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Teck Highland Valley Copper Partnership – HVC 2040 Project

Project Description

HVC004A4-PD-9720-RPT-0001

FINAL

Revision: 1

Revision Date: 05-Sep-2019

EXTERNAL

Forward-looking Statement

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Acronyms and Abbreviations

AAC	allowable annual cut
AIA	Archaeological Impact Assessment
ALR	Agricultural Land Reserve
BC	British Columbia
BCEEA	BC *Environmental Assessment Act*
BCUC	BC Utilities Commission
BEC	Biogeoclimatic Ecosystem Classification
CAP	Corrective Action Program
CEA	cumulative effects assessment
CEAA, 2012	*Canadian Environmental Assessment Act, 2012*
CNA	Citxw Nlaka'pamux Assembly
CO_2e	carbon dioxide equivalent
COI	Community of Interest
CP	Canadian Pacific
Cu	copper
EA	environmental assessment
EAC	Environmental Assessment Certificate
EAO	BC Environmental Assessment Office
ECDA	Economic and Community Development Agreement
EMA	BC *Environmental Management Act*
EMB	Environmental Monitoring Board
EMS	Environmental Management System
ENV	British Columbia Ministry of Environment and Climate Change Strategy
EOR	Engineer of Record
EPRP	Emergency Preparedness and Response Plan
FPIC	free, prior, and informed consent
GHG	greenhouse gas
ha	hectares
HSEC	health, safety, environment and community

HVC	Teck Highland Valley Copper Partnership
IC	Implementation Committee
ICMM	International Council on Mining and Metals
IPP	(Teck's) Indigenous Peoples Policy
IR	Indian Reserve
ISO	International Organization for Standardization
km	kilometres
kV	kilovolt
LNIB	Lower Nicola Indian Band
LOM	Life of Mine
LRMP	Land and Resource Management Plan
m	metres
MAPA	*Mines Act* Permit Amendment
masl	metres above sea level
MDRC	Mine Development Review Committee
MEMPR	British Columbia Ministry of Energy, Mines and Petroleum Resources
MFLNRORD	British Columbia Ministry of Forest, Lands, Natural Resource Operations and Rural Development
mm	millimetres
Mo	molybdenum
MOTI	British Columbia Ministry of Transportation and Infrastructure
Mt	million tonnes
MVA	Mega Volt Amp
NNTC	Nlaka'pamux Nation Tribal Council
NO_2	nitrogen dioxide
NPAG	non-potentially acid generating
NRCan	Natural Resources Canada
OGMAs	Old Growth Management Areas
OMS	Operations, Maintenance and Surveillance
PA	Participation Agreement
PASS	Passive Air Sampling System

PD	Project Description
PM	particulate matter
PMA	Permitted Mine Area
POP	People of Pukaist
RCMP	Royal Canadian Mounted Police
SAMP	Sulphate Adaptive Management Plan
SDMB	Shared Decision Making Board
SMS	Social Management System
SO_2	sulphur dioxide
SSN	Stk'emlupsemc te Secwepemc Nation
t	tonnes
Teck	Teck Resources Limited
the Project	HVC 2040 Project
tpd	tonnes per day
tph	tonnes per hour
TRB	Tailings Review Board
TSA	timber supply area
TSD	Territorial Stewardship Department
TSF	Tailings Storage Facility
TSM	Toward Sustainable Mining
TSP	total suspended particulates
UNB	Upper Nicola Band
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UTM	Universal Transverse Mercator
UWR	ungulate winter range
WG	working group
WMA	Wildlife Management Area
WMP	Waste Management Plan

Glossary

Alluvial fan	A fan-shaped deposit of sediment formed when a stream's slope is abruptly reduced.
Aquifer	A formation that is sufficiently porous and permeable to yield a significant quantity of water to a borehole, well, or spring.
Benthic macro-Invertebrates	Organisms that live on or in the bottom sediment of a water body or watercourse.
Biogeoclimatic ecosystem classification	A hierarchical ecosystem classification system that has three levels of integration - regional, local, and chronological - and which combines climatic, vegetation, and site factors.
Blue list	List of indigenous species and subspecies of special concern (formerly vulnerable) in British Columbia.
Climate change	A change in the statistical properties of the climate system when considered over long periods of time.
Communities of Interest (COIs)	Individuals or groups that may be affected by, have an interest in, or have the ability to influence a site. Reference to "stakeholders" often excludes those individuals and/or groups with Rights around a project, such as many First Nations. Therefore, Teck uses the term "communities of interest" to ensure that all affected and interested parties are included, including the Rights holders.
Cumulative effects	The combined impacts of past, present, and future human activities and natural disturbances.
Drainage	As a verb, the natural or artificial removal of surface and sub-surface water from an area. As a noun, a natural or artificial system that removes surface and sub-surface water from an area.
Drumlins	An elongated hill in the shape of an inverted spoon or half-buried egg formed by glacial ice acting on underlying unconsolidated till or ground moraine.
Easting	A term used to describe a location within a Universal Transverse Mercator (UTM) zone. The midline of each zone is given an easting value of 500,000 m. A point to the west of the midline has an easting value less than 500,000 m, and a point to the east of the midline has an easting value greater than 500,000 m.
Ecosystem	A volume of earth-space that is composed of non-living parts (e.g., climate, geologic materials, groundwater, and soils) and living or biotic parts (e.g., vegetation, wildlife), which are all constantly in a state of motion, transformation, and development.

Ecosystem map unit	Map units represent mappable portions of the landscape (Valentine 1986). They are established as a result of applying a classification to map polygons. Ecosystem map units include site series, site modifiers, and vegetation developmental units (structural stages and seral community). An ecosystem map unit contains either predominantly one mapping individual (simple map unit) or more than one (compound map unit). Each may contain a certain proportion of other ecosystem units that are unmappable at the scale of mapping (Valentine 1986).
Ecosystem unit	Classification units that are generally derived from the site series of biogeoclimatic ecosystem classification by further differentiating the units based on more specific site conditions (e.g., site modifiers; RIC 1998).
Effluent	Liquid waste products that are discharged to the receiving environment. In the context of the HVC Mine, effluent sources include contact waters comprised of coarse plant rejects, process plant tailings, surface water runoff, sewage and grey water.
Fault	Fracture along which the blocks of crust on either side have moved relative to one another parallel to the fracture.
Free, prior, and informed consent (FPIC)	A specific right that pertains to Indigenous Peoples, as recognized in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). FPIC allows Indigenous Peoples to give or withhold consent to a project that may affect them or their territories. Once they have given their consent, they can withdraw it at any stage. Furthermore, FPIC enables them to negotiate the conditions under which the project will be designed, implemented, monitored and evaluated.
Fugitive dust emissions	Particulate matter not emitted from a stack, chimney or vent that becomes airborne from activities such as construction, commercial mining, demolition and soil erosion from wind.
Geology	The science that examines the earth, its form and composition, and the changes which it has undergone and is undergoing.
Glaciation	An interval of time (thousands of years) within an ice age that is marked by colder temperatures and glacial advances.
Glaciofluvial deposits	Sediment deposited by streams deriving much or all of their water from the melting of a glacier.
Glaciolacustrine deposits	Sediments deposited into lakes that have come from glaciers.
Gradient	The slope of a stream, generally expressed as the vertical drop over a fixed distance.
Groundwater recharge	Inflow of water added to a groundwater system from the surface, such as the direct infiltration of rainfall or leakage from an adjacent formation or from a waterbody.
Habitat	Land and water surface used by wildlife. This may include biotic and abiotic aspects such as vegetation, exposed bedrock, water and topography.

Haul road	Roads within the mining area used to transport waste or ore around the mine site.
Hydrogeology	Within geology, the science that deals with the distribution and movement of groundwater in the soil and rocks of the earth's crust.
Hydrology	The study of the movement and distribution of water.
Hydrostratigraphic unit	Geologic units with the same hydrogeologic properties (Anderson and Woessner 1992).
Indigenous Governments and Organizations	Is a phrase used to refer to any Indigenous group (governance or administrative) engaging with Teck/HVC in relation to the Project. This definition is not meant to address or limit recognition of Indigenous Rights and Title.
Infrastructure	Basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to function (refers to the technical structures that support a society, such as roads, bridges, water supply, sewers, electrical grids, and telecommunications).
Make-up water	Water supply required for processing to compensate for water lost because of factors such as evaporation.
Malfunction	Equipment or system failure.
Metallurgical coal	A grade of low-ash, low-sulphur and low-phosphorus coal that can be used to produce high grade coke.
Meteorology	The science of weather and weather forecasting.
Moraine	A landform of glacial origins made of till.
Northing	A term used to describe a location within a UTM zone. Northing values are measured in metres relative to the equator.
Outwash gravels	A deposit of sand and gravel carried by running water from the melting ice of a glacier and laid down in stratified deposits.
Particulate matter	A mixture of solid particles and liquid droplets found in the air.
Periphyton	A community of tiny organisms such as protozoans, hydras, insect larvae and snails that lives on the surfaces of rooted aquatic plants.
Receiving environment	Surface water, porewater or sediment containing aquatic life downstream or otherwise able to come into contact with the discharges of a project or other human activity. It does not include artificial watercourses such as collection ditches, treatment ponds, or artificial watercourses such as those whose primary purpose is to convey contact water.
Red list	List of indigenous species and subspecies that are extirpated, endangered or threatened in British Columbia. Red-listed species and sub-species have, or are candidates for, official extirpated, endangered or threatened status in British Columbia. Not all red-listed taxa will necessarily become formally designated. Placing taxa on the red list flags them as being at risk and requiring investigation.

Riparian	Pertains to anything connected with or immediately adjacent to the banks of a stream or other body of water.
Risk	The effect of uncertainty on objectives (positive or negative).
Runoff	The precipitation that does not evaporate and is available to discharge from a watershed.
Section 35	Is the part of the *Canadian Constitution Act* that recognizes and affirms Aboriginal Rights.
Seral	Refers to an intermediate stage in the sequential succession of plant communities within an ecosystem along a trajectory toward an equilibrium state known as a climax.
Surficial geology	Of or relating to the earth's surface.
Till	Unsorted material deposited directly by glacial ice and showing no stratification.
Topography	The configuration of a surface, including its relief and the position of its natural and man-made features.
Topsoil	Uppermost layer of soil that has the highest concentration of organic matter and microorganisms and where most of the biological soil activity occurs.
Turbidity	A water quality measure of the cloudiness of a fluid caused by the number of suspended particles in the fluid.
Ungulate	Hoofed mammal such as caribou, elk, moose, mule deer, white-tailed deer, and mountain goat.
Universal Transverse Mercator	A grid present on most topographic maps and used for quantitative descriptions of locations (RIC 1998).
Waste rock	Rock that must be removed from a mine to safely and economically extract the ore, but which has no value.
Wetland	Lowland or depressional features where water saturation is the dominant factor determining the nature of soil development and the resulting vegetation communities.
Wildlife Habitat Area	An area identified by BC's Deputy Minister of Environment as being necessary to meet the habitat requirements of a species with the purpose of conserving those habitats considered most limiting. The authority to establish Wildlife Habitat Areas is enabled through the Government Actions Regulation to the *Forest and Range Practices Act*.

1 Introduction

Teck Resources Limited (Teck), through Teck Highland Valley Copper Partnership (HVC) owns the Highland Valley Copper Mine Site (HVC Mine Site), which has a Life of Mine (LOM) plan currently permitted to 2028. However, mine production rates are anticipated to decline as early as 2022, leading to a reduction in workforce and equipment. HVC is proposing to extend the LOM to 2040 or beyond by mining approximately 800 million tonnes of additional ore from an extension of HVC Mine Site's existing pit infrastructure by focusing on further development of resources. This extension, which would yield approximately 4.3 billion pounds of copper, is referred to as the HVC 2040 Project (the Project).

The Project is located approximately 75 kilometres (km) southwest of Kamloops, British Columbia (BC), by road, and 17 km west of the town of Logan Lake, BC, at 50° 30' 25" N and 121° 04' 49" W and 1,280 metres (m) above sea level (masl). The site is readily accessible by paved highway, including from Vancouver via Highway 1, the Coquihalla Highway, and Highways 97D or 97C.

HVC recognizes that Indigenous Peoples have used and occupied the land for thousands of years and have underlying Title to their lands, which includes an inescapable economic component. HVC acknowledges that the Project is situated in the unceded territory of the Nlaka'pamux Nation, and that Stk'emlupsemc te Secwepemc Nation has also asserted title within the Project area. The south section of the proposed power supply upgrade alignment is in the Syilx Nation territory. The Project location is shown on Figure 1-1.

The nature of mining activities has impacts to the HVC Mine Site property and the surrounding environment. HVC strives to minimize these impacts and is committed to incorporating Indigenous values, culture, and resources into environmental planning through all stages of the mining lifecycle, inclusive of the closure and post-closure periods, in a manner that recognizes and respects Section 35 of the *Constitution Act* (1982) and Canada's implementation of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP; United Nations 2007).

The Project would include the following main modifications:

- Extension of existing Highmont and Valley open pits.
- Extension of existing waste rock dumps.
- Increased tailings storage capacity.
- Upgrades to existing pit infrastructure, processing facilities and water and tailings infrastructure.
- Potential relocation of a portion of Highway 97C and BC Hydro power infrastructure to the north of the Highland TSF, should no alternative tailings storage options within the existing mine footprint be identified.
- Increased average mine production from 136,000 up to 175,000 tonnes per day (tpd).
- Increased annual average volume of water use from 97 to 113 Mm^3.
- New and upgraded power supply.

Engineering studies are ongoing to support the optimization of Project options and alternatives. The pre-feasibility level of design is now complete and has been informed by substantial information obtained from the current operations. Initial planning has indicated that the Project is financially viable. A full description of the Project is provided in Section 5.

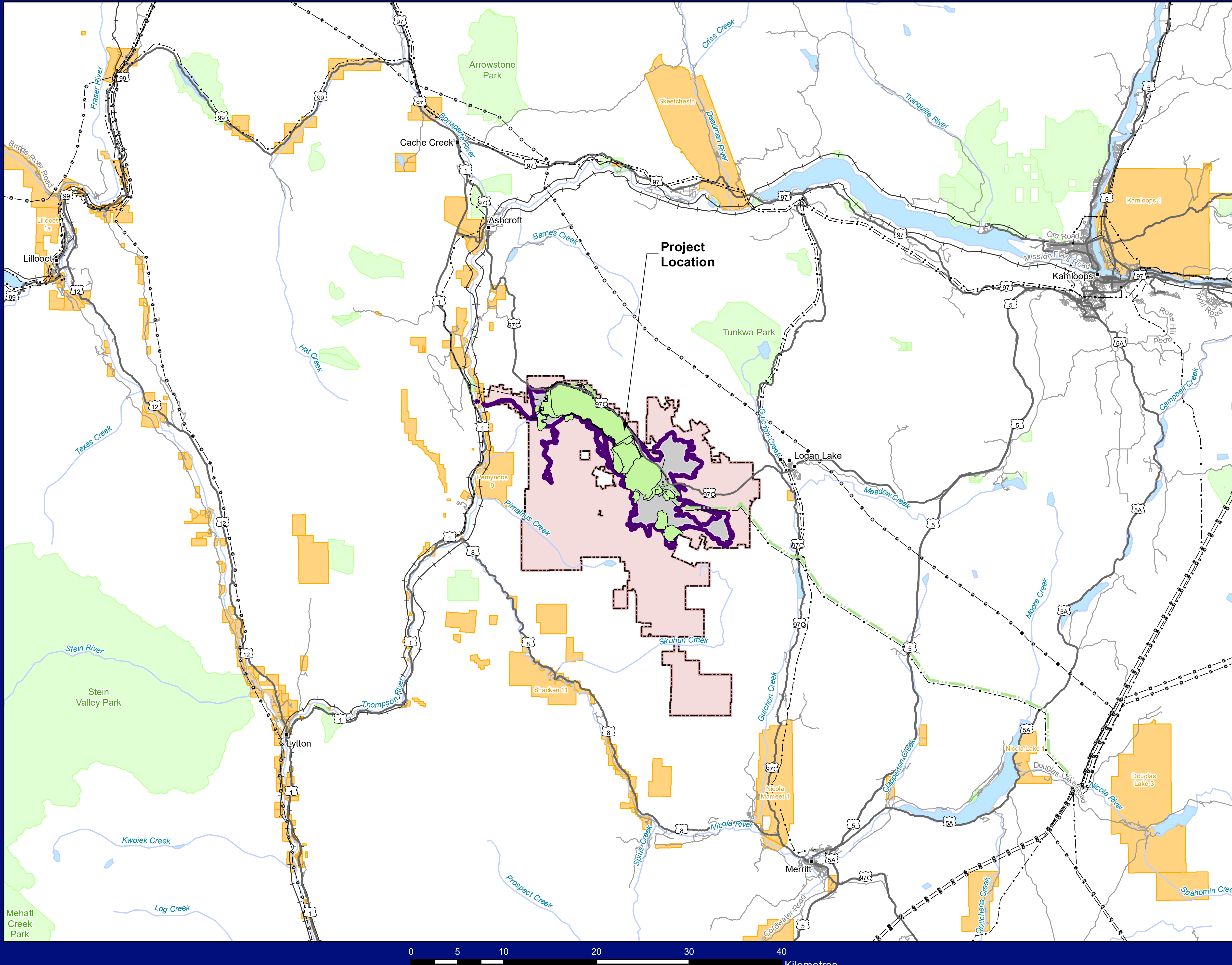
The existing HVC Mine Site area currently includes a disturbed area of approximately 6,900 hectares (ha). Based on the proposed preliminary design, the Project would exceed the current Permitted Mine Area (PMA), as defined by the existing M-11 permit. This additional area of disturbance outside the PMA would total 758 ha, which includes 408 ha associated with the HVC Mine Site (pits, dumps, tailings, and other infrastructure) and 235 ha associated with a new 138 kV power supply line, as well as a potential area of up to 115 ha that may be utilized for additional waste storage at the Valley North Dump location. Utilization of this area could reduce visual impacts and improve the aesthetics by minimizing dump height.

Under the British Columbia *Environmental Assessment Act* (BCEAA) and the BC *Reviewable Projects Regulation,* an environmental assessment (EA) is required for mine expansions which result in disturbance of at least 750 ha of land that was not previously permitted for disturbance, and for transmission lines with voltages of 500 kV or higher. While the proposed new power supply line does not meet the *Reviewable Projects Regulation* threshold, the estimated total area of Project footprint outside of the PMA currently exceeds the regulation threshold. Therefore, the Project is currently expected to require an EA under the BCEAA, administered by the BC Environmental Assessment Office (EAO). A joint *Mines Act* / *Environmental Management Act* permit amendment would be required for the Project independent of the BCEAA process requirements. As Project design development is further refined, HVC will continue to look for opportunities to minimize impacts to the environment through reduction of new disturbances.

In April 2019, the Canadian Environmental Assessment Agency confirmed that—based on a draft Project Description—the physical activities associated with the Project do not meet the thresholds described in the Regulations Designating Physical Activities under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). For this reason, an EA under CEAA 2012 is not anticipated.

In addition to the EA under the BCEAA, HVC has committed to a collaborative approach to assessing the Project with the Nlaka'pamux Nation in recognition of the nation's Rights, Title and jurisdiction (see Section 3). HVC recognizes each Indigenous group may have a different approach to how they assess the Project and how it relates to the BCEAA process.

To initiate development of the BCEAA Project Description for the Project, a template populated with EAO guidance (taken from EAO 2016) was provided to Indigenous Governments and Organizations for contributions regarding structure, approach or text for integration into the document. Collaborative conversations with Indigenous representatives were then conducted to ensure that the intent of the contributions were maintained. A similar approach was taken with both the first and second draft of the Project Description. Appendix A presents a summary of the contributions from some Nlaka'pamux communities and the resultant changes to the Project Description. Further description of HVC's engagement process is provided in Section 3.



Legend

Base Data

- City, Town, Village, or District Municipality
- Highway
- Road
- Railway
- Transmission Line: <500kV
- Transmission Line: 500kV
- Watercourse
- Waterbody
- First Nations Reserve
- Park, Ecological Reserve, or Protected Area

Highland Valley Copper

- Permitted Mine Area
- Proposed Power Supply Upgrade Alignment
- Proposed Project Area
- HVC Claims and Tenures

Highland Valley Copper / Teck

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Logan Lake, BC, Canada

HVC 2040 PROJECT

Figure 1-1
Location of the HVC 2040 Project

1:400,000

N

DATUM: WGS 1984	PROJECTION: HVC Mine Grid
DATE: 7/24/2019	DRAWN BY: ERM

2 Proponent Information

Teck Resources Limited (Teck) is Canada's largest diversified resource company and is committed to responsible mining and mineral development, with a focus on copper, metallurgical coal, zinc, and energy. Teck is a publicly traded entity with shares traded on the Toronto Stock Exchange (TSX: TCK.A and TCK.B) and the New York Stock Exchange (NYSE: TCK).

2.1 Project Contacts

Table 2-1 provides contact information relevant to this Project Description.

Table 2-1 Project Contact Information

Entity	Contact Information
Teck Resources Limited	Teck Resources Limited Suite 3300, Bentall 5, 550 Burrard Street Vancouver, BC Canada V6C 0B3 Tel: 604.699.4000 Fax: 604.699.4750 Website: www.teck.com
Project Proponent	Teck Highland Valley Copper Partnership P.O. Box 1500 Logan Lake, BC, Canada V0K 1W0 Website: www.teck.com Tel: 250.523.2443 Fax: 250.523.3242
Proponent Representative for the Environmental Assessment	Amber Chong Social, Environmental and Regulatory Approvals Lead Teck Highland Valley Copper Partnership P.O. Box 1500 Logan Lake, BC, Canada V0K 1W0 Tel: 250.523.3208 Mobile: 250.299.6194 Fax: 250.523.3242 Amber.Chong@teck.com
Alternate Proponent Representative for the Environmental Assessment	Jodi Waring Social, Environmental and Regulatory Approvals Manager Suite 3300, Bentall 5, 550 Burrard Street Vancouver, BC Canada V6C 0B3 Tel: 604.699.4181 Mobile: 604.220.1731 Fax: 604.699.4750 Jodi.Waring@teck.com

The information presented in this Project Description was prepared by the professionals listed in Table 2-2. Stantec Consulting Ltd./A.E.W. LP assisted with the initial preparation of the draft Project Description; ERM Consultants Canada Ltd. (ERM) assisted in finalization of this document.

Table 2-2 Responsible Authors of the Project Description

Name/200Qualification	Project Role/Company	Relevant Experience
Amber Chong, B.Sc., EP	Social, Environmental and Regulatory Approvals Lead, HVC	• 13+ years in the environment and regulatory field, 5+ years with Teck • Social, Environmental and Regulatory Approvals Manager, Bethlehem MAPA, HVC • Environmental Coordinator, PMH1 Environmental Assessment, Ministry of Transportation
Jodi Waring, P.Eng.	Social, Environmental and Regulatory Approvals Manager, HVC	• 15+ years in bulk materials handling industry including 5+ years in environmental and regulatory field
Tamlyn Botel, B.Sc., EPt	Environmental Coordinator, HVC	• 4+ years in the environment and regulatory field, related to mining • Technical reviewer for HVC's Bethlehem *Mines Act* Permit Application
Shahab Alikhani, P.Eng.	Sr. Project Engineer, Teck	• 11+ years of experience in mining engineering • Sr. Project Engineer, HVC2040 Prefeasibility Study (2017 – 2018) • Project Manager, HVC2040 Scoping Study (2015 – 2016) • Sr. Mining Engineer, HVC Strategic Planning (2013 – 2015)
Chris Hercun, P.Eng.	Sr. Environmental Engineer, Teck	• 8 years mine engineering experience with Teck • Environmental Engineer, HVC 2040 Project (2017 – present) • Senior Mine Engineer, HVC (2013 – 2017) • Project EIT, HVC Mill Optimization Project (2013)
James M. Johnson, B. Eng.	Technical Manager, Fluor	• 10+ years' experience on mining projects • Technical manager for HVC D3 project • Supported Environmental Impact Application for NuevaUnion, Chile
Greg Norton, M.Sc.	Project Lead, ERM	• 16 years of experience in environmental assessment and approvals • Project manager for the environmental assessment and permitting of several mining projects in BC
Jackie Lerner, Ph.D.	Environmental Assessment Lead, ERM	• 20+ years of experience focusing on environmental assessment of major resource development projects in BC and across Canada

2.2 Operations Managed by Teck

Teck owns, manages, and/or operates multiple operations in BC. A list of these operations is presented in Table 2-3.

Table 2-3 Other Teck Operations in British Columbia

Operation/Project	Type	Location	Status
Highland Valley Copper (HVC) Operations	Copper and molybdenum	South-central BC	Operating
HVC Bethlehem Extension	Copper and molybdenum	South-central BC	M-11 Permit amendment approved (May 27, 2019)
Elkview Operations	Metallurgical coal	Elk Valley, BC	Operating, Environmental Assessment Certificate (EAC) issued September 2016 for Baldy Ridge Extension
Line Creek Operations	Metallurgical coal	Elk Valley, BC	Operating, EAC issued September 2013 for Line Creek Operations Phase II
Coal Mountain Operations	Metallurgical coal	Elk Valley, BC	Care and Maintenance,[a] environmental assessment process suspended for Coal Mountain Phase 2
Fording River Operations	Metallurgical coal	Elk Valley, BC	Operating, EAC issued September 2015 for Fording River Operations Swift
Galore Creek Project	Partnership to develop copper and gold deposit	Northwest BC	Care and Maintenance,[a] EAC issued in February 2007
Greenhills Operations	Metallurgical coal	Elk Valley, BC	Operating
Trail Operations	Zinc and lead smelting and refining complex	Southern BC	Operating
Quintette Project	Metallurgical coal	Northeast BC	Care and Maintenance

Notes:

[a] *Teck also has a number of legacy sites currently in care and maintenance such as Sullivan, Pinchi and Beaverdell. Teck keeps active permits in place during active closure management activities carried out under the responsibility of meeting post-mining commitments to communities and the Province.*

Teck also has several exploration sites including Shaft Creek.

2.3 Corporate Policies

Under Teck's corporate commitment to sustainability, HVC undertakes responsible business practices in all aspects of its activities. Company policy and environmental, social, and safety performance is directed and monitored by the Safety and Sustainability Committee under the Board of Directors.

Health, safety, environment, and community (HSEC) management is detailed in overarching policies, standards, and guidelines that provide a structure for HVC to implement Teck's sustainability commitments. The following sustainability policy documents outline Teck's key operating commitments;

- *Charter of Corporate Responsibility* (overarching governing principles related to business ethics, health, safety, environment, and community);
- *Code of Sustainable Conduct* (commitment to sustainable development);

- *Code of Ethics* (code for operating with high moral and ethical standards, outlining business conduct and behaviour);
- *Indigenous Peoples Policy* (principles for engaging with Indigenous Peoples potentially affected by Teck's activities, including Teck's commitment to responsible resource development, the UN Declaration on the Rights of Indigenous Peoples, and recognition that building relationships with Indigenous Peoples is fundamental to Teck's success);
- *Health and Safety Policy* (Teck's beliefs, values and expectations for integrating its core value, safety, across all aspects of its business);
- *Human Rights Policy* (commitment to respecting the rights of employees, communities, and others affected by Teck's activities);
- *Water Policy (*commitment to protect water and the life it sustains by being an industry leader in water stewardship); and
- *Tailings and Water Retaining Structures Policy* (commitment to keep stored materials within assigned locations, protect downstream environments and to operate and close as stable and secure entities).

Further to Teck's sustainability policy documents outlined above, HVC also operates under its own Highland Valley Copper Environmental Policy. Originally enacted in 1992, and formally reviewed annually, the policy promotes the principles that align with those of HVC's communities of interest (COIs). The most recent update to this policy (HVC 2017) outlines the following environmental management principles to which HVC will adhere:

- **Comply** with regulatory requirements, external commitments and maintain positive relationships with COIs.
- Effectively **communicate** HVC values, obligations, and environmental performance to COIs.
- Maintain a commitment to the prevention of pollution, by using best management practices to **minimize** releases to the environment.
- Use best management practices to regularly evaluate environmental risks and **improve** environmental management programs through proactive planning, engagement, education and training.
- **Collaborate** with COIs to manage environmental impacts.

In addition, HVC has a Communities Policy (HVC 2016) that states that HVC commits to conducting proactive engagement with COIs in a way that builds trust through collaboration, education, and inclusive dialogue.

HVC subscribes to the following social principles:

- maximizing opportunities and providing sustainable benefits;
- understanding community interests, concerns, and aspirations;
- responding to community feedback;
- collaborating with communities to manage economic, social and environmental impacts; and
- incorporating community interests into planning processes.

Teck's performance in relation to social and environmental standards is also guided by participation in the Mining Association of Canada's Toward Sustainable Mining (TSM) protocol. TSM is recognized globally as an industry-leading system for ensuring that mining proponents operate using best practices across six protocols (Aboriginal and community outreach, crisis management, safety and health, tailings management, biodiversity conservation management, and energy use and greenhouse gas emissions management). Teck's operations in BC are regularly evaluated against the TSM protocols by independent third party auditors with results posted publicly (http://mining.ca/towards-sustainable-mining/tsm-progress-report). Teck has been recognized for outstanding performance at many of its operations and in 2016, Highland Valley Copper received a TSM Leadership award recognizing that audit results meet or exceed a 'Level A' rating across all six TSM protocols.

Teck has also been a member of the International Council on Mining and Metals (ICMM) since 2006. ICMM is an international organization of 27 of the largest global mining companies and 30 industry associations dedicated to a safe, fair and sustainable mining and metals industry and enhancing mining's contribution to society. ICMM membership requires a corporate commitment to implement ten ICMM sustainable development principles (https://www.icmm.com/en-gb/about-us/member-commitments/icmm-10-principles) supported by a robust system of guidance materials and protocols. Teck CEO Don Lindsay is currently the Chair of the ICMM.

3 Engagement

HVC's engagement approach focuses on respect for Indigenous jurisdiction, Rights, and Title. HVC recognizes that Indigenous Peoples have used and occupied the land for thousands of years and have an underlying Title to their lands which includes an inescapable economic component. HVC's engagement is collaborative in nature and consistent with Teck's Indigenous Peoples Policy (IPP) which is guided by UNDRIP, International Labour Organization Convention No. 169 on Indigenous and Tribal Peoples, and the International Council on Mining and Metals (ICMM) *Indigenous Peoples and Mining Position Statement* (ICMM 2013).

HVC and Nlaka'pamux communities have been working together to develop a collaborative assessment process that includes integration of Indigenous values and perspectives into the application and mitigation development phases, as well as respects decision-making processes and is consistent with Teck's IPP.

In addition to the EA under the BCEAA, HVC has committed to a collaborative approach to assessing the Project with the Nlaka'pamux Nation in recognition of Rights, Title and jurisdiction (see Section 3). HVC recognizes each Indigenous group may have a different approach to how they assess the Project and how it relates to the BCEAA process.

3.1 HVC's Approach to Engagement

HVC is committed to proactive engagement by building trust through collaboration, education, and inclusive dialogue. The key objectives of HVC's engagement strategy include but are not limited to undertaking early engagement, being transparent with its communication and content, and working collaboratively.

HVC engages with individuals or groups who could be directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. For the Project, these individuals and groups could include:

- Indigenous Governments and Organizations;
- Canadian government (federal, provincial, regional and local);
- special interest groups (non-governmental organizations, community organizations, recreational groups);
- community service providers (emergency responders, health care organizations);
- land, resource and property interests (other land and natural resource users);
- media;
- academic or research interests;
- residents of area communities and members of the public; and
- HVC employees and contractors.

HVC has implemented a Social Management system (SMS) which guides activities in local communities influenced by the Project. The SMS also supports HVC in the following areas:

- Compliance with contracts, legal requirements, agreements, and commitments.
- Managing grievances, complaints, and other feedback received from communities.
- Addressing the direct and indirect impacts of HVC's presence on the economy and society.
- Understanding the local context of HVC's supply chains and workforce.

- Community investment, including community development.
- Identifying issues related to resettlement and economic displacement.
- Monitoring, evaluation, reporting, and continuous improvement.
- Addressing specific issues such as human rights, conflict management, community health, gender.
- Factoring in social and community factors in emergency preparedness and response.
- Protection of cultural heritage, including archaeology.
- Being inclusive of vulnerable and other disadvantaged groups.

3.2 HVC's Existing Relationships and Project Engagement Processes

HVC currently has completed agreements with all 15 Nlaka'pamux communities, represented by the Citxw Nlaka'pamux Assembly, Kanaka Bar Indian Band, Lower Nicola Indian Band, and Nlaka'pamux Nation Tribal Council. HVC acknowledges that formation of *Indian Act* Bands are a product of colonialism. Given the Project's power supply upgrade component route is partially within the territory of the Syilx Nation, HVC has recently initiated discussions with Upper Nicola Band; the EAO has communicated that additional members of the Syilx Nation may also be interested in engaging on the proposed Project.

HVC has commitments to local Nlaka'pamux communities through existing agreements, which include establishment of regular meetings of Implementation Committees (ICs) as well as technical working groups (WGs). A condition of HVC's M-11 *Mines Act* permit includes quarterly meetings with government and community representatives regarding the implementation of commitments within the permit.
The Project team has provided regular updates to the ICs, WGs and M-11 board since 2015 when the Project entered a scoping study phase. These meetings occur on a quarterly basis and provide an opportunity for ongoing discussion and updates.

In addition, the Project team regularly communicates with the representatives from the Nlaka'pamux Nation, Stk'emlupsemc te Secwepemc Nation, and Syilx Nation, as appropriate, to ensure that updates and information relating to the Project are communicated in a timely manner. These updates include HVC's ongoing efforts to reduce the Project footprint and avoid or minimize potential Project environmental impacts.

HVC also has relationships with local provincial government representatives from the British Columbia Ministry of Energy, Mines and Petroleum Resources (MEMPR), Ministry of Environment and Climate Change Strategy (ENV) and Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) through existing site permits and the Bethlehem *Mines Act* permit amendment application process, which underwent a Mine Development Review Committee (MDRC) process. Where appropriate since 2015, HVC has provided updates and sought input from government representatives on proposed work programs related to the Project.

3.3 Citxw Nlaka'pamux Assembly (CNA) and CNA Environmental Assessment Strategy

The Citxw Nlaka'pamux Assembly (CNA) is a not-for-profit organization formed by eight Nlaka'pamux Bands to implement the Participation Agreement (PA) with Teck Highland Valley Copper and to manage commitments made in an Economic and Community Development Agreement (ECDA) with the Province of British Columbia. The Participating Bands are: Ashcroft, Boston Bar, Coldwater, Cook's Ferry, Nooaitch, Nicomen, Shackan, and Siska.

The CNA created the Territorial Stewardship Department (TSD) in 2015 to provide technical support services to the bands in the administration and implementation of various commitments in the agreements. The TSD also provides advice regarding provincial and federal legislation that pertains to the regulation of the natural environment. The TSD is grounded in Nlaka'pamux knowledge which provides a foundation for its technical review and analysis.

The TSD has developed a strategy and work plan to identify opportunities for more fully informed engagement, government to government collaboration and improved decision-making as the Project proceeds through development and assessment processes. The strategy also identifies opportunities for Nlaka'pamux knowledge to inform decisions made throughout the process and to develop and implement tools to ensure impacts to Nlaka'pamux Rights and Interests are identified and addressed.

The strategy will focus around three significant relationships that occur throughout the development of the Project and EA process that should be understood and managed. The relationships are:

- Province and participating Bands.
- CNA and the participating Bands.
- HVC and CNA.

The CNA work plan is intended to set clear tasks and objectives to meet the following goals:

- Fulfill the mandate of the CNA.
- Ensure expectations around engagement/consultation are met.
- Ensure principles of UNDRIP/FPIC are integrated.
- Support communities in the development and implementation of engagement plan with respect to their consultation with the Province of British Columbia.
- Ensure the Rights and Interests of Nlaka'pamux are protected throughout the Project.

HVC will collaborate with the CNA to align application development with the objectives of the CNA Environmental Assessment Strategy.

3.4 Lower Nicola Indian Band (LNIB)

The Lower Nicola Indian Band (LNIB) *Cultural Heritage Policy: Respect, Responsibility and Relationships* (2017) notes "zummíntm tékmme he tmíxwkt 'we really care for all our land.'"

The LNIB policy also states:

> *Since time immemorial, we the Nlaka'pamux have held Aboriginal Title to the traditional lands of our Nation. For countless generations, we have exercised sovereignty over the land, the waters, the salmon, the animals and all other resources through the government of our nation.*

LNIB describes Traditional Use Areas and Areas of Historical Significance:

> *Our Traditional Use Areas are places throughout the LNIB traditional territory used for past or present resources use activities. It is important to acknowledge that current use of lands and resources for traditional purposes does not reflect the entirety of LNIB traditional use areas. These areas were traditionally maintained and enhanced year-round. Access to these traditional use areas and to resources in our territory is essential to the continuation of our way of life. These sites should be maintained and, where possible, enhanced in accordance with our traditional practices.* (LNIB 2017).

HVC and LNIB have been developing a framework for an assessment process that focuses on collaborative and iterative development of application materials and mitigation methods, identifies key community decision points throughout the assessment process, and acknowledges that LNIB will provide input into the regulatory process through engagement with the Province, independent of the relationship that exists between LNIB and HVC.

LNIB has identified the importance of ensuring that the assessment of potential impacts includes consideration and inclusion of how the Project would affect the "intangible" aspects of Nlaka'pamux culture.

3.5 Nlaka'pamux Nation Tribal Council (NNTC)

The Nlaka'pamux Nation Tribal Council (NNTC) and the Province have established a Shared Decision Making Board (SDMB). The Board structure and collaborative process moves away from individual, transactional and isolated assessments of potential impacts of a proposed activity or project on Nlaka'pamux Title and Rights, to a shared and transparent process where there is equal accountability and respect for Nlaka'pamux jurisdiction.

The NNTC has developed the process for an 8-step Recognition Based Environmental Assessment. This process reflects the recognition of Nlaka'pamux Title and Rights, respects Nlaka'pamux jurisdiction and laws, is aligned with the Province's 10 principles (Province of BC 2018a) and UNDRIP and aimed at securing the NNTC's FPIC, and respects the SDMB structure in place between the Province and the NNTC and the Political Accord (NNTC and Province of BC 2017). Underlying the entire process is the understanding that NNTC and the Province are distinct governments and jurisdictions, with distinct laws, and that the process that exists between the NNTC and Provincial government reflects this fact. The NNTC's Recognition Based Environmental Assessment was shared with the Province in May 2018.

The NNTC and HVC agree that in order for the HVC 2040 Project to proceed, it must follow the eight-step process outlined in the Recognition Based Environmental Assessment. Should the Project proceed through the first seven steps, the eighth step is a final decision on the Project by the NNTC and the Province, pursuant to their respective laws and jurisdictions. The NNTC process includes establishment of a project committee to implement all technical aspects of the assessment, and will include representation from NNTC, the Province, and HVC. The committee will report to the SDMB and guide engagement activities, led by NNTC and supported by HVC, within NNTC communities.

EAO guidance for a Project Description includes preliminary assessment of potential impacts on established or asserted Aboriginal Rights, Title and other Interests; however, under the NNTC EA process, this preliminary assessment will be identified by NNTC through its EA process and under the guidance of the SDMB.

3.6 Stk'emlupsemc te Secwepemc Nation (SSN)

SSN's website (https://stkemlups.ca/) states:

> *A deep connection to the land is vital to our Nation. It is the land that gives us our deep sense of place and our sense of self. The work of the Nation really began in the 1800's with the original eight tribes. Today the only two tribes remaining are known as T'Kemlups and Skeetchestn. Wisely guided by our ancestors, our internal fires burning, we are always reminded to work in collaboration for our people.*

In SSN's statement of intent and purpose (https://stkemlups.ca/intentpurpose/), they describe their scope as follows:

- *Work cooperatively to safeguard our interest and the protection of our land.*
- *Enrich the political, social, cultural, linguistic, and spiritual well-being of our people.*
- *To protect our people, land, and resources by working toward long-term sustainable development.*

SSN has presented their Project Assessment Process, which includes an extensive family panel component, to HVC and the Province; an order from the SSN joint council to carry out this approach for the Project has been shared with HVC. HVC has been actively engaging with SSN on the Project and the SSN Project Assessment process and will continue to collaborate as the Project advances.

3.7 Upper Nicola Band (UNB)

HVC initiated discussions with UNB following the inclusion of the proposed 138 kV transmission line from the Nicola Substation to the HVC Mine Site. HVC will continue engaging with UNB on the Project as development advances.

HVC has initiated discussions with UNB based on the Project footprint. HVC will continue to engage with the UNB regarding collaborative integration of Traditional Knowledge, Values and Interests into Project planning and application development. Based on the UNB website, their mission and vision are as follows:

The UNB website (http://uppernicola.com/) states:

> *MISSION: Upper Nicola is a proud, inclusive Syilx community working together to promote Suxwtxtem, teach our Captikwl and committed to building foundations through En'owkin'wixw.*
>
> *VISION: A strong, flourishing community in harmony with our Tmixw.*

3.8 Project Engagement Activities

3.8.1 2015 Engagement

In 2015, ERM completed a review of HVC's existing data and monitoring programs and generated a gap analysis to identify baseline work programs to support the Project. The gap analysis considered requirements associated with assessment and permitting processes pursuant to CEAA 2012, BCEAA, *Mines Act* and *Environmental Management Act*.

The *Baseline Gap Analysis Report* was provided for review and feedback to technical reviewers from local Indigenous Governments and Organizations as well as representatives from MFLNRORD and ENV. The feedback received supported execution of proposed programs to gain an increased understanding of the baseline conditions and support future assessment.

HVC engineers undertook a high-level internal siting study to identify potential locations with the capacity to accommodate tailings associated with the Project as well as a review of alternative technologies and options for tailings management. The identified options focused solely on engineering capacity and did not include environmental or social considerations. Consistent with agreement commitments in place at the time, the preliminary siting study results were presented to Nlaka'pamux representatives through Implementation Committee and working group meetings; feedback on the siting study did not support creation of a new tailings storage facility but did support further investigation of options to reduce pond water and move the pond further away from the L-L Dam in the direction of the H-H Dam. In general, clear direction was provided to ensure incorporation of safety considerations during a potential dam raise. The current Project understanding, footprint and road realignment has been communicated to Indigenous Governments and Organizations.

Teck engaged with the Ministry of Transportation and Infrastructure (MOTI) in late 2015 to present the Project and the potential relocation of Highway 97C near the Highland Tailings Storage Facility. MOTI communicated the importance of ensuring public safety.

3.8.2 2016 Engagement

HVC engaged with ENV technical staff regarding the proposed baseline programs for surface and groundwater quality and quantity. ENV feedback indicated that the proposed hydrogeology sampling approach was reasonable, though identified a need to clearly document decisions relating to sampling locations and to develop a site-wide model. For hydrology, ENV identified that important elements of the program should include good spatial coverage and ensure manual quality assurance and quality control sampling at locales with continuous flow meters.

ENV also reviewed the air monitoring baseline programs and generally supported HVC's proposed program. Suggestions provided by ENV to improve the monitoring of air quality and climate were implemented by HVC. In 2016, ENV confirmed that the specifications of HVC's meteorological station matched the standard used by the Ministry.

3.8.3 2017 Engagement

HVC initiated a large baseline work program to support an increased understanding of baseline conditions to support the assessment of potential Project effects. Work scopes were drafted by HVC based on the 2015 gap analysis and provided to Indigenous technical representatives for review. A total of five subsequent live edit sessions were held to review and refine the work scope language in a collaborative manner; HVC received positive feedback regarding the transparency of live edit sessions. Overarching revisions included provisions for community engagement activities and the use of Nlaka'pamux language, where available.

HVC initiated engagement planning discussions in 2017 with representatives from the Nlaka'pamux agreement holders. A total of five engagement planning meetings were held over the course of the year. These high level discussions focused on topics such as the goals of community engagement and strategies to facilitate sharing.

Based on the engagement planning discussions held in 2017, HVC and Nlaka'pamux technical representatives prepared a series of three handouts (Appendix B) for distribution at public and community events. The first document, "What is Environmental Baseline," was developed to increase understanding related to environmental baseline conditions and the types of data collected in order to define the baseline conditions. It was supported by the second document, "What is an Environmental Assessment," developed to increase understanding related to an environmental assessment process, as defined by the EAO. Finally, a document titled "What is the Proposed Project" helped provide an overview of the understanding of the Project at that time. Since the creation of this document, the footprint and mine plan for the Project has been reduced through further optimization.

In 2017, the Project team hosted a total of four informal public sessions at Lytton, Merritt, Logan Lake, and Ashcroft bakeries to hear about the experiences of people and their families in the Highland Valley and share information about baseline data collection programs, the EA process and the Project.

The Lower Nicola Indian Band (LNIB) and HVC hosted a Sharing Session in November 2017; the session focused on listening to the contributions of the community members. Discussions included topics such as the suitability of meat and plants for consumption, the availability of water and fish in the area, and spiritual connections to the land. HVC was able to share a photobook (Appendix C) developed in 2015 to document the collaborative dust study undertaken with the community. HVC also has an ongoing wildlife study that includes tissue analysis and welcomes community donations for inclusion. Data collected will be incorporated into a human health baseline and subsequent predictive assessment.

Representation from the Project team was also present at HVC public open houses held in Spences Bridge and Lytton in addition to an HVC booth at the annual Ribfest held in Kamloops. These events were components of HVC's operational engagement strategy and were not specific to the Project, nor did they include formal sharing of Project-related materials; however, general information was shared in the course of discussions with community members. No concerns or issues relative to the Project were raised at these events.

In late 2017, HVC presented SSN with an overarching update on the Project, baseline work, and path forward.

HVC extended invitations to MFLNRORD and MEMPR to review baseline work scopes and participate in live edit sessions with representatives from the Nlaka'pamux agreement holders to refine the language and text in advance of initiating HVC's procurement process. Ministry technical reviewers participated in the live edit sessions for water, geochemistry, hydrology and terrestrial disciplines, but were unable to participate in the review of the wildlife and fisheries disciplines. However, both of these work scopes were reviewed by MFLNRORD representatives and input was incorporated into the final work plans.

As a component of HVC's annual meeting with the District of Logan Lake, the Project was introduced to the Mayor and Council in early 2017.

3.8.4 2018 Engagement

The Project team hosted three informal public sessions at local bakeries in Merritt and Ashcroft as well as a local band hall in Spences Bridge (due to a seasonal closure of the local bakery). These sessions focused on hearing the experiences of local community members and their families regarding the Highland Valley as well as sharing information about baseline data collection, the EA process and the Project.

The Project team, in collaboration with the Nlaka'pamux Nation, also hosted two public engagement events in Merritt and Spences Bridge focusing on sharing information pertaining to HVC's current knowledge and preliminary baseline findings for the following programs:

- fisheries and aquatic;
- terrestrial;
- wildlife; and
- cultural heritage.

Information shared at public engagement events is provided in Appendix B.

Advertisement and Information regarding these events was distributed by representatives from the Nlaka'pamux Nation as well as HVC. Although attendance was generally low, the information shared was well received by community members.

In September 2018, HVC met with representatives from the EAO, Ministry of Energy, Mines and Petroleum Resources, Ministry of Indigenous Relations and Reconciliation and the Ministry of Environment to introduce the current understanding of the HVC 2040 Project. Representatives from the Nlaka'pamux Nation were invited to participate in the meeting. Citxw Nlaka'pamux Assembly (CNA) representatives attended the meeting in Victoria, BC and Nlaka'pamux Nation Tribal Council (NNTC) participated via phone; however, the Lower Nicola Indian Band (LNIB) was unable to attend.

A subsequent meeting was held in November 2018 with representation from similar provincial agencies and Stk'emlupsemc te Secwepemc Nation to introduce the current understanding of the Project.

3.8.5 2019 Engagement

In 2019, HVC continued its engagement with the communities and governments discussed previously in Section 3, focusing primarily on engagement relating to this Project Description and the collaborative development of work plans to advance Application development, as described in Section 1.

3.9 Engagement Planning

HVC will continue to engage throughout the EA process and the life of the Project, in accordance with agreements and other commitments as described in the HVC Social Management System (SMS).

HVC is working with the Nlaka'pamux Nation, Stk'emlupsemc te Secwepemc Nation, and Syilx Nation to better understand community engagement goals, establish collaborative Project WGs, and work towards development of collaborative engagement plans for execution.

Engagement with stakeholders and the general public through the EA regulatory process will follow guidance established by the EAO pursuant to BCEAA.

Engagement with NNTC will continue to follow the NNTC EA process and be guided by the SDMB.

3.10 Disclaimers

HVC has completed extensive engagement with local Indigenous representatives on the Project Description. HVC recognizes each Indigenous group may have a different approach to how they assess the Project and how it relates to the British Columbia Environmental Assessment process. Through multiple reviews, we have been unable to reach consensus on all of the non-technical content. We believe that many of the outstanding concerns should be resolved in other forums. HVC will continue to collaborate with the communities in accordance with the agreements we have in place.

The following disclaimers have been provided by Indigenous parties; they do not necessarily reflect the views of HVC.

3.10.1 Citxw Nlaka'pamux Assembly (CNA)

The Citxw Nlaka'pamux Assembly (CNA) is a not-for-profit organization formed by eight Nlaka'pamux Bands to implement the Participation Agreement (PA) with Teck Highland Valley Copper and to manage commitments made in an Economic and Community Development Agreement (ECDA) with the Province of British Columbia. The Participating Bands are: Ashcroft, Boston Bar, Coldwater, Cook's Ferry, Nooaitch, Nicomen, Shackan and Siska.

The CNA created the Territorial Stewardship Department (TSD) in 2015 to provide technical support services to the bands in the administration and implementation of the various environmental, regulatory and cultural heritage commitments in the agreements.

The TSD's participation in the EA process for the HVC 2040 project is

- *not prepared as part of litigation*
- *not intended to be statement or summary of all information in these areas regarding the Participating Bands that maybe relevant to Aboriginal Rights and Interests*
- *without prejudice to the Participating Bands Aboriginal Rights and Interests.*

The TSD's participation the EA process for the HVC 2040 Project is intended to be a technical review for the CNA Participating Bands and is not intended to fulfill all of the Crown's obligations to consult and accommodate.

The CNA board is comprised of leadership from the eight Participating Bands. In January 2019, the board passed a resolution designating the TSD as their representatives for the HVC 2040 EA; however, the board holds the final decision-making authority.

3.10.2 Lower Nicola Indian Band (LNIB)

The Lower Nicola Indian Band (LNIB) has provided a verbal request to include the letter provided to Teck Highland Valley Copper Partnership on February 19, 2019 in the Project Description (Appendix D).

3.10.3 Nlaka'pamux Nation Tribal Council (NNTC)

The Nlaka'pamux Nation Tribal Council (NNTC) is cooperating with Teck Highland Valley Copper Partnership (HVC) on the assessment of the HVC 2040 Project (the Project). This co-operation does not equate to Nlaka'pamux acceptance of the British Columbia Environmental Assessment process, the contents of the Project Description, the Project, or any element of the Project. While the Project Description attempts to describe Nlaka'pamux title and rights and concerns, it is not for others to speak on behalf of the Nlaka'pamux.

NNTC and HVC are parties to a Relationship Agreement. Further, HVC has agreed to respect and follow the NNTC 8 Step Recognition Based Environmental Assessment process (Recognition EA). This process, not the Project Description, is where title and rights are properly dealt with. HVC, however, is also following the British Columbia Environmental Assessment process. The co-existing jurisdictions of the Nlaka'pamux and the Province create a situation where research and other technical work may be duplicated. All agree, this is not a good use of limited resources and co-operation can be beneficial.

The Province has undertaken to act in a manner consistent with United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Any process must be based on recognition and implementation of Nlaka'pamux title and rights and must be aligned with the standards of UNDRIP. Constitutional obligations respecting Section 35 title and rights must be met by the Crown.

NNTC participation with HVC is without prejudice to Nlaka'pamux title and rights including rights of jurisdiction.

3.10.4 Stk'emlupsemc te Secwepemc Nation (SSN)

Stk'emlupsemc te Secwepemc (SSN) asserts and has declared unextinguished Section 35.1 rights, title and interests within the HVC area.

The information presented in this HVC 2040 Project description does not prejudice, limit, abrogate, or derogate from:

- *(i) Any Aboriginal rights, title and interest of the SSN, including any inherent rights or customary laws and traditions that pertain to the SSN including rights, title and interest recognized and affirmed under section 35(1) of the Constitution Act, 1982 or that may be recognized under a treaty or Land Claim Agreement between the SSN and the Crown;*
- *(ii) Any rights, claims or interests or positions that the SSN may take in any negotiations or court proceedings with the Crown; or*
- *(iii) Any rights to or benefits of, notice, consultation, accommodation, compensation, negotiation or discussion with the Crown, arising directly or indirectly, from claims, rights or interests.*

SSN believes the HVC 2040 project description fails to accurately reflect the key issues identified by SSN to date, and how those issues will be addressed, including but not limited to:

1. *SSN's Section 6 request for EAO to review the Bethlehem and 2040 projects as <u>one</u> expansion project,*
2. *the need to undertake SSN's indigenous-led assessment process of the proposed HVC Expansion Project (including Bethlehem and 2040),*
3. *The Panel Report following that process will inform SSN's leadership on whether consent for the proposed project will be given, or not.*
4. *Recognition of the potential effects that SSN has identified to date (i.e. – impacts to integrity, tmicw, respect, preservation & restoration, K'wsweltken, and indigenomics).*

4 Highland Valley Copper Mine

This section provides a brief description of the history of the area and current operations at the HVC Mine Site.

4.1 Mining History

4.1.1 Overview

HVC acknowledges that the Highland Valley region is situated in the unceded territory of the Nlaka'pamux Nation. Stk'emlupsemc te Secwepemc Nation has also asserted title within the region. The region has been actively explored for mineral potential since 1896, prior to exploration and development, the area that has now become the HVC Mine Site was used and occupied by Indigenous Peoples. The first mining in the Guichon Creek Batholith started around 1907 when a wagon trail was built to Ashcroft and hand-sorted copper ore was sent to a smelter in Trail from the Snowstorm and Iona Zones of the Bethlehem deposit. Exploration and mining in the area continued through to the 1920s, but work quieted until 1953, when more exploration was completed on the showings of the Bethlehem deposit.

The Bethlehem Mine began operating in 1962 as an open pit copper mine in the northeast section of the HVC operational area (Figure 4-1). Three additional copper deposits were discovered between 1962 and 1964 (Highmont, Lornex, and Cominco/Valley).

4.1.2 Highmont Deposit

The Highmont ore body was discovered in 1962; however, production did not begin until 1980. Production ceased in 1984 due to unsustainably low molybdenum prices and was reactivated in 2005. Operations are expected to continue on an intermittent basis throughout the current LOM ending in 2028.

4.1.3 Lornex Deposit

The Lornex (Rio Algom) ore body was discovered in 1963. Stripping of the Lornex deposit began in 1970 and the milling of ore commenced in 1972. The work force needed for the mine increased as the operations at Lornex expanded. This resulted in the construction and incorporation of the Municipality of Logan Lake in 1970 to provide accommodation for workers to live close to the mine. An extension of operations in the Lornex deposit occurred in 2011 and mining is expected to continue until approximately 2028.

4.1.4 Valley Deposit

The Valley (Cominco) deposit was discovered in 1964; however, mining was not initiated until 1982. Extensions to mining activities in this deposit have occurred in 2005 and 2009, with active mining expected to be ongoing until the end of mine life in 2028.

4.1.5 Bethlehem Deposit

Mining activities at the Bethlehem deposits were staggered. Initial production began in December 1962 at a rate of 3,000 tpd, commencing with the Jersey Pit (1962 to 1965). Production increased to 17,000 tpd in 1972 with the expansion of the Jersey Pit (1964 to 1982), the Huestis Pit (1970 to 1976), and finishing with the Iona Pit (1976 to 1979). Tailings and waste rock generated during the mining and processing activities were deposited in relatively close proximity to the pits.

Copper production and mining operations at the Bethlehem Mine ceased in 1982. The mill at the Bethlehem Mine continued to be used for several years after the closure of mining operations.

In May 2019, HVC received Provincial approval to extend the Bethlehem deposit (see Sections 4.2.1 and 4.2.13 for further information).

4.1.6 Recent History

Consolidation of the ownership of the various mine operations in Highland Valley began in 1981 with the purchase of Bethlehem by Cominco. In 1986, Valley Copper Mines (Cominco) and Lornex Mining Corporation (Rio Algom) merged into Highland Valley Copper. This was followed by Highmont (Teck and Highmont) joining HVC in 1988. In 2000, Billiton purchased Rio Algom (Lornex). Teck consolidated its presence in the valley with the purchase of Cominco in 2002 and acquired Billiton's interest in the project in 2004. In 2016, Teck acquired the remaining 2.5% minority interest stake, resulting in Teck's wholly owned interest in the HVC Mine Site.

The region surrounding the HVC Mine Site hosts a number of other mines. New Afton is a gold, silver, and copper mine that began operating in 2015 and is located approximately 10 km from Kamloops and 65 km from the HVC Mine Site. Nicola Mining Inc. operates the Merritt Mill and Tailings Facility, located 24 km from the HVC Mine Site, which processes 200 tpd of ore.

4.2 Current Mine Operations

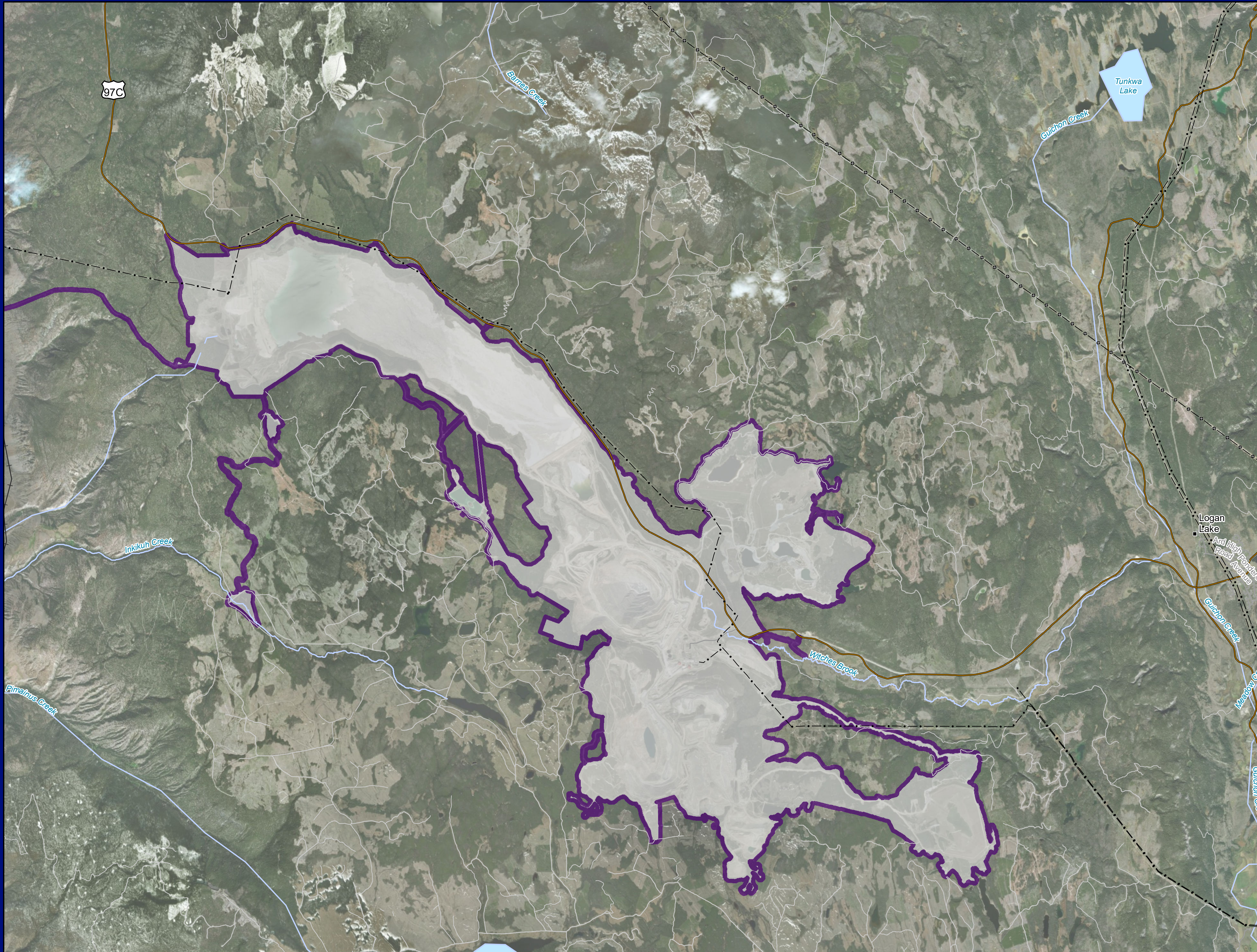
The HVC Mine Site is currently the largest open pit copper mine in Canada and produces both copper and molybdenum concentrates that are sold to overseas smelters. Reserves and resources at the HVC Mine Site are expected to support mining at planned production rates until 2028.

Current mine operations consist of three main components: delineation and extraction of ore, handling and disposal of waste generated by mining and milling activities, and facilities required to support mining activities.

4.2.1 Provincial Regulatory Context

The HVC Mine Site currently operates under *Mines Act* Permit M-11 (formerly Reclamation Permit M-11) that was first issued on January 20, 1970 and has since been amended to reflect the mine's development over time. Appendix E summarizes amendments to existing HVC permits. Waste discharges to the environment are authorized by PE-376 (effluent) and PA-1557 (air) issued under the *Environmental Management Act* (2003). Water withdrawal from surrounding sources is enabled by 25 water licences (Government of British Columbia 2013) for locations in the Ashcroft (15 licences) and Nicola (10 licences) districts. The licences cover mine processing, ponds, stock watering, non-power storage, land improvements, and irrigation.

In June 2016, HVC submitted an application for an amendment to *Mines Act* Permit M-11 for the Bethlehem Expansion Project. This *Mines Act* permit amendment application was approved by the BC Ministry of Energy, Mines and Petroleum Resources on May 27, 2019.



5 2.5 0 5
Kilometres

Legend

Base Data

- City, Town, Village, or District Municipality
- Highway
- Road
- Resource Road
- Railway
- Transmission Line: <500kV
- Transmission Line: 500kV
- Waterbody

Highland Valley Copper

- Permitted Mine Area

Highland Valley Copper / Teck

Teck Resources Limited
PO Box 1500
Logan Lake, BC, Canada

HVC 2040 PROJECT

Figure 4-1
HVC Permitted Mine Area

1:100,000

N

DATUM: WGS 1984	PROJECTION: HVC Mine Grid
DATE: 7/23/2019	DRAWN BY: Luke.Powell

4.2.2 Mining Areas

There are seven open pits that have been developed at the HVC Mine Site for the recovery of ore. Of these, Lornex, Highmont East and Valley Pits are active while the Jersey, Iona, Huestis, and Highmont West pits are inactive. Mining in the Highmont West Pit ceased in 2011 and it now serves as a waste rock dump. As of December 2017, approximately 6,900 ha of land at the HVC Mine Site is disturbed, of which 1,824 ha has been re-vegetated for more than a year as part of the progressive reclamation program.

4.2.3 Extraction

To extract copper and molybdenum ore, overburden is first stripped and transported to either waste rock dumps or reclamation material stockpiles (if it is deemed suitable for use in reclamation). Once the overburden has been removed, on-site blast-hole drilling is carried out by a fleet of rotary drills, which drill 311 millimetre (mm) diameter holes to a depth of 16 m into the waste rock and ore deposits. The blast patterns are designed, reviewed, and executed for each sequenced mining bench. Blasting is then conducted to transform in situ rock into a more unconsolidated material, allowing bench heights of 15 m. Waste rock is then hauled to nearby waste dumps (see Section 4.2.4.1) and higher mineralized portions of the deposits (ore) are segregated for processing.

Where possible, original ground/overburden that is soft enough to be removed without blasting and is suitable for reclamation is segregated and stored in designated overburden dumps for use in future reclamation activities.

Once ore is extracted, it is hauled by truck to one of the three crushers (two in the Valley Pit and one in Lornex) to reduce material size.

Following extraction and size reduction, the ore is transferred to the Highland Mill complex on a three-line conveyor system, each line operating at a maximum of 6,000 tph. In 2017, HVC mined 325,000 tpd (ore and waste rock) on average of which 143,000 tpd was ore.

4.2.4 Overburden and Waste Rock

4.2.4.1 Waste Rock Dumps

To access ore, barren and low-grade waste rock must be removed from the pits. These materials are transferred via haulage trucks to dump sites along the perimeter of the active pits. Waste piles are then contoured for slope stability. Waste rock at the HVC Mine Site is comprised primarily of mineral poor Bethsaida granodiorite and Skeena quartz diorite that is non-potentially acid generating (NPAG).

Waste rock from the Lornex Pit is primarily placed in the north, northwest, and southwest waste rock dump areas around the perimeter of the pit. Bethsaida granodiorite originating from west of the Lornex fault is minimally mineralized and does not have suitable textural properties for use in reclamation activities. Waste material obtained from west of the Lornex fault, including the fault gouge itself, is appropriate for use as waste rock dump capping material and is stockpiled to facilitate reclamation activities.

Waste rock produced by mining activity in the Valley Pit is placed in dumps located north and south of the pit. Waste material from the Highmont East Pit is placed into the exhausted Highmont West Pit and in a dump to the south of the Highmont Pits.

4.2.4.2 Overburden Dumps and Stockpiles

Where available, overburden removed from the Lornex Pit is used as capping material for reclamation purposes or placed onto designated stockpiles for future use. Most of the historic Lornex dumps were successfully reclaimed with suitable material from the pit.

Valley Pit overburden consists of glacial till, sand, gravel and lacustrine sediments. Metal accumulation and clast size variation in these sediments largely limit their use in reclamation. Any overburden that is classified as appropriate for reclamation is selectively placed on disturbed surfaces to enhance future vegetation growth or stored in designated stockpiles for future use. Areas previously capped with selected overburden from the Valley Pit include the Valley area and Bethlehem tailings and waste rock dumps.

Historically, some overburden material was stockpiled in the Highmont mining area. This material has exhibited successful reclamation and has been used to cap the Highmont South Dump. Remaining stockpiled material is located northeast of the West Pit.

Several borrow pits were created at the L-L Dam to access material during dam construction. The surface overburden material from these pits has been stockpiled nearby for capping of the borrow pits once they are ready to be reclaimed.

4.2.5 Processing

Crushed ore is fed to the Highland Mill for processing. The ore is ground via grinding lines, with three lines consisting of semi-autogenous mills and ball mills, and two lines consisting of autogenous mills and ball mills. The grinding stage reduces the ore to the consistency of sand in order to liberate copper and molybdenum. Figure 4-2 shows the processing flow of ore.

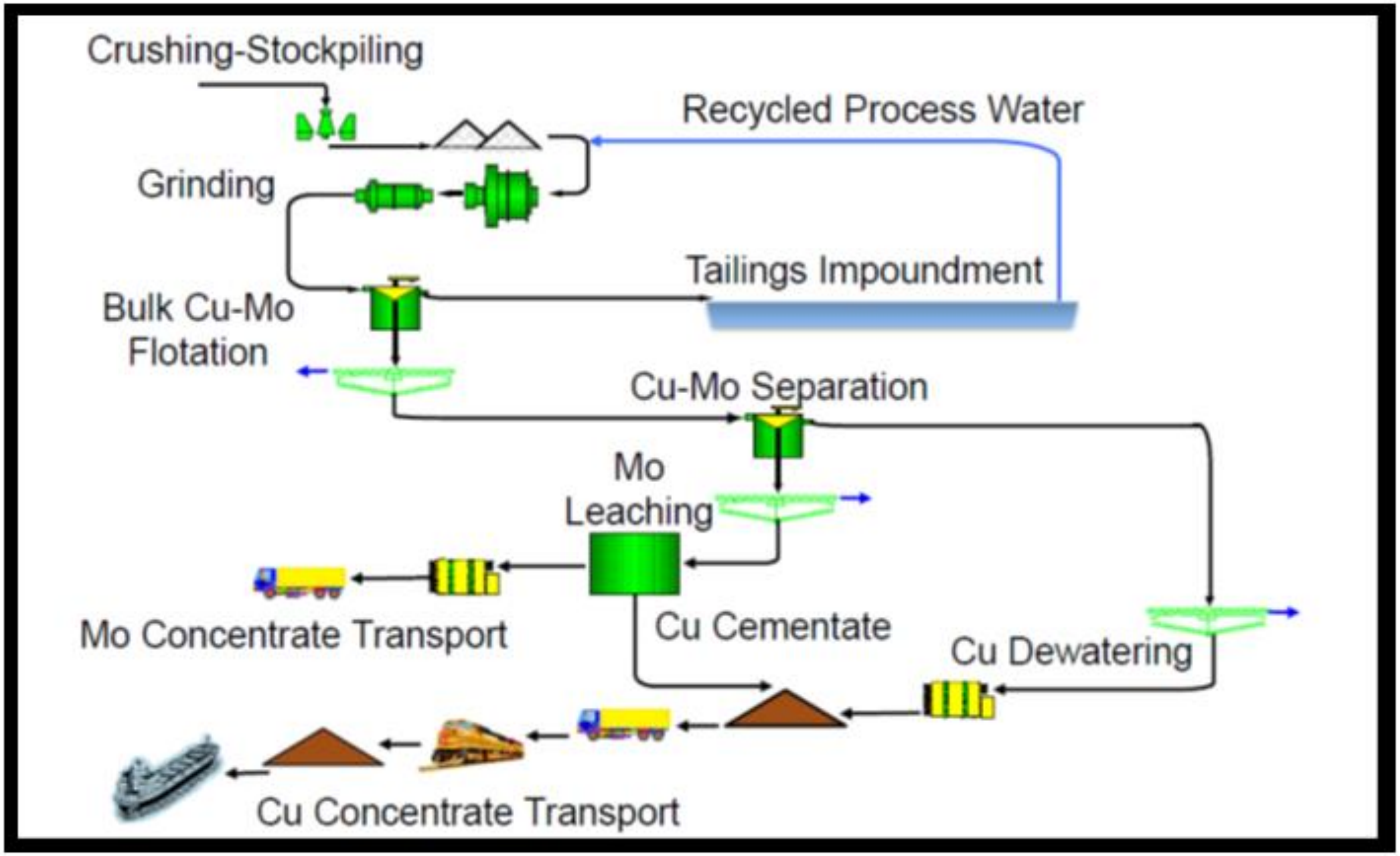
To recover copper and molybdenum sulphide minerals, the ground ore is processed through a bulk sulphide flotation circuit. A series of reagents (fuel oil, potassium amyl xanthate, potassium isopropyl xanthate, Polyfroth W-31 and pine oil) are used to concentrate the copper and molybdenum sulphides into a bulk concentrate. The reagents used as part of processing are partially released with tailings to the Highland TSF.

The bulk concentrate, containing copper and molybdenum sulphide minerals, is further separated via flotation into separate copper and molybdenum concentrates. These concentrates are filtered and stored prior to shipment off-site.

Tailings are the sand-and-water slurry left over from the milling and extraction processes; they are transported through pipes by pumps and gravity to the Highland TSF where they are deposited for final storage. Water is reclaimed from the Highland TSF for re-use in the Highland Mill.

4.2.6 Tailings Management

The tailings produced at the HVC Mine Site are primarily a fine- to medium-grained sand with some silt-sized particles and low residual metals content. Dam safety is a key interest for all communities, and very significant for the Indigenous communities living downstream of the LL-Dam. HVC has a comprehensive community engagement strategy and plan that has been implemented and updated annually since 2012 and includes ongoing engagement, including participation in emergency planning, to improve awareness of tailings and water management in the community and provide assurance that HVC is managing its facilities well. The HVC Mine Site has four TSFs. Three of these TSFs are closed and reclaimed: Highmont, Bethlehem, and Trojan. The Highland TSF is the only active TSF on the site.



Cu: copper.

Mo: molybdenum.

Figure 4-2 Process Flow Diagram

The Highland TSF is a conventional tailings facility that is approximately 10 km long and 2 km wide with a surface area of approximately 1,830 ha set within a pre-existing east-west oriented valley. The Highland TSF is formed by the H-H Dam at the southeast side, and by the L-L Dam at the west side (Figure 4-3). The H-H Dam is 90 m high; it is 1.9 km long and built of rock fill from the pits with a till core and granular filters, while the L-L Dam is approximately 170 m high, 3.0 km long and built of hydraulically placed cyclone tailings sand with a till core. The Highland TSF contains approximately 1.5 billion tons of tailings as of 2017.

Tailings slurry is piped from the Highland Mill approximately 7 km to the tailings facility at the H-H Dam, where most of the tailings are deposited. A long beach forms at the H-H Dam, sloping gently towards the L-L Dam, located approximately 9 km from the H-H Dam. A portion of the tailings is piped along the TSF to the L-L Dam where it is processed by cyclones and used for construction of L-L Dam.

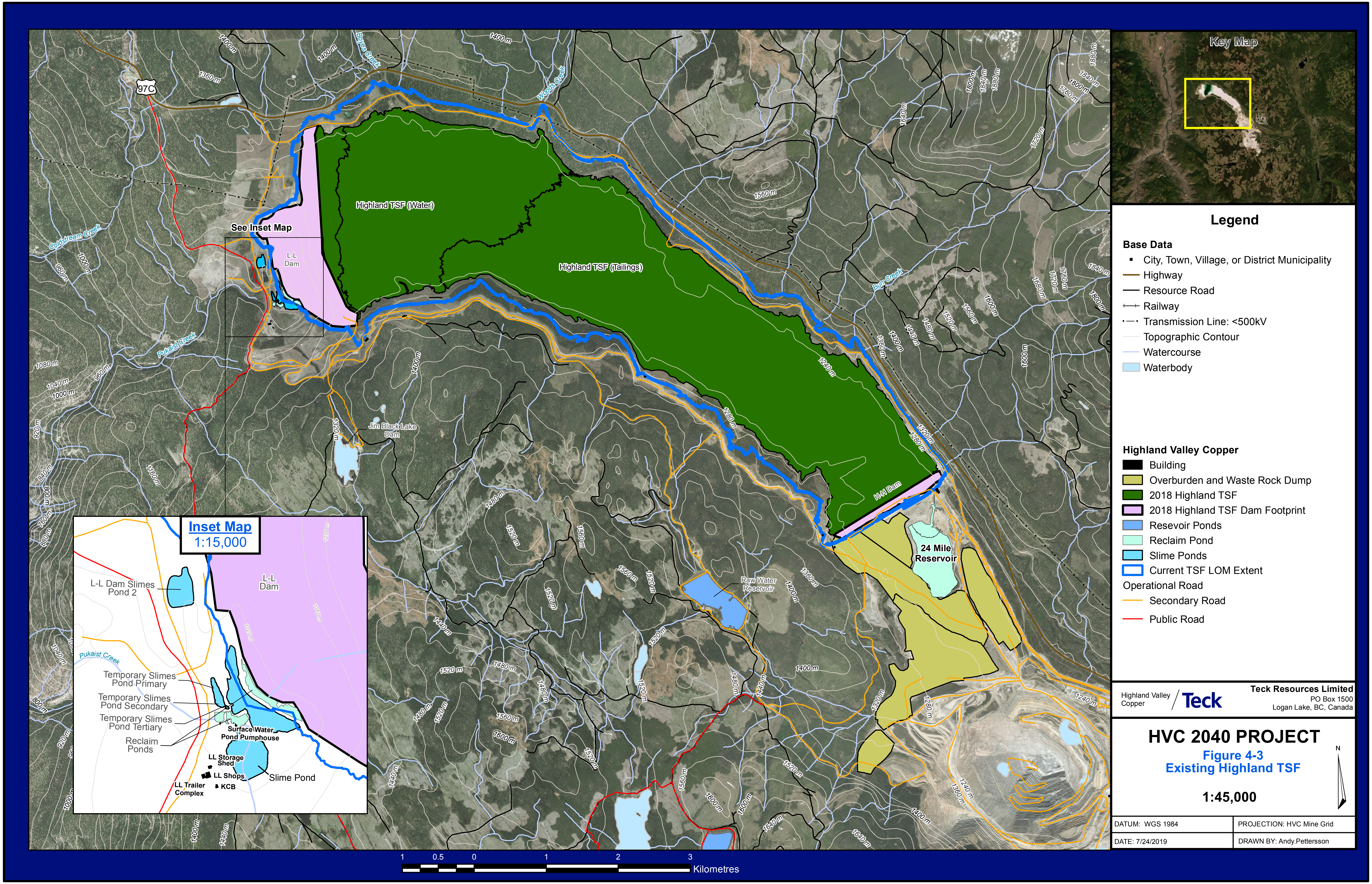
Approximately 120,000 to 160,000 tpd of tailings are discharged into the Highland TSF. The current dam elevations for the H-H Dam and L-L Dam are 1,271 masl and 1,260.5 masl, respectively, and are currently permitted to increase to 1,293.2 masl and 1,279 masl, respectively.

Water is recovered from the tailings pond and reused in the mill at an average rate of 9,000 m^3 per hour. The HVC Mine Site reuses approximately 78% of its process water, with the remaining 22% lost through evaporation or entrainment in tailings. The water needed to compensate for water lost in processing because of factors such as evaporation, known as make-up water, currently comes from a combination of surface water inflows, seepage flows, pit dewatering, and groundwater wells. Process water is not discharged from the TSF.

HVC uses management systems and leading-edge technologies to ensure safe management of the Highland TSF. HVC has an external Engineer of Record (EOR) and has assembled an Independent Tailings Review Board (TRB) to oversee all practices at the tailings dams on site. There are over 250 instruments installed in the L-L Dam alone, many of which are real-time monitored. This real-time monitoring includes alert thresholds which trigger automatic email notifications for internal review and escalation to the EOR. HVC employs dam inspectors who are responsible for inspecting the L-L Dam and H-H Dam daily. Additional monitoring is completed using conventional and aerial surveys, including drone and satellite imagery and topography. All employees and contractors who work at the Highland TSF receive dam safety training to ensure that they clearly understand their responsibilities as per the Highland TSF Operations, Maintenance and Surveillance (OMS) Manual and Emergency Preparedness and Response Plan (EPRP).

4.2.7 Products

Following processing, copper and molybdenum concentrates are filtered and/or dried and stockpiled at the Highland Mill. Copper concentrate is trucked to Ashcroft (50 km) along Highway 97C, then transported to Vancouver (300 km) via rail, where the majority is shipped to overseas smelters from the Port of Vancouver. Molybdenum concentrate is bagged in 1.8 t tote bags and transported to customers by truck and then by ocean vessel. Approximately 70 total truckloads of mineral concentrate leave the HVC Mine Site each day.



Key Map
Legend
Base Data
City, Town, Village, or District Municipality
Highway
Resource Road
Railway
Transmission Line: <500kV
Topographic Contour
Watercourse
Waterbody
Highland Valley Copper
Building
Overburden and Waste Rock Dump
2018 Highland TSF
2018 Highland TSF Dam Footprint
Resevoir Ponds
Reclaim Pond
Slime Ponds
Current TSF LOM Extent
Operational Road
Secondary Road
Public Road
Highland TSF (Water)
Highland TSF (Tailings)
See Inset Map
L-L Dam
H-H Dam
24 Mile Reservoir
Raw Water Reservoir
Jim Black Lake Dam
Coldstream Creek
Pukaist Creek
Boyes Creek
Woods Creek
Bar Creek
97C
Inset Map
1:15,000
L-L Dam Slimes Pond 2
Temporary Slimes Pond Primary
Temporary Slimes Pond Secondary
Temporary Slimes Pond Tertiary
Reclaim Ponds
Surface Water Pond Pumphouse
LL Storage Shed
LL Shops
KCB
LL Trailer Complex
Slime Pond
1 0.5 0 1 2 3
Kilometres
Highland Valley Copper
Teck
Teck Resources Limited
PO Box 1500
Logan Lake, BC, Canada
HVC 2040 PROJECT
Figure 4-3
Existing Highland TSF
1:45,000
N
DATUM: WGS 1984
PROJECTION: HVC Mine Grid
DATE: 7/24/2019
DRAWN BY: Andy.Pettersson

4.2.8 Infrastructure and Ancillary Components

Infrastructure supporting current and approved mine operations at the HVC Mine Site is shown in Figure 4-4 and includes:

- three semi-autogenous mills;
- two autogenous mills;
- nine ball mills;
- flotation cells and columns;
- administrative and maintenance buildings;
- warehouses;
- fueling stations;
- maintenance shop at Highmont Pit;
- explosives facility;
- landfill;
- power supply infrastructure;
- potable water supply and treatment facilities;
- tailings facilities; and
- network of roads suitable for light and heavy vehicle traffic.

The primary equipment used in current mining activities includes:

- six electric drills;
- eight electric shovels;
- two front-end loaders; and
- 52 haulage trucks.

Support equipment used for mining activities includes:

- three large water trucks;
- ten road graders;
- 12 track dozers; and
- two rubber tire dozers.

Electrical power to the mine is provided by a single 138 kilovolt (kV) transmission line. The transmission line runs from BC Hydro's Highland Substation to the HVC Mine Site with drops at three HVC-owned substations: Highmont Substation adjacent to the mill; L-L Dam Substation at L-L Dam; and Spatsum Substation at the Spatsum Pumphouse on the Thompson River. The existing total load averages approximately 125 MW and is estimated to increase to approximately 135 MW in 2019. The alignment of the line is shown in Figure 4-4.

4.2.9 Operating Hours and Staff

The HVC Mine Site operates continuously 24 hours a day, 7 days a week and has a workforce of approximately 1,320 employees (full time equivalent).

4.2.10 Procurement and Employment

HVC has a preferred recruitment process for local First Nations community members with the objective of removing barriers and substantially increasing employment at HVC. The past three years, entry level hires have averaged over 40% First Nations of total entry level.

HVC has a comprehensive in-house materials management department responsible for the purchasing of goods and services and on-site warehousing. This department manages all aspects of procurement activities and is a major component of local and regional economic development initiatives and controls.

In 2017, HVC procured $137 million in goods and services from the surrounding region.

As of December 2017, HVC employed over 1,320 local residents from nearby communities. These numbers account for 24% of the local labour force in Logan Lake, 12.6% in Ashcroft, 5.1% in Cache Creek, 5.9% in Merritt, and 1.6% in Kamloops (Statistics Canada 2016). In 2017, HVC's salary and benefit costs were approximately $185 million.

4.2.11 Environmental Management

4.2.11.1 Overview

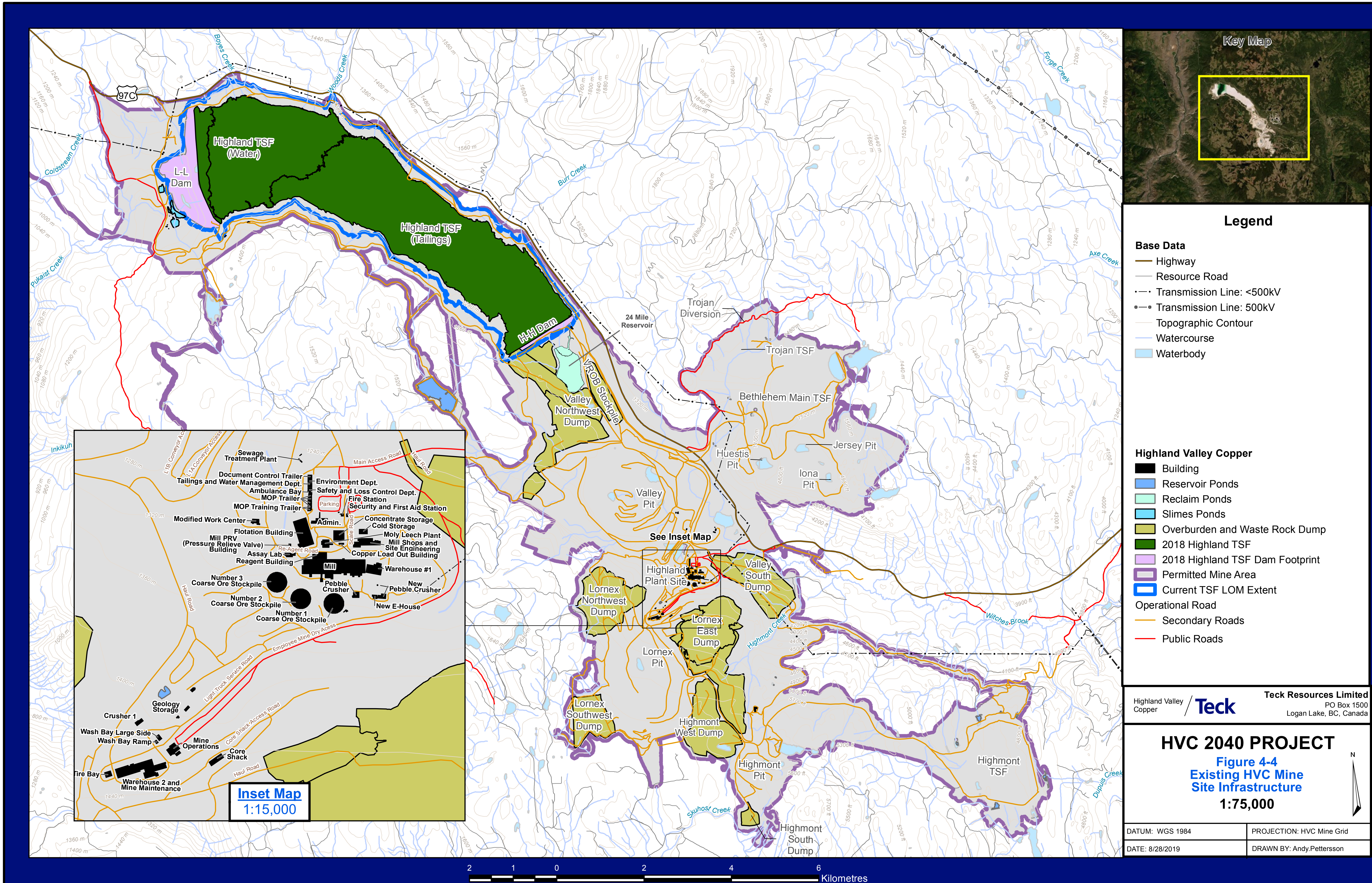
HVC strives to be a leader in environmental sustainability and therefore is committed to environmental management in accordance with Teck standards and guidelines, which are compliant with all pertinent regulations and standards. Current HVC environmental management systems would be applied to the Project.

HVC has implemented an Environmental Management System (EMS) that conforms to the requirements of ISO 14001:2015 and Teck's HSEC Management Standard. HVC has maintained certification to the ISO 14001 standard since 2010. The HVC EMS applies to all activities that occur at HVC. Environmental management plans are encompassed in the HVC EMS which includes the EMS Manual and associated procedures as well as referenced policies and procedures that provide direction for effective operational environmental management and monitoring on site.

On-site monitoring of a full suite of environmental effects is currently in place at the HVC Mine Site, including monitoring of surface water quality and quantity, groundwater water quality, fish and aquatic resources, terrestrial ecology, and dust management and reclamation efforts. The current monitoring program is used to characterize background levels and monitor potential mine interactions.

4.2.11.2 Water Management

A site-wide operational water balance model is used for managing water for current mining operations. HVC use approximately 97 Mm^3 of water annually (approximately 76 Mm^3 of which is reused). The process make-up water (approximately 21 Mm^3 per annum) is currently supplied from a combination of surface runoff inflows, seepage inflows, and groundwater wells. HVC has also recently restarted utilizing the Spatsum Pumphouse to pump water from the Thompson River as an additional source of make-up water supply, on an as-needed basis when the Highland TSF pond volume is forecasted to be at a critically low level. HVC conducts extensive water balance modelling to minimize use of the Spatsum Pumphouse, which was utilized through the 2017-2018 winter for the first time since 2010, following five years of below average precipitation. HVC will utilize water from pit dewatering, Highmont Deepwells and Spatsum Pumphouse as required to meet additional make-up water requirements.


Key Map
Legend
Base Data
Highway
Resource Road
Transmission Line: <500kV
Transmission Line: 500kV
Topographic Contour
Watercourse
Waterbody
Highland Valley Copper
Building
Reservoir Ponds
Reclaim Ponds
Slimes Ponds
Overburden and Waste Rock Dump
2018 Highland TSF
2018 Highland TSF Dam Footprint
Permitted Mine Area
Current TSF LOM Extent
Operational Road
Secondary Roads
Public Roads
Highland Valley Copper
Teck
Teck Resources Limited
PO Box 1500
Logan Lake, BC, Canada
HVC 2040 PROJECT
Figure 4-4
Existing HVC Mine Site Infrastructure
1:75,000
N
DATUM: WGS 1984
PROJECTION: HVC Mine Grid
DATE: 8/28/2019
DRAWN BY: Andy.Pettersson
2 1 0 2 4 6
Kilometres
97C
Highland TSF (Water)
Highland TSF (Tailings)
L-L Dam
H-H Dam
24 Mile Reservoir
ROB Stockpile
Valley Northwest Dump
Trojan Diversion
Trojan TSF
Bethlehem Main TSF
Huestis Pit
Jersey Pit
Iona Pit
Valley Pit
See Inset Map
Highland Plant Site
Valley South Dump
Lornex Northwest Dump
Lornex East Dump
Lornex Pit
Lornex Southwest Dump
Highmont West Dump
Highmont Pit
Highmont TSF
Highmont South Dump
Boyes Creek
Woods Creek
Coldstream Creek
Pukaist Creek
Burr Creek
Forge Creek
Axe Creek
Witches Brook
Highmont Creek
Skuhost Creek
Dupuis Creek
Inkikuh
Sewage Treatment Plant
Document Control Trailer
Tailings and Water Management Dept.
Ambulance Bay
MOP Trailer
MOP Training Trailer
Environment Dept.
Safety and Loss Control Dept.
Fire Station
Security and First Aid Station
Parking
Modified Work Center
Admin.
Concentrate Storage
Cold Storage
Moly Leech Plant
Mill Shops and Site Engineering
Flotation Building
Mill PRV (Pressure Relieve Valve) Building
Re-Agent Road
Assay Lab
Reagent Building
Copper Load Out Building
Mill
Warehouse #1
Number 3 Coarse Ore Stockpile
Pebble Crusher
New Pebble Crusher
Number 2 Coarse Ore Stockpile
New E-House
Number 1 Coarse Ore Stockpile
Main Access Road
Haul Road
L1B Conveyor Access
L1A Conveyor Access
State Road
Employee Mine Dry Access
Light Truck Service Road
Geology Storage
Crusher 1
Wash Bay Large Side
Wash Bay Ramp
Mine Operations
Core Shack Access Road
Core Shack
Tire Bay
Warehouse 2 and Mine Maintenance
Inset Map
1:15,000

HVC uses an integrated approach to water management that supports coordination of production, sustainability, and efficiency while meeting environmental commitments as well as the needs of communities and other stakeholders during all stages of development. A description of current water management strategies at the HVC Mine Site is presented in the following sections.

4.2.11.2.1 Surface Water Management

There are two main directions of flow from the HVC Mine Site, which are separated by a natural divide east of the Highland H-H Dam. Flows to the west drain into the Thompson River via Pukaist Creek and flows to the east drain into Guichon Creek via Witches Brook. Guichon Creek flows south and joins the Nicola River at Lower Nicola, west of the town of Merritt. South of the HVC Mine Site, the Nicola River flows west and joins the Thompson River at Spences Bridge.

Figure 4-5 presents local creeks and watersheds on the HVC Mine Site property. The primary streams within the watersheds located at HVC are detailed in Table 4-1 and Table 4-2 based on whether they flow into or out of the Project at the Mine Site. The second column (i.e., “Reports To”) in Table 4-1 provides the watercourse or watershed into which each creek is diverted or drains. For example, Highmont Creek is diverted within the area of mine influence to the 325 ft. Thickeners are released into Witches Brook below the area of mine influence. Other ponds and natural water collection locations within the same watersheds as the HVC Mine Site are shown in Table 4-3 (Teck 2017a).

Table 4-1 Creeks that Convey Flow into Watersheds Located at the HVC Mine Site

Name	Reports To	Total Approximate Length of Creek (km)
Award Creek	3-325 foot Thickeners (Thickeners) – piped	0.14
Bethsaida Creek	Thickeners – piped	3.3
Highmont Creek	Witches Brook and Thickeners – piped	4.4
Trojan Creek	Witches Brook	9.5
Tait Creek	Million Gallon Tanks – piped	unknown
Oram Creek	R4 Reclaim Pond	1.8
Nicholson Creek	Witches Brook via Trojan Diversion or Trojan Pond	2.6
Ford Creek	Witches Brook via Trojan Diversion or Trojan Pond	1.3
Michael Creek	Witches Brook via Trojan Diversion or Trojan Pond	1.2
Mann Creek	Witches Brook via Trojan Diversion or Trojan Pond	6.6
Boyes Creek	Highland TSF	8.6
Woods Creek[a]	Highland TSF	6.7
Forgotten Creek	Highland TSF	6.6
Burr Creek	Highland TSF	5.7
Eastside Creek	24 Mile Reservoir	5.2
Winslow Creek	24 Mile Reservoir	3.9

Note:

[a] *A diversion has been created which allows a portion of Woods Creek flow to enter Pukaist Creek.*

Table 4-2 Creeks that Convey Flow Away from Watersheds Located at the HVC Mine Site

Name	Approximate Length (km)
Fouquet Creek	2.3
Fowler Creek	1.3
Guichon Creek	75.9
Witches Brook	19.9
Dupuis Creek	9.4
Axe Creek	7.6
Pukaist Creek	6.3

Table 4-3 Additional Rivers and Creeks within the Watersheds Located at the HVC Mine Site

Name	Approximate Length (km)	Note
Thompson River	787.0	Potential water supply source via Spatsum Pumphouse; termination of Inkikuh Creek, Pukaist Creek and Nicola River
Nicola River	342.8	Termination of Guichon Creek
Fourier Creek	0.0	Licensed for use (1979) but is now ephemeral
McKay Creek	0.0	Licensed for use (1978) but is now ephemeral with flows during freshet
Ravine Creek	0.0	Licensed for use (1978) but is no longer flowing

Surface water infrastructure at the HVC Mine Site consists of water catchments, surface impoundments, piping, ditches, channels, ponds, and pumping systems to manage surface water. HVC operates diversions from several sources within the mine property to provide make-up water or to divert water and re-establish historic drainage. Where possible, the surface water systems are segregated into contact water and non-contact water. These systems are managed to minimize mixing of these different water types.

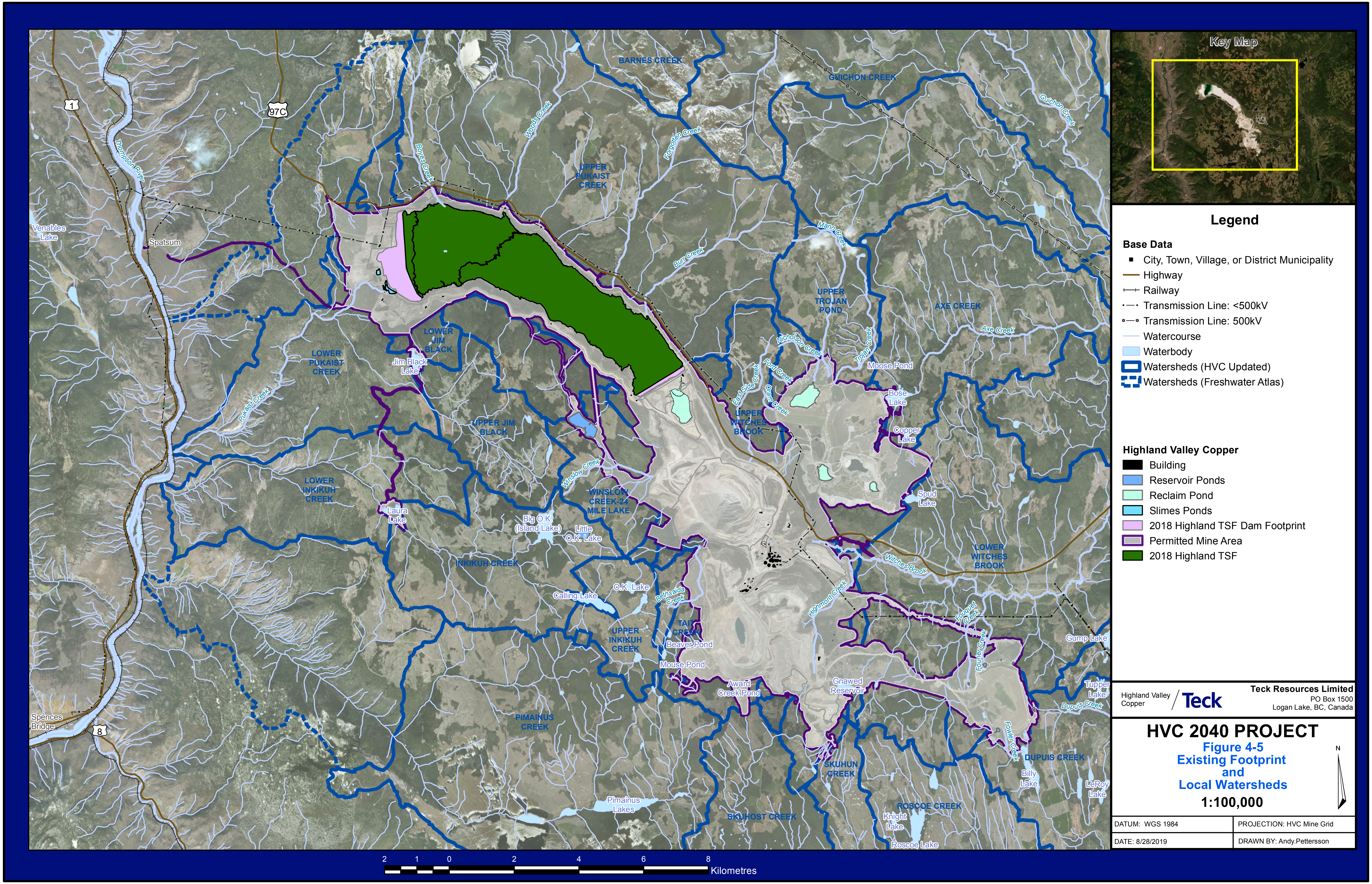
Locations of permitted surface water discharge to the environment include:

- Trojan Creek at End of Diversion;
- Highmont South reclaim S4;
- Highmont S9 Pond (not effluent from TSF);
- Highmont S-5 Discharge @ Pipe (SRB Pond, not a regular discharge);
- Highmont S8 Discharge (SRB Pond, not a regular discharge); and
- Bose Lake (Saddle) Seepage.

4.2.11.2.2 Groundwater Management

Groundwater resources utilized by HVC consist of pit dewatering water and wells for make-up or potable water. Groundwater at the HVC Mine Site is typically collected for use as mill process water or potable water supply.

Groundwater from the Highmont deep wells and Valley Pit dewatering wells is used as process water. Groundwater from Shula deep wells is used for potable supply. Groundwater from the H-H Dam is used for H-H Pumphouse gland water (supply for process).



HVC 2040 PROJECT
Figure 4-5
Existing Footprint and Local Watersheds

HVC is permitted to discharge Valley Pit Dewatering Well groundwater to Witches Brook Creek; however, HVC does not currently have the infrastructure in place for this discharge. The Valley Pit Dewatering Well water is conveyed to either the Witches Brook Pumphouse for use in the process plant or to the Highland TSF via the 24 Mile Reservoir.

4.2.11.2.3 Potable Water

Drinking water for HVC is obtained from the Shula deep wells. It is pumped to the on-site water treatment plant and is treated using a sodium hypochlorite process. The water plant operator monitors the drinking water daily.

4.2.11.2.4 Wastewater Treatment

Grey and black water generated at the site is treated on site at the wastewater treatment plant, as authorized under PE-376. The sewage treatment plant is an aeration-based system, which uses bacteria and oxygen to break down and separate solids and liquids. Treated effluent is returned to the process water system. Solids settle as sludge which is removed and transferred to the authorized sludge dump, adjacent to the Highland tailings pond. The plant output is monitored and tested on a daily basis.

4.2.12 Site Rehabilitation Planning and Execution

Through engagement frameworks, HVC has committed to long-term collaboration on matters pertaining to land use both during and after operations of the mine, including but not limited to annual reclamation planning and the development of end land use and closure objectives with the Nlaka'pamux Nation and Stk'emlupsemc te Secwepemc Nation. Long-term engagement and collaboration includes annual reclamation, monitoring, research and assessment will ensure that consensus-based decision-making happens throughout and that Indigenous Interests are reinstated on the lands.

Reclamation at HVC is directed by the *Highland Valley Copper End Land Use Plan*, and the *Highland Valley Copper Closure Plan*. Both reports are required by legislation to accompany major permit applications, but are updated every five years by HVC as per commitments in current Participation Agreements. In 2016, HVC also produced the *Returning Land Use Plan - Highland Valley Copper* (Appendix G), a photobook intended to serve as a non-technical summary of the *End Land Use Plan*. The *End Land Use Plan* was developed as a collaboration between HVC staff and Nlaka'pamux community members and technical representatives, with two specific goals:

- to incorporate input from the Nlaka'pamux people about what the landscape should be reclaimed to after the mine closes; and
- to identify the possible land uses that the post-closure mine site is capable of providing and that are important to the Nlaka'pamux people.

These goals will ensure that HVC has a plan that incorporates Nlaka'pamux input and meets internal (HVC) and external (Province of British Columbia) reclamation and closure-planning commitments.

Reclamation programs at the HVC Mine Site have included establishing vegetation and continuing to monitor and undertake research programs to address issues important to reclamation planning. The total area disturbed as of December 31, 2017 was 6,900 ha. Of this, 1,824 ha (28%) have been re-vegetated for more than one year.

Reclamation, rehabilitation, and supporting research currently undertaken at the HVC Mine Site is summarized as follows:

- soil salvage and stockpiling;
- re-vegetation (seeding and tree planting);
- invasive species management;
- organic amendment research;
- research on establishment of species that are culturally important;
- monitoring of vegetation to determine the establishment and sustainability of vegetation on operationally reclaimed areas;
- wildlife studies and projects including the continuation of sample collection for the study of ungulate health, and the wildlife sighting geodatabase;
- continued stocking and assessment of the research lakes on the property; and
- pit lake and tailings pond aquatic and riparian research and reclamation.

4.2.13 Bethlehem Project

The Bethlehem Extension Project has received permit approval from MEMPR (as part of the M-11 amalgamated submission, received May 27 2019). HVC is currently evaluating how to best incorporate Bethlehem material into LOM (refer to Section 5.6.2.2).

The proposed Bethlehem Extension Project was initiated in 2013 with a *Mines Act* permit amendment application, which was submitted for screening in 2015 and submitted for Application review in June 2016. The Bethlehem Extension Project includes a pushback and deepening of the historic Jersey and Iona Pits. The extension would enable the extraction of 137 Mt of ore averaging 0.287% Cu, 0.0048% Mo and 146 Mt of waste. Development of this pit would include the dredging of the tailings currently located in the Jersey Pit and construction of a new haul road and overpass to connect to the active HVC operations.

4.2.14 Technological Initiatives

Certain progressive changes are occurring at the HVC Mine Site to increase efficiency as part of ongoing improvements. These changes include the following:

- **Autonomous Haulage System:** Autonomous haulage utilizes high-precision Global Positioning System (GPS) and sophisticated logic to control the operation of the haul truck fleet without the use of operators. This technology provides safety benefits by eliminating fatigue factors and human error from the truck operation while increasing productivity by eliminating downtime associated with breaks and shift change.
- **Shovel Sense Technology:** Shovel Sense uses sensors on the shovel buckets to analyze the chemical composition of the rock in the bucket and can classify material as waste or ore in real-time. This technology reduces the amount of non-economic material that is sent for processing, effectively reducing operating costs.

5 The Proposed Project

5.1 Overview

The Project consists of incremental expansions/extensions of several existing HVC Mine Site facilities and processes, including:

- **Pit and waste rock dump extensions:** extension of the existing Valley and Highmont Pits and associated waste rock dumps;
- **Increased production rate (28%):** current average production capacity is approximately 136,000 tpd and the Project would increase production to approximately 175,000 tpd;
- **Increased water use (16%):** annual average volume of water use would increase from 97 to 113 Mm^3;
- **Milling modifications:** modification to the existing Highland Mill to achieve the proposed production rates;
- **Tailings storage extension:** incremental extension of the existing Highland TSF to accommodate additional tailings from the longer mine life;
- **Powerline and road realignments:** potential realignment of the existing powerline and road (Highway 97C) infrastructure near the L-L Dam; and
- **Power supply upgrades:** the Project could require up to 215 Mega Volt Amp (MVA) of power, which would exceed the capacity of the existing single 138 kV line (184 MVA) and is anticipated to require twinning of the BC Hydro existing powerline.

These Project components are discussed in further detail in Section 5.4.

5.2 Purpose and Rationale

The purpose of the Project is to extend the operational life of HVC for an additional approximately 13 years, until 2040 or beyond, by mining additional ore identified within the HVC Mine Site.

The current LOM plan requires a reduction in mining production rates commencing in 2022, with exhaustion of available ore reserves in 2028. Without additional resources, HVC mining operations and copper production would cease after this time.

Teck's review of historical drilling records and ongoing geological exploration across the HVC Mine Site have identified additional copper and molybdenum deposits within the Valley and Highmont Pits that are of sufficient quantity and economic viability to support further mining. Teck has designed the Project to facilitate the mining and processing of these resources.

The Project would result in continued employment of the current workforce of approximately 1,320 personnel that would otherwise start to decrease in 2022. The extension of the LOM beyond 2028 would also allow for continuity of the many social and economic benefits from HVC for surrounding communities and the province of BC. On an annual basis, the HVC Mine Site currently provides over $180 million of wages and benefits to its workforce, spends close to $100 million on local goods and services, and contributes $75 million in municipal and provincial resource taxes.

5.3 Project Location

The Project is located at the current HVC Mine Site operations, approximately 17 km west of Logan Lake and 50 km southwest of Kamloops, along Highway 97C. HVC acknowledges that The Project is situated in the unceded territory of the Nlaka'pamux Nation, and that Stk'emlupsemc te Secwepemc Nation has also asserted title within the Project area. The south section of the proposed power supply upgrade alignment is in the Syilx Nation territory. Approximate coordinates for the mine site are:

- Universal Transverse Mercator - 0640405E, 5596846N (10U); and
- Latitude/Longitude - 50° 30' 25" N and 121° 04' 49" W.

The HVC Mine Site claim group consists of approximately 1,125 leases, Crown grants, and mineral claims that encompass an area of approximately 61,000 ha.

The location of Project is shown in Figure 5-1.

5.4 Modifications to Current Operations

Currently, initiation of Project construction activities is targeted for 2021 (Year 1), upon receipt of appropriate approvals and permits. On this basis, first ore for the Project would be scheduled for 2024 (Year 4).

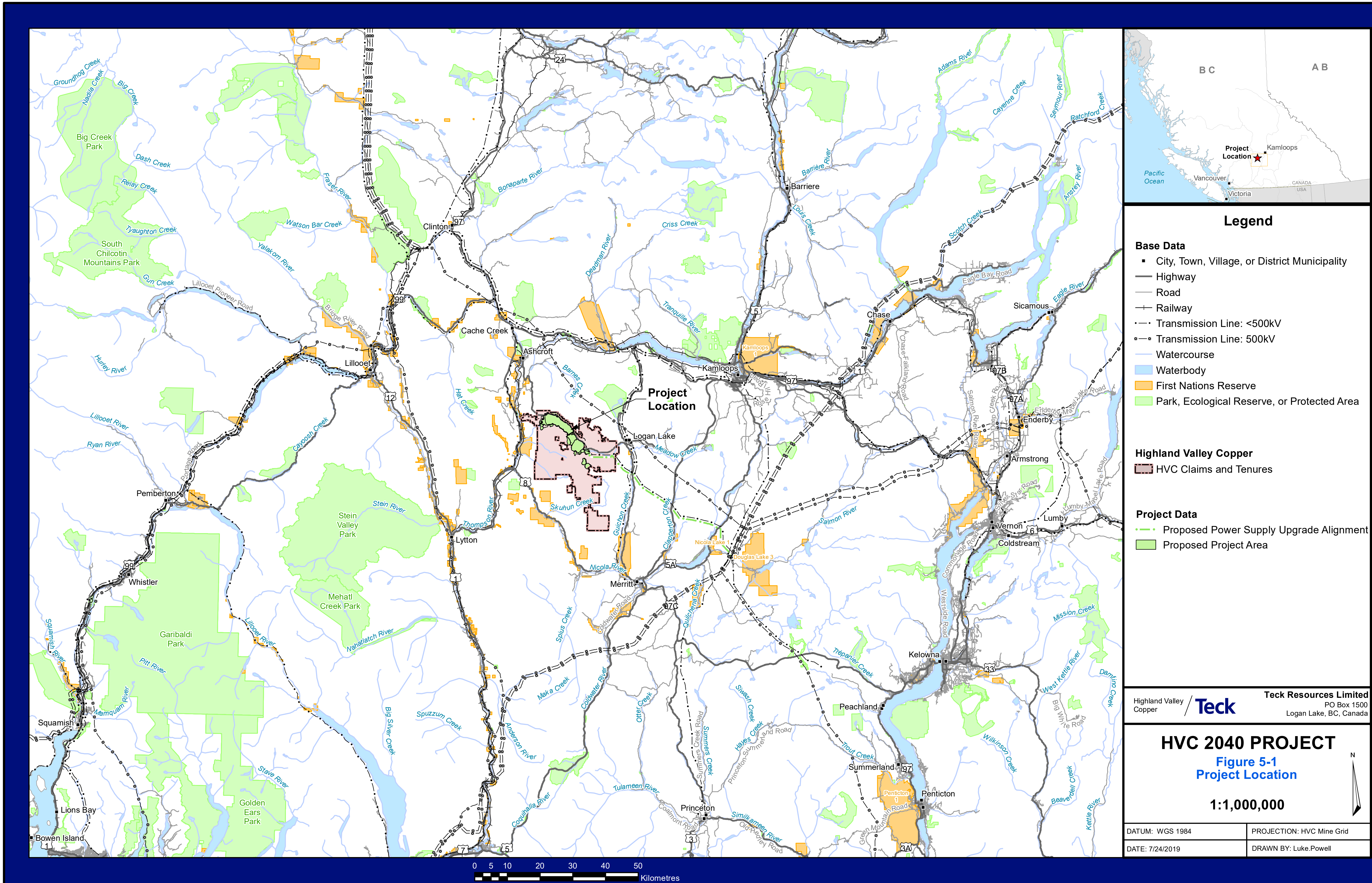
Sequencing for the LOM, including the Project, is ongoing. The current proposed sequencing is discussed further in Sections 5.4.1 and 5.6.2.2.

5.4.1 Pit and Waste Rock Dump Extensions

5.4.1.1 Valley Pit and Waste Rock Dumps

The Valley Pit would be extended in all directions by a total of approximately 229 ha, of which 44 ha are outside the current PMA. This extension would allow for the extraction of approximately 1.4 to 1.5 Bt of additional material from Valley Pit, consisting of an estimated 646 Mt of ore with average grades of 0.276% copper (Cu) and 0.0072% molybdenum (Mo), and 808 Mt of waste rock. The pit bottom elevation would change from its current design of 590 masl (current) to 455 masl.

Extension of the Valley Pit would commence with stripping; this is anticipated to start in Year 3 (approximately 2023) with first ore production, based upon that approximate stripping timing, sometime in Year 4 (2024).



HVC 2040 PROJECT
Figure 5-1
Project Location

To accommodate an additional 808 Mt of waste rock extracted from Valley Pit, the existing Valley North Dump would be extended to the west by approximately 139 ha, and the existing Valley South Dump would be extended by approximately 64 ha to the south. Of the 203 ha associated with waste rock dumps, 27 ha are outside the current PMA. Some waste rock would also be placed in the existing Lornex Northwest Dump (no extension required). A potential area of up to 115 ha may be utilized for additional waste storage at the Valley North Dump location. Utilization of this area could reduce visual impacts caused by minimizing dump height and potentially improve Project economics. The potential inclusion of this area will consider potential social, environmental, and economic factors which will involve collaboration between the Project team and both the Nlaka'pamux Nation and Stk'emlupsemc te Secwepemc Nation. All 115 ha would be outside the current PMA.

The extension of the Valley South Dump would also require the relocation of existing power and gas lines currently routed east of the Valley South Dump to a new right-of-way east of the dump. This relocation would fall inside the current PMA.

The Valley Pit and waste rock dump extensions would operate until the end of the Project and are shown in Figure 5-2. Design refinements have been completed for the Valley Dumps that have yielded positive environmental outcomes. These are outlined in Section 5.5.1.

5.4.1.2 Highmont Pit and Waste Rock Dump

The Highmont Pit would be extended in all directions by a total of approximately 137 ha, of which 38 ha are outside the current PMA. This extension of Highmont Pit would allow for the extraction of approximately 200 Mt to 250 Mt of additional material, consisting of an estimated 109 Mt of ore with average grades of 0.156% Cu and 0.0149% Mo, and 129 Mt of waste rock. The pit bottom elevation would change from its current design of 1,435 masl to 1,375 masl. A portion of the extension to the east of the Highmont Pit would accommodate future haul roads and is shown on Figure 5-2.

The extension of the Highmont Pit would likely be initiated in Year 7 (2027), with ore production planned to supplement depleting ore reserves from the current pit operations.

To accommodate an estimated additional 129 Mt of waste rock extracted from the Highmont Pit, the Highmont West Dump would be extended to the north and west over the inactive Lornex East and Lornex Southeast dumps by approximately 141 ha, of which 1 ha is outside the current PMA.

The Highmont Pit and Highmont West Dump extensions would operate until the end of the Project in 2040 and are shown in Figure 5-2. Several design refinements have been completed for the Highmont Pit and waste rock dump locations that have yielded positive environmental outcomes. These are outlined in Section 5.5.1.

5.4.2 Production Rates

The Project would include incremental upgrades to the current processing facilities, resulting in an increase in average production rate from approximately 136,000 to 175,000 tpd and an anticipated increase in the recovery rate of copper and molybdenum.

5.4.3 Water Use

Preliminary development of the water balance model indicates that additional make-up water would be required to support an increase in annual throughput at the processing facilities. The annual average volume of water used would increase from the current 97 to 113 Mm^3, a difference of 16 Mm^3, or 16%. This increase can be accommodated within existing permitted water sources. A description of water management over the different Project phases is presented in Section 5.7.

As a result of these changes, amendments to existing permits are expected (see Section 8.3).

HVC holds EAC WO2-01 for the Basal Aquifer Dewatering Project, approving a maximum extraction rate of 10,000 US gpm (631 L/s) from the Basal Aquifer, and the subsequent discharge of this water into Witches Brook at a maximum discharge rate of 6,000 US gpm (379 L/s). Pumping from the Basal Aquifer associated with the Project will not exceed this permitted volume; therefore, no amendment for volume increase is expected. However, an amendment to the existing use ground water licence application is anticipated.

5.4.4 Milling Modifications

To achieve the proposed production rate increase described in Section 5.4.2, the capacity of the Highland Mill would be increased. The Project design includes upgrading of existing grinding mills and the installation of additional grinding mills. Modifications are also planned to increase the capacity and performance of the existing bulk sulphide flotation circuit. To produce copper concentrate for transport, either additional filtration equipment or replacement of existing equipment would likely be required.

The final tailings discharge rates would be higher than the current LOM, and tailings composition would be similar to existing characteristics. No new processing reagents are anticipated.

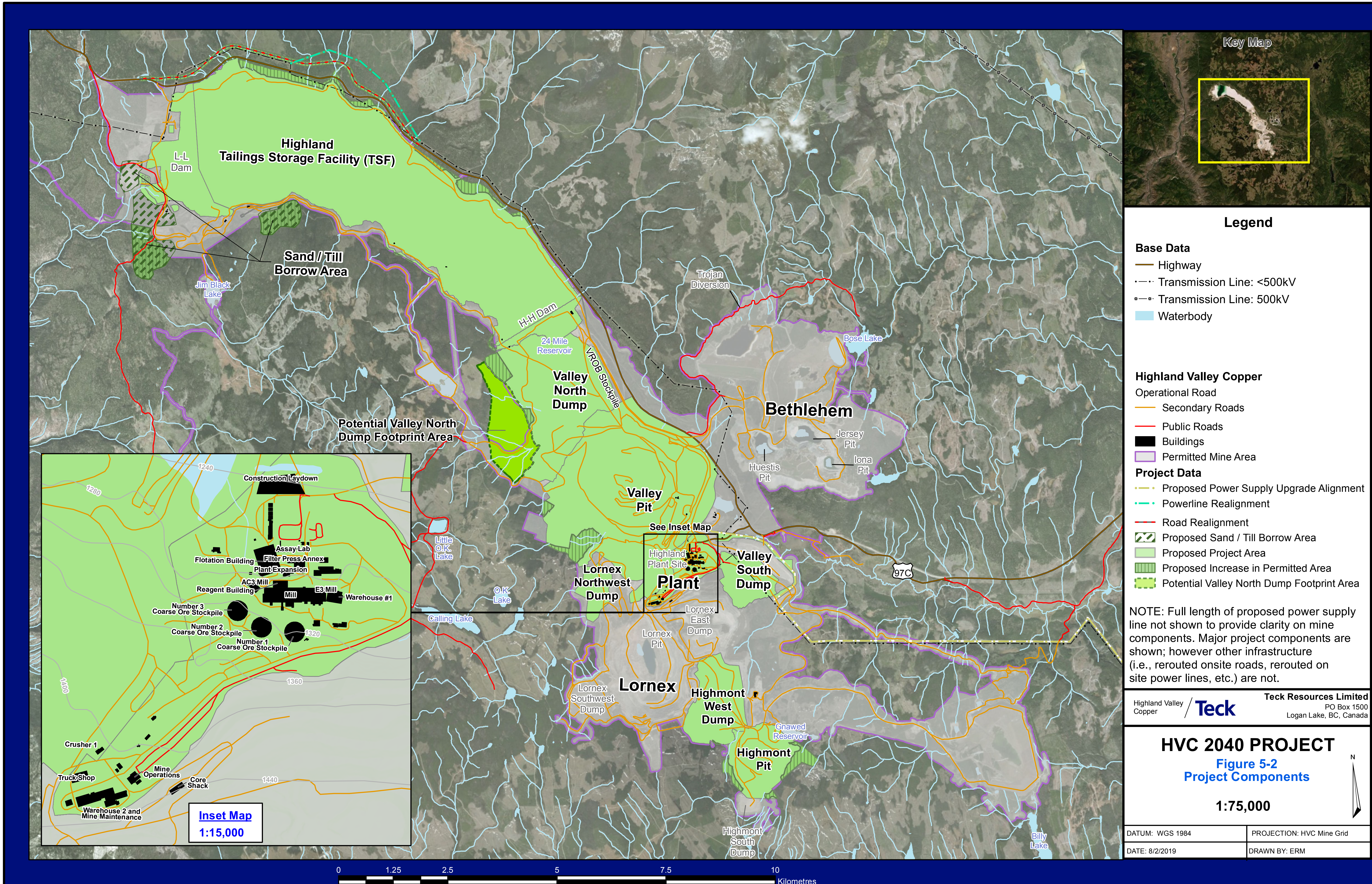
Proposed activities to support increased mill capacity, including modification and relocation of existing infrastructure, would take place within the current PMA.

5.4.5 Tailings Storage Extension

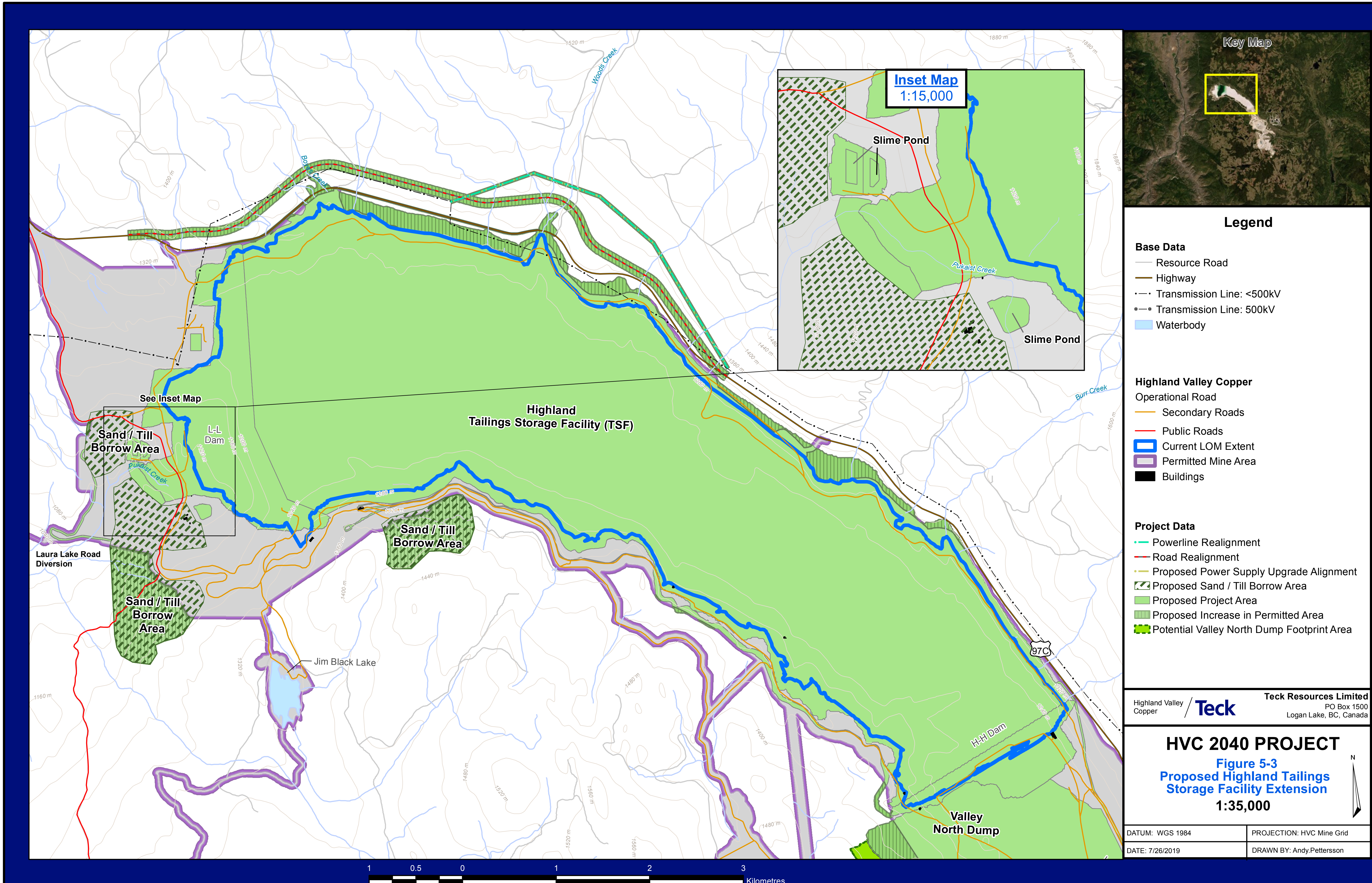
Additional tailings storage capacity would be required to accommodate the estimated one billion tonnes of tailings solids that would be produced by the Project between 2028 and 2040 or beyond. The proposed method of managing these additional tailings would be an extension of the existing Highland TSF.

The H-H and L-L dams at the Highland TSF would be raised to create additional storage capacity for the Project. These dam height increases would result in an enlargement of the tailings surface area, which would require additional footprint. While the footprint extents are currently expected to remain south of Highway 97C, a possible realignment of a section of the highway may be required. The proposed extension of the Highland TSF, including the area required for a potential realignment of a portion of Highway 97C, is discussed in Section 5.4.5.1 and shown on Figure 5-3.

For the proposed Highland TSF, the L-L Dam height would increase by about 2.5 m per year from the currently permitted elevation of 1,279 masl by the year 2028 to 1,310 masl by 2040, while the H-H Dam height would increase from the currently permitted elevation of 1,293 masl to an average of 1,324 masl over the same period. The incremental area that would be added to the Highland TSF and surrounding infrastructure as a result of this extension would be approximately 508 ha, of which 208 ha is outside the current PMA. This area would include proposed borrow pits located near the L-L Dam. However, other alternatives for borrow sources are still being evaluated.



Highland
Tailings Storage Facility (TSF)
L-L Dam
Sand / Till Borrow Area
Jim Black Lake
H-H Dam
24 Mile Reservoir
VROB Stockpile
Valley North Dump
Potential Valley North Dump Footprint Area
Trojan Diversion
Bethlehem
Bose Lake
Jersey Pit
Iona Pit
Huestis Pit
Valley Pit
See Inset Map
Highland Plant Site
Plant
Valley South Dump
97C
Lornex Northwest Dump
Little O.K. Lake
O.K. Lake
Calling Lake
Lornex East Dump
Lornex Pit
Lornex
Lornex Southwest Dump
Highmont West Dump
Gnawed Reservoir
Highmont Pit
Highmont South Dump
Billy Lake
Construction Laydown
Assay Lab
Flotation Building
Filter Press Annex
Plant Expansion
AC3 Mill
Reagent Building
E3 Mill
Mill
Warehouse #1
Number 3 Coarse Ore Stockpile
Number 2 Coarse Ore Stockpile
Number 1 Coarse Ore Stockpile
Crusher 1
Truck Shop
Mine Operations
Core Shack
Warehouse 2 and Mine Maintenance
1240
1260
1320
1360
1400
1440
Inset Map
1:15,000
Key Map
Legend
Base Data
Highway
Transmission Line: <500kV
Transmission Line: 500kV
Waterbody
Highland Valley Copper
Operational Road
Secondary Roads
Public Roads
Buildings
Permitted Mine Area
Project Data
Proposed Power Supply Upgrade Alignment
Powerline Realignment
Road Realignment
Proposed Sand / Till Borrow Area
Proposed Project Area
Proposed Increase in Permitted Area
Potential Valley North Dump Footprint Area
NOTE: Full length of proposed power supply line not shown to provide clarity on mine components. Major project components are shown; however other infrastructure (i.e., rerouted onsite roads, rerouted on site power lines, etc.) are not.
Highland Valley Copper
Teck
Teck Resources Limited
PO Box 1500
Logan Lake, BC, Canada
HVC 2040 PROJECT
Figure 5-2
Project Components
1:75,000
N
DATUM: WGS 1984
PROJECTION: HVC Mine Grid
DATE: 8/2/2019
DRAWN BY: ERM
0
1.25
2.5
5
7.5
10
Kilometres


Key Map
Inset Map
1:15,000
Slime Pond
Pukaist Creek
Slime Pond
Woods Creek
Bose Creek
Burr Creek
See Inset Map
Sand / Till Borrow Area
L-L Dam
Pukaist Creek
Highland Tailings Storage Facility (TSF)
Sand / Till Borrow Area
Laura Lake Road Diversion
Sand / Till Borrow Area
Jim Black Lake
H-H Dam
97C
Valley North Dump
Legend
Base Data
Resource Road
Highway
Transmission Line: <500kV
Transmission Line: 500kV
Waterbody
Highland Valley Copper
Operational Road
Secondary Roads
Public Roads
Current LOM Extent
Permitted Mine Area
Buildings
Project Data
Powerline Realignment
Road Realignment
Proposed Power Supply Upgrade Alignment
Proposed Sand / Till Borrow Area
Proposed Project Area
Proposed Increase in Permitted Area
Potential Valley North Dump Footprint Area
Highland Valley Copper
Teck
Teck Resources Limited
PO Box 1500
Logan Lake, BC, Canada
HVC 2040 PROJECT
Figure 5-3
Proposed Highland Tailings Storage Facility Extension
1:35,000
N
DATUM: WGS 1984
PROJECTION: HVC Mine Grid
DATE: 7/26/2019
DRAWN BY: Andy.Pettersson
1 0.5 0 1 2 3
Kilometres

The infrastructure upgrades listed below would be required to extend the existing Highland TSF to accommodate tailings associated with the Project. This infrastructure (except for the possible highway and power line move) would be located within the 208 ha of disturbance outside the current PMA mentioned above.

- Upgrade and increase the capacity of the flotation to H-H Pumphouse tailings system, including replacement of the existing three tailings lines and the installation of a new parallel fourth tailings line.
- Relocate the H-H Pumphouse.
- Upgrade and increase the capacity of the H-H Pumphouse to tailings discharge lines.
- Potentially relocate and upgrade the L-L booster station No. 2.
- Potentially relocate booster station 3.
- Relocate a significant portion of the South Side Tailings Delivery System.
- Relocate the L-L tailings distribution lines to account for raise in dam height.
- Relocate the L-L cyclone house.
- Upgrade the existing reclaim barge and Install a second reclaim barge.
- Upgrade the existing reclaim booster station No. 1.
- Upgrade the reclaim tailings lines.
- Relocate L-L Dam's Seepage Pond 2, Slimes Pond 2, and Seepage Water Reclaim Pond.
- Relocate the Woods Creek diversion.
- Relocate approximately 3 km of the Laura Lake Road.
- Possibly relocate a portion of Highway 97C and BC Hydro powerline.

5.4.5.1 Potential Powerline and Road Realignments

Modifications to the Highland TSF are expected to result in a relocation of an approximately 3 km long section of Laura Lake Road.

Should the Highland TSF modifications result in the requirement for Project footprint over a section of Highway 97C, the following powerline and road relocations may be required:

- A realignment of existing (BC Hydro) powerline infrastructure currently to the north of the Highland TSF, along Highway 97C. The realignment would accommodate the extension of the Highland TSF. Assuming a 35 m corridor, the realignment would result in approximately 14 ha of disturbance outside the current PMA.
- Highway 97C—Similar to the powerline infrastructure, Highway 97C to the north of the Project would also need to be realigned to enable extension of the Highland TSF and maintain connectivity between local and regional townships. Assuming a 100m corridor, the realignment would result in approximately 76 ha of disturbance outside the current PMA. It is assumed the current Highway 97C location would fall within the extended boundary of the Highland TSF.

Most other haul and access roads would be unaffected and would continue to be used in their current capacity (as shown in Figure 5-2), including roads used to transport ore to the Highland Mill site and around the perimeters of the pits, roads for hauling waste rock to waste dumps, and additional light-duty roads to separate light-duty vehicle traffic from the heavy-duty haul trucks. However, certain access and haul roads would be required to be relocated as part of the Project, with the proposed new routing remaining within the current PMA.

5.4.6 Power Supply Upgrades

Increased milling capacity and tailings management requirements would result in an increase to the HVC Mine Site's electrical power needs from 135 MW to approximately 215 MW. Neither the existing 138 kV transmission line which services the HVC Mine Site nor BC Hydro's Highland Substation has the capacity to supply the increased power needs. Therefore, a second 138kV line would be required, and is anticipated to run from the Nicola Substation to the HVC Mine Site, a distance of approximately 60 km. It is expected that this transmission line would run parallel to the existing transmission lines (Figure 5-4) and, conservatively assuming a 35 m right-of-way, would result in an estimated 235 ha of new disturbance, including allowances for temporary construction facilities. This estimate is expected to be refined as HVC's understanding and engineering advances. A new switchyard would likely be required immediately to the east of the main processing facilities to manage the parallel electrical feeders and enable power to be distributed to both the processing plant and the tailings infrastructure.

Additional modifications to the existing power infrastructure would include:

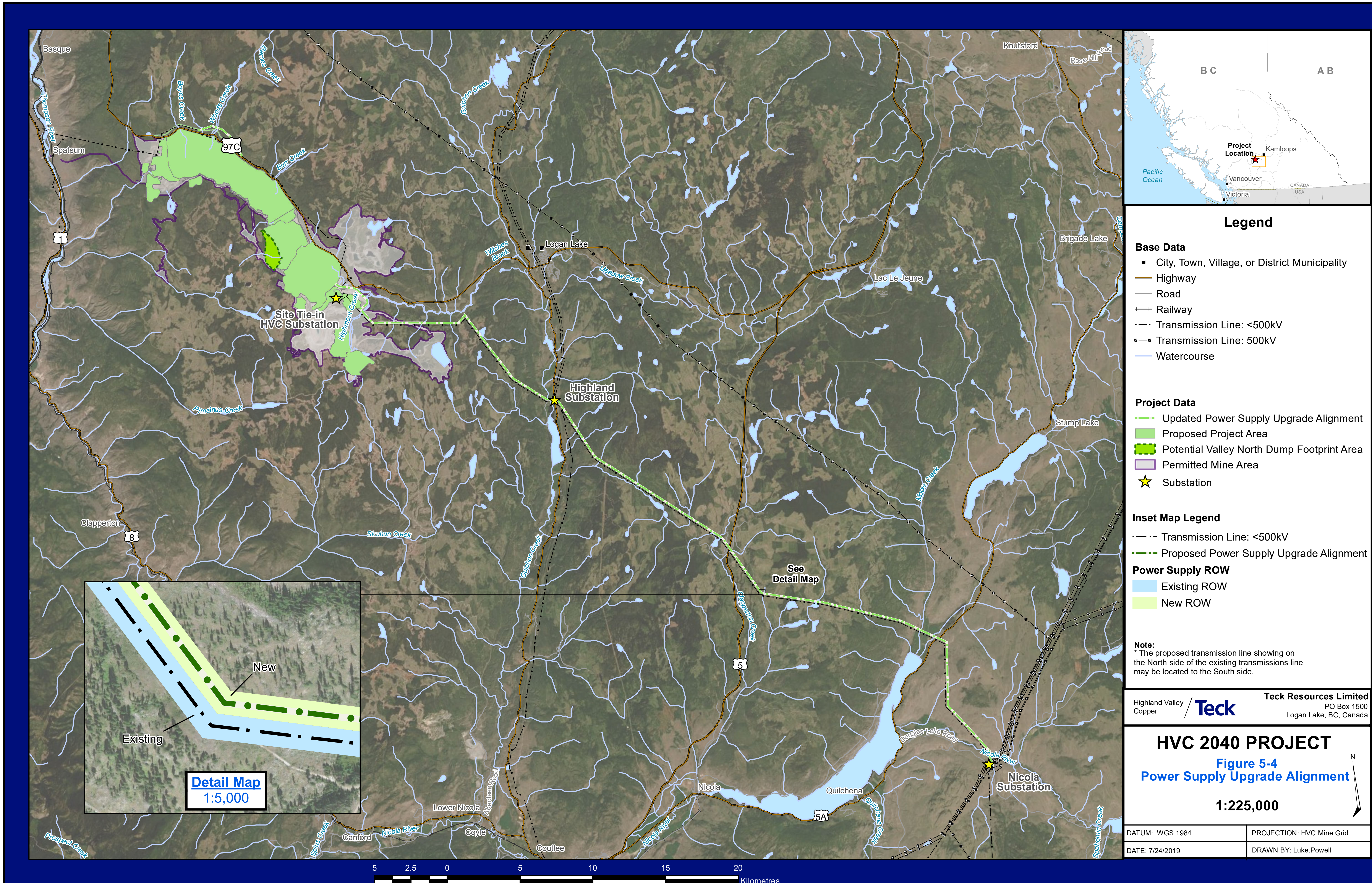
- a new Valley Substation adjacent to the relocated H-H Pumphouse. The new substation would be tapped off of the existing 138 kV line presently feeding the L-L Dam Substation. The new Valley substation would provide the additional power for the tailings upgrades and any future increase in crushing/conveying loads within the Valley Pit;
- upgrading the Highmont Substation upgrade. This would include replacement of existing transformers with larger units, and increases in switchgear and cable capacities;
- relocating and upgrading of the existing 13.8 kV Highland tailings and reclaim power distribution network;
- upgrading the existing 13.8 kV Valley Pit distribution; and
- upgrading the existing 13.8 kV pit services and Lornex Pit distribution.

It is possible that easements and/or surface leases would be required across privately held land in order to build the power supply line.

Alternative power supply options, including solar, wind, natural gas generation, and liquid natural gas were evaluated in prefeasibility but have been deemed impractical due to lack of capacity, elevated costs, and reliability concerns. Although the base case does not include alternative energy, further studies will be done during the feasibility stage of engineering, which is ongoing.

5.5 Summary of Modifications

The Project would aim to utilize as much of the existing operations at the HVC Mine Site as possible in order to minimize incremental disturbances and take advantage of efficiencies with respect to power, fuel and water use. Table 5-1 shows the anticipated incremental increase to key HVC Mine Site components should the proposed Project be constructed and operated. Table 5-2 summarizes the Project's new disturbance areas outside the current PMA.



HVC 2040 PROJECT
Figure 5-4
Power Supply Upgrade Alignment
1:225,000
Legend
Base Data
City, Town, Village, or District Municipality
Highway
Road
Railway
Transmission Line: <500kV
Transmission Line: 500kV
Watercourse
Project Data
Updated Power Supply Upgrade Alignment
Proposed Project Area
Potential Valley North Dump Footprint Area
Permitted Mine Area
Substation
Inset Map Legend
Transmission Line: <500kV
Proposed Power Supply Upgrade Alignment
Power Supply ROW
Existing ROW
New ROW
Note:
* The proposed transmission line showing on the North side of the existing transmissions line may be located to the South side.
Highland Valley Copper
Teck
Teck Resources Limited
PO Box 1500
Logan Lake, BC, Canada
DATUM: WGS 1984
PROJECTION: HVC Mine Grid
DATE: 7/24/2019
DRAWN BY: Luke.Powell
B C
A B
Project Location
Kamloops
Vancouver
Victoria
Pacific Ocean
CANADA
USA
Site Tie-in HVC Substation
Highland Substation
Nicola Substation
See Detail Map
Detail Map
1:5,000
New
Existing
Logan Lake
Lac Le Jeune
Brigade Lake
Stump Lake
Knutsford
Basque
Spatsum
Clapperton
Nicola
Quilchena
Lower Nicola
Canford
Coyle
Coutlee
97C
1
8
5
5A
Thompson River
Nicola River
Witches Brook
Meadow Creek
Skuhun Creek
Pimainus Creek
Guichon Creek
Highmont Creek
Woods Creek
Burr Creek
Moore Creek
Quilchena Creek
Douglas Lake Road
Spahomin Creek
Prospect Creek
Spius Creek
Aberdeen Road
Rose Hill Road
5
2.5
0
5
10
15
20
Kilometres
N

Table 5-1 Summary of HVC Mine Site Changes Resulting from the Project

Key Component	HVC Mine Site Existing Conditions	Incremental Project Contribution (%)	Existing and Project
Project/operating area (mine site)	16,000 ha	408 ha to 523 ha (2.6% to 3.3%)[a]	16,408 ha to 16,523 ha[a]
Disturbance area	6,900 ha (expected 7,400 ha at closure)	408 ha to 523 ha (5.9% to 7.6%)[a]	7,308 ha to 7,423 ha[a]
Project duration	Up to year 2028	Approximately 13 years	Approximately 2040
Annual mining production	118 Mt	25 Mt (21%)	143 Mt
Annual mill production	52 Mt	12 Mt (23%)	64 Mt
Annual product produced	146,200 t copper 4.4 Mlbs of molybdenum	36,500 t copper (25%) 4.1 Mlbs of molybdenum (93%)	182,700 MT copper 8.5 Mlbs molybdenum
Tailings storage	1.8 billion T	1 billion T (55.6%)	2.8 billion T
Annual tailings production	52 Mt	12 Mt (23%)	64 Mt
Annual waste rock production	66.4 Mt	13.4 Mt (20%)	79.8 Mt
Water supply	Primary: surface water Supplementary: groundwater	Primary: surface water Supplementary: groundwater	Primary: surface water Supplementary: groundwater
Annual average volume of water use	97 Mm^3	16 Mm^3 (16%)	113 Mm^3
Annual average volume of water reused	76 Mm^3	11 Mm^3 (14%)	87 Mm^3
Annual average volume of make-up water	21 Mm^3	5 Mm^3	26 Mm^3
Annual average water reuse	78%[c]	--not applicable--	77%
Annual average makeup water	22%	--not applicable--	23%
Transport of product	Road and rail	No change proposed	Road and rail
Mining method	Open pit, truck and shovel	No change proposed	Open pit, truck and shovel
Construction and operation hours	24 hours a day, 7 days a week.	No change proposed	24 hours a day, 7 days a week.
Workforce	1,320 full time operational workforce	Average 275, peak 500 additional construction workforce (Year 1 & 2) No additional operational workforce	1,320 full time operational workforce
Electricity supply	138 KV line	Twinning of 138 KV line (235 ha disturbance)	2 x 138 KV line

Key Component	HVC Mine Site Existing Conditions	Incremental Project Contribution (%)	Existing and Project
Operational equipment fleet	6 electric production drills 8 electric shovels 2 front-end loaders 52 218-t haul trucks 3 water trucks 10 road graders 12 track dozers 2 rubber tire dozers	0 electric production drills 1 electric shovel 1 front-end loaders 44 218-t haul trucks 1 water truck 3 road graders 3 track dozers 1 rubber tire dozer	6 electric production drills 9 electric shovels 3 front-end loaders 96 218-t haul trucks 4 water trucks 13 road graders 15 track dozers 3 rubber tire dozers

[a] *Upper area values include potential area for the Valley North Dump footprint (under evaluation).*
[b] *Annual figures represent Life of Mine average.*
[c] *Water reuse has the ability to change dramatically year on year based on annual observed precipitation. Numbers provided are based on an average precipitation year.*

Table 5-2 Project New Disturbance Areas

Project Component	Estimated Incremental New Disturbance (ha)[a]
Valley Pit	44
Valley Pit Waste Rock Dump	27
Highmont Pit	38
Highmont Waste Rock Dump	1
Powerline and Gasline rerouting at Highmont South Dump	0
Highland Tailings Storage Facility	208
Realignment of Highway 97C and powerline relocation	90
Mine Subtotal	**408**
Power Supply Upgrade Alignment	**235**
Total	**643**
Valley North Dump Footprint Area (under evaluation)	115
Total (including area under evaluation)	**758**

[a] *Disturbance outside of Permitted Mine Area.*

5.5.1 Environmental Mitigation by Design

Several mine design changes have been made since the initial layout to avoid or minimize potential environmental impacts and reduce the overall footprint of disturbances outside the PMA by approximately 600 ha:

- Highmont Dumps have been moved to eliminate new land disturbance and impact to sensitive riparian areas.
- Highmont Pit has been reconfigured to remove a portion of the pit that would have intercepted the upper reaches of Highmont Creek.
- Valley North Dump has been moved primarily on to areas already disturbed by the mine (refer to Section 5.4.1.1 regarding potential expansion to the Valley North Dump).
- Overall reductions have been made to the Highland TSF infrastructure modifications.

5.6 Project Development Schedule

The Project would extend the operational life of the HVC Mine Site by approximately 13 years. Construction would start in 2021 (Year 1) and waste stripping would begin in 2023 (Year 3). Mining would continue until 2040 at which point the ore reserves would be exhausted and decommissioning of the mine would commence. Where possible, progressive reclamation would be carried out throughout the mining phase of the Project with reclamation of any areas not reclaimed at the end of mine life beginning immediately following mine closure.

5.6.1 Construction Phase

The construction phase would generally include the following:

- raising the tailings dam for the Highland TSF;
- preparing the site, including vegetation clearing, topsoil/subsoil stockpiling, and bulk earth works;
- constructing additional facilities and internal roads;
- modifying the Highland Mill and tailings distribution system;
- installing groundwater management infrastructure at the Highmont and Valley Pits;
- carrying out powerline and road realignments; and
- upgrading the power supply.

Site preparation would involve clearing vegetation and topsoil/subsoil for the initial mining cuts and internal roads. Conventional earth moving equipment would be used, including dozers, front-end loaders, scrapers, and trucks to clear vegetation and stockpile material. Activities would also include bulk earthworks, construction of drainage infrastructure and water storage dams and installation of above ground and below ground services.

Temporary facilities such as construction laydown areas and contractor trailers would be located within the current PMA.

5.6.2 Operation Phase

5.6.2.1 Overview

Mining operations for the Project would be consistent with the mining methods currently employed at the HVC Mine Site (see Section 4.2). Under base case assumptions, minimal operational changes would be associated with the Project.

5.6.2.2 Mining Schedule

Stripping would start in 2023 (Year 3). Extraction of material would commence in 2024 (Year 4) and involve the estimated removal of 1,454 Mt from Valley Pit, comprising 646 Mt of ore and 808 Mt of waste rock. Waste rock would be placed in the Valley North and Valley South dumps. The Valley Pit and its waste rock dumps would operate until the end of the Project

In 2027, mining would commence at Highmont Pit and involve the removal of 238 Mt, comprising 109 Mt of ore and 129 Mt of waste rock. Waste rock would be placed in the Highmont West Dump. The Highmont Pit and its waste rock dump would operate until the end of the Project.

Mine plan layouts are provided in Figure 5-5 to Figure 5-8 for Years 2023, 2030, 2035 and 2040, respectively.

The HVC 2040 Project would produce ore at an average rate of 64 Mt/year, which will support an estimated 13-year LOM. The LOM modelling is based on an average production of 175,000 tpd of ore and assumes operations would run 365 days per year. It is anticipated that approximately 937 Mt of waste would be produced over the LOM.

During the operation phase, non-contact water not needed for processing would be diverted around mine facilities when practical and contact water would be collected and managed. The size of the non-contact-water catchment areas surrounding the key facilities (open pits and waste dumps) is expected to be very small. The alignment of the mine water management facilities would be adapted throughout the operation phase to fit Project requirements. Further detail on water management is provided in Section 5.7.

Further refinement and detail on the mining schedule is expected once the prefeasibility study for the Project is released. The currently envisaged mining schedule is shown in Figure 5-9.

At the time of the Bethlehem Extension Project *Mines Act* permit amendment formal submission (June 2016), Bethlehem Mine sequencing was expected to occur within the current LOM to supplement a forecast period of low Copper grade and quantity. Through an iterative mine planning process which included Bethlehem, the existing HVC Mine Site LOM, and the Project, mine sequencing has been updated (Figure 5-9). Mine sequencing, including mining of existing permitted pits and use of existing permitted dumps, will continue to be re-evaluated annually as per current operational practice.

5.6.3 Workforce and Estimated Project Capital Costs

The Project would result in continued employment for approximately 1,320 employees (full time equivalent). During the construction phase, there would be a short-term increase in the workforce. During the operation phase, development of additional Project process facilities and infrastructure would lead to an incremental marginal increase to the current workforce. It is anticipated that the majority of the current workforce would be retained and reside in the region in Logan Lake, Ashcroft, Merritt, and Kamloops.

The estimated initial, sustaining capital, and closure and decommissioning costs of the Project are currently estimated at $2.5 billion (2018 Canadian dollars). This is broken down by phase, as follows:

- construction initial capital: $1.1 billion;
- operation sustaining capital: $1.35 billion; and
- closure and decommissioning (Project components only): $30 million.

5.6.4 Transportation and Shipping of Materials

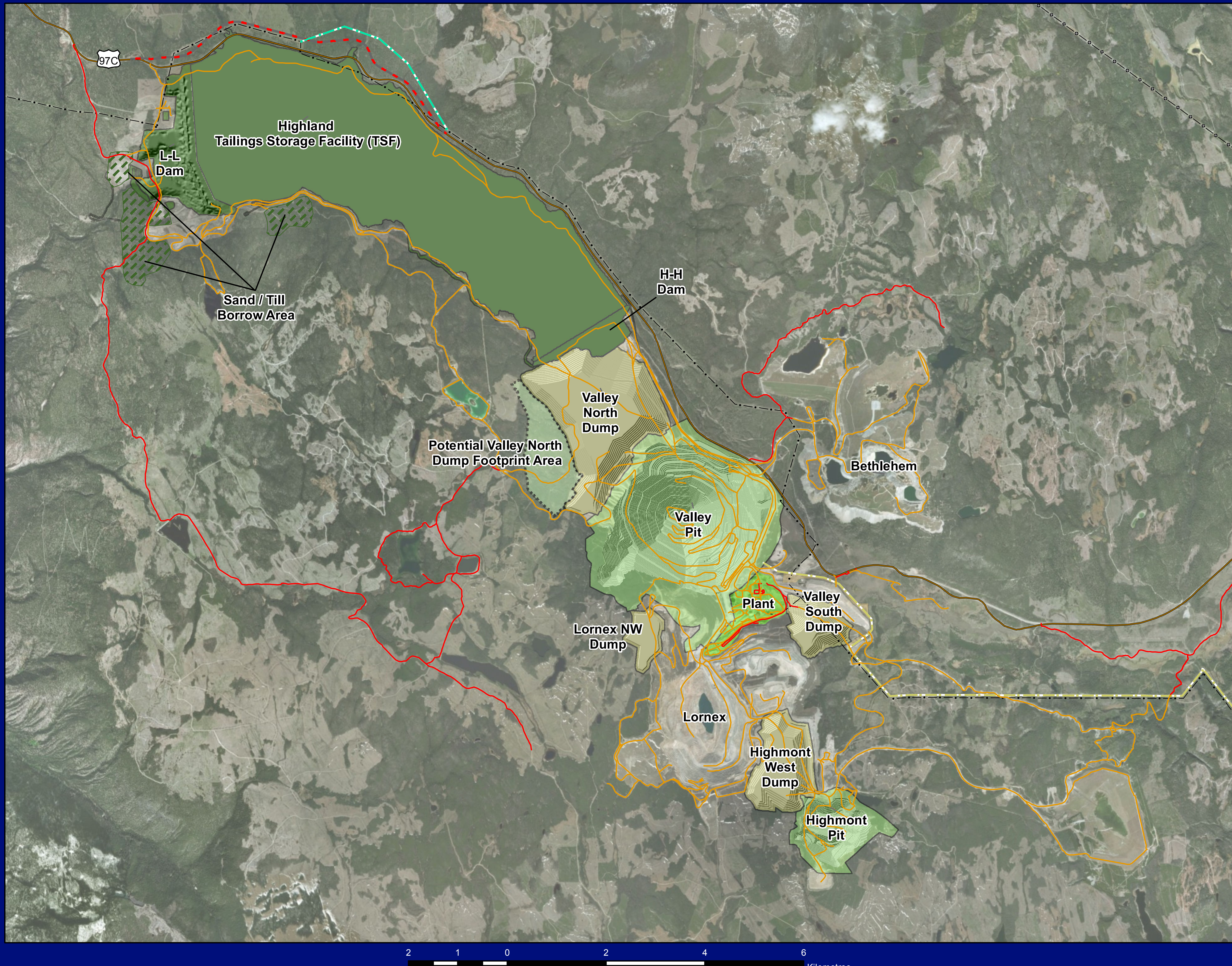
Consistent with current practice, copper concentrate would be trucked to Ashcroft (50 km) along Highway 97C, then transported to Vancouver (300 km) via rail, where the majority would be shipped to overseas smelters from the Port of Vancouver. Molybdenum concentrate would be bagged in 1.8 t tote bags and transported to customers by truck and then by ocean vessel.

During operations, approximately 95 truckloads of concentrate per day would leave the HVC Mine Site. This would be an additional 25 truckloads per day relative to current HVC Mine Site operations.

Figure 5-5
Preliminary Mine Plan Year 2023


Key Map
97C
L-L Dam
Highland Tailings Storage Facility (TSF)
Sand / Till Borrow Area
H-H Dam
Valley North Dump
Potential Valley North Dump Footprint Area
Valley Pit
Bethlehem
Valley South Dump
Plant
Lornex NW Dump
Lornex
Highmont West Dump
Highmont Pit
Legend
Base Data
City, Town, Village, or District Municipality
Highway
Transmission Line: <500kV
Transmission Line: 500kV
Project Data
Proposed Power Supply Upgrade Alignment
Proposed Sand / Till Borrow Area
Proposed Project Area 2030
Mine Pit
Tailings Storage Facility
Waste Rock Dump
Plant Site
Potential Valley North Dump Footprint Area
Operational Road
Secondary Roads
Public Roads
NOTE: Borrow areas shown represent maximum potential extents expected at Year 2040
Highland Valley Copper
Teck
Teck Resources Limited
PO Box 1500
Logan Lake, BC, Canada
HVC 2040 PROJECT
Figure 5-6
Preliminary Mine Plan Year 2030
1:75,000
N
DATUM: WGS 1984
PROJECTION: HVC Mine Grid
DATE: 7/26/2019
DRAWN BY: Andy.Pettersson
1.5 0.75 0 1.5 3 4.5
Kilometres

97C
L-L Dam
Highland Tailings Storage Facility (TSF)
Sand / Till Borrow Area
H-H Dam
Valley North Dump
Potential Valley North Dump Footprint Area
Bethlehem
Valley Pit
Valley South Dump
Plant
Lornex NW Dump
Lornex
Highmont West Dump
Highmont Pit
Key Map
Legend
Base Data
City, Town, Village, or District Municipality
Highway
Transmission Line: <500kV
Transmission Line: 500kV
Project Data
Proposed Power Supply Upgrade Alignment
Powerline Realignment
Road Realignment
Proposed Sand / Till Borrow Area
Potential Valley North Dump Footprint Area
Proposed Project Area 2035
Mine Pit
Tailings Storage Facility
Waste Rock Dump
Plant Site
Operational Road
Secondary Roads
Public Roads
NOTE: Borrow areas shown represent maximum potential extents expected at Year 2040
Highland Valley Copper
Teck
Teck Resources Limited
PO Box 1500
Logan Lake, BC, Canada
HVC 2040 PROJECT
Figure 5-7
Preliminary Mine Plan Year 2035
1:75,000
N
DATUM: WGS 1984
PROJECTION: HVC Mine Grid
DATE: 7/26/2019
DRAWN BY: Andy.Pettersson
2 1 0 2 4 6
Kilometres



Legend

Base Data

- City, Town, Village, or District Municipality
- Highway
- Transmission Line: <500kV
- Transmission Line: 500kV

Project Data

- Proposed Power Supply Upgrade Alignment
- Powerline Realignment
- Road Realignment
- Proposed Sand / Till Borrow Area
- Potential Valley North Dump Footprint Area

Proposed Project Area 2040

- Tailings Storage Facility
- Mine Pit
- Waste Rock Dump
- Plant Site
- Utilities Corridor

Operational Road

- Secondary Roads
- Public Roads

NOTE: Borrow areas shown represent maximum potential extents expected at Year 2040

NOTE:TSF shading at western extents of TSF include allowance for construction and infrastructure areas.
L-L Dam does not extend out to extents of shading.
Buffers have been added to pits and dumps to show allowance for access and reclamation.

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HVC 2040 PROJECT

Figure 5-8
Preliminary Mine Plan Year 2040

1:75,000

N

DATUM: WGS 1984	PROJECTION: HVC Mine Grid
DATE: 7/26/2019	DRAWN BY: Andy.Pettersson

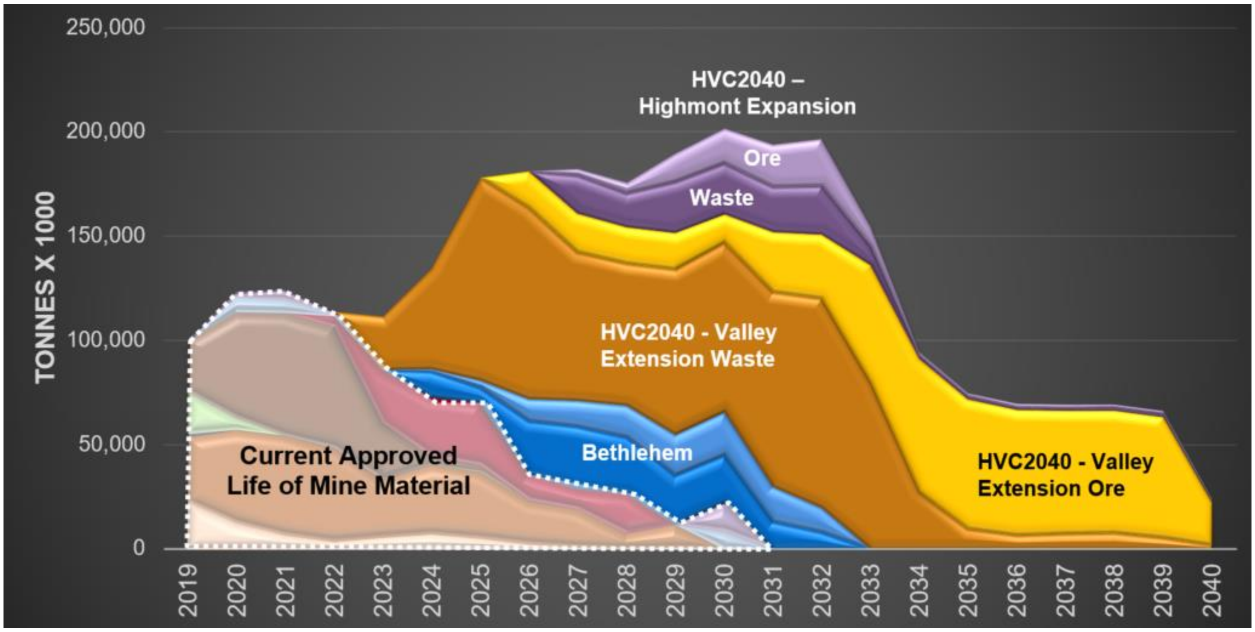


Figure 5-9 Preliminary Mining Schedule

5.7 Water Management

5.7.1 Water Management Approach

Water management for the Project would rely on the existing HVC Mine Site water management system with some minor modifications to address potential Project interactions. Water would continue to be managed in accordance with HVC's Water Management Plan. The Nlaka'pamux Nation has expressed the importance of water to sustain life; the Project would collaborate with communities, through WGs and committees, to incorporate contributions to the water management approach. The approach will be further refined using inputs from the environmental assessment process.

5.7.1.1 Construction

Water management during construction of the Project would be consistent with current water management practices. For pit extensions, this would include groundwater extraction as per geotechnical requirements and control of surface and groundwater inflows through sumps with pumping directly to the mill for use in process or to the Highland TSF for later use in process. Reclaim water from the Highland TSF would continue to be the primary water source for processing.

5.7.1.2 Operation

As discussed in Section 4.2.11.2, a site-wide water balance model is used for current operations. This water balance model would be updated to include the Project. HVC's Water Management Plan would also be updated accordingly.

Reclaim water from tailings would continue to be the primary source of water for processing operations. Make-up water requirements would be primarily met through the collection of water from surface water runoff, groundwater wells, and pit dewatering. However, preliminary development of the water balance model indicates that additional make-up water would be required to support an increase in annual throughput. This increase can be accommodated within existing permitted water sources. Alternative Project design options currently under consideration by HVC have the potential to affect water usage and reclaim water availability. Should these options be included in the Project, the water balance model would be refined.

5.8 Mine Closure, Decommissioning, and Reclamation

Mine closure, decommissioning and reclamation activities associated with the Project would continue to be managed according to the current HVC program (described in Section 4.2.12), including progressive reclamation and in alignment with the *End Land Use Plan*, developed collaboratively between HVC staff and the Nlaka'pamux Nation with support of consultants (described in Section 5.8.1). Closure phase activities for the Project would commence prior to the completion of operations. A final mine closure plan would be developed for approval prior to closure, and activities would include decommissioning, removal of equipment or facilities, and final reclamation of sites. Closure phase activities would involve:

- continuing reclamation research;
- closing and, as appropriate, resloping waste rock dump facilities, utilizing geomorphic design features that incorporate local landforms into the final configuration of the dump;
- placing stockpiled soil or overburden on resloped dumps, roads and other mining disturbances in accordance with reclamation priorities;
- incorporating, as appropriate, organic amendment and conducting site preparation on dumps, roads and other mining disturbances based on reclamation research;
- re-vegetating lands disturbed by mining using native plant species in accordance with end land use goals;
- closing and reclamation of the Highland TSF according to the Highland TSF closure plan;
- controlling invasive species;
- recreating wildlife habitat;
- conducting aquatic and riparian reclamation on inactive pit lakes and tailings pond;
- constructing final water management facilities;
- removing redundant mobile and fixed equipment;
- removing temporary fixed structures;
- removing pipelines and pumping systems no longer required; and
- removing the electrical distribution system, excluding power lines required for post-closure phase infrastructure.

Post-closure phase activities potentially include the following:

- controlling invasive species;
- undertaking reclamation monitoring;
- environmental monitoring (fisheries, wildlife, air quality, groundwater, surface water quality, etc.);
- geotechnical monitoring of pits, dumps, and dam structures;
- maintaining and operating water management infrastructure;
- securing and maintaining fencing and critical site infrastructure; and
- annual reporting of activities.

5.8.1 End Land Use

HVC prepared the *Highland Valley Copper End Land Use Plan* in 2016 and the accompanying non-technical photobook titled *Returning Land Use Plan* (the latter is presented as Appendix G). The plan and book were developed collaboratively between HVC staff and the Nlaka'pamux Nation with support of consultants. The plan outlines two end land use scenarios that emerged from the collaboration:

- **the base case scenario:** this scenario emphasizes reestablishment of pre-mine ecosystems to address the strong interest of many Nlaka'pamux members to see a return of natural ecosystems to the post-mine landscape to support traditional land uses, including hunting, gathering, fishing, and trapping; and
- **the alternative scenario:** this scenario is a variation of the base case that features additional reclamation of agricultural pasturelands to account for broad support among Nlaka'pamux people for increased presence of pasturelands on the post-mine landscape to support haying and grazing, as well as return of natural ecosystems.

Almost every ecosystem targeted in the base case scenario will have the ability to support one or more traditional land uses, including hunting, gathering and trapping, and will be useful as wildlife habitat, including deer, moose, bears, small mammals, upland and shore birds, and waterfowl, among other animals. There will also be areas on the post-mine landscape associated with wetlands and locations that have already been reclaimed to grasslands, meaning that the post-mine landscape will also provide for fishing and agricultural uses such as haying and grazing.

The alternative scenario is a version of the base case scenario that includes increases in agricultural pastureland and decreases in the area of surplus drier native ecosystems. All other characteristics of the landscape remain similar, including ecosystem diversity and provision of potential end land uses.

5.9 Emissions, Discharges and Waste

The Project would have the potential to result in additional air, noise and GHG emissions, liquid discharges, and solid wastes, as discussed in Sections 5.9.1 to 5.9.5.

5.9.1 Management of Air Emissions

Air contaminant emissions during construction would consist mainly of emissions from mobile equipment on site and trucks used to deliver equipment to the Project. Emissions are expected to include particulates, sulphur dioxide, nitrogen oxides, and other criteria air contaminants from the combustion of fuel. In addition, dust would be generated from earthworks and on-site activities.

HVC would continue the current dust suppression program, employing water sprays and Haulage-DC, a water additive that improves the efficiency of the road watering, to mitigate the potential environmental effects of dust on areas near the Project.

During operations, emissions would also continue to be released from concentrate dryers, flotation circuits, leaching vats, dust collectors, distribution bins, baghouses, scrubbers, heaters/boilers, generators, dozers, drills, blasting, product handling, conveyors and transfer points, erosions from exposed surfaces, refueling, storage tanks, mobile equipment emissions and other ancillary activities. HVC's Site-Wide Dust Management Plan (Teck 2017b) is used to manage air contaminant emissions from on-site sources. It is possible that HVC's emissions permit will need to be amended to accommodate the Project.

In 2013, HVC introduced an anti-idling policy with the aim of reducing greenhouse gas (GHG) emissions. The policy would continue to be implemented for the Project. In April 2016, the site was externally verified as AAA conformant with the Towards Sustainable Mining Energy and GHG Emissions Management protocol. HVC also currently utilizes several electric drills and shovels on site. These activities are not captured in HVC's air quality monitoring program but reflect HVC's commitment to improving air quality on site.

5.9.2 Management of Greenhouse Gas Emissions

Greenhouse gas (GHG) emissions from the Project would primarily be associated with emissions from mobile equipment and releases from blasting activities as well as from stationary heaters and power generators during construction and operations.

The total annual GHG emissions associated with the Project are expected to incrementally increase compared to current HVC Mine Site GHG emissions of approximately 199,000 t of carbon dioxide equivalent (CO_2e) per year.

5.9.3 Management of Noise Emissions

Noise emissions generated during construction would be typical of large-scale construction projects. These would include noise-producing activities such as the movement and use of heavy equipment and operation of generators.

Sources of noise during operations would be consistent with current operations and include mining and surface crushing activities, blasting, processing, movement of material, other heavy equipment operation (e.g., horn and traffic noise), trucking, and the occasional use of diesel generators.

5.9.4 Management of Discharges

Contact water is considered to be any water, surface water, or groundwater that contacts mine workings or interacts with mine rock material. Conversely, non-contact water is water that does not contact mine workings and/or interact with mine rock material. The Project would be designed, as much as is practical, to minimize the generation of contact water.

Project effluent would consist of mine contact water released at permitted locations described in *Environmental Management Act* (EMA) authorization PE-376 issued to HVC. These locations are shown on Figure 6-1 in Section 6. Consistent with current practice, all liquid discharge released to the environment would be monitored by HVC's Environment and Community Affairs Department and adhere to the requirements of PE-376. An amendment to PE-376 would likely be required for the Project. HVC prioritizes diverting non-contact water away from site. No new discharge locations are proposed through the Project.

Multiple sources of contact water would be managed during the construction and operation phases, including: site runoff arising from precipitation; dewatering for foundation preparation; and dewatering of the existing open pits. These water sources would be collected on site and used in processing.

Collection ditches would be constructed around Project infrastructure to collect Project-related contact water. Water collected in the sumps and/or small ponds and during pit dewatering would be used for mill process. This is consistent with current HVC practice. Where practical, collection ditches may be constructed to divert non-contact water around Project facilities to natural drainages.

5.9.5 Management of Waste

Management of mine waste including tailings and waste rock are described in Section 5.4. Other types of waste that would typically be generated by the Project include both non-hazardous waste and hazardous waste. These wastes would be generated during construction and operation, and would be managed following the existing HVC Waste Management Plan (WMP).

The WMP sets guidelines for the management of hazardous and non-hazardous waste and establishes roles and responsibilities for HVC personnel, contractors, and subcontractors. The WMP provides a framework for proper handling and disposal of wastes, minimization of potentially adverse effects on the environment, and compliance with the regulatory requirements for waste management. HVC is committed to ensuring the collection, storage, transportation, and disposal of all wastes generated by Project components is conducted in a safe, efficient, and environmentally sound manner in full compliance with applicable regulations.

While the WMP focuses on waste handling and disposal, one of HVC's goals is to minimize the amount of waste subject to handling and disposal by reducing the amount of waste generated and increasing waste materials reused and recycled (i.e., efficient operations).

5.9.6 Accidents and Malfunctions

Teck's Environmental, Health, and Safety Management Information System (EHS-MIS), called SiteLine, is a custom-built software application developed by Teck for use by all Teck-owned companies and affiliated operations.

Environmental, health, and safety incidents are reported using the SiteLine Corrective Action Program. All incidents are recorded in SiteLine, then investigated, reviewed and assessed by the responsible department (Safety or Environment and Community Affairs) based on incident type. Responses to incidents, as well as actions to correct deficiencies and prevent reoccurrence of similar incidents are tracked in the Corrective Action Program (CAP) module of SiteLine. As part of the CAP, the root causes of environmental and community incidents are determined using different frameworks, and the effectiveness of corrective or preventive actions are systematically evaluated. HVC will continue to utilize these successful methods to manage and mitigate any potential accidents and malfunctions that could occur during Project activities.

Teck also utilizes an Emergency Response Plan that contains a list of procedures that should be adhered to during an emergency at any Teck facilities. This contains the emergency reporting procedure for HVC, actions to be taken to remediate the threat/emergency, key evacuation routes, and responsibilities of key personnel during the emergency. The plan is documented in the OMS Manuals for the various facilities and updated annually to reflect any relevant changes.

5.10 Land Tenure

HVC acknowledges that the Project is situated in the unceded territory of the Nlaka'pamux Nation, and that Stk'emlupsemc te Secwepemc Nation has also asserted title within the Project area. The south section of the proposed power supply upgrade alignment is in the Syilx Nation territory. Prior to exploration and development, the area that has now become the HVC Mine was used and occupied by the Nlaka'pamux Nation, in post-contact times several parcels of reserve lands were allotted to the Cook's Ferry Indian Band (Kelly, Lopéz, and Trip 1995). In 1889, four Indian Reserves [IRs] 12, 13, 14, and 15 were established in the Highland Valley, with Nlaka'pamux families harvesting swamp hay on the shores of local lakes in the summer months and residing on the reserves during winter after driving their cattle to these locations. The reserves continued to be used until purchase of the IRs in the 1960s.

Mining and milling activities have occurred at the mine since 1962. In 1964, Valley Copper Mines Limited (in 1986 Cominco Ltd., now HVC) purchased two of the reserves and included them in their Valley Mine property: IR 12 (Chilthnaux), around the 24 Mile Reservoir; and IR 13 (Quiltanton), between Quiltanton and Little Divide Lakes (Venture Kamloops 2013). The Cook's Ferry Indian Band previously had reserves along Witches Brook, including Enquotco IR 14 and Squetankilhats IR 15. Teck now owns these acreages, designated Lots 1033 and 1034. In the 1980s, Big Divide, Little Divide, Quiltanton, McNaughton, and 24 Mile lakes were drained for the combined mine operation. At this time, the two reserves were sold to Cominco with a stipulation that, in the year 2073, the Cook's Ferry Indian Band may reacquire Squetankilhats IR 15.

As noted above, the area that has now become the HVC Mine Site and was an important area of use by Indigenous Peoples since a time immemorial. The land required for the Project does not currently overlap any Indian Reserves, parks, or protected areas.

The Project overlaps with 13 active Crown tenures (12 statutory rights-of-way or easements and 1 licence of occupation) and 3 Crown tenure applications (2 for investigative licences and 1 for a statutory right-of-way or easement) as shown in below:

Thirteen active tenures:

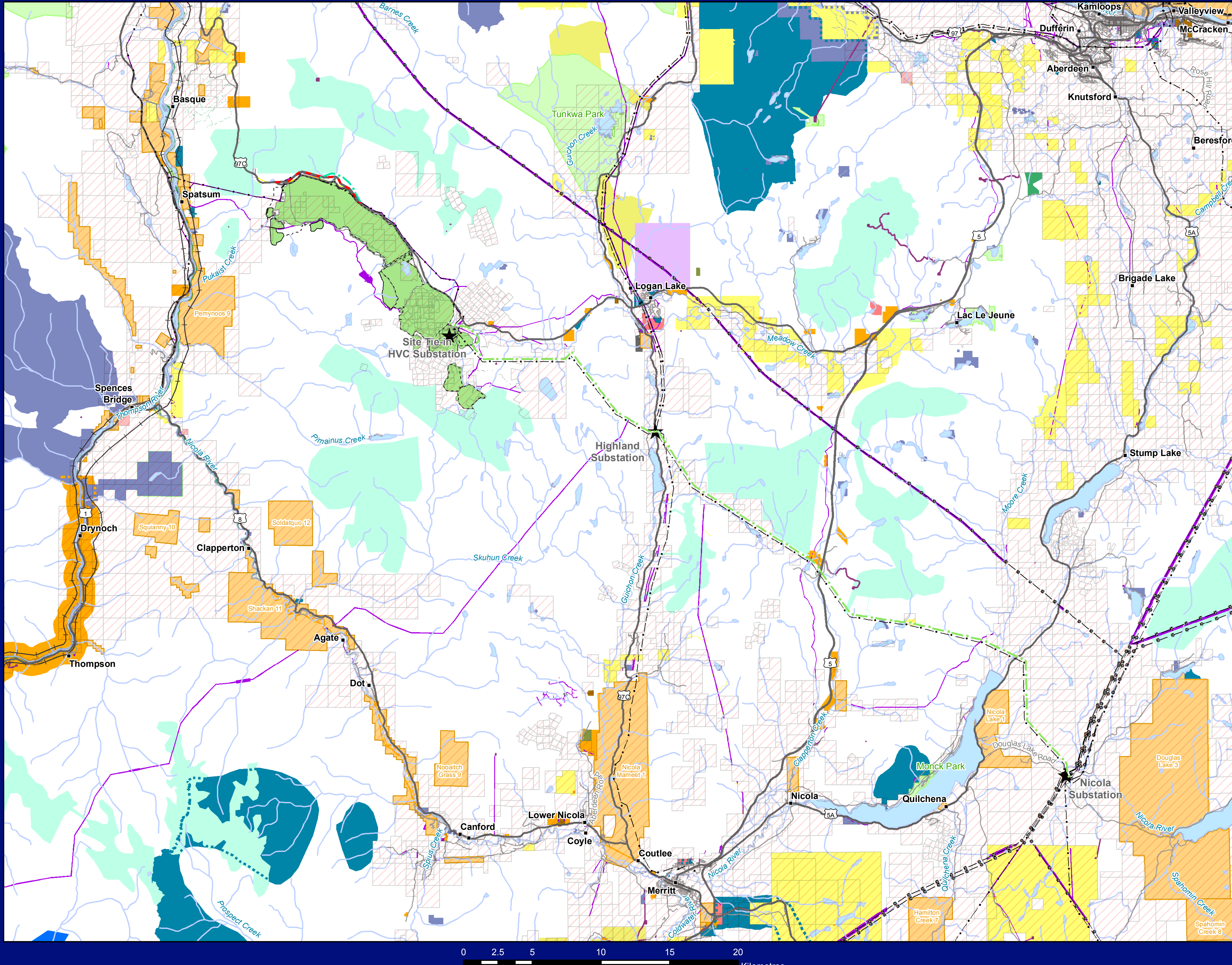
- Two Teck HVC Corporation.
- Seven BC Hydro.
- Three Fortis BC Inc.
- One SB Okanagan Holding (08) Corp.

Three Crown tenure applications:

- One Teck HVC Corporation.
- One SB Okanagan Holding (08) Corp.
- One Sunfield Energy Inc.

The majority of the Mine Site component of the Project is in the District Municipality of Logan Lake and in the General Resource Management Zone defined under the Kamloops Land and Resource Management Plan (LRMP), within which mineral development is identified as an allowable land use. The Kamloops LRMP includes objectives and strategies for mineral exploration and development, including: encouraging new mineral development that provides for local employment and investment; and maintaining or enhancing land access for mineral exploration and development. The Kamloops LRMP specifically identifies Highland Valley Copper as a large producing metal mine in the region.

The legal land descriptions and/or tenure numbers of the lands required for the mine and power supply upgrade components of the Project are shown in Appendix F. Land tenure and land use are depicted in Figure 5-10 and Figure 5-11. Land use and traditional land use are further described in Sections 6.5.2 and 6.5.3.



Legend

Base Data

- City, Town, Village, or District Municipality
- Highway
- Road
- Railway
- Transmission Line: <500kV
- Transmission Line: 500kV
- Crown Tenure Right of Way (Utility)
- Watercourse
- Waterbody
- First Nations Reserve
- Park, Ecological Reserve, or Protected Area
- Fee Simple

Project Data

- Proposed Power Supply Upgrade Alignment
- Powerline Realignment
- Road Realignment
- Proposed Project Area

Existing Crown Tenure — Tenure Purpose:

- Agriculture
- All Season Resort
- Alpine Skiing
- Aquaculture
- Commercial
- Commercial Recreation
- Communication
- Community
- Energy Production
- Environment, Conservation, Recreation
- First Nations
- Industrial
- Institutional
- Miscellaneous Land Uses
- Ocean Energy
- Quarrying
- Residential
- Solar Power
- Waterpower
- Windpower

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Logan Lake, BC, Canada

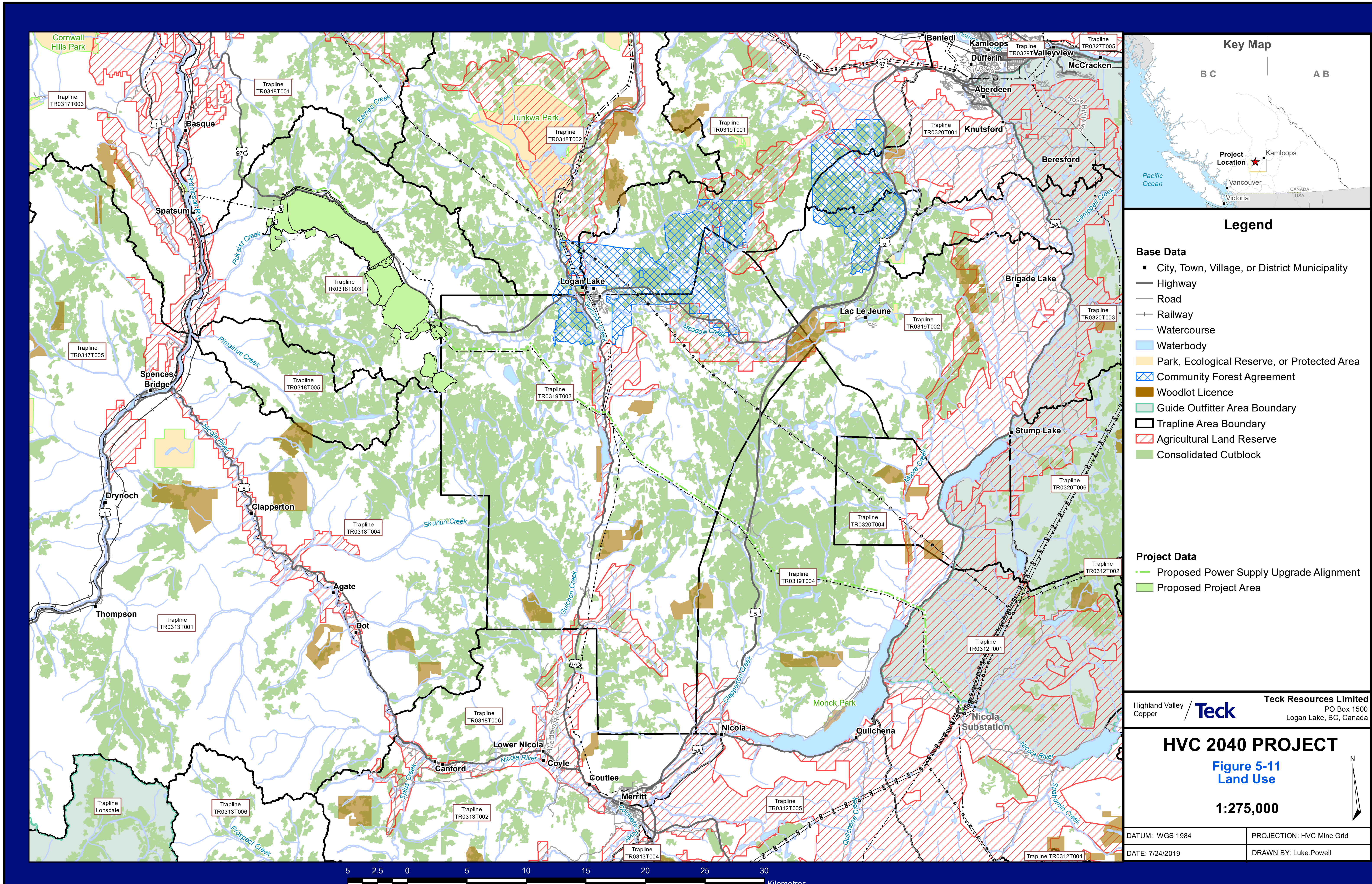
HVC 2040 PROJECT

Figure 5-10
Land Tenure

1:270,000

N

DATUM: WGS 1984	PROJECTION: HVC Mine Grid
DATE: 8/1/2019	DRAWN BY: Andy.Pettersson


Key Map
B C
A B
Project Location
Kamloops
Vancouver
Victoria
Pacific Ocean
CANADA
USA
Legend
Base Data
City, Town, Village, or District Municipality
Highway
Road
Railway
Watercourse
Waterbody
Park, Ecological Reserve, or Protected Area
Community Forest Agreement
Woodlot Licence
Guide Outfitter Area Boundary
Trapline Area Boundary
Agricultural Land Reserve
Consolidated Cutblock
Project Data
Proposed Power Supply Upgrade Alignment
Proposed Project Area
Highland Valley Copper
Teck
Teck Resources Limited
PO Box 1500
Logan Lake, BC, Canada
HVC 2040 PROJECT
Figure 5-11
Land Use
1:275,000
N
DATUM: WGS 1984
PROJECTION: HVC Mine Grid
DATE: 7/24/2019
DRAWN BY: Luke.Powell
5 2.5 0 5 10 15 20 25 30
Kilometres
Cornwall Hills Park
Tunkwa Park
Monck Park
Basque
Spatsum
Spences Bridge
Drynoch
Clapperton
Agate
Dot
Thompson
Canford
Lower Nicola
Coyle
Coutlee
Merritt
Nicola
Quilchena
Nicola Substation
Logan Lake
Lac Le Jeune
Brigade Lake
Stump Lake
Benledi
Kamloops
Dufferin
Valleyview
McCracken
Aberdeen
Knutsford
Beresford
Thompson River
Nicola River
Pukaist Creek
Pimainus Creek
Skuhun Creek
Guichon Creek
Meadow Creek
Moore Creek
Clapperton Creek
Quilchena Creek
Spius Creek
Prospect Creek
Campbell Creek
Barnes Creek
Trapline TR0317T003
Trapline TR0318T001
Trapline TR0318T002
Trapline TR0319T001
Trapline TR0320T001
Trapline TR0327T005
Trapline TR0329T
Trapline TR0318T003
Trapline TR0317T005
Trapline TR0318T005
Trapline TR0319T003
Trapline TR0319T002
Trapline TR0320T003
Trapline TR0320T006
Trapline TR0320T004
Trapline TR0318T004
Trapline TR0319T004
Trapline TR0312T002
Trapline TR0312T001
Trapline TR0313T001
Trapline TR0318T006
Trapline Lonsdale
Trapline TR0313T006
Trapline TR0313T002
Trapline TR0312T005
Trapline TR0313T004
Trapline TR0312T004

6 Existing Conditions

This chapter describes the existing biophysical and human and socio-economic conditions for the Project, including the identification of sensitive or vulnerable values. The information in the following sections is summarized from existing data and reports, including monitoring reports and previous regulatory applications; a list of these information sources are compiled in Section 10. Recently collected information supplements the historical dataset to inform HVC's understanding of baseline conditions.

The existing conditions relevant to the mine and power supply upgrade components of the Project are described separately in the following sections. The mine component includes all Project infrastructure except for the power supply upgrade component, which would initiate at the Nicola Substation and terminate at the HVC Mine Site (see Figure 5-4). Baseline conditions at the mine component are well understood; baseline data collection along the route for the power supply upgrade component is ongoing.

6.1 Geology

6.1.1 Mine Component

Detailed descriptions of the geology of the HVC Mine Site property are available from several sources including *Lornex in Porphyry Deposits of the Canadian Cordillera* (Waldner et al. 1976), *Highland Valley Porphyry Copper Deposits Near Kamloops, British Columbia: A Review and Update with Emphasis on the Valley Deposit* (Casselman et al. 1995), and *Geology and Ore Deposits of the Highland Valley Camp* (Tsang and Sanford 1985). The following sections present a summary of these detailed works as they relate to the Highland Valley area, as well as a summary of deposit geology and resource characteristics specific to the mine component.

6.1.1.1 Overview of Geology of the Highland Valley

The regional surficial geology near the HVC Mine Site exhibits the effects of glacial activity. At least two periods of glacial advance and retreat have been mapped (Fulton 1975); during the most recent advance, the regional ice movement was southward. As the retreat progressed, the remaining ice was limited to major valleys. Further from the regional centre, as the ice further thinned, it may have become stagnant with limited tongues on the valley floors. The resulting late glacial period lakes filled many of the local valleys, resulting in thick deposits of glacio-lacustrine silts. The east half of the Highland Valley was a lake environment prior to the last glacial advance.

The last period of glaciation may not have eroded a significant amount of material from Highland Valley as the predominant direction of glacial movement was transverse to the valley alignment. Much of the surficial geology is the result of late glacial history. During the later stages of deglaciation, fine-grained material produced during melting of the glacier resulted in till-like deposits on the valley floor. As the glacier tongue retreated from the valley, periodic cessation of retreat or small re-advances probably resulted in moraine-like deposits. At the same time, during ice melting significant quantities of water were flowing along the ice and ice margins. Meltwater channels mark many of the valley slopes and run parallel to contour lines. The placement of glacial tongue deposits, particularly end moraine features within Highland Valley, indicate that the last glacial period was similar in extent to previous glacial advance.

The regional bedrock setting is dominated by the Guichon Creek Batholith which intrudes Cache Creek volcanic and sedimentary rocks of Mississippian to Permian age and Nicola volcanic and sedimentary rock of Karnian age. The batholith is a composited, concentrically zoned calc-alkaline, I-type intrusion that has been emplaced and has metamorphosed the country rock of the Nicola Group. The intrusive is approximately

30 km wide and 65 km long. Gravity surveys indicate that the intrusive is a flattened, funnel-shaped body whose root zone is found under Highland Valley. The surrounding country rock consists of Cache Creek Group (Permian) and Nicola Group (Late Triassic) sedimentary and volcanic rocks. North- and northwest-trending fault systems that transect the batholith are intimately related to the mineralization in the area. Sedimentary and volcanic rocks of the Eocene Kamloops group cap the plateau to the north of the valley and have been identified at several locations in and adjacent to the valley.

The copper found in the Highland Valley is contained within porphyritic copper deposits within the Bethlehem and Bethsaida phases of the Guichon Creek Batholith. This granitic intrusion dates to 200 million years ago and is a concentrically zoned calcalkaline pluton.

6.1.1.2 Deposit Geology and Resource Characteristics

6.1.1.2.1 Valley Deposit

The Valley deposit is found at the intersection of the northerly striking Lornex fault and the northwesterly to westerly striking Highland Valley Fault. The deposit is dominated by silicic and potassic alteration in its central core. This alteration zone is encircled by a halo of phyllic and argillic alteration, and this in turn has a fringing propylitic alteration halo. The copper mineralization is predominantly associated with the phyllic alteration zone but does extend into the silicic, potassic, and argillic zones.

6.1.1.2.2 Lornex Deposit

The Lornex deposit occurs in the Skeena quartz diorite, a weakly porphyritic, medium- to coarse-grained intrusive. An early quartz porphyry dike cuts north to northwesterly into the southern end of the Lornex deposit area. This was emplaced prior to the mineralizing phase. Ore rock in the Lornex mining area is a part of the Skeena quartz diorite and has been subject to geochemical alteration throughout the area's geologic history.

6.1.1.2.3 Highmont Deposit

The Highmont property contains several low-grade mineralized zones in Skeena quartz diorite. The Gnawed Mountain porphyry dike, trending west-north-westerly, separates the two ore zones already actively mined (West Pit and East Pit) from the Highmont South mineralization currently being investigated with diamond drilling. This dike consists of biotite quartz feldspar porphyry that is derived from the Bethsaida phase quartz porphyry (Tsang and Sanford 1985).

6.2 Climate and Air Quality

6.2.1 Mine Component

The mine component is in an area of continental climate, with semi-arid conditions in the valleys. The prevailing wind direction in the Highland Valley is from west to east, particularly in the summer months. Moist westerlies lose their water vapour before they reach the mine component, as they rise and pass over the Coast Mountains, which creates some of the driest areas in southern Canada. Valley bottoms are arid, with potential evaporation substantially higher than precipitation. The highlands receive more precipitation than valley bottoms due to the orographic effects.

Precipitation occurs at the mine site as rain or snow, depending on the season. Summer rainfall is often a result of convective storms. Winter snowfall is relatively light and dry, with accumulation depth varying with topography (varied relief with multiple well-defined watersheds) and ground cover. Melt typically begins in mid-April, initiating freshet (Teck 2017c).

In 2016, a climate study was completed for the HVC Mine Site property to compile a single point of statistical climate data to be used as a reference point and applied across all aspects of the HVC Mine Site. It provides results for wet and dry precipitation years and for high and low evaporation years (Teck 2017c).

Due to the distance between the mine site and the closest community (Logan Lake, approximately 17 km to the east), air quality at the mine component is largely a function of emissions associated with operation of the mine; however, significant wildfires in 2017 and 2018 have also contributed to historical air quality conditions. These emissions include particulate matter (PM), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), and greenhouse gases (GHGs). PM emissions result from activities such as drilling, blasting, and material handling. SO_2 and NO_2 emissions and GHGs arise from combustion of fossil fuels in vehicles and equipment, and diesel generators when in use.

HVC holds a waste discharge permit (Permit PA-1557) issued by ENV under the *Environmental Management Act* for air emissions from existing operations. As per the conditions of this permit, HVC conducts year-round ambient air quality and meteorological monitoring for dustfall, total suspended particulates (TSP), PM_{10}, $PM_{2.5}$, SO_2, and NO_2.

Fugitive dust emissions have been monitored since 2013 when the L-L Dam Dust Management and Mitigation Plan was implemented. In 2015, HVC voluntarily expanded its air quality monitoring program to include the entire HVC Mine Site and background locations.

Expansion of monitoring activities included the introduction of dustfall monitoring locations, a Passive Air Sampling System for monitoring of NO_2 and SO_x, and ambient air quality monitoring for PM using Met-One Environmental Beta Attenuation Monitors (EBAMs). In late 2016, HVC's Site-Wide Dust Management Plan was updated to incorporate the L-L Dam Dust Management Plan. Apart from this merger, no major changes to the Site-Wide Dust Management Plan have occurred (Teck 2017b). The Site-Wide Dust Management Plan is applied to current mine operations.

The 2017 Assessment Report for Permit PA-1557 (Teck 2017c) indicates that dustfall at the HVC Mine Site ranged from <0.1 $mg/dm^2/day$ to 114 $mg/dm^2/day$. This is an increase from the 2016 dustfall levels, which ranged from <0.1 $mg/dm^2/day$ to 34 $mg/dm^2/day$.

In 2017, PM was monitored at five stations: three on-site (Shula Flats L-L Dam Stations 1 and 3) and two off-site (Rey Creek Ranch and Logan Lake). Mean values recorded for TSP were below daily BC objectives at Rey Creek Ranch; however, not enough data was available for Shula Flats and L-L Dam Stations to compare against BC objectives. In 2017, the Shula Flats, Rey Creek Ranch, and L-L Dam Stations had 17, 12, 24, and 1 daily mean exceedances of TSP, respectively, compared to BC objectives. This was likely due to factors other than HVC activities such as smoke and wildfires.

Of 306 valid daily PM_{10} data collected in 2017 at Ray Creek Ranch, 22 were above the BC objectives, most likely due to the widespread smoke and wildfires during that sampling period.

In 2017, there were 224 and 333 records of valid daily $PM_{2.5}$ data from the Logan Lake and Rey Creek Ranch background monitoring stations. Not enough data were available from the Logan Lake station to directly compare against the daily or annual $PM_{2.5}$ BC objectives or federal standards.

The annual 98th percentile of daily average $PM_{2.5}$ concentrations recorded at the Rey Creek Ranch station was above the 24-hour BC objective and federal standards. The annual average for 2017 was also above the annual BC objective and federal standards. These exceedances were due to elevated levels of $PM_{2.5}$ recorded at the station during the months of July, August, and September that were likely caused by the widespread smoke from wildfires in BC. Elevated levels of $PM_{2.5}$ were also recorded at the nearby Kamloops Aberdeen air quality station during these periods.

NO_2 and SO_2 are monitored at passive sampling stations located above the Lornex Pit (dustfall station site Lornex 5 and Rey Creek baseline site). In 2017, monthly NO_2 and SO_2 concentrations were below the annual BC air quality objective (Teck 2017c).

6.3 Water Resources and Aquatic Environment

6.3.1 Hydrogeology (Groundwater Flow and Quality)

6.3.1.1 Mine Component

Hydrostratigraphic units within the Project area consist of a series of sand and gravel aquifers separated by fine-grained glaciolacustrine sediments overlain by bedrock. The overburden aquifers are identified as the main aquifer, alluvial fan deposits, and the basal aquifer. The main aquifer is up to 60 m thick in the centre of the valley and is unconfined in the northwestern portion of the Project area (Pukaist Creek) and confined by glacial till in the southeastern portion of the Project area (Witches Brook). Three alluvial fans have been identified in the Valley Pit area, which represent discontinuous deposits that are hydraulically connected with the main aquifer. The basal aquifer, located in the southwestern portion of the Project area (Witches Brook), overlies bedrock and is separated from the main aquifer by glaciolacustrine deposits.

Groundwater flow in the Project area is strongly influenced by topography with localized influences on groundwater flow associated with mine infrastructure (e.g., Highland TSF, historical pits that have been allowed to flood) and dewatering for mine operations. Groundwater flow originates from topographically high areas associated with the valley walls to the centre of the valley. A groundwater flow divide exists in the central portion of the Highland TSF, which results in groundwater flow to the northwest along the Pukaist Creek valley and to the south, southeast along the Witches Brook valley. Localized drawdown (reduction of the pressure head in an aquifer as the result of the withdrawal of free water) is observed in areas associated with dewatering such as the Valley Pit, Shula Flats, and Highmont Well Fields.

Overall groundwater quality in the Project area meets the BC Water Quality Guidelines for drinking water. However, elevated concentrations of sulphate are measured in groundwater seepage from the Highland TSF area where a Sulphate Adaptive Management Plan (SAMP) has been developed. This plan was developed by HVC and accepted by MEMPR in 2012; HVC is actively implementing strategies to mitigate impacts to groundwater that feed Pukaist Springs.

HVC currently monitors continuous groundwater levels at 38 monitoring wells and groundwater quality and manual levels at 47 monitoring wells on a quarterly basis. The existing program is based on a baseline groundwater monitoring review and an updated program completed in 2015.

6.3.2 Hydrology

6.3.2.1 Mine Component

The mine component is within the Dupuis Creek, Inkikuh Creek, Pimainus Creek, Pukaist Creek, Skuhost Creek and Witches Brook watersheds, with the majority falling within the Pukaist and Witches Brook watersheds.

Surface water resources consist of water catchments, surface impoundments, piping, and conveyance channels. HVC operates diversions from several sources within the mine property to provide make-up water or to divert water and re-establish historic drainage.

There are two main directions of flow from the HVC Mine Site, which are separated by a natural divide east of the Highland H-H Dam. Flows to the west drain into the Thompson River via Pukaist Creek and flows to the east drain into Guichon Creek via Witches Brook. Guichon Creek flows south and joins the Nicola River at Lower Nicola, west of the town of Merritt. South of the HVC Mine Site, the Nicola River flows west and joins the Thompson River at Spences Bridge.

Figure 4-5 presents local creeks on the HVC Mine Site property.

Several creeks enter the HVC Mine Site property and are partially diverted to avoid contact with mine infrastructure (Trojan, Nicholson, Ford, Michael, Mann, and Woods) or captured to provide process water (Bethsaida, Tait, Oram, Boyes, Forgotten, Burr, Eastside, and Winslow Creeks).

For the purposes of baseline monitoring in support of the Project, between November 2017 and March 2018, hydrometric monitoring was conducted at 24 sites in and around the mine area. The 24 sites included 10 continuous monitoring sites installed in 2015 and 14 manual measurement sites.

6.3.3 Surface Water Quality

6.3.3.1 Mine Component

Historic surface water quality baseline data from streams and lakes near the HVC Mine Site began in the 1970s. Currently, surface water quality is monitored at more than 50 sites in and around the HVC Mine Site for mine effluent permit PE-376 compliance, aquatic effects monitoring, and/or Project baseline collection.

Sample sites for the existing PE-376 permit are in tailings ponds, monitoring wells, seepage reclaim ponds, open pits, diversion channels and the receiving environment. Effluent is currently discharged under permit to Trojan Creek at End of Diversion, Highmont South Reclaim S-4, Highmont S9 Pond, and Bose Lake (Saddle) Seepage. HVC retains authorization under PE-376 to discharge from Highmont S-5 Discharge @ Pipe (SRB Treatment Wetland) and Highmont S-8 Discharge (SRB Treatment Wetland), which are not currently in operation; all seepage water is maintained in HVC's water management infrastructure. Discharges may occur at the Highmont TSF spillway only during high flow events when discharges meet permit requirements for release. The Highmont Creek Diversion may be released to the environment providing permit requirements are met. Figure 6-1 shows the location of permitted discharge sites.

Sites for the aquatic effects monitoring program and Project baseline data collection are generally in streams and lakes upstream and downstream of the Project, and in reference sites in unaffected watersheds. There are multiple sites that act as both permit and baseline sample sites. Baseline water quality data at potentially affected sites in streams and lakes have been collected since 2015, including collection of five samples in thirty days during high and low flow periods. HVC continues to sample baseline surface water quality sites though may consider changes to the sampling program in the future. Surface water quality data is available for the Thompson River from the ENV.

Water samples are analyzed in the field for pH, conductivity, temperature, oxidation reduction potential, turbidity and dissolved oxygen and in the lab for dissolved and total metals, and nutrient and ion concentrations. Ultra-low detection sampling was conducted in 2015 to inform the Project sampling program design.

Surface water quality samples are collected from the following watercourses:

- Pukaist Creek (downstream of the L-L Dam and Highland TSF);
- Woods Creek (upstream of the Highland TSF);
- Boyes Creek (reference stream);

- Coldstream Creek (reference stream);
- Trojan Creek (upstream and downstream of the Bethlehem pits and TSF).
- Highmont Creek (upstream and downstream of the Highmont Pits and waste rock dumps).
- Witches Brook (downstream of the Highmont and Bethlehem pits and Highmont TSF);
- Guichon Creek (upstream and downstream of the Witches Brook confluence);
- Dupuis Creek (downstream of the Highmont TSF);
- Inkikuh Creek (reference stream);
- Pimainus Creek (reference stream);
- Roscoe Creek (reference stream);
- Skuhun Creek;
- Skuhost Creek;
- Bose Lake (downstream of the Bethlehem TSF);
- Billy Lake (downstream of the Highmont TSF).
- Mamit Lake; and
- Calling Lake (for benthic invertebrate assemblage data only).

Upstream of the HVC Mine Site, before surface water is affected by the site, water quality in streams is naturally high in uranium, aluminum, copper, iron, and zinc, and concentrations routinely exceed BC Water Quality Guidelines for protection of aquatic life. Sulphate concentrations in Pukaist Creek downstream of the L-L Dam have been increasing since 1985 and currently exceed BC Water Quality Guidelines for drinking water. HVC is currently implementing the SAMP to mitigate elevated sulphate concentrations in Pukaist Creek.

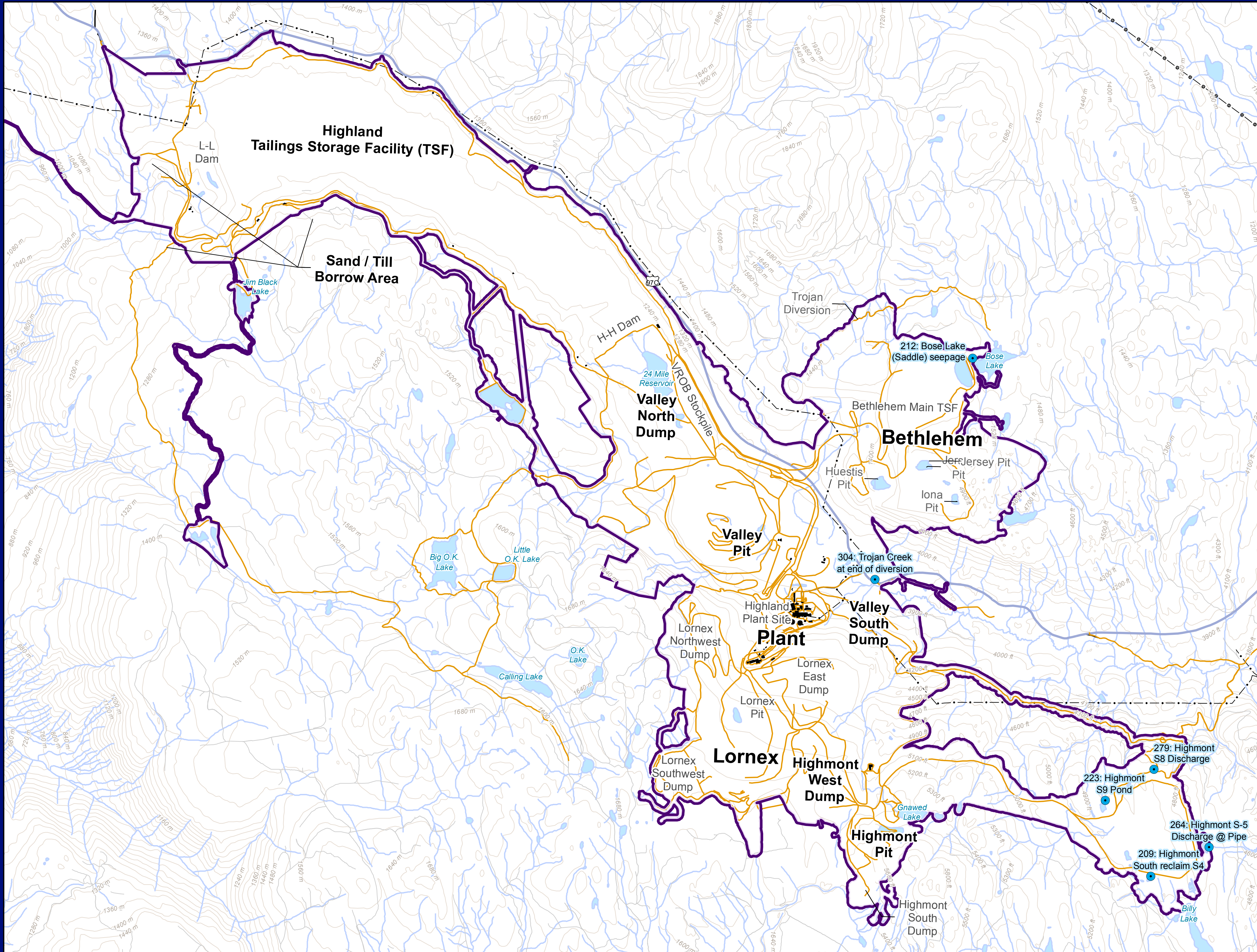
6.3.4 Fish and Fish Habitat

6.3.4.1 Mine Component

The mine component of the Project is located in the historical headwaters of the Pukaist Creek and Witches Brook watersheds. Headwater tributaries of Pukaist Creek currently flow into the Highland TSF. These include Woods Creek, Boyes Creek, Burr Creek, Forgotten Creek, and seven unnamed tributaries. Upstream of the TSF, these tributaries are steep (>5%) with rocky substrates. Except for Woods Creek, most of these tributaries are ephemeral and non-fish-bearing.

Downstream of the Highland TSF, Pukaist Creek is divided into upper and lower reaches by an impassable waterfall. Habitat upstream of the waterfall provides spawning, rearing, and overwintering habitat for an isolated rainbow trout (*Oncorhynchus mykiss*) population. Habitat downstream of the waterfall provides spawning, rearing, and overwintering habitat for rainbow trout and is also accessible to other fish species present in the Thompson River, including Pacific salmonids and steelhead (anadromous rainbow trout).

Rainbow trout is the only fish species that has been captured in streams and lakes near the Project. Isolated, self-sustaining populations exist in Pukaist Creek upstream of the waterfall, in Highmont Creek upstream of the diversion pipe, and in Woods Creek, a fish-bearing tributary of the Highland TSF. Resident rainbow trout are also present in Witches Brook and Skuhun, Skuhost, Inkikuh, and Pimainus creeks.



Legend

Base Data

- Highway 97C
- Road
- Resource Road
- Transmission Line: <500kV
- Topographic Contour
- Watercourse
- Waterbody

Highland Valley Copper

- Water Discharge Location
- Operational Road
- Building
- Permitted Mine Area

Highland Valley Copper / Teck

Teck Resources Limited
PO Box 1500
Logan Lake, BC, Canada

HVC 2040 PROJECT

Figure 6-1
Permitted Discharge Locations

1:75,000

N

DATUM: WGS 1984	PROJECTION: HVC Mine Grid
DATE: 8/2/2019	DRAWN BY: Andy.Pettersson

2 1 0 2 4 6 Kilometres

Rainbow trout and coho salmon (*O. kisutch*) are historically known to occur in Guichon Creek upstream of Mamit Lake. However, coho salmon have not been captured upstream of Mamit Lake since 1979. Rainbow trout, coho salmon, chinook salmon (*O. tshawytscha*), steelhead, mountain whitefish (*Prosopium williamsoni*), longnose sucker (*Catostomus catostomus*), largescale sucker (*C. macrocheilus*), northern pikeminnow (*Ptychocheilus oregonensis*), peamouth chub (*Mylocheilus caurinus*), and redside shiner (*Richardsonius balteatus*) are known to occur in Guichon Creek downstream of Mamit Lake. Mamit Lake itself, which is approximately 23 km from the mine, is known to support populations of rainbow trout, burbot (*Lota lota*), northern pikeminnow, largescale sucker, longnose sucker, and peamouth chub.

Rainbow trout is the only fish species known to occur in Skuhun Creek upstream of its confluence with Chataway Creek. Rainbow trout, coho salmon, Chinook salmon, steelhead, longnose sucker, longnose dace, and bull trout are known to occur in Skuhun Creek between the Chataway Creek confluence and its mouth at the Nicola River, a reach approximately 11 km downstream from the mine.

Highmont Creek is a headwater tributary of Witches Brook that supports a self-sustaining rainbow trout population. Riffles and runs provide spawning and rearing habitat and pools with sufficient depth and cover to provide overwintering habitat. Flows from Highmont Creek are diverted to the mill for processing ore. During extreme high flows, when water quality meets permit guidelines, Highmont Creek discharges to Witches Brook.

Habitat in Upper Witches Brook immediately downstream of the Highmont Creek confluence consists of low gradient, braided channels with generally fine substrates and thick overhanging riparian vegetation. Further downstream, flow is confined to a single mainstem channel with higher gradient and regular riffle/run and run/pool sequences. In mid-summer, a portion of the Witches Brook mainstem flow goes to ground, effectively restricting fish movements in the creek. Rainbow trout are the only fish species known to inhabit Witches Brook.

Habitat in Upper Skuhost and Skuhun creeks is comprised of low gradient (<2%) runs and small pools with fine substrates. Spawning habitat for rainbow trout is limited and portions of the channel become dry in summer. An expansive wetland area forms a common headwater of Skuhost and Skuhun Creeks.

Baseline fish and fish habitat data collection for the Project began in 2015 and have continued from 2016 through 2018. The studies include reconnaissance-level and detailed fish presence and habitat studies, rainbow trout tissue analyses, benthic invertebrate and periphyton community composition, benthic invertebrate tissue analyses, and sediment chemistry in various watercourses that would be affected by the Project.

Periphyton and benthic macro-invertebrates were sampled because they represent primary and secondary producers, respectively, in streams and lakes and are prey items for fish. They provide a linkage to fish due to any potential change in density, community composition, or metal burden caused by changes in habitat, flow, or water quality due to the Project. Owing to their sensitivity to environmental stress, benthic macro-invertebrates and periphyton are also useful for monitoring long-term changes in water quality and habitat. Sediment chemistry was sampled because sediment can be a repository or contributor of metals to surface waters.

6.3.4.2 Power Supply Upgrade Component

The alignment of the power supply upgrade component would parallel an existing transmission line right-of-way that runs through the following watersheds: Witches Brook, Dupuis Creek, Guichon Creek, Rey Creek, Clapperton Creek, Mabel Creek, Moore Creek, Stumplake Creek, Nicola River, and Howse Creek. Fish information for Guichon Creek and Witches Brook is provided in Section 6.3.4.1. There are known observations of rainbow trout from multiple watercourses near or intersected by the existing transmission line (e.g., Highmont Creek, Guichon Creek, Rey Creek). Baseline fish and fish habitat data collection for the power supply upgrade component began in 2018 and will continue into 2019.

6.4 Terrestrial Environment

Baseline data on the terrestrial environment for the mine component of the Project was collected in 2017 and 2018. Baseline data collection for the power supply upgrade component began in 2018 and is ongoing.

6.4.1 Biogeoclimatic Units

6.4.1.1 Mine Component

The mine component of the Project intersects three Biogeoclimatic Ecosystem Classification (BEC) variants: Interior Douglas Fir Thompson Dry Cool (IDFdk1), Interior Douglas Fir Thompson Very Dry Hot (IDFxh2), and Montane Spruce South Thompson Very Dry Cool (MSxk2). These BEC variants are described in the following sections. Unless otherwise noted, the descriptions are based on Lloyd et al. (1990).

6.4.1.1.1 Interior Douglas Fir Thompson Dry Cool (IDFdk1)

The IDF zone dominates the low to mid-elevation landscape of the southern Interior Plateau and southern Rocky Mountain Trench. The IDF has a continental climate characterized by warm, dry summers, a relatively long growing season in which moisture deficits are common, and cool winters with low to moderate snowfall. The IDFdk1 variant occurs at lower elevations between 1,130 and 1,460 m. Soils are predominantly Eutric or Dystric Brunisols and Gray Luvisols.

Mature climax stands in the IDFdk1 consist of Douglas fir (*Pseudotsuga menziesii*), with lodgepole pine (*Pinus contorta*) as a seral species. The herb-dominated understory has a high cover of pinegrass (*Calamagrostis rubescens*), with some birch-leaved spirea (*Spirea betulifolia*), soopolallie (*Shepherdia canadensis*), twinflower (*Linnaea borealis*), and kinnikinnick (*Arctostaphylos uva-ursi*). The moss layer is poorly represented.

6.4.1.1.2 Interior Douglas Fir Thompson Very Dry Hot (IDFxh2)

The IDFxh is the warmest and driest forested subzone in the IDF zone, with the northern IDFxh2 cooler and with a shorter growing season than the southern IDFxh1 variant. The IDFxh2 generally occurs above the PPxh2 and below the IDFdk1 at an elevation range of 850 to 1130 m. Common soils include Eutric, Melanic, and Dystric Brunisols, and Gray Luvisols.

In the IDFxh2, Douglas Fir forms climax stands, with ponderosa pine (*Pinus ponderosa*) occurring in seral stands. The open, pinegrass-dominated understory is species poor, but common snowberry (*Symphoricarpos albus*), birch-leaved spirea, saskatoon (*Amelanchier alnifolia*), tall Oregon-grape (*Mahonia aquifolium*), red-stemmed feathermoss (*Pleurozium schreberi*), and electrified cat's-tail moss (*Rhytidiadelphus triquetrus*) are consistently present.

6.4.1.1.3 Montane Spruce South Thompson Very Dry Cool (MSxk2)

The MS zone occurs at middle elevations of the southern Interior Plateau, the lee side of the Coast and Cascade Mountains, and the southern Rocky Mountain Trench. It occupies an elevational band above the IDF, and below the Engelmann Spruce–Subalpine Fir Zone with climate, vegetation, and soil characteristics intermediate between these two zones. The MS has a cool, continental climate characterized by cold winters, moderate snowfall, and moderately short, warm summers. The MSxk2 occupies middle elevations at the boundary between the South Thompson Uplands and North Thompson Uplands ecosections (Ministry of Forests and Range 2005a). This variant typically occurs above the IDFdk1 at elevations from 1,400 to 1,800 m, depending on aspect (Ministry of Forests and Range 2005). Soils are Dystric Brunisols or Eutric Brunisols (Ministry of Forests and Range 2005a).

The MSxk2 is characterized by mature seral stands of lodgepole pine, primarily due to the high frequency of forest fires (Ministry of Forests and Range 2005a). Zonal sites in the MSxk2 are dominated by lodgepole pine, with minor amounts of regenerating Douglas fir, Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*). Typically, the shrub layer is poorly developed, and the herb layer is well-developed (Ministry of Forests and Range 2005a). Common species include Utah honeysuckle (*Lonicera utahensis*), soopolallie, birch-leaved spirea, Arctic lupine (*Lupinus sericeus*), heart-leaved arnica (*Arnica cordifolia*), twinflower, one-sided wintergreen (*Orthilia secunda*), showy aster (*Eurybia conspicua*), and bunchberry (*Cornus candadensis*) (Ministry of Forests and Range 2005a). The moss layer is dominated by red-stemmed feathermoss (Ministry of Forests and Range 2005a).

6.4.1.2 Power Supply Upgrade Component

The power supply upgrade component of the Project would intersect four BEC variants: IDFdk1, IDFxh2, Ponderosa Pine Thompson Very Dry Hot (PPxh2), and Bunchgrass Nicola Very Dry Warm (BGxw1). The IDFdk1 and IDFxh2 are described in Section 6.4.1.1; the PPxh2 and BGxw1 are described in the following sections; all are based on Lloyd et al. (1990), unless noted otherwise.

6.4.1.2.1 Ponderosa Pine Thompson Very Dry Hot (PPxh2)

The PP zone occurs at lower elevations in the very dry valleys of the southern Interior Plateau and in the Southern Rocky Mountain Trench. The PP is the driest and, in the summer, the warmest forested zone in BC. Winters are cool, with low snowfall. The PPxh2 variant is found in valley bottoms and above the BG zone at elevations between 400 and 950 m. Soils are generally Orthic Brown and Elluviated Brown Chernozems.

Open climax stands in the PPxh2 contain ponderosa pine with minor components of Douglas fir, with a sparse shrub layer including rabbit-brush (*Chrysothamnus nauseous*) and Saskatoon. Bluebunch wheatgrass (*Pseudoroegneria spicata*) and rough fescue (*Festuca campestris*) dominate the well-developed herb layer, and numerous other herbs occur with a low cover. The moss layer is generally absent.

6.4.1.2.2 Bunchgrass Nicola Very Dry Warm (BGxw1)

The BG zone occurs at lower elevations in the very dry valleys of the southern Interior Plateau and is characterized by hot, dry summers, and moderately cold winters with little snowfall. Summer droughts and high temperatures result in the development of grassland vegetation. The BGxw1 occurs from elevations of 650 m to 1,050 m, depending on aspect (Ministry of Forests and Range 2005b). The BGxw is the coolest and wettest grassland BG subzone; but the BGxw1 is warmer and drier than the Alkali variant (BGxw2) found farther to the north (Ministry of Forests and Range 2005b). Soils are dominated by Dark Brown Chernozems and, less commonly, Brown Chernozems.

The BGxw1 is dominated by grassland ecosystems, although trees may be present on some sites (e.g., steep north aspects, rock outcrops; Ministry of Forests and Range 2005b). Zonal sites in the BGxw1 are characterized by bluebunch wheatgrass (*Pseudoroegneria spicata*), with minor amounts of junegrass (*Koeleria macrantha*), Sandberg's bluegrass (*Poa sandbergii*), prairie sagewort (*Artemisia frigida*), and common rabbit-brush (*Ericameria nauseosa*). The moss and lichen layer is moderately to poorly developed on relatively undisturbed sites (Ministry of Forests and Range 2005). Following disturbance, such as heavy grazing, bluebunch wheatgrass declines in cover, and other species increase in cover (e.g., Sandberg's bluegrass and big sagebrush (*A. tridentata*) (Ministry of Forests and Range 2005).

6.4.2 Soils

6.4.2.1 Mine Component

BC soil surveys have been conducted in and around the Project area (Young et al. 1992). Minnie and Abbott soil associations correlate with till deposits in the area. Minnie soils are associated with basal till deposits that are typically Orthic Gray Luvisols, well drained with moderately coarse textures. Abbott soils are less commonly mapped (associated with ablation till) and are Orthic Dystric Brunisols that are rapidly drained and can be excessively stony. Gisborne soils are degraded Eutric Brunisols associated with glaciofluvial deposits. They are noted as having very gravelly textures and well to rapid drainage. Along rivers and waterways, soils are classified as Frances soils that are Gleyed Cumulic Regosols resulting from sediment deposition during overbank flows. These soils are typically medium textured and stone-free with imperfect drainage. The wetland soil is Organic, classified as the Jack soil association, and occurs along floodplain areas and in discontinuous pockets along low-lying areas. Typic Mesisols are partially decomposed sedge derived materials that are over 2 m thick. Along steeper slopes where material has been moved by gravity, soils are classified as Clapperton soils described as well drained Orthic Dystric Brunisols with coarse to moderately coarse textured deposits that can be excessively stony.

Soils derived from glaciolacustrine deposits in Witches Brook are Orthic Brown and Dark Brown Chernozems and are termed the Lundbom and Laluwissen soil associations. These soils are generally quite fertile, consist of silt and clay, are stone-free, and are moderately well to well drained.

6.4.2.2 Power Supply Upgrade Component

Soils mapped along the power supply upgrade component alignment (Young et al. 1992) are similar to those identified at the mine component (see Section 6.4.2.1). Dominant soil associations mapped along the alignment sections are summarized below.

6.4.2.2.1 HVC Mine Site (Start of Witches Brook Watershed Boundary Area) East to Highway 97C

Between Witches Brook watershed boundary area adjacent to the HVC Mine Site east towards Highway 97C, degraded Eutric Brunisols of the Gisborne Association, and Orthic Dystric Brunisols of the Clapperton soil associations (Young et al. 1992) dominate the landscape. These soils are located along lower to middle elevation slopes. Gisborne soils are derived from glaciofluvial parent materials with discontinuous terraced topography. The soils are generally well to rapidly drained with gravelly, sandy loam textures. Seepage at the base of short slopes or emerging on terraced landforms from shedding can occur and have been noted to improve site productivity (Young et al. 1992). Clapperton soils are mapped along middle to upper elevations with moderately steep to very steep slope gradients (5 to 60%). Soils are well-drained with sandy loam to coarse sand textures and are generally excessively stony. They are associated with colluvial and colluvial fan deposits derived from granitic bedrock (Young et al. 1992).

Minnie and Abbott soil associations are commonly mapped along upper elevation, gently rolling and convex topography. Both soils are derived from till parent materials. Minnie soils are associated with undulating valley fill deposits and granitic bedrock. They commonly have gravelly sandy loam textures and are well drained. Most common soil types are Orthic Gray Luvisols (high clay percent) and are mapped on gradients ranging from 10% to 30%. Seepage is common along the base of slopes and in depressions. This soil type is similar to the Tunkwa soil association further east. Abbott soils are mapped along similar elevations on hillier, 10% to 60% gradients. The soils are derived specifically from ablation till deposits and granitic bedrock sources. Orthic Dystric Brunisols are the most common soil type with very gravelly sandy loam to coarse sand textures. Abbott soils can be excessively stony.

The middle to lower elevation topography leading to and along Highway 97C represents a broad glaciofluvial channel. Middle elevation, east facing slopes leading to Highway 97C are mapped as the Glossey Association. Similar to the Gisborne soils, Glossey soils are derived from glaciofluvial deposits overlying a variety of bedrock types, most commonly volcanics. Rolling slope gradients are typically less than 15%. The rapid to well drained, gravelly sandy loam textured Eurtirc Brunisols are typically degraded, indicating poor soil development conditions. The Gwenn soil association is located along the valley bottom (less than 10% slopes) where the alignment crosses the Highway 97C area. This soil type is commonly mapped as an Orthic Black Chernozem with silt loam textures. Vegetation along the soil unit is typically dominated by grass and shrub, representing a 'disclimax' due to fires and open grazing (Young et al.1992).

6.4.2.2.2 Highway 97C to Highway 5

The glaciofluvial derived Gwenn and Glossey soils are also mapped on west-facing lower slopes above Highway 97C. Colluvial deposits along middle elevation, west-facing slopes are mapped as Cavanaugh soils consisting of degraded Eutric Brunisols associated with underlying volcanic bedrock. These are similar to the lower elevation Clapperton soils to the west. Cavanaugh soils are found on 10% to 60% gradients and can be exceedingly stony.

Extensive areas along this alignment section have been mapped as the Tunkwa soil association derived from till deposits. These are similar to the western Minnie soils; however, the underlying bedrock is volcanic opposed to granitic. Tunkwa soils are commonly well drained Orthic Gray Luvisols on rolling, 5 to 30% slopes between 1,050 and 1,650 masl.

Trachyte soils are located further east along south-southeast facing slopes and are also associated with till deposits overlying volcanic bedrock. Textures are silty clay loam with well drained, Orthic Black Cherrnozmic soils on gentle slopes. Seepage can be common along the slope base, with vegetation along these mapped soil units dominated by grass and shrubs (fire and grazing effects), similar to Gwenn soils.

Gisborne soils derived from glaciofluvial deposits are mapped along middle to lower elevation, south facing slopes further east along the alignment. These glacifluvial derived soils are similar to partially terraced areas along the western portions of the alignment. The till resultant Abbot soils, as seen in the western alignment area, are mapped along the gently valley slopes immediately above Highway 5.

6.4.2.2.3 Highway 5 to Northern End of Nicola Lake

The Gisborne, Glossey, Abbott, and Clapperton soil associations are continuously mapped from Highway 5 to the northern end of Nicola Lake. Gisborne soils have also been mapped in small depressions along this alignment section.

Upper elevation, east facing slopes along the alignment immediately above Nicola Lake are mapped as the Conant soil association. These colluvial based soils are mapped on 3 to 30% gradients (run out deposits). Soils have very gravelly, sandy loam to coarse sand textures and are excessively stony. Volcanic or metamorphic bedrock commonly underlay the colluvial deposits. Eutric Brunisols are the most common soil types.

Soils derived from post glaciation fluvial parent materials associated with the Nicola Lake drainage system have been mapped as the Godey association. These Orthic Brown Chernozems are typically rapidly drained. Soils have loam textures, with increasing stoniness and gravels at depths. Godey soils can contain eolian veneer (less than 1 m) capping at variable depths.

The less extensive Courtney soil association is mapped along lower elevation, west-facing slopes above Nicola Lake. Soils are mapped as overlying volcanic bedrock, overlain by colluvial fans. Gradients are generally less than 15%. The sandy loam textured soils are slightly stony and well drained. Orthic Brown

Chernozems and Regosols are common soil types and can contain sand to silt textured eolian materials at the surface.

6.4.2.2.4 Northern End of Nicola Lake to Quilchena Power Station

The Trapp Lake soil association is the most common soil type mapped along this section of the alignment. Soils have been mapped along lower west-facing slopes above Nicola Lake, middle to upper elevation rolling plateau topography and the gentle southwest facing slopes above Nicola River. Soils are Orthic Dark Brown to lithic Eutric Brunisols overlying extensive till deposits and volcanic bedrock. Soils are mapped along gentle to strongly rolling topography. Textures are silty clay loam and soils are well drained. Seepage can be common at slope bases and depressions where site productivity can improve, however salinity commonly increases (Young et al. 1992). Vegetation is typically grass and shrub dominated.

Tullee soils are mapped along the upper elevation rolling plateau area between 750 and 1,050 masl. Dominant soil types are Orthic Black Chernozems with silty clay loam textures derived from the underlying till deposits. As with Trapp Lake soils, these are well drained with seepage common in low-lying areas.

Soils mapped along the Nicola River crossing are imperfectly drained Gleyed Cumulic Regosols of the Frances association. Soils are derived from modern fluvial deposits and are generally stone-free with sandy to silt loam textures.

The Glimpse soil association have been mapped on gently rolling terrain around the power station area. The glaciofluvial parent materials and soils are mapped between 750 and 1,050 masl. Orthic Dark Brown Brunisols and Regosols are the most common soil types. Textures are generally sand to sandy loam. Soils are typically moderately to very stony and are well to rapidly drained.

6.4.3 Vegetation and Ecosystems

6.4.3.1 Mine Component

The general vegetation characteristics of the mine component of the Project are described in Section 6.4.1.1. This section focuses on plant species and ecosystems of management concern and invasive plants.

There is a historical occurrence record of silvery orache (*Atriplex argentea var. argentea*; red-listed provincially) at the western extent of the mine component of the Project (BC CDC 2018). Ecosystem mapping and baseline rare plant surveys are being completed for the mine component. There are multiple ecological communities of conservation concern that may overlap with the mine component: 21 in the IDFdk1, 16 in the IDFxh2, and 17 in the MSxk2.

There are 106 known occurrence records of invasive plant species within the mine component area, located along the east edge of the proposed dump, pit, and TSF areas, and concentrated at the west extent of the TSF (MFLNRORD 2018a). Most of the records are for spotted knapweed (Centaurea stoebe ssp. micranthos), with some records of scentless chamomile (*Tripleurospermum inodorum*), sulphur cinquefoil (*Potentilla recta*), common hound's-tongue (*Cynoglossum officinale*), diffuse knapweed (*Centaurea diffusa*), Canada thistle (*Cirsium arvense*), blueweed (Echium vulgare), common tansy (*Tanacetum vulgare*) and bull thistle (*C. vulgare*) (MFLNRORD 2018a). HVC actively manages invasive plants on site and maintains occurrence and treatment records that are reported in the annual reclamation report. Preventive measures to control weeds include seeding disturbed areas as well as road and pipeline rights-of-way. A seed mix that limits colonization by noxious weeds until operations are complete and final reclamation can occur is applied to prevent the spread of weeds. HVC conducts annual herbicide applications in key locales around site and has released bio-control for hound's-tongue and Canada thistle in past years.

6.4.3.2 Power Supply Upgrade Component

The general vegetation characteristics of the power supply upgrade component of the Project are described in Section 6.4.1.2. This section focuses on plant species and ecosystems of management concern and invasive plants.

There is a historical occurrence record of alkaline wing-nerved moss (*Pterygoneurum kozlovii*; blue-listed provincially) at the north end of Nicola Lake, approximately 1.5 km south of the existing transmission line (BC CDC 2018). Ecosystem mapping and baseline rare plant surveys will be completed in 2019 along the power supply upgrade alignment. There are multiple ecological communities of conservation concern that may be encountered along the alignment: 21 in the IDFdk1, 16 in the IDFxh2, 16 in the PPxh2, and 18 in the BGxw1. Invasive plant species are common along and adjacent to the power supply upgrade alignment.

6.4.4 Wildlife and Wildlife Habitat

6.4.4.1 Mine Component

The mine component of the Project is within Wildlife Management Unit (WMU) 3-18 in the Thompson Region. As described in Section 6.4.1.1, the mine component intersects three BEC variants; these variants support a diversity of wildlife.

The mine component overlaps five general habitat types: forest, grassland, wetlands, barren, and vegetated anthropogenic disturbance (e.g., transportation rights-of-way, agriculture). Immature and mature forested habitats provide breeding habitat for upland birds, roosting habitat for bats, and shelter and foraging habitat for wildlife such as moose (*Alces alces*), deer, black bear (*Ursus americanus*), small mammals, and furbearers. Agricultural areas, particularly pasture, provide spring and summer forage for deer and cover for small mammals, and nesting habitat for some bird species. Wetland habitats provide: breeding habitat for amphibians, waterfowl, and shorebirds; foraging habitat for bats; and drinking sources for other wildlife. Barren areas consisting of rocks, boulders and gravel, typically associated with steep topography, provide habitat for reptiles and small mammals (e.g., common pika [*Ochotona princeps*]).

Multiple species at risk and species of management concern (e.g., migratory birds and species important to Indigenous groups) have the potential to interact with the mine component. Species at risk that may interact with the mine component include little brown myotis (*Myotis lucifugus*), horned grebe (*Podiceps auratus*), northern goshawk (*Accipiter gentilis*), short-eared owl (*Asio flammeus*), Lewis's woodpecker (*Melanerpes lewis*), common nighthawk (*Chordeiles minor*), olive-sided flycatcher (*Contopus cooperi*), barn swallow (*Hirundo rustica*), bank swallow (*Riparia riparia*), western rattlesnake (*Crotalus oreganus*), and western toad (*Anaxyrus boreas*). Species of management concern that are likely to interact with the mine component include moose, mule deer (*Odocoileus hemionus*), bobcat (*Lynx rufus*), black bear, feral horse, and waterfowl. The mine component does not overlap with caribou (*Rangifer tarandus*) herd ranges and grizzly bear (*Ursus arctos*) is considered extirpated from the region.

The mine component of the Project does not overlap identified important wildlife areas (e.g., species at risk critical habitat; Figure 6-2). Additional information on the location of important wildlife areas relative to the power supply upgrade component is provided in Section 6.4.4.2.

6.4.4.2 Power Supply Upgrade Component

The power supply upgrade component of the Project would cross through WMU 3-18, WMU 3-19, and WMU 3-120 in the Thompson Region. As described in Section 6.4.1.2, the power supply upgrade component would intersect four BEC variants; these variants support a diversity of wildlife including, at the southeastern end of the alignment, species at the northern extent of their range in BC (e.g., burrowing owl [*Athene cunicularia*]).

The power supply upgrade component would follow an existing transmission line right-of-way but may overlap with, or run adjacent to, the same five general habitat types described for the mine component: forest, grassland, wetlands, barren, and vegetated anthropogenic disturbance. Forestry cutblocks are common in the region along the power supply upgrade alignment, so species associated with immature forest may be encountered more often in this component than in the mine component. The extensive grassland habitat at the southeastern end of the proposed right-of-way supports a wide variety of species, including coyote (*Canis latrans*), raptors, ground-nesting songbirds, sandhill crane (*Grus canadensis*), and reptiles.

A similar suite of species at risk and species of management concern identified for the mine component have the potential to interact with the power supply upgrade component. The relative abundance of these species along the alignment will, however, change as elevation decreases and the landscape transitions to ponderosa pine and bunchgrass ecosystems at the southeastern end, and additional species at risk and species of management concern may be encountered (e.g., Great Basin spadefoot [*Spea intermontana*], flammulated owl [*Otus flammeolus*], American badger [*Taxidea taxus jeffersonii*], sharp-tailed grouse [*Tympanuchus phasianellus*], migrating birds). Like the mine component, there would be no overlap of the power supply upgrade component with caribou herd ranges or occupied grizzly bear range.

The power supply upgrade alignment would cross through critical habitat for Lewis's woodpecker starting north of Nicola Lake and then eastward to the Nicola Substation, and intersects approved Ungulate Winter Range (U-3-003) for mule deer at four locations (Figure 6-2). Additional information on the location of important wildlife areas relative to the mine component of the Project is provided in Section 6.4.4.1.

6.4.5 Environmentally Sensitive Areas/Biodiversity

6.4.5.1 Mine Component

Table 6-1 presents a list of the nearest environmentally sensitive areas to the mine component of the Project. More generally, the mine component has the potential to interact with sensitive habitats (e.g., amphibian breeding areas) and important habitat features (e.g., mineral licks, snake and bat hibernacula, nest trees).

Table 6-1 Environmentally Sensitive Areas Closest to the Mine Component of the Project

Environmentally Sensitive Area	Distance Relative to Project Component
Wildlife Management Area (WMA), Dewdrop-Rosseau	36.6 km northeast
Ungulate Winter Range (mule deer)	2.4 km south-southwest
Wildlife Habitat Area (data sensitive)	5.4 km west-southwest
South Thompson River Important Bird Area	39.5 km northeast
Douglas Lake Plateau Important Bird Area	37 km east
Critical Habitat (western rattlesnake and Great Basin gopher snake)	3.75 km west
Old Growth Management Area – Legal	overlap
Old Growth Management Area - Non-legal	0.3 km south

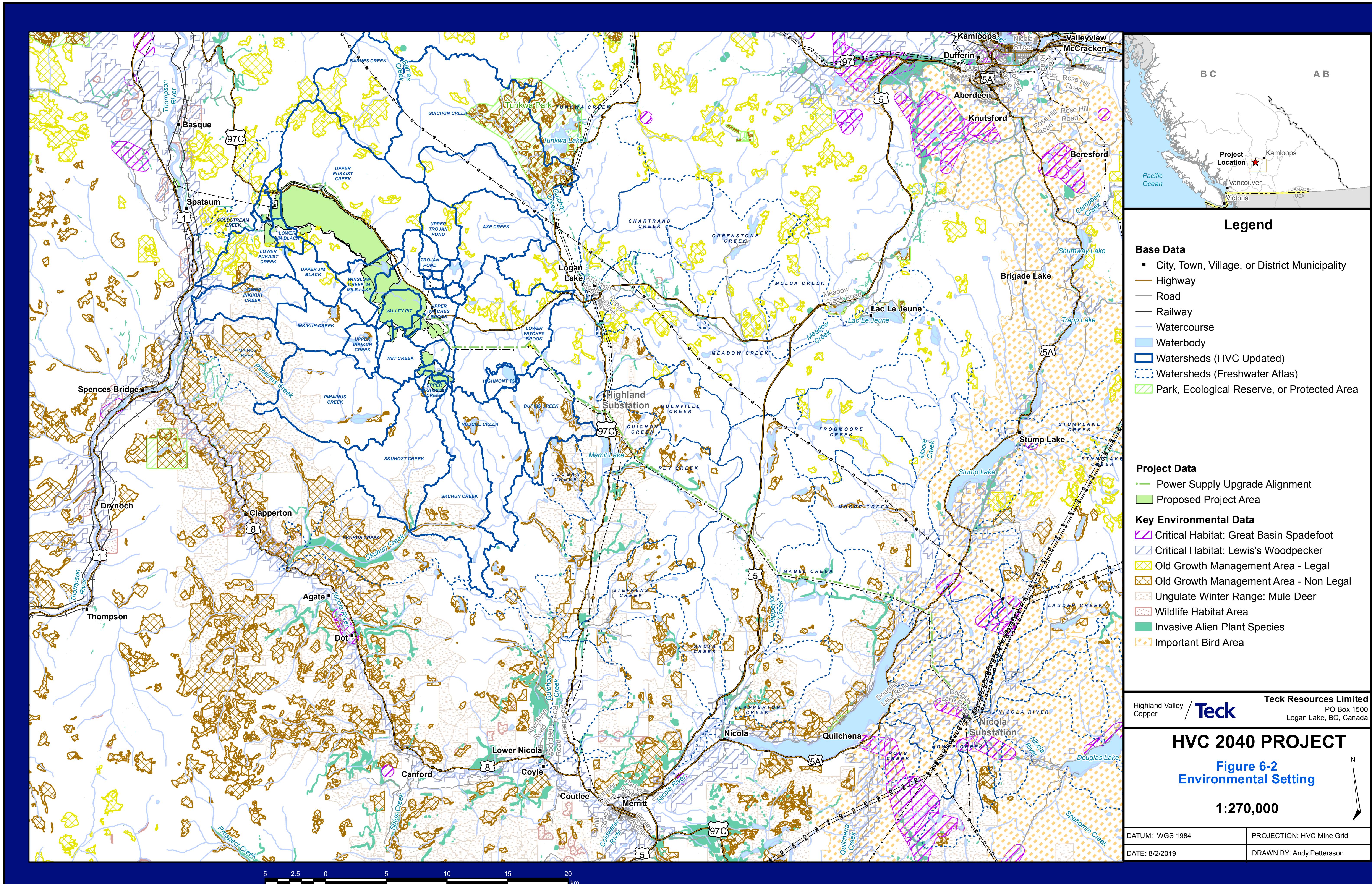


Figure 6-2
Environmental Setting

The mine component of the Project does not overlap with any parks, ecological reserves, or protected areas. The nearest provincial parks are Epsom Provincial Park located on the west side of the Thompson River, approximately 7.5 km west of the existing mine, and Tunkwa Provincial Park, located 13 km northeast of the existing mine (Figure 6-2). Epsom Provincial Park protects riparian areas and grassland terraces above the river, and Tunkwa Provincial Park protects mid-elevation grasslands, forests, lakes, and wetlands, including bogs and ponds.

6.4.5.2 Power Supply Upgrade Component

Table 6-2 presents a list of the nearest environmentally sensitive areas to the power supply upgrade component of the Project. More generally, the power supply upgraded component has the potential to interact with sensitive habitats (e.g., amphibian breeding areas, bird migration and breeding areas) and important habitat features (e.g., mineral licks, snake and bat hibernacula, leks, nest trees).

Table 6-2 Environmentally Sensitive Areas Closest to the Power Supply Upgrade Component of the Project

Environmentally Sensitive Area	Distance Relative to Project Component
Wildlife Management Area (WMA), Dewdrop-Rosseau	36.4 km northeast
Ungulate Winter Range (mule deer)	4 intersections
Wildlife Habitat Area (Lewis's woodpecker)	8.9 km south
South Thompson River Important Bird Area	42.3 km northeast
Douglas Lake Plateau Important Bird Area	overlap
Critical Habitat (Lewis's woodpecker, Great Basin spadefoot, and Great Basin gopher snake)	overlap
Old Growth Management Area – Legal	overlap
Old Growth Management Area - Non-legal	overlap
Moose Critical Winter Range (Kamloops LRMP)	3.7 km of intersection

The power supply upgrade component of the Project would not overlap with parks, ecological reserves or protected areas. The closest provincial parks are Tunkwa Provincial Park, located 10 km north of the existing transmission line at its nearest point, and Monck Provincial Park, located 10 km west of the Nicola Substation (Figure 6-2). Monck Provincial Park protects ponderosa pine and bunchgrass ecosystems and a volcanic rock cliff feature, and Tunkwa Provincial Park protects mid-elevation grasslands, forests, lakes, and wetlands, including bogs and ponds (BC Parks 2018b).

6.5 Human and Socio-Economic Environment

Except where specified, the information in the following sections apply to both the mine and power supply upgrade components of the Project. The description of existing conditions for the power supply upgrade component considers the right-of-way that would be required from the Nicola Substation to the Mine Site.

The Project is located near Highway 97C in the District Municipality of Logan Lake within the Thompson-Nicola Regional District. The nearest communities are Logan Lake (17 km), Ashcroft/Cache Creek (34 km), Merritt (60 km), and Kamloops (75 km) (see Figure 5-1). The Project is accessible by paved highway from Vancouver via Highway 1 (Trans-Canada Highway), Highway 5 (Coquihalla Highway), and Highway 97C (see Figure 5-1).

The Thompson-Nicola Regional District is the sixth largest regional district in BC, covering an area of approximately 45,279 km^2, with the City of Kamloops as its largest municipality (Statistics Canada 2016). The Thompson-Nicola Regional District has a history of development and land use including forestry, ranching, and mining dating back to the late 1800s. It currently supports substantial urban settlement, mining, forestry, agriculture (cattle), recreation, and transportation including several highways and railway corridors. In 2016, the population of the Thompson-Nicola Regional District was 132,663 persons (an increase of 3.3% from 2011), and had an estimated labour force of 67,655 persons, with an unemployment rate of 8.4%. Employment within the Thompson-Nicola Regional District is greatest in health care and social assistance, followed by retail trade and construction. As of December 2017, existing HVC operations employed over 1,321 residents from nearby communities. These numbers account for 21% of the local labour force in the town of Logan Lake, 12.6% in Ashcroft, 5.1% in Cache Creek, 5.9% in Merritt, and 1.6% in Kamloops (Statistics Canada 2016). In 2017, HVC's salary and benefit costs were approximately $185 million.

HVC contributed approximately $3.5 million in property taxes to regional and provincial governments. HVC has also contributed approximately $200,000 to the local economy through community investment, and approximately $137 million through the procurement of goods and services.

There are three airports within the Thompson-Nicola Regional District, one of which provides commercial services. The Kamloops Airport, serviced by Air Canada, Central Mountain Air, and WestJet, provides commercial scheduled and charter air transportation services for area residents and cargo to Vancouver, Calgary, and other Western Canadian destinations. Non-commercial services are available at the Cache Creek/Ashcroft and Merritt airports. The nearest international airport with commercial services is the Kelowna International Airport, located outside the Thompson-Nicola Regional District.

There are no passenger or freight rail services available from Logan Lake. The nearest freight rail services are provided at the Ashcroft Terminal with industrial transloading, materials handling, and industrial storage capabilities. Services offered at Ashcroft include bulk, break-bulk, and container (forthcoming). Passenger rail services provided by VIA Rail and Canadian Pacific (CP) are available in Kamloops.

6.5.1 Community Profiles

6.5.1.1 District of Logan Lake

Logan Lake community is located 17 km east of the HVC Mine Site along Highway 97D within the District Municipality of Logan Lake. The HVC Mine Site resides largely within the boundary of the District Municipality of Logan Lake. The District Municipality of Logan Lake was incorporated in 1983 and has a long history of mining. Lornex Mining Corporation Ltd. initially established the Village of Logan Lake, which was then incorporated in 1970 as a mining community (District of Logan Lake n.d.). In 2016, the population of the District Municipality of Logan Lake was 1,993 (Statistics Canada 2016), down 3.9% from 2011, and had an estimated labour force of 805, with an unemployment rate of 11.2%.

Mining continues to be a principal industry, employing roughly 24% of the labour force within Logan Lake; however, industries such as construction and retail trade have seen growth, accounting for roughly 13% and 10% of the local labour force, respectively (Statistics Canada 2016).

Community services include the district's municipal office and council chambers, fire hall, post office, Royal Canadian Mounted Police (RCMP) Detachment, BC Ambulance Station, and local non-emergency health centre.

Logan Lake has two public schools that fall within the Kamloops/Thompson School District: an elementary school (kindergarten through grade 4) and a secondary school (grade 5 through grade 12).

6.5.1.2 Ashcroft

Ashcroft is a village located approximately 40 km from the HVC Mine Site with a population of 1,558. It is 30 km downstream from the west end of Kamloops Lake at the confluence of the Bonaparte and Thompson Rivers, and is in the Thompson-Nicola Regional District.

Ashcroft is home to municipal offices and council chambers, retail and grocery, fire hall, post office, and several restaurants. The primary industries in Ashcroft are mining and agriculture. Ashcroft Terminal is an inland railcar transloading facility that is specifically located to where it can service both railway companies (CP and Canadian National) on its property. It consists of 320 acres of industrially zoned land providing an opportunity for railcar storage, transloading for multimodal transportation, and handling of bulk goods.

Ashcroft is also a centre for tourism and a service centre for surrounding communities of Lytton, Spences Bridge, Clinton, and Cache Creek.

6.5.1.3 Lower Nicola

The community of Lower Nicola is located approximately 65 km from the HVC Mine along Highway 97C at the confluence of Guichon Creek and Nicola River, within the Thompson-Nicola Regional District. In 2016, the population of Lower Nicola was 965 (Statistics Canada 2016), down about 10% from 2011, with a labour force of 490 and an unemployment rate of 11.2%.

Employment in Lower Nicola is not concentrated within one or two principle industries, but is relatively diverse. Agriculture, forestry, and fishing and hunting account for 13% of local employment, retail services for another 13%, manufacturing for another 9%, transportation and warehousing for 8%, health care and social assistance for 8%, and public administration for 8%. The mining industry employs approximately 7% of the local labour force (Statistics Canada 2016).

6.5.1.4 Merritt

The city is in the Nicola Valley in the south-central interior of BC at the confluence of the Nicola and Coldwater rivers and within the Thompson-Nicola Regional District. It is the first major community encountered after travelling north along the TransCanada Highway 5 from the Lower Mainland and acts as the gateway to other major highways to the BC Interior.

Merritt was incorporated in 1911 as an established nucleus for transportation, ranching and mineral extraction for European settlers. At the turn of the 20th century, several coal mines were in operation, and as the town grew, other industries developed in the Valley including copper, nickel, gold and silver mining, and forestry. Today, ranching, farming, forestry, transportation, and tourism are the primary industries.

Merritt’s population is 7,139 (Statistics Canada 2016). The city has civic parks, historical sites, an aquatic centre, a local arena, major shopping and tourism amenities, a public library and a civic centre. Merritt is also home to a local radio station and a weekly newspaper. Nearby, there are four provincial parks, numerous lakes, and several recreational trails.

Merritt is also home to the Nicola Valley Institute of Technology, a post-secondary institution offering undergraduate degrees and vocational training to 1,279 students (2017/2018) between their campuses in Merritt and Vancouver, or in distance or online courses and programs (NVIT 2019). In 2017/2018, over 80% of their students identified as Indigenous.

Community retail services and facilities in Merritt include many restaurants, grocery stores, gas stations, gift shops, and hotels. Public services include a post office, hospital, and health centre, two walk-in acute care clinics, provincial government office (ServiceBC), municipal offices and council chambers.

The main office for School District 58 Nicola-Similkameen, which operates the schools in the area, is also located in Merritt. The area is served by five elementary schools: Nicola Canford Elementary; Bench Elementary; Collettville Elementary and French Immersion; Central Elementary; and Diamond Vale Elementary. Merritt Secondary School, and one alternate education school also service the area.

6.5.1.5 Kamloops

The City of Kamloops is located in south-central BC at the confluence of the two branches of the Thompson River near Kamloops Lake. With an urban population of 78,026, it is the largest municipality in the Thompson-Nicola Regional District and the location of the regional district’s offices (Statistics Canada 2016). The surrounding region is commonly referred to as Thompson Country with 103,811 residents in 2016 (Statistics Canada 2016).

European settlers arrived in the early 19th century and established a fur trading centre with local Indigenous Nations. The gold rush of the 1860s and the construction of the CP Railway in 1883 brought further growth, resulting in the City of Kamloops being incorporated in 1893 with a population of about 500 (City of Kamloops 2016).

Today the primary employers include agriculture, regional health authority, school district, Thompson Rivers University, local government and mining.

The Kamloops area supports a wide range of crops including alfalfa, hay, fruits, and vegetables, and the large valleys with lakes and rivers provide fertile soil and a readily available water supply (Venture Kamloops 2018). Beef production continues to be the primary agricultural activity in the region. Both the BC Cattlemen’s Association and the BC Livestock Producers Co-op Association are headquartered in Kamloops (Venture Kamloops 2019).

Public services in the urban area include a large hospital, acute care walk-in clinics, district fire and ambulance services, insurance agencies, federal and provincial government offices, telecommunications, community recreation, municipal services, and municipal offices and council chambers.

Community retail services and facilities include grocery stores, shopping malls, museums, live theatre centres, art galleries, wildlife park, seven arenas (one Olympic size), Women’s Hockey League team, curling clubs, golf courses, indoor pools, baseball stadium, two ski resorts and 82 parks totaling 1,350 hectares (Venture Kamloops 2019).

Public schools in Kamloops and adjacent communities are run by School District 73 Kamloops/Thompson. The y operate 32 elementary schools, one middle school, 10 secondary schools, one kindergarten-to-grade-12 school, two alternate programs, and one distance education school. Private schools include Kamloops Christian School, Our Lady of Perpetual Help School (Catholic), and St. Ann’s Academy (Catholic).

Thompson Rivers University is a post-secondary institution offering undergraduate and graduate degrees and vocational training to over 26,000 students on their campuses in Kamloops and Williams Lake, or in distance or online courses and programs through Open Learning (Thompson Rivers University 2019).

6.5.2 Land Use

The existing conditions for land use are described separately for the mine and power supply upgrade components except for *Land Act* land reserves, withdrawals, notations and prohibitions, and mineral claims and leases.

6.5.2.1 Land Use Planning

6.5.2.1.1 Mine Component

The mine component of the Project is located within the planning area of the Kamloops Land and Resource Management Plan (LRMP), a sub-regional Strategic Land and Resource plan covering roughly 2.2 million ha of south-central BC (Province of BC 2018b). The Kamloops LRMP was declared a higher-level plan pursuant to Section 1(1) of the *Forest Practices Code of British Columbia Act*, and took effect January 31, 1996, with amendments occurring in 1996 and 2001 (ENV 2018). The LRMP applies to Crown land and land that is held privately within tree farm licenses or woodlot licenses and is divided into six resource management zones (General Resource Management Zone, Settlement Resource Management Zone, Protection Resource Management Zone, Special Resource Management Zone–Community Watersheds, Special Resource Management–Habitat/Wildlife Management Areas, and Special Resource Management–Recreation and Tourism; Ministry of Forests 1995). The mine component is within a General Resource Management Zone, where 17 sets of objectives and strategies apply to management of land, water, ecosystems, and resources (Ministry of Forests 1995).

Because the mine component is within the municipal boundaries of the District Municipality of Logan Lake, it is subject to zoning Bylaws 834, 625 (2010) and 675 (2010), and has been designated as zoning area M3. Per Bylaw 834, the purpose of the M3 zone is to regulate land designated in the Official Community Plan as Mining Operations and encourage uses oriented toward mining. Per Bylaw 675 (2010), permitted uses within the M3 zone include: mining operations, storage of explosives and related material, tourism interpretive centre, and accessory use. Bylaw 625 (2010), refers to the *Mines Act*, noting that it applies to all mines during exploration, development, construction, production, closure, reclamation and abandonment.

In addition, HVC and Nlaka'pamux groups undertake planning on an annual basis under the agreements which provides various provisions for land management onsite.

Further, HVC recognizes that Nlaka'pamux communities may undertake land use planning or develop land use policies from time to time with respect to Nlaka'pamux territory and that these influence land use planning in the region and will be central to HVC and Nlaka'pamux collaboration noted above.

6.5.2.1.2 Power Supply Upgrade Component

The north end of the power supply upgrade component of the Project would be located within the planning area for the Kamloops LRMP, with the remainder not covered by an LRMP. The power supply upgrade alignment would intersect the following Crown tenures: agriculture, quarrying, transportation, utility, and wind power (Figure 5-10).

6.5.2.2 Land Reserves, Withdrawals, Notations and Prohibitions

The Project would overlap two *Land Act* Section 16 Map Reserves, one for sand and gravel quarrying held by the MOTI (Crown Lands File Number 3401702), and one for roadway transportation also held by MOTI (Crown Lands File Number 3405456). Section 16 map reserves, or withdrawals from disposition, are established to support a provincial or federal government objective and preclude or prevent the acceptance of Crown land applications for disposition of Crown land in the subject area (Ministry of

Forests, Lands and Natural Resource Operations 2011). A variance for use of areas withdrawn from disposition under Section 16 of the *Land Act* must be completed in accordance with the Policy Variance Procedure (Ministry of Forests, Lands and Natural Resource Operations 2011).

6.5.2.3 Agricultural Land Reserves, Agricultural Use, Trapping, and Guide Outfitting

6.5.2.3.1 Mine Component

The mine component of the Project is not located within an Agricultural Land Reserve (ALR). The closest ALR lands are located approximately 4 km west of the mine site (see Figure 5-11). Agriculture use near the Project is dominated by cattle ranching and uses associated with cattle ranching, such as hay production. There are six active range tenures overlapped by the Project (RAN076284, RN076821, RAN077553, RAN077563, RAN077812, and RAN077813).

HVC facilitates annual meetings or discussions with surrounding Nlaka'pamux and local range holders. Maintaining communication and relationships allows for discussion of any potential or present impacts from HVC mining activities that may affect range practices such as damage to fence lines, limitation to water access or disruption of cattle grazing. HVC proactively implements an annual Cattle Range Management Plan that states areas for improvement based on requirements of the *Mines Act* M-11 Permit.

The mine component of the Project overlaps two traplines (TR0318T003, TR0319T003, see Figure 5-11). The mine component does not overlap with any guide outfitter areas.

6.5.2.3.2 Power Supply Upgrade Component

The power supply upgrade component of the Project would intersect an ALR in two locations: along Guichon Creek, and from the north of Nicola Lake eastward to the Nicola Substation (see Figure 5-11). Agriculture use along the alignment is dominated by cattle ranching and uses associated with cattle ranching, such as hay production.

The power supply upgrade component of the Project would cross four traplines (TR0318T003, TR0319T003, TR0319T004, TR0312T001; see Figure 5-11). The southeastern end of the alignment from Stumplake Creek to just north of the Nicola Substation is within a guide outfitter area.

6.5.2.4 Mineral Claims and Mining Leases

The HVC claim group currently holds approximately 1,125 leases including Crown Grants and Mineral Claims (Teck 2016), including all areas associated with the Project. The Project would be on land held by HVC, which includes 76 claims (Appendix F, Table F-2). The Project would overlap 32 mining leases, all of which are held by HVC (Appendix F, Table F-3). The Project would not require any additional tenure.

6.5.2.5 Forestry

6.5.2.5.1 Mine Component

The mine component of the Project is within the Kamloops Timber Supply Area (TSA). The current allowable annual cut (AAC) in the Kamloops TSA is 2.3 million m^3 (MFLNRORD 2018b). As of March 23, 2009, a total of 4.0 million m^3 have been apportioned across replaceable forest licences (1,570,637 m^3), non-replaceable forest licences (1,446,887 m^3), BC Timber Sales licences/licences to cut (764,476 m^3), Timber Supply Licence pulpwood agreement (86,000 m^3), woodlot licences (15,000 m^3) and forest service reserve (117,000 m^3).

The mine component overlaps 39 cutblocks, 35 of which are associated with HVC active licences to cut, two with forest licence A88772 held by Aspen Planers Ltd., and two with forest licence A85122 held by Pelltiq't Energy Group Ltd. As of March 23, 2009, forest licence A85122 (Pelltiq't Energy Group Ltd.) has an apportionment of 200,000 m^3 of pine species from the Kamloops TSA. An apportionment for forest licence A8872 (Aspen Planer Ltd.) is not noted in MFLNRORD's TSA Apportionment and Commitments report effective April 6, 2018 (MFLNRORD 2018b). Cutblocks overlapped by the mine component are described in Appendix F.

6.5.2.5.2 Power Supply Upgrade Component

The power supply upgrade component of the Project would primarily be located within the boundaries of the Merritt TSA; only the north end, west of Mamit Lake, is within the Kamloops TSA. The power supply upgrade component may be adjacent to cutblocks west of Nicola Lake.

6.5.2.6 Recreation

6.5.2.6.1 Mine Component

Multiple public recreational opportunities are available in the regional area around the Project (e.g., camping, canoeing, fishing, and snowmobiling). Publicly accessible facilities include boat launches, picnic tables, and washrooms. Public use of Crown land near the Project also includes recreation sites (Bose Lake Calling Lake, Billy Lake) and areas used by all-terrain vehicle (ATV) enthusiasts. The closest provincial parks to the Project are Epsom Provincial Park and Tunkwa Provincial Park (see Figure 6-2). Epsom Provincial Park is one of the few areas along its section of the Thompson River that provides public access to the river. Tunkwa Provincial Park includes two large, man-made trout-fishing lakes, Tunkwa and Leighton, with campgrounds located at both locations. Tunkwa Lake is listed as one of the top ten provincial rainbow trout fisheries. The park is also a year-round recreation area known for camping, hunting, horseback riding, wildlife viewing, fishing, cross-country skiing, and snowmobiling (BC Parks 2018a).

6.5.2.6.2 Power Supply Upgrade Component

Multiple public recreational opportunities are available in the regional area along the power supply upgrade component of the Project (e.g., camping, canoeing, fishing, snowmobiling). Publicly accessible facilities include boat launches, picnic tables, and washrooms. Public use of Crown land near the existing transmission line also includes recreation sites (Gump Lake, Tupper Lake, Mab Lake) and areas used by ATV enthusiasts. The closest provincial parks to the Project are Monck Provincial Park and Tunkwa Provincial Park (Figure 6-2). Monck Provincial Park is located on the west shore of Nicola Lake and is very popular for camping, picnicking, hiking, and a variety of water activities (boating, swimming, wind-surfing, fishing). The recreational features of Tunkwa Provincial Park are described above.

6.5.3 Traditional Land Use

6.5.3.1 Mine Component

HVC acknowledges that the Project is situated in the unceded territory of the Nlaka'pamux Nation, and that Stk'emlupsemc te Secwepemc Nation has also asserted title within the Project area. The *Returning Land Use Plan* (Appendix G) is a collaborative effort between HVC, Nlaka'pamux Technical Working Group with representatives of LNIB, Nicola Tribal Association (NTA), CNA, and the NNTC and a

Community Working Group with representatives from CNA, LNIB, and NNTC. In describing the history of the area, the *Returning Land Use Plan* states that:

spiləx̣m ł xin̓ us te c̓iy us

ce xeʔe he nłeʔkepmx he tmixʷs he HV

tuł sksewts xeʔe ƛ̓əł he sʔemstc xeʔe he tmixʷ

tuł sxin̓s he tekm us he tmixʷ ʔex pəx̣pix̣m q̓ʷuʔq̓ʷʔum yəykem̓m̓ ʔeł cewstiyxs ʔeł nik̓etiyxs ʔik̓etiyxs he qʷuʔqʷuʔuym̓xʷ te syiq̓m ʔes ʔem̓əces he xʷepitiyxs (st̓malt)

ʔesqayqayt he tmixʷ nam̓ xeʔe x̣aʔx̣aʔ tk tmixʷ

neʔe ʔews cəwecut ʔeł cutiyxs he mlamn

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tuł sƛ̓łełs (Ashcroft) tuł he sx̣ʷzewk (Stoyoma Mountain) ʔews nk̓entwew̓xs

ʔesnp̓aʕp̓aʕ he ʔews cəwecut he setknmx moqiyx ʔeł pilex̣twew̓x

ʔes zəxzex ʔeł ʔesqaytew̓s tekm us weʔe he tmixʷ ʔesk̓wen̓stem us tekm te seytknmx

ʔeszʕ̓ʷzoʕ̓ʷts ne sxʷewkʷs ʔeł ne sptinusms he nłeʔkepmx

Source: Identified Nlaka'pamux Translation by Mandy Jimmie with the help of Jimmy Toodlican, Percy Joe and Lorraine Spence

Figure 6-3 Nlaka'pamuxcin Translation of the History of the Highland Valley Area

Highland Valley lies within Nlaka'pamux lands; the Nlaka'pamux people have been stewards of and connected to this area since time immemorial.

Many traditional activities have been – and continue to be – carried out here, such as hunting, fishing, trapping, gathering, and growing and cutting hay for livestock.

The higher elevations of the valley are important to Nlaka'pamux culture, since they are considered to be places of power and yield a variety of medicinal plants.

Valuable trade materials were harvested in the valley and a Nlaka'pamux travel route was established for seasonal harvesting and trade. The valley was, and is, an important site for spiritual training, social gatherings, and sharing of knowledge and stories.

From the valley and lowlands to the highest remote peaks surrounding it, the Highland Valley area has sustained the Nlaka'pamux people not only physically, but also culturally.

The Project has the potential to affect the availability of resources and access to lands for the exercise of traditional harvesting and cultural activities, however; a detailed overview of traditional land use has not been included as part of this Project Description based on direction from the Nlaka'pamux who have identified that this not the role of the proponent or the government.

This information will be provided through the processes identified by the Nlaka'pamux Nation, Stk'emlupsemc te Secwepemc Nation, and Syilx Nation.

6.5.3.2 Power Supply Upgrade Component

HVC acknowledges that the Project is situated in the unceded territory of the Nlaka'pamux Nation, and that Stk'emlupsemc te Secwepemc Nation has also asserted title within the Project area. The south section of the proposed power supply upgrade alignment is in the Syilx Nation territory.

The Project has the potential to affect the availability of resources and access to lands for the exercise of traditional harvesting and cultural activities, however; a detailed overview of traditional land use has not been included as part of this Project Description based on direction from the Nlaka'pamux Nation who have identified that this not the role of the proponent or the government.

This information will be provided through the processes identified by the Nlaka'pamux Nation, Stk'emlupsemc te Secwepemc Nation, and Syilx Nation.

7 Potential Project Effects

The following sections provide a preliminary description of potential environmental, economic, social, heritage, health, cumulative, and transboundary effects of the Project in consideration of proposed mitigation and management measures based on Project physical works and activities.

In addition to the EA under the BCEAA, HVC has committed to a collaborative approach to assessing the Project with the Nlaka'pamux Nation in recognition of Rights, Title and jurisdiction (see Section 3). HVC recognizes that each Indigenous group may have a different approach to how they assess the Project and how it relates to the BCEAA process.

Current mine operations include an extensive and already implemented collection of detailed policies, guidelines, procedures, and management plans. This includes early and ongoing engagement with the Nlaka'pamux Nation and Stk'emlupsemc te Secwepemc Nation in support of a collaborative approach towards environmental management as well as execution of existing management documents within the following plans: Environmental Management System, Emergency Response Plan, Occupational Health and Safety Plan, Construction Management Plan, Erosion and Sediment Control Plan, Fuel Management and Spill Control Plan, Water Management Plan, ML/ARD Characterization and Management Plan, Traffic Control Plan, Waste Management Plan, Chemical and Materials Storage and Handling Plan, Wildlife Management Plan, and Archaeological Impact and Mitigation Management Plan.

7.1 Potential Environmental Effects

Proposed Project activities have the potential to result in changes to the environment. Direct impacts may include, but are not limited to:

- vegetation clearing and removal to accommodate pit extensions, mining infrastructure and the twinning of the existing transmission line from the Nicola Substation to HVC;
- reduction in wildlife habitat due to vegetation clearing, construction, and sensory disturbance (e.g., noise);
- atmospheric emissions from equipment, infrastructure, or mining activities;
- changes in groundwater recharge and changes to groundwater levels and flow as a result of Project activities;
- changes in fish and riparian habitat and changes in watershed area runoff;
- changes in site hydrogeology, hydrology, and surface water quality leading to effects on terrestrial ecosystems, fish and fish habitat; and
- light emissions and visual impacts as a result of Project activities.

The potential impacts of the Project on the physical and biological environment will be assessed as part of the EA in conjunction with the measures proposed to mitigate them. Many of these mitigations are already being effectively used at the HVC Mine Site. Potential impacts would be managed through the collaborative development of mitigation measures and management that consider Indigenous Interests including but not limited to environmental, cultural, and spiritual value. HVC acknowledges that Indigenous processes may include assessment of aspects not contemplated under the BCEAA process.

At present, HVC has comprehensive environmental management and monitoring programs in place and these would be updated to reflect the extended LOM and additional activities associated with the Project.

7.2 Potential Economic Effects

Anticipated employment, expenditures, and population growth related to the proposed Project could result in both positive and adverse economic effects. Potential effects will be assessed in collaboration with the Nlaka'pamux Nation. HVC recognizes each Indigenous group may have a different approach to how they assess the Project and how it relates to the BCEAA process. Economic effects may include changes to the regional labour force, regional business, or government finances. HVC would develop mitigation measures to optimize the economic benefits of the Project and manage potential adverse effects. These may include developing and implementing local employment plans, tailoring contracting and procurement opportunities to fit within the capabilities of local businesses, and implementing employment and training plans.

7.3 Potential Social Effects

By extending the life of the HVC Mine, the proposed Project would likely affect social conditions through maintaining and stabilizing current population structure in local communities. There may also be some changes associated with the construction phase when mine employment increases temporarily. Related changes may affect housing availability, community infrastructure and services, and local traffic volumes. HVC would develop mitigation measures to manage potential social effects; for example, access management plans to address potential transportation effects, implementing local training programs, and planning for local procurement of project goods and services.

7.4 Potential Heritage Effects

Ground disturbing activities associated with the proposed mine extension and right-of-way expansion to accommodate the proposed twinning of the existing transmission line have the potential to adversely affect archaeological, paleontological and cultural heritage resources. These potential effects would be managed by conducting archaeological impact assessments (AIA) in advance of disturbance followed by the implementation of archaeological impact mitigation management, consistent with HVC practices. This may include site-wide chance find procedures, establishment of no work zones and implementation of measures to avoid or reduce impacts of identified and documented archaeological sites.

Highland Valley has a high potential for cultural heritage. HVC has Cultural Heritage commitments through agreements that acknowledge Indigenous jurisdiction, adhere to high cultural heritage standards, and require HVC to seek consensus with Indigenous communities on cultural heritage standards and management. The agreements also provide guidance on mitigation and accommodation strategies. Adherence to these requirements would be accomplished through HVC's annual Cultural Heritage field program, which proactively collaborates with the Nlaka'pamux Nation and their field crews. Stk'emlupsemc te Secwepemc Nation representatives also participate in HVC field programs. Cultural Heritage baseline studies have identified and mapped trail segments based on previously recorded information and further Cultural Heritage studies are ongoing.

7.5 Potential Health Effects

The proposed extension of HVC operations has the potential to cause effects to human or ecological health associated with Project construction, operation, and decommissioning activities. However, HVC would continue to implement existing mitigation and management measures for air quality and water quality, and would adjust measures as required to address any new exposure pathways or potential effects associated with the Project.

The Nlaka'pamux Nation and Stk'emlupsemc te Secwepemc Nation have expressed an interest in understanding potential health effects associated with the Project; WGs and committees would provide a forum to collaboratively develop mitigation strategies as required. Examples of measures already in place include implementation of a Site-Wide Dust Management Plan (including using Haulage-DC as a water truck additive to minimize dust), an erosion and sediment control plan, and construction of water diversions to maintain water quality.

7.6 Potential Cumulative Effects

The effects of the Project may interact with the effects associated with past, present or reasonably foreseeable future projects and activities in the region.

This potential will be evaluated in the cumulative effects assessment (CEA) prepared as part of the EA Application. The CEA methods will be developed in collaboration with the Nlaka'pamux Nation, Stk'emlupsemc te Secwepemc Nation, Syilx Nation and in accordance with EAO requirements. It will take into consideration the potential for effects of the Project to act cumulatively with:

- the predicted effects of ongoing operations of the HVC Mine Site and the pending Bethlehem Extension.
- the predicted effects of other past, ongoing, and reasonably foreseeable future development in and around the Project, including forestry, ranching, mining, power, and agriculture operations, as well as other land use activities.
- other effects as may be identified through community led processes and collaborative engagement on methodology

7.7 Potential Transboundary Effects

The proposed Project is located more than 280 km from the BC-Alberta border and over 170 km from Canada's border with the United States. No effects outside of the province of BC are anticipated.

7.8 Preliminary Assessment of Potential Impacts on Indigenous Rights, Title, and Interests

The Project may have the potential to affect the Rights, Title, and Interests of Indigenous groups. The Province has committed to meaningful engagement with Indigenous Peoples to "secure their free, prior, and informed consent when BC proposes to take actions which impact them and their rights, including their lands, territories, and resources" (Province of British Columbia 2018a, p.5). HVC recognizes that legal interpretations and definitions of Rights, Title, and Interests may differ from those of Indigenous groups.

A preliminary assessment of potential impacts on Indigenous Rights, Title, and Interests has not been included as part of this Project Description based on direction from the Nlaka'pamux Nation who have identified that this not the role of the proponent or the government.

The EAC Application will include an assessment of the Project's potential effects on Indigenous Rights, Title, and Interests, together with measures to mitigate or accommodate for any potential effects. It is expected that assessment related to Rights and Title will be developed by the Nlaka'pamux Nation, Stk'emlupsemc te Secwepemc Nation, and Syilx Nation.

8 Project Regulatory Context

HVC recognizes that Indigenous Peoples have used and occupied the land for thousands of years and have an underlying Title to their lands which includes an inescapable economic component. The nature of mining activities has impacts to the surrounding environment. HVC is committed to collaboratively incorporating Indigenous Peoples' values, culture, and resources into planning through all stages of the mining lifecycle, including assessment of the Project.

HVC's engagement is collaborative in nature and consistent with Teck's Indigenous Peoples Policy (IPP) which is guided by UNDRIP, International Labour Organization Convention No. 169 on Indigenous and Tribal Peoples, and the International Council on Mining and Metals (ICMM) Position Statement on Indigenous Peoples Mining.

In addition to the EA under the BCEAA, HVC has committed to a collaborative approach to assessing the Project with the Nlaka'pamux Nation in recognition of Rights, Title and jurisdiction (see Section 3). HVC recognizes that each Indigenous group may have a different approach to how they assess the Project and how it relates to the BCEAA process. Consistent with HVC's engagement practices with the Nlaka'pamux Nation and Stk'emlupsemc te Secwepemc Nation, HVC would work to achieve consensus on the Project; where required, decision-making processes would be utilized.

The governments of Canada and BC have committed to a renewed relationship with Indigenous Peoples, based on the recognition of Rights (Government of Canada 2017; Ministry of Indigenous Relation and Reconciliation 2017). Both governments have endorsed UNDRIP (United Nations 2007) and recognize the need to consult with Indigenous Nations with the aim of securing their free, prior, and informed consent (Department of Justice 2018; Province of British Columbia 2018a).

As described in Sections 8.1 and 8.2, based on HVC's current understanding, the Project meets the criteria of a reviewable project under the BC *Reviewable Projects Regulation* pursuant to BCEAA. However, it is anticipated that the Project will not meet the criteria for a designated project under the *Regulations Designating Physical Activities* pursuant to CEAA 2012 or the *Impact Assessment Act*, which came into force in August of 2019. HVC will engage with the Canadian Environmental Assessment Agency to confirm this understanding. Other permits and authorizations, as well as amendments to existing permits and authorizations, will also be required for the Project (Section 8.3).

8.1 British Columbia *Environmental Assessment Act*

The *Reviewable Projects Regulation* under the BC *Environmental Assessment Act* (2002) sets criteria for requiring projects to undergo environmental assessments. The parts of this regulation that apply to the Project are Part 1, Interpretation; Part 3, Mine Projects; and Part 4, Energy Projects. The criteria provided in each part and their applicability to the Project are described below:

- **Part 1, Interpretation:** *"existing facility"* means a constructed or substantially constructed facility, whether or not operating, but does not include a facility that has permanently ceased operations and has been abandoned.

- **Part 3, Section 8—Criteria for proposed modifications of mine projects:** The proposed modification of the existing mine facility would have a production capacity of greater than 75,000 tonnes per year of mineral ore, and the modification would result in the disturbance of:
  - at least 750 ha of land that was not previously permitted for disturbance; or
  - an area of land that was not previously permitted for disturbance and that is at least 50% of the area of land that was previously permitted for disturbance at the existing facility.
- **Part 4, Section 9—Definitions [Energy Projects]:** "electric transmission line" means a transmission line of 500 kV or higher voltage.

The Project includes the extension of Valley and Highmont Pits and waste dumps as well as the Highland TSF, which are part of the existing HVC Mine. This meets the criteria for an existing facility. The associated projected area of disturbance outside of the current PMA would be 408 ha and would result in a 5.9% increase over existing operations (Table 5-1).

The Project is also anticipated to include an upgrade to the mine power supply, which would likely require installation of a new 138 kV powerline parallel to the existing BC Hydro right-of-way from the Nicola Substation to HVC. The estimated new disturbance for the powerline is 235 ha. However, the proposed powerline would not meet the Section 9 definition of an electric transmission line.

In addition, a potential area of up to 115 ha may be utilized for additional waste storage at the Valley North Dump location. As the estimated total Project disturbance is anticipated to be 758 ha (including the Valley North Dump area under evaluation), an EA under the BCEAA is currently expected to be required. HVC will continue to look for opportunities to minimize impacts to the environment through reduction of new disturbances.

8.2 *Canadian Environmental Assessment Act, 2012*

CEAA 2012 would apply to the Project if any of the following criteria are met under the Regulations Designating Physical Activities (SOR/2012-147):

1. The construction, operation, decommissioning and abandonment, in a wildlife area or migratory bird sanctuary, of a new
   - (a) electrical generating facility or electrical transmission line;
   - (d) mine or mill

17. The expansion of an existing:
   - (a) metal mine, other than a rare earth element mine or gold mine, that would result in an increase in the area of mine operations of 50% or more and a total ore production capacity of 3 000 t/day or more;
   - (b) metal mill that would result in an increase in the area of mine operations of 50% or more and a total ore input capacity of 4 000 t/day or more.

39. The construction, operation, decommissioning and abandonment of an electrical transmission line with a voltage of 345 kV or more that is 75 km or more in length on a new right-of-way. (Under Definitions, "new right-of-way" is defined as land that is subject to a right-of-way that is proposed to be developed for an electrical transmission line, an oil and gas pipeline, a railway line, or an all-season public highway and that is not alongside and contiguous to an existing right-of-way).

As the Project is not located in a wildlife area or migratory bird sanctuary, does not increase ore production capacity or the area of mine operations at the HVC Mine by 50% or more, and does not involve developing an electrical transmission line with a voltage of 345kV or more, it does not meet criteria 1(a) or (d), 17 (a) or (b), or 39 above. In April 2019, the Canadian Environmental Assessment Agency confirmed that the physical activities associated with the Project do not meet the thresholds described in the Regulations Designating Physical Activities. For this reason, an EA under CEAA 2012 (or under the *Impact Assessment Act*, which came into force in August 2019) is not anticipated.

8.3 Other Required Permits and Authorizations

Potential permits, approvals, and authorizations anticipated to be required by the Project are presented in Table 8-1 and Table 8-2. Some of the items listed in these tables may not be required as the Project advances.

In addition to the EA under the BCEAA, HVC has committed to a collaborative approach to assessing the Project with the Nlaka'pamux Nation in recognition of Rights, Title and jurisdiction (see Section 3). HVC recognizes that each Indigenous group may have a different approach to how they assess the Project and how it relates to the BCEAA process.

Table 8-1 Potential Key Provincial Permits and Authorizations

Permits/Authorizations/Licenses	Enabling Mechanism	Issued By	Requirement
Environmental Assessment Certificate	*Environmental Assessment Act*	EAO	Environmental Assessment Certificate
Permit Approving Work System & Reclamation (Mine site – Initial Development)	*Mines Act*	EMPR	New Permit
Amendment to Permit Approving Work System & Reclamation Program (Preproduction)			Amendment
Amendment to Permit Approving Work System & Reclamation Program (Bonding)			Amendment
Amendment to Permit Approving Work System & Reclamation Program (Mine Plan – Production)			Amendment
Amendment to Permit Approving Work System & Reclamation Program (Construction & Operation of Tailings Impoundment Dam)			Amendment
Permit Approving Work System & Reclamation Program (Gravel Pit/Wash Plant/Rock Borrow Pit)			New Permit
Waste Management Permit Amendment – Effluent (Sediment, Tailings & Sewage)	*Environmental Management Act*	ENV	Amendment
Waste Management Permit Amendment – Discharge from Filter Plant			Amendment
Waste Management Permit Amendment – Air (Crushers, Concentrator)			Amendment
Waste Management Permit Amendment – Refuse			Amendment
Water License Amendment – Notice of Intention (Application)		MFLNRORD	New Application

Permits/Authorizations/Licenses	Enabling Mechanism	Issued By	Requirement
Water License Amendment – Storage & Diversion	*Water Sustainability Act*		Amendment
Water License Amendment – Use			Amendment
Occupant License to Cut – Mine Site/Tailings Impoundment	*Forest Act*	MFLNRORD	New Permit
Occupant License to Cut – Gravel Pits			New Permit
Occupant License to Cut – Access Road			New Permit
Occupant License to Cut – Borrow Areas			New Permit
Occupant License to Cut– Power Transmission Line			New Permit
Special Use Permit – Access Road			New Permit
Road Use Permit			New Permit
License of Occupation –Water Discharge Line	*Land Act*	MFLNRORD	New Permit
License of Occupation – Borrow/Gravel Pits			New Permit
License of Occupation – Staging Areas			New Permit
License of Occupation/Statutory Right of Way – Power Transmission Line			New Permit
Surface Lease – Mine Site Facilities			New Permit
Surface Lease – Concentrate Dewatering Facility (Filter Plant)			New Permit
Section 12 Site Alteration Permit	*Heritage Conservation Act*	MFLNRORD	New Permit
Section 14 Inspection Permit			New Permit
Section 14 Investigative Permit			New Permit

Table 8-2 Potential Key Federal Permits and Authorizations

Permits/Authorizations/Licenses	Enabling Mechanism	Issued By	Requirement
Explosives Factory License	*Explosives Act*	Natural Resources Canada	Amendment
Explosives Magazine License			Amendment
Schedule 2, Metal and Diamond Mining Effluent Regulations (MDMER)	*Fisheries Act/ Environmental Code of Practice for Metal Mines*	Environment and Climate Change Canada	New Authorization
Fish Habitat Compensation Agreement	*Fisheries Act*	Fisheries and Oceans Canada	New Permit
Section 35(2) Authorization			New Permit

9 Project Schedule

A summary of the timing of key phases and milestones for the Project is presented in Table 9-1.

Table 9-1 Proposed Schedule

Project Phase/Milestone	Timing
Social and Environmental Baseline Studies	2015-2019
Engineering and Technical Studies	2016-2020
Permitting Process	2018-2021
EAC Application	Q3 2020
Construction start date	2021 (Year 1)
Operations start date	2024 (Year 4)
Life of the Mine	2040[a]

[a] *See following paragraph.*

The Project is expected to extend LOM for at least 13 years, until at least 2040. Where possible, progressive reclamation would be carried out throughout the mining phase of the Project. Reclamation of any areas not reclaimed by the end of mine life would begin immediately following mine closure. Closure phase activities would commence prior to final ore removal, as outlined in Section 5.8.

Project design is currently at the pre-feasibility (PFS) stage, which includes:

- PFS level design work and Project evaluation;
- major permit application preparations;
- ongoing engagement and collaboration with stakeholders; and
- continuous mine planning and value analysis.

It is anticipated that feasibility studies would commence in Q3 2019 and would conclude in Q1 2020.

10 List of Existing Data

Table 10-1 List of Other Existing Data

Author	Year	Title	Location
Ashcroft Terminal	2018	Ashcroft Terminal Website	https://www.ashcroftterminal.com/about-us/infrastructure
BC CDC	2018	Species and Ecosystems Explore	http://a100.gov.bc.ca/pub/eswp/
BC EAO	2016	Guidelines for Preparing a Project Description. British Columbia	Environmental Assessment Office: Victoria, BC
MFLNRORD	2018	Invasive Alien Plant Program Spatial Database	http://maps.gov.bc.ca/ess/hm/iapp/
ENV	2018	Kamloops Land and Resource Management Plan	http://www.env.gov.bc.ca/thompson/esd/hab/lrmp.html
BC Parks	2018	Tunkwa Provincial Park	http://www.env.gov.bc.ca/bcparks/explore/parkpgs/tunkwa/
BC Parks	2018	Monck Provincial Park	http://www.env.gov.bc.ca/bcparks/explore/parkpgs/monck/
Casselman M J, W J McMillan, K M Newman	1995	Highland Valley porphyry copper deposit near Kamloops, British Columbia: A review and update with emphasis on the Valley deposit: in Schroeter T G (Ed), Porphyry Deposits of the Northwestern Cordillera of North America	Can. Inst. of Min. Met & Pet. Spec Vol 46 pp 161-191
Citxw Nlaka'pamux Assembly	2016	Citxw Nlaka'pamux Assembly Website	http://cna-trust.ca
Ferby, T, A Plouffe, and A L Bustard	2016	Geochemical, mineralogical, and textural data from tills in the Highland Valley Copper mine area, south-central British Columbia	British Columbia Geological Survey GeoFile 2016-11. Geological Survey of Canada Open File 8119, 15p. doi: 10.4095/299242
Heritage BC	2017	Lower Nicola Indian Band Cultural Heritage Policy	https://heritagebc.ca/wp-content/uploads/2018/04/Cultural-Heritage-Policy-1.pdf
Lloyd, D A , K Angove, G Hope, and C Thompson	1990	A Guide to Site Identification and Interpretation for the Kamloops Forest Region: Land Management Handbook 23. BC Ministry of Forests	https://www.for.gov.bc.ca/hfd/pubs/docs/Lmh/Lmh23.pdf
Lower Nicola Indian Band	2018	Lower Nicola Indian Band Website	https://lnib.net/

Author	Year	Title	Location
Ministry of Forests, Lands, Natural Resource Operations	2013	Ministerial Order under the *Land Act* – Land Use Objectives Regulation. Old Growth Management Objectives for the Kamloops Land and Resources Management Plan Area	https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/land-use-plans-and-objectives/thompsonokanagan-region/kamloops-lrmp/kamloops_lrmp_luor_18apr2013.pdf
Moss, Brian	July 30, 2007	Water Pollution by Agriculture. Phil. Trans. R. Soc. B.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2610176/pdf/rstb20072176.pdf
New Gold Inc.	March 23, 2015	Technical Report on the New Afton Mine, British Columbia, Canada. NI 43-101 Report.	http://s1.q4cdn.com/240714812/files/documents_properties/new_afton/2015-03-23_RPA-New-Gold-New-Afton-PEA-Tec-Report_FINAL.pdf
Nlaka'pamux Nation Tribal Council	2018	Nlaka'pamux Nation Tribal Council Website	http://nntc.ca/pages/home.aspx
Plouffe, A and T Ferbey	2015	Surficial geology, Gnawed Mountain area, British Columbia, Parts of NTS 92-I/6, NTS 92-I/10, and NTS 92-I/11	Geological Survey of Canada, Canadian Geoscience Map 214 (preliminary); British Columbia Geological Survey, Geoscience Map 2015-3, scale 1:50 000. Doi: 10.4095/296285
Province of BC	2018	Kamloops Land and Resource Management Plan	https://www2.gov.bc.ca/gov/content/industry/natural-resource-use/land-use/land-use-plans-objectives/thompson-okanagan-region/kamloops-lrmp
Province of BC	2018	Old Growth Management Areas	https://catalogue.data.gov.bc.ca/dataset/old-growth-management-areas-legal-current
Ratcliff & Company LLP	2009	Attachment B: Writ Filed on Behalf of the Members of the Bands of the Nlaka'pamux Nation, in "Responses of the Intervenors the Coldwater, Cook's Ferry, Siska and Ashcroft Indian Bands to Information Request No. 1 of the British Columbia Utilities Commission, Information Request No. 1 of BC Hydro and Information Request No. 1 of BCTC"	http://www.bcuc.com/Documents/Proceedings/2009/DOC_23720_C6-6_Coldwater_Resps_BCUC_IR-1.pdf
Stk'emlupsemc te Secwepemc Nation	2018	Stk'emlupsemc te Secwepemc Nation Website	https://stkemlups.ca
Teck	March 2018	2017 Annual Reclamation Report	
Teck	June 2016	Bethlehem Extension Project *Mines Act* M-11 Permit Amendment Application	
Teck	May 18. 2017	Teck Highland Valley Copper Partnership Water Management Plan. Version 3	

Author	Year	Title	Location
Teck	March 30, 2017	Teck Highland Valley Copper Permit PA-1557-2016 Assessment Report	
Turner, James A	2016	Assessment Report 2015 for the Lucky Mike Copper -Tungsten Property, Merritt British Columbia. Nicola Mining Division Effective date: July 27, 2016, Amended December 11, 2016	http://aris.empr.gov.bc.ca/ARISReports/36240.PDF
Upper Nicola Band	2018	Upper Nicola Band Website	http://uppernicola.com
Young G., M A Fenger and H A Luttmerding	1992	Soils of the Ashcroft map area. Report No. 26	British Columbia Survey. Integrated Management Branch, Ministry of Environment

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BC Parks. 2018b. *Monck Provincial Park*. Available at: http://www.env.gov.bc.ca/bcparks/explore/parkpgs/monck/ (accessed March 2018).

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Appendix A Indigenous Governments' and Organizations' Contributions to the Development of the Project Description

Appendix A – Indigenous Governments' and Organizations' Contributions to the Development of the Project Description

As described in Chapter 1, this Project Description was developed collaboratively with contributions from the Nlaka'pamux Nation and Stk'emlupsemc te Secwepemc Nation. Contributions from Indigenous Governments and Organizations provided between September 2018 and July 2019 have led to changes to both the document text and structure and prompted action outside of the Project Description. A high-level summary of those contributions is provided below. Disclaimers regarding participation are provided in Section 3.10.

1 Citxw Nlaka'pamux Assembly

Citxw Nlaka'pamux Assembly (CNA) contributions to the Project Description included:

- Additional terms and definitions for inclusion in the Glossary as well as Nlaka'pamux words with English translations, suggested sources for additional terms.
- Recommendations for additions of definitions of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and Section 35 of the *Constitution Act* to the glossary, as well as addition of sections concerning the government of BC's draft principles on reconciliation (Province of British Columbia 2018); UNDRIP; and Free, Prior, and Informed Consent.
- Addition of language about HVC's collaborative commitments as part of the application and mitigation development phases to the Engagement chapter.
- Clarification on use of abbreviations to refer to Communities of Interest.
- Addition of references to existing agreements as well as collaborative working groups with Nlaka'pamux.
- Addition of context around the history of the Cook's Ferry reserves.
- Addition of section on other land uses (including exploration projects and logging) to discussion of cumulative effects in the Potential Project Effects chapter.
- Addition of references to and intentions of the End Land Use Plan and Returning Land Use Plan to several sections.
- Request for correct capitalization, form, and consistency in certain terminology used throughout the document.

In addition, during the course of development of the Project Description, CNA:

- Provided instruction on how comments on the document should be confirmed as addressed in subsequent iterations.
- Requested more information about the Project's relocated gas lines, water management, and the continuing use of the Spatsum Pumphouse, and HVC provided this information.
- Expressed interest in consideration of reduced waste rock dump heights, resulting in HVC's proposal to use additional area west of North Valley Dump to reduce dump height (refer to Figure 5-2).

2 Lower Nicola Indian Band

Lower Nicola Indian Band (LNIB) contributions to the Project Description included:

- Changes to multiple chapters to add reference to water usage required by the Project to accomplish increase in production.
- Recommendations for addition of sections concerning UNDRIP and Section 35 of the *Constitution Ac*t.
- Clarification of language describing Traditional Territories.
- Review the Engagement and Existing Conditions chapters' sections on LNIB and addition of additional text.
- Recommendation that a section be added to the Existing Conditions chapter to describe the Lower Nicola community.

In addition, during the course of development of the Project Description, LNIB:

- Requested information about leases and tenures related to renewal and exploration, as well as about fencing and access.
- Supplied geospatial information about georeferenced Nlaka'pamuxcin place names. This information was considered for inclusion as a map in the Project Description, but, following to discussions between HVC and CNA, the need for additional discussion around the correct level and presentation of information was identified, and the map was reserved for possible inclusion in future documentation.
- Asked for additional information regarding the ore estimates for the proposed pit and tailings grade differences over the course of the Project.
- Communicated their concern about the mine and the Project's effects on vegetation and wildlife, and as a result on human health, as well as their expectation to be engaged in technical discussions through the permitting process to ensure their interests and concerns on country foods, plant and wildlife studies, human health, water management, water quality (especially sulphate concentrations) are addressed, and in meaningful discussions on opportunities associated with the Project.
- Communicated their position that the Stk'emlupsemc te Secwepemc Nation should be removed from the figure depicting Indigenous Governments and Organizations and that only Nlaka'pamux agreement holders and Upper Nicola Band (for the transmission line) should be referenced.

3 Nlaka'pamux Nation Tribal Council

Nlaka'pamux Nation Tribal Council (NNTC) has provided contributions to the Project Description; however, they have identified the NNTC perspective will be addressed through the NNTC assessment process. Please refer to NNTC disclaimer text (Section 3.10).

4 Stk'emlupsemc te Secwepemc Nation

Stk'emlupsemc te Secwepemc Nation (SSN) contributions to the Project Description included:

- Recommendation for clarification to the discussion of the SSN Project Assessment Process in the Engagement chapter as well as identification of additional sections of the document where reference to this process should be added.
- Clarification of wording with respect to asserted territory.

- Recommendation of additions to the Glossary.
- Recommendation for additional details to be included, such engagement activities involving SSN, the reason for additional make-up water requirements and differences between water consumption rates relating to the options to increase Highland Mill capacity.
- Recommendation for greater acknowledgement of SSN jurisdiction, leading to updates throughout the text to highlight HVC's approach to engagement as framed through recognition of Indigenous jurisdiction.
- Request for reference to HVC and SSN's agreement to engage on end land use requirements in the Site Rehabilitation Planning and Execution section.

Appendix B HVC 2040 Community Engagement Handouts

What is environmental baseline and why does HVC collect environmental baseline information?

Environmental baseline can be described as the current environmental conditions. Highland Valley Copper collects environmental baseline information to ensure that current environmental conditions are understood before starting a new project. This is important so we can better understand the potential changes or impacts a project may have on the environment.

HVC recognizes that First Nations have used and occupied the t'mixw (land) for thousands of years. Therefore, it is important that HVC includes Nlaka'pamux rights, values and interests throughout the baseline assessment.

What do we collect?

We collect information for all aspects of the environment, with a focus on species at risk. This includes individual programs for terrestrial, aquatic and social disciplines.

Terrestrial (Land) Environment

- wildlife, vegetation including culturally significant plants, soils and ecosystems.

Aquatic (Water) Environment

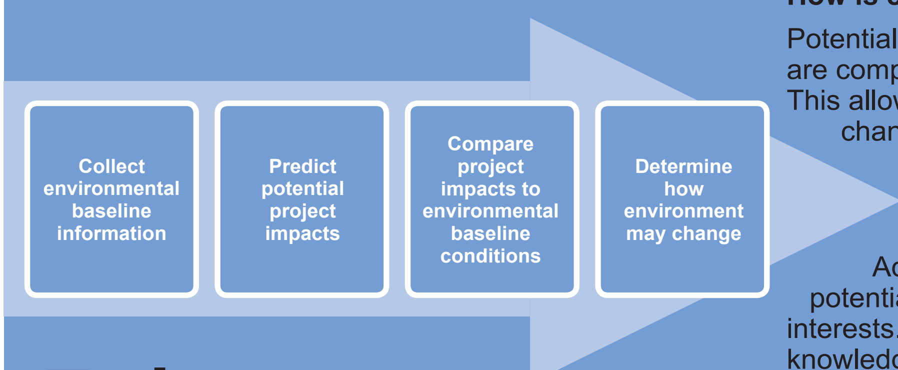
- water volume, flow and quality, fish and fish habitat, fish food sources, and fish health.

Social Environment

- air quality, noise, human and wildlife health, cultural heritage, community knowledge, community perception, and the economy.

Nlaka'pamux Rights, Values & Interests

- including but not limited to, historical use and occupation, oral history which includes the passing on of teachings,' creation and non-creation stories, governance, genealogy (lineage and kinship), language, songs, place names, ceremonial sites, culturally significant terrestrial and aquatic data.



How is environmental baseline information used?

Potential impacts from the project on the environment are compared to the baseline information collected. This allows us to predict how the environment could change if a project is constructed and starts operating. Decisions on if a project is approved, relies heavily on if the environment will be significantly impacted.

Additionally, baseline information is used to assess potential impacts to Nlaka'pamux Rights, values and interests. The collection of Nlaka'pamux traditional knowledge and the assessment of effects to Nlaka'pamux rights, values and interests is completed in collaboration with Nlaka'pamux.

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Highland Valley Copper mine is currently permitted to operate until 2026; however HVC has been investigating options to extend operations to 2040 or beyond.

What's next?

The proposed extension of the mine is expected to trigger an Environmental Assessment (EA) approval process under the BC Environmental Assessment Act (BCEAA). An EA is a project review that considers the implementation of mitigation measures, to assess the potential for adverse environmental, economic, social, heritage or health effects.

But what does that really mean?

The EA process evaluates a proposed project to identify positive project benefits and understand if there will be an undesired effect, after controls have been put in place to minimize and manage any potential risks or impacts. The EA process considers potential environmental, economic, social, heritage and health effects that may result from the proposed project.

Potential Effects Explained

Environmental Effects
Potential impacts to the air, land, water and wildlife.

Economic Effects
Potential impacts to the economy of the local communities and surrounding areas.

Social Effects
Potential impacts to the well-being of local communities and surrounding areas.

Heritage Effects
Potential impacts to physical and cultural heritage including structures or sites of historical or archaeological significance to local First Nations.

Health Effects
Potential impacts to the health condition of local people.

What does an Environmental Assessment involve?

The EA process is managed by the Environmental Assessment Office (EAO) in BC and includes three main stages: a pre-application, application and decision phase. The EAO seeks advice from the public, local First Nations and all levels of government during both the pre-application and application phases of an EA.

HVC recognizes that First Nations have used and occupied the t'mixw (land) for thousands of years. Therefore, HVC will collaborate with the Nlaka'pamux to ensure that Nlaka'pamux rights, values and interests will be incorporated throughout the application.

In addition to EAO consultation, HVC is committed to early and ongoing engagement with local communities.

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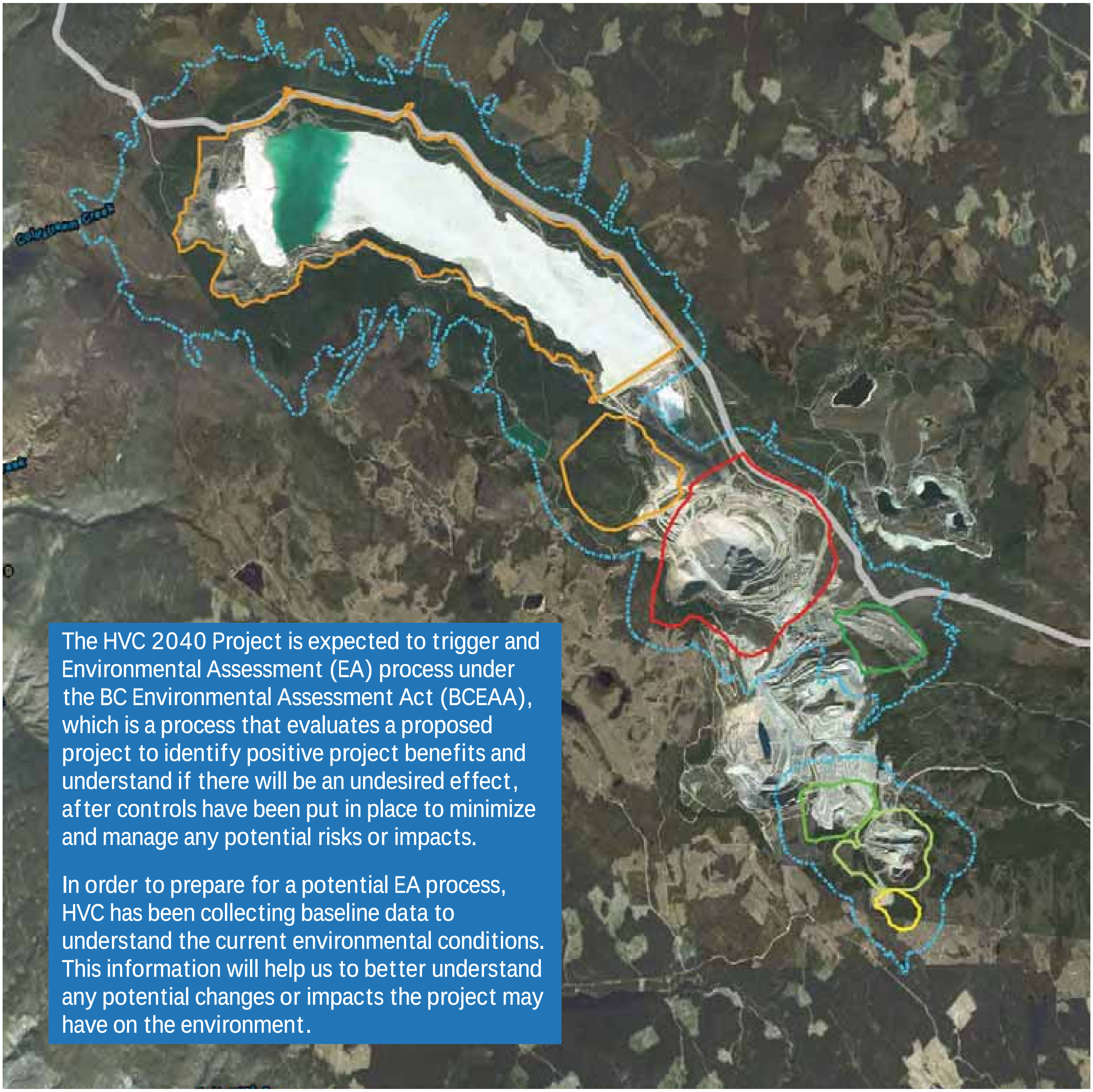
What is the HVC 2040 Project?

Highland Valley Copper Mine (HVC) is currently permitted to operate until 2026; however, HVC has been investigating options to extend operations to 2040 or beyond. The proposed project, HVC 2040, would involve the expansion of the existing Highmont and Valley pits, the creation of new waste rock dumps and extension of the existing Highland Tailings Storage Facility (TSF). Alternative storage options, within the existing mine footprint, are also being evaluated.



The HVC 2040 Project is expected to trigger and Environmental Assessment (EA) process under the BC Environmental Assessment Act (BCEAA), which is a process that evaluates a proposed project to identify positive project benefits and understand if there will be an undesired effect, after controls have been put in place to minimize and manage any potential risks or impacts.

In order to prepare for a potential EA process, HVC has been collecting baseline data to understand the current environmental conditions. This information will help us to better understand any potential changes or impacts the project may have on the environment.

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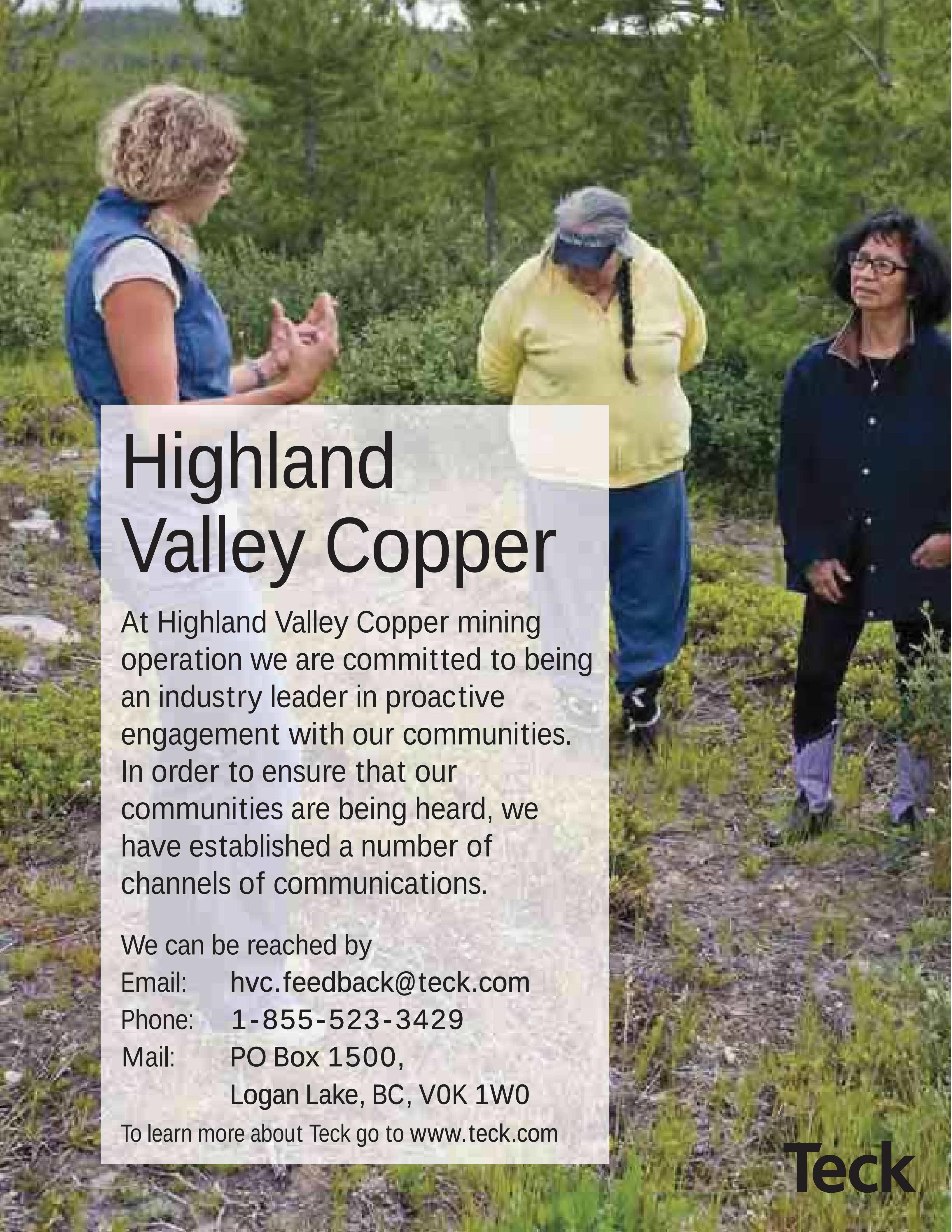

Highland Valley Copper

At Highland Valley Copper mining operation we are committed to being an industry leader in proactive engagement with our communities. In order to ensure that our communities are being heard, we have established a number of channels of communications.

We can be reached by

Email: hvc.feedback@teck.com

Phone: 1-855-523-3429

Mail: PO Box 1500,
Logan Lake, BC, V0K 1W0

To learn more about Teck go to www.teck.com

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Baseline Cultural Heritage Program

Cultural Heritage Baseline Studies

Ongoing Cultural Heritage baseline studies around HVC are focused on increasing our understanding of past uses of the land including field studies to confirm information previously recorded through maps, reports and historic information sources.

The ongoing baseline study will be used to identify traditional use areas and locations requiring additional archaeological survey and investigation. The results of these studies will guide next steps, which may include further investigation.

Observations from Cultural Heritage Baseline Studies

The Baseline Cultural Heritage studies to date indicate that many areas at HVC have cultural heritage potential including expansive trail networks. Field programs have successfully identified and mapped trail segments based on previously recorded information.

Did You Know?

Archaeological surveys have been occurring in the Highland Valley since 1981 and there are records, such as maps, from as early as 1888. HVC's cultural heritage program includes desktop studies, field programs and reporting, including mapping and categorization of areas around the mine site.

Cultural Heritage is a key consideration during the planning stages for any new project or activity at HVC. Where possible, HVC aims to avoid areas with a high potential for cultural heritage value and will suggest alternative locations for consideration.

If avoidance is not possible, fieldwork will be completed to better understand the cultural heritage value and identify if an archaeological site is present. Fieldwork results inform determination of appropriate next steps.

HVC has Cultural Heritage Agreements with the local First Nations communities that require HVC to use best efforts to protect cultural heritage, and guides mitigation and accommodation strategies. Adherence to this requirement has been continually demonstrated in the form of HVCs annual field program, which proactively collaborates with local First Nations communities and their field crews.

Baseline Fisheries and Aquatic Program

Environmental baseline can be described as the current environmental conditions at Highland Valley Copper (HVC). Environmental baseline data informs the current environmental conditions and helps to develop models that can predict how changes will potentially affect the environment.

Fisheries and Aquatic Baseline Studies

HVC has evaluated creeks and lakes around the mine site to better understand current conditions:

- HVC completed surveys of aquatic (water bug) communities and sediments from creeks and lakes in and around the mine site.
- Electrofishing surveys have been completed since 2015 to better understand where and how many (presence/distribution) fish are present in water bodies in and around the HVC mine site.
- Tissue samples (liver and muscle) have been collected at select creeks and lakes to understand the current fish conditions.
- Fish habitat was assessed at key times of year on creeks in the HVC area, including Woods, Pukaist, Highmont and Witches Brook creeks.

Did You Know?

HVC is located in a dry, hot area, and many of the smaller creeks only flow during spring melt and after heavy rainfalls. Most of the creeks that carry water all year provide habitat for rainbow trout, and many lakes near the mine contain fish. In the Highland Valley, Salmon and/or steelhead trout are only known to be present in the lower reaches of Skuhun Creek.

Observations from HVCs Baseline Fisheries and Aquatic Studies

Many of the channels on the north side of the Tailings Storage Facility likely do not contain fish as they only carry water during spring melt and after significant rainfall events. Copper appears to be naturally elevated in creek sediments across the region.

Baseline Fisheries and Aquatic Observations

Witches Brook	•Limited fish presence and distribution due to natural flows •Rainbow trout present •Healthy and productive aquatic communities
Pukaist Creek	•Rainbow trout present •High-quality winter habitat
Woods Creek	•Rainbow trout present •Healthy and productive aquatic communities •Physical barriers limit fish distribution •High-quality winter habitat
Highmont Creek	•Rainbow trout present •Physical barriers limit fish distribution •High-quality winter habitat
Skuhun Creek	•Rainbow trout present •healthy and productive aquatic communities
Skuhost Creek	•Limited fish presence and distribution due to natural flows
Chataway Creek	•Rainbow trout present •healthy and productive aquatic communities

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Baseline Terrestrial Program

Environmental baseline can be described as the current environmental conditions at Highland Valley Copper (HVC). Environmental baseline data informs the current environmental conditions and helps to develop models that can predict how changes will potentially affect the environment.

Terrestrial Baseline Studies

Field studies were conducted in the summer of 2017 to confirm the results of the previous mapping. Baseline activities included visiting the land to sample and survey the ecosystems, plants and soils in and around the HVC mine sites.

Field work identified ecosystems including forests, grasslands, rock outcrops, and wetlands and also identified all plants observed, including those identified as rare by the provincial government.

Observations from the Terrestrial Baseline Program

Data collected in 2017 has been used to update the existing mapping to produce a more accurate map that shows existing ecosystems within the vicinity of HVC. This information helps us to better understand the terrestrial habitat, which is closely linked to wildlife habitat, around HVC.

No provincially listed rare plants were found during the summer 2017 field surveys.

Did You Know?

An ecosystem is a group or community of plants, animals and their surrounding physical environment. In 2014 a map describing ecosystems in the area around HVC was created using air photos, satellite imagery, computer-based map programs and other data. The 2014 map included various ecosystems that vary from dry ponderosa pine areas and wetlands.

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Baseline Wildlife Program

Environmental baseline can be described as the current environmental conditions at Highland Valley Copper (HVC). Environmental baseline data informs the current environmental conditions and helps to develop models that can predict how changes will potentially affect the environment.

Wildlife Baseline Program

HVC has conducted baseline wildlife surveys to better understand the location and occurrence of wildlife and their habitat in and around the HVC mine site since 2015. Select surveys will also be completed in 2018 to confirm our understanding.

To date, surveys have been completed for amphibians and reptiles, song birds, raptors, bats, breeding birds, ungulates, woodpeckers, waterfowl, common nighthawk, raptors and owls.

The information collected will be used to develop wildlife habitat suitability models that will help HVC understand and assess any potential effects on key species based on the availability of suitable habitat.

Did You Know?

There is a large amount of existing wildlife information for HVC and the surrounding area. In addition to data from provincial and public databases, surveys have been completed onsite and in the surrounding area for a number of species including American pika, songbirds, ungulates, feral horses, moose and waterfowl.

Observations From The Wildlife Baseline Program

Species Detected During Wildlife Baseline Studies

- American Pika
- Feral Horse
- Golden Eagle
- Bats (13 species)
- Canada Lynx
- Bald Eagle
- Flammulated Owl
- Bobcat
- Red-Tailed Hawk
- Amphibian Larvae (4 species)
- Porcupine
- Northern Harrier
- Moose
- Common Nighthawk
- Merlin
- American Black Bear
- Western Rattlesnake
- Sharp-Shinned Hawk
- Mule Deer
- Breeding Birds (61 species)
- Sandhill Crane
- Coyote
- Waterfowl (20 species)

Northern Goshawks, Western Screech Owls, or their nests were not observed during baseline studies.

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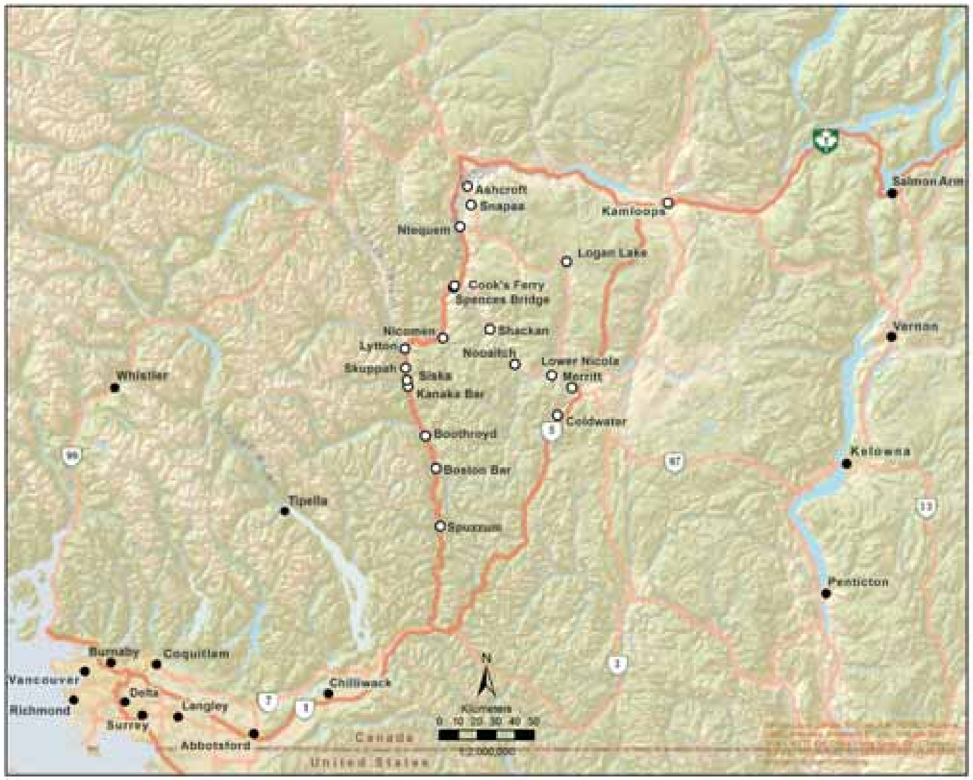
Appendix C Study of Mine Dust and Traditional Plants in the Highland Valley Area (Photo Book)

Study of Mine Dust and Traditional Plants in the Highland Valley Area



Old-One was travelling about, and came upon a woman sitting in an attitude of grief. She was bent forward, and her hands covered her face. He asked her why she was sorrowful, and she answered, "Because I am alone and deserted." He said to her, "Do not be sorry, for I will make you great and the mother of many. All things will grow from you." He transformed her into the earth, which he made expand, and shape itself into valleys, mountains, and plains. Her bones become the rocks, the largest ones, the mountain ranges and ridges. Her blood dried up, and assumed the form of gold, copper and other metals. Much of it ran to one place and congealed in the form of a large mass of gold among the mountains. (The whites know this, and therefore always search for gold in the mountains and not on the plains. They value the woman's blood very much, and are anxious to find the large deposit. They will never be able to find it, however, for the Old-One made the mountains all so alike, that it will be impossible for them to find the spot.) Now, Old-One commenced to make the Nicola country. He flattened, lowered, and heightened it here and there, until it became similar to what it is at the present day.

Reference: Teit-Boas Digitization Project, included by permission of the Nicola Tribal Association and Esh-kn-am.

Study of Mine Dust and Traditional Plants in the Highland Valley Area

Authors:
Nlaka'pamux Communities,
Teck Highland Valley Copper Partnership
and the Integral Ecology Group

Teck

TABLE OF CONTENTS

Teck Highland Valley Copper Partnership (HVC) is funding this project to address Nlaka'pamux community concerns about dust from the mine and potential impacts to traditional plants and foods in the Highland Valley area. This study is being conducted as part of HVC's mine permitting requirement with the BC government. Thirteen Nlaka'pamux First Nations agreed to actively participate in this research with HVC. Integral Ecology Group (IEG) is facilitating the project with all parties. Several representatives from the following First Nations communities participated in this project:

Nlaka'pamux Nation Tribal Council (NNTC)

Citxw Nlaka'pamux Assembly (CNA)

Lower Nicola Indian Band (LNIB)

ACKNOWLEDGEMENTS

HVC funded this research, and HVC staff contributed to this work through participation in the community workshops and guiding the research. HVC supported community researchers to participate in summer sampling for the study.

HVC Participants: Jaimie Dickson, Erin Weatherwax, Natasha Fountain, Peter Martell
HVC Interns: Ariel Swayze (Siska), Lasha McIntyre (Skuppah), JR Drynock (Nicomen), and Will Shuter (Lower Nicola Indian Band)

Integral Ecology Group facilitated this project, working together with the communities and HVC.
IEG Participants: Shanti Berryman, Ann Garibaldi, Kevan Berg, Justin Straker, Beth Keats, Melissa Iverson, Carolyn King, and Hannah Roessler

Nlaka'pamux community representatives who coordinated with participating communities included:
Lower Nicola Indian Band: Dave Caswell
Nicola Tribal Association: Sharon Joe
Esh-kn-am Cultural Resource Management Services: Brenda Walkem
Nlaka'pamux Nation Tribal Council: Tawnya Collins and Simone Sandercombe

Design, Layout, Photo editing: Hannah Roessler

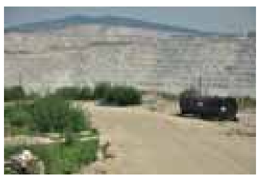
Photographers: Viktoria Haack, Ariel Swayze, Bev Herman, Carolyn King, Clint Smyth, Kevan Berg, Melissa Iverson, Hannah Roessler, Nancy Turner, Amar Athwal, the Pasco Family, and the Anderson family.

For more information on this study, please contact Jaimie Dickson at Teck Highland Valley Copper: Jaimie.Dickson@teck.com or 250.523.3353.

Information regarding wolf lichen, and traditional use of soapberry was also gathered and summarized from the following sources:
Turner, Nancy J., et al. Thompson ethnobotany: knowledge and usage of plants by the Thompson Indians of British Columbia. Royal British Columbia Museum, 1990.
Turner, Nancy J., and Carla M. Burton. Soapberry: unique northwestern foaming fruit. Festscrift for Thomas M. Hess (2010): 278-305.

We wish to thank all of the people who have made this study possible. We especially want to acknowledge the community members who participated in this research. Nlaka'pamux community members generously shared their rich traditional knowledge to help guide the research and to ensure the study addressed community concerns. We would like to express our deepest gratitude to community members for their contribution to this work.

1st Row: Al Peters, Alisa Briones, Amelia Washington, Amy Charlie, Anthony Briones, Arthur Sam, Basil Wilson, Bernice Garcia, Betsy Munro, **2nd Row:** Betty Jean Bergh and James Bergh, Brenda Walkem, Brenda Munroe, Brian Michel, Caroline Lytton, Christine Wilson, Debbie John, Derek Sheena, Doreen Harry, **3rd Row:** E. Dusty Wilson, Earl Joe, Earl Munro, Elaine Sterling, Esther Voght, Fabian Oppenheim, Geraldine Tom, Hank Yamelst, Harold Joe, **4th Row:** Ina Dunstan, Jim Fountain, Jim Toodlican, Joel Raphael, John "Oly" Bent, John Haugen, Joseph Munro, Lasha McIntyre, Lisa Dunstan, **5th Row:** Marshal Krause, Maurice Michell, Nicholas Peterson, Pauline Henry, Pearl Hewitt, Penny Toodlican, Peter Brown, Phyllis Moses and William Oppenheim, Rhonda Munro, **6th Row:** Riley Joe, Sharon Joe, Travais Oppenheim, Verna Miller, Vince Peters, Viola McIntyre, Yvonne Joe
Not pictured above: Angie Vomberg, Ariel Swayze, Barry Toodlican, Dave Clarke, Elaine Adams, Eva Paul, James Jackson, Judy McKay, Kassandra Phillips, Katrina Sam, Kevin Duncan, Krisalena Antoine, Mary Suchell, Matty Chillihitzia, William Abbott, Wyatt Smith, Rena Joe, Ryan Webster Ted Tom, Thomas Brown, Violet Brown, Vonnet Hall.



GLOSSARY OF TERMS

Chemical Element – in this study most elements we study are metals, but a few are not, such as nitrogen, sulphur and phosphorus. Many chemical elements are required by living beings for health, but can be unhealthy at high levels.

Concentration – the amount of something, in the case of this study it is the amount of a chemical element (or metal) measured in lichen, soils or the soapberry plant.

Copper – a metal. It is an essential mineral to all living things.

Copper concentrate – a powder-like copper substance that is produced at mines after milling and concentrating ore (or rock that copper is present in).

Deposition – in the case of this study, deposition is the amount of dust deposited from the air onto a lichen or plant.

Dust source – something that creates dust in the air. In the case of this study, it could be various activities on the mine or logging activities.

Enrichment – the action of increasing something. In the case of this study, dusting of plants can enrich metals on and in the plant.

Fungus – an organism such as yeast, mold or mushrooms. Fungus can produce diseases on plants.

Indicator plant – a plant that is used for study of environmental conditions. In the case of this study, soapberry is used as an indicator plant to study the effects of mine dust in the Highland Valley area.

Lichen – an organism that is formed between a fungus and algae living together in one plant. Lichens do not have roots, and require nutrients from the air.

Maximum tolerance level - concentrations of metals that will not affect animal health when consumed for a defined period of time.

mg/kg - A milligram is equal to one thousandths of a gram. A milligram per kilogram is a milligram of something in a kilogram of something (e.g., a milligram of copper per kilogram of soapberry leaves).

Mill site – the site at HVC where the copper ore rock is milled and concentrated for the final product.

Mitigation – the action of reducing the severity or impacts of something.

Nłeʔkepmxcin - the traditional language of the Nlaka'pamux people.

Ore rock – ore is a type of rock that contains sufficient minerals with metals that can be mined for economic benefit.

Prediction – a forecast or guess based on existing information. In the case of this study, we are using measured metal concentrations in lichen and soapberry to predict or estimate metal concentrations in locations where we did not sample.

Sample – taking a small part of something for study or analysis. In the case of this study we took small amounts of soapberry leaves and berries, lichen and soils for analysis.

Shepherdia canadensis – the Latin name for soapberry.

Sites - locations where samples were taken for this study.

Sxwúsm – soapberry plant.

Tailings pond – an engineered dam and dyke system that is used to store the mixture of water, sand and residual materials that is left after mining. In the case of HVC, the tailings pond contains residual material from milling the copper ore rock.

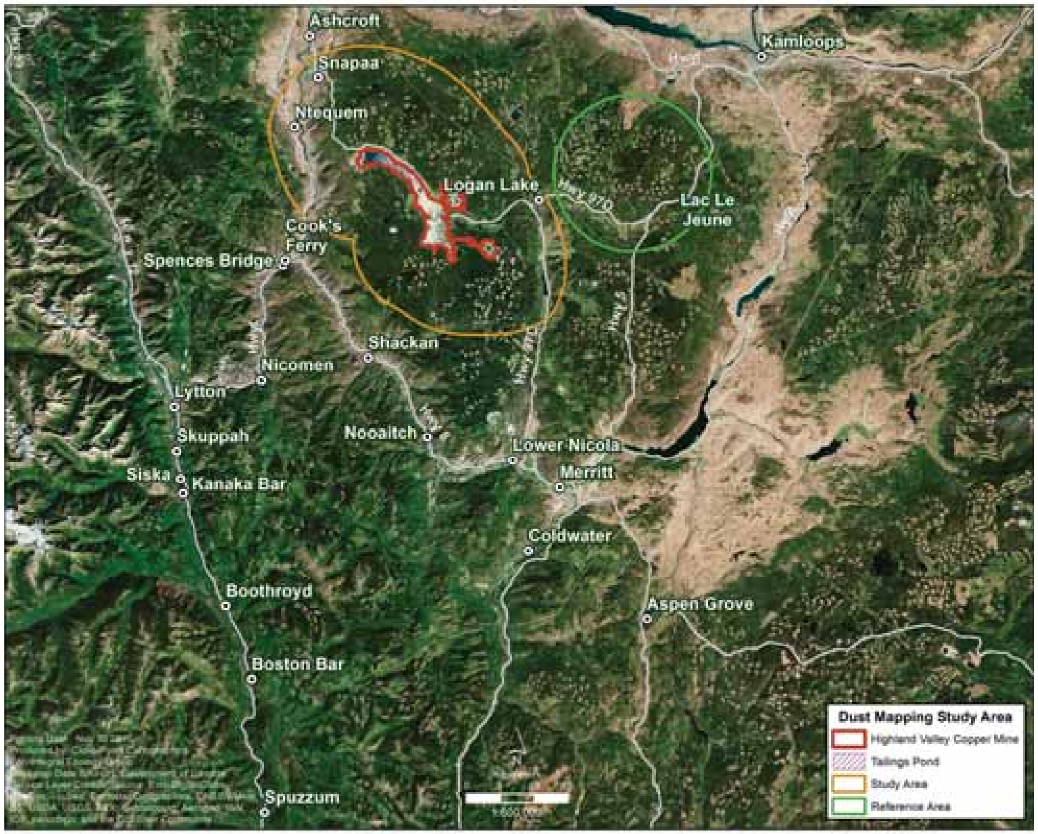
Toxicity – the state in which something is poisonous or damaging to something.

Threshold – a level that is exceeded.

Traditional protocols – protocols that have been developed for the sharing and practicing of traditional knowledge.

µg/L - one microgram per litre (e.g., a microgram of copper in a litre of soapberry juice).

Xwúsm – soapberry whip or confection.



FORWARD

This study was designed to address Nlaka'pamux community members' concerns regarding the potential impacts of mine dust on the land and the traditional plants in the Highland Valley area. Many traditional plants are still used by the Nlaka'pamux community members for food, medicine and spiritual purposes.

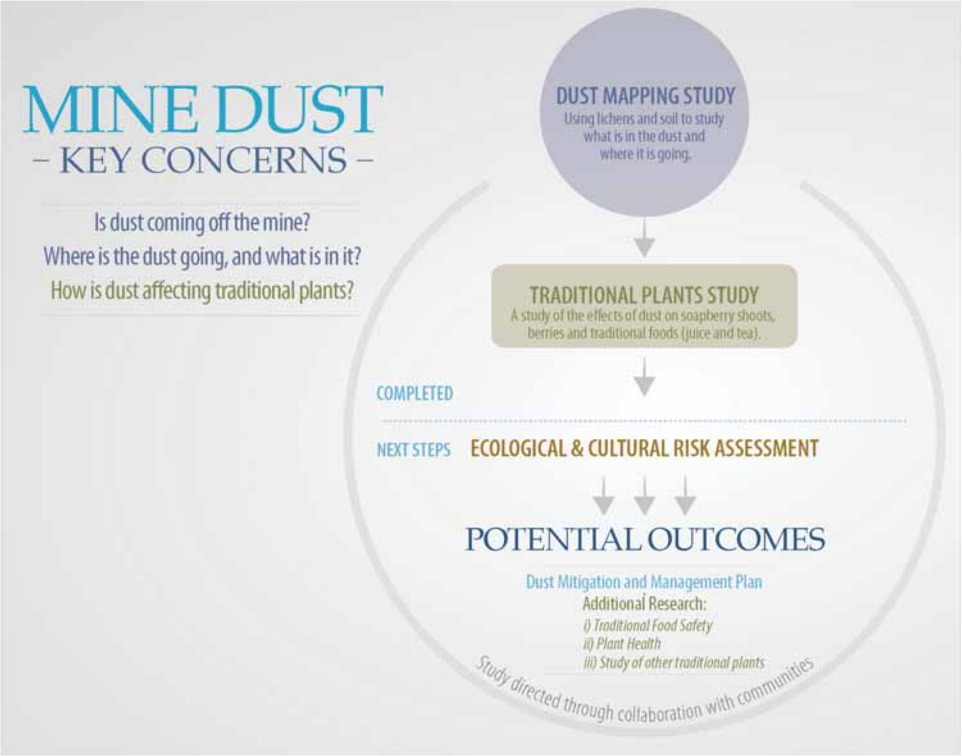
The rich and detailed knowledge shared by community participants in this study will inform opportunities for HVC to consider mitigations for managing dust and for addressing potential cultural impacts.

The purpose of this book is to share knowledge with people in the Nlaka'pamux communities, and to share the process of the research.

Key Study Questions:

- Is dust coming off the mine?
- Where is the dust going and what is in it?
- How is dust affecting traditional plants?

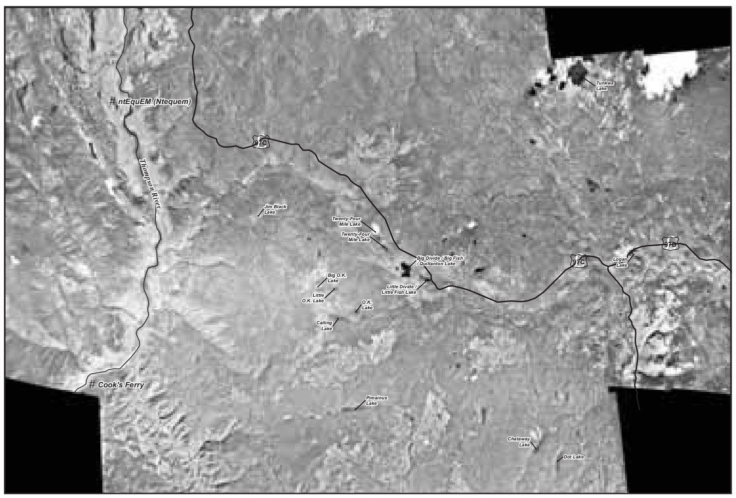
KEY STEPS TO THE STUDY:



HISTORY OF THE HIGHLAND VALLEY AREA

The Highland Valley area is within Nlaka'pamux lands of which the people have been connected to and stewards of since a time immemorial. Historically, many activities such as hunting, fishing, trapping and gathering were carried out in this area, as well as growing and cutting of swamp hay for livestock. The higher elevations were important to the Nlaka'pamux culture as these areas were considered to be places of power, and also yielded potent medicinal plants.

Valuable trade items were also gathered or harvested in the valley, and the area near the HVC tailings dam was part of traditional Nlaka'pamux travel routes for seasonal harvesting and trade from Ashcroft to Stoyoma Mountain. The valley was an important site for spiritual training, social gatherings, and sharing of knowledge and stories. From the valley and lowlands to the highest remote peaks surrounding it, the Highland Valley area provided sustenance - both in the past and today - for the Nlaka'pamux people on many levels, including social, spiritual and cultural.



The Highland Valley area prior to mining, 1951

Jim Toodlican (Shackan): "I remember my grandparents turning out their horses before spring, and then before summer they'd gather their horses in. But we don't no more.… I don't know what year they stopped people from catching wild horses. They were filming, making a movie out of the wild horses that were left. At one time they asked me if I wanted any wild horses. [I said] I don't need any wild horses, they come to my house."

Jim Fountain (Nooaitch) recalls an "Indian trail" that would run from Ashcroft through to the valley, where people would travel to gather all summer. He recalls being a young boy and traveling by trail with his grandmother on horseback, picking huckleberries and says, "where that mine is, I used to chase wild horses."

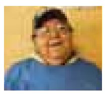
Vonnet Hall from LNIB remembers picking soapberries and camping near Witches Brook and Mamette Lake, but remembers exploring all around the Highland Valley area, explaining "People hunted and camped all around that place."

Photo below: Chief Simeon Pasco (Poscah) piling swamp hay near Divide Lake 1937 (photo courtesy of the Pasco Family)

Elaine Sterling (LNIB): "Where that water is we used to hunt game. That reservoir [tailings pond] all the way around...That used to be a meadow. Hunting moose deer, bear, the occasional cougar. There was a lot of berries. Saskatoon, sxwúsm, raspberry, strawberry, grouse berries, a lot of buckwheat. 1981/82 was the last time I was up there. [I stopped going because] too much dust there, we kept sneezing."

Ted Tom (LNIB staff): "That's where I used to go to gather sxwúsm, but haven't been in 16 years… I didn't know if there would be anything in [the dust] that would hurt me, I could wash it off but I don't know about if it gets in the ground."

Many community members who participated in this study agreed that much has changed - today there are very few people who harvest around the mine area. After the mine became active, there was uncertainty around the safety of hunting and gathering in the valley. Some elders even advised community members not to harvest in the Highland Valley area.



Elaine Sterling (LNIB) recalls a meadow site that was popular for harvesting traditional foods, a site which is now covered by the tailings pond. She used to pick sxwúsm in the area where the old mine used to be, where Bose Lake is, but has since stopped picking in that area "I think there was a lot of dust [Bose Lake, Mamette Lake, Witches Brook], even then [when people were frequenting those areas to camp] lots of dust, and the elders told us never to go back up there."

Many community members have not been to the Highland Valley area for many years, and most people hunt and gather in other areas outside of the valley. While there are some people who still hunt and gather berries in parts of the valley, it is almost always in areas further from the mine.

Debbie John (LNIB): "I've never gathered up there. It's too close to… whatever's going on up there…we stay away from it…My mom and them never took me. She talked about being up there, but we've never been there. So, that's been 34 years for me and I've never been up there to gather. Because of the elders saying we don't gather no more just because of the mine. [I now go to] places I can't see a mine."

Above left photo: Moose near the mine. Above right photos: Tommy Billy and Agnes Hewitt and others with a catch of trout from Divide Lake in late summer. "They used to dry those – it was cooler up there and they were smaller", Marie Anderson, August 2012. (photo courtesy Anderson family)

Jim Toodlican (Shackan): "When I was growing up as a child there was a lot of people that went out picking, out on horses, buggies, wagons. And then it came to a time when they didn't do that. Then, say maybe in the last 20 years, I see a lot of people are going back to picking, gathering food, berries, roots and that. Our traditional foods and medicines. They seem to be coming back…So, to me that, for my grandkids kids, the ones not born yet, they'll see that, they'll know where to go to gather whatever traditional food they want to gather and put away."

Jim Fountain (Nooaitch) explains, " A lot of Indian people who would go around the mine don't anymore. Same with Logan Lake. Last time I was there was in the fifties. We shared with one another, stories, good berries...We used to raise horses, pick berries and hunt. That's what I want to see again."

Below left photo: Moses Hewitt with deer kill in Highland Valley, 1930's (photo courtesy Anderson Family). Below right photo: Deer near the mine.

THE HIGHLAND VALLEY COPPER MINE

The Highland Valley Copper (HVC) mine is the largest open pit copper mine in Canada, and produces approximately 1% of the world's copper and 1.5% of the world's molybdenum. HVC is a combination of four mining operations.

Initial mining began with the Bethlehem operation in 1962, and included three pits (Huestis, Jersey and Iona) and two tailings ponds (Bethlehem Main and Trojan). The Bethlehem operation was completed in 1982 and is currently reclaimed. When operations ceased in the Bethlehem area, mining was no longer considered profitable, however due to advances in technology and current market prices, HVC is developing an application to amend the exisiting Mines Act. The Bethlehem Mill supported all of these operations until transition to the Highland Mill in 1989 which is still currently operating.

In 1970, the Lornex operation began and continues to operate today. The Valley operation began in 1982 and also continues to operate today. The Highmont operation began in 1979 and included two pits, Highmont West and East, and a tailings pond. It closed in 1984 due to low molybdenum prices, but was reopened in 2005 and is currently actively mined. The Bethlehem Mill operated until 1989 and supported all of these operations until transition to the Highland Mill in 1989.

The four mining operations merged in 1986, and the Highland Mill and the Highland Tailings now support all operations.

HIGHLAND VALLEY COPPER MINE


Valley pit

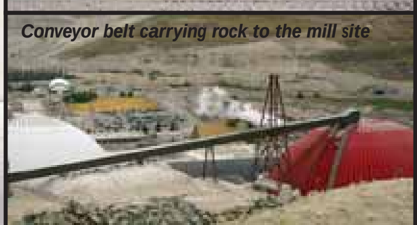
Ore rock is mined from open pits, where rock is blasted from the pit walls for removal. Dust is created during these blasts.


Walls of the pit


Truck hauling ore rock to the crusher

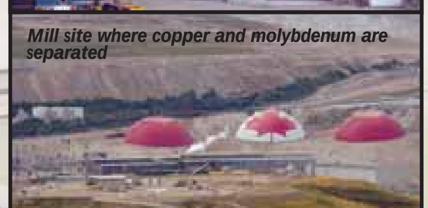
Trucks haul the ore to crushers. These crushers create dust.


Rock crushers

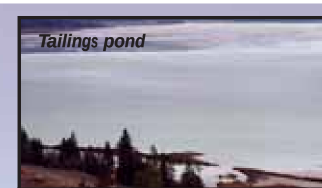

Conveyor belt carrying rock to the mill site

Crushed rock is then put on a conveyor to the mill site.

The ore rock is milled to separate out the copper and molybdenum metals.

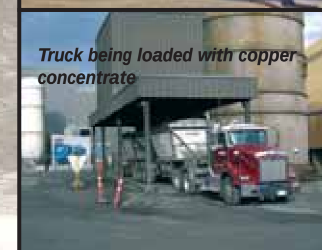

Mill site where copper and molybdenum are separated

Tailings is the sand-and-water slurry that are left over from the milling process and is stored in the tailings pond. The water is recycled back to the mill for reuse in the milling process. The pond is mostly wet, but there a some areas that are dry that can be a source of dust. The tailings dam is also dry and is a substantial dust source.

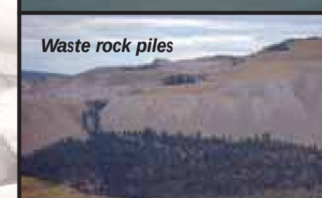

Tailings pond


Tailings dam

The copper metal concentrate is a dark powder that is loaded into haul trucks and carried to the railroad in Ashcroft. The molybdenum is put in bags and transported to Vancouver on trucks. The loading of the copper concentrate can create dust in the local area and some of this will remain on the undercarriage of the truck.


Truck being loaded with copper concentrate

Waste rock that does not contain ore is carried to waste rock piles. The mine is in the process of revegetating the waste rock piles that have reached their design capacity. These rock piles create minimal dust.


Waste rock piles

COMMUNITY PARTICIPATION

Nlaka'pamux community members worked with HVC to design and implement the study, following a participatory research approach that involved elders, adults and some youth.

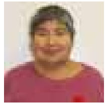
Community workshops were held over a two-year period to design the study. As part of this process, community members guided the development of the research objectives, study design and methods, and provided input on the interpretation and presentation of results.

The research methods were developed through knowledge shared by community members in workshops and in the field, as well as using scientific methods. IEG worked with HVC community interns to gather samples for the research.

Traditional knowledge shared by community participants informed areas included in the study, the sampling methods and how results were interpreted and presented.

Verna Miller (Cook's Ferry): "I'm also curious about different plants and how they absorb and how much they absorb, because they may not absorb the same levels as say the wolf lichen because the structure and biological composition of the wolf lichen would be very different from soapberries for example."

Debbie John (LNIB): "All that dust is seeping into the ground. So, it is feeding the plant. It would be interesting to see what the plant contains."



Betsy Munro (Siska): "I'd like to know what's in the dust and whether it affects the berries. Do the berries absorb what's in the dust?"

Brenda Walkem (Cook's Ferry): "I would say there's a greater concern over the mine dust…[mine dust is] going to be more concentrated in metals, I'm assuming, than regular dust."

Photo: July 2014 berry picking workshop
Back row, left to right: Marshal Krause, Pauline Henry, Amelia Washington, Verna Miller, Caroline Lytton, Brenda Walkem, Debbie John, Dusty Wilson, Alisa Briones, Sharon Joe, Yvonne Joe, Fabian Oppenheim, Travais Oppenheim, Anthony Briones, Hank Yamelst.
Front row, left to right: Christine Wilson, Pearl Hewitt, Esther Voght, Art Sam, Jim Toodlican, Basil Wilson, Elaine Sterling

DUST MAPPING

The first part of the study addressed the three study questions related specifically to dust:

- Is the dust coming off the mine?
- Where is the dust going?
- What is in the dust?

To answer these questions, we studied wolf lichen, a plant that grows on trees in the Highland Valley area. Lichen are useful for studying dust because they get their nutrients from the air and absorb much of what lands on them, including dust. Lichen are also culturally important to the Nlaka'pamux people.

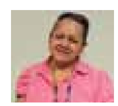
In the Nłeʔkepmxcin, the terms used to refer to wolf lichen translate to 'yellow' (kwəl'·/kwál'), or 'light yellow branch' (/kwəl'-m-ékeʔ), or 'yellow-green branch' (kwəl'·/kwal'-=áyqw). Many Nlaka'pamux people also simply refer to wolf lichen with the general term for mosses (/qwzém).

Above: Wolf lichen close-up

Traditionally, wolf lichen was used to obtain a bright-yellow dye, which was used to colour wood, hides, mountain goat wool, and horsehair. More recently, the dye has been used to colour sheep wool. Preparation for these materials generally involved boiling the lichen in water to extract the dye, and then soaking the material in the boiled solution. Under certain circumstances, the dye was also traditionally used as a body and face paint, which involved either dipping the lichen in water, or wetting the skin and applying the lichen dry. This technique may also have been used when using the dye as paint for wood.

We collected lichens from 137 locations in areas both near and far from the mine, out to 15 km from the mine area (see map on the next page). The lichen samples were sent to the laboratory where they were ground up to analyze what metals are in the lichen, to see if there is more dust in the Highland Valley area. We used these results to make maps that show where the dust from the mine is going and to show what metals from dust are in the lichen.

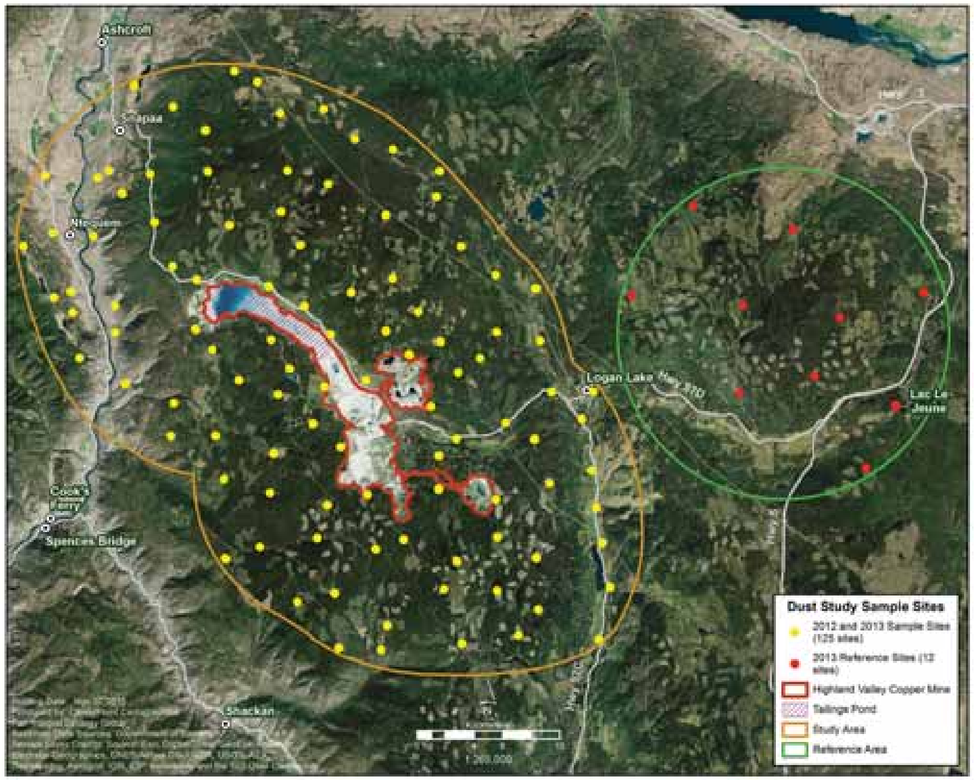
Lichens were also collected in the Lac Le Jeune area, which was identified by community members as a relatively clean and dust-free area, as well as an important hunting and gathering area. Metals in lichen were compared to this dust-free "reference area" in Lac Le Jeune to see if dust higher in the Highland Valley area.



Debbie John (LNIB): "You guys should do some dust studies a little farther away. We would like to select sites so that we can compare – clean areas to compare."

Above: Harvesting wolf lichen samples

Map showing sample sites for wolf lichen in the mine study area and the Lac Le Jeune reference area.

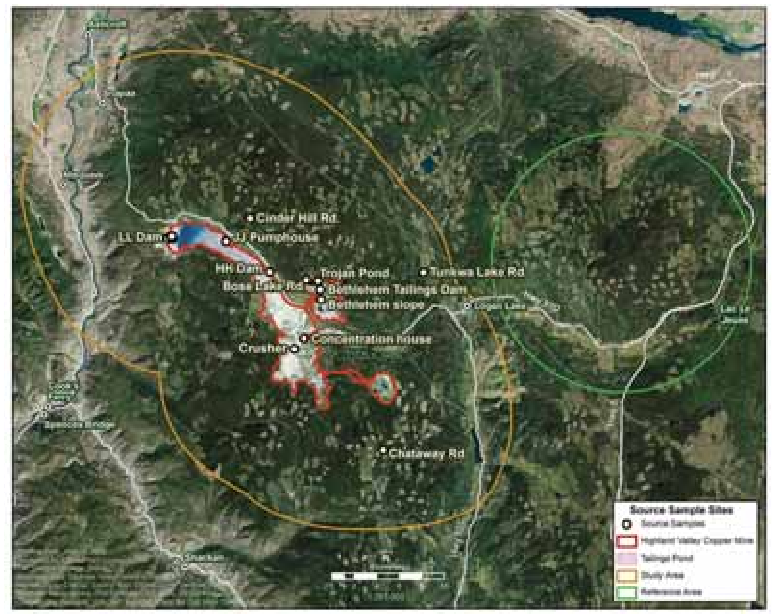


SOIL SAMPLING

In addition to sampling lichens at all locations, we also took samples of soil to determine metals in soils. Soils were taken at two places, the surface (0-20 cm) and deeper (20-40 cm) below the surface. Soils were sampled because dust is naturally high in metals in the Highland Valley area. By comparing the metals in lichen to the metals in soil, we can determine if the dust in lichen is "natural" or if it is dust from the mine activities.

DUST SOURCE SAMPLING

Samples were also taken from materials on the mine that create dust, including: the mill site, the Bethlehem area, the tailings pond and dam. Dust from active logging roads was also collected to determine if metals in the road dust differ from dust coming off the mine. In addition, we sampled the copper and molybdenum concentrate powder to determine what metals are present in the concentrate being hauled by the trucks to Ashcroft and Vancouver.



RESULTS

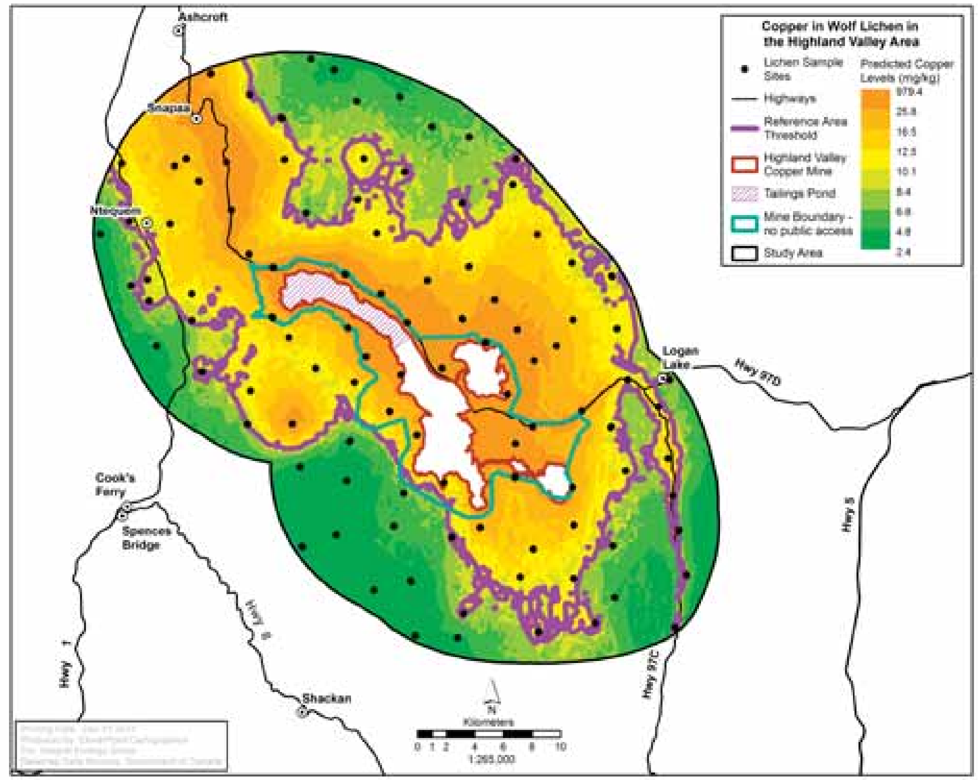
Results indicated that 13 elements in lichens showed a pattern of decreasing concentration with distance from mine dust sources. Most of these elements were higher near to the mine than in the reference area (with the exception of cadmium and lead). This indicates that these elements are from mining activities, not from natural dust. These elements extend in some cases out to the 15 km from the mine area. Results also revealed that Highway 97C from Logan Lake to Ashcroft is a key dust corridor, mainly for copper, and this may be related to the trucks hauling copper along this highway.

For example, if you refer to the map on the next page, you can see that the main highway is a key dust source, with deposition extending north along the highway. The purple line on the map shows the boundary for the "reference area" copper concentrations, where samples within the lines have higher levels of copper than in the reference area.

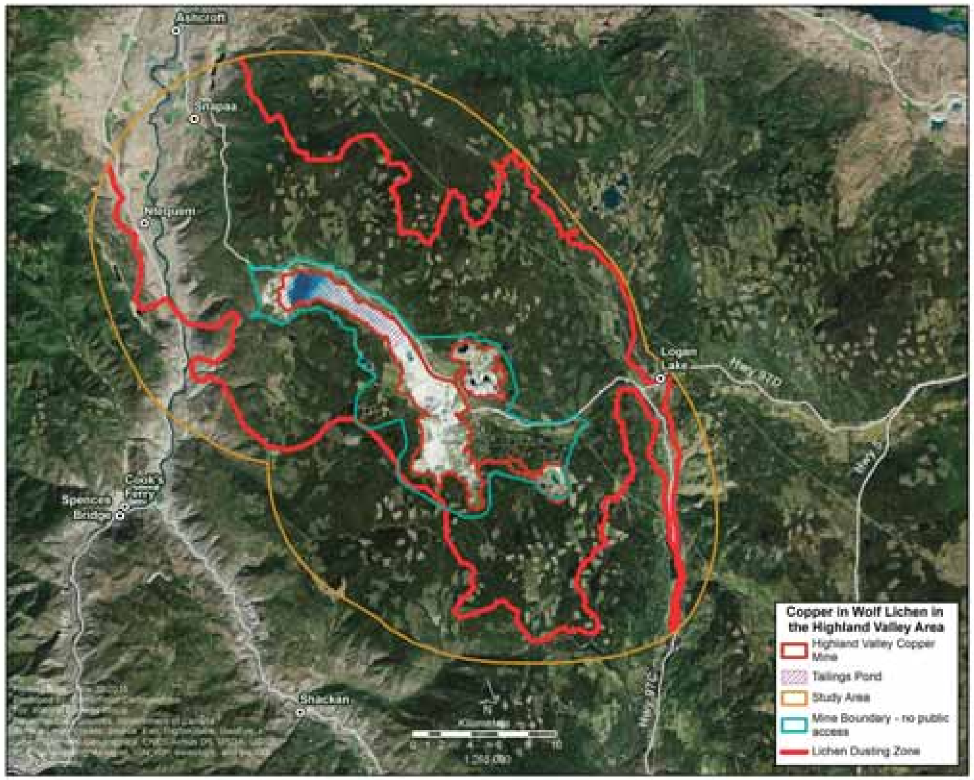
Four other elements were also measured in lichen and did not show levels that were related to mine activity.

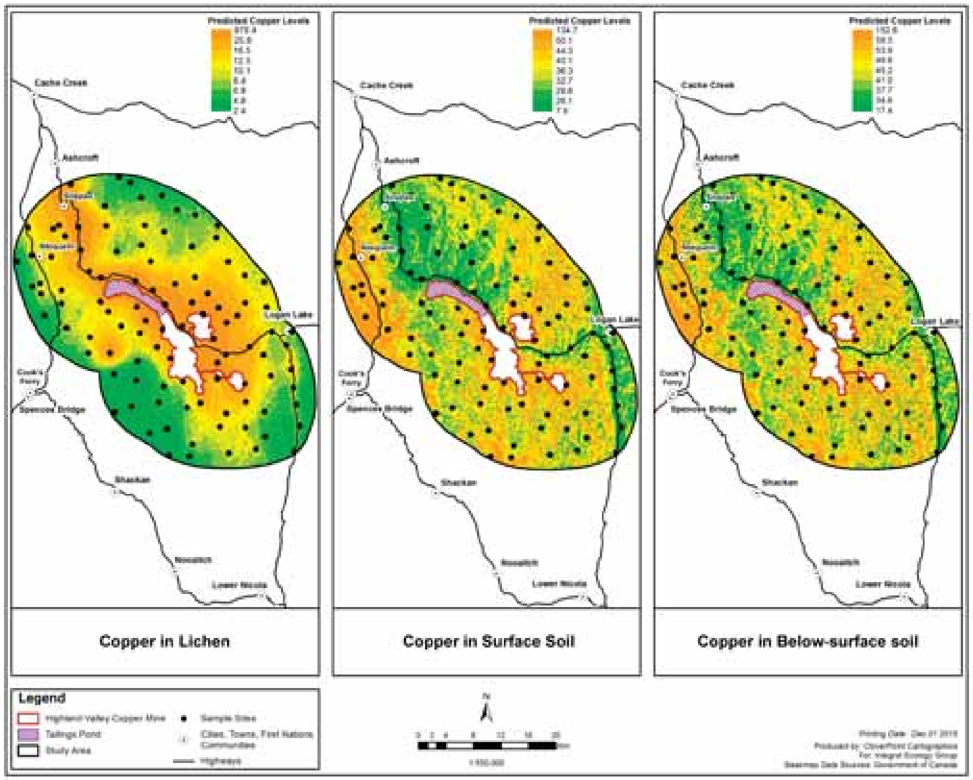
Elements that **did** show a pattern of deposition with distance from the mine:
Aluminum (Al)
Barium (Ba)
Calcium (Ca)
Cadmium (Cd)
Chromium (Cr)
Copper (Cu)
Iron (Fe)
Lead (Pb)
Manganese (Mn)
Molybdenum (Mo)
Nitrogen (N)
Sulphur (S)
Strontium (Sr)

Elements that **did not** show a pattern of deposition with distance from the mine:
Arsenic (As)
Nickel (Ni)
Phosphorus (P)
Zinc (Zn)



Map showing the area where wolf lichen was most affected by mine dust, as indicated by the area within the red line. All areas within this boundary show elevated copper over the Lac Le Jeune reference area. The turquoise line shows the mine boundary that restricts public access.





The soils in the Highland Valley area are naturally high in copper as well as other metals. This is why it was chosen for a mine site. The elements in soils and lichens were not related, and showed very different concentrations in the Highland Valley area (see map on the left). For example, the map showing copper in lichen on the far left shows very different patterns than copper in surface and below-surface soils on the right. This suggests that most of the copper in lichen is a result of dust from the mine activities, whereas copper in soils is naturally occurring and not related to the mine activities.

Top: Trucks heading down to the mine pit
Right: Researcher in the field
Far Right: Soil pit for sampling

TRADITIONAL PLANT STUDY

Once we understood the patterns of dust around the mine, we used this information to help develop a study on the potential dust effects to traditional plants in the Highland Valley area. The objective of the traditional plants study was to assess the effects of mine dust on traditional plants of key concern to Nlaka'pamux communities.

In the community workshops, many traditional plants of the Highland Valley area were discussed as being important to study. The list shown to the right shows only some of the plants that are culturally important to the Nlaka'pamux people.

Key questions for this study were:

- Is dust from the mine accumulating on traditional plants?
- Are the plants taking up metals from the dust?
- Will washing the plant reduce the dust on the plant?

Traditional Plants Discussed In This Study:

These are some of the important plants that are harvested by the Nlaka'pamuxcommunity members. This is by no means a comprehensive list of all of the plants used by the Nlaka'pamux people, it is only a subset of culturally important plants that were discussed in the context of this dust study.

Common Name	Botanical Name	Nłeʔkepmx
Kinnikinnick	*Arctostaphylos uva-ursi*	7éyk (berries); 7ik-élhp (plant)
Balsamroot	*Balsamorhiza sagittata*	snílhqn (whole plant); sóxwm' (above ground part)
Fireweed	*Chamerion angustifolium*	sxák'i7t (cf. 7esxák' 'narrow, straight up')
Bitterroot	*Lewisia rediviva*	łḱʷəpn
Indian celery, Barestem lomatium	*Lomatium nudicaule*	cewete?
Wild nodding onion	*Allium cernuum*	qwléwe
Rose hip	*Rosa acicularis*	skwəkwéw' (cf. Proto-Interior-Salish s-kwəkwaw' - Kuipers 2002); OR sk'epy'-élhp (Lytton form)
Chokecherry	*Prunus virginiana*	zəlkwú7 (fruit); zəlkwu7-élhp (tree)
Wild sunflower, Balsamroot	*Helianthus annuus*	sóxʷḿ
Stinging nettle	*Urtica dioica*	swal'wl'íqt (also applied to *Rhus radicans*, poison ivy)
Dandelion	*Taraxacum officinale*	7es-n/lq-us (lit., 'it's got a spot in its eye', also Salsify, *Tragopogon* spp.)
Wild rhubarb, Cow Parsnip	*Rumex hymenosepalus*	hékwu7 (sometimes hakwu7-élhp)
Fairy's slippers, Calypso	*Calypso bulbosa*	sk'wetese?
Red columbine	*Aquilegia canadensis*	/ce'w'ek-=úpe?
Yarrow	*Achillea millefolium*	qwən'xn-únpe7? ('little soak root')
Rat root	*Acorus calamus*	(not known)
Buckwheat	*Eriogonum sp.*	(not known)
Mullein	*Verbascum sp.*	sqway'éle?xw
Trapper's tea	*Ledum glandulosum*	ḱecé?
Labrador tea	*Ledum groenladicum*	ḱecé?
Tamarack, Larch	*Larix laricina*	cáqʷəlx
Cottonwood	*Populus sect. Aigeiros*	nəqw'níqw'ats'
Poplar	*Populas sp.*	nəq'ʷníq'ʷ (might be name for buds)
Fir, subalpine	*Abies sp.*	tl'sélhp (the real balsam)
Trembling aspen	*Populus termuloides*	wəl'wəl'tsétslhp ('little trembling/shivering plant')
Mountain spruce, Englemann spruce	*Picea engelmannii*	tsxa7z-élhp ('rustling tree/plant', general for any spruce)
Paper birch	*Betula sp.*	qwlhín (bark); qwlhín'lhp
Alder	*Alnus sp.*	zəsu7s-élhp ('thick tree plant')
Lodgepole pine	*Pinus contorta*	qw7ít, qwi7t-élhp (tree); ntú7 (edible inner bark)
Low bush juniper, Common juniper	*Juniperus communis*	ts'íts'xts'axt (sometimes considered a kind of púnlhp)
High bush juniper, Rocky mountain juniper	*Juniperus scopulorum*	púnlhp
Red osier dogwood, Red willow	*Cornus nuttallii*	tə'x-pé7 'bitter-tail'? (berries); or təxpe7-élhp (bush)
Big sagebrush	*Artemisia sp.*	kéwkwu ('far from water')
Blackcap	*Rubus fruticosus*	mə'tsəkw (berries); mə'tsəkw-éłp, OR mətsəkw-xín (plant)
Saskatoon	*Amelanchier alnifolia*	stsáqwm (fruit); stsaqwm-élhp (bush)
Hazelnut	*Corylus cornuta*	qapúxʷ
Tall oregon grape	*Mahonia aquifolum*	scól̀ṣe?
Black currant	*Ribes hudsonianum*	qw'óqw'oxw (fruit); qw'oqw'oxw-élhp (bush)
White stemmed gooseberry	*Ribes inerme var. inerme*	sxets'ə´n' (berries); sxets'n'-élhp (bush)(*Ribes spp.*)
Swamp gooseberry	*Ribes lacustre*	swu?puse?
Red raspberry	*Rubus idaeus*	s7xéy'itsqw (berries); s7ey'itsqw'-él-hp (bush)
Trailing wild raspberry	*Rubus pedatus*	s/núk'ʷe?-s e s-q'ʷo·/q'ʷy'=ép ('friend/relative of strawberry)
Salmonberry	*Rubus spectabilis*	?elíle?
Soapberry	*Sheperdia canadensis*	sxwúshm sxwúsm (cf. xwúxm 'make foam' (berries); sxwusm-élhp (bush))
Willow, general	*Salix sp.*	stxálhp 'because it is bitter' (*Salix* general - *S. scouleriana, S. glauca, S. sitchensis*)
Grouseberry	*Vaccinium scoparium*	7ímixw (a kind of)(see also *V. caespitosum*)
Tiger lily	*Lilium columbianum*	tséw'ek
Black tree lichen	*Bryoria sp.*	wi7e or qwzem-éyqw 'tree-moss'


INDICATOR PLANT: SXWÚSM
(Shepherdia canadensis)

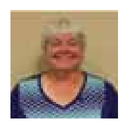
While there were many culturally important plants to consider in this study, Nlaka'pamux workshop participants agreed to focus the study on the leaves and berries of sxwúsm because of its importance as a food and medicine and its current and historical cultural significance. Other traditional plants may be studied in subsequent research in the future, but it was not possible to study all plants initially. Some community members shared that they have noticed changes to sxwúsm over the years, such as changes to taste and juice preservation. Sxwúsm is a good plant to study the effects of dust because the plant is very common across the Highland Valley area and grows in places both near and far from the mine. Thus, sxwúsm represents a good indicator plant on which to focus this study, for both cultural and biological reasons.

Once an indicator plant was chosen, community participants contributed information on sxwúsm to inform the study. Some of the topics discussed were some of the ways to harvest a sxwúsm plant, where it was typically found growing, what would determine where and when it would be harvested and, most importantly, how to respectfully harvest according to traditional practices.

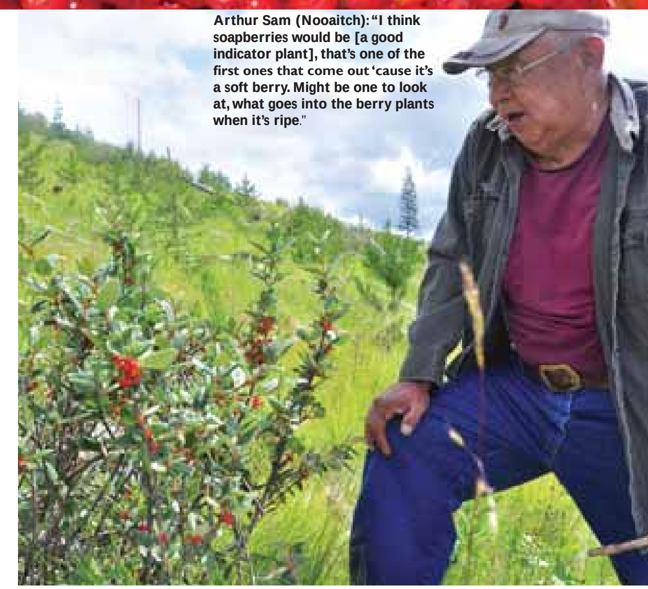
Jim Toodlican (Shackan) "Give you an idea, when the saskatoons flower down the way there, it's when the bitteroots are ready. And when the chokecherries ripen, that's when the huckleberries are ready. Before the chokecherries ripen we start making our way to the huckleberries because where I live and where the huckleberries are, it takes us three days to get there. When the rosebush flowers we know that trout is ready in the lakes. Just to give you some idea. That's what my grandparents taught us. They relied on nature for all the traditional foods that they preserved for the winter."

Amelia Washington (Nooaitch): "I think one thing to consider if you're going to do a sample from a clean area is to make sure you talk to elders…we have places that are sacred and you don't want to tread on those grounds without talking to somebody or having somebody accompany you."

Jim Toodlican (Shackan): "The sxwúsm used to be one of the top trading materials our ancestors used because the sxwúsm was a top quality berry of the interior… but it is not top quality today."



Brenda Walkem (Cook's Ferry): "I don't think we would be [harvesting from unhealthy looking plants] …So if the plant doesn't look healthy I think a general rule of picking would be…look around for a healthier plant and leave the unhealthy ones alone."



Arthur Sam (Nooaitch): "I think soapberries would be [a good indicator plant], that's one of the first ones that come out 'cause it's a soft berry. Might be one to look at, what goes into the berry plants when it's ripe."

SOAPBERRY: SXWÚSM

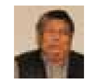
(*Shepherdia canadensis*)

The soapberry plant is critically important to the Nlaka'pamux people as both a food and medicinal resource. All parts of the plant are utilized, though berries are perhaps the most highly prized part of the plant. The berries are harvested when fully ripe, typically in mid-July through early August. Harvesting techniques are varied, but most commonly a container or mat is held under a branch with berries, and the branch is then shaken or struck with a stick to dislodge the ripe berries (Turner et al. 1990).

Traditionally, harvested soapberries were consumed fresh (whole) or as a diluted thirst-quenching beverage, or they were stored and traded in the form of dried cakes, which involved heating or boiling the berries over hot rocks, and then spreading them out and drying them on mats or layers of grass (Turner and Burton 2009). Today, the berries are usually jarred whole in water or as juice concentrate, or frozen in berry-form until later use.

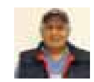
Photo, left to right: Soapberry whip - xwúsm

Photo: Soapberry willow whipper, referred to as c'əłiʔmén



Jim Toodlican (Shackan): "A lot of the soapberries and other berries today are also frozen today. When I was growing up most of the berries were dried, huckleberries, choke cherries and soapberries were dried, and then [you] added water to the dried berries. [You] have a rice bag full of dried berries, then put it in a cup of water and soak for a few minutes."

Harold Joe (LNIB): "Traditionally make a drink out of the juice or the berry itself, it quenches your thirst better than drinking just plain water when it's hot in the summer time. Quenches your thirst better."



Maurice Michell (Siska): "People don't juice it like we do today, people used to use the whole berry."

The fresh or jarred berries or reconstituted pieces of dried cakes can be mixed with water and "swished" or beaten with an egg-beater or mixer into a frothy dessert known as Indian ice cream, or soapberry whip (Toodlican pers. comm. 2015). In the past, the dessert was swished by hand, or with a whisk-like implement made by binding coils of the inner bark of silverberry, maple or willow to one end of a wooden handle. The unique foaming characteristic of soapberry occurs because of the presence of saponin, a natural detergent that also produces a distinctive bitter flavor. The Nlaka'pamux people consider soapberry whip to be a festive food, and it is still served in many households, especially at social gatherings.

In Nłeʔkepmx, the terms used to refer to soapberry include "sxwúshm" or "sxwúsm," which refers to the plant, "sxwusm-élhp," referring to the bush, and "xwúsm," which means berries, or "to make foam." The soapberry whipper is referred to as c'əłiʔmén.

USES OF SOAPBERRY

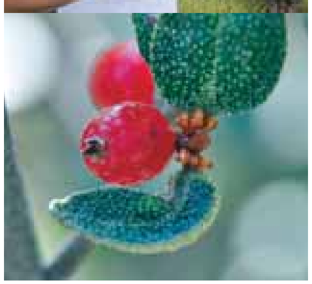
The soapberry plant (sxwúsm) is valued for numerous medicinal purposes. Traditionally, juice from soapberries (xwúsm) was used to treat acne, boils, digestive problems, and gallstones, and soapberry whip was used as a general tonic for settling the stomach. Various teas made from sxwúsm leaves and twigs were used as sedatives and laxatives, as well as for treatment of ulcers, dandruff and high blood pressure. Medicinal extractions of sxwúsm prepared from bark were taken as a stomach tonic, while preparations made from roots were used as purgatives or for spiritual purposes. A solution made from branches was drunk prior to hunting and fishing to bring good luck through internal cleansing.

Dried xwúsm cakes were an important and prized item of trade among aboriginal groups in the coast-interior exchange routes of western North America. For example, the Nlaka'pamux traded xwúsm to Coastal peoples in exchange for products such as fish oil, clams, and edible seaweed, among many other items. This distribution in trade is reflected by the various names for sxwúsm in different languages and dialects. Xwúsm cakes were also traded more directly among Interior groups depending on the local availability of sxwúsm. It has been reported that one large dressed buckskin could be acquired for ten dried xwúsm cakes. Elders have also stated that a half cake of dried xwúsm could be traded for a whole salmon.

Right: Soapberry whip ready to eat

Left: Dried soapberry cake and wooden spoons

DUST CONCERNS FOR SWXÚSM



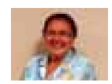
Community members shared concerns about dust on sxwúsm in the Highland Valley area and in other important gathering areas such as Calling Lake. Some of the specific concerns include:

- Dusty plants and berries, caused health problems when gathering
- Dust affecting the health of plants
- Plants are unhealthy with less leaves
- Growths on the leaves
- Smaller and less berries
- Change in the taste of berries
- Oily film on the berries
- Shorter season for berry gathering
- Berry juice does not preserve as long
- Sediment in the berry juice over time – darker
- More juice is needed to make a xwúsm froth

Overall, community members expressed that there are less quality areas to harvest sxwúsm now than there used to be as a result of development, and that the quality of the berries has changed due to things like dust.

Top left: Amelia Washington and Esther Voght show IEG member Shanti Berryman a dusty damaged plant
Bottom left: Dusty sxwúsm plant

Freshly canned xwúsm juice (above). Canned sxwúsm juice that has changed colour and darkened over time (top right). Canned sxwúsm berries disintegrating in the preserve over time (below right). The change in colour and disintegrating berries in these canned preserves are a newly observed phenomena. "I want to show you that this juice, it's almost 3 years old now, but the sxwúsm has disintegrated… The berry from last year is still intact and still orange but ….this [disintegration and discolouration] is a result of the dust" - Amelia Washington



Amelia Washington (Nooaitch): "I just came back from picking soapberries around Chattaway lake, and I noticed in the container an oily film. And the dust kind of stayed in the oil. I also know that when it's preserved there's a heavy sediment that happens in the canning and turns the preserved sxwúsm very dark. The preserves used to keep for a couple years, but these you have to throw away in that season, because of the sediment. It turns black."

Elaine Sterling (LNIB) tells of a creek near Logan Lake where she used to harvest willow and soapberries "We used them for a medicine, but we quit picking there…no more soapberries…I don't trust picking the strawberries up there. The mine used to be right where the strawberries are…We used to pick soopolallie in the area of where the old mine used to be. We still used to pick where you've got that water looking area. The water area. Now I quit picking in there."

Krisalena Antoine (Coldwater): "Yeah, definitely the season, it's drier. You know when the cycle, the berry bush starts in spring and then it blossoms, then it turns to berries, and then it's got the full colour to it, and then by now August-September it's dry, yellow blotchy. The berries, that life cycle looks like it's shorter now. That cycle from the full green to the blotchy colours. It's sooner now….[in the dusty areas it's] Drier. Brittle. Kinda burnt, like sunburnt, or real super dehydrated."

Arthur Sam, (Nooaitch): "I used to take an elder up [there], she didn't like what she saw, she noticed that the taste was different. She didn't like it, said get out of here. She is gone now. Soapberries, saskatoons, everything, even the fish, the deer, all taste different. Something out there, maybe it's the dust settling on the food."

The dust on berries and other plants could be coming from the mine or also from logging activity. There are many more roads and many trucks on the roads because of logging, and logging has also caused more open forests, which allows dust to move around the land more easily.

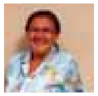
Ted Tom (LNIB Staff) tells the story of why he abandoned an old harvesting site near the mine, 16 years ago. He explained that he used to lay a blanket on the ground and beat the sxwúsm bush to catch the berries in the blanket, but as he was beating the bush he was coughing because there was so much dust. That was the last time he harvested there. He explains, "I didn't know if there was anything in there that could hurt people. Just the unknown 'cause everywhere else wasn't like that. And my concern was that the mine is so close and the dust and everything, I could wash it off, but….if it goes on the ground and it rains, it leaches into the ground, is the tree picking up whatever in its leaves?"

Clean soapberries (left) and dusty sxwúsm leaves (below)

Verna Miller (Cook's Ferry) says, "I have an immediate concern because there are people who still, today, collect traditionally, they collect sxwúsm, and they harvest it up in that area [Highland Valley]…"

Viola McIntyre (Skuppah): explained that bears will often only go and eat soapberries after the dust has been rinsed off by rainfall.

Rain-rinsed soapberries (right) and bear eating soapberry (above)



Amelia Washington (Nooaitch): "I've noticed change to the potency. Takes more berries to froth up (soapberries)... Shorter growing season, they stay on the bush for a shorter time than in other areas, [around] Chattaway."

TRADITIONAL GATHERING METHODS

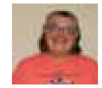
Community members decided which sxwúsm harvesting and food preparation methods would be used for the study. This included harvest timing, processing of the berries after harvesting, and preparation methods for making sxwúsm juice and making tea from sxwúsm leaves.

When picking sxwúsm, only healthy plants full of berries are picked. Many Nlaka'pamux community members will avoid harvesting from roadsides or from dusty areas, if possible. Berries are gathered by shaking or knocking the ripe berries into a bucket, cooler or onto a tarp or umbrella. Only ripe berries will fall off the bush, this leaves some berries for next year. Some people pick berries directly from the branches, but this takes more time. Sometimes full branches are gathered, which helps to "prune" the bushes and hopefully help the bush yield more berries the next year. Berries are cleaned and taken home to be processed.

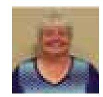
New leaves are harvested for use in tea for medicine and other uses. The leaves are gathered from the tip of the bush branch, and only the healthy ones are harvested.

Above: Yvonne Joe harvesting plants by picking individual berries

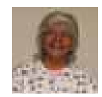
Below: Caroline Lytton harvesting plants by knocking berries into a tarp



Verna Miller (Cook's Ferry): "Unless you have very gentle hands you can't pick them [soapberries]. But I wouldn't [pick them], your hands would come out all mushy. What we do is we put something under the bush, we take a branch hold it firmly and tap it [sxwúsm bush] with a stick lightly. The berries that are really ripe will just fall right off. And then you gently take them and you put them in a container."

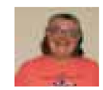


Brenda Walkem (Cook's Ferry): "I shake the berries off the bush onto a tarp or into an open umbrella then put the berries into a container with a tarp or an umbrella and you put it into a container."

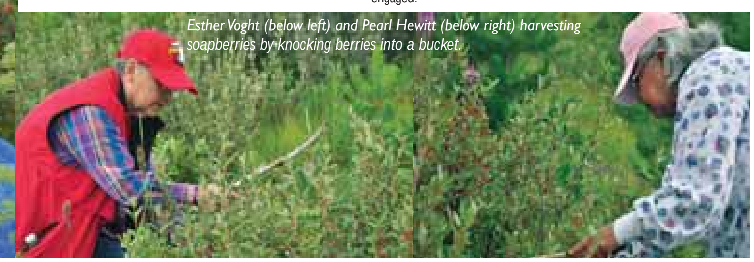


Pearl Hewitt (Cook's Ferry): "Just take the whole branch off without hitting the berries off."

Above: Brenda Walkem (left) and Verna Miller (right) harvesting soapberries by knocking them off the bush and catching them in an open umbrella



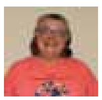
Verna Miller (Cook's Ferry): "And that's really important too because one thing that we've learned from the bears for example is pruning. It's really important to prune bushes as you're picking so, taking the whole branch is a great idea, but there's still also learning the whole technique of how you would take the leaves off, you'd harvest the stems, the roots, the whole thing. Marianne Ignace used to take the elders out and she'd prune a branch and bring it to an elder who couldn't climb around and give the branches to the elder and they'd just sit there ard tap off the berries and take off the leaves and twigs and everything, and that's how they were able to stay engaged."



Esther Voght (below left) and Pearl Hewitt (below right) harvesting soapberries by knocking berries into a bucket.

TRADITIONAL PROTOCOLS

Amelia Washington (Nooaitch): "Along with what Jim is saying, we have natural laws to tell us where to pick, where not to pick. And there are certain times when people can't pick. When they've lost loved ones, they have to, we have ceremonies so they can fix themselves and fix the berries. So, those kind of traditions and ceremonies have been lost too. Our kids think that's the old way. They don't need to abide by that, but we still have to live by those laws because it affects everybody, the whole tribal area and our picking areas. If they don't look after the food, 'cause there's certain ways you go out there and you pick. You don't just go in and just demolish the whole bush. You just take a little bit in each area and then go to the other, and then leave every third or fourth one for the animals. So, there's certain things we have to mindful of, certain areas that you don't go to. The ceremonial or sacred areas, you don't go in there."



Verna Miller (Cook's Ferry): "I think as far as protocols, the only protocol I know of is whenever we go to harvest something we ask permission, we make an offering. There's various ways to do it but my particular way is I try to bring an offering and I always ask permission. In my own language".

Art Sam (Nooaitch): "When you gather as well you got to tell it what you're going to do with it. This I'm gathering for food. This I'm gathering for medicine. This I'm gathering for our study. Who wants to come help us. When you do this, these things will come and help you. They tell you which ones you need to use. That's how it is when I gather medicine."

Ina Dunstan (Siska): "There are a couple of traditions that we went though as children. Like picking…if a parent had passed away we weren't allowed for one year to go out there. And I think a lot of that's been lost, but I've been hearing that its coming back. Those traditions and those cultures".

Marshal Krause (LNIB) harvesting sxwúsm

Debbie John (LNIB): "That's all right. If you're going out, no matter who you are, all you have to do is spill some water, there's your offer."

Top Left: Erin Weatherwax (HVC) and Amelia Washington (Nooaitch)
Bottom Left: Pearl Hewitt (Cooks Ferry)

Top Right: Community members during a field day
Bottom Right: Pauline Henry (LNIB staff)

We selected one method for gathering sxwúsm for the study, to be consistent. The method we chose was to use a stick to knock berries off the bush into a bucket, and berries were cleaned of debris in the bush. The goal of the study was to collect soapberries in dusty areas near the mine and areas further away from the mine.

The sampling was done in July and August in the Highland Valley area and in the Lac Le Jeune "reference area". At each site, collections were made of first year sxwúsm leaves, and surface and subsurface soil. We collected soils so that we could compare the metals in the soils to the metals in the sxwúsm leaves and berries to see if the metals in sxwúsm are from mining dust or from the soil.

We collected berries of the sxwúsm at a subset sites, because we could not find enough berries at all sites for collection. The summer of 2014 was not a great year for berries, as it was really hot before the berries ripened and many of them dried up on the bushes. Also, many of the berries that were collected had a naturally occurring fungal infection.

Left: Sxwúsm leaves and berries Center: Healthy soapberries Right: Researchers sorting through soapberries

Above: Community researcher Ariel Swayze harvesting sxwúsm berries

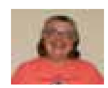
Berries are lightly rinsed in water and mashed through a food mill to squeeze out the juice. They are then poured into jars, and then water bath canned for 15 minutes.

MAKING JUICE FROM BERRIES

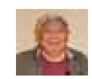
Sxwúsm juice was made using traditional methods that were shared by community participants. Berries were first frozen after collection in the bush. Juice was made from both washed and unwashed berries to see if it would result in a difference in metal concentration in the juice. Berries that were washed were lightly soaked in a bowl of water, and then drained.

Juice was made by squishing the berries through a food mill. The juice was then put in jars, while the stems and berry skins were thrown out – however, some community members shared that some people traditionally prefer to keep the stems and skins.

For the purposes of this study, no sugar or water was added to the juice, but some community members add sugar and water to their juice before canning. The jars of juice were canned using a boiled water bath method for 15 min.



Verna Miller (Cook's Ferry): "Where I picked what I've had the chance to pick I've just taken my berries, I don't wash them, because I know where they come from, and I just I make some with juice and some with just the whole berry. The reason I do that is to try and save as many of the nutrients as possible. But a lot of people do wash, and that's fine with me. It's just a personal choice. Also, my grandmother would save the stems when she would peel off the leaves because the stems have high medicinal value, for a variety of ailments. One of them was mixing the leaves and stems with Saskatoons and choke cherries, and you mix those three into a concoction where you boil everything together...That's the reason they would save just about everything 'cause there was always a reason to use the different parts of the plant."



Art Sam (Nooaitch): "…look at metals in the juice [rather than the foam]."

MAKING TEA FROM SXWÚSM LEAVES

Traditionally, tea is made with a variety of different plants mixed together, usually for a specific use, but for this study tea was made solely from leaves of sxwúsm. We brewed the leaves in order to test whether or not the metals in the dust that landed on the leaves would be detectable in the tea.

We harvested from the tips of the branches, gathering leaves from the current season's growth, and then dried them. Dried leaves were then steeped in boiling water for 5 minutes, and tea was strained and put in jars. We brewed the leaves in the laboratory to test whether or not the metals in the dust on leaves would be detectable in the tea."

We made the tea by gathering leaves from the current season's growth at the tip of the branches, and then we dried the leaves before brewing them in the laboratory.

BREWING TEA

Tea was made from new leaves of 24 samples to test if metals from the dust on leaves get into the tea.

Dried leaves were then steeped in boiling water for 5 minutes, and tea was strained and put in jars.

Tea samples were sent to the laboratory for analysis.

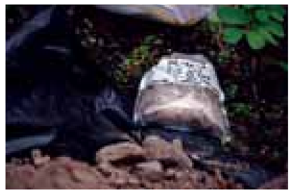
WHAT WAS SAMPLED?

We gathered samples of new leaves from 47 locations, where we also collected soils. Berries were only gathered at 27 locations, because many areas did not have enough berries for a sample. When we had enough berries, we made juice to be analyzed at the laboratory. Only 9 sites had enough berries to make juice. Tea was made from new leaves from 24 locations. All samples of leaves, soils, berries, juice and tea were sent to the laboratory to be analyzed for metals.

Community members shared different views on if they wash sxwúsm leaves and berries or not. This varies by individual as well as where people are harvesting. For example, if there is concern about dust, people tend to wash the berries and plants. Because of this, we chose to analyze both washed and unwashed samples of leaves and berries for this study.

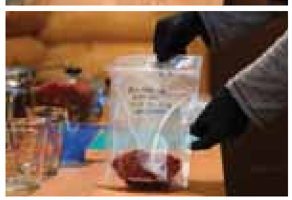
For leaves and berries, we did a washed and unwashed comparison, where we split the samples and washed half of the leaves or berries. This allowed us to see if washing the leaves or berries would change the metal content.

Soil Samples

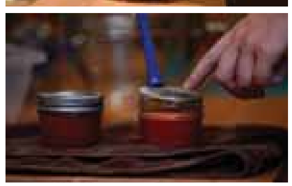


Berry Samples, Washed

Berry Samples, Unwashed



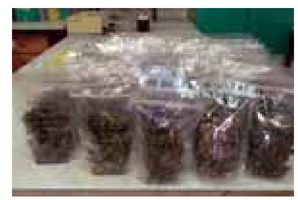
Sxwúsm Juice Samples



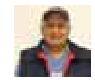
Leaf Tips

Gathering Fresh Leaves

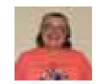
Leaf Samples



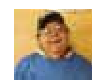
Tea Samples



Maurice Michell (Siska): "I'm the harvest coordinator from the Siska Traditions. We are really careful about where we harvest because we don't like to wash the leaves when we harvest them."

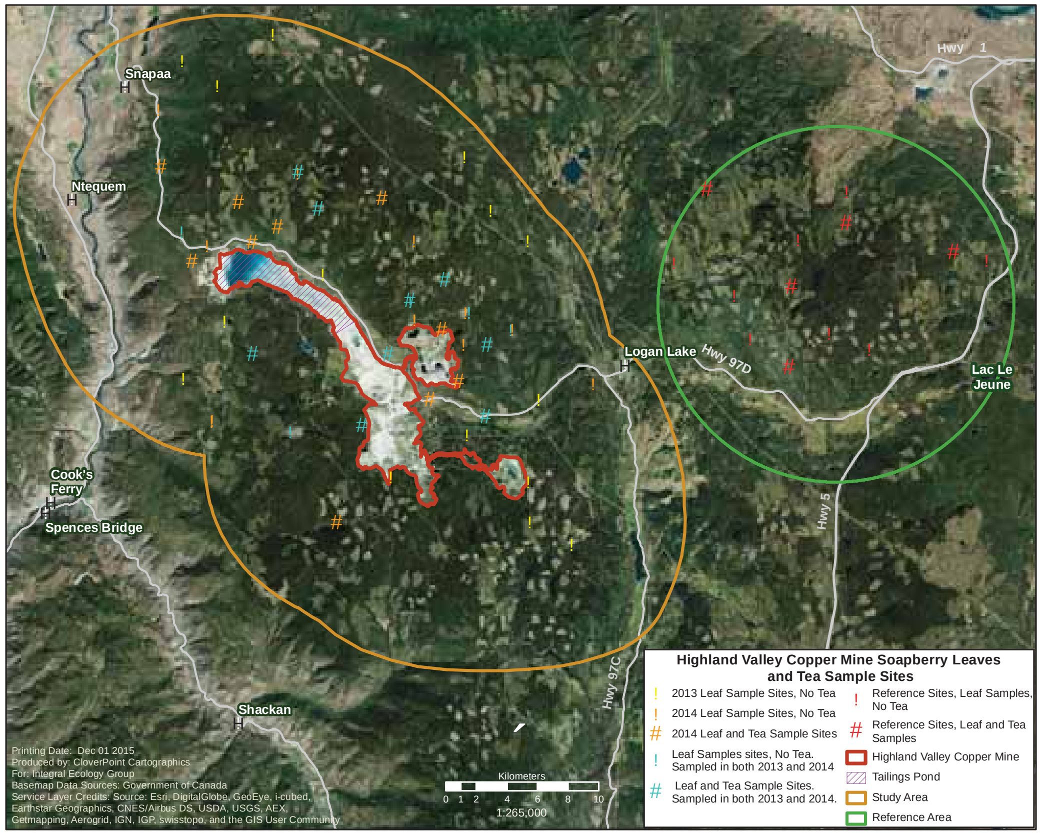


Verna Miller (Cook's Ferry): "Traditionally we don't wash them, just because traditionally they were always clean right from the bush, and washing them…would reduce the value of that leaf plant, berry, root whatever the case may be. It would diminish the value whether it be medicinal, spiritual or food or materials."

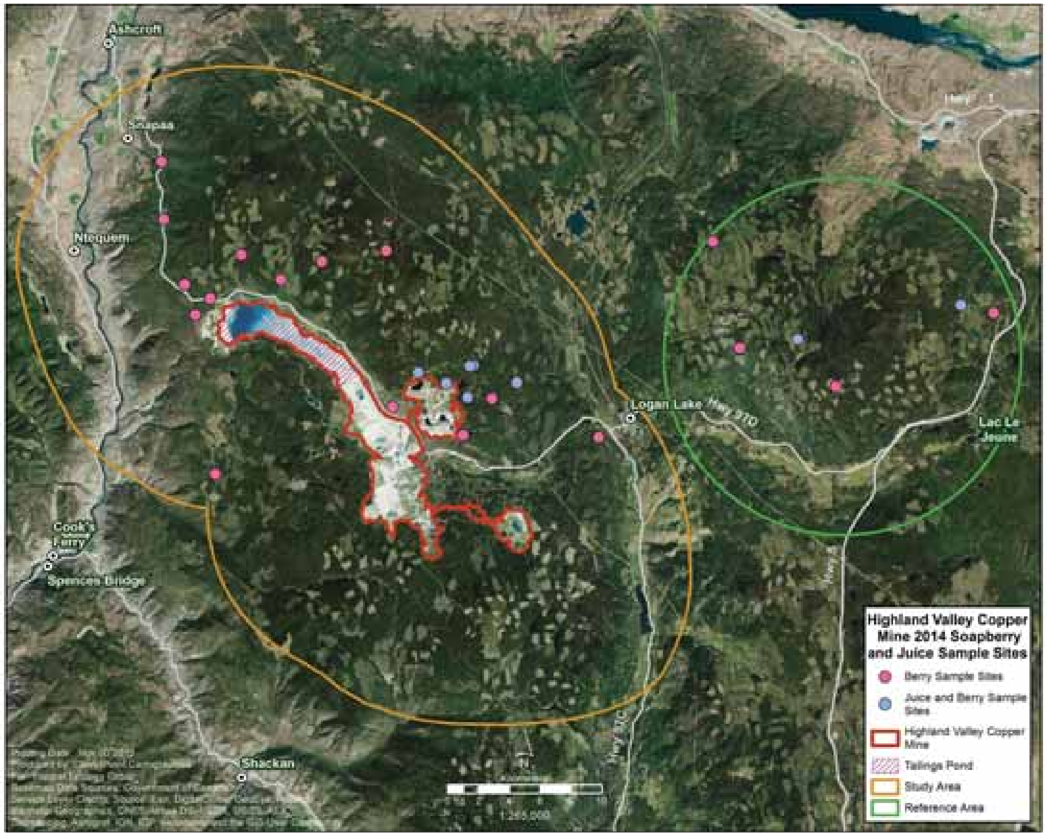


Elaine Sterling (LNIB): "Can it, dry it. Usually boil the whole thing. The leaves, the trees. We don't wash it or anything because you take the pollen out of the berries. Once you boil it, you take a lot of it and boil it, and make a juice like I just gave you."

Sample locations for sxwúsm leaves and tea in the mine study area and the Lac Le Jeune reference area.



Sample locations for sxwúsm berries and juice in the mine study area and the Lac Le Jeune reference area.



WHAT DID WE FIND?

The key focus of this study was to determine if dust from HVC mining activity is being deposited on soapberry plants in the Highland Valley area. To address this, we analyzed the concentrations of a suite of metals in soapberry leaves and berries as well as in soapberry tea and juice. We tested if metal concentrations were higher near the mine site using the following two key questions:

- Do metal concentrations in soapberry decrease as you move away from the mine?
- Are metal concentrations in soapberry higher around the mine than in the Lac Le Jeune reference area?

Of all the metals analyzed, there were eight metals with higher concentrations near the mine than further away for one or more of the soapberry materials (leaves, tea, berries or juice). For some of the soapberry materials, these metals showed higher concentrations near the mine than in the Lac La Jeune reference area. See table for details.

Eight metals showing dust effects on soapberry materials.

Soapberry material	Metal concentrations decreasing as you move away from the mine	Metal concentration higher in the mine area than reference area
Leaves	Copper, Iron	Copper, Iron
Tea	Arsenic, Barium	Arsenic, Barium
Berries	Aluminum, Barium, Iron, Strontium	Aluminum, Iron, Lead
Juice	Barium, Manganese	Barium, Manganese, Strontium

For all of these eight metals, concentrations in soapberry material were not related to metal concentrations in local soils where the plant was growing. This lack of relationship suggests the elevated metal concentrations in soapberry materials are likely due to mining dust, rather than from natural dust or uptake from the soil the plant is growing in.

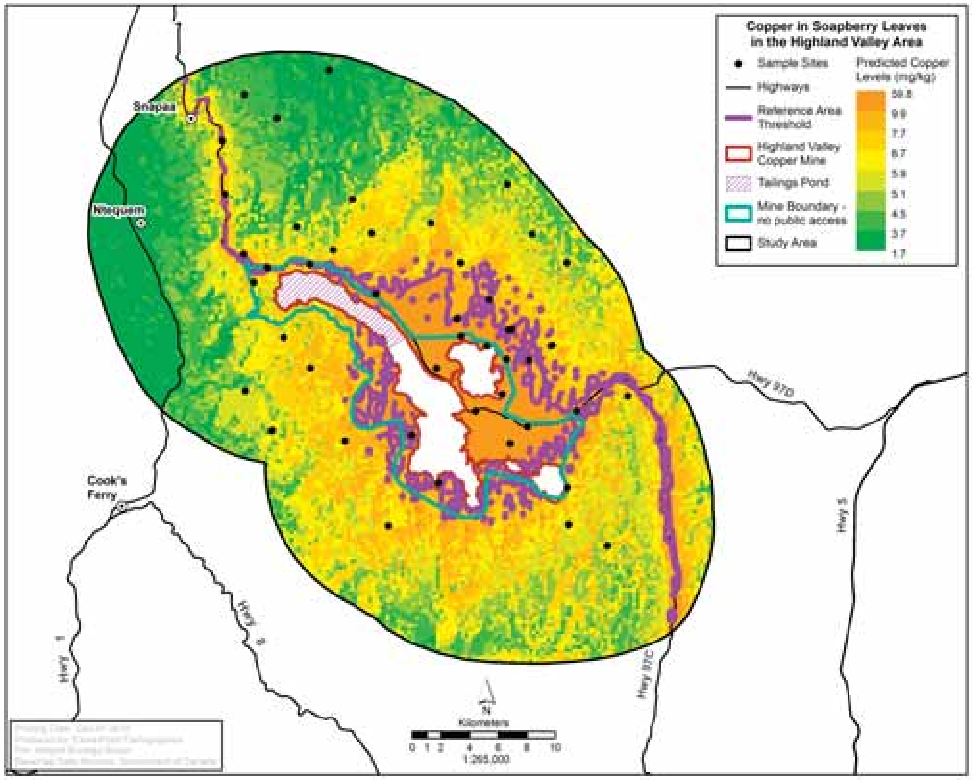
Compared to natural soils, these metals were also present in higher concentrations (with the exception of aluminum) in one or more of the dust source samples collected from the mine area. This provides further indication that the elevated metals measured in soapberry materials is likely linked to mine dust. This was not the case for aluminum, which is a common natural metal in soils and is likely elevated due to increased road dust from mining activities.

WHAT DID WE FIND?

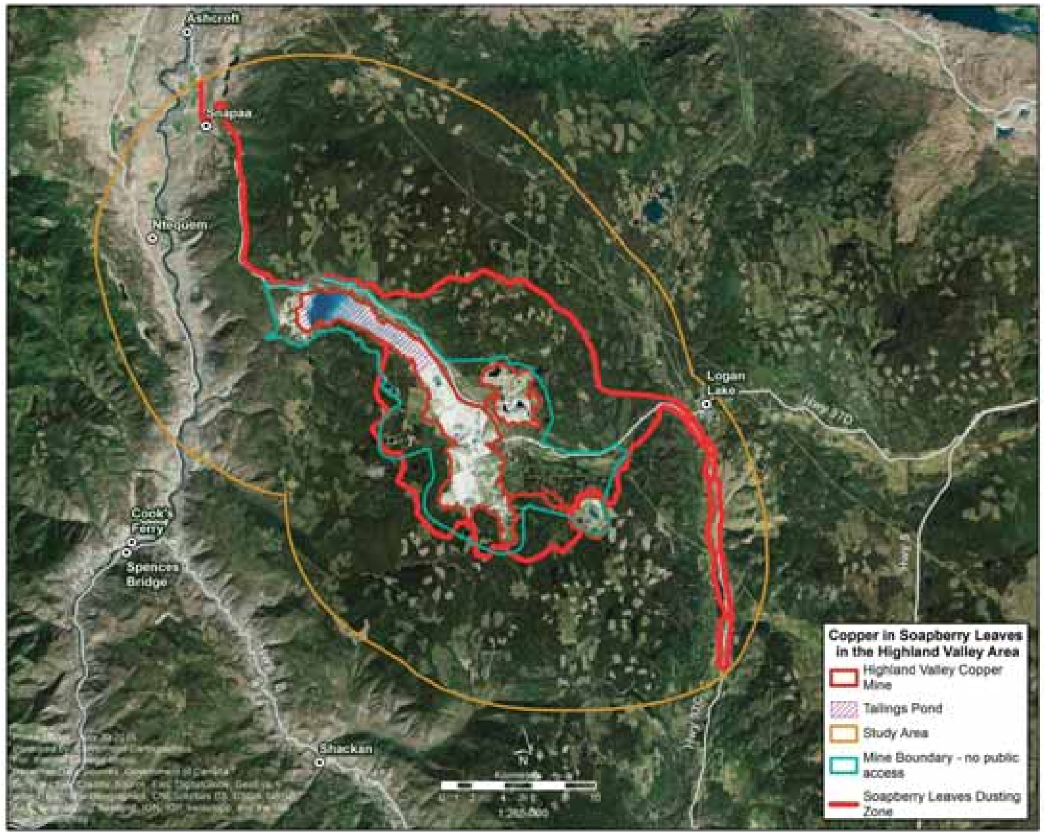
Copper in soapberry leaves

Copper is the key metal found in mine dust, and shows the strongest effect from mine dust. Copper in leaves at the Lac Le Jeune reference area (4-8 mg/kg of copper) were similar to other studies in dust-free areas (3-8 mg/kg of copper). According to other studies, copper concentrations over 8 mg/kg in leaves is considered elevated. Copper in leaves in the mine study area averaged 8.5 mg/kg with a maximum of 67.9 mg/kg. Highest copper concentrations were found in the following areas: directly around the mine, around the Bethlehem and Bose Lake Road area and to the northeast, along the east side of the Highlands tailings, and along Highway 97 C from the mine towards Ashcroft and towards Merritt (see map).

On the map, the purple line is the threshold for copper concentrations in soapberry leaves at the Lac Le Jeune reference area (see the reference area on the map, pg. 68-69). Any areas located within the purple line indicate that copper concentrations in leaves are higher than the reference area.
Areas outside of the purple line indicate areas where copper concentrations in leaves are similar to the reference area.



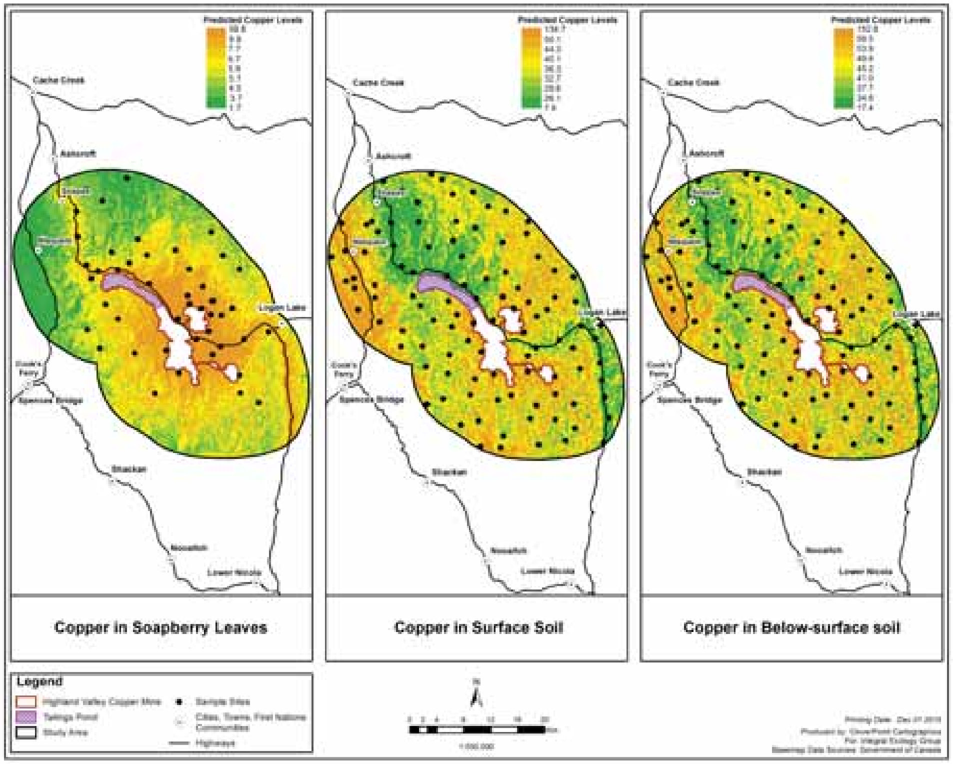
Map showing the area where soapberry leaves were most affected by mine dust, as indicated by the area within the red line. All areas within this boundary show elevated copper over the Lac Le Jeune reference area. The turquoise line shows the mine boundary that restricts public access.



Soils

Dusting effects on local soils were not detected for any of the metals we analyzed. For example, the maps on the next page show copper in soapberry leaves on the left and copper levels in both surface and below surface soils on the right. The patterns are not similar for soils and soapberry, suggesting that the high copper concentrations in soapberry leaves are likely related to mine dust. This pattern was similar for the additional seven metals that showed dusting effects in soapberry materials.

Top right: Sxwúsm
Bottom right: Debbie John harvesting sxwúsm



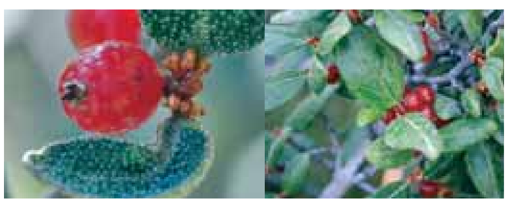
WHAT DID WE FIND?

Does washing the plant reduce dust?

Results from this study showed that washing soapberry leaves and berries is effective at reducing concentrations of most metals on the plant (see Table). Washing removes more dust from the plant in dustier areas near the mine, compared to less dusty areas. Of the eight metals that showed higher concentrations near the mine compared to further away, there were four metals (aluminum, copper, iron, lead) for which washing reduced concentrations on soapberry leaves from between approximately 15 to 27%. For berries, washing reduced the concentrations of all metals except for arsenic and lead by 13 to 48%.

This shows that the dusting effect can be reduced near the mine by simple washing of the harvested plant before use.

DUST



NO DUST

Washing effects for eight metals in soapberry leaves and berries.

Metal	Washing Effect - Leaves	Washing Effect - Berries
Aluminum	27%	48%
Arsenic	No effect	No effect
Barium	No effect	17%
Copper	15%	20%
Iron	21%	27%
Lead	24%	28%
Manganese	No effect	15%
Strontium	No effect	13%

DOES DUST EFFECT PLANT AND ANIMAL HEALTH?

Although we detected a dust effect for these eight metals in soapberry materials, most of the metal enrichment in soapberry materials was very low. The exception was for copper in soapberry leaves and iron in leaves and berries, where the concentrations were considered moderate in areas right near the mine. Concentrations of the other six metals were so low that our review of literature on these metals indicates that there is no concern for plant or animal health effects.

Copper

Copper is an essential nutrient important to plant growth and naturally occurs in plants from 5 to 30 mg/kg. Toxicity of copper to the plant will begin to occur around 20 to 100 mg/kg of copper in plants; this varies by the type of plant. Health effects to woody plants, like soapberry, can include loss of leaves and dying branches, and stunted growth.

Within the HVC mine study area, there were only three measured soapberry leaf samples that were within the 20-100 mg/kg threshold. Average copper concentrations in the mine study area were 8.5 mg/kg in soapberry leaves, which is considered within normal ranges for woody plants and slightly higher than the mean of copper in leaves in the Lac Le Jeune reference area (5.6 mg/kg).

The map showing predictions of copper in soapberry leaves (page 73) indicates that the potential concern for copper to plant health would be in areas around Bethlehem to the east of the mine, right around the mine near the pits, immediately along Hwy 97C and on the east side of the tailings pond.

For animals, copper is an essential nutrient, and the amount of copper varies by type of animal. The animals that consume soapberry are varied, and include deer, elk, sheep, cattle, horses and snowshoe hares. The berries are highly favored by bears and grouse. For all of these animals, the average copper concentrations of soapberry leaves (8.5 mg/kg) and berries (2.1 mg/kg) are below the maximum tolerance levels of copper established in other research studies.

Iron

Iron is essential to plant function, and often plants are deficient in iron. Plant injury from high concentrations of iron is possible above 1,000 mg/kg. Soapberry leaves had an average iron level of 112 mg/kg. A few locations near the mine on the east side near Bethlehem showed copper concentrations approaching 500 mg/kg, which is considered moderate, but still below the threshold of 1,000 mg/kg for plant health.

For animals, the maximum iron concentrations in the HVC study area for leaves (477 mg/kg) and berries (59.5 mg/kg) were below the maximum tolerance level for iron in animals, which ranges from 500 mg/kg for cattle, sheep and poultry, to 3,000 mg/kg for pigs. Anything above these levels could affect animal health.

HOW DOES DUSTING FROM THE MINE AFFECT TRADITIONAL FOODS?

In this study, we measured metals in soapberry juice, and tea made only from soapberry leaves. All metals were present in very low levels in both the juice and tea. We will focus on a few key metals, and how the concentrations measured relate to human health. However, it is important to note that this study was not meant to be a food safety study.

A food safety study would require more detailed research to look at how much soapberry juice or tea is consumed relative to other foods in people's diet, over certain periods of time. This was not the focus of this study, rather we first wanted to understand if we could measure increased metals in soapberry leaves and berries as well as the traditional foods made from this plant.

Copper

Copper is an essential element to human health, and very high levels of consumption, over 15 mg per day, would be required to cause any health problems. For berries, this would require eating over 2 kg of dusty berries per day from the Highland Valley, which is very unlikely. A dusting effect of copper was only detected for soapberry leaves, and was not found in tea, berries or juice.

The levels of copper in berries were on average 2.1 mg/kg with a maximum of 8.6 mg/kg right near the mine. Even in areas with highest copper concentrations, one could still consume ~2 kg of whole berries per day safely without washing berries.

As copper is present mostly as a dust particle on the plant, washing berries or leaves will reduce copper on leaves and berries by 15-20%. Much of the copper is likely washed off during the process of making tea and juice as we did not see a dusting effect for these foods, although we could measure copper in them. For tea, the average copper concentration was 22 µg/L and the maximum was 97 µg/L which are within ranges reported for distributed Canadian drinking water (≤5 to 900 µg/L). For juice, copper concentrations were average 667 µg/L with a maximum of 887 µg/L, but still within the reported range of distributed water.

Iron

Iron is a common element in the earth's rocks and soils, and is naturally found at high concentrations. Iron showed a dust effect in soapberry leaves and berries, but did not show a dust effect in tea or juice, likely due to washing during the tea- and juice-making process. Iron concentrations can be reduced by 21% with washing of soapberry leaves and by 27% with washing of berries. Health Canada has not established a maximum acceptable concentration for iron in food or drinking water because there is no evidence to indicate that the iron levels in Canadian diets pose a health hazard. However, the Food and Nutrition Board of the Institute of Medicine of the National Academies has listed an upper limit of 70 mg iron/day. The average iron concentration in berries was 14.9 mg/kg in the mine study area, where maximum levels measured reached 60 mg/kg. In order to exceed the 70 mg iron/day suggested threshold by drinking juice, one would have to drink 9-17 litres of concentrated juice per day.

The average and maximum iron concentrations for tea (102 and 308 µg/L, respectively) and for juice (4,224 and 7,820 µg/L, respectively) were below the average level reported for Canadian drinking water by Health Canada. Health Canada's iron levels in water are typically below 1,000 µg/L and are often less than 300 µg/L.

In order to exceed the 70 mg iron/day suggested threshold by drinking juice, one would have to drink 9-17 litres of concentrated juice per day.

Other metals

The other six metals were within or below the ranges or thresholds reported in the literature for human health safety. These metals include aluminum, arsenic, barium, lead, manganese, and strontium. Of particular interest with respect to human health are arsenic and lead, which we will focus on here.

Arsenic was present in concentrations below safety guidelines. The maximum arsenic concentration in berries was 0.07 mg/kg, and was within comparable ranges of the total daily dietary intake from food and water as reported by Heath Canada (0.02 mg/day). The maximum measured arsenic concentration in tea was 1.0 µg/L, while the maximum in juice was 4.9 µg/L. Arsenic levels in tea and juice were much lower than the Health Canada drinking water limits of 10 µg/L of arsenic.

Lead was also at concentrations that were well below safety guidelines. The maximum lead concentration in berries, 0.05 mg/kg, was within comparable ranges of the typical daily dietary intake of a 70 kg adult according to Health Canada (0.05 mg/day). The maximum measured lead concentration in tea was 0.9 µg/L, while the maximum in juice was 3.5 µg/L. Lead levels and tea and juice were below the Health Canada drinking water limits of 10 µg/L.

OVERALL CONCLUSIONS FOR THE DUST AND TRADITIONAL PLANT STUDY

Is there dust coming off the mine?

- Where is the dust going?
- What is in the dust?

Overall there is a dusting effect in the Highland Valley from mine activities. Measurements in wolf lichen show that this effect extends as far as 10-15 km from the mine area, but is greatest around the mine and tailings, and to the north and east due to prevailing winds in the valley. Dust-affected areas have higher metal levels than measured in the Lac Le Jeune reference area, with copper and molybdenum showing the most pronounced patterns. Some high metal concentrations in wolf lichen near the mine may be affecting lichen health, but all are within safe levels for animals eating the lichen.

Dust effects measured in wolf lichen are greater and extend further than in other plants, as lichens are designed to capture dust from the air for their nutrients. Most other plants would show much lower levels of dust and metals.

How is dust affecting traditional plants?

- Is the dust from the mine accumulating on traditional plants?
- Are the plants taking up metals from the dust?
- Will washing the plant reduce the dust on the plant?

Results from this study showed that there is a measurable effect of dust from the HVC mine area and along Highway 97C, and this effect is unlikely to affect plant health. Eight metals showed elevated concentrations in areas near to the mine compared to farther away. As expected, the measureable dust effect on soapberry is less than on lichen, and generally extends from 1-4 km from the mine site and tailings pond, particularly to the northeast side of the mine and in the Bethlehem mine area.

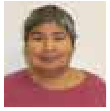
The dust effect was most pronounced for copper in leaves, which showed the largest area of influence around the mine of all metals and showed clear patterns where it decreased as you move away from the mine. Copper in soapberry leaves is at moderate concentrations directly near the mine and along the highway 97C that may affect plant health. Copper concentrations in soapberry leaves and berries are considered low risk for animal consumption. Copper in berries, juice and tea are within health standards for human consumption, and washing of leaves and berries will reduce copper by 15-27% and by 13-48%, respectively.

For the other seven metals, a review of the literature shows that the levels of enrichment detected in the mine study area can be considered low risk for human, animal and plant health.

IMPLICATIONS TO GATHERING TRADITIONAL FOODS

The map on pages 74 and 75 showing copper in soapberry leaves can be used as a guide to determine where there is a dusting effect from the mines. However, concentrations of copper in leaves and berries in this area are still relatively low and are still within health standards. The tea made from leaves, and the juice from berries have even lower concentrations of copper, as much of the dust is likely washed off in the tea and juice making process. Therefore, from a scientific perspective, it is still safe to harvest in these areas, but gathered leaves and berries could be washed if desired in order to remove some of the metals. Washing of leaves will reduce dust by 15-27%, and washing of berries will reduce dust by 13-48%, depending on the metal of interest.

Nlaka'pamux community members who participated in this study indicated that for the most part, most people do not harvest this close to the mine and despite the results, people will likely still con-tinue to avoid areas right near the mine for gathering.



Betsy Munro: "Thank you for taking the time and energy, for taking the time to listen to our concerns. It's our choice where to pick."

DUST MANAGEMENT AND FURTHER STUDIES

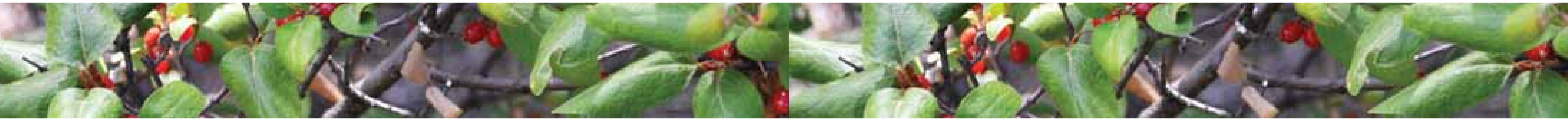
HVC is implementing various dust management approaches around the mine site, and some specific to the tailings dam (the LL Dam at the north end of the tailings pond), to reduce dust in these areas. A site-wide management plan is being developed in 2015, and a dust reduction approach will be trialed in 2015, including a dust suppressant product applied to a new roadway. A dust management plan has been developed for the LL Dam which includes reduction in traffic on the dam, avoiding removal of vegetation unless necessary, road watering, and employee and contractor training. In 2014, a mitigation plan for the LL Dam was completed to determine the best approach to suppressing dust. The suppressant chosen was DustFloc, which was applied to a large area of the LL Dam that is not currently under construction.

There is on-going monitoring of dust on the mine and at the LL Dam, as well as weather data, to measure levels of dust and how these change with variable weather conditions. This information will also be used to understand if dust mitigation approaches are effective for managing dust in the area.

Additional studies are under-way at HVC to study the potential effects of dust. These include:

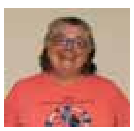
Wildlife study – this study focuses on deer and moose to determine if metals in plants either from dust or from uptake from reclaimed soils is affecting animal health after consumptions. For more information contact: Richard Doucette at 250.523.3723 or Richard.Doucette@teck.com

Site-wide vegetation and water monitoring - this includes monitoring for metals in plants and water, which can include dust effects. For more information contact: Jaimie Dickson at 250.523.3353 Jaimie.Dickson@teck.com



COMMUNITY REFLECTIONS

Ina Dunstan (Siska): "I've been to a lot of gatherings and even the younger ones are joining in. It's not a whole lot, but there is some. And I think just by having these sessions and hearing what everybody else has to say, that helps us help our children."



Verna Miller (Cook's Ferry): "What is important…is the symbiotic relationship, what is the relative of the sxwúsm…we have to honour all of these other connections to the sxwúsm. It's not just about sxwúsm, it's about where it grows, why it grows there, why it's important to walk there or ride your horse there."

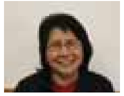
Nicholas Peterson (LNIB): "I consider myself a youth. I feel youthful. But I want to just kind of give a message of hope. I can't speak for others necessarily, but my grandparents were gone by the time I was mature enough to appreciate really who they were and it was too late…I didn't get to learn a lot traditionally that way, and my mom travels a lot, and I didn't get to learn a lot of these things. So I'm trying my best to learn and taking my kids and picking mushrooms… and salmon fishing and hunting, doing all these things. It's not lost. I was out harvesting last week, and taking my kids to the tide pools on the island yesterday. So all these things that many of you hold in your teaching, it is coming down, and this book I think is a fantastic idea, and I want to tie in the western scientific world to it as well. It would be nice to have the botanical descriptions and the ecology of where it is, but also these other aspects of the stewardship, you get there you make sure your shoes are clean, and if there's only a little bit there then you save that for the animals and you harvest somewhere else where there's plenty, and you have this in the book so that we know. My parents aren't able to teach me as much and my grandparents are gone, so I need you to teach me. And many of us youth are hungry for it. We want it. So don't stop."

COMMUNITY REFLECTIONS

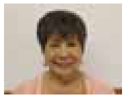
Penny Toodlican (LNIB): "I want to thank the HVC and the elders …how to preserve the berries, I think it's really important. I preserve the berry…… if we don't take care of the land now, we're going to lose all that. ….so I'm glad that you guys are all taking part in doing this study. There are a lot of people here I just thought I'd come in and see what you are doing and I would like to thank you for all your time and all your energy."

Arthur Sam (Nooaitch): "All our stories, the way we do our tradition, every one of us here growing up…we'll use this [book] as a tool for our grandchildren."

Derek Sheena (LNIB): I'm glad this study was done because some of the families that used to trap live and range in that area. They know a lot more about it the berries, the medicines and what's in them. Hopefully we can continue on collecting all those medicines without losing any."



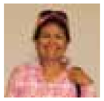
Doreen Harry (Coldwater): "…I really have a concern about the bears, because they eat a lot of berries."



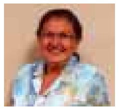
Bernice Garcia (Coldwater): "Thank you for HVC for providing this study. I am now a community member I wasn't fully able to participate in the plant study but I'm glad I'm here now today. And there is more work to be done [that] HVC needs to do."

Maurice Michell (Siska): "…For HVC to call on us and have us share with them - what we do with our land, and how we want to take care of our land - it's just one small step and I think that other organizations in industry [should] start to call on us too…"

Arthur Sam (Nooaitch): "I learned a lot here, some of us had different ideas of how our cultures or traditions go... the workshop was good for me...Like Bernice says there is a lot of work to do. Hope we all get together. Off on our own it's pretty hard. It's a learning curve for everybody...The mines have to work together with communities that way we know what's coming up and then we can work as a team."



Yvonne Joe (Shackan): "I want to thank our elders that are here and every participant, even though I voiced my opinions it was great being a part of the study and I learnt a lot. Whether or not I'll consume berries in my area or not I don't know. Like Pearl was saying though, if you can't consume the berries in your area you move to another area. I feel that I am against the moving of industry into our territory. This whole country was our land. The white people still want a piece of our land. But I guess we are humble people and we share."



Amelia Washington (Nooaitch): "I'm very happy to be part of this study it's my life passion to be out on the land and I have a site on Facebook called Amelia's traditional harvesting. If you want to come out I go almost every day and I'm never home and …I decided last year and I'm not going to sit by …and I have quite a big group. Thank you all very much."

Jim Toodlican (Shackan): "I would like to thank all of you for being here and to learn a little bit about the dust and the soapberries. I would like to say thank you to William and Phyllis over there, I'm sure glad they are here to hear what we are talking about over here. I'm very glad that you are making a book out of this, so the younger generation or the ones that are not born yet, most likely they'll do a lot of reading, a lot of our elders are going home, and I'm one of them, I'm so lucky that I grew up with my grandparents…I'm really appreciating sharing the little I know with you guys…I hope you share it.

I want to leave you with one thing from my grandmother: I teach you now, I don't expect you to learn, but I have taught you. But one day if you walk into your future and you look back, then you will see what I have taught you."

Appendix D Lower Nicola Indian Band Letter to Teck Highland Valley Copper Partnership, Feburary 19, 2019

February 19, 2019

Teck - Highland Valley Copper
PO Box 1500
Logan Lake, BC
V0K 1W0

Dear Amber:

Re: LNIB Comments to the Draft Project Description

The Lower Nicola Indian Band (LNIB) has reviewed the 2040 project description and would like to raise two preliminary areas of concern: (i) scope of engagement, and (ii) continued commitments to mitigate impacts and address economic accommodation.

First, LNIB confirms that all project activities are within Nlaka'pamux traditional territory and impact our unextinguished Aboriginal title and rights. This is consistent with our existing Relationship Agreement with HVC, which we view as an acknowledgement of the mine's current and future impacts to Nlaka'pamux traditional territory and our Aboriginal title and rights.

Despite this, the project description provided to us for review and consideration includes reference to the Stk'emlupsemc te Secwepemc Nation (SSN). To be clear, the SSN does not have jurisdiction over the HVC mine site. Furthermore, any accommodation given to the SSN relating to impacts of the project on Nlaka'pamux traditional territory goes counter to previous recognitions of LNIB jurisdiction over Nlaka'pamux traditional territory and will inevitably affect our ongoing relationship with HVC, both through our Relationship Agreement and otherwise.

Second, although we have had some successes with our Relationship Agreement, we have also had significant failures that need to be addressed before we can fully support moving ahead. These include but are not limited to improvements to all environmental conditions that affect our culture, employment, procurement, retention rates related to racism, and ongoing union issues.

Furthermore, the 2040 project description states how we will work together to manage, protect and enhance traditionally used resources. However, there is no mention of how HVC anticipates addressing economic accommodation to LNIB and other impacted Nlaka'pamux communities.

The courts have concluded that when the Crown approves extracting resources on Aboriginal title lands without the consent of the Indigenous peoples, it commits a serious infringement of constitutionally

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protected rights and that permits may be cancelled and damages owed. Therefore, it is crucial that HVC continue to work with LNIB and other Nlaka'pamux communities to mitigate impacts and address concerns relating to the 2040 project. LNIB looks forward to continuing to work collaboratively with HVC to address these and other concerns as the 2040 project progresses.

Please note that our participation in this process does not define or amend our Aboriginal title and rights. Further, our participation does not limit any priorities afforded to our Aboriginal title and rights, nor does it limit the positions that we may take in future negotiations or court actions.

If you require further information or clarification, please do not hesitate to contact: 250.378.5157.

Sincerely,

Kari Reilander

Kari Reilander, Executive Director

Appendix E List of Permits

Appendix E – List of Permits

Table E-1 Summary of Amendments to *Mines Act* Permit M-11

Approval Date	Description of Amendment
20-Jan-70	Permit 11 Authorizing Surface Work (Bethlehem Copper Corporation)
30-May-73	Approving Permit Extension (Bethlehem Copper Corporation Ltd)
03-Jan-80	M-11 Authorizing Surface Work (Bethlehem Copper Corporation Ltd)
14-Jul-81	M-55 (Highmont Operation Corporation)
25-Mar-82	Approving Trojan Creek Diversion Works (Bethlehem Copper Corporation Ltd)
07-Dec-84	M-11 Amendment - Approving Reclamation Program (Bethlehem Copper Corporation)
17-Apr-86	M-11 Amendment - Approving Valley Main Haul Road
06-Aug-86	M-11 Amendment - Approving Name Change
15-Jul-87	M-11 Amendment - Approving Bethlehem Haul Road Alignment
27-Jan-88	M-11 Amendment - Approval to Use Jersey, East Jersey and Iona Open Pits
22-Sep-89	Letter - Highland Valley Tailings Impoundment
27-Oct-89	M-11 Amendment - Approving Highland Valley Copper Reclamation Plan, September 1987
12-Apr-91	Letter - 1991 Mine Plan Submission
24-Nov-94	Approving reclamation plan due date extension
08-Mar-95	M-11 Amendment - Bethlehem & Highmont Tailings Dams Abandonment Spillways
05-May-95	M-11 Amendment - Approving Work System and Reclamation Program
15-Jul-98	M-11 Amendment - Amalgamation with Permit M-55
16-Jul-98	M-11 Amendment:
23-Feb-00	- Reclamation Program - End Land Use Plan
05-Jun-03	- Reclamation Plan for 1995-1999
24-Mar-04	- Revegetation of Lornex South Waste Dump
09-Jun-04	M-11 Amendment - Approving Modifications to the L-L Dam Upstream Section
27-Aug-04	M-11 Amendment - Approving Highmont Tailings Dam Abandonment Spillway
15-Oct-04	M-11 Amendment - Approving Highland Tailings Storage Facility, LL Dam Spillway and Low Level Outlet
23-Mar-05	M-11 Amendment - Approving Highland Tailings Storage Facility LL Ultimate Dam
19-Jul-05	M-11 Amendment - Approving Disposal of Contaminated Soils
23-Sep-05	M-11 Amendment - Approving Five Year Reclamation Plan
14-Feb-08	M-11 Amendment - Approving Five Year Reclamation Plan
05-Jun-09	M-11 Amendment - Approving 300,000 Tonne Bulk Sample in the Highmont Pit
19-Jun-09	M-11 Amendment - Approving Amendment to the 2005 Mine Plan
19-Jun-09	M-11 Amendment - Approving LL Ultimate Dam Design for Crest Elevations 1260.6 m & 1266.5 m
19-Jun-09	M-11 Amendment - Approving Company Name Change Extension of the Valley Pit Westwall and the Highmont East Pit
19-Jun-09	Permit M-11 MX 3-224 Pimainus Property
19-Jun-09	Permit M-11 MX 4-350 Getty Copper Property

Approval Date	Description of Amendment
19-Jun-09	Permit M-11 MX 4-350 Highmont Property
06-Oct-09	Permit M-11 MX 4-350 Valley Pit Property
31-Oct-11	Permit M-11 MX 4-350 Valley South Dump Property
22-Jun-12	Permit M-11 MX 4-483 Bethlehem Property
22-Feb-13	M-11 Amendment - Approving Valley Pit Upper West Wall and Permit Boundary Extension
15-May-13	Lornex Pit Expansion, Raising the H-H and L-L Damns and the South Side Tailings Distribution System
20-Mar-14	Approving Traditional Use Study Deadline Extension
23-Dec-14	Decommissioning Low Level Outlet at LL Dam
29-Apr-16	Decommissioning Low Level Outlet at LL Dam, Revised
14-Dec-16	WQ Model Extension
17-Nov-17	Approving Bethlehem Main Tailings Test Fill Program
09-Aug-18	Approving Lornex North Dump Extension

Appendix F Cadastre

Appendix F – Cadastre

Table F-1 Land Ownership

PIN	PID	Legal Land Description
Private (Titled)		
3524070	N/A	DISTRICT LOT 5703, BEING CALCO NO. 19 MINERAL CLAIM, KDYD.
4632650	N/A	DISTRICT LOT 3122, BEING DF5 AND FLW5FR MINERAL CLAIM, KDYD.
4631740	N/A	DISTRICT LOT 3115, BEING AL 2 FRACTION MINERAL CLAIM, KDYD.
4631900	N/A	DISTRICT LOT 3120, BEING DV 2 FRACTION MINERAL CLAIM, KDYD.
3137840	N/A	SECTION 15, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD.
3525270	N/A	DISTRICT LOT 5715, BEING BEN NO. 4 MINERAL CLAIM, KDYD.
3525560	N/A	DISTRICT LOT 5718, BEING APEX NO. 25 MINERAL CLAIM, KDYD.
4632100	N/A	DISTRICT LOT 3121, BEING DF 3 MINERAL CLAIM, KDYD.
4462260	N/A	DISTRICT LOT 4943, BEING AL 3 FRACTION MINERAL CLAIM, KDYD.
4630960	N/A	DISTRICT LOT 3130, BEING MD 3 MINERAL CLAIM, KDYD.
4632360	N/A	DISTRICT LOT 4941, BEING LTC 3 MINERAL CLAIM, KDYD.
3139240	N/A	SECTION 29, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD.
4630700	N/A	DISTRICT LOT 4960, BEING LAKE 3 MINERAL CLAIM, KDYD
4529880	N/A	DISTRICT LOT 3159, BEING HH 4 FRACTION MINERAL CLAIM, KDYD.
4081280	N/A	DISTRICT LOT 2349, BEING LYNN 15 MINERAL CLAIM, KDYD
4081310	N/A	DISTRICT LOT 2351, BEING IDE 2 MINERAL CLAIM, KDYD
4630670	N/A	DISTRICT LOT 4959, BEING LAKE 1 MINERAL CLAIM, KDYD
3526050	N/A	DISTRICT LOT 5723, BEING BEN NO. 5 MINERAL CLAIM, KDYD.
3524100	N/A	DISTRICT LOT 5704, BEING CALCO NO. 20 MINERAL CLAIM, KDYD.
4625750	N/A	DISTRICT LOT 3157, BEING HH 9 FRACTION MINERAL CLAIM, KDYD.
4632070	N/A	DISTRICT LOT 3128, BEING DF 2 MINERAL CLAIM, KDYD.
4628060	N/A	DISTRICT LOT 4949, BEING LTK FRACTION MINERAL CLAIM, KDYD.
4634180	N/A	DISTRICT LOT 2682, BEING VALLEY 2 MINERAL CLAIM, KDYD
4485600	N/A	DISTRICT LOT 4950, BEING LTK 6 MINERAL CLAIM, KDYD.
4020370	N/A	DISTRICT LOT 2329, BEING JAY 103 FR MINERAL CLAIM, KDYD
3518530	N/A	DISTRICT LOT 5648, BEING A.M. NO. 34 MINERAL CLAIM, KDYD.
3524650	N/A	DISTRICT LOT 5709, BEING APEX NO. 73 MINERAL CLAIM, KDYD.
3526180	N/A	DISTRICT LOT 5724, BEING BEN NO. 1 FRACTION MINERAL CLAIM, KDYD.
3518240	N/A	DISTRICT LOT 5645, BEING A.M. NO. 36 MINERAL CLAIM, KDYD.
4631610	N/A	DISTRICT LOT 3114, BEING LTK 7 MINERAL CLAIM, KDYD.
3525140	N/A	DISTRICT LOT 5714, BEING LEA NO. 2 FRACTION MINERAL CLAIM, KDYD.

PIN	PID	Legal Land Description
3680070	N/A	DISTRICT LOT 28, BEING PERIMETER SURVEY MINERAL CLAIM, KDYD.
3548580	N/A	DISTRICT LOT 6013, BEING KEN NO. 21 MINERAL CLAIM, KDYD.
3524520	N/A	DISTRICT LOT 5708, BEING CALCO NO. 24 FRACTION MINERAL CLAIM, KDYD.
3871400	N/A	DISTRICT LOT 1028, BEING PERIMETER SURVEY MINERAL CLAIM, KDYD.
4478410	N/A	DISTRICT LOT 4944, BEING LTK 11 FRACTION MINERAL CLAIM, KDYD.
4630540	N/A	DISTRICT LOT 3158, BEING HH 5 MINERAL CLAIM, KDYD
3524230	N/A	DISTRICT LOT 5705, BEING CALCO NO. 22 MINERAL CLAIM, KDYD.
4632230	N/A	DISTRICT LOT 3127, BEING DF 4 MINERAL CLAIM, KDYD.
4630830	N/A	DISTRICT LOT 3129, BEING MD 2 MINERAL CLAIM, KDYD.
3524780	N/A	DISTRICT LOT 5710, BEING APEX NO. 89 FRACTION MINERAL CLAIM, KDYD.
3524360	N/A	DISTRICT LOT 5706, BEING CALCO NO. 26 MINERAL CLAIM, KDYD.
3524810	N/A	DISTRICT LOT 5711, BEING APEX NO. 88 MINERAL CLAIM, KDYD.
4631870	N/A	DISTRICT LOT 3119, BEING DF 1 MINERAL CLAIM, KDYD.
4631290	N/A	DISTRICT LOT 3133, BEING DV 1 FRACTION MINERAL CLAIM, KDYD.
4628480	N/A	DISTRICT LOT 3155, BEING LTK 1 FRACTION MINERAL CLAIM, KDYD.
4631160	N/A	DISTRICT LOT 3132, BEING MD 5 MINERAL CLAIM, KDYD.
3526470	N/A	DISTRICT LOT 5728, BEING GLENN FRACTION MINERAL CLAIM, KDYD.
3518370	N/A	DISTRICT LOT 5646, BEING A.M. NO. 35 MINERAL CLAIM, KDYD.
4631320	N/A	DISTRICT LOT 3116, BEING HH 15 MINERAL CLAIM, KDYD.
4630410	N/A	DISTRICT LOT 3156, BEING HH 10 MINERAL CLAIM, KDYD
4510320	N/A	DISTRICT LOT 4952, BEING LTK 8 MINERAL CLAIM, KDYD.
4632520	N/A	DISTRICT LOT 4964, BEING AL 1 FRACTION MINERAL CLAIM, KDYD.
4631580	N/A	DISTRICT LOT 3118, BEING HH 16 FRACTION MINERAL CLAIM, KDYD.
4625200	N/A	DISTRICT LOT 4940, BEING HH 3 FRACTION MINERAL CLAIM, KDYD.
4510160	N/A	DISTRICT LOT 4951, BEING LTK 5 MINERAL CLAIM, KDYD.
3519990	N/A	DISTRICT LOT 5662, BEING SKEENA COPPER NO. 22 MINERAL CLAIM, KDYD.
3106430	N/A	SECTION 24, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD.
3525430	N/A	DISTRICT LOT 5717, BEING APEX NO. 76 FRACTION MINERAL CLAIM, KDYD.
3525010	N/A	DISTRICT LOT 5713, BEING BEN NO. 2 MINERAL CLAIM, KDYD.
3518400	N/A	DISTRICT LOT 5647, BEING A.M. NO. 33 MINERAL CLAIM, KDYD.
3517040	N/A	DISTRICT LOT 5633, BEING A.M. NO. 37 MINERAL CLAIM, KDYD.
4542930	N/A	DISTRICT LOT 3160, BEING HH 2 MINERAL CLAIM, KDYD
4521150	N/A	DISTRICT LOT 4958, BEING LTK 9 MINERAL CLAIM, KDYD.
3525980	N/A	DISTRICT LOT 5722, BEING BEN NO. 6 MINERAL CLAIM, KDYD.

PIN	PID	Legal Land Description
3524490	N/A	DISTRICT LOT 5707, BEING CALCO NO. 28 FRACTION MINERAL CLAIM, KDYD.
3517170	N/A	DISTRICT LOT 5634, BEING A.M. NO. 38 MINERAL CLAIM, KDYD.
3525690	N/A	DISTRICT LOT 5719, BEING APEX NO. 74 MINERAL CLAIM, KDYD.
3525850	N/A	DISTRICT LOT 5721, BEING DOUG NO. 7 FRACTION MINERAL CLAIM, KDYD.
4062770	N/A	DISTRICT LOT 2347, BEING TRY AGAIN MINERAL CLAIM, KDYD
4632490	N/A	DISTRICT LOT 4942, BEING LTC 4 MINERAL CLAIM, KDYD.
4631030	N/A	DISTRICT LOT 3131, BEING MD 4 MINERAL CLAIM, KDYD.
3526210	N/A	DISTRICT LOT 5726, BEING CAMP NO. 4 MINERAL CLAIM, KDYD.
3525720	N/A	DISTRICT LOT 5720, BEING APEX NO. 90 FRACTION MINERAL CLAIM, KDYD.
3700290	N/A	DISTRICT LOT 5725, BEING LEA NO. 1 FRACTION MINERAL CLAIM, KDYD.
90027805	N/A	N 1/2, OF LEGAL SUBDIVISION 2, SECTION 1, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD.
2245781	N/A	FRACTIONAL LEGAL SUBDIVISION 15, SECTION 36, TOWNSHIP 17, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
2246271	N/A	SW1/4, SECTION 1, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
4081291	N/A	SW1/4, SECTION 32, TOWNSHIP 17, RANGE 22, WEST OF THE 6TH MERIDIAN, KDYD
2245941	N/A	LEGAL SUBDIVISION 7, SECTION 1, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD.
2246141	N/A	S1/2, OF LEGAL SUBDIVISION 2, SECTION 1, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
3522120	N/A	DISTRICT LOT 5684, BEING SCOTT FRACTION MINERAL CLAIM, KDYD.
3523160	N/A	DISTRICT LOT 5694, BEING AWARD NO. 37 MINERAL CLAIM, KDYD.
3523290	N/A	DISTRICT LOT 5695, BEING CALCO NO. 17 MINERAL CLAIM, KDYD.
3523870	N/A	DISTRICT LOT 5701, BEING BEN NO. 1 MINERAL CLAIM, KDYD.
3523900	N/A	DISTRICT LOT 5702, BEING DOUG NO. 4 FRACTION MINERAL CLAIM, KDYD.
3524940	N/A	DISTRICT LOT 5712, BEING APEX NO. 80 FRACTION MINERAL CLAIM, KDYD.
3525300	N/A	DISTRICT LOT 5716, BEING BEN NO. 3 MINERAL CLAIM, KDYD.
3921700	004-474-902	DISTRICT LOT 1669, KAMLOOPS DIVISION YALE DISTRICT (KDYD)
2251641	004-474-970	N1/2 OF SW1/4, SECTION 29, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
2251771	004-474-988	W1/2 OF NW1/4, SECTION 29, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
2252391	004-475-003	E1/2 OF NE1/4, SECTION 30, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
3679820	004-475-038	DISTRICT LOT 25, KDYD

PIN	PID	Legal Land Description
2204291	004-515-099	LEGAL SUBDIVISION 16, SECTION 23, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD
90027725	004-515-102	LEGAL SUBDIVISION 7, SECTION 25, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD.
2205071	004-515-111	LEGAL SUBDIVISION 1, SECTION 26, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD
90027726	004-515-129	LEGAL SUBDIVISION 9, SECTION 25, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD.
2204611	004-515-145	LEGAL SUBDIVISION 10, SECTION 25, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD
90027727	004-515-153	LEGAL SUBDIVISION 16, SECTION 25, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD.
2204451	004-515-161	N1/2 OF NW1/4, SECTION 24, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD
2204741	004-515-170	SW1/4, SECTION 25, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD
2248381	004-515-234	NE1/4, SECTION 15, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
3138460	004-515-251	SECTION 21 TOWNSHIP 18 RANGE 23 WEST OF THE 6TH MERIDIAN KDYD
2249741	004-515-269	SW1/4, SECTION 22, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
2249581	004-515-277	S1/2 OF SE1/4, SECTION 22, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
15239190	004-516-991	CHILTHNUX INDIAN RESERVE NO 12 SHOWN AS LOT 1 ON PLAN M9649 TOWNSHIP 18 RANGE 23 WEST OF THE 6TH MERIDIAN KDYD
3136350, 3136480, 14141930, 14145020	014-189-208	LOT 1 DISTRICT LOTS 6278 AND 6279 SECTION 1 TOWNSHIP 18 RANGE 23 WEST OF THE 6TH MERIDIAN SECTION 36 TOWNSHIP 17 RANGE 23 WEST OF THE 6TH MERIDIAN TOWNSHIPS 17 AND 18 RANGE 22 WEST OF THE 6TH MERIDIAN AND OF TOWNSHIPS 17 AND 18 RANGE 23 WEST OF THE 6TH MERIDIAN ALL OF KDYD PLAN 41319
Provincial Crown (Titled)		
3931590	004-617-894	DISTRICT LOT 1244A, BEING TAMARAC MINERAL CLAIM, KDYD.
3931620	004-617-908	DISTRICT LOT 1245A, BEING SHAMROCK MINERAL CLAIM, KDYD.
3743890	004-617-916	DISTRICT LOT 3642, BEING MAJOR FRACTION MINERAL CLAIM, KDYD.
3931750	004-617-924	DISTRICT LOT 1246A, BEING STAR MINERAL CLAIM, KDYD.
3743760	013-188-658	DISTRICT LOT 3641, BEING DUKE MINERAL CLAIM, KDYD.
Provincial Crown (Non-titled)		
2204031	N/A	NW1/4, SECTION 23, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD
2245231	N/A	BLOCK A, OF LEGAL SUBDIVISION 7, SECTION 36, TOWNSHIP 17, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
3106300	N/A	SECTION 23, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD.
3106560	N/A	SECTION 25, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD

PIN	PID	Legal Land Description
3106690	N/A	SECTION 26, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD
3136350	N/A	SECTION 36, TOWNSHIP 17, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD.
3138590	N/A	SECTION 22, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
3139370	N/A	SECTION 30, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD
3831961	N/A	BLOCK A, DISTRICT LOT 3122, DF5 AND FLW5FR, KDYD.
3921830	N/A	DISTRICT LOT 1670, KDYD
3921960	N/A	DISTRICT LOT 1671, KDYD
4765680	N/A	SECTION 31, TOWNSHIP 17, RANGE 22, WEST OF THE 6TH MERIDIAN, KDYD.
4765710	N/A	SECTION 32, TOWNSHIP 17, RANGE 22, WEST OF THE 6TH MERIDIAN, KDYD.

Note: N/A = Not applicable

Table F-2 Mineral Claims Overlapped by the Project

Tenure Number	Claim Name	Claim Type	Claim Holder
216807	JDG. FR.	Fractional Claim	Teck HVC Corporation
217690	SEAN #1 FRACTION	Fractional Claim	Teck HVC Corporation
218213	NB 34	Four Post Claim	Teck HVC Corporation
219955	None Provided	Mining Lease	Teck HVC Corporation
219999	None Provided	Mining Lease	Teck HVC Corporation
220001	None Provided	Mining Lease	Teck HVC Corporation
220002	None Provided	Mining Lease	Teck HVC Corporation
220066	None Provided	Mining Lease	Teck HVC Corporation
220109	S.J. #63	Two Post Claim	Teck HVC Corporation
220110	S.J. #64	Two Post Claim	Teck HVC Corporation
220111	S.J. #65	Two Post Claim	Teck HVC Corporation
220119	P.R. NO. 27	Two Post Claim	Teck HVC Corporation
220120	P.R. NO. 28	Two Post Claim	Teck HVC Corporation
220142	S.J. 90	Two Post Claim	Teck HVC Corporation
220143	S.J. 91	Two Post Claim	Teck HVC Corporation
220144	S.J. 92	Two Post Claim	Teck HVC Corporation
220210	H.H. NO. 1 FR.	Fractional Claim	Teck HVC Corporation
220241	L.T.K.#12	Two Post Claim	Teck HVC Corporation
220247	H.H. #12	Two Post Claim	Teck HVC Corporation
220248	H.H. #13	Two Post Claim	Teck HVC Corporation
220397	C.S. NO. 1 FR	Fractional Claim	Teck HVC Corporation
220443	DAWN #1	Two Post Claim	Teck HVC Corporation
220444	DAWN #2	Two Post Claim	Teck HVC Corporation
220445	DAWN #3	Two Post Claim	Teck HVC Corporation
220446	DAWN #4	Two Post Claim	Teck HVC Corporation
220461	LYNN NO. 1	Two Post Claim	Teck HVC Corporation
220462	LYNN NO. 2	Two Post Claim	Teck HVC Corporation
220463	LYNN NO. 3	Two Post Claim	Teck HVC Corporation
220464	LYNN NO. 4	Two Post Claim	Teck HVC Corporation
220471	C.U. NO.2	Two Post Claim	Teck HVC Corporation
220511	D.F. #16	Two Post Claim	Teck HVC Corporation
220668	ANN NO. 1 FR	Fractional Claim	Teck HVC Corporation
220673	ANN NO. 6 FR	Fractional Claim	Teck HVC Corporation
220679	ANN #16 FR.	Fractional Claim	Teck HVC Corporation
220683	JM #3	Two Post Claim	Teck HVC Corporation
220684	JM #4	Two Post Claim	Teck HVC Corporation

Tenure Number	Claim Name	Claim Type	Claim Holder
220685	D.V. #1 FR.	Fractional Claim	Teck HVC Corporation
220717	GRR #1 FR	Fractional Claim	Teck HVC Corporation
220719	CALCO #30	Two Post Claim	Teck HVC Corporation
220728	GRR 3 FR.	Fractional Claim	Teck HVC Corporation
220729	DEN #63	Two Post Claim	Teck HVC Corporation
220730	DEN #64	Two Post Claim	Teck HVC Corporation
220731	DEN #65	Two Post Claim	Teck HVC Corporation
220743	DEN #72	Two Post Claim	Teck HVC Corporation
221073	BROOK #1 FR.	Fractional Claim	Teck HVC Corporation
221074	DG #1 FR.	Fractional Claim	Teck HVC Corporation
221104	DEN #71 FR.	Fractional Claim	Teck HVC Corporation
221180	VIK 7 FR.	Fractional Claim	Teck HVC Corporation
221181	VIK 8 FR.	Fractional Claim	Teck HVC Corporation
303869	NB 2	Four Post Claim	Teck HVC Corporation
303870	NB 3	Four Post Claim	Teck HVC Corporation
303871	NB 4	Four Post Claim	Teck HVC Corporation
303872	NB 5	Four Post Claim	Teck HVC Corporation
303873	NB 6	Four Post Claim	Teck HVC Corporation
303874	NB 7	Four Post Claim	Teck HVC Corporation
303875	NB 8	Four Post Claim	Teck HVC Corporation
303876	NB 9	Four Post Claim	Teck HVC Corporation
303877	NB 10	Four Post Claim	Teck HVC Corporation
303878	NB 11	Four Post Claim	Teck HVC Corporation
303879	NB 12	Four Post Claim	Teck HVC Corporation
303880	NB 13	Four Post Claim	Teck HVC Corporation
303881	NB 14	Four Post Claim	Teck HVC Corporation
303882	NB 15	Four Post Claim	Teck HVC Corporation
303883	NB 16	Four Post Claim	Teck HVC Corporation
303884	NB 17	Four Post Claim	Teck HVC Corporation
303885	NB 18	Four Post Claim	Teck HVC Corporation
303886	NB 19	Four Post Claim	Teck HVC Corporation
303887	NB 20	Four Post Claim	Teck HVC Corporation
303888	NB 21	Four Post Claim	Teck HVC Corporation
303890	NB 23	Four Post Claim	Teck HVC Corporation
303891	NB 24	Four Post Claim	Teck HVC Corporation
303892	NB 25	Four Post Claim	Teck HVC Corporation
303893	NB 26	Four Post Claim	Teck HVC Corporation

Tenure Number	Claim Name	Claim Type	Claim Holder
303894	NB 27	Four Post Claim	Teck HVC Corporation
303895	NB 28	Four Post Claim	Teck HVC Corporation
303896	NB 29	Four Post Claim	Teck HVC Corporation
303897	NB 30	Four Post Claim	Teck HVC Corporation
303899	NB 32	Four Post Claim	Teck HVC Corporation
303900	NB 33	Four Post Claim	Teck HVC Corporation
303902	NB 36	Four Post Claim	Teck HVC Corporation
303903	NB 37	Four Post Claim	Teck HVC Corporation
385184	INK 13	Four Post Claim	Teck HVC Corporation
385185	INK 14	Four Post Claim	Teck HVC Corporation

Table F-3 Mining Leases Overlapped by the Project

Tenure Number	Tenure Type	Interest Holder
219953	Mining Lease	Teck HVC Corporation
219954	Mining Lease	Teck HVC Corporation
219956	Mining Lease	Teck HVC Corporation
219957	Mining Lease	Teck HVC Corporation
219958	Mining Lease	Teck HVC Corporation
219990	Mining Lease	Teck HVC Corporation
219991	Mining Lease	Teck HVC Corporation
219992	Mining Lease	Teck HVC Corporation
219993	Mining Lease	Teck HVC Corporation
219994	Mining Lease	Teck HVC Corporation
219996	Mining Lease	Teck HVC Corporation
219997	Mining Lease	Teck HVC Corporation
219998	Mining Lease	Teck HVC Corporation
220003	Mining Lease	Teck HVC Corporation
220004	Mining Lease	Teck HVC Corporation
220005	Mining Lease	Teck HVC Corporation
220006	Mining Lease	Teck HVC Corporation
220027	Mining Lease	Teck HVC Corporation
220029	Mining Lease	Teck HVC Corporation
220030	Mining Lease	Teck HVC Corporation
220031	Mining Lease	Teck HVC Corporation
220032	Mining Lease	Teck HVC Corporation
220034	Mining Lease	Teck HVC Corporation
220035	Mining Lease	Teck HVC Corporation
220036	Mining Lease	Teck HVC Corporation
220047	Mining Lease	Teck HVC Corporation
220048	Mining Lease	Teck HVC Corporation
220050	Mining Lease	Teck HVC Corporation
220052	Mining Lease	Teck HVC Corporation
220054	Mining Lease	Teck HVC Corporation
220055	Mining Lease	Teck HVC Corporation
305938	Mining Lease	Teck HVC Corporation

Table F-4 Cut Blocks Overlapped by the Project

Cut Block Forest File ID	Cutting Permit ID	Cut Block ID	Client Name
A88772	22K	2	Aspen Planer Ltd.
	22K	6	Aspen Planer Ltd.
A85122	08K	GN1	Pelltiq't Energy Group Ltd.
	08K	GN2	Pelltiq't Energy Group Ltd.
L46831	N/A	A	Teck HVC Corporation
L47880	N/A	A	Teck HVC Corporation
L48237	N/A	A	Teck HVC Corporation
L48285	N/A	A	Teck HVC Corporation
L48478	N/A	A	Teck HVC Corporation
L48631	N/A	1	Teck HVC Corporation
L48632	N/A	2	Teck HVC Corporation
L48635	N/A	4	Teck HVC Corporation
L48636	N/A	2	Teck HVC Corporation
L48640	N/A	3	Teck HVC Corporation
	N/A	4	Teck HVC Corporation
	N/A	5	Teck HVC Corporation
L48645	N/A	3	Teck HVC Corporation
L48701	N/A	1	Teck HVC Corporation
L48703	N/A	1	Teck HVC Corporation
L48765	N/A	5	Teck HVC Corporation
L48820	N/A	1	Teck HVC Corporation
	N/A	2	Teck HVC Corporation
L48821	N/A	1	Teck HVC Corporation
	N/A	2	Teck HVC Corporation
L48852	N/A	1	Teck HVC Corporation
L49000	N/A	1	Teck HVC Corporation
L49001	N/A	1	Teck HVC Corporation
L49100	N/A	1	Teck HVC Corporation
	N/A	4	Teck HVC Corporation
L49344	N/A	1	Teck HVC Corporation
L49395	N/A	A	Teck HVC Corporation
L49615	N/A	1	Teck HVC Corporation
	N/A	2	Teck HVC Corporation
L49908	N/A	C1	Teck HVC Corporation
	N/A	C2	Teck HVC Corporation
	N/A	C3	Teck HVC Corporation

Cut Block Forest File ID	Cutting Permit ID	Cut Block ID	Client Name
L50303	N/A	1	Teck HVC Corporation
	N/A	2	Teck HVC Corporation
L50558	N/A	1	Teck HVC Corporation

Note: N/A = Not applicable

Table F-5 Crown Tenures Overlapped by the Project

Crown Land File Number	Tenure Subtype	Tenure Purpose	Tenure Sub-purpose	Tenure Stage	Legal Description	Interest Holder
0238935	Statutory Right of Way (or Easement)	Utility	Electric power line	Tenure	REMAINDER S1/2; REMAINDER N1/2; REMAINDER W1/2; REMAINDER E1/2; REMAINDER E1/2; REMAINDER N1/2; REMAINDER S1/2; REMAINDER N1/2; REMAINDER THAT PART EAST OF RIVER; N 1/2 OF SE 1/4 & S 1/2 OF NE 1/4; REMAINDER OF N 1/2; REMAINDER THAT PART NORTH OF RIVER; REMAINDER THAT PART WEST OF RIVER; REMAINDER S1/2; EAST 1/2 OF SECTION 36, TOWNSHIP 18, RANGE 25, WEST OF THE SIXTH MERIDIAN, KDYD; REMAINDER; REMAINDER E1/2 LYING EAST OF DL 14; THAT PART OF SEC 36 LYING EAST OF DL 14; THAT PART OF S1/2 LYING SOUTH OF DL'S 14 & 376 AND EAST OF DL 19; SECTION 25, TOWNSHIP 18, RANGE 24, WEST OF THE SIXTH MERIDIAN, KDYD; SECTION 26, TOWNSHIP 18, RANGE 24, WEST OF THE SIXTH MERIDIAN, KDYD; SECTION 22, TOWNSHIP 18, RANGE 23, WEST OF THE SIXTH MERIDIAN, KDYD; SECTION 30, TOWNSHIP 18, RANGE 23, WEST OF THE SIXTH MERIDIAN, KDYD; SECTION 25, TOWNSHIP 19, RANGE 25, WEST OF THE SIXTH MERIDIAN, KDYD; DISTRICT LOT 5724, KDYD; DISTRICT LOT 5726, KDYD; RW IN UCL VIC OF TWENTY-FOUR MILE LAKE (0238935); RW IN UCL VIC OF DL 5919 (D17631)(0238935); RW IN UCL VIC OF IR 9 (PEMYNOOS)(PL D17631);RIGHT OF WAY OVER SECTIONS 1, 15, 21, 22, 29, 30, TOWNSHIP 18, RANGE 23, WEST OF THE 6TH MERIDIAN, KDYD, AS SHOWN ON PLAN CG999 FILED IN KAMLOOPS LAND TITLE OFFICE. R/W OVER SECTIONS 25, 26, 31, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, SECTION 36, TOWNSHIP 18, RANGE 25, WEST OF THE 6TH MERIDIAN, SECTION 6, TOWNSHIP 19, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD AND OVER UCF BEING PART OF THE BED OF THOMPSON RIVER, PLAN CG1005 FILED IN KAMLOOPS LTO. R/ W OVER SECTIONS 18, 19, 30, TP 18, R 24, W6M, SEC 36, TP 18, R 25, W6M, KDYD, PLAN CG1011 FILED IN KAMLOOPS LTO. R/W OVER SEC 30, 31, TP 17, R 24, W6M, SEC 36, TP 17, R 25, W6M, SEC 6, 7, TP 18, R 24, W6M, KDYD, PLAN CG1048 FILED IN KAMLOOPS LTO. RIGHT OF WAY OVER DISTRICT LOT 1260, SECTIONS 12, 13, TOWNSHIP 17, RANGE 25, WEST OF THE 6TH MERIDIAN, DISTRICT LOT 28, PERIMETER SURVEY, KDYD, AS SHOWN ON PLAN CG1049 FILED IN KAMLOOPS LAND TITLE OFFICE.	Teck HVC Corporation

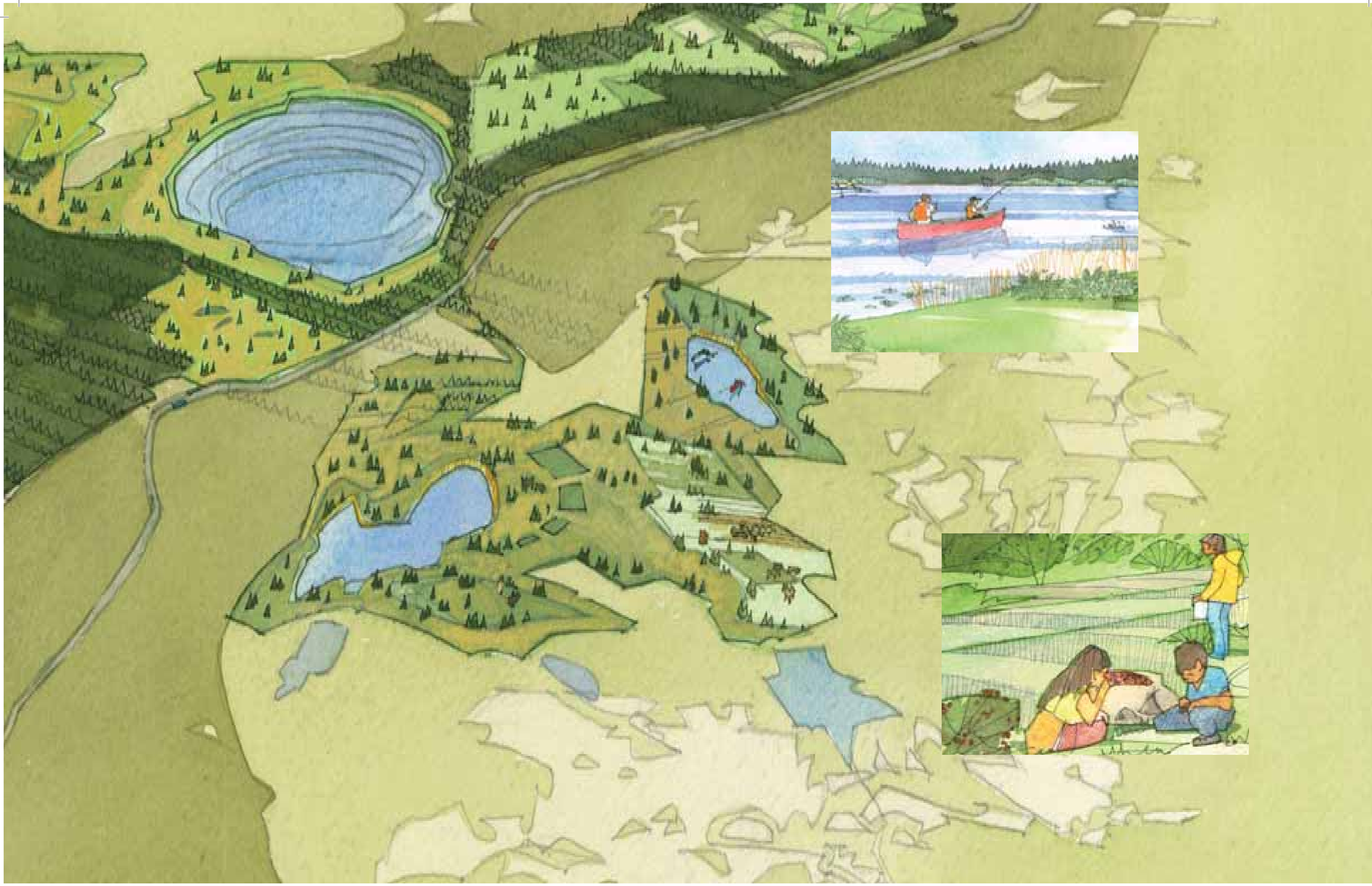
Crown Land File Number	Tenure Subtype	Tenure Purpose	Tenure Sub-purpose	Tenure Stage	Legal Description	Interest Holder
0248373	Statutory Right of Way (or Easement)	Utility	Electric power line	Tenure	EAST 1/2 OF DISTRICT LOT 1489, KDYD; REM OF SEC 31 LYING S & E OF IR #13 (QUILTANTON) & N OF DL 1669; DISTRICT LOT 2262, KDYD; DISTRICT LOT 2264, KDYD; DISTRICT LOT 2402, KDYD; DISTRICT LOT 1584, KDYD; DISTRICT LOT 1637, KDYD; UCL IN VIC OF TUPPER LAKE (0248373); RW IN UCL IN VIC OF HIGHLAND VALLEY (0248373);	BC Hydro
0292250	Statutory Right of Way (or Easement)	Utility	Electric power line	Tenure	ALL THOSE PARCELS OR TRACTS OF LAND SITUATED, MORE PARTICULARLY SHOWN OUTLINED ON PLAN 37725; THAT PART OF THE SOUTHWEST 1/4 OF SECTION 32, TOWNSHIP 17 RANGE 22 W6M INCLUDED WITHIN THE BOUNDARIES OF LOT 1028 SURVEYED AS V1K 9 FRACTION MINERAL CLAIM; LOT 1028 SURVEYED AS S.J. 90 MINERAL CLAIM SHOWN OUTLINED IN RED ON PLAN C12758; THAT PART OF THE SURFACE OF LOT 1028 SURVEYED AS J.M. 3 MINERAL CLAIM SHOWN OUTLINED IN RED ON PLAN C12758; THAT PART OF THE SOUTHEAST 1/4 OF SECTION 31, TOWNSHIP 17 RANGE 22, W6M INCLUDED WITHIN BOUNDARIES OF LOT 5726 SURVEYED AS CAMP 4 MINERAL CLAIM; LOT 5724 SURVEYED AS BEN 1 FRACTION MINERAL CLAIM; LOT 5725 SURVEYED AS LEA 1 FRACTION MINERAL CLAIM; LOT 1028 SURVEYED AS S.J.90 MINERAL CLAIM SHOWN OUTLINED IN RED ON PLAN C12758; THAT PART OF THE NORTHWEST 1/4 OF SECTION 32, TOWNSHIP 17 RANGE 22, W6M INCLUDED WITHIN THE BOUNDARIES OF LOT 1028 SURVEYED AS V1K9 FRACTION MINERAL CLAIM SHOWN OUTLINED IN RED ON PLAN C12758; THAT PART OF THE SURFACE OF LOT 5725 SURVEYED AS LEA 1 FRACTION MINERAL CLAIM SHOWN OUTLINED IN RED ON PLAN C12758; THAT PART OF THE SURFACE OF LOT 1028 SURVEYED AS J.M.4 MINERAL CLAIM SHOWN OUTLINED IN RED ON PLAN C12758; ALL THOSE PARCELS OR TRACT OF LAND LYING BETWEEN LOT 1028 MINERAL CLAIM AND SECTION 25 TOWNSHIP 17 RANGE 22 WEST OF THE SIXTH MERIDIAN SHOWN OUTLINED IN RED ON PLAN C12758 ALL OF KDYD	BC Hydro

Crown Land File Number	Tenure Subtype	Tenure Purpose	Tenure Sub-purpose	Tenure Stage	Legal Description	Interest Holder
0294580	Statutory Right of Way (or Easement)	Utility	Water line	Tenure	THAT PART OF DISTRICT LOT 1670 TOGETHER WITH ALL THAT UNSURVEYED CROWN LAND SHOWN ON PLANS C10545, C10587 AND C18540 ALL OF KDYD AND CONTAINING 103.14 HECTARES	Teck HVC Corporation
	Statutory Right of Way (or Easement)			Application	THAT PART OF DISTRICT LOT 1670 TOGETHER WITH ALL THAT UNSURVEYED CROWN LAND SHOWN ON PLANS C10545, C10587 AND C18540 ALL OF KDYD AND CONTAINING 103.14 HECTARES	
0303297	Statutory Right of Way (or Easement)	Utility	Gas or oil pipeline	Tenure	DISTRICT LOT 5715, KDYD; DISTRICT LOT 5724, KDYD; DISTRICT LOT 5725, KDYD; DISTRICT LOT 1027, KDYD; DISTRICT LOT 1028, KDYD; UNS CL SHOWN ON PLAN C10553; UNS CL LYING BETWEEN DL 1027 & 1028 PLAN C13006;	Fortis BC Energy Inc.
347716	Statutory Right of Way (or Easement)	Utility	Electric power line	Tenure	SECTION 25, TOWNSHIP 18, RANGE 24, WEST OF THE SIXTH MERIDIAN, KDYD; UCL VIC DL 6167 AS SHOWN ON PLAN C14636 - 0347716;	BC Hydro
0354573	License of Occupation	Utility	Gas or oil pipeline	Tenure	ALL THAT UNSURVEYED CROWN LAND TOGETHER WITH THAT PART OF THE SURFACE OF DISTRICT LOT 1028, BEING PERIMETER SURVEY MINERAL CLAIM, KDYD, CONTAINING 4.22 HECTARES, MORE OR LESS	Fortis BC Energy Inc.
03401702	Sec. 16 Map Reserve	Quarrying	Sand and Gravel	Tenure	UNSURVEYED CROWN LAND SITUATED ADJACENT TO DISTRICT LOT 25, KAMLOOPS DIVISION OF YALE DISTRICT, CONTAINING 32.7 HECTARES MORE OR LESS.	Not Provided
3404226	Statutory Right of Way (or Easement)	Utility	Electric power line	Tenure	SECTION 26, TOWNSHIP 18, RANGE 24, WEST OF THE SIXTH MERIDIAN, KDYD; RW OVER UCL (TRANSMISSION LINE) PLAN KAP47006;	BC Hydro
3405420	Statutory Right of Way (or Easement)	Utility	Electric power line	Tenure	DISTRICT LOT 5712, KDYD; DISTRICT LOT 5713, KDYD; DISTRICT LOT 5714, KDYD; DISTRICT LOT 5715, KDYD; DISTRICT LOT 1028, KDYD;	BC Hydro
03405456	Sec. 16 Map Reserve	Transportation	Roadway	Tenure	ALL THAT UNSURVEYED CROWN LAND IN THE VICINITY OF DISTRICT LOT 6167, KAMLOOPS DIVISION OF YALE DISTRICT, AND CONTAINING 50.7 HECTARES, MORE OR LESS	Not Provided

Crown Land File Number	Tenure Subtype	Tenure Purpose	Tenure Sub-purpose	Tenure Stage	Legal Description	Interest Holder
3406072	Statutory Right of Way (or Easement)	Utility	Electric power line	Tenure	RIGHT OF WAY OVER THOSE PARTS OF SECTION 31 AND SECTION 32 TOWNSHIP 17 RANGE 22 TOGETHER WITH ALL THAT UNSURVEYED CROWN LAND AS SHOWN ON PLAN C11009; THAT PART OF SECTION 22 TOWNSHIP 18 RANGE 23, WEST OF THE SIXTH MERIDIAN TOGETHER WITH ALL THAT UNSURVEYED CROWN LAND, KDYD SHOWN ON PLAN C11194	BC Hydro
3412225	Statutory Right of Way (or Easement)	Utility	Electric power line	Tenure	UNSURVEYED CROWN LAND OVER SECTION 31, TOWNSHIP 17, RANGE 22, W6M, KDYD, AS SHOWN ON PLAN EPP9315 ON FILE IN THE KAMLOOPS LAND TITLE OFFICE.	BC Hydro
3412683	Investigative License	Wind power	Investigative and monitoring phase	Application	THE SURFACE OF DISTRICT LOTS 5632 AND 2351 KNOWN AS THE KATHLEEN AND IDE 2 MINERAL CLAIMS RESPECTIVELY AND THE SURFACE OF PARTS OF DISTRICT LOTS 2300 AND 2537 KNOWN AS JDG FR. AND JERICHO NO. 3 MINERAL CLAIMS RESPECTIVELY TOGETHER WITH ALL THAT UNSURVEYED CROWN LAND IN THE VICINITY OF ROSCOE LAKE, ALL OF KDYD, CONTAINING 4500.0 HECTARES, MORE OR LESS	SB Okanagan Holding (08) Corp.
				Tenure	THE SURFACE OF DISTRICT LOTS 5632 AND 2351 KNOWN AS THE KATHLEEN AND IDE 2 MINERAL CLAIMS RESPECTIVELY AND THE SURFACE OF PARTS OF DISTRICT LOTS 2300 AND 2537 KNOWN AS JDG FR. AND JERICHO NO. 3 MINERAL CLAIMS RESPECTIVELY TOGETHER WITH ALL THAT UNSURVEYED CROWN LAND IN THE VICINITY OF ROSCOE LAKE, ALL OF KDYD, CONTAINING 4500.0 HECTARES, MORE OR LESS	
3413137	Investigative License	Wind power	Investigative and monitoring phase	Application	ALL THAT UNSURVEYED CROWN LAND IN THE VICINITY OF SPATSUM CREEK, KDYD, CONTAINING 3962.10 HECTARES, MORE OR LESS TOGETHER WITH THAT PART OF SE1/4, SECTION 16, TOWNSHIP 18, RANGE 24, WEST OF THE 6TH MERIDIAN, KDYD.	Sunfield Energy Inc.

Crown Land File Number	Tenure Subtype	Tenure Purpose	Tenure Sub-purpose	Tenure Stage	Legal Description	Interest Holder
9704159	Statutory Right of Way (or Easement)	Utility	Gas or oil pipeline	Tenure	RIGHT OF WAY OVER THAT PART OF UNSURVEYED CROWN LAND WITHIN KAMLOOP DIVISION YALE DISTRICT SHOWN AS 0.238 HA ON PLAN EPP9836 FILED IN NEW WESTMINSTER LAND TITLE OFFICE; RIGHT OF WAY OVER THAT PART OF UNSURVEYED CROWN LAND WITHIN KAMLOOPS DIVISION YALE DISTRICT SHOWN AS 1.08 HA ON PLAN EPP9836 FILED IN NEW WESTMINSTER LAND TITLE OFFICE; RIGHT OF WAY OVER THAT PART OF UNSURVEYED CROWN LAND WITHIN KAMPLOOPS DIVISION YALE DISTRICT SHOWN AS 0.260 HA ON PLAN EPP9836 FILED IN NEW WESTMINSTER LAND TITLE OFFICE	Fortis BC Energy Inc.

Appendix G xʷuy̓ p̓en̓t he tmixʷ təw ł c̓iy us (Returning Land Use Plan – Highland Valley Copper)



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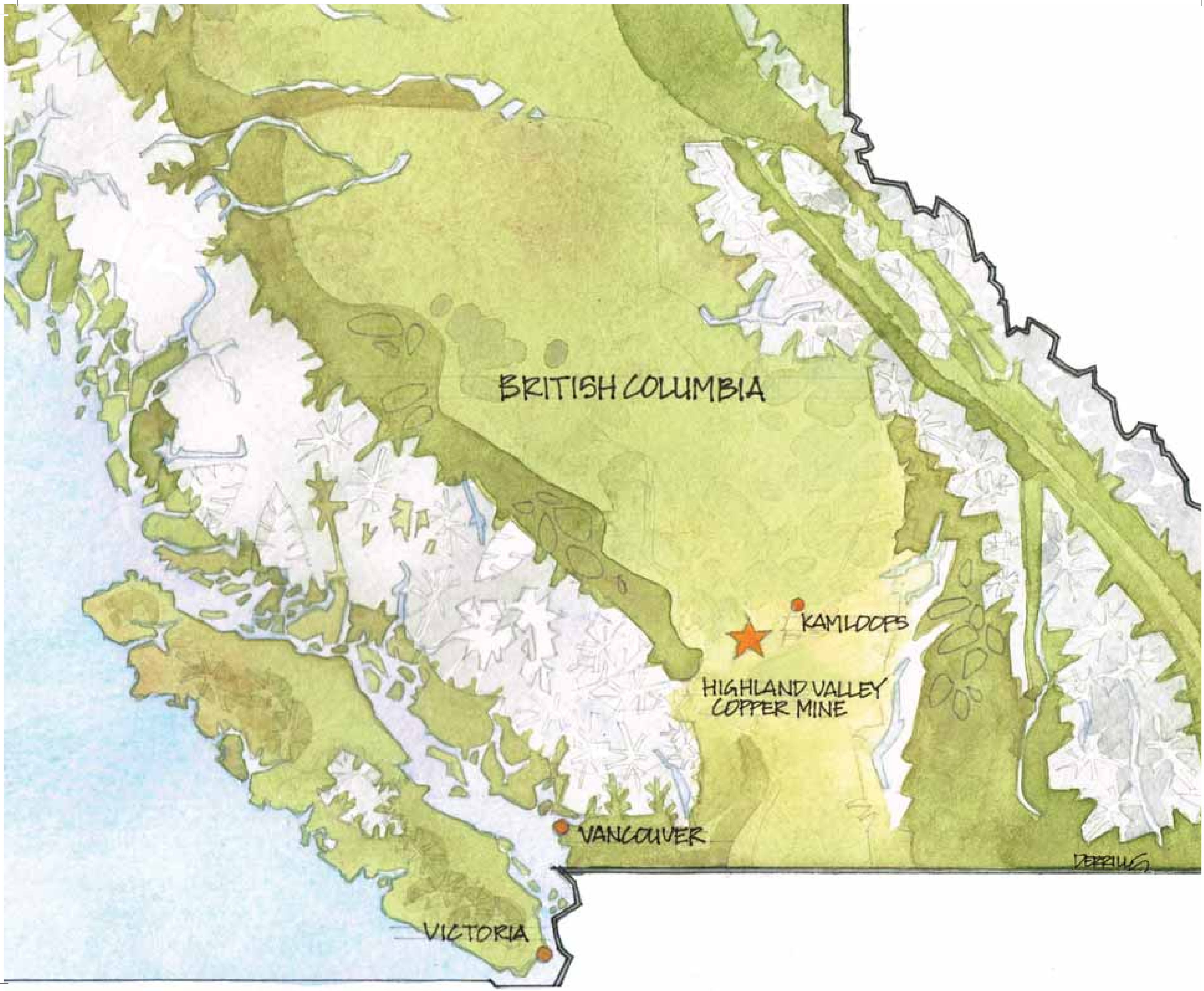
Returning Land Use Plan - Highland Valley Copper



BRITISH COLUMBIA
KAMLOOPS
HIGHLAND VALLEY
COPPER MINE
VANCOUVER
VICTORIA

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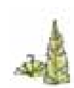
RETURNING LAND USE PLAN

HIGHLAND VALLEY COPPER

2016



Prepared for
Teck Highland Valley Copper

Natalie Melaschenko, Kevan Berg,
Melissa Iverson and Justin Straker

Illustrations
Derrill Shuttleworth

Design
Julie Melaschenko

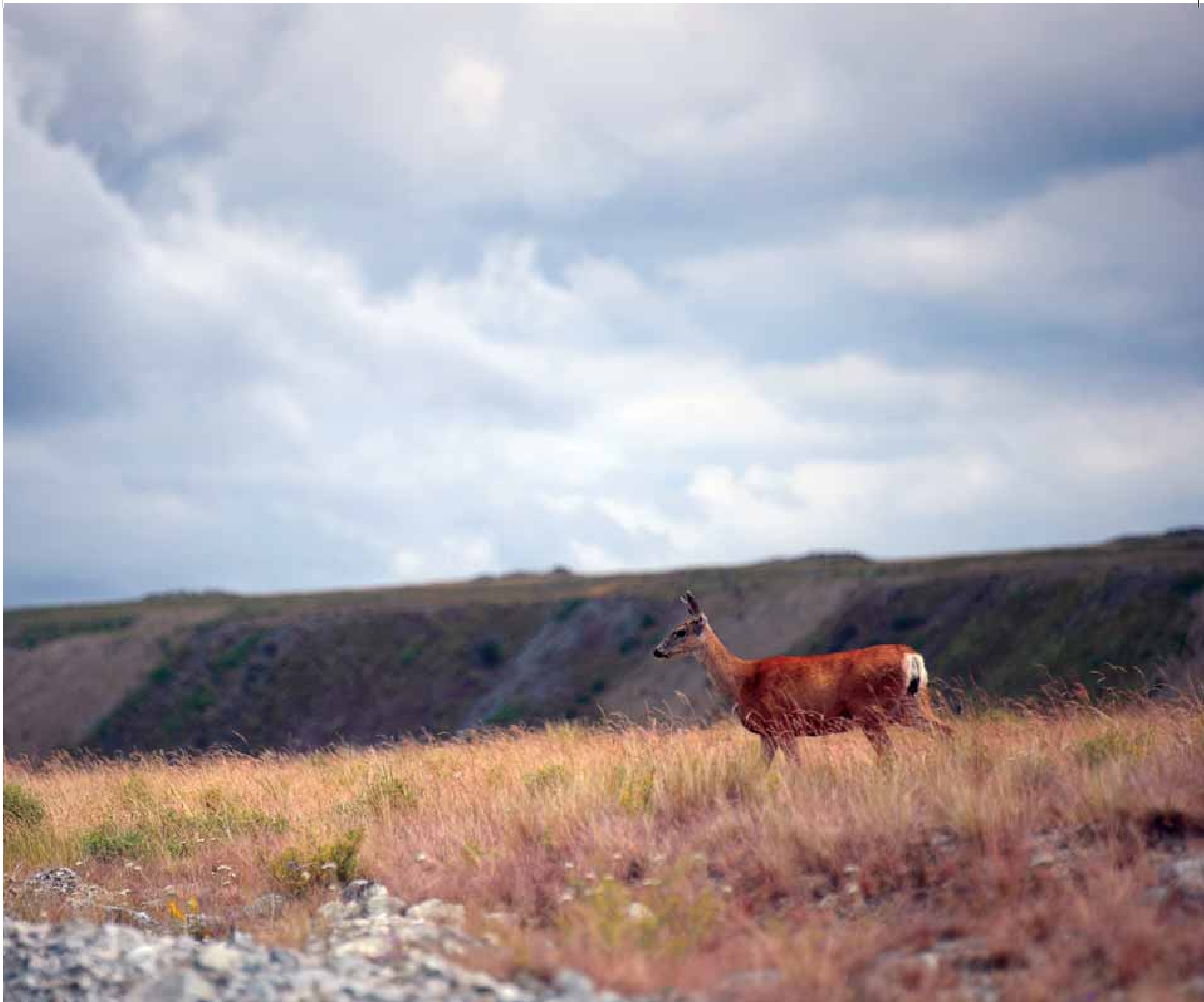
HVC's Commitment to Collaborate

Teck Highland Valley Copper (HVC) Partnership's 2016 Returning Land Use Plan incorporates Nlaka'pamux input into planned future reclamation on the HVC site. HVC has committed to collaborate with Nlaka'pamux communities on reclamation and closure planning.

The Returning Land Use Plan was directed by HVC with facilitation by Integral Ecology Group (IEG).

For more information on this study, or for a copy of the full technical report (Highland Valley Copper End Land Use Plan, 2016), please contact Jaimie Dickson at HVC. jaimie.dickson@teck.com or 250.523.3353.

Integral Ecology Group



FORWARD

The purpose of this book is to share information with Nlaka'pamux community members about the End Land Use Plan that was developed in 2015–2016 for Highland Valley Copper (HVC). HVC is located within Nlaka'pamux Traditional Territory. The Highland Valley was used extensively prior to mining by the Nlaka'pamux people, and it continues to be used today.

A key goal of the plan was to better understand what Nlaka'pamux communities would like the HVC mine site to look like and what uses the land should support once the mine is closed.

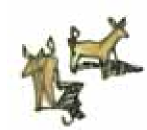
This information was then incorporated into reclamation and closure planning. The rich and detailed knowledge shared by community members during this engagement process was the first step in incorporating Nlaka'pamux interests and ideas into end-land-use planning at HVC.

Both the formal report and this book are considered to be "living documents"—that is, they are the beginning of a long-term commitment by HVC to collaborate actively with Nlaka'pamux communities on end-of-mine planning for the site.

These documents will be revisited and updated every five years in collaboration with Nlaka'pamux communities.

An idea that people raised repeatedly throughout the community workshops was that the working title of the plan—the End Land Use Plan—should be changed to the Returning Land Use Plan.

Thus was born the title of this book.



COMMUNITY MEMBERS AT THE VALLEY PIT OVERLOOK

ACKNOWLEDGEMENTS

We wish to thank everyone who made this project possible, and express our deepest gratitude to the Nlaka'pamux community members who so generously shared their time and expertise in community workshops and surveys.

Nlaka'pamux Technical Working Group

Nlaka'pamux community representatives who were involved in technical aspects of the project include:

Dave Caswell (LNIB), who also completed the traditional plant modeling in this book; Mary Suchell (LNIB); Tamlyn Botel (CNA); Nalaine Morin (CNA); Brenda Walkem (Esh-kn-am Cultural Resource Management Services); Sharon Joe (Nicola Tribal Association); Tawnya Collins (NNTC); and Simone Sandercombe (NNTC).

Valley pit overlook.

Highmont tailings.

Community meeting.

Community Working Group

Many people from Nlaka'pamux communities participated in the process. Following are the lists of people who participated in the community workshops as part of the Community Working Group.

Citxw Nlaka'pamux Assembly

Ruby Adams, Shackan | Laura Antoine, Coldwater | Terry Barnett, Ashcroft | Beverly Dale Bob, Coldwater | Connie Bob, Coldwater | Norma Collins, Cook's Ferry | Tina Draney, Cook's Ferry | Heather Fader, Shackan Band Administrator Angela Fountain, Nooaitch | Jim Fountain, Nooaitch | Louise Fountain, Nooaitch | Bernice Garcia, Coldwater | Kristy Henkes, Citxw Nlaka'pamux Assembly | Pearl Hewitt, Cook's Ferry | Lennard Joe, Shackan | Caroline Lytton, Nicomen | Adrian Mackenzie, Nooaitch | Annie Rose Major, Coldwater | Vera Massicotte | Jeanette McCauley, Nicola Tribal Association | Lena Nicholson, Cook's Ferry | Charlene Oppenheim, Coldwater | Fred Sampson (Chief), Siska | Judy Service, Cook's Ferry | Brenda Walkem, Cook's Ferry | Carol Walkem, Cook's Ferry | David Walkem (Chief), Cook's Ferry | Amelia Washington, Nooaitch

Lower Nicola Indian Band

Angie Bain | Randy Coutlee | Joyce Dick | Elisha Hall | Sonja Hall | Rosemary Justice | Robert Lafferty | Hugh D. Mackenzie | Rod McMaster | Gloria Moses | Jaden Peterson Jerrod Peterson | Katolina Peterson | Nicholas Peterson | Leona Rabitt | Andrea Ritchie | James Shuter | Joe Shuter | Marvin Shuter | Doreen M. Sterling | Elaine Sterling | Kay Swakum | Ruth Tolerfan – LNIB Staff | Barry Toodlican Heather Shuter Trosky | Bonita Voght Crystal Wallace – LNIB Staff – Mt. Curry First Nation | Jessie Webster | Wyatt Webster

Nlaka'pamux Nation Tribal Council (NNTC)

Vincent Abbott | Buster Adams | Sheila Adams | Nellie Anderson | Romona Baxter | Lorraine Campbell | Amy Charlie | Kevin Duncan | Denis Dunstan | Karen Dunstan Doreen Dunstan | Lisa Dunstan | Rod Nolan Dunstan | Dr. Ruby Dunstan | John Haugen | Alfred Higginbottom | Bob Howard | Guy Jules | Freda Loring | Michelle Machelle Vincent Machelle | Judy McKay | Daphne Moody | Darian Moody | Justin Moody | Katie Moody | Brenda Munroe | Dorothy Phillips | Linda Phillips | Kristi Raphael | Michael Sam | Ted Smith | Gene Spinks | Bobby Thomas | Jasmyne Thomas | Robert Thomas | Joe Wilson

COMMUNITIES INVOLVED IN THE RETURNING LAND USE PLAN

LEGEND

- PARTICIPATING COMMUNITIES
- TOWNS / CITIES
- MINE SITE

OTHER KEY PARTICIPANTS

HVC Environment and Community Affairs

HVC Environment and Community Affairs staff were key participants in all aspects of the project.

In particular, **Jaimie Dickson** was instrumental to the planning process and implementation of the project.

HVC also supported interns and community members, **Beth Coutlee**, **Lena Nicholson** and **Joel Raphael** to conduct surveys in addition to those completed during the community workshops.

HVC staff participants included **Marlena Anderson**, **Natasha Fountain**, **Peter Martell** and **Genevieve Pelletier**.

Integral Ecology Group

Integral Ecology Group (IEG) facilitated the project, working together with Nlaka'pamux communities and HVC. IEG participants included **Kevan Berg**, **Ann Garibaldi**, **Melissa Iverson** (maps), **Natalie Melaschenko** and **Justin Straker**.

Larratt Aquatic Design

Larratt Aquatic Consulting Ltd. contributed aquatic expertise during community workshops and to the final technical report. Larratt Aquatic Design participants included **Heather Larratt, Jaimie Self** and **Justin Larratt**.

Nlaka'pamux Translation

Mandy Jimmie with the help of **Jimmy Toodlican**, **Percy Joe** and **Lorraine Spence.**

Photography

Kelly Funk, Kelly Funk Photography, **Viktoria Haack** Viktoria Haack Photography, **Clint Smyth** and **Kevan Berg,** IEG, as well as the **Anderson and Pasco families** for historical photos.

IN MEMORIAM

ELAINE STERLING

Elaine Sterling was an invaluable part of the LNIB, Nlaka'pamux and HVC communities. She was active on the land and had extensive experience that she graciously shared with everyone interested in hearing her stories. She played an active role in many HVC and LNIB projects related to land use and the environment. Elaine participated in the Returning Land Use Plan workshops and passed away during the preparation of this book.

Her immense knowledge along with her positive, thoughtful and often humorous input had a profound and significant impact on not only the projects but with everyone she worked with on them.

Elaine will be deeply missed.

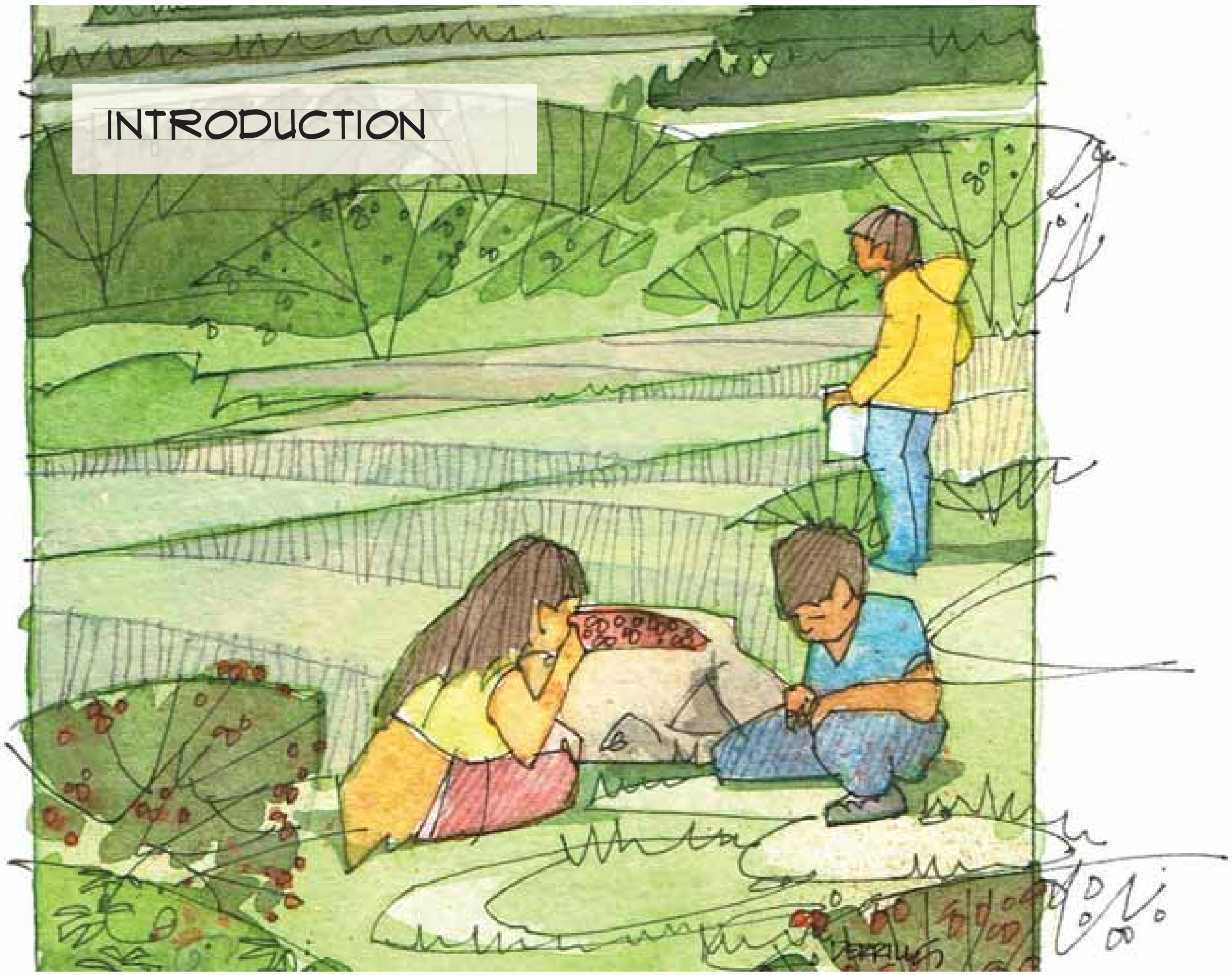
TABLE OF CONTENTS

"I think that sometimes some of our people, especially our older people, if they have a translation from their own thought processes...they don't necessarily have the ability to translate, so they do a direct translation and it ends up meaning something totally different.

LNIB Participant

The quotes in this book were transcribed from recordings of community meetings but have not been verified with individual community members. While they represent what was expressed during meetings, they may not perfectly reflect the thoughts of participants whose first language is Nlaka'pamxcin.

INTRODUCTION



INTRODUCTION

This book presents an overview of the planning process and findings of the Highland Valley Copper End Land Use Plan, 2016 technical report.

The plan was developed as a collaboration between Teck Highland Valley Copper (HVC) staff and Nlaka'pamux community members and technical representatives, with technical guidance and support from Integral Ecology Group (IEG).

This book describes the potential end land uses for the HVC site after the mine closes and discusses some of the key interests and returning-land-use goals of Nlaka'pamux communities.

Image: Open, dry, ts'q'-álhp (Douglas-fir) forest in the Highland Valley with an understory of 7ik-élhp (kinnikinnick), ts'íts'x̲ts'ax̲t (common juniper), lichens and wildlife trees.

STUDY GOALS

The overarching purpose of this work is to create a Returning Land Use Plan for the HVC mine that is guided by the Nlaka'pamux people. The specific goals are to:

- **Incorporate input** from the Nlaka'pamux people about what the landscape should look like—and be reclaimed to—after the mine closes; and
- **Identify the possible land uses** that the post-closure mine site is capable of providing and that are important to the Nlaka'pamux people.

These two goals will ensure that HVC has a plan that incorporates Nlaka'pamux input and meets internal (HVC) and external (Government of British Columbia) reclamation and closure-planning commitments.

HISTORY OF THE HIGHLAND VALLEY AREA

The Highland Valley lies within Nlaka'pamux lands; the Nlaka'pamux people have been stewards of and connected to this area since time immemorial.

Many traditional activities have been - and continue to be - carried out here, such as hunting, fishing, trapping, gathering, and growing and cutting of swamp hay for livestock.

The higher elevations of the valley are important to Nlaka'pamux culture, since they are considered to be places of power and yield a variety of medicinal plants.

Tommy Billy and Agnes Hewitt and others with a catch of trout from Divide Lake in late summer. "They used to dry those – it was cooler up there and they were smaller." Marie Anderson, August 2012 (photo courtesy Anderson family).

Chief Simeon Pasco (Poscah) piling swamp hay near Divide Lake 1937 (photo courtesy of Pasco family).

Valuable trade materials were harvested in the valley and a Nlaka'pamux travel route was established for seasonal harvesting and trade. The valley was, and is, an important site for spiritual training, social gatherings, and sharing of knowledge and stories.

From the valley and lowlands to the highest remote peaks surrounding it, the Highland Valley area has sustained the Nlaka'pamux people not only physically, but also culturally and spiritually.

"Where that water is we used to hunt game. That reservoir (tailings pond) all the way around...That used to be a meadow. Hunting moose, deer, bear, the occasional cougar. There was a lot of berries, Saskatoon, sxwúsm, raspberry, strawberry, grouse berries, a lot of buckwheat. 1981/82 was the last time I was up there." LNIB Participant

Moses Hewitt with deer kill in the Highland Valley, 1930s (photo courtesy Anderson family).

"When I was growing up as a child there was a lot of people that went out picking, out on horses, buggies, wagons. And then it came to a time when they didn't do that. Then say maybe in the last 20 years, I see a lot of people are going back to picking, gathering food, berries, roots and that. Our traditional foods and medicines. They seem to be coming back...So, to me that, for my grandkids' kids, the ones not born yet, they'll see that, they'll know where to go to gather whatever traditional food they want to gather and put away." CNA Participant

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The above text is a Nlaka'pamxcin translation of the "History of the Highland Valley Area" on page 6.

THE HIGHLAND VALLEY COPPER MINE

HVC is a combination of three mining operations, Bethlehem Copper, Lornex, and the Highmont Operating Corporation.

The Bethlehem Copper operation began in 1962, and included three pits (Huestis, Jersey and Iona) and two tailings facilities (Bethlehem Main and Trojan). The operation was completed in 1982 and is currently reclaimed.

The Valley operation began in 1982 when Bethlehem Copper became Valley Copper. There is one Valley pit, which continues to operate today. The Bethlehem mill processed the ore from Valley until 1989, when processing shifted to the Highland mill.

The Lornex operation began in 1970, includes one pit and continues to operate today. The Highland mill began processing ore from Lornex in 1986.

The Highmont operation began in 1979 and included two pits (Highmont east and west), a tailings facility and a mill site. It closed in 1984 due to low molybdenum prices, but was reopened in 2005 and the Highmont east pit is currently mined.

The three mining operations merged in 1986 to form Highland Valley Copper. The Highland mill and the Highland tailings facility now support all HVC mining activities.

Image: Valley pit. Opposite: HVC mine features.

HIGHLAND TAILINGS
TROJAN TAILINGS
BETHLEHEM MAIN TAILINGS
HIGHLAND TAILINGS DAM
JERSEY PIT
VALLEY PIT
IONA PIT
HUESTIS PIT
LORNEX PIT
HIGHMONT WEST PIT
HIGHMONT EAST PIT
HIGHMONT TAILINGS

HAUL TRUCK

HVC MINING PROCESS

Ore is mined from open pits, where rock is blasted from pit walls for removal.

Trucks haul the ore to crushers.

Crushed ore is then placed on a conveyor to the Highland mill. The ore is milled to separate out the copper and molybdenum metals.

Tailings (the sand-water slurry remaining after milling) are stored in the tailings facility. The water used to move the tailings through pipes to the facility is recycled back to the mill for reuse in the milling process. The Highland tailings facility is the only tailings area of the mine that is currently operational.

Waste rock, which is mined rock that does not contain sufficient quantities of ore, is trucked to waste-rock dumps. Through its reclamation program, HVC is in the process of revegetating waste-rock dumps that have reached their storage capacities.

Overburden, which is the ground material that lies above the mineralized ore rock, is trucked to overburden piles. This material is stored separately and used during reclamation as a cover, over waste rock, to help vegetation grow.

"All I want is insurance that my children and their children have land to live on in the future, that can feed them and sustain them. That's my biggest concern.

NNTC Participant

APPROACH

APPROACH

The planning approach for the Returning Land Use Plan was threefold.

The first step was to assess what the HVC landscape looked like prior to mining in the 1950s.

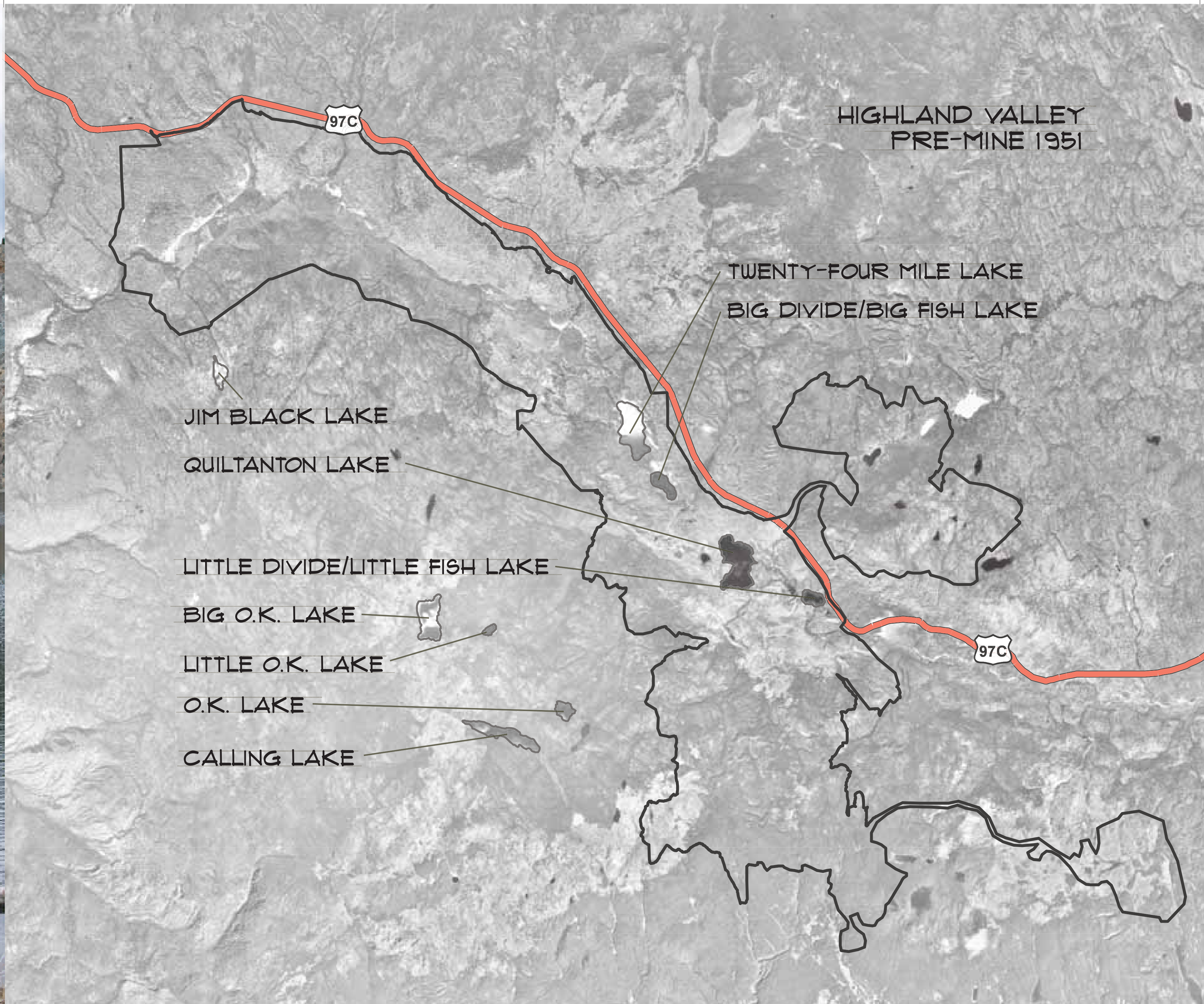
The second step was to determine what revegetation could be achieved on the post-closure landscape, given the changes brought about by mining.

The third step was to talk with Nlaka'pamux community members about landscape types and land uses they would like to see on the mine site after the mine closes.

WHAT DID THE LANDSCAPE LOOK LIKE BEFORE MINING?

It was important to know what the HVC mine site looked like before mining to determine if similar ecosystems could exist on the landscape after mining ends. The map on the following page was created using photographs taken from airplanes in the 1950s, prior to mining. Pre-mine ecosystems were then identified over the HVC mine area. The black outline represents the location of the HVC mine.

Image: Huestis pit. Opposite: Highland Valley Pre-Mine, 1951.


HIGHLAND VALLEY
PRE-MINE 1951
97C
TWENTY-FOUR MILE LAKE
BIG DIVIDE/BIG FISH LAKE
JIM BLACK LAKE
QUILTANTON LAKE
LITTLE DIVIDE/LITTLE FISH LAKE
BIG O.K. LAKE
LITTLE O.K. LAKE
O.K. LAKE
CALLING LAKE
97C

WHAT WILL THE LANDSCAPE LOOK LIKE AFTER MINING?

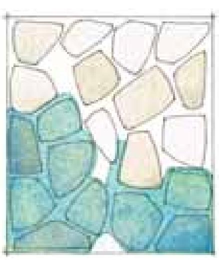
Due to mining activities, both the shape of the land and the land's ability to retain water have changed over time.

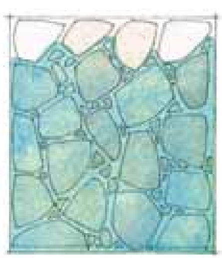
For example, there are more hills from stockpiling waste rock and overburden, and pits have been created. The new hills are made from materials that allow water to drain through them freely. Due to low rainfall and snowfall in the Highland Valley area, the water available to plants plays a large role in influencing what types of forests and grasslands will grow here.

To understand how HVC might be able to reclaim the land after mining activities cease, the first step was to determine how much water might be available for plants to use after the mine closes. Mining can affect the amount of water available to plants in three main ways:

1. **Type of ground material.** The amount of water the ground can hold changes based on the type of ground material present. For example, large pieces of waste rock (a byproduct of the mining process) hold less water than tailings (a byproduct of the milling process), which are made up of comparatively tiny pieces of rock. Examples of ground cover on the mine include waste rock, tailings, overburden, and natural topsoil.

Large pieces of ground material = less water retention.



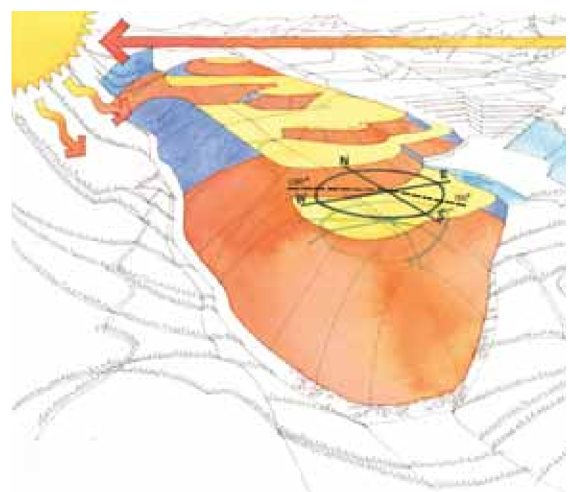


Small pieces of ground material = more water retention.

2. **Layering of ground material.** Water will move more quickly through a single type of ground material than through multiple materials or layers. As different ground materials are layered on top of one another, water moves more slowly, giving plants more time to access it. Layering of ground material therefore increases the amount of water available to the plants.

3. **Shape of the land.** The steepness of the land and the direction a slope faces also affect how much water is available to plants. Slopes that face southward receive more sunlight, and are hotter and drier than slopes that face a more northern direction. The steepness of a slope also affects how much sunlight reaches plants and has an impact on water retention.

Maps were then created using these three key aspects– in addition to elevation, which affects which plants can grow where—to predict what potential forests, grasslands and wetlands could exist on the land after mining stops.



Orange indicates hotter, drier, more southerly slopes, while blue indicates cooler north-facing slopes.

WILL THE FUTURE LANDSCAPE BE SIMILAR TO WHAT EXISTED PRIOR TO MINING?

The different landforms and coarse ground materials created by mining generally decrease the ability of the ground to retain water. To some degree, HVC can alter this through the development of landforms and ground materials.

For materials that are not very good at storing water (e.g., waste-rock dumps), placing an overburden "cover" on top can help create wetter conditions that may be more similar to what existed prior to mining. However, even with these covers, our maps indicate that some of the wetter areas that existed before mining either cannot be recreated at all, or cannot be recreated in the same quantity as existed prior to mining.

Image: Young, high-elevation qwi7t-élhp (lodgepole pine) forest with a white-flowered rhododendron understory, near the mine site.

JAIMIE DICKSON AT HIGHMONT TAILINGS DURING THE COMMUNITY WORKING GROUP MINE TOUR

NLAKA'PAMUX COMMUNITY PARTICIPATION

The next step in the process was to get feedback from Nlaka'pamux communities and create post-mine maps that reflect their land-use goals. Three groups of Nlaka'pamux communities participated in the project:

- Citxw Nlaka'pamux Assembly (CNA);
- Lower Nicola Indian Band (LNIB); and
- Nlaka'pamux Nation Tribal Council (NNTC).

Each group met separately and included a Community Working Group (comprised of community members) and a Technical Working Group (comprised of representatives of the three Nlaka'pamux groups).

Highmont tailings.

Valley pit overlook.

Surveys were conducted in various Nlaka'pamux communities to gain additional feedback for the Returning Land Use Plan.

The Community Working Groups shared information and addressed concerns about the mine. Some key questions that led discussions at the meetings were:

- What types of land uses would you like the landscape to provide after closure?
- Would you like to see the land returned to how it was before mining, to the extent that this is possible?
- Would you like the future landscape to support economic opportunities, such as agriculture?

As Nlaka'pamux land-use goals were identified, the information was incorporated into two post-mine maps.

NLAKA'PAMUX ENGAGEMENT PROCESS

1ST COMMUNITY MEETING

Open community meetings were held to provide information about HVC's mining process, the Returning Land Use Plan process and reclamation activities. Community members from CNA and NNTC shared their thoughts on these topics.

2ND COMMUNITY MEETING – MINE TOUR

Community members from LNIB, CNA and NNTC toured the mine to gain a better understanding of the mining process and reclamation activities. LNIB community members were provided a synopsis of the first community meeting and a discussion ensued on the tour bus.

3RD COMMUNITY MEETING

Nlaka'pamux communities provided input into the types of reclamation activities and returning land use goals they would like to see upon closure. A survey was also completed to help gain a better understanding of preferred post-closure land uses.

FACE-TO-FACE SURVEY

To ensure that as many community members as possible had a voice in the development of the Returning Land Use Plan, HVC interns met with community members to administer additional surveys.

JUNE JULY SEPTEMBER OCTOBER NOVEMBER

2015

1ST TECHNICAL MEETING

The Nlaka'pamux Technical Working Group discussed what information would most help their communities to understand HVC's mining process, the Returning Land Use Plan process, and reclamation activities.

2ND TECHNICAL MEETING

The Nlaka'pamux Technical Working Group provided insight into HVC's approach to engaging the Nlaka'pamux community in the Returning Land Use Plan and discussed how Nlaka'pamux values can help guide the plan.

2016

JANUARY

4TH COMMUNITY MEETING

The draft Returning Land Use Plan maps and survey results were presented to Nlaka'pamux community members for review and feedback.

3RD TECHNICAL MEETING

The Technical Working Group met to review the draft Returning Land Use Plan maps and survey results and provided feedback.

FEBRUARY

4TH TECHNICAL MEETING

The Technical Working Group was provided with the draft Returning Land Use Plan report to review and provide comments. A conference call was then held with HVC for further discussion.

APRIL

TECHNICAL REPORT

HVC incorporated the Technical Working Group comments and finalized the Returning Land Use Plan report.

2017

MAY

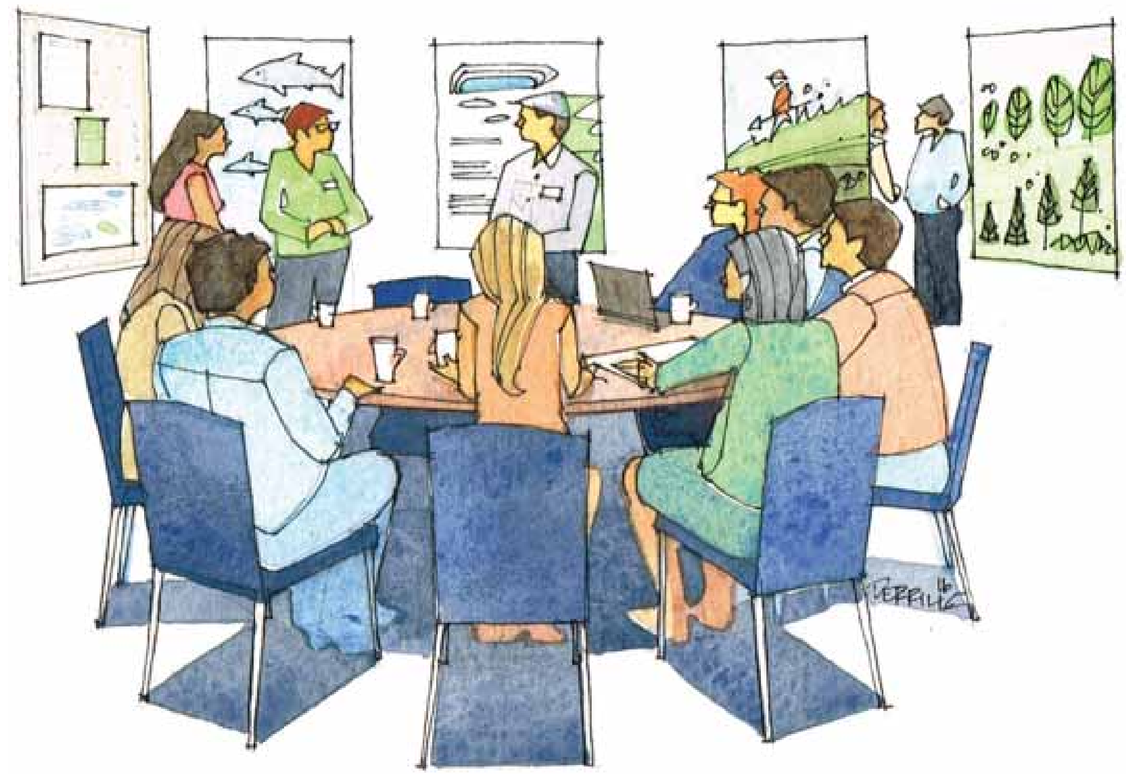
PHOTOBOOK

The Technical Working Group was provided with the draft Returning Land Use Plan book to review and provide comments which were then incorporated into the final version. The book was then printed for distribution to communities.

"AND IF PART OF THAT PLAN INCLUDES ECONOMIC DEVELOPMENT WE WANT TO MAKE SURE THAT IT DOESN'T COMPROMISE THE HISTORICAL ATTACHMENT TO THAT LAND. WE WANT TO HAVE ATTACHMENT BACK SO THAT THE GRANDCHILDREN, AND GREAT GRANDCHILDREN, STILL HAVE SOME PLACE THEY CAN HUNT, OR FISH, OR GATHER MEDICINES, OR GATHER SOAPBERRIES.

CNA PARTICIPANT

NLAKA'PAMUX PERSPECTIVES



KEY THEMES

Two key themes emerged from Nlaka'pamux feedback gathered at the meetings and in the nearly 200 completed surveys:

- **Desire for the return of natural ecosystems.** The majority of community participants want to see a return of natural ecosystems after the mine closes so that the future landscape will support traditional Nlaka'pamux land uses, including hunting, gathering, fishing, and trapping.

- **Support for agricultural pasturelands.** There is relatively broad support among participants to allow for some reclamation of pasturelands for haying and grazing in addition to restoring natural ecosystems.

The responses to the question, "What types of land uses would you like the future landscape to provide?" summarized the surveys' key findings.

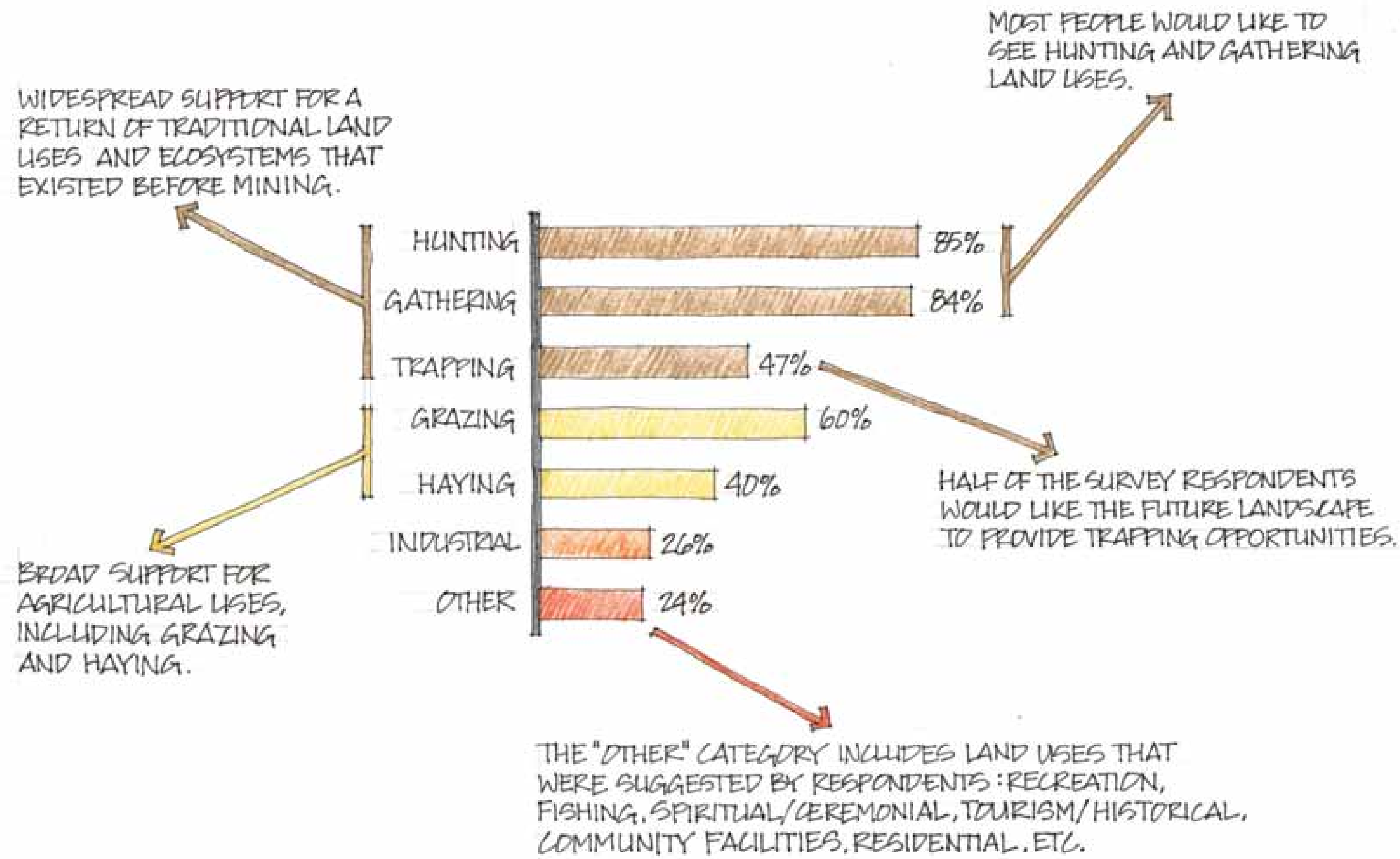
Reclaimed agricultural grassland.

Young ts'q'-álhp (Douglas-fir) forest.

The figure on the following page shows percentages of positive participant responses to a range of traditional land uses (e.g., hunting, gathering, trapping) and economic land uses (e.g., grazing, haying, industrial/commercial) for the post-mine landscape.

Land uses were then grouped into two categories - agricultural (grazing, haying; yellow in figure) and traditional (hunting, gathering, trapping; brown in figure)—and survey responses were used to determine what proportion of the HVC landscape should be reclaimed to agricultural uses and what proportion should be for traditional uses.

This resulted in a Returning Land Use Plan design in which about two-thirds of the land is reclaimed to native ecosystems and one third is reclaimed to agricultural grasslands. It should be noted that as mine closure draws closer, there will be opportunities to refine and adjust this plan, and to include additional end land uses suggested by survey respondents in the "other" category, such as economic opportunities.

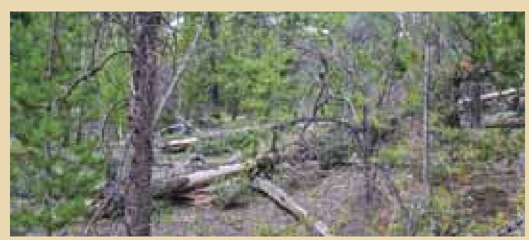

MOST PEOPLE WOULD LIKE TO SEE HUNTING AND GATHERING LAND USES.
WIDESPREAD SUPPORT FOR A RETURN OF TRADITIONAL LAND USES AND ECOSYSTEMS THAT EXISTED BEFORE MINING.
HUNTING
85%
GATHERING
84%
TRAPPING
47%
GRAZING
60%
HAYING
40%
INDUSTRIAL
26%
OTHER
24%
HALF OF THE SURVEY RESPONDENTS WOULD LIKE THE FUTURE LANDSCAPE TO PROVIDE TRAPPING OPPORTUNITIES.
BROAD SUPPORT FOR AGRICULTURAL USES, INCLUDING GRAZING AND HAYING.
THE "OTHER" CATEGORY INCLUDES LAND USES THAT WERE SUGGESTED BY RESPONDENTS: RECREATION, FISHING, SPIRITUAL/CEREMONIAL, TOURISM/HISTORICAL, COMMUNITY FACILITIES, RESIDENTIAL, ETC.

Throughout the Community Working Group meetings, numerous Nlaka'pamux participants expressed a desire to see a return of natural ecosystems and also supported reclaiming pasturelands on the post-mine landscape.

"…I like the forestry part of this because you'll be here longer, you'll have to look after it longer and then longer after that. And that's good for future generations…Like with the forestry, in 2080 we still have the trees standing, you know. And not only that, the wild animals can hide in there. Rather than a little bit of grass." (CNA Participant)

"You know, the hard part because we're older, we're old here…but say 19, 20 years old that's where we need the input. I could say, no we're not doing that. I want grass and no forest. But it's just me. What do you expect me to do, I've got 2,000 head of cattle. So it's really difficult for me to say put it back the way it was." (CNA Participant)

"…like I said we know what we want. Like myself, restore it the way it is like before…I could tell my grandchildren and my great grandchildren, I can tell them no you guys put it back at forestry, this is my dream, I want it to be just a forest." (CNA Participant)



Nlaka'pamux participants also raised specific concerns about reclamation planning. In particular, the locations of biosolids applications relative to the revegetation of traditional food and medicinal plants.

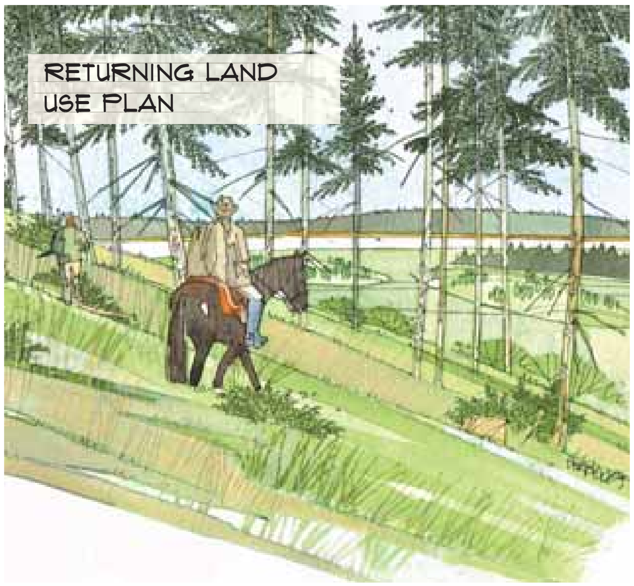
"[In] my discussions with some of the [elders] about reclamation and putting the plants back in place again, they talked about…biosolids and not planting our food trees or the medicine trees and bushes where biosolids were… nowhere in our history and nowhere in our doings do we put our toilets and our human waste where we eat and where we gather our food from…So the direction to me by [the elders] I spoke to, they said please let them know don't plant soapberries and don't plant Saskatoon berries where the biosolids have been spread…that's really a big issue for us, and it's a really big issue I think for me as a person who eats from the land, that I not be serving my grandchildren food that's been on or by biosolids." (LNIB Participant)

"Yeah, pastureland is good, some of the ranchers I know, they've got cattle and all that. The pasture is good for the deer and the moose too. And they would benefit from that." (NNTC Participant)

"I'd like to see the trees come back…It used to be the healing grounds of the Indian people long time ago. I remember my first trip, it took us four days on saddle horse to get to the lakes…I made my grandmother a promise, I'm going to come back and clean it up. That's what I'm doing now. I want it to be back to the healing grounds like the Indian people had it before… Anyways that's what I'd like to see happen to that…make it look like it did a long time ago." (LNIB Participant)

"I was taught everything changes, sometimes we overuse something and we have to maintain it...our mushroom patches rotated, deer ate elsewhere if we overdid something. It's constantly changing. It's always not in the little drawn shapes we see in these maps, and that needs to be taken into consideration. Because the way I was taught, everything changes.

CNA Participant


RETURNING LAND
USE PLAN

Pre-mine and Post-closure Landscapes

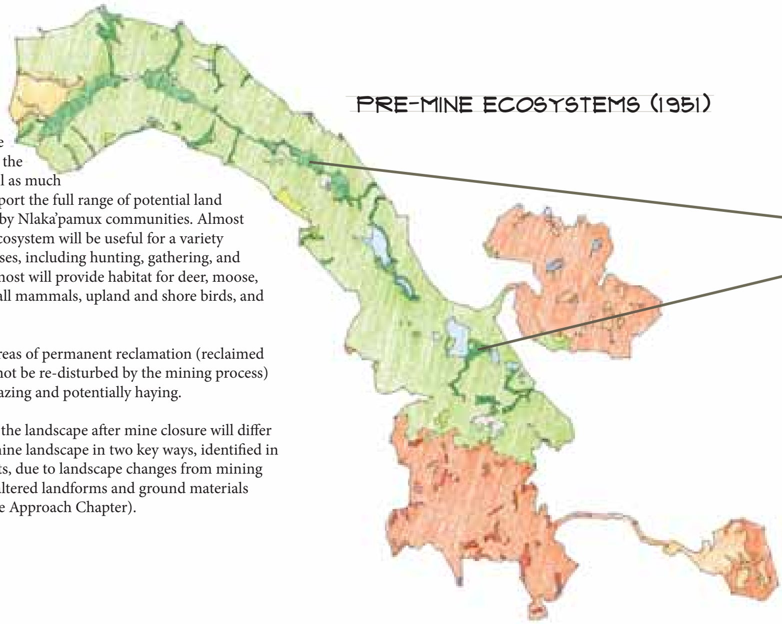
The first post-closure map focuses on re-establishing ecosystems that existed in the 1950s prior to the start of mining in the valley.

Map 1 shows a plan in which the return of pre-mine ecosystems is maximized. In this plan, the landscape after the mine closes will as much as possible support the full range of potential land uses identified by Nlaka'pamux communities. Almost every type of ecosystem will be useful for a variety of traditional uses, including hunting, gathering, and trapping, and most will provide habitat for deer, moose, bears, bats, small mammals, upland and shore birds, and waterfowl.

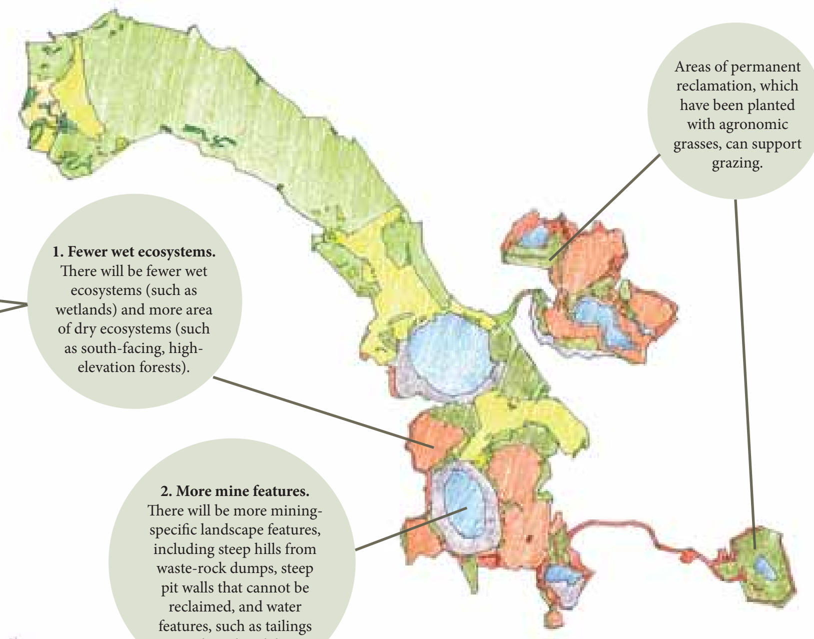
Additionally, areas of permanent reclamation (reclaimed areas that will not be re-disturbed by the mining process) will support grazing and potentially haying.

Ecosystems on the landscape after mine closure will differ from the pre-mine landscape in two key ways, identified in the map callouts, due to landscape changes from mining activities (i.e., altered landforms and ground materials discussed in the Approach Chapter).

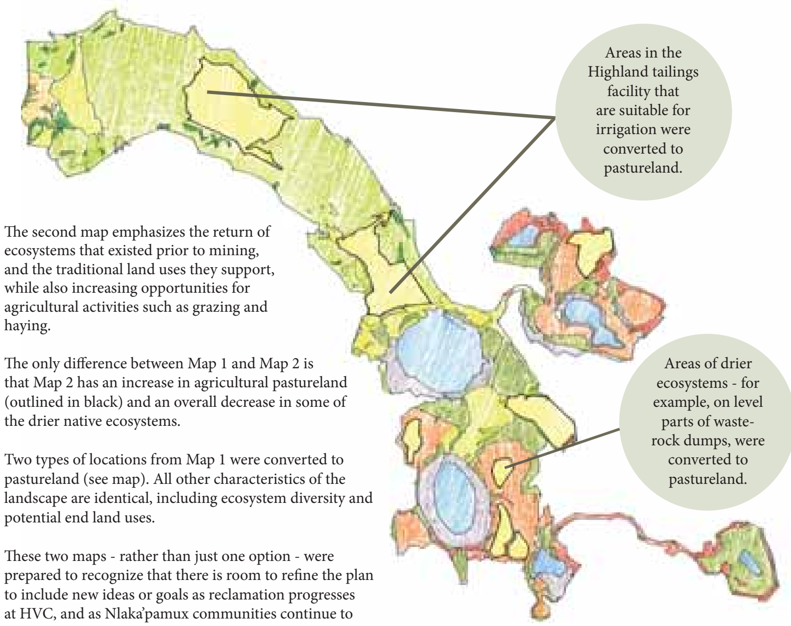
Pre-mine Ecosystems (1951)



Post-closure Map 1
Return of Pre-mine Ecosystems



POST-CLOSURE MAP 2
PASTURELAND AND PRE-MINE ECOSYSTEMS



The second map emphasizes the return of ecosystems that existed prior to mining, and the traditional land uses they support, while also increasing opportunities for agricultural activities such as grazing and haying.

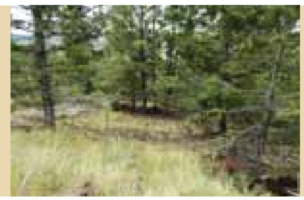
The only difference between Map 1 and Map 2 is that Map 2 has an increase in agricultural pastureland (outlined in black) and an overall decrease in some of the drier native ecosystems.

Two types of locations from Map 1 were converted to pastureland (see map). All other characteristics of the landscape are identical, including ecosystem diversity and potential end land uses.

These two maps - rather than just one option - were prepared to recognize that there is room to refine the plan to include new ideas or goals as reclamation progresses at HVC, and as Nlaka'pamux communities continue to provide input over time.

LEGEND

DOUGLAS-FIR LOW ELEVATION 850 - 1130M



Location: valley bottoms and lower slopes

Climate: warm, and dry with a relatively long growing season

Ecosystems: *ts'q'-álhp* (Douglas-fir) and *s7é7tqwlhp* (ponderosa pine) forests, grasslands on ridge crests and south-facing slopes

DRY
MOIST
WET

DOUGLAS-FIR HIGH ELEVATION 1130 - 1450M

Location: lower elevations on the plateau

Climate: warm and dry with a relatively long growing season

Ecosystems: *ts'q'-álhp* (Douglas-fir) forests with a *tl'aqwm'* (pinegrass) understory and grassland communities

DRY
MOIST
WET

MONTANE SPRUCE 1450 - 1650M

Location: mid elevation

Climate: cold winters and moderately short, warm summers

Ecosystems: *qwi7t-élhp* (lodgepole pine) forests with regenerating white spruce, *tl'sélhp* (subalpine fir) and abundant *tl'aqwm'* (pinegrass)

DRY
MOIST
WET

OTHER

DISTURBANCE
PERMANENTLY RECLAIMED
EXEMPT
GRAZING/HAYING
WATER

RETURNING LAND USE PLAN

The Returning Land Use Plan maps outline a plan for the future mine landscape guided by Nlaka'pamux input.

The plan focuses on types of land uses the landscape should be able to provide after mining has ended, concentrating first on traditional land uses (hunting, fishing, gathering, trapping, spiritual), and incorporating agricultural land uses (haying, grazing).

The plan is intended to be a living document, and will be revisited with input from Nlaka'pamux communities every five years.

The following pages display both a pre-mine map as well as two maps that show potential uses of the land after the mine closes. These post-closure maps were created based on input from the community meetings and surveys.

Image: Deer on reclaimed waste-rock area.

END LAND USES

DOUGLAS-FIR LOW ELEVATION

DRY	MOIST	WET
Hunting, gathering, trapping, commercial forestry, deer, bears, upland birds, bats, moose, small mammals	Hunting, gathering, trapping, commercial forestry, deer, bears, upland birds, bats, moose, small mammals	Hunting, gathering, trapping, commercial forestry, deer, bears, upland birds, bats, moose, small mammals

MONTANE SPRUCE

DRY	MOIST	WET
Hunting, gathering, trapping, commercial forestry, deer, bears, upland birds, bats, moose, small mammals, reptiles	Hunting, gathering, trapping, commercial forestry, deer, bears, upland birds, bats, moose, small mammals	Hunting, gathering, trapping, commercial forestry, deer, bears, upland birds, bats, moose, small mammals, amphibians, waterfowl, shore birds

DOUGLAS-FIR HIGH ELEVATION

DRY	MOIST	WET
Hunting, gathering, trapping, commercial forestry, deer, bears, upland birds, bats, moose, small mammals, reptiles	Hunting, gathering, trapping, grazing, commercial forestry, agriculture, deer, bears, upland birds, bats, moose, small mammals	Hunting, gathering, trapping, commercial forestry, deer, bears, upland birds, bats, moose, small mammals, amphibians, waterfowl, shore birds

OTHER

GRAZING/ HAYING	WATER	PERMANENTLY RECLAIMED
Grazing, haying, agriculture, moose, deer, bears, small mammals, upland birds	Fishing, potential drinking sources for wildlife, water reservoir for droughts	Grazing, haying, agriculture, moose, deer, bears, small mammals, upland birds
EXEMPT		**DISTURBANCE**
None		None

SXWÚSM IN NEARBY FOREST

TRADITIONAL PLANT MODELING

Dave Caswell, the Referrals Manager and Environmental Coordinator for LNIB, followed the Provincial Wildlife Habitat Rating Standards and used information from LNIB's participation in the Nicola Similkameen Innovative Forestry Society to map where the following four common traditional plant species might grow on the mine site after mining ends:

- *qwən'xn-únpe7* (yarrow, *Achillea millefolium*),
- *7ik-élhp* (kinnikinnick, *Arctostaphylos uva-ursi*),
- *s7ey'itsqw-élhp* (red raspberry, *Rubus idaeus*), and
- *stsaqwm-élhp* (Saskatoon, *Amelanchier alnifolia*).

Community members have a strong understanding of the typical forest conditions that support species used for traditional and cultural purposes; as such, these maps may help people better visualize the future landscape after mining ends.

~30% OF THE HVC LANDSCAPE WILL PROVIDE MODERATE POTENTIAL FOR RED RASPBERRIES, WHILE 70% WILL BE UNSUITABLE.

In locations where each plant is expected to grow, Dave examined how likely it would be for them to grow there. He assigned a habitat rating of low, medium or high to each plant over the HVC footprint area.

Although some areas of the reclaimed mine site will be unsuitable for these species, others will provide moderate to high potential for them to grow. HVC is continuing to develop methods for improved native-species establishment in reclamation.

~60% OF THE HVC LANDSCAPE PROVIDES MEDIUM TO HIGH POTENTIAL HABITAT FOR KINNIKINNICK, YARROW AND SASKATOON, WHILE THESE PLANTS ARE NOT EXPECTED TO GROW ON ~40% OF THE MINE.

Traditional land use studies have shown that historically, much of the valley bottom of the HVC property supported considerable berry-picking opportunities that are not well represented in the proposed plans, due to both landform and ground material changes brought about by mining (see Approach Chapter for more details).

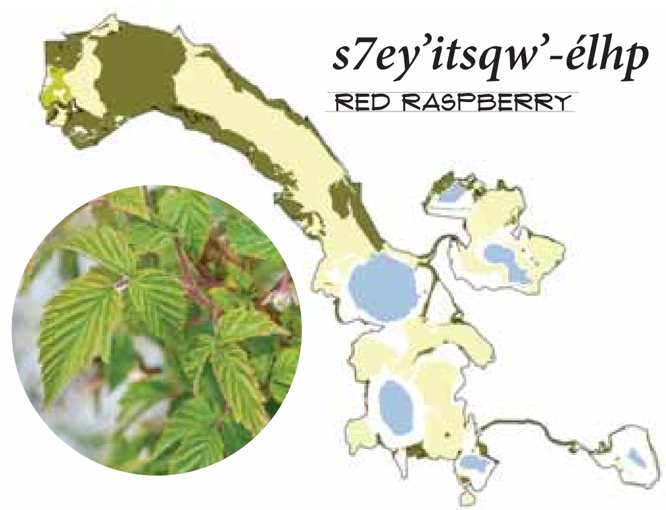
Some medicinal plants associated with dry habitats are considered more potent at higher elevations. The proposed post-mining landscape may provide increased habitat in which these can grow.

7ik-élhp
KINNIKINNICK

qwən'xn-únpe7
YARROW

stsaqwm-élhp
SASKATOON

s7ey'itsqw'-élhp
RED RASPBERRY



SPECIES ABUNDANCE

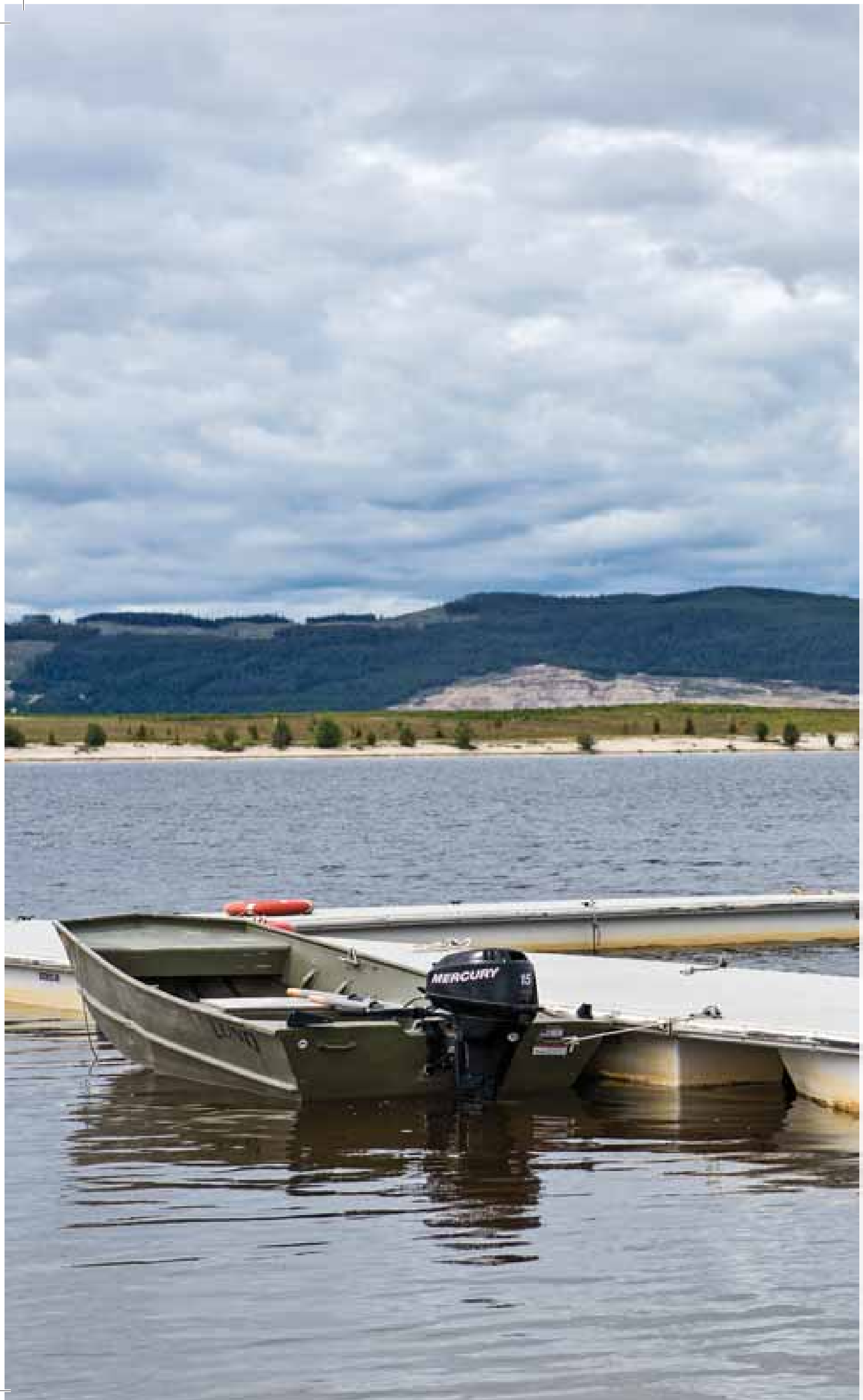
- HIGH
- MEDIUM
- LOW
- NOT PRESENT
- WATER
- EXEMPT; PERMANENTLY RECLAIMED

"I MEAN THERE'S A REASON WHY MANY OF OUR WOMEN CARRY THE LAST PART OF THEIR NAME AS "COOK". BECAUSE IT'S RELATED TO WATER. IT'S ALL WATER AND WHEN THE WOMEN GAVE BIRTH TO OUR CHILDREN IT WAS WATER. SO IT IS VERY VERY SACRED. THAT'S WHY I THINK YOU WILL RECEIVE A LOT OF QUESTIONS AROUND WATER ESPECIALLY FROM OUR ELDERS.

I THINK IT'S WONDERFUL THAT THIS DISCUSSION IS HAPPENING.

CNA PARTICIPANT

MONITORING ACTIVITIES



WATER-QUALITY MONITORING

As post-closure reclamation progresses, HVC will continue to assess water quality.

Water quality models completed for water discharge sites, as well as long-term monitoring of reclaimed water bodies in the Bethlehem area, have demonstrated that pit lake and tailings pond water quality will gradually improve over time.

HVC will oversee an ongoing and comprehensive water-quality monitoring plan designed to detect any changes that could potentially affect wildlife, agriculture, or human health.

Image: Trojan pond, reclaimed tailings area.

WILDLIFE MONITORING

An ungulate health study began in 2013 to determine the influence of mine activities on the health of moose and deer.

The study is still ongoing and will be expanded based on recommendations by the Nlaka'pamux Technical Working Groups to include the following three additional focuses:

Additional species - Monitoring the health of additional wildlife species that are culturally significant, year-round residents and common in the HVC area.

Impacts of water consumption - Determining potential impacts to animals who consume water on the mine property.

Human health impacts - Assessing possible human health impacts from consuming wildlife whose range overlaps the mine.

Image: Moose from neighbouring forest area.

DAM STABILITY AND MONITORING

After mine closure, tailings dam inspections and surveillance will continue to be HVC's responsibility.

In some cases, public access to dams may be restricted to ensure protection of monitoring instrumentation and prevent slope erosion (for example, use of ATVs and snowmobiles may be restricted in certain areas).

In addition, the geotechnical stability of other structures such as waste-rock dumps will be assessed to ensure safety for humans and other animals using the post-mine area.

Image: Highland tailings dam, HVC's only active tailings impoundment.

PLANT MONITORING

The establishment and growth of plants on reclaimed areas is currently monitored at HVC.

Monitoring will continue throughout the lifespan of the mine and after closure. Reclaimed areas will be monitored to see what types of plants grow on reclaimed areas, and what their quality is as food for wildlife, and potential for humans.

As part of this work, adjacent forest types will be visited, and the vegetation in these natural ecosystems will be compared with reclaimed areas of the mine to determine whether reclamation efforts are successful in replacing native ecosystems.

Plant monitoring will be conducted to identify ways to improve current reclamation, and to understand which areas have been most successfully reclaimed, and why.

Image: 7ik-élhp (kinnikinnick).

> " I think that when you want to add something to the land, that it takes away from something else on the land because it takes over. And so you don't want to plant things that have not been here before.
>
> LNIB Participant

NEXT STEPS

ACTIVE WASTE-ROCK DUMPS WILL BE RE-SLOPED AND RECLAIMED AFTER MINE CLOSURE

NEXT STEPS

The Returning Land Use Plan is intended to be a living document that will continue to be developed collaboratively by HVC and Nlaka'pamux communities and reviewed to incorporate new ideas, requests and reclamation knowledge. The current commitment is to update the plan every five years. In the next five years, there are a number of additional steps that have been suggested to build on the progress and knowledge shared. These include:

Regular community involvement. Annual updates for Nlaka'pamux communities would help to maintain project continuity and reduce the time required to produce five-year updates. The annual updates could consist of:

- Annual meetings and/or tours of reclamation progress;
- Regular collaboration with communities to identify changes in perspectives and land-use goals; and
- Community member involvement in reclamation research, planning, monitoring, and associated activities.

Nlaka'pamux place names. Some Nlaka'pamux participants suggested including Nlaka'pamux place names in the Returning Land Use Plan to make the future landscape more "relatable." Most participants agreed that the topic should be pursued as a focused mapping exercise with Nlaka'pamux Elders.

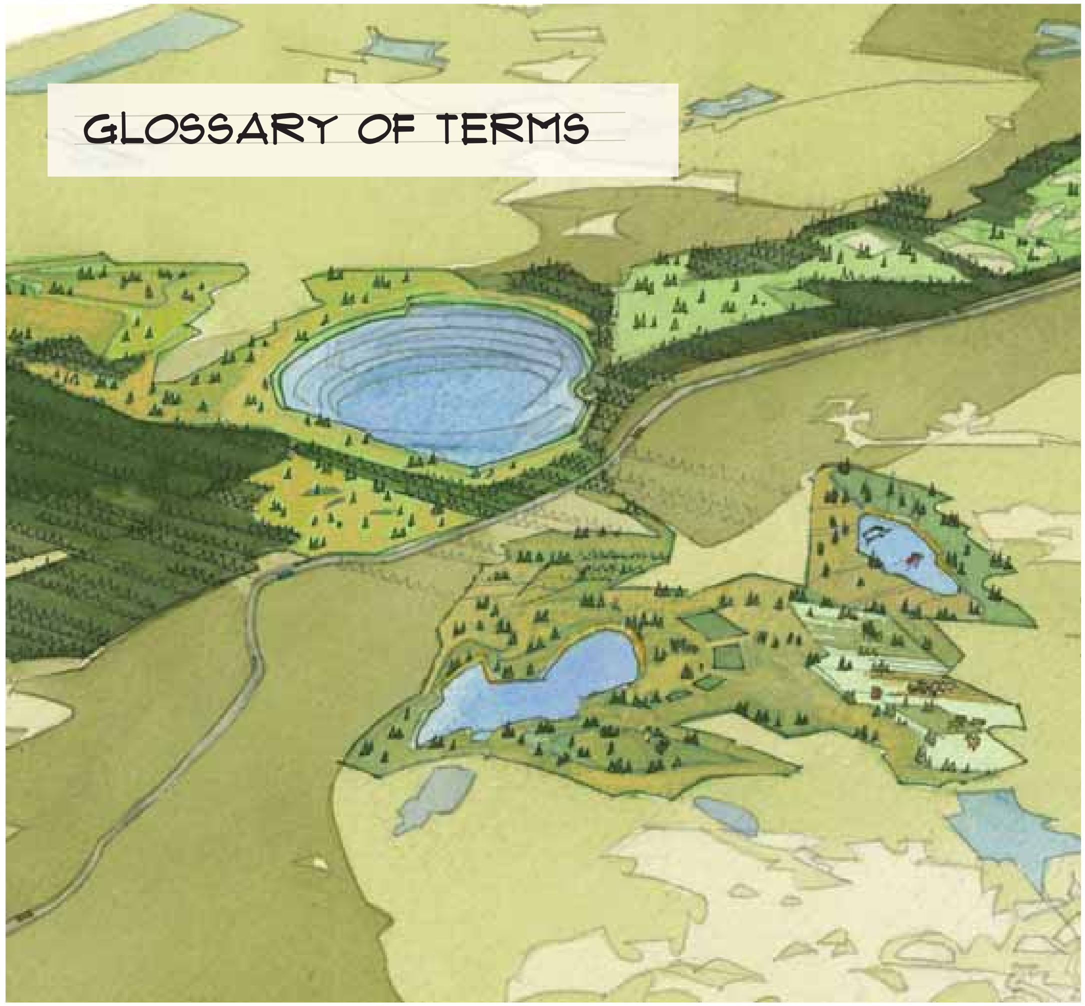
Development of detailed reclamation guidance and site specific plans. The 2016 Returning Land Use Plan is intended to be a long-range conceptual plan to guide future reclamation activities, with detailed planning required for implementation. It should be used as a basis to develop more detailed reclamation planning for each projected post-closure ecosystem and each specific area to be reclaimed.

Cattle management plan. Ongoing implementation of HVC's range management and monitoring plan will be necessary, not only to ensure livestock safety but to preserve biodiversity and control invasive species.

"I don't really know how it works. But I know there's a process that I've talked to our elders in the past. And I didn't know I was getting knowledge from them through the stories they used to tell. But now today when I sit back and I think about it, what I learned from my elders is pretty interesting.

I thought I was just listening to a story but it was knowledge handed down.

NNTC Participant


GLOSSARY OF TERMS

GLOSSARY OF TERMS

Cover
A layer or layers of overburden or soil materials placed on the surface of mine-waste deposits to help moderate water movement and establish vegetation.

Ecosystem
A group or community of plants, animals, and their surrounding physical environment.

End Land Use Plan
A plan that describes land uses after mine closure.

HVC
The acronym for the Teck Highland Valley Copper Partnership. HVC mines both copper and molybdenum.

Mill
The HVC site where ore rock is milled and concentrated to make the final products.

Modelling
A method of forecasting the way something will behave in the future using both math and data collected from the environment. For the purposes of the Returning Land Use Plan, soil pits were dug throughout British Columbia and Alberta to better understand soil moisture and what affects the amount of water different types of soil can hold. This soil moisture information, in combination with other data, was used to predict the soil moisture of reclaimed landforms at HVC.

Molybdenum
A metal that is mined at HVC and used in steel alloys to increase the strength, corrosion resistance and performance of steel at extreme temperatures.

Monitoring
Regularly checking something over time.

Nlaka'pamxcin
The traditional language of the Nlaka'pamux people.

Ore rock
A type of rock or mineral that contains sufficient metals to be mined for economic benefit. Copper and molybdenum are the metals mined at HVC.

Overburden
Rock, soil, or other surficial materials that lie on top of mineral deposits and must be removed to gain access to ore rock. Overburden is stored separately from waste rock at HVC, and is used during reclamation to help establish vegetation.

Reclamation
The process of restoring mined lands to productive uses, by shaping landforms and re-establishing plant communities and other ecosystem components.

Restoration
Returning the land to what it was prior to mining activity.

Tailings
The mixture of water and ground-up rock (sand and silt) left after milling and extracting mining products.

Tailings facility
An engineered impoundment (dam and upstream area) used to store tailings.

Topography
The physical features of an area that define its shape.

Waste rock
Rock that contains such a low concentration of mineral deposits that it is not profitable to mill. Waste rock is stored in piles referred to as "dumps" on the mine site.