Chapman Lake Siphon System

Environmental Management Plan

Photo: SCRD Chapman Lake Dam June 2025

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1. INTRODUCTION

Chapman Lake is a critical component of the SCRD water supply system. The lake, located within Tetrahedron Provincial Park, serves as a storage reservoir that feeds Chapman Creek, which supplies drinking water to downstream communities (AECOM, 2016).

Due to prolonged drought conditions, in 2017 the SCRD installed a temporary siphon system in Chapman Lake to access additional water from the lake to ensure adequate water supply to the residents and to ensure EFN (Environmental Flow Needs) requirements in Chapman Creek are met. The siphon system allows access to an additional 1,000,000 cubic meters of water in Chapman Lake.

While several other initiatives have been undertaken by the SCRD towards securing additional water supply on the Sunshine Coast including groundwater investigation and development, intense drought conditions in past years have made it necessary to use the emergency siphons.

The intent of this Environmental Management Plan (EMP) is to further understand any environmental impacts to Chapman Lake and the surrounding watershed that using the emergency siphons may have, and to develop a plan for how to mitigate and respond to these impacts.

The specific objectives of the Environmental Management Plan include:

- Identify potential environmental risks associated with the operation of the siphon system and subsequent drawdown of the lake.
- Outline appropriate mitigation measures, best management practices (BMPs), and contingency actions to avoid or minimize adverse impacts on aquatic and terrestrial ecosystems, wildlife, water quality, and cultural resources.
- Establish a clear framework for environmental monitoring, reporting, and adaptive management throughout the project's duration.
- Define the roles and responsibilities of project personnel, including contractors, environmental monitors, and SCRD staff, with respect to environmental protection and compliance.
- Demonstrate compliance with all applicable provincial and federal legislation, policies, and permit conditions governing activities in and around water, within a provincial park, and in a drinking water source area.

This plan has been developed collaboratively with shíshálh Nation to respect rights and interests.

2. PROJECT OVERVIEW

2.1 Background

Chapman Lake

Chapman Lake is an alpine lake located in Tetrahedron Provincial Park; a class A park protected under the Park Act. With a surface area of approximately 34 ha, Chapman Lake is the largest lake in the Chapman Creek Watershed. Under the SCRD's conditional water license for storing water at Chapman Lake (#C050724), a volume of 906,600 m3 of water can be drawn down from the lake. This is approximately 3m of water storage when the lake is full. The SCRD holds the park use permit (102714), which grants the Regional District authorization for maintaining water

impoundment infrastructure at Chapman and Edwards Lake as well as the helicopter pad at Chapman Lake.

Chapman Lake Dam

The dam was constructed in 1978 and is located at the outlet of Chapman Lake into Chapman Creek. Throughout the year, water from Chapman Lake naturally flows over the dam into Chapman Creek. When the water level in Chapman Lake drops below the dam crest and stops overflowing into the creek, the SCRD remotely operates the valve at the bottom of the dam to control the release of water into Chapman Creek. During periods of drought when water levels in the lake drop below the valve in the dam, the SCRD operates the emergency siphon system.

Site Access

Primary access to the Chapman Lake Dam site is available by helicopter. There is a wooden helicopter landing platform located near the North bank of the dam channel at Chapman Lake. Helicopter access is available year-round as long as visibility permits flying. Chapman Lake can also be accessed on foot by hiking trails in the Tetrahedron Provincial Park via an 18km round trip trail. The trailhead is accessible by vehicle, the lower parking lot is approximately 11 km from Sechelt Inlet Road along Gray Creek FSR. All access into the Tetrahedron Park by SCRD staff must be reported to the BC Parks area supervisor.

2.2 Siphons

The siphon system at Chapman Lake consists of five parallel 200 mm HDPE pipes that are each 285m in length. The siphons draw water from Chapman Lake and discharge about 90m downstream in Chapman Creek. The siphon inlets are located in Chapman Lake approximately 195m from the dam, suspended by buoys 2m below the lake surface and anchored in place by concrete blocks.

3. ENVIRONMENTAL CONTEXT

3.1 Aquatic and Terrestrial Vegetation

The Chapman Lake area supports a range of alpine and subalpine plant communities, including wetland, riparian, and upland vegetation. Care must be taken to avoid disturbing sensitive species and communities.

Table 3-1. Representative Vegetation in the Chapman Lake Project Area

Vegetation Type	Common Species Observed
Riparian	Sitka alder (*Alnus viridis*), willow (*Salix* spp.), sedges (*Carex* spp.), mosses
Wetland	Skunk cabbage (*Lysichiton americanus*), horsetail (*Equisetum* spp.), mosses
Upland Forest	Western hemlock (*Tsuga heterophylla*), mountain hemlock (*Tsuga mertensiana*), yellow cedar (*Callitropsis nootkatensis*), Pacific silver fir (*Abies amabilis*)
Alpine Meadows	Heather (*Phyllodoce* spp.), Alaskan blueberry*(Vaccinium alaskaense),* Oval-leaved blueberry *(Vaccinium ovalifolium),* alpine grasses and forbs.

3.2 Fish and Wildlife

Both Rainbow Trout and Dolly Varden have been found to reside in Chapman Lake and use the influent tributaries as spawning ground (AECOM, 2016). Rainbow Trout spawn from August 1 to October 31 and Dolly Varden from June 15 to August 31. The tributary flowing from the North on the East end of the lake has been observed to be productive Dolly Varden spawning habitat (AECOM, 2016). Additionally, other small streams and channels leading into Chapman Lake are noted to be spawning and nursery habitat for Dolly Varden (AECOM, 2016).

Surveys in 2016 by AECOM did not identify any rare plants or species at risk (SARA) present near the work area. However, the following SARA/ BC List species are potentially within the Chapman Lake area (AECOM, 2016).

Table 3-2: Species at Risk listed under SARA and BC List

Category	Name (English name [Scientific name])	BC List
Red-listed	Painted Turtle – Pacific Coast Population *(Chrysemys picta pop. 1),* Western Branded Skipper (*Hesperia colorado oregonia)*	Red
Amphibians	Coastal Tailed Frog *(Ascaphus truei),* Northern Red-legged Frog *(Rana aurora)*	Blue
Fish	Bull Trout *(Salvelinus confluentus)*	Blue
Birds	Marbled Murrelet *(Brachyramphus marmoratus),* Olive-sided Flycatcher *(Contopus cooperi),* Black Swift *(Cypseloides niger),* Barn Swallow *(Hirundo rustica),* Western Screech-Owl *(Megascops kennicottii kennicottii)*	Blue
Ungulates	Roosevelt Elk *(Cervus elaphus roosevelti),* Mountain Goat *(Oreamnos americanus)*	Blue
Carnivores	Wolverine *(Gulo gulo luscus),* Fisher *(Pekania pennanti)*	Blue
Bats	Keen's Myotis *(Myotis keenii)*	Blue
Invertebrates	Silver-spotted Skipper *(Epargyreus clarus),* Sinuous Snaketail *(Ophiogomphus occidentis),* Clodius *Parnassian (Parnassius clodius claudianus)*, Rocky Mountain Physa *(Physella propinqua),* Sunset Physa *(Physella virginea),* Meadow Rams-horn *(Planorbula campestris),* Striated Fingernailclam *(Sphaerium striatinum)*	Blue

3.3 Chapman Lake Cultural Values

The Chapman Creek Watershed has been part of the shíshálh Nation swiya (lands, birthplace, "Territory")since time immemorial. The shíshálh Nation Freshwater Management Policy states: "Water is central to the shíshálh way of life, spirituality, culture, economy, and society". Protecting the land's most valuable resource, fresh water, is deeply important to the shíshálh Nation, not only due to its cultural value but also as a source of drinking water for current and future generations. This EMP aims to take into consideration shíshálh Nation values when discussing environmental impacts and mitigation strategies by addressing key concerns, including around sustainability, water quality, and water quantity.

4. REGULATORY FRAMEWORK & PREVIOUS REPORTING

The project will comply with all applicable provincial and federal legislation, park policies, and guidelines

4.1 Legislation and Policy

Table 4-1. Relevant Legislation and Policy

Jurisdiction	Legislation / Policy	Relevance
Provincial (BC)	*Water Sustainability Act*	Use Approval to use additional 1,000,000 m3 from Chapman Lake
	Park Act	Park Use Permit for activities within Tetrahedron Park
	Environmental Management Act	Spill prevention and response
	Wildlife Act	Protection of wildlife and habitat
	Heritage Conservation Act	Protection of archaeological and cultural sites
Federal	*Fisheries Act*	Protection of fish and fish habitat
	Species at Risk Act	Protection of listed species and habitats
	Canadian Environmental Protection Act	Pollution prevention
	Migratory Birds Convention Act	Protection of migratory birds and nests

4.2 Previous Reporting

4.2.1 Whitehead Report (1999)

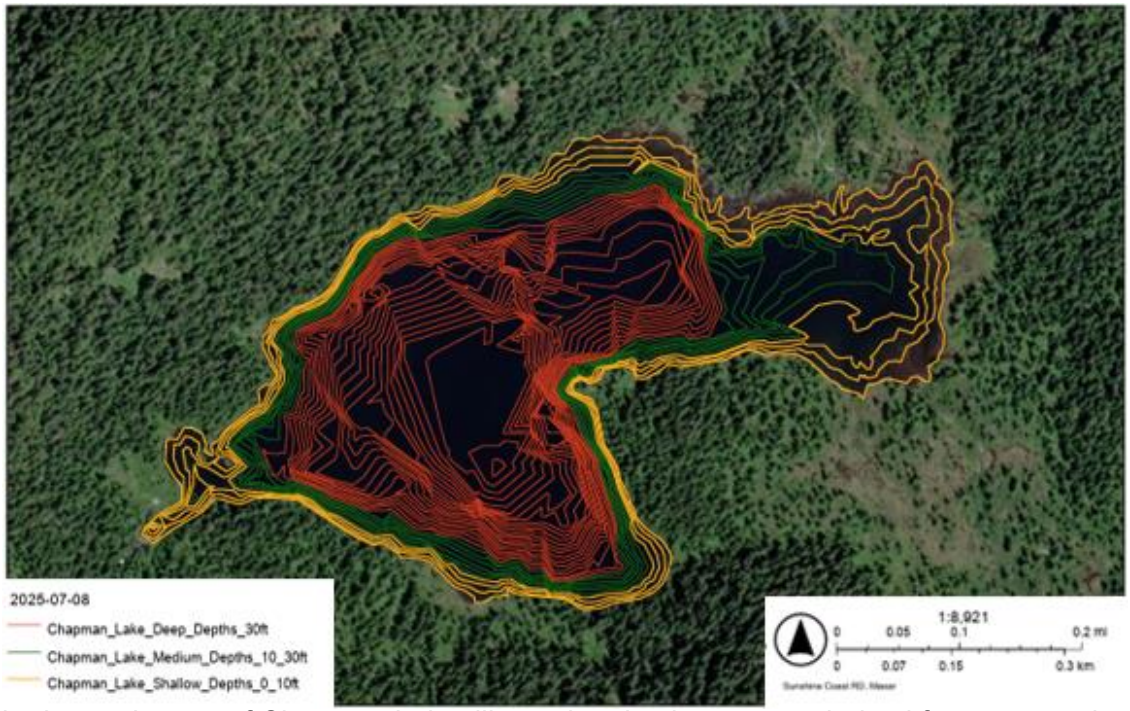
In 1999, an Environmental Impact Assessment study was completed for a previously proposed floating pump station on Chapman Lake. Field investigations conducted over three days served as the foundation for the report. The scope of the assessment encompassed ecological elements of the lake as well as considerations concerning park usage and cultural heritage, including archaeological resources.

4.2.2 AECOM Report (2016)

In 2016 an Environmental Assessment was completed for a previously proposed Chapman Lake Expansion Project. This report assessed a similar scope of work to siphon usage, including lake draw down. The findings of the AECOM (2016) have informed the development of this EMP.

4.3 Lake Drawdown

Figure 4-1: Bathymetry of Chapman Lake



This figure shows the bathymetric map of Chapman Lake, illustrating depth contours derived from survey data.

- The **shallow zone (0–3 m(0-10 ft), orange/yellow)** extends around the entire lake margin and represents the littoral and riparian interface.
- The **medium depth zone (3–9 m(10-30 ft), green)** occupies the mid-slope areas of the lake basin.
- The **deep zone (> 9 m(> 30 ft), red)** dominates the central basin of the lake.

5. ENVIRONMENTAL RISK AND MITIGATION STRATEGIES

5.1 Fish and Fish Habitat

During lake drawdown via siphons, access to the tributary streams for fish spawning may be restricted due to low flow in the creeks. Some of the groundwater-fed streams that flow into Chapman Lake appear to support the rearing of young fish and spawning (AECOM, 2016).

Table 5-1: Fish and Fish Habitat Potential Risks and Mitigation Measures

Potential Risks	Mitigation Measures
Reduced downstream flows	Maintain minimum instream flow (> 0.2 m^3/s)
Increased sedimentation from shoreline erosion degrading habitat	Monitor lake & creek water quality (turbidity), minimize erosion
Increased water temperature in Chapman Creek & Chapman Lake	Monitor temperature; avoid drawdown during peak spawning if practical

Fish stranding in downstream pools, tributaries, and lake shore	Conduct fish salvage in stranded pools if required
Impacts to fish rearing and spawning habitat	Monitor tributaries and adjust lake drawdown if necessary
Decrease in fish habitat through alteration of lake dynamics	Monitor habitat condition and adjust withdrawal rate if necessary
Fish harm from entering siphons	Install and maintain screens of appropriate mesh size on siphon inlets

5.2 Water Quality

During lake draw down, a greater surface area of the shoreline perimeter would be exposed to weathering. This could increase the chance of sediment transport to the lake and thus impact the light penetration through the lake and increase bacteria growth (AECOM, 2016). Elevated levels of turbidity in the lake could affect photosynthesis of aquatic plants and algae. Additionally, fish, amphibians, birds, and other wildlife may be affected by a decrease in water quality.

Table 5-2: Water Quality Potential Risks and Mitigation Measures

Potential Risks	Mitigation Measures
Increased turbidity and suspended particulate	Position siphon intakes above sediment to avoid disturbance and monitor turbidity at siphon outlet.
Increased water temperature	Monitor regularly; adjust operations as needed
Changes to lake dissolved oxygen	Monitor DO; adjust withdrawal rate if levels drop
Nutrient release & algae blooms	Monitor water quality; minimize disturbance of sediments
Contamination (fuel, oil, chemicals)	Use clean, well-maintained equipment; spill prevention & response plan; have spill kits on site
Long-term physical & biotic effects of lakeshore drying	Monitor shoreline & adjust operations if adverse effects observed
Decreased light penetration and increased bacteria growth	Monitor turbidity & water clarity; minimize sediment resuspension

5.3 Terrestrial and Riparian Habitat

Vegetation near the Chapman Lake dam is mainly forested with Yellow cedar, Mountain Hemlock, and Amabilis Fir with patches of shrubs mainly consisting of Alaskan blueberry and Oval-leaved blueberry (AECOM, 2016). Increased drying of soils in the surrounding lakeshore area could have impacts on this vegetation.

Drying and warming of the sediment surface can change the physical and chemical characteristics of the sediment, affecting plants, microbes, and animals that live there. These reactions can influence water quality when the area becomes submerged again (AECOM, 2016). Additionally, organisms that live in the lakebed can be disrupted due to changes in moisture, temperature or chemistry. If additional surface area of the lakeshore is exposed to drying effects, it could increase erosion of the soil. Adjacent wetland may experience additional hydrologic draw-downs during drought conditions that would cause the lake to be drawn down below the historic norm of –3m. Potential residual effects on Sitka sedge / peat-mosses (Fen) during siphon operation are

expected to involve a limited hydrologic drawdown within the lake area, particularly during drought years when lake levels are lower

Table 5-3: Terrestrial and Riparian Habitat Potential Risks and Mitigation Measures

Potential Risks	Mitigation Measures
Disturbance to vegetation and soils at staging areas	Use existing disturbed or hardened areas; minimize footprint
Partial or complete drying & warming of sediment surface	Monitor effects; adjust drawdown rate if necessary
Physical-chemical reactions in sediment surface	Monitor and assess changes; adjust operations if needed
Biotic community effects (plants, microbes, animals)	Monitor and assess changes; Minimize exposed area & duration of drawdown if required
Lateral flow of pore water from drying lakebed	Monitor and assess
Increased erosion of lakebed & riparian area	Monitor erosion; restore if needed
Residual effects on drying peat mosses	Limit drawdown below historic norms; monitor sensitive areas
Hydrologic drawdown impacts on adjacent wetlands	Monitor wetland levels & adjust withdrawal if adverse impacts observed

5.4 Wildlife

Wildlife activity previously noted by SCRD staff include bear, wolf, elk and cougar tracks at the lake shore. Additional wildlife noted by AECOM include Bald eagle, Red fox, American dipper, Belted kingfisher, Rufous hummingbird, Steller's jays, Common raven, shorebirds and swallows, Long-toed salamander, Northwestern salamander, and northern Pacific treefrog. Noise from helicopters, and workers may disturb nesting birds in the project area. Additionally, deer, elk, bears, and other mammals rely on the lakeshore as a source of drinking water. However, as water levels drop, parts of the shoreline may become soft or unstable, potentially making it difficult for animals to reach the water. Additionally, as the waterline recedes from the protective cover of riparian vegetation, animals may face a higher risk of predation while accessing the lake. Whitehead (1999) identified specific areas around the lake with firm ground, as well as smaller watercourses and ponds, that provide safer access to water. Based on this, Whitehead (1999) concluded that further drawdown of the lake would not have significant effects on terrestrial wildlife.

Siphons are also utilized to maintain the current minimum flow rates of 200l/s in Chapman Creek during drought conditions. Maintaining a minimum flow within Chapman Creek during drought years is expected to enhance wildlife habitat and access to water downstream resulting in a neutral or positive effect. In particular salmonids rely on sufficient flow in Chapman Creek in late summer and fall seasons for spawning.

Table 5-4: Wildlife Potential Risks and Mitigation Measures

Potential Risks	Mitigation Measures
Wildlife disturbance from project activities	Schedule work outside critical breeding/nesting periods where possible
Decreased ability for wildlife to access drinking water	Maintain minimum flows; monitor shoreline conditions
Increased predation risk as water recedes from cover	Maintain riparian buffers where possible
Lower water level in wetlands affecting amphibian breeding/rearing	Monitor wetland water levels; adjust operations if needed
Noise disturbance (helicopters, equipment)	Minimize noise to essential operations only
Difficulty accessing water on unstable or soft ground	Identify and maintain firm access points around the lake

5.5 Cultural and Recreational Values

The Chapman Creek Watershed holds significant cultural value to the shíshálh Nation and is part of shíshálh Nation swiya (lands, birthplace, “Territory”). Protecting this natural resource is imperative. Should draw down of the lake level have negative impacts on the area, this could affect the shíshálh Nation. Cultural values (ex. Artifacts) may exist in the lake and surrounding land which could be exposed during lake draw down. Archaeological sites are protected under the Heritage Conservation Act and must not be altered or damaged without a site alteration permit from the Archaeology Branch. Some examples of cultural values that could be encountered are stone carvings, remains from campsites, cultural shell deposits, culturally modified trees, ancient tools, and remains.

Chapman Lake also resides within the Tetrahedron Provincial Park. Disruption to recreational access and enjoyment of the park area is a possible risk of lower lake levels.

Table 5-5: Cultural and Recreational Values Potential Risks and Mitigation Measures

Potential Risks	Mitigation Measures
Disruption of recreational access	Provide public notice of project timing and access restrictions.
Inadvertent damage to cultural sites	Cease work and notify authorities if cultural materials are encountered, Consult and collaborate with Indigenous communities throughout the project

6. ENVIRONMENTAL MONITORING & THRESHOLDS

This section details the monitoring protocols that will be implemented while the siphons are in operation. The primary objectives are to evaluate the effects of siphon use on the lake ecosystem and to provide an early-warning mechanism for initiating emergency response measures in the event of observed environmental degradation.

Mitigation measures have been developed with consideration to the following:

- Duration and intensity of lake drawdowns
- Impacts on Dolly Varden spawning access and sites

- Water level changes and connectivity in Chapman Creek
- Areas at risk of fish stranding, including lake foreshore and wetland margins

To support clear organization and effective data collection, the monitoring area has been divided into three regions: Chapman Creek between the dam and the siphon outlet, the Northeastern shore of Chapman Lake and the influent tributaries, and the overall lake as a whole.

The monitoring thresholds specified in this Environmental Management Plan (EMP) are based on the biological needs of Dolly Varden (*Salvelinus malma*) and the regulatory framework established by the BC Water Quality Guidelines (WQGs) and the *Fisheries Act.*

Dolly Varden are highly sensitive to water temperature, dissolved oxygen (DO), and turbidity. These parameters are crucial to maintaining their habitat quality, particularly during sensitive life stages such as spawning and incubation.

6.1 Temperature

Dolly Varden requires cold water throughout their life cycle, with specific needs during spawning and incubation.

The BC WQGs set the following protective thresholds:

- Maximum daily temperature (general aquatic life): ≤ 15 °C
- Maximum temperature for spawning: ≤ 10 °C
- Preferred incubation range: 2–6 °C
- Hourly rate of change (streams): ≤ 1 °C
- Alpine lakes: ± 1 °C from natural ambient

Based on historical data, a surface temperature threshold of 15 °C for Chapman Lake is not realistic. In recent years, surface temperatures have regularly peaked around 21 °C. We will adopt a maximum acceptable surface temperature threshold of 20 °C, assuming cooler, deeper strata remain accessible. If temperatures exceed this threshold, potential mitigation measures will be considered.

6.2 Dissolved Oxygen

As with other salmonids, Dolly Varden is highly sensitive to reduced DO, particularly during spawning and incubation.

Adequate DO is vital for respiration and egg development. The BC WQGs specify:

- General aquatic life (rearing & adults): ≥ 9.0 mg/L (24-hour average) and ≥ 8.0 mg/L (instantaneous minimum)
- Spawning & incubation: ≥ 10.0 mg/L (24-hour average) and ≥ 9.0 mg/L (instantaneous minimum)

For Chapman Lake, the EMP adopts ≥ 8.0 mg/L instantaneous minimum as the trigger for mitigation, while aiming to maintain ≥ 9.0 mg/L where feasible.

6.3 Turbidity

Turbidity affects foraging, gill health, and spawning habitat. BC WQGs recommend:

- If background ≤ 8 NTU: ≤ +2 NTU increase
- If background 8–80 NTU: ≤ +10% increase
- If background > 80 NTU: ≤ +8 NTU increase

Given the low turbidity conditions at Chapman Lake, the EMP adopts ≤ +2 NTU above background as the action threshold.

These thresholds align with provincial and federal expectations under the *Fisheries Act*, which prohibits activities that cause "serious harm" to fish and fish habitat, including through degradation of water quality.

6.4 Summary of Monitoring Program

The Environmental Monitor (EM) will establish photo monitoring stations to capture existing conditions prior to starting the siphons. Weekly environmental monitoring visits to the lake are required once the siphon system is online.

The EM will be onsite at least once a week to examine the environmental conditions and will report their findings. If a significant environmental disturbance occurs (e.g. landslide, major sluffing along the lake bed, major fuel spill, or uncontained water with extreme levels of turbidity etc.), the EM will be called to site and operation of the siphon will be re-evaluated.

Table 6-1: summarizes the environmental thresholds for water temperature, dissolved oxygen, turbidity, and tributary access, along with the rationale behind each one.

Parameter	Method	Frequency	Location
Lake level	Staff gauge or logger	Continuous	Lake
Tributary access	Visual survey & photo log	Weekly and at 2 m, 3 m drawdowns	Tributary mouths (helipad & far end)
Fish behaviour	Visual observation of schooling, avoidance	Weekly	Near tributaries
Water quality (lake)	DO, temp, turbidity (vertical profile)	Weekly & at drawdown triggers	Lake
Water quality (outflow)	DO, temp, turbidity spot checks	Weekly	Downstream of siphons
Water quality (outflow, Use Approval)	pH, Conductivity, Colour	Weekly	Downstream of siphons (as specified in the Use Approval)
Vegetation and soils	Aerial imagery with polygons	Annually	Entire lake margin
Wildlife	Tracks & sightings log	Opportunistic	Lake margins, staging areas

Table 6-2: Monitoring Thresholds and Adaptive Management Responses. Guide for Environmental Monitors to implement daily and weekly field monitoring activities, with clear actions if thresholds are exceeded.

Parameter	Threshold	Potential Responses	Considerations
Lake Temperature	≥ 20°C	Reduce withdrawal rate, prioritize deeper intakes, document trend.	Operations capacity, EFN & downstream impacts, migrating salmon, site accessibility.
DO (lake column)	≥ 8.0 mg/L (instantaneous minimum)	Reduce or pause withdrawal, prioritize oxygenated strata, notify SCRD Project Manager & QEP	Operations capacity, EFN & downstream impacts, migrating salmon, site accessibility.
DO (outflow)	≥ 8.0 mg/L (instantaneous minimum)	Reduce withdrawal, investigate cause, notify SCRD Project Manager & QEP	Operations capacity, EFN & downstream impacts, migrating salmon, site accessibility.
Turbidity (lake or outflow)	> +2 NTU over background	Stop withdrawal temporarily, investigate sediment source	Operations capacity, EFN & downstream impacts, migrating salmon, site accessibility.
Tributary Isolation	Observed disconnection or persistent fish schooling at mouth	Reduce withdrawal, close one or more siphons, prioritize refill	Operations capacity, EFN & downstream impacts, migrating salmon, site accessibility.
Wildlife Distress	Stranding, mortality, abnormal behaviour	Suspend withdrawal if necessary, contact regulator, consider salvage	Operations capacity, EFN & downstream impacts, migrating salmon, site accessibility.
Vegetation Loss	Significant unanticipated decline outside expected zone	Document with imagery	

6.5 Response to Thresholds

If thresholds are exceeded:

- Field personnel and the Environmental Monitor will document conditions and notify the Project Manager immediately.
- Siphon withdrawal may be reduced or paused (e.g., closing two of four siphons) to slow drawdown.
- In extreme cases, all withdrawal may cease to allow for stabilization.
- Fish or wildlife salvaging may be undertaken if feasible and authorized.

- A follow up investigation and report will assess the cause, actions taken, and recommendations.

As refilling the lake is not immediately possible once water is withdrawn, the emphasis is on preventing conditions from worsening, and documenting harm if it occurs. The monitoring program therefore prioritizes early detection and rapid adjustment of withdrawal rates to stay within ecological limits.

6.6 Compliance with Provincial Approval Conditions

The SCRD is required to comply with all conditions set out in the provincial Approval for the Chapman Lake siphon drawdown project. These conditions are to provide regulatory authorities with timely and accurate information on project activities and environmental outcomes.

Table 6-3: Requirements summary under the Use Approval

Requirement	Location/Activity	Frequency/Timing	Responsible Party
Inlet Velocity ≤ 0.14 m/s	Siphon inlet	Setup & weekly	Field Environmental Monitor (EM)
Approval Document on Site	At siphon works	Continuous	Project Manager
Updates to shíshálh Nation	Project activities	As required	Lead EM & Project Manager

6.7 Best Management Practices (BMPS)

- Limit helicopter and equipment use to essential trips.
- Use clean, leak-free, and invasive-species-free equipment.
- Confine works to daylight hours and avoid unnecessary noise.
- Install erosion and sediment controls as required.
- Keep a spill kit onsite at all times and train personnel in its use. In the event of a spill contact the Environmental Monitor for mitigation response.
- Remove all equipment, materials, and waste daily and at project completion.
- Travel to be limited as to avoid vegetation disturbance, no permanent trails will be created
- All wildlife observations and encounters will be recorded
- Water sampling and wildlife salvaging to occur as required

7. REPORTING

This section describes the reporting deliverables required during and after the drawdown. A standardized monitoring template (Appendix A) will be used to record daily field data, which will form the basis of weekly and post-operation reports.

7.1 Weekly reporting

During drawdown, SCRD will produce concise weekly reports summarizing monitoring results, threshold compliance, mitigation actions, and water diversion volumes. These will be shared with BC's Ministry of Water, Lands and Resource Stewardship (the "Ministry"), Water Manager, shíshálh Nation, and the SCRD Project Manager.

These reports will include the following:

- Lake level & drawdown progression.
- Water quality (temperature, DO, turbidity, pH, conductivity, colour) for lake & outflow.
- Observations of tributary access & fish behaviour.
- Wildlife & vegetation observations.
- Inlet velocity.
- Volume of water diverted (weekly & cumulative).
- Any threshold exceedances & mitigation actions

7.2 Post-Operation Reporting

After the drawdown ends, a comprehensive report will analyze all monitoring data, evaluate mitigation effectiveness, and provide recommendations for future operations. It will also document changes in vegetation and habitat conditions using aerial imagery.

After drawdown & removal of siphons:

- Comprehensive analysis of all weekly monitoring data.
- Comparison to AECOM (2016) baseline.
- Evaluation of mitigation effectiveness.
- Aerial imagery & vegetation change analysis.
- Analysis of Chapman Creek hydrology
- Recommendations for future operations.
- Shared with all stakeholders.

A QEP will be responsible for weekly environmental monitoring as well as providing monitoring reports while the siphons are online. Wildlife salvaging shall be conducted if required while the siphon system is operational. Areas of concern include the influent tributaries on the Northeastern shore of Chapman Lake pictured in Appendix C and the section of Chapman Creek immediately downstream of the dam.

8. ROLES AND RESPONSIBILITIES

This section identifies the key personnel involved in the project and their respective responsibilities for monitoring, decision-making, and mitigation.

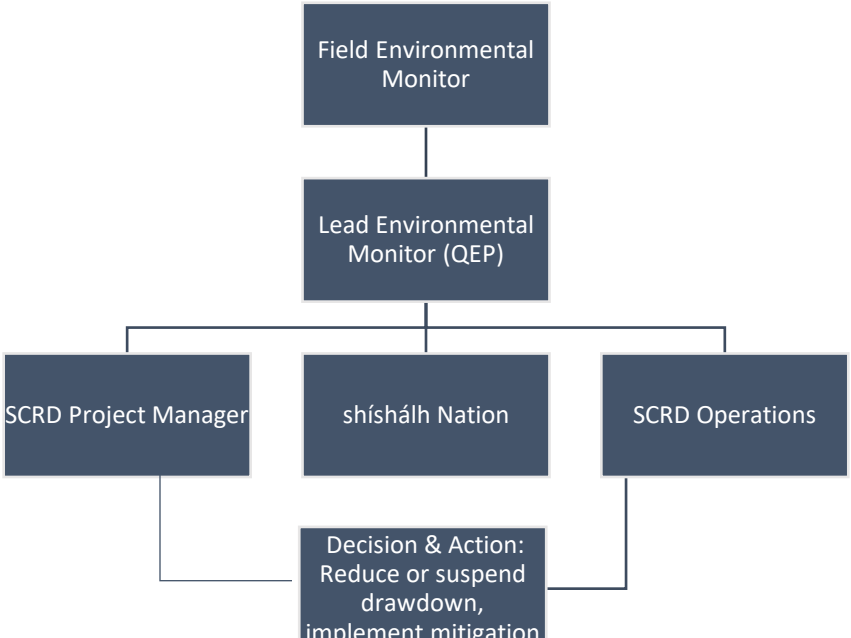


Table 8-1: Summary of key project roles and their responsibilities for monitoring, operations, and compliance

Role	Responsibilities	When Thresholds Exceeded
SCRD Project Manager	• Overall project oversight and decision-making. • Review and approve reports.	Notified immediately by lead EM. Works with Operations to determine response actions.
Lead Environmental Monitor (QEP)	• Lead the monitoring program. • Oversee field monitoring team. • Liaison with regulators and shíshálh Nation. • Interpret data and compare against thresholds. • Advise Project Manager on mitigation.	Receives notification from field EM. Confirms exceedance. Notifies Project Manager, shíshálh Nation, and SCRD Operations.
Field Environmental Monitors (EMs)	• Collect water quality, biological, and observational data. • Document and report results. • Complete daily logs and weekly summaries. • Document fish behaviour and tributary access. • Report potential issues to Lead EM.	Immediately notify Lead EM of any suspected threshold exceedance.
SCRD Operations Division	• Operate and adjust siphon system. • Implement mitigation measures (e.g., reduce withdrawal rate, close siphons). • Provide technical support to field crews.	Notified by Lead EM & Project Manager. Adjusts lake drawdown rate as directed.
shíshálh Nation Representatives	• Provide cultural and ecological guidance. • Participate in reviews and collaborates on developing the field monitoring program.	Notified by Lead EM or Project Manager of exceedance and response actions.

9. ENVIRONMENTAL IMPACT EMERGENCY RESPONSE

Should the Environmental Monitor note any triggers outlined in the above section, the appropriate response will be taken as indicated in Table 8-1. In case of an environmental incident or non-compliance with the Use Approval, the monitor must:

- Notify WaterActReferrals.LowerMainland@gov.bc.ca
- Include the Approval File number in the subject line.
- Report within 24 hours.

9.1 Water Quality Emergency Response

Should the water quality in Chapman Lake decrease due to siphon drawdown such that fish or other wildlife are severely affected, draw down of the lake via siphons will be reduced or halted and additional monitoring will be required to assess overall impacts. Severe water quality effects from lake drawdown may include fish kills, visible plumes of sediment, and algal blooms.

Should the water quality in Chapman Creek decrease due to siphon use such that fish or wildlife are severely affected, operation of the siphons can be adjusted by the following measures:

- Prioritizing deeper siphon intakes for lower temperatures
- Prioritizing withdrawal from oxygenated strata in Chapman Lake
- Using Edwards Lake to augment Chapman Creek

If water quality in either Chapman Creek or Chapman Lake is severely impacted by siphon use, the SCRD Project Manager, QEP, SCRD Operations Superintendent, and the shíshálh Nation will be notified, and the cause will be investigated.

9.2 Water Quantity Emergency Response

Should the water quantity in Chapman Lake cause severe effects to fish, fish habitat, and other wildlife, draw down of the lake via siphons will be reduced or halted and additional investigation will occur to assess impacts. Severe effects from lake drawdown may include fish stranding, fish kills, inability for fish to access spawning ground, and destruction of fish habitat. If required, a fish salvage will be performed. As it is not possible to operationally refill Chapman Lake, drawdown may be halted to prioritize the lake naturally refilling and documented monitoring will occur.

Should the flow in Chapman Creek drop below the minimum EFN, the SCRD will reduce the amount of water withdrawn from Chapman Creek and adjust flows where operationally feasible to maintain minimum EFN. Following an EFN non-compliance, the SCRD Project Manager, QEP, SCRD Operations Superintendent, the shíshálh Nation, and the Ministry will be notified, an inspection of Chapman Creek for fish kills will occur, and the cause of the non-compliance will be investigated.

9.3 Spill Response

Should a release of deleterious substance enter or be likely to enter Chapman Lake, the Provincial Environmental Emergency Program will be notified with appropriate follow up reporting. Additionally, DFO, Environment Canada, SCRD Project Manager, QEP, SCRD Operations Superintendent, and the shíshálh Nation will be notified, and the cause will be investigated.

9.4 Archaeology

In the event that archaeological material is encountered during lake drawdown, monitoring, or any other activities, work in the area of discovery will cease immediately and the shíshálh Nation's Rights and Title Department will be contacted immediately to determine the current conditions and next steps. =The SCRD Project Manager, QEP, and SCRD Operations Superintendent will also be notified as soon as possible.

9.5 Environmental Emergency Contacts

In the event that a significant environmental impact occurs (e.g. landslide, earthquake, major sluffing along the lakebed, dam failure, detriment to fish or fish habitat, major fuel spill, etc.) the contacts listed below will be notified immediately. Depending on the type of environmental impact occurrence, one or more of the following agencies will be contacted:

Table 9-1: Emergency Contact Summary Table

Agency	Contact Name	Office Phone	Email Address
Police, Fire and Ambulance		911	
Sechelt Hospital		604-885-2224	
BC Parks – Sechelt Branch	Rod Dalziel	604-885-6755	rod.dalziel@gov.bc.ca
shíshálh Nation	Angeline Robertson	604-399-4553	arobertson@shishalh.com
Ministry of Environment and Climate Change Strategy		1-800-663-7867	www.env.gov.bc.ca
Ministry of Water Lands and Resource Stewardship		1-877-855-3222	
Federal Department of Fisheries and Oceans		1-800-465-7735	info@dfo-mpo.gc.ca
Provincial Emergency Coordination Center (PEP)		1-800-663-3456	
Regional Dam Safety, South Coast Region	Binod Acharya	778 572-2183	Binod.Acharya@gov.bc.ca
BC Wildfire Service		1-800-663-5555	
Sechelt Fire Hall		604-885-7017	
Coastal Invasive Species Committee		1-844-298-2532	
Replay Answering Services and Lone Worker Checks		1-866-291-4645	SCRD alarm lone worker account #222915
SCRD Project Manager	Jesse Waldorf	604-885-6800	Jesse.Waldorf@scrd.ca
SCRD Utility Operations Superintendent	Codi Abbott	604-885-6800	codi.abbott@scrd.ca

10. CLOSURE

This Environmental Management Plan (EMP) for the Chapman Lake siphon operations was developed using the best available information, including previous environmental assessments, field observations, monitoring data, and professional judgment. While every effort has been made to ensure the accuracy and completeness of the information presented, it is acknowledged that site conditions and environmental responses can vary and that some baseline data are limited.

Accordingly, the EMP is intended to be a living document that can be updated or refined as new information becomes available or as conditions warrant. SCRD and its Environmental Monitors will remain adaptive and responsive to observed conditions in the field to ensure environmental protection objectives are met.

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REFERENCES

AECOM. 2016. Chapman Lake Water Supply Expansion Project Environmental Assessment. Report prepared for Sunshine Coast Regional District. 178 pages.

SLS 2016 Topographic Plan of Chapman Lake Dam and Part of Chapman Lake and Chapman Creek, Strait Land Surveying Inc., November 5, 2015 revised August 26, 2016.

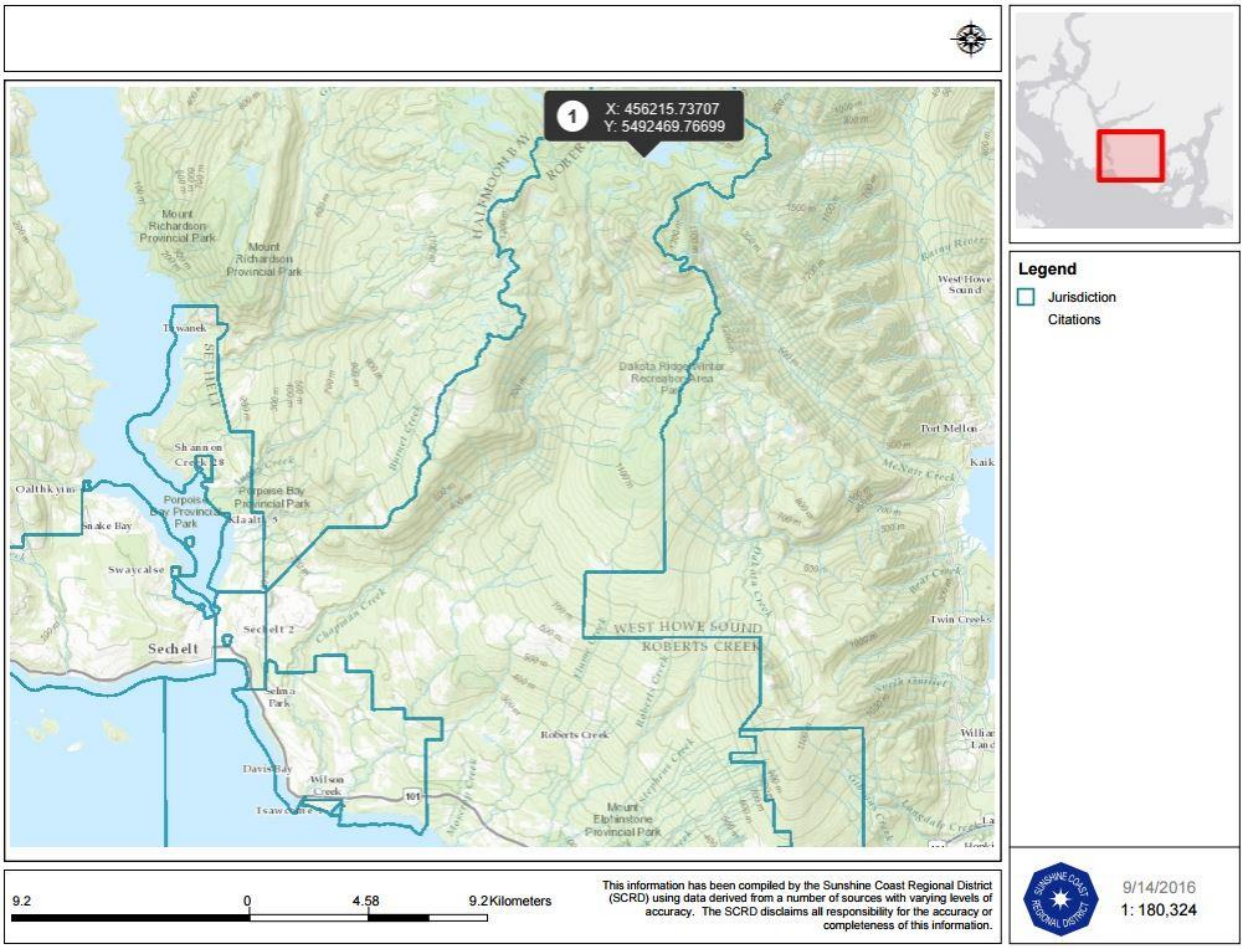
Whitehead. 1999. Impact Assessment: Sunshine Coast's Proposed Water Storage Project (Floating Pump Station) on Chapman Lake, in Tetrahedron Provincial Park. Prepared for Garibaldi/Sunshine Coast District, BC Parks. 146 pages.

WSP 2022 Environmental Impact Assessment Upgrades To Chapman Lake And Edwards Lake Reinforced Concrete Lake Dams Report prepared for Sunshine Coast Regional District 36 Pages

WSP 2022 Chapman Lake Dam Operation, Maintenance And Surveillance Manual (OMS) Sunshine Coast Regional District 56 Page

Appendix A

GPS Coordinates: UTM Zone 10 5492470 N, 456215 E



Appendix B – to be provided as a separate document

Environmental Monitoring Inspection Template

Appendix C – to be provided as a separate document

July 10, 2025, Chapman Lake Environmental Monitoring Report