

**ALLCO HATCHERY WATER  
SUPPLY UPGRADE  
AND  
WELL RE-SERVICING PROJECT**

**Funded through the  
Bridge Coastal Restoration Program  
and  
Pacific Salmon Foundation**

**Prepared and Submitted by**

Geoff Clayton, M.&Pow.Eng  
Alouette River Management Society  
PO Box 21117, Maple Ridge, BC V2X 1P7

Spring 2001



## **ALLCO HATCHERY WATER SUPPLY UPGRADE AND WELL RE-SERVICING PROJECT**

There are two components to this project, Allco Springs and the re-servicing of the Allco Hatchery Well system. These projects began as two independent projects but have now worked to compliment each other.

### **Allco Springs Project**

The Alouette River Correctional Centre's approved grant from the Pacific Salmon Foundation has now achieved field completion of the new water supply, except for fine-tuning. Therefore we are now in a position to give you a short report on the project and the new benefits for the upper and lower hatcheries. As this project proceeded costs used up the PSF grant without completing our objectives.

B.C. Hydro's, Bridge Coastal Restoration (kick-start) Program (BCRP) was applied for to fund the completion of the new water system. Hydro approved this expenditure and became a funding partner.

The Alouette River Correctional Centre (ARCC), an aqua-culturist and the B.C. Government had partnered for many years on a small project to develop biologically altered trout (restaurant table food). This was carried out in a building on the NE corner of ARCC property and was called the Research Hatchery. Later on, cultured coho and chinook were raised in this facility. Water to this building was supplied from one of the ALLCO springs through a jury rigged capture box system with no back up supply, or water license.

### **The Project Plan**

The purpose of this project was to accomplish the following:

- Obtain a formal water license for all spring water at this general location.
- Build three engineered capture boxes to entrain these springs in a competent and effective fashion.
- Pipe the three separate capture boxes into a manifold trunk line leading to the aeration tower and head tank at the research hatchery (now referred to as the "upper hatchery").
- Construct a pipeline that would cross-connect the upper hatchery water into the lower hatchery discharge line from the well. This created an alternate and supplemental supply of water for the lower hatchery.
- Dedicate Allco Spring water to building and enhancing Alouette river salmonid stocks.

### **Present Status (March 2001)**

- All formal documents of application were processed. B.C. Water Rights, Surrey, Div. MoELP have issued a Water License (copy attached).
- The project is commissioned and in service, with a potential of 500 litres per min. of high quality, temperature advantaged water.
- Potential, pressure and kinetic energy are now working for us, free of electrical charges!

The upper hatchery now has a surplus 160 litres per minute, which is being diverted to the lower hatchery. Theoretical cost to pump this quantity of water to the lower hatchery would require a 5 hp motor @ \$200.00 per month. From May to November (6 months) the upper hatchery could be shut down as generally speaking, this hatchery is operated for incubation and a fry grow-out facility. Therefore with the new system in place, all of the water up to 500 litres per minute can be diverted from the upper to the lower hatchery thereby saving up to \$1000.00/mon. in electrical bills overall. Yearly savings are projected on the following assumptions:

$(\$200 \times 6) + (\$1000 \times 6) = \$7,200$  per year.

### **ALLCO HATCHERY WELL RE-DEVELOPMENT PROJECT**

The object in this summary is not to duplicate the *Columbia Water Well's* information, as their report is attached as a stand-alone document. What we have attempted to do here is give an overview of the past, present and future for this Well and its new auxiliary system.

#### **Past History**

A history search leads us to believe that the original tests that were carried out to determine the specific capacity of the Well have not, over time, been proven out in terms of overall performance. On the other hand, re-development that included cable tool, surge and bail, since 1985, have returned results that do not indicate any overall reduction in the **realistic capacity** of this Well. The original pumping rate in June of 1982 was 858 USGPM – drawdown 27.9 ft. Specific Capacity 30.8 USGPM/ft. The motor and pump unit, at that time, was a three phase 40 HP, two-stage submersible, operating at a depth of 30 metres.

#### **Recent History**

In March of 1996 the 40 HP motor was replaced. The replacement and current unit is a Berkeley pump, Model #8S5H-1, single stage, rated at 400 USGPM at 90 TDH. This is coupled to a 20 HP 575-volt motor, which had a **subtrol protection device**. Pump and motor are submersible units with the pump placed at 30 metres sub-surface. The performance potential calculated by Precision Service & Pumps (Mike Lamont) in 1996 was:

“Potential yield = 26.1 USGPM/ft x 21 ft = 584 USGPM”

#### **Present and Future Considerations**

The potential source of recharge for this aquifer from natural ground water flow was considered to be Alouette Lake, the river upstream of the site where there is a probable influent effect, surface recharge (rain) and possibly spring water. It is reasonable to believe that long droughts and low river flows, prior to the flow agreement in August of 1996, may have coupled from time to time, resulting in poor Well capacity. Having increased base river flows from 20 cf/s to 100 cf/s right through drought periods may have a greater influent effect on the aquifer in the future.

On the minus side, the new spring water collection system that is designed for hatchery supply, may have a small negative effect. The springs and their capture boxes are approximately 500 metres NE of the well and surface 20 metres higher than the Well house elevation. These springs may have had some influent effect in the past on the aquifer through surface water recharge. This will not happen with the new system.

On examining operating conditions in October, 2000, prior to the re-development of the Well, we found no instrumentation (pressure gauges or flow meter) in place. We installed a pressure gauge upstream of the gate discharge valve and a compound gauge downstream. We then placed the pump in service with the gate valve open to the previous position. There was no line gauge pressure at all and in a few minutes it was apparent that discharge pressures to the hatchery had swung to sub-atmospheric (2-3 in. Hg). Drawdown records were incomplete. There was no pump flow curve operation point in the picture here, balanced to a known recent specific capacity.

In the future, we recommend throttling the pump discharge valve to produce 2-5 psi backpressure on the pump. This will discharge a flow to the lower hatchery of 200-250- Imp gal/min at 1" hg of sub-atmospheric pressure (present conditions). These operating conditions were creating a very modest 13 ft drawdown in the well.

A wye connection has been installed in the 6" lower hatchery line just behind the Well pumphouse. A new 4" spring water supply pipe is connected at this point. Given the sub-atmospheric pressure in the 6" pipe and the 15-ft head pressure on this 4" supply, a balanced, or alternate, flow system to the lower hatchery has resulted. (See attached diagram)

This well and its auxiliary equipment is a valuable key to the lower hatchery and must be maintained. A record of gauge pressures and well draw-down readings will create a valuable picture of performance trends. Once every six months the pump should be tested for pressure against a closed discharge valve. (Currently at 20psi). An electrician should take amperage and voltage readings with flows under normal operating conditions. ARMS will make up a record logbook format for the future, if requested. In order to measure Well draw-down we have replaced the broken bubble tube gauge and will calibrate this against a conductivity tape measure of draw-down.

Every effort should be made to start and stop this pump against a closed discharge valve to extend the service of the motor, pump and Well.

All funding and volunteer partners must be assured of the upkeep of systems they have helped to build. Equipment records and appropriate maintenance is a necessity. In this way we support the trust and money that has been supplied for this project. Past records indicate, re-development is required every four years. The funds that must be found at that point should be based on sound documented records and a clear picture of good value.

The above report was framed out in November 2000. Since that time there have been some additional problems and changes required to the Well's auxiliary equipment. The electrical supply to the Well pump motor is transformed from 208v to 580v. This transformer malfunctioned and had to be replaced. There may have been a voltage imbalance from the malfunctioning transformer supply to the motor as, at that point, the motor was indicating a dead ground.

Precision Service & Pump were called in to replace the motor and did so. At this point we questioned their service representative about the effectiveness of the Subtrol protective device. It appeared to fail when needed and trip mysteriously on any waterline pressure above 4psi. Franklin extends their warranty when a subtrol is installed, but this gremlin of tripping the motor without alarmed conditions indicated, or believed, is unacceptable. A new subtrol was installed with the same problem. Mike Lamont, at Precision S&P suggested a solution. This has been to remove the subtrol unit which gave: phase imbalance, overload, underload and over temperature protective trips and replace it with a Cutler Hammer protective device that trips on: phase imbalance and overload protection only.

This solved the problem. The two alarmed trips that are lost in this cheaper less troublesome device are: underload and overtemp. We submit that overtemp is not required due to the built in overtemp protection incorporated in the motor. In addition, underload should only come up if someone left the discharge valve shut on start up for more than a few minutes. As this is not a remote start motor, there is very little chance of this happening.

We no doubt all hope that this solves the long outstanding issues with an unreliable water supply from this Well. There should be far more flexibility to reduce discharge flows from the Well when low aquifer levels occur, without subtrol trips. And, at times, with the upper hatchery shut down, the new spring water connection to the lower hatchery can be a stand-alone supply.

### **Funding Explanations**

We have attached a full accounting breakdown of the various funds applied to this project. This outlines the various funding sources and what costs have been allocated to the various components.

### **Conclusion**

Your vision, trust and faith in funding these fishery projects gives a great lift to both the Alouette River Correctional Centre and ARMS. Environmental partnerships developed on this project increases our capacity to accomplish these worthwhile projects.

We wish to thank the following people for their assistance during this project:

**B.C. Corrections** (Ministry of A.G.) - Debbie Hawbolt, District Director,  
Hatchery Staff and inmate labour

**B.C. Hydro** Carol Lamont - for their funding and encouragement

**Pacific Salmon Foundation** - Rich Chapple - funds and support

**North Fraser Salmon Assistance Program** - Tony Matahlija - labour

**Fisheries and Oceans Canada:** Maurice Coulier Boisvert – Community Advisor  
Harold Beardmore and Mike Landiak – Engineering  
Matt Foy – Biologist

**ARMS** –Jenny Ljunggren, administrator, who keeps our wheels on and cheerfully  
excepted many draft changes to this report.

We thank all of you for the funds and support you have given us.

Respectfully submitted,

Geoff Clayton –M.& Pow.Eng.  
President  
Alouette River Management Society



### **Dimensions of ALLCO Fish Hatchery's Aeration Cistern**

The tank is 3.96 metres square and 3.35 metres deep. Therefore for every 30.5cm of water held in the cistern the following applies.

$$3.96 * 3.96 * .305 = 4.8\text{cm}$$

Imperial conversion is:

$$4.8 * 35.3 = 169\text{cu/ft}$$

$$169 * 6.25 = 1055 \text{ gallons—or}$$

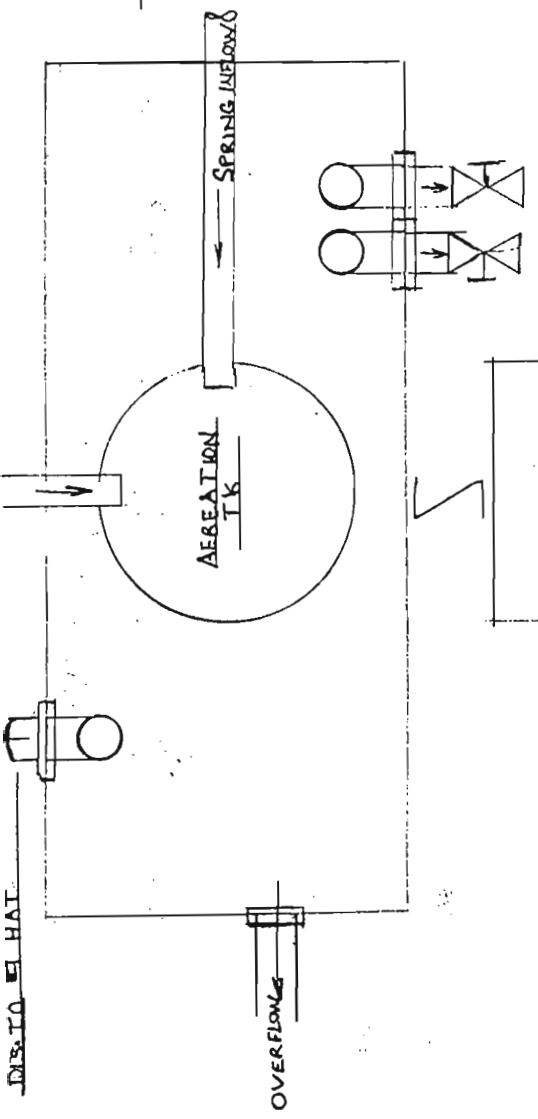
1055 gallons for every foot of increased height in the aerator.

By keeping this quantity of "gallons per foot" on file you will at any time in the future be able to run a performance test on the well pump capacity over a timed event.

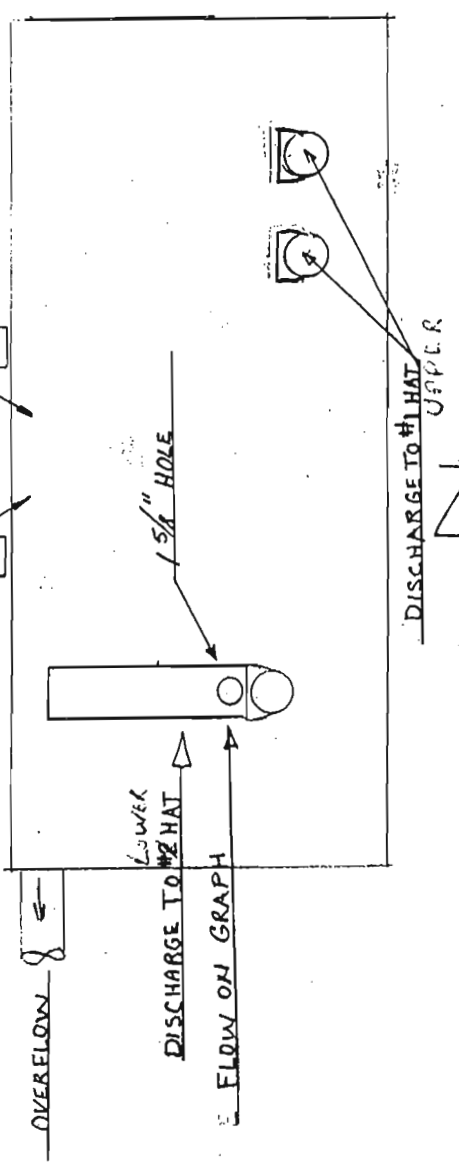
Geoff Clayton

Fall 2000

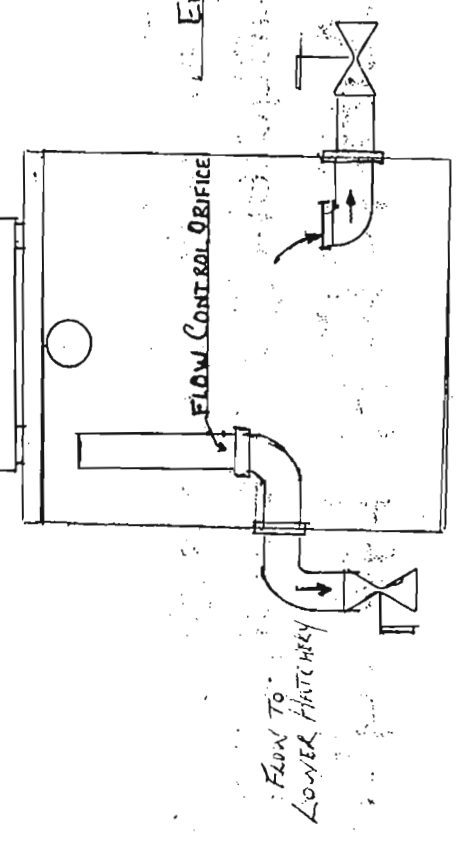
PLAN



SIDE ELE.



END ELE.

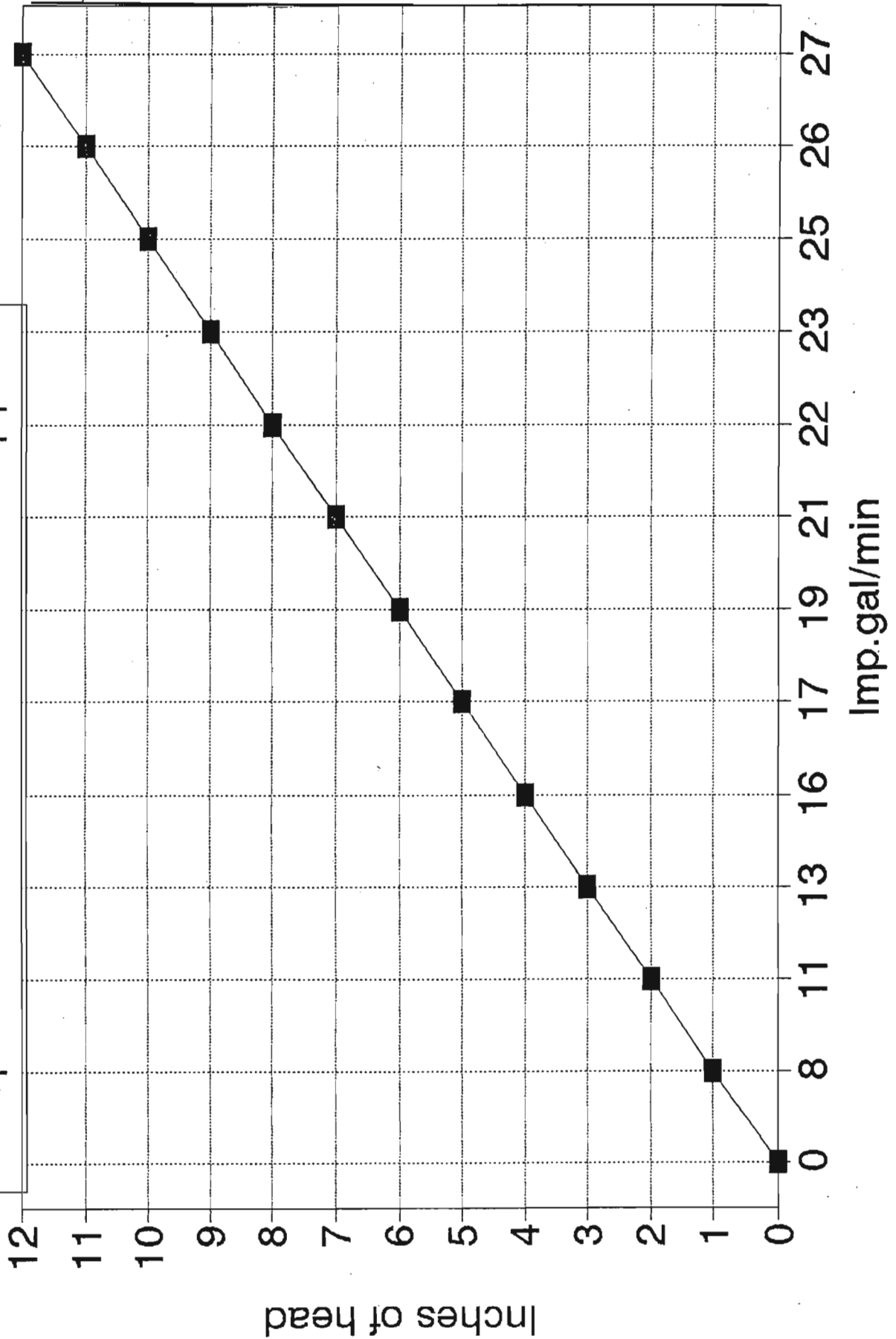


Math for graph based on the following formula;  
 $Q \text{ in gal/min} = (ca * .7854 * D^2) * (cv \text{ (sq.root of } 2gh)) * 60 * 6.25$

- ca= coefficient of reduction of area of hole in stand pipe (.64)
- D= diameter in ft of hole in stand pipe
- cv= coefficient of velocity (.97)
- g= force of gravity
- h= head in feet

# Flow Graph: #1 Hatchery

Discharge to #2 Hatchery  
 Graph based on 1.625" sized hole in stand pipe





BRITISH  
COLUMBIA

Ministry of Environment,  
Lands and Parks

## PERMIT UNDER THE WATER ACT AUTHORIZING THE OCCUPATION OF CROWN LAND

- a) The holder of **Conditional Water Licence 114028** whose licence authorizes the diversion of water from **Allco No 1 Spring, Allco No 2 Spring, Allco No 3 Spring and Allco No 4 Spring**, is hereby authorized to enter onto and occupy Crown land for the purpose of constructing, maintaining, and operating works authorized by the above licence. The Crown land so occupied has a width of 4.6 meters (15 feet) and a length commensurate with the length of the works authorized in the licence and any licences which may be issued in substitution thereof.

**This permit is issued subject to all subsisting rights of other persons acquired under other provincial legislation, whether or not the permit holder has actual notice of them.**

*Marc Zubel*

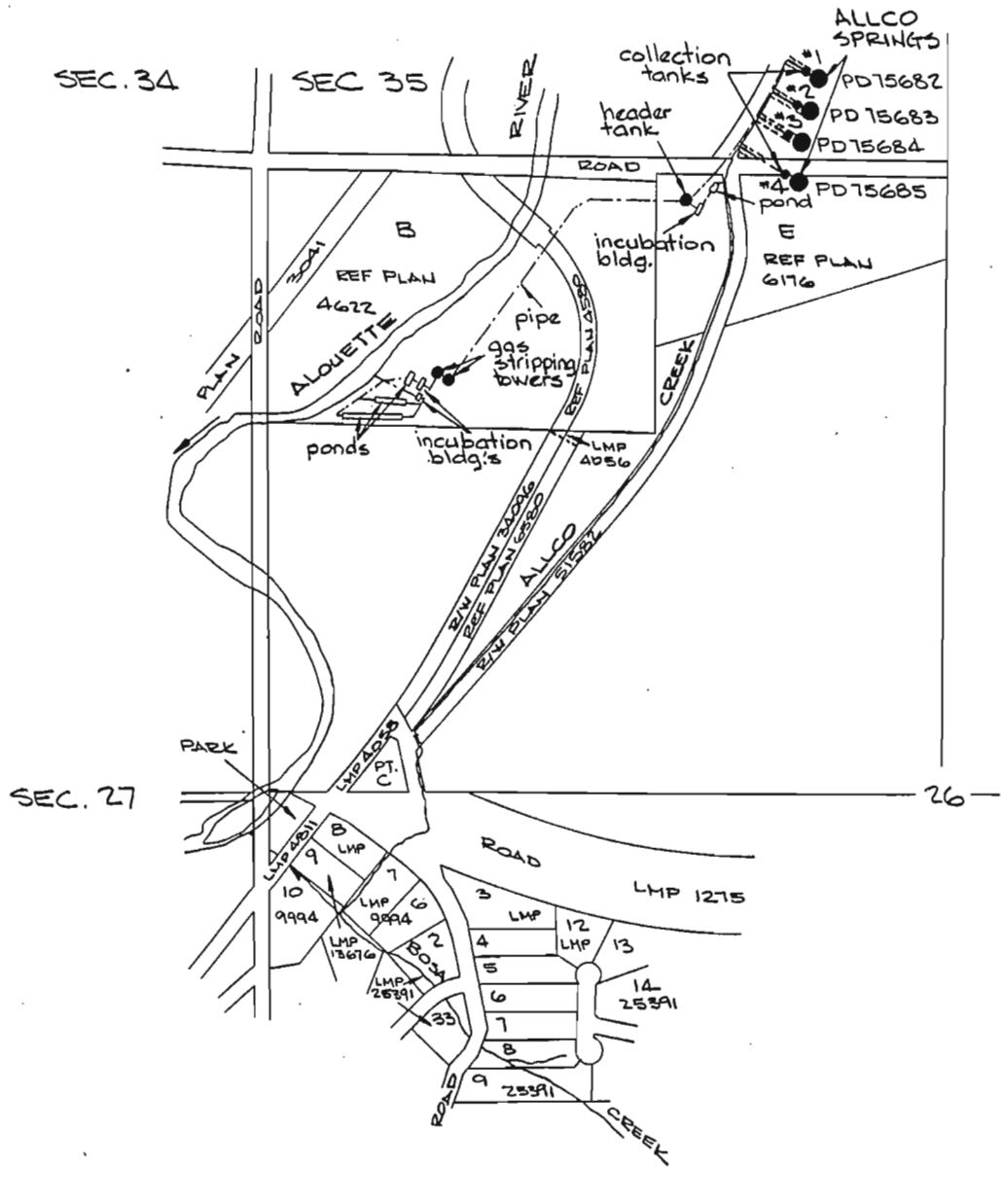
Marc Z. Zubel, P.Eng.  
A/Assistant Regional Water Manager



# Province of British Columbia

TP 12

E.C.M.



WATER DISTRICT: New Westminster  
 PRECINCT : Pitt Lake  
 LAND DISTRICT : New Westminster

Signature: *Mara Zuber*  
 Date: 30 November, 2001.

Scale : 1:7500  
 Points of Diversion : ● PD 75682, 75683, 75684 & 75685  
 Map Number : WR 5910L  
 Pipe : -----

C.L. 114028  
 File: 2002342  
 P.C.L.: 25305

## THE PROVINCE OF BRITISH COLUMBIA—WATER ACT

## CONDITIONAL WATER LICENCE

The Department of Fisheries & Oceans, Canada is hereby authorized to divert, store and use water as follows:

- (a) The streams on which the rights are granted are **Allco No 1 Spring, Allco No 2 Spring, Allco No 3 Spring and Allco No 4 Spring.**
- (b) The points of diversion are located as shown on the attached plan.
- (c) The date from which this licence shall have precedence is **25<sup>th</sup> June, 1999.**
- (d) The purpose for which this licence is issued is **conservation (hatchery).**
- (e) The maximum quantity of water which may be diverted, stored and used is **0.300 cubic foot per second.**
- (f) Water may be used throughout **the whole year.**
- (g) This licence is appurtenant to the conservation project of the licensee within **Parcel B, Reference Plan 4622 and Parcel E, Reference Plan 6176, except Statutory Right of Way Plan 51582, all of Northwest ¼ Section 26, Township 12, East of the Coast Meridian, New Westminster District.**
- (h) The works authorized to be constructed are **diversion structures, collection boxes, pipe, header tank, gas stripping towers, incubation buildings and ponds** which shall be located approximately as shown on the attached plan.
- (i) The construction of the said works shall be completed and the water beneficially used prior to **31st December, 2003.** Thereafter, the licensee shall continue to make a regular beneficial use of water in the manner authorized herein.



Marc Z. Zubel, P.Eng.  
A/Assistant Regional Water Manager





## **COLUMBIA WATER WELLS (1986) LTD.**

25188 – 52 Ave Aldergrove, BC V4W 1G2

Phone: 604-857-0008

Fax: 604-856-3294

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### **Summary of Well Development: Alouet Correctional Institute**

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#### **TW # 1**

Development by 22W Cable Tool Drill Rig

Method by surge and bail

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The development went quite well, there was a lot more sand removed from the well than back in 1995 when it was last developed.

It appears to surge in 10" casing with loose surge blocks then go in screens from top to bottom of screens at 2ft intervals.

The reason is not to pull to hard and cause it to pack and bridge before it can enter into the screens. It takes a little longer but the results seem to be better.

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A short pump test was run with existing pump at 280 gpm and 100ft layflat discharge. After 2 hours pumping the drawdown was coming backup.

After pump test was finished, Precision Service and Pumps came out to check control panel to find out why pump was shutting down when throttled down to 10lb pressure. At that time we completed pump installation and moved rig off site.

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It would appear that the well may have to be serviced approximately every 3 years or when they notice the draw down dropping more than normal.

If there are any others questions you may have please call at 604-857-0008

We thank you for the opportunity of working with you.

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**Bob Franks**

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# COLUMBIA WATER WELLS (1986) LTD.

**JOB No.**

TW # 1 – 10" Casing

**DRILLER**

Bob Franks

**SITE**

Alouet River Correctional Center

**HELPER**

Darren Mitchell

DATE 2000	START	FINISH	JOB HRS.	SAND FT & IN	DESCRIPTION OF WORK COMPLETED	CASING RECORD
Oct 24 Tue	8:50		8 ½		Move rig on site. Set rig up. Disconnect pump and electrical. Pump motor Franklin 20 hp 575 volt 215 amps.	
					Top of screen Riser Bottom of blank Total screen and blank length Possible 5' riser	103-0 127-10 24-10
					Pull 5" pump out column and sub pump. Check screens for sand. Bail out 1-0 sand.	
					Total 5" pump column	94-10
					Pump motor length Total length	6-4 101-2
					Put on surge blocks	
	2:00	3:00		2-6	Surge in 10" casing	
	3:10	4:10		1-7	C-F sand, rusty wash	
	4:20	5:20		1-6	C-F sand, rusty wash	

# COLUMBIA WATER WELLS (1986) LTD.

**JOB No.** TW # 1 – 10" Casing

**DRILLER** Bob Franks

**SITE** Alouet River Correctional Center

**HELPER** Darren Mitchell

DATE 2000	START	FINISH	JOB HRS.	SAND FT & IN	DESCRIPTION OF WORK COMPLETED	DEPTH IN SCREENS
Oct 25 Wed	7:30	8:30	10	1-1	Surge in 10" casing Measure top of screens to bottom 24 ft.	
	8:50	9:50		0-7	Surge in screens	4-2
	10:00	11:00		0-11		6-4
	11:10	12:10		1-4	C-F sand, rusty wash	8-6
	12:20	1:20		0-8		10-8
	1:30	2:30		1-2		12-10
	2:40	3:40		1-0		14-12
	3:50	4:50		1-2	More red rusty wash Surge in screens	16-14
	5:00	5:30		1-2	Left in	18-16

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**JOB No.** TW # 1 – 10" Casing

**DRILLER** Bob Franks

**SITE** Alouet River Correctional Center

**HELPER** Darren Mitchell

DATE 2000	START	FINISH	JOB HRS.	SAND FT & IN	DESCRIPTION OF WORK COMPLETED	DEPTH IN SCREENS
Oct 26 Thur	7:30	8:00	10	1-4	Rusty wash	18-16
	8:10	9:10		1-2		20-18
	9:20	10:00		3-2	More fines, rusty wash	22-20
	10:10	11:10		2-0	C-F sand, dark rusty wash	22-20
	11:20	12:20		2-3		23-21
	12:35	1:35		2-0	Put on tighter surge	7-5
	1:45	2:45		1-1	C-F sand	9-7
	2:55	3:55		1-5		11-9
	4:05	5:05		1-0		13-11
	5:15	5:30			Left in	15-13

# COLUMBIA WATER WELLS (1986) LTD.

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**DRILLER** Bob Franks

**SITE** Alouet River Correctional Center

**HELPER** Darren Mitchell

DATE 2000	START	FINISH	JOB HRS.	SAND FT & IN	DESCRIPTION OF WORK COMPLETED	DEPTH IN SCREENS
Oct 27 Fri	8:55	9:40	7	2-5	C-F sand more fines	15-13
	9:50	10:50		1-0		15-13
	11:00	12:00		1-2	C-F sand. More F-sand, rusty wash	17-15
	12:10	1:10		1-9		19-17
	1:20	2:20		1-6		21-19
	2:30	3:30		1-9		23-21
	3:30	3:55			Install 4 pails Carela. Treme into screens through 1" PVC Surge for 2 mins. Let sit over weekend.	

# COLUMBIA WATER WELLS (1986) LTD.

**JOB No.** TW # 1 – 10" Casing

**DRILLER** Bob Franks

**SITE** Alouet River Correctional Center

**HELPER** Darren Mitchell

DATE 2000	START	FINISH	JOB HRS.	SAND FT & IN	DESCRIPTION OF WORK COMPLETED	DEPTH IN SCREENS
Oct 31 Tue	7:30	8:30	9 ½	1-0		7-5
	8:40	9:40		1-5	Brown rusty wash	9-7
	9:50	10:50		0-7		11-9
	11:00	12:00		1-5	Rusty brown wash, more rusty fine silty wash.	13-11
	12:10	1:10		1-3		15-13
	1:20	2:20		0-10		17-15
	2:30	3:30		0-9		19-17
	3:40	4:40		1-0		21-19
	4:50	5:00			Left in	23-21

# COLUMBIA WATER WELLS (1986) LTD.

**JOB No.** TW # 1 – 10" Casing

**DRILLER** Bob Franks

**SITE** Alouet River Correctional Center

**HELPER** Darren Mitchell

DATE 2000	START	FINISH	JOB HRS.	SAND FT & IN	DESCRIPTION OF WORK COMPLETED	DEPTH IN SCREENS
Nov 1 Wed	7:35	8:35	7 ½			23-21
	8:45	9:45				13-11
	9:55	2:20			Install pump. Put on flow meter for pump test. 100ft layflat	
	2:20	3:00			Discharge pipe. Check GPM with pressure gauge.	
	<b>Time</b>	<b>Gal</b>	<b>Draw</b>	<b>Pressure Lbs.</b>		
	3:35	250	21.33	61		
	3:40	250	21.55	5		
	3:45	250	21.55	5		
	3:46	280	21.83	3		
	3:49	200	20.67	8	Pump shut down 10 lbs pressure Run pump test tomorrow	



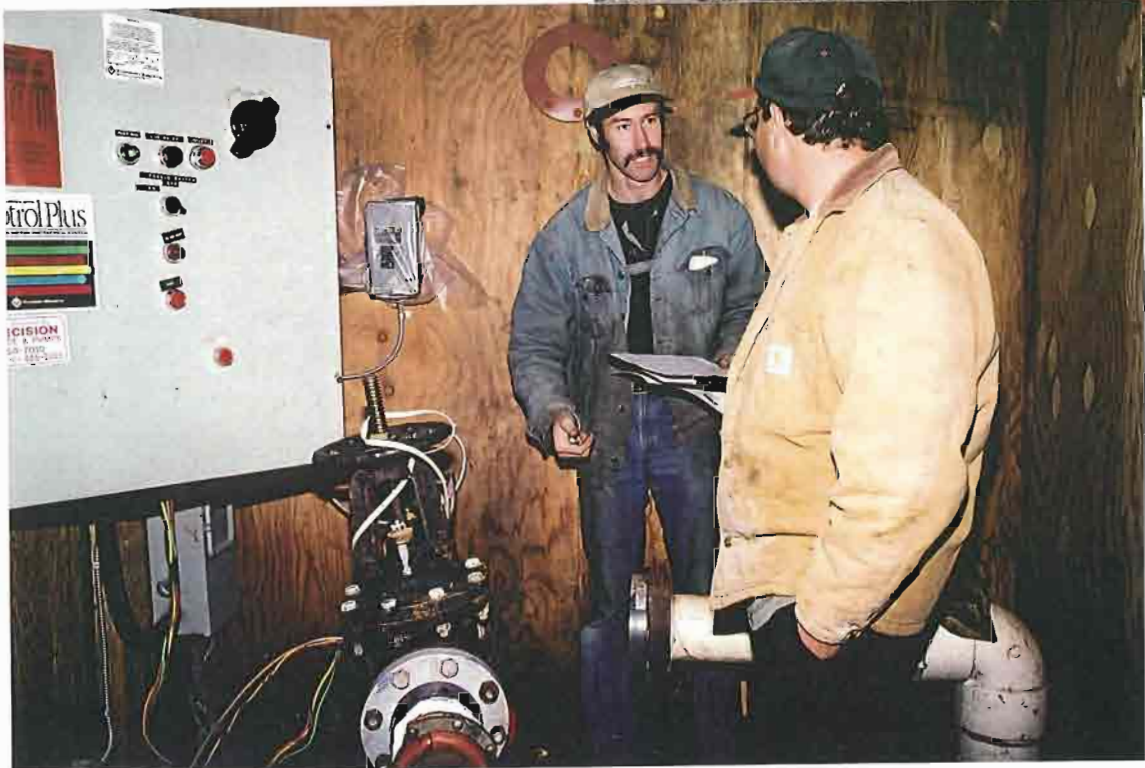


## ALLCO HATCHERY WATER SUPPLY UPGRADE AND WELL RE-SERVICING PROJECT

Photo 1: Columbia's Well service rig at work. Access was through the roof of the Pump House. An electrical service pole was installed to relocate the cable entry thus allowing full access.



Photo 2: Inside pump house.





**ALLCO HATCHERY WATER SUPPLY UPGRADE  
AND WELL RE-SERVICING PROJECT**



**Photos 3 and 4:**

Allco springs capture boxes. Discharge valve and vacuum breaker are also illustrated in the picture





**ALLCO HATCHERY WATER SUPPLY UPGRADE  
AND WELL RE-SERVICING PROJECT**



**Photo 5:**  
Old collection system  
for upper hatchery.

**Photo 6:**  
Connection to manifold  
trunk line.





**ALLCO HATCHERY WATER SUPPLY UPGRADE  
AND WELL RE-SERVICING PROJECT**

Photo 7: Head tank at upper hatchery illustrating 4" pipe line leading to lower hatchery cross- connect.

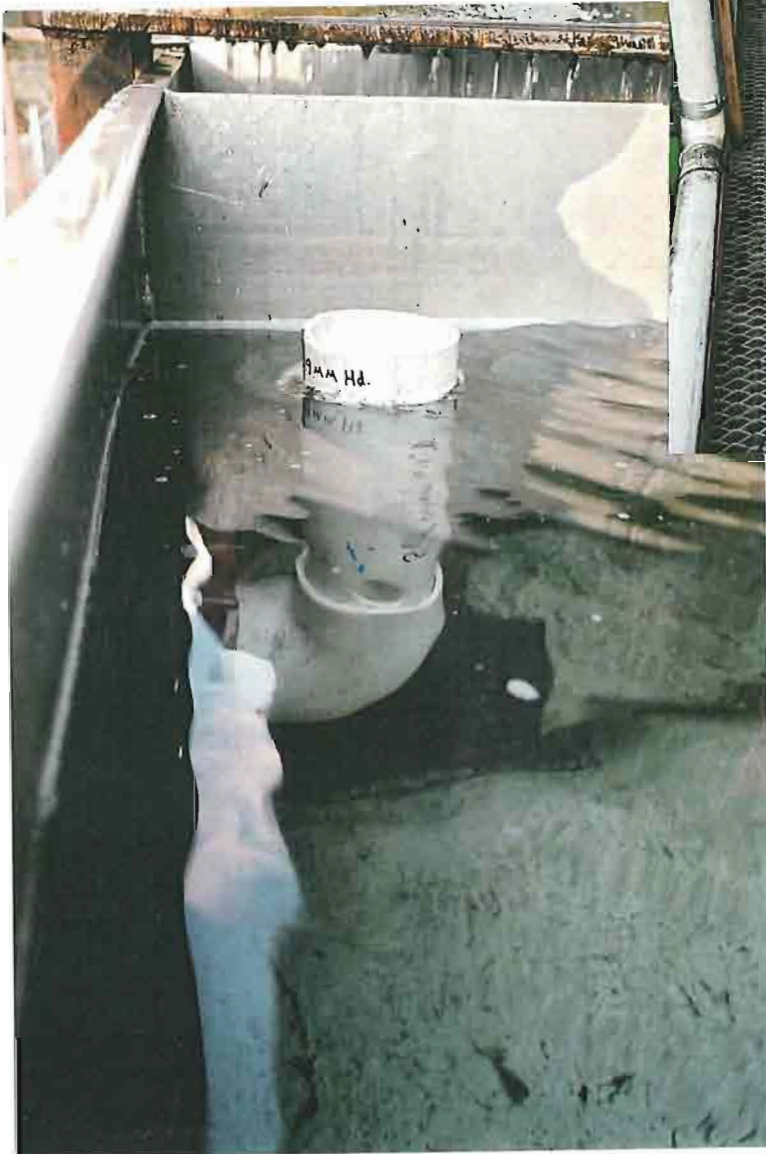


Photo 8: Showing flow rate orifice control to regulate outflow to lower hatchery. Graph attached to the report on orifice performance.



## ALLCO HATCHERY WATER SUPPLY UPGRADE AND WELL RE-SERVICING PROJECT

Photo 9: Allco springs discharge pipe in aeration tank above upper hatchery.



Photo 10: Flat hose being laid for well pump performance test.





**ALLCO HATCHERY WATER SUPPLY UPGRADE  
AND WELL RE-SERVICING PROJECT**

Photo 11 and 12:

Interior of concrete cistern at lower hatchery illustrating  
repaired cracks





**ALLCO HATCHERY WATER SUPPLY UPGRADE  
AND WELL RE-SERVICING PROJECT**



Photo 13: Allco's new hatchery office illustrating another FOC, Allco Hatchery, ARMS partnership.

Photo 14: Where it starts and what its all about.  
Netting salmon from the trap for an egg take.





**ALLCO HATCHERY WATER SUPPLY UPGRADE  
AND WELL RE-SERVICING PROJECT  
PROJECT COSTS**

<b>Project Expenses from 1998 to 2001</b>	<b>PSF 1998 -99</b>	<b>PSF 2000 Funds</b>	<b>Bridge Coastal</b>
Western Canadian Screens	1060.62		
Dick's Lumber	2655.15		
Pacific Poly-pipe	2171.64		
Pacific Fasteners	463.80		
CPI Equipment	3118.10		
CPI Equipment	492.48		
International Plastics	430.92		
International Plastics	807.29		
International Plastics		554.35	
International Plastics			1361.64
International Plastics			245.12
Haney Builders		139.26	
CPI Equipment		838.00	
Haney Builders		60.86	
Steelhead Marine		1248.12	
Pacific Poly-pipe		320.93	
United Rentals		69.24	
Pacific Fasteners		190.78	
Canadyne Technologies		2793.00	
Invoice for Labour			1920.00
Columbia Water Wells (1986) Ltd.			9,880.92
John Sherman Agencies Ltd			50.28
Caamano Lumber Sales			42.80
Kanaka Creek Pole			222.30
Axis Electric 2000			481.50
Unicorn Products			267.50
International Plastics Ltd.			1,361.64
International Plastics Ltd			245.12
Lorco Auto Parts			35.05
International Plastics			651.45
International Plastics			87.40
Haney Builders			62.48
Haney Builders			367.74
Haney Builders			204.63
Precision Service and Pumps			4,885.23
Bontech			856.00
<b>TOTALS</b>	<b>\$11,200.00</b>	<b>\$6214.54</b>	<b>\$23,228.80</b>