Preliminary Design Report

WATER SOURCE IDENTIFICATION & PRELIMINARY WATER SYSTEM DESIGN

UPPER FINTRY / SHALAL ROAD / VALLEY OF THE SUN

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May 2010

ENGINEERING • PLANNING • URBAN DESIGN

Water Source Identification & Preliminary Design
Upper Fintry / Shalal Road / Valley of the Sun Water System

Preliminary Design Report

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REFERENCE MATERIAL

Summit Environmental Consultants Inc.
Fintry Groundwater Development Program :
Completion Report May 2010

A) BACKGROUND / SCOPE OF PROJECT

The existing Upper Fintry, Shalal Road and Valley of the Sun neighbourhoods (hereafter referred to as the 'Service Area') were created in the 1960's without water servicing. Property owners of these neighbourhoods formally petitioned the Regional District of Central Okanagan (RDCO) requesting water service in March of 2009. Through the adoption of a service area bylaw, the Regional Board has approved the design and construction of a water system for the Service Area for a final cost not to exceed $17,500 per parcel.

The "Northwest Side Water Report" dated September 2007 as authored by Agua Consulting Inc. (herein after referred to as the "2007 Agua Report") presented RDCO with high level analyses and cost estimates for water servicing options for the Service Area and surrounding lands. This report builds upon the information and conclusions provided in this document and repeats relevant information when warranted.

It is important to note that for financial and legal purposes, the design and costing of the water system needs to be limited to the Service Area alone. Proposed developments such as the Kubas property near Valley of the Sun and existing neighbourhoods such as Fintry Delta may end up being serviced by this water system. However, they will be treated as separate entities from a financial point of view and will be offered service by RDCO if it is determined to be a financial and operational benefit to the Service Area.

The scope of the Preliminary Design assignment included the following tasks:

- consultation with project stakeholders including affected property owners;
- identification of a preferred water source;
- investigation of options available to expand the Service Area;
- exploration of options available to best provide domestic and fire protection water servicing to the Service Area;
- identification of requisite statutory right of ways;
- preliminary design of the preferred servicing option;
- preparation of project cost estimates, and
- the identification of such further works and investigations as may be required to facilitate subsequent detailed engineering design works.

One item that was added to the scope of work was the preparation of an Onsite Sewage Disposal brochure for the Open House meeting (included with the Appendices). Once the water system is in place, property owners with existing homes or cottages will need to confirm that their sewage disposal system is approved and in good working order prior to be being connected to the water system. The brochure explains the process and potential costs to determine if the sewage system is suitable and what to do if it needs upgrading or replacement.

B) WATER SOURCE IDENTIFICATION

As described in the 2007 Agua Report, the feasible water source options for the system was determined to be either Okanagan Lake or groundwater from the Fintry delta. A meeting was held with the project team and Robert Birtles, Christina Yamada and Wayne Radomske of Interior Health Authority (IHA) to discuss the approval requirements and treatment requirements for the two source options. For new lake water sources to be approved they must now plan for expensive filtration treatment as part of the 4-3-2-1-0 water treatment requirements. An application for deferral of filtration will be considered if the water supplier submits a proposal with at least one full year of data including:

- E.coli and coliform monitoring from the proposed source location;
- Continuous turbidity monitoring from the source location;
- Preparation of a Watershed Control Program.

Even if the filtration deferral is granted in lieu of UV and chlorine treatment, IHA anticipates that all systems will be required to include filtration some time in the near future (5-10 years perhaps).

For groundwater sources, there are currently no long term monitoring requirements and no water license required. There is also no water treatment required if the water quality test results from the wells meet Canadian Drinking Water Guidelines and the well site is determined not to be groundwater under the direct influence of surface water (non-GWUDI). Typically, the only regulatory requirements are well drilling permits and a Water Source Protection Plan upon completion.

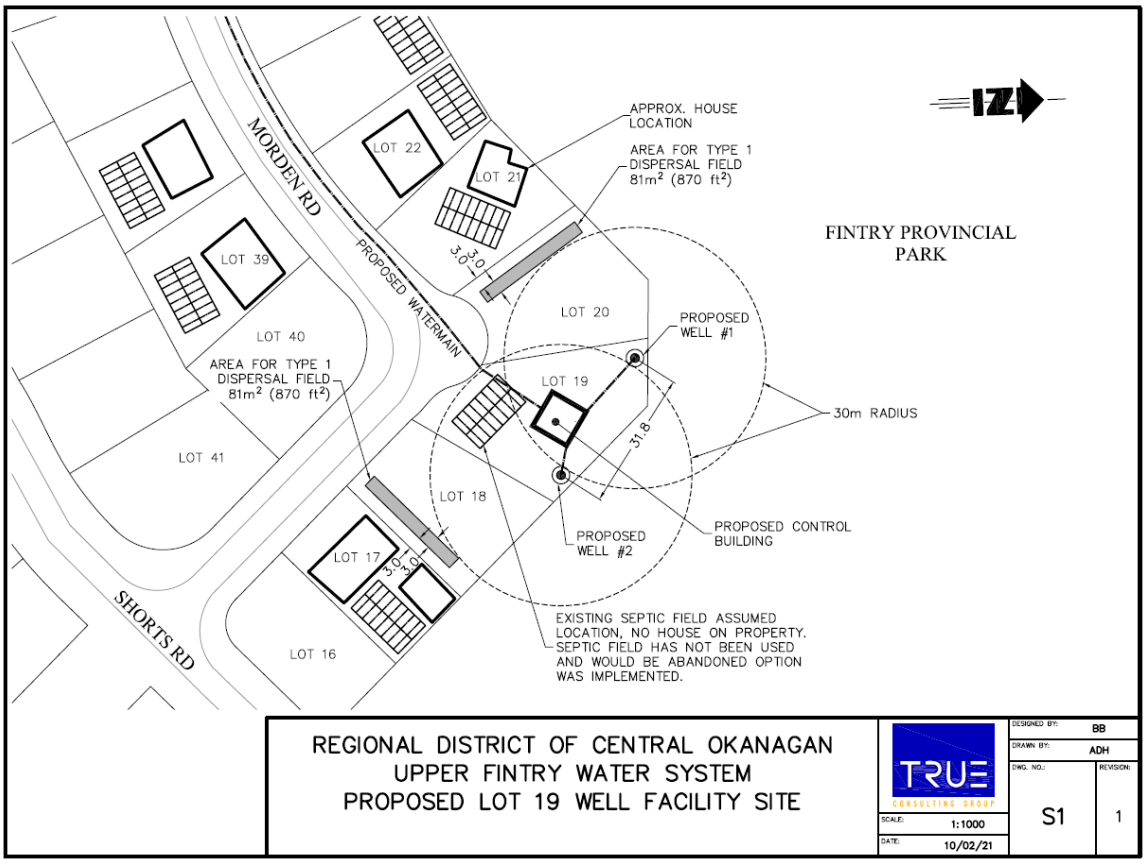
Given the longer timeline for approval of a lake source and the added cost of water treatment, it was determined that the preferred water source would be groundwater.

The ideal spot for a well site in the Fintry delta would be the Fintry Provincial Park, but this was not an option due to BC Parks regulations restricting public or private utilities using Parks property. Therefore, the only remaining area within the delta was on private land or road right-of-way within the Fintry Delta neighbourhood.

The subdivided area was examined in detail to determine all possible well sites that met the IHA requirement to be 30m from all septic system disposal fields. Records were obtained from IHA for the location of existing fields where possible. Only two potential areas were identified as being suitable for wells: in and around Lot 1 at the entrance to the neighbourhood and Lot 19 on Morden Road. Lot 19 was selected as the preferred option for the following reasons:

- Lot 19 is farther from Shorts Creek than Lot 1 for potential GUDI issues;
- Lot 19 is more central to the aquifer, away from the slope of land;
- Lot 1 is next to the Fintry Park intersection and a tight turn into the neighbourhood, increasing the potential for traffic accidents or spills;
- The adjacent lots are undeveloped so septic fields have not yet been installed;
- There is suitable space for a control building on the same site.

RDCO was able to purchase the property and test wells were commissioned The well drilling and testing is described in detail in the Summit Environmental "Fintry Groundwater Development Program: Completion Report" dated May 2010. As shown below, there is suitable area on the adjacent undeveloped properties for standard Type 1 septic dispersal fields 30m away from the new wells. The building permit process will ensure the fields are constructed as indicated. There isn't room on the Lot 19 well site property for a dispersal field, so conventional washroom facilities will not be possible in the control building.



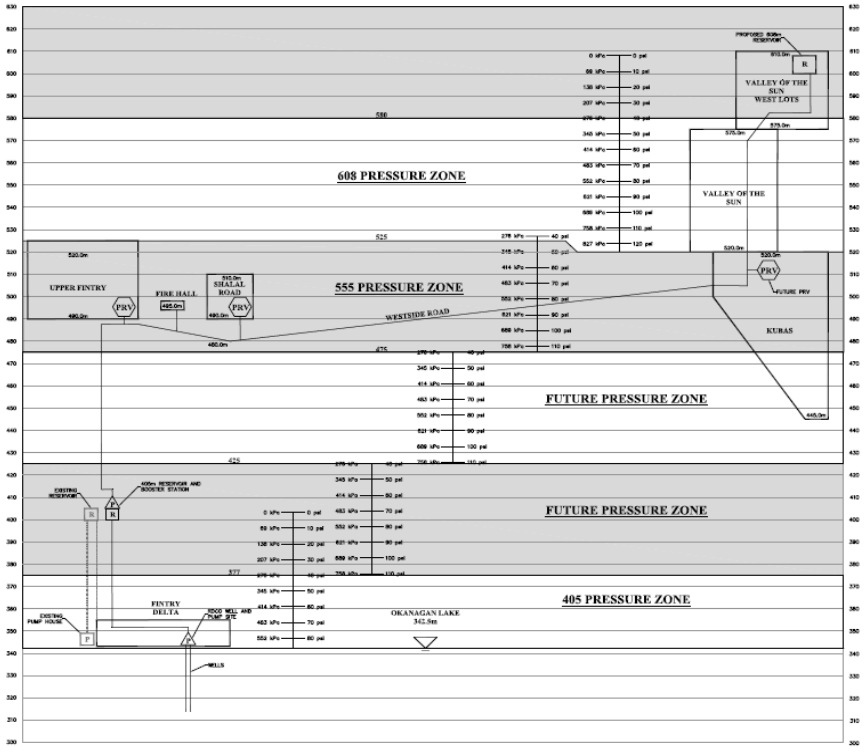
C) WATER SYSTEM OVERVIEW

The proposed system has been designed to best manage both capital and operational costs. As mentioned above, initial sizing of the system is based only on the current Service Area. However, it is logical that the Fintry Delta neighbourhood will eventually become part of the system, so this eventuality has been included in the design logic. Fintry Delta residents have

recently requested RDCO to consider taking over the privately owned Fintry Water Utility which currently provides them with water service. Their current system does not provide treatment or water storage to current standards. CTQ Consultants have completed a report on the condition of the water system and RDCO has now formally petitioned the land owners with a financial offer to acquire the system. If the petition is accepted and an agreement is reached with the utility owner, it is expected that RDCO will connect the Fintry Delta system to the new water system once it is commissioned. Financial implications of this Service Area expansion are included in the Cost Estimate section.

As shown on the system profile drawing below and the full size drawing with the appendices, there will be two pressure zones for the Service Area. Pressure zones are typically referred to by the top water elevation of the reservoir that serves them, or by the same zero water pressure elevation created by a pressure reducing valve (PRV). Valley of the Sun will be serviced by a reservoir at the 608m elevation (608m Zone). Upper Fintry and Shalal Road (herein after referred to as Upper Fintry) is at a lower elevation and will be serviced at the 555m Zone. This will provide general service pressures for the residences in the range of 345-690 kPa (50-100 psi). Properties at the extreme top or bottom of the pressure zones may experience pressures outside this range as discussed in greater detail in the Supply and Distribution Piping Design section.

The total elevation difference from the well site building to the 608m reservoir is approximately 263m. This equates to a potential static pressure of 2,570 kPa (370 psi) at the well site, so a single pump lift from bottom to top is impractical, due to the large size of pumps required and the inherent risks with high pressures. The design of well pump systems can either have submersible well pumps lifting directly to a reservoir or submersible pumps lifting to a wet well at the surface where additional booster pumps lift to the reservoir.



System Profile

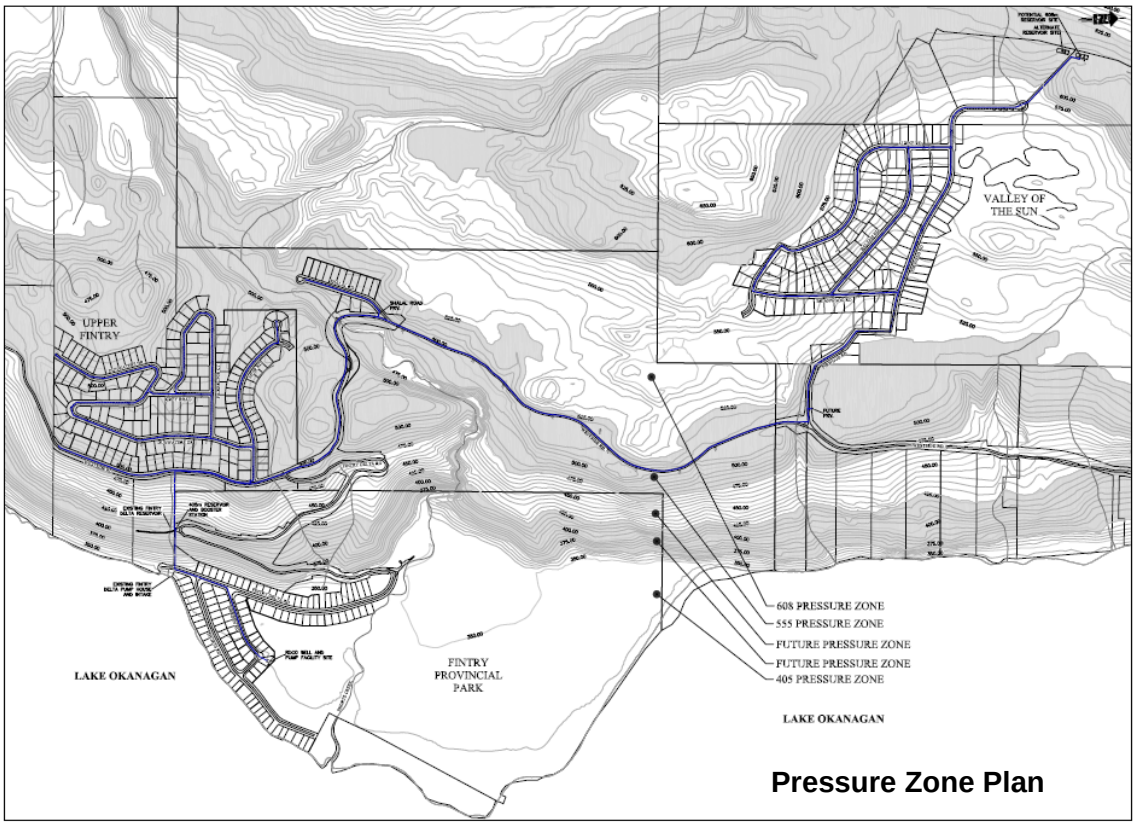
Due to the nature of submersible pumps and the environment in which they operate, their maintenance costs are higher and design life considerably shorter than pumps operating in the dry. Therefore, it is good practice to limit their size and lift demands (and replacement cost) where possible. Larger submersible pumps also require larger well casings to provide sufficient cooling water past the motor assembly.

It was determined that the best solution for this system would be for the submersibles to lift to a reservoir (wet well) and booster station at the elevation of the existing Fintry Utilities reservoir (approximately 405m). This is a manageable 60 metres of lift (plus well depth) for the submersibles and reduces the maximum pipe pressure and pump size for larger lift to the top reservoir location. The potential for reservoir storage for the Fintry Delta system also ensures that if they join the system, daily water needs for this lowest pressure zone is not pumped above the elevation where it is needed, hence minimizing pumping costs.

There is sufficient surplus road right-of-way to accommodate the pump station facility next to the Fintry Utilities reservoir site at the switchback on Fintry Delta Road. Ministry of Transportation approval for the site has yet to be pursued. There would be an opportunity to utilize the existing reservoir if Fintry Delta joins the system, however, it is expected that due to the age of the structure, the costs to retrofit and expand the existing tank is not practical. As an additional complication, the existing system would need to stay in place during the construction of the new station and tank.

The 405m Booster Station will pump from the new reservoir/wet well and be designed to lift the remaining 203 metres to the 608m reservoir at the top end of the Valley of the Sun subdivision. This is well within the capabilities of vertical turbine line shaft booster pumps.

There is no height of land or reservoir location at the 555m range in the Upper Fintry area, so this subdivision will be served from the 608m reservoir with a PRV at the entrance to the neighbourhood. A second intermediate reservoir and booster station was considered at the 555m elevation in the Valley of the Sun area to serve the lower pressure zone. This would



reduce the pumping costs somewhat by not having to lift the Upper Fintry water higher than necessary, but the extra capital could not be justified. Similarly, a reservoir was also considered for Upper Fintry but it would need an additional booster pump system to provide operating pressures and fire flow. Gravity flow from a reservoir is much preferred over a pressure pump system wherever feasible, for reduced capital costs, operational costs and increased reliability.

D) WATER SYSTEM DESIGN

The proposed water supply system will be designed to RDCO requirements for new subdivisions wherever practical. All components and water quality criteria will meet the standards of the Interior Health Authority (IHA) and the British Columbia Safe Drinking Water Regulations. The system will be fully metered to track water use and performance. Individual wells, pump stations, reservoir and all service connections will be metered.

As described in the 2007 Agua Report, the water quantity design criteria utilized are based on the RDCO Subdivision and Development Servicing Bylaw #704, 1996. The specific section pertaining to water is Schedule "C.5" Design and Construction of Water Systems. The water quantity criteria used in this report are summarized below. Modifications to the RDCO criteria are noted.

Table 1 - Water Quantity Criteria

Quantity Parameter	Criteria	Comments
Water Demand: Average Daily Demand ADD Maximum Day Demand MDD Peak Hour Demand PHD	 900 litres / capita / day 2,400 litres / capita / day 4,000 litres / capita / day / 24 hr/day	Criteria is less than RDCO Bylaw 704 criteria, based on City of Kelowna and data from RDCO (West Kelowna Estates)
Population Density: Single Family Units Multi-Family Units	 3.0 persons per unit 2.0 persons per unit	RDCO bylaw criteria that is also commonly used for most Okanagan Municipalities
Fire Demand / duration Single Family Units Multi-Family Units	 Minimum of 75 L/s for 1.67 hrs Minimum of 150 L/s for 2.0 hrs	Based on Fire Underwriters Survey (FUS) requirements
Reservoir Storage	Sum of the following 3 items A = Balancing storage (25% MDD) B = Fire storage C = Emergency storage (25% A+B)	Standard municipal criteria for reservoir sizing
Pump Station Capacity	Maximum Day Demand with Balancing Storage in place	Typical to provide full redundancy (assume largest pump out of service)

For pumping criteria, the pump stations should have full redundancy with the ability to provide maximum daily demands, provided there is balancing and fire storage above. For typical booster stations, redundancy means having extra pumps in place. In the case of well supply, redundancy in well capacity may not be practical, so an additional submersible well pump "on the shelf" ready for installation is recommended to provide the necessary redundancy.

The Service Area design population and flow demands may be summarized as follows:

Table 2 - Summary of Development Units and Design Flows

Development	Lots	ADD	MDD	PHD
Upper Fintry	180	486.0 m^3	1,296.0 m^3	90.0 m^3
Shalal Road	14	37.8 m^3	100.8 m^3	7.0 m^3
Valley of the Sun	146	394.2 m^3	1,051.2 m^3	73.0 m^3
TOTALS	**340**	**918 m^3**	**2,448 m^3**	**170 m^3**
			28.3 L/s	**47.2 L/s**

Based on the rated capacity of the test wells, as noted in the Summit Environmental Report, the current wells can provide up to 30 L/s (475 USGPM) each or a total of 60 L/s. This amount provides for more than double the capacity required for the Service Area and considerable excess capacity for Service Area expansion.

Well Site Pump Station Design

The Lot 19 well site will require a building to house the flow meter, electrical pump controls, programmable logic controller (PLC) control system, SCADA connection, back-up power generator and residual chlorination system. The well pumps should be equipped with electrical soft starts or variable speed drives for smooth operation and interfacing with the booster station.

As the well site is located within the Fintry Delta development, it is proposed that it be architecturally designed to fit in with the neighbourhood. Additional features could include a workshop, field office and storage for maintenance parts and equipment. The back portion of the site with the two wells will be fenced similar to a residential property. Landscaping for the entire lot could be used as a demonstration site for low water use xeriscape planting.

Three phase power will be required for both the Well Site Pump Station and 405m Booster Station. BC Hydro has been notified of the project and is in the process of upgrading their electrical service to the west side of Okanagan Lake. Electrical servicing has the potential to be the greatest variable to both project completion and project cost. The existing power line from Westside Road down to the Fintry Delta site will need to be upgraded from the current single phase system. The existing poles down the slope within the SRW have 3-phase cross arms and may be suitable for reuse. For the upgrading portion within the neighbourhood, along Fintry Delta Road and Morden Road, undergrounding of the 3 phase service could be considered to minimize the visual impact.

Sample neighbourhood pump house in Kamloops

The Lot 19 property has an existing septic field that will need to be decommissioned when the pump house is constructed. As mentioned previously, there isn't room on the lot for a septic field that is 30m from the wells, so the building will not have conventional washroom facilities.

405m Booster Station Design

The 405m Booster Station will consist of a pump house on top of a buried concrete reservoir. The reservoir will act as a wet well for the booster pumps, and will be designed to ultimately replace the existing 50 m^3 Fintry Delta tank. Recommended volume is the average day demand for the build-out of Fintry Delta or 300 m^3 in two cells. If Fintry Delta does not join the system, only half of this volume could be constructed initially.

Proposed 405m Booster Station Location

The pump house building will contain the vertical turbine booster pumps, flow meter, PLC, electrical controls, SCADA connection and back-up power generator. The initial design will include two pumps with the ability to add a third pump when warranted. The design will include provisions for a control valve to dump water back into the Fintry Delta pressure zone in the case of a fire or other emergency.

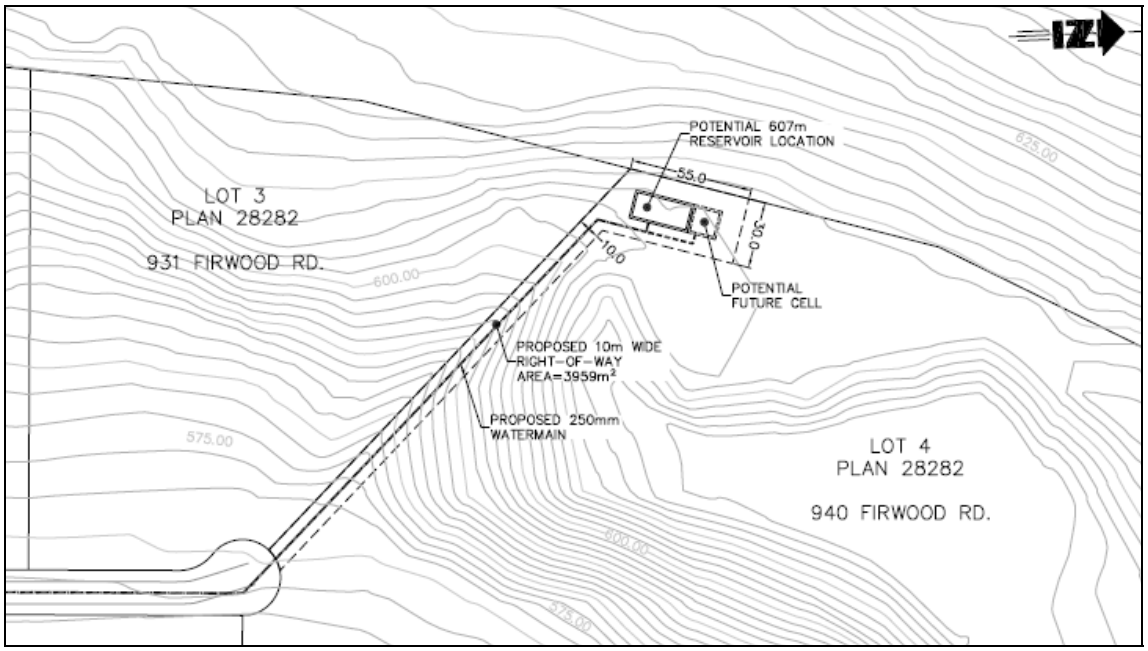
The new reservoir will have a dedicated supply main from the well site if Fintry Delta does not join the new system. If Fintry Delta becomes part of the system, new hydrants can be connected to the supply main rather than replacing the undersized main on Morden Road. Since chlorine contact time is not required for treatment, a separate supply main is not essential. The connection to the Fintry Delta system can be made anywhere on Fintry Delta Road. The pressure increase experienced by Fintry Delta residents when the well pumps are working will be insignificant.

There is an existing easement between Okanagan Lake and Westside Road, containing the power line and Fintry Delta reservoir piping. It is planned to obtain permission to utilize this easement for the new supply main. If Fintry Delta does not join the system at this time, an emergency fire connection could be negotiated as part of the exchange for access to their portion of the easement. Overflow and drain provisions would be directed back toward the lake (after de-chlorination) and could utilize one of the existing Fintry Delta 150mm pipes or a new pipe installed with the supply main.

Power line easement up to Westside Road

608m Reservoir Design

There are a number of potential sites for the 608m reservoir in and around the Valley of the Sun neighbourhood. The preferred location at the west corner of Lot 4, #940 Firwood Road was selected as it is within an existing property that will be served by the system, has low impact on the existing building site, good driveway access and an existing power line. RDCO has started the Statutory Right-of-Way (SRW) acquisition process for this location. If this site is unsuccessful, the next preferred site is on the adjacent Lot 3, #931 Firwood Road.



It is suggested that the proposed reservoir be a two cell rectangular concrete structure buried within the ground, with provisions for an additional cell to serve future development. The buried tank provides a more secure structure from vandalism, and less impact from day-time heating or freezing during the winter. A two cell system allows one cell to be shut down for cleaning and maintenance purposes without affecting customer service.

Detailed design of the reservoir should include a PLC control system, electronic security features, water quality test ports, chlorine residual analyzer and provisions for the potential addition of a rechlorination system if it becomes necessary. The reservoir will have very little circulation for a number of years until additional homes are constructed, so chlorine levels may dissipate with time.

Access route to reservoir site

Supply and Distribution Piping Design

All piping designs should be prepared in accordance with standard RDCO bylaw requirements, except as noted herein. Limited site survey was obtained during the preliminary design, with the general objective to tie the various legal surveys together, and to spot check the accuracy of cadastral topographic information in critical locations.

For the supply main between the 405m Booster Station and Valley of the Sun, the pipe will need to be greater strength than standard as the static and dynamic pressures will range from 2,140 kPa (310 psi) at the booster station to 830 kPa (120 psi) at the lower end of Valley of the Sun.

Typical Upper Fintry Road Cross Section

Roads within the Upper Fintry neighbourhood are currently gravel surfaced and those within Valley of the Sun are asphalt surfaced in poor condition. RDCO is pursuing funding support from the Ministry of Transportation & Infrastructure to include road paving and resurfacing as part of the project if budget permits. Geotechnical input will be required to confirm the suitability of the existing road base. Pipeline offsets are proposed for the centre of one travelled lane. If paving is not feasible, pipe installation in Valley of the Sun could be moved to the shoulder of the road. However, it is expected that a percentage of the existing asphalt will be damaged with construction traffic in any case.

Typical Valley of the Sun Road Cross Section

The existing Westside Road cut/fill cross section will necessitate the pipeline installation to be within the existing asphalt. Geotechnical review during the design phase will assist in determining which lane is best suited for the installation. Subsurface rock could be encountered, especially in the hillside lane.

Typical Westside Road Cross Section

The PRV station for Upper Fintry will be located at the entrance to the neighbourhood at Muir Road. Static pressure reduction is approximately 1035 to 518 kPa (150 to 75 psi). A section of double main will be required on Westside Road between the PRV and the Fintry Delta power line right-of-way for the high pressure supply main and a reduced pressure distribution line from the PRV.

The properties along Westside Road south of the SRW have significant access issues for development, due to the steep slope and highway cut. We understand that a back lot access easement from Dunwaters Road was recently determined to be unregistered and illegal. If the easement was re-established, it could provide an alternative servicing scheme for these lots through an SRW for a water service line over the access easement.

A hydrant and water service will be provided to the Fire Hall on Westside Road, with locations to be confirmed in consultation with the Fire Chief.

A PRV is indicated on the plans for Shalal Road similar to Upper Fintry. Since Shalal Road only includes 14 services, a standard PRV station may not be warranted or desirable. One alternative would be to improve the piping standards and rely on domestic PRVs. Another alternative would be a separate servicing line (50-75mm diameter) and a small PRV station. If this option was chosen, the PRV would be installed in the middle section of Shalal Road after the last hydrant location to keep circulation in the dead-end high pressure line. A third option could be an 850m long parallel pipe from the Upper Fintry PRV in common trench with the supply main. The decision will require input from the Fire Department, Operations staff and may depend on the estimated cost of the PRV once design requirements have been confirmed.

The first 8-10 properties on Firwood Road at the entrance to Valley of the Sun are at the low end of the 608 pressure zone and will experience static pressures slightly above the typically recommended 830 kPa (120 psi). They should be notified that on-site plumbing before the residential PRV should be of a higher standard. The large acreage lots at the west end of Firwood Road are at the upper end of the pressure zone. The prime building sites on these lots will require residential booster pumps (jet pumps) for domestic service. Fire protection will also be limited. In the future, these properties could be better served as part of a higher pressure zone with a new reservoir or booster station that could be established with further development.

E) POTENTIAL SERVICE AREA EXPANSION

The 2007 Agua Report and previous studies have considered a number of scenarios for service area expansion. The two initial potential expansion areas are the existing Fintry Delta neighbourhood and the proposed Kubas development at the intersection of Westside Road and Firwood Road adjacent to the entrance to the Valley of the Sun neighbourhood. It is expected that once the water system is in place, more new development and subdivision proposals in the vicinity will request water service.

Typically, additional water connections will be an asset to the system, since more users paying operation and maintenance fees reduces the cost per user. Expansion to the Service Area for additional development will also permit RDCO to collect additional capital cost

contributions that can be put into a reserve fund for future upgrading or emergency repairs. The issues for determining suitability of service area expansion are available water supply and water storage. Watermain sizing is rarely an issue as mains are typically sized for the worst case fire flow scenario. However, if multi-family developments are proposed, watermain sizes would need to be reviewed to suit large fire flow demands.

Available water supply from the wells has been calculated for the number of units served, the pump capacity and the well capacity, as outlined in the following section. Based on the calculations, the new wells could potentially support the addition of Fintry Delta and an additional 270 single family development units. This is subject to actual water use data and performance of the well source.

As more properties are included, the pumps will require upgrading/replacement. Once the well capacities are reached, an additional well site would be required or one of the existing wells could possibly be replaced with a larger diameter casing to provide some additional volume. Additional well sites other than Lot 19 may be a challenge, as other suitable well sites may not exist within the Fintry delta. Blending with lake water or even a well under the direct influence of surface water (GWUDI) would create significant treatment and logistic challenges. Therefore, more study and investigation would be required to confirm if additional units could be served beyond the current capacity of the wells.

Water storage can always be increased to accommodate additional development. Additional storage can be addressed by expanding existing facilities or locating new facilities at other suitable locations. Construction staging of water supply and storage for potential service area expansion is discussed in the next section.

F) PROJECT STAGING AND COMPONENT SIZING

Water use at the inception of the project will be minimal. There are approximately 60 existing dwellings within the Service Area (18% of properties). While difficult to forecast, it could conceivably take 10-20 years until the area is fully developed. Although the capital cost for the ultimate system may be available through the Service Area Bylaw contributions, it may not be prudent to install the ultimate pump configurations.

Delaying the ultimate pump configurations also allows data to be collected as to the actual water use being experienced. With seasonal occupation of residences, water metering, progressive usage rate structures and evolving landscape practices, future water use for this system could be significantly different than current design practices.

The table on the following page outlines the proposed well pump and booster station pump installations for the initial design and a potential future upgrade program. The upgrade program will depend on the rate of development, water use records and pump performance. It is also subject to input from the electrical design process, as to the most cost effective power servicing scenarios.

Recommended initial well pumps are two 22 L/s (350 USGPM) capacity (assuming Fintry Delta joins the system), which provides for approximately 264 single family units with full pump redundancy. Once MDD surpasses 22 L/s on a regular basis, a back-up well pump

should be purchased. Depending on the age of the original pumps, one pump could be replaced with the next design size up and one of original pumps refurbished for back-up. Once MDD surpasses 30 L/s (500 USGPM) both pumps should be replaced with the larger ultimate size. As demand continues to grow and the system ages, a third 30 L/s pump should be purchased as a back-up.

Table 3 - Proposed Well Pump and Booster Pump Staging

	Current	Initial Design	Stage 2	Stage 3	System Max. [1]
Design Year (est.)	0	0-5	5-10	10-15	15+
Service Area Units	60	130	200	270	340
Fintry Delta Units	72	84	92	100	110
Future Development		50	68	158	270
Total Units	132	264	360	528	720
MDD Volume	950 m^3	1,900 m^3	2,592 m^3	3,800 m^3	5,184 m^3
MDD Well Pump Flow	11 L/s	22 L/s	30 L/s	44 L/s	60 L/s
Well Pumps		2 x 22 L/s	+ 30 L/s shelf	2 x 30 L/s	+ 30 L/s shelf
Booster Pump Flow [2]	5 L/s	15 L/s	22 L/s	36 L/s	51 L/s
Booster Pumps [3]		2 x 15 L/s	2 x15, 1 x26 L/s	2 x 26, 1 x 15	3 x 26 L/s

Note 1: System Maximum assuming no additional water source development.
Note 2: Booster pump MDD flow does not include Fintry Delta MDD, as it is not pumped above 405m.
Note 3: Larger pump selection subject to pump curve and friction loss review, as the supply main is 4.7 km in length.

A similar staged process should be followed with the 405m Booster Station, though in this case, the third pump can be installed into the pre-plumbed location when warranted. The demands will be less for the 405m Booster Station, as the MDD for Fintry Delta is not pumped above this elevation. The recommended initial two pumps are 15 L/s (240 USGPM). As demand surpasses this design flow, a third pump (larger size) should be installed to maintain full redundancy. When the MDD design flow reaches 30+ L/s, one of the original pumps should be replaced with a second 26 L/s (415 USGPM) pump. When MDD reaches 40+ L/s, the remaining original pump should be upgraded to the ultimate size.

For reservoir storage sizing and staging, the same principles can apply but in fewer stages, as the economies of scale dictate that it is more cost effective to build less often. If the reservoir is oversized, water quality issues can occur due to water age. If this is the case, reservoir levels and controls can be adjusted seasonally and/or slowly increased with development growth to ensure sufficient turnover.

It is recommended that the full size reservoir for the built-out Service Area be constructed at the outset, with two equal sized cells (see size calculation below). Once the Service Area reaches the 340 unit level, an additional cell would be constructed from the reserve fund.

Table 4 - Proposed 608m Reservoir Storage Sizing

Reservoir Storage Components		Service Area 340 Lots	Ultimate System 610 Lots *
A = Balancing Storage	MDD for 6 hrs	612 m^3	1,098 m^3
B = Fire Storage	75 L/s x 1.67 hrs	451 m^3	451 m^3
C = Emergency Storage	25% x (A+B)	266 m^3	387 m^3
Total Storage Required		**1,329 m^3**	**1,936 m^3**
Approx. Reservoir Dimensions		**12m x 24m x 5m**	**+ 12m x 12m x 5m**

* Fintry Delta MDD storage contained within the 405m Booster Station tank.

As noted above, single family fire storage is based on providing flow at 75 L/s for 1.67 hours. Multi-family development fire storage is based on providing a flow of 150 L/s for 2.0 hours. If a developer proposed to construct multi-family development, this would increase the fire storage and emergency component of the reservoir by an additional 787 m^3. This additional cost would be borne by the development requiring the higher fire flow rates.

Similar sized reservoir built last year in Princeton

G) COST ESTIMATES AND DEVELOPMENT CHARGES

Details of the project cost estimate are included with the appendices, along with the cost implications and projections for Service Area Expansion with the addition of Fintry Delta and future development. As shown in the summary below, the total estimated cost of the project remains similar to the petition amount. As more information is available, the level of accuracy has improved and the contingency amount has been reduced accordingly.

Table 5 - Project Cost Summary
Upper Fintry - Shalal Road – Valley of the Sun
Preliminary Water System Design

Description	Conceptual Budget		Prelim. Estimate	
Distribution System - Upper Fintry / Shalal Rd		$772,350		$948,650
Distribution System - Valley of the Sun		$675,275		$803,575
Transmission Mains		$752,400		$857,800
Groundwater Well Pump Station		$850,000		$750,000
405m Booster Station & Reservoir		$445,000		$425,000
608m Reservoir (+ Fire Storage Capacity)		$546,000		$645,000
Subtotal , Construction Cost Estimate		**$4,041,025**		**$4,430,025**
Engineering	10%	$404,103	10%	$443,003
Contingency	20%	$808,205	10%	$443,003
TOTAL CAPITAL COST		**$5,253,333**		**$5,316,030**
Interim Project Financing	10%	$525,333	10%	$531,603
RDCO Administrative Fee	3%	$157,600	3%	$159,481
TOTAL PROJECT COST		**$5,936,266**		**$6,007,114**
Towns for Tomorrow Grant		-$400,000		-$400,000
Revised Total		**$5,536,266**		**$5,607,114**
Number of Single Family Units		341		341
Cost per Single Family Unit		**$16,235**		**$16,443**

If Fintry Delta joins the system, the construction project would expand to include additional storage at the 405m booster station and the control valve to release water back to the lower pressure zone in case of fire or emergency. Fintry Delta property owners would pay a pro-rata share (Fintry Delta Lots / Total Lots) of the cost of the work that directly benefits their neighbourhood. This includes the connection works, water supply, well pump station and reservoir storage. It does not include the 405m booster station or the piping system as these items are required specifically for the upper pressure zones.

The Fintry Delta contribution is estimated at $486,301, which equates to $4,588 per lot for 106 lots. With this contribution, the estimated cost per unit for Upper Fintry / Shalal Road / Valley of the Sun is reduced from $16,443 to $15,435.

For new developments that make application to join the system at a later date, their capital contributions required to join the system will be placed into a specific reserve fund to pay for future upgrading and infrastructure replacement. This ensures that any future costs attributed to development have no impact on the maintenance fees paid by current users. It should also help reduce or eliminate the need for any future increases in maintenance costs, as pumps replaced with larger pumps by new developments won't need to be replaced by the current users.

As noted in a previous section, additional serviced lots through development also benefit current users by having more properties share the fixed costs of operations and maintenance.

The capital cost contribution for new development can be calculated (or justified) in a few different ways. The amount must be sufficient to cover future costs, but must also be considered fair when compared to the amount paid by those that established and paid for the original system. It must also be reasonable to attract new customers, so that current users can realize the long term benefits mentioned above.

A formula could be applied similar to the Fintry Delta contribution, where new development pays an amount equal to the cost per lot that the current users will be paying for the "common benefit" features of the system. If the amounts for water supply, well pump station, booster pump station and reservoir storage are added and then divided by the number of current users, the cost per lot ranges from $6,000 to $9,500 depending how much one considers the supply mains to be mutually beneficial.

The calculation included at the end of the cost estimates considers the future improvement costs that will be necessary as new developments join the system. The timing and final determination of these costs will be affected by a number of variables as noted in the report. The maximum number of future units mentioned in the report may occur in 5 years or 50 years. Well performance or water quality may change, affecting the costs and number of units that can be serviced. Without major improvements to Westside Road, extensive new development may not be permitted. Based on future infrastructure requirements, the cost per single family development lot would range from $4,000 to $7,000 depending on the number of lots that are created.

Based on the above, a capital charge rate in the range of $6,000 to $7,000 would seem reasonable.

H) CLOSURE

In combination with the Summit Environmental "Fintry Groundwater Development Program: Completion Report", the preliminary design process has confirmed and initiated groundwater as the preferred source for the Service Area. The preliminary design and cost estimate confirms that the petition amount of $17,500 per property is considered to be sufficient to complete the construction of the water system. This report outlines options, features, further works and investigations required to facilitate subsequent detailed engineering design and construction of the works.

APPENDIX A

PRELIMINARY DESIGN COST ESTIMATES

UPPER FINTRY - SHALAL ROAD - VALLEY OF THE SUN
PRELIMINARY WATER SYSTEM DESIGN
PROJECT COST ESTIMATE

May 2010

	ITEM	QTY.	UNIT	PRICE	TOTAL
1	**UPPER FINTRY**				
	250 PVC Pipe	270	m	110.00	29,700.00
	200 PVC Pipe	1880	m	100.00	188,000.00
	150 PVC Pipe	1370	m	90.00	123,300.00
	100 PVC Pipe	75	m	100.00	7,500.00
	250 PVC Fittings	5	ea	700.00	3,500.00
	200 PVC Fittings	11	ea	600.00	6,600.00
	150 PVC Fittings	14	ea	500.00	7,000.00
	100 PVC Fittings	1	ea	400.00	400.00
	250 PVC Valves	1	ea	1,500.00	1,500.00
	200 PVC Valves	12	ea	1,000.00	12,000.00
	150 PVC Valves	7	ea	800.00	5,600.00
	100 PVC Valves	1	ea	600.00	600.00
	Hydrants (complete)	19	ea	4,000.00	76,000.00
	Blowoffs	2	ea	1,500.00	3,000.00
	Air Release Valves	1	ea	2,500.00	2,500.00
	19mm Services (complete)	180	ea	1,000.00	180,000.00
	PRV Station	1	LS	100,000.00	100,000.00
	Road Restoration	3600	m	25.00	90,000.00
	Sub-Total				837,200.00
2	**SHALAL ROAD**				
	200 PVC Pipe	290	m	100.00	29,000.00
	200 PVC Fittings	2	ea	600.00	1,200.00
	200 PVC Valves	1	ea	1,000.00	1,000.00
	Hydrants (complete)	2	ea	4,000.00	8,000.00
	19mm Services (complete)	15	ea	1,000.00	15,000.00
	PRV Station	1	LS	50,000.00	50,000.00
	Road Restoration	290	m	25.00	7,250.00
	Sub-Total				111,450.00
3	**VALLEY OF THE SUN**				
	250 PVC Pipe	1480	m	110.00	162,800.00
	200 PVC Pipe	1215	m	100.00	121,500.00
	150 PVC Pipe	575	m	90.00	51,750.00
	250 PVC Fittings	10	ea	700.00	7,000.00
	200 PVC Fittings	4	ea	600.00	2,400.00
	150 PVC Fittings	1	ea	500.00	500.00
	250 PVC Valves	10	ea	1,500.00	15,000.00
	200 PVC Valves	8	ea	1,000.00	8,000.00
	150 PVC Valves	4	ea	800.00	3,200.00
	Hydrants (complete)	16	ea	4,000.00	64,000.00
	Air Release Valves	3	ea	2,500.00	7,500.00
	19mm Services (complete)	147	ea	1,000.00	147,000.00
	Road Restoration - Asphalt	2915	m	70.00	204,050.00
	Road Restoration - Gravel	355	m	25.00	8,875.00
	Sub-Total				803,575.00

UPPER FINTRY - SHALAL ROAD - VALLEY OF THE SUN
PRELIMINARY WATER SYSTEM DESIGN
PROJECT COST ESTIMATE (cont'd)

May 2010

	ITEM	QTY.	UNIT	PRICE	TOTAL
4	**SUPPLY MAIN**				
	250 PVC Pipe	3535	m	130.00	459,550.00
	250 PVC Pipe (High Pressure)	200	m	160.00	32,000.00
	250 Fittings	16	ea	700.00	11,200.00
	250 Valves	15	ea	1,500.00	22,500.00
	Hydrants (complete)	1	ea	4,000.00	4,000.00
	Air Release Valves	2	ea	2,500.00	5,000.00
	Trench Anchors	32	ea	250.00	8,000.00
	Slope Restoration	320	m	25.00	8,000.00
	Road Restoration - Asphalt Westside Rd.	2750	m	100.00	275,000.00
	Road Restoration - Asphalt Fintry Delta	465	m	70.00	32,550.00
	Sub-Total				857,800.00
5	**WELL SITE PUMP STATION**				
	Property Purchase	1	LS	200,000.00	200,000.00
	Well Drilling & Development	1	LS	60,000.00	60,000.00
	Well Pumps (2)	1	LS	40,000.00	40,000.00
	Control Building	1	LS	120,000.00	120,000.00
	Piping and Mechanical	1	LS	100,000.00	100,000.00
	Electrical & Generator	1	LS	80,000.00	80,000.00
	BC Hydro Charges	1	LS	100,000.00	100,000.00
	Site Work and Landscaping	1	LS	50,000.00	50,000.00
	Sub-Total				750,000.00
6	**405m BOOSTER STATION**				
	Reservoir Construction (50% of 300 m3)	1	LS	75,000.00	75,000.00
	Booster Pumps (2)	1	LS	70,000.00	70,000.00
	Booster Station Building	1	LS	50,000.00	50,000.00
	Piping and Mechanical	1	LS	80,000.00	80,000.00
	Electrical & Generator	1	LS	100,000.00	100,000.00
	BC Hydro Charges	1	LS	50,000.00	50,000.00
	Sub-Total				425,000.00
7	**608m RESERVOIR**				
	Reservoir SRW Acquisition	1	LS	50,000.00	50,000.00
	Reservoir Construction (1,330 m3)	1	LS	450,000.00	450,000.00
	Piping and Valve Chamber	1	LS	50,000.00	50,000.00
	Electrical	1	LS	30,000.00	30,000.00
	Supply Main and Drain Line	1	LS	40,000.00	40,000.00
	Access Road, Gate, Fencing	1	LS	20,000.00	20,000.00
	BC Hydro Charges	1	LS	5,000.00	5,000.00
	Sub-Total				645,000.00
	SUB-TOTAL CAPITAL COST				**4,430,025.00**
	CONTINGENCY		10%		443,002.50
	ENGINEERING		10%		443,002.50
	TOTAL CAPITAL COST				**5,316,030.00**
	Interim Project Financing		10%		531,603.00
	RDCO Administration Fee		3%		159,480.90
	TOTAL PROJECT COST				**6,007,113.90**
	Less GOV'T GRANT				(400,000.00)
	TOTAL PROJECT COST				**5,607,113.90**

UPPER FINTRY - SHALAL ROAD - VALLEY OF THE SUN
PRELIMINARY WATER SYSTEM DESIGN
FUTURE DEVELOPMENT COST IMPLICATIONS

May 2010

IF FINTRY DELTA JOINS SYSTEM:

	ITEM	QTY.	UNIT	PRICE	TOTAL
	SUB-TOTAL CAPITAL COST WITHOUT FINTRY DELTA				**4,430,025.00**
	Additional Work Required:				
6	**405m BOOSTER STATION**				
	Reservoir Construction (50% of 300 m3)	1	LS	75,000.00	75,000.00
	Emergency Control Valve & Connection	1	LS	30,000.00	30,000.00
	SUB-TOTAL CAPITAL COST WITH FINTRY DELTA				**4,535,025.00**
	CONTINGENCY		10%		453,502.50
	ENGINEERING		10%		453,502.50
	TOTAL CAPITAL COST				**5,442,030.00**
	Interim Project Financing		10%		544,203.00
	RDCO Administration Fee		3%		163,260.90
	TOTAL PROJECT COST				**6,149,493.90**
	Less GOV'T GRANT				(400,000.00)
	Less FINTRY DELTA CONTRIBUTION *				(486,301.00)
	TOTAL PROJECT COST				**5,263,192.90**
	PER UNIT COST		**341**	**Units**	**15,434.58**

* Fintry Delta contribution is based on an estimate of their per lot share of the Well Site Pump Station and Reservoir Storage.

WHEN FUTURE DEVELOPMENT JOINS SYSTEM:

	ITEM	QTY.	UNIT	PRICE	TOTAL
	Additional Work Required:				
5	**WELL SITE PUMP STATION**				
	Additional Well Pumps (3)	1	LS	90,000.00	90,000.00
	Upgrade Electrical & Generator	1	LS	80,000.00	80,000.00
6	**405m BOOSTER STATION**				
	Additional Booster Pumps (4)	1	LS	185,000.00	185,000.00
	Upgrade Electrical & Generator	1	LS	100,000.00	100,000.00
7	**608m RESERVOIR**				
	Additional Reservoir Const. (665 m3)	1	LS	250,000.00	250,000.00
	Additonal Piping and Valve Chamber	1	LS	50,000.00	50,000.00
	Misc. Electrical & Site Work	1	LS	20,000.00	20,000.00
	SUB-TOTAL CAPITAL COST				**775,000.00**
	CONTINGENCY		10%		77,500.00
	ENGINEERING		10%		77,500.00
	TOTAL CAPITAL COST				**930,000.00**
	Inflation Factor		10%		93,000.00
	RDCO Administration Fee		3%		27,900.00
	TOTAL PROJECT COST				**1,050,900.00**
	PER UNIT COST		**160**	**Units**	**6,568.13**
	PER UNIT COST		**270**	**Units**	**3,892.22**

APPENDIX B

ONSITE SEWAGE DISPOSAL BROCHURE

REGIONAL DISTRICT of CENTRAL OKANAGAN

UPPER FINTRY / SHALAL ROAD / VALLEY OF THE SUN

WATER SYSTEM

ONSITE SEWAGE DISPOSAL

QUESTIONS AND ANSWERS

Do I need a septic permit when I apply to connect to the new RDCO water system?

Yes, you will need to obtain approval for a wastewater system if you don't already have an approved system. They are no longer called permits however – instead they are now called "filings". Filings are submitted to Interior Health by a ***Registered Onsite Wastewater Practitioner*** (ROWP). A home owner cannot submit a filing on their own any more, only an ROWP or a Professional can submit a filing. If you are applying for a building permit you will first have to get a ROWP to complete a sewerage system filing and the pink copy of the filing will go to the RDCO building authority.

What do I need to do to get a wastewater system installed on my lot?

You will need to have a registered planner carry out an assessment of your property to determine the feasibility of constructing a wastewater system on the site. As part of the site assessment, the planner will have to excavate testpits to observe the underlying soil conditions and carry out soil permeability testing by either doing percolation tests or permeameter tests. If all the conditions are met (i.e. setbacks, basal area, etc.) then the planner can complete the sewage system design and submit the filing to Interior Health.

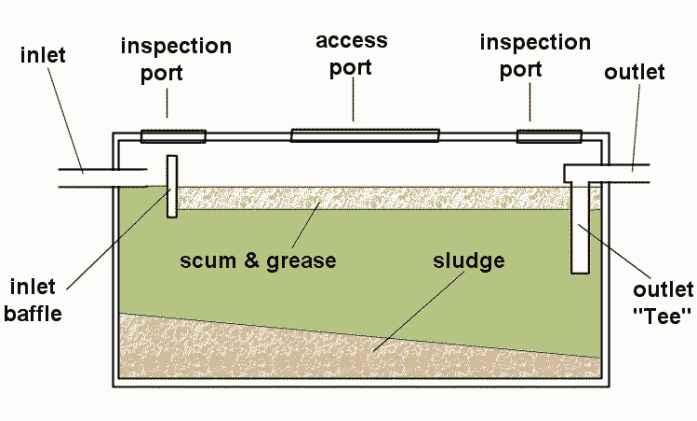
If I have an existing home with an approved septic system do I need to do anything more?

No, not unless it is failing, breaking out to the ground surface, or causing a human health risk or environmental concern. You will need to prove you have the records for the sewage system. If you do not have the records you can carry out a record search with Interior Health, 1340 Ellis Street in Kelowna. The fee for this is $25.

I have an existing home with a septic system but I don't know if it is approved or if it will function once we are connected to the new water system.

Once the home is connected to the water system the household will likely use more water than was previously used when functioning from a cistern or low production water well. In some cases, older septic systems that do not conform to the newer regulations will fail if they are hydraulically overloaded with wastewater. These systems will likely need to be replaced or upgraded to today's standard. Other systems might function properly with minor alterations.

A registered person can assess your system to determine if it is functioning properly or if it meets the standard of the day. The first step is to carry out the record search with Interior Health. Then the ROWP will have to expose and inspect the sewage system so that they can assess its condition. Once assessed, they would make recommendations for any necessary alterations or will develop a plan to bring the system into conformance with the new standards if possible.



How much does it cost to have my existing system inspected and assessed?

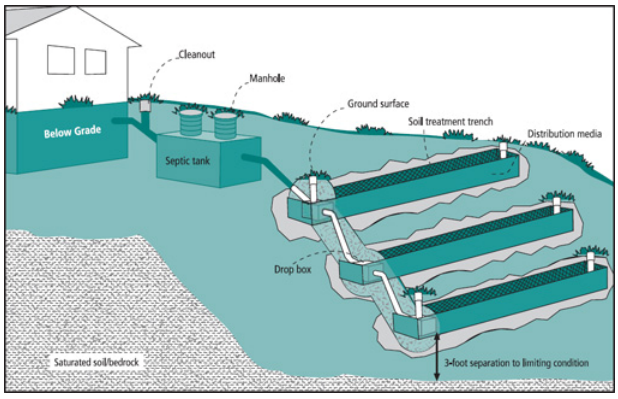
Most planners in the valley are charging between $1000 and $2000 to assess an existing sewage system to confirm it is functioning properly and that it meets the standards of the day. Generally speaking, sewage systems that were installed 10 years or more before the new standards were implemented in 2005, will not meet the standards. To assess a sewage system, the tank, distribution box and some of the drain field have to be exposed. This will cause some damage to landscaped areas.

How much does it cost for a wastewater system filing?

The fee for filing with Interior Health is $200. Most planners charge around $1,200 to $1,800 for the site assessment and filing with Interior Health. Some sites are more difficult and therefore require more time on the planner's behalf so a higher fee may be charged at times. Some sites require a "professional" to assess the site conditions and therefore the fees tend to be slightly higher again. Some professionals charge $2,500 for an assessment and filing.

How long does it take to do a filing?

The site assessment, design and reporting normally takes 5 to 10 working days. Once the design has been completed by the planner it is submitted to Interior Health for filing and the stamped copies are returned to the planner at that time. The planner then provides the property owner or builder with copies of the filing document and the sewage system design.



What will it cost to install a wastewater system to current standards?

The cost to install a septic system varies significantly depending on the location, type of soils, design, and contractor. Most standard Type 1 gravity systems are in the range of $8,000 to $14,000. Pressure distribution systems are in the range of $13,000 to $17,000. When site conditions are challenging, a more technically advanced treatment system may be required. Type 2 systems generally range between $16,000 and $25,000 with some difficult sites being more expensive. Type 3 (engineered) systems tend to be in the range of $25,000 to $35,000 and these are usually for larger homes.

Where can I find more information?

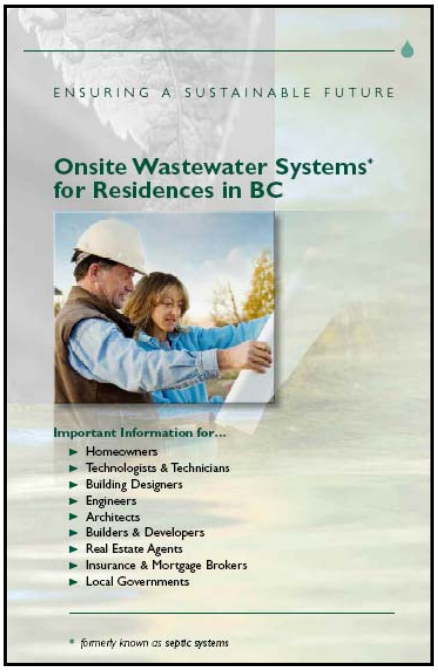
You can obtain more information from Interior Health, 1340 Ellis Street in Kelowna or their website at:

http://www.interiorhealth.ca/health-and-safety.aspx?id=496

Another good website is the Applied Science Technologists & Technicians of BC wastewater site: *http://wastewater.asttbc.org*

Their brochure can be found at:

http://wastewater.asttbc.org/p/pdf/OWRPBrochure2008.pdf



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APPENDIX C

PRELIMINARY DESIGN DRAWINGS