

Low Flow Restoration and Fish Screening Improvements on Tributaries to the Lower Shuswap River

A PSC funded project

Prepared by:

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Abstract

Low flows continue to be a significant contributor to the decline of the Interior Fraser Coho as is described in the Conservation Strategy for coho salmon (*Oncorhynchus kisutch*), interior Fraser River populations (Interior Fraser Coho Recovery Team. 2006). Salmon and resident fish species are being impacted by low stream flows caused by environmental changes and the increased demand from expansion of agriculture water use. Impacts are most significant on the smaller tributaries which are also the preferred habitat for Coho Salmon during the rearing stage of their lifecycle and some for spawning. Blurton Creek, tributary to Lower Shuswap River, is one of these small tributary streams which because of its cool clear flows contributes to rearing habitat for Coho salmon, Chinook Salmon and Rainbow trout and has been recorded to support Coho Spawning in the past. Lower Shuswap River that Blurton Creek flows into has been measured at high turbidity and lethal temperatures for fish at the time when Chinook are migrating to their spawning grounds. Salmon need these inputs of cool, clear water to clear their gills of sediment and cool off their bodies on their migration. There are significant agricultural water withdrawal demands on Blurton Creek which have resulted in dewatering of the creek and fish kills several times in the past four years when demand is coupled with climatic low flow conditions. This project is an example of a solution to the problems with low flows on tributary streams which are used for agricultural water withdrawal. The two significant irrigation intakes on Blurton Creek were relocated downstream to the confluence of Blurton Creek where it enters Shuswap River so they will be drawing from the mixed water of the Shuswap River. As a result of this project the cold, clear, Blurton Creek water will be available to flow the length of the stream for fish and two landowners will be provided with steady, predictable source water for irrigation. This project is one that DFO would like to see repeated throughout the BC Interior area in streams with low flow problems.

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This project removed the agricultural water withdrawal pressure from Blurton Creek by re-locating the two significant irrigation intakes from the locations on Blurton Creek to the confluence of Blurton Creek and Shuswap River. This results in the return of cool, clear water to approximately 1.5 km of stream, reduces the footprint impact to fish habitat from two intakes to one intake structure, provides stable source water for the irrigators which is better for their crops at the higher temperatures and allows that important cold clear water to flow to the Lower Shuswap river for refuge during Salmon migration. This project will result in increased rearing habitat for juvenile Coho, Chinook, and Rainbow Trout and potentially bring back Coho spawning in that creek in the future. And this project will act as a demonstration project to allow Fisheries and Oceans and community organizations to encourage other landowners to complete similar projects.

Objectives

1. Increase Productive Capacity of endangered Coho stocks in a portion of the Shuswap River watershed by prevention or elimination of the annual threat and occurrence of fish stranding, stress and kills.
2. Improvement of water quality, low flows, available rearing habitat and the reduction of summer stream temperatures over the long term.
3. Increase awareness of the need for better water management in the lower Shuswap River watershed and promote stewardship by working with the concerned community groups, water licensees and the Province of BC to develop alternative strategies that reduce the impact of inadequate flows on fish and fish habitat.

Methods

DFO partnered with the Whitevalley Community Resource Center (WVCRC) to carry out this project. Whitevalley was successful in securing the remaining funding for this project through the Canada/BC Water Supply Expansion Program and BC Hydro Community Donations and Sponsorship Program as well as other partners and significant in-kind contribution from landowners. This made it a complex project involving several steps and complicated reporting structure.

The project involved the relocation of two intakes from Blurton Creek to one shared intake location at the confluence of Blurton Creek and Lower Shuswap River. Project components:

Step	Action	Completed Target	Date Completed
1	Legal permissions,	May 2007	July 2007
2	Transmission line extension and upgrade,	July 26, 07	July 27, 2007
3	Electrical and valve components purchased,	Part July 26, 07 Aug 15, 2007	Part July 26, 07
4	Mainline installations,	Aug 10, 2007	
5	Intake installation,	Aug 20, 2007	
6	Pump house construction and	Aug 30, 2007	
7	Irrigation pump purchase and installation.	Aug 20, 2007	
8	Decommissioning of the old intake sites	Sept 20, 2007	
9	Monitoring of project success by DFO	Sept 30, 2007 to Sept 30, 2009	

Table 1-Project Timelines and Milestones

To date, steps one to three have been completed, the Pacific Salmon Commission contributed funds to steps two and three. A legal easement was achieved to ensure access for the upstream landowner to the pump house site and for maintenance of the mainline and power line. The power line was extended from Riverside Road to the Pump house site with increased capacity to 3 phase (600 volt) in order to power two irrigation pumps from the single line. See Figure 4 for Transmission line layout. The transmission line extension was designed to minimize the materials needed while avoiding environmentally sensitive areas. (see Figure 5 and 6) Ten poles were installed at 90 meter spacing to provide power to the riverbank. The transmission line layout specifically avoided all trees and was located a significant distance from existing trees so that vegetation maintenance will not be necessary. Transmission line costs and part of the electrical and valve components have been purchased under the PSC funding envelope. There are two parts to the transmission line costs as there is a portion of private line installation and there is a cost for the portion that BC Hydro had to complete.

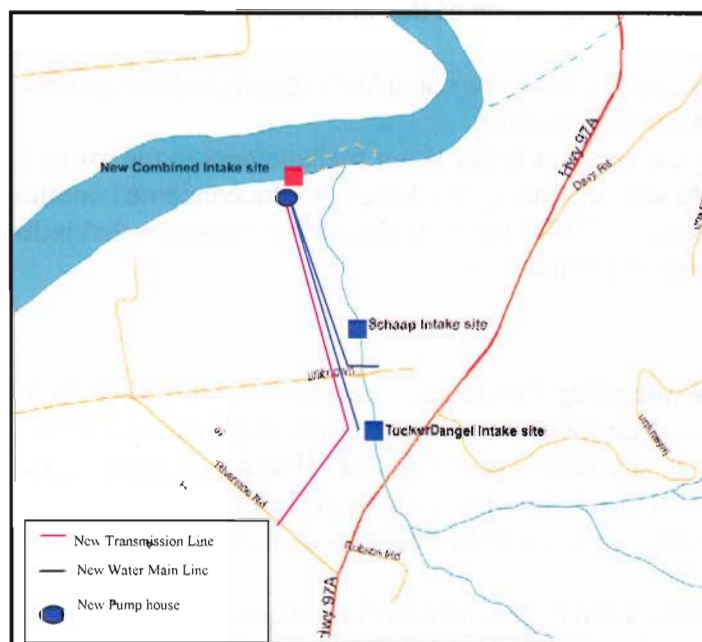


Figure 4 - Site Map



Figure 5- Transmission line. View toward Road- Blurton Cr. is to the left of the photo.

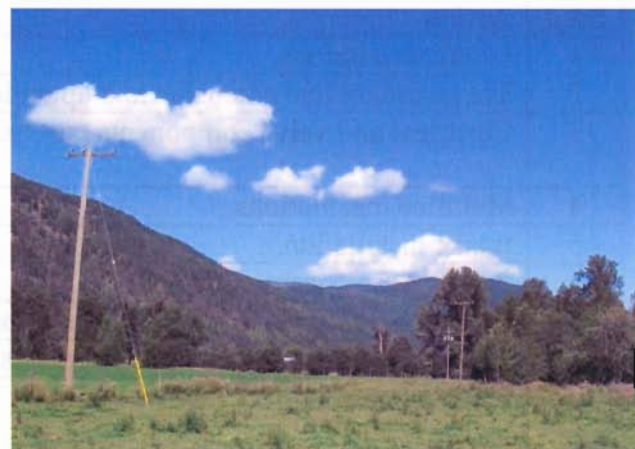


Figure 6 - Transmission line. View toward River-Blurton Cr. is to the right in photo.

Next steps will be purchase of the other valve component then the mainlines will be installed. The mainlines will be constructed of 6" and 4" Class 200 PVC Pipe and will be installed two feet below ground just prior to the intake installation to avoid extra excavator mobilization fees. Mainlines, intake installation and pump house are all located in natural openings so no riparian vegetation will be destroyed. The mainlines will then be attached into the existing water distribution systems on each property. The shared intake will be constructed of 12 inch steel pipe which will be pushed under the bed of the river out into the thalweg to ensure water availability during lower water months and to avoid navigability concerns. See figures 7 and 8 for screen design and detailed intake installation drawing. By pushing the pipe through there will be significantly less potential for harmful effects to the environment and minimal need for in stream sediment mitigation but this step will be completed within the fisheries work window of Aug 7th to Aug 23rd as a best practice. The pump house will be elevated above ground level to protect the pumps if there were to be high flows onto the flood plain. Two standpipes will be installed onto the buried 12 inch steel pipe for the pumps to be placed into. The pumps will then be hooked up to the mainline, the system energized and the system is complete. The previous intake sites and all disturbed ground will be rehabilitated and planting of exposed soil will be completed by the landowner prior to October 30, 2007.

Ongoing monitoring will be undertaken by DFO in coordination with the landowners during the low flow and irrigation periods.

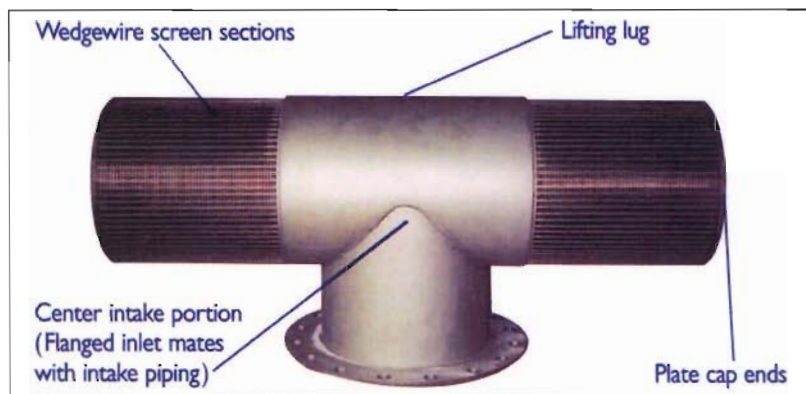


Figure 7 - Intake Screen Design

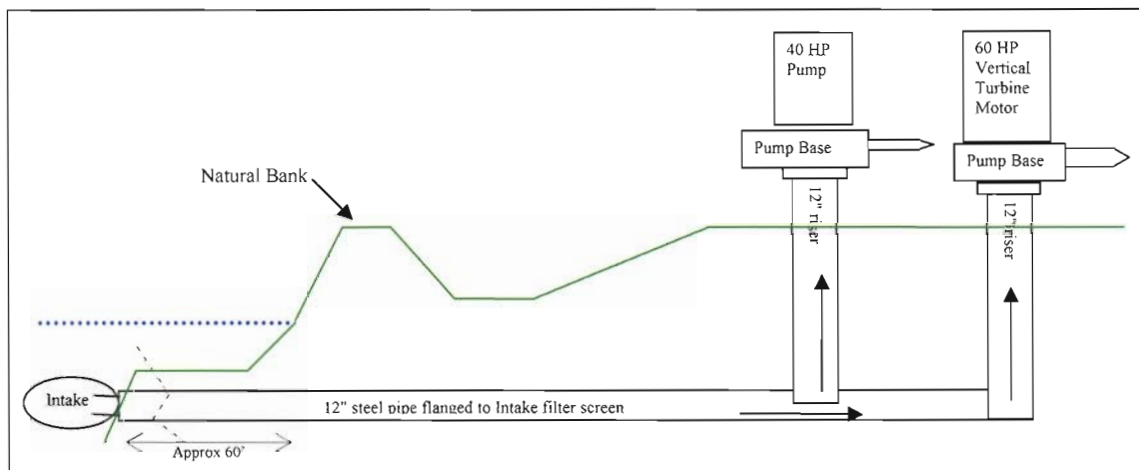


Figure 8 - Intake Installation Design

Results

The objectives for this project were to 1) increase productive capacity of endangered Coho stocks in a portion of the Shuswap River watershed by prevention or elimination of the annual threat and occurrence of fish stranding, stress and kills, 2) improve water quality and quantity available rearing habitat and the reduction of summer stream temperatures over the long term, and 3) increase awareness of the need for better water management in the lower Shuswap River watershed and promote stewardship by working with the concerned community groups, water licensees and the Province of BC to develop alternative strategies that reduce the impact of inadequate flows on fish and fish habitat.

All three objectives were accomplished. Increase in productive capacity of Coho and other salmonid species will be achieved through the availability of water in the 1.5 km section which was previously withdrawn for irrigation. With the irrigation withdrawal ceased the stream stage changes in Blurton Creek will be gradual with the natural hydrograph so stranding and fish kills will be avoided. The landowners will now draw from the mixed water of the Shuswap River allowing the clear, cool Blurton Creek water to flow the length of the stream and provide cooling waters for the Shuswap River as well. Fish access, water depth, and water temperature will all be improved by this project. DFO will monitor water availability, access, fish use, and temperature in Blurton Creek for at least two years. This project involved many partners and a great deal of involvement and investment by the landowners. We worked with the concerned community group, Whitevalley Community Resource Center, and with BC Ministry of Agriculture to make this a success and will continue to increase awareness of water management issues throughout BC Interior by using this project as a demonstration project.

The project was on budget but behind planned schedule. This was due in part to complications with partnering funding agencies and changes of staff managing the project. The Canada/BC Water Supply Expansion Program became the other significant funding source for which we received confirmation early in the spring but they would not release the funds until environmental review was completed, which later it was determined that this project did not require. With a few intake changes suggested Whitevalley received the contract in mid July we arranged to get the contractors mobilized as soon as possible. The landowner Darrel Tucker was instrumental in pulling all of the people together to get this project going in the short timeframe that we had and will be a significant financial contributor to the project.

The total project budget is \$177,247 of which Pacific Salmon Commission Southern Boundary Fund contributed \$59,362 with other funding totalling \$73,941 and in-kind value of more than \$44,000. See Appendices A and B for details. The project is partially complete and the remaining portions of the project will be completed this summer. On July 27, 2007 the hydro line extension and upgrade was completed (\$33,432.40 private line, and \$4923.70 public line); the electrical components required for the irrigation pumps (\$16,358.88) and one of the required control valves (\$4,311.02) have been purchased. The mainline and intake installations will be completed within the fisheries work window before August 23rd, 2007. The remainder of the structure installation, construction and site rehabilitation work will be accomplished before October 31, 2007.

Discussion

The project outcome will be a significant gain and improvement of fish habitat in Blurton Creek and a positive change in Lower Shuswap River benefiting the Salmonids in the Shuswap River system. The project intent is a simple concept; install hydro power, install intake and extend mainlines. But, partnership assumptions were made prior to the Pacific Salmon Commission Funding application that did not come through. Alternative funding was sought and secured although this significantly delayed the start of the project. The delays resulted in the prices changing as the original quotes were received more than one year earlier and commodity prices had risen significantly. The ability to stay on budget was due to a reduction in transmission line installation cost from the budgeted amount. As the project was funded through Canada-BC Water Supply Expansion Program there were suggested changes to the intake and pump system resulting in higher costs for the landowner but the new design will ensure a stable source of water with little to no intake maintenance and fewer impacts to the river and its banks. Many lessons were learned from this project so that the next time the opportunity arises to complete a similar project timelines will be met and things will go smoother.

Blurton Creek is a beautiful creek with complexity, a mixture of pools and riffle habitats with gravels suitable for Coho spawning, significant invertebrate population and cool water temperatures. The upstream most landowner has already, in cooperation with DFO, removed the intake impoundment area for his intake in Blurton Creek to provide upstream fish access and voluntarily reduces his water use for protection of fish. But those measures are still limiting the availability of water for fish and impacting the economic balance on his property. When this project is completed it will allow the full flow of Blurton Creek water to be available for fish use and will provide two landowners with a stable, reliable source of water for irrigation.

This project was designed to be long term requiring little maintenance. The intake structure will be constructed of thick walled 12 inch steel pipe installed under the bed of the river with a steel fish screen at end of pipe. The mainlines are going to be constructed with Class 200 PVC Pipe. The transmission line was constructed to BC Hydro standards. This project will provide results in perpetuity as the intakes were relocated to the main river and the structural component of this project has a lifespan of at least 50 years when the hydro line poles may need to be replaced. Electrical and pump components will need to have regular maintenance as well as there will need to be regular checks of the intake screen for debris or damage. The landowners have full responsibility for maintenance and upkeep of the project from completion.

This project is an example of a great way to return water to streams that have been or will potentially be impacted by irrigation water withdrawal. Blurton Creek has already benefited from this project and will continue to benefit for the long term contributing to healthier fish populations in the Lower Shuswap River. Many other streams can benefit from this type of project and despite the complications that came up here DFO looks forward to completing the next intakes relocation project that will benefit fish and fish habitat.

Conclusion and Recommendation

The funding provided by Pacific Salmon Commission was used to leverage further funds required to complete this project. On completion, the overall project will have more costs than originally proposed but the landowner, realizing the benefits and previous investment in the creek, has agreed to contribute the costs above the funded amounts. There is significant buy in for these landowners. As well, the local electrical company, Mountainview Electric, who has been arranging the physical electrical and irrigation components of the project has stated that he has learned a lot about the importance of fish habitat and will apply that knowledge to other projects that he is contracted to work on. The landowner, DFO and the electrical company, along with BC Agriculture are still working on methods to reduce costs to relieve the resulting cost to the landowners such as use of used steel pipe and having the landowner use his own equipment to backfill the trenches to save on excavation costs. All of the services contracted for this project were provided by local companies contributing to the local small community economies of Enderby and Lumby.

Although the project will be successful over all, there are several improvements which had to be made midway through the progress of the project. All who were involved in this project learned from those complications. The learning points which would be applied to the next project similar to this one include:

- knowledge of the BC Hydro Processes for transmission line extension,
- knowledge that BC Hydro will not contribute any type of electrical or transmission components of a project due to union concerns,
- knowledge of different types of intake designs and associated costs,
- knowledge of limits to community group management of multi partnership projects

Even though there were difficulties to overcome, this project is an excellent example of a win-win project for the fish and the farmer so we desire to monitor this project and promote this type of project elsewhere in the BC Interior area.

References

Irvine, J.R. 2002. COSEWIC status report on the coho salmon *Oncorhynchus kisutch* (Interior Fraser population) in Canada, in COSEWIC assessment and status report on the coho salmon *Oncorhynchus kisutch* (Interior Fraser population) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-34 pp.
http://www.sararegistry.gc.ca/status/showASCII_e.cfm?ocid=281

Interior Fraser Coho Recovery Team. 2006. Conservation Strategy for coho salmon (*Oncorhynchus kisutch*), interior Fraser River populations. Fisheries and Oceans Canada.

Appendix A: Financial Statement of Project Expenditures

Applicant Name: Department of Fisheries and Oceans Canada

Project Name: Low Flow Restoration and Fish Screening Improvements on Tributaries to the Lower Shuswap River

Labour

Wages & Salaries

Position	# of crew	# of work days	hrs per day	rate per hour	Total (All Sources)	In-kind and Cash	PSC Budgeted Amount	PSC Actual costs
					-			
					-			
Person Days (# of crew x work days)								
					sub total			

Labour - Employer Costs (percent of wages subtotal amount)

(CPP, EI, WCB, Vacation Pay)	rate	12%		sub total	-			
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Subcontractors & Consultants

	# of crew	# of work days	hrs per day	rate per hour				
DFO Technician	1	15	7.5	\$56.00	6,300.00	6,300.00		
DFO Engineer	1	30	7.5	\$93.33	21,000.00	21,000.00		
					-	-		
WCB if applicable (not covered by own policy)								
					rate	0%		
					sub total	27,300.00	27,300.00	

Volunteer Labour

	# of crew	# of work days	hrs per day	rate per hour				
Skilled Community rep	1	5	8	15	600.00	600.00		
Un-skilled					4,000.00	4,000.00		
WCB if applicable (not covered by own policy)								
					rate	0%		
					sub total	4,600.00	4,600.00	

Total labour costs

	Total (All Sources)	31,900.00	31,900.00		
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Site / Project costs

Item	Unit Cost	# of Units	Cost	Total (All Sources)	In-kind and Cash	PSC Budgeted Amount	PSC Actual costs
Travel (do not include to & from work)	meals	\$53/day	20	1060	1,060.00		

Electrical

Schapp	Irrigation Service Electrical including pressure regulation control system.		5,982.00	-		5,982.00
Combined	BC Hydro hookup -including new pole across road		4,645.00	-	1,500.00	4,645.00
Tucher/Dangel	Irrigation Service Electrical including pressure regulation control system.		9,489.00	-	7,230.00	9,489.00
Combined	B.C. Hydro Service upgrade costs Primary Extension 3PH from Riverside Road across to the river's edge (890 meters)		31,540.00	-	43,200.00	31,540.00

Mechanical

Schapp	Supply 40HP 240V 3phase Goulds End Suction 200GPM @ 360' TDH - Landowner to supply pump		-	-	4,675.00	
Schapp	Supply and install a Singer Valve pressure regulation valve		2,695.00	2,695.00		
Tucher/Dangel	Supply 60HP Pump - one Landowner to supply both pumps		13,000.00	13,000.00		
Tucher/Dangel	Supply and install a Singer Valve pressure regulation valve		4,067.00	-		4,067.00
Combined	Intake & Discharge systems materials and installation. and connection to new mainline piping.		8,485.00	8,485.00		

Structural

Schapp	Install a ramp/rail design. NOW rodpush standpipe design. Cost included in Intake and Discharge Row.					
Tucher/Dangel	Install a ramp/rail design. NOW rodpush standpipe design. Cost included in Intake and Discharge Row.					

Mainline

Combined	Extend mainline from existing location on the creek to the river. Mainline to be 6" Class 200 PVC with necessary fittings, concrete thrust blocks. Have allowed for 1800ft of mainline.		17,368.00	17,368.00		
Tucher/Dangel	Extend mainline from existing location on the creek to the river. Mainline to be 8" Class 200 PVC with necessary fittings, concrete thrust blocks. Have allowed for 1700ft of mainline.		21,345.28	21,345.28		

Site / Project costs (cont'd)		Detail (use additional page for details if needed)		Total (All Sources)	In-kind and Cash	PSC Budgeted Amount	PSC Actual costs
Excavation							
	Tucher/Dangel	Excavation charges for mainline upgrade, and civil work at river's edge for the pump support system		3,108.89	2,830.19		278.70
	Schapp	Excavation charges for mainline upgrade, and civil work at river's edge for the pump support system		1,886.79	1,886.79		
Site Supplies & Materials							
	Equipment Rental						
	Safety Training & Supplies						
	Repairs & Maintenance						
	Permits						
	Technical Monitoring						
	Report writing			720.00	720.00		
	Other site costs	GST	(6% not included above)	7,416.72	4,056.62	3,396.30	3,360.10
Total Site / Project Costs				132,808.68	73,446.88	60,001.30	59,361.80

Training		Detail (use additional page for details if needed)					
Total Training							
				-	-	-	-

Overhead		Detail (use additional page for details if needed)					
	Office space; including utilities, etc.			1,500.00	1,500.00		
	Insurance			150.00	150.00		
	Office supplies	color printing, photography			-		
	Telephone & long Distance			50.00	50.00		
	Photocopies & printing				-		
	Other overhead costs				-		
	Admin Costs			10,588.21	10,588.21		
	Bookkeeping	25	10	250.00	250.00		
Total Overhead				12,538.21	12,538.21	-	-

6,538.21

Capital Costs / Assets (subject to BCRP policy)		Detail (use additional page for details if needed)					
Total Capital Costs							
				-	-	-	-
Project Total				\$177,246.89	\$117,885.09	\$60,001.30	\$59,361.80

Budget Summary

(PSC and Inkind)

	Total Costs	PSC	
		Contribution	Other Contributors
Labour	31,900.00	-	31,900.00
Project / Site Costs	132,808.68	59,361.80	73,446.88
Training Costs	-	-	
Overhead Costs	12,538.21	-	12,538.21
Capital Costs	-	-	
Total	177,246.89	59,361.80	220,544.57

I, Carol Smith, administrator for Oceans, Habitat and Enhancement Branch, BC Interior South have reviewed and approve this financial statement.

Signed _____ on the _____ of _____, 2007

Appendix B: Summary of Additional Grants and Contributions

Materials

Item	Contributor	Approximate amount
Intake and Discharge systems materials and installation Shared Large diameter Steel intake pipe with fish screen- Design under review by BC Agriculture.	CBCWSEP	\$8,994.10
Extend Mainline from existing pump house to new pump location – Tucker/Dangel	BC Hydro	\$22,626.00
Extend Mainline from existing pump house to new pump location - Schaap	CBCWSEP	\$18,410.08
Excavation Charges – mainline and intake installation	CBCWSEP/BC Hydro	\$5,000.00
Pumps purchase – Tucher/Dangel 60HP VT, Schaap 40HP VT, (pump styles under review)	Landowner	\$13,780.00
Singer Valve Pressure Regulation Valve –Schaap	CBCWSEP	\$2,856.70

Labour

Item	Contributor	Approximate amount
DFO Engineer (including overhead)	DFO	\$21,000.00
DFO Technician (including overhead)	DFO	\$6,300.00
Travel expenses	DFO	\$1,060.00
Community Organization (Project management)	DFO	\$6,000.00
Community Organization (technical advice, services)	FRISP/CBCWSEP	\$7,138.00
Landowner Contractor Co-ordination, Legal Easement, Site Preparation, site rehabilitation, machine and equipment use	Landowner	\$4,000.00
report Writing- value added after	DFO	\$720.00

Total Other Contributions **\$117,884.88**