



# Agua Consulting Inc.

“Engineered Water Solutions”

Agua file: 030-04

January 16, 2008

Regional District of Central Okanagan  
1450 KLO Road  
Kelowna BC  
V1W 3Z4

Attention: Mr. Rob Mueller  
Engineering Project Coordinator

**RE: North West Side Water Servicing Report  
Integration with La Casa Water System – Preliminary Report**

Dear Rob:

## **1.0 INTRODUCTION**

This report summarizes the conceptual plan and costs for expansion of the existing La Casa Water System to enable servicing of the subdivisions of Upper Fintry, Valley of the Sun, and nearby future development lands with water. The objective of the work was to review the existing La Casa water system infrastructure capacity and identify required upgrades to supply water to the existing Northwest Side Subdivisions.

This report is presented in the following sections:

- 1.0 Introduction
- 2.0 Existing La Casa Water System
- 3.0 Northwest Side Water Demand
- 4.0 Integrated Water System
- 5.0 Cost Estimate
- 6.0 Summary of Report  
Detailed Cost Estimates

The Agua Consulting Inc. NW Side – Water Servicing Report, dated August 27<sup>th</sup> 2007, establishes the design water demands for the northwest side subdivisions and adjacent development lands. Two potential development areas have also been included in this report. The area to be serviced includes the following existing development areas which are illustrated on Figure 1.1 on the next page.

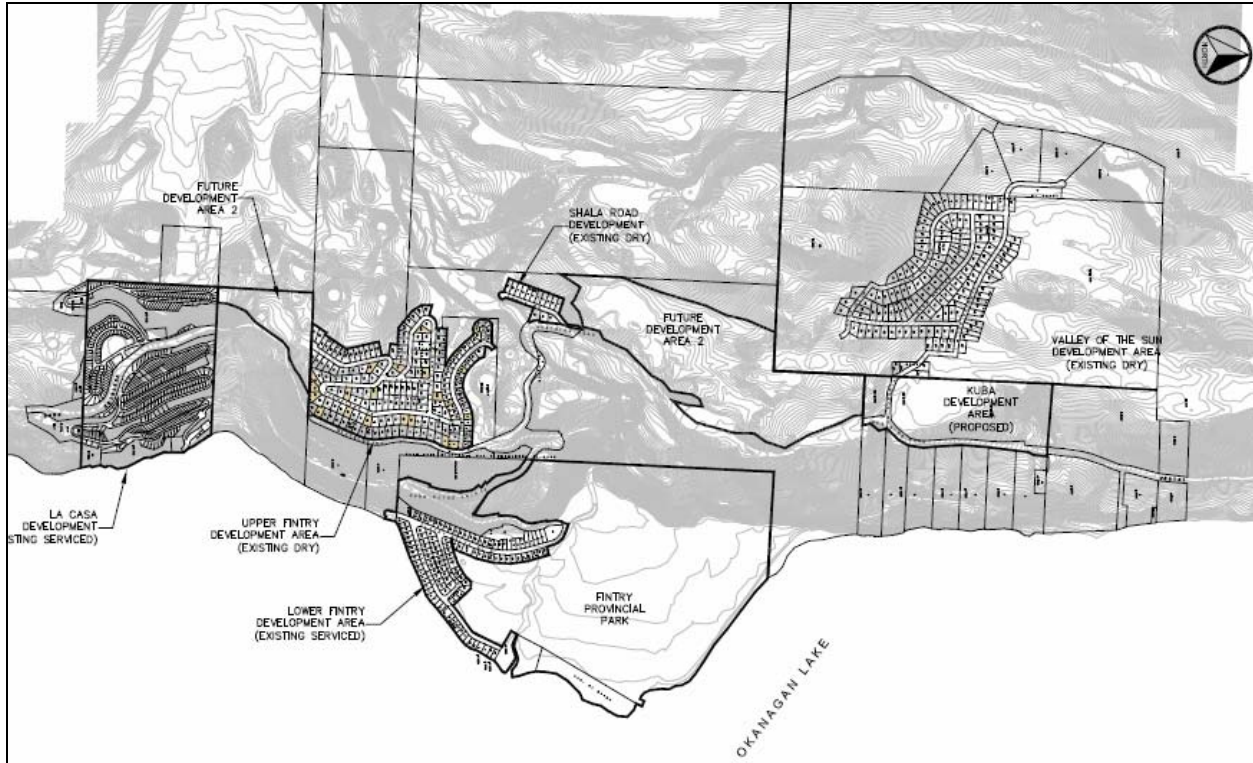
- Upper Fintry
- Shala Road
- Valley of the Sun
- New Development (Kubas Property)
- Future Development Area 1 (land south of Upper Fintry)
- Future Development Area 2 (land north of Upper Fintry)

**Agua Consulting Inc.** “Engineered Water Solutions”

- o 3349 East Kelowna Road, Kelowna, BC, V1W 4H3
- o Phone: 250.860.1222 Facsimile: 250.860.1254 Cellular: 250.212.3266

Once water infrastructure is in the vicinity of “dry” lands, the pressure of development of those lands will inevitably increase. Figure 1.1 shows the Northwest Side lands being considered for water service.

**Figure 1.1 - Northwest Side Development Areas**



## 2.0 EXISTING LA CASA WATER SYSTEM

The water supply system for La Casa development was designed by Stantec (formerly Stanley and Associates). Information presented in this section has been obtained from the project Record Drawings and from a Design Concept letter dated October 1, 1996 that was submitted by Stanley and Associates to Ministry of Environment as part of the Certificate of Public Convenience and Necessity (CPCN).

### Infrastructure Components

The water source for the existing system is Okanagan Lake. There is a 72m long, 26m deep, 350mm diameter HDPE DR 17 intake pipe complete with screens, that conveys water to a pump station located at the lakeshore. Although the depth of the intake is 26 metres, which is sufficient to access the colder higher quality water from Okanagan Lake, the depth may not be sufficient to avoid the wind blown seiches (currents) that drive the warmer water down to depth. This occurrence is infrequent and would affect the stability of the chlorination system. Chlorine residual levels decay faster in warmer water.

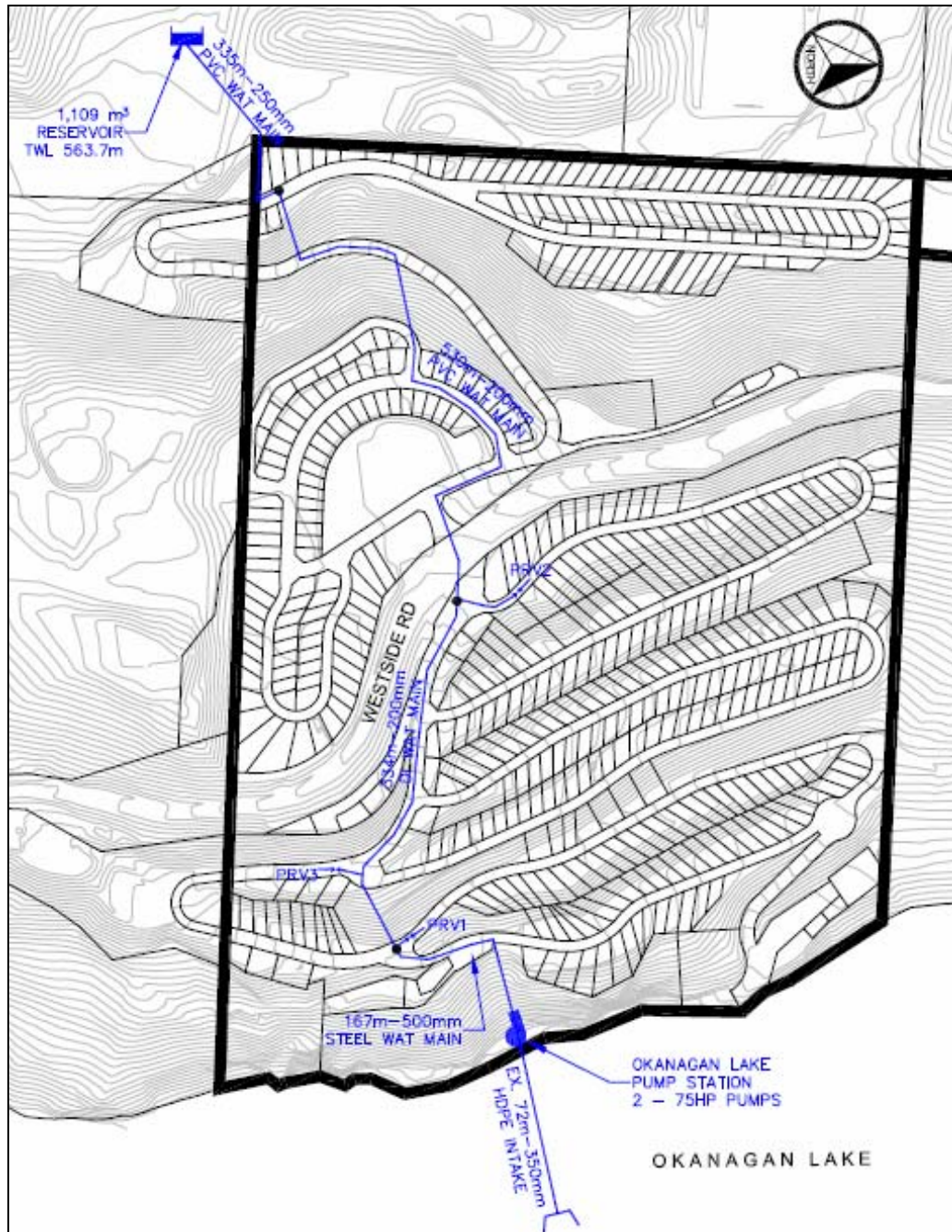
The pump station houses two 75 hp vertical turbine pumps. Each pump is designed to deliver 18.9 L/s @ 229m TDH (300 Usgpm @ 751' TDH). The pumps are installed above a 2.40m diameter wet well.

The lake pump station feeds water to a 1,109 m<sup>3</sup> concrete reservoir with top water level (TWL) of 563.7 metres. This reservoir provides balancing, emergency and fire storage for the development. The reservoir was sized based on the following storage components.

Balancing storage (25% MDD)	670 m <sup>3</sup>	(147,600 Imperial gallons)
Fire Storage	218 m <sup>3</sup>	(48,000 Imperial gallons)
Emergency Storage	222 m <sup>3</sup>	(48,700 Imperial gallons)
<b>TOTAL STORAGE</b>	<b>1,109 m<sup>3</sup></b>	<b>(244,300 Imperial gallons)</b>

Figure 2.1 illustrates the key infrastructure components of the La Casa water system.

**Figure 2.1 - La Casa Water System - Schematic**



There is a water main that feeds the system reservoir and the distribution system. The water main from the pump station to the reservoir is comprised of the following sections:

- 167m of 500mm Steel pipe (To provide Cl<sub>2</sub> contact time from the wet well on)
- 334m of 200mm DI pipe (Class 200)
- 529m of 200mm PVC (Class 150)
- 335m of 250mm PVC (Class 150)

Water is fed off of the above described watermain feed through three PRV stations to supply the existing pressure zones of the water supply system.

### Water Demand Criteria

La Casa development is comprised of approximately 500 recreational vehicle lots. The water demands utilized for the design by Stantec are as follows

**Table 2.1 - Summary of Criteria**

Criteria	La Casa Criteria (Stantec)
Average Day Demand (ADD)	1,250 L/day/connection
Maximum Day Demand (MDD)	5,000 L/day/lot
Fire flow (FF)	30.3 L/s (rural) for 2.0 hrs or 60 L/s for 1.0 hr
ADD	(500 Lots) = 3.9 L/s
MDD	(500 Lots) = 29.0 L/s
Irrigation Allowance	3.9 L/s
TOTAL La Casa Demand	32.9 L/s
50% Occupation assumed	16.5 L/s

The pump capacity is set out with the assumption that not all of the RV lots would be occupied at any one time. Each of the two lake pumps has 18.9 L/s capacity or about 58% of the total demand.

For carrying capacity forwards, the La Casa area would have reserved rights for 18.9 L/s of capacity. They would be allowed to access spare capacity from the redundant pump if actual demands were greater than 18.9 L/s.

### 3.0 NORTHWEST SIDE WATER DEMAND

Agua Consulting Inc. report dated August 27<sup>th</sup>, 2007 assessed the water demand for the northwest side developments. Table 3.1 summarizes the expected demands for those service areas.

**Table 3.1 - North west side water demands - Summary**

Development	Existing	Build Out 1	Build Out 2	Ultimate
Upper Fintry – Shala Rd.	25	206	206	206
Valley of the Sun	30	153	153	153
Kubas Development	0	50	133*	133*
	55	409	492	492
Future Development Area No. 1	0	0	0	50
Future Development Area No. 2	0	0	0	285
Total SFE Development Units	55	409	492	827
Water Demand in L/s	4.6	34.1	41.0	68.9
La Casa Demand (L/s)	18.9	18.9	18.9	32.9
<b>TOTAL WATER DEMAND</b>	<b>23.5</b>	<b>53.0</b>	<b>59.9</b>	<b>101.8</b>

\* 133 Single Family Equivalent (SFE) units at Kubas = 200 MF units  
 MDD = 2,400 L/ca/day x 3.0 persons per SFE unit

Three scenarios are listed in Table 3.1 as there may be the potential to stage some of the works. The minimum level of water system development would be to allow all parties that are currently occupying parcels of land and are active to be serviced. Expansion beyond that stage would require additional infrastructure works

## 4.0 INTEGRATED WATER SYSTEM

### Introduction

Existing infrastructure at La Casa water system could be used to supply water to the developments located to the north. Duplication of facilities such as the water intake, lake pump station, and treatment facilities can be reduced and would result in lower overall long term operations and maintenance costs.

The objective of this section is to set out a plan for a regional water supply system for the entire northwest side area. The system must meet the approval agencies regulations for water quality and hydraulic performance. Upgrades to the existing La Casa water system will be required in order to achieve this objective. The recommended improvements are presented in this section.

### Design Criteria

Table 4.1 summarizes the design criteria adopted for the integrated water system plan.

**Table 4.1 - Design Criteria Summary**

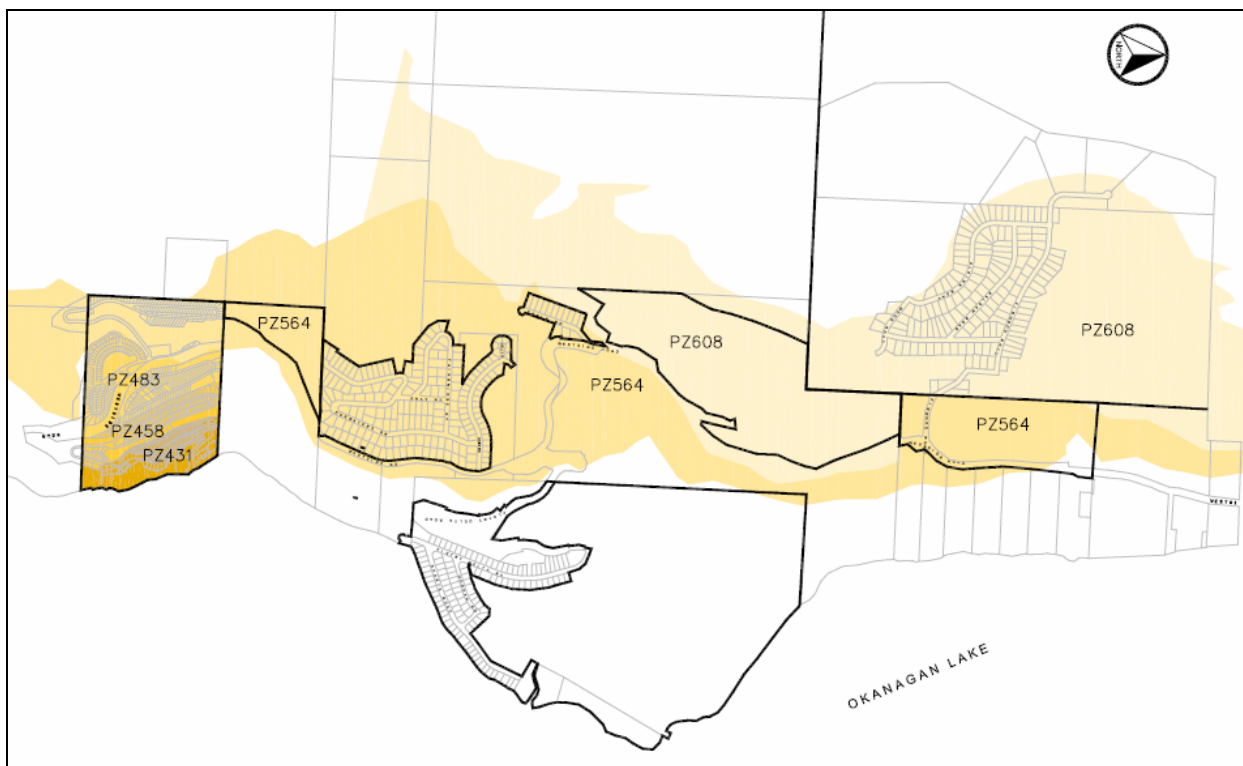
Parameter	La Casa Criteria	NW Area Criteria
<b>Population Density</b>	-	3 people/SFE
<b>Water Demand</b>		
ADD	1,250 L/day/lot	2,700 L/day/SFE
MDD	5,683 L/day/lot	7,200 L/day/SFE
Peak Hour Demand (PHD)	-	12,000 L/day/SFE
FF	30.3 L/s	FUS Requirement Min. 75 L/s for 1.67hr for SF Min. 150 L/s for 2.0 hr for MF
<b>Reservoir Storage</b>		
Balancing Storage, A	25% MDD	25% MDD
Fire Storage, B	FF for 2.0 hr	FUS Requirement
Emergency Storage, C	19.6% (A+B)	25% (A+B)
<b>Minimum Pressures</b>		
Maximum Static	800 kPa	1000 kPa
Minimum Static	275 kPa	275 kPa
Minimum Residual under FF	140 kPa	140 kPa
Minimum Residual under PHD	250 kPa	250 kPa
<b>Pump Station</b>	Duplex System. Each pump capable of supplying ADD	Pump station capable of supplying MDD with larger pump out of service

The integrated system will be designed based on the Northwest Area criteria listed in Table 4.1 while maintaining the current level of service for La Casa water system. La Casa water system will experience significant upgrades as a result of the integration process, mainly in regards to enhanced disinfection, redundancy in pumping capacity and a higher level of fire protection capacity.

**Pressure Zones**

Setting out pressure zones is the first step in developing a regional integrated water system. Table 4.2 summarizes the proposed pressure zones (PZ) which are identified by their Hydraulic Grade Lines (HGL) in metres of head. The service elevation range for each PZ is also listed in Table 4.2. There is an existing reservoir site and existing pressure zones at LaCasa. For Upper Fintry and Valley of the Sun, a reservoir is proposed at the 608 metre elevation. The pressure zones are developed with the reservoir sites fixed. Figure 4.1 illustrates the areas serviced by each pressure zone.

**Figure 4.1 - Pressure Zones**



A detailed assessment of existing infrastructure at La Casa water supply system has been completed. Each key system component is discussed in the following paragraphs.

**Table 4.2 - Pressure Zone Summary**

PZ	Service Elevations		Comments
	From	To	
608	506	578	Proposed new PZ
564	462	534	Existing PZ from La Casa Reservoir
483	381	455	Existing PZ from La Casa PRV 2
458	356	430	Existing PZ from La Casa PRV 3
431	329	403	Existing PZ from La Casa PRV 1

### Okanagan Lake Intake

The existing intake is a 72m-350mm DR17 HDPE pipe that extends out to a depth of 26 metres. The outside diameter of the pipe is 350mm while the actual internal diameter for a DR17 HDPE pipe is only 311mm.

The Okanagan Lake intake capacity was checked under four scenarios as described in Table 4.3. Although flow velocities in the intake will increase, they will be relatively low (lower than 1.5 m/s) and the increase in head loss is estimated to be 0.36 m for Build Out No. 3 which includes all of LaCasa and all of the development lands. The head loss increase will influence the pump selection and the designer will have to be aware of net positive suction head available (NPSHa) reduction due to high velocities.

Higher flow velocities will also generate higher momentum for the water conveyed through the intake. Consideration must be given to a sudden pump stoppage due to power failure and overflow of the wet well due to the higher velocity. Increased flow momentum towards the wet well could create flooding within the wet well. This issue must be reviewed during design modifications to the pump station.

**Table 4.3 - Existing Okanagan Lake Intake - Estimated Head Loss**

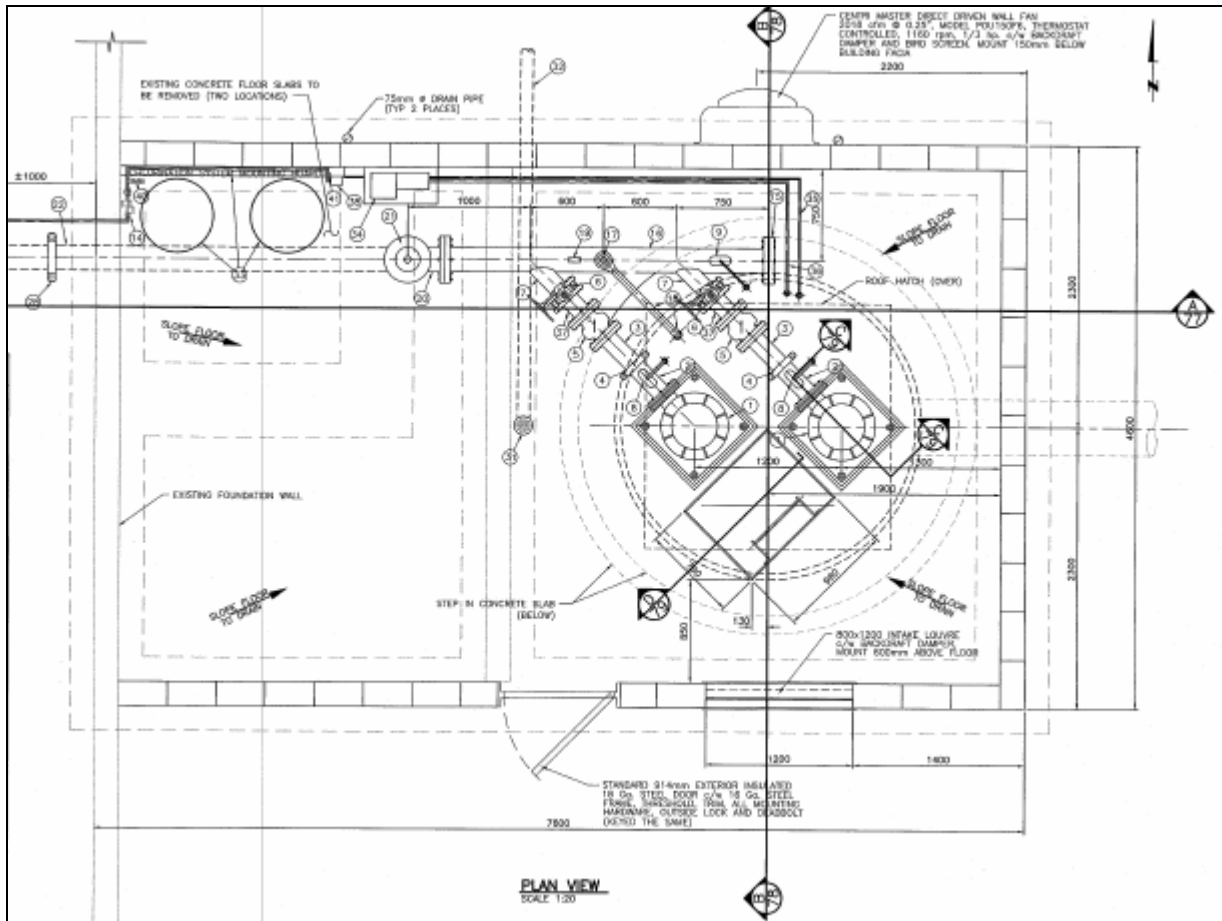
SCENARIO	Flow	Velocity	Head Loss		Comments
			m/m	m	
Current	32.9	0.43	0.00064	0.05	La Casa @ 18.9 + Ex. Homes
Build Out 1	53.0	0.70	0.00155	0.12	La Casa @ 18.9 L/s + Ex. Lots
Build Out 2	59.9	0.79	0.00195	0.15	La Casa @ 18.9 L/s + Ex. Lots + Kubas
Ultimate	101.8	1.34	0.00498	0.36	La Casa @ 32.9 L/s + Ex. Lots + all development

### Okanagan Lake Pump Station

The existing Okanagan Lake Pump Station has two 75 hp vertical turbine pumps. The design point for each pump is 18.9 L/s @ 229m total dynamic head (TDH). Pressures at the lake station operate at 325 psi. Currently both pumps in the station have to be running to supply the full build-out MDD for the La Casa Development. There is currently no room available for additional pumps within the existing building as the wet well restricts pump station expansion at this location. We believe that the most economical way to increase pump station capacity is to upgrade the existing pumps.

The RDCO design criteria for pump stations require, in general, that the MDD can be supplied with the largest pump out of service. The fact that La Casa development is not a mobile home park and use/occupation is intermittent explains why the current pump capacity is lower than the RDCO criteria for MDD. Developments north of La Casa will be permanently occupied making necessary for each upgraded pump to deliver the expected MDD. Table 4.4 summarizes the required upgrades at the pump station. It should be noted that additional work is required to assess the possibility of replacing the pumps. Once a pump is selected all dimensions inside the station will have to be confirmed to ensure a suitable pump replacement.

Figure 4.2 - Existing La Casa Pump Station Wet Well



Source of Figure 4.2: Stantec Plan of Record, Ridgeview RV Resort and Marina Dwg No. 76

Table 4.4 - Pump upgrades - Summary

Expected Flow (L/s)			Required Pumps	Comments
To La Casa	To North Devel.	Total Flow		
18.9	34.1	53.0	2-200 hp Vert. Turbine	Current pump rate at La Casa + Build Out 1 MDD at North Developments
18.9	41.0	59.9	2-250 hp Vert. Turbine	Current pump rate at La Casa + Build Out 2 MDD at North Developments
18.9	68.9	87.8	2-350 hp Vert. Turbine	Current pump rate at La Casa + Build Out 3 MDD at North Developments
32.9	34.1	67.0	2-250 hp Vert. Turbine	Current MDD at La Casa + Build Out 1 MDD at North Developments
32.9	41.0	73.9	2-300 hp Vert. Turbine	Current MDD at La Casa + Build Out 2 MDD at North Developments
32.9	68.9	101.8	2-400 hp Vert. Turbine	Current MDD at La Casa + Build Out 3 MDD at North Developments

RDCO may eventually consider the installation of additional wet well capacity to increase the number of pumps installed and reduced the size of each required pump. The required pumps for the ultimate Build Out scenario is very large and may not fit within the existing building. Expansion of the pump station allows better staging and flow supply ability so that the electrical surcharges can be minimized.

A flow of 59.9 L/s will require the installation of two 250 hp pumps, each capable of providing the Max. day demand for Build-Out No. 2 which is 492 SFE units.

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## Disinfection and Water Treatment

Currently La Casa water system disinfection process consists of chlorine injection inside the lake intake pipe through a diffuser. Contact time is achieved by low flow velocities along approximately 167m of 500mm steel pipe immediately after the pump station. With additional flow, the contact time will be reduced and will not longer meet the IHA criteria for 3 log *Giardia* inactivation. The system currently does not meet the IHA requirement for two types of treatment or the disinfection of *Cryptosporidium*.

Any reduction in safety of supply would have to be addressed or offset through improvements by some other means. To address this, it is proposed that a dedicated 300mm diameter main be installed from the end of the 500mm transmission main to the existing reservoir at elevation 563 metres. Chlorine disinfected water from the pump station will be pumped to the reservoir allowing sufficient contact time. Water will be then UV disinfected at a location within the existing PZ 564. A new UV facility would be proposed with room for future water treatment expansion. This approach is flexible in that it allows for a range of treatment scenarios in the future if it is determined that the existing system has risks that are unmanageable.

The IHA is also working through a filtration deferral process which may apply to the LaCasa Utility. For utilities without filtration, filtration may be deferred by developing a watershed control program which would include waste reduction management techniques to protect the source water. If the utility is to be expanded, then upgrades in the level of water disinfection will require upgrading.

## Existing La Casa Distribution System

La Casa water system was designed to supply water to a 500 recreational vehicle lot development with MDD in the range of 18.9 L/s. The water main from the Okanagan Lake Pump Station to the La Casa reservoir is used to feed the reservoir and also as part of the distribution system. The first 167m of the main are 500mm steel, designed to reduce flow velocity and increase the contact time for the chlorine before water reaches the first user in the system. The main reduces its diameter to 200mm close to PRV 1 and remains at 200mm diameter except for the last 333m where the size is increased to 250mm for fire protection. Once the integration with the north developments is completed the above described main, with the exception of the 500mm diameter section, will become part of the La Casa distribution system. It does not require upgrades.

## Interconnection Water Main

Water to the north developments will be supplied by a 1,100m long water main along Westside Road. The proposed water main will supply flows equal or lower than the MDD for the north developments. The minimum diameter required based on a maximum flow velocity of 2.0 m/s is 250mm however a minimum 300mm diameter main is recommended to accommodate higher flows that could result from additional developments in the area. The interconnection water main will be installed from the proposed UV Facility, within the existing 564m pressure zone (La Casa Reservoir TWL of 563.7m), and will feed to a booster station that will pump the water to the proposed 608m reservoir.

It should be noted that the Upper Fintry, Shala Road, Kubas Development and Future Development Area 2 will all be within the existing PZ 564.

### Integrated System Reservoirs

The integrated system will have two reservoirs; existing 564m La Casa Reservoir and 608m Valley of the Sun Reservoir. The existing La Casa Reservoir meets the current storage requirements for La Casa development as per design criteria shown on Table 4.1.

It is proposed that all new fire protection and emergency storage will be built in the 608m Reservoir and will be available to PZ 564 through an orifice plate complete with solenoid valve. This frees up the existing 564 reservoir to service additional development to PZ 564 and the lower pressure zones. The solenoid will be kept closed isolating PZs 564 and 608 but will open if fire demands in the PZ564 lowers the reservoir below a minimum reservoir water level set point. When the solenoid valve is open, water from the 608m Reservoir would be available at PZ 564. The required volumes are summarized in Table 4.5.

**Table 4.5 - New Storage Requirement**

Development Condition	MDD (L/s)	Balancing	Fire Storage	Emergency	TOTAL	Shortfall
Existing Residences	23.5	508	451	240	1198	89
Build Out No. 1	53.0	1145	451	399	1995	886
Build Out No. 2	59.9	1294	451	436	2181	1072
Ultimate	101.8	2199	1080	820	4099	2990
Existing Storage		669	218	222	1109	

Fire flows are provided in Table 4.5 to a level of 75 L/s for a duration of 1.67 hours. If new development demands a higher fire flow, the specific development would be responsible for construction of the additional fire storage.

PZ 608 reservoir will provide balancing storage for developments within PZ608 and emergency and fire storage for PZs 564 and 608. Required 608 Reservoir size for each scenario is as indicated on Table 4.5

### North Developments Key Infrastructure

The key infrastructure components at north end of the system will differ from what was proposed in the Agua Consulting report dated August 27<sup>th</sup>, 2007. A new Okanagan Lake Intake and Pump Station is no longer required. The 514m reservoir and pump station will be replaced by a single booster station pumping from the 564 existing pressure zone to the 608m proposed reservoir. A bypass for fire flows from PZ 608 to PZ 564 will be included at this pump station. The 608m Reservoir will be at the location proposed in the Agua report. The interconnection to the existing Lower Fintry water system is still feasible and may benefit that system. Figure 4.2 illustrates the key components of the proposed integrated system.

## 5.0 COST ESTIMATE

Table 5.1 summarizes the cost estimate for the integrated water system. A 10% interim financing fee is included in the cost estimates.

TOTAL CONSTRUCTION COSTS	NW SIDE - LA CASA INTEGRATED SYSTEM	
Distribution System - Upper Fintry	\$	810,025
Distribution System - Valley of the Sun	\$	675,275
Distribution System - Kubas	\$	225,250
Transmission Mains	\$	1,075,800
Lake Pump Station	\$	425,000
564 / 608 Pump Station	\$	447,500
608m Reservoir	\$	537,500
Enhanced Disinfection UV & Chlorination	\$	733,750
<b>Subtotal , Construction Cost Estimate</b>	<b>\$</b>	<b>4,930,100</b>
Engineering 10%	\$	493,010
Contingency 15%	\$	739,515
<b>TOTAL CAPITAL COST</b>	<b>\$</b>	<b>6,162,625</b>
RDCO Interim Project Financing Fee	10% \$	<b>616,263</b>
RDCO Administrative Fee	3% \$	184,879
<b>TOTAL</b>	<b>\$</b>	<b>6,963,766</b>
No. of Connections	\$	492
<b>Cost per Connection</b>	<b>\$</b>	<b>14,154</b>

## 6.0 SUMMARY OF REPORT

This section summarizes our report.

- Using the existing infrastructure of La Casa water system, it is possible to service the Northwest area if upgrades to key components are completed. Infrastructure facility duplication will be reduced and maintenance and operational costs will also be reduced.
- Existing level of service to the La Casa area cannot be compromised or reduced in terms of disinfection capacity. For this reason, additional disinfection is recommended to bring the water system up to standards set by the IHA. This includes the installation of UV disinfection.
- The impact of additional development to the north has been assessed. The pumps at Okanagan Lake Pump Station must be upgraded to assure proper level of service and redundancy for developments north of La Casa. The existing pump station building may not be sufficient to supply long term demands. To meet ultimate demands, pump station wet well expansion is necessary complete with an additional building. Building expansion will allow for staging of pumps so that appropriate sizes can be utilized for varying water demands. Smaller pumps will be more efficient in reducing peak load electrical charges.
- In addition to pump station upgrades, a dedicated main from the end of the existing 500mm steel transmission main to La Casa Reservoir is recommended. The dedicated main will help with attaining desired contact time for chlorine disinfection.

- 
- A new UV disinfection facility is being proposed. Land costs are included in the estimates for this facility. UV will be the second method of treatment required by IHA.
  - Interconnection to the north developments through a 1,100m –300mm minimum diameter is required. The interconnection main will be installed along Westside Road. The interconnection water main will feed a new booster station that will pump from PZ564 to proposed PZ608.
  - Most of the developments north of La Casa will be fed from the existing PZ564. Only Valley of the Sun and Future Development Area 1 would be within PZ608.
  - The first phase of development recommended would be to install capacity to provide 60 L/s flow from the pump station and at least 75 L/s fireflow for 1.67 hrs. A reservoir at the 609 m elevation should be at least 1,100m<sup>3</sup> in size within two cells.
  - Based on initial cost estimates, the total cost per single family lot will be in the range \$14,000.

Based on this investigation, we believe that the option of connecting to La Casa Development water system may be viable and requires additional information and investigation.

**Next Steps (should the La Casa water supply option be pursued)**

The option of connection to the La Casa system appears viable although more investigation is required. The next logical steps for further consideration include the following:

- Review the existing pump station to determine space restrictions within the existing station;
- Electrical service capacity to the pump station should be reviewed to ensure sufficient service sizing for larger horsepower requirements;
- watermain routes from the 500mm main to the reservoir should be reviewed to ensure constructability and consider any restrictions;
- Watermain route between La Casa and Upper Fintry should be reviewed to determine to potential for encountering rock.
- A UV disinfection building site must be located and a closer estimate of the land value must be assigned in the estimate;
- Meet with IHA to review options and what will be acceptable to them in terms of existing system upgrades;
- Actual flow records and occupancy for La Casa should be reviewed to obtain a more accurate Maximum Day water demand per occupied RV site.

Please review the report and contact us once you have had time to review the information.

Yours truly,

**Agua Consulting Inc.**



Bob Hrasko, P.Eng.

Principal

RJH/af

**NORTH WEST SIDE WATER SUPPLY**

**Capital Cost Estimate - Water Supply Components - RDCO Criteria**

**OPTION 5 La Casa**

<b>TOTAL CONSTRUCTION COSTS</b>	<b>No.</b>	<b>Unit</b>	<b>Unit Price</b>	<b>Total Cost</b>
<b><i>Domestic Distribution Systems</i></b>				
<b>Upper Fintry</b>				
150 mm WM - FF & Domestic, Kelly Pl	60 m		\$ 110.00	\$ 6,600
200 mm WM - FF & Domestic, Muir Rd	505 m		\$ 125.00	\$ 63,125
150 mm WM - FF & Domestic, Gray Rd	215 m		\$ 110.00	\$ 23,650
300 mm WM - FF & Domestic, Westside Rd	685 m		\$ 180.00	\$ 123,300
200 mm WM - FF & Domestic, Dunwaters (Muir to Gray)	920 m		\$ 125.00	\$ 115,000
150 mm WM - FF & Domestic, Dunwaters (Gray to end of road)	455 m		\$ 110.00	\$ 50,050
150 mm WM - FF & Domestic, Fairbridge	740 m		\$ 110.00	\$ 81,400
150 mm WM - FF & Domestic, Shala	250 m		\$ 110.00	\$ 27,500
19 mm dia Domestic Service	206 each		\$ 1,100.00	\$ 226,600
Blow-offs	3 each		\$ 1,600.00	\$ 4,800
Hydrants	22 each		\$ 4,000.00	\$ 88,000
<b>Section Sub Total</b>				<b>\$ 810,025</b>
<b>Valley of the Sun</b>				
250 mm WM - FF & Domestic, Lower Firwood to Wood Rd	615 m		\$ 140.00	\$ 86,100
150 mm WM - FF & Domestic, Upper Firwood Rd	860 m		\$ 125.00	\$ 107,500
200 mm WM - FF & Domestic, Wood Road	645 m		\$ 125.00	\$ 80,625
200 mm WM - FF & Domestic, Alpine Road	765 m		\$ 110.00	\$ 84,150
150 mm WM - FF & Domestic, Balsam Road	580 m		\$ 110.00	\$ 63,800
19 mm dia Domestic Service	153 each		\$ 1,100.00	\$ 168,300
Blow-offs	3 each		\$ 1,600.00	\$ 4,800
Hydrants	20 each		\$ 4,000.00	\$ 80,000
<b>Section Sub Total</b>				<b>\$ 675,275</b>
<b>Kubas Property</b>				
150 mm WM - FF & Domestic, "Ring Road"	1315 m		\$ 110.00	\$ 144,650
19 mm dia Domestic Service	50 each		\$ 1,100.00	\$ 55,000
Blow-offs	1 each		\$ 1,600.00	\$ 1,600
Hydrants	6 each		\$ 4,000.00	\$ 24,000
<b>Section Sub Total</b>				<b>\$ 225,250</b>
<b>Transmission Main</b>				
300 mm WM - La Casa System to south of Upper Fintry Development	1100 m		\$ 200.00	\$ 220,000
300 mm WM - Dedicated main from Pump Stn to La Casa Reservoir	1134 m		\$ 300.00	\$ 340,200
250 mm WM - PZ564 to 608m Reservoir	1415 m		\$ 140.00	\$ 198,100
250 mm WM - New Main Reservoir at 608m to Upper Fintry	2250 m		\$ 140.00	\$ 315,000
Connection to Firehall	1 LS		\$ 2,500.00	\$ 2,500
Transmission main from GW wells to Westside Road				\$ -
<b>Section Sub Total</b>				<b>\$ 1,075,800</b>
<b>Lake Pump Station</b>				
Site works and Access	1 LS		\$ -	\$ -
Wet well	1 LS		\$ -	\$ -
Building Structure Modifications	1 LS		\$ 25,000.00	\$ 25,000
Building Electrical Upgrades	1 LS		\$ 100,000.00	\$ 100,000
Pumps, Supply and Install	1 LS		\$ 200,000.00	\$ 200,000
New pipe and valve equipment	1 LS		\$ 100,000.00	\$ 100,000
<b>Section Sub Total</b>				<b>\$ 425,000</b>

TOTAL CONSTRUCTION COSTS	No.	Unit	Unit Price	Total Cost
<b>PZ564 to PZ608m Pump Station</b>				
Site works	1	LS	\$ 75,000.00	\$ 75,000
Building Structure	1	LS	\$ 75,000.00	\$ 75,000
Building Electrical	1	LS	\$ 75,000.00	\$ 75,000
Pumps	2	each	\$ 31,250.00	\$ 62,500
Process Piping	1	LS	\$ 75,000.00	\$ 75,000
Offsite Power and transformers	1	LS	\$ 35,000.00	\$ 35,000
land value allowance	1	LS	\$ 50,000.00	\$ 50,000
<b>Section Sub Total - 564 / 608 Pump Station</b>				<b>\$ 447,500</b>
<b>608m Reservoir</b>				
Reservoir Domestic Balancing and Fire flow	1100	m3 **	\$ 400.00	\$ 440,000
Electrical Service to Reservoir Site	1	LS	\$ 10,000.00	\$ 10,000
Control valve chamber	1	LS	\$ 25,000.00	\$ 25,000
250mm Drain Pipe - Reservoir to overland ditch rip rap lined	60	m	\$ 125.00	\$ 7,500
50 mm Instrumentation Conduit (common trenching with WM)	900	m	\$ 25.00	\$ 22,500
Reservoir chain link fencing around compound and on reservoir roof	150	m	\$ 50.00	\$ 7,500
ROW and Access Road Allowance	1	LS	\$ 25,000.00	\$ 25,000
<b>Section Sub Total - 600 m Reservoir</b>			** developer covers Res. Oversize	<b>\$ 537,500</b>
<b>Enhanced Disinfection and Water Treatment</b>				
Building Space for UV and Chlorine Disinfection System 8m x 15m	100	m2	\$ 1,500.00	\$ 150,000
Land for Building site and future WT area	1000	m2	\$ 350.00	\$ 350,000
UV Disinfection System ( two lamp system supply & Install)	2	LS	\$ 75,000.00	\$ 150,000
UV Disinfection System low flow system	1	LS	\$ 18,750.00	\$ 18,750
Electrical and HVAC for Building	1	LS	\$ 30,000.00	\$ 30,000
Instrumentation, controls and alarms for water system	1	LS	\$ 35,000.00	\$ 35,000
<b>Section Sub Total - Enhanced Disinfection</b>				<b>\$ 733,750</b>
<b>Subtotal , Construction Cost Estimate</b>				<b>\$ 4,930,100</b>
Engineering 10%				\$ 493,010
Contingency 15%				\$ 739,515
<b>TOTAL CAPITAL COST</b>				<b>\$ 6,162,625</b>
<b>Interim Project Financing (10%)</b>				<b>\$ 616,263</b>
RDCO Administrative Fee		3%		\$ 184,879
<b>TOTAL</b>				<b>\$ 6,963,766</b>
<b>No. of Connections</b>				<b>492</b>
<b>Cost per Connection</b>				<b>\$ 14,154</b>

Kubas(1) = 50 SFE  
 Kubas(2) = 133 SFE

**OPTION 5**

**CONTINGENT ITEMS ( INCLUDES 25% ENG. & CONTINGENCY)**

<b>Cartridge Filter System (supply and install)</b>	1	LS	\$ 750,000.00	\$ 750,000
<b>Additional cost per unit for filter system</b>	492	unit	\$ 1,524.00	\$ 749,808
<b>200 mm WM - Westside Rd to Lower Fintry Reservoir</b>	175	m	\$ 250.00	\$ 43,750
<b>Surcharge on Reservoir Cost for Multi-Family Dev.</b>	786	m3	\$ 487.50	\$ 383,175
<b>TOTAL</b>				<b>\$ 1,176,733</b>