

**MINE CLOSURE PLANNING WITH FIRST NATIONS COMMUNITIES: THE  
STK'EMLUPSEMC TE SECWEPENIC NATION AND THE NEW AFTON MINE**

by

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B.A.Sc. The University of British Columbia, 2013

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF  
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF APPLIED SCIENCE

in

THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES  
(Mining Engineering)

THE UNIVERSITY OF BRITISH COLUMBIA  
(Vancouver)

August 2015

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## **Abstract**

The goal of this research is to understand how the traditional knowledge of the Stk'emlupsemc te Secwepemc Nation can be used to improve reclamation and closure planning of the New Afton mine. Furthermore, this research will provide insight into consultation with First Nation communities for closure and reclamation planning. The New Afton Mine site, located ten kilometers west of Kamloops, BC is on the traditional territory of the Tk'emlúps te Secwepemc and Skeetchestn Indian Bands. The application of traditional knowledge for closure is a relatively new field. As such, the application of the findings of this research are at a conceptual level.

Interviews with traditional knowledge keepers were conducted to understand the relationship between plant life, wildlife, water sources and the traditional use pattern in the area. Site visits to both the Stk'emlupsemc te Secwepemc Nation and New Afton Mine site have taken place during this research study. Visits to the New Afton property focused on determining and understanding the different areas of disturbance. Visits with the Stk'emlupsemc te Secwepemc members were aimed at engaging, recognizing, and understanding their objectives for the long term post-closure use of the mine site.

This research found an extremely strong connection between the community's culture and natural environment. In addition, hunting, fishing, medicinal and nutritional plant gathering were considered as the key traditional land uses in the area. The New Afton Mine was known as an old stop-over ground for travelers in the region. Concerns relating to the impacts of tailings and possible contaminants to the environment (water, wildlife and plant life) were indicated. Reclaiming the land to a natural state was outlined as the most desirable outcome for closure. The technical constraints of the property were also discussed (subsidence zones, semi-arid conditions, etc.) and how the property, considered as a brownfield development, impacts the closure and reclamation outcomes. Finally, through the interviews and field notes, it was found that successful consultation and collaboration with First Nations communities requires: respect and understanding of the community's culture and history, well established trust, and an ability to be flexible to the needs of the community.

## **Preface**

I conducted the entire research and thesis writing process. I was responsible for the identification, design, and fieldwork of this research. In addition, I conducted and designed all data collection, compilation, analysis, and interpretations.

The qualitative data collection methods for this research were approved by the UBC Research Ethics Board (identification number: H14-02632) and the Stk'emlupsemc te Secwepemc Nation (Appendix E).

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## **Acknowledgements**

I would like to first acknowledge the members of both the Skeetchestn and Tk'emlúps te Secwepemc Indian Bands for sharing with me their knowledge, traditions, culture and for being welcome hosts during my time in their territory. I hope this research will help to further promote collaborative work between UBC and the Skeetchestn and Tk'emlúps te Secwepemc Indian Bands, as there are still many more lessons to be shared. I specifically would like to acknowledge the contributions of:

Chief Ron Ignace, Chief Shane Gottfriedson, Councilor Darrell Draney, Councilor Jeanette Jules, Councilor Ed Jensen, Elder Daniel Calhoun, Elder Garlene Dodson, Elder Barb Larson, Freda Jules, Diena Jules, Esme Parsons, Travis Marr, Mike Anderson, Jo-Anne Hales and Leonard Jackson.

I feel grateful every day to be part of such a supportive family as mine. My mother, father, and most importantly my sister, have helped me through almost every step during my time in graduate school. The success I have in any aspect of my life I owe to my family. This research study is just one of many success of my life that would not be possible without their support.

After seven years of being both an undergraduate and graduate student at the University of British Columbia in the Mining Engineering Department, I feel privileged to have grown up with such a distinguished and caring faculty and staff. My supervisor, Dr. Dirk van Zyl, never ceases to amaze me with his work ethic, knowledge, and ability to somehow always make time for me and my project. Dr. Scott Dunbar has always been extremely supportive and helpful during my

time in the department and was a main reason why I joined seven years ago. Although not on this research study's committee, Dr. Marcello Veiga has taught me more about how to be a researcher than any other person. It is he who taught me to work with passion, excitement, and constant dedication. Furthermore, I would like to thank Professor Dawn Mills for helping me organize and find this project.

Finally, I would like to thank the Stk'emlupsemc te Secwepemc Nation and the Natural Sciences and Engineering Research Council for their financial support for this research.

## **Dedication**

I dedicate this thesis to my late uncle, Dr. Larry Collins. A true scholar – the lessons he taught me during his time with us will be with me for the rest of my life.

## **Chapter 1: Introduction**

Mine closure and reclamation represent one of the final steps in the life cycle of a mining operation, and modify the property for future use. The requirements for reclamation are outlined by the regional or national government through the mine permit(s), and are often required to take into account the expectations of Indigenous or First Nations communities (Boadi, 2012).

Closure planning requires a conceptual identity of how the mine site will appear at the end of mining (Bowman & Baker, 1998). This identity can be very difficult to envision, as mines can unexpectedly close for a wide range of reasons; including, economics, geological conditions, and regulatory and community issues (Laurence, 2006). Mining operations that have unsuccessfully planned for closure can potentially negatively impact the local and regional communities economically, socially, and environmentally (Australian Government - Department of Industry Tourism and Resources, 2006a). Closure planning should result in remediation of the land for safe, future generational use, as agreed upon through consultation and collaboration with the mine site's stakeholders and rights holders (Warhurst & Noronha, 2000).

This chapter will begin by structuring the problem addressed in this thesis, present the issues to be studied, provide an overview of the New Afton closure planning case study with the Stk'emlupsemc te Secwepemc Nation (SSN), introduce the research question and objectives, and finally, present the chapter outline for this research.

### **1.1 Structuring the Problem**

Successful mine closure planning in Canada requires input from all stakeholders and rights holders (McHaina, 2001). Common stakeholders are government, non-governmental

organizations (NGOs), mining companies, associated industry and businesses, environmental organizations and the local communities (S. A. Roberts, 2005; Warhurst & Noronha, 2000; Xavier, 2013). A common misconception is considering First Nations communities as stakeholders (Joseph, 2014). First Nations communities are considered to be sovereign nations with rights to the land (Brooks, 2013). As with regional and national governments, First Nations communities need to be considered rights holders. Mine closure and reclamation planning attempts to answer the questions of long term use and site risk, which are often of key concern to the mine's stakeholders and rights holders (Laurence, 2006; Peck & Sinding, 2009). In addition, mine closure planning is at the center of discussions regarding environmental assessments, permitting, and mine property reviews (Berg, 2008; Peck et al., 2005; Schmitt, Ames, & Stoopnikoff, 2008).

As permitting requires consultation with the First Nations communities (BC Ministry of Energy and Mines, 2008), a robust closure plan that takes into account First Nations views on post-closure land use is crucial and furthermore, a requirement. Environmental assessment (EA) studies help to define and understand the environmental risks (e.g. risks to the water, air, wildlife and plant life) (Baker & McLelland, 2003). The information from the environmental assessments can help provide an understanding of the site's environmental risks during the operation, closure, and reclamation of the mine site, and assist with planning of risk mitigation and reduction.

Mine closure planning is a site specific task that requires much more than just technical input and information from reports such as environmental assessments, but also social and cultural values from local First Nations communities (Boadi, 2012). In many cases in British Columbia and

across Canada, including the New Afton Mine, the First Nations communities hold rights to the land, and their views and values of closure need to be an important consideration for mine closure planning.

## **1.2 Background: Stk’emlupsemc te Secwepemc Nation and The New Afton Mine**

To provide context to this research, this section presents information collected by New Gold Inc., Rescan Environmental Services, the Province of British Columbia, and by Schmitt, Ames & Stoopnikoff (2008). The New Afton Mine (owned and operated by New Gold Inc.) is located ten km west of Kamloops and about 350 km north-east from Vancouver, B.C., in the traditional territory of the Secwepemc Nation (See Figure 1.1). The site is situated near two major highways, the Trans-Canada Highway 1 and the Coquihalla B.C. Highway 5. The area is the home of the Tk’emlúps te Secwepemc and Skeetchestn Indian Bands (See Figure 1.2). The two bands hold historically close ties through shared lands and cultural heritage (Coffey, Goldstrom, Gottfriedson, Mathew, & Walton, 1990; “Slexlexeytwecw: Sharing our Stories: Informational Mining Conference,” 2012). In addition, they are two of the 17 Indigenous communities in the Secwepemc Nation (Ignace, 2008). The two bands created a joint enterprise and partnership, called the Stk’emlupsemc te Secwepemc Nation (SSN) or Stk’emlupsemc Enterprises Inc. (SEI), for negotiations with the mining companies of the region. The office of the Stk’emlupsemc te Secwepemc Nation (SSN) is located on the Skeetchestn Reserve on the outskirts of Savona, B.C. and near Kamloops, B.C. (See Figure 1.1 and Figure 1.2)





Figure 1.1 Map of BC with Kamloops and New Afton (Source Google Maps)



Figure 1.2 Skeetchestn Reserve (Red) Tk'emlúps te Secwepemc Reserve (Blue) (Source Google Maps)

The New Afton Mine site has a long history of mining operation. In 1978, Teck began production of the Afton Pit. Teck mined the gold and copper resource for 13 years and closed down in 1991. Between 1999 and 2003, DRC Resources Corporation conducted exploration. New Gold Inc. completed the feasibility study for the underground block cave mine in 2007, and began production in 2012 (Schmitt et al., 2008). The New Afton Mine has a 12 year life span, which is fairly short compared to other block cave mines around the world (Woo, Eberhardt, Elmo, & Stead, 2013). The New Afton property's history, including its previous land tenure and ownership, describe how the site was used prior to New Gold's development, and could provide insight for the final use of the land. The property's land tenure will be outlined in the next section.

### **1.2.1 Land Tenure**

The mine property has a complicated ownership and land rights division. Furthermore, the land is within the traditional territory of the Stk'emlupsemc te Secwepemc Nation. There are also numerous lands and land authorizations requiring purchase or attention in advance to mining. These lands include:

*“Crown-granted mineral claims, fee simple lands owned by Teck-Cominco Ltd., Crown land, Sugarloaf Ranch lands, ALR land, grazing leases, Mines Act Permit M-112, provincial highway right-of-way, Canadian Pacific Railway right-of-way, oil pipeline right-of-way, B.C. Hydro transmission line right-of-way, natural gas pipeline right-of-way, Teck-Cominco and third party access agreements, and adjoining subsurface mineral rights” (Schmitt et al., 2008).*

The divisions of land can be seen in Figure 1.3 below. Although not shown in the figure, the entire property is on the traditional territory of the Tk'emlúps te Secwepemc and Skeetchestn Indian Bands. Also as shown in Figure 1.3, the New Afton site is situated on a considerably varied set of claims, from highways to grazing agriculture lands. For the New Afton Mine, in advance of mining operations commencing, the British Columbia government conducted a mine property review to understand the previous work on the site.

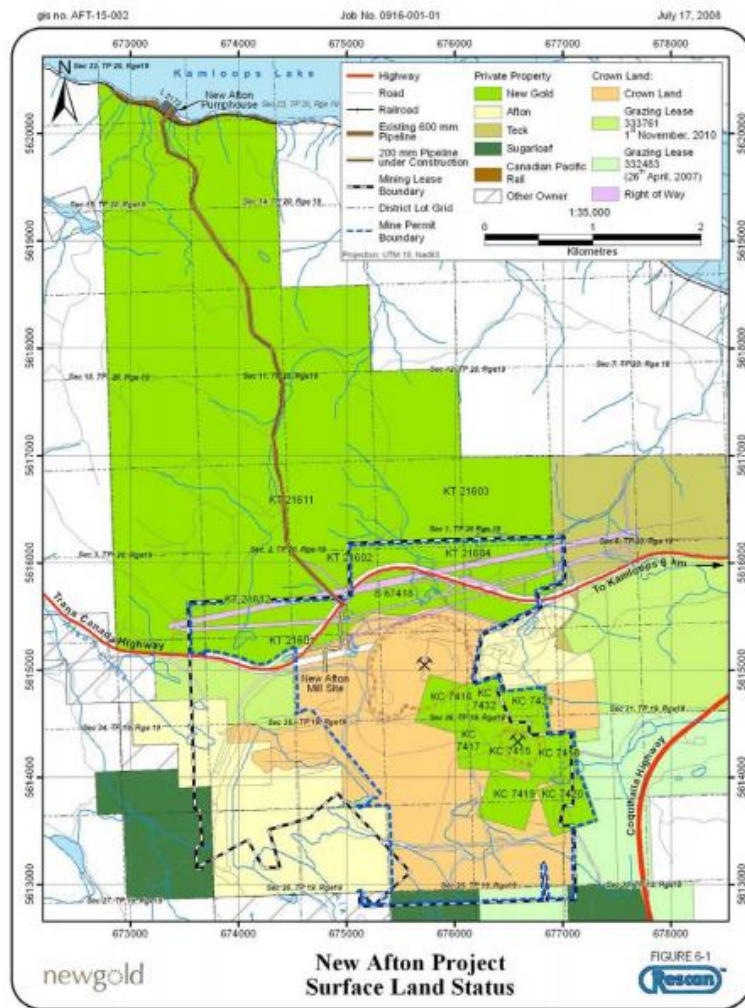
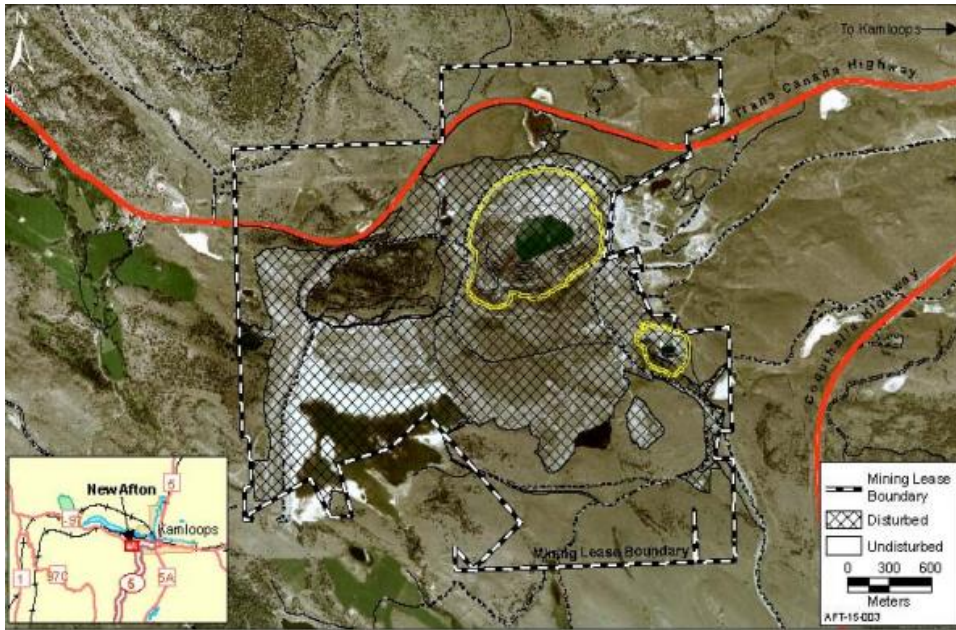


Figure 1.3 New Afton Project Surface Land Status (Schmitt et al., 2008)

### **1.2.2 Mine Property Review and Permit**

With the previous mining development on the property, the government considered this area a brownfield site (Rennie et al., 2007; Schmitt et al., 2008). Figure 1.4 shows the previous disturbance of the land at the time of the mine property review. The previous reclamation carried out by Teck Resources Ltd. supported some grazing and wildlife use (“Permit M-229 New Afton,” 2007). The British Columbia government determined that the overall review would be as a major mine under the Mines Act. The New Afton project occurs on a former mine site and did not require an Environmental Assessment; although environmental baseline studies were required through the appropriate agencies (Schmitt et al., 2008). The review was coordinated by the Ministry of Energy, Mines and Petroleum Resources, with the terms of reference approved by the South Central Mine Development Review Committee. This committee involved agency representatives from provincial, federal, and local governments, as well as First Nations communities, for guiding the project terms of reference.



**Figure 1.4 New Afton Disturbed vs. Undisturbed Land (Schmitt et al., 2008)**

New Gold Inc. submitted the Mine Permit Application to the Regional Mine Development Review Committee (RMDRC) on January 12, 2007. A 30-day formal review was required with the public and First Nation communities (the Tk'emlúps te Secwepemc and Skeetchestn Indian Band). On October 30, 2007, the Chief Inspector issued Mines Act Permit M-229 authorizing construction of the New Afton Mine.

The permit for the New Afton Mine (permit #M-229), signed and dated October 24<sup>th</sup>, 2007, addresses both Chief Ignace and Chief Gottfriedson. It discusses the current mine plan of New Gold and describes what is required over the mine life regarding inspection, monitoring and reporting. The permit discusses requirements for sites impacted from mining activities such as wildlife protection, vegetation management, soil salvage and storage, cultural heritage resources and air quality.



The letter in the mine permit from the Chief Inspector of Mines of British Columbia, Douglas E. Sweeney, discusses the environmental concerns of Chief Ignace and Chief Gottfriedson. The Chiefs' concerns related to surface and subsurface water resources; protection of cultural-heritage, wildlife, and vegetation; reclamation of roads, mine waste piles and tailings; geotechnical stability; fuel or reagent spills; and air quality ("Permit M-229 New Afton," 2007). Furthermore, the permit states that the end land use objectives are to promote livestock grazing, wildlife habitat, and traditional land use where appropriate.

New Gold Inc. and the Tk'emlúps te Secwepemc were able to sign a participation agreement in March 2008, after the 30 day review period. This participation agreement states that the mine will help the bands realize substantial economic, educational, employment, and social benefits for all parties over the life of the mine, and for many years into the future (Schmitt et al., 2008).

### **1.3 Environmental Baseline Studies**

As a requirement of government policy, environmental baseline studies were undertaken on the project site between April and December 2006. The main goal of the study was to identify areas of hazards requiring environmental risk management and mitigation. The information would be the base for both operational environmental design and long term mine closure planning.

Areas of study and their outcomes were as follows:

**Air Quality:** Dust is the main air quality concern, as the project is in a semi-arid local.

**Hydrology:** There is no surface run-off. Water will collect in the open pit and underground workings.

**Wildlife:** 70 wildlife species were documented in the study area. Two toad species found onsite are listed as at risk.

**Fish:** There are no fish in the mine permit study area.

**Vegetation:** Four species of invasive plants and noxious weeds found in the study area will require management plans.

**Metal Leaching and ARD potential:** The tailings storage facility is highly unlikely to generate acid rock drainage (ARD). Most waste rock from the facility has no metal leaching or acid rock drainage concern and will be placed within the Afton Pit (Schmitt et al., 2008). The New Afton site, as of July, 2013, can be seen below in Figure 1.5 (Klohn Crippen Berger, 2014).



Figure 1.5 Orthophoto of New Afton July, 2013<sup>1</sup> (Source: Klohn Crippen Berger New Afton Third Party Review, 2014)

#### 1.4 Issues to be Studied

From the review of the New Afton Mine’s history and baseline studies, a recurring question arises in regards to mine closure and reclamation planning: “*What is required in light of the fact the proposed mine is on a former mine site?*” (Schmitt et al., 2008). There are difficulties in evaluating properties which have a long history of mining operation using today’s standards for closure and reclamation (Berg, 2008; Cowan, Mackasey, & Robertson, 2010). The property’s development and operation can carry long term environmental risks which are difficult to manage and mitigate. With a long history, and ownership/management changes, who is

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<sup>1</sup> TSF refers to Tailings Storage Facility



accountable for these risks? And what are fair standards for mining companies operating today, enduring sins from their past?

Through reviewing environmental baseline studies, major environmental risks during and after operations do not appear to be prevalent. It is important to develop greater understanding into the other rights holders' and stakeholders' perspective of risk. What are the views of the communities? What are their requests for mine closure? How can they be involved further in the process? In general, this research will look to understand how consultation with the First Nations communities on traditional land use can assist in providing details in closure planning, as per the requirements set out in the mine permit. The research questions outlined at the end of this chapter will provide more detail into what will be studied and analyzed in this thesis.

### **1.5 Purpose of this Research**

The purpose of this research study is to analyze how First Nations traditional knowledge and consultation can be used to improve mine closure, reclamation, and land use planning.

Furthermore, this research will provide insight into how to consult and work with First Nations communities in regards to mine closure planning. Through the use of a case study, the New Afton Mine and the Stk'emlupsemc te Secwepemc Nation (SSN), this research includes a practical example of how to implement and understand First Nation community's objectives, perspectives, and traditional knowledge for closure and reclamation planning.

### **1.6 Research Question and Objectives**

The overarching research question explored in this research study is:

How can First Nations traditional knowledge and consultation be utilized to improve closure, reclamation, and land use planning?

To help answer the above research question, the following are this research's objectives:

1. Explore the objectives for mine closure, reclamation and long-term land use planning of the New Afton Mine, for the Stk'emlupsemc te Secwepemc Nation.
2. Find the important flora, fauna and traditional use patterns of the Stk'emlupsemc te Secwepemc Nation on and near the New Afton Mine site.
3. Investigate the general thoughts about mining and mine closure planning for the Stk'emlupsemc te Secwepemc Nation.
4. Understand the proper engagement procedures with First Nations communities for mine closure and sustainable land management of mining sites.

## **1.7 Research Organization**

This thesis is organized into seven chapters as follows:

Chapter 1 – Introduction

Structuring of the problem and case study background information.

Chapter 2 – Literature Review

Review of current literature on mine closure, sustainable development, social license to operate, and First Nations, Aboriginal and Indigenous community engagement.

Chapter 3 – Methodology

Describes and argues for the qualitative research methods used in this research.

#### Chapter 4 – Results

Presents qualitative results from interview, site visits, and field notes.

#### Chapter 5 – Analysis

Analyzes the results and themes. Creates relationships between current and past literature, and describes the limitations of the research.

#### Chapter 6 – Conclusion

Provides the conclusions and key takeaways of the research. Discusses generalizability and transferability.

#### Chapter 7 – Recommendations

Presents new questions and potential future work that have materialized from this research study.

## **Chapter 2: Literature Review**

*“The future of mining is dependent on the legacy it leaves.”*

- Leading Practice Sustainable Development Program Australia (2006)

### **2.1 Introduction**

This chapter provides a review of the literature in the areas of mine closure, reclamation, post-closure planning, and the incorporation of sustainable development praxis and Indigenous, Aboriginal, and First Nations community objectives. This review will provide background into the complex nature of closure planning and the value of engaging with Indigenous, Aboriginal, and First Nations communities for improved mine closure and reclamation decision-making, social license to operate (SLO), and permitting. Finally, the limitations of the literature will be summarized.

### **2.2 Overview of Terms**

#### **2.2.1 Introduction**

This section presents how the current and past literature define closure and reclamation. Moreover, the sections outlines when closure and reclamation occur during the lifecycle of resource extraction. The general activities associated with mining include the following: exploration, development, extraction, closure, and reclamation (Nelson, 2011). This research focusses on the activities post-extraction, after the orebody has been depleted. There can be disagreement between experts on exactly how closure and reclamation are defined (as seen in the

next section), but often the terms are used synonymously as post-extraction activities (McHaina, 2001; Otto, 2010).

### **2.2.2 Closure and Reclamation**

Environment Canada (2013) defines mine closure as:

*When the ore minerals are completely exhausted or when it is no longer profitable to recover the minerals that remain. In some cases, mines may be closed temporarily and put into a status called "care and maintenance," also known as temporary suspension. This is frequently done during periods of low commodity prices in the expectation that higher prices in the future will make further commercial operations financially viable. Eventually, ore reserves are depleted, and mines are permanently closed.* (Environment Canada, 2013).

This statement demonstrates that closure occurs post-extraction but that closure may be temporary or unexpected depending on economics and future commodity prices.

The National Orphaned and Abandoned Mines Initiative (NOAMI), present a report by Cowan, Mackasey, & Robertson (2010) that states: a closure plan must ensure that mine site be returned to a safe, physically and chemically stable state. The term “post-closure” is also discussed, and explained as further site management required past the original decommissioning and rehabilitation outlined in the closure plan (Cowan et al., 2010).

Australia's Leading Practice Sustainable Development Program (2006), uses the terms closure, completion and rehabilitation. Closure is described as a process when mining has ended (or is ending) and final decommissioning and rehabilitation is being conducted. Mine completion is the goal of mine closure. It is when the mine site can be relinquished to the next land user of the site. To successfully reach mine completion a number of economic, social, and environmental management goals have to be completed, which in today's regulatory system requires stakeholder consultation and Aboriginal engagement (Australian Government - Department of Industry Tourism and Resources, 2006a, 2006b).

The SME Mining Engineering Handbook (Nelson, 2011), defines reclamation as when:

*The disturbances caused by any previous activities are corrected or ameliorated.*

and defines closure as when:

*The activity ceases and the area is abandoned or returned to another use (Nelson, 2011).*

As defined by Nelson (2011), closure occurs post-reclamation after the disturbances have been corrected. Mudder and Harvey (1998), state that closure is a period in time where post extraction activities such as vegetation, surface contouring, and a ground water monitoring program have been established and completed.

Finally, Roberts, Veiga, & Peiter (2000) state:

*The objective of mine closure and reclamation is to provide long-term stabilization of the geochemical and geotechnical conditions of the disturbed mined areas to protect public*

*health and safety, and to minimize and prevent any additional or on-going environmental degradation.*

Terms such as decommissioning, restoration, reconstruction, abandonment and post-closure are also used within the realm of post-extraction, or closure and reclamation (Jones, 2011; Mudder & Harvery, 1998; Peck et al., 2005; S. A. Roberts, 2005). All of these activities occur after mineral extraction is, for a variety of reasons, no longer possible. It is important to note, that depending on the site, there can be opportunities to conduct these post-extraction type activities alongside the mine operation, this will be examined in the next section.

As outlined in this section, it is evident that there exists variations in the definitions of closure and reclamation. Differences exist in when they occur during life-cycle of mining, as well as, which specific activities are carried out during closure and reclamation. The definition of closure and reclamation to be used in this study will be presented in this section's summary, section 2.2.4.

### **2.2.3 Progressive Reclamation**

Progressive reclamation is a term to describe post-extraction and rehabilitation activities which occur during mine operations (Brodie, 2013). Progressive reclamation helps to reduce the mine closure liability at the end of the mine life (Bowman & Baker, 1998; Brodie, Robertson, & Gadsby, 1992) and provides an opportunity to test and optimize closure strategies (van Niekerk, 2014). Progressive reclamation is argued as the lowest cost reclamation work due to the availability of equipment during the mine operation period (Brodie, 2013). The benefit of

progressive reclamation is evident but for a relatively small site, such as New Afton, finding opportunities or space to conduct progressive reclamation can be difficult.

Another issue with progressive reclamation is that over the years a mine site may have to disturb previously reclaimed areas due to: changes in the mine plan, a better understanding of the materials, or development for a better final landform (Goodbody, 2013). Finally, reclamation technology and methods are continually improving and by waiting until the end of mine life to conduct reclamation, the best available and cost-effective technologies have a higher likelihood of being used (Goodbody, 2013). Some current examples of progressive reclamation at New Afton are: habitat enhancement for a variety of bird, bat and amphibian species, removal of invasive species, a native tree planting program, and a wetland rehabilitation project (New Gold, 2013). However, with limited space and available land at New Afton, it is difficult to establish a large-scale progressive reclamation plan. At other larger mine sites, with perhaps numerous pits or mining areas, progressive reclamation could be established on a much larger scale throughout the operation (Goodbody, 2013).

#### **2.2.4 Section Summary**

After the review of current literature, this research will refer to closure and reclamation as work and activities that are conducted post mineral extraction, when the mine has ceased mineral production and is in the process of developing the land to be suitable for a different use. This work should always include, (and has for many years) consideration of physical stability, chemical stability, land use and aesthetics (Brodie et al., 1992; Cowan et al., 2010). Progressive reclamation is the same type of work but is conducted throughout the life of mine. This research



will assume progressive reclamation is included when discussing general closure and reclamation activities.

Questions continue to arise regarding the true extent of land reclamation. Should reclamation be solely focused on minimizing the environmental degradation? Or is it an opportunity to bring the site back to a productive state to feasibly incorporate community objectives? From the review of literature on the definitions of closure and reclamation, the answer sways both ways. The mining industry's reputation is heavily tied to both current and past decisions in closure and reclamation planning (Bowman & Baker, 1998). The following sections (2.3-2.6) outline a number of the elements and associated challenges which need to be accounted for in closure planning.

### **2.3 Current Mine Closure and Reclamation Activities**

There can be disagreement between which activities are included in closure and reclamation independently. The following is a list that includes but is not limited to work within current closure and reclamation plans (Bingham, 2011; Bowman & Baker, 1998; Cowan et al., 2010; Environment Canada, 2013; McArthur & Gallinger, 1994; Nelson, 2011; O'Hara, 2003; Xavier, 2013):

- Removal of infrastructure and buildings
- Removal of all chemicals, reagents, and explosives for offsite disposal
- Contaminated soil treatment, recontour surfaces, redistribution of top soil, creation of topsoil, vegetation
- Tailings, acid rock drainage, and waste rock management
- Erosion and sediment control

- Wildlife and fish habitat management and habitat creation
- Setting-up a water quality management system
- Closing of underground workings, backfill portal to prevent entry, cover shafts and vent raises
- Pit management (back fill, flood, or/and restrict access)
- Access management
- Establish monitoring and maintenance requirements
- Socio-economic closure
- Preparing site for other use

The following are a list of supporting documents that may be required to support a closure plan

(Bentel, 2007; Bowman & Baker, 1998; Cowan et al., 2010; McArthur & Gallinger, 1994;

Xavier, 2013):

- Geotechnical Assessment
- Hydrology and Water Management
- Review of Historical Environmental Data of Surrounding Area
- Site Description
- Mine Rock and Tailings Geochemistry
- Socio-Economic Impact Assessments
- Cultural Heritage Studies
- Monitoring and Maintenance Plans

The extent to which these closure and reclamation activities are carried out depend on the guidelines and requirements outlined by the local and regional governments, the company's corporate goals, stakeholder consultation, and industry standards (Bentel, 2007; Garcia, 2008). The literature outlining closure planning practices is often quite general and with limited detail on how to specifically apply the planning methodology. From the review of literature, it would be challenging and burdensome for a non-technical person to fully understand current mine closure practices. Closure and reclamation literature needs to address how to integrate First Nations community members, and in general, non-technical individuals, into closure planning. Furthermore, this research addresses how to effectively engage and communicate with First Nations community members to help understand mine closure planning, and to show how their knowledge can be integrated to improve this field.

#### **2.4 Variability in Closure and Reclamation Planning**

A mine site evolves over time and thus a closure plan may be subject to revisions or amendments on a periodic basis (Cowan et al., 2010; S. Roberts, Veiga, & Peiter, 2000). To account for these changes, in British Columbia for example, the closure and reclamation plans must be updated every five years (BC Ministry of Energy and Mines, 2008). With variability in geology, metal prices, production schedule, etc., it can be very difficult to know exactly how the mine site will appear upon closure (G. McKenna et al., 2011). Furthermore, closure may occur for many different, and sometimes unexpected reasons (Laurence, 2006). Economic, unexpected geological and geotechnical conditions, equipment failures, government policy or community opposition can all contribute to a mine closing earlier originally planned (Laurence, 2006; Prno

& Slocombe, 2014). If these unexpected reasons for closure occur, it can cause a final landscape to be significantly different from what was outlined in the initial closure design.

Closure can also be a temporary event (Peck et al., 2005), and often there can be significant time that passes between a “care and maintenance program” and closure (Laurence, 2006). This can create unrest with the local communities as the closure and reclamation objectives are viewed as not being fulfilled (Veiga, Scoble, & McAllister, 2001). As Laurence (2006) and Veiga et al. (2001) discuss, the importance of community engagement throughout each process is imperative for optimal closure outcomes. As indicated in the literature (Cowan et al., 2010; Laurence, 2006; S. A. Roberts, 2005; Veiga et al., 2001), the variability in closure timelines should be openly communicated, and expectations managed during and after operations, and throughout temporary closure time periods. This research further addresses the need for openly communicating and accounting for variability in closure and reclamation design.

## **2.5 Mine Closure Risk Management**

There are numerous economic, social, and environmental risks that must be accounted for by mine closure planners (International Council on Mining & Metals, 2008). Garcia (2008) and Laurence (2006) argue that risk management techniques are useful tools to account and mitigate a mine site’s overall risks, post mineral extraction. Risk assessments can be performed for entire mine sites but also for specific key components of closure sites. Components such as crown pillars (Hutchinson, Phillips, & Cascante, 2002), tailings dams (Australian Government - Department of Industry Tourism and Resources, 2007; “British Columbia Dam Safety Regulation,” 2011), pit lakes (Sampson, Mellott, & Pastorok, 1996), hydro-geological risks of

mine waste and acid-rock drainage (D. Evans, 2015), all require varying levels of risk assessments and management strategies. Risk assessments analyze both the potential of failure and consequence of failure (Australian Government - Department of Industry Tourism and Resources, 2007; Hutchinson et al., 2002; Laurence, 2006).

Hutchinson et al.'s (2002) table on remediation for a crown pillar, provides a matrix for remediation decisions, based on a given failure mode (probability and consequence of failure). This was redeveloped for general remediation requirements and decision making in Table 2.1. The Pinchi Lake Mine for example conducted an ecological risk assessment, environmental site assessment, and a human health risk assessment to determine the high priority areas of reclamation (Allard, Baker, & Mackintosh, 2013; Unger, Donald, & Marsland, 2013). A remediation plan was then developed for the identified high risk sites. Risks can be categorized into different types of consequences such as health/safety, economic, environmental, social, and reputational. The Pinchi Lake reports analyzed the consequences in terms of ecology, environment and human health.

**Table 2.1 Remediation Decision Making Table (Hutchinson et al., 2002)**

Remediation Decision Making Matrix		Probability of Failure		
		High	Medium	Low
Consequence of Failure	High	Remediation Is Required	Remediation Is Required	Remediation May Be Required
	Medium	Remediation Is Required	Remediation Is Required	Remediation is Not Required
	Low	Remediation May Be Required	Remediation is Not Required	Remediation is Not Required

In Table 2.2, as developed from Anglo American’s risk matrix, the losses are categorized into safety/health, environmental, business interruption, legal/regulatory and impact on reputation. In this scheme, each failure would consider each category of consequence and analyze its impact within that category. A risk rating can then be applied and guidelines for management are then discussed. It is essential to use this method, as one of many tools, along with expert experience, to assess the risks of a closure property.

**Table 2.2 Risk Decisions for Multiple Loss Types (Anglo American, 2013)**

Loss Type		Hazard Consequence		
Harm To People		Multiple Fatalities	Loss Time Injury	First Aid Case
Environmental Impact		Extreme Environmental Harm	Serious Environmental Harm	Minimal Environmental Harm
Business Interruption/Economic		>\$75M	\$1M to \$10M	20K - 100K
Reputation/Social		International Coverage of Event and Concern	Regional Concern	Little to no Public Concern
Risk Decision Making Matrix		Consequence of Failure		
		High	Medium	Low
Probability of Failure	High	Eliminate Risk	Proactively Manage	Actively Manage
	Medium	Proactively Manage	Proactively Manage	Monitor
	Low	Actively Manage	Monitor	Monitor

For closure plans, Garcia (2008) argues that a company needs to determine how much risk they are willing to accept and then create a closure plan to mitigate all risks to at least that level. He mentions the importance of closure plans to reduce the risks and impacts to all aspects of the environment (soil, water, air, communities) in addition to reducing future financial risk to the shareholders (Garcia, 2008). Garcia (2008) and the literature on closure risks and risk management, lacks a discussion on communicating risks to First Nations communities.

First Nations communities can see and define risk in a different manner than western science (Haalboom, 2014). In western science, the magnitude of risk can be estimated by the probability of failure multiplied by its consequence (Gardner, 2008; Laurence, 2006; Slovic, Finucane, Peters, & Macgregor, 2004). As analyzed by Slovic et al. (2004), using solely the analytical (or western science) approach for risk communication can be ineffective. Risk communication needs to consider the community's own intuitive experiential view of risk, which is based on their past experiences and values (Gardner, 2008; Slovic et al., 2004). For the analytical or western science approach, a low risk situation can occur if the probability of failure is low even though the consequence of failure is significant. However, on an experiential level, if the views and values associated with consequence of risk are so great, or perhaps immeasurable, the low level of risk or probability calculated from the analytical approach is inconsequential (Slovic et al., 2004). Poor communication of risk can result in a loss of community acceptance and community dissatisfaction with the risk management decisions of the company (Veiga et al., 2001). This research evaluates ways of communicating risk of closure and reclamation sites to First Nations communities, rather than conventional risk assessments.

## **2.6 Economics of Mine Closure Planning**

The costs associated with mine closure are carefully analyzed by mining companies as they can greatly affect the economic viability of a mining project. Mine Closure costs are typically incurred post-extraction and at the end of the mine life. At this stage of the operation, there is relatively low positive cash flow. Due to this, the closing stages of most mining projects are almost always operating at a loss (Otto, 2010). To mitigate these negative costs, companies



typically look for progressive reclamation opportunities that can be conducted during operation (Goodbody, 2013). Again, Brodie (2014) mentions the overall mitigation of costs to closure from conducting progressive reclamation. As well, Peck et al. (2005) argue the positive impacts of proper closure planning during the each stage of mineral extraction as a business case. Closure planning conducted at all stages throughout the life cycle of mining reduces liabilities, facilitates timely relinquishment and bond recovery, and improved access to capital from reputable lending institutions (Peck et al., 2005).

From a mining company's perspective, closure and reclamation activities can reduce the profits of the mining project. Without any well-defined environmental legislations, mining companies have limited guidance for what is required for closure and reclamation work (Kahn, Franceschi, Curid, & Vale, 2001). What is required in this sense depends on what is stated in the mine permit issued by the regional government (Brodie, 2013; Kahn et al., 2001). This shows the importance for the government to provide a robust mine permit, which balances environmental protection with overall project economics. As previously noted, closure planning is a dynamic process that occurs in parallel to all stages of mine development (Warhurst & Noronha, 2000). Due to the unpredictability of why and when a mine will close, it is difficult to predict the final level of impact from the mine development. Therefore it can be unrealistic for the permit, which is issued prior to any mine development, to provide detailed technical requirements for closure. For now, it is imperative that the industry participates in best available practices during early planning stages, and that closure plans are updated on a consistent basis as development of the mine site occurs.

### **2.6.1 Closure Bonding and Financial Assurance**

Financial assurance systems for closure are established at early stages of the operation to confirm that adequate funds are available at the end of the mine life for closure and reclamation activities (Otto, 2010). Depending on the operation, different levels or financial instruments may be required (Peck & Sinding, 2009). Corporate assurance, letters of credit, and bonds are common types of financial assurance instruments used between the mining companies and the government (Gord Mckenna & Dawson, 1997; Peck & Sinding, 2009). The amount of assurance required has historically been related to the number of hectares disturbed, or the total cost of closure at the end of mineral extraction (Gord Mckenna & Dawson, 1997).

When determining the amount or type of financial closure assurance system, studies need to be undertaken to understand the mine site's risks at the end of mineral extraction (Brodie, 2013; Peck & Sinding, 2009). The government often establishes protocols to utilize the closure bond if the company does not adhere to the environmental rules and regulations set-out in the mine permit (Otto, 2010). As mentioned, the closure bond is often established at the early stages of the mine life-cycle, when it is difficult to accurately determine the site's closure costs. With such, there are difficulties in adequately estimating the closure bond requirements. Furthermore, the reclamation standards and technologies may considerably change over the lifetime of a mine. What is acceptable now for closure, may not be acceptable in the next decade (Goodbody, 2013; Gord Mckenna & Dawson, 1997). Closure bond requirements should be adapted periodically throughout the mine life to account for changes in closure costs, plans, and technologies

There is limited literature on the relationship, understanding, and satisfaction of closure bonding requirements for First Nations communities. If the company fails to reclaim the site, poor bonding and financial assurance can greatly affect First Nations communities. However, there is limited research on how First Nations communities influence closure bonding. Furthermore, how to fairly account for their expectations within the mine's financial assurance system.

## **2.7 Reclamation Policy in BC**

Motivated by the public and conservation agencies, mine reclamation became a legal obligation with an amendment to mining legislation in 1969. They were provoked by a proposal by Kaiser Steel of Oakland, California to open a large-scale coal in the East Kootenay coal fields (Britton, 1998). In current practices, minerals are under provincial jurisdiction and therefore most legislation that affects mining is provincial (Britton, 1998). Under the provincial legislation, each mine is responsible for preparing a closure plan in advance of receiving permission to start mine construction (BC Ministry of Energy and Mines, 2008). Reclamation plans are sent to the Reclamation Advisory Committee (RAC) and the Mine Development Review Committee (MDRC), which is comprised of technical staff from federal and provincial regulatory agencies and chaired by the district inspector of mines (BC Ministry of Energy and Mines, 2008; Britton, 1998; Schmitt et al., 2008). Local governments, First Nations/Aboriginal community members, and public representatives are often invited to provide input. The RAC and the MDRC set requirements as specified in the regulations for:

- Land-use objectives
- Water quality objectives
- Productivity objectives

- Stability of structures
- Need and content to baseline studies
- Environmental impact studies (Britton, 1998)

The public is involved with the review of new mines proposals through the Environmental Assessment Office or Mine Development Review Committee, but not with reclamation (BC Ministry of Energy and Mines, 2008). Further work needs to be conducted into integrating rights holding Aboriginal communities, as well as other stakeholders, for reclamation and closure policy.

## **2.8 Sustainable Development and Land Management in Mining and Mine Closure**

Following sustainable development initiatives has recently become an important part of conducting business for both mining companies (Hamann, 2003) and industry as a whole (Kolk, 2010). Sustainable development is defined by the Brundtland Report (1987) as: “*development that meets the needs of the present without compromising the ability of the future generations to meet their needs*”. The three pillars of sustainability (environmental, social, and economical) must all be accounted for the sustainable development of a company, country, community, or any other entity (Dyllick & Hockerts, 2002). As industry moves towards sustainable development, the potential environmental and social impacts of projects have become crucial issues to consider (Kolk, 2010).

The mining industry has largely subscribed to sustainable business practices for their operations with initiatives such as the Mining Association of Canada’s “Towards Sustainable Mining” and Australia’s “Leading Practice Sustainable Development Program for the Mining Industry”.

These initiatives provide frameworks and tools to help mining companies responsibly extract minerals with consideration of the community's economic, social and environmental needs.

These initiatives however are voluntary and non-binding. Most multi-national mining companies report on their sustainable practices through their sustainability reports (Lodhia & Hess, 2014).

Some of these specific initiatives will be further discussed in section 2.10.

Mining has an important role within the realm of global sustainable land management (Barkemeyer, Stringer, Hollins, & Josephi, 2015; UNCCD, 2011). UNCCD (2011) defines Sustainable Land Management (SLM) as:

*“Land use practices that ensure the land, water, and vegetation adequately support land-based production systems for current and future generations”*

Barkemeyer et. al (2015) states:

*“Mining is the fifth largest industry in the world and has largely been overlooked in terms of its potential to reorient land quality towards a more sustainable trajectory “*

To “reorient land”, closure and reclamation planning are essential, as they re-establish the land for a future use (S. Roberts et al., 2000). Sustainable land management practices can be applied to the mine closure and reclamation plans to help improve the site's socio-ecological systems (Barkemeyer et al., 2015). However as Barkemeyer et al. (2015) discusses, there can be differences in how stakeholder conceptualize sustainable land management for mines. In

addition, there needs to be improved communication and engagement practices to disseminate the information of how the mining industry is addressing sustainability in their operations. Veiga et. al (2001) address the significance of a “sustainable mining community”. They discuss the need to “*adhere to the principles of economic sustainability, economic vitality, and social equity*” in order to be considered sustainable. To achieve this, communication and cooperative decision making with stakeholders and rights holders is essential (Veiga et al., 2001). There has been a growing societal expectations in regards to ecological sustainability in the resource extraction sectors (Harris, 2007). The balancing of stakeholders’ views for economic development with environmental and social stewardship has fallen to the corporations. Company engagement capacity with the community for strategic decisions making in ecological sustainability is as Harris (2007) argues, helps us towards a more “*socially and ecologically viable existence*”.

There has been a number of initiatives towards sustainable development in the mining industry (International Council on Mining & Metals, 2008; Peck et al., 2005; “Towards Sustainable Mining,” 2015; World Bank Group and International Finance Corporation, 2002; Xavier, 2013). All include lengthy discussions on closure and reclamation planning ensuring both the environment and communities are sustainably managed. Xavier (2013), for example, introduces a framework to address the socio-economic challenges of mine closure.

Again, it is imperative to understand that First Nations communities in British Columbia are not solely stakeholders, they are rights holders (Brooks, 2013; Ignace, 2008; Joseph, 2014). As mentioned in the Towards Sustainable Mining Framework on Mining and Aboriginal

communities, understanding the rights and the local perspective on these rights is imperative (Towards Sustainable Mining, 2008). Working with these sustainable development initiatives to improve corporate social responsibility or possibly earning a social license to operate needs to be evaluated within the context of First Nations rights holders, not just community stakeholders.

### **2.8.1 Social License to Operate and First Nations Rights Holders**

For mining companies today, earning a social license to operate can be one of the most difficult challenges facing a resource development project (Joyce & Thomson, 2000; Prno & Slocombe, 2012). A social license to operate is earned when the project is seen as having the overall and ongoing approval of the society (Joyce & Thomson, 2000). This research specifically looks at right's holding First Nations communities, who are of critical importance to be considered for a social license to operate. The risks and consequences of not having a social license can be immense (Prno & Slocombe, 2014). Protests, blockades, non-issuance or retraction of government permits, media and shareholder campaigns, and government lobbying can all arise from social conflict between the company and the community (Prno & Slocombe, 2012). Delays and economic impacts from these social conflicts can be significant (Joyce & Thomson, 2000). Sustainable reporting (Kolk, 2010) and constructive approaches to stakeholder engagement (Owen & Kemp, 2013) ultimately improves your social license to operate.

A social license to operate can be very difficult to receive when facing significant differences in ideologies, values, and culture (Ali, 2003). Ali (2003), provides a number of examples when resource companies failed to receive acceptance from Indigenous and Aboriginal communities. An essential step to help resolve resistance is creating fair planning frameworks for all

stakeholders and rights holders in order to build a consensus. Communication and fair engagement processes are essential when establishing relationships with groups with significant differences in ideologies, particularly on the environment (Ali, 2003). There is limited research on the relation between First Nations communities, social license to operate, and closure planning. This research analyzes how engagement with First Nations communities on closure planning can help the company's overall social license to operate.

## **2.9 Indigenous, Aboriginal and First Nations Community Engagement**

In Canada, and specifically British Columbia, First Nations communities are an extremely important and influential rights holder for mining projects (Baker & McLelland, 2003). As the land and territory rights continue to be developed through cases such as the Delgamuukw (1997) and the Tsilhqot'in (2015), First Nations will continue to become key player in the resource extraction industry. The ability to engage in techno-scientific discussions with mining companies for some First Nations communities can be onerous (Danard, 2010; Haalboom, 2014). Having the proper protocols to explain all technical aspects and risks of mining or mine closure is imperative.

For mining companies it is now common practice engage with First Nations communities when developing Environmental Assessments with the Provincial Government and Impact Benefit Agreements (IBAs) with the First Nations communities (Fidler, 2009; Ginger & O'Faircheallaigh, 2010). The environmental assessment can be an avenue for First Nation communities to share their expectations and concerns of the environmental and social impacts of



a mining project, which can be utilized to help the project's contributions to sustainable development (Whitelaw, McCarthy, & Tsuji, 2009).

IBAs consider a number of aspects in regards to sharing of the benefits from the project as well as further engagement plans and procedures. The IBA can discuss sharing of the economic benefits through a number of different opportunities such as Aboriginal employment and training programs, and royalty payments (Fidler, 2009; Heisler & Markey, 2014). As part of gaining a social license to operate and adhering to sustainable development corporate goals, Aboriginal engagement is a critical aspect of mining (Heisler & Markey, 2014).

The Truth and Reconciliation Commission of Canada (2015), provides background and awareness for society as whole into the importance of understanding the impacts of the Canadian residential schools for Aboriginal communities. Furthermore, provides avenues and support for Aboriginal community members to share their stories from residential schools in a safe environment. The social and cultural impacts from residential schools, which operated across Canada from 1831 to 1996, can still be seen today (The Truth and Reconciliation Commission of Canada, 2015). Acknowledging and comprehending these impacts is crucial for researchers and mining companies when working with Aboriginal communities (Estey, Smylie, & Macaulay, 2009).

A key consideration when engaging and consulting with First Nations and Aboriginal communities in Canada is the ownership, control, access, and possession (OCAP) of the data collection (Schnarch, 2004). With research and engagement with Aboriginal communities

having a history of “*colonial approaches*”, it is imperative to establish protocols for information sharing, ownership, and control with the Aboriginal communities before any research and consultation takes place (Estey et al., 2009; Schnarch, 2004). In addition, as stated in the First Nations Principles of OCAP document by Schnarch (2004), for aboriginal communities, engagement, research, and consultation is commonly seen as being “*done to death*”. Finally, research should properly align with First Nations objectives to improve their society as a whole (Schnarch, 2004; The Truth and Reconciliation Commission of Canada, 2015).

There are a number of studies that explore the process of working with First Nations and Aboriginal communities in a resource extraction setting within environmental assessments and permitting (Haalboom, 2014; O’Faircheallaigh & Corbett, 2005; Whitelaw et al., 2009; Wiles, McEwen, & Sadar, 1999), but even though it’s critical to successful sustainable development there is very limited research on the process of engaging with First Nations in B.C. communities to help improve mine closure, reclamation and long-term land use planning.

### **2.9.1 Cultural and Ecological Traditional Knowledge**

Traditional ecological knowledge is defined by Johnson (1992) as:

*A body of knowledge built by a group of people through generations of living in close contact with nature. It includes a system of classification, a set of empirical observations about the local environment, and a system of self-management that governs resource use.*

The use of traditional knowledge can help to understand the plants and animals of the region, but also how to sustainably manage the local resources (Johnson, 1992).

In Canada, traditional ecological knowledge is required to be reviewed and understood during the environmental assessment process (Wiles et al., 1999). Wiles et al. (1999) found that traditional ecological knowledge was both a detailed description of the environment and the wildlife, and “*broader cultural comments*”. The cultural comments help provide detail on the social-cultural effects of a project which includes their identification with the land and their environment (H. Evans & Goodjohn, 2008; Wiles et al., 1999). This research analyzes both the detailed cultural comments and environmental descriptions within traditional knowledge, as described by Wiles et al. (1999).

Moreover, Danard (2010) and Haalboom (2014), note the difficulties with incorporating traditional knowledge into western scientific frameworks. In addition, they present the significance of preserving, protecting and properly sharing traditional knowledge for a First Nations community. The preserving and protecting of traditional knowledge is an essential consideration for research as seen in the OCAP’s Principles (Schnarch, 2004), and due to the losses of inter-generational traditional knowledge transfer over the last hundred years (The Truth and Reconciliation Commission of Canada, 2015). Ensuring ownership of traditional knowledge remains with the Aboriginal community is a paramount objective for Aboriginal communities. Traditional knowledge can be complex and made up of songs, ceremonies, words and stories (Danard, 2010; Estey et al., 2009; Ignace, 2008). Aboriginal research is qualitative, diverse, and most importantly, ensures sustainable community survival for at least seven generations (Danard,

2010). Implementing traditional knowledge incorporates the perspectives and priorities of the community for post-mining land use (Reo, 2011). With such, the implementation of traditional knowledge can help mine closure planners positively affect the territory's First Nations communities.

The literature on Aboriginal traditional knowledge provides considerable discussion on the environment (Eigenbrod & Hulan, 2008). The environment is of great significance as it is the center and base of Aboriginal traditional knowledge and culture (Johnson, 1992). Cultural activities and traditional knowledge in hunting, fishing, and plant gathering, spiritual ceremonies and other traditional activities are tied closely with the environment (Ignace, 2008; Johnson, 1992; Wiles et al., 1999). As many Aboriginal societies place great importance and dependency on a healthy environment, industry that affects the environment is seen as affecting their well-being and Aboriginal rights (Castellano, 2004). It is also noted, that there can be inherent differences between western scientific research and Aboriginal values, sensibilities and thought processes (Castellano, 2004; Danard, 2010; Haalboom, 2014). For example, as Castellano (2004) discuss, scientific research:

*...sets ethical guidelines for research involving human subjects, but assumes that the earth and the waters are inanimate or lifeless, and that mice, monkeys or fish can be treated as objects of research rather than co-inhabitants with humans of a living biosphere.*

## **2.10 Mine Closure and Sustainable Development Guidelines**

This section discusses mine closure and sustainable development guidelines that have been developed to improve the mining industry's overall practices and reputation. The guidelines have a range of technical design criteria and sustainable planning methods.

It can be very difficult to establish strict technical environmental guidelines for mine closure, due to the site specific nature of closure planning (Bowman & Baker, 1998; Laurence, 2006). Design considerations for tailings, waste rock, erosion control, vegetation for examples can vary considerably (Queensland Mining Council, 2001), and require expert engineering review and design. In other aspects, such as water quality, hazardous material disposal, and infrastructure removal, some strict guidelines are provided to ensure human and environmental health and safety (Berg, 2008).

In the past, the mining industry has had very little guidance in terms of mine closure (Cowan et al., 2010). Companies would solely follow the government's environmental and safety regulations of the region. These guidelines would vary in terms of both technical and environmental requirements, and social consultation and integration (Garcia, 2008; World Bank Group and International Finance Corporation, 2002, 2007). Today, there exist principles and guidelines that mining companies voluntarily follow and as Garcia (2008) states, there is a trend for further regulation of closure in all jurisdictions worldwide. Mine closure guidelines have been established by institutions such as the World Bank, the International Finance Corporation (IFC), International Council on Mining and Metals (ICMM), and the Environmental Security

Initiative to help improve practices worldwide and ensure the industry's continued development. These guidelines will be discussed in the following sub-sections.

### **2.10.1 Financial Institution Guidelines**

International financial institutions such as the IFC and World Bank have underlined the importance of international social and environmental stewardship in mine closure for socially conscious and fiscally safe banking purposes (Garcia, 2008). The World Bank and IFC discuss the utility of taking on a proactive approach to mine closure, and outlines the significance of integrating local communities in planning to ensure sustainable benefits for future generations (World Bank Group and International Finance Corporation, 2002, 2007).

### **2.10.2 International Mining Organizations' Guidelines**

The ICMM report (Planning for Integrated Mine Closure: Toolkit, 2008), also mentions the value of considering closure early on in the design phases, and even during exploration. As well, to set-up goals in regards to all aspects of closure, including stakeholder and Aboriginal/Indigenous community engagement (International Council on Mining & Metals, 2008). There are no detailed technical discussions on what is required, but the report provides an overall guidance to the process of closure planning (Garcia, 2010). It helps planners set goals and to understand uncertainty in closure cost estimates, based on the stage of operation.

Bingham (2011), in Chapter 16.7: Closure Planning of the SME Mining Engineering Handbook, provides a closure plan checklist. It discusses each "life-cycle phase" and provides details on how to integrate them into a closure plan at every stage of operation (Prefeasibility, Feasibility,

Operation and Closure/Decommissioning/post-closure (Bingham, 2011)). Life-cycle phases such as: water management, stakeholder engagement, closure risk management, post closure land-use, underground workings plant/infrastructure, waste and chemical management, and air quality management are considered.

Finally, as developed by the Mining Minerals and Sustainable Development (MMSD) developed “The Seven Questions to Sustainability Assessment Framework” was created to test mining activities with their compatibilities with concepts of sustainability (IISD, 2007). It looks at each mining stage’s contribution to sustainability over the long term. This can be applied to closure as discussed by Xavier (2013).

### **2.10.3 Government Guidelines**

Guidelines such as Mine Closure Planning in Queensland (2001), provides detail on where to find the region’s technical design criteria and how to properly engage with stakeholders. The report names which technical documents provide detail on the various codes of environmental compliance. However it notes, the codes: “*do not provide a framework or guidance for mine closure planning or surrender of tenure*”, rather a “*range of suggested actions to be undertaken*”. The document discusses how various stakeholders from the community, government and employees should be involved throughout the closure planning process. However, the document does not specifically consider Indigenous communities. A similar document, from the Government of Western Australia (2015), discusses the structure and content of a mine closure plan, which includes land use plans, stakeholder engagement, financial provisioning, and risk

assessments, but also does not discuss in detail about Indigenous or Aboriginal engagement and collaboration (Government of Western Australia, 2015).

Australia's Leading Practice Sustainable Development Program for the Mining Industry (2006) are a series of documents that discusses how planners can integrate environmental, economic, social aspects through all stages of the life cycle of mining. There are specific documents that examine mine closure, reclamation, and working with Indigenous communities. The documents analyze the benefit of integrating Indigenous communities with the closure and reclamation planning processes, but do not provide details on what is critical to communities for closure planning, and what can be done to help them achieve their objectives.

Environment Canada's (2013) guidelines for mine closure discuss that the objectives should ensure public and wildlife safety, stable waste rock/tailings facilities, to minimize environmental impacts, and to rehabilitate the land for a specific land use ("*A natural state or other acceptable land use*"). The document goes into detail on what aspects need to be addressed for each component of the mine. Shafts and underground workings, open pit, ore processing facilities, waste rock piles, tailings management facilities, water management facilities, landfill/waste disposal facilities and infrastructure are all considered (Environment Canada, 2013).

Furthermore, Environment Canada's (2013) guidelines explore environmental management tools for mine owners and operators to incorporate traditional knowledge. It discusses the importance of understanding the sensitivities when using traditional knowledge and obtaining approval for use is imperative. In addition, the value of establishing trust, communication, working on



projects of common benefit, and providing “*value added*” knowledge back to the community through reports and services. Similar to the previously discussed guidelines, Environment Canada (2013) discusses the usefulness of considering closure planning throughout all phases of the mining cycle, and to identify progressive reclamation opportunities when possible. Finally, the document provides management practices to be used for water management, rehabilitation, vegetation, and the other components that were previously mentioned.

Finally, guidelines for mine closure in British Columbia can be found in the Health, Safety, and Reclamation Code for Mines in BC and in the requirements for mine permit applications (BC Ministry of Energy and Mines, 1998, 2008). The guidelines in BC provide similar technical detail as shown in Environment Canada’s (2013) guidelines, however do not provide any discussion, or detail into coordinating mine closure planning with First Nations communities, or the use of traditional knowledge.

#### **2.10.4 Summary of Guideline Trends**

Through the analysis and review of the current mine closure guidelines it is apparent that there is a strong trend towards sustainable development. International guidelines convey the benefit of continued sustainable economic benefits, environmental protection, and social development to occur after mine closure completion. The government guidelines, codes, or legislations, tend to be more technically detailed as compared to the guidelines from the IFC and World Bank, which focus on a more holistic approach to environmental and social risk management. The government guidelines provide aspects for key components (underground workings, open pit, etc.) that need to be addressed, but do not provide exact criteria to be applied to the components.

Some of the technical requirements for mine closure planning are site specific, and the guidelines analyzed do not attempt to give exact figures for successful closure planning. Each site should develop their own set of criteria and objectives that is acceptable to all stakeholders and rights holders, and ensures health, safety, and environmental protection in perpetuity. In terms of the sustainable development guidelines within mine closure, most of the guidelines are not made specifically for mine closure (Xavier, 2013). Furthermore, none are specifically developed for planning and working with Indigenous communities. With the site specificity nature of closure planning, this research aims to provide insight into working and developing closure planning objectives through the example of the New Afton Mine and the Stk'emlupsemc te Secwepemc Nation (SSN).

## **2.11 Aboriginal Consultation Guides**

There exist a number of guides that discuss strategies to consider when working with Aboriginal, Indigenous, and First Nations communities. This section will present and analyze some of these documents.

The Exploration and Mining Guide for Aboriginal Communities (2013), discusses the entire life cycle of mining (exploration, development/construction, operation, and closure/reclamation).

The guide provides Aboriginal communities with an overview of each phase of mining, the environmental and social impacts, how Aboriginal communities can be involved, and potential employment and economic opportunities (Government of Canada, Prospectors and Developers Association of Canada, The Mining Association of Canada, & Canadian Aboriginal Minerals

Association, 2013). In regards to the closure and reclamation section, the document discusses the environmental impacts to be land use and water quality. For land use, the guide identifies stability of waste rock piles and mining slopes, and tailings containment structures, as the main potential environmental impacts. For water quality, acid rock drainage or metal leaching are identified.

The social impacts during the closure phase of mining in The Exploration and Mining Guide for Aboriginal Communities (2013), were presented as being: a decrease in community capacity and losing social services, reduction of employment, and having to return to traditional skills.

Possible solutions were assisting in acquiring new capacities, skills, economic opportunities, and learning traditional skills through elders. Specific examples of post-mining economic opportunities were then discussed as being:

- Construction and trades personnel for closure activities (earth moving, dismantling equipment etc.)
- Inspectors for auditing closure activities
- Site security and monitoring
- Water sampling, analysis and treatment
- Overall reclamation of site (replanting of trees, establishing vegetation)

In general, the document states that it is vital for the community to look at post mining site uses years prior to the mining operation shutting down, in order to successfully plan for a new future economic base (tourism, manufacturing, agriculture, etc.) (Government of Canada et al., 2013).

Although focusing on the exploration stage of the mining life cycle, The Association for Mineral Exploration British Columbia (AMEBC), discusses engagement principles when working with Aboriginal communities in their document: *Aboriginal Guidebook: A Practical and Principled Approach for Mineral Explorers* (2015). The following are the guideline principles for sustainable relationships with Aboriginal as outlined by AMEBC (2015):

- 1. Work proactively with Aboriginal communities to build mutually beneficial relationships based on a shared understanding of our respective rights and interests.*
- 2. Respect existing and asserted Aboriginal and treaty rights.*
- 3. Respect Aboriginal communities' assertions regarding their traditional territories.*
- 4. Respect the diversity of interests and cultures among Aboriginal Peoples and their respective relationships and views towards land and its resources.*
- 5. Assist, to the extent reasonable, governments in carrying out their duty to consult and, where appropriate, accommodate Aboriginal Peoples regarding government decisions that may affect existing and asserted Aboriginal and treaty rights.*
- 6. Ensure early and timely discussions with local Aboriginal communities regarding activities that may affect them.*
- 7. Provide potentially affected communities with the information needed to encourage open, meaningful dialogue that addresses their interests and concerns.*
- 8. Encourage the governments to carry out their duty to consult in a manner that reasonably balances existing and asserted Aboriginal and treaty rights with the interests of AME BC and its member (Association for Mineral Exploration British Columbia, 2015).*

AMEBC's guidelines present the need for companies to have cultural awareness, respect, and strong information sharing systems with Aboriginal communities. Respecting and understanding the culture, history, views, and priorities of Aboriginal communities is discussed as being paramount for successful engagement. This document is focused on mineral exploration, but can we assume that these engagement principles still apply for the closure and reclamation stages? This research explores how these exploration guidelines differ for mine closure and reclamation planners.

IFC Performance Standard 7 discusses the potential impacts to the land, as well as the natural and cultural resources of indigenous communities from project development. The document discusses the necessity of "*free, prior, and informed consent*", and requires the company to engage with not only the representative bodies of the community, but the community members themselves throughout the entire project life-cycle (World Bank Group and International Finance Corporation, 2012). The identification and avoidance of adverse social and environmental impacts when working with indigenous communities is implored through this document. If determined through analysis and assessment that the environmental and social impacts are unavoidable, minimization, restoration, and compensation in a culturally appropriate manner is required for the affected communities in the area (World Bank Group and International Finance Corporation, 2012)

The British Columbia Government document, *Building Relationships with First Nations* (2015), further discusses First Nations engagement and its importance for industry in BC. The document discusses the role the BC government plays in working with industry and First Nations

communities. Furthermore, the benefits for industry to have a strong relationship with First Nations communities. Benefits such as, having an access to a labor force, an access to services, social responsibility, support for government consultation, and an access to local knowledge (Government of British Columbia, 2015). For successful engagement and relationships with First Nations communities, this document discusses understanding the significance of land and environmental protection for First Nations' and Aboriginal communities. Aboriginal rights and title need to be understood when working in BC with First Nations communities. Furthermore, recognizing capacity challenges for First Nations communities and understanding their “*history, culture, governance, values, and interests*” (Government of British Columbia, 2015). Finally, companies need to help set up employment, and other collaborative opportunities throughout all stages of the business.

In all, the guidelines for consulting with Aboriginal and First Nations communities outline the value of understanding the local communities. Recognizing and respecting their history, territory, culture, wants, and needs, is paramount. Moreover, awareness of the resources and capacity challenges of the community is essential. Capacity challenges can occur in different areas for each community, and therefore understanding the specific challenges of the community is crucial. These guidelines aim to both provide information to First Nations communities and companies to bridge these capacity challenges. Furthermore, realizing that Aboriginal communities value economic opportunities stemming from mining operations. Finally, throughout all aspects of mining, including closure, they need to be consulted and given an opportunity to participate.

## 2.12 Literature Review Summary: Improving Mine Closure Practices

The costs associated with mine closure are key considerations for mining companies when evaluating the mining project's economics. The significance for closure planning to exceed the requirements in the government's mine permit, is that it helps to improve the site's sustainable development. In addition, the company's reputation and current and future social license to operate (SLO).

Table 2.3 presents a number of concerns for stakeholders in regards to closure as outlined by Otto (2010). A separate category for First Nations or Aboriginal rights holders is not included, as community could refer to the local population and/or the First Nations community. This may be appropriate in other jurisdictions, but in Canada and British Columbia, the "community" and First Nations communities, require a separate analysis due to differences in rights to the land, wants, needs, and values (Castellano, 2004; O'Faircheallaigh & Corbett, 2005; Schnarch, 2004).

**Table 2.3 Reclamation and Closure Issues (Otto, 2010)**

<u>Reclamation/Closure Issue</u>	<u>Stakeholder</u>
Long term Profits and Costs	Company
Liability Minimization and Relinquishment	
Reputation	
Status of Benefits/Pension	Employee
Transferability for Future Employment	
Company Well-being	
Long term Economics of Community	Community
Unemployment	
Environment	
Unforeseen Unpaid Costs	
Future of Infrastructure and Facilities	

**Table 2.3 Reclamation and Closure Issues (Otto, 2010) Cont.**

Recovery of Environment	National Government
Landscape	
Overall Country Economics	
Debt Repayments	
Site Safety	

To improve closure planning, planners must successfully take into consideration all issues outlined in Table 2.3. To accomplish this, as explored in the analyzed literature, closure objectives need to be established from engagement with stakeholders and rights holders of the property. In British Columbia, Canada, and many other places in the world, Indigenous, First Nations, and Aboriginal communities can play an important role in determining successful mine closure and reclamation outcomes. However, there is a lack of research in mine closure on how to plan and implement the environmental, economic, and social, expectations of First Nation communities. This research analyzes how to use the traditional knowledge of First Nations communities in establishing mine closure and reclamation objectives. Furthermore, this research provides recommendations on how to engage with First Nations and Aboriginal communities for closure and reclamation planning. In the end, this study looks to add to Table 2.3 by contributing the reclamation and closure issues discussed by First Nations communities in Canada.



## **Chapter 3: Methodology**

### **3.1 Introduction**

This chapter describes the research methodology. Furthermore, it presents the research procedures, entering assumptions, participants, data collection, and analysis methods. This chapter also describes the intellectual property agreement and ethical review that were developed for this research.

### **3.2 Choice of Research Methodology**

To understand and explore the interpretative nature of the research questions outlined in Chapter 1, a qualitative methodology was selected. Qualitative research is a “*pragmatic, interpretive and grounded in the lived experiences of people*” (Marshall & Rossman, 2011). Furthermore, as Denzin and Lincoln (2005) state “*Qualitative research is a field of inquiry in its own right. It crosscuts disciplines, fields, and subject matters. A complex, interconnected family of terms, concepts, and assumptions surround the term qualitative research.*”

Qualitative research is typically:

- Conducted in a naturalistic setting
- Draws on multiple methods that are interactive and emphasizes the humanistic value.
  - Interviews, field notes, photographs, recordings etc.
- Focuses on content
- Is emergent and evolving
- Is fundamentally interpretive (not product oriented) (Denzin & Lincoln, 2005; Marshall & Rossman, 2011; Rossman & Rallis, 2003; Yin, 1994)

This research study is focused on understanding of First Nations oral histories, traditional use, and land use preferences, and therefore qualitative research methods are fitting. In addition, Wilson (2008) argues that Indigenous and Aboriginal research must strive to improve the reality of the research participants. Maxwell (2012), defines critical realism as a mix between a

*“realist ontology (the belief that there is a real world that exists independently of our beliefs and constructions) with a constructivist epistemology (the belief that our knowledge of this world is inevitably our own construction, created from a specific vantage point, and that there is no possibility of achieving a purely objective account that is independent of all particular perspectives)”.*

With this, a realist approach for the research and data collection as described above by Maxwell (2012), was deemed the most appropriate in order to satisfy the goal of helping to improve the reality of the research participants, while acknowledging the biases of the researcher (Maxwell, 2012; Smith, 1999; Wilson, 2008).

It is important to note, that the process of qualitative research can be subjective, and as stated above, each qualitative researcher brings their own distinct frame of reference. In the past, reliability, validity, and generalizability were not seen as possible as “more quantitative approaches were the criteria against which the soundness of a study were judged” (Marshall & Rossman, 2011). Lincoln and Guba (1985), uses more modern terms of credibility, dependability, confirmability, and transferability. Creswell and Miller (2000) developed a list of

procedures to help ensure “*rigor and usefulness of a qualitative study*” (Marshall & Rossman, 2011) and also discussed by Lincoln and Guba (1985):

- Triangulation
- Searching for disconfirming evidence
- Engaging in reflexivity
- Member checking
- Prolonged engagement in the field
- Collaboration
- Developing an audit trail
- Peer debriefing (Creswell & Miller, 2000; Lincoln & Guba, 1985)

Sandelowski (1986) states the validity of qualitative research is subject orientated and is ensured by the participants approval of the results, this was conducted through the ethics process between the interviewer and the interviewee. Furthermore the validity is further confirmed if the researcher acknowledges and presents an honest discussion of pre-existing internal bias (Creswell & Miller, 2000; Denzin & Lincoln, 2005). Pre-existing bias will be discussed in the following sections.

For this qualitative research, a case study with interviews (life history and narrative inquiry) with First Nations traditional knowledge keepers of the Skeetchestn and Tk'emlúps te Secwepemc Indian Bands, photographs, and a document analysis were conducted and will be discussed in more detail later in this chapter. With such, credibility and validity with triangulation is established by combining data collection methods.

A case study helps provide exploration of a bounded system (a time and place) to allow the researcher the ability to collect data through direct observation and interviewing of subjects (Creswell & Miller, 2000; Yin, 1994). In terms of the system boundaries, the New Afton Mine site is located in the traditional territory of the Skeetchestn and Tk'emlúps te Secwepemc Indian Bands and therefore their knowledge and views are the most appropriate to analyze. In terms of time, the mine site has been in development as an open pit for more than 20 years and then as an underground mine since 2012. With closure not commencing for about 10 years from now (Bergen, Rennie, & Scott, 2009), it is crucial to have meaningful discussions on the objectives of closure and reclamation planning.

Finally, this research study can be seen as having a participant observer approach as the data was also collected through the researcher's own observations throughout the data collection. The researcher was embedded in the environment where unplanned events take place that can be analyzed for the nuances, subtleties, and other phenomena that would not be possible without the participant-observer approach (Yin, 2010).

### **3.3 Entering Assumptions**

The acknowledgement of bias and a discussion of the researcher's perspective helps to validate and further understand the study's results (Denzin & Lincoln, 2005; Marshall & Rossman, 2011). Subjective bias is very important to try to avoid in the research and data collection process, but through acknowledgement of the researcher's history and relationship with the subject, the study is undoubtedly enhanced. The following is a list of entering assumptions of the researcher that:

- The traditional knowledge keepers of the First Nations bands goals are to preserve their community's culture, interests and overall well-being.
- It is the responsibility of the mining company to set-up open discussions with the communities that are both fair and transparent.
- The mining company is committed to today's sustainable land management and development goals of the mining industry.

### **3.4 Reflexive Questions: Triangulated Inquiry**

Patton (2002) discusses a range of questions to consider to confirm an open discussion of the researcher's bias, and how the participants and those receiving the study (audience) influence the data. This will be discussed in this section.

#### **3.4.1 The Researcher or the Qualitative Inquirer**

It is important to note, especially in sensitive qualitative research, such as understanding cultural values of First Nations communities, the researcher's background and how he or she could be perceived by the interviewees (Marshall & Rossman, 2011). The researcher's knowledge base in this case can be simply viewed as an outside perspective, without any prior relation to the First Nations communities. With extensive prior background knowledge of the fields of applied sciences of mining and understanding of the mining industry, the researcher's perspective is of a mine closure planner, whom is analyzing the best methods for improving the mine closure process. The researcher's background was openly shared with the interviewees.

### **3.4.2 The Participants**

The eight participants of this research were traditional knowledge keepers of the Skeetchestn and Tk'emlúps te Secwepemc Indian Bands. To gain a robust and well-rounded view from the communities, this research study interviewed an equal number of participants from both the Skeetchestn and Tk'emlúps te Secwepemc bands. The interviewees were elders, non-elders and band office employees, and were considered traditional knowledge keepers. For reasons of confidentiality, the exact demographics of each of the participants will be withheld. Selecting a proper sample size can be a complex task based on many factors (Marshall & Rossman, 2011). Due to the small populations of both bands and relatively small number of traditional knowledge keepers (estimated to be approximately 50), the research purpose of understanding the traditional knowledge and usage of the area can be satisfied with eight participants. These eight knowledge keepers were selected to be interviewed, as they were considered by the Joint Chief and Council to be the most knowledgeable of the New Afton area, and the cultural values of the community. It is important to note that the participants had varying levels of knowledge in terms of plant species, wildlife, water sources, historical land use, the current and past mining operations at the New Afton site, and what is possible in terms of today's mine closure and reclamation practices.

### **3.4.3 The Audience**

The audience of this research is quite broad but includes fellow researchers, First Nations and Aboriginal community members, leaders, employees and knowledge keepers, mining industry employees, and the general public. This research aims to provide them with a case study exploring how to find closure objectives of First Nations communities for improving mine closure planning, reclamation and long term land use planning.

### 3.5 Procedure

The researcher was based out of the Tk'emlupsemc te Secwepemc office on the Skeetchestn reserve and had access to chief and council, and band office employees and management. This greatly helped to facilitate communication to perspective participants. As well, as to establish the interview protocols and procedures.

To contact perspective participants there were different methods for each of the two bands. For the Tk'emlups te Secwepemc, a list of traditional knowledge keepers was provided from the education department of the band office. The potential participants were also approved by elected council members. The potential participants were then contacted by email with an introductory letter (Appendix A), or with a phone call if advised to be more appropriate for the specific potential interviewee. Interested participants were given a consent form (Appendix B) and questionnaire (Appendix C). For the Skeetchestn Band, the traditional knowledge keepers were contacted in person during their weekly elder meetings. The project was presented and interested participants were then contacted again by phone and provided with a consent form (Appendix B) and questionnaire (Appendix C).

The interviews were approximately 40 minutes on average and were recorded on a digital recording device. The recordings were then transcribed verbatim in the qualitative research data management software NVIVO. The recordings were then preliminarily analyzed for themes and patterns using open coding. Open coding refers to when the researcher “*constantly compares his/her codes of events and behaviors and words and soon starts to generate theoretical*

*properties of the category*” (Glaser & Strauss, 1967; Marshall & Rossman, 2011). Using a term called clustering, the codes were analyzed for points of intersection, or grouped into clusters. Immersion of data is essential in this step to help understand and see the complicated interconnected aspects of the data (Marshall & Rossman, 2011).

Once the categories or themes emerged from this process it was critical to ensure that the categories/themes are “*internally consistent but distinct from one another*” (Marshall & Rossman, 2011). Finding complete mutual exclusivity is not the goal of this process, but rather finding the principal categories of meaning from the participants (Marshall & Rossman, 2011).

### **3.6 Interview Questions**

The list of interview questions is attached in Appendix C. The interview questions are divided into four groups: plant life, wildlife, water, and overall land use. Questions were designed to understand the cultural, spiritual, medicinal, and nutritional significance of these groups at the New Afton Mine site, or if they were not familiar with that area, nearby at the Cherry Creek Reserve, or wherever else the interviewee would be most knowledgeable. Moreover, how and if they have seen mining impact their significant plants, wildlife, water and overall usage of the area. Finally, to understand what kinds of reclamation and what they would like to see addressed, once mining has ceased operations at New Afton.

### **3.7 Photographs of Traditional Areas**

During the interview process, two of the interviewees requested to bring the researcher to areas of their territory to share their knowledge of the land. During these field trips, photographs and



field notes were taken to understand the important aspects of the land. In addition, photographs were taken at the New Afton Mine site as approved by New Gold employees. Furthermore, the photographs of the traditional areas were approved by the interviewee. Interpretation of these photographs was then conducted.

### **3.8 Document Reviews**

Cultural and traditional heritage studies, NI 43-101 feasibility reports, and New Afton closure plans, were all analyzed for this research to understand both the New Afton Mine site and the work that is being conducted, as well as the cultural significant aspects of the site and the general region. The list of documents reviewed by the researcher can be seen in Appendix I.

### **3.9 Methodological Delimitations**

There are certain methodological delimitations with this qualitative research study (as with all qualitative studies) (Patton, 2002), that are important to note. A discussion of the study's delimitation is essential as it demonstrates the reality of the system and its boundaries on generalizability and conclusiveness (Marshall & Rossman, 2011).

The boundaries of time and space have an important role to play when discussing delimitations. The data was collected over time period of: September, 2014 until April 2015. As the New Afton Mine progresses closer to closure, the overall views of the First Nations community members might change as further knowledge of reclamation, closure, and the New Afton site could change. Furthermore, at that time the cultural knowledge of the two bands could be further documented, developed, and implemented. This research focused around two Secwepemc bands

whose territory is where the New Afton Mine site is located. The two bands are the Tk'emlúps te Secwepemc and Skeetchestn Indian Bands. Furthermore, there are numerous distinct First Nations bands and cultures in British Columbia and it is difficult to conclude if the findings in this research can be generalized for other bands in British Columbia or even in the Secwepemc nation (see Appendix D).

### **3.10 Ethical Considerations and Validation of Results**

Ethical considerations were carefully planned and taken into account for this research. Ethical standards were approved by both The University of British Columbia through the Behavioral Research Ethics Board (BREB) and the Stk'emlupsemc te Secwepemc Nation (SSN) through the two band's Education departments. The Behavioral Research Ethics Board required discussions on the research topic, who were being interviewed, the possible risks they faced participating in the research, and protocols for interviewing and data storage.

The Stk'emlupsemc te Secwepemc Nation required an Intellectual Property Agreement to take into account ethical considerations similar to what was outlined in the BREB application. In addition, to discuss how credit would be given to the Stk'emlupsemc te Secwepemc Nation, and the specific knowledge keepers, if they chose to be acknowledged during the approval process. The knowledge keepers have been specifically mentioned in the acknowledgements.

Furthermore, for the final thesis to clearly state that the traditional knowledge is owned by the Stk'emlupsemc te Secwepemc Nation and that further use of the knowledge has to be approved by their community. Finally, that this final thesis be reviewed by the SSN and the interviewees

to ensure they have been recognized, and that their knowledge is accurately documented. The agreement can be found attached in Appendix E.

### **3.11 Data Security and Storage**

Data security and storage is discussed in both the BREB ethics approval application and the Intellectual Property Agreement. Copies of the data will be stored in a locked cabinet at the University of British Columbia for a period of five years, and the original data will be stored indefinitely with the Stk'emlupsemc te Secwepemc Nation. Reuse of the data must first require approval from the Stk'emlupsemc te Secwepemc Nation and the author of this thesis.

## **Chapter 4: Results**

### **4.1 Introduction**

In this chapter the qualitative results from eight semi-structured interviews will be presented. Interview recordings were transcribed and organized using the software NVIVO. Some of the NVIVO inputs will be discussed at the beginning of this chapter. Alongside the interviews, site visits were undertaken. Photographs and field notes from these site visits will be presented after the interview sections in this chapter.

As stated in Chapter 3, a questionnaire was developed in preparation for the interview discussions. During the interviews, the interviewees were allowed to further elaborate their answers, and discuss other themes that they felt were related to the interview questions. Their responses were then coded into four main sections, or as named in NVIVO, “nodes”. The four nodes/sections are: flora, fauna, water, and land use. These sections were developed in the questionnaire as seen in Appendix C. Finally, during the initial coding for the first four nodes, there was considerable discussion on their general views of mining and their thoughts on their relationship with New Gold, therefore a fifth node was created to consider this discussion.

This chapter will present the results from each node through NVIVO’s word count/clouds, to find themes from the interviews. Moreover, specific quotes from the interview data will be presented to outline and further understand the key themes. Themes were developed to help answer the research questions outlined in Chapter 1. At times there is overlapping of coding, as the interviewees discussed numerous topics in the same response.

### 4.1.1 NVIVO Inputs

NVIVO was used to input, transcribe, and organize the interview data. Word count outputs for each node will be shown in the following sections. A number of words were determined not to be analyzed in NVIVO. NVIVO puts these words in a “Stopped Word List”, this can be seen in Appendix F. These words were not analyzed because they are determined as insignificant.

Conjunctions or prepositions, or words that were not meaningful for this analysis were excluded.

The following sections present the interview data from NVIVO.

## 4.2 Flora

The following is a table presenting the top 25 terms and a *Word Cloud* of all the coded data in the *Flora* node.

**Table 4.1 Top 25 Words in Flora Node**

Word	Count	Weighted Percentage (%)	Similar Words
plants	44	1.88	plant, planted, planting, plants
used	44	1.88	use, used
site	35	1.50	site, sites
mine	28	1.20	mine, mined, mines, mining
people	28	1.20	people
species	25	1.07	species
year	23	0.98	year, years
time	22	0.94	time, times
grows	21	0.90	grow, growing, grows
medicines	21	0.90	medicin, medicinal, medicine, medicines, medicins
lake	19	0.81	lake, lakes
natural	19	0.81	natural, naturally
place	19	0.81	place, places
work	19	0.81	work, worked, working, workings, works
water	18	0.77	water
hunting	17	0.73	hunt, hunted, hunting
important	16	0.68	importance, important
land	16	0.68	land
sage	16	0.68	sage, sages



reclamation planning. Flora or plant life was a key cultural component for the First Nations communities. Food, medicine, building materials (baskets, pit houses, tipis), and spiritual ceremonies were all identified as traditional plant uses.

The following is a list of plants that were discussed in the interviews and their corresponding traditional use is summarized in Table 4.2.

**Table 4.2 Identified Plants**

<u>Name</u>	<u>Use</u>	<u>Count</u>	<u>Sources</u>
Sage Brush	Medicinal, Spiritual	16	7
Balsam root	Food	12	5
Fir Tree	Materials	4	5
Saskatoon Berries	Food	6	4
Hooshum	Medicinal, Spiritual	10	3
Juniper Berries	Medicinal	10	3
Ponderosa Pines	Materials	5	2
Wild Potatoes	Food	2	2
Birch Tree	Medicinal, Food, Materials	7	1
Tarragon	Medicinal	4	1
Brown Eyed Susan	Medicinal	4	1
Wild Roses	Medicinal	2	1
Cottonwood Tree Sap	Medicinal	1	1
Other wild berries	Food	1	1

The *Sources* column represents the number of interviews that the specific plant species were mentioned and the *Count* column represents how many times the plant species were mentioned across all interviews.

For closure planning, an emphasis from the interviews was on replanting the land using native plant species and to ensure protection from the invasive weeds. However, the level of

reclamation required with these native species was different across the interviews. Responses such as: *pre-contact, a natural state as possible, a native grassland with native species as much as possible*, were all mentioned, this will be further presented with the interview quotes.

Furthermore, a resistance to planting grasses for grazing was discussed.

#### **4.2.2 Flora Quotes**

The following interview excerpts present some of the thoughts for closure outcomes the interviewees considered in terms of plant life.

*Regenerate the plants. If there's some way that they could, we could have a green house there, [a] big one in Tk'emlúps and one in Skeetchestn. That'll make work for our young people. they go there, dig it up, bring it back, and regenerate the plants and then replant.*

*Interview 7 Line 14*

*They're trying to make it look really nice, but the only plants you see are weeds. And a lot of them are noxious weeds. So a lot your natural plants are gone. I don't know if you're going to get them back. That's what I noticed around [but] it was very clean there.*

*Interview 8 Line 11*

*We're getting told, hey you got to put cattle out there. And from our perspective, well we just assume not have the cattle out there, because it means our traditional plants have a little more chance to come back. We have to determine which plants are suitable for the site. You have to determine how they are propagating and how they are cultivated. I'd*



*like to see the site get returned to native grasslands with native species as much as possible.*

*Interview 2 Line 31*

*Like I said, all this time we used it for the purpose I told you about. The main thing is medicine. We're losing a lot of that.*

*Interview 6 Line 7*

*Given that it's in a bunch grass zone, it's dry, it's not a lot of water for ample vegetation. It's very selective vegetation. It's sage brush, mariposa lily, knotting onion, things like that, that I don't think can be re-stored on an artificial level. It's stuff that would take years to come back. I think New Afton is currently doing what they can to put plans in place, and I know they're working on a closure plan.*

*Interview 3 Line 3*

*The way it looked before they got there. I think that it's not a matter of how it looked. I would like to see it pre-contact...I know what I'm proposing or what I'm visioning is an expensive endeavour, but ultimately I think on a personal note, it's a responsibility on corporations that disturb the landscape to such a high level to do what they can to repair it. There's also a spiritual component to things. You can plant and replant, unless you ask the land to repair itself or pray for it, and ask our animal relatives to make it their home again. It's not going to be as successful as it could be. Our ancestors, you know we need to ask them as well. Is it ok to bring everyone back home again? All of the blasting and*

*bulldozing and those sorts of things that have happened over the decades that has been the mine. Permanently scarred the earth there. So I look at it that way as well.*

*Reconstructive surgery. It's never going to be the same. It's never going to look the same but we should do what we can to patch it up.*

*Interview 4 Line 10*

### 4.3 Fauna

The following is a table presenting the top 25 terms and a *Word Cloud* of all the coded data in the *Fauna* node.

**Table 4.3 Top 25 Words in Fauna Node**

Word	Count	Weighted Percentage (%)	Similar Words
hunting	51	1.91	hunt, hunted, hunting
water	42	1.57	Water
mine	36	1.35	mine, mines, mining
animals	33	1.24	animal, animals, animation
site	32	1.20	site, sites, siting
use	32	1.20	use, used, uses, using
lake	30	1.12	lake, lakes
years	30	1.12	year, years
fishing	27	1.01	fish, fished, fishing
people	27	1.01	People
times	26	0.97	time, times
deer	22	0.82	Deer
land	21	0.79	Land
important	18	0.67	importance, important
wildlife	17	0.64	Wildlife
new	16	0.60	New
plant	16	0.60	plant, planting, plants
food	14	0.52	Food
pond	14	0.52	pond, ponds
gold	13	0.49	Gold
reserve	13	0.49	reserve, reserves
work	13	0.49	work, working
little	12	0.45	Little
moose	12	0.45	Moose
creek	11	0.41	Creek



**Figure 4.2 Fauna Word Cloud**

Through analyzing Figure 4.2 and Table 4.3 above, themes from this node emerge. These themes are presented in the next section.

### **4.3.1 Fauna Themes**

The responses discussed the various species of animals on the New Afton Mine site and their cultural importance. In addition, the interviewees shared their ideas for wildlife consideration during mining operation, mine closure, and reclamation.

In the discussion of fauna, hunting and fishing was of central cultural importance for the traditional knowledge keepers being interviewed. The mine site and the area around the site (Greenstone Mountain, Cherry Creek) were identified as key traditional hunting grounds. Deer, moose, elk, salmon and trout were identified as key animals for the community to hunt.

Furthermore, there was a general consensus of the importance and significance of all wildlife to the community, and that considering all fauna in a closure plan was essential.

The fauna that was discussed in the interviews can be seen below in Table 4.4. The *Sources* column represents the number of interviews that the plant was mentioned and the *Count* column represents how many times the plant was mentioned across all interviews.

**Table 4.4 Identified Fauna**

<u>Name</u>	<u>Count</u>	<u>Sources</u>
Deer	22	8
Trout/Salmon/Fish	29	7
Moose	12	6
Birds	9	4
Coyote	6	4
Ducks/Geese	8	3
Foxes	4	3
Big Horned Sheep	4	3
Bats	3	3
Snakes/Reptiles	9	2
Elk	7	2
Toads/Frogs/Amphibians	7	2
Grouse	3	2
Badgers	2	1
Wolves	2	1
Beavers	1	1
Bears	1	1
Cougars	1	1
Gopher	1	1
Marmots	1	1
Weasels	1	1

Restricted access to the mine site was seen as a concern for the interviewees and their community's cultural interactions with the fauna on their territory. Finally, the health and well-

being of the fauna was extensively explored. Ensuring that during and after mining, the wildlife not be exposed to dangerous toxins or chemicals in water. This will be presented further in section 4.4 on the “Water” node.

### **4.3.2 Fauna Quotes**

The following is a number of quotes from the interview transcripts that further present the themes explored in the previous section.

*Like I told you, that's one of our main hunting areas. Same with that six mile, where that golf course is now. That was one of our big ones [for] Skeetchestn. They gave us [only] so much for that. You know, once that's covered, that's no more use to us. We use to go fishing over there, there was nice fishing places all over in there, now it's all blocked off. There's no more, we lost all of that.*

*Interview 6 Line 5*

*I know of other winterring areas that I still hunt. They were shown to me when I was a kid. So there was that transfer over generations. Just by them knowing that area and then showing it to me, that someone had told them about it, and on and on. So even with the change in the landscape, we still utilized the area because it was important. So reclaiming it back to it's past glory would ultimately be a vision of mine. I would love to see belly deep grasses that all of our animal relatives could sustain themselves on and hopefully build up healthy populations of animals that can sustain life for each and future generation. My grandchildren and great grandchildren.*

*Interview 4 Line 3*

*There was a lot of deer up there. A lot hunting up there. It's important to reintroduce wildlife just for our aboriginal rights and title. We are able to so that our people can hunt, for our food and everything. A lot of the young men still go out and hunt. Like my first cousins and brothers still go out hunting. They need to be able to go out and hunt for their children and grandchildren.*

*Interview 5 Line 10*

*Put in wild and native grasses...if you put back and try to get some of the wild and native grasses in. Maybe you'll get some of the wildlife back too. Well there's not much deer left. We don't have much left in our hunting areas. They've opened it to everybody, what chance does wildlife have when people, with machines and ATVs go in there. There's really no need for it.*

*Interview 8 Line 18*

*We still can't go hunting in the pit, we can't go hunting in the tailings pond. There's a whole pile of that site that we don't have access to for safety and mine legislation reasons and whatnot. But I believe there's an understanding that on the areas that, that site. New Gold has a big site, right to the lake basically, I believe there's an understanding that we are allowed activity much north of the highway.*

*Interview 2 Line 29*

*There's deer and moose all around that area up above, there's the greenstone, I hunt. All around the edges of the New Gold site, for deer and moose. There's moose winter range just right above. and I'll go up there after the hunting season ends...The moose come down a little lower, I've gotten three moose just above New Gold...You wouldn't want to even eat the deer (on the mine site) and maybe you hunt around the edge. Due to the industry being up there, band members just don't go there, it's almost like the whole territory you just don't go. Somewhere off the side of the road because you know its private property, you know there's industry going on up there.*

*Interview 1 Line 7*

*Successful reclamation would be good, and involvement of our people in the reclamation. All those young folks that work at the mine, have them involved from the beginning, and have them involved right till the end...and having those mine people be able to listen and not just roll their eyes and take what we say as a people as whimsical. "You know, you want the Skelep back/coyote back, because of your stories of relation and Skelep the creator" and not taking that into account and into consideration.*

*Interview 1 Line 9*

*All they can do is think about safety for humans and animals. What can they do to ensure safety those entities and then again try restoring back to the natural state that is good for you, the people and animals at the time. Because we can never get back to where it was 100 years ago.*

*Interview 3 Line 13*

#### 4.4 Water

The following is a table presenting the top 25 terms and a *Word Cloud* of all the coded data in the *water* node.

**Table 4.5 Top 25 Words in Water Node**

Word	Count	Weighted Percentage (%)	Similar Words
water	94	5.10	water, waters
lake	35	1.90	lake, lakes
using	34	1.84	use, used, using
year	27	1.46	year, years
mine	26	1.41	mine, mines, mining
site	24	1.30	site, sites
hunting	22	1.19	hunt, hunted, hunting
time	21	1.14	time, times
fishing	17	0.92	fish, fishing
important	15	0.81	importance, important
ponds	15	0.81	pond, ponds
new	14	0.76	new
people	14	0.76	people, peoples
tailings	13	0.70	tailings
land	12	0.65	land
life	12	0.65	life
pit	12	0.65	pit
gold	11	0.60	gold
creek	10	0.54	creek
dry	10	0.54	dried, dry, drying
ground	10	0.54	ground
natural	10	0.54	natural, naturally
spring	10	0.54	spring, springs
stories	10	0.54	stories
move	9	0.49	move, moved, moving





only water bodies on the New Afton site and that they supported the frogs/toads/amphibian type wildlife. Also mentioned was, the alkali lakes being used historically as a method for cleaning clothes and garments. Finally, Jacko Lake, which is situated on the nearby Ajax property (owned by KGHM), was discussed as being extremely significant in terms of the community's cultural history, and for fishing.

Tailings, chemicals, toxins, and over-usage were expressed as potential hazards caused by the mine site. Ensuring water was suitable for both drinking and sustaining wildlife were important mine closure objectives found in the interviews.

#### **4.4.2 Water Quotes**

The following is a number of quotes from the interview transcripts that discuss the significant water bodies and further present the themes discussed in the previous section.

*Definitely Kamloops lake right. Presently they're drawing water from the lake. I'm not sure or too familiar with down stream effects. But I do know that the lake itslef has a lot importance in terms of sustaining wildlife, water birds, migratory birds, salmon runs. Local fish populations. You know we would've definitely had camps all along the lake during different parts of the year. The creek itself would've been a spawning channel. Things have probably changed through the years we utilize different spawning areas. Definitely, Jacko, I know for a fact was utilized during the spring spawn. We have significant spiritual stories about the whole area. It's not that far away, when you consider life on foot.*

*Interview 4 Line 4*

*As I stated, very flatly, this water has to be brought back to the state where it can be used. Like they were saying, it can be used, but you can't drink it. If you can't drink it, then it's not brought back to as pure a form as it could be.*

*Interview 8 Line 31*

*Well that water is going down to the ocean. That affects everything. I won't use any of the fish that came out of the river that year. We saw a TV program that showed fish with lots of sores. Who wants to eat that. That's a fear that we have. That's why we are so concerned with the chemicals and contaminants that come out of those mines there. What guarantee have we got.*

*Interview 8 Line 47*

*All water from a First Nations' view point is sacred. It is spiritual, it's a living element. You're going back into your animation. You know, water is a living element to First Nations, it has a spiritual element to it and it's living. So all water is important. Jacko lake is extremely significant spiritually, just north of that site. On the Ajax site. Cherry Creek was an important source, important fishing site years ago. Probably an important source of a number of different things. Hughes lake was probably an important source of fish and what not for the Cherry Creek reserve. Hugh's lake is now the old Teck Cominco tailings pond. Water is important because it supports all of the species.*

*Interview 2 Line 35*

*Water to our people and the Tk'emlupsemc and to myself is the largest connection and to me the highest importance to our traditional territory. And when I see the use of it for industry and for the rich and the profit...It kinda gets close to the heart and you hear from the people in town who aren't involved in all of this, and that are just in my community that don't know about the mine or what's going on, they'll ask these questions, and they'll ask why is their water being used for, who's profiting from it, and how is it being impacted.*

*Interview 1 Line 13*

*Also up in the area, there's Jacko Lake, East of the New Gold site. It has a very large spiritual significance to creation stories and the water people. With connections to underground connections of the water people that comes from traditional stories, it's in the Ajax model but that would include down through the Alkali Creek area. Probably what was a few lakes or ponds on the site that were destroyed when the mine was developed and which is a shame.*

*Interview 1 Line 13*

*It's a hefty amount of water. My worry is the cumulative effects. I mean that mine is active but we've got another giant mine growing beside it, so both of them using that amount of water, it's significant. It's a significant amount of water. I mean our food fishery is right below it. Kamloops lake, Thompson river, that's our First Nation food fishery.*

*Interview 1 Line 15*

## 4.5 Land Use

The following is a table presenting the top 25 terms and a *Word Cloud* of all the coded data in the *Land Use* node.

**Table 4.6 Top 25 Words in Water Node**

Word	Count	Weighted Percentage (%)	Similar Words
hunting	33	2.15	hunt, hunted, hunting
lake	23	1.50	lake, lakes
site	22	1.43	site, sites
year	21	1.37	year, years
people	19	1.24	people
plants	18	1.17	plant, planted, planting, plants
fishing	17	1.11	fish, fished, fishing
time	17	1.11	time
use	17	1.11	use, used, using
land	16	1.04	land
mine	15	0.98	mine, mines, mining
Kamloops	13	0.85	Kamloops
natural	13	0.85	natural
reserve	13	0.85	reserve, reserves
cattle	12	0.78	cattle
make	12	0.78	make, makes, making
new	11	0.72	new
animals	10	0.65	animal, animals
work	10	0.65	work, working, works
first	9	0.59	first
food	9	0.59	food
grazing	9	0.59	graze, grazing
important	9	0.59	importance, important
berry	8	0.52	berrie, berries, berry
camp	8	0.52	camp, camped, camping, camps



#### 4.5.2 Land Use Quotes

The following is a number of quotes from the interview transcripts that further present the themes discussed in the previous section.

*There's a lot Indian trails that went to and from. My mom and dad would talk about how their families travelled back and forth between the different villages. Going back and forth visiting families. We called it the Cherry Creek reserve going towards to what is now called Skeetchestn. There was the Cherry Creek reserve that was the stop over because people went by horseback or horse and buggy or by foot ... We'd go hunt and fish there, there was little stop over that we kind of food fish and hunt and whatever. I think Jacko Lake was one of them, which is on the Ajax site... So there's some areas that we went, we hunt and fished and we stayed.*

*Interview 5 Line 14*

*Well I think just generally speaking it would be nice to see the land restored to a state where you can look at it and say: "This was a mine?" Because I've gone to some mine sites where's been a little lake and that was actually an open pit at one time. And they restocked it with fish and natural as it could possibly be. You know, reclamation work, restoring or rehabbing the tailings to grass.*

*Interview 3 Line 9*

*All they can do is think about safety for humans and animals. What can they do to ensure*

*safety to those entities, and then again, try restoring back to the natural state that is good for you, the people and animals at the time. Because we can never get back to where it was 100 years ago. And the landscape as I said is so dry, just planting something doesn't mean it's going to survive. They have to be realistic to what their goal is and people have to be realistic in their expectations. To just say I want to do this and fill up the pit with water or make a lake or all the block caving is going to pretty or whatever. It has to be done in a way that is tangible and realistic.*

*Interview 3 Line 13*

*Alright, I'll go back to what John Jules told me, he told me New Afton mine area was a jumping off area. In the spring people would come down from the valley and people would camp there. From there, you can go up to Jacko Lake and into the Jacko Lake fishery up towards greenstone. You can do some hunting in there and the timber... they would do their plant digging there. But it was also a place where there could go a higher up in elevation and dig the next plants. So he called it a jump off place for spring, so that's of special significance, because it's also the proximity to Kamloops.*

*Interview 2 Line 43*

*You probably start taking a few fences out and probably get rid of an awful lot of roads. Get rid of a lot of the infrastructure. I don't know, it's really hard to revive this stuff. Your animal populations have been impacted and what not. Replant habitat and when you go to replant the site, or you go to manage that site, don't just look at it as cattle graze.... We're getting told, hey you got to put cattle out there. And from our perspective, well we*



*just assume not have the cattle out there, because it means our traditional plants have a little more chance to come back.*

*Interview 2 Line 31*

*I know their escape pattern, I know their daily routines, and they're pretty consistent, year to year, day to day, week to week, depending on the season. I know that's why we set up that hunting blind there. I know that my ancestors would've patterned the animals and it would've been in conjunction with the seasonal round. There would've been a time of year where they would've been say at the New Gold site, collecting berries and routes and being opportunistic because of the hunt.*

*Interview 4 Line 2*

#### **4.6 Thoughts about Mining**

As mentioned, during the initial coding for the first four nodes, there was significant discussion on the interviewee's general views of mining, this fifth node was created to consider this part of the interviews. For this node, there was not enough material to produce a useful *Word Cloud* or *Table* from NVIVO. The themes however will still be discussed.

There were a number of discussions about the current relationship between the community and New Gold. There was a discourse on being satisfied with the respect from New Gold to their community, in terms of cultural ceremonies, and their work with biodiversity enhancement.

There were also discussions on their views of the reclamation and closure work that has been previously carried out by the mining industry. In addition, the tradeoff of environmental impacts,

with economic well-being from employment opportunities was mentioned. Finally, the dissatisfaction with reclamation processes in Canada, and the long term concerns of the community, as rights holders to the land, was expressed.

#### **4.6.1 Thoughts about Mining Quotes**

*The current relationship that we have, I like it that they respect our culture enough that anytime they are doing new work there. That they are calling up, you know they call myself up or any of the spiritual people, we go up there and do a ceremony. So you know, we go up there and we do a ceremony to either, we are calling on the ancestors, or doing prayers to the ancestors to let them know what is going on. Or if they're closing a site, we are having a ceremony and you know asking again, speaking to the ancestors, this is what's going on, that they're closing that site and letting them know what's going on. So they're having that sort of respect for the site, and that's a part of their protocol agreement, and participation agreement that my brother John put in place. He was a very spiritual person and very traditional person so they have that amount of respect for us, they are always calling on the spiritual people here.*

*Interview 5 Line 5*

*If you ask me as a Tk'emlúps band member as a hunter. I just see them all as accumulated, you got industry and growth all over my territory. My territory getting smaller and smaller because of development and growth and industry. You know it's a good thing for our people, we got jobs, and there's folks working there, it's an agreement that it's the first of its kind in North America with First Nations and the mine. You know,*

*it's 50/50 what I think. You know it's economically it's viable but what it does to the land, environmentally, it's a tough one, I haven't seen a successful reclamation process, and I've been to other mines and I've watched the reclamation and I'm sure the attempt has been there but the land just never gets back to 100% of what it was before.*

*Interview 1 Line 5*

*I would like to see under their requirement on reclamation, and I've heard promise of, but see a little step above and beyond, and be a pioneer in reclamation with working with us and working with our interests. Having whatever native species can live on this mine site brought back with our help.*

*Interview 1 Line 19*

*Whatever New Gold does there, we have to inherit it for the next thousand years. They don't. They'll be free of their obligation 15 years after they move out of there but we have to inherit that our kids, grandkids. I think that there needs to be a lot of work to be done on their reclamation plan and how they involve the bands.*

*Interview 2 Line 16*

*I know that New Afton is doing what they can to enhance biodiversity, and they have the wildlife management plans, they've met ISO standards for the ISO 15001(should this be 14001?). So I know that they're doing a lot to manage and enhance and all that stuff on the property...and they're working with bands on what native grasses need to be planted and seeded because that's important. So many years have gone by when mine sites have*

*just planted crested wheat grass that's just not natural to this area and they end up just taking over. It would be nice to see grass that's native to these parts, plants, making sure that it just looks like an area that you can look at and say, a small foot print.*

*Interview 3 Line 9*

#### **4.7 Site Visits**

Site visits occurred with First Nations community members to the mine site and native grasslands. The following section will provide photographs from the site visits with a written summary of the field notes for each photograph.

When driving by the mine site on Trans-Canada Highway 1, the area shown in Figure 4.5 was mentioned by a number of First Nations community members as an example of reclamation. The top half of the photo and below the mountain is where the previous reclamation (approximately 10 years of growth) was conducted on the site. This was seen as “not enough” by many First Nations community members due to the lack of diversity and native plant species. An abundance of sage brush and native grasses can be seen in the lower half of this photo where mining development has not taken place.



**Figure 4.5 New Afton Mine Site Previous Reclamation. Reclaimed area (after approx. 10 years) is above and non-disturbed land is below (Photo Taken October 2014)**

Figure 4.6 to Figure 4.9 were taken during a site visit coordinated by the Natural Resource Department of the Skeetchestn Indian Band. The site visit was to an area that was “as close as possible” to a native grassland. What was noted and discussed was the diversity of plant life in this area. Areas that had been over used by cattle and industry were expressed as having an overabundance of sage brush. This can be seen in bottom half of Figure 4.5. Sage brush can be seen below in Figure 4.10.

Finally, in Figure 4.11 a dying pine tree, can be seen. The impact of the pine beetle was noted by the Natural Resource department as drastically impacting the pine trees in their territory, and therefore affecting the region's grasslands. This will be further discussed in Chapter 5.



**Figure 4.6 Horseshoe Island Grassland (Photo taken November 2014)**





**Figure 4.7 Horseshoe Island Grassland 2 (Photo taken November 2014)**



**Figure 4.8 Horseshoe Island Grassland 3 (Photo taken November 2014)**





**Figure 4.9 Horseshoe Island Grassland 4 (Photo taken November 2014)**



**Figure 4.10 Sage Brush: Horseshoe Island (Photo taken November 2014)**





**Figure 4.11 Ponderosa Pine: Horseshoe Island (Photo taken November 2014)**

## **Chapter 5: Analysis**

### **5.1 Introduction**

This chapter discusses the results of Chapter 4 as they relate to the research questions and literature review outlined in Chapter 2. The emerging themes from the interviews will be further analyzed both as a whole, and within their independent nodes<sup>2</sup>, as shown in Chapter 4. This analysis will help convey and realize the traditional knowledge and the closure objectives of the interviewees. Unanticipated findings will be considered in general, and specifically for each node. Finally, the limitations of this research study's findings will be analyzed in order to examine how they affect the transferability and generalizability for future work.

### **5.2 Analysis: Flora**

Plant life and specifically native species were of great cultural, medicinal, and nutritional importance to the interviewees. Their uses varied. Plants were expressed as being used as constructional materials for pit houses and baskets with pine and fir trees, nutrition and medicine such as berries and hooshum, and finally spiritual ceremonies plants such as sage. The list of plants created by the Skeetchestn Natural Resource Department (SNRD) in Appendix G provides about 100 plant species. Through these interviews only 14 were vocalized as seen in Table 4.2. Comparatively few plants were discussed. Through the way the interviewees discussed the mentioned plants, the interviewees seemed to have a stronger connection to the plants in Table 4.2 as compared to the SNRD list.

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<sup>2</sup> Independent nodes: Flora, Fauna, Water, Land Use, Thoughts about Mining

In regards to discussions on reclamation and closure, most of the interviewees expressed all native plants were seen as being significant. However, they did not mention which specific plants would be the most important to be revived.

*I'd like to see the site get returned to native grasslands with native species as much as possible.*

*Regenerate the plants.*

Although as one interviewee mentioned:

*The main thing is medicine. We're losing a lot of that.*

Furthermore, as seen in Table 4.2, most of the specific plants mentioned in the interviews were medicinal plants (8 of 14). With sage, hooshum and juniper being the most discussed medicinal plants in terms of sources. However, three out of the top five plants by sources were non-medicinal (2 nutritional, 1 building material). Again showing the importance of not just medicinal plants. From one interviewee:

*Two of the most significant [plants] would be hooshum, or soap berries and spukbuk booie aka Saskatoon berries...Along with that, you know the balsam root, that's another root food that we utilized...*

In terms of closure objectives, replanting native species was key, but as well, the removal of invasive species for protection of these native species was identified to be implemented.

*They're trying to make it look really nice, but the only plants you see are weeds. And a lot of them are noxious weeds. So a lot your natural plants are gone.*

The interviewees have mentioned reclaiming the land to support grazing as not a desirable outcome:

*We're getting told, hey you got to put cattle out there. And from our perspective, well we just assume not have the cattle out there, because it means our traditional plants have a little more chance to come back.*

The native plants have a spiritual significance for the community and by not re-planting native species, and using it for grazing the community could feel at a loss.

*I think on a personal note, it's a responsibility on corporations that disturb the landscape to such a high level to do what they can to repair it. There's also a spiritual component to things. You can plant and replant, unless you ask the land to repair itself or pray for it, and ask our animal relatives to make it their home again. It's not going to be as successful as it could be. Our ancestors, you know we need to ask them as well.*

There is an apparent lack of understanding of what is possible in terms of reclamation for plant life and what the site will look like in terms of vegetation post-extraction.

*It's never going to be the same. It's never going to look the same but we should do what we can to patch it up.*

*We have to determine which plants are suitable for the site.*

*Given that the mine site itself...and given that it's in a bunch grass zone, it's dry, it's not a lot of water you have for ample vegetation. It's very selective vegetation. Its sage brush, mariposa lily, knotting onion, things like that, that I don't think it can be re-stored on an artificial level. It's stuff that would take years to come back.*

In addition, mining development is not the only impact that has changed the plant life both in the region and on the mine site. Grazing, climate change, water usage, invasive species, and general industry all have had impacts on the native species. These were all mentioned during the site visits and/or interviews. Over-grazing has been impacting the native grasslands for over 100 years causing an overabundance of sage and destruction of the grasslands. Climate change and water usage has influenced the amount of water bodies and water in the ground, which in turn changed the overall appearance of the area. As seen in Figure 4.11, during the site visit to Horseshoe Island, the pine trees were expressed as having been severely impacted by the pine beetle. The pine tree was also mentioned as being used for building materials by First Nations communities and as a key traditional plant.

There were responses looking for closure to return the land to “pre-contact”:

*The way it looked before they got there. I think that it's not a matter of how it looked. I would like to see it pre-contact.*

Pre-contact in this sense is prior to the first European settlers reaching the Kamloops region, over one-hundred years ago. The European settlers developed and impacted the land with cattle grazing, forestry, mining and general urban development. Reclaiming the land back to “pre-contact” with today’s technology may not be possible, due to the impacts of development over the last hundred years. For a mining company, it is essential to be transparent of what is possible for closure objectives and to understand the desires and values of the community. Furthermore, to try to be as accommodating as possible throughout the entire mine development process. Cowan et al. (2010) and Roberts et al. (2000) discuss how a mine site evolves over time, and how continually working with communities is critical. The discussion of Cowan et al. (2010) and Roberts et al. (2000) as mentioned, are echoed in the findings of this study.

The knowledge keepers did provide some exact closure activities that could be implemented, such as creating a native plant species nursery or greenhouse:

*If there's some way that they could, we could have green house there, big one in Tk'emlúps and one in Skeetchestn. That'll make work for our young people. and they go there dig it up, bring it back. And regenerate the plants and then replant.*

Providing future economic opportunities is a crucial part of sustainable development as discussed by Dyllick and Hockerts (2002). Having job opportunities through the native plant nursery post mineral-extraction would help achieve many aspects of sustainability. Providing economic opportunities is also considered in the Aboriginal engagement guides as being of key consideration (Association for Mineral Exploration British Columbia, 2015; Government of British Columbia, 2015; Government of Canada et al., 2013).

### **5.3 Analysis: Fauna**

The wildlife in the territory and at the New Afton site were of great worth for the interviewees for hunting, fishing, and overall cultural significance. As seen in Table 4.4, over 22 species were discussed by the interviewees. The wildlife that were identified as hunting or fishing animals were mentioned considerably more than any other species. Deer, trout, salmon, moose, and water fowl were identified as the key hunting animals. It is apparent that hunting and fishing are of considerable worth of the community members, and that any impact to their ability to hunt and fish would be of great concern.

*It's important to reintroduce wildlife just for our Aboriginal rights and title. We are able to so that our people can hunt, for our food and everything.*

Nearby at Cherry Creek and Greenstone Mountain, and on the actual New Afton Mine site, hunting is and has been conducted by the First Nations communities. The New Afton Mine site

was identified to have significant deer populations at one time, with Greenstone Mountain being a key wintering area for moose hunting.

*That's one of our main hunting areas*

*There was a lot of deer up there. A lot hunting up there.*

*There's deer and moose all around that area up above, there's the greenstone, I hunt. All around the edges of the New Gold site, for deer and moose.*

*Well there's not much deer left. We don't have much left in our hunting areas.*

With the essential goal of mine closure planning to ensure the highest levels of safety, fencing and restricting of access has been conducted consistently as stated by Cowan, Mackasey, & Robertson (2010) in a report to The National Orphaned and Abandoned Mines Initiative (NOAMI). With such, it is of great concern from a number of the community members about how and if the mine closure plan will restrict access to the site. This restriction of access is seen as a major impact to their ability to hunt and fish in the region.

*We still can't go hunting in the pit, we can't go hunting in the tailings pond. There's a whole pile of that site that we don't have access to for safety and mine legislation reasons and whatnot.*



*We use to go fishing over there, there was nice fishing places all over in there, now it's all blocked off. There's no more, we lost all of that.*

These two quotes speak to the balance of access for hunting and fishing, with safety. The mining company has to first and foremost ensure safety is upheld, but the cultural significance of wildlife for hunting needs to be comprehended, and allowing for hunting needs to be reviewed.

*I would love to see belly deep grasses that all of our animal relatives could sustain themselves on and hopefully build up healthy populations of animals that can sustain life for each and future generation. Put in wild and native grasses...if you put back and try to get some of the wild and native grasses in. Maybe you'll get some of the wildlife back too.*

Plants and wildlife were also consistently mentioned alongside one another. This can be seen in the quotes above and in Table 4.1 and Table 4.3 as the term “plant” and its stem terms were notably discussed in the wildlife node and vice-versa. Reclaiming plant life was seen as a means to bring back wildlife. This further shows the importance of flora for the interviewees.

Furthermore, the uptake of potential toxins from the mine site to the plants (or water), and then to wildlife was mentioned as a concern and an impact to hunting.

*You wouldn't want to even eat the deer [on the mine site] and maybe you hunt around the edge. Due to the industry being up there, band members just don't go there, it's almost like the whole territory you just don't go.*

In summary, site access, toxin uptake management, and creating wildlife habitat through plant species are the key takeaways from the interviews for closure objectives and communication planning points. Openly discussing the risks to wildlife and traditional hunting practices needs to be conducted during all phases of closure and reclamation planning. Communicating closure planning during all phases of mining is consistently discussed throughout previous literature and echoed in this research (Laurence, 2006; Veiga et al., 2001; Warhurst & Noronha, 2000). The community members want to be involved and facilitating this could potentially help the company reaching social acceptance of their closure plan and overall reputation. However as Danard (2010) states, it can be difficult to incorporate engagement or traditional knowledge into western science fields such as closure planning. This research shows that through setting up of discussions on the various environmental impacts of mining one can start to understand some of the environmental cultural conservation expectations of the community.

#### **5.4 Analysis: Water**

Water and the impacts to water were considered as having the greatest significance and concern for their community. As discussed in the interviews, water quality affects both the flora and the fauna of the region, and therefore safe water ensures the preservation of the culturally important plants and wildlife.

*Water to our people, and the Tk'emlúps and to myself is the largest connection, and to me the highest importance to our traditional territory.*

*Water is important because it supports all of the species.*

Furthermore it is important to note there is a spiritual component to water as well:

*All water from a First Nations' view point is sacred. It is spiritual, it's a living element.*

The New Afton Mine site is situated near Kamloops Lake, which is where it pumps its water for mineral processing and other mining activities. The uses of Kamloops Lake and other nearby lakes, such as Jacko Lake, are based on fishing for trout and salmon, and hunting for water fowl (ducks and geese). Again, all water is considered sacred, with runoff water from Greenstone Mountain and Cherry Creek being essential for feeding and spawning for Kamloops Lake and other water bodies.

*Definitely Kamloops lake right. Presently they're drawing water from the lake. I'm not sure or too familiar with down stream effects. But I do know that the lake itself has a lot importance in terms of sustaining wildlife, water birds, migratory birds, salmon runs... The creek itself would've been a spawning channel...Definitely, Jacko, I know*

The use, and cultural and spiritual connection surrounding water is evident for the interviewees. It is therefore not surprising that the impacts to water from mining were of great relevance to them. The amount of usage, impacts from tailings, and disposed chemicals were repeated across the interviewees with a notable amount of concern.

*It kinda gets close to the heart and you hear from the people in town who aren't involved in all of this...they'll ask why is their water being used for...and how is it being impacted It's a hefty amount of water. My worry is the cumulative effects...It's a significant amount of water. I mean our food fishery is right below it. Kamloops lake, Thompson river, that's our First Nations food fishery.*

*That's why we are so concerned with the chemicals and contaminants that come out of those mines there. What guarantee have we got [for our fish].*

For the knowledge keepers, due to its importance, water was identified as needing to be reclaimed to the highest level possible. The question is what is the actual acceptable level? Most interviewees did not provide a comment on this. Mostly they were concerned about its use for sustaining the animals, fish, and plants. In terms of drinking of water, one interviewee expressed his/hers expectation for the water to be brought as drinking water.

*This water has to be brought back to the state where it can be used. Like they were saying, it can be used, but you can't drink it. If you can't drink it, then it's not brought back to as pure a form as it could be.*

It is important to note that the New Afton Mine site and the entire territory is situated in a semi-arid zone, with only 277 mm of annual precipitation (Environment Canada, 2015). As discussed in the interviews, this has historically put pressure on communities to be very conscious of water usage and preservation, and therefore heightens concerns for industry, such as mining, to be

conservative with their water usage. The long-term management of water usage, storage, and treatment, needs to again be addressed with First Nations communities. There are concerns about losing, wasting, or contaminating the water, and its effects to the plants and wildlife of the region.

In summary, key questions that arose from the interviewees were: How will the mine affect the surrounding water bodies and ground water? And once mining ends, how will the water be reintroduced back into the environment?

These water management considerations and treatments are all already central components of closure plans for the mining industry (Brodie et al., 1992; Goodbody, 2013; Warhurst & Noronha, 2000). There are numerous technical difficulties that need to be considered when storing, treating, and releasing water from a mine site (Bingham, 2011; Nelson, 2011), that may not make it possible for the water to be suitable for drinking. The key findings from this research for closure planning with First Nations communities are that the cultural significance of water is evident. Community members see water being properly revived in terms of the water being able to sustain wildlife and plant life. Communicating the impacts or non-impacts of mine water usage to the plant and wildlife is therefore of utmost importance. Furthermore, there were discussion to ensure that the water that needs to be stored on site, that may be contaminated, does not affect the groundwater or any other water bodies in the region.

## 5.5 Analysis: Land Use

The Land Use node focused specifically on the New Afton site more than any other node. It further provided thoughts on closure objectives. The historical uses of the land on and around the New Afton site were as a stop-over or camping ground for travelers going from the Skeetchestn Reserve area into Kamloops or the Tk'emlúps te Secwepemc Reserve.

*New Afton Mine area was a jumping off area. In the spring people would come down from the valley and people would camp there.*

Knowing that it was used for a stop-over as well as having a nearby hunting blind, interviewees stated that it shows the area must have been used for not just hunting, but fishing and plant collection as well.

*We'd go hunt and fish there, there was little stop over that we kind of used for food fish, hunting and whatever. I think Jacko Lake was one of them, which is on the Ajax site... So there's some areas that we went, we hunt and fished and we stayed.*

*I know that's why we set up that hunting blind there. I know that my ancestors would've patterned the animals and it would've been in conjunction with the seasonal round. There would've been a time of year where they would've been say at the New Gold site, collecting berries and routes and being opportunistic because of the hunt.*

With such, discussions on how they'd like to see the land be reclaimed was again mentioned in this section, and as repeated from the fauna node fences and land access were seen as concerns for being able to use the land to its full potential.

*You probably start taking a few fences out and probably get rid of an awful lot of roads.*

*Get rid of a lot of the infrastructure. I don't know, it's really hard to revive this stuff. Your animal populations have been impacted and what not. Replant habitat...*

*Well I think just generally speaking it would be nice to see the land restored to a state where you can look at it and say "This was a mine?"*

The question however is, what is possible? Can the land be truly brought back to a natural state? This was discussed by a few interviewees, but many (not all) were not familiar with some of the technical constraints at the New Afton site.

*And the landscape as I said is so dry, just planting something doesn't mean it's going to survive. They have to be realistic to what their goal is and people have to be realistic in their expectations. To just say I want to do this and fill up the pit with water or make a lake or all the black caving is going to pretty or whatever. It has to be done in a way that is tangible and realistic.*

For closure planning, the discussions on land use provided further insight into the interrelation between wildlife, water, and plant life. Moreover, how the communities would set-up camping

sites in areas where they could capitalize on hunting, fishing, drinking water, and plant collecting all at once. Furthermore, the nearby Ajax property was mentioned during discussions of the New Afton property. The Ajax discussions focused on Jacko Lake and the hunting blind, where hunting, fishing, and plant collecting were all conducted in the past.

The discussions on post-closure land use centered on adapting the land back to the state it was prior to any mining operation. The problem is, is this even possible? There were no discussions on other uses for the area other than reclaiming it to a natural state, with native plant and wildlife species. Warhurst et al. (2000) mention land use objectives should:

*“Ensure viable post mining land use for the region, no health impacts detrimental to the community, local communities are not impoverished as a result of the closure plan, spread the costs over the life of mine, and enhance capacity utilization over life of mine”*

Can these objectives be achieved if what the community wants is not possible? The First Nations community puts a very strong value on their environment. It is evident that by not reclaiming the land back to an environmentally viable state, the local community will be “impoverished” as a result of the closure plan, as shown in the land use objectives stated by Warhurst et al. (2000). What requires to be analyzed further is finding alternatives for not achieving the exact environmental reclamation as per the wants of the community. However, would not achieving the environmental expectations of the community be a complete failure in the sense of sustainability (environmental, social, and economic) as analyzed in the Seven Questions to Sustainability Framework (Appendix H)? Again, the constraints of the possible



closure options need to be openly discussed before and during all mining activities. This can provide help for the community to understand what is, and what is not possible in terms of closure objectives.

## **5.6 Analysis: Thoughts about Mining**

The responses in this node were mixed in terms of their concerns, and what was specifically discussed in regards to their relationship with New Gold. Overall, it was positive, however, the interviewees were still concerned with how current and potential environmental impacts are being managed. Respecting the spirituality and customs of the community was mentioned as an extremely positive aspect of the already existing relationship.

*The current relationship that we have, I like it that they respect our culture enough that anytime they are doing new work there, that they are calling up, you know they call myself up or any of the spiritual people, we go up there and do a ceremony.*

There was a lack of understanding of how the site will look after mining and what kinds of reclamation work will be carried out by New Gold. Furthermore, the success of these reclamation activities was not really trusted as noted in the quote below.

*You know it's a good thing for our people, we got jobs, and there's folks working there, it's an agreement that it's the first of its kind in North America with First Nations and the mine. You know, it's 50/50 what I think. You know it's economically it's viable but what it does to the land, environmentally, it's a tough one, I haven't seen a successful*

*reclamation process, and I've been to other mines and I've watched the reclamation and I'm sure the attempt has been there but the land just never gets back to 100% of what it was before.*

A positive and open relationship where trust has been established between the First Nations communities and the mining company is absolutely imperative for successful closure and reclamation planning. Furthermore, it helps reduce overall social risk and community acceptance for all aspects of mining (Joyce & Thomson, 2000; Prno & Slocombe, 2012). Through these interviews it does seem that the relationship is well established and is continuing to develop. From this research, the key steps for a successful relationship in regards to closure, will be to have the communities involved with understanding the site's reclamation constraints, then establishing land use objectives, and finally determining a final land use. Communicating what is and what is not possible, is a critical piece for cooperative closure planning. Once communicated and understood, detailed closure goals and plans can then be implemented.

## **5.7 Summary of Overall Themes**

For this case study, the cultural significance of the environment in terms of native plants and wildlife is evident for the traditional knowledge keepers. Programs to conserve and manage wildlife and plant species will be keys to success of a closure and reclamation plan. Reclamation of the water and the soil to sustain plants and wildlife, in order to return the land to where it was prior to mining seems to be the most desirable outcomes for the closure and reclamation plans. Hunting, fishing, and plant harvesting are seen as the most valuable uses of the land.

The traditional knowledge can be used, as seen in this research study, to determine the significant plant life and wildlife to focus on during closure planning. For this research, it was the animals that were used for hunting (moose, deer, geese etc.) and fishing that were discussed as being the most important. As well, the medicinal plants were of highest importance in terms of conserving and managing for the future. Engagement with the community needs to be undertaken to discuss what is and what is not possible in terms of closure planning. Moreover, to respect the fundamental issue of placing the land at risk for the First Nations rights holders. Trying to adhere to the requests of the community as best as possible is vital for the company during and after mining.

The importance of the environment for First Nations communities is also noted by Castellano (2004), and in the Aboriginal consultation guidelines in section 2.11, as culture is tied closely to the environment and therefore impacts to the environment directly affect their community's well-being. The previous literature on closure planning describes the complexity of the process. With today's mining company's taking on sustainable development practices, a proactive approach for community involvement is necessary for closure success and acceptance. This research shows that a dialogue of cultural heritage can help to establish closure objectives.

## **5.8 Limitations of Analysis**

This section discusses the limitations that could cause the greatest potential impact on this research study's findings and ability to answer the aforementioned research questions.

The first is the fact that this research study took place in the fall and winter months, perhaps influencing how the community saw the usage of the land. Different traditional land uses occur during the warmer months of the year and perhaps if this research study took place at that time, the focus of the discussions and interview responses would have focused on traditional knowledge for the Summer/Spring months. To overcome this limitation, future research could consider when the interviews take place, and try to spend at least one year analyzing the traditional knowledge of the region.

The second limitation is whether the traditional knowledge keepers that were selected truly represented the traditional knowledge and mine closure needs/wants of the community. The number of traditional knowledge keepers in this region is quite small in the first place and access to more traditional knowledge keepers was limited by number of willing and able participants. As stated in Chapter 3, to gain a robust and well-rounded view from the communities, this research study interviewed an equal number of participants from both the Skeetchestn and Tk'emlúps te Secwepemc bands as well as elders, non-elders and band office employees that were considered traditional knowledge keepers.

The researcher's own biases and background could be considered as a limitation. In addition to growing up in Canada, the researcher also has an educational background in the applied science and commerce fields from a Canadian university. This was further discussed in section 3.4.1. Through acknowledging the researcher's background and bias, this research aims to be transparent with all possible limitations.

The final limitation, is if it is even possible today to collect and understand the full spectrum of traditional knowledge and the expectations of the community. There was a significant loss of traditional knowledge due to the numerous impacts to the transfer of knowledge between generations caused by the residential school systems of the 19<sup>th</sup> and 20<sup>th</sup> centuries (Ignace, 2008). Furthermore, the impacts of the residential school system as well as many other practices of European settlers has created communities to be extremely cautious when discussing their wants, needs, and traditional knowledge, with people that are not from their community. This research study was organized through a partnership with the Stk'emlupsemc te Secwepemc Nation, which greatly helped to facilitate interview cultural protocols and establish a preliminary level of trust. Future studies should be aware of the impacts to traditional knowledge over the past hundred years, and researchers should clearly understand their social position when working with First Nations traditional knowledge keepers.

## **5.9 Guidance and Ideas for Implementation of this Research**

From this research study, a number of elements have emerged that should be considered for implementation into closure planning processes with First Nations communities. These are some ideas but this list is not necessarily exhaustive. It is crucial to be innovative when working with First Nations communities, and open to new ideas and approaches. These considerations are as follows:

1. Secure adequate resources (time, finances, and employees) for engaging and consulting with First Nations communities.

2. Establish a traditional knowledge and cultural heritage conservation program during the exploration stage, the beginning of the life-cycle of mineral development. Make sure that the program is properly managed and implemented through to the post-closure activities of the site.
  - a. Investigate the important flora, fauna, water sources, and overall traditional, spiritual, and cultural uses of the land.
3. The traditional knowledge data repository should be owned and managed by the First Nations community.
4. A special mine closure development committee, with both company representatives and First Nations community members, should be formed to facilitate and encourage engagement and excellent communication is ongoing.
5. Educate the community about mining, mine closure, reclamation, and land use planning.
6. Confirm that the community appreciates the technical engineering constraints, decisions, and processes before mining development commences.
7. Facilitate engagement through organizing open houses and other appropriate communication, as defined by the First Nations community, with both First Nations community members and leadership.
8. Create protocols for a transparent information-sharing environment with the First Nations community.
9. In the early stages, work with the First Nations community to understand the regulatory process of mining and mine closure in the region. Understand the current relationship between the community and the local government, and help to facilitate collaborative approaches.

10. Establish transitioning protocols alongside the First Nations communities for employees leaving and new employees joining.

## Chapter 6: Conclusions

The purpose of this research study was to analyze how First Nations traditional knowledge and consultation can be used to improve mine closure, reclamation, and land use planning.

Furthermore, to provide insight into how to consult and work with First Nations communities in regards to mine closure planning. Interview questions were designed to inquire about traditional knowledge on specific aspects of the environment (plants, wildlife, and water), the overall traditional usage of the New Afton Mine and the nearby territory, and elicit how they would like to see aspects of the environment be reclaimed following mine closure. From the information gained through site visits, field notes, and traditional knowledge keeper interviews the following conclusions can be made:

- The Skeetchestn and the Tk'emlúps te Secwepemc First Nations community members are interested in being involved in mine closure, reclamation, and land use planning and implementation.
- There is a lack of understanding from the First Nations community of what is possible from closure and reclamation activities. How the land will look and the long term impacts to the wildlife and plant life post-mining.
- Skeetchestn and the Tk'emlúps te Secwepemc culture is strongly tied to the environment (hunting, fishing, plant gathering, and spiritual ceremonies), and is valued greatly.
- The preservation of medicinal, nutritional, cultural, and spiritual native plant species is a key objective and should be considered for closure planning.
- All fauna in the region are considered significant and their conservation for the community is crucial. The importance of fauna that is gathered (salmon, trout, moose,



deer, etc.) for cultural, spiritual, and nutritional practices, was emphasized by the community.

- For the Skeetchestn and the Tk'emlúps te Secwepemc bands, access to their territory for hunting and fishing is an important land use objective.
- There is value put towards employment and economic well-being throughout the mining operation.
- Tailings, and other contaminated materials are of concern for their potential to impact the soil and water and therefore health of the territory's plants and animals.
- The New Afton Mine is seen as one of many other impacts to the land such as other nearby mine sites, grazing, pipelines, forestry, and overall industrial development.
- Prior to any mining taking place, the New Afton Mine area was traditionally used as a stopping and camping ground for the Skeetchestn and the Tk'emlúps te Secwepemc bands.
  - In addition, the presence of the nearby hunting blind signifies to the community that the area around New Afton was historically extensively used for hunting as well as possible opportunistic collecting of native plant species.
- Requiring companies working on their territory to understand First Nations culture and history is crucial.
- Respect and being open to different points of view is paramount during all stages of collaboration.
- In all, hunting, fishing, and plant harvesting are seen as the most valuable uses of the land.

The limitations of the analysis of this research are discussed in section 5.10 and should be noted with the concluding statements as well. The interviewees who represented the traditional knowledge keepers of the Skeetchestn and the Tk'emlúps te Secwepemc bands were selected and agreed upon by the two bands to represent their communities.

The challenges in terms of generalizability and transferability of this research study to other First Nations bands in British Columbia, and Aboriginal communities in Canada, could be difficult in a number of senses. First Nations and Aboriginal communities in Canada have their own distinct traditional knowledge, culture, land use, and values, and some of the specific findings from this research should not be applied to other nations. Furthermore, this research should not be seen to transfer and generalize to Indigenous communities all over the world. However, a number of overarching themes for closure planning could be applied to other Indigenous or Aboriginal communities, but in detail about preferences, expectations, and culture, this research study should only be used as a reference. The goal of this research was to provide a case study example for insight into closure planning of a specific mine and should be used only as a reference and an example for one approach to work with First Nations and Indigenous communities to establish objectives for closure and reclamation planning. In addition, this research should not be viewed as a comprehensive cultural heritage study for the Stk'emlupsemc te Secwepemc Nation. Any use or application of the cultural and traditional knowledge contained in this research, should be discussed, and approved by the Stk'emlupsemc te Secwepemc Nation.

Revisiting Otto's (2010) table on stakeholders' reclamation and closure issues, a new rights holder, can be considered. Some issues could be added for the First Nations rights holder:

- Preservation of culture
- Traditional land uses
  - Hunting, fishing, and plant gathering
- Environmental health and aesthetics
  - Flora, fauna, water and soils
- Long term economic well-being
  - Jobs, sharing of profits, community investments (scholarships, entrepreneurial support, etc.)

When relating these conclusions to the Aboriginal consultation guidelines in section 2.11, it can be seen that this study confirms many of their statements. Having respect and taking the time to understand the community's culture and history is paramount. Realizing the significance of the land and the environment, and understanding that First Nations culture is tied to the land and the environment. In addition, as found in both this research and the literature in section 2.11, creating economic opportunities for First Nations communities is vital during the closure, reclamation, and post-closure stages of the operation (Government of Canada et al., 2013). The Exploration and Mining Guide for Aboriginal Communities (2013), discusses the main environmental impacts to be associated with water contamination, and tailings and waste rock pile stability. These concerns for these environmental impacts were also found for the First Nations community members in this research.

Applying these conclusions and First Nations traditional knowledge can no doubt help to improve a mine closure, reclamation, and land use plan in terms of many aspects of sustainable development. It helps greatly to align closure planning with the community's views for environmental protection (wildlife, plant life, water sources), as well as their social and economic needs. For the company, it helps to attain community acceptance, improve company reputation, and to adhere the industry's push towards sustainable mining. For the mining industry, as projects continue to be shut down and delayed due to their potential environmental impacts and lack of community support, working directly with First Nations communities for closure planning and environmental remediation will continue to increase in importance.

## **Chapter 7: Recommendations and Future Work**

A number of recommendations, new questions, and potential future work arise from the analysis and conclusion of this research. These topics will be discussed in this chapter.

### **7.1 Recommendations**

From this research study, it is recommended that when establishing mine closure objectives and working with First Nations community members, planners need to:

1. Respect, conserve, and help develop First Nations culture.
  - a. Understand culture is tied to the environment.
2. Realize planners have a critical role to play in preserving both the environment and First Nations culture.
3. Be flexible, understanding, and consistent during all discussions and engagement.
4. The technical limitations of the site needs to be clearly communicated to the First Nations communities.
  - a. The New Afton Mine uses block caving techniques, subsidence will be an issue for areas of the site indefinitely.
5. Allowing land access is an important objective for First Nations communities.
  - a. With New Afton, the subsidence zones will be fenced or access will be restricted in order to uphold public safety. This needs to be carefully discussed and explained.

On a policy stand point, the New Afton Mine permit states as an end land use objective: “to allow for traditional land use where appropriate”. Does this truly require companies to work

with First Nations communities to develop traditional land use objectives? With this statement, the BC government is taking into account the fact that a mine site and mine closure planning is a dynamic process, and requiring specific hard requirements for closure could be unreasonable for mining companies. However, this statement could perhaps be modified to require mining companies to consider traditional usage and knowledge through a report or study to help support the closure and reclamation plans.

From the wildlife discussions, creating a conservation plan for all wildlife impacted by mining needs to be created and considered with First Nation community members. The key animals can be identified through this process and specific management plans for them can then be started. Engagement and the use of traditional knowledge can help closure plans to maintain the animal populations impacted around the mine site, and ensure cultural important activities like hunting and fishing can be sustainably continued in the future.

As a final land use, this research discussed the possibility of a native plant species nursery run by the local bands. Perhaps providing educational tours for people to learn about the native plant species, their names, what they were used for, and how to use them. This type of land use helps provide economic opportunities for the community, while developing cultural and traditional land use practices in the region.

## **7.2 Future Research and Studies**

Future studies should look at other land uses that could provide avenues of cultural education and preservation, and lasting employment opportunities. Furthermore, studies need to be

developed to understand how to minimize the environmental impacts of mining. In addition, closure and reclamation technologies need to continue to improve to help better reclaim the environmental impacts post-mining. Specifically for New Afton, to explore what can be done in terms of usage and reclaiming of subsidence zones.

Some new questions that have arisen from this research for possible future studies are:

1. Is society efficiently helping to develop innovative technologies and methods for closure and reclamation?
2. Is society properly incorporating First Nations communities into closure, reclamation, and general mining development planning?
3. Do First Nations communities have the capacity to work with mining companies on reports such as Environmental Assessments, Permits, Impact Benefit Agreements, etc., and what can be done to support them?
4. What can be done to improve the post-mining land use planning process for First Nations communities?
5. How do the wants and needs differ across First Nations and Aboriginal communities in British Columbia and/or Canada for mining and mine closure objectives?
6. How to integrate First Nation communities for closure and reclamation policy?

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## Appendices

### Appendix A : Introductory Letter



## UNIVERSITY OF BRITISH COLUMBIA

### NORMAN B. KEEVIL Institute of Mining Engineering

tel: 604 822 2540 fax: 604 822 5599 517, 6350 Stores Road, Vancouver, BC V6T 1Z4 [www.mining.ubc.ca](http://www.mining.ubc.ca)

Dear Tk'emlúps te Secwepemc and Skeetchestn community members,

The University of British Columbia is conducting a graduate student research study called: Mine Closure Planning of the New Afton Mine with Stk'emlupsemc te Secwepemc Nation. The study is being conducted by Mr. Benjamin Collins who is currently pursuing his Master's in Applied Science at the Norman B. Keevil Institute of Mining Engineering at the University of British Columbia. He is working under the supervision of myself, Dr. Dirk van Zyl, as well as Dr. W. Scott Dunbar and Dr. P. Dawn Mills.

This study reviews how First Nations traditional knowledge can be utilized in mine closure, reclamation and long-term land use planning. Specifically looking at the New Afton Mine with the Stk'emlupsemc te Secwepemc Nation.

Funding for the student, Mr. Benjamin Collins, is provided through NSERC's Industrial Postgraduate Scholarship in conjunction with Stk'emlupsemc Enterprises Inc., the general partner of the limited partnership between Tk'emlúps te Secwepemc (former Kamloops Indian Band) and Skeetchestn Indian Bands.

Engaging with community members in order to understand the interaction of landscapes, soils, water, wildlife and plant life in the territory is an essential initiative for this research.

For further information, feel free to contact myself at \_\_\_\_\_ or Mr. Benjamin Collins at \_\_\_\_\_.

Sincerely,

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Dr. Dirk van Zyl

## Appendix B : Interview Consent Form



# UNIVERSITY OF BRITISH COLUMBIA

## NORMAN B. KEEVIL Institute of Mining Engineering

tel: 604 822 2540 fax: 604 822 5599 517, 6350 Stores Road, Vancouver, BC V6T 1Z4 [www.mining.ubc.ca](http://www.mining.ubc.ca)

As part of the research project: Mine Closure Planning of the New Afton Mine with Stk'emlupsemc te Secwepemc Nation, you are asked to participate through the provision of an interview.

The research considers a design of the mine closure and reclamation for the New Afton Mine that takes into account Aboriginal Right uses. The New Afton Mine site is located 10 km west of Kamloops, BC in the traditional territory of the Stk'emlupsemc te Secwepemc Nation (SSN). This mine was initially operated by Teck Resources from 1978 to 1991 as an open pit copper mine, and the property was acquired by New Gold Inc. in 1999. The New Afton mine is operating as a block cave gold, silver and copper mine. Expertise from the SSN will be used to understand the level of reclamation required to enable the site to be used for traditional activities.

This research is to be undertaken by Benjamin Collins under the supervision of Dr. Dirk van Zyl, Dr. W. Scott Dunbar and Dr. P. Dawn Mills, at the Norman B. Keevil Institute of Mining Engineering. Funding for the student, Benjamin Collins, is provided through NSERC's Industrial Partnership Scholarship in conjunction with Stk'emlupsemc Enterprises Inc., the general partner of the limited partnership between Tk'emlups te Secwepemc (former Kamloops Indian Band) and Skeetchestn Indian Band.

- Your signature on this form will signify that Benjamin Collins, Master's student at the University of British Columbia, has explained the research procedures, that you have received adequate opportunity to consider any personal risks (physical, psychological, emotional and social), and that you voluntarily agree to participate in the project.
- My participation will involve answering questions about my views and opinions of traditional land usage in general, in my territory, and at the New Afton Mine Site.
- With approval photographs may be taken of areas discussed during the interview. Photos will be taken with annotations, comments, and observations.
- I understand that I may withdraw my participation at any time and that it can be done verbally. A note will be written why participation was withdrawn.
- I may obtain copies of the results of this study upon its completion by contacting the student at \_\_\_\_\_ and/or his supervisor Dr. Dirk van Zyl at \_\_\_\_\_ .
- The results of my contribution will be stored indefinitely in a locked file cabinet by the Stk'emlupsemc te Secwepemc Nation in the John Jules Professional Building located at the Big Sky Gas Station, and for a period of five years (after which it will be destroyed) in the office of Dr. Dirk Van Zyl, and will be available for review at any time.

- Please note that with the audio recordings, which will be stored by the Stk'emlupsemc te Secwepemc Nation in the John Jules Professional Building that it is possible that even if you choose not to have your names used in the reports, a member of the community accessing the interview data could recognize you by your voice.
- I also understand that I may register any complaint that I might have about the research or the student named above with the Norman B. Keevil Institute of Mining Engineering at the University of British Columbia. E: [info@mining.ubc.ca](mailto:info@mining.ubc.ca) P: 604-822-2540
- If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or if long distance e-mail [RSIL@ors.ubc.ca](mailto:RSIL@ors.ubc.ca) or call toll free 1-877-822-8598

I, ..... (PRINT YOUR NAME HERE) give consent to participate in this study and:

- agree to have my interviews tape-recorded.
- do not agree to have my interviews tape-recorded.
- will allow direct quotes from my interview to be used.
- will not allow direct quotes to be used.
- would **like** to have my name used during publication
- would **not like** to have my name used during publication

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

WITNESS: \_\_\_\_\_ DATE: \_\_\_\_\_

Once signed you should receive a copy of this consent form.

## Appendix C : Interview Questionnaire



# UNIVERSITY OF BRITISH COLUMBIA

## NORMAN B. KEEVIL Institute of Mining Engineering

tel: 604 822 2540 fax: 604 822 5599 517, 6350 Stores Road, Vancouver, BC V6T 1Z4 [www.mining.ubc.ca](http://www.mining.ubc.ca)

### Interview Questions

#### Plant Species

“Are there plants in the Cherry Creek Reserve or the New Gold/New Afton region that hold special significance (spiritual, medicinal, cultural, nutritional) to the Tk'emlúps te Secwepemc and Skeetchestn communities?”

“Can you tell me about why these plants are significant?”

“Has the historical mine development affected the community's access to and use of these plants?”

“Has the recent mine development, which started in 2012, affected the community's access to and use of these plants?”

“How has it affected the use?”

“How would you like to see these plant(s) and its use be revived?”

“Do you think there is anything that the New Afton mine could do to help this revival?”

“What do you know and think of the current work being conducted by New Gold Inc.?”

“Are there any other locations outside the mine site where these plants also occur?”

“Can you please show me these plants (if possible, and take a picture of them)”

#### Wildlife

“Is there wildlife in the Cherry Creek Reserve or the New Gold/New Afton region that hold special significance (spiritual, medicinal, cultural) to the Tk'emlúps te Secwepemc and Skeetchestn communities?”

“Can you tell me about why these species are significant?”

“Has the recent mine development, which started in 2012, affected the community's interaction with these animals?”

“Has the historical mine development affected the community's interaction with these animals?”

“How has it affected the interaction?”

“How would you like to see these interactions be revived?”

“Do you think there is anything that the New Afton mine could do to help this change?”

“What do you know and think of the current work being conducted by New Gold Inc.?”

“Are there any other locations outside the mine site where these interactions also occur?”

**Water**

“Are there water sources in the Cherry Creek Reserve or the New Gold/New Afton region that hold special significance (spiritual, medicinal, cultural) to the Tk’emlúps te Secwepemc and Skeetchestn communities?”

“Can you tell me about why these water sources are significant?”

“Has the recent mine development, which started in 2012, affected access to and use of these water sources?”

“Has the historical mine development affected the community’s access to and use of these water sources?”

“How has it affected the use?”

“How would you like to see this be revived?”

“Do you think there is anything that the New Afton mine could do to help this revival?”

“What do you know and think of the current work being conducted by New Gold Inc.?”

“Are there any other locations outside the mine site where these types of water sources also occur?”

“Can you please show me these water sources (if possible, and take a picture of them)”

**Landscape Features and General Use**

“Are there geographic areas or landscapes in the Cherry Creek Reserve or the New Gold/New Afton region that hold special significance (spiritual, medicinal, cultural) to the Tk’emlúps te Secwepemc and Skeetchestn communities?”

“Can you tell me about why these areas or landscapes are significant?”

“Has the recent mine development, which started in 2012, affected the community’s access to and use of these areas or landscapes?”

“Has the historical mine development affected the community’s access to and use of these areas or landscape features?”

“How has it affected the use?”

“How would you like to see this area or landscape be revived?”

“Do you think there is anything that the New Afton mine could do to help this revival?”

“What do you know and think of the current work being conducted by New Gold Inc.?”

“Are there any other locations outside the mine site where these types of areas or landscapes also occur?”

“Can you please show me these areas or landscapes (if possible, and take a picture of them)”

If you would like to know more information and are interested in the study feel free to contact:

Mr. Benjamin Collins at: \_\_\_\_\_

## Appendix D Secwepemc Territory Map

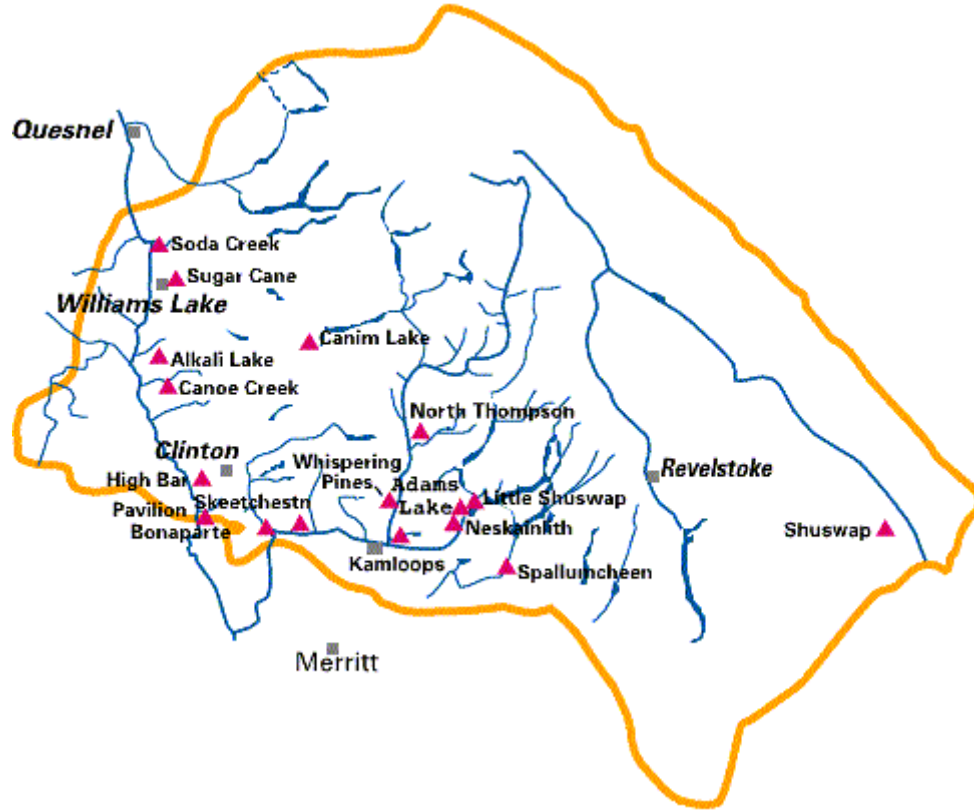


Figure 7.1 Secwepemc Map (Source Secwepemc.org)

## Appendix E SSN and UBC Intellectual Property Agreement



Stk'emlupsemc te Secwepemc Nation  
PO Box 188  
Savona, BC V0K 2J0  
P: 250 373-0023  
F: 250 373-0025

### **PERMISSION TO CONDUCT RESEARCH: STATEMENT OF RESEARCH AND INFORMATION SHARING PROTOCOL PRINCIPLES**

**Between, The Stk'emlupsemc te Secwepemc Nation (SSN) and The University of British Columbia (UBC), with offices at #103-6190 Agronomy Road, Vancouver, BC V6T 1Z3, represented by its authorized signatory Dr. Mario Kasapi:**

Whereas it is understood and acknowledged by all parties that

- A. The rights of the Stk'emlupsemc te Secwepemc People are,
- ◆ embedded within their customary laws and structures, and are inclusive of their intellectual, Aboriginal rights, and cultural properties;
  - ◆ protected under Section 35 of the *Canadian Constitution Act* and are inherent, *sui generis* rights;
  - ◆ supportive of the principles, guidelines, and implementation of the United Nations Declaration on the Rights of Indigenous Peoples; and,
  - ◆ Stk'emlupsemc te Secwepemc Nation to jointly review the Researcher's draft reports for accuracy, consistent with the joint UBC and Stk'emlups Enterprises Inc. contract with NSERC (the "NSERC Contract"), hereby attached as Appendix A.

B. Benjamin C. Collins B.A.Sc., M.A.Sc. is the UBC student under the NSERC contract as supervised by Dirk Van Zyl, PhD, W. Scott Dunbar, PhD, and P. Dawn Mills, PhD. (together the "UBC Committee Members") at the Norman B. Keevil Institute of Mining Engineering;





Stk'emlupsemc te Secwepemc Nation  
PO Box 188  
Savona, BC V0K 2J0  
P: 250 373-0023  
F: 250 373-0025

The Research Project is entitled:

**Mine Closure Planning of the New Afton Mine with the Stk'emlupsemc te Secwepemc Nation.**

The research is conducted with the assistance of the people from the Stk'emlupsemc te Secwepemc Nation (SSN)

The goals of the research and the research question: How can First Nations Traditional Knowledge be utilized in mine closure, reclamation and post closure land use planning? Specifically looking at the New Afton Mine with the people of the Stk'emlupsemc te Secwepemc.

Data will be gathered using written notes or digital recording devices depending on the preference of the interviewee. The Interviewees must never feel burdened to answer questions and the Interviewer will stop and have a break or reschedule at another time. Interviewees will be given full credit in the acknowledgements for their contributions to this project. All Interviewees will be given a written and digital copy of their respective interview(s). All digital recordings will be stored in a locked cabinet in the UBC Committee Members' offices and will be accessed only by the UBC Committee Members as indicated above. The repository for the original data and the copy of Benjamin C. Collins Master's Thesis for this project will be stored in a fireproof safe at the John Jules Professional Building – Skeetchestn, as well as in UBC library as per UBC internal policies. Benjamin C. Collins' Master Thesis shall comply with NSERC IP Policy, as per the NSERC contract.

In agreeing to these principles, UBC, recognizes and affirms:

- Acknowledgement of the political relationship proposed in the *Memorial Sir Wilfred Laurier, 1910*.
- The research will be conducted in an open and respectful manner;
- If requested by the interviewee, another individual may be present during the interview;
- It is of utmost importance for the Stk'emlupsemc te Secwepemc Nation (SSN) to review the research and draft publications to confirm that UBC is not disclosing personal information of the interviewees. If personal information of SSN is disclosed in draft publications, UBC will immediately remove that information from the draft publication, after which UBC is free to publish;
- Stk'emlupsemc te Secwepemc participating members (research partners) are to be fully informed of the nature, scope, and ultimate integration of their participation, knowledge, and narratives in all stages of the thesis work, as well as its potential publication, dissemination, and use;
- That the raw data obtained from interviewees must be reviewed and approved by the interviewee;
- That material related to the Stk'emlupsemc te Secwepemc people collected by Mr. B.C. Collins or any of his project team is owned by the Stk'emlupsemc te Secwepemc People, and they retain their respective inherent rights, including all intellectual property rights and have ownership of all cultural information obtained from them, and will be housed in the John Jules Professional

Building at an off-site archive. This includes oral testimony (transcripts), historical, genealogical, anthropological, traditional use studies, resource based data and studies, as well as any other relevant material;

- That the copyright of the final Master's Thesis will remain with Benjamin C. Collins, BAsC in Mining Engineering/MASc Student, University of British Columbia.
- Copies of interviews and transcripts may not be used for future research without written consent from the Stk'emplupsemc Te Secwepemc Nation (SSN) and UBC;
  - If the request is from UBC, SSN will give consent after the proposal has been vetted;
  - The Researcher will be given full use of existing interviews of the Stk'emplupsemc te Secwépemc members and he/she will give them full credit in the thesis for their contribution;

\_\_\_\_\_  
Date

\_\_\_\_\_  
Mario Kasapi, Associate Director,  
University-Industry Liaison Office

\_\_\_\_\_  
Tk'emplúps te Secwepemc (TteS)

\_\_\_\_\_  
Skeetchestn Indian Band (SIB)

Chief Shane Gottfriedson

Chief Ron Ignace

\_\_\_\_\_  
Tk'emplúps te Secwepemc (TteS)

\_\_\_\_\_  
Skeetchestn Indian Band (SIB)

Councilor Jeanette Jules

Councilor Darrel Draney

\_\_\_\_\_  
Stk'emplúps Enterprises Inc.  
Leonard Jackson, CEO

Agreed and Acknowledged by:

UBC Committee Members:

Dr. Dirk van Zyl \_\_\_\_\_

Dr. W. Scott Dunbar \_\_\_\_\_

Dr. P. Dawn Mills \_\_\_\_\_

Benjamin C. Collins \_\_\_\_\_

\*\*All signatures are withheld for confidentiality

## Appendix F : NVIVO Stopped Words List

a able about above absolutely after again against all along also always am amount an and another any anything are area areas aren't aren't around as aside ask asked at away back basically be because become becomes been before being below between big bit both brought but by call called calling can can't cannot can't cause certain clear clearing come comes coming could couldn't couldn't day days definitely did didn't didn't difference different do does doesn't doesn't doing don't done don't down during each early end even evenly ever every everything few for from further get gets getting given going gone good got had hadn't hadn't happen happened happening happens hard has hasn't hasn't have haven't haven't having he he'd he'll he's he'd he'll her here here's here's hers herself he's hey him himself his how how's how's i i'd i'll i'm i've i'd if i'll i'm in into is isn't isn't it it's its it's itself i've just kind kinda know knowing knows last let's let's like long look looked looking looks lot lots made many may maybe me mean means more most much mustn't mustn't my myself never next no nor not nothing nothings now number numbers of off on once one ones only or other ought our ours ourselves out over own part parts point pretty probably put putting really right said same say says see seen set shall shan't shan't she she'd she'll she's she'd she'll she's should shouldn't shouldn't show showed showing shows side sides significant significantly so some something sort sorts start started starting state stay stayed stays still stuff such sure take taking than that that's that's the their theirs them themselves then there there's there's these they they'd they'll they're they've they'd they'll they're they've thing things think thinking this those though through throughout to too towards tried try trying turn under until up upon us very want was wasn't wasn't way we we'd we'll we're we've we'd well we'll went were we're weren't weren't we've what what's what's when when's when's where where's where's which while who who's whole whom who's whose why why's why's will with won't won't would wouldn't wouldn't would've yeah you you'd you'll you're you've you'd you'll your you're yours yourself yourselves you've

## Appendix G : Skeetchestn Plant List

Skeetchestn Cultural Heritage				
Kinnickinnic, bearberry	<i>Arctostaphylos ova-ora</i>	85	Sk	m, f, c, o
Arrow-leaved balsamroot	<i>Balsamorhiza sagittata</i>	133		f, c
Mountain lady slipper	<i>Calypto bulbosa</i>	284		m
Wild strawberry	<i>Fragaria virginiana</i>	219	Sk	f, m
Oregon grape	<i>Mahonia aquifolium</i>	72	Sk	f, t, m
Prickly rose	<i>Rosa acicularis</i>	64	Sk	m, f, c
Thimbleberry	<i>Rubus Parviflorus</i>	62		f, t
Common snowberry	<i>Symphoricarpos albus</i>	82		m, t
Huckleberry	<i>Vaccinium membranaceum</i>	92	Sk	f
Balsam, sub alpine fir	<i>Abies lasiocarpa</i>	39	Sk	f, m, str
Douglas maple	<i>Acer glabrum</i>	73		t
Yarrow	<i>Achillea millefolium</i>	116	Sk	m, o
Baneberry	<i>Actaea rubra</i>	211		m
Quackgrass	<i>Agropyron repens</i>	314		t
Bluebunch wheatgrass	<i>Agropyron spicatum elymus spicatus</i>	314		t
Short-beaked agroseis	<i>Agrosotis glauca</i>	109		
Nodding Onion/Wild onion	<i>Allium cernuum</i>	296	Sk	f, m, t
Sitka alder	<i>Alnus crispa ssp. Sinuata</i>	78		t
Mountain alder	<i>Alnus incana tenuifolia</i>	79		m, t
Saskatoon	<i>Amenochier alatifolia</i>	55	Sk	f, m, sp, t, o
Cut-leaved anemone	<i>Anemone multifida</i>	212		m, t
Sharpooth angelica	<i>Angelica arguta</i>	246		m
Low pussytoes	<i>Antennaria dimorpha</i>	138		m
Rosy pussytoes	<i>Antennaria microphylla A. rosea</i>	138		m, c
Spreading dogbane	<i>Apocynum androsaemifolium</i>	190		t
Indian hemp, hemp dogbane	<i>Apocynum cannabinum</i>	190	Sk	t
Red columbine	<i>Aquilegia formosa</i>	205		m, o
Wild sarsaparilla	<i>Arake nudicaulis</i>	250		m
Heart leaved arnica	<i>Arnica cordifolia</i>	124		m
Arnica	<i>Arnica cordifolia, latifolia</i>	124-126		m
Mountain arnica	<i>Arnica latifolia</i>	126		m, o
Pasture sage	<i>Artemisia frigida</i>	143		m, c
Showy aster	<i>Aster conspicuus</i>	122		m
Leafy aster	<i>Aster foliaceus</i>	123		m
American milk-vetch	<i>Astragalus americanus</i>	164		c, sp
Timber milk-vetch	<i>Astragalus miser</i>	164		t
Water birch	<i>Betula occidentalis</i>	31		t, str, m
Paper birch	<i>Betula papyrifera</i>	30	Sk	t
Edible horsehair	<i>Bryoria fremontii</i>	439		f
Pinegrass	<i>Calamagrostis rubescens</i>	321		t
Fairy slipper	<i>Calypto bulbosa</i>	285		f, m
Fairy slipper	<i>Calypto bulbosa</i>	285		m, f
Northwest sedge	<i>Carex concinnoles</i>	341		t
Beaked sedge	<i>Carex rostrata</i>	344		f, t
Sedges	<i>Carex spp.</i>	339-357		f, t, str
Common red paintbrush	<i>Ceanothus miniata</i>	168		s
Strawberry bite	<i>Chenopodium capitatum</i>	147		f, t
Princes pine	<i>Chimaphila umbellata</i>	98	Sk	f, m
Douglas's water hemlock	<i>Cicuta douglassii</i>	245		m, o
Edible thistle	<i>Cirsium edule</i>	135		f
Spring beauty	<i>Claytonia lanceolata</i>	258	Sk	f
Blue clematis	<i>Clematis occidentalis</i>	210		m
Queen's cup	<i>Clintonia uniflora</i>	302		m, t
Bunchberry	<i>Cornus canadensis</i>	250		f

f-food =53 sp-spiritual =13  
 m-medicine =90 o-ceremonial =12  
 str-structural =11 o-other =17  
 t-technological =66 s-sacred =2

Cultural Heritage Overview Field Card

Skeetchestn Cultural Heritage

Red osier dogwood	<i>Cornus alonifera</i>	80		f, m, t, str, sp, o
Black hawthorn	<i>Crataegus douglasii</i>	57		m, t
Few flowered shooting star	<i>Dodecatheon pulchellum</i>	194		m, sp, o
Wolf-willow	<i>Eleoagnus commutata</i>	71	Sk	t
Common spike rush	<i>Eleocharis palustris</i>	354		t, c, sp
Blue wildrye	<i>Elymus glaucus</i>	314		o
Fire weed	<i>Epilobium angustifolium</i>	241	Sk	m, f, t
Common horsetail	<i>Equisetum arvense</i>	371		m, t
Scouring rush	<i>Equisetum hyemale</i>	372	Sk	m, t
Meadow horsetail	<i>Equisetum pratense</i>	371		t
Dwarf scouring rush	<i>Equisetum scirpoides</i>	373		m, t
Thread-leaved daisy	<i>Erigeron filifolius</i> var. <i>filifolius</i>	120		m
Subalpine daisy	<i>Erigeron peregrinus</i> ssp. <i>Callanthemus</i>	121		t
Parsnip-flowered buckwheat	<i>Erigeron heracleoides</i>	201		m
Chocolate lily	<i>Fritillaria lanceolata</i>	297		f
Brown-eyed susan	<i>Gaillardia aristata</i>	133		m
Northern bedstraw	<i>Galium boreale</i>	196		t
Sweet scented bedstraw	<i>Galium triflorum</i>	196		t
Bastard toad-flax	<i>Geocaulon lividum</i>	198		m
Sticky geranium	<i>Geranium viscosissimum</i>	262		m
Large-leaved avens	<i>Geum macrophyllum</i>	223		m
Oldman's whiskers	<i>Geum triflorum</i>	222		m, sp.
Rattlesnake plantain	<i>Goodyera oblongifolia</i>	289		m
Oak fern	<i>Gymnocarpium dryopteris</i>	362		t
Cow parsnip	<i>Heracleum lanatum</i>	244	Sk	f, t
Round leaved alumroot	<i>Heuchera cylindrica</i>	266		m
Step moss	<i>Hypnum splendens</i>	384		m
Baltic rush	<i>Juncus balticus</i>	356		t, o
Common juniper	<i>Juniperus communis</i>	99	Sk	m, f, t, str, sp
Rocky mountain juniper	<i>Juniperus scopulorum</i>	99	Sk	m, f, t, str, sp
<b>Common Name</b>	<b>Latin Name</b>	<b>Page #</b>	<b>Contemporary Use</b>	<b>USES</b>
Trappers tea, labrador tea	<i>Ledum grandulosum/groenlandicum</i>	86	Sk	f, t
Oxeye daisy	<i>Leucanthemum vulgare chrysanthemum</i>	124		f
Tiger lily	<i>Lilium columbianum</i>	298		f
Wood lily	<i>Lilium philadelphicum</i>	298		f
Twin flower	<i>Linnaea borealis</i>	84		t
Lemonweed	<i>Lithospermum ruderale</i>	185		m, t, sp, o
Large-fruited desert-parsley	<i>Lomatium macrocarpum</i>	248		f, m
Black twinberry	<i>Lonicera involucrata</i>	83		m
Arctic lupine	<i>Lupinus arcticus</i>	158		str
Pineapple weed	<i>Maticaria discoides</i>	144		m
Field mint	<i>Mentha arvensis M. canadensis</i>	152	Sk	m, o
Common mitrewort	<i>Mitella nuda</i>	267		f, m
Single delight	<i>Moneses uniflora / pyrola uniflora</i>	274		m
Brittle prickly-pear cactus	<i>Opuntia fragilis</i>	217	Sk	f, m
Mountain sweet cicely	<i>Osmorhiza chilensis</i>	247		f, m
Falsebox	<i>Pachistima myrsinites</i>	72		m
Bracted lousewort	<i>Pedicularis bracteosa</i>	170		t
Spruce	<i>Picea glauca/engelmannii</i>	44-45	Sk	f, m, str
Lodge pole pine	<i>Pinus contorta</i>	35	Sk	f, m, str
Ponderosa pine	<i>Pinus ponderosa</i>	34	Sk	f, m, s
Common plantain	<i>Plantago major</i>	150	Sk	m
White bog orchid	<i>Platanthera dilatata</i>	287		t
Black cottonwood	<i>Populus trichocarpa</i>	28		t

Skeetchestn Cultural Heritage

Trembling aspen	<i>Populus tremuloides</i>	29		t
Silverweed	<i>Potentilla anserina</i>	225		f,t,o
Graceful cinquefoil	<i>Potentilla gracilis</i>	227		m
Self-heal	<i>Prunella vulgaris</i>	153		m
Self-Heal	<i>Prunella vulgaris</i>	153		m
Choke cherry	<i>Prunus virginiana</i>	58	Sk	f, m, t
Douglas fir	<i>Pseudotsuga menziesii</i>	47	Sk	f, m, c, str, t
Pink wintergreen	<i>Pyrola asarifolia</i>	273		m
Green wintergreen	<i>Pyrola chlorantha</i> P. virens	273		m
Little buttercup	<i>Ranunculus uncinatus</i>	208		sp,c
White flowered rhododendron	<i>Rhododendron albiflorum</i>	87		sp,c,o
Squaw current	<i>Ribes cereum</i>	53		f,m
Northern black currant	<i>Ribes hudsonianum</i>	52	Sk	f,m
Black gooseberry	<i>Ribes lacustre</i>	52	Sk	f, m
Red raspberry	<i>Rubus idaeus</i>	61	Sk	f, m
Five leaved bramble	<i>Rubus pedatus</i>	61		f
Trailing raspberry	<i>Rubus pubescens</i>	60	Sk	f
Scoulers willow	<i>Salix Scouleriana</i>	77	Sk	t
Sitka willow	<i>Salix sitchensis</i>	77	Sk	m, o
Willows	<i>Salix species</i>	74-77	Sk	m, t
Red elderberry	<i>Sambucus racemosa</i>	81		f,m,t
Lance-leaved stoncrop	<i>Sedum lanceolatum</i>	261		m
Hooshum, soapberry	<i>Shepherdia canadensis</i>	71	Sk	f, m, sp, t, o
Menzies's campion	<i>Silene menziesii</i>	255		m
Water parsnip	<i>Sium suave</i>	244	Sk	f
False solomons-seal	<i>Smilacina racemosa</i>	299		f,m
Star-flowered false solomon's seal	<i>Smilacina stellata</i>	299		f,m
Spikelike goldenrod	<i>Solidago multiradiata</i>	131		m
Western mountain ash	<i>Sorbus scopulina</i>	54		f
Shaggy peat moss	<i>Sphagnum spp.</i>	384		t
Birch leaved spirea	<i>Spiraea betulifolia</i>	55		m
Clasping twisted stalk	<i>Streptopus amplexifolius</i>	300		f, m
Rosy twisted stalk	<i>Streptopus roseus</i>	300		m
Common dandelion	<i>Taraxacum officinale</i>	112	Sk	f,m
Western meadowrue	<i>Thalictrum occidentale</i>	211		m
Stinging nettle	<i>Urtica dioica</i>	150		m, f
Dwarf blueberry	<i>Vaccinium caespitosum</i>	94	Sk	f
Grouseberry	<i>Vaccinium scoparium</i>	94	Sk	f
Sitka valerian	<i>Valeriana sitchensis</i>	197		m
Great mullein	<i>Verbascum thapsus</i>	176		m, t
High-bush cranberry	<i>Viburnum edule</i>	82	Sk	f,m,c,t
American vetch	<i>Vicia americana</i>	160		t
Meadow death camas	<i>Zigadenus venenosus</i>	305		t



## Appendix H : Seven Questions to Sustainability



**Figure 7.2 Seven Questions to Sustainability** (International Institute for Sustainable Development: Mining Minerals and Sustainable Development North America, 2002)

## Appendix I : Reviewed Document List

Stk'emlupsemc te Secwepemc Cultural Heritage Study, 2014
New Afton Updated Closure Plan by Klohn Crippen Berger, 2012
New Afton NI-43 101 Feasibility Report, April 2007
Tk'emlúps te Secwepemc New Afton Cultural Heritage Study, 2006
Skeetchestn New Afton Cultural Heritage Study, 2006
Skeetchestn 6 Mile Heritage Study, Wildtech Biological Services, 2004