SCRD Water Intake Inspections

Trout, Ruby, Waugh, McNeil, Garden Bay & Hotel Lakes

Project Dates: Aug 15 -18, 2022

Prepared For

Sunshine Coast Regional District
1975 Field Road,
Sechelt, BC
Attention: Sandi Bandara

Email: Sandi.Bandara@scrd.ca

Prepared For

Freedom Diving Systems Ltd.
PO Box 712
Gibsons, BC
info@freedomdivingsystems.com

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1. Project Details

Freedom Diving Systems Ltd. (FDS) mobilized a surface supplied dive crew to conduct visual inspections on six water intakes within the Sunshine Coast Regional District (SCRD). The Project occurred between August 15th and 18th, 2022.

The inspection schedule was as follows:

a)	Trout Lake	August 15th, 2022	d)	Garden Bay Lake	August 17th, 2022
b)	McNeil Lake	August 16th, 2022	e)	Waugh Lake	August 18th, 2022
c)	Ruby Lake	August 16th, 2022	f)	Hotel Lake	August 18th, 2022

The scope of work, as detailed through the request for proposal included the following condition assessments and inspection deliverables:

a) Condition of intake pipe, screen and pipe anchoring,

b) Identify pipe size and material,

c) Depth at the end of the intake (GPS coordinate),

d) Length and location of the pipe (GPS coordinate),

e) Video survey of the intake pipe, screen and pipe anchoring,

f) Manual cleaning of the intake screen.

Inspection dives were completed by a compliant surface-supplied dive team, where facilities were appropriately locked out during the inspection. In locations where intakes were not accessible from the shoreline, a floating work platform was constructed to stage divers. To prevent exposure of hydrocarbons to the lake environment, given the sensitive nature of these lakes, this platform was propelled with electric motor. Divers collected necessary information and all intake screens were cleaned at the end of the inspection.

Each lake intake is detailed in the report below consisting of a one-page description and one page of key photos. Videos have been compiled to supplement this inspection report illustrating what divers saw during this inspection. It should be noted that in some videos visibility is not great, lakebed sediment is extremely fine and can easily be disturbed.

Drawings are being compiled as an additional deliverable for this contract and its requirements and shall be delivered as separate documents to the SCRD. KMZ files are available with GPS coordinates for the intakes on Google Earth upon request.

2. Trout Lake

Intake Location Address:	8446 Sunshine Coast Hwy.	
Intake Location GPS:	49° 30.440 North,	123° 52.742 West
Terminus GPS Location:	49° 30.462 North,	123° 52.719 West
Pipe Length:	136 feet / 42 metres	
Intake Screen Depth:	13 feet / 4.0 metres	
Lakebed Depth:	18 feet / 5.5 metres	

Construction Details:

Pipe Diameter	7-inches OD
Pipe Material:	Gray Plastic (no identifying marks)
Anchoring	Concrete block with stainless banding
Tee Riser and Gate Valve	15 inches high by 3.8-inch outer diameter at 16 feet from shore

Intake Screen Details

½" Stainless steel mesh outside with inside 1/8th inch stainless mesh.

Screen Flange bolts: 9/16-Inch bolt heads

Trout Lake Assessment Notes

The Trout Lake intake pipe was measured at 136 feet / 42 metres in length from the point where it emerges out of the sediment at the edge of the lake to the terminus at a depth of 13 feet / 4.0 metres. A tee-riser and gate valve is present at approx. 16 feet / 4.9 metres along the pipe from the shoreline. From 119 feet / 36.3 metres from the shoreline to the pipe terminus, the pipe sits approx. 3 feet / 1 metre off the lakebed. The intake screen structure is 7 feet / 2.1 metres in height and is composed of a vertically situated intake screen approx. 3 feet / 1.0 metres in height atop a cylindrical fibreglass riser pipe measuring 4 feet / 1.2 metres. The support structure is sunken into the lake sediment by approx. 7-inches. The intake screen sits approx. 3.5 feet / 1.06 metres above the sediment.

The intake screen was composed of two layers of stainless-steel mesh. The outside mesh was a larger hole grade at ½-inch mesh while the inside mesh was a finer grade with estimated 1/8-inch holes. The mesh was in a good visual condition with little growth present and intake screen flange bolts, securing the mesh to the lower fibreglass support structure were also in a good condition.

Pipe anchors are rectangular collar anchors banded together around the pipe with stainless steel banding. There were 9 blocks observed on 119 ft of pipe. Banding condition visually looked good. Stainless banding visually appeared to be in good condition.

Overall, the pipe and screen are in a good visual condition. Hardware present on flanges was exhibiting a light level of corrosion. The screen consists of an outer and inner stainless mesh screen which was observed in good condition.

Trout Lake Photos

3. McNeil Lake

Intake Location Address:	12222 McNeil Lake Forest Service Road	
Intake Location GPS:	49 35.747 North,	123 59.230 West
Terminus GPS Location:	49 35.814 North	123 39.158 West
Pipe Length:	600 feet / 183 metres	
Intake Screen Depth:	19 feet / 5.8 metres	
Lakebed Depth:	35 feet / 10.7 metres	

Construction Details:

Pipe Diameter	10-inches
Pipe Material:	Sclairpipe 10: IPS PE3408
Anchoring	Concrete pipes with stainless two steel bands

Intake Screen Details

White PVC pipe with diameter of 14-inches with stainless steel mesh ends.

Intake tee length: 21 feet / 6.4 metre

McNeil Lake Assessment Notes

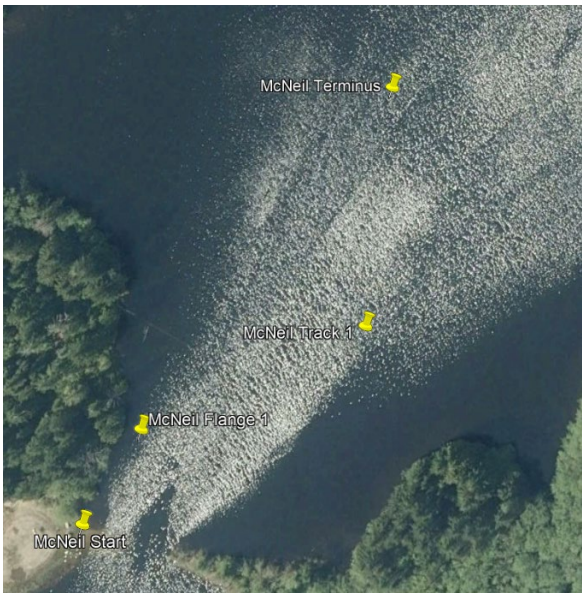
The McNeil Lake intake pipe runs for approx. 600 feet / 183 metres from the shoreline into the lake. A steel pipe emerges from the foreshore to a flange approx. 100 feet / 30 metres along where the pipe transitions to the hi-Impact black sclairpipe material. The flange hardware at this location is exhibiting a moderate to high level of corrosion. The main 10-inch diameter sclairpipe runs to a large steel triangular support structure which supports the intake diffuser tee at the terminus. The large, triangular steel pipe support structure suspends the intake tee approx. 15 feet / 4.6 metres above the lakebed. The intake screen-tee structure at the pipe terminus is 21 feet / 6.4 metres in length and composed of white-PVC with slits cut into the pipe and a fine grade stainless steel mesh covering the ends. The diameter of this pipe is approx. 14-inches. The tee intake rises off a large loop of pipe (detailed in the McNeil Lake pipe drawing). Intake screen holes / slits are approx. 3-inches in length, detailed in photos below. Looking into the end of the tee through the mesh cover, approx. 4-inches of sediment can be seen to be built up.

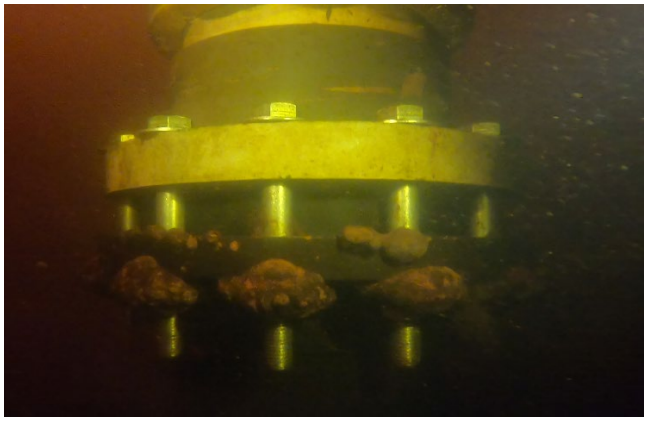
Pipe anchors are sections of concrete pipe 12-inches in length, straddling the intake pipe and secured with stainless steel banding around the pipe. Banding was visually in good condition and secure. Anchors are spaced at approx. 10-15 feet between anchors near the end of the pipe and 5-10 feet through anchors in the shallows of the lake, closer to the shoreline commencement point.

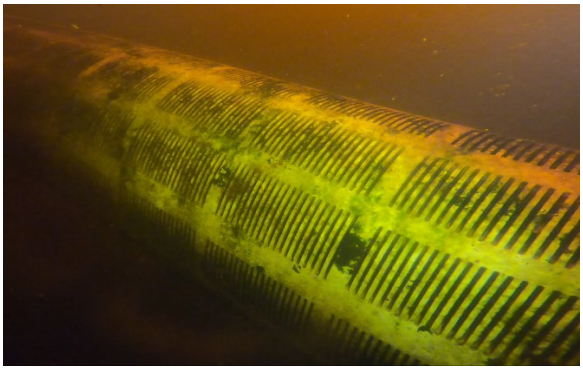
The steel support structure is composed of 3-inch angle iron in a triangle format with horizontal beam lengths of 14.5 feet / 4.4 metres. The main vertical components of the support structure are welded 4-inch steel piles where there is one horizontal member bolted, with U-bolts, to the vertical support pile. Support brackets and bolts, which extend from the horizontal cross member, that support the intake-tee, are exhibiting a high level of corrosion.

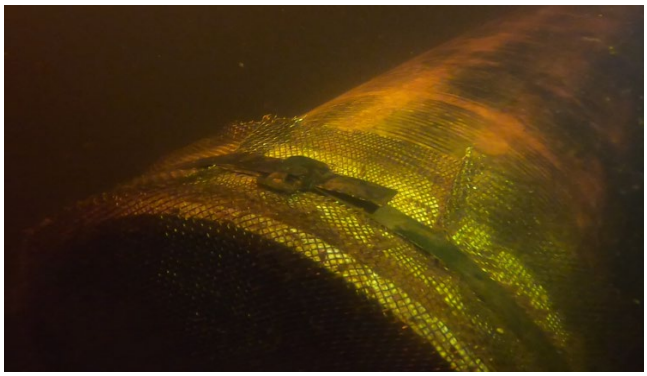
Overall, the intake pipe and its components were visually observed to be in good condition and the intake screen was cleaned by divers.

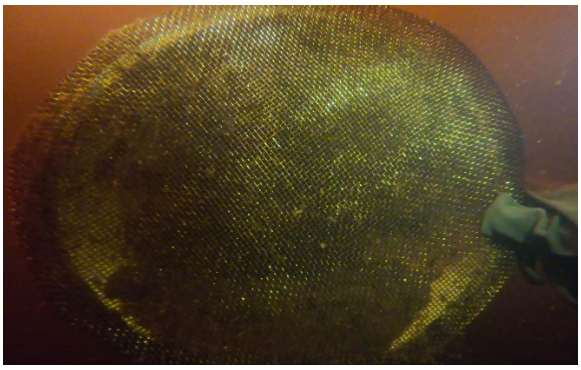
McNeil Lake Photos

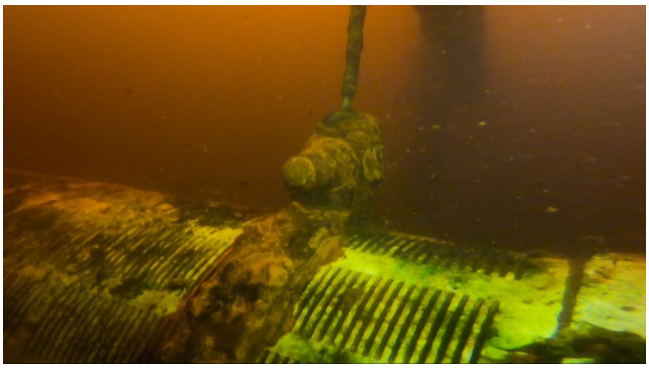


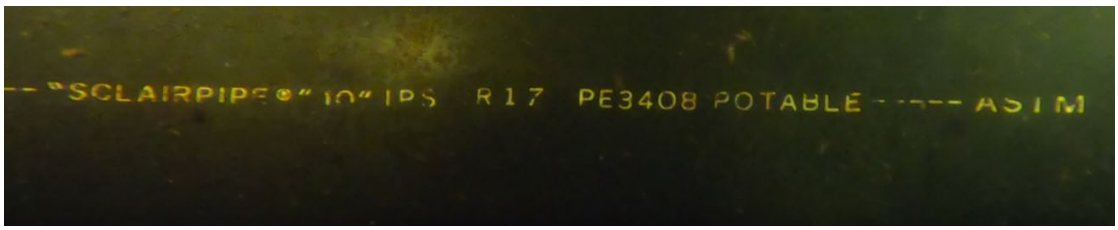












4. Ruby Lake

Intake Location Address:	16241 Sunshine Coast Hwy.	
Intake Location GPS:	49° 44.470 North	124° 0.213 West
Terminus GPS Location:	49° 44.459 North	124° 0.226 West
Pipe Length:	75 feet / 23 metres	
Intake Screen Depth:	44 feet / 13.5 metres	
Lakebed Depth:	47 feet / 14.3 metres	

Construction Details

Pipe Diameter	6-inch
Pipe Material:	SDR 20 PVC 1120 160PSI, Hi Impact
Anchoring	None

Intake Screen Details

Intake screen at 90-degrees horizontal to lakebed

Screen consists of a plywood top and base which supports a fine stainless mesh screen

Screen dimensions are 90 cm / 35 inches vertical by 40 cm / 15.7-inches horizontal

Ruby Lake Assessment Notes

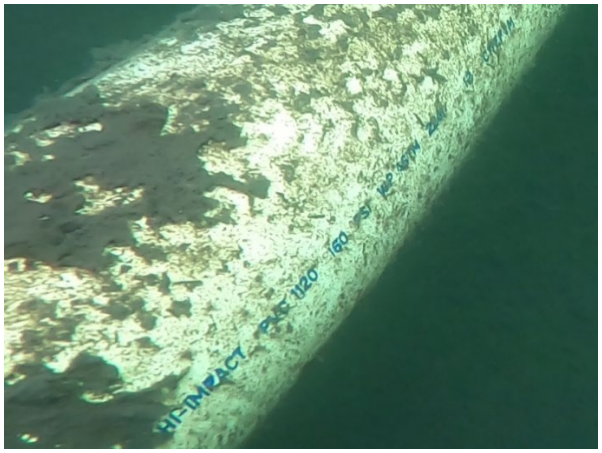
The Ruby Lake intake pipe was measured at 75 feet / 23 metres in length from the point where it is exposed from the shoreline. The pipe extends down to a terminus depth of 44 feet / 13.5 metres. The pipe extends from the shoreline through a moderate amount of fallen tree and wood debris where in a few locations, contact of wood debris can be seen on the pipe. No damage was observed as a result of this contact. A stainless steel, 4-bolt repair clamp exists at 3.0 feet / 10 metres along the pipe which likely represents a previous repair to the pipe. A 6-inch vai-matic silent check valve exists approx. 5 feet / 1.5 metres from the terminus of the pipe before the pipe makes a 90-degree elbow. The intake screen is a vertical extension off a steel support structure and the base of the screen was measured at 3 feet / 1 metre above the lakebed. The mesh of the intake screen is stainless steel and is capped on each end with plywood squares measuring 16-inches by 16-inches in dimension. The intake screen is 3 feet / 0.9 metres in height. The stainless-steel mesh is screwed into the plywood caps which are moderately deteriorated.

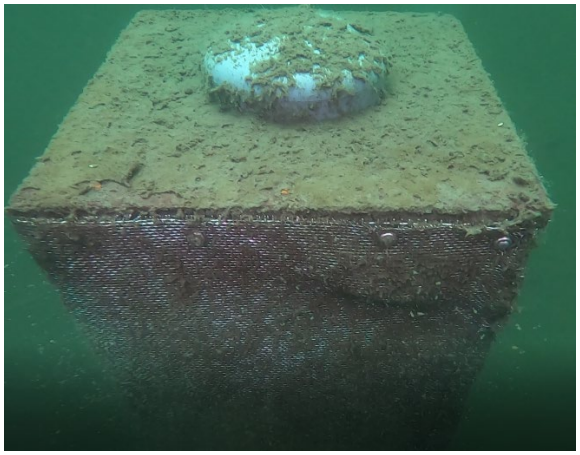
No anchors were observed on the length of this pipe, however, the steel support truss at the terminus of the pipe, which supports the intake screen flange and box structure, is possibly providing a sufficient amount of weight to keep the pipe secure in its current location.

The overall condition of the pipe was visually observed to be in good condition. There were no indications of any leaks or damage to the pipe. The previous repair clamp was in good condition. The check valve was observed to be missing one bolt.

The intake screen showed moderate coverage and was cleaned by divers.

Ruby Lake Photos





5. Garden Bay Lake

Intake Location Address:	4470 Garden Bay Road	
Intake Location GPS:	49° 38.217 North	124° 1.613 West
Terminus GPS Location:	49° 38.448 North,	124° 1.685 West
Pipe Length:	1,492 feet / 455 metres	
Intake Screen Depth:	85 feet / 26 metres	
Lakebed Depth:	90 feet / 27.4 metres	

Construction Details:

Pipe Diameter	12-inch
Pipe Material:	Unknown. No distinct markings observed
Anchoring	Concrete pipe sleeves at approx. 6m spacing

Intake Screen Details

Intake screen stainless steel structure 2 feet / 0.6 metres in length and diameter of 24-inches

Stainless steel diffuser consists with slits 1-inch by 1/8-inch

Intake screen supported by steel A-frame structure & floating barrel

16 Bolt flange only supporting 8 bolts which connects screen to main pipe

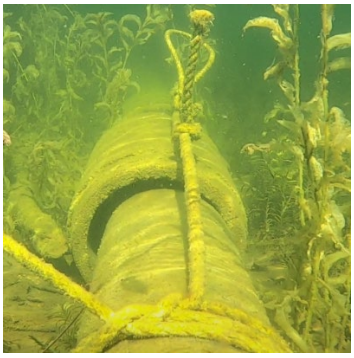
Garden Bay Lake Assessment Notes

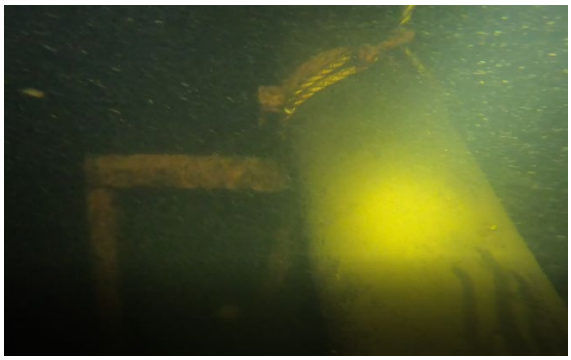
The Garden Bay Lake intake pipe extends for a total estimated length of 1,492 feet / 455 metres. Approx. 6.5 feet / 2 metres from shore is a clock spring joint measuring 4 feet / 1.2 metres in length with a total of 32, ¾-inch bolts securing the two flanges. The pipe is exposed over the first 900 feet / 274 metres of its length before it gets buried to the terminus. The main section of pipe, through the part of the lake where it is exposed above the lakebed, runs parallel to an old section of pipe which is not active and this infrastructure has been left in the lake. The terminus of the pipe was recorded at a depth of 85 feet / 26 metres at an area of the lake that is 90 feet / 27.4 metres deep. The intake screen has a rise of 5 feet /1.5 metres above the lakebed and is supported by a steel A-frame structure with a support bracket that is 3.5 feet / 1 metre back from the screen connection flange. The support bracket shows a moderate to heavy amount of corrosion but is still functional in securing the pipe. Above this bracket is a piece of rope secured by a shackle that suspends a plastic barrel which is full of air. This barrel provides lift to the end of the pipe potentially keeping the steel frame structure from sinking into the sediment. The main intake connection flange is a 16-bolt flange assembly but only contains 8-bolts.

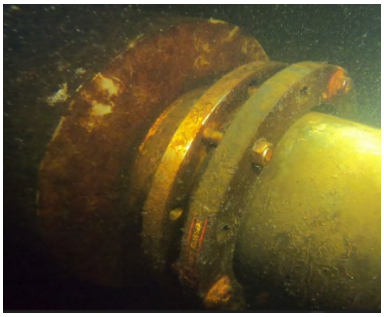
Pipe anchoring is comprised of sections of concrete pipe tied into place with sections of rope which were observed along the entire length of the exposed section of the pipe.

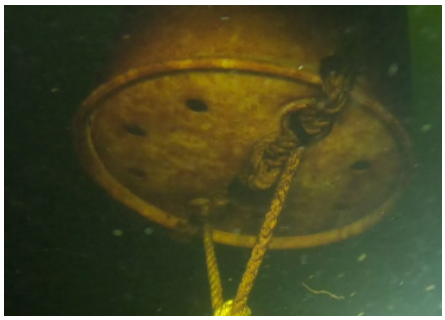
Overall, the intake pipe and screen are visibly in good condition with no signs of leaks or damage. There is no indication that the 8-bolts, versus 16-bolts in the flange is of a concern, as the bolts are secure and in good condition. The screen did have a heavy amount of algae/sediment coverage when inspected which was all removed by divers

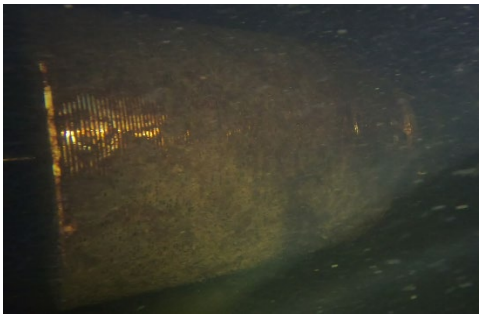
Garden Bay Lake Photos

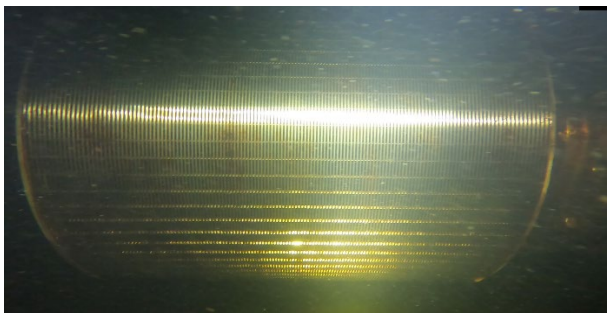












6. Waugh Lake

Intake Location Address:	6544 Egmont Rd.	
Intake Location GPS:	49° 44.998 North	123° 56.591 West
Terminus GPS Location:	49° 44.914 North	123° 56.661 West
Pipe Length:	577 feet / 178 metres	
Terminus Depth:	42 feet / 12.8 metres	

Construction Details:

Pipe Diameter	6-inch
Pipe Material:	PVC 1120 125 PSI ASTM D 2241 SDR 32 5 1H3
Anchoring	None observed

Intake Screen Details

Length of PVC pipe with a series of drilled holes approx. ¾-inch

Waugh Lake Assessment Notes

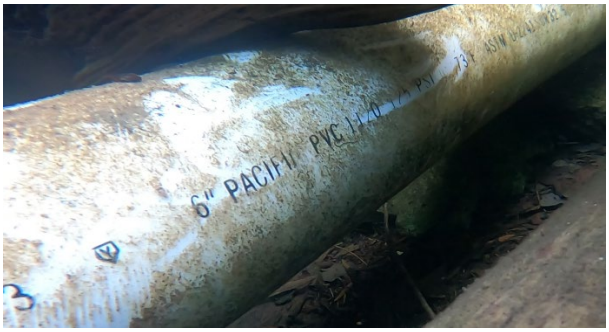
The Waugh Lake intake pipe extends for a total of 577 feet / 178 metres. The first 400 ft / 122 metres of the pipe is exposed above the lakebed and the pipe is buried for the remaining 177 feet of distance only to be exposed where the terminus exists. The terminus of the pipe jets out of the sediment at an approx. 30-degree angle to the lakebed. The PVC intake screen is approx. half a metre above the lakebed and is comprised of 60 drilled holes approx. ¾-inch in diameter; 6 rows of 10 holes. The start of the intake screen was measured at 1.15 feet / 0.35 metres off the bottom off the lakebed, and the terminus of the screen at 1.64 feet / 0.5 metres. The screen does not have a support bracket present to keep the intake above the sediment. Near the shoreline where the pipe starts, there are sections of an old pipe which is no longer active and components have been left in the lake environment.

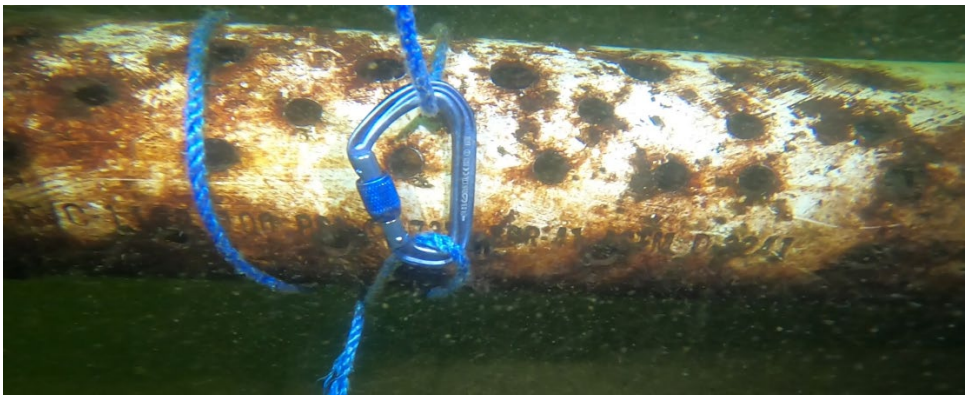
There were no anchors observed along the length of the main pipe.

Overall, the condition of the pipe was visually observed to be in good condition. There were no signs of holes or damage to the pipe along its length to the intake diffuser. Near the lake shore where the pipe starts into the lake, there is a substantial amount of wood debris, but it does not appear to be compromising the state of the pipe. The intake screen, the length of PVC pipe with drilled holes, was in a functional state and clear of the sediment.

Holes in this intake diffuser are approx. ¾-inch, which is larger than typically observed in diffuser structure of this type. The pvc diffuser / screen was cleaned by divers.

Waugh Lake Photos





7. Hotel Lake

Intake Location Address:	4510 Hotel Lake Road	
Intake Location GPS:	49° 38.289 North,	124° 3.185 West
Terminus GPS Location:	49° 38.301 North	124° 3.127 West
	Shallow / North	***Deep / South***
Pipe Length	38 feet / 11.6 metres	220 feet / 67 metres
Intake Screen Depth	8 feet / 2.4 metres	23 feet / 7.0 metres
Lakebed Depth:	8 feet / 2.4 metres	26 feet / 7.9 metres
Construction Details		
Pipe Diameter	3-inch	3-inch
Pipe Material	SER100 HDPE pipe	SCH40 Max 3" septer
Anchoring	None observed	Concrete blocks 10-inch square

Intake Screen Details

Screen length 4 ft / 1.2 metres by 3-inches diameter

Screen flange consists of 4 stainless steel bolts: heavy corrosion on these bolts

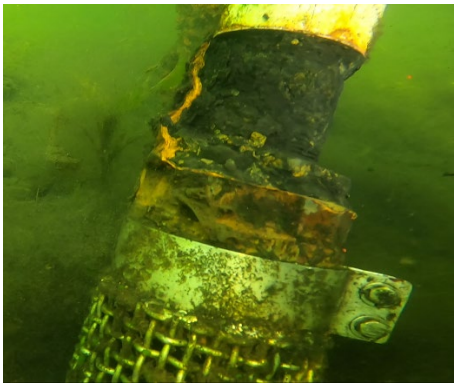
Hotel Lake Assessment Notes

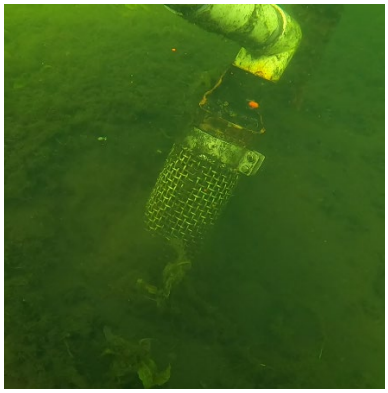
The Hotel Lake intake system currently consists of 3 pipes; one that is broken and no longer in use, one is a short pipe at 38 feet / 11.6 metres in length and terminates at a shallow depth of 8 feet / 2.4 metres and a longer deep-water pipe that runs for a total length of 220 feet / 67 metres and terminates at a depth of 23 feet / 7.0 metres. The pipes are approx. 4 feet / 1.2 metres apart at the shoreline. Old sections of pipe which are not being used for operations have been left to sit in the lake.

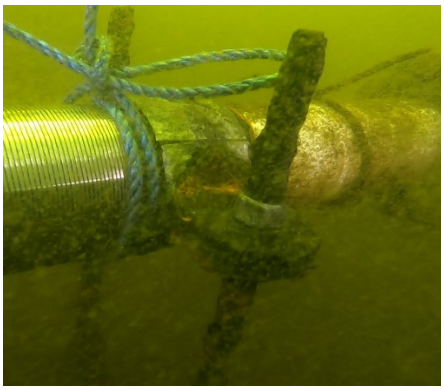
The northern pipe extends deeper into the lake and was reported to the dive crew as the main intake for this facility, while the southern pipe is the shorter, shallower one. The southern pipe terminus consists of a 90-degree elbow with stainless steel mesh intake screen of diameter 6.5-inches. The pipe was originally supported off the lakebed by a steel support bracket which has since failed. The intake screen now sits in the sediment, upside down with the mesh making direct contact with the lakebed. The hardware on this intake screen shows a high level of corrosion. The screen was cleaned by divers.

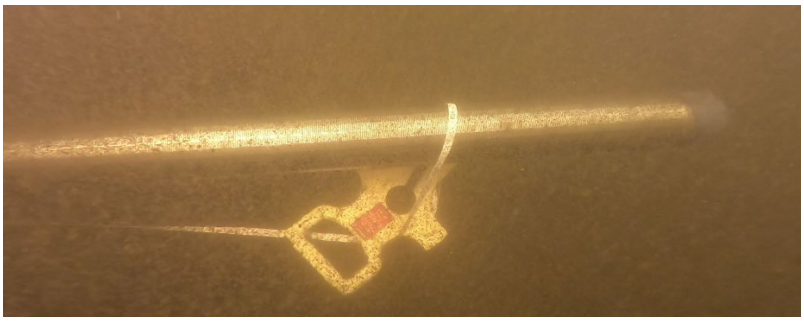
The main intake pipe, which extends 220 feet / 67 metres offshore, is buried in the lakebed from 85 feet / 25.9 metres to 215 feet / 65.5 metres from the shoreline. The final 5 feet / 1.5 metres to the terminus is exposed from the lakebed. The terminus of the pipe is supported off the lakebed by a support structure consisting of a support collar with two ¾-inch threaded rods descending into the lakebed. The base of these support rods was not observed as it was buried. The intake screen is approx. 3.5 feet / 1 metre off the lakebed and is 4 ft / 1.2 metres in length with a diameter of 3-inches. The intake flange bolts are showing a heavy level of corrosion. The anchors observed on this pipe were 10-inch square concrete blocks, with the first anchor seen at 85 feet along the pipe length. Anchor spacing is approx. every 15 feet / 4.6 metres.

Hotel Lake Photos









8. Summary

The following table details some of the areas of deficiencies we noted through our inspection where repairs and/or alterations could be provided.

Table 1.0 - Areas of Deficiencies

Location	Noted Deficiencies
Waugh Lake	- Remove old sections of pipe from environment
	- Rotate intake screen to vertical position to give greater distance from sediment
	- Cover intake screen with finer grade mesh (smaller than 3/4-inch diameter
	- Lack of anchors present, consider adding anchors
	- Install additional support structure at terminus to prevent intake from sinking into sediment
Ruby Lake	- Plywood component of screen showing deterioration, consider rebuild with UHMW
	- Install missing bolt in check valve
Hotel Lake	- Remove old sections of pipe from environment
	- Repair or remove near shore intake screen and pipe
Garden Bay Lake	- Old sections of pipe should be considered for removal from environment
McNeil Lake	- Remove mesh ends and clean sediment from tee
	- Consider replacing hardware at steel flange transition, nearshore
	- Intake screen support clamps and hardware replacement

Please do not hesitate to contact us with any questions or to discuss our summary of findings. We appreciate the opportunity to conduct services for the SCRD and look forward to future opportunities to provide services.

Sincerely,

The Freedom Diving Systems Ltd. Team

Ben Zander,
Director of Operations
Freedom Diving Systems Ltd.
Email: ben@freedomdivingsystems.com
Cell: 604-366-3039

Kevin Swoboda, B.Sc., BIT
Chief Executive Officer
Freedom Diving Systems Ltd.
Email: kevin@freedomdivingsystems.com
Cell: 778-855-5533