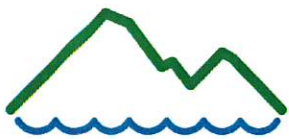


Analysis of Potential Demand from Undeveloped Properties

NORTH SALT SPRING WATERWORKS DISTRICT



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1 INTRODUCTION

Westbrook Consulting Ltd. has been engaged by The North Salt Spring Waterworks District (NSSWD) to analyse the potential demand from undeveloped and inactive properties on the District's parcel tax roll. All properties on the District's parcel tax roll are currently eligible to receive a District water service.

2 PROJECT BACKGROUND

In May 2018, Kerr Wood Leidal Engineering Consultants completed an updated analysis of the NSSWD's water supplies, titled, "St. Mary Lake Watershed – Water Availability and Demand Climate Change Assessment 2017 Update". The analysis confirmed that St Mary Lake and Maxwell Lake do not have sufficient capacity for the withdrawal of the total licensed volume in minor drought conditions.

Based on the report an updated policy (NSSWD OP#9) was issued by NSSWD to limit the water connections to one 19mm (¾") diameter water service per lot currently on the NSSWD parcel tax roll. The policy is a moratorium which does not permit multiple services to the same property or for the future development, or subdivision, of properties to be serviced with additional water services.

As part of the water supply planning process, the potential water demand for properties with connections but where the water meter is turned off and undeveloped properties already on the NSSWD parcel tax roll needs to be determined. This will provide the Trustees with the information necessary to determine the potential total water withdrawals from Maxwell Lake and St. Mary Lake from all the properties on the District's tax roll.

As part of the analysis on the existing St Mary Lake and Maxwell Lake water supplies, the following report provides the following information:

- The potential water consumption for each undeveloped property the NSSWD is committed to serving.
- The total bi-monthly and annual volume of water required to be held in reserve to serve the undeveloped properties the NSSWD is committed to serving.
- The corresponding volume of water that the District will need to withdraw from each source to serve the above-mentioned properties.

3 METHODOLOGY

The following methodology was used to estimate the water consumption for the undeveloped lots within the NSSWD's jurisdiction.

3.1 DATA RECEIVED FROM NSSWD

The following data was provided by the NSSWD to complete the analysis of the existing water demands to determine the volume of water that must be held in reserve for undeveloped properties entitled to water service in the future:

- 2013-2017 Water Consumption Data
- 2017 Property addresses and folio numbers
- 2018 Estimate of commitments
- 2013-2017 Maxwell Lake and St. Mary Lake Bulk Withdrawal Data
- 2013-2017 NSSWD Water Audits.

4 ASSUMPTIONS

The following assumptions were made to complete the water demand analysis.

- All properties with the same lot type designation have similar irrigation demands.
- All properties with the same lot type designation have similar number of inhabitants or users.
- All properties with the same lot type designation have similar building sizes.
- All commercial and industrial lots have business that use a similar amount of water.
- The representative sample was chosen as the average of the properties with water consumption during that period.
- Negative values within the data sets represent overbilling from the month prior. Negative values will be distributed evenly between the current and previous billing periods.

5 RESULTS

Based on the assumptions stated above the average for each lot type and service area were calculated. Properties which did not consume any water during the specific two-month billing period were not included in the calculation of the averages. Additionally, all negative values were divided over the current and previous billing period to limit the affects on the calculated averages.

5.1 AVERAGE DEMANDS

The following tables summarize the average demands for the proposed lot types annually and for specific a two- month periods. All values shown in the tables below are in imperial gallons.

Table 1: Average Demands for Maxwell

Lot Type	January - February	March - April	May - June	July - August	September - October	November - December	Annual
SFD	4,957	5,965	8,208	10,260	6,491	5,921	41,802
MFD*	2,904	3,432	5,198	6,491	4,936	3,441	26,402
FARM	4,083	5,460	11,091	24,356	8,660	10,692	64,342
COM	8,451	11,254	13,759	9,874	6,341	4,989	54,668
COM 1	7,208	8,973	12,909	24,159	13,880	11,529	78,658
COM 2	25,683	31,399	39,747	60,422	43,535	36,595	237,381
COM 3	6,981	13,310	25,795	53,159	19,602	9,285	128,132
INST	7,433	7,643	14,429	11,790	5,359	3,614	50,268
INST 1	6,698	6,656	7,467	10,924	9,357	10,030	51,132
INST 2	10,008	12,784	20,161	27,811	21,585	15,943	108,292
INST 3	3,165	4,914	5,533	18,062	9,076	6,953	47,703

*Per unit

Table 2: Average Demands for St. Mary

Lot Type	January - February	March - April	May - June	July - August	September - October	November - December	Annual
SFD	4,249	4,893	8,223	10,764	6,269	5,150	39,548
MFD*	4,092	4,698	7,527	8,907	5,231	4,567	35,022
FARM	6,291	9,544	23,070	42,050	17,026	10,758	108,739
COM	10,610	11,793	17,450	13,926	7,049	4,663	65,491
COM 1	13,828	10,641	20,675	36,146	19,307	13,283	113,880
COM 2	36,294	37,790	48,021	50,027	75,288	71,093	318,513
COM 3	98,380	67,448	143,027	187,919	99,731	81,336	677,841
INST	21,051	25,290	35,381	27,116	14,485	12,312	135,635
INST 1	19,372	21,269	34,446	39,851	27,858	29,895	172,691
INST 2	56,956	69,070	80,995	127,082	112,298	104,360	550,761
INST 3	3,411	2,525	16,149	20,054	25,076	5,124	72,339

*Per unit

5.2 INDIVIDUAL PROPERTIES

The averages tabulated above were applied to the undeveloped properties based on their lot categorization.

Table 3: Annual Water Consumption for Undeveloped and Inactive Properties for Maxwell

Number of Units	Lot Type	Annual Volume per Unit	Total Annual Volume
41	SFD	41,802 Gallons	1,713,882 Gallons
24	MFD	26,402 Gallons	633,648 Gallons
65	-	-	2,347,530 Gallons

Table 4: Annual Water Consumption for Undeveloped and Inactive Properties for St. Mary

Number of Units	Lot Type	Annual Volume per unit	Total Annual Volume
32	SFD	39,548 Gallons	1,265,536 Gallons
96	MFD	35,022 Gallons	3,362,112 Gallons
7	*MFD	39,776 Gallons	278,432 Gallons
3	Assumed Similar to SFD	39,548 Gallons	118,644 Gallons
138	-	-	5,024,724 Gallons

*MFD = Multi-Family Units with Indoor Swimming Pool

5.3 BULK WITHDRAWAL

To accommodate for water system losses, operational usage and unmetered consumption the additional percentage of operational usage and losses was determined based on the bulk withdrawal and metered consumption data for the last five years. No trend was observed in the losses over the last five years and therefore the average was taken.

The following equation was used to determine the percentage of losses.

$$\text{Operational Usage and Losses} = 1 - \frac{\text{Metered Consumption}}{\text{Bulk Withdrawal}}$$

Table 5: Maxwell Operational Usage and Losses

Year	Bulk Withdrawal	Metered Consumption	Losses
2013	63,077,000	47,402,574	25%
2014	58,720,800	45,440,603	23%
2015	48,915,969	43,008,394	12%
2016	48,902,000	41,563,853	15%
2017	46,806,332	42,671,692	9%
Average			17%

Table 6: St. Mary Operational Usage and Losses

Year	Bulk Withdrawal	Metered Consumption	Losses
2013	85,053,860	62,297,983	27%
2014	86,074,311	64,945,923	25%
2015	73,256,778	56,670,008	23%
2016	80,619,250	56,159,761	30%
2017	73,757,560	54,824,530	26%
Average			26%

Based on the average loss percentage the following potential bulk withdrawal volumes were determined.

$$\text{Potential Bulk Withdrawal} = \frac{\text{Metered Consumption}}{1 - \text{Operational Usage and Losses}}$$

- Potential Bulk Withdrawal from Maxwell Lake

$$\text{Potential Bulk Withdrawal} = \frac{2,347,530}{1 - 0.17} = 2,828,349 \text{ Gallons}$$

- Potential Bulk Withdrawal from St. Mary Lake

$$\text{Potential Bulk Withdrawal} = \frac{5,024,724}{1 - 0.26} = 6,790,168 \text{ Gallons}$$

6 CONCLUSION

The North Salt Spring Island Waterworks District engaged Westbrook Consulting Ltd. to determine the potential demand for the undeveloped properties on the NSSWD parcel tax roll. A Water Availability and Demand – Climate Change Assessment report completed by Kerr Wood Leidal Consulting Engineers in May 2018 identified that the NSSWD’s water supplies are at risk of failing to refill during the winter. As a result, the NSSWD implemented an updated policy on water service connections during moratorium. The moratorium restricts the water service connections to one 19mm (¾”) diameter water service for each lot currently on the NSSWD parcel tax roll.

This report was prepared to determine the demand on the water supplies from the undeveloped and inactive properties that are currently on the NSSWD parcel tax roll. Using consumption data provided by the NSSWD from 2013 to 2017 the potential annual water consumption for the Mt Maxwell and St Mary Lake systems was determined.

Table 7: Total Potential Consumption and Withdrawal from Undeveloped and Inactive Properties

System	Potential Annual Consumption	Potential Operational Usage and Losses	Potential Annual Withdrawal	Increase from 2017 Withdrawal
Maxwell	2,347,530 Gallons	480,819 Gallons	2,828,349 Gallons	6.0%
St. Mary	5,024,724 Gallons	1,765,444 Gallons	6,790,168 Gallons	9.2%
Total	7,372,254 Gallons	2,246,263 Gallons	9,618,517 Gallons	8.0%

We trust the above meets the requirements of your request. If you have any questions or comments, please contact the undersigned.

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