
Greater Victoria Water District
LONG TERM WATER SUPPLY PLAN
Executive Summary
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GREATER VICTORIA WATER DISTRICT

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EXECUTIVE SUMMARY

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The following executive summary for the Greater Victoria Water District Long Term Water Supply Plan provides the important findings, conclusions and recommendations.

Mission Statement - The following mission statement was adopted for the study and the work plan:

> *To provide for the future needs of the Greater Victoria area by planning effectively for an adequate supply of water that meets or exceeds water quality standards and regulations. The plan will reflect community environmental and economic expectations and values.*

Existing Conditions - Findings

1) The GVWD is responsible for delivering potable water to its members and customers. Most of the deliveries are "as required" in quantity.

2) The GVWD has problems with delivering the required quantities because of increased demands associated with population growth and the loss of some water storage capacity in some of its watershed storage reservoirs. The loss of storage capacity results from lowering of operating levels on the Goldstream and Waugh reservoirs because of a concern with dam safety.

3) The GVWD has problems with water quality because the increasing water demands from population growth and the partial loss of Goldstream and Waugh Reservoirs reduces the natural purification ability of the remaining Sooke Reservoir. Water quality issues are also resulting from changing regulatory criteria and increasing awareness and expectations by the waterworks industry and the public respectively about the quality of water delivered to the user.

4) The GVWD has concerns with the security of supply as over 90% of the water is now delivered through the single lifeline Kapoor Tunnel and should anything happen to the tunnel, the GVWD would rapidly be short of water.

Water Quantity - Findings

1) The GVWD service area population is increasing. For water supply planning purposes the following population levels are projected:

1994	-	295,000 persons
2012	-	389,000 persons
2045	-	667,000 persons
Long Term (75-100 years)	-	800,000 persons

2) The existing GVWD controlled or licensed watersheds tributary to Sooke Reservoir, Upper Goldstream River Reservoirs and Leech River Diversion Tunnel have the water quantity to provide for an 800,000 population level as long as more storage and the appropriate facilities are completed or provided. A summary of the water storage capability of each of these watersheds and the corresponding population levels that can

be accommodated are listed in the following table.

POPULATION SERVICEABLE FROM VARIOUS GREATER VICTORIA WATERSHEDS

Watershed	Water Storage Volume, Million m^3	Population
Upper Goldstream	10 (existing) 25 (maximum suppliable by watershed)	30,000 70,000
Sooke Reservoir	50 (existing) 100 (Sooke Reservoir raised) 115 (Sooke Reservoir drawn down) 165 (Sooke Reservoir raised and drawn down)	225,000 350,000 360,000 400,000
Sooke and Leech	165 (Sooke Reservoir raised and drawn down)	700,000
Sooke, Leech and Goldstream	185 (Sooke Reservoir raised and drawn down and Weeks Lake and Goldstream Reservoirs provided).	800,000

3) If the foregoing is provided, then there is no need to consider new sources because the existing watersheds will meet GVWD estimated demands in the next 75-100 years as long as some demand management is used to keep the per capita water demands at current levels. The development of new sources is also much more costly than the upgrading of existing sources.

4) Aditional demand management has the ability to defer the District's new source development requirements possibly in excess of 100 years or to serve close to 1,000,000 people.

Water Quality - Findings

1) Sooke Reservoir contains high quality water that meets all current health-related regulations. Summer temperatures exceed the aesthetic objective of 15°C and there are occasional problems with colour in the winter and tastes and odours associated with mini algal blooms.

Similar to Sooke Reservoir, the water in the Goldstream Reservoirs is also a high quality water source. However, the water delivered to Japan Gulch Reservoir via the Goldstream River is variable, especially during major run-off periods.

The Leech River is not impounded or controlled by reservoirs so its quality tends to be more variable than that of the Sooke Reservoir and the Goldstream Reservoirs. Colour and turbidity peaks can be high during runoff events.

2) The present method of disinfection of Sooke Reservoir water with chloramination does not provide adequate protection against waterborne disease. However, it is anticipated disinfection goals can be met with enhanced disinfection with ozone.

3) With addition of other watersheds, particuarly Leech River to the Sooke Reservoir, filtration may be necessary to achieve turbidity, colour and disinfection by-product

water quality goals. It is likely that direct filtration will provide the necessary level of treatment although no decision should be made until after a pilot study is completed and final recommendations made.

4) It is important that the GVWD begin source of supply treatment studies as soon as possible. The studies should include a pilot treatment study and a mixing/limnology study. These should be performed for at least 12 months to obtain the seasonal water quality variations.

5) The timing for filtration is uncertain and will depend on the percentage of the total Sooke Reservoir water originating from outside the Sooke watershed. The limnology/mixing study in the Sooke Reservoir will provide direction as to when filtration may be required.

Transmission System and Security of Supply - Findings

1) The existing transmission system from Sooke Reservoir has a major security of supply problem with the single lifeline Kapoor Tunnel. There are also a number of other lesser problems in the transmission system, notably in the Saanich Peninsula.

2) To provide backup to the Kapoor Tunnel, either the Goldstream Dams have to be reconstructed, or a second independent line of supply from the Sooke Reservoir provided. The second line of supply can be over the Jack Lake Pass or to the Saanich Peninsula via a northern supply main. Pumping of the water would be required in both of the latter cases.

3) The existing transmission system downstream of the Kapoor Tunnel can be readily expanded for capacity by implementing either Plan 3, (expansion of system through Victoria) or Plan 4 (the use of GVWD No. 4 Main and a new system through Saanich) of the 1988 comprehensive system study. Both Plans recognize overall costs and the security of supply of the transmission system downstream of the tunnel.

4) Plan 3, involving a strengthening of the transmission system through southern Victoria, is now recommended because of the anticipated population growth in the Saanich Peninsula. The corresponding intensive usage of the No. 4 Main for these demands uses up the spare capacity in the main previously available for Plan 4.

5) Utilization of the storage reservoirs within the service area needs to be addressed for reasons of overall transmission system cost, security of supply and water quality.

Alternative Plan Development - Findings

1) Six alternatives have been developed and evaluated. The principal elements in each Alternative include:

Alternative A - Raise Sooke Reservoir for immediate additional storage and restore Goldstream Reservoir for security of supply.

Alternative B - Lower Sooke Reservoir for immediate additional storage and restore Goldstream Reservoir for security of supply.

Alternative C - Raise Sooke Reservoir for immediate additional storage and provide a pumped line over the Jack Lake pass.

Alternative D - Lower Sooke Reservoir for immediate additional storage and provide a pumped line over the Jack Lake pass.

Alternative E - Raise Sooke Reservoir for immediate additional storage and provide a Northern Supply line.

Alternative F - Lower Sooke Reservoir for immediate additional storage and provide a Northern Supply line.

2) The Alternatives are not significantly different in their total long term cost.

Total GVWD Capital Cost $279.5 million to $305.5 million (8.5% spread)

Total Capital & Yearly O&M
at 4% Present Value GVWD Cost $213.28 million to $256.06 million (20.0% spread)

Using present value discount factors of 6% and 8% does not affect the financial evaluation of the Alternatives to any major extent.

3) The early stages of the Northern Supply main alternatives (Alternatives E and F) are more costly in comparison to the others.

Alternatives	A	B	C	D	E	F
Total 1994-2000 Capital GVWD Cost (million $)	81.4	73.4	69.5	61.5	106.6	98.6

4) The alternatives need to be evaluated to account for other benefits as well as the net long term costs and on an overall basis.

Cost Criteria - Findings

1) The cost estimates provided in this study and report have been extensively reviewed and found accurate for evaluation of alternatives.

2) The estimates are projected 1994 costs and need to be adjusted for budgetary purposes to correspond to the inflationary level at the time of implementation.

3) The more distant in time costs also need to be updated in the future for conditions anticipated to prevail at the time of implementation.

Evaluation of Alternatives - Conclusions

1) The estimated cost in million 1994 dollars for the Alternatives are:

	Alternatives					
	A	B	C	D	E	F
GVWD 1994-2000 Capital Cost	81.4	73.4	69.5	61.5	106.6	98.6
GVWD Long Term Capital Cost	305.5	297.0	288.0	279.5	297.1	288.6
GVWD and Non Common Municipal Long Term Capital Cost	347.1	338.6	329.6	321.1	310.1	301.6
4% Present Value of long term Capital and Operating and Maintenance Costs:						
- GVWD	226.44	233.9	213.28	221.84	245.94	256.06
- GVWD and Non Common Municipal*	278.39	285.85	265.24	275.01	258.87	268.99

* - Non Common refers to work by Saanich Peninsula municipalities and work by Saanich in its northern areas.

2) An effective program of demand management has the ability to reduce the unit water demand per consumer. Based on achieving a fifteen percent reduction in the per capita water consumption, a savings of between $50 and $60 million dollars could be realized compared to no demand management conditions.

3) Senior Government Grants are not assumed, but if such were to be available, most likely the capital cost would be reduced while the Operating and Maintenance costs would remain a local responsibility in perpetuity.

4) The alternatives can be further evaluated by a number of other parameters some quite difficult to define. Evaluation with an emphasis on security of supply, water quality and environmental considerations favours Alternative A (Raise Sooke Reservoir/Restore Goldstream Dams), with Alternative E (Raise Sooke Reservoir/Northern Supply Line) being second. Evaluation with an emphasis on least initial cost and least long term cost favour Alternative D (Lower Sooke Reservoir/Pumped line over Jack Lake pass) and Alternative E (Raise Sooke Reservoir/Northern Supply line) respectively. Technical simplicity and ease of expansion beyond the study horizon also favour Alternative A.

Recommendations

1) Alternative A involving an early raising of the Sooke Reservoir as well as the restoration of the Goldstream Reservoir for emergency storage is recommended.

2) The principal reasons for the recommendation include:

   a) Reasonable security of supply.
   b) Potential ability to defer costly water filtration as long as possible.

c) Least environmental impact.
d) Technical simplicity.
e) Reasonable cost to users.

3) Also recommended is the implementation of demand management to lower per capita water demands, the initiation of Development Cost Charges and a better definition of GVWD responsibilities including the assumption for responsibilities of some trunk system elements in Victoria, Saanich and the Saanich Peninsula.