

Raw Water Reservoir Refining Site B

Presentation to SCRD Board

06-July-2023



Review Project History

Presentation Outline

Preamble..

- The RWR is not just about storage...
- It is an opportunity for a **re-engineering** of the raw water and treatment system.
- It can enable
 - Reduced operating costs
 - Reduced infrastructure
 - Actioning of SCRD climate goals on energy and GHG's
 - Increased resource access (gravel mine)
 - Environmental restoration



Sunshine Coast Tourism 2014

WDA Change

The drought of 2022 has changed things, and the RWR needs to change too.

	2018 Goals	2023 Goals
In-service date	2027	2030-35
Solve Water supply Deficit to when?	2035	2050
Target Size	0.9 to 1.3Mm3	5.6Mm3

The SCRD has spent over \$700k on Site B.

Can we use all this knowledge gained to solve today's problem, not yesterday's ?



Sunshine Coast Tourism 2014

Early RWR Study, 2018

Constraints set:

- Target size 0.9 to 1.3Mm3
- Only sites on Provincial or SCRD land to be considered
- No private or mine lands
- Dam to be less than 15m high to not be a "large dam"
- Identified 13 sites
- Short list 4 sites



Sunshine Coast Tourism 2014

RWR Study, 2019

Site B emerged as the best site

- Largest storage size at 1.3Mm3
- Easiest (but not cheapest) to build
- Future expansion potential
- Significant operational benefits
 - Gravity feed to and from RWR
 - Eliminate existing Booster Pump Stn
 - New intake is above almost all present and future logging and gravel mining activity
 - Potential for hydro generation



Sunshine Coast Tourism 2014

Site B Satellite View



Site B Constraints



Site B Environmental

Not a pristine area

- Most of it has been logged
- "Resource Area" in Roberts Creek OCP
- Surrounded by human activity
 - Gun Club to east
 - Private gravel pit to north, permitted for 1Mm3
 - Main logging road to west
 - Gas line RoW to south
- Within SC Community Forest operations area
- Despite all this, there is still some habitat there!



Sunshine Coast Tourism 2014

2019 Design

- Site B stores 1.27 Mm³ of water in current configuration
- Assumed bedrock would be encountered at 3m, based on observed outcrops
 - Blasting
 - Concrete wall liner to tie-in to bedrock
- Cost of development was estimated in 2019
 @ \$53M or ~ \$41.7 / m³ of storage



Sunshine Coast Tourism 2014

Phase 4 work

- Phase 4 Field work to refine design and cost assumptions for Site B [2020]
 - GHG analysis
 - Hydro potential analysis
 - Geophysics Completed in fall of 2020
 - Drilling Permits Submitted in May 2020 to FLNRO
 - Permit to drill received in March 2023
 - Drilling in April of 2023
 - Evaluation of Results in May 2023
- Scope expanded in 2020 to consider reservoir options on the mine site – study done by JDS mining.



Sunshine Coast Tourism 2014

Updating & Refining Site B What we now know

- Bedrock is at least 15m deep!
- Silts, sands and gravels
- No clay for reservoir core
- Commericial viability for gravel mining is questionable, but yet to be confirmed either way



Sunshine Coast Tourism 2014

Updating & Refining Site B What we now know

Geophysics Section



Figure 3-2 Velocity model for Line 3.

Updating & Refining Site B What we now know

- Latest Developments
 - Bedrock is below reservoir base
 - No concrete liner required
 - Can use synthetic liner for seepage control
 - Reduced volumes for excavation and excess fill
 - Slight increase in storage volume with reduced walls (~25,000 m³)



Sunshine Coast Tourism 2014

Review Current Design Site B Preliminary Design Adjusted for Bedrock



PLOTTED: 2023-05-12 3:08 PM, FILENAME: W1,Sunthine Coast Regional District/VP19-SCR-01-00/S8 Civil-Earthwork1/CSD \/troduction Drawings/VP19-SCR-01-00-DWG-CI-201-204.dwg, BY: CHERYL DORM

Updating & Refining Site B What We Now Know

	Site B	
	Original Design	
Avoid ICOLD	Y	
Avoid gun club land	Y	
Avoid private land	Y	
Water Depth (m)	10	
Embankment vol Mm3	0.4	
Water Area ha	15	
Water Volume	1.3	
Target (2050)	5.6	
Cost \$M	44	
\$ /m3	33.9	
Church Rd	11.4	

Rethinking the Site B design

Size

- Target size to solve Water Supply Deficit to 2050 is now 5.6Mm3
- Minimum possible RWR size for EFN deficit alone is 1.5Mm3
- The current RWR size 1.3Mm3 is now too small
- What is the best we can do within the original site constraints?

Updating & Refining Site B Revised Option 1 design



Updating & Refining Site B What We Now Know

	Sit	Site B		
	Original Design	Update Opt 1		
Avoid ICOLD	Y	Ν		
Avoid gun club land	Y	Y		
Avoid private land	Y	Y		
Water Depth (m)	10	12		
Embankment vol Mm3	0.4	0.7		
Water Area ha	15	20		
Water Volume	1.3	1.8	Still too small!	
Target (2050)	5.6	5.6		
Cost \$M	44	49		
\$ /m3	33.9	25.8		
Church Rd	11.4	11.7		

Updating & Refining Site B Option 2 Design using Gun Club land



Updating & Refining Site B What We Now Know

	Site B			
	Original Design	Update Opt 1	Opt 2	
Avoid ICOLD	Y	N	N	
Avoid gun club land	Y	Y	N	
Avoid private land	Y	Y	Y	
Water Depth (m)	10	12	17	
Embankment vol Mm3	0.4	0.7	1.7	
Water Area ha	15	20	30	
Water Volume (Mm3)	1.3	1.9	4.4	
Target Volume (Mm3)	5.6	5.6	5.6	
Cost \$M	44	49	91	
\$ /m3	33.9	25.8	21	
Church Rd	114	117	117	

Updating & Refining Site B Option 3 using Private Mine Land



Updating & Refining Site B What We Now Know

	Site B				
	Original Design	Update Opt 1	Opt 2	Opt 3	
Avoid ICOLD	Y	N	Ν	N	
Avoid gun club land	Y	Y	Ν	N	
Avoid private land	Y	Y	Y	N	
Water Depth (m)	10	12	17	22	
Embankment vol Mm3	0.4	0.7	1.7	2.6	
Water Area ha	15	20	30	40	
Water Volume	1.3	1.9	4.4	<mark>7.6</mark>	
Target Volume	5.6	5.6	5.6	5.6	
Cost \$M	44	49	91	106	
\$ /m3	33.9	25.8	21	13.9	
Church Rd	11.4	11.7	11.7	11.7	

Operational Benefits of Site B RWR

Action	Benefit
Gravity feed to WTP from RWR or new intake	Eliminate existing booster pump station
Gravity feed to Creek for EFN	Eliminates pumping Eliminates evaporative loss supplying from alpine lakes
Supply WTP via RWR all the time	RWR acts as pre-treatment and pre-settling, giving consistent clean water to WTP
Can supply WTP entirely from RWR and isolate from creek intake	Isolation from any disturbance in Chapman Creek catchment, summer or winter
Can supply WTP entirely from creek and isolate RWR	Isolation from RWR for disturbance or maintenance
Can supply EFN from RWR in winter	Difficult to do with alpine reservoirs
New intake location (at 300m) is above all privately owned and gravel lands	Minimises risk of water contamination from disturbance from logging, gravel mining, erosion etc

Environmental and Climate Resiliency Benefits

Action	Benefit
Ability to supply WTP exclusively from RWR at any time	Protects against emergencies in the catchment area – fire , flood, landslide, etc
Can supply Chapman Creek EFN from base of RWR in late summer	Water will be colder than water from surface of Chapman & Edwards lakes and is more beneficial for salmon migration
If spare water is in RWR in October, can release extra for environmental flow	Provide improved flow for improved migration and spawning conditions
Extra water in reserve for any other purpose	e.g. environmental flow in Husdon Creek
Fill firefighting floatplanes and helicopters from RWR	RWR will be the only low elevation, aerial accessible forest fire fighting reservoir between Chapman Creek and Howe sound.

Hydro Generation

	Inline System	Creek System
Flow	RWR to WTP 20,000m3/day	New Intake to Chapman Falls 150,000m3/day
Duration	Year round	Winter/spring
Power	99kW	1.7MW
Annual production	0.6M kWh	10MkW
Value	\$50k	\$400k
Cost	\$700k	\$6M



The inline system produces all the electricity needed by the WTP, making it a *net-zero energy facility*

The Creek system, produces more electricity than the SCRD uses (6M kWh), making it a **net-negative electricity government!**

GHG Analysis

- Per SCRD Climate Change policy, for all new projects
- Also required for all Federal Funding applications estimate GHGs for Construction and annually to 2050
- Below are approximate values only, scaled for new options

	Opt 2	Opt 3	Opt 3 + Creek Hydro
Size	4.6Mm3	7.6Mm3	1.7MW
Construction	12000	15000	15000
Operation 2030- 2050	2400	2400	-3900
Total	14,400	17400	11,100

A large part of the construction GHG is loss of forest cover

RWR Enabled Long Term Improvements to Water System

- Near term (by 2030)
 - relocate pipeline and residuals storage off minesite to east side of Ch. Ck.
 - Enables > 1Mm3 of mining
 - Construct proper residuals facility
 - Eliminate booster pump station
- Long Term (2040+)
 - When WTP is at end of life or needs expansion, relocate to below site B.
 - Eliminates all remaining pipe creek crossings
 - Enables more resource at Mine
 - New site has room for expansion
 - Relocate waterworks yard to new WTP
 - Unifies operations
 - At geographical centre of water system
- Relocation of the mine enables over 5ha of land back to the Shishalh Nation

Relocated Infrastructure



What can we do with the excess water?

- Option 3 at 7.6Mm3 is 2Mm3 larger than needed for 2050 (or even 2060)
- Do we really want to spend that money now for the benefit of future people?
- Look at the water storage budget:

Storage	Volume (Mm3)
Chapman & Edwards Lake	1.8
RWR	7.6
Total	9.4
2050 target	7.4
Extra	2.0

We have created enough extra storage at Site B to be able to decommission the dams on the alpine lakes and restore them to their original condition!

Environmental Restoration Option

- The combined area of Chapman and Edwards Lakes is over 60ha
- Site B is about 60ha, and only 40 of this is forested
- We would trade the loss of 40ha of mid-elevation in return for the restoration of 60ha of alpine lakes – the two largest on the Sunshine Coast
- The SCRD is then out of the alpine operations business and does not need to operate infrastructure up there anymore
- No more helicopter rides!
- No more engineering works on the weir structures
- Avoids weather related staff safety issues as experienced last November

An outstanding example of infrastructure development enabling environmental restoration!

"Naturalized Lake" Option

- The reservoir liner is to prevent seepage loss it is not needed for structural purpose
- It is over \$10M and must be replaced every 30 years.
- Alternative is to do an un-lined reservoir, as most large dams are
- Seepage flow will flow via groundwater into aquifer 556 and into Chapman Creek
- This is supplementing EFN the natural way!
- Do some habitat enhancements in and around the lake floating islands, etc
- Eliminate the permitter fencing (\$1M) and just fence and gate the access road
- The hill at the SW corner (elev 229m) would make a great public viewing platform

Water Licensing Implications

- The SCRD holds a diversion licence for 7.5Mm3/yr (max 33,000m3/day)
- This is for Waterworks purpose
- If using the RWR for EFN, then a separate licence can be obtained for winter diversion for summer EFN use.
- A separate licence is also needed for the reservoir storage. This can allocate portions of the storage to different purposes
- A separate license is needed for the Creek hydro system
- A license is not needed for the inline hydro systems this water is already being used for "waterworks" purpose

Permitting

The project requires numerous environmental and other permits to proceed

- Archaeology
- ALR exclusion, Community Forest exclusion
- Riparian area (Husdon Creek)
- Habitat assessments
- Water licensing
- Mitigation plans
- Potential Provincial Environmental Assessment
- Potential Federal "impact assessment"

There is a lot work required!

Room for one more expansion in the future!

	Site B				
	Original Design	Update Opt 1	Opt 2	Opt 3	Opt 3, Ph 2
Avoid ICOLD	Y	N	N	N	N
Avoid gun club land	Y	Y	N	N	N
Avoid private land	Y	Y	Y	N	N
Water Depth (m)	10	12	17	22	27
Embankment vol Mm3	0.4	0.7	1.7	2.6	4.3
Water Area ha	15	20	30	40	50
Water Volume	1.3	1.9	4.4	7.6	<mark>11.1</mark>
Cost \$M	44	49	91	106	48*
\$ /m3	33.9	25.8	21	13.9	14*
Church Rd	11.4	11.7	11.7	11.7	11.7

* = incremental cost for Phase 2

Grant Funding Alignment

Use federal Disaster Mitigation and Adaption Fund as an example

- Requires statement of "how long does the asset mitigate the disaster for"
- For Site B, Opt 3, this is for 40 years, or 25 if we restore the alpine lakes
- Mandatory GHG assessment
- Mandatory Climate Resiliency Assessment
- Strong focus on co-benefits
 - Hydro generation is a good co-benefit
 - Lake restoration option is an outstanding co-benefit
 - Enabling gravel mining at the existing site is a good co benefit
 - Enabling land back to the Shishalh Nation is a great co-benefit
- Return on Investment Calculation can include revenue from hydro generation

SCRD Policy Alignment. Corporate Carbon Neutrality Goals (2023)

Corporate Carbon Neutrality Goals (2023)

Climate Lens:

- How can this project maximize reduction in GHG emissions?
- How can this project increase resilience to climate change impacts?
- Pursue renewable energy opportunities

- Site be would make the SCRD net electricity neutral
- The future simplification of operations, and potential elimination of the alpine dams will significantly reduce travel and fuel use

SCRD would not be the first to do gravity flow + hydro..

Nanaimo South Fork Dam (1931)

Incredible foresight was used when planning and designing the dam as they built it at an elevation to allow water to flow to Nanaimo by gravity instead of using pumps (although there are a few areas in Nanaimo that require pumping due to their elevation).

The dam is formed in an arch configuration and leans downstream 32 feet. The City has saved (and continues to save) hundreds of thousands of dollars in electricity costs from having the dam built this way.

The dam holds 2 million cubic metres of water and the reservoir is kept full. This creates the hydraulic grade line that allows Nanaimo's water system to be fed by gravity. For the past 15 years or so, power has been generated at the dam for local needs.



In Closing

- The Site B RWR study has been ongoing since 2018
- We have optimized the original design just in time for it to be made obsolete by the new WDA!
- New target of 5.6Mm3 for 2050
- Best value option is 7.6Mm3 + Hydro for ~ \$110M
- Solves the Water Supply Deficit to at least 2050!
- Expandable to solve for 2075
- Enables major re-organization and simplification of raw water system
- Enables all infrastructure off mine and 5 ha of land back to Shishalh Nation
- Enables option of restoring the alpine lakes and removing all infrastructure from the Provincial Park
- Outstanding grant funding potential

Questions?

Thank you