MEMORANDUM

URBAN systems

Date:	January 29, 2015
To:	Joe Mitchell
cc:	Jeremy Clowes, Peter Gigliotti
From:	Scott Shepherd
File:	0655.0170.11
Subject:	Tech Memo #2 - Peachland Creek Source: Water Treatment Process Selection and Funding Strategy

Background

The Peachland Creek Source Concept involves adding a water treatment plant at the existing creek intake site in order to meet the Province's Drinking Water Treatment Objectives (DWO). The need for a treatment plant was identified in the 2007 Water Master Plan (WMP) that was endorsed by council. The WMP included a conceptual estimate for treatment based on constructing a conventional water treatment plant (WTP) in the amount of **$16,785,000** (2007 Dollars).

Urban Systems Ltd. (Urban) evaluated treatment options for the Peachland Creek source in 2014 (refer to the Bench and Pilot Scale Testing Report). As a result of the piloting results, two potential treatment options were identified for the Peachland Creek source including:

1. A conventional WTP, and
2. A direct filtration plant.

The intent of this memo is to identify and evaluate treatment concepts, identify life cycle costs and to identify a preferred treatment concept. This memo will also form the basis to inform the 2015 amendment to the District's 2007 WMP.

Water Treatment Plant Work Completed

In order to move forward with the implementation of the treatment strategy identified in the 2007 WMP and to refine the cost estimate prepared for the WTP, the following has been completed by the District since 2010:

- Water supply and demand analysis,
- Reviewed WTP and storage sizing.
- Identified treatment process options,
- Confirmed site location for treatment plant,
- Reviewed conceptual site plan,
- Prepared updated cost estimates,
- Evaluated treatment options,
- Reviewed funding strategy, and
- Identified next steps for District to proceed with.

A summary of the work completed for each task is summarized below.

Water Supply and Demand Analysis

Refer to Tech Memo #1 – Peachland Creek Water Supply and Demand Analysis, 2014, Urban. The District will be able to secure adequate water supply at the proposed treatment plant site to meet future demands.

WTP and Storage Sizing

The current Maximum Day Demand (MDD) for the Peachland Creek source is equal to 145 l/s (12.5 ML/d). The existing MDD for entire water system is 193 L/s (16.7 ML/d). The ultimate MDD is estimated at 436 l/s (38 ML/d).

Based on above, it would be reasonable to construct the plant in two phases. Phase 1 would have a capacity of 25 ML/d. Phase 2 would be sized for 15 to 25 ML/d. Growth in the community should be monitored over time to determine optimal capacity for the Phase 2 expansion. Our cost estimate allows for up to a 25 ML/d capacity increase in Phase 2.

The Phase 1 plant capacity of 25 ML/d (289 L/s) will be capable of supplying water to all existing users and will provide some allowance for growth before the second phase is required. 2,500 m^3 of storage will be provided in Phase 1a. An additional 2,500 and 2,800 m^3 of storage will be required in Phase 1c and 2, respectively.

Table 1 – Reservoir Sizing (all units m^3)

Phase	Fire Protection[1] (A)	Equalization[2] (B = 25% * MDD)	Emergency[3] (25% of A+ B)	Minimum Required Storage (A+B+C)	Storage Provided
1a[4]	1,080	-[5]	-	1,080	2,920[6]
1b[7]	1,080	1,534[8]	-	2,614	4,675[9]
1c[10]	1,080	5,681[11]	-	6,761	7,175[12]
2[13]	1,080	8,856[14]	-	9,936	9,975[15]

Note:

1. Fire flow of 150 L/s used for estimating required storage.
2. Irrigation demand of 26 L/s deducted from equalization storage requirements (based on maximum demand of 15,500 m^3/week from WEAP model).
3. Emergency supply not included based on dependability of Peachland Creek source and Okanagan Lake being available for backup supply.
4. Phase 1a based on supplying existing Peachland Creek system only. MDD equals 145 L/s.
5. Surplus WTP capacity of 144 L/s and agricultural irrigation demand deducted from equalization storage requirements.
6. Storage provided volume equals 420 m^3 (Law Street Reservoir) + 2,500 m^3 (proposed reservoir at WTP).

7. Phase 1b based on supplying entire existing water system. MDD equals 193 L/s.
8. Surplus WTP capacity of 96 L/s and agricultural irrigation demand deducted from equalization storage requirements.
9. Storage provided volume equals 420 m^3 (Law Street Reservoir) + 2,500 m^3 (proposed reservoir at WTP) + 420 m^3 (Upper Ponderosa Reservoir) + 1,335 m3 (Cousins Road Reservoir).
10. Phase 1c based on supplying entire water system with growth occurring and MDD increasing to 289 L/s (max capacity of phase 1 WTP).
11. Agricultural irrigation demand deducted from equalization storage requirements only.
12. Storage provided as per note 9 + additional 2,500 m^3 storage required.
13. Phase 2 based on supplying entire water system with growth occurring and MDD reaching 436 L/s.
14. Agricultural irrigation demand deducted from equalization storage requirements only.
15. Storage provided as per note 12 + additional 2,800 m^3 storage required.

Treatment Options

Table 2 summarizes the treatment processes identified and utilized to prepare the cost estimates and evaluation for the District's consideration. As noted in the 2014 Bench and Pilot Scale Testing, chlorine disinfection by-products are a potential concern with a surface water source and require further testing to determine if additional treatment is required in the future.

Table 2 – Treatment Options

Option	Process	Comments
1. Conventional WTP	Coagulation, flocculation, DAF, filtration and chlorine	Meets IH Objectives but may not meet GCDWQ limits for disinfection by-products
2. Direct Filtration Plant	Coagulation, flocculation, direct filtration, UV and chlorine	Meets IH Objectives but may not meet GCDWQ limits for disinfection by-products

Location and Conceptual Site Plan

The location plan and layout of the WTP was completed in the 2010 *Water Treatment Plant and Reservoir Siting Options* report prepared by Urban. The land immediately north of the existing Peachland Creek intake was identified as the preferred location for the proposed WTP. This location is still preferable and is suitable for both filtration treatment options.

In 2011, Urban completed the *Peachland Creek Reservoir and Pump Station preliminary Design* report. The site plan in this report shows the conceptual layout for the future treatment plant and a future 7,500 m^3 of treated water storage (identified in the WMP as the Priority 2 project). This site layout will be

feasible for both treatment options. For the direct filtration option, the plant will require less area on the site. Upgrades to the road access into the site may be required. We suggest the District review the access during the preliminary design of the WTP.

Cost Estimate

Cost estimate have been prepared and include phasing options based on current capacity needed and future capacity. Tables 3 and 4 summarize the capital and O&M costs for each filtration option. Table 5 identifies life cycle costs. Refer to **Appendix A** for a detailed breakdown of the cost estimates.

Table 3 – Capital Cost

Capital Cost[2]	Option 1 - Conventional WTP	Option 2 - Direct Filtration Plant
Ultimate Capacity[1]		
Subtotal	$19,031,019	$16,031,019
Engineering and Contingency	$7,485,857	$6,285,857
Total (rounded)	**$26,515,000**	**$22,315,000**
Phase 1 Capacity[3]		
Subtotal	$13,532,019	$11,531,019
Engineering and Contingency	$5,286,257	$4,485,857
Total (rounded)	**$18,820,000**	**$16,015,000**

Notes:
1. Both options are based on a plant capacity of 50 ML/d
2. Both options include a low lift pump station and a 2,500 m^3 treated water reservoir as identified in the 2011 Peachland Creek Reservoir and Pump Station predesign report prepared by Urban. The treatment plant site has space for an additional 5,000 m^3 of treated water storage.
3. Both options are based on a plant capacity of 25ML/d

Table 4 – Annual O&M Costs

	1. Conventional WTP	2. Direct Filtration Plant
Total/yr	$400,000	$380,000

Table 5 – Annual Life Cycle Cost

	1. Conventional WTP	2. Direct Filtration Plant
Total/yr	$2,182,224	$1,879,918

Notes:
1. Based on 20 year period with 3% annual interest rate.
2. Annual life cycle cost for 50 ML/d plant.

Evaluation of Treatment Options

The Table 6 summarizes the comparison of filtration treatment options based on the costs and ability to manage public risks.

Table 6 – Option Comparison

	Option 1 – Conventional WTP	Option 2 – Direct Filtration
Description	Low lift pump station + 50 ML/d Conventional Water Treatment Plant + 2,500 m^3 reservoir[1]	Low lift pump station + 50 ML/d Direct Filtration Plant + 2,500 m^3 reservoir[2]
Capital Costs, Infrastructure Components	$26.5M	$22.3M
Operating Costs	$400,000/yr	$380,000/yr
Annual Life Cycle Costs (20 yrs @ 3%)	$2,182,224/yr	$1,879,918/yr
Opportunity for Phasing Works	**High** – Plant can be designed and built in a manner that allows it to be expanded as growth occurs. Based on 25 ML/d capacity, Phase 1 plant will cost approx. **$18.8M**	Same as Option 1. Based on 25 ML/d capacity, Phase 1 plant will cost approx. **$16.0M**
Potential Funding Opportunities	Build Canada, Gas Tax	Same as Option 1
Ability to Manage Public Health Risks	**High** – Filtering and disinfecting source water will ensure the District meets the Province's drinking water treatment objectives. Additional treatment for disinfection by-products may be required but is least likely with this option.	**Medium –** Same as Option 1 with the exception that there is higher risk that additional treatment will be required for disinfection by-products.
Achieving Legislative Requirements	**High** – No apparent concerns with meeting legislative requirements.	Same as Option 1
Interior Health Support	**High** – High probability of getting IH support for a filtration plant.	Same as Option 1
System Reliability and Redundancy	**Reliability: High** – System would be built with provisions to maximize reliability. **Redundancy: High** – Redundancy provided in plant.	Same as Option 1
Ease of Constructability	**High** – All required work to be completed at one site. No specialized construction staff required to complete build.	Same as Option 1
Energy Consumption	**Medium –** Will require most energy of the two options.	**Medium –** Will require slightly less energy than Option 1.
Environmental Impact	**Low –** Work completed at one location that is not a sensitive habitat.	Same as Option 1.

Notes:

1. Conventional WTP – Process includes coagulation, flocculation, Dissolved Air Flotation, filtration and chlorine
2. Direct Filtration Plant – Process includes coagulation, flocculation, direct filtration, UV and chlorine

Based on the above comparison, Option 1 has a higher capital cost but will provide highest ability to manage public health risks (including minimizing potential for chlorine disinfection by-products through removal of organics). Option 2 has a slightly lower capital cost but provides a reduced ability to ensure that chlorine disinfection by-products meet the Guidelines for Canadian Drinking Water Quality. As such, **Urban recommends that the District proceed with Option 1.**

Funding Strategy

The funding strategy is based on scenario 2 (part grants) from the 2007 Water Master Plan. The potential for grants remains a key variable in the financial strategy that is not within the control of the District. The original financial model assumed a 67% grant for the non-DCC portion of the capital costs (~43% of the total costs). The current reserve (unreconciled) balances held by the District for water treatment are as follows (to Sept. 30th, 2014):

Water Treatment Plant DCC Reserve	$317,161.86
Water Improvements DCC Reserve	$1,024,768.00
Water Improvements Non-DCC Reserve	$5,348,915.78

The following assumptions remain current for the funding strategy.

- 64% of the cost is allocated to existing water users (43% grant funded and 21% rate funded) and 36% allocated to new development (funded through Development Cost Charges)
- Any borrowing required by the District for this project would be financed through the Municipal Finance Authority (MFA)

Based on the above, the following table summarizes the cost recovery strategy for each option.

Table 7 – Cost Recovery Summary (Phase 1 Only)

Option	Total Cost	Cost Recovery							
		Water Treatment Plant DCC's			Water Utility				Financing
		Required Amount	**Current Reserve Balance**	Difference (Borrowing if positive)	Required Amount	**Current Reserve Balance**	Difference (Borrowing if positive)	**Grants**	Total Borrowing Required
Conventional WTP Phase 1	$18,820,000	$6,775,200	$317,161	**$6,458,039**	$12,044,800	$5,348,915	**-$1,374,131**	$8,070,016	**$6,458,039**
Direct Filtration - Phase 1	$16,015,000	$5,765,400	$317,162	**$5,448,238**	$10,249,600	$5,348,916	**-$1,966,548**	$6,867,232	**$5,448,238**

There is a significant shortfall in the current DDC reserve account and the District will need to borrow against this fund which will be paid back through future DCC collections for all options.

Note that the District can consider utilizing the full amount of the existing non-DCC reserve to minimize borrowing for Options 1 and 2. For example, the Option 1 total borrowing amount would decrease to $5,072,484 if this was done.

Next Steps

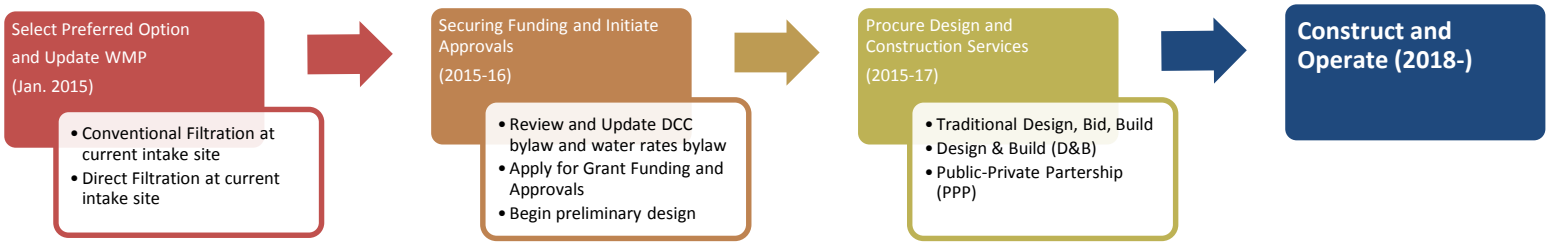
At the January 19th, 2015 Council meeting, Peachland Council endorsed staff proceeding with Option 1 – Conventional treatment plant due to the higher ability of this option to manage health risk outcomes.

In order to achieve the cost recovery outlined in the funding strategy outlined above and to meet the necessary timelines for implementation (as indicated by Interior Health), the following next steps are recommended.

1. Prepare application to the Small Communities Fund (due February 18th, 2015)
2. Consolidate all pertinent reports completed since 2007 in an amendment to the Water Master Plan (February 10th meeting of council)
3. Review current cost recovery bylaws cost recovery bylaws to ensure adequate funds are available in 2017-18 to fund the construction of the preferred option.
4. Aim to budget approximately 2% of the capital cost in 2015 to undertake the preliminary design.

The following graphic illustrates the key steps required to implement a new water treatment plant to meet all regulatory requirements in Peachland and have construction of a plant commencing by 2018.

Figure 1 – Key Next Steps



Attachments

Appendix A – Cost Estimates

Appendix A

Cost Estimates

Option 1: Conventional WTP
Ultimate Capital Cost Estimate (50 ML/d)

0655.0170.11

ITEM	DESCRIPTION	COST
1	Low Lift Pump Station and 2500 m3 Reservoir	$2,531,019
2	WTP (50 ML/d)	$16,500,000
	Subtotal	$19,031,019
	Contingency and Engineering	$7,485,857
	Total (rounded)	$26,515,000

Option 1: Conventional WTP
O&M Cost Estimate

0655.0170.11

ITEM	DESCRIPTION	COST
1	Low Lift Pump Station and 2500 m3 Reservoir	$79,490
2	WTP	$320,000
	Total (rounded)	$400,000

Option 1: Conventional WTP
Ultimate Capital Cost Estimate (50 ML/d)

Job No. 0655.0170.11
Date

Prepared by: P.Gigliotti
Checked by: J.Clowes

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
1	Equipment supply	1	ls	$4,150,000	$4,150,000
2	Installation	1	ls	$1,450,000	$1,450,000
3	Backwash facility	1	ls	$1,250,000	$1,250,000
4	Concrete	1	ls	$3,050,000	$3,050,000
5	Superstructure	1	ls	$2,550,000	$2,550,000
6	Yard Piping	1	ls	$1,450,000	$1,450,000
7	Power& Dist.	1	ls	$1,150,000	$1,150,000
8	SCADA	1	ls	$1,050,000	$1,050,000
9	Sitework	1	ls	$400,000	$400,000
				Subtotal	$16,500,000
				Contingency and Engineering (40%)	$6,600,000
				Total (rounded)	$23,100,000

Option 1: Conventional WTP
Phase 1 Capital Cost Estimate (25 ML/d)

0655.0170.11

ITEM	DESCRIPTION	COST
1	Low Lift Pump Station and 2500 m3 Reservoir	$2,531,019
2	WTP (25 ML/d)	$11,001,000
	Subtotal	$13,532,019
	Contingency and Engineering	$5,286,257
	Total (rounded)	$18,820,000

Option 1: Conventional WTP
O&M Cost Estimate

0655.0170.11

ITEM	DESCRIPTION	COST
1	Low Lift Pump Station and 2500 m3 Reservoir	$79,490
2	WTP	$320,000
	Total (rounded)	$400,000

Option 1: Conventional WTP
Phase 1 Capital Cost Estimate (25 ML/d)

Job No. 0655.0170.11
Date

Prepared by: P.Gigliotti
Checked by: J.Clowes

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
1	Equipment supply	1	ls	$2,767,000	$2,767,000
2	Installation	1	ls	$967,000	$967,000
3	Backwash facility	1	ls	$833,000	$833,000
4	Concrete	1	ls	$2,033,000	$2,033,000
5	Superstructure	1	ls	$1,700,000	$1,700,000
6	Yard Piping	1	ls	$967,000	$967,000
7	Power& Dist.	1	ls	$767,000	$767,000
8	SCADA	1	ls	$700,000	$700,000
9	Sitework	1	ls	$267,000	$267,000
				Subtotal	$11,001,000
				Contingency and Engineering (40%)	$4,400,400
				Total (rounded)	$15,400,000

Option 1: Conventional WTP

Job No. 0655.0170.11

Prepared by: P.Gigliotti

Checked by: J.Clowes

				2040	
ITEM	DESCRIPTION	UNIT	$/UNIT	QTY	TOTAL
1	Power ($.08/kwhr)	ls	38,000	1	$38,000
2	Chemicals (Coag)	ls	102000	1	$102,000
3	Chlorine	ls	40000	1	$40,000
4	Labour	ls	132,000	1	$132,000
5	Lamps (replace)	ls		1	$0
6	Parts (allow)	ls	8,000	1	$8,000
			subtotal		$320,000

Option 2: Direct Filtration WTP
Ultimate Capital Cost Estimate (50 ML/d)

0655.0170.11

ITEM	DESCRIPTION	COST
1	Low Lift Pump Station and 2500 m3 Reservoir	$2,531,019
3	WTP (50 ML/d)	$13,500,000
	Subtotal	$16,031,019
	Contingency and Engineering	$6,285,857
	Total (rounded)	$22,315,000

Option 2: Direct Filtration WTP
O&M Cost Estimate

0655.0170.11

ITEM	DESCRIPTION	COST
1	Low Lift Pump Station and 2500 m3 Reservoir	$79,490
3	WTP	$302,000
	Total (rounded)	$380,000

Option 2: Direct Filtration WTP
Ultimate Capital Cost Estimate (50 ML/d)

Job No. 0655.0170.11
Date 18-Dec-14

Prepared by: P.Gigliotti
Checked by: J.Clowes

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
1	Equipment supply	1	ls	$2,950,000	$2,950,000
2	Installation	1	ls	$1,150,000	$1,150,000
3	Backwash facility	1	ls	$1,250,000	$1,250,000
4	Concrete	1	ls	$2,450,000	$2,450,000
5	Superstructure	1	ls	$2,150,000	$2,150,000
6	Yard Piping	1	ls	$1,150,000	$1,150,000
7	Power& Dist.	1	ls	$1,050,000	$1,050,000
8	SCADA	1	ls	$950,000	$950,000
9	Sitework	1	ls	$400,000	$400,000
				Subtotal	$13,500,000
				Contingency and Engineering (40%)	$5,400,000
				Total (rounded)	$18,900,000

Option 2: Direct Filtration WTP
Phase 1 Capital Cost Estimate (25 ML/d)

0655.0170.11

ITEM	DESCRIPTION	COST
1	Low Lift Pump Station and 2500 m3 Reservoir	$2,531,019
3	WTP (25 ML/d)	$9,000,000
	Subtotal	$11,531,019
	Contingency and Engineering	$4,485,857
	Total (rounded)	$16,015,000

Option 2: Direct Filtration WTP
O&M Cost Estimate

0655.0170.11

ITEM	DESCRIPTION	COST
1	Low Lift Pump Station and 2500 m3 Reservoir	$79,490
3	WTP	$302,000
	Total (rounded)	$380,000

Option 2: Direct Filtration WTP
Phase 1 Capital Cost Estimate (25 ML/d)

Job No. 0655.0170.11
Date 18-Dec-14

Prepared by: P.Gigliotti
Checked by: J.Clowes

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
1	Equipment supply	1	ls	$1,967,000	$1,967,000
2	Installation	1	ls	$767,000	$767,000
3	Backwash facility	1	ls	$833,000	$833,000
4	Concrete	1	ls	$1,633,000	$1,633,000
5	Superstructure	1	ls	$1,433,000	$1,433,000
6	Yard Piping	1	ls	$767,000	$767,000
7	Power& Dist.	1	ls	$700,000	$700,000
8	SCADA	1	ls	$633,000	$633,000
9	Sitework	1	ls	$267,000	$267,000
				Subtotal	$9,000,000
				Contingency and Engineering (40%)	$3,600,000
				Total (rounded)	$12,600,000

Option 2: Direct Filtration WTP

Job No. 0655.0170.11

Prepared by: P.Gigliotti

Checked by: J.Clowes

				2040	
ITEM	DESCRIPTION	UNIT	$/UNIT	QTY	TOTAL
1	Power ($.08/kwhr)	ls	28,000	1	$28,000
2	Chemicals (Coag)	ls	92,000	1	$92,000
3	Chlorine	ls	36,000	1	$36,000
4	Labour	ls	132,000	1	$132,000
5	Lamps (replace)	ls	8,000	1	$8,000
6	Parts (allow)	ls	8,000	1	$8,000
			subtotal		$302,000

Pre-Design Cost Estimate for Peachland Creek Pump Station and Reservoir

Option 2 - Separate Pump Station

Job No. 0655.0158.02

Prepared by: J.Clowes 19-Sep-11
Checked by: S.Shepherd 21-Sep-11

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
1	Reservoir				
1.1	C.I.P Concrete Reservoir	2500	cu.m	$550	$1,375,000.00
1.2	General Site work	1	ea.	$20,000	$20,000.00
1.3	Fence	800	m	$60	$48,000.00
1.4	750mm PVC outlet	170	m	$550	$93,500.00
1.4	450mm PVC drain and overflow	110	m	$350	$38,500.00
1.5	450mm butterfly valve (buried service)	2	ea.	$7,000	$14,000.00
1.6	Dechlorination manhole	1	ea.	$15,000	$15,000.00
1.7	Access hatches	10	ea.	$2,000	$20,000.00
2	Pump Station				
2.1	Manhole for flow meter	1	ea.	$5,000	$5,000.00
2.2	Suction piping connection to chlorine chamber	2	ea.	$19,000	$38,000.00
2.3	600mm PVC suction line	45	m	$375	$16,875.00
2.4	600mm PVC discharge line	185	m	$375	$69,375.00
2.5	600mm butterfly valve (buried service)	6	ea.	$11,000	$66,000.00
2.6	Parking Pad	1	ea.	$10,000	$10,000.00
2.7	Building	71	sq.m	$1,750	$124,250.00
2.8	150HP Horizontal Split Case Pump (275L/s @ 33 m)	2	ea.	$40,485	$80,970.00
2.9	Pressure Gauge	4	ea.	$500	$2,000.00
2.10	50mm vacuum valve c/w manhole	2	ea.	$9,000	$18,000.00
2.11	Air/vacuum valve	2	ea.	$1,000	$2,000.00
2.12	450mm sch.10 SS pipe	21	m.	$2,000	$42,000.00
2.13	450mm butterfly valve	3	ea.	$5,250	$15,750.00
2.14	300mm check valve	2	ea.	$5,550	$11,100.00
2.15	300mm sch.10 SS pipe	18	m.	$1,500	$27,000.00
2.16	300mm butterfly valve	3	ea.	$3,600	$10,800.00
2.17	Chlorine residual analyzer	1	ea.	$9,000	$9,000.00
2.18	Electrical Installation Labour and Material Complete	1	ea.	$86,190	$86,190.00
2.19	Supply of MCC	1	ea.	$68,310	$68,310.00
2.20	Supply of Genset	1	ea.	$90,000	$90,000.00
2.21	Supply of HVAC Fans, Louvers, Dampers, Heaters	1	ea.	$7,659.60	$7,659.60
2.22	Supply Lighting	1	ea.	$690	$690.00
2.23	Supply PLC	1	ea.	$20,700	$20,700.00
2.24	Supply Instrumentation	1	ea.	$11,040	$11,040.00
2.25	Programming	1	ea.	$13,824	$13,824.00
2.26	Electrical Service	1	ea.	$20,000	$20,000.00
				Subtotal	$2,490,533.60
				Contingency and Engineering Allowance	$652,000.00
				Rounded Total (not including optional work)	$3,143,000.00
3	Optional Work				
3.1	600mm butterfly valve (buried service)	8	ea.	$11,000	$88,000.00
3.2	150HP Horizontal Split Case Pump (275L/s @ 33 m)	1	ea.	$40,485	$40,485.00
3.3	450mm butterfly valve (buried service)	2	ea.	$7,000	$14,000.00
3.4	Fire hydrant	1	ea.	$5,000	$5,000.00
3.5	300mm check valve	1	ea.	$5,550	$5,550.00
3.6	Rock excavation (if required)	600	cu.m	$100	$60,000.00
				Subtotal	$213,000.00
				Total (Pump Station, Reservoir and Optional Work)	$3,356,000.00

Low Lift Pumps and 2500m3 Reservoir

Job No. 0655.0170.11

Prepared by: J.Clowes

Checked by: S.Shepherd

				2040	
ITEM	DESCRIPTION	UNIT	$/UNIT	QTY	TOTAL
1	Labour				
	Weekly Inspection	hrs	45	1 hr/day	$11,700
	Maintenance and Trouble Shooting	hrs	45	4 hrs/month	$2,160
	Emergency Call-outs				$5,000
2	Electricity				
	Building Load (6kW)	Kwh	0.08		$4,205
	150HP Pump x 2 (Total = 224kW)	Kwh	0.08		$50,425
3	Heating	ea	1,000		$1,000
4	Equipment Maintenance	ea	5,000		$5,000
			subtotal		$79,490