–as a significant portion of their diet. These traditional foods are shared with those who may not be able to obtain it directly (e.g., single mothers, elders).

Hunting, fishing, and harvesting are also very important aspects of Northern Tutchone culture and diet, and for continued monitoring of the land. Northern Tutchone people have always relied heavily on the foods of the forests and the rivers. Moose, caribou, sheep, grouse and fish, as well as many types of plants and berries are harvested and preserved to last through the seasons.

10.4.1.1 Hunting

Elders have reported that the moose population in the Dublin Gulch area has been declining. The Project area, NND lands south of the Project, and the Potato Hills have been identified as important moose habitat by elders. Local waterways, including the Mayo River and the South McQuesten River, are used for travelling and hunting.

Caribou typically are not found in the Project area; FNNND citizens harvest caribou to the east (Mount Patterson and Wernecke Mountains) and near Ethel Lake (to the south of Mayo), but a voluntary no-hunt policy is in place for Ethel Lake.

Sheep have historically migrated through the Mount Haldane area, and occasionally tracks have been observed in Dublin Gulch. Deer populations are increasing in the area. As a result, so are cougars. Both grizzly and black bears are known in the Project area, as are wolves. Grouse and ptarmigan are hunted in the Project area.

10.4.1.2 Fishing

The McQuesten, South McQuesten, Mayo (e.g., near the Wareham dam) and Stewart Rivers are used for fishing by FNNND citizens, as are many lakes in the area. Many families have fish camps set up along the Stewart River that have been used for generations. There is also a camp at Fraser Falls (northeast of Mayo) on the Stewart River that is used by several families as well as culture camps hosted by FNNND.

Previous studies have reported the presence of Chinook salmon rearing in Haggart Creek and the South McQuesten River. Salmon previously observed in Haggart Creek were juveniles (1+ years old) and were not of a suitable size for fishing. There is no known record of Chinook salmon presence in Dublin Gulch or its tributaries.

The Haggart Creek watershed provides habitat for Arctic grayling and a number of forage fish species. However the FNNND has not reported frequent fishing usage of Haggart Creek for Arctic grayling or any other species.

10.4.1.3 Trapping

Registered Trapline Concessions (RTCs) adjacent to the Project are held by FNNND citizens, and provide both economic benefits as well as preservation of traditional activities. The Na-Cho Nyäk Dun Fish and Wildlife Planning Team (2008), note that fewer citizens are participating in trapping for a number of reasons, including higher fuel prices, lack of interest, and difficulty obtaining trap lines.

10.4.2 Other Cultural Activities

The FNNND also offers a number of on the land programs, including day-trips for medicine gathering, fishing and hunting camps for youth, and an archaeological camp, as well as some longer trips. Programs for jigging, beading, and other craft work are also offered.

Ongoing activities organized by the FNNND include:

- Traditional food lunches at the school
- Teacher cultural orientation
- Participation at other First Nation events (Moosehide Gathering, May Gathering)

- Traditional pursuits funding to assist people to get out on the land
- Old Village Day, Aboriginal Day, Self-Government Day
- Elders in the school and daycare

Recent initiatives include:

- Renewed linkages with Fort Good Hope (NWT) families
- Hide tanning workshop
- Knife making workshop
- Wind River canoe trip

Many of the First Nation arts and crafts are sold at Binet House and the NND office.

The FNNND has worked with the proponent and contractor for the Mayo B project in an effort to provide cross-cultural awareness and training, and events such as country food feasts.

In discussions with FNNND staff, it was noted that there is a need to further develop a traditional pursuit program for adults to further enhance the traditional culture in the community.

10.4.3 Heritage Sites and Special Places

Although the entire FNNND Traditional Territory is important, there are several noteworthy places, which the Elders and community have identified through the strategic planning process. FNNND's five-year strategic heritage development plan (FNNND 2007) identifies priorities relating to heritage sites and special places. The Strategic Plan identified the following heritage sites of value to FNNND:

- Ethel Lake (southwest of Mayo)
- Old Village (just west of Mayo on the Stewart River)
- Boats such as the *Yukon Rose*, *The Loon*, and *The Peter's Boat*
- Lansing Post (Stewart River east of Mayo at Lansing Creek)
- Burial sites
- Foot trails
- Fraser Falls
- Old Revival Building in Mayo
- No Gold Creek (southeast of Mayo)

There are trails in the Potato Hills and in the South McQuesten River Valley that have been used by NND members for generations.

10.5 HERITAGE

10.5.1 Historic Resources

An archaeological and historic assessment was conducted in 1995 for the then-proposed Dublin Gulch Mine site (Greer 1995). The study included a field assessment on a large project area that encompassed the proposed mine location. During the studies, no archaeological or historic period sites were identified; all areas favourable for pre-contact human occupation were deemed to have been destroyed by the extensive placer mining activity in the area, and all structures identified within the Project area were all determined to be related to mining activities over the past 50 years.

A subsequent assessment of the access road to the Project site was conducted in 1996 for the South McQuesten and Haggart Creek roads (Greer 1996). During that study, archaeological and historic period sites along two possible routes were inventoried. No sites were identified along the Haggart Creek road and three sites of potential concern were located along the South McQuesten road. Subsequent to completion of those studies, VGC indicated that avoidance of all of these sites would be implemented during road design and construction.

10.5.2 Paleontological Resources

The Dublin Gulch area has yielded a significant Pleistocene vertebrate fossil locality (Harington 1996). This fossil site is significant as it is the only substantial Pleistocene record from the Mayo District. The fossil material was collected during the mid-1970s during placer gold mining and includes small horse, bison, Dall sheep, caribou, moose, American lion and possibly mammoth. The predominance of horse and bison in the assemblage is typical of Yukon and Alaskan Pleistocene faunas. A date of 31,450 +/- 1,300 years was obtained from radiocarbon analysis of a horse metatarsal bone, which makes the fauna Middle Wisconsinan. All of the species found at the Dublin Gulch Pleistocene locality have also been reported at other Middle Wisconsinan sites south of the Arctic Circle in Yukon, such as Sixtymile (Harington 1997), Big Creek (Harington 1989), and Ketza River (Jackson and Harington 1991). The Middle Wisconsinan faunas suggest that a widespread grassland steppe was established in the central Yukon, although the presence of moose suggests a wetland component (Jackson and Harington 1991).

For the currently proposed Project, a HRIA for palaeontology was conducted in September 2009 (FMA 2010) and was submitted as part of the YESAA Project Proposal (available upon request). Four days of field studies were conducted to investigate the Dublin Gulch Pleistocene fossil locality and to examine strata in and around the Dublin Gulch area and along the proposed access road.

Field surveys found that most of the valley fill at Dublin Gulch and Haggart Creek has been reworked by placer mining. There is no sign of any remaining source layer for the Dublin Gulch Pleistocene fossil locality, and no additional fossil vertebrate material was found. Organic layers at the top of the surficial sequence in Dublin Gulch contain plant and arthropod material and yielded conventional (calibrated) radiocarbon ages of approximately 10,000 to 13,000 years before present. These late Pleistocene to early Holocene dates indicate the sediments were deposited during climatic warming following the McConnell Glaciation. A large piece of wood recovered from intact surficial deposits along the access road yielded a conventional (calibrated) radiocarbon age of approximately 2,700 years before present, which is late Holocene.

Remnant intact surficial deposits that have not been disturbed by placer gold mining occur along the south side of Dublin, along Ann Gulch, and at Secret Creek (along access road).

11 REFERENCES

Aho, A.E. (2006). Hills of Silver: The Yukon's Mighty Keno Hill Mine; Harbour Publishing, Maidera Park, B.C.

Altman, B. and R. Sallabanks. 2000. Olive-sided Flycatcher (Contopus cooperi), The Birds of North America Online (A. Poole, ed.). Cornell Lab of Ornithology, Ithaca, NY. Available at: http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/502. Accessed: August 2010.

Avery, M.L. 1995. Rusty Blackbird (Euphagus carolinus). In: A. Poole (ed.). The Birds of North America Online. Cornell Lab of Ornithology. Ithaca, NY. Available at: http://bna.birds.cornell.edu/bna/species/200. Accessed: August 2010.

BGC (2010). Eagle Gold Project Dublin Gulch, Yukon – Site Facilities Geotechnical Investigation Factual Report; prepared by BGC Engineering Inc., Vancouver, for Victoria Gold Corp March 5, 2010.

BGC (2011). Eagle Gold Project Dublin Gulch, Yukon – 2010 Geotechnical Investigation for Mine Site Infrastructure Factual Data Report; prepared by BGC Engineering Inc., for Victoria Gold Corp. November 17, 2011.

BGC (2012a). Eagle Gold Project Dublin Gulch, Yukon – 2011 Geotechnical Investigation for Mine Site Infrastructure Factual Data Report; prepared by BGC Engineering Inc., for Victoria Gold Corp. January 20, 2012.

BGC (2012b). Eagle Gold Project Dublin Gulch, Yukon – 2011 Geotechnical Investigation for Mine Site Infrastructure Foundation Report. Final Report; prepared by BGC Engineering Inc., Vancouver, for Victoria Gold Corp. January 31, 2012.

BGC (2012c). 2012 Geotechnical Investigation for Mine Site Infrastructure Factual Data Report, Final Report; prepared by BGC Engineering Inc., Vancouver, for Victoria Gold Corp. November 30, 2012.

BGC (2012d). Eagle Gold Project - Estimate of Ice-rich Material – Final, BGC Project Memorandum, prepared November 16, 2012, Project No: 0792008-03-06.

BGC (2012e). Eagle Gold Project - Lower Dublin Gulch Valley Aquifer Tests; report prepared for Victoria Gold Corp, September 6, 2012.

BGC (2012f). Eagle Gold Project – Open Pit Pumping Tests; report prepared for Victoria Gold Corp, September 6, 2012.

BGC (2013a). Eagle Gold Project, 2012 Groundwater Data Report, prepared for Victoria Gold Corp., by BGC Engineering, Inc., July 7, 2013.

BGC (2013b). Eagle Gold Project - Production Well Completion Report for PW-BGC12-04, Final report Prepared July 7, 2013; Project No: 0792-010.

BGC (2014). Eagle Gold Project, Numerical Hydrogeologic Model, Final Report; prepared for Victoria Gold Corp, by BGC Engineering, Inc., Vancouver, April 2017.

BC MWLAP (2003). BC Freshwater Biological Sampling Manual; prepared by the BC Ministry of Water Land and Air Protection.

BCMOE (2006).British Columbia Contaminated Sites Regulation (CSR) Schedule 6 Generic Numerical Water Standards for the protection of Freshwater Aquatic Life (British Columbia Ministry of Environment

Bleiler, L., C. Burn and M. O'Donoghue (2006). Heart of the Yukon: a Natural and Cultural History of the Mayo are; Village of Mayo.

Bond, J.D. (1997a). The glacial history and Placer gold potential of the North McQuesten River (116A/1), Dubline Gulch (106D/4) and Keno Hill (105M/14) map areas, Mayo Mining District, Central Yukon; In: LeBarge, W.P. and Roots, C.F., (eds.), 1997; Yukon quaternary Geology, volume 2, Exploration and Geological Services Division, Northern Affairs Program, Yukon Region, p 30-43.

Bond (1998a). Surficial Geology of North McQuesten River, central Yukon, NTS 116A/1 (1:250,000 scale). Exploration and Geological Services Division.

Bond (1998b). Surficial geology of Keno Hill, Central Yukon, NTS 105M/14; Exploration and Geological Services Division.

Bostock (1965). Physiography of the Canadian Cordillera with Special Reference to the area North of the Fifty-fifth parallel; Department of Energy and Mines, Geological Survey of Canada, ME247.

Brown, R.J.E. (1979). Permafrost Distribution in the southern part of the discontinuous zone in Quebec and Labrador, Geographjic Physique at Quaternerie 33, 279-289.

Brown, V.S., Baker, T. and Stephens, J.R. (2001). Ray Gulch Tungsten Skarn, Dublin Gulch, Central Yukon: Gold-Tungsten Relationships in Intrusion-Related Ore Systems and Implications for Gold Exploration. In Yukon Exploration and Geology 2001, pp. 259-268.

Buskirk, S.W. and R.A. Powell. 1994. Habitat ecology of fishers and American martens. Cited in Buskirk, S.W., A.S. Harestad, M.G. Raphael and R.A. Powell (eds.). Martens, sables, and fishers: biology and conservation. Cornell University Press. Ithaca, NY. 283–296.

CCME. 2003. Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives. Accessed at: ceqg-rcqe.ccme.ca/download/en/221/

CCME (2007). Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the protection of Aquatic Life: Summary Table; updated December 2007; In: Canadian Environmental Quality Guidelines, 1999, CCME

COSEWIC. 2007. COSEWIC assessment and status report on the Olive-sided Flycatcher, Contopus cooperi in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON

COSEWIC (2010). Species at Risk, Public Registry, http://www.sararegistry.gc.ca/background/default e.cfm. Committee on the Status of Endangered Wildlife in Canada

DFO (2010). Yukon Fisheries Information Summary System (FISS); available at: http://habitat.rhq.pac.dfo-mpo.qc.ca/fiss/dcf01.cfm accessed March 2010.

Environment Canada. (2009a). Migratory Birds Cons. Monitoring and Reporting: Olive-sided Flycatcher; Available at: http://www.cwsscf.ec.gc.ca/mgbc/trends/index.cfm?lang=e&go=info.bird&speciesid=4590. Accessed: September 2010.

Environment Canada. (2009b). Migratory Birds Conservation Monitoring and Reporting: Rusty Blackbird. Available at: http://www.cwsscf.ec.gc.ca/mgbc/trends/index.cfm?lang=e&go=info.bird&speciesid=5090. Accessed: September 2010.

Environment Yukon (2009). Wildlife Key Areas.
Available at: http://environmentyukon.gov.yk.ca/mapspublications/wildlife_key_areas.php . Accessed December 2009.

FAN (2007). The Atlas of Breeding Birds of Alberta: A Second Look. Federation of Alberta Naturalists, Edmonton, AB.

FMA (2010). Environmental Baseline Report: Historical Resources (Draft Report); prepared for Victoria Gold Corp., Vancouver, BC by FMA Heritage Inc., Burnaby, BC, March 2010

FNNND (2007). 5 Year Strategic Heritage Development Plan.

FNNND (2008). Tan Sothan – A good Path: Integrated Community Sustainability Plan; May 2008; First Nation of Na-Cho Nyak Dun; available at:
http://www.infrastructure.gov.yk.ca/pdf/hacho_Nyak_dun_icsp.pdf; accessed July 2010.

Gardner, T. (2010). Water Resources Scientist, Stantec Consulting, Inc., Burnaby, B.C.; personal communication, August 20, 2010.

GeoViro Engineering Ltd., 1996. Hydrogeology Characterization and Assessment – Dublin Gulch Gold Project (Yukon), File GV192.01, Final report issued to New Millennium Mining Ltd. October 1996.

Goldfarb, R.J., Marsh, E.E., Hart, C.J.R., Mair, J.L., Miller, M.L. and Johnson, C. (2007). Geology and Origin of Epigenetic Lode Gold Deposits, Tintina Gold Province, Alaska and Yukon. Chapter A of Recent U.S. Geological Survey Studies in the Tintina Gold Province, Alaska, United States and Yukon, Canada – Results of a 5-Year Project (editors: L.P. Gough and W.C. Day). Scientific Investigations Report 2007-5289-A.

Government of Canada (2012). Species at Risk Act Public Registry. Accessed: August 30, 2012 from: http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=999.

Greer, S. (1995). Archaeological and Historic Sites Impact Assessment Dublin Gulch Mine Property Final Report; report prepared for Hallam Knight Piesold Ltd. on behalf of First Dynasty Mines Ltd; by Sheila Greer, Consulting Anthropologist and Archaeologist, Edmonton, AB.

Greer (1996). Archaeological and Historic Sites Impact Assessment South McQuesten Road Upgrading; report prepared for New Millennium Mining Ltd. Dublin Gulch Mine Development; by Sheila Greer, Consulting Anthropologist and Archaeologist, Edmonton, AB.

Hallam Knight Piésold Ltd. (1994). Ivanhoe Capital Corporation Ivanhoe Gold Fields LTD Dublin Gulch Project Data Report 1993.

Hallam Knight Piésold (1995). Dublin gulch Project, Preliminary Baseline Fisheries Study Proposal; prepared for Department of Fisheries and Oceans Canada, 8 pp.

Hallam Knight Piesold (1996a). Initial environmental Evaluation Volume 11. Environmental Setting, Dublin Gulch Project.

Hallam Knight Piésold (1996b). New Millennium Mining Ltd., Dublin Gulch Project, 1996 Fisheries Survey; prepared for Department of Fisheries and Oceans Canada, 12 pp.

Hallam Knight Piésold (1996c). Ivanhoe Goldfields Ltd, Dublin Gulch Project, Proposed Access Road Fisheries Study; prepared for Department of Fisheries and Oceans Canada, 11 pp.

Harington, C.R. (1989). Pleistocene vertebrate localities in the Yukon; In L.D. Carter, T.D. Hamilton and J.P. Galloway (eds); Late Cenozoic History of the Interior Basins of Alaska and the Yukon, U.S. Geological Survey Circular 1026:93-98.

Harington, C.R. (1996). Pleistocene mammals of Dublin Gulch and the Mayo District, Yukon Territory; In: K.M. Stewart and K.L. Seymour (eds.), Palaeoecology and Palaeoenvironments of Late Cenozoic Mammals; Tributes to the Career of C.S. (Rufus) Churcher, University of Toronto Press, Toronto, ON. 346-374.

Harington, C.R. (1997). Pleistocene vertebrates of Sixtymile, Yukon Territory: a preliminary discussion; In: M.E. Edwards, A.V. Sher, and R.D. Guthrie (eds); Terrestrial Paleoenvironmental Studies in Beringia, Alaska Quaternary Center, University of Alaska, Fairbanks, AK, 83-90.

Inukshuk and Jacobsen (2008). First Nation of Nacho Nyak Dun 2008-2013 Capital Plan Situation Analysis Report; prepared by Inukshuk Planning & Development Ltd. & N.A. Jacobsen.

Jackson, L.E., Jr., and C.R. Harington (1991). Middle Wisconsinian mammals, stratigraphy and sedimentology at the Ketza River site, Yuon Territory. Geographie Physique et Quaternaire 45: 69-77.

Jacques Whitford-AXYS (2008). Dublin Gulch Project (Eagle Zone and Mar-Tungsten Deposit); Water and Sediment Quality Environmental Baseline Study Report; prepared for StrataGold Corp., 15 pp.

Knight Piésold (1996a). Report on Feasibility Design of the Mine Waste Rock Storage Area. Report prepared for First Dynasty Mines Ltd., Denver, CO by Knight Piésold Ltd. Consulting Engineers, Vancouver, BC.

Knight Piésold (1996b). Report on Feasibility Design of the Heap Leach Pad and Associated Structures. Report prepared for First Dynasty Mines Ltd. by Knight Piésold Ltd. Consulting Engineers, Vancouver, BC.

Knight Piesold (2013a). Victoria Gold Corp., Eagle Gold Project - Climate Baseline Data Summary (Ref. no. VA101-290/6-9), August 2013.

Knight Piésold (2013b). Victoria Gold Corp., Eagle Gold Project - Hydrology Baseline Data Summary (Ref. no. VA101-290/6-10), August 2013.

Knight Piesold (2013c). Hydrometeorology Report, Eagle Gold Project, prepared for Victoria Gold Corp., by Knight Piesold, Vancouver, August 30, 2013.

Kotliar, N.B. (2007). Olive-sided Flycatcher (Contopus cooperi): A Technical Conservation Assessment. U.S. Forest Service, Rocky Mountain Region.

Lawrence (1997). Humidity Cell Kinetic Tests on Waste Rock: Dublin Gulch Project. Report prepared for New Millennium Mining Ltd., by Lawrence Consulting Limited May 1997, 105 pp.

Lorax (2013). Baseline Water Quality Report; prepared for Victoria Gold Corp., Vancouver, BC, December 2012

Madrone (2006). Dublin Gulch Project Gap Analysis: Environmental Baseline Information; prepared for StrataGold Corp., 32 pp.

McPhail, J. D. (2007). The Freshwater Fishes of British Columbia. University of Alberta Press, Edmonton, 620 pp.

Mayo Historical Society (1999). Gold and Galena: A History of the Mayo District; compiled by Linda E.T. MacDonald and Lynette Bleiler.

Mech, L.D., and L.L. Rogers (1977). Status, distribution, and movements of martens in northeastern Minnesota. U.S.D.A. For. Serv. Res. Pap. NC-143.

MOE (1981). Snow Sampling Guide, Water Management Branch, Province of BC, 27 pp.

Moose Management Team. 1996. Moose Management Guidelines. Yukon Department of Natural Resources. July 1996. Available at: http://www.yfwcm.ca/species/moose/guidelines.php. Accessed: September 2010.

Natural Resources Canada (2009). Accessed online at http://cfs.nrcan.gc.ca/subsite/ecoleap/definitions on November 27, 2009

O'Donoghue, Mark (2010a). Personal communication, Regional Biologist, Yukon, Environment, November 2, 2009 teleconference.

Pendray, T. (1983). Life History and Habitat Utilization of Arctic grayling (Thymallus arcticsu) in Two Central Yukon Drainages. Land Planning Branch, Department of Renewable Resources, Government of Yukon. Yukon River Basin Study, Project Report: Fisheries No. 8, 63 pp.

Rutqvist, J. and Stephansson, O. (2003) The Role of Hydromechanical Coupling in Fractured Rock Engineering. Hydrogeology Journal, 11, pp. 7-40.

Savignac, C. (2006). COSEWIC assessment and status report on the Rusty Blackbird Euphagus carolinus. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON.

Semenchuk, G.P. (ed.) (1992). The atlas of the breeding birds of Alberta. Federation of Alberta Naturalists, Edmonton, AB.

Shaw, D. (2006). Breeding ecology and habitat affinities of an imperiled species, the Rusty Blackbird (Euphagus carolinus) in Fairbanks, Alaska. United States Fish and Wildlife Service. Available at: http://www.alaskabird.org/?s=rusty+blackbird. Accessed: August 2010.

Slough, B.G. (1989). Movements and habitat use by transplanted marten in the Yukon Territory. Journal of Wildlife Management 53: 991-997.

SRK (2013). Geochemical Characterization of Proposed Excavation Areas and Borrow Sources from the Eagle Gold Project, Yukon; report prepared by SRK Consulting (Canada) Inc. for Victoria Gold Corp., May 2013.

SRK (2014). Geochemical Characterization - Eagle Gold Project; report prepared by SRK Consulting (Canada) Inc. for Victoria Gold Corp., March 2014.

Sitka Corp. (1996). Field Investigation Data Report, Dublin Gulch Project, New Millennium Mining.

Stantec (2010a) Environmental Baseline Report: Climate, prepared for StrataGold Corp., February 2010.

Stantec (2010b).Environmental Baseline Report: Hydrology, prepared for StrataGold Corp., March 2011

Stantec (2010c). Environmental Baseline Report: Water Quality and Aquatic Biota, prepared for StrataGold Corp., June 2011

Stantec (2010d). Environmental Baseline Report: Surficial Geology, Terrain and Soils

Stantec (2010e). 2007-2009 Environmental Baseline Report: Fish and Fish Habitat, prepared for StrataGold Corp., June 2011

Stantec (2010f). First Nation of Na-Cho Nyäk Dun Traditional Knowledge and Use. Final Report. Prepared for Victoria Gold Corp., Vancouver, BC by Stantec Consulting Limited, Burnaby, BC, and First Nation of Na-Cho Nyäk Dun, YT. June 2010.

Stantec (2011a). Eagle Gold Project, Environmental Baseline Report: Hydrogeology, prepared for Victoria Gold Corp., July 2011.

Stantec (2011b). Eagle Gold Project, Environmental Baseline Report: Terrestrial Wildlife, June 2011

Stantec (2011c). Eagle Gold Project, Environmental Baseline Report: Vegetation, June 2011

Stantec (2012a). Eagle Gold Project, Environmental Baseline Report: Climate 2011 Update , prepared for Victoria Gold Corp.

Stantec (2012b). Eagle Gold Project, Environmental Baseline Data Report: Hydrology 2011 Update, prepared for Victoria Gold Corp., June 2012.

Stantec (2012c). Eagle Gold Project, Environmental Baseline Data Report: Hydrogeology 2011-2012 Update, Final Report, prepared for Victoria Gold Corp by Stantec Consulting Ltd, Burnaby, BC, June 2012.

Steventon, J.D. and J.T. Major (1982). Marten use of habitat in commercially clear-cut forest. Journal of Wildlife Management 46(1):175-182.

US Geological Survey (USGS). 2010. North American Breeding Bird Survey. Available at: http://www.pwrc.usgs.gov/bbs/. Accessed: September 2010.

Village of Mayo (2006a). Integrated Community Sustainability Plan. Available at http://www.infrastructure.gov.yk.ca/pdf/icsp_mayo.pdf; accessed July 2010.

Village of Mayo (2010). List of Businesses in the Mayo and Silver Trail Area

Wardrop (2009). Technical Report on the Dublin Gulch Property, Yukon Territory, Canada. Prepared for StrataGold Corporation, January 2009.

Yukon Government. 2003. Community-Based Fish and Wildlife Management Plan, Nacho Nyäk Dun Traditional Territory 2002-2007.

Yukon Government (2009). Yukon Snow Survey Bulletin and Water Supply forecast, May 1, 2009, Water Resources Branch, Environment Yukon.

Zanasi, L. and Research Northwest (2010). Socio-economic Baseline Draft Report; prepared for Victoria Gold Corp., Vancouver, BC.