Abbotsford Mission
Water & Sewer Services

Cannell Lake Watershed Control Program Plan

December 2019

our water matters
Your **opinion** matters

Executive Summary

Fraser Health granted filtration exemption for the Abbotsford-Mission Water & Sewer Commission's (AMWSC) Cannell Lake water source. One criterion for this exemption is that the AMWSC implement and review a watershed control program every five years that will mitigate detrimental changes to lake water quality. This report aims to satisfy this requirement by describing such a program.

Cannell Lake is relatively isolated and within a small watershed. The entire watershed is protected by the Province as a 'watershed reserve'. There are no point sources of waste discharge. Considering these factors, there are not many potential mechanisms by which Cannell Lake water quality could be detrimentally impacted. Five potential sources of contamination identified include:

1. Natural disaster (e.g. forest fire, landslide, etc.);
2. Climate change (which may alter phytoplankton species composition and exacerbate natural disasters);
3. Accidental pollution (by persons visiting watershed);
4. Deliberate pollution (i.e. terrorism);
5. Diesel spill (from a generator used to power water supply intake pumps); and
6. Logging.

Of the above potential contaminant sources, a risk quantification exercise suggests that none of the above are high risk. *Natural disaster* and *deliberate pollution* are deemed moderate risks. To mitigate and monitor the risks, the AMWSC's plan includes:

A. The following water quality monitoring practices:
   - On-line raw water turbidity measurements;
   - Weekly raw water coliform testing;
   - Monthly raw water protozoa testing;
   - Annual physical-chemical parameter testing; and
   - Limnology monitoring program.

B. Further assessment of wildfire risks through development of a Community Wildfire Protection Plan;
C. Weekly visual checks for watershed contamination during Operation's staff site visits;
D. Maintaining watershed access gates & fences to discourage vehicular entry into the watershed;
E. Conducting more detailed watershed evaluations;
F. Completing an annual helicopter inspection of the watershed to identify any changes that may increase contamination risk;
G. Maintaining electronic surveillance devices to monitor human entry to the watershed;
H. Maintaining signage at watershed access points to alert the public that entry is restricted; and

I. Developing environmental management plans for diesel generator storage, fuel transportation and refueling.

The above actions constitute the scope of the AMWSC's watershed control program. The watershed control program implementation is discussed within the AMWSC's annual water quality report.

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1. Introduction

1.1 Background

Cannell Lake, located approximately 13 km north of Mission's town centre, provides approximately 10% of the Abbotsford Mission Water and Sewer Commission's (AMWSC) regional water supply. It provides higher volumes when the AMWSC's primary water supply from Norrish Creek is off-line due to maintenance or during emergencies.

The Fraser Health Authority (FHA) is the regulatory body overseeing the AMWSC's compliance with the BC Drinking Water Act. In 2012, the FHA adopted the Drinking Water Treatment Objectives (Microbiological) for Surface Water Supplies in British Columbia. These standards generally require filtration for drinking water supplied from surface water sources. However, authorities may exclude such sources from filtration assuming compliance with four criteria, as described below:

1. Overall inactivation is met using a minimum of two disinfections, providing 4-log reduction of viruses and 3-log reduction of *Cryptosporidium* and *Giardia*.

2. The number of *E. coli* in raw water does not exceed 20/100 mL (or if *E. coli* data are not available less than 100/100 mL of total coliform) in at least 90% of the weekly samples from the previous six months. The treatment target for all water systems is to contain no detectable *E. coli* or faecal coliform per 100 ml. Total coliform objectives are also zero based on one sample in a 30-day period. For more than one sample in a 30-day period, at least 90% of the samples should have no detectable total coliform bacteria per 100 ml and no sample should have more than 10 total coliform bacteria per 100 ml.

3. Average daily turbidity levels measured at equal intervals (at least every four hours) immediately before the disinfectant is applied are around 1 NTU, but do not exceed 5 NTU for more than two days in a 12-month period.

4. A watershed control program is maintained that minimizes the potential for fecal contamination in the source water. (Health Canada, 2003)

A consistent supply of good source water quality is critical to the approach, but source quality can change. Therefore, the exclusion of filtration must be supported by continuous assessment of water supply conditions.

In 2013, the FHA advised the AMWSC that it would grant filtration exemption for Cannell Lake if the AMWSC demonstrates compliance with all four criteria (Appendix A). The AMWSC has demonstrated that Cannell Lake water meets Criteria #2 & 3 and installed UV-disinfection treatment in December 2016 to satisfy Criterion #1. For Criterion #4, the AMWSC developed the Cannell Lake Watershed Control Program as described in this report.

1.2 Watershed Control Program Goal

The primary goal of the Cannell Lake Watershed Control Program is to mitigate both the risk of lake fecal contamination and the risk of water quality deterioration below filtration exemption's coliform and turbidity thresholds. However, the program scope also addresses mitigation of all potential contaminant types.

1.3 Program Development

BC does not have specific guidelines for developing a watershed control program. As such, the AMWSC program is based on concepts taken from other jurisdictions. The program has been developed using the following four steps:

1. Characterize the watershed's land ownership, hydrology and water supply infrastructure;
2. Identify potential contaminant risk within the watershed;
3. Quantify each identified risk; and
4. Define the control program = risk mitigation and monitoring measures.

2 Watershed Characterization

2.1 Land Ownership

Cannell Lake is on Crown Land and is classified as a Provincial “watershed reserve”. Provincial watershed reserves are public lands specifically set aside and protected as community drinking and domestic water sources under the Provincial Land Act. As the quality and quantity of water within a watershed is largely a function of the intact forest cover, the Act provides protection by mainly managing commercial logging and public trespass. The District of Mission owns 32 hectares of private Municipal forest land within the watershed, which is managed by the District under Tree Farm License (TFL) 26.

2.2 Geographical Location and Physical Features

Cannell Lake (Photo 1) is situated approximately 13 km north of the District of Mission town centre (Figure 2). A GIS analysis based on Lidar data and orthophotograph review shows that the lake area is 40.5 Ha based on the approximate average water level between the 278m-279m contour elevation. . The watershed covers 2.05 km^2 and ranges in elevation from the lake level of 278 m geodetic up to a maximum of about 650m, with moderately steep slopes increasing up to approximately 40 degrees along the western edge of the lake.

The lake has no mapped significant perennial tributary streams. However, watershed modeling and direct observation of fish species present within the lake suggest that the watershed does include some unmapped watercourses of unknown permanence. Drainage network extraction suggests that streams would be limited to 1st or 2nd order tributaries only.

Photo 1 – North-east view of Cannell Lake

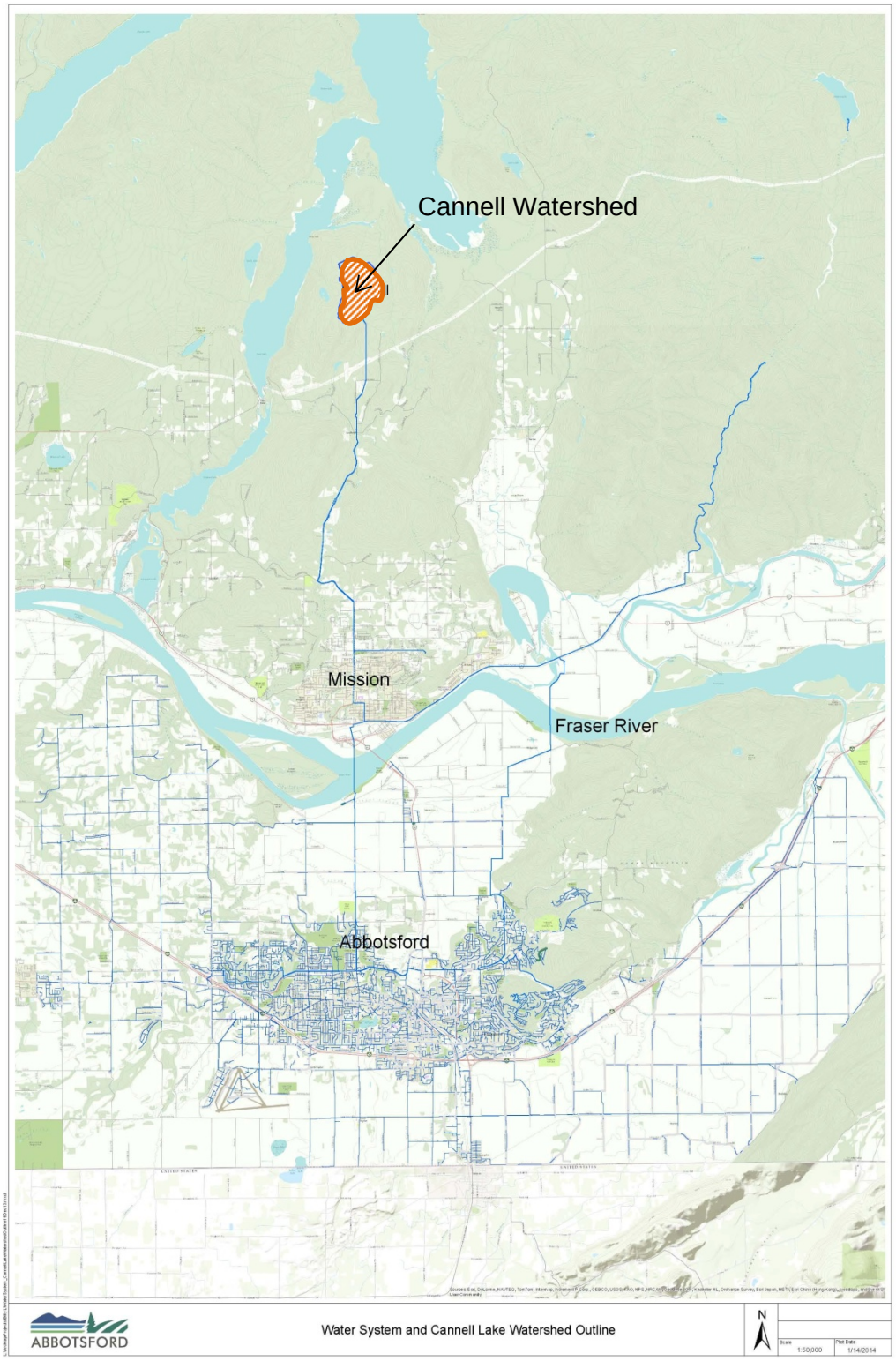

Figure 2 - Location of Cannell Lake

The watershed catchment aspect is generally N-S, and is fairly confined with steep terrain surrounding the lake, which is oriented along the main N-S axis. Cannell Lake drains into Stave Lake via Cannell Creek and Cardinalis Creek. The watershed is bordered on the north and west by local drainage to Stave Lake, and on the east by the Cardinalis Creek catchment.

2.3 Climate

Climate in the area consists of mild, moist winters and summers tend to be warmer and drier with temperatures modified by the ocean. Snow can occur in the watershed but the development of a significant snowpack is rare, even at the highest elevations. Average annual precipitation (2013-2018) was 3000mm with the majority of rainfall occurring from November through March (Figure 3).

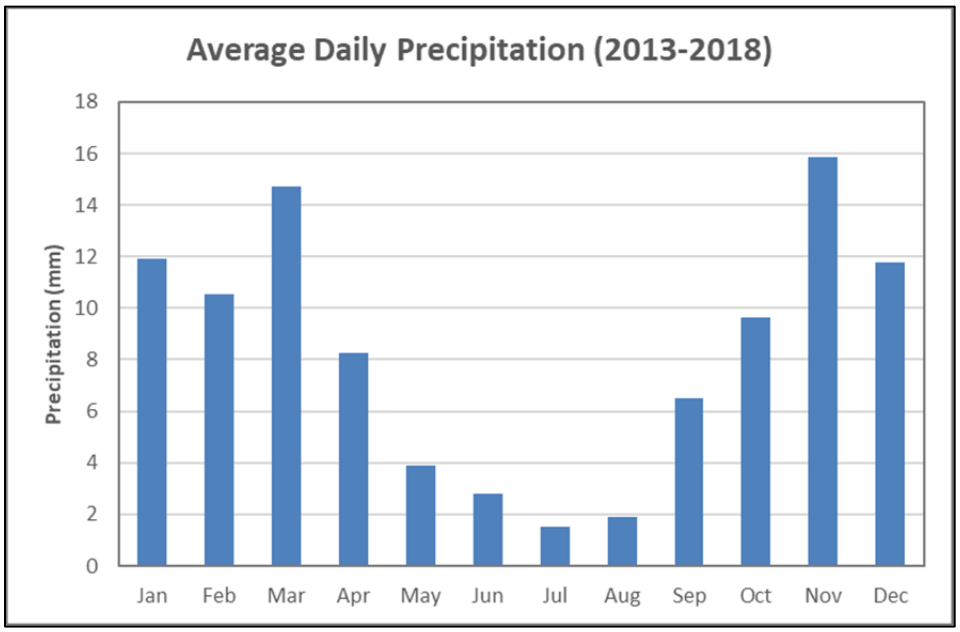

Figure 3 - Average Daily Precipitation by Month

2.4 Biogeoclimatic Zone

The Cannell Lake watershed is part of the Coastal Western Hemlock (CWH) biogeoclimatic zone. This zone is characterized as having cool summers and mild winters, with mean annual temperatures ranging from 5.2º to 10.5º C and a high amount of precipitation (Pojar et al. 1991). The area surrounding Cannell Lake has been identified as a very wet subzone of the CWH, characterized as a wet, humid climate with cool summers and mild winters.

Vegetation in the watershed generally consists of second-growth forests, as aerial photos show that much of the watershed was affected by forest fire and logging in the

1940s (Scott Resource Services, 2010). A list flora and fauna species typical of the CWH is included in Appendix B.

2.5 Description of Water Supply Infrastructure at Cannell Lake

The dam at Cannell Lake was built in the 1950s. Flow from the lake into the water supply system is provided by gravity discharge pipes, with a floating pump station that is used if the level drops below the gravity outlet. Cannell Lake provides approximately 10% of the annual AMWSC system supply. Existing water licenses allow for annual average withdrawal of 11.8 MLD and maximum day withdrawal of 69.1 MLD.

Water from the lake is disinfected by UV and chlorine at the Cannell Lake Water Treatment Plant (WTP), located 1 km south of the lake. Ammonia is then added at a point 7 km south of the WTP, producing chloramines

At a top water level of 279 m, the Cannell Lake system is at a higher elevation than the AMWSC's primary water supply (Norrish Creek). Cannell is the only water source able to service the higher elevation customers in the District of Mission. When the Norrish system is off-line due to maintenance or other events, the Cannell system is utilized at a higher capacity to compensate for the reduced output from Norrish.

3 Contaminant & Risk Identification

3.1 Delineation of Protection Area

The Cannell watershed is 20.5 km². As the watershed boundary is already defined, the protection area will coincide with this boundary, as shown in Figure 4.

Figure 4 - Watershed Protection Boundary

Review of the Tree Farm License No. 26 (TFL26) Forest Stewardship Plan 2017-2022 explicitly recognizes Cannel Lake watershed as a community water supply and reaffirms that no harvesting has been completed in the watershed during the history of TFL26 and

that under the term of the FSP, no forestry operations are contemplated within the watershed in accordance with the License.

3.2 Contaminants of Concern

Faecal Matter
Faecal matter from wildlife and humans is a primary source of microbes that can cause human illness.

Naturally occurring microbial contaminants such as protozoa (e.g. *Giardia lamblia* & *Cryptosporidium parvum)*, bacteria (e.g. total & fecal coliform) and viruses are found in virtually all freshwater ecosystems. Sources of *Giardia* cysts and fecal coliform bacteria in the Cannell Lake watershed could come from warm-blooded wildlife species such as deer, elk, cougar, black bear, mink, and marten. Sources of *Cryptosporidium* oocysts would come from most mammalian wildlife species as well as some bird species in the area.

The existing water supply treatment is designed to inactivate protozoa, bacteria and viruses. However, should source coliform levels rise above those approved for filtration exemption (refer to Figure 1, Criterion #2), then such treatment processes may need to be augmented by filtration.

Microorganism-Produced Compounds
Some microorganisms, particularly cyanobacteria, can produce compounds that cause undesirable taste and odor (e.g., geosmin and 2 methylisoborneol [MIB]) and/or toxins (e.g. microcystins).

Other Contaminants
With a focus on prevention of human illness, there are a variety of other contaminants that should be acknowledged. Parameters such as turbidity, natural organics/inorganics, or colour can be considered ‘contaminants’ in the sense that they can block the effectiveness of treatment processes designed to inactivate microbes. Chemical contaminants could be in the form of hydrocarbons, pesticides, etc. Although rare, some watersheds have the threat of radioactive contamination.

3.3 Risks to Drinking Water Quality

The Cannell Lake watershed currently has no known point-sources of waste discharge (e.g. no wastewater plants, no septic systems, no campsites, no industrial/commercial activity, no residences, etc.). A walk-through of the area led to the identification of five potential risks that could compromise lake water quality.

Natural Disaster

Natural disasters such as forest fires, landslides, loss of tree swaths (e.g. from wind or disease) could upset the existing erosion processes within the watershed. This could result in increased run-off to the lake and, in turn, alter lake water concentrations of pathogens and other microorganisms, nutrients, turbidity, colour, and organics.

The risk of natural hazards is exacerbated by climate change as discussed in the following section.

Climate Change

Climate change projections based on the Intergovernmental Panel on Climate Change (IPCC) Assessment Report 4 (AR5) project general trends which may influence the risks to drinking water quality.

Specific risks associated with climate change include the following:

- Increased rainfall in winter, which results in higher runoff and increases loadings of sediment and nutrients (nitrogen and phosphorus) to the lake;
- Increased risk of forest fires, which may be followed by erosion and further increase sediment and nutrient loadings;
- Warm, dry summers, which result in lower lake levels, less dilution, longer residence times for water and nutrients, and warmer temperatures.

All of the foregoing can combine to cause algal blooms and changes in phytoplankton community structure. For example, the proportion of cyanobacteria may increase, as their growth rates are optimized at high temperatures (Moss *et. al*. 2011, Paerl and Paul 2012). Cyanobacteria are of particular concern in drinking water sources as some species cause taste and odor problems, while others produce toxins.

Accidental Pollution

While the watershed is gated to prevent public vehicular access, members of the public are known to enter on foot or all-terrain vehicles, generally for recreational purposes (e.g. hiking, camping, fishing, etc.). Such human presence could pose a threat to water quality through faecal contamination or other human-transported pollutants. Also, authorized entry to the watershed (e.g. water supply personnel) could conceivably cause accidental release of contaminants.

Deliberate Pollution

While one would hope that it never occurs, there is a risk that someone may deliberately attempt to compromise Cannell Lake water quality. Various types of contaminants could be used (e.g. microbiological, chemical, and radioactive).

Diesel Spill

The floating pump station at Cannell Lake is powered by a diesel generator. This generator, located on the lake shore is a potential source of diesel contamination. The

diesel tanks are double-lined and inside a 20-foot ‘sea container’ that is mounted on a concrete pad (Photos 2 & 3).

Photo 2 - Generator inside Sea Container

Photo 3 - Double-Lined Diesel Tank

Transportation of diesel to the generator is completed via a designated fuel truck, which include onboard spill kits. The transportation route within the local catchment consists of a well maintained graded aggregate surface roadway. Onsite refueling is accomplished via an external refueling inlet located on the landward side of the container.

Logging

Currently, the majority of the Cannell watershed is well-forested. Similar to the outcome of natural disasters, logging has the potential to change erosion patterns and result in increased levels of pathogens, turbidity, colour and organics in the lake water.

4 Quantifying Risks

Risk is a combined measure of the likelihood of a specific event occurring and the extent of the consequences. The AMWSC has chosen to quantify risk using a method developed by the Alberta Ministry of Environment and Sustainable Resource Development (AMESRD). Their Drinking Water Safety Plan defines 'risk likelihood' and 'risk consequence' as shown in Tables 4-1 and 4-2. Risk itself is then scored by multiplying likelihood and consequence as shown in Table 4-3.

Table 4-1 Likelihood Scoring Table (ABMSRD, 2013)

Likelihood Scoring

Likelihood	Definition	Value
Not applicable	Does not apply in this water supply system	0
Most Unlikely	Conceivable but extremely small chance of happening in next 4-5 years	1
Unlikely	Is possible and cannot be ruled out in next 4-5 years.	2
Medium	As likely as not to happen in next 4-5 years.	4
Probable	Would be expected to happen in next 4-5 years but there is a small chance it may not.	8
Almost Certain	Would be confident this will happen at least once in next 4-5 years	16

Table 4-2 Consequence Scoring (ABMESRD, 2013)

Consequence Scoring

Consequence	Definition	Value
Not applicable	Does not apply in this water supply system	0
Insignificant	Wholesome water or interruption < 8 hrs	1
Minor	Short term or localised non-compliance, non health related e.g. aesthetic or interruption 8-12 hrs	2
Moderate	Widespread aesthetic issues or long term non compliance, not health related or interruption 12-24	4
Severe	Potential Illness or interruption >24 - 48 hrs	8
Catastrophic	Actual illness or potential long term health effects or interruption >48 hrs	16

Table 4-3 Risk Scoring Matrix (ABMESRD, 2013)

			Consequence Descriptor				
	Score	Not Applicable	Insignificant	Minor	Moderate	Severe	Catastrophic
	Not Applicable	0	1	2	4	8	16
Likelihood Descriptor	Most Unlikely	1	1	2	4	8	16
	Unlikely	2	2	4	8	16	32
	Medium	4	4	8	16	32	64
	Probable	8	8	16	32	64	128
	Almost Certain	16	16	32	64	128	256

According to AMESRD, risk scores of 32 or more are considered high and watershed control programs should address such risk with mitigation action(s). Scores of 8 to 16 require monitoring and mitigative actions where appropriate. Risk with scores of 0 – 4 are unlikely to require action within the next 4 to 5 years.

Using the risk quantification method outlined above, Table 4-4 assigns a risk score to the six Cannell Lake risks identified in Section 3. "Climate change" itself is not included as a risk factor. Generally climate change is a variable influencing the natural hazards risk through the projections for increasing frequency and magnitude of extreme events (e.g. precipitation and wildfire). However, the combined effects of increasing temperature, increased sediment and nutrient fluxes on water quality has been added as a risk.

Confidence that climate change will exert an ultimate influence on the temperature and precipitation extremes affecting the Cannell watershed is high; however, the timeframes within which the effects of climate change will exert a discernible influence extend well into the future and beyond the cycle of review under the Watershed Protection Plan. Consequences of increasing magnitude and frequency of extreme events (e.g. landslide and wildfire) however, have been considered in the risk assessment.

Note the assumptions used for scoring 'consequence':

- 'consequence' refers to the impact to the water supply system (e.g. treated water), not to the lake water itself; and
- 'consequence' assumes the effectiveness of UV-disinfection.

The risk matrix suggests that none of the identified Cannell Lake contamination risks are high. *Natural disaster* and *deliberate pollution* score as moderate risks.

Table 4-4 Cannell Lake Water Supply Quality Risk Scoring

Risk	Likelihood	Consequence	Score	Score Explanation
Natural Disaster	2	8	16	It is always possible that there could be a natural disaster within the watershed. Depending on the scale of the disaster, the consequence would vary. At a worst case, one could expect severe consequences with supply interruptions >48 hours to adjust treatment processes for the new raw water conditions (which could reduce UV-disinfection effectiveness and/or increase chlorine demand). Climate change projections provide confidence that extreme events will increase in frequency and intensity; however, uncertainty remains in timelines for the realization of climate change effects. Additionally, the bedrock geology predominant in the watershed and the lack of logging reduces the likelihood that climate change would yield a natural disaster influencing water quality. Based on IPCC projections, the likelihood variable is ranked as moderate.
Climate Change Influences	1	4	4	Climate change influences on temperature and the risk of additional nutrient inputs as a result of natural disaster (e.g. wildfire) pose a risk of changes to water quality. Temperature and changes to phytoplankton community (e.g. increase in cyanobacteria) pose a risk with moderate consequence re: aesthetics and taste. However, the likelihood of climate change producing changes in water quality within the next 5 years is low.
Accidental Pollution	2	2	4	Authorized and unauthorized human entry to the Cannell watershed will continue and possibly cause accidental pollution. Historical observation suggests that unauthorized visits are sporadic and in limited numbers. The scale of any accidental contamination would likely be small and, at worst, result in minor impacts.
Deliberate Pollution	1	16	16	It is considered unlikely that there would be deliberate contamination (terrorism). However, the consequences of such an event could be catastrophic, potentially requiring shut-down of the Cannell water supply for an extended time while clean-up is addressed.

Risk	Likelihood	Consequence	Score	Score Explanation
Diesel Spill	1	4	4	The double-lined diesel tank and containment within sea container provides redundancy that makes it most unlikely that diesel could escape to lake. Even if it did, the volumes + distance of the intakes from the generator would probably only necessitate short-term supply shut down while the spill is contained. Transportation of fuels to the generator site occurs via a well graded and maintained road surface. The designated refueling vehicle is equipped with onboard spill response equipment. Thus, the likelihood of a spill occurring during transportation or if it did, affecting drinking water quality is low.
Logging	0	N/A	N/A	Under the District of Mission's current "TFL 26 Timber Supply Analysis and Twenty Year Plan", there are no current plans to harvest within the Cannell Watershed. This will be reviewed in 2020 when their next Timber Supply Review is completed (Appendix C). Should logging ever occur, the consequences should be insignificant assuming regulated watershed logging practices are applied (which are designed to mitigate impacts to water quality).

5 Watershed Control Program

Table 5-1 list the strategies that will be used mitigate or monitor the potential risks to Cannell Lake water quality identified in Section 4. These strategies are then further discussed below.

Table 5-1 Risk Mitigation/Monitoring Strategies

Strategies	Natural Disaster	Deliberate Pollution	Climate Change	Accidental Pollution	Diesel Spill	Logging
• Raw water quality monitoring	x	x	x	x		
• Limnological monitoring	x		x			
• Visual inspection for watershed contamination as part of regular site visit duties.	x	x		x	x	
• Maintain access road gates to discourage vehicular access to watershed.		x		x		
• Complete an annual helicopter inspection of the watershed	x	x	x	x		
• Maintain electronic surveillance devices within watershed	x	x		x		
• Signage for education purposes				x		
• Practice diesel fuel storage and re-fueling according to an environmental management plan				x	x	
• Continue no harvesting practices			x			x
• Complete one-time studies to inform 2024's Watershed Management Plan Update (refer to Section 5.12)	x		x			

5.1 Continue Water Quality Monitoring Practices

The AMWSC currently monitors Cannell Lake raw water quality according to the following schedule and objectives.

A) On-line raw water turbidity measurements

- OBJECTIVE: *Average daily turbidity levels measured at equal intervals (at least every four hours) immediately before the disinfectant is applied are around 1 NTU, but do not exceed 5 NTU for more than two days in a 12-month period*. *(Drinking Water Treatment Objectives for Surface Water Supplies in BC).*

On-line turbidity monitoring has been active at Cannell Lake since 2012.

B) Weekly raw water coliform testing

- OBJECTIVE: *The number of E. coli in raw water does not exceed 20/100 mL (or if E. coli data are not available less than 100/100 mL of total coliform) in at least 90% of the weekly samples from the previous six months. The treatment target for all water systems is to contain no detectable E. coli or fecal coliform per 100 ml. Total coliform objectives are also zero based on one sample in a 30-day period. For more than one sample in a 30-day period, at least 90% of the samples should have no detectable total coliform bacteria per 100 ml and no sample should have more than 10 total coliform bacteria per 100 ml. (Drinking Water Treatment Objectives for Surface Water Supplies in BC).*

The AMWSC began weekly sampling for raw water coliforms in 2012.

C) Monthly raw water protozoa testing

- OBJECTIVE: *Monitor for trend changes that may necessitate adjustments to UV-treatment process.*

Giardia cysts and Cryptosporidium oocysts in both Cannell raw and chlorinated water have been monitored on a monthly basis for since 1991. This frequency was increased to twice monthly from 2011 until 2016, and then reverted back to monthly.

D) Annual physical-chemical parameter testing.

- OBJECTIVE*:* Meet *or exceed the Guidelines for the Protection of Freshwater Aquatic Life*

Cannell Lake has been sampled on an annual basis for physical and chemical parameters for over 10-years (and more frequently prior to this).

5.2 Continue Limnology Monitoring Program

A limnology monitoring program was implemented in June 2019 with the purpose of collecting enough data to identify changes in water quality (particularly temporal trends) that could compromise the use of Cannell Lake as a drinking water source. It focuses on (but is not limited to) nutrients and algal biomass and species composition. The program will continue in accordance with “Cannell Lake Limnology Monitoring Program” (ENKON 2019a).

5.3 Visual checks during Regular Site Inspections

Water supply staff visit the lake weekly for various routine operational duties. This includes visual contaminant checks to answer questions such as:

- Any evidence of new human activity within watershed (e.g. footprints, ATV tracks, campfires, etc.)? If yes, any indication of potential contamination (e.g. gasoline spills, human faecal waste near shoreline, etc.)?
- Any evidence of natural disaster (e.g. fire, landslide, loss of trees due to windstorm, etc.)?

- Any evidence of increased wildlife presence around lake (e.g. tracks, scat, beaver activity, etc.)?

5.4 Maintain Entrance Gates and Fences

Currently, there are two locked gates to discourage unauthorized vehicular entry to the watershed. These gates will be maintained.

5.5 Continue Annual Helicopter Watershed Inspection

Ongoing visual checks of the entire watershed are only practical from the air. The AMWSC completes an annual Cannell Lake watershed helicopter inspection flight to look for any signs of increased contaminant risk (e.g. landslides, large swaths of tree loss, ATV trails, other human activity, etc.).

5.6 Signage for Education Purposes

The AMWSC maintains a sign (Photo 4) on the entrance gate to the Cannell Lake access road that informs the public that the area is a community watershed and that access is restricted. An additional sign exists close to the water's edge (Photo 5), explaining the potential threat that humans pose to the water supply, including details on the boundary of the watershed and how protecting the ecological integrity of the watershed will keep the region's drinking water safe.

Photo 4 – Sign at gate entrance

Photo 5 – Sign near water's edge

5.7 Maintain Electronic Surveillance Devices

The AMWSC maintains a video camera along the road into the watershed to monitor human entry. The camera footage is reviewed to ensure that all vehicles going to the lake belong to AMWSC or authorized consultants/contractors.

5.8 Practice Diesel Generator Storage & Refueling According to an Environmental Management Plans

The diesel generator is presently in place as a contingency to maintain water supplies under extreme low-water levels. To date, the diesel generator has never required operation. Notwithstanding the lack of use of the generator, the generator system and its associated fuel supply are stored immediately adjacent to the reservoir during the summer. During the winter, the generator is removed from the sea container for offsite storage; the diesel tank is drained to portable storage and also removed from the site.

During the summer months, and as long as lake levels are above the gravity feed elevation, only enough diesel volume is kept on site to permit monthly generator tests. The tank would only be fully filled if lake levels neared the pumping level. As of 2019, the Cannell Lake level has never dropped this low. Should a year occur when pumping became necessary, it would likely be two months or less before fall rains refreshed the lake enough to resume gravity operations.

Under operating conditions, the diesel fuel tank is contained within a double-walled diesel tank and has re-fueling intakes connected at the outside of the sea-can container. Spill kits are currently stored within the container; however, formal re-fueling procedures and additional spill protection measures and management plans will be developed for the transportation and refueling procedures at the designated operational location with supervision and documentation protocols for refueling operations.

5.9 Continue No Harvesting Practices

As part of the District of Mission's "Timber Supply Analysis and Twenty-Year Plan" Cannell Lake is excluded from harvesting until the next timber supply review in 2020 as indicated in Appendix C. The updated Forest Stewardship Plan (2017-2022) for the District of Mission also indicates "that there are no plans under the plan to complete any forestry operations in accordance with the License (Appendix E). When the review occurs, the AMWSC will encourage the District to continue the no harvesting practice within the watershed.

5.10 Watershed Control Plan Review and Update

The AMWSC will review and update the Watershed Control Program Plan every 5-years. The AMWSC's Annual Water Quality Report to Fraser Health contains a section to demonstrate compliance with all Cannell Lake filtration exemption criteria, including a discussion on the watershed protection aspect.

5.11 Adaptive Management

The AMWSC will implement adaptive management measurements as necessary based on review of the limnological and watershed level monitoring results.

5.12 Studies to Inform 2024 Watershed Management Plan Update

Undertake Further Assessment of Wildfire Risk

Although the wildfire threat at the Cannell Lake watershed is currently moderate, for the purposes of watershed management planning and accommodating future climate change impacts, the AMSWC will consider further assessment of wildfire risk and opportunities for reducing wildfire risk in the watershed. This could be done through the Community Resiliency Investment Program (CRI), which provides grants for developing a Community Wildfire Protection Plan (CWPP). A CWPP for the Cannell Lake watershed would identify the primary causes of wildfire risk to the watershed and engage local stakeholders in developing recommendations for reducing wildfire risk.

Conduct More Detailed Watershed Evaluations

Some further assessment of watershed conditions is needed, specifically:

- Pursuant to the terrain/ watershed modeling results (ENKON 2019b), conduct a detailed assessment of the forest road segment along the watershed boundary and assess the status of the road drainage system (culverts and ditches); verify the extent of natural and anthropogenic flow-path connectivity to Cannell Lake;
- Investigate the status and geomorphic/hydrologic risk associated with the historic road alignment located along southwest slopes of Cannel Lake watershed;
- Verify the locations and morphological class of tributary watercourses per the drainage network model results (ENKON 2019b) (Appendix D) ; and
- Complete a reconnaissance survey of the lake perimeter on an annual basis (spring) to inspect verified tributary confluences for evidence of channel instability or debris torrents.

Timeline for Studies

The reconnaissance surveys of the lake perimeter will begin in the spring of 2020 and be repeated annually. All other studies will be completed by December 31, 2023 in order to be used in the 2024 Watershed Management Plan update.

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Appendix A – Letter from Fraser Health

fraserhealth Better health. Best in health care.

May 23, 2013

Jim Gordon
General Manager, Engineering & Utilities
Engineering Department
32315 South Fraser Way
Abbotsford, BC V2T 1W7

Dear Jim:

Re: Cannell Lake Water Treatment Plans

This letter is in response to the report submitted by AMWSC on behalf of Hatch Mott MacDonald dated March 26, 2013. The Cannell Lake surface water source requires treatment to meet the provincial surface water treatment outcome expectations. Based on the report provided, Fraser Health has no objection to granting filtration avoidance and the approval to install a UV-disinfection facility to meet the Health Canada requirements for surface water. The following conditions will be placed on the AMWSC's permit to operate.

For Cannell Lake Source:

1. Overall inactivation is met using a minimum of two disinfections, providing 4-log reduction of viruses and 3-log reduction of *Cryptosporidium* and *Giardia*.
2. The number of *E. coli* in raw water does not exceed 20/100 mL (or if *E. coli* data are not available less than 100/100 mL of total coliform) in at least 90% of the weekly samples from the previous six months. The treatment target for all water systems is to contain no detectable *E. coli* or fecal coliform per 100 ml. Total coliform objectives are also zero based on one sample in a 30-day period. For more than one sample in a 30-day period, at least 90% of the samples should have no detectable total coliform bacteria per 100 ml and no sample should have more than 10 total coliform bacteria per 100 ml.
3. Average daily turbidity levels measured at equal intervals (at least every four hours) immediately before the disinfectant is applied are around 1 NTU, but do not exceed 5 NTU for more than two days in a 12-month period.
4. A watershed control program is maintained that minimizes the potential for fecal contamination in the source water. (Health Canada, 2003)

Applying the exclusion of filtration criteria does not mean filtration will never be needed in the future. A consistent supply of good source water quality is critical to the approach, but source quality can change. Therefore, the exclusion of filtration must be supported by continuous assessment of water supply conditions on an annual basis.

Public Health Protection
Fraser Health Authority

#207 - 2776 Bourquin Crescent West
Abbotsford BC
V2S 6A4 Canada

Tel (604) 870-7900
Fax (604) 870-7901
www.fraserhealth.ca

The following dates will be added to the operating permit for the Cannell Lake source:

- By December 31, 2013 a watershed control program be submitted to Fraser Health for review
- A preliminary design for the UV treatment facility be completed by December 31, 2014
- Completion of the UV treatment facility at Cannell Lake by December 31, 2016

If you require further information please contact the undersigned at 604-870-7905.

Sincerely,

Jeniene Lutz, C.P.H.I (C)
Environmental Health Officer
Drinking Water Program, Fraser Health

JL/pg

Appendix B – Flora and Fauna Species Found in the Cannell Lake Watershed

Tree and Shrub Species

- Western Hemlock (*Tsuga heterophylla)*
- Sitka Spruce (*Picea sitchensis*)
- Western Red Cedar (*Thuja plicata)*.
- Douglas fir (both *Abies anabilis* and *A. grandis)*
- Western Yew (*Taxus brevifolia*)
- Alder (*Alnus sinuvata)*
- Hemlock
- Vine Maple (*Acer circinatum*)
- Dull Oregon Grape (*Mahonia nervosa)*
- Salal (*Gaultheria shallon*)
- Red Huckleberry (*Vaccinium parvifolium*)
- Oregon Beaked Moss (*Kindbergia oregano*)
- Step Moss (*Hylocomium splendens*)
- Lanky Moss (*Rhytidiadelphus loreus*)
- Flat Moss (*Plagiothecium undulatum*)

Native Wildlife

- Black Tailed Deer (*Odocoileus hemionus*)
- Black Bear (*Ursus americanus*)
- Elk (*Cervus elaphus*)
- Cougar (*Felis concolor*)
- Mink (*Mustela vison*)
- Marten (*Martes americana*)
- Pileated Woodpecker (*Dryocopus pileatus*)
- Stellar Jay (*Cyanocitta stelleri*)
- Blue Grouse (*Dendragapus obscurus*)
- Raven (*Corvus corax*)
- Mallard (*Anas platyrhynchos*)
- Great Blue Heron (*Andrea herodias*)
- Hooded Merganser (*Lophodytes cucullatus*)
- Glaucous Gull (*Larus hyperboreus*)
- Canada Goose (*Branta canadensis*)
- Dolly Varden (*Salvelinus malma*)
- Rainbow Trout (*Oncorhynchus mykiss)*
- Cutthroat trout (*Oncorhynchus clarki*)

Appendix C - TFL 26 Timber Supply Analysis and Twenty Year Plan

DISTRICT OF
Mission
ON THE FRASER

FORESTRY DEPARTMENT

FILE CATEGORY: FOR.INT.WAT
FILE FOLDER: CANNELL LAKE WATERSHED

October 10, 2013

Amy Wakeford
Water Conservation Program Coordinator
32315 South Fraser Way
Abbotsford, BC V2T 1W7

Dear Amy:

Re: Cannell Lake Watershed – TFL26 Future Harvesting Opportunities

The Cannell Lake Community watershed located within the District of Mission contains 32 hectares of private municipal forest land, and hectares of provincial crown land, managed by the District under Tree Farm Licence 26.

On March 26, 2010, the Deputy Chief Forester approved the annual allowable cut (AAC) for TFL26, valid for a period expiring March 25, 2020. As part of the timber supply analysis completed for this AAC determination, it was noted that since there was no harvesting within the Cannell Lake community watershed, it was removed from the timber harvesting land base (THLB) analysis and therefore excluded from harvesting until the next timber supply review was completed (prior to expiry in 2020). An excerpt with reference to Cannell Lake from "TFL 26 Timber Supply Analysis and Twenty-Year Plan" is included for your reference (page 10), as well as page 8 from the AACE determination information package, and page 19 from Management Plan 9.

In 2013, the Provincial government concluded the landscape unit planning for the Hatzic Landscape Unit and spatially located old growth management areas (OGMAs) to be permanently protected to the extent practicable across the landscape. One of these OGMAs is currently located within the Cannell Lake watershed, generally adjacent to the lakeshore from 0-200m upslope, excluding the District owned private lots. A map of the watershed boundary, private lots and OGMAs is attached.

The remaining legal document pertaining to the community watershed is within our 2007-2012 Forest Stewardship Plan with an effective extended expiry date of March 31, 2017. Attached is page 6 and 7 of that plan and describes the objectives set by government and TFL's results and strategies to meet the objectives.

In regards to future management, potential for harvesting, inclusion into the timber harvesting landbase, the current management objectives are valid until 2020. We will not make any amendments until a new timber supply analysis is required.

P.O. Box 20, 33835 Dewdney Trunk Road, Mission, B.C. V2V 4L9
Phone: 604-820-3762 Fax: 604-826-8633 Web Site: www.mission.ca E-mail: boneal@mission.ca

The District of Mission Forestry Department Is SAFE Company Certified as of December 2006

As a leader in protecting the environment, a comprehensive Environmental Management System is used for Mission Tree Farm Licence 26 operations

However, there have been two instances where our adjacent operations have caused an operational planning issue. The line demarcating the watershed boundary on a one dimensional map was generated following the height of land from digital contour information. It is known that the contour maps have some margin of error. As a result, our harvest layout crew has followed logical harvesting operational boundaries in the field, and in good faith located them outside of where they determined height of land to be in the field. Once field notes have been entered into the computer and plotted onto the digital map base, sometime it appeared that the blocks were located within the fictional watershed boundary, when in fact, in real life, they does not. It has caused a lot of administrative difficulties.

For the purposes of protecting and maintaining the water quality within Cannell lake, we feel a more reasonable approach would be to permanently agree to a measurable slope distance from the existing shoreline where no disturbance would be permitted. A field measurable slope distance would give us the ability to complete minor harvesting on the upper boundaries when harvesting generally outside of the watershed, as we could ensure we have met or exceeded the minimum slope distance away from the lakeshore, rather than not being able to locate the actual height of land in the field (which in some instances is not feasible).

We would also need the ability to amend the area protected from harvesting if the lake level were to increase in time for more water storage purposes, and provisions for tree removal to accommodate a rise in lake level.

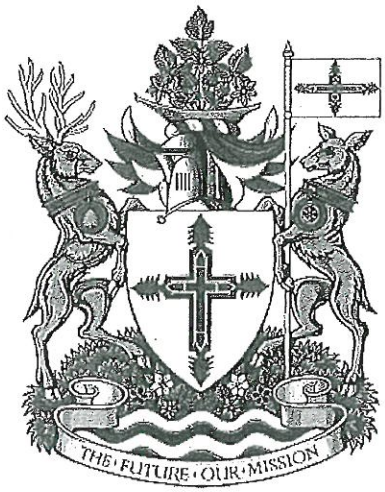
So at this time, we are not able to commit to permanently protecting all timber within the Cannell Lake watershed. However, we would be willing to work together to create a workable protected area strategy that can eventually be incorporated in our planning documents as they come up for renewal.

Yours truly

Bob O'Neal, RPF
DIRECTOR OF FOREST MANAGEMENT

g:\correspondance\Cannell Lake harvesting plans.docx

DISTRICT OF MISSION
MISSION MUNICIPAL FOREST



TIMBER SUPPLY ANALYSIS AND TWENTY-YEAR PLAN

-TREE FARM LICENCE #26 -

Submitted to the Timber Supply Branch,

B.C. Ministry of Forests

July, 2001

Version 2.0

Prepared with assistance from:

Forest Ecosystem Solutions Ltd.

#210 - 275 Fell Avenue, North Vancouver, B.C.

V7P 3R5

latest forest development plan. These commercial thinning areas have been identified and are applied in the analysis. Mission estimates that between 2.5% and 5% of the merchantable volume is left in reserves on harvested blocks in addition to permanent reserves and wildlife tree patches. In the analysis, a 3.5% volume reduction was applied to account for the reserves and is applied to those polygons that had received less than a 10% area net down due to other resource value reductions.

- Incremental silviculture - Mission is using genetically improved seed for all planting. A total of 172 hectares has been spaced in the past. This analysis assumes that the majority of regenerated stands will be spaced as per table 8.7.1.b of the Analysis Information Package.

- Forest health and unsalvaged losses - Timber losses to fire, wind and pest damage are assumed to average 115 m^3 per year over the planning horizon.

- Green-up - Before harvesting can occur in a stand, adjacent stands must reach a green-up height of 3 m in integrated resource management (IRM) zones. The area that does not meet green-up conditions cannot exceed 33% in IRM zones at any given time. This prevents over concentration of harvest in any specific area.

- Protection of environmentally sensitive areas (ESA) – ESA's represent areas with potentially unstable soils, avalanche tracks, recreation activities, regeneration problems, and habitat for various wildlife species. These areas have been completely or partially removed from the THLB.

- Domestic and community watersheds – Since there is no harvesting within the Cannell Lake community watershed, it was removed from the THLB. Within the Kenworthy Creek watershed a maximum of 30% of the watershed area is allowed to be less than the green-up height of 7 m. This green-up height, which is substantially more than that of the IRM zone, is used as a surrogate for equivalent clearcut area rule.

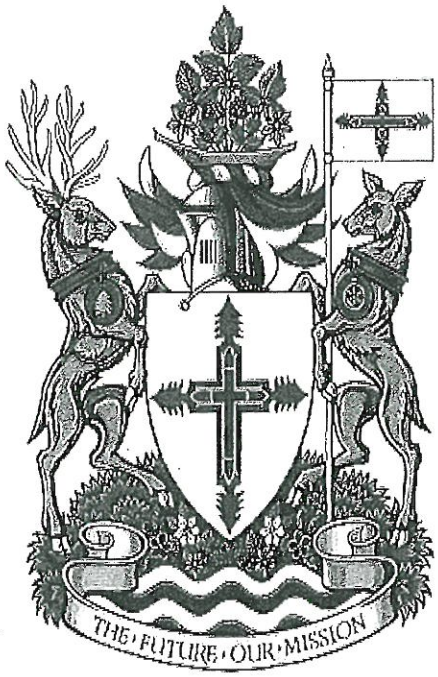
- Maintenance of scenic values - Visible evidence of harvesting must be kept within specific limits within visually sensitive areas of the TFL. The maximum proportion of each scenic area that may be covered by young stands that are shorter than the green-up height varies throughout the TFL depending on visual quality class and characteristics of the forest. In areas classified as partial retention, 5-15% may be less than 4 meters tall. In areas classified as modification, 20% may be less than 4 meters tall.

- Minimum harvestable ages (MHA) – MHA refers to the time it takes for stands to reach a merchantable condition. The analysis units classified as having a good site index will be available for harvest at 600 m^3/ha or at max MAI, while 500 m^3/ha and 400 m^3/ha are the minimum volume requirements for the medium and poor analysis units respectively, unless maximum MAI is achieved first.

DISTRICT OF
Mission
ON THE FRASER
FORESTRY DEPARTMENT

Information Related to a New AAC Determination for Mission TFL 26

Version: November 18, 2009



Prepared by Kim Allan, RPF
Director of Forest Management, District of Mission

- Although a sensitivity analysis was not done in 2001, the District of Mission provided the following information to MOF staff in 2005 regarding the water resources for Cannell Lake. This information is still valid today: "*There is still no harvest activity in the Cannell Lake Watershed. It is possible in future that some harvesting could occur in the upper part of the watershed although there is currently no planning for this*".
- Although this is not a sensitivity analysis, regarding the harvesting performance of TFL 26, Table 1 below (source MOF Cut Control statements) is provided. The figures show the amount of timber harvested plus waste and residue in TFL 26 since the approval of the last timber supply analysis in 2001:

Table 1: TFL 26 Harvesting Performance 2001 – 2008 (source: MOF Cut Control Statements)

Year	Cubic Metres (m3) Charged to TFL 26 Cut Control by MOF	Approved Allowable Annual Cut – District of Mission Portion (cubic metres)
2001	40,284	43,398
2002	47,612	43,398
2003	50,493	43,398
2004	43,425	43,398
2005	47,761	43,398
2006	40,267	43,398
2007	59,331	43,398
2008	26,824	43,398
Total in 8-year period	**355,997**	**347,184**
Average in 8-year period	**44,500**	**43,398**

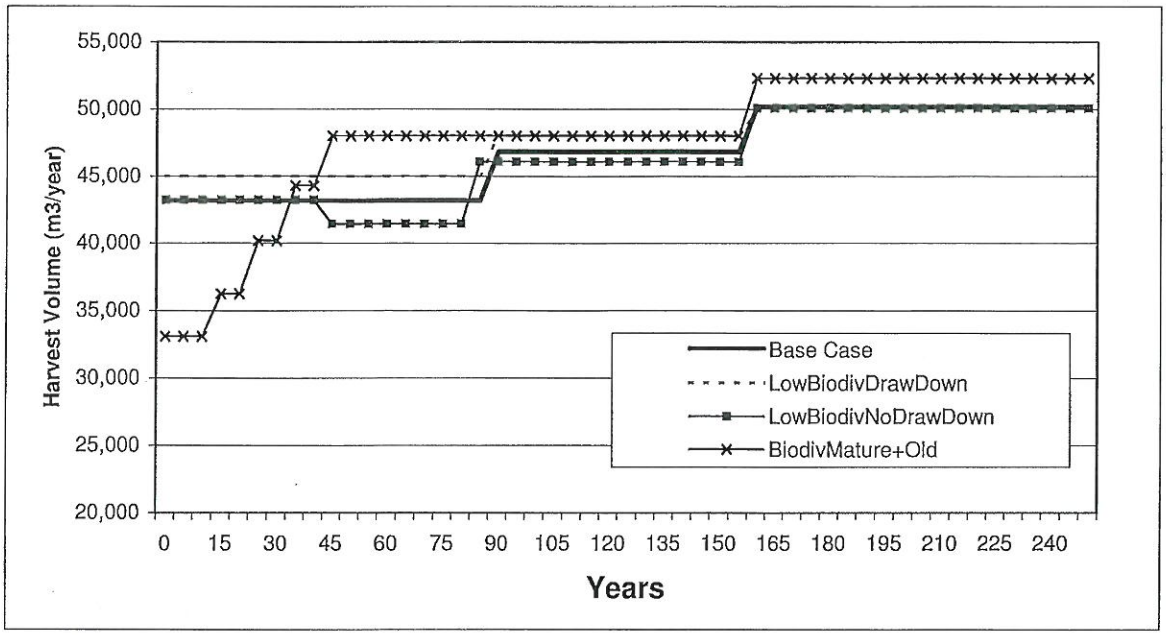
Analysis of harvesting performance/cut control figures:

- For the five-year cut control period for 1999 – 2003, the assessed performance by the MOF Coast Forest Region was 97.2% which was determined from a total volume harvested of 210,897 m3 compared to the total allowable annual cut of 216,990 m3.
- For the five-year cut control period for 2004 – 2008, the assessed performance by the MOF Coast Forest Region was 100.3% which was determined from a total volume harvested of 217,608 m3 compared to the total allowable annual cut of 216,990 m3.
- For the combined ten-year period from 1999 - 2008, the percent harvest was 98.7% which was determined from a total volume harvested of 428,505 m3 compared to the total allowable annual cut of 433,980 m3.
- This variance of only 1.7% between the actual timber harvested and allowable annual cut over the past ten-year period indicates a very stable timber volume utilization status in TFL 26.

- Pages 39-40 discuss a sensitivity analysis of the harvest forecast to landscape level biodiversity.

  This sensitivity analysis compared three biodiversity options to the base case and concluded that certain increases or decreases were suggested depending on the option considered. Figure 4 illustrates this sensitivity analysis and additional details can be found in the 2001 TSA for TFL 26.

Figure 4: Base Case and Biodiversity Sensitivity Harvest Forecasts (source: 2001 TSA for TFL 26)



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2002	47,612	43,398
2003	50,493	43,398
2004	43,425	43,398
2005	47,761	43,398

Result or Strategy	The licensee will undertake to retain the following levels of standing trees in the Riparian Management Zones:

Column 1 - RIPARIAN CLASS	Column 2 - RMZ BASAL AREA RETENTION [1]
S1-A & S1-B	≥ 20%
S2 & S3	≥ 20%
S4 & S5[2]	≥ 10%
S5[3] & S6	≥ 0%
W1, W2, W3, W4 & W5	≥ 10%
L1-A & L1-B	≥ 0%
L2, L3 & L4	≥ 10%

[1] Merchantable and non-merchantable conifer and deciduous trees.
[2] Valley or non-valley bottom stream dependent on woody debris or streamside trees to maintain channel and/or stream-bank stability
[3] Non-valley bottom stream not dependent on woody debris or streamside trees to maintain channel and/or stream-bank stability

Management Application – When forest development is planned in a riparian management zone, the licensee will use a qualified professional to conduct a field assessment and develop a prescription considering the factors relating to objectives set by government for water, fish, wildlife and biodiversity in riparian areas in FPPR Schedule 1, section 2. The licensee will conduct forest operations in accordance with the developed prescriptions. The basal area retention is to be met over each Cutting or Road Permit and not necessarily on each individual stream, wetland or lake.

Application: All FDUs in TFL 26.

Table 7	Objectives Set by Government for	**FISH HABITAT IN FISHERIES SENSITIVE WATERSHEDS**
Regulation:	FPPR S. 8.1	
Objective as set:	Until December 31, 2005, to prevent to the extent described in subsection (3) the cumulative hydrological effects of primary forest activities in the fisheries sensitive watershed from resulting in a material adverse impact on the habitat of the fish species for which the fisheries sensitive watershed was established.	
Result or Strategy	This section does not apply, as there are no fisheries sensitive watersheds identified for TFL 26.	
Application: N/A		

Table 8	Objectives Set by Government for	**WATER IN COMMUNITY WATERSHEDS**
Regulation:	FPPR S. 8.2	
Objective as set:	For water being diverted for human consumption through a licensed waterworks in a community watershed is to prevent to the extent described in subsection (3) the cumulative hydrological effects of primary forest activities within the community watershed from resulting in: (a) A material adverse impact on the quantity of water or the timing of the flow of the water from the waterworks, or (b) The water from the waterworks having a material adverse impact on human health that cannot be addressed by water treatment required under: (i) An enactment, or (ii) The licence pertaining to the waterworks.	

Result or Strategy	There are two community watersheds entirely within TFL 26: Cannell Lake and Kenworthy Creek. A small portion of the Kanaka Creek community watershed is within TFL 26 on part of the western boundary. The licensee, when carrying out primary forest activities, will do so in a manner that is consistent with recommendations in a hydro-geomorphological assessment or watershed assessment as determined and prepared by a qualified professional.
Application: All FDUs in TFL 26.	

Table 9a	Objectives Set by Government for	**WILDLIFE AND BIODIVERSITY – LANDSCAPE LEVEL**
Regulation:	FPPR S. 9	
Objectives as set:	Without unduly reducing the supply of timber from British Columbia's forests and to the extent practicable, to design areas on which timber harvesting is to be carried out that resemble, both spatially and temporally, the patterns of natural disturbance that occur within the landscape.	
Result or Strategy	Maximum cutblock size: In accordance with the opportunity provided under FPPR 12.1(3), the licensee undertakes to comply with FPPR S. 64 during the term of this FSP.	
	Harvesting adjacent to another cutblock: In accordance with the opportunity provided under FPPR 12.1(3), the licensee undertakes to comply with FPPR S. 65 during the term of this FSP.	
Application: All FDUs in TFL 26.		

Table 9b	Objectives Set by Government for	**WILDLIFE AND BIODIVERSITY – STAND LEVEL**
Regulation:	FPPR S. 9.1	
Objectives as set:	Without unduly reducing the supply of timber from British Columbia's forests and to the extent practicable, to design areas on which timber harvesting is to be carried out that retain wildlife trees.	
Result or Strategy	Wildlife tree retention: The licensee has identified and spatially located a minimum of 13% of the total TFL land base under long term and rotational reserves, to be retained as required under FPPR Sec 66(3). The minimum 13% will be managed for the length of the licence. Wildlife tree retention on a cutblock basis will range from 0 – 10% of total cutblock volume.	
	Restriction on harvesting: In accordance with the opportunity provided under FPPR 12.1(4), the licensee undertakes to comply with FPPR S. 67 during the term of this FSP.	
Application: All FDUs in TFL 26.		

Table 10	Objective Set by Government for	**VISUAL QUALITY**
Regulation:	FPPR S. 9.2	
Objective as set:	In relation to visual quality for a scenic area, that: (a) Was established on or before October 24, 2002, and (b) For which there is no visual quality objective is to ensure that the altered forest landscape for the scenic area (c) In visual sensitivity class 1 is in either the preservation or retention category, (d) In visual sensitivity class 2 is in either the retention or partial retention category, (e) In visual sensitivity class 3 is in either the partial retention or modification category,	

Appendix D – 2017-2022 Forest Stewardship Plan

DISTRICT OF
Mission
ON THE FRASER

TREE FARM LICENCE NO. 26
(Mission Municipal Forest)

FOREST STEWARDSHIP PLAN
2017- 2022

Preparer of the Plan:

Signature and Seal

I certify that the work described herein fulfils the standards expected member of the Association of British Columbia Forest Professionals and that I did personally supervise the work.

November 4, 2016
Bob O'Neal, RPF
Director of Forestry

REGISTERED FOREST TECHNOLOGIST
PROVINCE
OF
KELLY J. KITSCH
BRITISH
COLUMBIA
NO. 0367

Signature and Seal

I certify that the work described herein fulfils the standards expected of a member of the Association of British Columbia Forest Professionals.

November 4, 2016
Kelly Kitsch, RFT
Forest Technologist

Authorized Licensee Signature:

Ron Poole, Chief Administrative Officer
I certify that this Forest Stewardship Plan is authorized on behalf Of the District of Mission

November 4, 2016
District of Mission

TABLE OF CONTENTS

1.0 DATE OF SUBMISSION

The date of submission of the original replacement Forest Stewardship Plan (FSP) is, for the purposes of Forest Planning and Practices Regulation (FPPR) Sections 7, 14 and 26 and Forest and Range Practices Act (FRPA) Section 196(3), November 4, 2016 (the "Date of Submission").

2.0 ABBREVIATIONS

"AIA" means Archaeological Impact Assessment
"BA" means basal area (m^2)
"CMT" means Culturally Modified Tree
"CP" means Cutting Permit
"DDM" means Designated Decision Maker
"FDU" means Forest Development Unit
"FLNRO" means the Ministry of Forests, Lands and Natural Resource Operations
"FPC" means Forest Practices Code (rescinded)
"FRPA" means the Forest and Range Practices Act
"FPPR" means the Forest Planning and Practices Regulation
"FVIPC" means the Fraser Valley Invasive Plant Council
"GAR" means the Government Actions Regulation
"GWM" means General Wildlife Measure
"IAPP" means the provincial Invasive Alien Plant Program
"LU" means "Landscape Unit", which are as established in the LUO, Schedule 1
"LUO" means the Land Use Objectives Order
"NAR" means Net Areas to be Reforested
"PAS" means Permanent Access Structure
"PRRO" means People of the River Referral Office
"RMA" means Riparian Management Area
"RMZ" means Riparian Management Zone/"RRZ" means Riparian Reserve Zone
"RP" means Road Permit
"rVQC" means recommended Visual Quality Class
"SEA" means Strategic Engagement Agreement
"VIA" means Visual Impact Assessment
"VQO" means Visual Quality Objectives
"TFL" means Tree Farm Licence"
"WHA" means Wildlife Habitat Area

Species Acronyms:

Ba – amabalis fir	Bg – grand fir
Cw – western red cedar	Fd – Douglas-fir
Hm – mountain hemlock	Hw – western hemlock
Se – Engleman spruce	Ss – sitka spruce
Pw – western white pine	Yc – yellow cedar

3.0 APPLICATION OF THIS FSP

3.1 Licensee and Licence

This Forest Stewardship Plan (FSP) applies to all of District of Mission Tree Farm Licence 26 (TFL 26). TFL26 is 10,515 hectares within the municipal boundaries and comprised of 88% crown land and 12% municipally owned forest. The current allowable annual cut for TFL 26 is 43,398 cubic metres, with an additional 1,602 cubic metres available annually within the BC Timber Sales program.

3.2 Cutblocks and Roads to Which the Forest Practices Code (FPC), Not This FSP Will Apply

There are no cutting permits remaining in effect under the provision of the FPC as of the submission date of this FSP. All new cutting permits and road permit application after the Effective Date of this FSP will be subject to this plan.

4.0 TERM OF THIS FSP

The term of this FSP commences on the date of FSP approval by the Designated Decision Maker (DDM) and expires 5 years after the date of approval, or another date specified in writing by the Minister or DDM.

This FSP may be:

- Terminated earlier if the District of Mission elects to replace it with another approved FSP; or
- Extended by the minister pursuant to applicable Acts and Regulations

5.0 FOREST DEVELOPMENT UNITS (FDUs)

5.1 Map

The overview FSP map (Appendix 1) shows the boundaries of TFL 26 and other relevant features and a 1:20,000 scale map is also available.

5.2 FDUs in Effect as of Date of Submission of this FSP (FPPR S. 14(1)(b))

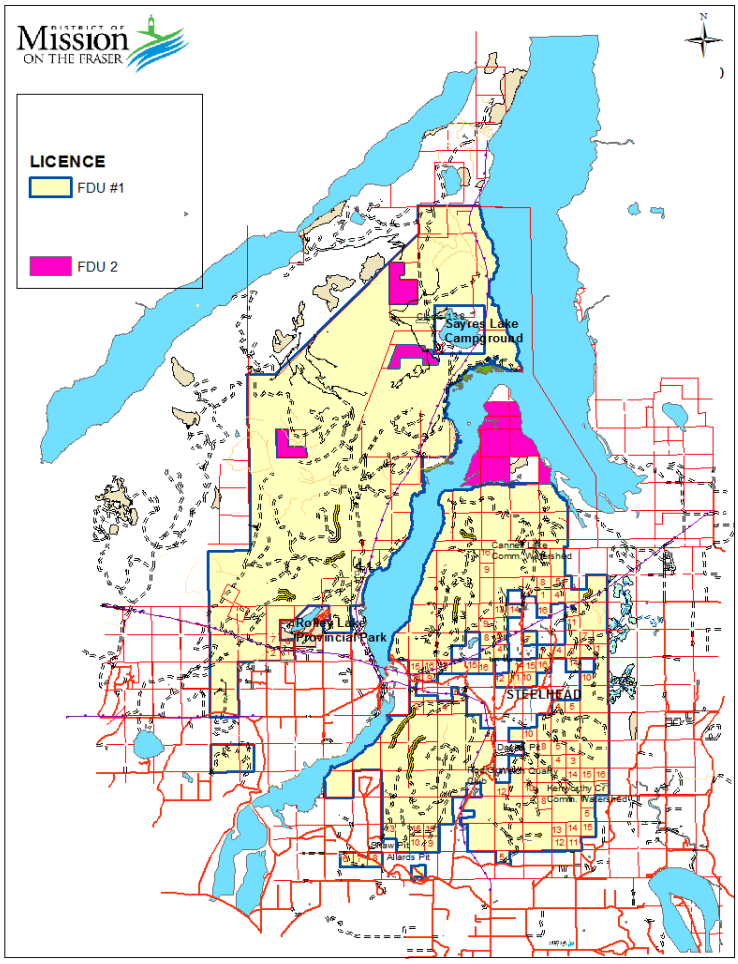
FDUs indicate areas that will contain forest development activities and that will have a common set of objectives, results and strategies.

FDUs in effect as of the Date of Submission area: FDU #1–District of Mission TFL26

5.3 New Forest Development Units

There are two FDUs included in this plan for TFL26. FDU #1 covers the existing TFL26 tenure area and is in effect at the time of the submission, and a proposed FDU #2 for the purposes of facilitating a potential transfer of vacant crown land within the TFL26 boundary, currently excluded from the TFL26 tenure area. FDU #2 as identified may be incorporated under TFL26 during the term of this FSP, with comparable lands in FDU #1 removed in order to facilitate a future First Nations Woodland Licence adjacent to TFL26.

Figure 1: Forest Development Units within TFL26



5.4 Forest Development Plan (FDP) Roads and Cutblocks With Assessments Complete

In accordance with FRPA S. 196(1) and FPPR S. 14(1)(c), there are no cutblocks and roads remaining to be harvested in Category 'A' in this Forest Stewardship Plan.

6.0 STOCKING STANDARDS

6.1 Current Stocking Standards

Stocking standards are the stocking and free growing standards developed by Mission and approved by the FLNRO. These standards apply when establishing a free growing stand and are described for each Standards Unit. The Licensee will apply FPPR 44 on all areas where a Free Growing Stand is required to be established by FRPA 29. The stocking standards to be used in this FSP are listed in Appendix 1.

6.2 Projected Climate Scenarios on Stocking Standards

While not a legal requirement, the following information regarding elk management and actions to address climate change are provided to demonstration that these factors have been taken into account in the development of the Current Stocking Standards.

From *"Updates to the Reference Guide for FSP Stocking Standards (2014): Climate-Change Related Stocking Standards"*, it is projected that CWHvm1 ecosystems will have similar climate through to 2080 (>75%). The majority of the FDU(s) are comprised of CWHdm and CWHvm1 and transitional bands between the two ecosystems. Preferred and acceptable species remain much the same for the next rotation, and as FSPs get replaced, this can continue to be monitored for the best information available.

6.3 Elk Standards

At the time of this FSP preparation, there are no elk populations present within the FDU(s) in TFL26, nor any reports of populations adjacent. There are no elk standards included for consideration.

6.4 Actions To Address Climate Change

The Licensee monitors the forest stand health (biotic and abiotic) and species form and vigour during silviculture surveys, stand monitoring, and in the course of completing other forest management activities on a year-round basis. In "Adapting Natural Resource Management to Climate Change in the West and South Coast Regions", the province states that ecosystems will likely undergo both predictable and unpredictable ecological shifts.

Current non-climate related forest health issues include hemlock dwarf mistletoe (low incidence), root rots (low incidence), and western hemlock looper (very low incidence). Possible climate change related forest health issues include drought (low incidence), windthrow (low - increasing), and within the last ten years, incidences of swiss needle cast on Douglas-fir under 20 years of age (moderate-high incidence, low mortality to date).

6.4.1 Health and Disease Management

Swiss needle cast is present in most young forest stands (<20 years) and the FNRLO has been conducting research and monitoring since 2012 into the cause, rates of spread, and ongoing impact. It is suspected that successive years of cool wet springs may be the cause of the current outbreak and spread the disease and only through continual monitoring will there be conclusive evidence of whether climate change is accelerating the disease.

From 2012 surveys, most Douglas-fir still appear to be growing with normal, consistent growth increments. As a general summary, it appears that when the trees reach layer 1 in size (>12.5cm dbh) the effects of Swiss Needle cast became less obvious and most Fdc

appear to be recovering and growing as well as the site indexes for their particular biogeoclimatic series predict.

The licensee has made adjustments to species composition in its reforestation practices by increasing the amount of cedar planted throughout the licence area, in hopes to promote resilience by increasing species diversity. This adjustment will not only lesson the potential risk of future losses or impacts to Douglas-fir, but will also assist in increasing the long term cedar supply for First Nations and restore cedar closer to the percentage it was in the first pass.

Swiss Needle Cast documentation is attached in the supporting documentation.

Western spruce budworm, which infects Douglas-fir (80%) stands on warm dry sites are noted in the 2015-2017 Timber Supply Area Forest Health Overview, however no incidences have been recorded to date within TFL26.

Douglas-fir bark beetle is a native insect that attached fresh windthrow or trees predisposed by other factors such as drought, defoliation or root diseases. Douglas-fir bark beetle has not been noted as a pest of concern within TFL26. This could be for the reason that Douglas-fir species distribution accounts for less than 30% of forest stands. Douglas-fir that are maintained as wildlife tree retention or leave trees could be susceptible should windthrow occur. Efforts are made by the Licensee to reduce windthrow through heli-pruning, and this practice will continue to be analyzed for its effectiveness. Also, every effort will be made to avoid leave trees on rocky shallow soils prone to experience more windthrow than other sites. Salvage of windthrow trees is completed if easily accessible and minimal impact to surrounding forests can be achieved.

Hemlock Dwarf Mistletoe is present in low amounts within TFL26 due to the amount of second growth forests existing in the licence area. As over mature stands of hemlock develop, increases could be experienced. Harvesting patterns will target these stands as a priority.

6.4.2 Drought management

Losses from recent droughts (< 5 years) have typically occurred on rock outcrops and areas with shallow soils. While drought cannot be managed or prevented, ensuring adequate minimum stocking in accordance with the stocking standards will assist in maintaining acceptable densities through the rotation period. With drought mortality, comes an increase in forest fuels. Efforts are taken to ensure that in areas where mortality has occurred that are accessible to the public, that fuels are removed where possible.

6.4.3 Windthrow management

Storm events with high winds are occurring more frequently, causing windthrow on forested edges and on group reserves and variable retention leave trees. The licensee makes efforts to maintain deep rooted species such as Douglas-fir as leave trees, and completes heli-pruning annually on all harvested areas with leave trees or windprone edges in accordance with specification set out in the cutting permits. It has been successful, however the unpredictable timing of storm events has resulted in an increase in windthrow in areas that have previously weathered the storms (>5 years). High windthrow has occurred after periods of drought (soils have reduced binding capacity) and higher than average rainfall in a 24 hr period (soils too loose). Windthrow will continue to be managed through prevention (ie: cutblock design, size, location, reserve tree selection criteria, heli-pruning).

The licensee recognizes the limitations of ecological and climate models, and the uncertainty of climate change predictions. In recognizing past and current forest health issues, the licensee will continue to gather information, and has developed these short term strategies to ensure a healthy rotation given the knowledge of the best available information to date. Continual collaboration with professionals and completing innovative

practices as they are developed will assist in developing the suitable adaptation strategies for TFL26.

7.0 NATURAL RANGE BARRIERS

No range activities or practical opportunities exist for range within TFL26, therefore no measures are needed to deal with effects on natural range barriers.

8.0 CUMULATIVE EFFECTS OF MULTIPLE FSPS

The following licensees hold FSPs which cover all or portions of TFL 26:

British Columbia Timber Sales Program: *MTFL FDU*
Leq'a:mel Forestry Limited Partnership: *FDU – Hatzic*.
Teal Cedar Products Ltd: *FDU #2 – Hatzic* (adjacent)

The licensee plans to communicate in writing with the relevant forest licenses to discuss situations involving potential cumulative effects, including but not limited to adjacency, green-up, and operational adjustments to OGMAs. If holders of FSPs on overlapping FDUs are unable to reach an agreement for sharing the responsibility to obtain results consistent with objectives set by government then request would be made to the minister to act under section 9 of the FRPA.

9.0 COMMUNITY WATERSHEDS

There are two community watersheds entirely within TFL 26, and a small portion of the Kanaka Creek community watershed within TFL 26 on part of the western boundary.

Cannell Lake watershed is a secondary source of water to the communities of Mission and Abbotsford and managed by the Abbotsford-Mission Water Sewer Commission. No harvesting has been completed in Cannell Lake watershed during the history of TFL26, and there are no plans under the term of this FSP to complete any forestry operations in accordance with the Licence.

Kenworthy Creek Community Watershed is 278 ha on the south-east side of TFL26. It supplies an unknown number of agricultural/domestic users.

The Government Actions Regulation section 8 has not specified water quality objectives for any watersheds within TFL26.

10.0 REFERRAL AND INFORMATION SHARING

In accordance with FPPR sections 20, 21 and 22, this FSP is being made available to the general public and stakeholders for review and comment. This is being done through advertisements in the Mission City Record, Abbotsford News, through letters sent to known interested stakeholders, via an open house at the Mission Leisure Centre and placement on Mission's website. Copies of the advertisement, listing of all stakeholders and general referral letters are included in Appendix 3. Comments upon completion of the referral period are included in Appendix 4.

Given the community nature of TFL26, enquiries are taken throughout the year from residents and visitors to Mission. Items requiring action or further correspondence (ie: not general questions in nature), are documented on a Record of Discussion form and filed electronically. Operational maps are updated at a minimum of annually, or after each new approved Cutting Permit and available at the licensee's office during regular business hours.

11.0 REVISIONS

Any revisions to this FSP are or will be summarized in Appendix 4.

12.0 HIGHER LEVEL PLANS – LANDSCAPE UNITS

Within the Chilliwack Natural Resource District, landscape unit plans have been established under Ministerial Order with objectives set by government. TFL26 lies mainly within the Hatzic LU, with a small portion on the western boundaries lying in the Alouette LU. The Order is included in the supporting material, with the objectives included in Table 1.

<table>
<tr><td>Table 1</td><td colspan="2">Objectives Set by Government for</td><td>Old Growth Management Areas</td></tr>
<tr><td>Regulation:</td><td colspan="3">Section 93.4 of the Land Act</td></tr>
<tr><td>Objective as set:</td><td colspan="3">Pursuant to Sections 93.4 of the Land Act, the following objectives are established and came into effect February 14, 2013.

Excerpt From Table A (as applying to TFL26)
<table>
<tr><th>Landscape Unit</th><th>BEC Variant</th><th>Min requirement of BEC Variant to be retained as OGMA</th></tr>
<tr><td>Alouette</td><td>CWHdm</td><td>>9%</td></tr>
<tr><td></td><td>CWHvm1</td><td>>13%</td></tr>
<tr><td></td><td>CWHvm2</td><td>>13%</td></tr>
<tr><td></td><td>MHmm1</td><td>>19%</td></tr>
<tr><td>Hatzic</td><td>CWHdm</td><td>>9%</td></tr>
<tr><td></td><td>CWHvm1</td><td>>13%</td></tr>
<tr><td></td><td>CWHvm2</td><td>>13%</td></tr>
<tr><td></td><td>MHmm1</td><td>>19%</td></tr>
</table>
Retain forests in the OGMAs identified in accordance with the amounts set out in Table A except where necessary for the following:
(a) Topping or pruning of trees along boundaries necessary to improve windfirmness.
(b) Sanitation to prevent the spread of insect infestations or diseases that pose significant threat to forested areas.
(c) Removal of danger trees or brushing and clearing on existing roads under active tenure within the right-of-way necessary for safety purposes.
(d) Recreation trail and site maintenance or development to address public safety.
(e) Felling trees for guyline clearance or tailholds. Any trees felled for tailhold or guyline purposes are to be left on site to function as coarse woody debris, unless the felled tree(s) poses a significant risk to forest health.

(2) In addition to 4(1)(a) to (3), harvesting within any OGMA is permitted, provided that all the following apply:
(a) harvesting is required to provide for:
i a logical harvesting boundary, or
ii road or bridge construction to access resource values beyond or adjacent to the OGMA and no other practicable option for road or bridge location exists;
(b) The area harvested does not exceed the greater of:
i two hectares, or
ii 5% of the area of the OGMA; and
(c) The biological diversity of the OGMA is maintained.

(3) Replacement forest is required if the total area of an OGMA that is subject to the activities pursuant to 4(1) and 4(2) exceeds 0.5 ha. Replacement forest must be of an equal or greater area of forest, with equivalent or greater ecological attributes, in order of priority:
(a) contiguous to the OGMA in the same BEC subzone or variant; or,</td></tr>
</table>

	(b) contiguous to another OGMA in the same BEC subzone or variant. (4) Area harvested and the area replacing the area harvested made in accordance with 4(3), including attributes and rationale, must be document and submitted to the delegated decision maker at the end of each calendar year. Digital spatial data must be as 'shape file' and BC Albers projection.
Results or Strategy	In accordance with FPPR Section 25 (1) and (2), the Licensee will accept all Objectives specified under the Order and retain forests as specified under the Objectives. As specified in FPPR Section 25.1 (2): If an established objective is comprised of measurable or verifiable steps, processes or outcomes, an intended result or strategy that (a) is specified in a forest stewardship plan for that objective, (b) restates the same measurable or verifiable steps, practices or outcomes, and (c) describes the circumstances in which those measurable or verifiable steps, practices or outcomes are to be achieved or carried out, is to be considered to be consistent with objectives set by government and with the other established objectives to the extent practicable, as described in subsection (1) of this section. The licensee plans to communicate with other relevant forest licensees in the Hatzic and Alouette LUPs to discuss potential cumulative effects with the intent to ensuring that the overall objective is met whenever an OGMA within TFL26 is proposed for harvest/replacement exceeding 0.5 ha.
Application: FDU #1 and FDU #2.	

13.0 OBJECTIVES, STRATEGIES AND RESULTS

The Government has established objectives for ten forest resource values in legislation, regulation or approved higher level plans under the FPPR Sections 5-10, or other acts that affect land management. To facilitate implementation of these objectives, government has established practice requirements and/or provision for the development of Results and/or Strategies, or combinations thereof, to be defined within the FSP.

Strategies mean a description of:

(a) measurable or verifiable steps or practices that will be carried out in respect of a particular established objective, and

(b) the situations or circumstances that determine where in a forest development unit the steps or practices will be applied

Results mean a description of:

(a) measurable or verifiable outcomes in respect of a particular established objective, and

(b) the situations or circumstances that determine where in a forest development unit the outcomes under paragraph (a) will be applied

13.1 Objectives Set by Government Under FRPA S. 149

Table 2	Objectives Set by Government for	**SOILS**
Regulation:	FPPR S. 5	
Objective as set:	Without unduly reducing the supply of timber from British Columbia's forests, to conserve the productivity and the hydrologic function of soils.	
Result or Strategy	Soil disturbance limits: In accordance with the opportunity provided under FPPR 12.1(1), the licensee undertakes to comply with FPPR S. 35 during the term of this FSP.	
	Permanent Access Structure Limits: In accordance with the opportunity provided under FPPR 12.1(1), the licensee undertakes to comply with FPPR S. 36 during the term of this FSP.	
Application: FDU #1 and FDU #2		

Table 3	**Objectives Set by Government for**	**TIMBER**
Regulation:	FPPR S. 6	
Objectives as set:	(a) Maintain or enhance an economically valuable supply of commercial timber from British Columbia's forests, (b) Ensure that delivered wood costs, generally, after taking into account the effect on them of the relevant provisions of this regulation and of the Act, are competitive in relation to equivalent costs in relation to regulated primary forest activities in other jurisdictions, and (c) Ensure that the provisions of this regulation and of the Act that pertain to primary forest activities do not unduly constrain the ability of a holder of an agreement under the *Forest Act* to exercise the holder's rights under the agreement.	
Result or Strategy	In accordance with FPPR section 12(8), "*A person who is required to prepare a forest stewardship plan is exempt from the requirement to prepare results or strategies for an objective set by government for timber*." Therefore, no results or strategies are included in this FSP.	
Application: N/A		

Table 4	Objectives Set by Government for	**WILDLIFE**
Regulation:	FPPR S. 7	
Objectives as set:	Without unduly reducing the supply of timber from British Columbia's forests, to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas, for (a) The survival of species at risk, (b) The survival of regionally important wildlife, and (c) The winter survival of specified ungulate species.	
Result or Strategy (in accordance with FPPR S. 7(2)	A Notice given August 2007 with respect to *Wildlife Habitat Areas for Pacific Water Shrew* has not been fulfilled. At the time of writing this FSP, there are no known detections or current inventoried sites of Pacific Water Shrew within TFL26. The licensee has: • identified and spatially located a minimum of 13% of the total TFL26 land base under long term and rotational reserves, to be retained as required under FPPR Sec 66(3). The majority of these reserves are located along riparian corridors, around wetland or aquatic features or in otherwise isolated old growth patches, with landscape connectivity, which will aid in the protection of habitat requirements for possible locations of Pacific Water Shrew as listed in the identified wildlife management strategy, provided in the supporting documentation. Long term reserves are those that are planned to be retained longer than >80 years. Rotational reserves are those that are planned to be retained for a minimum of 80 years, after which they could be harvested and replaced with a comparable forest stand in size of area, age distribution, or recruitment area. Areas currently outside of the identified 13% of long term and rotational reserved landbase that potentially meet the species habitat criteria will be observed during cutblock and road engineering to monitor for any detections of the Pacific Water Shrew. When any riparian inventories or assessments occur within or adjacent to riparian areas, qualified professionals will be instructed to monitor for possible occurrences in conjunction with their work. Detections will continue to be monitored during primary forestry activities. If any detections of Pacific Water Shrew are found in TFL 26, during preliminary or primary forestry activities and operations, the licensee will report this through the BC Conservation Data Centre website and discuss management options or course of action with the FLNRO or qualified professional. The Licensee will assist all agencies and stakeholders in fulfilling the WHA order. When the fulfillment of wildlife habitat areas under FPPR Section 7 are completed by the Province, the *Order–Wildlife Habitat Areas-Pacific Water Shrew-Chilliwack Forest District* will be considered as fulfilled and the Notice will be turned off.	
Application: FDU #1 and FDU #2		

Table 5	Objectives Set by Government for	**WATER, FISH, WILDLIFE AND BIODIVERSITY WITHIN RIPARIAN AREAS**
Regulation:	FPPR S. 8	
Objective as set:	Without unduly reducing the supply of timber from British Columbia's forests, to conserve, at the landscape level, the water quality, fish habitat, wildlife habitat and biodiversity associated with those riparian areas.	
Result or Strategy	Stream riparian classes: In accordance with the opportunity provided under FPPR 12.1(2), the licensee undertakes to comply with FPPR S. 47 during the term of this FSP.	
	Wetland riparian classes: In accordance with the opportunity provided under FPPR 12.1(2), the licensee undertakes to comply with FPPR S. 48 during the term of this FSP.	
	Lake riparian classes: In accordance with the opportunity provided under FPPR 12.1(2), the licensee undertakes to comply with FPPR S. 49 during the term of this FSP.	
	Restrictions in a riparian management area: In accordance with the opportunity provided under FPPR 12.1(2), the licensee undertakes to comply with FPPR S. 50 during the term of this FSP.	
	Restrictions in a riparian reserve zone: In accordance with the opportunity provided under FPPR 12.1(2), the licensee undertakes to comply with FPPR S. 51 during the term of this FSP.	
	Restrictions in a riparian management zone: In accordance with the opportunity provided under FPPR 12.1(2), the licensee undertakes to comply with FPPR S. 52(2) during the term of this FSP.	
	Temperature Sensitive Streams: In accordance with the opportunity provided under FPPR 12.1(2), the licensee undertakes to comply with FPPR S. 53 during the term of this FSP.	
Application: FDU #1 and FDU #2		

Table 6	Objectives Set by Government for	**Retention Rates in Riparian Management Zones**
Regulation:	FPPR S 12(3)	
Objective as set:	A person who prepares a forest stewardship plan must specify in it, for objectives set out in section 8, a result or strategy that address retention of trees in a riparian management zone	
Result or Strategy	The licensee will undertake to retain the following levels of standing trees in the Riparian Management Zones:	

Riparian Class	Riparian Reserve Zone	Riparian Management Zone	RMZ BASAL AREA RETENTION [1]
S1-A	0	100	≥ 20%
S1-B	50	20	
S2	30	20	
S3	20	20	
S4	0	30	≥ 10%
S5	0	30	≥ 10%
S6	0	20	≥ 0%
W1	10	40	≥ 10%
W2	10	20	
W3, W4	0	30	
W5	10	40	
L1-A	0	0	≥ 0%
L1-B	10	0	
L2	10	20	≥ 10%
L3, L4	0	30	

[1] Merchantable and non-merchantable conifer and deciduous trees, across representative dbh classes

	Management Application – When forest development is planned in a riparian management zone, the licensee will use a qualified professional to conduct a field assessment and develop a plan considering the factors relating to objectives set by government for water, fish, wildlife and biodiversity in riparian areas in FPPR Schedule 1 Section 2. Factors to be assessed include but are not limited to: tree species and composition, soils, hydrology, risk of erosion, windfirmness, wildlife habitat, operational constraints, damage to the stand or imminent threats, stream channel integrity, type timing or intensity of the forest practices to be carried out, importance or sensitivity of the riparian management area in conserving water quality, fish habitat, wildlife habitat and biodiversity, and/or other site specific factors the qualified professional deems important.
	The spatial pattern of prescribed retention will vary from single trees to groups of two or more trees, as prescribed from the field assessment and developed plan. Retained trees will be representative of the stand structure as it was prior to harvesting. The licensee will conduct forest operations in accordance with the developed plan. The basal area retention is to be measured over each Cutting Permit and not necessarily on an individual stream, wetland or lake, or cutblock. Removal of trees as safety hazards shall be carried out in adherence to WorksafeBC regulations, despite specified levels of retention.
Application: FDU #1 and FDU #2	

Table 7	Objectives Set by Government for	**FISH HABITAT IN FISHERIES SENSITIVE WATERSHEDS**
Regulation:	FPPR S. 8.1	
Objective as set:	Until December 31, 2005, to prevent to the extent described in subsection (3) the cumulative hydrological effects of primary forest activities in the fisheries sensitive watershed from resulting in a material adverse impact on the habitat of the fish species for which the fisheries sensitive watershed was established.	
Result or Strategy	This section does not apply, as there are no fisheries sensitive watersheds identified for TFL 26.	
Application: N/A		

Table 8a	Objectives Set by Government for	**WATER IN COMMUNITY WATERSHEDS**
Regulation:	FPPR S. 8.2	
Objective as set:	For water being diverted for human consumption through a licensed waterworks in a community watershed is to prevent to the extent described in subsection (3) the cumulative hydrological effects of primary forest activities within the community watershed from resulting in: (a) A material adverse impact on the quantity of water or the timing of the flow of the water from the waterworks, or (b) The water from the waterworks having a material adverse impact on human health that cannot be addressed by water treatment required under: (i) An enactment, or (ii) The licence pertaining to the waterworks. GAR Section 8 –No water quality objectives have been established for Cannell Lake or Kenworthy Creek community watersheds.	
Result or Strategy	When carrying out primary forest activities in community watersheds, the licensee will: a) ensure a watershed assessment is completed by a qualified professional, that assesses the current watershed condition; the potential impacts on water quality and quantity, including risks to public health, b) operate in a manner that is consistent with any recommendations made in the watershed assessment,	

	c) ensure the watershed assessment is completed on or before the site plan preparation stage, d) notify the watershed licence purveyor in advance of the commencement of forestry activities and provide a copy of the watershed assessment. The watershed assessment or other hydrological assessment may include but is not limited to: • analyzing current and future forest development impacts, • identifying fans and delineating watersheds as well as identifying elements-at-risk in watersheds and on fans • identifying historical and current hydrologic and geomorphic processes affecting runoff, the frequency and magnitude of peak flows, sediment delivery and sediment transport in a watershed • a qualitative risk analysis that assesses the sensitivity of the watershed to changes in the magnitude and frequency of hazardous peak flows, increases in sediment delivery or changes to riparian function, and determining changes in the likelihood for impacts (consequence and hazard) to elements at risk, given past development/disturbance and future forest development The threshold for when a watershed assessment as defined above will be completed is when proposed the gross area (excluding reserves) of forest alterations are ≥ 5% to the total watershed area, and completed in a 5 year period. To account for cumulative effects, proposed alterations will include the previous 5 year period as well as those projected to be carried out in the next 5 year period. With regards to roads and harvesting, the licensee will: • plan to minimize road requirements, • carry out annual road inspections and complete any identified road repairs within six months, • minimize soil disturbance during harvesting, • install adequate culverts and any necessary filtration measures, to ensure natural water drainage is maintained, • revegetate areas of soil disturbance with Common #1 Forage Mixture or better as defined in the Canada Seeds Act, • focus retention in riparian areas Exceptions: When development associated with basic silviculture (ie. planting, manual brushing, juvenile spacing, pruning) and forest health practices are proposed, a watershed assessment will not be required.
Application: FDU #1 and FDU #2	

Table 9a	Objectives Set by Government for	**WILDLIFE AND BIODIVERSITY – LANDSCAPE LEVEL**
Regulation:	FPPR S. 9	
Objectives as set:	Without unduly reducing the supply of timber from British Columbia's forests and to the extent practicable, to design areas on which timber harvesting is to be carried out that resemble, both spatially and temporally, the patterns of natural disturbance that occur within the landscape.	
Result or Strategy	Maximum cutblock size: In accordance with the opportunity provided under FPPR 12.1(3), the licensee undertakes to comply with FPPR S. 64 during the term of this FSP.	
	Harvesting adjacent to another cutblock: In accordance with the opportunity provided under FPPR 12.1(3), the licensee undertakes to comply with FPPR S. 65 during the term of this FSP.	
Application: FDU #1 and FDU #2		

Table 9b	Objectives Set by Government for	**WILDLIFE AND BIODIVERSITY – STAND LEVEL**
Regulation:	FPPR S. 9.1	
Objectives as set:	Without unduly reducing the supply of timber from British Columbia's forests and to the extent practicable, to design areas on which timber harvesting is to be carried out that retains wildlife trees.	
Result or Strategy	Wildlife tree retention: The Licensee has identified and spatially located a minimum of 13% of the total TFL26 land base under long term and rotational reserves, to be retained for the term of the Licence, and as required under FPPR Sec 66(3). Long term reserves are those that are planned to be retained longer than >80 years. Rotational reserves are those that are planned to be retained for a minimum of 80 years, after which they could be harvested and replaced with a comparable forest stand in size of area, age distribution, or recruitment area. Wildlife tree retention on a cutblock basis will range from 0 – 10% of total cutblock volume, representative of all species occurring within cutblock, may have evidence of existing use or not, and selection shall favor trees that provide valuable attributes such as signs of internal decay, forks, scars, large branches, vets, or poor merchantable form. Where no specific features are present, wildlife tree retention will be representative of the pre-harvest stand. In the event that removal of wildlife tree retention areas already spatially located within the 13% identified, to facilitate salvage (windthrow or forest health or imminent danger), safety hazard, to facility road construction where no alternative access exists, or operational terrain constraints for logical harvest units, then equivalent or greater area will be identified adjacent or as reasonably close to the area removed as possible.	
	Application: The Licensee will complete a site specific evaluation during the site plan development phase, during which all forest values will be taken into account when applying a specific percentage of 0-10% by total cutblock volume for wildlife tree retention. Such evaluation will include but not be limited to: wind speed and direction, scenic and non-scenic areas, riparian zones, recreation corridors, adjacent spatially located long term and rotational reserves, soil holding capacity, cutblock size and shape, tree species, wildlife habitat and suitability, visual quality objectives, and forest worker safety. Where more values are present, higher retention rates will apply. For purposes of measuring the contribution of individual wildlife trees and where site plans prescribe dispersed or group retention, silviculture surveys shall tally and report basal area or patches greater than 0.25 ha in size, as required by government through RESULTS reporting system.	
Application: FDU #1 and FDU #2		

Table 10	Objective Set by Government for	**CULTURAL HERITAGE RESOURCES**
Regulation:	FPPR S. 10	
Objective as set:	Is to conserve, or, if necessary, protect cultural heritage resources that are: (a) The focus of a traditional use by an aboriginal people that is of continuing importance to that people, and (b) Not regulated under the *Heritage Conservation Act*.	
Result or Strategy	The licensee is committed to continual information sharing with all First Nations within the traditional territories that TFL26 lies, according to the provincial Consultative Areas Database. For the First Nation communities that are signatories of the Sto:lo Strategic	

	Engagement Agreement (SEA), and all other First Nations within whose traditional territories TFL26 lies, the Licensee will: • When conducting a primary forest activity, do so in a manner that is consistent with conserving and protecting Sto:lo cultural heritage resources that are: o of particular importance and traditional use by Sto:lo community members documented through an information sharing process, and for which information is received from the affected Sto:lo SEA communities and all other First Nations communities, in accordance with Section 20 of FPPR; o recognized in the Sto:lo Hertiage Policy and that are not similarly recognized, defined, conserved and/or protected by other arrangements; o likely to be adversely impacted by the primary forest activity of the Licensee. Development and authorizations will follow the engagement steps as defined in the Sto:lo SEA Reference Guide Section 5.3 – *Defined Engagement Processes, Forestry*, as well as individual information sharing sent directly to First Nations not part of the SEA.
	The licensee will continue to communicate with the First Nations within whose traditional territories TFL26 falls, to share information regarding upcoming forest activities before new cutting permit and road permits applications are made and request input regarding potential impacts to/on aboriginal interests. The licensee will document and keep on record any cultural heritage resource information provided. Any cultural heritage resource information received will be kept confidential. The licensee will consider information received by the First Nations, as well as from any archaeological assessments, prior to finalizing development activities and review this information for the potential future additions to Results or Strategies to be amended to this FSP. The licensee will carry out forest practices that do not damage the cultural heritage resource features that have been determined to require protection or conservation by the licensee or provincial government as guided by the factors specified in FPPR Schedule 1, Part 4. The licensee will make reasonable efforts to: allow an Aboriginal People that are likely to be affected by forest management activities, a continued opportunity to provide information on cultural heritage resources; provide operational or site specific information to an Aboriginal People whenever requested. The forestry operations will be consistent with the timber harvesting rights in the agreement to which this FSP pertains, but will also, if reasonable, modify proposed operations based on the information received through the information sharing process. If an archaeological site is encountered during operations, activities will be halted immediately and First Nations and Heritage Branch will be notified.
	The licensee will continue to assess aboriginal archaeological potential using results of overview archaeological assessments as well as with input received from First Nations and government agencies and, where indicated as reasonable from the overview assessments, conduct field recces in upcoming development areas using qualified professionals to assess cultural heritage resources potential and presence.

	Regarding short-term cedar bark supply strategies, upon request from First Nations, the licensee will identify opportunities to strip bark in areas suitable areas in TFL 26 or supply contact information for any dry land sorts where TFL 26 logs have been sent.
	Regarding a long-term cedar supply and bark potential, the licensee will reforest harvested areas with the same or greater percentage of western red cedar that was present prior to harvesting. The determination of evaluating the implementation of this strategy will be done using reforestation numbers over the five year cut control period.
Application: FDU #1 and FDU #2	

13.2 Recreation Resources

TFL26 contains over 50km of recreation trails for mountain biking, hiking and horseback riding. Some trails have been designated by the crown, and all trails have not yet been 'established' under Section 56 of FRPA. The crown is currently working with the Licensee to address the trails through the formal establishment process.

13.2.1 Management applications

For the following trails designated, but not yet established through Section 56 of FRPA:

900-5501 – Hoover Lake Trail,
900-5579 – Rolley Falls Trail,
900-6239 – Stave Dam Forest Interpretive Trail,
900-6554 – Red Mountain Trail West,
900-6642 – Hayward Reservoir Trail, and

the following trails neither designated, nor established through Section 56:

Devil's Lake Trail,
Red Mt East Trail,
Red Mt. Loop Trail,
Mt. Crickmer Trail,
Steelhead Trails,
Bell Road Interpretive Trail,

the licensee will consider what impacts forest management activities will have on trails, the permanence of the impact, and develop a mitigative plan to minimize impacts in consideration of FPPR S.6 objectives set by government for timber, until such time as the trails become Established by government. Each evaluation will be completed at the cutting permit and road permit development phase with the mitigative plan detailed in the specific site plan pertaining to that adjacent road or cutblock.

Signage and/or temporary closure notices will be placed in key locations notifying trail users of industrial activities. Any direct impacts to access road or trails will be rehabilitated as close to their original state as possible. If feasible, harvesting will occur during periods of low recreation use.

Table 11a	Objective Set by Government for	**RECREATION RESOURCES - TFL26 TRAILS**
Regulation	FRPA Section 180	
Objectives as set:	There are no objectives set for trails in TFL26, except as specified in Table 11b.	
Result or Strategy	There are no results or strategies applicable as there are currently no objectives set.	
Application: FDU #1 and FDU #2.		

Table 11b	Objective Set by Government for	**RECREATION RESOURCES - WOODLOT TRAILS**
Regulation	FRPA Section 180	
Objectives as set:	The following trails are located within TFL26 for which Legal Objectives have been established under "Legal Objectives for the Woodlot Trails" May 22, 2015: • Snakes and Ladders • Johns Trail • Cabin Trail/Road to Cabin Trail The objectives have been identified as "Normal Practice", which are: a) Harvest over trail with appropriate communications. b) Appropriate communications include: i) legible, clearly worded signage in appropriate location ii) seasonal or as required (meeting frequency determined by forest professional and bike club needs) communications meetings between licensee and stakeholders describing harvest plans iii) bike club communications to members via website, work of mouth, other c) Maintain trail surface where practicable and safe d) Make hauling schedule and frequency known to road users e) Replace trail way finding signage post-harvest	
Result or Strategy	For all known recreation trails the licensee will consider what impacts the forest management activities will have on the trail, the permanence of the impact, and develop a mitigative strategy to minimize impacts in consideration of FPPR S.6 objectives set by government for timber, until such time as the Recreation Trails become established by government. Each evaluation will be completed at the cutting permit and road permit development phase with the mitigative strategy detailed in the specific Site Plan pertaining to that adjacent road or cutblock. Normal Practice objectives for Woodlot trails within TFL26 will apply as follows: • communicate intentions for harvesting over or adjacent to trails via signage, user group meetings, and/or email, • re-establish trail surface in as good or better condition upon completion of forest management activities, • communicate falling, yarding and hauling schedules, • replace any trail way finding signage post-harvest.	
Application: FDU #1 and FDU #2.		

Table 11c	Objective Set by Government for	**RECREATION RESOURCES - MISSION INTERPRETIVE FOREST**
Regulation	FRPA Section 180	
Objectives as set:	The following Interpretive Forest designation has been established through Section 56 in TFL 26 on the west side of Stave Lake: **Mission Interpretive Forest Site** (REC 106116). Legal objectives for the Mission Interpretive Forest Site established under FRPA Section 56: • Maintain the quality of the experience of forest recreation activities;	

	• Maintain or enhance where practicable the forest interpretive qualities of the site.
Result or Strategy	In the Mission Interpretive Forest Site, the licensee will, as specified in the Management Intent: a) Retain forest management as the highest priority including managing for the eleven FRPA values; timber, including forest health, soils, water, forage and associated plant communities, cultural heritage resources, recreation resources, biodiversity, resource features, fish, visual quality, and wildlife, and b) Design cutblocks and roads in a manner that is consistent with the objectives of the Interpretive Forest Site, and c) Carry out the primary forest activities only if the activities are consistent with the design for the cutblocks or roads referred to in paragraph (b).
Application: FDU #1 and FDU #2.	

Table 12	Objective Set by Government for	**VISUAL QUALITY**
Regulation:	FPPR S. 9.2	
Objective as set:	In relation to visual quality for a scenic area, that: (a) Was established on or before October 24, 2002, and (b) For which there is no visual quality objective is to ensure that the altered forest landscape for the scenic area (c) In visual sensitivity class 1 is in either the preservation or retention category, (d) In visual sensitivity class 2 is in either the retention or partial retention category, (e) In visual sensitivity class 3 is in either the partial retention or modification category, (f) In visual sensitivity class 4 is in either the partial retention or modification category, and (g) In visual sensitivity class 5 is in either the modification or maximum modification category.	
Result or Strategy	A result or strategy is not required under FPPR S. 9.2 as Visual Quality Objectives have been established via a letter dated October 17, 2005 from the Chilliwack District Manager to continue the existing recommended Visual Quality Classes (rVQCs) into Visual Quality Objectives (VQOs) under the authority of GAR S. 17.	
Application: N/A		

13.3 Objectives Established Under the Government Actions Regulation

The Government Actions Regulation (GAR) has several measures identified that could also be included under an FSP. As of the date of submission of this FSP, one such measure applies to TFL 26:

- The Chilliwack District Manager in a letter dated October 17, 2005, continued the existing recommended Visual Quality Classes (rVQCs) into Visual Quality Objectives (VQOs) under the authority of GAR S. 17.
- This determination states that a VQC is continued as a VQO for a scenic area if the VQC has been included in the most recent TFL visual landscape inventory approved by the Regional Manager and that the VQCs must also have been in existence when GAR came into force in December 2004.

Table 13	Objective Under the Government Actions Regulation for	**SCENIC AREAS AND VQOs**
Regulation:	GAR S. 17	
Regulation states:	A visual quality class for a scenic area is continued under this regulation as visual quality objective if: (a) The visual quality class has been: (i) Set out before October 24, 2002 in a letter from the district manager to the holder of an agreement under the *Forest Act*, or (ii) Included in the most recent tree farm licence visual landscape inventory prepared by the holder of a tree farm licence and approved by the regional manager, and (b) In existence on the coming into force of this section.	
Scenic Areas	FPPR 14(3)(e): All polygons that have assigned VQOs are scenic areas.	
Result or Strategy	The licensee will be consistent with Visual Quality Objectives in accordance with Appendix 2 "Visual Quality Objectives Within TFL 26". These VQOs are indicated for each Visual Sensitivity Unit in TFL 26, and shown on the 1:20000 map. The licensee will conduct road construction or timber harvesting activities that conform with the VQOs, unless it is for the following circumstances: a) to recover timber damaged from natural causes b) the activities are otherwise required by government c) road construction is required for permanent access to prevent isolation of timber.	
	The licensee will assess conformance with the VQOs based on four visual design criteria: ensuring the proposed alterations have borrowed from the natural character of the landscape, identified major lines of force and used them to develop the size and shape of the alteration, incorporated edge treatments into the design, and maintained trees or tree patches where topography and operational requirements permit. The assessment will be used in the cutblock and road layout and design, and the results of the assessment will be described and defined in the Site Plan. The qualified professional will determine the best assessment procedure based on attributes of existing adjacent alterations, viewpoint screening, viewing opportunities, proposed alternation size and shape, variable retention to be applied, adjacent reserves, and using the relevant procedures and guidebook available. Acceptable visual assessments will include, but are not limited to: sketching, Google earth rendering, photographs and design, computer simulation, digital terrain modelling.	
Application: FDU #1 and FDU #2.		

13.4 Measures

Table 14	Measures Related to	**INVASIVE PLANTS**
Regulation:	FPPR S. 17	
Regulation states:	For the purpose of section 47 *[invasive plants]* of the Act, a person who prepares a forest stewardship plan must specify measures in the plan to prevent the introduction or spread of species of plants that are invasive plants under the Invasive Plants Regulation, if the introduction or spread is likely to be the result of the person's forest practices.	
Measures:	In context of FPPR S. 17, which specifies that a licensee has responsibilities where the introduction or spread of invasive plants is likely to be the result of the licensee's forest practices, the following measures will be used: ▪ The licensee will prioritize and risk rank invasive plan species typically found within TFL26 and surrounding areas. ▪ The licensee will continuously determine and monitor the presence and spread of invasive plants during the course of year round operations, while completing surveys and inspections, or while carrying out other forest management activities. ▪ The licensee will provide information and education about relevant invasive plants as prioritized, to staff and contractors at pre-work meetings and pre-work inspections if those plants are located within 100m of the designated worksite. Staff and contractors will be instructed on the importance of not transporting invasive plant seed or live material on clothing or equipment when moving to other locations or conducting forest operation. Staff and contractors are required to notify the licensee of the location and quantity of any presence of invasive plant when working in TFL26 if not otherwise advised by the Licensee. ▪ When invasive plants are reported within 100 metres of new road construction or cutblocks, the licensee will evaluate the relative risk for spread of the invasive plant and where it is determined to be a significant risk, make efforts to minimize the spread of these invasive plants. These efforts include, but are not limited to: minimizing the amount of soil disturbance during the construction of these roads and landings, seeding areas of exposed mineral soil along roadsides, landings or within the net area to reforest, requiring all equipment to be inspected for the presence of plants, and cleaning equipment prior to leaving an area containing a priority invasive plant species. ▪ When the licensee carries out efforts as described above, they will be done within a reasonable time frame considering both the risk of the invasive plant, the season, as well as the biology and/or effectiveness of the specified technique(s) in relation. ▪ When seed is used for re-vegetation after forest road construction, the licensee will use grade Common #1 Forage Mixture or better as defined in the Canada Seeds Act, and will target the soonest application possible with the best seasonal timing for adequate germination, and no later than 1 year from the date of completion of site disturbance activities. ▪ The Licensee will report new detections and locations of invasive plants to the Invasive Alien Plant Program (IAPP) application annually. ▪ Known locations will be identified in Site Plans if relevant to forest management in and around the site.	
Application: FDU #1 and FDU #2.		

APPENDICES

Appendix 1: Stocking Standards

STOCKING STANDARDS

The following stocking standards will apply for harvest units in subsequent site plans. The stocking standards were developed from the Establishment to Free Growing Guidelines – Vancouver Region, but modified based on normal practices in TFL 26. Mission has many areas where CWHdm is influenced by CWHvm1, therefore there are some standards where species suitability varies; for instance where western hemlock is listed as preferred or acceptable.

(a) Approved Stocking Standards

BEC Variant	Site Series	Species		Stocking * (well-spaced/ha)			Regen Delay	Free Growing	Group 1 Brush Comp % over height	Group 2 Brush Comp % over height	Other Info
		Preferred	Accept	Target+	Min p a	Min p		Late			
CWH dm Coastal Western Hemlock – dry maritime	01	Fd Hw Cw		900	500	400	3	20	150	100	
	03	Fd Cw	Hw	800	400	400	3	20	150	100	
	04	Fd Cw	Hw	900	500	400	3	20	150	100	
	05	Cw Fd	Bg Hw	900	500	400	3	20	150	100	
	06	Cw Hw	Fd	900	500	400	6	20	150	100	
	07	Fd Cw Bg	Hw	900	500	400	3	20	150	100	
	08	Cw Bg		900	500	400	3	20	150	100	
	09	Cw[1] Bg[1]		900	500	400	3	20	150	100	
	Free Growing Height Criteria (m)										
	Site Series			Fd	Hw	Cw	Bg				
	03			2.0	2.0	1.0	-			Minimum inter-tree distance	2.0
	01 04 06			3.0	3.0	1.5	2.5			Min-Max post spacing density (sph)	400-1,500
	05 07 08 09			4.0	4.0	2.0	3.5				

BEC Variant	Site Series	Species		Stocking * (well-spaced/ha)			Regen Delay	Free Growing	Group 1 Brush Comp % over height	Group 2 Brush Comp % over height	Other Info
		Preferred	Accept	Target+	Min p a	Min p		Late			
CWH vm1 Coastal Western Hemlock – submontane very wet maritime	01	Ba Cw Hw Fd	Ss[35] Yc	900	500	400	6	20	150	100	
	03	Cw Hw Fd		800	400	400	6	20	150	100	
	04	Cw Hw Fd	Ba Ss[35] Yc	900	500	400	3	20	150	100	
	05	Hw Ba Cw Fd	Ss[35] Yc	900	500	400	3	20	150	100	
	06	Ba Cw Hw	Fd Ss[35] Yc	900	500	400	6	20	150	100	
	07	Hw Ba Cw	Fd Ss[35] Yc	900	500	400	3	20	150	100	
	08	Hw Ba Cw	Ss[35] Yc	900	500	400	3	20	150	100	
	Free Growing Height Criteria (m)										
	Site Series			Fd	Hw	Cw	Ba	Ss	Yc		
	03			2.0	2.0	1.0	-	-	-	Min inter-tree distance	2.0
	01 04 05 06			3.0	3.0	1.5	1.75	3.0	1.5	Min-Max post spacing density (sph)	400-1,500
	07 08			4.0	4.0	2.0	2.25	4.0	2.0		

BEC Variant	Site Series	Species		Stocking * (well-spaced/ha)			Regen Delay	Free Growing	Group 1 Brush Comp % over height	Group 2 Brush Comp % over height	Other Info
		Preferred	Acceptable	Target+	Min p a	Min p		Late			
CWH vm2 Coastal Western Hemlock – montane very wet maritime	01	Ba Hw Yc Fd Cw	Ss[35] Hm	900	500	400	6	20	150	100	
	03	Cw Hw Fd Yc	Ba Hm	800	400	400	6	20	150	100	
	04	Cw Hw Fd Yc	Ba Ss[35] Hm	900	500	400	6	20	150	100	
	05	Ba Cw Hw Yc	Ss[35] Fd Hm	900	500	400	3	20	150	100	
	06	Ba Cw Hw Yc	Ss Hm	900	500	400	6	20	150	100	
	07	Ba Cw Yc Hw	Ss[35] Hm	900	500	400	3	20	150	100	
	08	Ba Cw Yc Hw	Ss[35] Hm	900	500	400	3	20	150	100	
	09	Cw[1] Hw[1] Yc[1]	Hm[1] Ba	800	400	400	3	20	150	100	

Free Growing Height Criteria (m)

Site Series	Fd	Hw	Cw	Ba	Ss	Yc	Hm		
03 04 09	1.5	1.75	1.0	1.5	2.0	1.0	0.75	Min inter-tree distance	2.0
01 05 06	2.25	2.5	1.5	1.75	3.0	1.5	1.5	Min-Max post spacing density	400-1,500
07 08	-	3.5	2.0	2.25	4.0	2.0	1.5		

BEC Variant	Site Series	Species		Stocking * (well-spaced/ha)			Regen Delay	Free Growing	Group 1 Brush Comp % Over height	Group 2 Brush Comp% over height	Other Info
		Preferred	Acceptable	Target +	Min p a	Min p		Late			
MHmm1 Mountain Hemlock – leeward moist maritime	01	Ba Hm Yc	Se Hw Cw	900	500	400	7	20	125	100	
	02	Hm Yc	Ba	800	400	400	4	20	125	100	
	03	Ba Hm Yc	Se Hw Cw	900	500	400	4	20	125	100	
	04	Ba Hm Yc	Se Hw Cw	900	500	400	7	20	125	100	
	05	Ba Yc Hm	Se Hw Cw	900	500	400	4	20	125	100	
	06	Hm[1] Yc[1] Ba		800	400	400	7	20	125	100	
	07	Ba[1] Yc[1] Hm		900	500	400	4	20	125	100	
	09	Yc[1] Hm[1]		800	400	400	4	20	125	100	

Free Growing Height Criteria (m)

Site Series	Ba	Yc	Hm	Se	Hw	Cw		
02 06 07 09	0.6	0.75	0.75	0.75	0.75		Minimum inter-tree distance	2.0
01 03 04 05	0.6	1.0	1.0	1.0	1.0	1.0	Min-Max post spacing density (sph)	400-1,500

Group 1 species include: Red Alder (Dr), Bigleaf Maple (Mb), Birch (Ep) and Cottonwood (Ac)
Group 2 species include: Cherry, Willow, Cascara, and misc *(as per District agreement Dec 2, 1999, and excepting site series where conifers are not 'preferred'. Where Group 2 heights are similar to immediately adjacent crop trees, acceptable crop trees must be in good health and continue to out compete those deciduous species. Crop trees under performing will not be acceptable as FTG.)*

[1] on elevated microsites *[35] risk of weevil damage* *+The target stocking standard is reduced by 100 stems/hectare for Douglas-fir stands*
** The stocking figures only relate to the immature/advanced regen layer but do not relate to the mature layer.*

Minimum Characteristics of any leave trees including form, health and vigor: Mature Layer will have various forms, health and vigor ranging from high grade and value, to low grade and marginal marketability for the primary purposes of providing for wildlife habitat, features and to meet particular visual quality objectives. Immature Layer or advanced regen acceptable trees will be based on good form, no health issues, good growth potential.

Appendix 2: Visual Quality Objectives in TFL 26

VISUAL QUALITY OBJECTIVES IN TFL 26

Visual Sensitivity Unit #s on FSP Map	*VSU #s To Reference to Original 1999 VLI **	Visual Quality Objective **	Comments 1:20,000 Map overlay available
606	*1000*	PR	
596	*1001*	PR	
580	*1002*	PR	
578	*1003*	PR	
562	*1004*	PR	
526	*1005*	PR	
n/a	*1006*	n/a	This unit was deleted in the VLI.
535	*1007*	PR	
521	*1008*	PR	
515	*1009*	PR	
507	*1010*	PR	
508	*1011*	PR	
491	*1012*	PR	
457	*1013*	PR	
434	*1014*	PR	
433	*1015*	PR	
452	*1016*	PR	
502	*1017*	PR	
402	*1018*	PR	
400	*1019*	PR	
412	*1020*	PR	
431	*1021*	PR	
440	*1022*	PR	
510	*1023*	PR	
504	*1024*	PR	
506	*1025*	PR	
467	*1026*	PR	
389	*1027*	PR	
405	*1028*	PR	
505	*1029*	PR	
531	*1030*	M	
530	*1031*	M	
529	*1032*	PR	
581	*1033*	PR	
550	*1034*	M	
585	*1035*	PR	
601	*1036*	PR	
605	*1037*	M	
612	*1038*	M	
588	*1039*	M	
495	*1040*	M	
427	*1041*	M	

Note: the source of the Visual Sensitivity Unit boundaries is from the 1999 Visual Landscape Inventory for Mission TFL 26 completed by Geoscape Environmental Planners. * These are the Visual landscape Unit #s shown in the 1999 Visual Landscape Inventory. While they have no relevance to the FSP, they can be used to reference to corresponding units identified in the original VLI. **M = Modification PR = Partial Retention**

Table of Alteration categories

Catergory of Alteration	Characteristics of Cutblock or Road
P – Preservation	(i) very small in scale; and (ii) not easily distinguishable from the pre-harvest landscape
R – Retention	(i) difficult to see; (ii) small in scale; and (iii) natural and not rectilinear or geometric in shape
PR – Partial Retention	(i) easy to see; (ii) small to medium in scale; and (iii) natural and not rectilinear or geometric in shape
M – Modification	(i) very easy to see; and (ii) is: (A) large in scale and natural in appearance; or (B) small to medium in scale but with some angular characteristics
MM – Maximum Modification	(i) very easy to see; and (ii) is: (A) very large in scale; (B) rectilinear and geometric in shape; or (C) both

Map of Visual Landscape Units is available as a 1:20000 overlay of the FSP

Appendix 3: Referrals

ADVERTISING

Advertising was completed as follows:

- *A copy of an advertisement is attached and was placed in the November 15 and November 29 edition of the Mission City Record which is free of charge to all households in the Mission area.*
- *Notification of the availability of the draft FSP was placed on the District of Mission's website. A link was provided to enable direct viewing of a .pdf copy of the text of the draft FSP.*
- *Open House December 1 Mission Leisure Centre 3pm – 8pm*

REFERRAL NOTICE – District of Mission
Forest Stewardship Plan for Tree Farm Licence 26

Please be advised that Tree Farm Licence 26, managed by the District of Mission since 1958 is advertising a draft Forest Stewardship Plan (FSP) 2017-2022 for public review and comment.

The FSP is a landscape level plan, which is focused on establishing objectives, strategies, results and measures for conserving and protecting timber and non-timber values within Crown lands slated for future forest management activities. The FSP is the primary referral process for notifying the public, First Nations, and government agencies as to the location of Forest Development Units (FDUs) and the strategies and results that will apply to the respective FDUs.

This notice is to provide resource users with an opportunity to identify areas of concern within FDUs to ensure that concerns are addressed prior to development of an area of Crown land allocated for the company's forest development activities.

The FSP is available for public review at 33835 Dewdney Trunk Road, Mission BC during regular business hours: 8am to 4:30 pm. Alternatively stakeholders can attend an Open House at the Leisure Centre at 7650 Grand Street, Mission BC, on December 1st from 3pm to 8pm.

For comments to be considered in the final submission of the FSP, they must be submitted by January 6th at 4:30pm, via email to forestry@mission.ca or in writing, attention of the undersigned to:

Bob O'Neal, RPF
Director of Forestry
District of Mission
Box 20, Mission, BC V2V 4L9

REFERRALS MADE

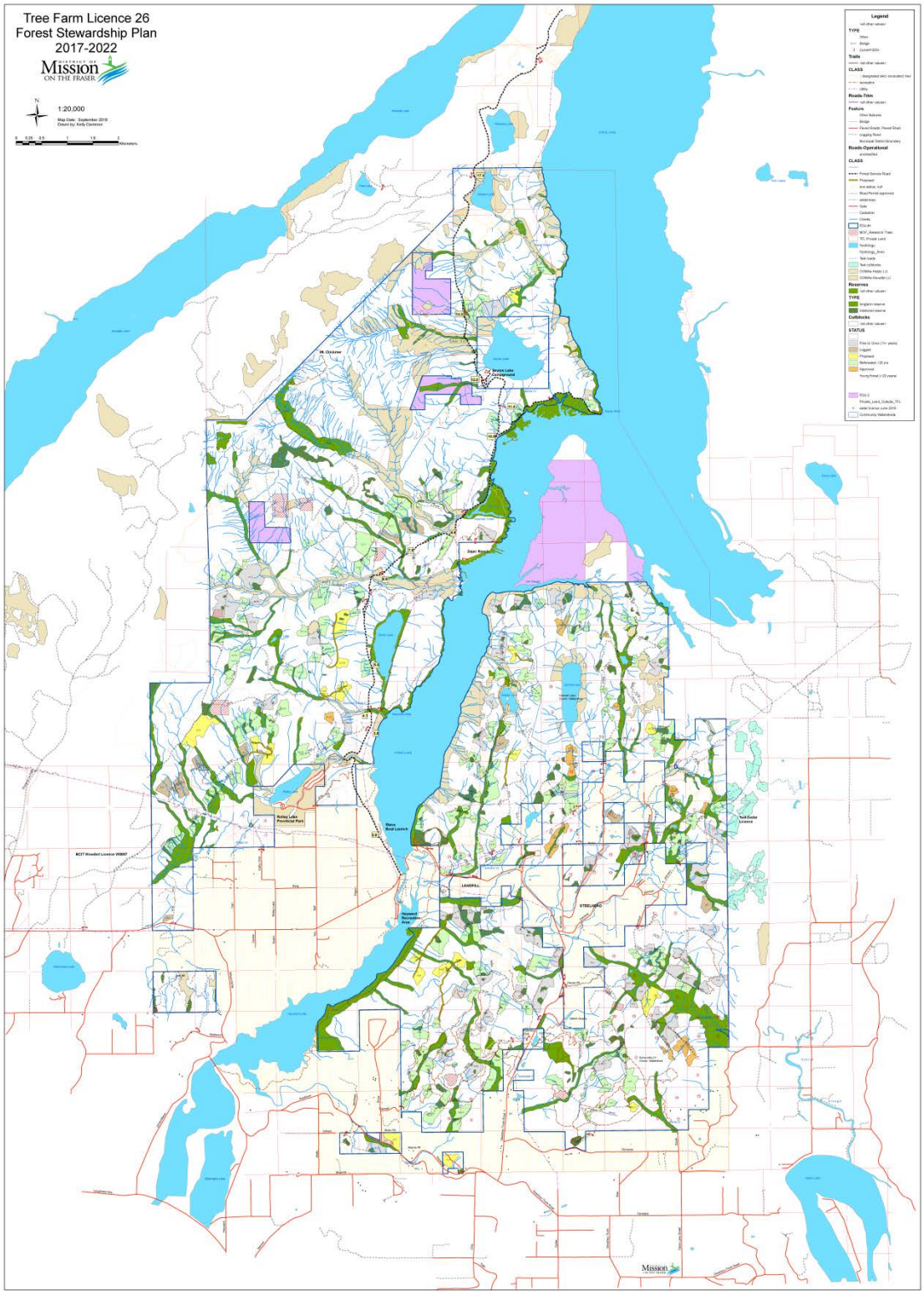
Organization	Contact
Government	
Fraser Valley Regional District	Graham Daneluz, Planner
Ministry of Forests, Lands and Natural Resource Operations	District Manager
BC Timber Sales, Chinook	Timber Sale Manager
John McAuley	City of Abbotsford, Water Management
Ministry of Environment (Trappers)	John Kelly/Veronica Russell
First Nations	
Kwantlen First Nation, Fort Langley	Chief Marilyn Gabriel and Council, Tumia Knott
Matsqui First Nation, Matsqui,	Chief Alice McKay, Cindy Collins
Sto:lo Tribal Council, Agassiz	Council
People of the River Referral Office	Representing: Sumas, Sto:lo Nation,
Katzie First Nation, Pitt Meadows	Chief and Council
Sto:lo Tribal Council	Council
Seabird Island Band	Chief and Council
Semiahmoo First Nation	Chief and Council
Recreation User Groups	
Back Country Horsemen of BC	Rose Schroeder, Karin Smith
Right-nutts ATV Club	Dean Jesiak
4 Wheel Drive Association of BC	Kim Reeves, Dan Wishart
Fraser Valley Mountain Bike Association	Ian Harker
Trails BC/Trans Canada Trail	Leon Lebrun
Cascade Off-road Motorcycle Club	Eugene Hulak
Southwestern All Terrain Trails	Cal Kaytor/Bruce Ledingham
Trappers	
c/o Ministry of Environment	John Kelly
Other	
Steelhead Community Association	Cindy Diamond
Hatzic/Durieu/McConnell Creek Ratepayers Association	Pauline Peters
Stave Lake Cabin Owners Association, BC	Alvin Johnson, Noreen Beauvais
Zajac Ranch for Children	Carmen Zajac
Tim Horton Childrens Foundation	Dave Newnham
Kenworthy Creek Community Watershed purveyor	Robert Dale, Jack Heptonstall

Appendix 4: Comments and Revisions

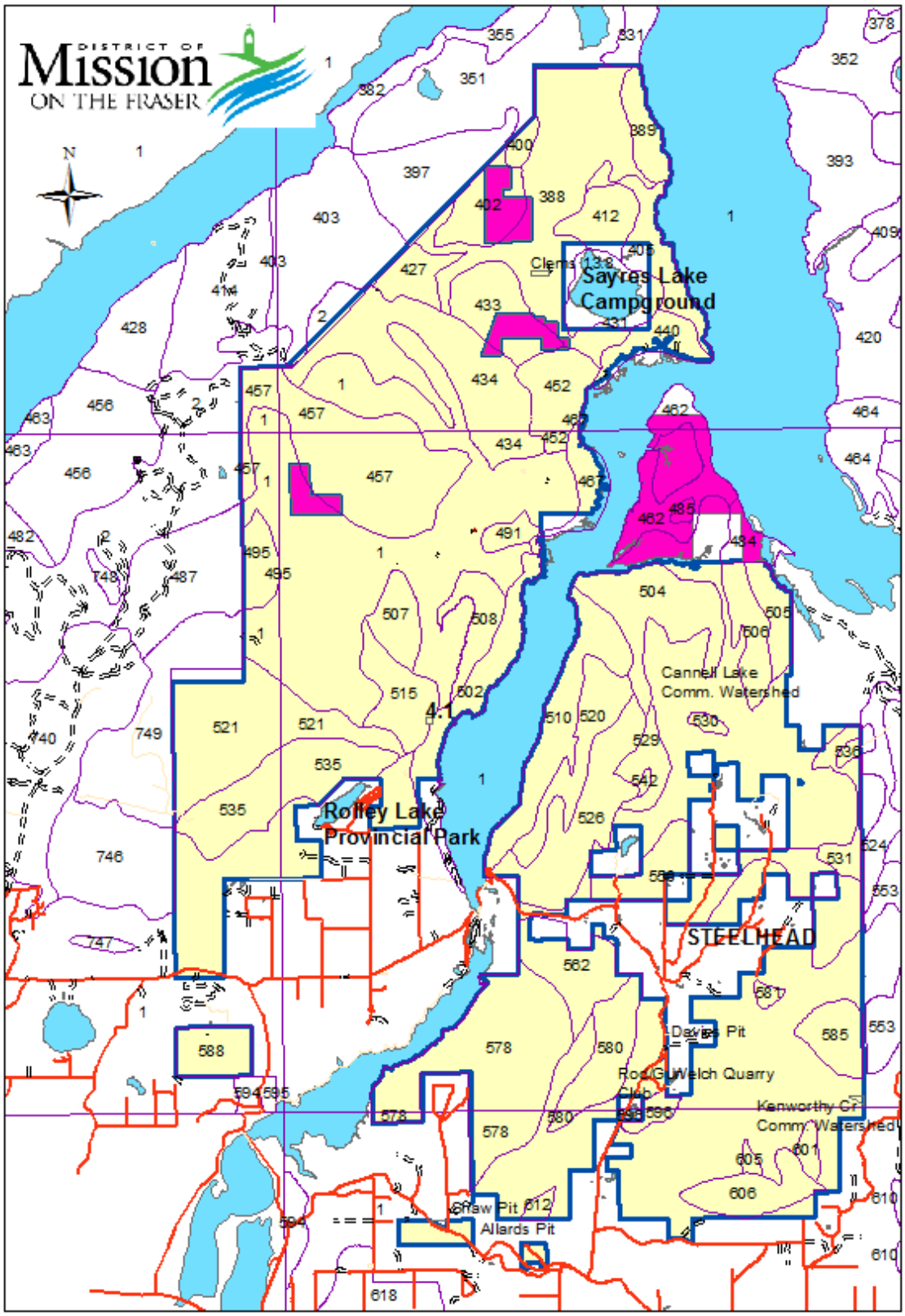
N/A at the time of draft plan submission

Appendix 5: Maps

Overview map of Mission TFL 26, titled 'Forest Stewardship Plan 2017-2022' Full Size Map attached to package

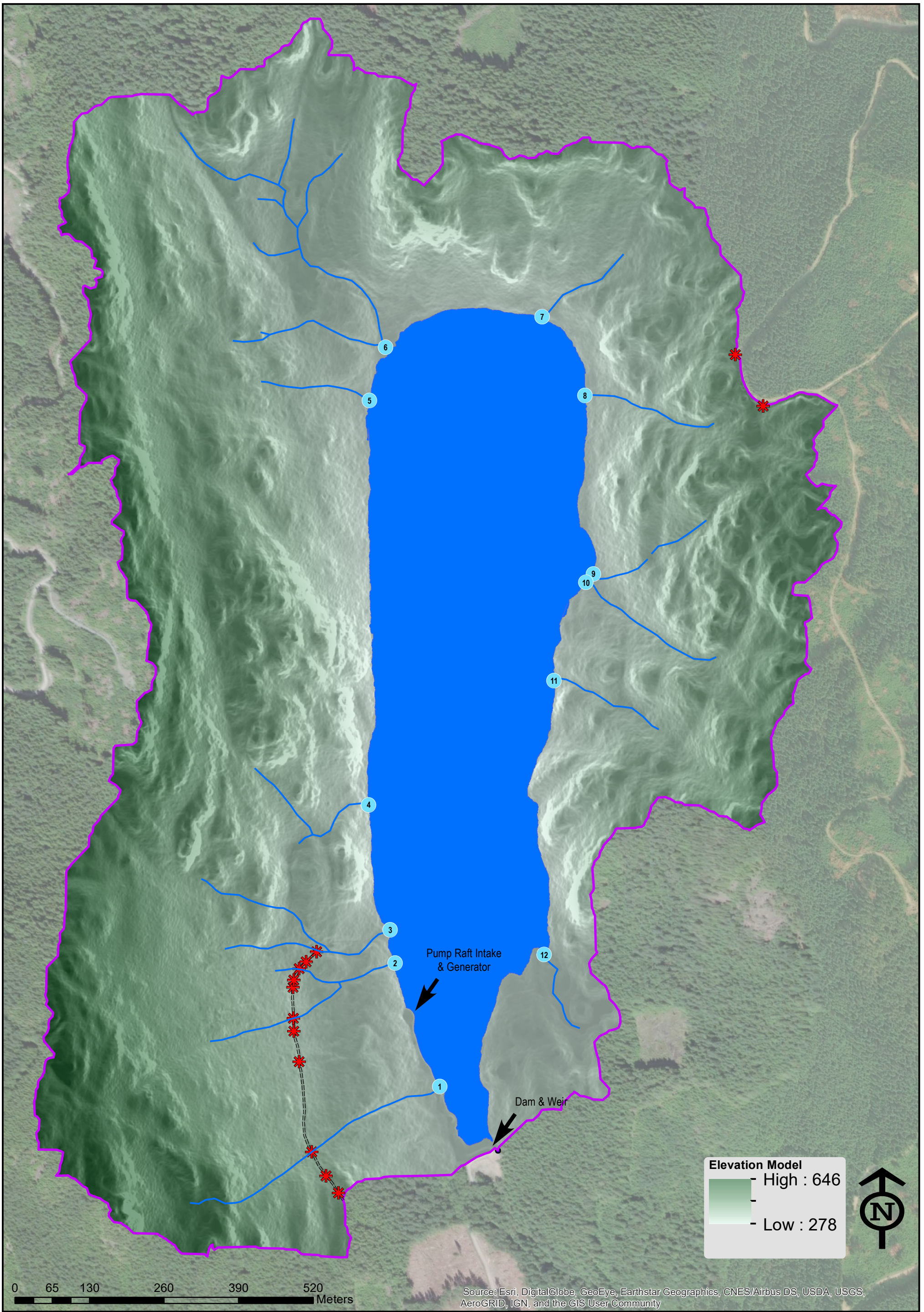


Overview map of Visual Quality Objective polygons (ref Appendix 2)



Appendix E – Cannell Lake Terrain Analysis and Drainage Network Model

Provided electronically



Legend

- Watershed
- Cannell_Lake_Poly
- Stream (>1ha catchment)
- ===== Road
- Tributary Confluence
- Risk

Prepared by:
ENKON
Environmental Ltd.

Map Created: July 16, 2019
by: R. Preston
NAD 83, Zone 10N

Cannell Lake Watershed Analysis

Figure 1

Cannell Lake
Watershed Protection Plan