Sunshine Coast Regional District:
Chapman Creek Water Treatment Plant

The Sunshine Coast Regional District (SCRD) is located 40 minutes by ferry northwest of Vancouver on the beautiful Sunshine Coast. The SCRD supplies water to residents with five separate water systems consisting of seven supply sources. The largest system is the Chapman Creek system which supplies water to 22,000 residents in Sechelt and adjoining rural areas.


Site of the new water treatment plant

In late 2001, the SCRD received approval of a $3.8 million Canada/BC Infrastructure Grant to construct a water treatment plant for the Chapman Creek water system. In 2002 the SCRD hired an engineering consultant, reviewed process designs, approved the detail project design and tendered the project. The total project cost was $7,000,000. The water treatment plant construction began in February 2003.

WATER SOURCE

Water from Chapman Creek is categorized as a very soft, coloured, low turbidity, low pH, high organic carbon, low alkalinity and calcium deficient water. This combination of characteristics results in a water that is very corrosive and is subject to formation of disinfection byproducts including trihalomethanes and haloacetic acids when using chlorine for disinfection. The water quality is quite good for most of the year, however colour and turbidity levels exceed drinking water guidelines during spring runoff and following heavy rains.

Plant Capacity	
Nominal Flow	25 ML/day
Hydraulic Capacity	32 ML/day
Average Daily Flow	12.5 ML/day
Minimum Flow	9.0 ML/day
Maximum Flow	25 ML/day

WATER SUPPLY

Water flows from the intake on Chapman Creek through an existing sedimentation box, where the water flow is slowed to allow settling of sand which can be manually flushed out. Water then travels by gravity pipeline for approximately one kilometer to a new raw water pumping station.


Chapman Creek intake during a winter storm

This pumping station consists of three low lift pumps which supply all the flow to the new treatment plant. Each pump has a capacity of 16 ML/day and operates on variable speed drives. Two pumps only can operate together. The raw water is pumped to the main treatment plant building which is adjacent to the existing 13 ML Selma Zone 2 reservoir.


Early in the construction

PLANT PROCESS

The water treatment plant process consists of chemical injection and rapid mixing, coagulation and flocculation, clarifying by flotation, filtration and disinfection. Treated water is discharged into the adjoining reservoir prior to entering the distribution system.


Formwork for the filters

Rapid Mixing

Raw water enters the plant by a 600 mm water main and passes through a flow meter which measures total flow and is used to adjust the chemical feed amounts. The plant uses aluminum sulphate (alum) as a coagulant, which is injected at the head of the plant. The liquid alum is rapidly mixed in the water by a pump and diffuser. Water then flows to a flow splitter box where soda ash is injected. The soda ash solution increases the low pH of the raw water.

The flow splitter box divides the water flow into two pre-treatment process trains. Each train consists of two flocculation tanks and one DAF tank. Following this are four filters. During lower flows from October to April, one process train and two filters are in operation; with both trains and four filters required for the spring and summer month's operations.

Coagulation and Flocculation

Alum is used as the coagulant, which results in the clumping together of fine particles which cause colour and turbidity, into larger particles called floc. Once the alum has been injected into the raw water, the water enters the flocculation tanks where it is gently mixed. The flocculators are mechanical paddle mixers with one mixer in each tank. The first tank mixing is done at about twice the speed as the second tank. Detention time at maximum flow is 23 minutes.

Coagulation and Flocculation	
Flocculation Tanks	4 (2 per train)
Volume per cell	110 m3
Water depth	4.40 m

DAF Clarification

Water leaves the flocculation tanks entering into the bottom of the dissolved air flotation (DAF) tanks. There is a slanted baffle plate in the first section of each DAF tank where aerated water is injected from recycled lines. Millions of microscopic air bubbles (20 - 50 micron diameter) are released and float to the

surface of the DAF floating the floc particles to the water surface. This floc is skimmed by a continuously rotating skimmer brush and sent to waste. Clean water is collected at the bottom of the DAF through launder pipes that lead to the filter influent channel.

DAF Clarification	
DAF tanks	2 (1 per train)
DAF size	5 m X 9.5 m
Water depth	3.9 m
Surface loading	12.2 m/hr
Maximum flow	13.9 ML/day per chamber

Filters

Water is diverted to any of the four filters from the filter distribution channel. Polymer is added as a filter aid and also added to backwashed waste water. The rapid rate filters are gravity down flow filters with dual media – 500 mm of anthracite on top of 250 mm of sand. The filters are backwashed from a submersible pump pumping treated water and air scoured by one of two blowers.

Filters	
Filters	4
Filter size	6.1 m X 3.6 m
Water depth	3.0 m
Filter media	500 mm anthracite
	250 mm sand

Disinfection

UV light is used as the primary disinfection system just before the treated water leaves the plant. Chlorine gas is the secondary disinfectant, added first in the filter distribution chamber before water enters the filters, then also in the effluent chamber as the treated water leaves the plant prior to flowing into the 13 ML reservoir. Chlorine is also added as required as the treated water leaves the reservoir for the distribution system.

Soda ash is also injected in the effluent chamber once the treatment process is complete, again to raise the pH of the treated water.

Sand and anthracite filter media

Underground piping for the raw water pump station


Raw water pumps

Residuals

The treatment process produces sludge from the removal of colour and turbidity in the DAF and filter processes. Floc from the DAF process and backwash waste from the filters is flushed by gravity to the old open water reservoir 1.5 km from the water treatment plant. The old reservoir was converted to a sludge settling basin where the water is decanted and piped to an adjacent gravel and sand operation.


Treated water pipe gallery

PLANT CONTROLS

Two new standby diesel generators are available for automatic switchover in case of a power outage. A 450 kW generator powers the main plant with a 100 kW unit powering the raw water pump station. An existing 35 kW generator powers the chlorine building in case of a power outage.

The new plant has a networked SCADA system allowing for onsite plant operation with data logging and report generation, and remote monitoring and alarming through the SCRD monitoring system.


Interior view

STAFFING

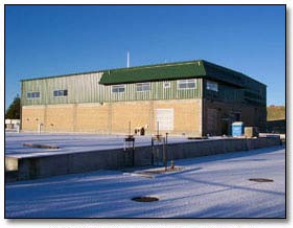
The plant is operated with one operator on day shift, seven days a week. There are four trained operators who share the work on a rotational basis throughout the year. The four operators, Dennis Cassin, Shane Walkey, Scott Fry and Gary Popp were all existing SCRD waterworks employees prior to training at the new plant.


DAF waste


Chlorine supply


Backwash settling pond

The Chapman Creek Water Treatment Plant was commissioned in March 2004, supplying safe and excellent quality water to Sunshine Coast residents and visitors. *Don Gare - SCRD*


Water treatment plant main building