



SECTION 1 EXECUTIVE SUMMARY

This report presents the results of a Value Planning (VP) Study conducted by Strategic Value Solutions, Inc. (SVS) to identify the best value solutions for a city-wide integrated water supply plan for Kelowna, BC. The study was commissioned by the City of Kelowna and the South East Kelowna Irrigation District.

The Value Planning workshop was conducted over a 5-day (40-hour) period in Kelowna on January 9-13, 2017. The VP Team was led by a Certified value Specialist® (CVS®) and was comprised of consultant subject matter experts in water system planning, financial and rate analysis, and construction cost of water systems. The consultant VP Team was augmented with local and provincial expertise from the City of Kelowna, the South East Kelowna Irrigation District, the Ministry of Community, Sport and Cultural Development (MCSCD), Interior Health Authority (IHA), the Ministry of Forests, Lands and Natural Resource Operations, as well as Agua Consulting and Associated Engineers.

Background

The City of Kelowna's water service is currently provided by the City Municipal Utility (City), the South East Kelowna Irrigation District (SEKID), the Black Mountain Irrigation District (BMID), the Rutland Water Works District (RWWD), and the Glenmore-Ellison Improvement District (GEID) as well as 26 other small water utilities. These various organizations deliver water to serve domestic, commercial, industrial, and agricultural needs with limited interconnectivity between providers. The water supplying these needs comes from a variety of water sources including Lake Okanagan, Mission Creek, Kelowna (Mill) Creek, Scotty Creek, Hydraulic Creek, and numerous wells. These varied sources have differing water qualities that have resulted in boil notices and long-standing advisories being issued for parts of Kelowna by the Interior of Health Administration (IHA) due to public health concerns. Additionally, there are also significant aesthetic issues related to taste, odor, and color.

A recent survey conducted by the City of Kelowna identified water quality improvements as the citizens' number one priority across the city. While technically, these water quality issues can be solved independently by each provider, these independent technical solutions will be very costly, creating substantial rate inequity for customers. The most sustainable and cost effective solution is to create an integrated water system that meets the customers' water service expectations relative to serving the demand, protecting public health, improving the aesthetic qualities of the water, and ensuring that there is equity in both services and costs.

In 2009, the Ministry of Community, Sport and Cultural Development (MCSCD) began working with Kelowna on a path forward to resolving the water issues in the region. The City, the South East Kelowna Irrigation District, the Black Mountain Irrigation District, the Rutland Water Works District, and the Glenmore-Ellison Improvement District (IDs) with support from the Province developed the 2012 Kelowna Integrated Water Supply Plan.



The 2012 Plan addresses important areas such as operation and maintenance, flexibility, best-lowest cost solutions, an achievement of public health outcomes, and agricultural interests. The Plan was cooperatively developed with the full participation from the City and the IDs; however, there has been very limited implementation of the plan toward the goal of integration. In general, the 2012 Plan involved improving water quality within the IDs, separation of the domestic and agricultural water service needs within each distribution system, and interconnections between systems to allow water to be moved from one distribution system to another through a controlled and metered connection.

MCSCD currently has a grant program that is available through March 2018 to help fund an integrated water supply plan for Kelowna. This grant can provide up to 83% of the funding for approved projects. There are also other funding sources that either are or will be available that could also provide a partial funding source for approved projects.

Scope of the Value Planning Study

The Ministry requires that Value Planning (or Value Engineering) studies be completed before providing funding for major infrastructure projects. For Kelowna, this means that a Value Planning (VP) process should be included in a plan that meets the needs of the residents of the City.

The purpose of this VP study is to review the 2012 Kelowna Integrated Water Supply Plan, along with other materials provided by the City and SEKID to ensure that all proposed works and their identified priorities are the best, lowest cost solutions, the solutions that meet current health standards and to ensure solutions are flexible in their nature and maintain agricultural interests.

The intent was that the workshop associated with this study would be conducted cooperatively between the City and the four major IDs: SEKID, BMID, RWWD, and GEID. However, prior to the workshop, BMID, RWWD, and GEID opted to not participate feeling that the needs of their districts had been addressed through their self-funded capital improvement projects.

Study Objectives

The VP Study was to assess the 2012 Plan and follow the original guiding principles for an integrated water supply plan that will serve all residents of Kelowna:

1. Identify the best, lowest cost solutions
2. Achieve public health standards
3. Allow flexibility from administrative and operational perspectives
4. Maintain agricultural interests

Specifically, the plan should address the best technical solution for an integrated water supply plan not just an interconnected plan. This means:



- Customer equity relative to costs
- Consistent level of service
- Consistently high water quality
- Efficiency in operations and administration
- Uniformity in practices and procedures
- A seamless experience for all water users of Kelowna
- Meeting the delivery demand for both domestic and agricultural needs

The VP Study was to specifically focus on the technical solution without regard to system Governance. Further, the technical solutions were not limited based on any ownership or rights to existing systems.

The plan needs to have a long-term perspective of 50 years; however, it is only practical to consider a 25-year planning horizon relative to supplies, demands, and capital projects. The plan will have to accommodate phased implementation due to funding availability, coordination between water providers, and other considerations. The graphic below illustrates that plan aims for where the region will be in 50 years; plans for where it needs to be in 25 years along that path; identifies the phases to accomplish that plan; and use priorities to determine the phases.



As a VP Study, the solutions developed are planning level concepts and will require additional engineering analysis to verify their feasibility and to substantiate the estimated costs.

Value Methodology

This VP Study used the international standard Value Methodology established by SAVE International®. The Value Methodology (VM) uses a six-phase process executed in a workshop format with a multidisciplinary team. Value is expressed as the relationship between functions and resources where function is measured by the performance requirements of the customer and resources are measured in materials, labor, price, time, etc. required to accomplish that function. VM focuses on improving Value by



identifying the most resource efficient way to reliably accomplish a function that meets the performance expectations of the customer.

With this process, the value team identifies the essential project functions and alternative ways to achieve those functions, and then selects the best solutions for achieving the required functions. These function-based solutions are then combined into value alternative concepts.

Workshop Results

The workshop began with presentations on the existing conditions and the prior analyses that have been performed by the City and SEKID. The presentations were followed by a tour around the Kelowna area to allow the VP Team to see the location of key features of the Kelowna water systems and to give the VP team a better understanding of the physical challenges of delivering water in Kelowna.

Following the presentations and site visit, the VP team analyzed the functional requirements associated with an integrated plan. From this, the VP Team concluded that the mission or higher order function of an integrated water supply plan is to meet the community's water service expectations. To meet these expectations, the plan must accomplish the following basic functions:

- ensure customer equity,
- deliver the volume of water demand,
- protect public health, and
- satisfy the aesthetic expectations for taste, odor, and color.

With an understanding of the basic functions that must be accomplished for a successful integrated plan, the VP team brainstormed to identify possible ways to accomplish those functions. This effort resulted in 124 ideas. The VP Team then selected the best options for accomplishing the required functions. These options were then combined into 10 different Value Alternative concepts that provide the key elements of a function-based solution to achieve a new integrated water supply plan.

Project Cost Basis

Project cost was developed for each of the Value Alternatives. Unit costs were taken from the updated cost estimates provided for the November and December 2016 reports regarding the surface water supply options and the groundwater supply option developed to serve the domestic water quality needs for SEKID. Other costs were taken from the 2012 Kelowna Integrated Water Supply Plan as well as cost developed by the VP Team's cost estimator. All costs were brought to equivalent 2017 values. For consistency, a 15% engineering cost allowance and a 30% design contingency allowance was added to the overall construction cost.



Significant Findings/Project Constraints

During the analysis of the project and development of the Value Alternatives, the VP Team made some significant discoveries and came to some important understandings relative to constraints on possible solutions.

- There are sufficient water supplies to meet Kelowna's city-wide demands for both domestic and agricultural needs into the foreseeable future.
- Currently, the City and various IDs have their own sources of water, with varying water qualities that supply distribution systems with combined flows for domestic and irrigation uses. The lowest cost solution for Kelowna should use source water with a quality most appropriate for the end use.
 - domestic drinking water that requires a minimum amount of treatment to meet regulations
 - water for agricultural purposes that has sufficient supply but would generally require significant treatment for domestic use
- The Kelowna area has numerous pressure zones requiring a significant portion of the water to be pumped to customers. The lowest cost solution should seek to minimize pumping costs.
- Agriculture is vital to the Kelowna economy and it requires as much water on an annual basis as the domestic water usage.

Value Improvement Alternatives

While the alternative concepts developed in this Value Planning study largely parallel the principal concepts in the 2012 Kelowna Integrated Water Supply Plan, there are also some significant changes from the 2012 Plan.

Source Water Quality

The 2012 Plan did not remove the operational boundaries constraint between the various water utilities; therefore, the plan addressed source water quality by adding supplemental water sources to serve specific poor water quality areas.

The concept from the Value Planning study focuses on the city-wide use of the two highest quality water sources, Lake Okanagan and Mission Creek for domestic water and lower quality water from Hydraulic Creek, Scotty Creek, and Kelowna Creek to serve the agricultural needs. This concept minimizes the need for advanced water treatment and ensures that all Kelowna water consumers receive the same quality water.

Source Water Redundancy and Resiliency

The 2012 Plan provides redundant water sources for each water utility by either adding a new source and/or providing a system interconnect with an adjacent water utility service area.



The Value Planning concept is to use the Mission Creek water source to the maximum extent possible to serve all of Kelowna domestic water needs when the water quality meets regulatory standards. This source can serve all of Kelowna's needs for nominally nine months of the year allowing gravity feed instead of pumping from the lake. When Mission Creek does not meet water quality standards, Lake Okanagan water will serve all of Kelowna. This provides the same two water sources for the entire city. Further resiliency is provided with four existing lake intakes and by maintaining the existing wells with interconnection to the city-wide distribution system as a backup source.

Separate Domestic and Agricultural Systems

The 2012 Plan recommended developing separate distribution systems to serve the domestic and agricultural needs. The existing piping system would remain to serve the agricultural needs. The domestic demand is smaller which allows smaller diameter pipes for the new parallel system.

The Value Planning concept is to implement this separation as recommended in the 2012 Plan.

Domestic Transmission System

The 2012 Plan recommended developing a transmission system to deliver the higher quality source water to all parts of the City; however, this was a last phase in the plan.

The Value Planning concept is to develop a transmission system for Mission Creek and Lake Okanagan water as an instrumental part of achieving an integrated water supply plan for the entire city. A significant portion of this new transmission system would be constructed as an initial phase of the plan to allow broader use of Mission Creek and Okanagan Lake water. By doing so, filtration can continue to be deferred until stipulated by a regulatory change.

Agricultural Transmission System

The Value Planning concept is to develop a transmission system for agricultural uses that would maximize use of lower water quality supplies from Kelowna Creek, Scotty Creek, and Hydraulic Creek, with backup supplies from Lake Okanagan, Mission Creek, some higher capacity wells, and interconnects with the domestic system.

Filtration

The 2012 Plan recommended filtration before developing an integrated transmission system. This seems to be a result of not truly integrating the water systems but rather trying to maintain operational boundaries between water utilities.

The Value Planning concept is to use Mission Creek and Lake Okanagan water with UV disinfection and chlorine until water quality regulations dictate the need for filtration. With these high quality sources, the expectation is that filtration may be deferred for most, if not all, of the 25 year planning period. When filtration is required, there would



be a filtration plant built on Mission Creek first with the potential to construct a second plant on one of the lake intakes. To ensure high quality water from the lake, the intakes would be extended to a depth of 35 meters; this should further delay the need to filter the lake sources. With the transmission system in place, the overall system would have filtration redundancy in the future with only two plants; one on Mission Creek and one on the lake.

Table 1-1 includes a complete list of all the Value Alternatives developed. This table shows the number and title of the alternative as well as the estimated construction cost to implement that portion of the plan.

Conclusions

The following are the key changes to the 2012 plan resulting from the Value Planning study.

- The domestic water quality needs in the SEKID area would be resolved by constructing Phase 1 of the new domestic transmission system which would supply Lake Okanagan water to the SEKID service area rather than developing a new groundwater source to service this area. While this has a higher initial capital cost than adding a well, it completes the first phase of the an integrated, city-wide domestic water transmission system, which will not require the use of wells, and it will further delay the need for filtration of the Mission Creek supply. This will substantially reduce the capital cost of filtration and the operational costs for treatment and pumping.
- The 2012 Plan recognized the value of using the highest quality water from Mission Creek and Lake Okanagan to service the domestic water demand. However, the plan allowed the operational boundaries to delay the implementation of this critical component. The Value Planning concept recognizes that the development of a domestic transmission system is pivotal to developing a truly integrated water supply plan that offers the best, lowest cost solution and ensures customer equity relative to water quality and costs. This approach also eliminates the need to construct a storage reservoir and treatment facility for high turbidity flows on Mission Creek. This results in a significant cost savings.
- The Value Planning concept focuses on using Mission Creek to service the entire demand whenever the water quality will allow without going to filtration. When Mission Creek water quality is lower, lake water will serve the city-wide system. The groundwater resources will be held in reserve as a backup in the future.
- The need for filtration is significantly reduced and deferred for many years by having redundant high quality water sources that can serve the entire city.
- The Value Planning concept puts greater focus on creating resiliency and redundancy for the agricultural water demand.

In response to the objective to identify the best, lowest cost solution, these Value Planning concepts offer a plan that can be implemented for approximately \$100 million



less than continuing to implement the 2012 Plan. In addition, the VP concepts substantially reduce operational costs by using the Mission Creek supply for nominally 75% of the year, essentially eliminating all source water pumping cost during this period. This concept, provided there are no significant pathogen-related changes in water quality, or lack of water supplier maintenance of activities necessary for filtration exclusion, should allow continued deferral of filtration until required by a change in the regulations which is another significant operational cost savings.

Most importantly, the concepts from this Value Planning study offer a solution that will ensure every citizen of Kelowna receives domestic water equal to their neighbors and of a quality that meets public health standards.



2017 Kelowna Integrated Water Supply Plan
Summary of Alternatives

Ideas		Cost
Technical Plan		
1	Construct system modifications to ensure the needed domestic water quality improvements for SEKID and irrigation quality improvements for SOMID are addressed as an initial implementation phase of the integrated system	\$ 67,803,000
2	Interconnect distribution systems city-wide to provide a consistent level of service and reliability to all water users	\$ 5,583,000
3	Separate domestic and agricultural water within all distribution systems	\$ 41,902,000
4	Construct a domestic water transmission system that provides redundancy and resiliency for distributing source water to supply the distribution system	\$ 96,126,000
5	Construct an agricultural water transmission system that provides redundancy and resiliency for distributing source water to supply the distribution system	\$ 21,585,000
6	Develop long term strategies and contingency plans for anticipated changes in water supplies and demands	\$ 46,618,000
7	Develop an implementation strategy for future filtration or advanced water treatment requirements	\$ 108,291,000
Implementation		
8	Perform advance work to support further planning and design of an integrated water system	
9	Develop a strategy for funding and allocation of costs that assures customer equity	
10	Develop a change management plan to facilitate the successful implementation of the integrated water supply plan	\$ 6,656,000
Total (does not include No. 6 which is beyond the planning horizon)		\$ 347,946,000