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REPORT TO PORT RENFREW UTILITY SERVICES COMMITTEE MEETING OF MONDAY, JUNE 22, 2015

SUBJECT EXISTING PORT RENFREW WATER SYSTEM CAPACITY AND RELIABILITY

ISSUE

To present the status of the water system capacity and reliability for the existing Port Renfrew water service and conceptualize water system improvements to address capacity and reliability of the system.

BACKGROUND

The Port Renfrew water system originated as a community system to service a logging camp at the site known as Beach Camp. The water system ownership was transferred to the Capital Regional District (CRD) in 1989 resulting in the establishment of Water Service Area #1. In 2006, water service was extended to the Snuggery Cove area and Water Service Area #2 was established (refer to Figures 1 and 2).

The existing Port Renfrew water treatment plant was commissioned in 1971, with the original well located within the treatment plant building. Water was originally stored in a wood stave tank near Parkinson Road and Wickanninish Road, which was replaced in 2001 with a bolted steel tank to improve quality and increase storage volume.

The existing water distribution system consists of approximately 4.4 km of 150mm and 100mm asbestos cement (AC) water main constructed in the 1970's (Beach Camp Area) and approximately 2.1 km of 150mm and 50mm PVC pipe constructed in early 2000 (Snuggery Cove Area).

The existing service area consists of 249 single family equivalents (SFE's), which includes one hotel, three restaurants, a school, a recreation centre and various residential dwellings. SFE's are defined in CRD Bylaw 3924 and are calculated using a table based on estimated usage relative to a single family's demand for water, or if not defined in the table, the calculation is to be based on the minimum daily design flow as specified in the *BC Sewerage System Standard Practice Manual*.

In 2006, Three Point Properties Ltd. (TPP) purchased three parcels of land south of Beach Camp with the intent of building a residential development on these properties. In 2007, TPP had started preliminary design of improvements to the community water supply, treatment and distribution system and the community sewer systems, as well as detailed design of the first phase of residential development. At that time the Port Renfrew water and sewer systems were considered to be at capacity, and the developer's consultant had determined that additional water system capacity, including water treatment capacity for hydrogen sulphide, water pressure, and water supply and distribution upgrades, would be required for the development. These upgrades were identified in the Design Brief of April 2012 and Technical Memorandum of November 2012 both prepared by Associated Engineering on behalf of TPP.

In about 2009 the CRD and TPP negotiated a memorandum of understanding (MOU) and adopted servicing and borrowing bylaws (Bylaws 3644, 3645, 3646 & 3647) to fund the extension of sewer and water service to TPP lands (MOU Lands). As a result of the MOU, the CRD had passed two borrowing bylaws, created new water and sewer service areas (Water Service Area #3 and Wastewater Service Area #2 – refer to Figure 2) and restrictive covenants were placed on the land titles until the developer constructed the works or provided a letter of credit for both new sewer and water treatment improvements. The borrowing bylaws have since expired and the proposed works have not been constructed, but the covenants remain in place. The market for the original real estate product(s) has changed since 2009 and the development has not progressed as anticipated.

In 2012, TPP applied to the CRD to develop lands within the existing water service area. At its meeting of October 22, 2012, the Port Renfrew Utility Services Committee (PRUSC) directed CRD staff to require TPP to provide water system capacity improvements that would accommodate double the number of housing units being proposed by the developer. TPP proceeded, in 2013, with upgrading the existing hydrogen sulfide scrubber at the existing water treatment plant and installing a backup generator which allowed TPP to develop 50 cottage units on Baird Road. The upgrades undertaken by the developer should have provided an additional 50 cottage units (25 SFE) of capacity in addition to the 50 units developed by TPP as per the committee discussions, however the upgrades may not have achieved the total anticipated additional capacity.

As noted at the last PRUSC meeting of September 23, 2014 there are several developers requesting servicing both within the existing service area and the lands associated with the MOU. The CRD has reviewed the previous engineering reports (refer to summary of references) provided by the developer's engineer and have obtained field information to assess the existing water system demands and available capacity. Potential reliability issues have also been identified in this report.

Existing Water System Demands

A total of 249 SFE's have been used for demand calculation purposes. This number was determined using CRD's September 2014 billing information and the current number of approved additional cabins on Baird Road (50 cottage units or 25 SFE's). The agreed upon design criteria as per the 2009 (MOU) between the CRD and TPP was a maximum day demand (MDD) of 1,450 litres per household or SFE and was determined using historical and anticipated demands. For comparison, using design guidelines such as the *Design Guidelines for Rural Residential Community Water Systems* and the *MMCD Design Guidelines*, the estimated MDD design ranges between 2,000 litres and 3,600 litres per day per SFE. Using the design criteria as per the MOU of 1,450 litres per SFE, 249 SFE's is equal to a MDD required capacity of 4.18 litres per second (l/s), therefore the existing capacity of the existing water system should theoretically equate to at least the same rate.

Based on current CRD land use zoning within the existing service area, development by way of subdivision and infilling could occur subject to various approvals (planning, engineering, MOT, CRD servicing requirements, etc.) resulting in increased water demand.

Existing Water System Capacity

The Port Renfrew water system is currently supplied from a single ground water source, well PW#3, that pumps to a nearby water treatment facility, located east of Port Renfrew. The current treatment process consists of a hydrogen sulfide scrubber and chlorine disinfection. The

treated water is then pumped 2.8km to the storage tank. On behalf of the TPP developer, Associated Engineering had supplied several reports to the CRD that outlined the existing and proposed water capacity after the interim upgrades (hydrogen sulfide scrubber and backup generator were completed in 2013). In addition, the CRD also keeps records of the total daily volume of water pumped from the ground water well over a fixed time period. As the capacity of the plant is limited by each piece of the treatment and supply systems, a summary of each component and its estimated capacity is listed below.

1. Ground water well maximum long-term yield – estimated capacity 17.3 to 17.5 l/s
2. Existing well pump (PW#3) – estimated capacity 4.3 to 4.5 l/s
3. Hydrogen sulfide scrubber - estimated capacity 7.3 l/s
4. Existing distribution pumps - estimated capacity 3.5 to 4.0 l/s – one pump operating in the field.
5. Existing storage tank – **undersized or close to capacity** (Associated Engineering did not allow for emergency storage in their reports). Existing tank volume = 455 cubic metres.

Minimum required storage volume based on Rural and MMCD Design Guidelines equals 563 cubic metres. Note that the MMCD design guidelines indicate that on approval of the local authority the requirement for emergency storage may be reduced or eliminated based on consideration of the following:

- Dependability of water source (Port Renfrew well source has been reliable in the past),
- Reliability of the supply system (existing supply main to tank is an old AC water main with reliability issues and has experienced several failures over the years),
- Presence of more than one supply source (Port Renfrew only has one well pump operational at PW#3),
- Whether the storage tank is part of a large system (Port Renfrew system is not a large system),
- Presence of other storage tanks in system (No other storage tanks in Port Renfrew system), and
- Availability of standby power (Port Renfrew has standby power at the treatment plant)

The minimum required storage volume based on CRD/JDF water system Engineering Specifications equates to 1,290 cubic metres. Reservoir sizing should include balancing, fire and emergency storage, but requirements could be adjusted based on Port Renfrew's expected level-of-service. Using only fire flow and balancing storage requirements as Associated Engineering had completed in their reports the required volume equates to 450 cubic metres which is very close to the required capacity.

6. Limitations of existing AC water main from treatment plant to the tank – flow rates through the water main are limited by the capacity of the distribution pumps. Any increase in the rate of flow will increase the pressure and head loss within this water main which may increase the risk and frequency of pipe failure.

In summary, the existing water system is at capacity with the existing distribution pumps (item 4. above) and the storage tank (item 5. above) being the limiting factors, however several other components are at or near capacity. Refer to Figure 3: Port Renfrew Existing Water System

Capacity for a graphical representation and Appendix A - Summary of Water System Components and Estimated Capacity for more details.

Note that this review only assessed the supply works (well/treatment/supply/storage) and did not evaluate the distribution system. Other system issues include the limited pressure available to higher elevations, such as Osprey Place, that may be addressed in the future with the addition of new pressure zones in the distribution system (noted in TPP reports).

Existing Water System Reliability

As per the Associated Engineering's Design Brief of April 2012, the existing water treatment facility for Port Renfrew has been noted as near the end of its design life and in an undesirable location due to flooding risk and accessibility concerns. These risks may increase due to anticipated sea level rise and the potential for tsunami inundation. In addition, there is a large portion of existing asbestos cement (AC) water mains constructed in the 1970's within the Port Renfrew system that may have reliability issues. In particular, the existing 150mm diameter AC water main from the treatment facility into Port Renfrew (2.2km) has a history of leaks and therefore is a reliability concern and it should be replaced in the future.

To increase system capacity and reliability, the CRD has conceptualized some short-term and long-term water system improvements. These improvements are needed to serve the existing customers and to facilitate any subdivision/development of lands within and potentially outside of the existing Port Renfrew service area.

Conceptual Short-Term System Upgrades (supply, treatment and storage)

The CRD has undertaken a review of previous reports and identified some conceptual short-term upgrades based on these reports as well as providing an alternative option, which are listed in Appendix B – Conceptual Short-Term Upgrades. These upgrades are premised on achieving a maximum production rate of 7.3 l/s based on the current capacity of the new hydrogen sulfide scrubber or total SFE's of 434 (including the existing 249 SFE's). Short-term upgrades could provide up to 185 additional SFE's.

Short-term upgrades may be completed to increase capacity, but could have limited benefit or feasibility due to the existing building site and infrastructure which may be at or near the end of its design life and do not consider renewal of the distribution system. These upgrades should also be reviewed in conjunction with development plans as they may not be able to service future developments at higher elevations. The estimated cost for short-term upgrades range from \$375,000 to \$465,000, which have included construction, contingency, engineering and administration costs, but excludes any land acquisition costs if required. For additional information refer to Figure 4: Short-Term upgrades and the budget spreadsheet Port Renfrew Water Utility Short-Term Capital Requirements in Appendix D.

Conceptual Long-Term System Upgrades (supply, treatment and storage)

Further to the conceptual short-term upgrades, conceptual long-term upgrades have been summarized in Appendix C - Conceptual Long-Term Upgrades. Long-term upgrades could provide up to an estimated 287 additional SFE's (9.0 l/s) expandable to 785 SFE's (17.3 l/s).

Long-term upgrades identified are generally consistent with the 2009 MOU between the CRD and the TPP and what was presented by the developers and MSR solutions (October 24, 2014

meeting) for an estimated 2015 cost of \$3,735,000 including construction, contingency, engineering and administration costs but excludes any land acquisition costs. Annual operating costs would increase with the new long-term improvements. For additional information refer to Figure 5: Long-Term upgrades and the budget spreadsheet Port Renfrew Water Utility Long-Term Capital Requirements in Appendix D.

In addition and previously noted, the existing 2.2km AC water main from the treatment plant into the town of Port Renfrew is in need of replacing for an estimated cost of \$1,000,000. This asset has not been included in either of the cost estimates to increase capacity and should be reviewed in more detail.

Long-Term Upgrade	Proposed Capacity	Estimated Cost*
1. Replace 2.2 km of existing 150mm dia. AC water main **	This water main appears adequately sized for future capacity but the length may change depending on the location of any proposed water works (i.e. location of new WTP).	\$1,000,000

* These estimated costs are for planning purposes only and will need to be refined if the projects move forward.

** This has not been included in either the short or long term upgrades to increase capacity.

As both development plans and the economic market have changed since the 2009 MOU it would be beneficial to continue to discuss development plans and potential water system upgrades with the existing community and developers.

ALTERNATIVES

1. That the Port Renfrew Utility Services Committee:
 - a. Receive this staff report for information;
 - b. Direct staff to implement a development cost charge bylaw in order to fund excess capacity needs due to development;
 - c. Direct staff to continue to discuss development plans and potential water system upgrades with the developers and report back to the committee on progress; and
 - d. Direct staff to search and pursue additional funding opportunities including grants.

2. That the Port Renfrew Utility Services Committee receive this report for information only.

IMPLICATIONS

Alternative 1

Having CRD staff implement a development cost charge bylaw will allow a funding mechanism for required upgrades due to development. CRD staff will continue to discuss development and potential water system upgrades with developers to provide the framework to address capacity and reliability issues and will provide a reference for assessing future developments including future service area expansion. In an effort to reduce the financial burden on the community/developers, additional funding sources, such as the second intake for the New Building Canada Fund-Small Communities Fund, will be pursued.

Alternative 2

By only receiving the report for information no further action will be taken. Any resolution or planning to address capacity and reliability issues will be deferred. This will limit any inclusion of additional developable lands into the existing service area.

CONCLUSION

The existing Port Renfrew water system was built in 1971, expanded in 2006, and has served the community well, however it has reached its point of theoretical capacity and there are reliability concerns with the existing infrastructure. Therefore, the service area cannot accommodate any services connections outside of the existing service area without improvements to the water system. A funding mechanism such as a DCC bylaw should be put in place to fund long-term infrastructure improvements. The CRD, existing community and developers should continue to discuss development and potential upgrades to address capacity and reliability issues related to the water system.

RECOMMENDATION

That the Port Renfrew Utility Services Committee:

- a. Receive this staff report for information;
- b. Direct staff to implement a development cost charge bylaw in order to fund excess capacity needs due to development;
- c. Direct staff to continue to discuss development plans and potential water system upgrades with the developers and report back to the committee on progress;
- d. Direct staff to search and pursue additional funding opportunities including grants.

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Attachments:

Appendix A - Summary of Water System Components and Capacity

Appendix B – Conceptual Short-Term Upgrades

Appendix C – Conceptual Long-Term Upgrades

Figure 1 - Port Renfrew Water System

Figure 2 - Port Renfrew Water Service Areas

Figure 3 - Port Renfrew Existing Water System Capacity

Figure 4 – Short-Term Upgrades

Figure 5 – Long-Term Upgrades

Appendix D

- Port Renfrew Water Utility Short-Term Capital Requirements
- Port Renfrew Water Utility Long-Term Capital Requirements

References:

Power Point Presentation-Port Renfrew Developments – Water and Sewer, October, 2014, MSR Solutions
Technical Memorandum – Port Renfrew – Analysis of Water System for Additional Cottage units, Nov 2012, Associated Engineering
Design Brief - Port Renfrew Water and Sewage Servicing Plan, April 2012, Associated Engineering
Servicing Letter – Wild Coast Cottages – Servicing for Future Phase, August 2011, First Team Engineering
Design Brief- Port Renfrew Water Supply and Distribution, June 2009, First Team Engineering
Memorandum of Understanding (MOU) - CRD and Rtown Holdings ULC, December 2009
Memorandum –Port Renfrew-Water and Sewer Servicing- August 2007, City Spaces
Memorandum- Port Renfrew- Community Well Water Supply: Re-test of Wells, Oct 2007, Thurber Engineering
Port Renfrew SFE's as of Sept 30, 2014 – CRD Finance Department
Port Renfrew July 2014 Water Use Records – CRD Operations

**PORT RENFREW UTILITY SERVICES COMMITTEE
APPENDIX A - SUMMARY OF WATER SYSTEM COMPONENTS AND ESTIMATED CAPACITY**

Component	Estimated Capacity	Comments/Notes/Reference
1. Ground water well maximum long-term yield (Circa 2005)	17.3 to 17.5 l/s	<ul style="list-style-type: none"> • The amount the well could produce if well pump adequately sized. (Item 2 below) • Thurber Engineering Memorandum - Port Renfrew Ground Water Supply – Dated October 31, 2007 • Two Existing Wells - TW07-02 and CRD/PW3(Commissioned and Operational)
2. Existing Well Pump (PW#3)(Circa 2006)	4.3 to 4.5 l/s	<ul style="list-style-type: none"> • Associated Engineering Memorandum- Analysis of Water System for Additional Cottage Units – Dated November 23, 2012 • Field Test undertaken by CRD operations staff October 24, 2014. • Current ground water well capacity may be limited by well casing diameter (may need new pump in new well listed above to increase flow)
3. Hydrogen Sulphide Scrubber (Circa 2013)	7.3 l/s	<ul style="list-style-type: none"> • Associated Engineering Design Brief Port Renfrew Water and Sewage Servicing Plan– Dated April, 2012 • Associated Engineering Memorandum- Analysis of Water System for Additional Cottage Units – Dated November 23, 2012 • New unit installed 2013
4. Existing Distribution Pumps (Circa 1970s)	3.5 to 4.0 l/s	<ul style="list-style-type: none"> • Associated Engineering Memorandum- Analysis of Water System for Additional Cottage Units – Dated November 23, 2012 estimated existing pumps had a capacity of 3.72 l/s and indicated impeller and flow may be larger which led to their conclusion that excess capacity was provided. • CRD operations records daily flow volumes over varying time periods. Analysis of flows from summer 2014 indicates a range of 3.5 l/s to 4.0 l/s capacity from the existing distribution pumps. • The distribution pumps and associated chlorine dosing pumps appear to be the limiting factor within the water system.
5. Existing Storage Tank (Circa 2001)	Existing Storage Volume = 455 Cubic Meters	<ul style="list-style-type: none"> • Associated Engineering Design Brief, Port Renfrew Water and Sewage Servicing Plan–Dated April, 2012 used a fire flow requirement of 360 cubic metres and 25% of Maximum Day Demand(balancing) and did not include emergency storage (25%(Balancing plus fire storage) • Required size based on Rural/MMCD design guidelines for existing demands = 563 cubic metres
6. Limitations of existing AC water main from plant to reservoir (Circa 1970's)	Adequately sized for higher capacity but has reliability concerns	<ul style="list-style-type: none"> • Indications are this pipe has a history of leaks and there could be concern with any additional flow or pressure increase. This should be reviewed in more detail.

**PORT RENFREW UTILITY SERVICES COMMITTEE
APPENDIX B – CONCEPTUAL SHORT-TERM UPGRADES**

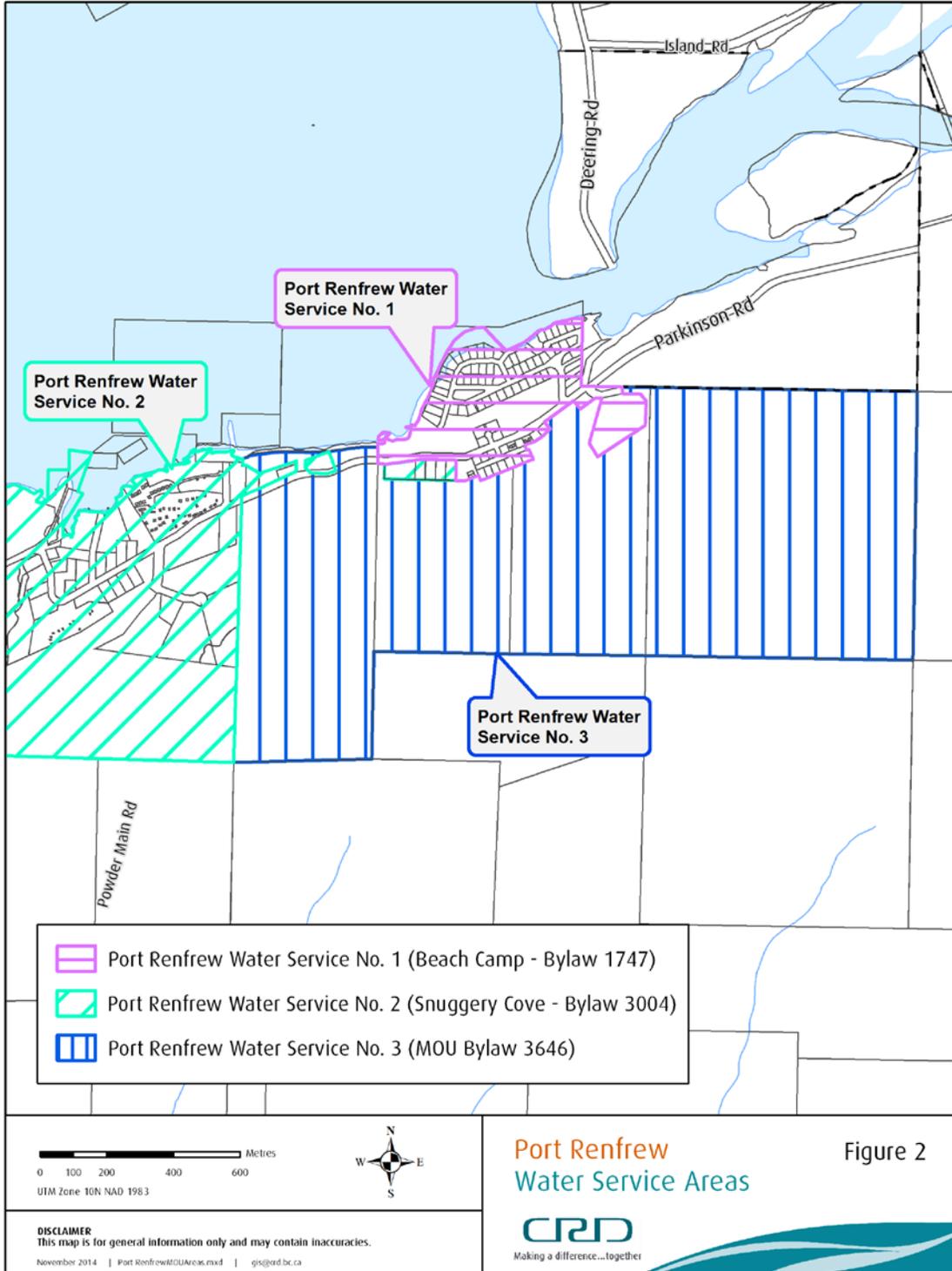
Short-Term Upgrades (supply, treatment and storage)	Proposed Capacity / SFE	Comments	Estimated Cost *	CRD Alt. Option Estimated Cost*
1. Supply and installation of new distribution pumps, associated piping and chlorine dosing equipment within the existing water treatment plant.	Up to 7.3 l/s 7 additional SFE's	<ul style="list-style-type: none"> • Once distribution pumps are upgraded the next limiting capacity is the existing well pump and storage tank. • The water treatment plant facility has been stated as at the end of its design life, in an unfavorable location and is manually controlled. A new water treatment facility may be the next step. The station may also not be able to convey up to 7.3 l/s. Listed below are conceptual short-term upgrades using a new well pump and an increased tank size to increase the water system capacity 	\$40,000	Concur \$40,000
2. Supply and construction of new well pump at well TW07-02 and supply main from new well to existing treatment plant	Up to 17.3 l/s No additional SFE's achieved until item 3(storage tank) is completed.	<ul style="list-style-type: none"> • As per 2009 MOU and Associated Engineering reports, except that the new well will supply the existing treatment plant • There is a possibility that a new higher capacity well pump could be installed within the existing well which could reduce the capital cost significantly 	\$240,000	Investigate utilizing larger well pump in existing well casing \$20,000
3. Supply and install additional ring to existing storage tank for additional capacity of about 85,000 litres.	Over 7.3 l/s No additional SFE's achieved until item 2(Well pump) is completed. Once items 2 and 3 are completed approximately 178 additional SFE's	<ul style="list-style-type: none"> • Associated Engineering had proposed adding a ring to the existing storage tank which may not be able to service future developments at higher elevations and may not be practical due to seismic concerns and construction logistics and warranty. This size assumes no emergency storage requirement due to the provision of backup power. 	\$75,000	The CRD suggests that if additional storage is required and the addition of an additional ring on the existing storage tank is not feasible a new tank may be required (assume same elevation) \$385,000
4. Supply and install pressure transducer to automate filling of reservoir.	<ul style="list-style-type: none"> • Operation benefit • No increase in capacity 	<ul style="list-style-type: none"> • Upgrades to communications and controls system identified as part of MOU • Provides automation and reliability to the system 	\$20,000	Concur \$20,000
Total estimated additional SFE's	185	Total	\$375,000	\$465,000

*These estimated costs are for planning purposes only and will need to be refined if the projects move forward.

**PORT RENFREW UTILITY SERVICES COMMITTEE
APPENDIX C – CONCEPTUAL LONG-TERM UPGRADES**

Long Term Upgrades (supply, treatment and storage) Generally consistent with 2009 MOU items	Proposed Capacity	Estimated Cost*
1. Supply and construction of new well pump at well TW07-02 and supply main from new well to new treatment plant (refer to short-term item #2).	Up to 17.3 l/s	\$240,000
2. New Water Treatment Plant & Associated Equipment	Estimated future demand capacity of up to 9.0 l/s expandable up to 17.3 l/s	\$1,330,000
3. New 8" Water main from supply main to booster station	Estimated future demand capacity of up to 9.0 l/s expandable up to 17.3 l/s	\$315,000
4. New Booster Station from supply main to new reservoir	Estimated future demand capacity of up to 9.0 l/s expandable up to 17.3 l/s	\$365,000
5. New 8" Water main from booster station to new reservoir	Estimated future demand capacity of up to 9.0 l/s expandable up to 17.3 l/s	\$720,000
6. Relocated and expanded tank(new tank) - Estimated Volume = 645 cubic metres	Estimated future demand capacity of up to 9.0 l/s expandable up to 17.3 l/s	\$385,000
7. Supply and install pressure reducing valve from new reservoir to existing system	Estimated future demand capacity of up to 9.0 l/s expandable up to 17.3 l/s	\$40,000
8. Additional costs such as potential easements and access roads		\$340,000
Total estimated additional SFE's = 287 (9.0 l/s) expandable to 785 (17.3 l/s)	Total Estimated Cost	\$3,735,000

* These estimated costs are for planning purposes only and will need to be refined if the projects move forward



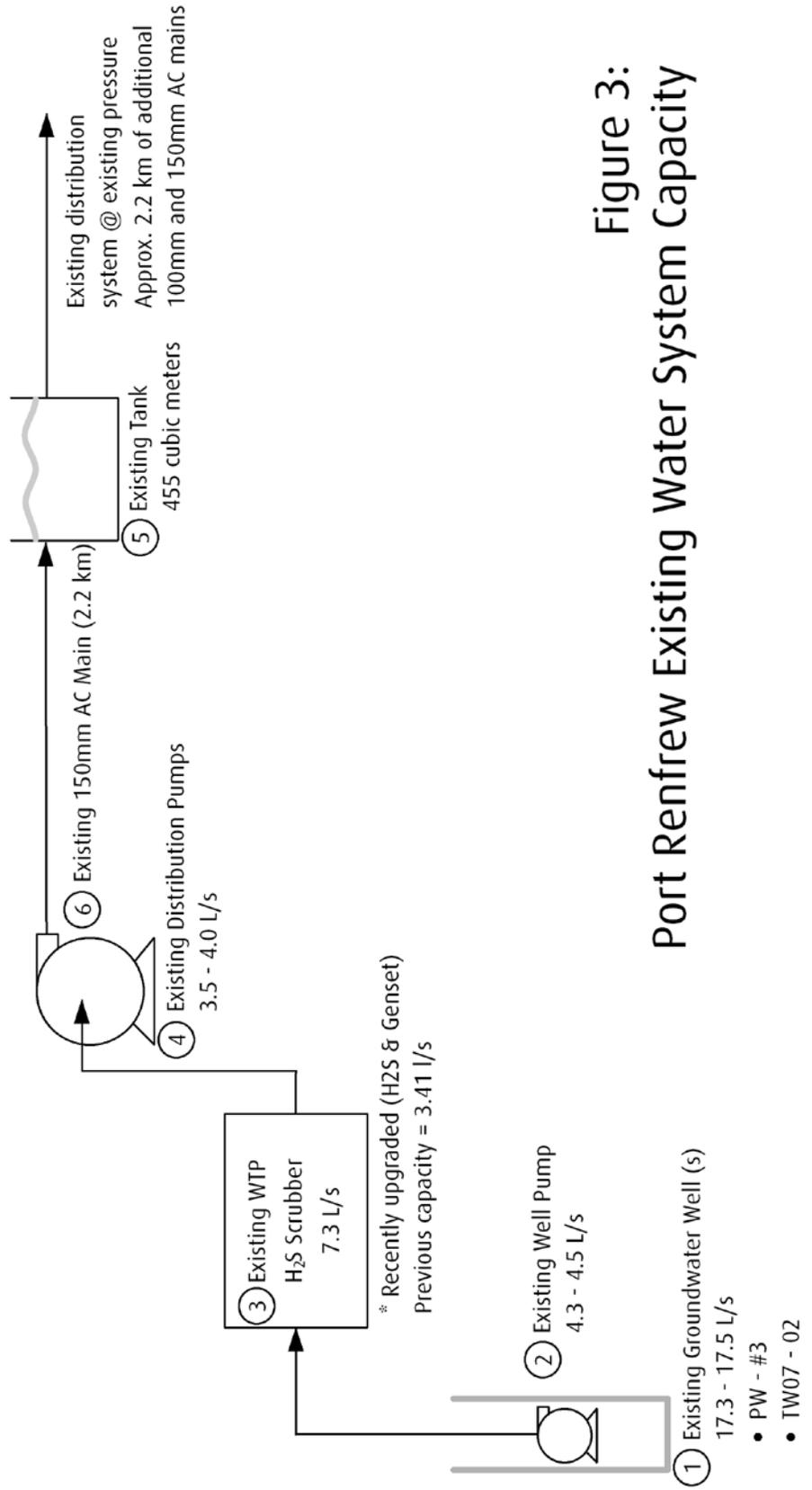


Figure 3:
Port Renfrew Existing Water System Capacity

Note: 2015 estimates including contingency, engineering and administration
 * Estimates exclude land acquisition and are based on works identified in 2009 MOU

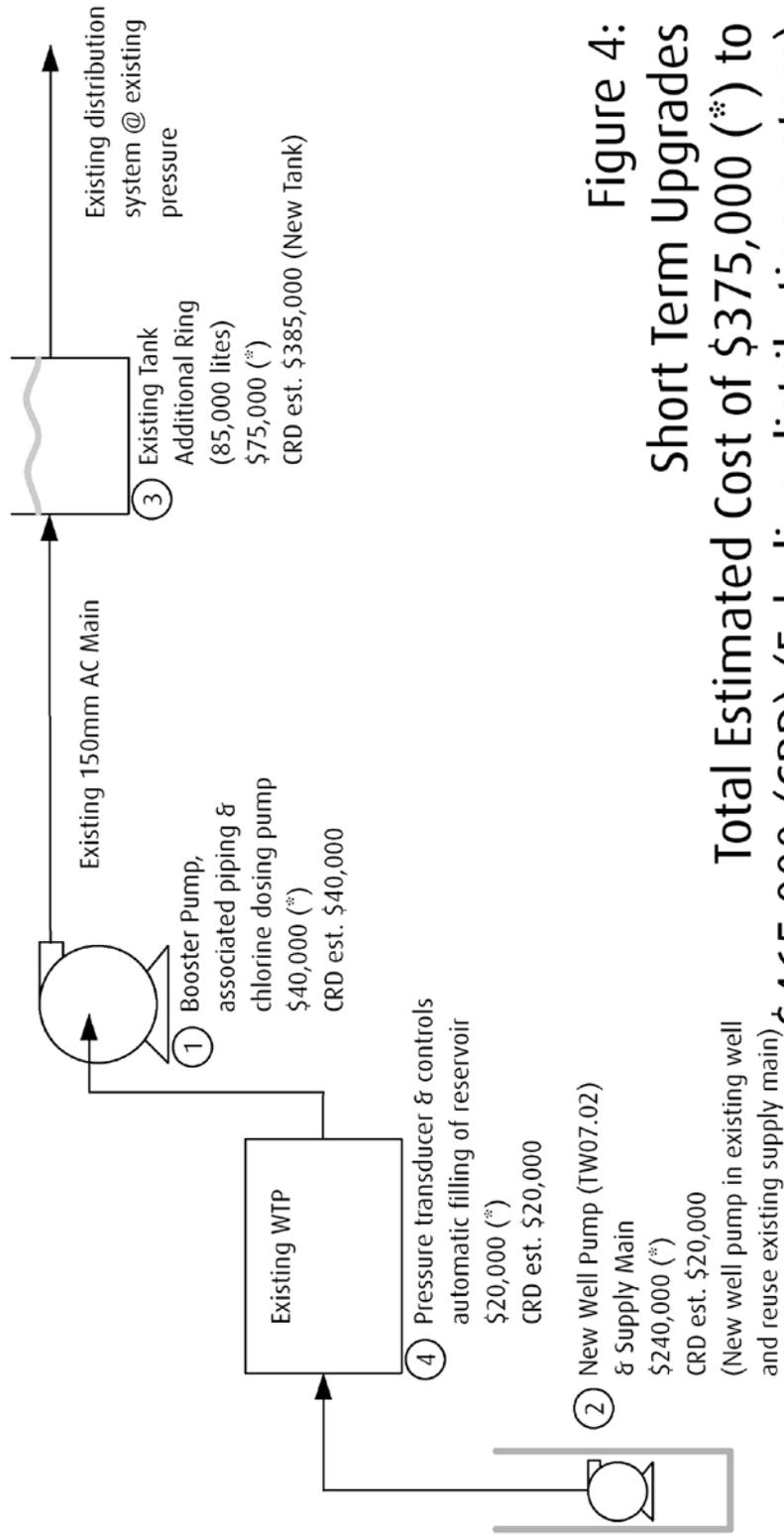


Figure 4:
Short Term Upgrades
Total Estimated Cost of \$375,000 (*) to
\$465,000 (CRD) (Excluding distribution system)

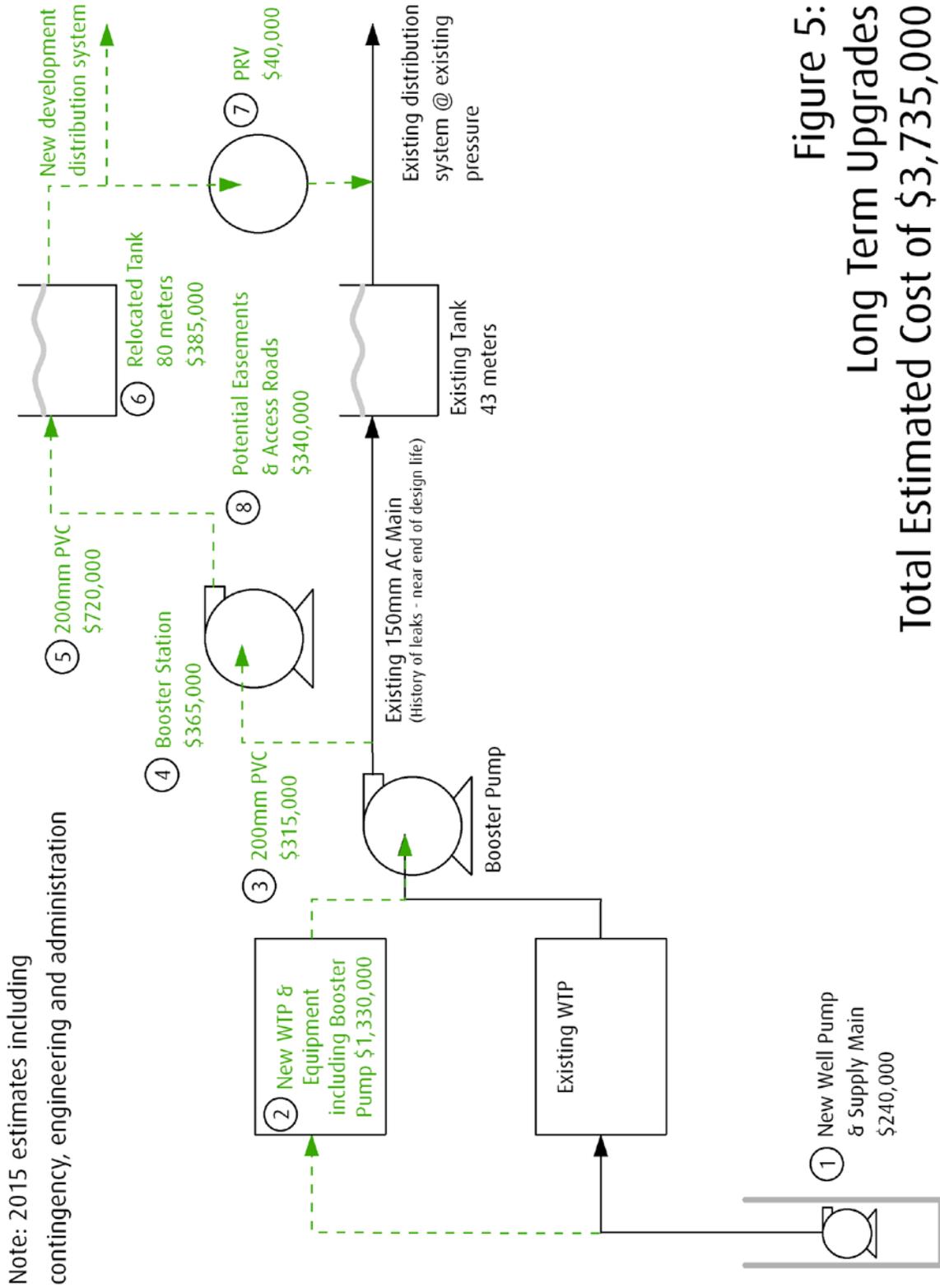


Figure 5:
Long Term Upgrades
Total Estimated Cost of \$3,735,000



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PORT RENFREW WATER UTILITY SHORT TERM CAPITAL REQUIREMENTS

Date: December 17, 2014
Prepared by: Joseph Marr, P.Eng.
Page 1 of 1

Description	Details										TOTAL			
	Funding Source	Year required	Cost - Previous kpt	Estimated Construction	Contingency (%)	Contingency	Subtotal	Engineering (%)	Engineering	Admin (%)		Admin	Operations (%)	Operation Staff
WATER SYSTEM														
Interim Upgrades	Capital	2013-2018	17,000	20,299	35	7,105	27,404	25	6,851	5	1,370	10	2,740	38,365
Interim Upgrades	Capital	2013-2018	112,000	126,057	35	44,120	170,177	25	42,544	5	8,509	10	17,018	238,248
Interim Upgrades	Capital	2013-2018	35,000	39,393	35	13,787	53,180	25	13,295	5	2,659	10	5,318	74,452
Interim Upgrades	Capital	2013-2018	10,000	11,255	35	3,939	15,194	25	3,799	5	760	10	1,519	21,272
TOTAL COST OF SHORT TERM UPGRADES & REPLACEMENTS													372,337	



PORT RENFREW WATER UTILITY LONG TERM CAPITAL REQUIREMENTS

Description	Details	Funding Source		Year Required	Cost - Previous Yrpt	2015		Estimated Construction	Contingency (%)	Contingency	Subtotal	Engineering (%)	Engineering	Admin (%)	Admin	Operations (%)	Operations	TOTAL
		Capital	2013-2018			2013-2018	2013-2018											
1. Long Term Upgrades	Supply and construction of new well pump at well TW07-02 and supply main from new well to existing treatment plant. (First Team Letter of 2011 for servicing future phases.)	Capital	2013-2018	2013-2018	112,000	126,057	35	44,120	170,177	25	42,544	5	8,509	10	17,018	238,248		
2. Long Term Upgrades	New Water Treatment Plant & Associated Equipment	Capital	2013-2018	2013-2018	590,000	704,491	35	246,572	951,063	25	237,766	5	47,553	10	95,106	1,331,488		
3. Long Term Upgrades	New 8" Water main from supply Main to Booster Station (MSR power point based on 2009 prices)	Capital	2013-2018	2013-2018	140,000	167,167	35	58,509	225,676	25	56,419	5	11,284	10	22,568	315,946		
4. Long Term Upgrades	New Booster Station from supply main to new reservoir (MSR power point based on 2009 prices)	Capital	2013-2018	2013-2018	165,000	194,631	35	68,121	262,751	25	65,688	5	13,138	10	26,275	367,852		
5. Long Term Upgrades	New 8" Water main from Booster Station to new reservoir (MSR power point based on 2009 prices)	Capital	2013-2018	2013-2018	320,000	382,097	35	133,734	515,831	25	128,958	5	25,792	10	51,583	722,163		
6. Long Term Upgrades	Relocated and expanded reservoir (MSR power point based on 2009 prices)	Capital	2013-2018	2013-2018	170,000	202,989	35	71,046	274,035	25	68,509	5	13,702	10	27,404	383,649		
7. Long Term Upgrades	Supply and install pressure reducing valve from new reservoir to existing system (MSR power point based on 2009 prices)	Capital	2013-2018	2013-2018	17,000	20,999	35	7,105	27,404	25	6,851	5	1,370	10	2,740	38,365		
8. Long Term Upgrades	Additional costs such as potential easements and access roads	Capital	2013-2018	2013-2018	150,000	179,108	35	62,688	241,796	25	60,449	5	12,090	10	24,180	338,514		
TOTAL COST OF UPGRADES & REPLACEMENTS																		3,736,224