



December 18, 2013

## REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN

# Faulder Well Aquifer Assessment and Water Supply Options Evaluation

**Submitted to:**

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REPORT





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## 1.0 INTRODUCTION

As requested by the Regional District of Okanagan-Similkameen (RDOS or Regional District), Golder Associates Ltd. (Golder) is pleased to provide this report summarizing the results of a hydrogeological assessment conducted for the Faulder Community Water System in Faulder, British Columbia (the Project). Golder prepared and submitted a proposal to complete this work in response to the RDOS Request for Proposal (RFP) entitled "Request for Proposals for the Faulder Well Aquifer Study", issued May 13, 2013. Golder was subsequently awarded the work and a contract was negotiated between RDOS and Golder on August 1, 2013.

As per the RFP, the main objective of the Project is to assist RDOS in securing a sustainable water supply for the Community of Faulder and area.

## 2.0 BACKGROUND

### 2.1 Project Area

The Project Area (Map 1, Appendix A) is located approximately 7 km west of Summerland, BC, and is comprised of the Community of Faulder and surrounding Meadow Valley. Meadow Valley is a generally north-south trending valley, approximately 9 km in length that extends from Garnet Valley (Garnet Lake) in the north to Trout Creek in the south.

The RDOS provides potable water to the Community of Faulder from a single supply well located near the confluence of the east-flowing Trout Creek and south-flowing Darke Creek (Map 2, Appendix A). The well is used to supply domestic water to approximately 78 connections, with an estimated population of 215 residents. The service area boundary extends approximately 2,000 m to the north of the Faulder Well. Residences to the north of the RDOS service area are serviced by private groundwater wells and surface water licenses. Although the Community of Faulder is located within Meadow Valley, for the purpose of this report, the Community of Faulder refers to the area within the RDOS service area, while Meadow Valley refers to the lands to the north of the RDOS service area (Map 3, Appendix A).

The southern-most region of Meadow Valley, north of Faulder, is the site of a historic settlement known as Mineola (Map 3, Appendix A) that was established in about 1916 by a farming community and large sawmill, which closed in 1923. Another notable location within Meadow Valley is Camp Boyle, located at 920 Fish Lake Road, which is a large parcel of land located in the west-central area of Meadow Valley, near the location where Darke Creek enters the valley. This parcel of land is leased by Scouts Canada for camp and outdoor recreation purposes. Potable water for the camp is supplied by a single water supply well on the property (WTN 54551).

### 2.2 Faulder Water Supply Concerns

The Regional District, along with the residents and water users of the Community of Faulder, has expressed concern over the long-term sustainability of the Faulder Well. Irregular and variable recharge of the aquifer has resulted in static (non-pumping) water levels in the well that fluctuate annually from less than 0.5 m (from 2007-2010) up to approximately 9 m (in 2011). This fluctuation in water levels was also noted in a previous investigation conducted by Golder (Golder, 2008b). The fluctuation in static water levels is compounded by the relatively limited available drawdown in the Faulder Well, which has necessitated decreasing the pumping rate



by approximately one half; from roughly 10.1 L/s (160 US gallons per minute [gpm]) in 2008 and 2009 to 3.0 L/s (48 US gpm) at present. It is understood that the reduced capacity of the well has been managed by the Regional District by adjusting/reducing the pumping rate, changing the pumping schedule of the well and implementing water restrictions. An additional concern is the presence of uranium in groundwater supplied by the Faulder Well. Concentrations of uranium exceed the allowable limits of the Guidelines for Canadian Drinking Water Quality. The Regional District has a proposal for a designed system to reduce uranium levels; however, it is understood that an assessment of aquifer sustainability as a condition on grant monies for improvements to the water system are required.

Based on discussions with RDOS, it is understood that there have been operational difficulties with the Faulder Well in recent years. Specifically, there have been periodic problems with gas entrainment in the pumped groundwater, which has caused difficulty in operating the booster station pump. The cause of this gas entrainment is not known, nor has it been investigated by Golder as it was outside of the scope of work for this project; however, RDOS has noted a correlation between periods of gas entrainment and rapid increases in water level in the Faulder Well. It was also reported that a contractor had been unable to complete a down-hole video camera inspection of the well, due to the presence of sediment in the well screen.

In order to address the above-noted concerns, the Regional District requested an assessment of the viability of various options for water supply, including the continued use/reliability of the existing Faulder Well, use of an additional or alternate well (the Gibbs well or a new well(s)), and/or other options not previously considered. Based on input from RDOS, the design flow rate used for the options assessment was assumed to be 10.1 L/s or 160 US gallons per minute (USgpm), which is the original flow rate of the Faulder Well. This flow rate results in a maximum water supply rate of just over 3,600 litres per person per day, based on a population of 215 people, and assuming negligible system losses. This rate is more than sufficient to meet the water use rates reported for the Okanagan Region, which averages 675 liters per person per day and increases to 1,000 liters per person per day in the summer (OBWB, 2013). It is noted that the Okanagan water use values are double to more than triple the Canadian average of 329 litres per person per day. It is noted that if system losses from the Faulder water supply are negligible, the current flow rate of 3.0 L/s, which works out to 1,206 L/person/day, is within the average summer water use reported for the Okanagan.

## 2.3 Previous Work and Established Conceptual Hydrogeological Model

The Faulder Well is completed on the north side of Trout Creek in an aquifer system known locally as the Meadow Valley Aquifer. In the area of the Faulder Well, the Meadow Valley Aquifer is comprised of a shallow unconfined aquifer, and a deeper, semi-confined to confined sand and gravel aquifer. The Faulder Well, and other private wells in the area, are screened within the deeper sand and gravel unit. One of these private wells is the Gibbs Well, which has been considered for acquisition by the Regional District to augment and/or replace the existing Faulder Well.

In the area of the Faulder Well, based on the much larger drainage area of the Trout Creek Watershed (74,645 ha) compared to that of the Darke Creek Watershed (7,766 ha), Trout Creek has historically been considered to be the major source of recharge to the Meadow Valley Aquifer (88%) versus Darke Creek (12%). Discharge to both Trout Creek and Darke Creek is regulated by water control structures. Thirsk Reservoir (on Trout Creek) is operated by the District of Summerland (DOS), while the Darke Lake Reservoir and numerous diversion structures on Darke Creek are operated by the Meadow Valley Irrigation District (MVID).



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

In addition, the presence of a spring, known as the Acland Spring, is located approximately 6 km to the north of Faulder and has been inferred to be a significant discharge source for the aquifer.

The Faulder Well, constructed in 1993, was drilled to a depth of 66.5 m below ground surface (bgs), at which depth bedrock was encountered. The well is screened in the confined to semi-confined portion of the Meadow Valley Aquifer, and the reported static water level at the time of drilling was approximately 47 m bgs. Based on pumping tests completed immediately after the well was drilled, the well yield for the well was determined to be 22.1 L/s (350 US gpm), based on utilizing 70% of the 11.8 m of total available drawdown from the static water level to the top of the well screens (Pacific Hydrology Consultants Ltd. (PHCL), 1993).

The Gibbs Well is located approximately 75 m to the east of the Faulder Well, and on the east side of Trout Creek. The Gibbs Well was constructed in 1992, to a total well depth of 83.5 m bgs, which is deeper than the Faulder Well. It is understood that drilling was terminated at this depth due to difficult drilling conditions (i.e. cobbles and boulders), and that bedrock was not encountered. The reported static water level at the time of drilling in 1992 was 50.1 m bgs, a similar depth as the Faulder Well static water level. The Gibbs well is completed in the same aquifer as the Faulder Well. At the time of drilling in 1992 the well completion report states that “the theoretical capacity of the Gibbs Well is as much as three times the testing rate of 17.04 L/sec (270 USgpm)” (PHCL, 1992). It is understood that a development proposal had previously been assessed by the Regional District for the property on which the Gibbs Well is located, which would see the Gibbs Well providing approximately 11.4 L/sec (181 USgpm) of water for the development. Golder does not know the current status of the development proposal.

The well records for the Faulder and Gibbs wells indicate that neither well was completed with a surface seal, which was consistent with common practice of the time, as the requirement for a surface seal was not in place in BC until the Groundwater Protection Regulation (B.C. Reg. 299/2004) was fully enacted on November 1, 2005.

Over the period from 2003 to 2008, Golder completed several hydrogeological assessments for the Meadow Valley Aquifer (Golder 2003, 2005a, 2005b, 2005c, 2005d, 2008a and 2008b). These investigations were brought about due to the interest in development in the aquifer, and to concerns regarding observed declines in water levels in some wells since the time of drilling. Most notably, Golder completed an investigation for the Regional District (Golder 2008b) to assess declining water levels in the Faulder Well, such that a determination could be made regarding future water supply options for the Community. The work included sampling of water for isotope and age-dating analyses, measurement of water levels and the review of climate data and historical water levels in observation wells. In part, the investigation concluded that:

- Groundwater within the confined aquifer could be classified as “modern”, that is between 5 and 43 years of age, based on the groundwater age-dating analyses;
- The groundwater isotope characteristics indicate winter and spring precipitation play a dominant role in the recharge of the aquifer;
- The distance of the recharge area from the Faulder Well and Gibbs Well ranges from 5 km to 30 km, based on the range of the age-dating results;
- A review of available historical water levels for the Faulder Well and Mearns Well (a nearby private well completed in the same aquifer as the Faulder Well) indicates that recharge to the semi-confined/confined aquifer typically begins in April or May and ends between July and August. However, very minimal recharge



was observed in the spring of 2004, 2007 and 2009. This lack of recharge in 2007 was also observed in MoE Observation Well No. 367, located approximately 4 km to the southeast and completed in the same aquifer as the Faulder Well. Golder is not aware of any other wells in the Okanagan that experience the same periodic lack of recharge noted within the Faulder area wells; and,

- Water levels within Thirsk Reservoir were noted to be lowest in 2003, 2006 and early 2007, when water demands were either high due to decreased precipitation (as seen in 2003) or where the water level within Thirsk was lowered to allow for construction to take place at the Reservoir (as seen in 2006 and part of 2007). At that time, it was inferred that a possible cause for the reduced recharge in the Aquifer in 2007 was a result of lower than normal water levels within Thirsk Reservoir in 2006 and 2007, which in turn impacted the pressure (and subsequently water levels) within the aquifer; however, no water level or discharge data for Thirsk Reservoir was available at the time of the assessment to validate this theory.

Based on available information, it is inferred that the depth of the confined to semi- confined aquifer is deeper than the Gibbs Well (83.5 m bgs). Previously, Golder recommended that the Regional District explore the option of drilling a new water supply well farther to the east of the Faulder Well and the Gibbs Well. The benefit to constructing a new well would be the potential for increased well depth, resulting in an increased total available drawdown, and in turn, the capacity to tolerate larger annual fluctuations in water levels without reduction in sustainable yield.

### 3.0 SCOPE OF WORK AND METHODS

The scope of work for the project developed by Golder was based on the requirements of the RFP, and consisted of the following six tasks. It is noted that Golder's proposed scope of work included stochastic water balance modelling; however, as discussed later in the results section, this task was not completed due to data gaps identified during the course of the project.

#### Task 1. Health & Safety and Project Management

A site-specific health and safety plan (SS-HASP) was developed for the Project, which described control measures for identified hazards associated with the field work portion of the proposed work. This plan was implemented and updated as necessary to reflect the hazards related to the actual working conditions. Project management was ongoing throughout the Project.

#### Task 2. Project Initiation Meeting with the Regional District in Penticton

Consultation with the Regional District was an important factor for the success of this Project. Thus, a Project Initiation meeting was held between the Regional District and the Golder Project Team on August 21, 2013. Key topics for the Project Initiation Meeting included:

- introduction of key personnel;
- updates of new key information since our last work in the area in 2008;
- identification of any new concerns and issues pertaining to the water supply;
- discussion of additional relevant information and reports from the Regional District to be used for the Project;



- confirming the proposed work schedule and identifying dates for future meetings;
- clarification of the Regional District's expectations regarding public engagement; and,
- collection of names and contact information for sources of data;

The key points from the Project Initiation Meeting have been summarized and are presented in Appendix B.

### Task 3. Literature and Site Review

Golder performed a literature review of existing information in files from previous projects, from sources identified during the initiation meeting, and of any new information (post-2008) from provincial ministry resources. The sources used consisted of the following:

- Mapping/GIS
  - Geology and Wells (MoE and Natural Resources Canada)
  - LIDAR/ Elevation (DOS, MoE)
  - Land Use and Legal Lots (DOS and RDOS)
  - Water bodies and Streams (MoE)
  - Ortho-image (Bing Maps, Google Earth)
- Hydrometric and Climate (Environment Canada)
- Groundwater Levels (RDOS, MoE well records, historic reports)
- Water Chemistry (RDOS, historic reports)
- Interviews (Residents, DOS, MVID)

### Task 4. Refine Existing Hydrological/ Hydrogeological Model

Data from the information review was used to update Golder's existing hydrological/ hydrogeological conceptual model for the area. In addition, Golder conducted a targeted field investigation in order to fill previously identified data gaps. A detailed description of each of these sub-tasks is provided below.

The items included under this task fulfil the objectives outlined in the RFP; specifically, assessing the recharge areas, aquifer sustainability, groundwater/ surface water interaction, and identification of any changes in water inputs (precipitation, surface water, or groundwater recharge).

#### Task 4a. Field Program

Golder conducted a field program consisting of the following:

- a geodetic survey of five wells in the Faulder area, including the Faulder Well, Gibb's Well and Mearn's Well, and of two private wells and two springs (including Acland Spring) in the Meadow Valley area;
- a geodetic survey of stream sections for monitoring of discharge and water levels in Trout Creek and Darke Creek;





- one time flow monitoring at two locations along Trout Creek; at six locations along Darke Creek; and at two locations on Acland Creek, downstream of the source of the spring, to assess discharge of, and recharge to, groundwater; and,
- collection and analysis of water quality samples from three wells, two springs and five surface water samples (three from Trout Creek and two from Darke Creek); for geochemical interpretation, to further assess the proportional recharge contributions of Trout Creek and Darke Creek to the Meadow Valley Aquifer, and to assess the concentrations of uranium in the various recharge sources.

### Task 4b. Construct 3D GIS Model and Cross Sections

Golder used the available topographic, stratigraphic, hydraulic, and borehole data available for the Community of Faulder and up-gradient recharge areas to construct a three-dimensional computer model using two commercially available Geographic Information System (GIS) software packages, EnviroInsight by HydroAnalysis Inc. and ArcMap by ESRI. Golder used the 3D model to gain a more in-depth understanding of the subsurface conditions, including drafting of cross sections, and an assessment recharge areas, bedrock boundaries and flow divides, and to assist in identifying potential target areas for the potential future drilling of a Test Well. As part of this, a Digital Elevation Model (DEM) was constructed for the Project Area using the following sources of elevation data:

- 1 m interval LiDAR data from 2102 provided by the District of Summerland;
- 20 m interval Canvec contours collected in 1985; and,
- 100 ft interval Canvec contours collected in 1976.

Golder has provided the electronic GIS data files comprising the 3D model in Appendix C for the Regional District's future use.

### Task 5. Meeting with the Regional District to Review Results

On November 6, 2013, Golder met with the Regional District to present the results of the analyses conducted and review the water supply options identified. The meeting included a review of Golder's preliminary rankings of the water supply options identified, and input from the Regional District on the various options.

### Task 6. Reporting

This technical report incorporates comments from the consultation meetings and addresses the questions regarding the fluctuation of the Faulder Well water levels in 2011, the reliability of the Faulder Well and the suitability to pursue the option of drilling a new well or acquiring the Gibbs Well. Recommendations regarding securing a sustainable water supply for the Faulder area, and implementation of a long-term monitoring plan are included.



### 4.0 RESULTS

The results of Golder's assessment are presented in the following. Section 4.1 outlines the details of the refined conceptual hydrological/hydrogeological model, which was used to assess the most significant factors controlling groundwater availability in the Meadow Valley Aquifer. This information was used to support Golder's assessment of the long-term sustainability of the various water supply options identified for the Community of Faulder, which is presented in Section 4.2.

The large amount of data used in the development of the conceptual model has been synthesized into various figures, which are presented within the report text wherever possible. However, for readability, several key large-format figures, including all of the cross sections, have been compiled into an appendix (Appendix D). The figures in Appendix D have been numbered sequentially in the order they appear in the text, and are labelled D1 through D7.

### 4.1 Hydrological/Hydrogeological

#### 4.1.1 Bedrock and Surficial Geology

According to the most recent bedrock geological mapping available for the area (Okulitch, 2013), the majority of the Darke Creek and Trout Creek Watersheds, including the immediate Faulder area, is comprised mainly of Early Jurassic age rocks of the Bromley Batholith (granodiorite, hornblende, biotite, marginal diorite, quartz gabbro and garnet skarn), and the upper Darke Creek watershed, including Darke Lake is underlain by Early Cretaceous age granodiorite of the Kathleen Mountain Pluton (Figure 1).

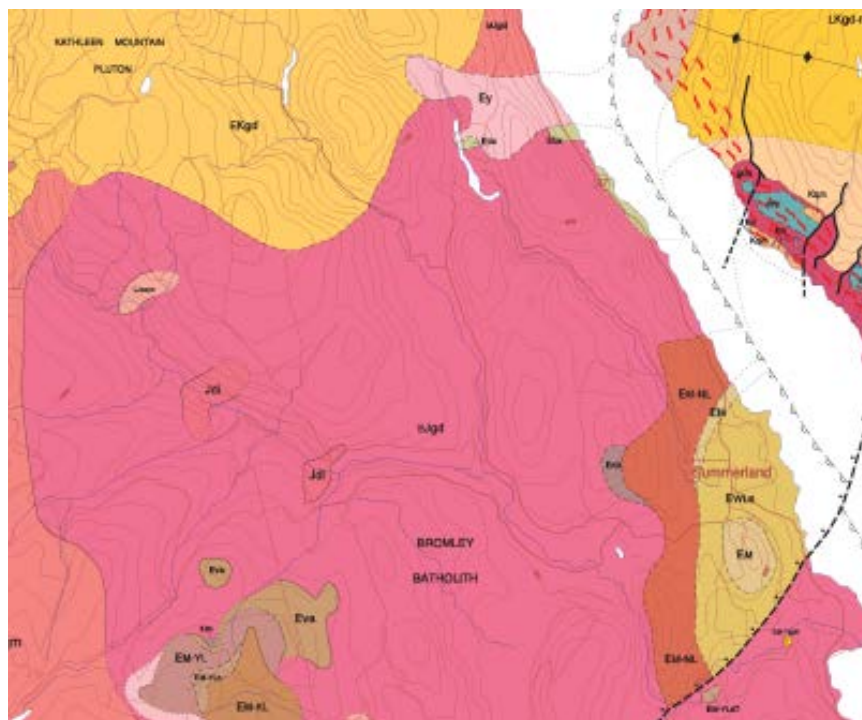


Figure 1: Bedrock geology in Summerland-Faulder area (from Okulitch, 2013).



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

It has been inferred that uranium present in groundwater and surface water in the Darke Creek/Summerland areas of the BC Interior is derived from the intrusive rock types present in the area (B.C. Ministry of Energy, Mines and Petroleum Resources, 1980), and it has been understood for quite some time that elevated concentrations of uranium in groundwater and surface water exist throughout the Faulder-Summerland area. It is reported that several uranium claims were explored in the Faulder area in the late 1970's (Culbert, 1977).

The most exhaustive research and mapping of the surficial geology of this area undertaken to date was by Nasmith in 1962 (Figure 2). The surficial sediments were deposited in sequence as the last glacial ice retreated from the Darke Creek and Trout Creek Valleys. It is postulated that the north/south trending valley south of Faulder and Trout Creek once carried meltwater from a large ice lobe that filled the Darke Creek and Trout Creek areas up to the present day location of the Community of Faulder. As the ice melted, the presence of stagnant blocks of ice resulted in kettled topography comprised of discontinuous deposits of glacial till, interspersed with glacial outwash deposited by flowing water. It is within these semi-confined glacial outwash deposits that the Faulder Well and Gibbs Well are inferred to be completed, as shown on Cross Section AA' (Figure D1), which passes through the intersection of the Darke Creek and Trout Creek Valleys at an oblique angle, as shown on the Key Plan (Map 2, Appendix A).

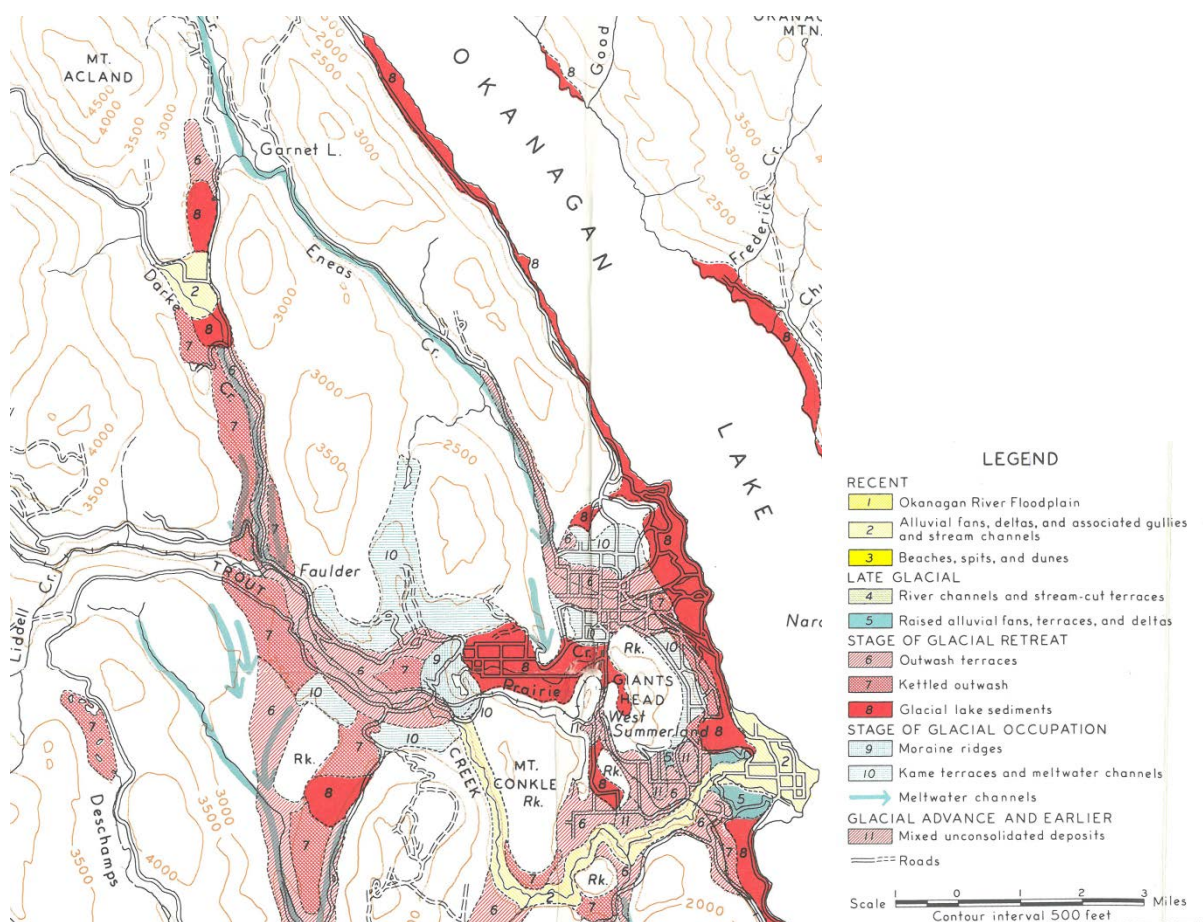


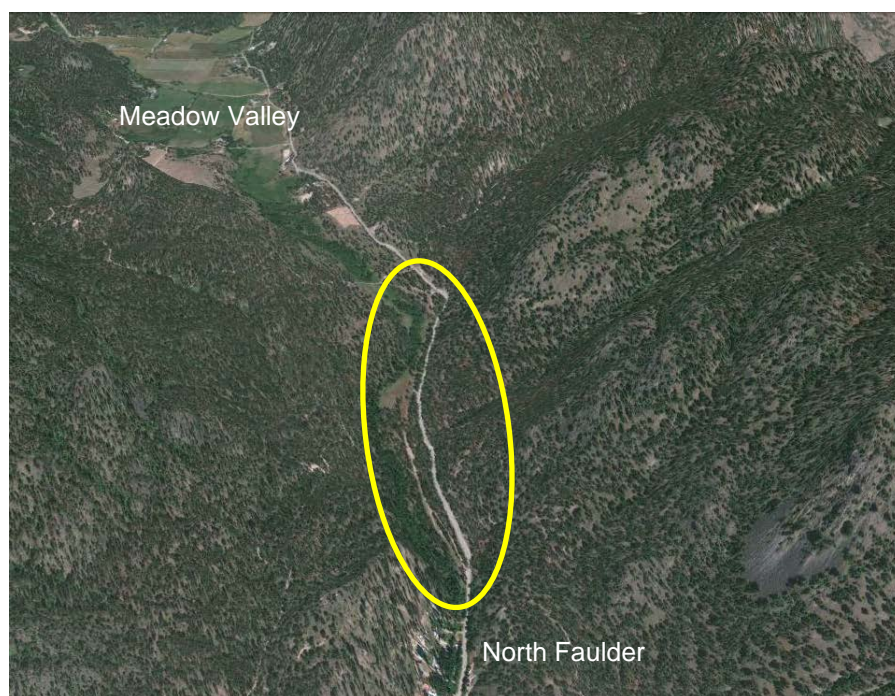
Figure 2: Surficial Geology of Summerland-Faulder Area (from Nasmith, 1962).





## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

Cross Section BB' (Figure D2), which crosses Darke Creek Valley from west to east at a location further to the north, shows the variability in thickness and discontinuous nature of the till aquitard. Based on Cross Section CC' (Figure 3), which runs along the length of the valley (and Darke Creek) from north to south, it is inferred that the aquitard pinches out north of 104 Fish Lake Road; thus, the aquifer in this area would be considered unconfined. It is also noted that the depth to bedrock is significantly less in the northern area of Faulder. There is no subsurface information available between the north end of Faulder, and the southernmost end of Meadow Valley; however, based on the shallow depth to bedrock at the southern end of Cross Section DD' (Figure D4), it is inferred that the depth to bedrock is generally shallow along the stretch of the Darke Creek valley between Meadow Valley and Faulder (an area hereafter referred to as "South Meadow Valley"). Furthermore, a Google Earth image of South Meadow Valley viewed from the north end of Faulder (Figure 3) shows a narrowing of the valley in this area, which would further reduce the flow of groundwater in this region.



*Figure 3: Google Earth image of North Faulder and Meadow Valley showing area of inferred flow restriction.*

The southern-most region of Meadow Valley, north of Faulder, is the site of a historic settlement known as Mineola (Map 3, Appendix A). Despite the shallow depth to bedrock reported in some water well records at the southern end of Meadow Valley and northern end of Faulder, there is some evidence supporting groundwater resource potential in the area of Mineola, as follows:

- There is anecdotal evidence that at least one well was present in the settlement of Mineola;
- There is anecdotal evidence for surface water infiltration into the subsurface in the area of Mineola, most notably with verbal accounts of a "whirlpool" where Darke Creek "disappeared into the ground"; and,
- Golder observed farming of what appeared to be fruit bushes at a property located in this area, and based on the lack of an existing surface water license for the property, it is inferred that domestic and irrigation



water for the property may be supplied by groundwater. However, no well record for this property was found in Golder's recent search of the MoE wells database.

Topographic mapping from GeoBC shows that, in the area of Mineola there is a widening of the Darke Creek valley, and another stream valley enters from the east. It is possible that there is an alluvial fan aquifer present in the area of Mineola that is associated with this smaller stream entering the valley from the east.

The surficial geology of North Meadow Valley shown in Figure 2 indicates that the most recent deposits are the alluvial sands and gravels associated with Darke Creek, the most significant of which form the alluvial fan where the Darke Creek canyon opens into Meadow Valley, shown on the left (west) side of Cross Section EE' (Figure D5). To the south, it is inferred that Darke Creek has eroded into the deposits of fine-grained glacial lake sediments, and the kettled outwash deposits shown on Figure 2 and deposited more permeable sands and gravels beneath the existing, and any abandoned, stream channels that may exist. To the north, it is inferred that glacial lake sediments form an aquitard that confines the sands and gravels associated with a pre-glacial stream, through which groundwater discharges at Acland Spring, as shown on Cross Section FF' (Figure D6).

### 4.1.2 Hydrometric

The Trout Creek watershed, which includes the Darke Creek sub-basin, is an important source of water supply for a large number of users, the two largest of which are the District of Summerland (DOS) and the Meadow Valley Irrigation District (MVID). As a result, a number of control structures are present in each of these watersheds, and flow in these streams is strongly influenced by storage and diversion. Despite this, there is a surprising lack of discharge data available for the reservoirs and streams in the watershed. Golder requested stream flow and reservoir data from both the DOS and MVID; however, no data was provided.

Golder was informed by a representative of the MVID that it does not keep formal records of the reservoir levels and discharges from the Darke Lake reservoir, and that the diversion structures on Darke Creek are not set up to record discharge. It was reported that typically, flows in Darke Creek peak around the long weekend in May, and the Darke Lake reservoir usually fills to capacity by the beginning of June. The MVID usually discharges from reservoir storage from the end of June until about the middle of September. It is understood that flow is apportioned to users on a percentage basis; however, based on observations by Golder during flow monitoring in the field, it appears that there is limited ability to control the amount of flow at the diversion structures, as shown in Figure 4. Moving clockwise from top the top left the locations are a) Darke Creek Section 4, near Osborne Rd.; b) 852 Fish Lake Rd.; c) intersection of Cottonwood Rd. and Relkey Road; and d) Darke Creek Section 7, also at intersection of Cottonwood Rd. and Relkey Road. The general locations of these diversion structures are shown on Map 2 and Map 3.

It is noted that during the field investigation, the presence of fish was observed by the Golder field crew and RDOS representative at Darke Creek Section 6 (bridge at Camp Boyle), and at the irrigation intake on Acland Creek immediately upstream of Acland Creek Section 1.





## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION



Figure 4: Examples of diversion structures on Darke Creek.

A representative from DOS indicated that regular checks are made on all of the District's reservoirs, and levels are recorded on the inspection sheets if a measurement gauge is in place; however, there is no method of recording discharge at any of the diversions, and the data is not easily searchable, as it is currently only available in paper format. An effort is being made to compile the data electronically; however, due to the size of the task, it was not finished in time for Golder to use for this assessment.

Therefore, the only available hydrometric data for Trout Creek and Darke Creek is from various Environment Canada hydrometric stations which have been monitored in the past, and some flow monitoring conducted in the lower reaches of Trout Creek downstream of the DOS intake for assessment of aquatic ecosystem flow requirements.

The locations of the Environment Canada stations for which Golder obtained data are shown on Map 1 (Appendix A). Note that the location of station 08NM055 shown on the map is based on the coordinates provided by Environment Canada; however, neither the name of the station "Summerland Diversion", nor the volume of discharge reported are consistent with the location as shown (immediately east of Faulder). Therefore, it is inferred that the location of 08NM055 was actually located near one of the diversion structures near Summerland.

The discharge data from the Environment Canada hydrometric stations is presented in Figure 5 and Figure 6 for Darke Creek and Trout Creek, respectively (Environment Canada, 2013). The flow data from downstream of the DOS intake was not examined because in order to correlate water levels in Trout Creek at Faulder, the consumption data from DOS would have had to be considered, which was not possible due to time and budget constraints.



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

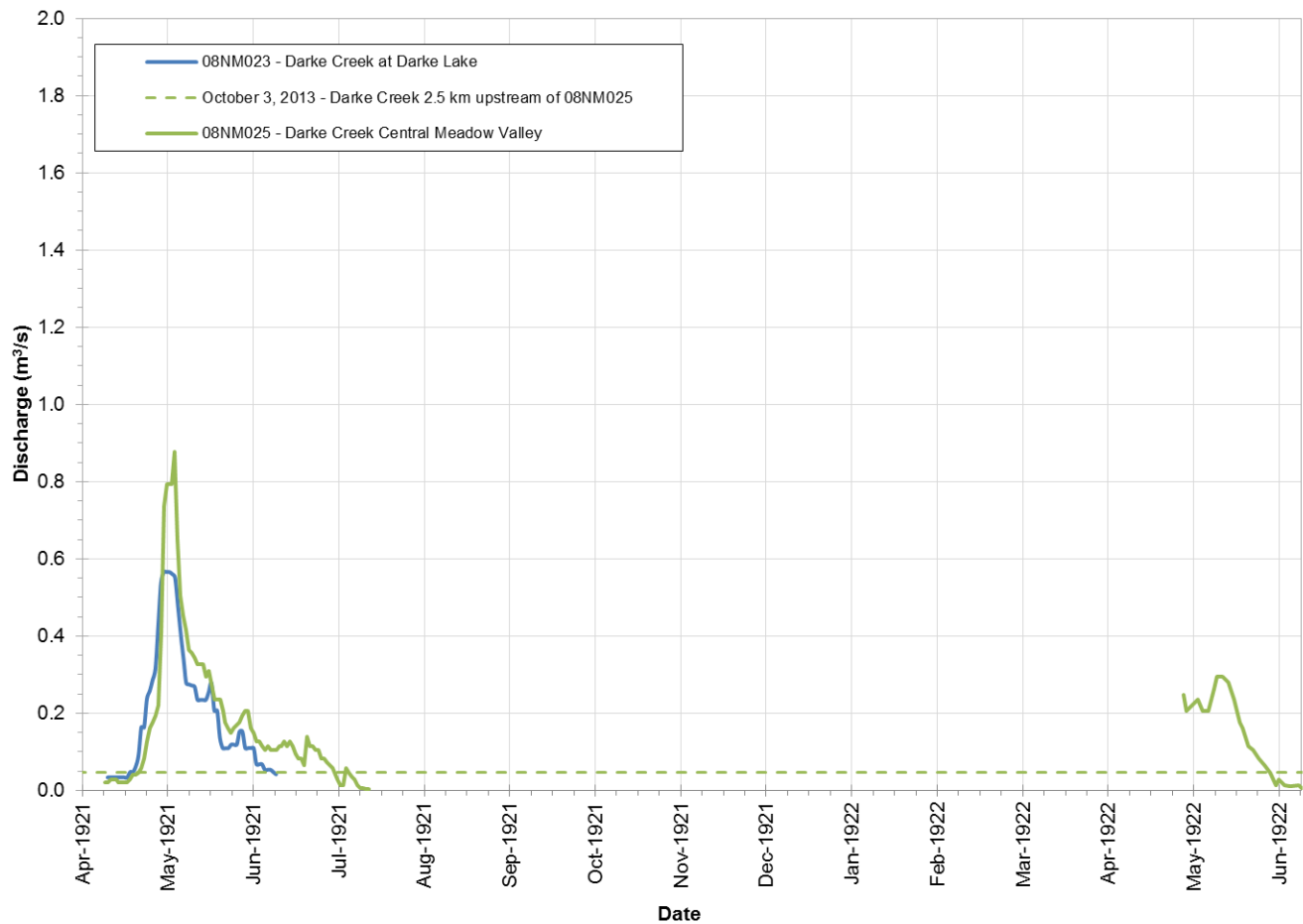


Figure 5: Available discharge data for hydrometric stations on Darke Creek (1921-1922).



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

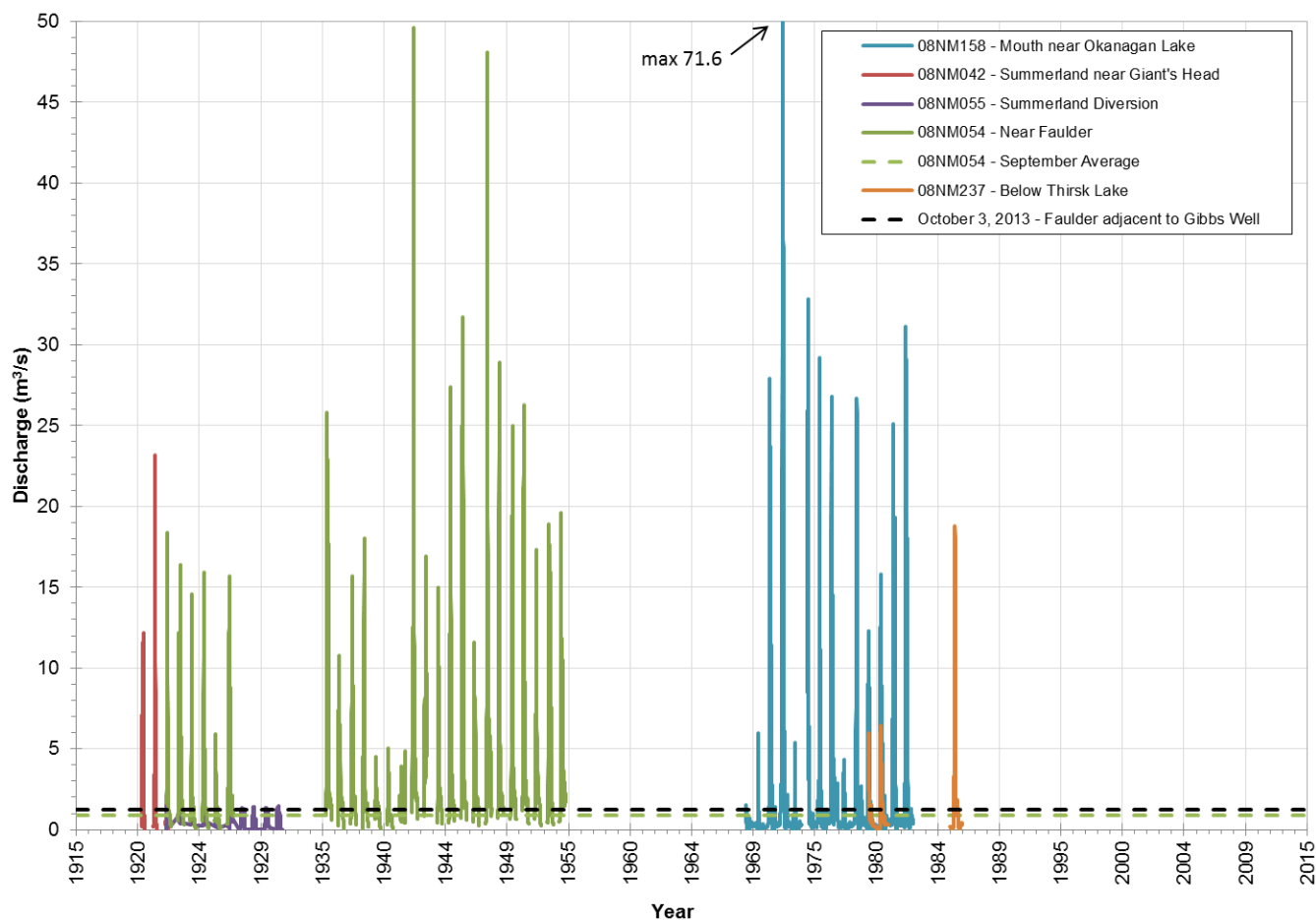


Figure 6: Available discharge data for Trout Creek hydrometric stations (1920-1986).

Review of the hydrometric data indicates that peak discharge for both Trout Creek and Darke Creek typically occurs in late May or early June of each year. It is apparent that the peak discharge from Darke Creek is significantly less than that of Trout Creek, and that peak discharge in Trout Creek is highly variable. Flow rates measured by Golder for this study were consistent with those reported by Environment Canada for non-peak flow periods.

Results of stream discharge monitoring conducted by Golder on October 3, 2013 are presented in Table 1 for Trout Creek, Table 2 for Darke Creek, and Table 3 for Acland Creek. The locations of the discharge monitoring points are shown on Map 2 and Map 3. Stream profiles for the Trout Creek stream sections are provided on Figure 7 and Figure 8. The majority of the Darke Creek discharge monitoring locations were channels or structures with simple geometry and no profiles were plotted; however, Figure 9 shows the stream profile for Darke Creek Section 6, located on the south side of the bridge at Camp Boyle (920 Fish Lake Road). Figure 10 shows the profile of Acland Creek Section 2, located near the mouth of the spring.



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

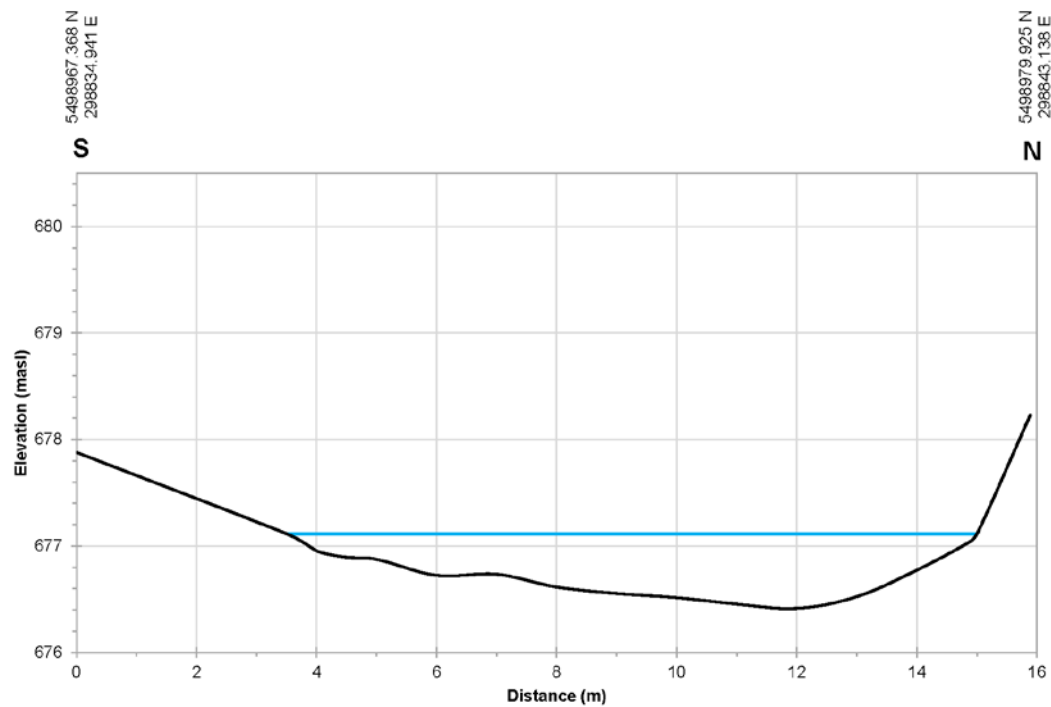


Figure 7: Stream profile of Trout Creek Section 2, located upstream of Faulder Well.

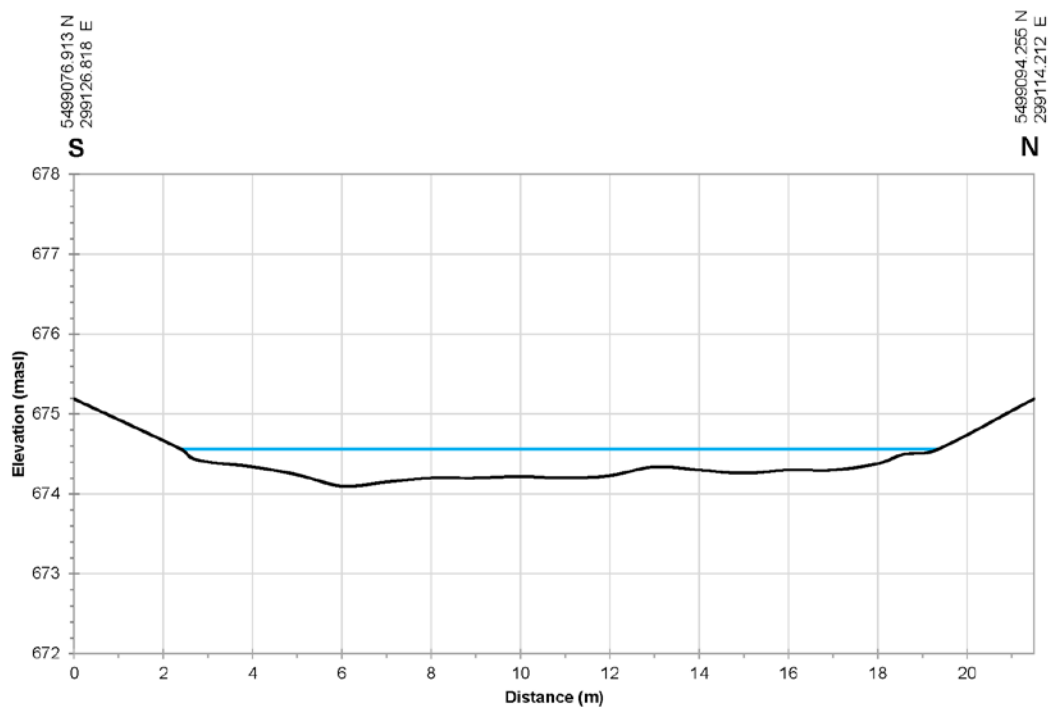


Figure 8: Stream profile of Trout Creek Section 1, located adjacent to Gibbs Well



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

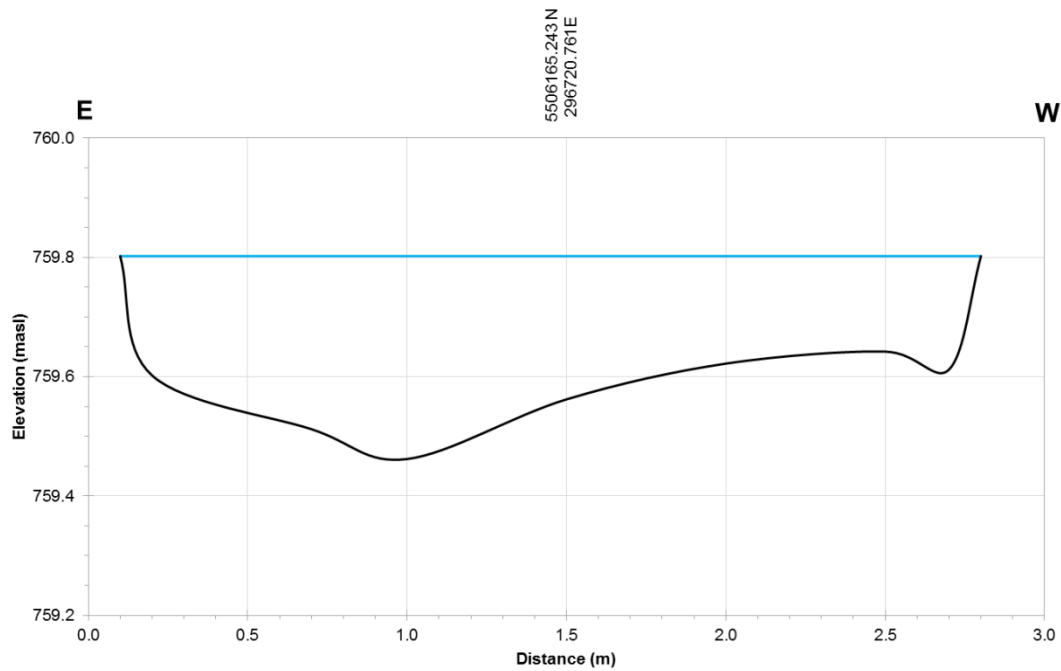


Figure 9: Stream profile of Darke Creek Section 6, located on the south side of the bridge at Camp Boyle.

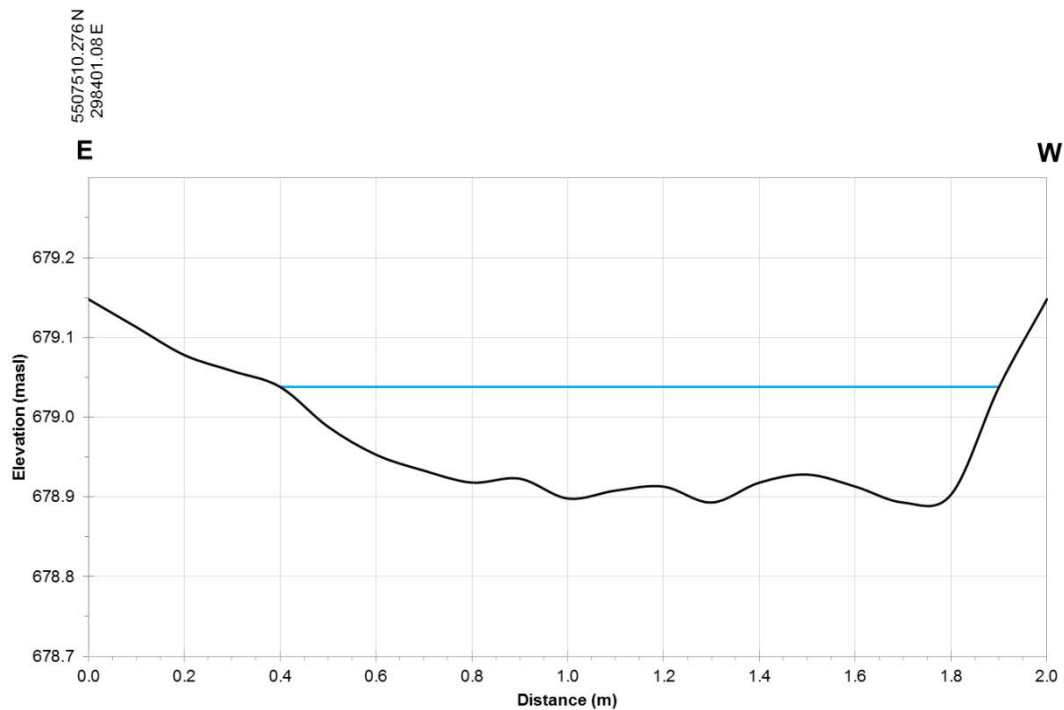


Figure 10: Stream profile of Acland Creek Section 2, near mouth of spring.





Results indicate that at the time of measurement, Trout Creek was losing water at a rate of approximately  $0.64 \text{ m}^3/\text{s}$  ( $55,296 \text{ m}^3/\text{d}$ ) as it passed across the south end of Faulder. It is inferred that these surface water losses recharge the unconfined sands and gravels associated with Trout Creek. The relatively thick aquitard overlying the Faulder and Gibb's Wells is inferred to limit recharge from Trout Creek to the semi-confined aquifer in the immediate area of these wells; however, due to the inferred discontinuity of the aquitard, it is possible that recharge from Trout Creek does contribute some groundwater to the semi-confined portion of the Meadow Valley Aquifer.

Discharge in Darke Creek decreased by approximately  $0.012 \text{ m}^3/\text{s}$  ( $1,037 \text{ m}^3/\text{d}$ ) as the stream passed over the alluvial fan sediments downstream of the bedrock canyon at Section 4 (near Osborne Rd.) to Section 6 at Camp Boyle. Greater losses were measured between Section 6 and the next downstream monitoring point, Section 7 (at the intersection of Cottonwood Rd. and Relkey Rd.); however, at the end of the field day it was observed that one field was being flood irrigated at that time. Based on discussion with one of the residents of Meadow Valley, the diversion from which the flood water was obtained typically diverts 9% of the stream flow. Therefore, the measured decrease in discharge over this section is inferred to over-represent actual stream losses. Discharge measurements in Darke Creek as it passed through the southern portion of Meadow Valley to the north end of Faulder showed only a very slight increase; which may represent additional flux from small tributary streams; however, it is inferred that these were within the range of measurement error. Additional losses from Darke Creek of  $0.017 \text{ m}^3/\text{s}$  ( $1,469 \text{ m}^3/\text{d}$ ) were measured at the north end of Faulder between Section 3 at 190 Fish Lake Road and Section 1, near 7 Agur Court. Based on this measured loss, along with groundwater gradients in the area (discussed in the section below), it can be inferred that this area at the north end of Faulder is an important recharge zone for the semi-confined aquifer beneath the Community of Faulder. The inferred approximate extent of the recharge zone is shown in plan view on Map 2 (Appendix A) and in cross section on Figure D3.

The discharge measured near the mouth of Acland Spring was  $0.018 \text{ m}^3/\text{s}$  or 285 US gpm, was similar to that previously reported by Golder (2008b), which was based on anecdotal information.

### 4.1.3 Groundwater Levels

To examine the fluctuations in groundwater levels in the aquifer, Golder compiled available groundwater level and pumping rate information for the Faulder Well (Figure D7). It is noted that in the summer of 2007 RDOS switched from recording water levels with a pressure transducer to taking manual water levels using a water level tape. Water level plots from previous reports (Golder 2008a and 2008b) showed an artificial difference in water level elevation between these two sets of measurements, with the elevation readings calculated from the transducer data for the beginning of June 2007<sup>1</sup> being approximately 3 m lower than those calculated from the manual measurements during the period between May 23 and June 13, 2007<sup>2</sup>. For the purposes of this report, Golder corrected the pressure transducer set of data by shifting it up by 3.024 m.

<sup>1</sup> The previously reported groundwater elevation calculated from pressure transducer data between June 1 and 8, 2007 was approximately 623.61 masl.

<sup>2</sup> The reported groundwater elevation calculated from manual data was 626.69 masl on May 23, 2007 and 626.62 masl on June 13, 2007.



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

The water level plot shows that there is a relatively large variation in static water levels, as follows:

- No detectable recharge noted in the years 2007 and 2009;
- Approximately 2 m of recharge in 2008, 2009 and 2012; and,
- Approximately 8 to 9 m of recharge in 2011 and 2013.

It is noted that the peak water level at the Faulder Well may not have been recorded in 2012, as no measurements were taken between July 27 and September 28, and peak levels were recorded in 2011 and 2013 on August 19 and September 6, respectively.

Water level fluctuations in the other Faulder area wells (Mearns and Gibbs) show the same pattern and degree of fluctuation. Although the same general pattern of water level fluctuations is observed at the MoE observation wells located approximately 4 km to the southeast and downgradient of Faulder, the amplitude of the effect is subdued, with a maximum observed annual fluctuation of approximately 3 m (not taking into account the brief period of what is inferred to be pumping of the DOS supply wells in late 2006).

The pumping water level in the Faulder Well shows that in periods of low aquifer levels, the pumping water level is within 1 m of the intake and top of the well screen. This has necessitated in decreasing the pumping rate of the well to less than one-third of the original rate (Figure D7). The Gibbs Well, however, has a much greater available drawdown, with 33 m of available drawdown still available at the conclusion of a 96 hr pumping test conducted at a rate of 12.6 L/s (200 USgpm) in summer of 2005. Assuming that the specific capacity of the Gibbs Well has not declined since the time of testing, if the pumping water level in the Gibbs Well when operating at 12.6 L/s (200 USgpm) was projected to the period with the historically lowest recorded static water level (the summer of 2010), the well would have had more than sufficient drawdown to operate at that rate.

Groundwater levels were measured at several wells during the field program conducted by Golder in September and October 2013. A summary of the well completion data (if available) and water levels is provided in Table 4. The field data was supplemented by historical water level data from well records to construct a groundwater flow map for Faulder and Meadow Valley (Figure 11). The inferred direction of groundwater flow is indicated by the black arrows. For comparison, measured surface water elevations are also shown on the map.

Based on the inferred groundwater contours, groundwater flows radially in the alluvial fan materials where the canyon of Darke Creek enters the wider Meadow Valley. From there, some groundwater flows north and discharges at Acland Spring due the strong gradient provided by the change in topography. There is a groundwater divide in the central area of Meadow Valley, as shown by the dashed red line on Figure 11, where a portion of the groundwater is inferred to flow south, towards Faulder. Due to the inferred presence of the previously described “flow restriction” area, which is circled in yellow on Figure 11, it is inferred that the flux of groundwater between Meadow Valley and Faulder is limited, and controlled by groundwater levels in the unconfined aquifer in the Meadow Valley area. Moving further south, there is a relatively steep groundwater gradient at the north end of Faulder, which is consistent with the inference that this is a groundwater recharge area. Groundwater then flows south through into the semi-confined portion of the aquifer, until it reaches the intersection with Trout Creek Valley. From there it is inferred that the majority of groundwater flow follows the Trout Creek Valley to the southeast.



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

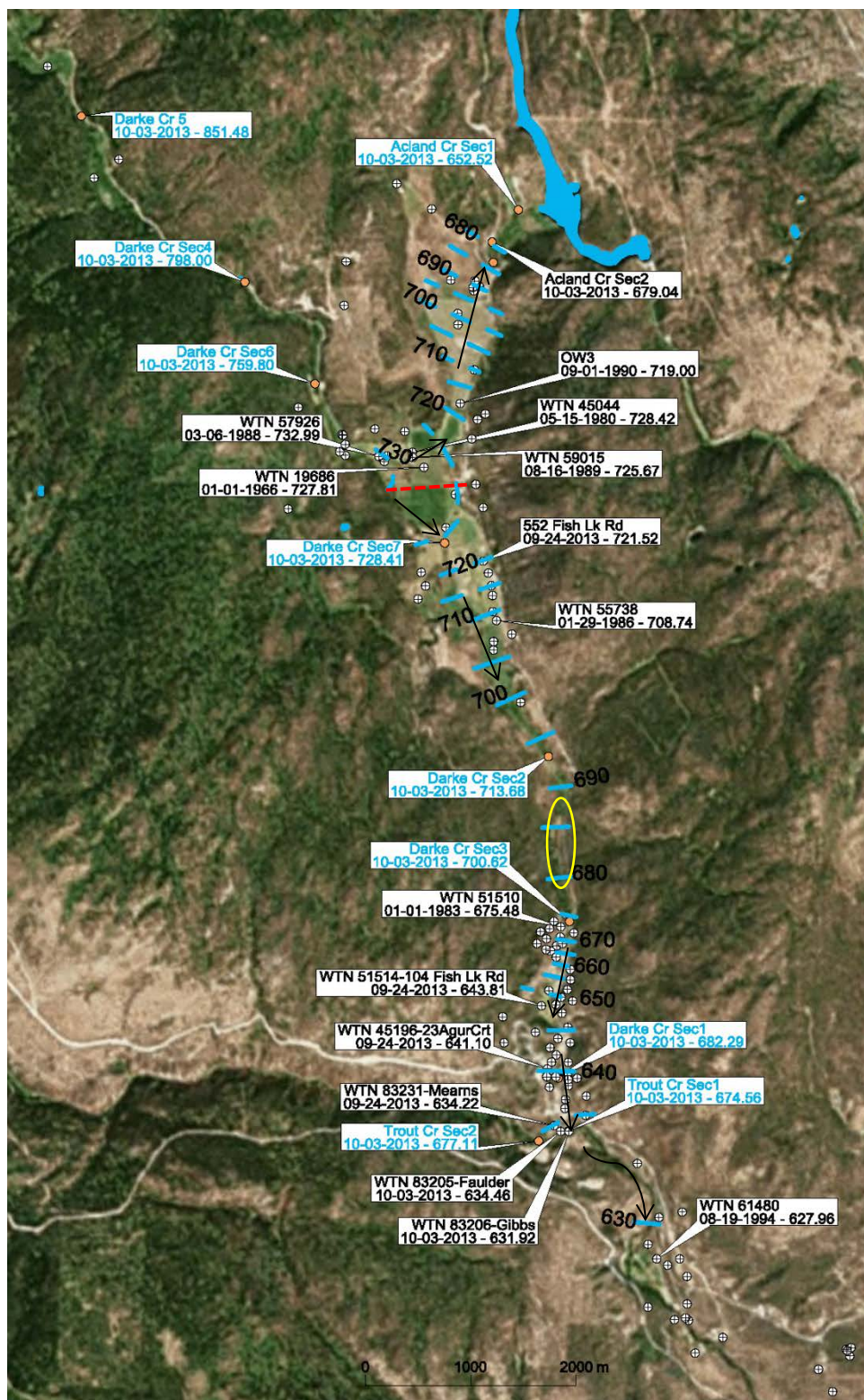


Figure 11: Inferred groundwater flow map for Faulder and Meadow Valley.



### 4.1.4 Precipitation

In order to investigate the correlation between static water levels in the Meadow Valley Aquifer wells and recharge of precipitation, Golder conducted a statistical analysis of the available precipitation data for the nearest two climate stations, Summerland, located at an elevation of 454 metres above mean sea level (masl), and Jellicoe, located at 9229 masl (Map 1, Appendix A). The elevation of Faulder, at approximately 680 masl, is between that of these two climate stations.

The daily and monthly total precipitation for the available period of record is shown for Summerland in Figure 12 and for Jellicoe in Figure 13.

Based on these figures, it is evident that there was a general period of drier conditions from around 1998 to 2003 and again from 2006-2009. Conversely, the period from 2010-2013 has generally been wetter.

To assess the seasonal trends in precipitation, a series of boxplots showing the min, max and quartile (25%, 50% and 75%) of precipitation for each month of the year, were constructed for the period of climate record. These plots are shown on Figure 14 for Summerland and Figure 15 for Jellicoe. These figures also show the monthly precipitation for the recent years with available groundwater levels in the Meadow Valley aquifer and are colour coded according to relative amount of observed recharge in the wells, with green being the highest, orange being moderate and yellow being the lowest.





## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

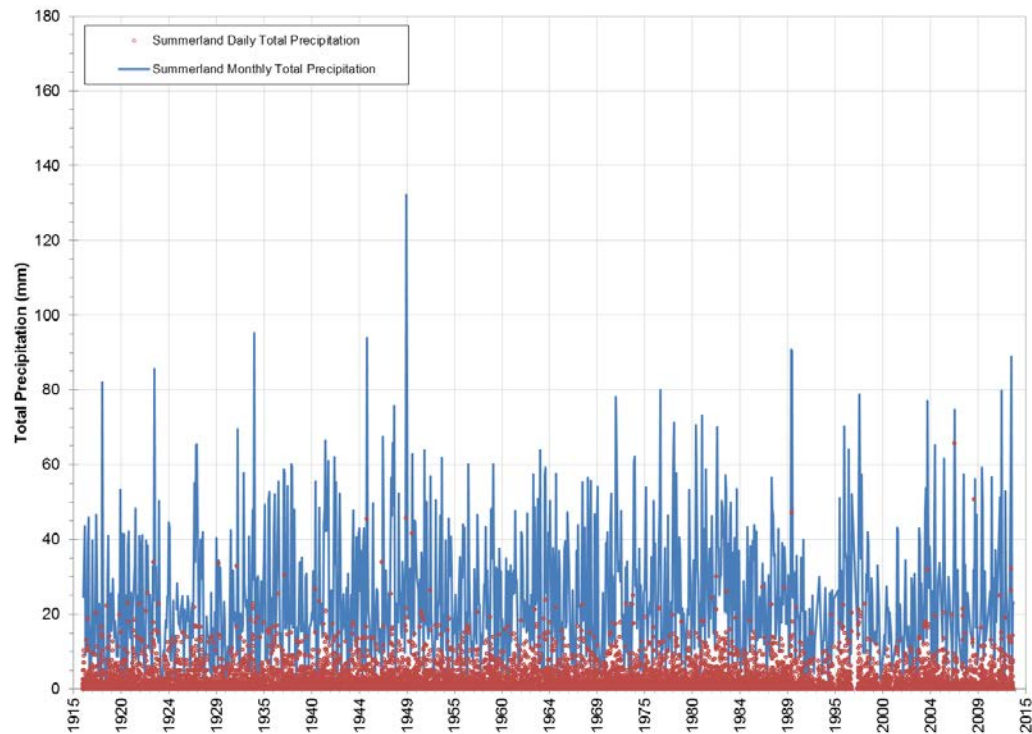


Figure 12: Daily and monthly total precipitation measurements at Summerland for the period of record (1915-2013).

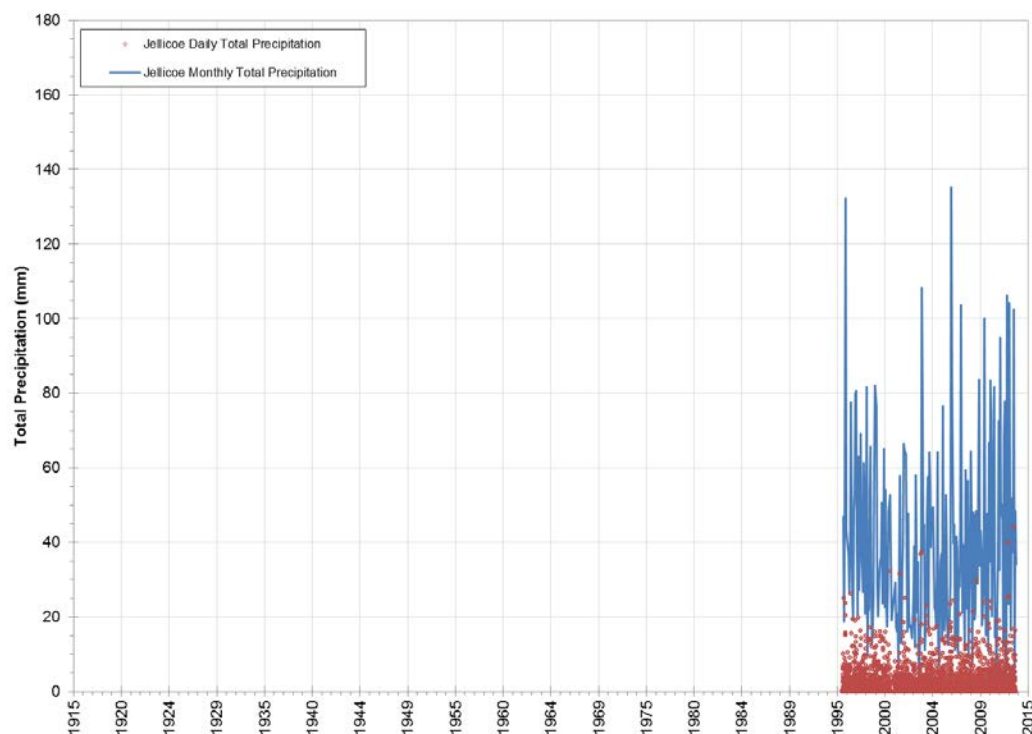


Figure 13: Daily and monthly total precipitation measurements at Jellicoe for the period of record (1995-2013).





## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

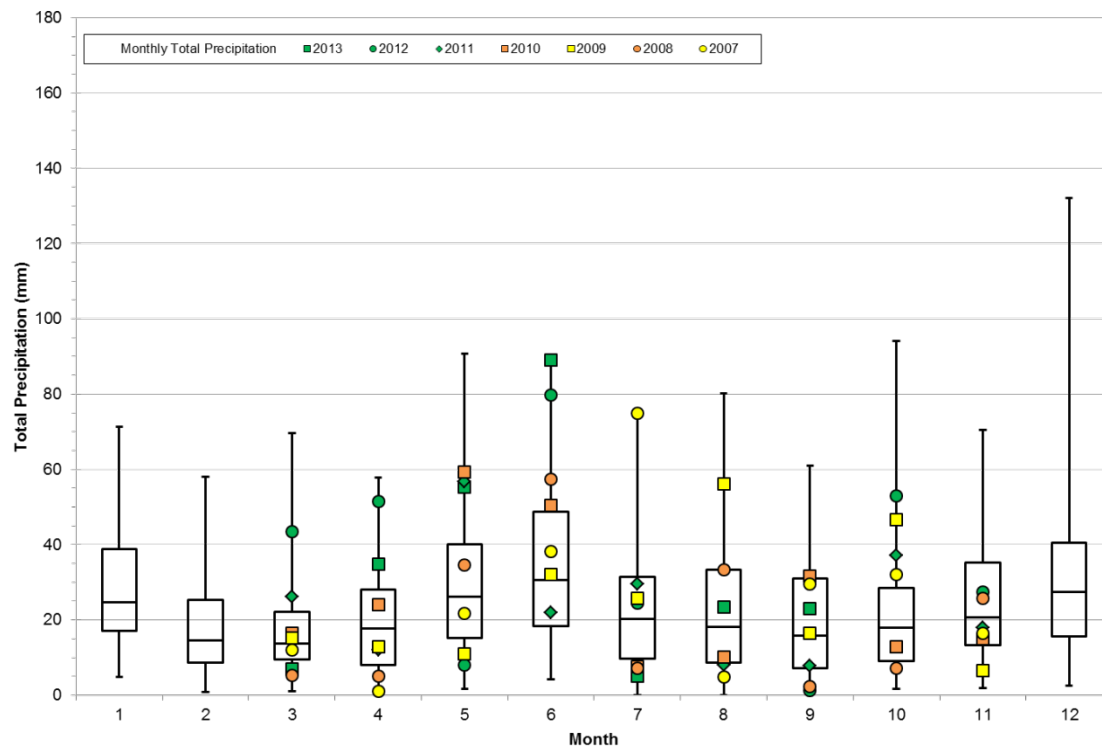


Figure 14: Monthly distribution of total precipitation at Summerland climate station, with key years highlighted.

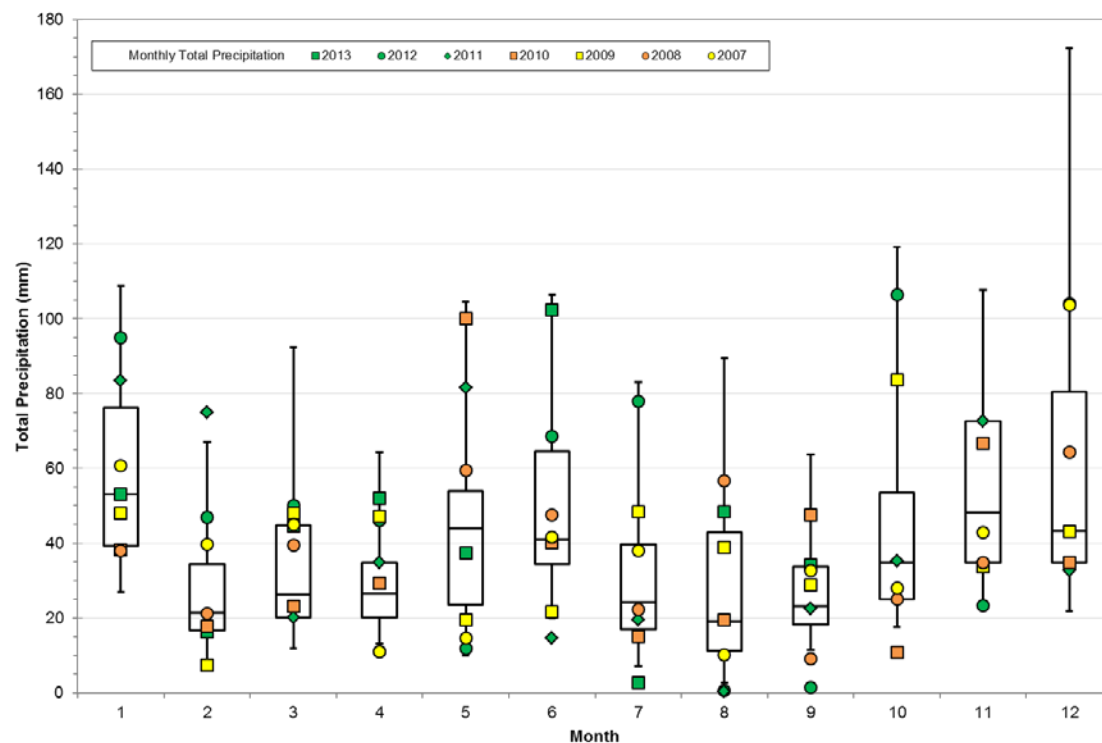


Figure 15: Monthly distribution of total precipitation at Jellicoe climate station, with key years highlighted.



Since it appeared that recharge observed in the wells was correlated with spring precipitation between March and May, Golder plotted the sum of total precipitation in March through May for each year in the period of record (Figure 16).

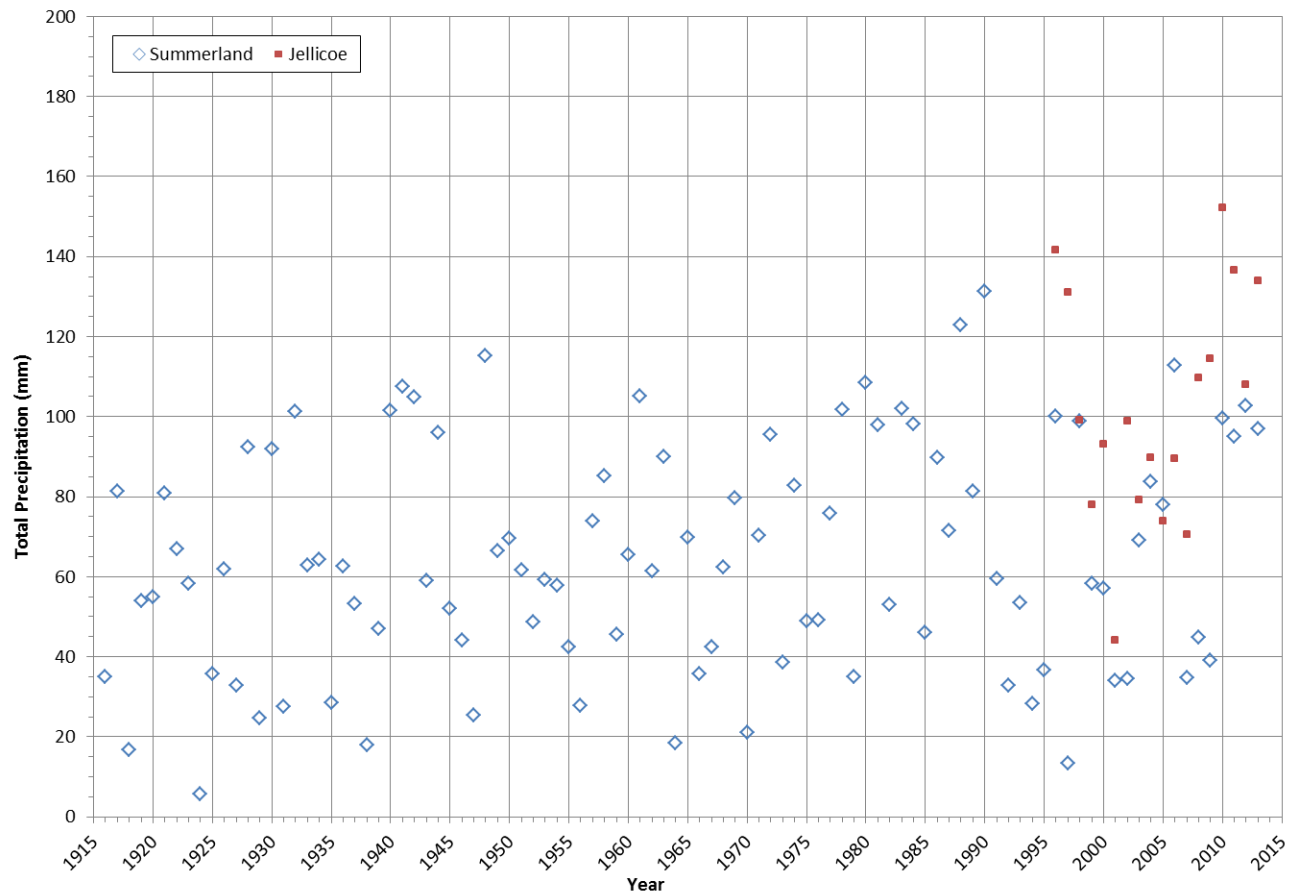


Figure 16: Total precipitation from Mar-May, by year, for Summerland and Jellicoe climate stations.

A comparison of groundwater levels (Figure D7) with total precipitation from March to May (Figure 16) shows that there is a correlation between recharge in the Meadow Valley Aquifer and the total precipitation in the spring, specifically, the years 2007 and 2009, which had very little recharge, also had lower than average spring precipitation, while the years 2010-2013, which had moderate to high groundwater recharge, had above average spring precipitation.

### 4.1.5 Water Quality

Golder conducted a review of groundwater and surface water quality, which included collection of samples during the field investigation, and compilation of available historic water quality data. The results are presented in the following sub-sections, and copies of the laboratory certificates of analysis are provided in Appendix E.



### 4.1.5.1 Stable Water Isotopes

Samples from groundwater and surface water sources in the area of Faulder were collected and analyzed for the stable isotopes of oxygen and hydrogen (Table 5). The isotope composition of oxygen and hydrogen in water is reported in terms of the difference of the  $^{18}\text{O}/^{16}\text{O}$  and  $\text{D}/^1\text{H}$  ratios relative to a common standard. In this case, results of the analyses are shown in Figure 17, which shows the distribution of the samples in relation to the local, or Okanagan meteoric water line (OMWL). The isotope ratios are reported as  $\text{d}18\text{O}$  and  $\text{d}2\text{H}$ , where d is expressed as a per mil deviation from that of the standard by use of the following formula:

$$d = \frac{[R_x - R_{std}]}{R_{std}} \times 1000$$

Where:

- $R_x$  is the isotopic ratio in the sample; and,
- $R_{std}$  is the isotopic ratio in the standard.

Water with a negative d value is enriched in the lighter isotope ( $^{16}\text{O}$  or H) and water with a positive d value is enriched in the heavier isotope ( $^{18}\text{O}$  or  $^2\text{H}$ ), compared to the standard. The isotopic compositions can be used to identify groundwater masses, to indicate mixing of water masses and to indirectly determine the relative ages of water masses.

Results indicate that the isotopic composition of all the groundwater and surface water samples were very similar and plotted along the local meteoric water line, thus, are interpreted to represent modern (post-glacial) precipitation. In particular, none of the samples showed evidence of enrichment in oxygen 18, which would be representative of a sample that had sufficient residence time in a surface body for a significant amount of evaporation to occur.

### 4.1.5.2 General Chemistry

A Piper plot (Piper, 1944), is a useful method of classifying the chemical composition of water by showing the relative concentrations of the major cations (potassium, sodium, magnesium and calcium) and anions (carbonate, bicarbonate). To account for difference in valence, the cation and anion concentrations are first converted to milliequivalents per liter. A Piper plot allows one to readily compare water samples visually to identify waters with similar characteristics, to identify mixing of waters with different characteristics, and possibly to assess the chemical evolution of groundwater composition along flow paths. A Piper plot was constructed for the water samples collected during the field program, and is shown on Figure 18.

Inspection of the Piper plot shows that all of the samples analyzed can be classified as calcium-bicarbonate dominant type waters. The waters are similar in composition, but waters from the different sources show some slight differences. The water from the spring at 1139 Fish Lake Rd. has the lowest relative chloride concentration of all the samples analyzed. The Darke Creek and Acland Creek (spring) samples, and all of the groundwater samples other than the Faulder Well, are grouped together on the Piper plot, having a slightly higher relative calcium and chloride concentrations than the 1139 Fish Lake Rd. sample. The Trout Creek samples had the lowest relative magnesium concentrations of all the samples, while the Faulder Well sample had the highest relative magnesium concentration. However, the Faulder Well and Trout Creek samples had higher relative concentrations of sulphate than the other samples.



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

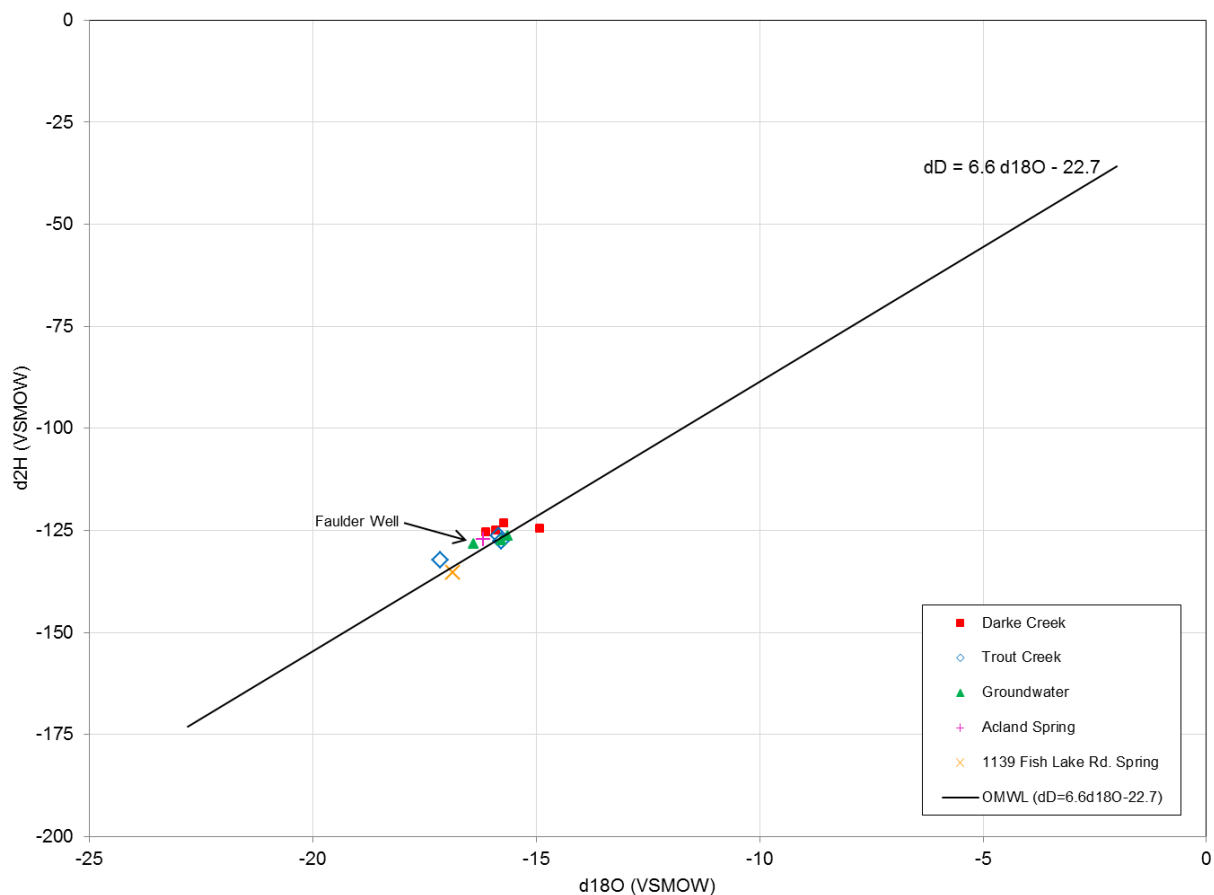


Figure 17: Results of water isotope analysis for samples collected during field program.



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

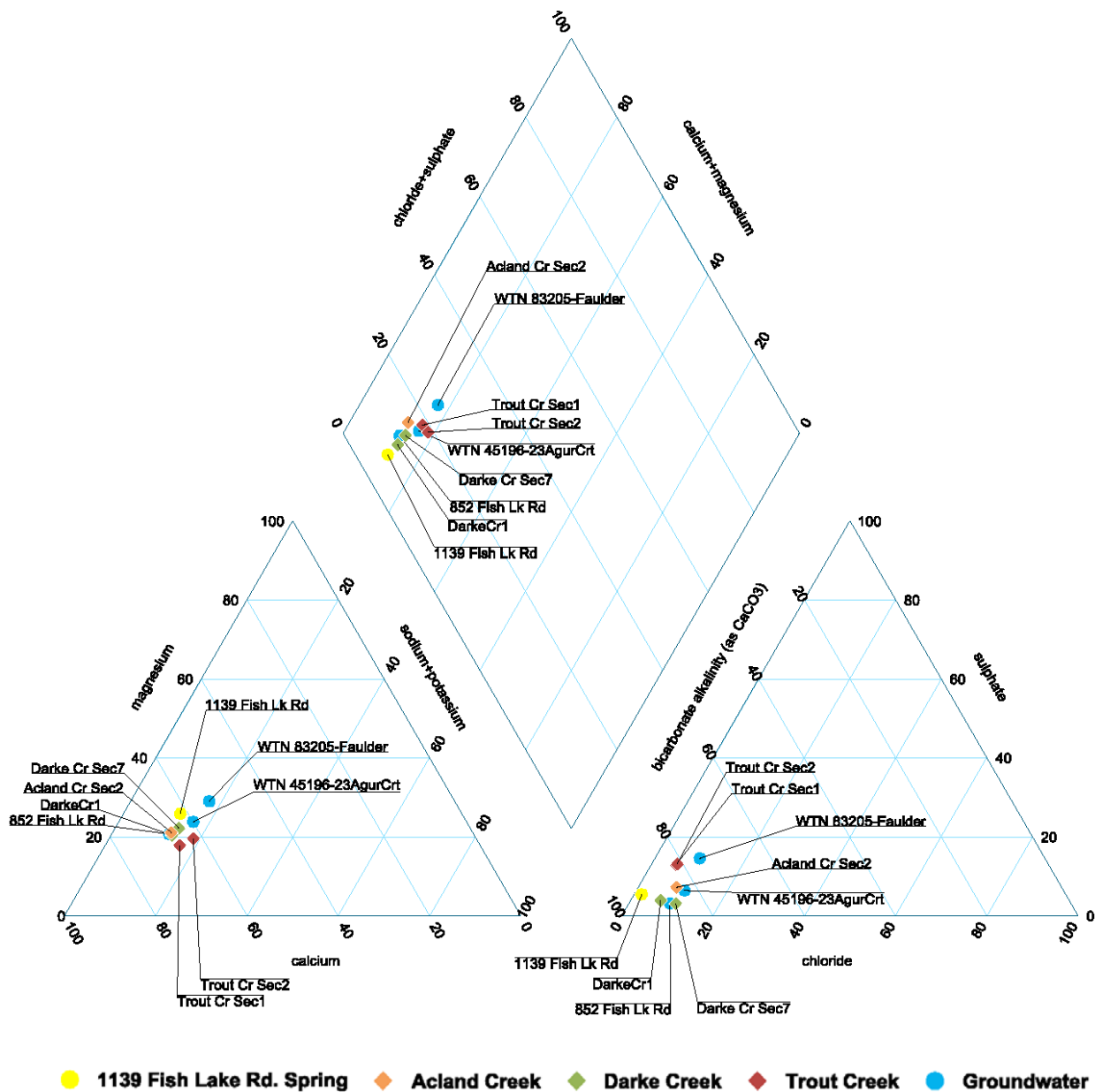


Figure 18: Piper plot for samples collected during field program.





### 4.1.5.3 Uranium Concentrations

Results of uranium analysis from the field samples were compiled together with historical results in order to conduct a geo-spatial assessment of the distribution of total uranium concentrations in groundwater and surface water in the Faulder-Summerland area (Figure 19) and North Meadow Valley (Figure 20). Total uranium concentrations were used to increase the number of samples available for analysis because the historical data tended to not have results for dissolved metals.

Results show that the samples from Trout Creek had total uranium concentrations an order of magnitude lower than the remainder of the samples with samples from upstream and downstream of Faulder having concentrations of 0.00127 mg/L and 0.00159 mg/L, respectively, and the concentration at the DOS intake on Trout Creek only slightly higher, at 0.002 mg/L. The next highest relative uranium concentrations tended to be in Darke Creek, where concentrations tended to increase along the flow path, from a low of 0.0031 mg/L in the sample Darke Cr5 located in the Darke Creek canyon between North Meadow Valley and Darke Lake, to a high of 0.012 mg/L for the sample Darke Cr1, located in Faulder near Agur Court.

Groundwater concentrations of uranium tended to be higher than surface water concentrations at nearby locations. For example, the lowest groundwater concentrations, ranging from 0.0028 to 0.008 mg/L, were at 852 Fish Lake Rd. and OW4, which are inferred to be relatively shallow wells completed in the alluvial fan materials near to where Darke Creek enters North Meadow Valley. Groundwater concentrations increased with distance along the groundwater flow path, for example, the concentration at Acland Spring was 0.017 mg/L and the highest reported concentration in the area was at the downgradient end of the semi-confined aquifer in South Meadow Valley (0.201 mg/L at WTN 82941).

It is interesting to note that groundwater concentrations of uranium in Faulder were higher than at Darke Creek, but lower than in South Meadow Valley, ranging from a low of 0.0141 mg to a high of 0.0275 mg/L. This is consistent with the inference of a limited flux of groundwater between South Meadow Valley and Faulder, and for surface water from Darke Creek recharging the semi-confined aquifer at the north end of Faulder.

A comparison of uranium concentrations in the Faulder Well in comparison with the static water level over time is shown in Figure 21. In general, it appears that higher concentrations of total and dissolved uranium typically occur during periods when the static water level is lowest, inferring that the well could mainly be accessing water from groundwater storage, due to decreased recharge from surface water.



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

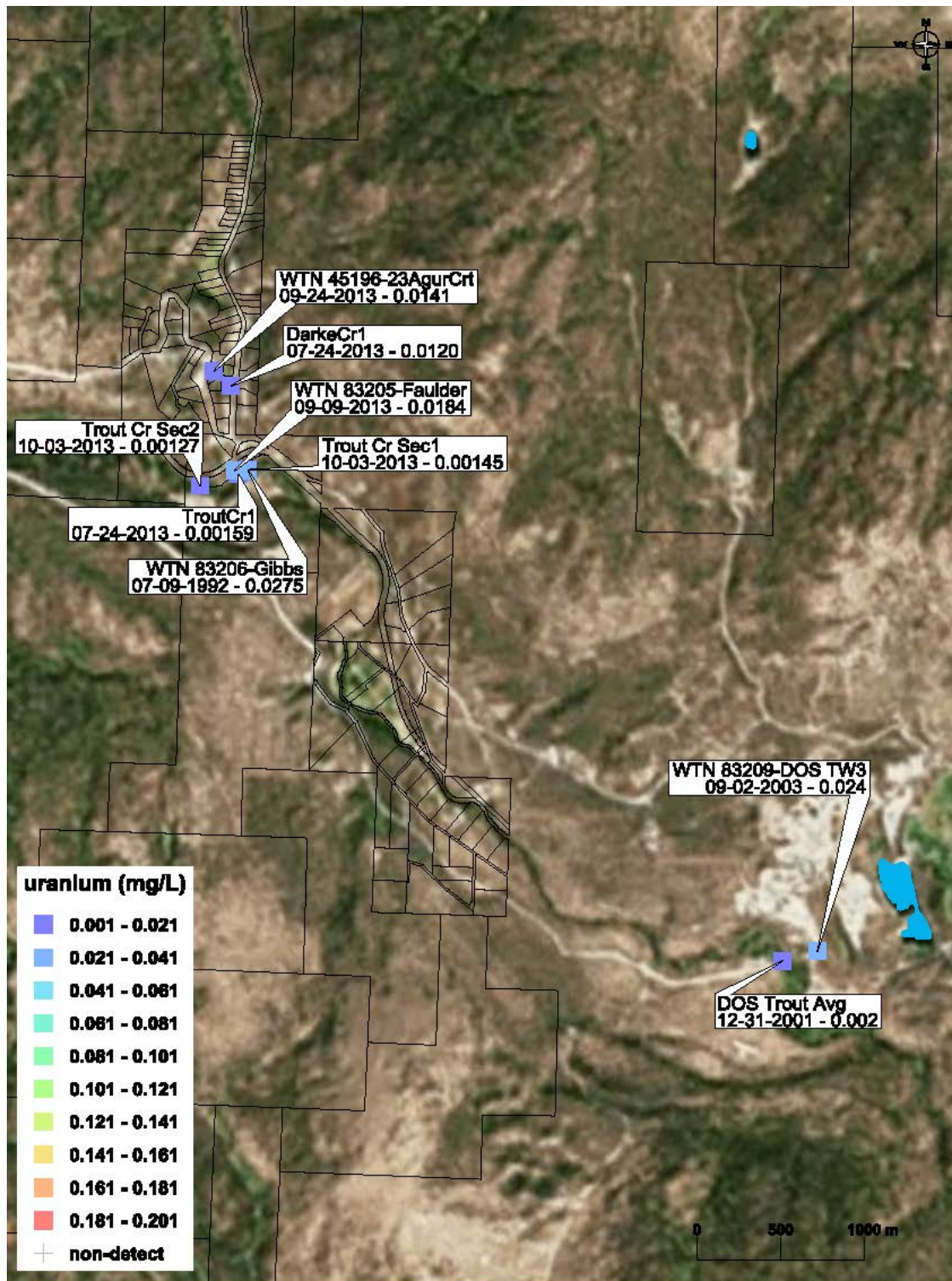


Figure 19: Average total uranium concentrations in Faulder area and District of Summerland wells completed in Meadow Valley Aquifer and area streams.





## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

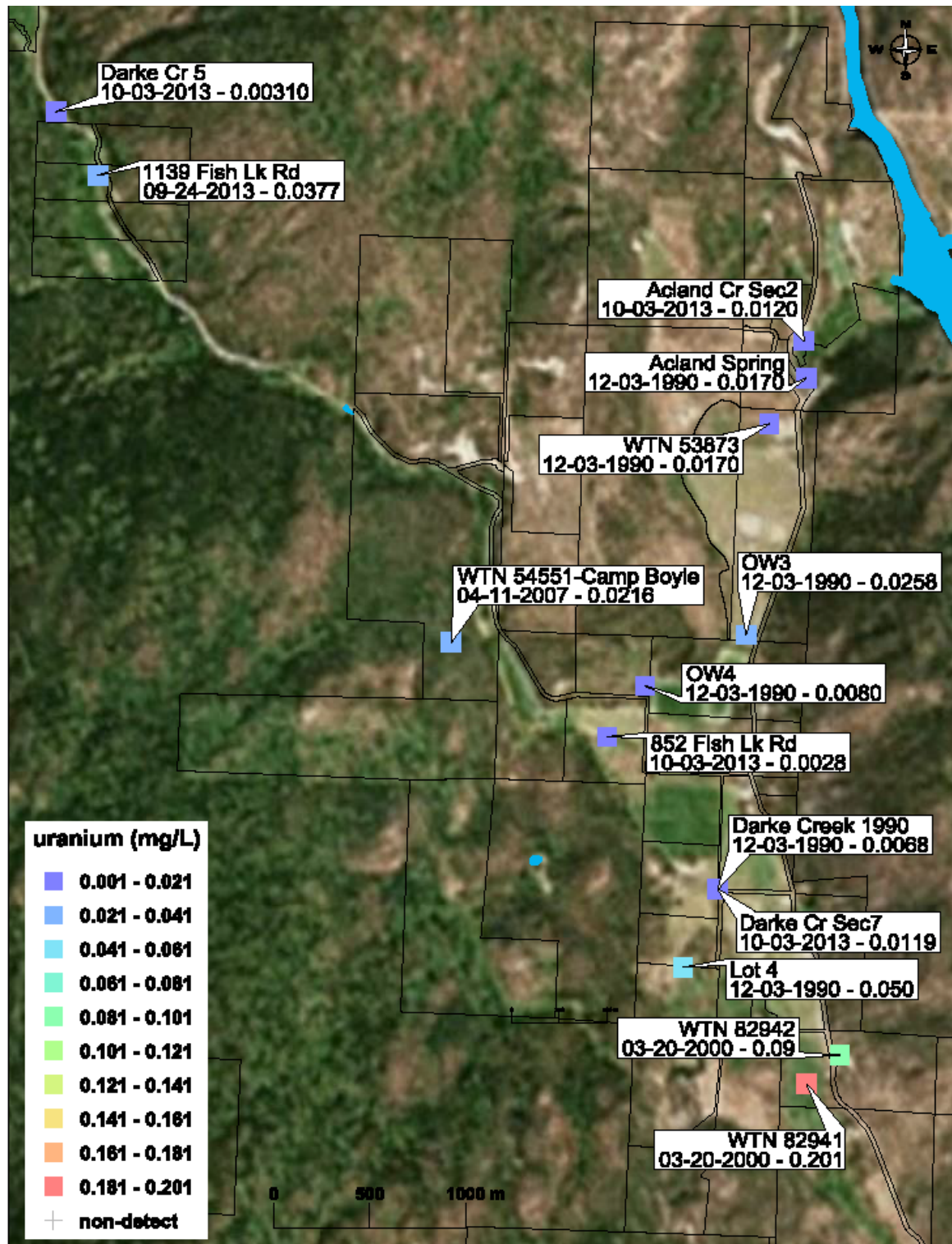


Figure 20: Average total uranium concentrations in Meadow Valley area wells and streams/springs.

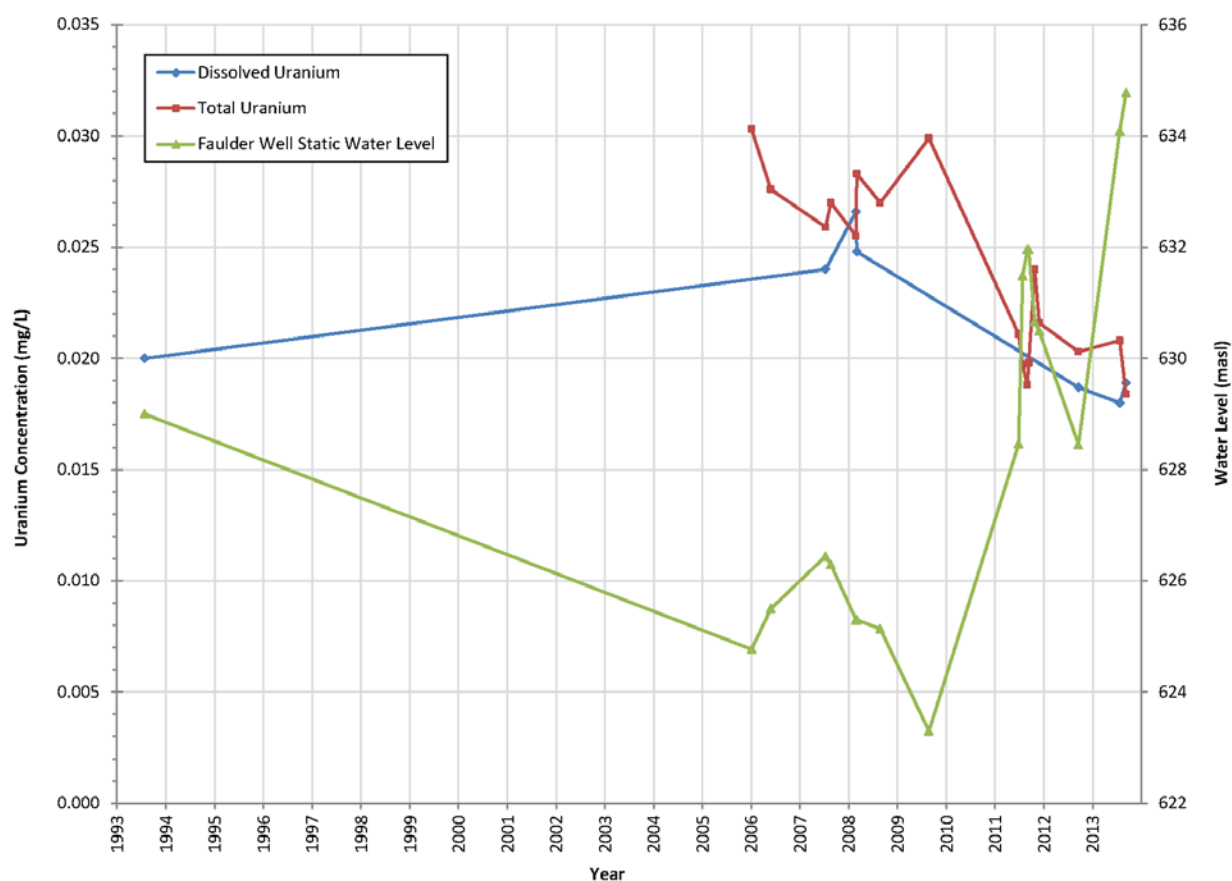


Figure 21: Trends in uranium concentration at Faulder Well in comparison with static water in the well over time.

### 4.1.6 Summary of Conceptual Site Model

The comprehensive data review reported in the foregoing sections has allowed Golder to refine the hydrologic/hydrogeologic conceptual site model for the Meadow Valley Aquifer in the area of Faulder. The inferences made to construct the conceptual model are supported by the available surficial geology, climate, water chemistry, and stream flow data. The refined hydrologic/hydrogeologic conceptual site model is summarized as follows:

- The Faulder Well and Gibbs Well are two wells, among others, completed in a sand and gravel aquifer known as the Meadow Valley Aquifer, which is generally described as the area extending from the Darke Creek alluvial fan located in North Meadow Valley, approximately 7 km north of the Faulder Well, to the area of the Summerland balancing reservoir, approximately 6 km southeast of the Faulder Well.
- The hydrostratigraphy of the Meadow Valley Aquifer is complex due to the various depositional processes inferred to have occurred since the period of the last ice age.
- An unconfined sand and gravel aquifer is inferred to be present in North Meadow Valley where the Darke Creek alluvial fan has formed where the Darke Creek bedrock canyon enters the wider valley, and these



materials are inferred to have groundwater resource potential. However, limited field verification was possible in this area.

- Groundwater is inferred to flow semi-radially within the Darke Creek alluvial fan, and a groundwater divide is inferred to exist, such that a portion of flow moves north due to a relatively steep topographic gradient and discharges at Acland Spring, and a portion of flow moves south toward Faulder.
- There is some anecdotal evidence supporting groundwater resource potential in the area of Mineola; however, no subsurface data is available to corroborate this.
- Groundwater flux from Meadow Valley to Faulder is inferred to be limited by a narrowing of valley and shallow bedrock in the South Meadow Valley.
- Based on well records, the Meadow Valley Aquifer is unconfined at the northern end of Faulder, and discharge measurements support that Darke Creek recharges the aquifer in this area. The aquifer becomes semi-confined further to the south, and there is a thick aquitard overlying the Faulder Well and Gibbs Well, which is inferred to limit direct recharge to these wells from Trout Creek.
- It is understood that flow in Darke Creek has been intermittent downstream of approximately Marsh Lane (Map 3, Appendix A) in recent history, and the presence of flow at the outlet to Trout Creek is rare. There is anecdotal evidence of observed increases in groundwater elevations at the Faulder Well during periods when there is flow in Darke Creek in the Faulder area.
- It is inferred that the large peaks in groundwater elevation observed at the Faulder Well in 2011 and 2013 resulted from increased discharge in Darke Creek and higher groundwater levels in Meadow Valley due to higher spring (March to May) precipitation, and potentially less irrigation water demand in Meadow Valley.

### 4.1.7 Information Quality and Data Gaps

Despite the effort put forth in conducting a comprehensive information review, the following data gaps and limitations of the assessment were identified:

- Mapping and GIS Data
  - The accuracy of well locations varied from excellent (i.e. surveyed by Golder) to very poor (one record listed an address of Rutland and was thus removed from the data set). Subdivision of lots caused particular difficulties, and in some cases it was believed that wells were present on properties for which no well records were found in the MoE database. To increase the reliability of the data, Golder cross-referenced the MoE well locations with the location description and with RDOS legal lot information and questionable records were not used in the analysis
  - No floodplain mapping was available for Darke Creek and Trout Creek





- Climate Data
  - Total precipitation data was no longer recorded at Summerland station between Nov and Mar after the mid-1990s
  - The watershed elevation is between that of the nearest climate stations, Summerland (lower) and Jellicoe (higher)
- Groundwater
  - There is limited water level trend data for the Gibbs well
  - There are few verifiable water levels and no trend data for the Meadow Valley area
  - Very limited subsurface data is available for Trout Creek Watershed upstream of Faulder
  - There is no water level data for the most severe drought years in the period of climate record
- Water Chemistry
  - Time-series data is only available for Faulder Well
- Hydrometric
  - Darke Creek discharge data was limited to 1921-1922
  - Trout Creek discharge data was limited to 1919-1987
  - No Reservoir level or discharge data was provided from DOS or MVID
- Water Use
  - Water use data is not tracked by MVID

There was insufficient data available to conduct the previously proposed probabilistic water balance modeling at this time; however, there is sufficient data to evaluate several identified groundwater supply options for the Community of Faulder.

## 4.2 Water Supply Options Evaluation

Golder used the information compiled during the information review, including the revised conceptual site model, to assist in identifying potential water supply options for the community of Faulder, for example to identify areas with groundwater resource potential and areas of potential flood risk and/or groundwater under the direct influence of surface water. The conceptual site model was also used to evaluate the considered options on a technical basis, for example, to assess the relative ability of the source to meet the existing demand, the potential for interference with other wells and/or surface water, and the inferred water quality.



### 4.2.1 Options Considered

Based on the RFP, the information review conducted for this assessment, and meetings with RDOS, the following five water supply options were selected for evaluation:

Option A: Keep the existing Faulder Well as the sole water supply source;

Option B: Acquire rights to and upgrade the Gibb's Well and keep the existing Faulder Well as back-up source;

Option C: Drill a new well on available land near the existing Faulder Well (i.e. Kettle Valley Railway right-of-way);

Option D: Drill a new well on Crown land in the area of Mineola; or,

Option E: Drill a new well on private land in area of the Darke Creek alluvial fan, north Meadow Valley.

The approximate locations of the areas associated with each of the above options are shown on Maps 2 and 3, (Appendix A).

### 4.2.2 Assumptions

The following assumptions were applied during evaluation of the water supply options.

- The existing reservoir is used and is sufficient in capacity;
- The treatment plant is located at existing Faulder Well Site and that the design, operation and construction costs of the treatment plant are not dependent upon the source location;
- Future climate and water demand are within the ranges of available data;
- Co-operative management of water resources in the watershed ensures that a minimum amount of recharge is made available to the aquifer; and,
- Environmental assessments and permitting not required for any options.

### 4.2.3 Multi-Criteria Analysis

A multi-criteria analysis (MCA) procedure was used to evaluate the identified water supply options. Golder compiled a preliminary list of criteria considered to be relevant to the decision making process and then assigned relative weights to each of the criteria. Following this, Golder assigned a preliminary score from 1-5 to each criterion for each of the options assessed. Following Golder's preliminary analysis, the wording of the criteria, weightings and rankings were adjusted based on input from RDOS.

A range of technical and socio-economic factors were considered and resulted in a final total of twenty criteria for the analysis. These criteria are listed in the first column of Table 6, from the highest to the lowest weighting, which ranged from ten to one. The top three highest rated criteria were the following, with the weights shown in brackets:



- 1) Ability to meet existing demand (10)
- 2) Land purchase costs (8)
- 3) Integration into existing system (7)

Results of the MCA, including justifications for the scoring, are provided in Table 6. Based on the results of the MCA, the five assessed options ranked from highest to lowest, as follows, with total scores shown in brackets:

- 1) Option C: Drill a new Test Well on available land near the existing Faulder Well (346)
- 2) Option A: Keep the existing Faulder Well as the sole water supply source (317)
- 3) Option B: Acquire rights to and upgrade the Gibb's Well and keep the existing Faulder Well as back-up source (276)
- 4) Option D: Drill a new Test Well on Crown land in the area of Mineola (251)
- 5) Option E: Drill a new Test Well on private land in area of the Darke Creek alluvial fan, north Meadow Valley (231)

The two water supply options identified within Meadow Valley (Options D and E) scored lower than the other options for several key reasons, including the increased distance from the proposed treatment plant and ability to integrate into the existing system; uncertainty in the subsurface conditions and groundwater quality; the higher level of additional research required to fully assess the options; and the inferred lower score for public perception. Option E had the further disadvantage of an increased potential for well interference with private domestic wells, and potential to affect surface water flows due to the inferred unconfined nature of the aquifer in this area. The potential to affect surface water flows is also associated with an increased risk of a potential well being groundwater under the direct influence of surface water (GWUDI), which may affect health licensing requirements and/or water treatment requirements.

Acquiring rights to the Gibbs Well (Option B) was more favorable than the Meadow Valley options, due to the reduced distance and ease of integration with the existing system and proposed treatment plant and the increased knowledge of ground conditions and water quality in this area; however, several criteria decreased the score of this option relative to the highest two ranked options. The location on private land potentially increases the cost of this option, the well age (12 years) is greater than the Faulder Well, and the current condition of the well (specific capacity, screen condition and water quality) are not known, as the last assessment of the well by Golder was in 2005.

The Gibbs Well has a higher potential flood risk due to a) its location in relation to Trout Creek, less than 10 m from the creek (Map 2, Appendix A), and b) the elevation of the ground surface, (approximately 675.5 masl) and top of the well casing 675.95 masl (Table 4), are less than a meter higher than the inferred high water mark of Trout Creek at the location of stream section Trout Creek Section 1, 675.19 masl (Table 1). Due to the absence of a surface seal and the increased flood risk, it is recommended to install a surface seal and extend the well casing of this well prior to putting it into production, which is potentially quite costly and may be difficult due to the ground conditions (till). It is also noted that the smaller casing diameter (6 inch) relative to the Faulder Well (8 inch) decreases the ability to install equipment in the Gibbs Well (i.e. sounding tubes for measuring water levels) and puts constraints on the available pump options (i.e. a vertical line shaft turbine pump). A new Test Well would be recommended to have at least an 8 inch diameter production casing.



The main advantage of the Gibbs Well is that its increased depth gives it more available drawdown than the Faulder Well, and assuming that the specific capacity of the Gibbs Well has not declined since the time of testing in 2005, it is inferred that it would have had more than sufficient drawdown to operate at 12.6 L/s (200 USgpm) during the period of lowest recorded static water level (in the summer of 2010). In comparison, the pumping rate of the Faulder Well was decreased to approximately 80 US gpm and the pumping water level was still within 1 m of the pump intake (Figure D7) at that time.

Keeping the existing Faulder Well as the sole water supply source (Option A) was the second-highest ranked option, mainly due to it having the lowest cost, ease of integration and proximity to proposed treatment plant, and known ground conditions and water quality. Although the Faulder well does not have sufficient drawdown to maintain the original pumping rate of 10.1 L/s (160 US gpm) during periods of low groundwater elevations, if system losses are negligible, the current, reduced pumping rate of 3.0 L/s (48 US gpm), results in a supply rate of 1,206 L/person/day, which is within the average summer water use reported for the Okanagan.

The Faulder Well scored higher than the Gibbs Well option due to reduced costs and lower flood potential due to higher elevation, with a top of casing elevation of 678.09 masl (Table 4) and a ground surface elevation of approximately 677.10 masl. However, although the well is several years newer than the Gibbs well, there are reports of operational difficulties (air entrainment and sediment within the well screen). This well also does not have a surface seal.

Drilling a new well on available land in Faulder, such as the Kettle Valley Railway (KVR) right-of-way, was the highest-ranked option assessed. This option was more costly than Option A or B, but ranked higher in that the well would be newer, would have a surface seal and is inferred to have a lower flood risk than the Gibbs Well due to a higher ground surface elevation. It is recommended for a new Test Well to have at least an 8 inch production casing, which would allow more flexibility for equipment installation and should increase the well yield compared to the Gibbs Well (assuming the total depth, groundwater elevation and well efficiency are the same).

Any Test Well drilled would result in encountering unknown ground conditions, and the groundwater quality may be different than that of the Faulder Well, which was tested for the uranium treatment plant feasibility study.

#### 4.2.4 Option Cost Comparison

Following the MCA procedure, Golder conducted a preliminary cost estimate for two of the top three highest ranked options, Option B and Option C (Table 7). The cost estimates came from a variety of sources, including costs provided in a previous engineering report on water supply options for Faulder (Associated Engineering, 2008), which were adjusted by an assumed inflation factor (5%); sub-contractor cost estimates provided by drillers and pump installers; and, consulting fees based on Golder estimates.

Option C: (Drill new well on available land near the existing Faulder Well) had an estimated cost in the range of approximately \$189,050 - \$227,850.

Option B: (Acquire and upgrade Gibb's Well) had an estimated cost in the range of approximately \$132,700 - \$180,200, which does not include the cost of acquiring the land/well and removing the existing pump house.



### 5.0 CONCLUSIONS

Golder conducted an information review and detailed hydrogeological assessment for the Meadow Valley Aquifer in the area upstream of Faulder to assist RDOS in securing a sustainable water supply for the Community of Faulder and area. A summary of the conceptual site model for the hydrogeology of the area is provided in Section 4.1.6. The following summarizes the most significant conclusions regarding selection of a preferred water supply option.

- An unconfined sand and gravel aquifer is inferred to be present at the north end of Meadow Valley where the Darke Creek alluvial fan has formed where the Darke Creek bedrock canyon enters the wider valley; these materials are inferred to have some groundwater resource potential.
- Groundwater is inferred to flow semi-radially within the Darke Creek alluvial fan, and a groundwater divide is inferred to exist, such that a portion of flow moves north due to a relatively steep topographic gradient and discharges at Acland Spring, and a portion of flow moves south toward Faulder.
- Groundwater flux from Meadow Valley to Faulder is inferred to be limited by a narrowing of valley and shallow bedrock at the south end of Meadow Valley.
- There are a large number of long-standing water licences on Darke Creek in Meadow Valley and many control structures exist. Darke Creek and Acland Creek are important sources of domestic and irrigation water supply for residents in this area, but despite this there is a lack of formal record keeping and little ability to control or measure flow at the diversion structures.
- Based on well records and field-measured stream losses, it is inferred that the Meadow Valley Aquifer is unconfined at the northern end of Faulder, and that this is a significant recharge zone, with Darke Creek providing the major source of recharge to this area. The aquifer becomes semi-confined further to the south, and there is a thick aquitard overlying the Faulder Well and Gibbs Well, which is inferred to limit direct recharge to these wells from Trout Creek.
- It is inferred that the large peaks in groundwater elevation observed in 2011 and 2013 resulted from increased discharge in Darke Creek and higher groundwater levels in Meadow Valley due to higher spring (March to May) precipitation, and potentially less irrigation water demand in Meadow Valley. There is anecdotal evidence of observed increases in groundwater elevations at the Faulder Well during periods when there is flow in Darke Creek in the Faulder area.
- The same general pattern of water level fluctuations observed in the Faulder area wells is seen in the downgradient MoE observation well near Summerland; however, the amplitude of the effect is subdued. It is likely that recharge from Trout Creek to the larger Meadow Valley Aquifer has less annual variability than that from Darke Creek, and therefore works to “level out” the aquifer downstream of Faulder.
- The pumping water level in the Faulder Well was within 1 m of the intake and top of the well screen during the periods of low aquifer levels, which necessitated in decreasing the pumping rate of the well to less than one-third of the target rate of 10.1 L/s (160 USgpm).
- Based on an estimated population of 215 residents, the target flow rate results in a maximum water supply rate of just over 3,600 litres per person per day, assuming negligible system losses.





## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

- Significant data gaps exist with respect to water balance data for the aquifer, particularly with respect to stream flow and surface water use, groundwater levels (other than the Faulder Well) and reservoir levels and discharge.
- There was insufficient data available to conduct the previously proposed probabilistic water balance modeling at this time; however, there is sufficient data to evaluate several identified groundwater supply options for the community of Faulder.
- Of the five water supply options for the community of Faulder selected for evaluation by multi-criteria analysis, the highest ranked option was to drill a new well in Faulder on available land (Option C), followed second by keeping the existing Faulder Well as the sole water supply source (Option A), and thirdly by acquiring rights to and upgrading the Gibb's Well and keeping the existing Faulder Well as back-up source (Option B).
- The two water supply options identified within Meadow Valley (Options D and E) scored lower than the other options for several key reasons, including the increased distance from the proposed treatment plant and ability to integrate into the existing system; uncertainty in the subsurface conditions and groundwater quality; the higher level of additional research required to fully assess the options; and the inferred lower score for public perception.
- The main advantage of the Gibbs Well is that the conditions at the well are known, and its increased depth gives it more available drawdown than the Faulder Well (it is inferred that it would have had more than sufficient drawdown to operate at the target pumping rate during the period of lowest recorded static water level in the summer of 2010). However, the proximity and elevation of the well in relation to Trout Creek increase the relative flood risk of the well, and the costs of recommended well head modifications (install surface seal and raise casing) may be significant to RDOS.
- Acquiring the Gibbs Well has less uncertainty than drilling a new well and the total estimated cost is less than drilling a new Test Well; however, this does not take into account the costs for acquiring the well which is not known.
- Keeping the existing Faulder Well as the sole water supply source was the second-highest ranked option, mainly due to it having the lowest cost, ease of integration and proximity to proposed treatment plant, known ground conditions and water quality and less of a flood risk than the Gibbs Well. Disadvantages include less available drawdown, and the reported operational difficulties (air entrainment and sediment within the screen area) and lack of surface seal.
- Although the Faulder Well does not have sufficient drawdown to maintain the original pumping rate of 10.1 L/s (160 US gpm) during periods of low groundwater elevations, if system losses are negligible, the current, reduced pumping rate of 3.0 L/s (48 US gpm), results in a supply rate of 1,206 L/person/day, which is within the average summer water use reported for the Okanagan.
- Drilling a new well on available land in Faulder, such as the Kettle Valley Railway (KVR) right-of-way, was the highest-ranked option assessed. This option would result in a newer well that would have a surface seal and is inferred to have a lower flood risk than the Gibbs Well due to a higher ground surface elevation. If drilled with at least an 8 inch production casing, it would have more flexibility for equipment installation



and an increased well yield compared to the Gibbs Well (assuming the total depth, groundwater elevation and well efficiency are the same).

- Any Test Well drilled would result in encountering unknown ground conditions, and the groundwater quality may be different than that of the Faulder Well, which was tested for the uranium treatment plant feasibility study.
- Based on the results of the overall assessment, it is concluded that the Meadow Valley aquifer has the potential to sustainably provide for domestic water for the current population of the Community of Faulder, based on average per capita water use for the Okanagan Region, provided that a) water demand and climate are within the ranges observed in the available historical data set, and b) co-operative management of water resources in the watershed ensures that a minimum amount of recharge is made available to the aquifer.

## 6.0 RECOMMENDATIONS

Based on the results of the above assessment, Golder provides the following recommendations:

- It is recommended that RDOS confirm the water demand for the Community of Faulder and assess for unidentified system losses. Because the current target flow rate results in a relatively high per person water demand for the Community of Faulder relative to the Okanagan average, it may be possible to reduce the target flow rate, which could affect the rankings of the assessed water supply options.
- Existing public education and water conservation initiatives should be continued as the Faulder area wells may be accessing water from groundwater storage during periods of decreased recharge from surface water.
- It is recommended that once RDOS has decided upon a preferred water supply Option for the Community of Faulder, a detailed work plan be developed that includes a detailed cost estimate and identification of key decision points following completion of the tasks with the most uncertain outcomes, such as drilling and pumping tests. The work plan should aim to minimize costs incurred prior to completion of these tasks.
- It is recommended to prepare detailed tender documents and carefully examine the cost estimates provided by contractors and consultants to ensure that the drilling conditions and groundwater fluctuations observed at Faulder are understood and planned for. It is noted that a driller contacted by Golder to provide a cost estimate described the drilling conditions in the area of south Faulder as “extreme”, based on prior experience.
- Should a Test Well be drilled, it is recommended to conduct a detailed water quality assessment to ensure that the performance of the designed water treatment plant is as expected.
- It is recommended to investigate whether gas entrainment observed at the Faulder Well and the fluctuations in groundwater levels have any implications for pump selection and borehole diameter for a Test Well.
- Future source protection planning for a potable water supply well completed within the semi-confined portion of the Meadow Valley Aquifer in Faulder should focus on the area of the inferred recharge zone at



the north end of Faulder. In particular, it is recommended to assess the potential for the short-term time-of-travel capture zone for the well to intercepts potential sources of contamination, such as septic fields.

- It is recommended to initiate co-operative management of groundwater and surface water resources within the Trout Creek and Darke Creek watersheds. Participating parties could include the following:
  - Regional District of Okanagan-Similkameen
  - District of Summerland
  - Meadow Valley Irrigation District
  - Penticton Indian Band
  - Private well owners and surface water license holders in the watershed
  - Ministry of Environment
  - Okanagan Basin Water Board
- A monitoring program should be implemented to collect the following water balance parameters, for which data gaps were identified during the course of this assessment:
  - Reservoir levels and discharges
  - Stream flow and diversions
  - Groundwater levels
  - Local climate data

## 7.0 LIMITATIONS

This report was prepared for the exclusive use of RDOS. The report is based on a review of data and information for the Study Area conducted by Golder personnel, and is based solely on the conditions encountered within the Study Area at the time of the field investigation, supplemented by data obtained by Golder as described in this report.

Hydrogeological investigations and groundwater modelling, including development of conceptual site models, are dynamic and inexact sciences. They are dynamic in the sense that the state of any hydrological system is changing with time, and in the sense that the science is continually developing new techniques to evaluate these systems. They are inexact in the sense that subsurface conditions are not known between the specific investigation locations, and there is invariably a lack of complete information both spatially and temporally about the geological and hydrogeological conditions. A groundwater model or conceptual model uses the laws of science and mathematics to draw together the available data into a mathematical or computer-based representation of the essential features of an existing hydrogeological system. While the model itself obviously lacks the detailed reality of the existing hydrogeological system, the behaviour of a valid groundwater model reasonably approximates that of the real system. The validity and accuracy of the model depends on the amount of data available relative to the degree of complexity of the geologic formations, the site hydrogeology,



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

and on the quality and degree of accuracy of the data entered. Therefore, every groundwater model is a simplification of reality and the model described in this report is not an exception.

The hydrogeological investigation services performed as described in this report were conducted in a manner consistent with the level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the quantity and quality of available data, the time limits and financial and physical constraints applicable to the services. Unless otherwise specified, the results of previous or simultaneous work provided by sources other than Golder and quoted and/or used herein are considered as having been obtained according to recognized and accepted professional rules and practices, and therefore deemed valid. This model provides a predictive scientific tool to evaluate the impacts on a real groundwater system of specified hydrological stresses and/or to compare various scenarios in a decision-making process. However, and despite the professional care taken during the assessment, the accuracy is bound to the normal uncertainty associated to hydrogeological investigation and no warranty, express or implied, is made.

Golder has relied in good faith on information provided by others and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the report as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based of it, are the responsibilities of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken, based on this report.

If new information is discovered during future work, including excavations, borings or other studies, Golder should be requested to re-evaluate the conclusions presented in this report and to provide amendments, as required.



## FAULDER WELL AQUIFER ASSESSMENT AND OPTIONS EVALUATION

### 8.0 CLOSURE

We trust this provides you with the information you require at this time. Should you have any questions, please feel free to contact the undersigned at your earliest convenience.

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**Table 1: Discharge Measurements for Trout Creek Stream Sections**  
**Faulder Well Aquifer Study**  
**Regional District of Okanagan-Similkameen**

<b>Location:</b> Trout Creek Section 2 (east side of bridge at 155 Kettle Place)					
<b>Date/Time:</b> 03-Oct-2013 10:10			<b>Water Elevation (masl):</b> 677.11		
<b>Measurements:</b>					
Distance (m)	Water Depth (m)	Cross Sectional Area (m <sup>2</sup> )	Base Elevation (masl)	Velocity (m/sec)	Discharge (m <sup>3</sup> /sec)
0	N High Water	-	677.88	-	-
3.5	N Edge	-	677.11	-	-
4.0	0.16	0.120	676.95	-0.020	-0.002
4.5	0.22	0.110	676.89	0.010	0.001
5.0	0.24	0.180	676.87	0.306	0.055
6.0	0.39	0.390	676.72	0.379	0.148
7.0	0.38	0.380	676.73	0.505	0.192
8.0	0.50	0.500	676.61	0.541	0.271
9.0	0.56	0.560	676.55	0.816	0.457
10.0	0.60	0.600	676.51	0.587	0.352
11.0	0.66	0.660	676.45	0.535	0.353
12.0	0.70	0.700	676.41	0.349	0.244
13.0	0.59	0.590	676.52	0.084	0.050
14.0	0.34	0.306	676.77	-0.086	-0.026
14.8	0.10	0.060	677.01	0.024	0.001
15.0	S Edge	-	677.11	-	-
15.9	S High Water	-	678.23	-	-
<b>TOTAL DISCHARGE (m<sup>3</sup>/sec)</b>					<b>2.10</b>

<b>Location:</b> Trout Creek Section 1 (adjacent to Gibbs Well)					
<b>Date/Time:</b> 03-Oct-2013 08:30			<b>Water Elevation (masl):</b> 674.56		
<b>Measurements:</b>					
Distance (m)	Water Depth (m)	Cross Sectional Area (m <sup>2</sup> )	Base Elevation (masl)	Velocity (m/sec)	Discharge (m <sup>3</sup> /sec)
0.0	S High water	-	675.19	-	-
2.4	S Edge	-	674.56	-	-
2.6	0.10	0.040	674.46	0.233	0.009
3.0	0.16	0.112	674.40	0.296	0.033
4.0	0.26	0.260	674.34	0.246	0.064
5.0	0.40	0.400	674.24	0.593	0.237
6.0	0.35	0.350	674.10	0.411	0.144
7.0	0.30	0.300	674.15	0.547	0.164
8.0	0.30	0.300	674.20	0.485	0.146
9.0	0.28	0.280	674.20	0.513	0.144
10.0	0.30	0.300	674.22	0.544	0.163
11.0	0.27	0.270	674.20	0.333	0.090
12.0	0.16	0.160	674.23	0.305	0.049
13.0	0.20	0.200	674.34	0.081	0.016
14.0	0.24	0.240	674.30	0.238	0.057
15.0	0.20	0.200	674.26	0.234	0.047
16.0	0.20	0.200	674.30	0.300	0.060
17.0	0.12	0.120	674.30	0.090	0.011
18.0	0.14	0.112	674.38	0.010	0.001
18.6	0.06	0.192	674.50	0.120	0.023
19.4	N Edge	-	674.56	-	-
21.5	N High Water	-	675.19	-	-
TOTAL DISCHARGE (m <sup>3</sup> /sec)					1.46
CHANGE FROM PREVIOUS SECTION (m <sup>3</sup> /sec)					-0.64

**Table 2: Discharge Measurements for Darke Creek Stream Sections**  
**Faulder Well Aquifer Study**  
**Regional District of Okanagan-Similkameen**

<b>Location:</b> Darke Creek Section 4 (Fish Lk. Rd north of Osborne Rd.)					
<b>Date/Time:</b> 03-Oct-2013 14:36			<b>Water Elevation (masl):</b> 798.00		
<b>Measurements:</b>					
<b>Culvert Dimensions</b>		<b>Water Depth - h</b> <b>(m)</b>	<b>Cross Sectional Area</b> <b>(m<sup>2</sup>)</b>	<b>Velocity</b> <b>(m/sec)</b>	<b>Discharge</b> <b>(m<sup>3</sup>/sec)</b>
<b>Parameter</b>	<b>Value (m)</b>				
Diameter	0.390	0.090	0.021	2.220	
Radius - r	0.195				
r <sup>2</sup>	0.038				
r-h (m)	0.105				
<b>TOTAL DISCHARGE (m<sup>3</sup>/sec)</b>					<b>0.046</b>

<b>Location:</b> Darke Creek Section 6 (Bridge at Camp Boyle)					
<b>Date/Time:</b> 03-Oct-2013 15:39			<b>Water Elevation (masl):</b> 759.80		
<b>Measurements:</b>					
<b>Distance (m)</b>	<b>Water Depth (m)</b>	<b>Cross Sectional Area (m²)</b>	<b>Base Elevation (masl)</b>	<b>Velocity (m/sec)</b>	<b>Discharge (m³/sec)</b>
0.1	N Edge	-	759.80	-	-
0.2	0.20	0.070	759.60	0.000	0.000
0.7	0.29	0.116	759.51	0.024	0.003
1.0	0.34	0.136	759.46	0.071	0.010
1.5	0.24	0.120	759.56	0.090	0.011
2.0	0.18	0.090	759.62	0.072	0.006
2.5	0.16	0.056	759.64	0.055	0.003
2.7	0.19	0.038	759.61	0.036	0.001
2.8	S Edge	-	759.80	-	-
<b>TOTAL DISCHARGE (m³/sec)</b>					<b>0.034</b>
<b>CHANGE FROM PREVIOUS SECTION (m³/sec)</b>					<b>-0.012</b>

<b>Location:</b> Darke Creek Section 7 (intersection of Cottonwood Rd. and Relkey Rd.)					
<b>Date/Time:</b> 03-Oct-2013 17:30			<b>Water Elevation (masl):</b> 728.41		
<b>Measurements:</b>					
Distance (m)	Water Depth (m)	Cross Sectional Area (m <sup>2</sup> )	Base Elevation (masl)	Velocity (m/sec)	Discharge (m <sup>3</sup> /sec)
0.0	E Edge	-	-	-	-
0.1	0.12	0.018	728.29	0.000	0.000
0.2	0.12	0.018	728.29	0.026	0.000
0.4	0.11	0.022	728.30	0.126	0.003
0.6	0.11	0.022	728.30	0.113	0.002
0.8	0.12	0.024	728.29	0.064	0.002
1.0	0.12	0.018	728.29	0.089	0.002
1.1	0.15	0.015	728.26	0.087	0.001
1.2	0.15	0.023	728.26	0.045	0.001
1.4	0.15	0.038	728.26	0.059	0.002
1.6	W Edge	-	-	-	-
TOTAL DISCHARGE (m <sup>3</sup> /sec)					0.013
CHANGE FROM PREVIOUS SECTION (m <sup>3</sup> /sec)					-0.021

**Table 2: Discharge Measurements for Darke Creek Stream Sections**  
**Faulder Well Aquifer Study**  
**Regional District of Okanagan-Similkameen**

<b>Location:</b> Darke Creek Section 2 (south end of Meadow Valley)					
<b>Date/Time:</b> 03-Oct-2013 18:19			<b>Water Elevation (masl):</b> 713.68		
<b>Measurements:</b>					
<b>Culvert Dimensions</b>		<b>Water Depth - h</b> (m)	<b>Cross Sectional Area</b> (m <sup>2</sup> )	<b>Velocity</b> (m/sec)	<b>Discharge</b> (m <sup>3</sup> /sec)
<b>Parameter</b>	<b>Value (m)</b>				
Diameter	1.190	0.160	0.089	0.200	
Radius - r	0.595				
r <sup>2</sup>	0.354				
r-h (m)	0.435				
<b>TOTAL DISCHARGE (m<sup>3</sup>/sec)</b>					<b>0.018</b>
<b>CHANGE FROM PREVIOUS SECTION (m<sup>3</sup>/sec)</b>					<b>0.004</b>

<b>Location:</b> Darke Creek Section 3 (190 Fish Lake Rd.)					
<b>Date/Time:</b> 03-Oct-2013 18:25			<b>Water Elevation (masl):</b> 700.62		
<b>Measurements:</b>					
<b>Culvert Dimensions</b>		<b>Water Depth - h</b> (m)	<b>Cross Sectional Area</b> (m <sup>2</sup> )	<b>Velocity</b> (m/sec)	<b>Discharge</b> (m <sup>3</sup> /sec)
<b>Parameter</b>	<b>Value (m)</b>				
Diameter	0.525	0.250	0.102	0.200	
Radius - r	0.263				
r <sup>2</sup>	0.069				
r-h (m)	0.013				
<b>TOTAL DISCHARGE (m<sup>3</sup>/sec)</b>					<b>0.020</b>
<b>CHANGE FROM PREVIOUS SECTION (m<sup>3</sup>/sec)</b>					<b>0.002</b>

<b>Location:</b> Darke Creek Section 1 (near 7 Agur Court)					
<b>Date/Time:</b> 03-Oct-2013 18:30			<b>Water Elevation (masl):</b> 682.29		
<b>Measurements:</b>					
Distance (m)	Depth (m)	Cross Sectional Area (m <sup>2</sup> )	Base Elevation (masl)	Velocity (m/sec)	Discharge (m <sup>3</sup> /sec)
0.0	W Edge	-	-	-	-
0.3	0.14	0.058	682.152	0.003	0.000
0.6	0.14	0.039	682.152	0.060	0.002
0.8	0.20	0.167	682.212	0.003	0.000
1.5	East Edge	-	-	-	-
<b>TOTAL DISCHARGE (m<sup>3</sup>/sec)</b>					<b>0.0030</b>
<b>CHANGE FROM PREVIOUS SECTION (m<sup>3</sup>/sec)</b>					<b>-0.017</b>

**Table 3: Discharge Measurements for Acland Creek Stream Sections**  
**Faulder Well Aquifer Study**  
**Regional District of Okanagan-Similkameen**

<b>Location:</b> Acland Creek Section 2 (near mouth of spring)					
<b>Date/Time:</b> 03-Oct-2013 13:00			<b>Water Elevation (masl):</b> 679.11		
<b>Measurements:</b>					
Distance (m)	Water Depth (m)	Cross Sectional Area (m <sup>2</sup> )	Base Elevation (masl)	Velocity (m/sec)	Discharge (m <sup>3</sup> /sec)
0.0	E High Water	-	679.15	-	-
0.1	0.00	-	679.11	-	-
0.2	0.00	-	679.08	-	-
0.3	0.00	-	679.06	-	-
0.4	E Edge	-	679.04	-	-
0.5	0.03	0.005	678.99	0.000	0.000
0.6	0.08	0.008	678.95	0.090	0.001
0.7	0.08	0.008	678.93	0.150	0.001
0.8	0.09	0.009	678.92	0.060	0.001
0.9	0.10	0.010	678.92	0.020	0.000
1.0	0.10	0.010	678.90	0.110	0.001
1.1	0.09	0.009	678.91	0.000	0.000
1.2	0.08	0.008	678.91	0.000	0.000
1.3	0.10	0.010	678.89	0.028	0.000
1.4	0.07	0.007	678.92	0.190	0.001
1.5	0.07	0.007	678.93	0.500	0.004
1.6	0.10	0.010	678.91	0.260	0.003
1.7	0.10	0.010	678.89	0.630	0.006
1.8	0.09	0.023	678.90	0.010	0.000
1.9	W Edge	-	679.04	-	-
2.0	W High Water	-	679.15	-	-
<b>TOTAL DISCHARGE (m<sup>3</sup>/sec)</b>					<b>0.018</b>

<b>Location:</b> Acland Creek Section 1 (downstream of intake at 931 Meadow Valley Rd.)					
<b>Date/Time:</b> 03-Oct-2013 12:46			<b>Water Elevation (masl):</b> 652.52		
<b>Measurements:</b>					
<b>Culvert Dimensions</b>		<b>Water Depth - h</b> (m)	<b>Cross Sectional Area</b> (m <sup>2</sup> )	<b>Velocity</b> (m/sec)	<b>Discharge</b> (m <sup>3</sup> /sec)
<b>Parameter</b>	<b>Value (m)</b>				
Diameter	0.300	0.075	0.014	1.280	
Radius - r	0.150				
r <sup>2</sup>	0.023				
r-h (m)	0.075				
<b>TOTAL DISCHARGE (m<sup>3</sup>/sec)</b>					<b>0.018</b>
<b>CHANGE FROM PREVIOUS SECTION (m<sup>3</sup>/sec)</b>					<b>0.000</b>



**Table 4: Well Survey and Water Level Data for Groundwater Contours**  
**Faulder Well Aquifer Study**  
**Regional District of Okanagan-Similkameen**

Location	Easting	Northing	Data Source	Measurement Date	Elevation of Measuring Point (masl)	Groundwater Elevation (masl)	Screen Top Elevation (masl)	Screen Bottom Elevation (masl)
Acland Cr Sec2	298401.1	5507510	a	03-Oct-2013	679.04	679.04	-	-
552 Fish Lk Rd	298315.8	5504482	a	24-Sep-2013	725.26	721.52	-	-
WTN 51514-104 Fish Lk Rd	298868.6	5500263	a	24-Sep-2013	691.89	643.81	-	629.71
WTN 45196-23AgurCrt	298925	5499665	a	24-Sep-2013	683.81	641.10	-	625.29
WTN 83231-Mearns	298988.7	5499125	a	24-Sep-2013	679.14	634.22	626.72	625.50
WTN 83205-Faulder	299050.9	5499071	a	03-Oct-2013	678.09	634.46	618.96	614.39
WTN 83206-Gibbs	299129.3	5499071	a	03-Oct-2013	675.95	631.92	596.09	592.43
WTN 61480	299962	5497861	b	19-Aug-1994	656.00	627.96	-	618.20
OW3	298098.6	5505978	c	01-Sep-1990	740.00	719.00	-	719.00
WTN 59015	297647	5505466	b	16-Aug-1989	740.00	725.67	-	710.43
WTN 57926	297327	5505476	b	06-Mar-1988	740.00	732.99	-	706.47
WTN 55738	298442	5503918	b	29-Jan-1986	723.37	708.74	-	700.20
WTN 51510	299052	5501012	b	01-Jan-1983	717.54	675.48	-	660.85
WTN 45044	297644	5505514	b	15-May-1980	740.00	728.42	-	718.66
WTN 19686	297754	5505372	b	01-Jan-1966	740.00	727.81	-	724.76

#### Data Source

- a) Position and elevation surveyed and water level measured by Golder, Sep-Oct 2013.
- b) Position from DataBC, Groundwater Wells Geospatial Dataset. Elevation inferred from digital elevation model compiled by Golder using method described in report text. Depth to water from well record.
- c) Position from overlay of figure in Gordon Wilson Associates, 1990. Elevation inferred from digital elevation model compiled by Golder using method described in report text.

**Table 5: Isotope Results**  
**Faulder Well Aquifer Study**  
**Regional District of Okanagan Similkameen**

LabID	Sample ID	Delta 2H x 1000	Delta 18O x 1000	Collection Date
W-22709	23 Agur Ct	-127.55	-15.78	24-09-2013
W-22710	1139 Fish Lake Rd	-135.45	-16.87	24-09-2013
W-22711	852 Fish Lake Rd	-126.36	-15.64	03-10-2013
W-22712	Acland Cr Sec 2	-127.3	-16.18	03-10-2013
W-22713	Darke Cr Sec 4	-125.52	-16.11	03-10-2013
W-22714	Darke Cr 5	-123.35	-15.72	03-10-2013
W-22715	Darke Cr Sec 7	-125.06	-15.9	03-10-2013
W-22716	Trout Cr Sec 1	-126.38	-15.83	03-10-2013
W-22717	Trout Cr Sec 2	-127.68	-15.78	03-10-2013
W-22718	Faulder Well	-128.27	-16.4	24-07-2013
W-22719	Trout Creek 1	-132.36	-17.14	24-07-2013
W-22720	Darke Creek 1	-124.54	-14.92	24-07-2013

Table 6: Final Multi-Criteria Analysis of Groundwater Supply Options  
Faulder Well Aquifer Study  
Regional District of Okanagan Similkameen

Criteria	Option:	A) Existing Well as Sole Source		B) Upgraded Gibb's Well - Faulder as Backup		C) New Well in Faulder on Available Land		D) New Well - Mineola		E) New Well - Darke Creek Alluvial Fan	
	Weight	Score	Comment	Score	Comment	Score	Comment	Score	Comment	Score	Comment
Ability to meet existing demand	10	1	not able to meet demand in dry spring years due to less available drawdown	3	available drawdown sufficient, with assumptions	3	not known, but potentially higher if well is deeper than Faulder Well	3	not known, former settlement at site, suspected productive well to north	4	not known, existing wells in aquifer, inferred to be productive
Land purchase costs	8	5	none	2	private land	5	none	3	crown land	2	private land
Integration into existing system	7	5	none needed	2	new electrical, building, piping	3	Small amount of change required	1	potentially many additions needed	1	potentially many additions needed
Drilling costs	6	5	none	5	none	2		3	inferred to be shallower than Faulder well	3	
Well performance	6	2	declining, but known	3	pumping test conducted in 2005, no recent data	5	new well	5	new well	5	new well
Proximity to reservoir	6	5	infrastructure in place	4	minor addition to infrastructure required	5	minor addition to infrastructure required	2		1	
Public perception	6	3		2		4		1		1	potential for conflict with residents of North Meadow Valley
Proximity to proposed treatment plant	5	5	onsite	4		5		4		4	
Age and well condition	4	2	ten years old, sediment issues and decline in specific capacity	2	twelve years old, current screen condition not known	5	new well	5	new well	5	new well
Surface Seal, well upgrade costs	3	1	well record indicates surface casing but no seal	1	well record indicates no surface casing or surface seal, potential flood risk unknown	5	new well required to meet GWPR, costs included in drilling	5	new well required to meet GWPR, costs included in drilling	5	new well required to meet GWPR, costs included in drilling
Demand on recharge source	3	2	most distant from recharge source, little control of upstream use	2	most distant from recharge source, little control of upstream use	2	most distant from recharge source, little control of upstream use	3	further upstream, but downstream of flow restriction	5	upstream of most demand
Flood risk	3	5	higher elevation but large stream and floodplain not mapped	3	lower elevation, adjacent to large stream, floodplain not mapped	5	higher elevation but large stream and floodplain not mapped	2	area available to set well back from creek but flat and floodplain not mapped, smaller stream	2	area available to set well back from creek but flat and floodplain not mapped, smaller stream
Additional research required	3	4		4		3	could conduct GIS assessment of bedrock, and ESA for KVR site	2	ESA recommended due to past land use	2	field verification of well records and water quality recommended
Potential for well interference	3	5	few wells in use in area	5		5		5	low population, few users	2	other wells known to be in use in area
Potential to affect surface water flows	3	5		5		5		3	not known	1	potential to decrease flow in Darke Creek and impacting MVID
Knowledge of sub-surface conditions	3	5		5		4		1	not known, no well records available	1	well records available, but little field verification
Pumping Test costs	3	5	not required	4	short term pumping test for verification of capacity recommended	3	long term pumping test recommended	3	long term pumping test recommended	2	long term pumping test recommended, with monitoring for interference (wells and creek)
Proximity of potential back-up well	2	2	sole source means no backup	4	near Faulder well but requires crossing Trout Creek	5	near Faulder well, doesn't require crossing Trout Creek	3		1	
Water quality, other	2	3	quality well known, periodic gas entrainment	3	one historic analysis	3	quality unknown	1	quality unknown, potential for GWUDI if shallow, unconfined	1	quality unknown, potential for GWUDI if shallow, unconfined
Uranium concentration	1	3	elevated, known history, treatment trials acceptable	3	elevated, single result higher than Faulder well	2	elevated, unknown quality but assumed to be similar to Faulder/Gibbs Wells	4	unknown, no results nearby	4	uncertain, potential to be less due to decreased residence time
SCORE		317		276		346		251		231	
RANKING		2		3		1		4		5	

Table 7: Cost Analysis of Groundwater Supply Options  
Faulder Well Aquifer Study  
Regional District of Okanagan Similkameen

Criteria	B) Upgraded Gibb's Well - Faulder as Backup			C) New Well in Faulder on Avail. Land		
	Range in Costs		Comment	Range in Costs		Comment
Surface Seal & Well Head Upgrade	\$25,000	\$35,000	Well record indicates no surface casing or surface seal; due to potential flood risk installation of surface seal and extension of casing recommended.	\$0	\$0	New well required to meet GWPR, costs included in drilling.
Aquiring Land	??	??	Well is on private land; it is assumed that costs would be incurred but value is not currently known. Existing pumphouse would also need to be removed.	\$0	\$0	External costs assumed to be none; however, would likely require RDOS time resources.
Additional Consulting	\$5,000	\$10,000	Recommended to obtain pre-approval from IHA re GWUDI before proceeding due to proximity to Trout Creek.	\$5,000	\$10,000	Site selection and developmenet of tender specs, utility locates, limited ESA of rail site recommended.
Electrical Modifications	\$12,600	\$12,600	Previously recommended by Associated Engineering (costs from 2008, plus 5% inflation).	\$12,600	\$12,600	Previously recommended by Associated Engineering (costs from 2008, plus 5% inflation).
Pumphouse Addition	\$26,250	\$26,250	Assumes addition built to existing pumphouse (costs from Associated Engineering, 2008, plus 5% inflation).	\$26,250	\$26,250	Assumes addition built to existing pumphouse (costs from Associated Engineering, 2008, plus 5% inflation)
Pump and Piping	\$49,350	\$58,850	Lower cost assumes re-use of existing pump equipment (costs from Associated Engineering, 2008, plus 5% inflation), higher cost assumes new submersible pump.	\$79,000	\$79,000	Assumes new submersible pump and 90 m (300 ft) of buried distribution line. Cost range based on one estimate.
Drilling-Subcontractor	\$0	\$0	None	\$31,200	\$38,500	Assumed well diameter of 8 inches and depth of 85 m (280 ft). Cost provided is lower and upper range based on estimates from three drillers.
Pumping Test-Subcontractor	\$4,500	\$7,500	Short term (24hr) pumping test for verification of capacity recommended.	\$10,000	\$16,500	Long term (72hr) pumping test recommended.
Drilling/Pumping Test-Consulting	\$10,000	\$30,000	Short term (24hr) pumping test for verification of capacity recommended.	\$25,000	\$45,000	Long term (72hr) pumping test recommended.
Estimated Range of Total Cost	\$132,700	- \$180,200		\$189,050	- \$227,850	



# **APPENDIX A**

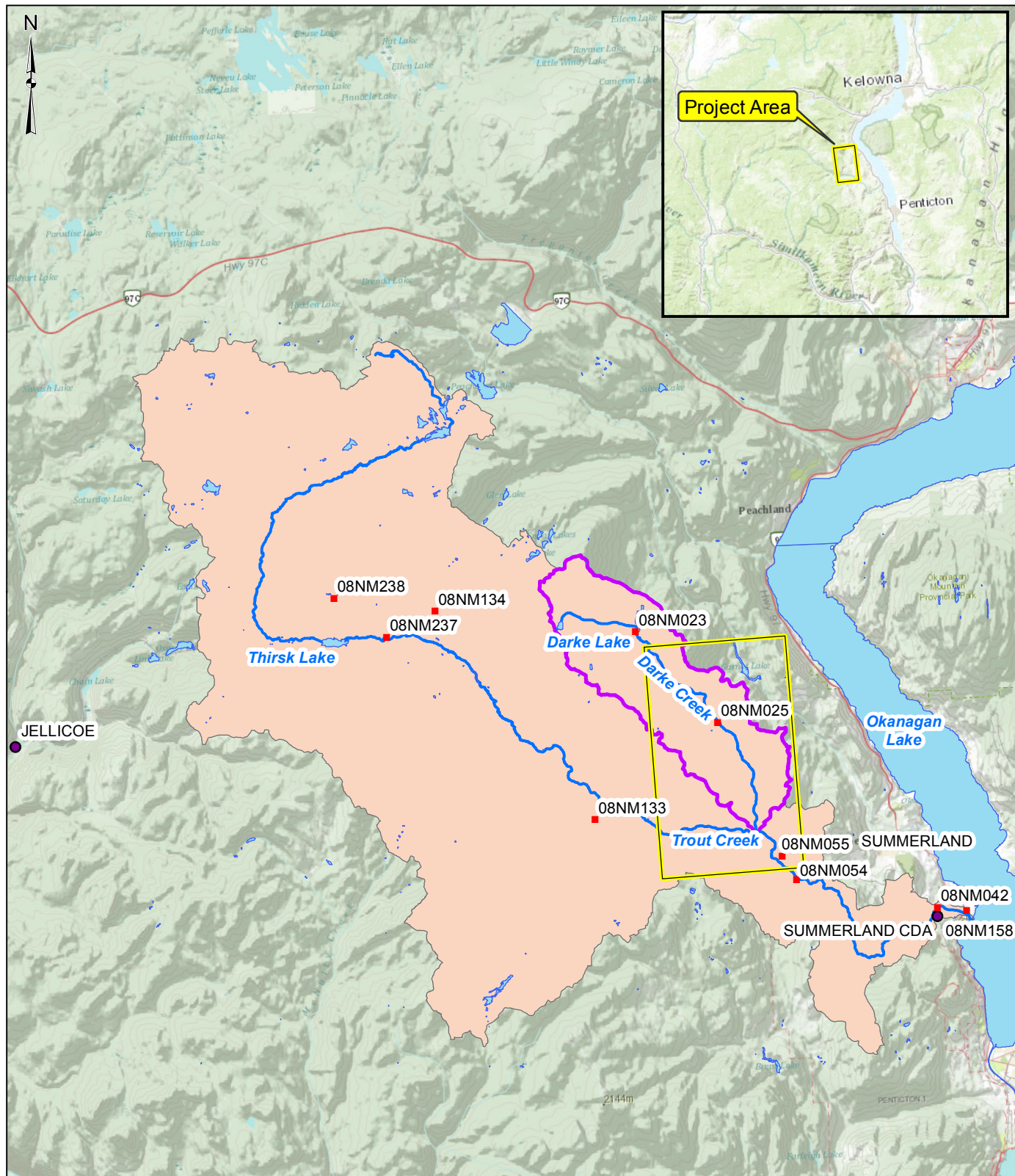
## **Maps**

Map 1: Key Plan

Map 2: Faulder Area Plan

Map 3: Meadow Valley Area Plan





#### LEGEND

- Project Area
- Darke Creek Watershed
- Hydrometric Stations
- Trout Creek Watershed
- Climate Stations
- Waterbodies
- Watercourses

5 0 5  
SCALE 1:300,000 KILOMETRES

#### REFERENCE

BASE MAPPING FROM ESRI WORLD TOPO MAPPING LAYER.

#### PROJECT

**FAULDER WELL AQUIFER STUDY  
REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN**

#### TITLE

### KEY PLAN



PROJECT NO. 13-1493-005			FILE No.	
DESIGN	PVA	4 Dec. 2013	SCALE AS SHOWN	REV. 0
GIS	BKL	6 Dec. 2013	<b>MAP: 1</b>	
CHECK	PVA	6 Dec. 2013		
REVIEW	JF	16 Dec. 2013		





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BASE IMAGERY FROM BING WEB MAPPING SERVICE  
BASE DATA FROM GEOBC WEB SERVICE  
PARCEL DATA FROM RDOS

PROJECT

PROJECT FAULDER WELL AQUIFER STUDY  
REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN

TITLE
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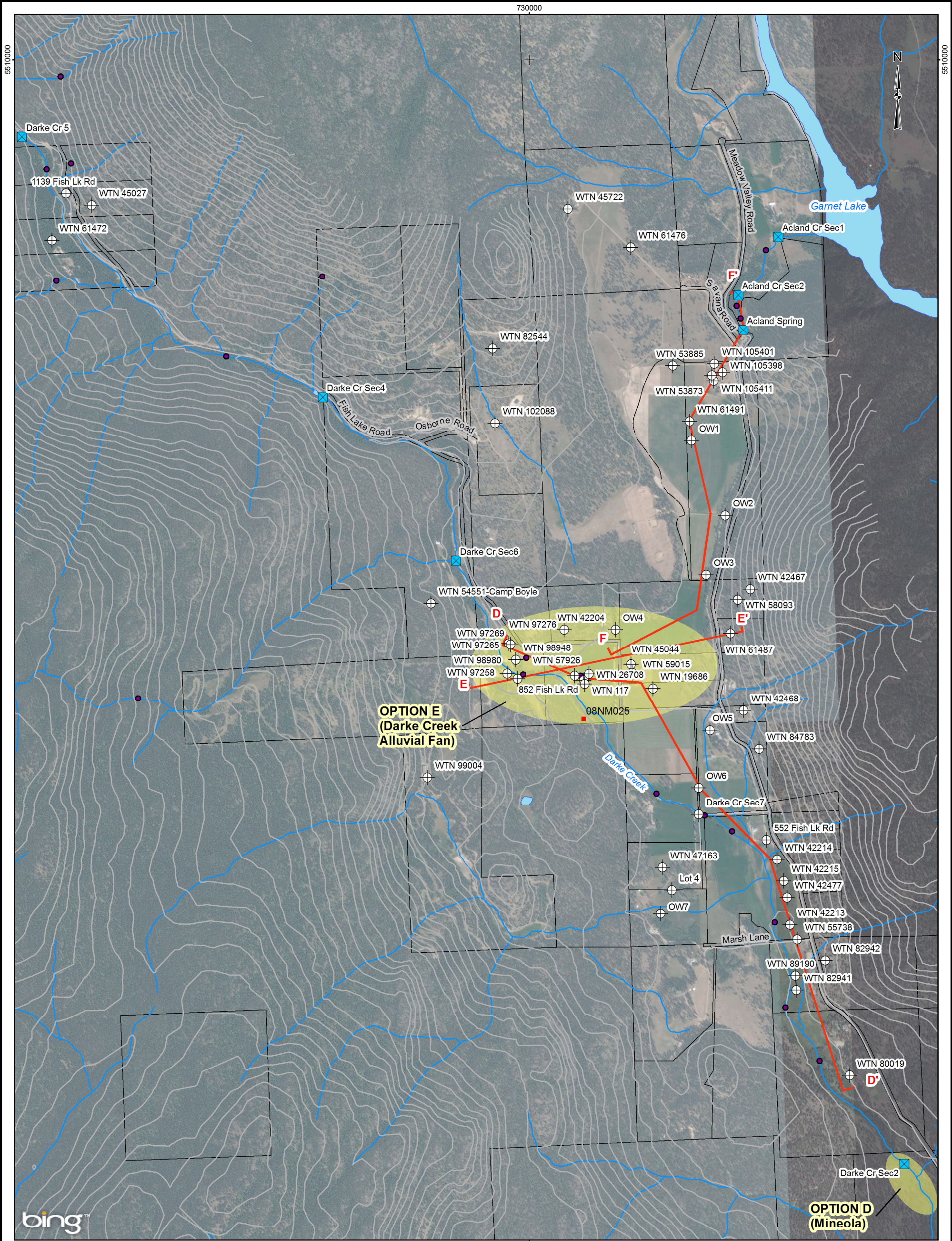
## FAULDER SITE PLAN



PROJECT NO. 13-1493-0055			FILE No.	
DESIGN	BKL	4 Dec. 2013	SCALE AS SHOWN	REV. 0
GIS	PVA	6 Dec. 2013	<b>MAP: 2</b>	
CHECK	PVA	6 Dec. 2013		
REVIEW	JF	17 Dec. 2013		

## MAP: 2

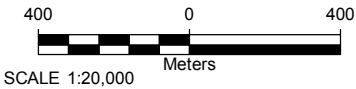




LEGEND

- Wells
- Surface Water Monitoring Point
- Location Included in Water Supply Options Assessment
- Hydrometric Station
- Point of Diversion
- Cross Section Location

- Contours (20m)
- Waterbodies
- Watercourses
- Parcels



REFERENCE

BASE IMAGERY FROM BING WEB MAPPING SERVICE  
BASE DATA FROM GEOBC WEB SERVICE  
PARCEL DATA FROM RDOS

PROJECT				
FAULDER WELL AQUIFER STUDY REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN				
TITLE				
MEADOW VALLEY SITE PLAN				
	PROJECT NO. 13-1493-0055		FILE No.	
	DESIGN	BKL	4 Dec. 2013	SCALE AS SHOWN
	GIS	PVA	6 Dec. 2013	REV. 0
	CHECK	PVA	6 Dec. 2013	
	REVIEW	JF	17 Dec. 2013	
MAP: 3				





# **APPENDIX B**

## **Project Initiation Meeting Notes**

August 27, 2013

Project No. 1314930055-M-Rev1

**FAULDER WELL AQUIFER STUDY**

Summary Notes of the Project Initiation Meeting  
Held at RDOS Office, 101 Martin Street, Penticton, BC

Held August 21, 2013 (10:30 - 11:30 AM)

**1.0 INTRODUCTION OF ATTENDEES**

<b>Regional District of Okanagan-Similkameen (RDOS)</b>		
Doug French	Public Works Manager	dfrench@rdos.bc.ca
Fiona Tischik	Assistant Environmental Technician	ftischik@rdos.bc.ca
Rob Palmer	Environmental Technician	rpalmer@rdos.bc.ca
Candace Wagner	Engineering Technologist	cwagner@rdos.bc.ca
<b>Golder Associates Ltd. (Golder)</b>		
Pattie Amison	Project Manager	Pattie_Amison@golder.com
Jacqueline (Jacquie) Foley	Project Director	Jacqueline_Foley@golder.com

**2.0 DISCUSSION TOPICS****2.1 Background Information and Key Updates since 2008**

- Doug presented background information on the RFP:
  - Best long term option assessed by RDOS to be connecting to Summerland's water supply, but they are about \$500,000 short of funding to complete the project and make the costs reasonable for residents.
  - RDOS has a proposal for Uranium removal to decrease concentrations to below Guidelines for Canadian Drinking Water Quality (GCDWQ).
  - BC Ministry of Environment (MoE) is requiring the study and that it is tied to funding grants for the Faulder water supply; MoE wants assurance that the aquifer can provide a sustainable supply of water.
  - RDOS does not want evaluate options with respect to Uranium concentrations in the source water.
- Doug and Rob discussed recent issue (approximately in the last six weeks) with entrained air or gases in water from the Faulder well. Water pumped from the well is milky in colour until it sits for a considerable





amount of time, and this is causing problems for the booster station that pumps water to 5-6 houses above. Currently the system is requiring almost daily checks. They think that the Gibb's well may have also had similar issues.

- Jacquie is not aware of any other wells in her experience that have had entrained gas issues but she will inquire with colleagues in Golder.
- Doug indicated that they will look into the matter internally.
- Golder indicated that they will make a few inquiries about the issue as well.
- RDOS mentioned that in 2011 an attempt was made to remove the 4 inch pump from the Faulder Well to replace with the 6 inch pump because the water levels had increased, but the contractor had difficulty removing it. An attempt was made to camera the well but the contractor had difficulty getting past the K-packer and it was reported that the screens were "full of mud". The pump had been fitted with a shroud and lowered into the screen previously, but Rob thinks that it is out of the screen now.
  - Jacquie said that if a subsequent video camera inspection of the well is undertaken, RDOS should specify for the contractor to record the inspection and provide it to RDOS for their records and viewing at a later date if necessary, because not all contractors record the inspections.
  - Doug said that a 5-day shut-down of the well and a cost of \$10,000 would be required to install the larger capacity (6-inch) pump in the Faulder Well, and this would be wasted if a new well was drilled; thus, they are waiting for the results of this assessment.
  - Residents want to know when the Faulder water supply issues will be addressed as they are on water restrictions.

## 2.2 Project Approach and Data Requests

- Pattie inquired as to whether the approach was to assess the supply of existing resident's needs or was it for assessing growth potential.
  - Doug indicated that the goal is to meet the current resident's needs and that RDOS is not considering any greater capacity in the area.
- Discussed data request list Golder provided to Rob.
  - Rob will go through the list to see what data RDOS is able to provide. GIS data can be provided following signing of a data sharing agreement. Golder should contact District of Summerland for GIS data for some areas of the watershed. Pump operation and water quality data can be provided electronically.
  - Approximately 10 year's worth of annual water quality may be available. Uranium concentrations are fairly consistent and just barely exceed guidelines.
  - Doug questioned the need to examine ten year's worth of data if Uranium concentrations are consistent.
  - Jacquie said that looking at a longer term data set can indicate trends otherwise not visible.

- Jacquie provided a summary of preliminary update to conceptual model based on more recent observations (water level trends and recent chemical analyses). This conceptual model will be further assessed during the first phase of this project. The Darke Creek Watershed may be providing greater recharge to the Faulder well than previously inferred based on the relative watershed areas of Trout Creek and Darke Creek Watersheds. A restriction of the Meadow Valley aquifer by bedrock outcrops up-gradient (north) of Faulder may be limiting recharge to the aquifer in the area of the well until a threshold water level is achieved in the area where the valley widens out. Also, the presence of a groundwater divide, discharge to the Acland Spring, and the timing and amount of discharge from the Darke Lake Reservoir all likely influence water levels in this area, and thus the amount of recharge available to the Faulder Well. Jacquie said that it is likely a new well drilled near the existing well would likely have similar issues and inquired whether RDOS would consider drilling a new well further to the north of the community.
- Doug is unsure whether RDOS would want to drill that far from the existing infrastructure, but may consider it. If the elevation is higher in the proposed new well location, then savings in pump costs may make the option more favorable.

## 2.3 Project Scope and Schedule

- Regarding scope, the desired amount of public engagement was discussed. Doug said that an open house would be held to inform the Public after a decision is made regarding the source.
- Jacquie said that original schedule was for approx. 12 weeks to complete work, based on project award and initiation meeting the project is estimated to be complete by the end of December.

## 3.0 ACTION ITEMS

- Candace will look at available land areas for drilling a potential new well.
- Pattie will forward the completed Health, Safety and Environment Plan to Candace.
- Pattie to contact District of Summerland for GIS data in over-lapping areas.
- Pattie will contact Rob regarding locations of private wells and contacting residents.
- RDOS to send their GIS data for area following Golder's signing of data sharing agreement.

Minutes Completed by:

Pattie Amison, M.Sc., EPT  
Scientist, Hydrogeology Group

PVA/JF/rv

Distribution: Liisa Bloomfield, RDOS  
Doug French, RDOS

Reviewed by:

Jacqueline Foley, M.Sc., Geo.L.  
Associate, Senior Hydrogeologist

[http://capws.golder.com/sites/p314930055faulderwellaquiferstudy/projectadministrationandinitiation/1314930055\\_initiation\\_meeting\\_notes\\_28aug\\_13.docx](http://capws.golder.com/sites/p314930055faulderwellaquiferstudy/projectadministrationandinitiation/1314930055_initiation_meeting_notes_28aug_13.docx)



# APPENDIX C

## Well Records and Electronic Data

- Faulder and Gibbs Well Records (Printed)
- GIS Files (on DVD)
- Well Database (on DVD)
- MoE Well Records (on DVD)
- Photographs (on DVD)



## Report 1 - Detailed Well Record

Well Tag Number: 83205	Construction Date: 1993-07-04 00:00:00		
Owner: FAULDER COMMUNITY WATER SYSTEM	Driller: Robbins Water Wells & Pump Service		
Address: 133 KETTLE PLACE	Well Identification Plate Number: 28564		
Area: FAULDER	Plate Attached By: LANCE VALCOURT		
WELL LOCATION: OSOYOOS (ODYD) Land District District Lot: 1072 Plan: 42524 Lot: A Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082E062111 Well: 2	Where Plate Attached: WELL CASING		
Class of Well: Subclass of Well: Orientation of Well: Status of Well: New Well Use: Water Supply System Observation Well Number: Observation Well Status: Construction Method: Drilled Diameter: 8 inches Casing drive shoe: Well Depth: 209 feet Elevation: 2224.1 feet (ASL) Final Casing Stick Up: inches Well Cap Type: Bedrock Depth: feet Lithology Info Flag: Y File Info Flag: N Sieve Info Flag: N Screen Info Flag: Y	PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 290 (Driller's Estimate) U.S. Gallons per Minute Development Method: Pump Test Info Flag: Y Artesian Flow: Artesian Pressure (ft): Static Level: 154 feet		
Site Info Details: Other Info Flag: Other Info Details:	WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: E258542 Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM): N		
	Water Utility: N Water Supply System Name: FAULDER COMMUNITY WATER SYSTEM Water Supply System Well Name: FAULDER COMMUNITY WS - WELL #1		
	SURFACE SEAL: Flag: N Material: Method: Depth (ft): Thickness (in):		
	WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:		
Screen from	to feet	Type	Slot Size
194	199		40
199	204		60
204	209		80
Casing from	to feet	Diameter	Material
0	148	10	null
0	235	8	null
			Drive Shoe
			null
			null
GENERAL REMARKS: SPEC CAP: 12.93 USGPM/FT; THEORETICAL CAP: 350 USGPM.			
LITHOLOGY INFORMATION:			
From 1 to 7 Ft.	SAND & GRAVEL WITH SMALL COBBLES	0 nothing entered 0 nothing entered 0 nothing entered	
From 7 to 9 Ft.	LARGE BOULDERS & SMALL GRAVEL; "SOME WATER"	0 nothing entered 0 nothing entered 0 nothing entered	
From 9 to 20 Ft.	CEMENTED SAND & GRAVEL; TIGHT	0 nothing entered 0 nothing entered 0 nothing entered	
From 20 to 30 Ft.	COMPACT SAND WITH GRAVEL	0 nothing entered 0 nothing entered 0 nothing entered	
From 30 to 41 Ft.	BROWN SAND WITH GRAVEL; LOOSE	0 nothing entered 0 nothing entered 0 nothing entered	
From 41 to 50 Ft.	SAND & GRAVEL; TIGHT	0 nothing entered 0 nothing entered 0 nothing entered	
From 50 to 60 Ft.	SAND & GRAVEL WITH COBBLES & BROWN CLAY	0 nothing entered 0 nothing entered 0 nothing entered	
From 60 to 70 Ft.	BROWN SAND & GRAVEL WITH CLAY; VERY TIGHT	0 nothing entered 0 nothing entered 0 nothing entered	
From 70 to 80 Ft.	BROWN SAND WITH LARGE COBBLES; LOOSE	0 nothing entered 0 nothing entered 0 nothing entered	
From 80 to 84 Ft.	BROWN CLAY WITH COBBLES; TIGHT	0 nothing entered 0 nothing entered 0 nothing entered	
From 84 to 90 Ft.	BROWN SHARP SAND WITH LARGE GRAVEL	0 nothing entered 0 nothing entered 0 nothing entered	
From 90 to 100 Ft.	MEDIUM TO LARGE GRAVEL WITH SOME BROWN SAND	0 nothing entered 0 nothing entered 0 nothing entered	
From 100 to 110 Ft.	LARGE COBBLES MIXED WITH BROWN SAND	0 nothing entered 0 nothing entered 0 nothing entered	
From 110 to 120 Ft.	MEDIUM TO HARD BROWN CLAY; "DRILLED"	0 nothing entered 0 nothing entered 0 nothing entered	
From 120 to 130 Ft.	BROWN SAND & GRAVEL; "TIGHT"	0 nothing entered 0 nothing entered 0 nothing entered	
From 130 to 140 Ft.	BROWN SAND & MEDIUM TO SMALL GRAVEL; TIGHT "DRILLED"	0 nothing entered 0 nothing entered 0 nothing entered	
From 140 to 149 Ft.	MEDIUM TO SMALL GRAVEL; TIGHT WITH FINE SAND	0 nothing entered 0 nothing entered 0 nothing entered	
From 149 to 155 Ft.	BROWN SAND & MEDIUM TO COARSE GRAVEL; SHARP & TIGHT	0 nothing entered 0 nothing entered 0 nothing entered	
From 155 to 160 Ft.	BROWN SAND WITH SMALL GRAVEL; SOME POLISHED & SOME SHARP	0 nothing entered 0 nothing entered 0 nothing entered	
From 160 to 170 Ft.	BROWN SAND & MEDIUM TO SHARP GRAVEL	0 nothing entered 0 nothing entered 0 nothing entered	
From 170 to 175 Ft.	LARGE & SMALL GRAVEL MIXED WITH BROWN SAND	0 nothing entered 0 nothing entered 0 nothing entered	
From 175 to 177 Ft.	MEDIUM TO LARGE GRAVEL & COARSE SAND	0 nothing entered 0 nothing entered 0 nothing entered	
From 177 to 178 Ft.	STRIP OF BROWN CLAY	0 nothing entered 0 nothing entered 0 nothing entered	
From 178 to 184 Ft.	BROWN FINE SAND	0 nothing entered 0 nothing entered 0 nothing entered	
From 184 to 189 Ft.	BROWN CLEAN COARSE SAND; "GOOD" WATER-BEARING	0 nothing entered 0 nothing entered 0 nothing entered	
From 189 to 192 Ft.	BROWN SAND & LARGE TO MEDIUM GRAVEL; A "LITTLE" DIRTY	0 nothing entered 0 nothing entered 0 nothing entered	
From 192 to 198 Ft.	MEDIUM TO LARGE GRAVEL WITH BROWN SAND	0 nothing entered 0 nothing entered 0 nothing entered	
From 198 to 205 Ft.	BROWN SAND WITH MEDIUM TO LARGE GRAVEL	0 nothing entered 0 nothing entered 0 nothing entered	
From 205 to 210 Ft.	BROWN SAND WITH BIG ROCKS; A "LITTLE DIRTY"	0 nothing entered 0 nothing entered 0 nothing entered	
From 210 to 214 Ft.	BROWN FINE SAND WITH SMALL GRAVEL "MIXED IN"	0 nothing entered 0 nothing entered 0 nothing entered	
From 214 to 216 Ft.	CEMENTED GRAVEL WITH LARGE COBBLES & BROWN CLAY ON ROCKS	0 nothing entered 0 nothing entered 0 nothing entered	
From 216 to 218 Ft.	BROKEN ROCKS	0 nothing entered 0 nothing entered 0 nothing entered	
From 218 to 235 Ft.	BEDROCK	0 nothing entered 0 nothing entered 0 nothing entered	
From to Ft.	BACKFILLED TO 209 FT.	0 nothing entered 0 nothing entered 0 nothing entered	

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## FAULDER COMMUNITY WATER SUPPLY WELL

**Location:** In Regional District of Okanagan-Similkameen, in the northwest part of D.L. 1072, on the north side of Trout Creek near its intersection with the Darke Creek Valley at Faulder, at a site approximately seven kilometres west of Summerland.

**Date of construction:** July 1993.

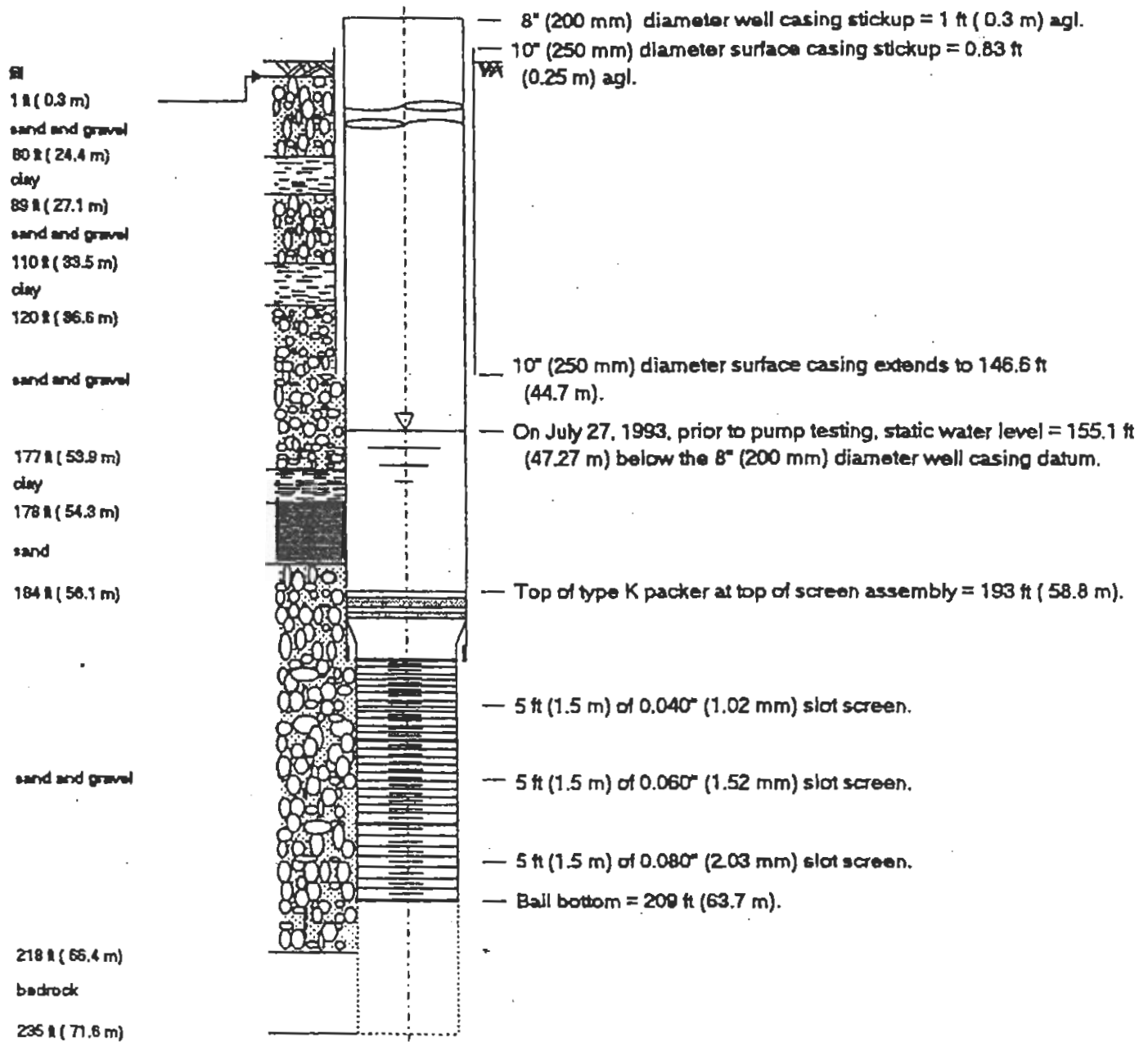
**Drilling contractor:** Robbins Water Well Drilling & Pump Services.

### Drillers litholog:

0.3 - 2.1 m ( 1 - 7 ft)	sand and gravel with small cobbles
2.1 - 2.7 m ( 7 - 9 ft)	large boulders and small gravel; "some water"
2.7 - 6.1 m ( 9 - 20 ft)	cemented sand and gravel; tight
6.1 - 9.1 m ( 20 - 30 ft)	compact sand with gravel
9.1 - 12.5 m ( 30 - 41 ft)	brown sand with gravel; loose
12.5 - 15.2 m ( 41 - 50 ft)	sand and gravel; tight
15.2 - 18.3 m ( 50 - 60 ft)	sand and gravel with cobbles and brown clay
18.3 - 21.3 m ( 60 - 70 ft)	brown sand and gravel with clay; very tight
21.3 - 24.3 m ( 70 - 80 ft)	brown sand with large cobbles; loose
24.3 - 25.6 m ( 80 - 84 ft)	brown clay with cobbles; tight
25.6 - 27.4 m ( 84 - 90 ft)	brown sharp sand with large gravel
27.4 - 30.5 m ( 90 - 100 ft)	medium to large gravel with some brown sand
30.5 - 33.5 m (100 - 110 ft)	large cobbles mixed with brown sand
33.5 - 36.6 m (110 - 120 ft)	medium to hard brown clay; "drilled"
36.6 - 39.6 m (120 - 130 ft)	brown sand and gravel; "tight"
39.6 - 42.7 m (130 - 140 ft)	brown sand and medium to small gravel; tight ("drilled")
42.7 - 45.4 m (140 - 149 ft)	medium to small gravel; tight with fine sand
→ 45.4 - 47.2 m (149 - 155 ft)	brown sand and medium to coarse gravel; sharp and tight
47.2 - 48.8 m (155 - 160 ft)	brown sand with small gravel; some polished and some sharp
48.8 - 51.8 m (160 - 170 ft)	brown sand and medium to sharp gravel
51.8 - 53.3 m (170 - 175 ft)	large and small gravel mixed with brown sand
53.3 - 53.9 m (175 - 177 ft)	medium to large gravel and coarse sand
53.9 - 54.2 m (177 - 178 ft)	strip of brown clay
54.2 - 56.1 m (178 - 184 ft)	brown fine sand
56.1 - 57.6 m (184 - 189 ft)	brown clean coarse sand; "good" water-bearing
57.6 - 58.5 m (189 - 192 ft)	brown sand and large to medium gravel; a "little dirty"
58.5 - 60.4 m (192 - 198 ft)	medium to large gravel with brown sand
60.4 - 62.5 m (198 - 205 ft)	brown sand with medium to large gravel
→ 62.5 - 64.0 m (205 - 210 ft)	brown sand with big rocks; a "little dirty"
64.0 - 65.2 m (210 - 214 ft)	brown fine sand, with small gravel "mixed in"
65.2 - 65.8 m (214 - 216 ft)	cemented gravel with large cobbles and brown clay on rocks
65.8 - 66.5 m (216 - 218 ft)	broken rocks
66.5 - 67.4 m (218 - 235 ft)	bedrock.

FIGURE 3

FAULDER COMMUNITY WELL - CONSTRUCTION DETAILS



Notes:

1. The sketch is not to scale.
2. The well screen is 8" (200 mm) nominal diameter Johnson stainless steel.
3. All measurements are below ground unless otherwise indicated.

## FAULDER COMMUNITY WATER SUPPLY WELL (cont'd)

Diameter: 200 mm (8") with 250 mm (10") diameter casing to 45 m (147.5 ft).

Completed depth of well: 63.7 m (209 ft).

Static water level: 47.0 m (154.10 ft) below ground on July 27, 1993.

### Completion:

The Faulder Community Well is completed with the following 200 mm (8") nominal diameter Johnson stainless steel well screen:

at top at 58.8 m (193 ft)	type K packer and riser pipe
1.5 m (5 ft) of	1.02 mm (0.040") slot screen
1.5 m (5 ft) of	1.52 mm (0.060") slot screen
1.5 m (5 ft) of	2.03 mm (0.080") slot screen
at bottom at 63.8 m (209 ft)	bail bottom.

Measurements are below ground level at the time of well construction.

**Well performance:** During pump testing at a final constant rate of 18.3 L/sec (290 USgpm) between 120 and 1440 minutes on July 27 and 28, 1993, the final drawdown in the Faulder Well was 6.8 m (22.4 ft), giving a specific capacity of 2.7 L/sec/m (12.93 USgpm/ft).

**Well capacity:** Rated according to standard procedure the theoretical capacity of the Faulder Community Well is as much as 22.5 L/sec (350 USgpm); however, under the prevailing geologic conditions, the Well should not be pumped in excess of 18.93 L/sec (300 USgpm) without additional testing at an higher rate. At the planned pumping rate of 9.08 L/sec (120 igpm), the projected pumping water level is estimated to be about 50.3 m (165 ft) below ground.



## Report 1 - Detailed Well Record

Well Tag Number: 83206 Owner: MARTIN GIBBS Address: PRINCETON SUMMERLAND RD Area: FAULDER WELL LOCATION: OSOYOOS (ODYD) Land District District Lot: 1072 Plan: Lot: Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082E062111 Well: 3 Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Status of Well: New Well Use: Water Supply System Observation Well Number: Observation Well Status: Construction Method: Drilled Diameter: 6 inches Casing drive shoe: Well Depth: 274 feet Elevation: feet (ASL) Final Casing Stick Up: inches Well Cap Type: Bedrock Depth: feet Lithology Info Flag: Y File Info Flag: N Sieve Info Flag: N Screen Info Flag: Y Site Info Details: Other Info Flag: Other Info Details:	Construction Date: 1992-07-01 00:00:00 Driller: All Western Drilling Well Identification Plate Number: Plate Attached By: Where Plate Attached: PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 270 (Driller's Estimate) U.S. Gallons per Minute Development Method: Pump Test Info Flag: Y Artesian Flow: Artesian Pressure (ft): Static Level: 164 feet WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM): N Water Utility: N Water Supply System Name: Water Supply System Well Name: SURFACE SEAL: Flag: N Material: Method: Depth (ft): Thickness (in): WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:			
Screen from	to feet	Type	Slot Size	
null	null		null	
Casing from	to feet	Diameter	Material	Drive Shoe
GENERAL REMARKS:				
LITHOLOGY INFORMATION:				
From	0 to	12 Ft.	CLAY & BOULDER	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	12 to	18 Ft.	GRAVEL	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	18 to	43 Ft.	GLACIAL TILL	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	43 to	80 Ft.	HARDPAN	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	80 to	101 Ft.	CLAY & COARSE GRAVEL	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	101 to	115 Ft.	SAND & GRAVEL	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	115 to	168 Ft.	GLACIAL TILL	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	168 to	173 Ft.	CLAY & FINE GRAVEL	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	173 to	224 Ft.	SAND & GRAVEL	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	224 to	233 Ft.	HEAVING SAND	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	233 to	240 Ft.	FINE GRAVEL	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	240 to	258 Ft.	HEAVING SAND	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered
From	258 to	274 Ft.	COARSE SAND	0 nothing entered 0 nothing entered 0 nothing entered 0 nothing entered

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## MARTIN GIBBS WELL

Location: On the west half of District Lot 1072 at Faulder, at the south end of Fish Lake Road on the south side of Trout Creek.

Date of construction: July 1992.

Contractor: All-Western Drilling '89 Ltd.

### Driller's Litholog:

0 - 3.7 m ( 0 - 12 ft)	clay and boulder
3.7 - 5.5 m ( 12 - 18 ft)	gravel
5.5 - 13.1 m ( 18 - 43 ft)	glacial till
13.1 - 24.4 m ( 43 - 80 ft)	hardpan
24.4 - 30.8 m ( 80 - 101 ft)	clay and coarse gravel
30.8 - 35.1 m (101 - 115 ft)	sand and gravel
35.1 - 51.2 m (115 - 168 ft)	glacial till
51.2 - 52.7 m (168 - 173 ft)	clay and fine gravel
52.7 - 68.3 m (173 - 224 ft)	sand and gravel
68.3 - 71.0 m (224 - 233 ft)	heaving sand
71.0 - 73.2 m (233 - 240 ft)	fine gravel
73.2 - 78.7 m (240 - 258 ft)	heaving sand
78.7 - 83.5 m (258 - 274 ft)	coarse sand.

Diameter: 150 mm (6").

Completed depth of well: 83.5 m (274 ft).

Static water level: 50.1 m (164.45 ft) on July 8, 1992.

## MARTIN GIBBS WELL (cont'd)

### Completion:

The Gibbs Well is completed with the following assembly of 150 mm (6") nominal (telescopic) diameter Johnson stainless steel well screen and 127 mm (5") riser pipe:

at top at 79.1 m (259½ ft)	type K packer and riser pipe, 0.6 m (2 ft) long
1.2 m (4 ft) of	0.76 mm (0.030") slot screen
1.2 m (4 ft) of	1.27 mm (0.050") slot screen
1.2 m (4 ft) of	1.02 mm (0.040") slot screen
at bottom at 83.5 m (274 ft)	threaded flat steel plate.

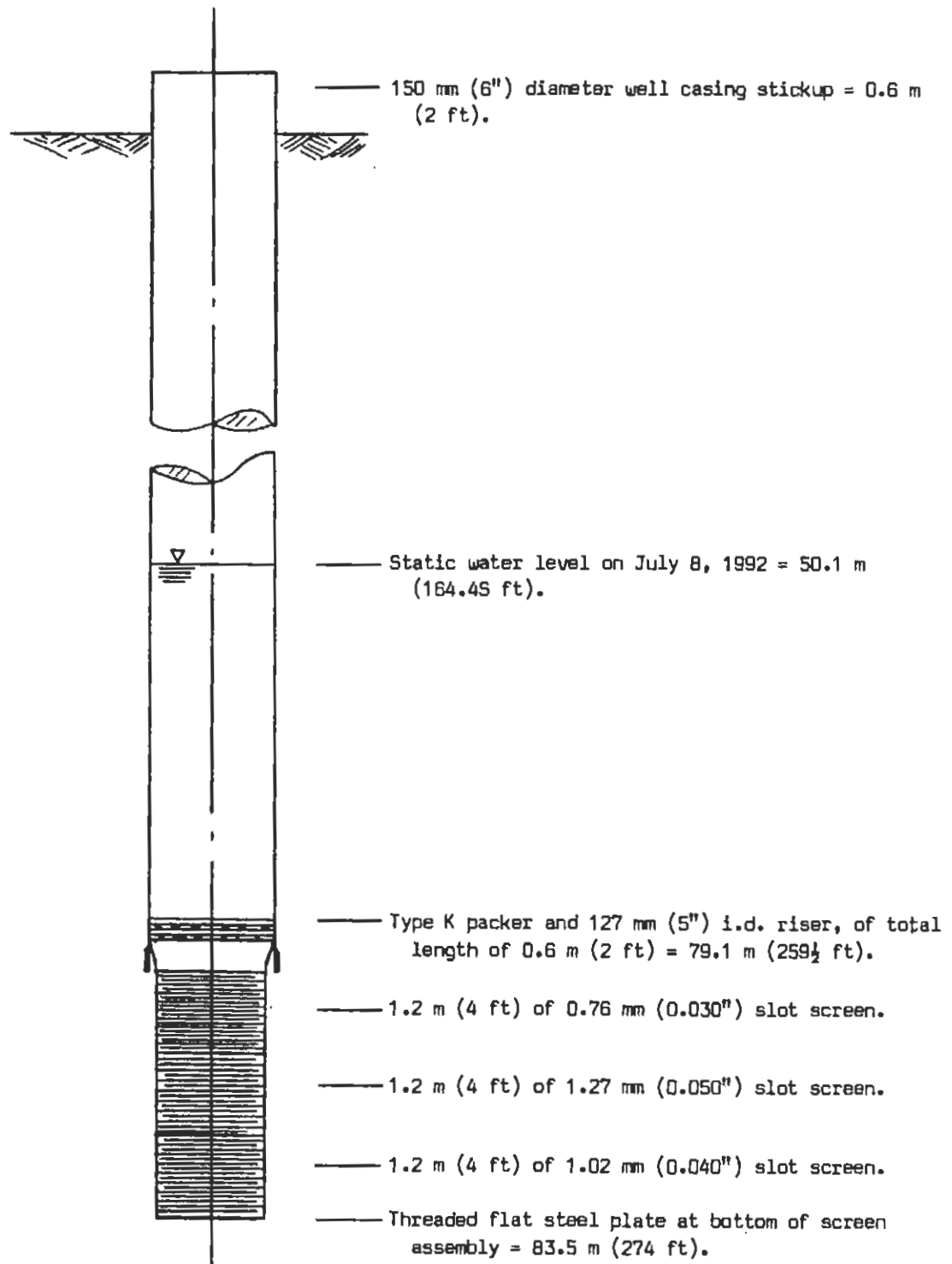
Measurements are below ground at the time of well construction.

Well performance: During pump testing on July 8, 1992, the maximum drawdown, after pumping at a rate of 17.04 L/sec (270 USgpm) between 40 and 440 minutes, was 5.58 m (18.30 ft) for a specific capacity of 3.05 L/sec/m (14.75 USgpm/ft).

Well capacity: Rated according to standard procedure, the **theoretical** capacity of the Gibbs Well is as much as three times the testing rate of 17.04 L/sec (270 USgpm); the **practical** capacity is controlled by the size of pump that can be obtained to pump from a 150 mm (6") diameter casing.

FIGURE 3

CONSTRUCTION DETAILS OF GIBBS WELL



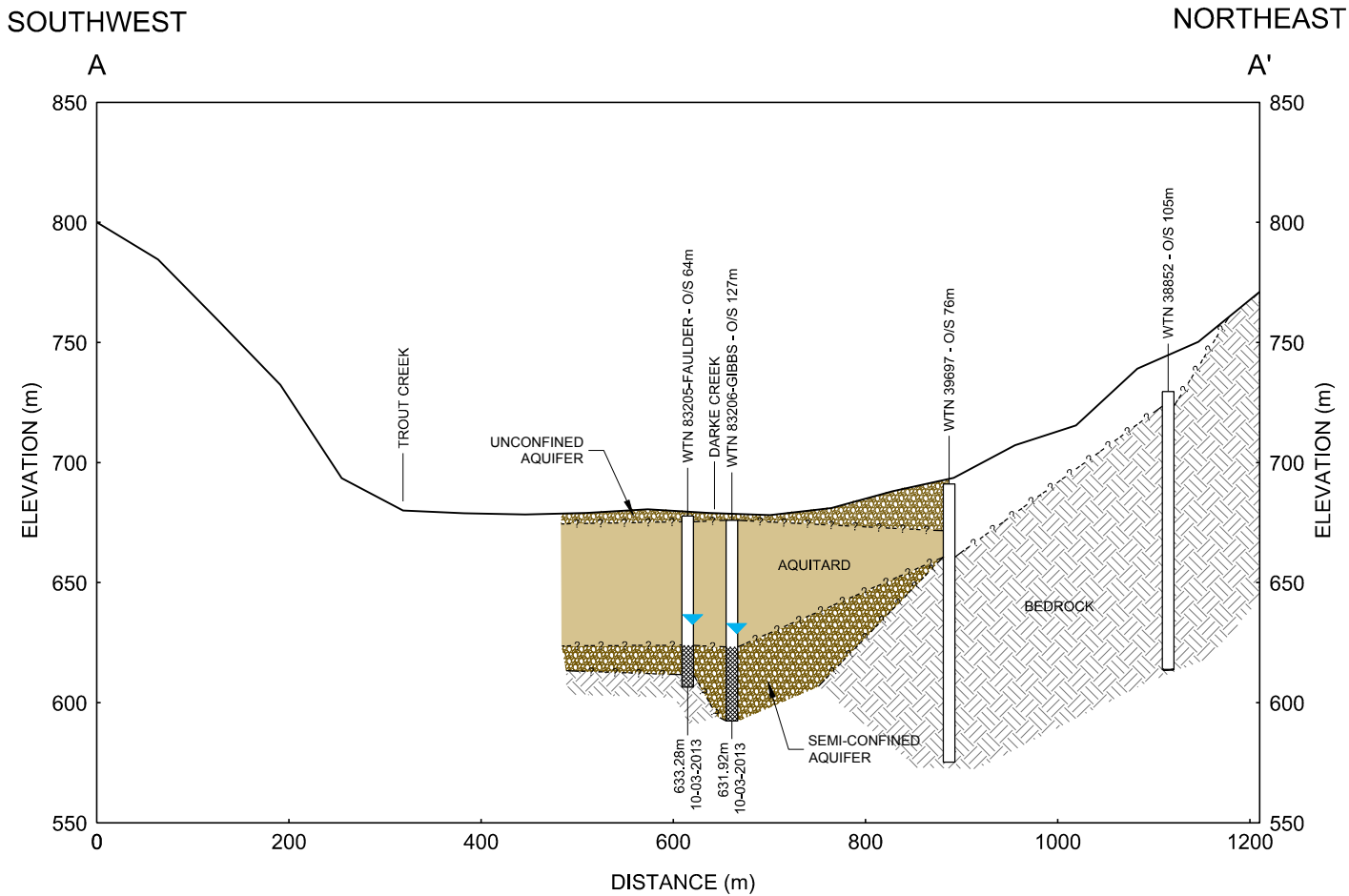
Notes:

1. The sketch is not to scale.
2. The well screen is 150 mm (6") nominal diameter Johnson stainless steel.
3. All measurements are below ground unless otherwise indicated.



# **APPENDIX D**

## **Cross Sections and Water Level Trends**



CROSS-SECTION A-A'  
H=SCALE A V=SCALE B

LEGEND

GROUNDWATER

WELL SCREEN

631.92m

GROUNDWATER ELEVATION

10-03-2013

DATE (MM-DD-YYYY)


O/S

OFF SET

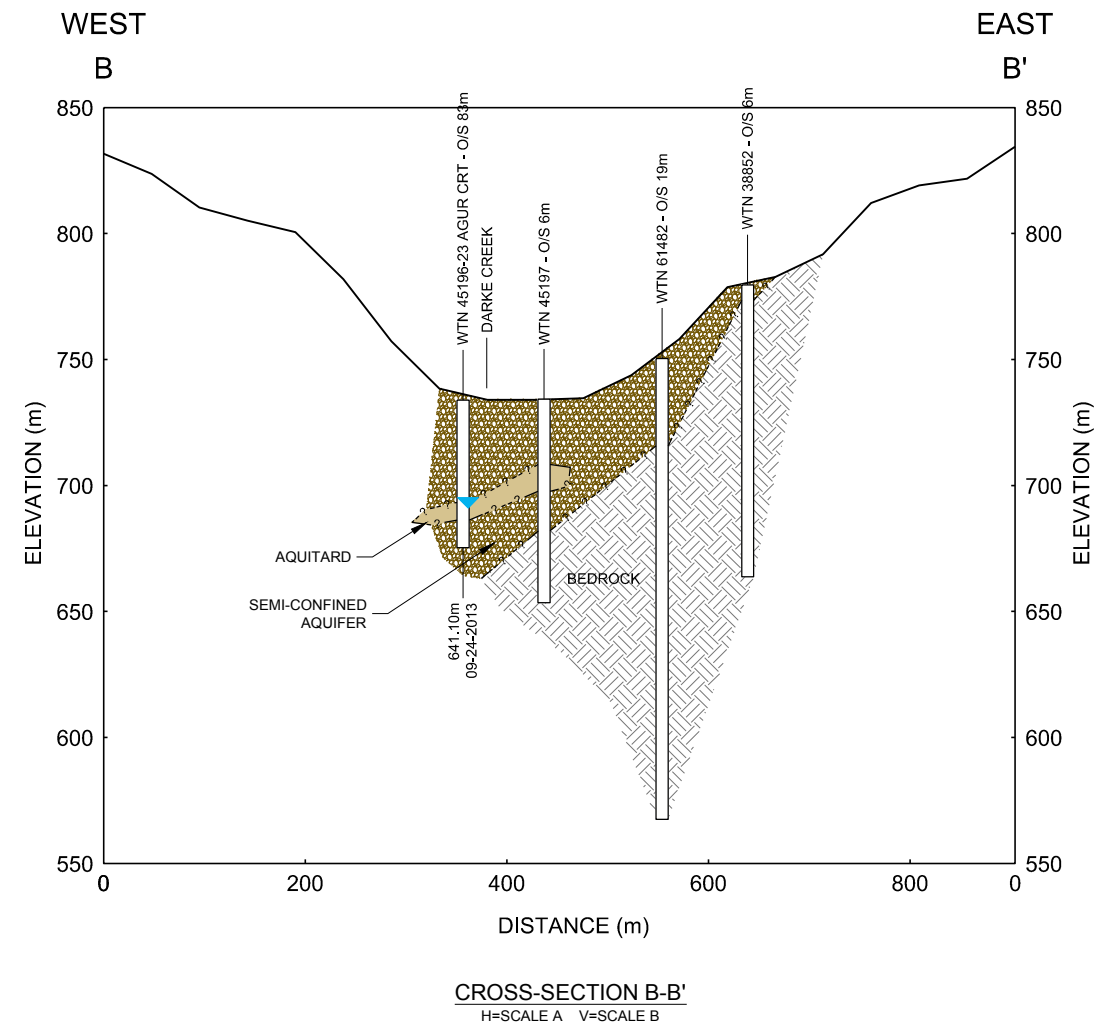
NOTES

CROSS-SECTION LOCATIONS SHOWN ON MAP 2 & 3.




REV	DATE	REVISION DESCRIPTION			DES	CADD	CHK	RWW		
PROJECT										
FAULDER WELL AQUIFER STUDY REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN										
TITLE										
CROSS-SECTION A-A'										
			PROJECT No.		13-1493-0055		FILE No.		SECTION	
			DESIGN	PVA	2013-12-04		SCALE		AS SHOWN	
			CADD	MD	2013-12-04		FIGURE		D1	
			CHECK	PVA	2013-12-04					
			REVIEW	JF	2013-12-04					

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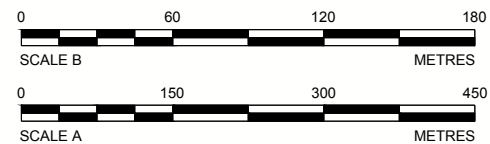



#### LEGEND

	GROUNDWATER
631.92m	GROUNDWATER ELEVATION
10-03-2013	DATE (MM-DD-YYYY)
O/S	OFF SET

#### NOTES

CROSS-SECTION LOCATIONS SHOWN ON MAP 2 & 3.

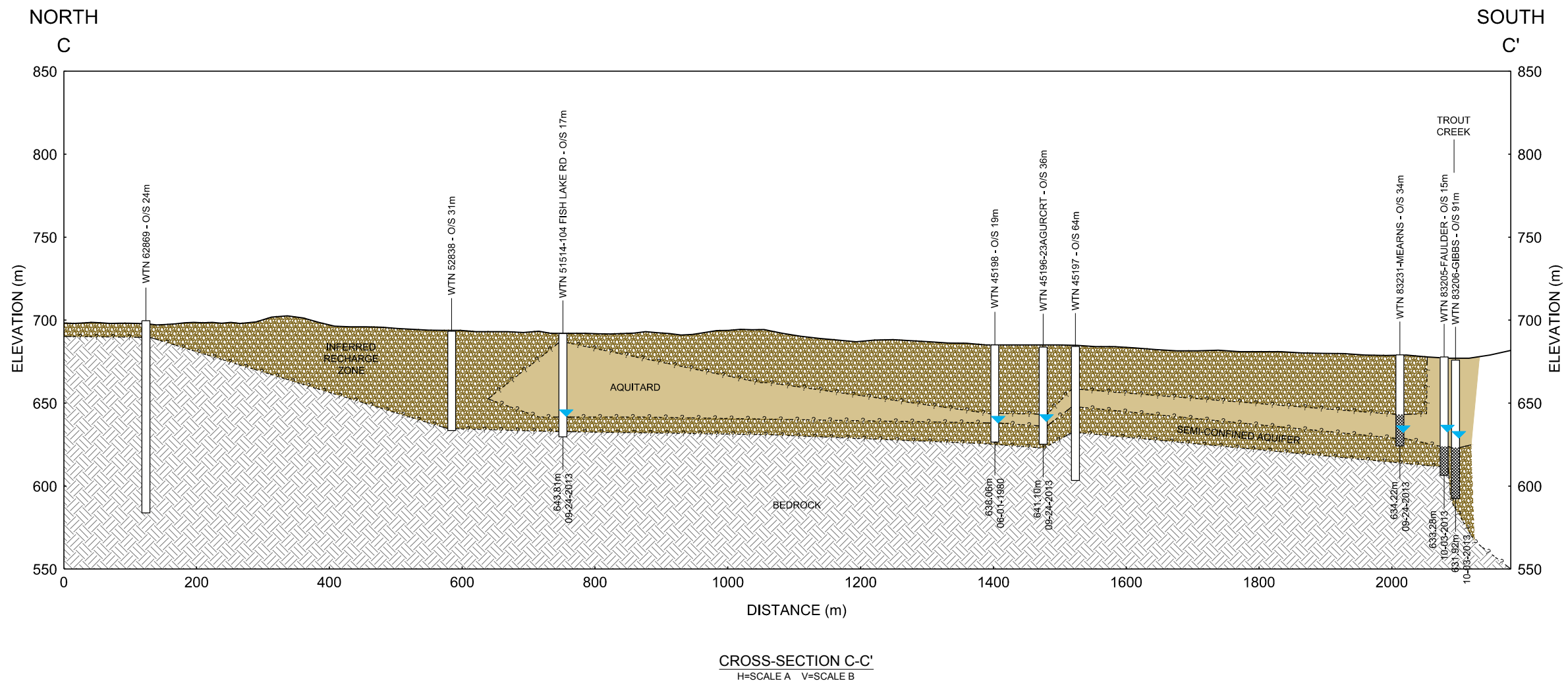


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PROJECT							
FAULDER WELL AQUIFER STUDY REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN							
TITLE							
CROSS-SECTION B-B'							
			PROJECT No.		13-1493-0055	FILE No.	SECTION
			DESIGN	PVA	2013-12-04	SCALE	AS SHOWN
			CADD	MD	2013-12-04	FIGURE	D2
			CHECK	PVA	2013-12-04		
			REVIEW	JF	2013-12-04		





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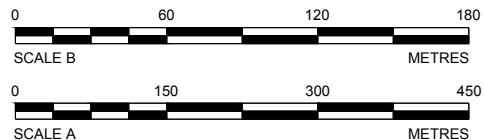



LEGEND

- GROUNDWATER
- WELL SCREEN
- GROUNDWATER ELEVATION
- DATE (MM-DD-YYYY)
- OFF SET

NOTES

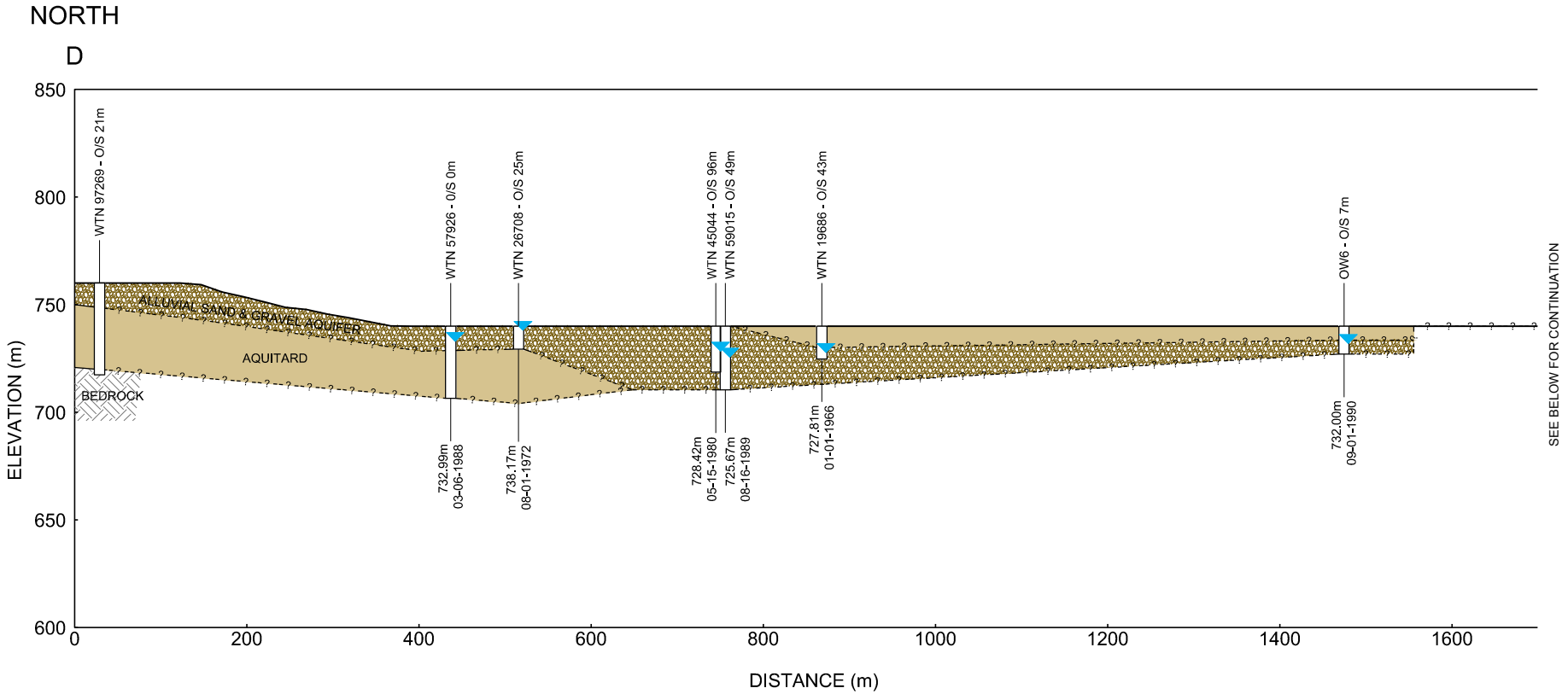
CROSS-SECTION LOCATIONS SHOWN ON MAP 2 & 3.



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PROJECT								
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TITLE								
CROSS-SECTION C-C'								
		PROJECT No. 13-1493-0055				FILE No.		SECTION
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		CHECK	PVA	2013-12-04				
		REVIEW	JF	2013-12-04				

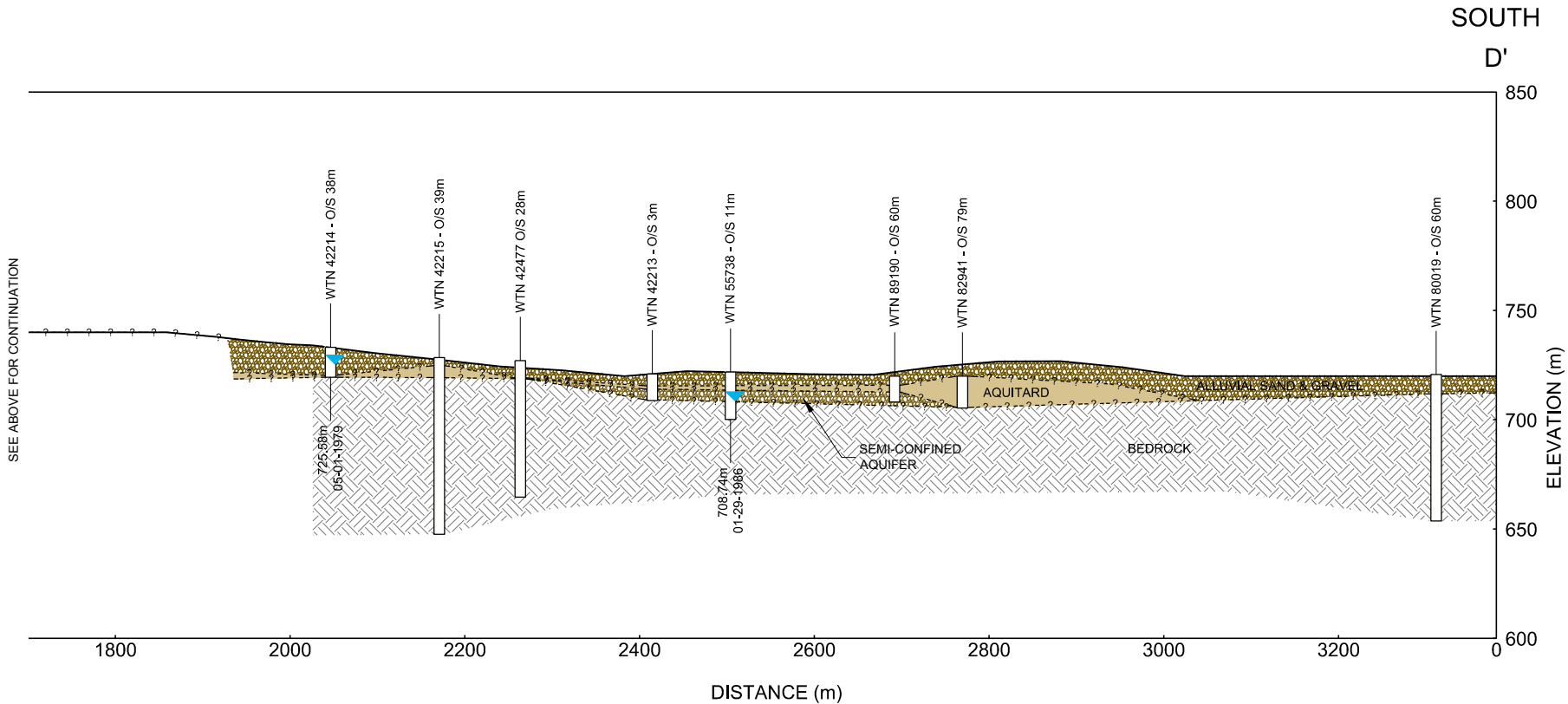


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CROSS-SECTION D-D'

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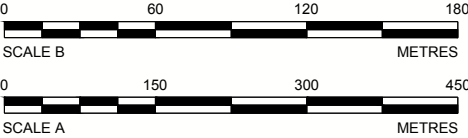



CROSS-SECTION D-D'

H=SCALE A V=SCALE B

LEGEND	
	GROUNDWATER
631.92m	GROUNDWATER ELEVATION
10-03-2013	DATE (MM-DD-YYYY)
O/S	OFF SET

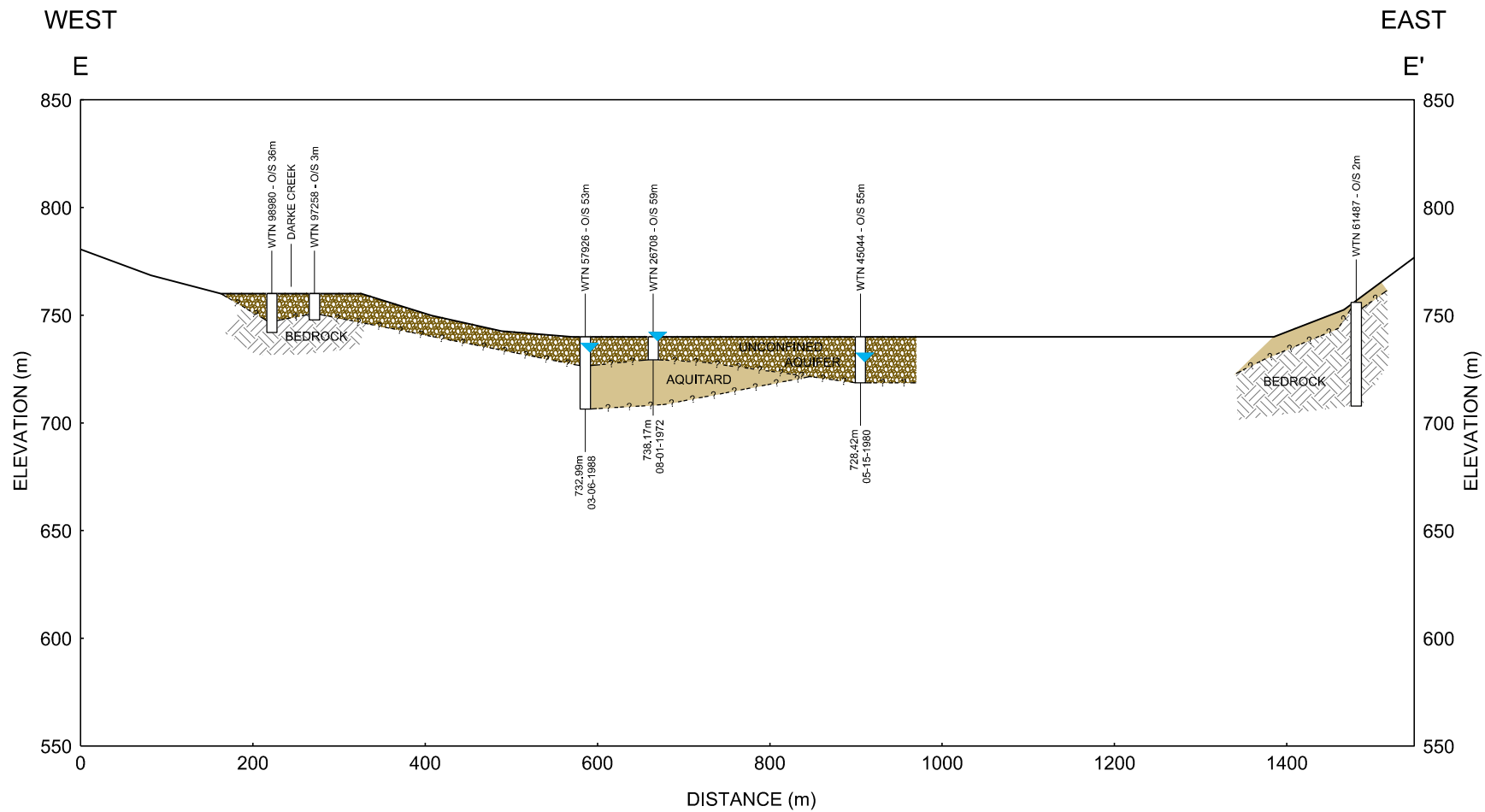
NOTES	
CROSS-SECTION LOCATIONS SHOWN ON MAP 2 & 3.	



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PROJECT									
FAULDER WELL AQUIFER STUDY REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN									
TITLE									
CROSS-SECTION D-D'									
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		CHECK	PVA	2013-12-04					
		REVIEW	JF	2013-12-04					



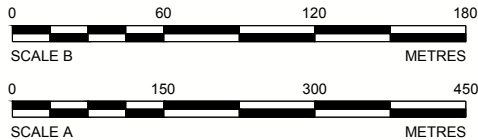
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LEGEND	
	GROUNDWATER
631.92m	GROUNDWATER ELEVATION
10-03-2013	DATE (MM-DD-YYYY)
O/S	OFF SET

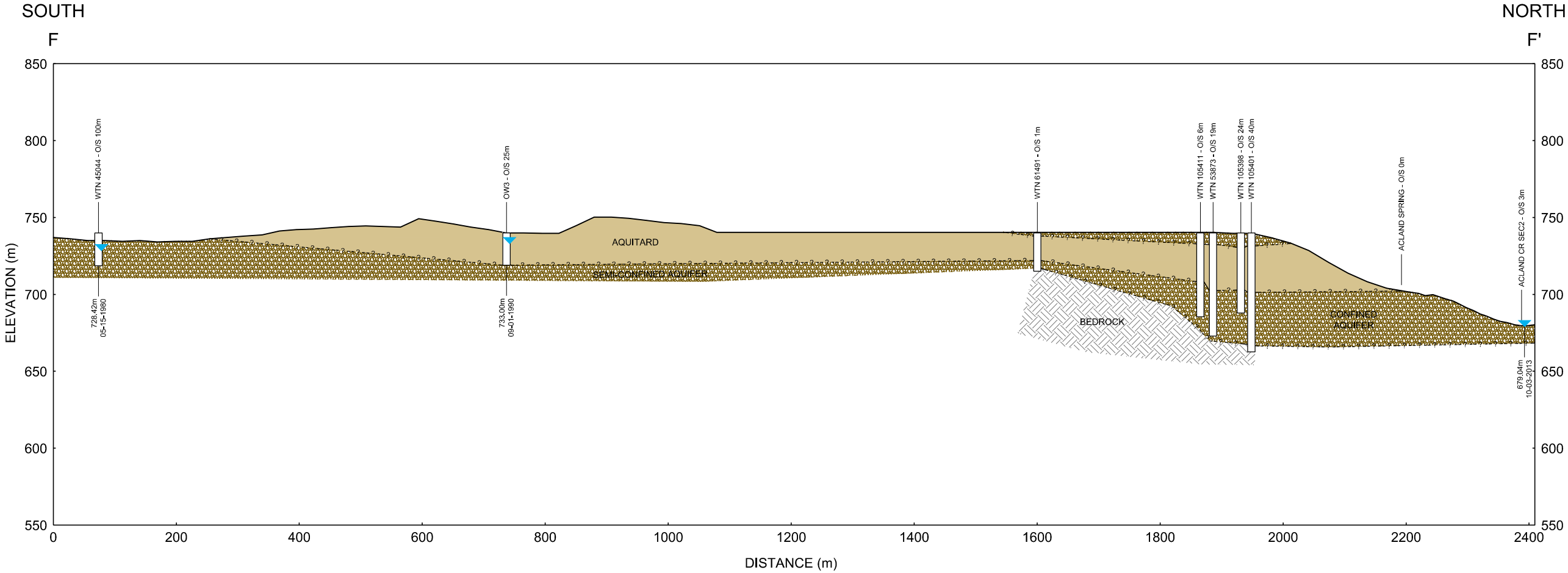
NOTES

CROSS-SECTION LOCATIONS SHOWN ON MAP 2 & 3.



	-	-	-	-	-	-			
REV	DATE	REVISION DESCRIPTION			DES	CADD	CHK	RVW	
PROJECT									
FAULDER WELL AQUIFER STUDY REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN									
TITLE									
CROSS-SECTION E-E'									
		PROJECT No.			13-1493-0055		FILE No.		SECTION
		DESIGN	PVA	2013-12-04		SCALE		AS SHOWN	
		CADD	MD	2013-12-04		FIGURE		D5	
		CHECK	PVA	2013-12-04					
		REVIEW	JF	2013-12-04					

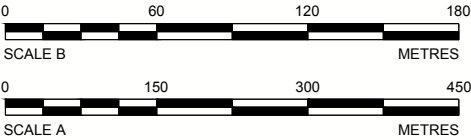
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LEGEND	
	GROUNDWATER
631.92m	GROUNDWATER ELEVATION
10-03-2013	DATE (MM-DD-YYYY)
O/S	OFF SET

**NOTES**

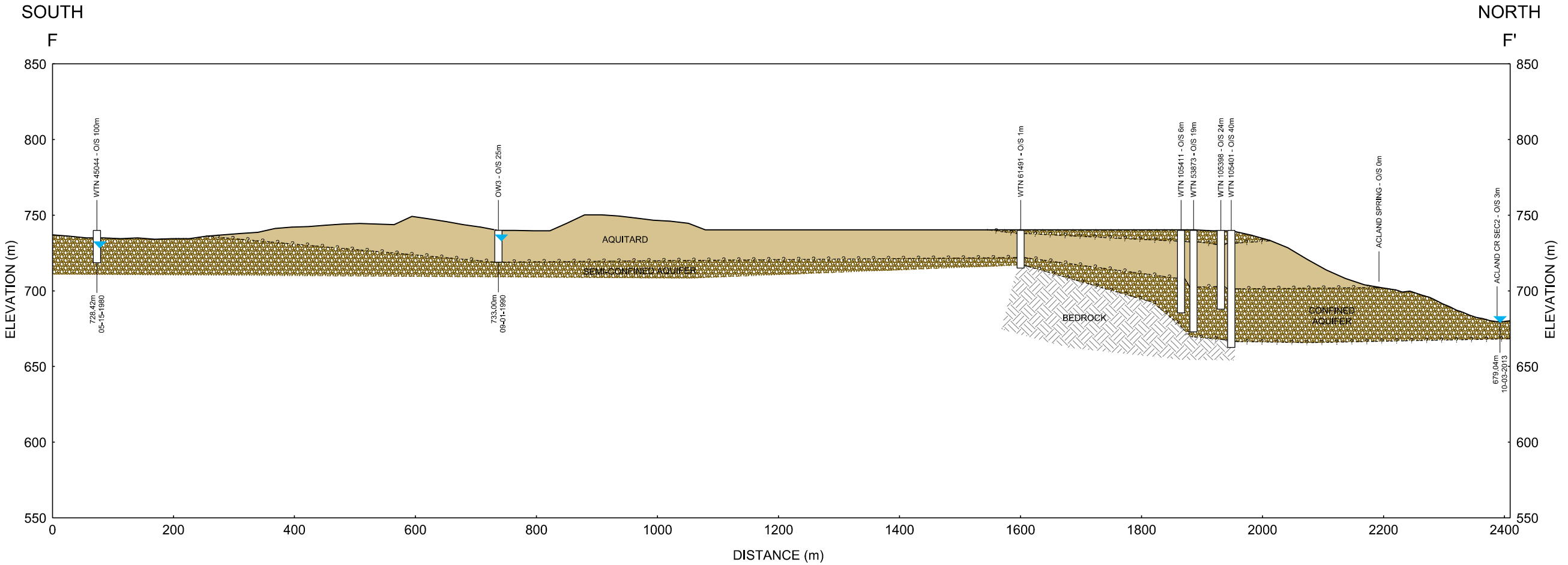
CROSS-SECTION LOCATIONS SHOWN ON MAP 2 & 3.



REV	DATE	REVISION DESCRIPTION			DES	CADD	CHK	RWW			
PROJECT											
FAULDER WELL AQUIFER STUDY REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN											
TITLE											
CROSS-SECTION F-F'											
		PROJECT No.			13-1493-0055		FILE No.		SECTION		
		DESIGN		PVA		2013-12-04		SCALE		AS SHOWN	
		CADD		MD		2013-12-04		FIGURE		D6	
		CHECK		PVA		2013-12-04					
		REVIEW		JF		2013-12-04					



N:\Active\2013\1403\13-1493-0055 Faulder Well Aquifer Study\03 CAD\CADD\CROSS SECTIONS\CROSS-SECTION NOV 5, 2013\PRODUCTION\CROSS-SECTION A-A.dwg | Layout: F-F' | Modified: purdy 12/18/2013 12:40 PM | Plotted: purdy 12/18/2013




LEGEND	
	GROUNDWATER
631.92m	GROUNDWATER ELEVATION
10-03-2013	DATE (MM-DD-YYYY)
O/S	OFF SET

**NOTES**

CROSS-SECTION LOCATIONS SHOWN ON MAP 2 & 3.

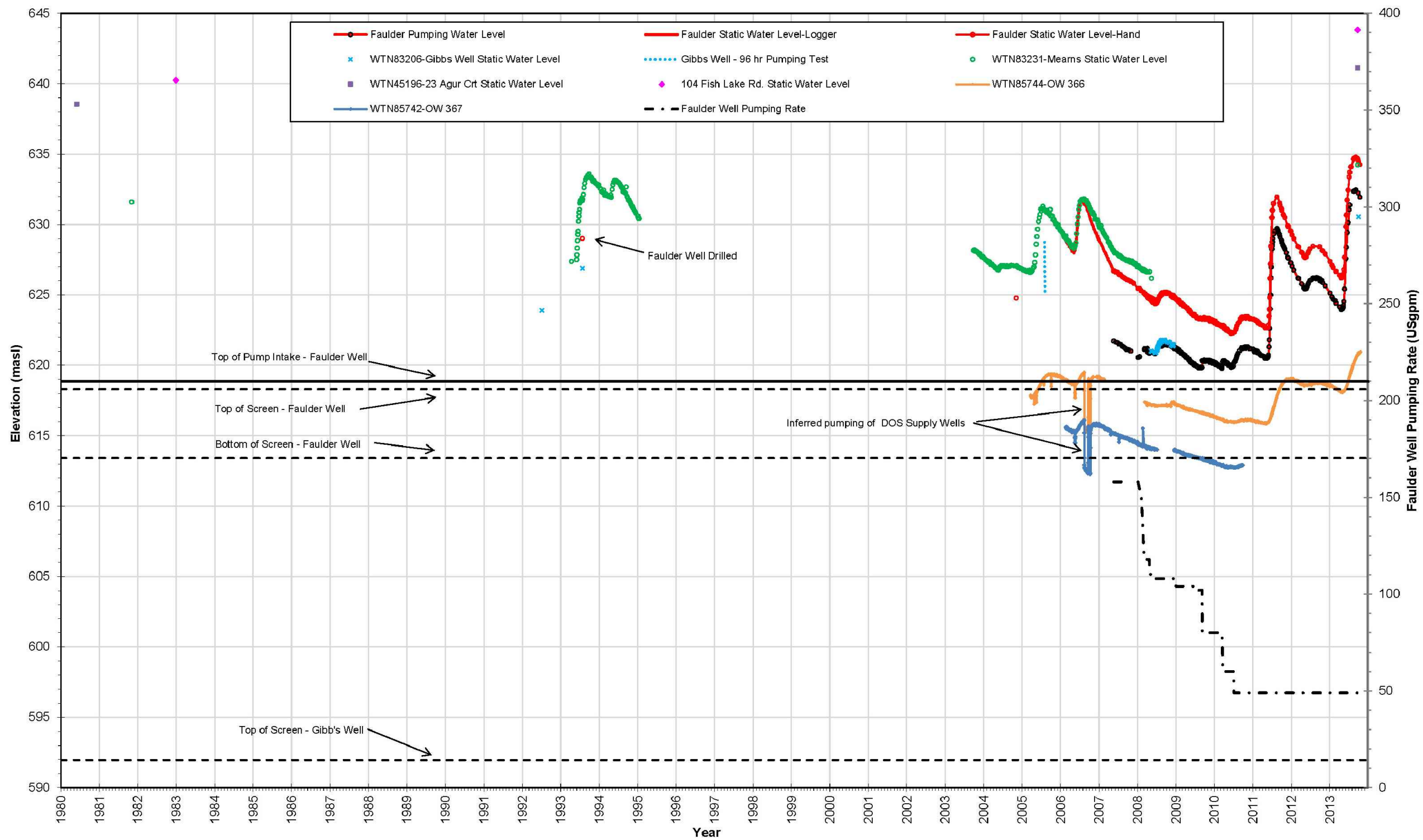



REV	DATE	REVISION DESCRIPTION			DES	CADD	CHK	RWW	
PROJECT									
FAULDER WELL AQUIFER STUDY REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN									
TITLE									
CROSS-SECTION F-F'									
			PROJECT No.			13-1493-0055			
			DESIGN		PVA	2013-12-04		FILE No.	
			CADD		MD	2013-12-04		SCALE	
			CHECK		PVA	2013-12-04		FIGURE	
			REVIEW		JF	2013-12-04		D6	
						SECTION			
						AS SHOWN			





N:\Active\2013\1403\13-1493-0055 Faulder Well Aquifer Study\03 CAD\CADD\CROSS SECTIONS\CROSS SECTION A-A\_NEW.dwg LLayout: D7 Modified: patty 12/18/2013 2:49 PM Plotted: patty 12/18/2013



REV	DATE	REVISION DESCRIPTION			DES	CADD	CHK	RWW				
PROJECT												
FAULDER WELL AQUIFER STUDY REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN												
TITLE												
WATER LEVEL TRENDS												
			PROJECT No.			13-1493-0055			FILE No.		SECTION	
			DESIGN		PVA		2013-12-04		SCALE		AS SHOWN	
			CADD		MD		2013-12-04		FIGURE		D7	
			CHECK		PVA		2013-12-04					
			REVIEW		JF		2013-12-04					







# **APPENDIX E**

## **Laboratory Certificates of Analysis**

**CERTIFICATE OF ANALYSIS**

**REPORTED TO** Golder Associates Ltd. (Kelowna)  
220 - 1755 Springfield Road  
Kelowna, BC V1Y 5V5

**TEL** (250) 860-8424  
**FAX** (250) 860-9874

**ATTENTION** Pattie Amison

**WORK ORDER** 3071639

**PO NUMBER** 13-1493-0055

**RECEIVED / TEMP** Jul-25-13 09:30 / 4.0 °C

**PROJECT** 13-1493-0055

**REPORTED** Aug-01-13

**PROJECT INFO**

**COC NUMBER** B01494

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**General Comments:**

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.



Issued By:

**Sara Gulenchyn For Jennifer Shanko, ASCT**  
Administration Coordinator

*Please contact CARO if more information is needed or to provide feedback on our services.*

---

**Locations:**

#110 4011 Viking Way  
Richmond, BC V6V 2K9  
Tel: 604-279-1499 Fax: 604-279-1599

#102 3677 Highway 97N  
Kelowna, BC V1X 5C3  
Tel: 250-765-9646 Fax: 250-765-3893

17225 109 Avenue  
Edmonton, AB T5S 1H7  
Tel: 780-489-9100 Fax: 780-489-9700

[www.caro.ca](http://www.caro.ca)

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

Analysis Description	Method Reference (* = modified from)		Location
	Preparation	Analysis	
Alkalinity, speciated	N/A	APHA 2320 B	Kelowna
Alkalinity, total	N/A	APHA 2320 B	Kelowna
Chloride in Water by IC	N/A	APHA 4110 B	Kelowna
Conductivity in Water	N/A	APHA 2510 B	Kelowna
Dissolved Metals	APHA 3030 B	APHA 3125 B	Richmond
Fluoride in Water by IC	N/A	APHA 4110 B	Kelowna
Hardness as CaCO <sub>3</sub> (CALC)	N/A	APHA 2340 B	Richmond
Nitrate-N in Water by IC	N/A	APHA 4110 B	Kelowna
Nitrite-N in Water by IC	N/A	APHA 4110 B	Kelowna
Orthophosphate as P by IC	N/A	APHA 4110 B	Kelowna
pH in Water	N/A	APHA 4500-H+ B	Kelowna
Potability, IH Comp (Excludes Micro) Pkg	N/A	APHA 1030 E	Kelowna
Potability, IH Comprehensive Pkg	N/A	APHA 1030 E	Kelowna
Sulfate in Water by IC	N/A	APHA 4110 B	Kelowna
Total Dissolved Solids	N/A	APHA 2540 C	Kelowna
Total Recoverable Metals	APHA 3030E *	APHA 3125 B	Richmond

**Note:** The numbers in brackets represent the year that the method was published/approved

### Method Reference Descriptions:

APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Association

### Glossary of Terms:

MRL Method Reporting Limit  
 < Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences  
 mg/L Milligrams per litre  
 pH units pH < 7 = acidic, pH > 7 = basic  
 uS/cm Microsiemens per centimeter

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Anions

#### Sample ID: Darke Creek (3071639-01) [Water] Sampled: Jul-24-13

Alkalinity, Total as CaCO <sub>3</sub>	113	1	mg/L	N/A	Jul-26-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Jul-26-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Jul-26-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	113	1	mg/L	N/A	Jul-26-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Jul-26-13	
Chloride	2.91	0.10	mg/L	N/A	Jul-26-13	
Fluoride	0.11	0.10	mg/L	N/A	Jul-26-13	
Nitrogen, Nitrate as N	0.011	0.010	mg/L	N/A	Jul-26-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Jul-26-13	
Phosphate, Ortho as P	< 0.01	0.01	mg/L	N/A	Jul-26-13	
Sulfate	2.4	1.0	mg/L	N/A	Jul-26-13	

#### Sample ID: Faulder Well (3071639-02) [Water] Sampled: Jul-24-13

Alkalinity, Total as CaCO <sub>3</sub>	144	1	mg/L	N/A	Jul-26-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Jul-26-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Jul-26-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	144	1	mg/L	N/A	Jul-26-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Jul-26-13	
Chloride	6.05	0.10	mg/L	N/A	Jul-26-13	
Fluoride	0.18	0.10	mg/L	N/A	Jul-26-13	
Nitrogen, Nitrate as N	0.724	0.010	mg/L	N/A	Jul-26-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Jul-26-13	
Phosphate, Ortho as P	< 0.01	0.01	mg/L	N/A	Jul-26-13	
Sulfate	8.2	1.0	mg/L	N/A	Jul-26-13	

#### Sample ID: Trout Creek (3071639-03) [Water] Sampled: Jul-24-13

Alkalinity, Total as CaCO <sub>3</sub>	45	1	mg/L	N/A	Jul-26-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Jul-26-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Jul-26-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	45	1	mg/L	N/A	Jul-26-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Jul-26-13	
Chloride	1.11	0.10	mg/L	N/A	Jul-26-13	
Fluoride	< 0.10	0.10	mg/L	N/A	Jul-26-13	
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L	N/A	Jul-26-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Jul-26-13	
Phosphate, Ortho as P	< 0.01	0.01	mg/L	N/A	Jul-26-13	
Sulfate	3.4	1.0	mg/L	N/A	Jul-26-13	

### General Parameters

#### Sample ID: Darke Creek (3071639-01) [Water] Sampled: Jul-24-13

Conductivity (EC)	231	2	uS/cm	N/A	Jul-25-13	
pH	8.15	0.01	pH units	N/A	Jul-25-13	
Solids, Total Dissolved	146	5	mg/L	N/A	Jul-25-13	

#### Sample ID: Faulder Well (3071639-02) [Water] Sampled: Jul-24-13

Conductivity (EC)	320	2	uS/cm	N/A	Jul-25-13	
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## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### General Parameters, Continued

**Sample ID: Faulder Well (3071639-02) [Water] Sampled: Jul-24-13, Continued**

pH	7.86	0.01	pH units	N/A	Jul-25-13	
Solids, Total Dissolved	179	5	mg/L	N/A	Jul-25-13	

**Sample ID: Trout Creek (3071639-03) [Water] Sampled: Jul-24-13**

Conductivity (EC)	103	2	uS/cm	N/A	Jul-25-13	
pH	7.81	0.01	pH units	N/A	Jul-25-13	
Solids, Total Dissolved	91	5	mg/L	N/A	Jul-25-13	

### Calculated Parameters

**Sample ID: Darke Creek (3071639-01) [Water] Sampled: Jul-24-13**

Hardness, Total (Total as CaCO <sub>3</sub> )	112	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	107	0.50	mg/L	N/A	N/A	

**Sample ID: Faulder Well (3071639-02) [Water] Sampled: Jul-24-13**

Hardness, Total (Total as CaCO <sub>3</sub> )	147	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	141	0.50	mg/L	N/A	N/A	

**Sample ID: Trout Creek (3071639-03) [Water] Sampled: Jul-24-13**

Hardness, Total (Total as CaCO <sub>3</sub> )	45.2	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	43.5	0.50	mg/L	N/A	N/A	

### Dissolved Metals

**Sample ID: Darke Creek (3071639-01) [Water] Sampled: Jul-24-13**

Aluminum, dissolved	0.006	0.005	mg/L	N/A	Jul-29-13	
Antimony, dissolved	0.0003	0.0001	mg/L	N/A	Jul-29-13	
Arsenic, dissolved	0.0007	0.0005	mg/L	N/A	Jul-29-13	
Barium, dissolved	0.066	0.005	mg/L	N/A	Jul-29-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13	
Boron, dissolved	< 0.004	0.004	mg/L	N/A	Jul-29-13	
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Jul-29-13	
Calcium, dissolved	32.6	0.2	mg/L	N/A	Jul-29-13	
Chromium, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-29-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Jul-29-13	
Copper, dissolved	0.0017	0.0002	mg/L	N/A	Jul-29-13	
Iron, dissolved	0.031	0.010	mg/L	N/A	Jul-29-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13	
Lithium, dissolved	0.0022	0.0001	mg/L	N/A	Jul-29-13	
Magnesium, dissolved	6.23	0.01	mg/L	N/A	Jul-29-13	
Manganese, dissolved	0.0119	0.0002	mg/L	N/A	Jul-29-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Jul-29-13	
Molybdenum, dissolved	0.0055	0.0001	mg/L	N/A	Jul-29-13	
Nickel, dissolved	0.0003	0.0002	mg/L	N/A	Jul-29-13	
Phosphorus, dissolved	0.05	0.02	mg/L	N/A	Jul-29-13	
Potassium, dissolved	2.46	0.02	mg/L	N/A	Jul-29-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

#### **Sample ID: Darke Creek (3071639-01) [Water] Sampled: Jul-24-13, Continued**

Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-29-13	
Silicon, dissolved	8.2	0.5	mg/L	N/A	Jul-29-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Jul-29-13	
Sodium, dissolved	6.23	0.02	mg/L	N/A	Jul-29-13	
Strontium, dissolved	0.380	0.001	mg/L	N/A	Jul-29-13	
Sulfur, dissolved	< 1	1	mg/L	N/A	Jul-29-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-29-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Jul-29-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13	
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-29-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-29-13	
Uranium, dissolved	0.0109	0.00002	mg/L	N/A	Jul-29-13	
Vanadium, dissolved	0.001	0.001	mg/L	N/A	Jul-29-13	
Zinc, dissolved	0.004	0.004	mg/L	N/A	Jul-29-13	
Zirconium, dissolved	0.0002	0.0001	mg/L	N/A	Jul-29-13	

#### **Sample ID: Faulder Well (3071639-02) [Water] Sampled: Jul-24-13**

Aluminum, dissolved	< 0.005	0.005	mg/L	N/A	Jul-29-13	
Antimony, dissolved	0.0002	0.0001	mg/L	N/A	Jul-29-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-29-13	
Barium, dissolved	0.091	0.005	mg/L	N/A	Jul-29-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13	
Boron, dissolved	< 0.004	0.004	mg/L	N/A	Jul-29-13	
Cadmium, dissolved	0.00002	0.00001	mg/L	N/A	Jul-29-13	
Calcium, dissolved	36.6	0.2	mg/L	N/A	Jul-29-13	
Chromium, dissolved	0.0008	0.0005	mg/L	N/A	Jul-29-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Jul-29-13	
Copper, dissolved	0.0475	0.0002	mg/L	N/A	Jul-29-13	
Iron, dissolved	< 0.010	0.010	mg/L	N/A	Jul-29-13	
Lead, dissolved	0.0020	0.0001	mg/L	N/A	Jul-29-13	
Lithium, dissolved	0.0035	0.0001	mg/L	N/A	Jul-29-13	
Magnesium, dissolved	12.0	0.01	mg/L	N/A	Jul-29-13	
Manganese, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-29-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Jul-29-13	
Molybdenum, dissolved	0.0153	0.0001	mg/L	N/A	Jul-29-13	
Nickel, dissolved	0.0005	0.0002	mg/L	N/A	Jul-29-13	
Phosphorus, dissolved	0.05	0.02	mg/L	N/A	Jul-29-13	
Potassium, dissolved	3.16	0.02	mg/L	N/A	Jul-29-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-29-13	
Silicon, dissolved	8.7	0.5	mg/L	N/A	Jul-29-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Jul-29-13	
Sodium, dissolved	11.2	0.02	mg/L	N/A	Jul-29-13	
Strontium, dissolved	0.632	0.001	mg/L	N/A	Jul-29-13	
Sulfur, dissolved	2	1	mg/L	N/A	Jul-29-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-29-13	



## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Dissolved Metals, Continued

**Sample ID: Faulder Well (3071639-02) [Water] Sampled: Jul-24-13, Continued**

Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Jul-29-13
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-29-13
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-29-13
Uranium, dissolved	<b>0.0180</b>	0.00002	mg/L	N/A	Jul-29-13
Vanadium, dissolved	<b>0.001</b>	0.001	mg/L	N/A	Jul-29-13
Zinc, dissolved	<b>0.172</b>	0.004	mg/L	N/A	Jul-29-13
Zirconium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13

**Sample ID: Trout Creek (3071639-03) [Water] Sampled: Jul-24-13**

Aluminum, dissolved	<b>0.039</b>	0.005	mg/L	N/A	Jul-29-13
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-29-13
Barium, dissolved	<b>0.033</b>	0.005	mg/L	N/A	Jul-29-13
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13
Boron, dissolved	< 0.004	0.004	mg/L	N/A	Jul-29-13
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Jul-29-13
Calcium, dissolved	<b>13.4</b>	0.2	mg/L	N/A	Jul-29-13
Chromium, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-29-13
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Jul-29-13
Copper, dissolved	<b>0.0013</b>	0.0002	mg/L	N/A	Jul-29-13
Iron, dissolved	<b>0.120</b>	0.010	mg/L	N/A	Jul-29-13
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13
Lithium, dissolved	<b>0.0013</b>	0.0001	mg/L	N/A	Jul-29-13
Magnesium, dissolved	<b>2.43</b>	0.01	mg/L	N/A	Jul-29-13
Manganese, dissolved	<b>0.0084</b>	0.0002	mg/L	N/A	Jul-29-13
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Jul-29-13
Molybdenum, dissolved	<b>0.0024</b>	0.0001	mg/L	N/A	Jul-29-13
Nickel, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-29-13
Phosphorus, dissolved	< 0.02	0.02	mg/L	N/A	Jul-29-13
Potassium, dissolved	<b>1.34</b>	0.02	mg/L	N/A	Jul-29-13
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-29-13
Silicon, dissolved	<b>8.0</b>	0.5	mg/L	N/A	Jul-29-13
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Jul-29-13
Sodium, dissolved	<b>3.63</b>	0.02	mg/L	N/A	Jul-29-13
Strontium, dissolved	<b>0.181</b>	0.001	mg/L	N/A	Jul-29-13
Sulfur, dissolved	< 1	1	mg/L	N/A	Jul-29-13
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-29-13
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Jul-29-13
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-29-13
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-29-13
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-29-13
Uranium, dissolved	<b>0.00141</b>	0.00002	mg/L	N/A	Jul-29-13
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-29-13
Zinc, dissolved	<b>0.006</b>	0.004	mg/L	N/A	Jul-29-13

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: Trout Creek (3071639-03) [Water] Sampled: Jul-24-13, Continued**

Zirconium, dissolved	0.0003	0.0001	mg/L	N/A	Jul-29-13	
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### *Total Recoverable Metals*

**Sample ID: Darke Creek (3071639-01) [Water] Sampled: Jul-24-13**

Aluminum, total	0.051	0.005	mg/L	Jul-29-13	Jul-29-13	
Antimony, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Arsenic, total	0.0006	0.0005	mg/L	Jul-29-13	Jul-29-13	
Barium, total	0.070	0.005	mg/L	Jul-29-13	Jul-29-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Boron, total	< 0.004	0.004	mg/L	Jul-29-13	Jul-29-13	
Cadmium, total	0.00001	0.00001	mg/L	Jul-29-13	Jul-29-13	
Calcium, total	34.3	0.2	mg/L	Jul-29-13	Jul-29-13	
Chromium, total	< 0.0005	0.0005	mg/L	Jul-29-13	Jul-29-13	
Cobalt, total	< 0.00005	0.00005	mg/L	Jul-29-13	Jul-29-13	
Copper, total	0.0015	0.0002	mg/L	Jul-29-13	Jul-29-13	
Iron, total	0.12	0.01	mg/L	Jul-29-13	Jul-29-13	
Lead, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Lithium, total	0.0023	0.0001	mg/L	Jul-29-13	Jul-29-13	
Magnesium, total	6.41	0.01	mg/L	Jul-29-13	Jul-29-13	
Manganese, total	0.0169	0.0002	mg/L	Jul-29-13	Jul-29-13	
Mercury, total	0.00002	0.00002	mg/L	Jul-29-13	Jul-29-13	
Molybdenum, total	0.0056	0.0001	mg/L	Jul-29-13	Jul-29-13	
Nickel, total	0.0002	0.0002	mg/L	Jul-29-13	Jul-29-13	
Phosphorus, total	0.054	0.020	mg/L	Jul-29-13	Jul-29-13	
Potassium, total	2.54	0.02	mg/L	Jul-29-13	Jul-29-13	
Selenium, total	< 0.0005	0.0005	mg/L	Jul-29-13	Jul-29-13	
Silicon, total	8.2	0.5	mg/L	Jul-29-13	Jul-29-13	
Silver, total	< 0.00005	0.00005	mg/L	Jul-29-13	Jul-29-13	
Sodium, total	6.45	0.02	mg/L	Jul-29-13	Jul-29-13	
Strontium, total	0.391	0.001	mg/L	Jul-29-13	Jul-29-13	
Sulfur, total	< 1	1	mg/L	Jul-29-13	Jul-29-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Jul-29-13	Jul-29-13	
Thallium, total	< 0.00002	0.00002	mg/L	Jul-29-13	Jul-29-13	
Thorium, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Tin, total	< 0.0002	0.0002	mg/L	Jul-29-13	Jul-29-13	
Titanium, total	< 0.005	0.005	mg/L	Jul-29-13	Jul-29-13	
Uranium, total	0.0120	0.00002	mg/L	Jul-29-13	Jul-29-13	
Vanadium, total	0.002	0.001	mg/L	Jul-29-13	Jul-29-13	
Zinc, total	0.004	0.004	mg/L	Jul-29-13	Jul-29-13	
Zirconium, total	0.0002	0.0001	mg/L	Jul-29-13	Jul-29-13	

**Sample ID: Faulder Well (3071639-02) [Water] Sampled: Jul-24-13**

Aluminum, total	< 0.005	0.005	mg/L	Jul-29-13	Jul-29-13	
Antimony, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Faulder Well (3071639-02) [Water] Sampled: Jul-24-13, Continued**

Arsenic, total	< 0.0005	0.0005	mg/L	Jul-29-13	Jul-29-13	
Barium, total	<b>0.096</b>	0.005	mg/L	Jul-29-13	Jul-29-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Boron, total	< 0.004	0.004	mg/L	Jul-29-13	Jul-29-13	
Cadmium, total	< 0.00001	0.00001	mg/L	Jul-29-13	Jul-29-13	
Calcium, total	<b>38.2</b>	0.2	mg/L	Jul-29-13	Jul-29-13	
Chromium, total	<b>0.0005</b>	0.0005	mg/L	Jul-29-13	Jul-29-13	
Cobalt, total	< 0.00005	0.00005	mg/L	Jul-29-13	Jul-29-13	
Copper, total	<b>0.0470</b>	0.0002	mg/L	Jul-29-13	Jul-29-13	
Iron, total	< 0.01	0.01	mg/L	Jul-29-13	Jul-29-13	
Lead, total	<b>0.0018</b>	0.0001	mg/L	Jul-29-13	Jul-29-13	
Lithium, total	<b>0.0036</b>	0.0001	mg/L	Jul-29-13	Jul-29-13	
Magnesium, total	<b>12.5</b>	0.01	mg/L	Jul-29-13	Jul-29-13	
Manganese, total	< 0.0002	0.0002	mg/L	Jul-29-13	Jul-29-13	
Mercury, total	< 0.00002	0.00002	mg/L	Jul-29-13	Jul-29-13	
Molybdenum, total	<b>0.0159</b>	0.0001	mg/L	Jul-29-13	Jul-29-13	
Nickel, total	<b>0.0003</b>	0.0002	mg/L	Jul-29-13	Jul-29-13	
Phosphorus, total	<b>0.024</b>	0.020	mg/L	Jul-29-13	Jul-29-13	
Potassium, total	<b>3.28</b>	0.02	mg/L	Jul-29-13	Jul-29-13	
Selenium, total	< 0.0005	0.0005	mg/L	Jul-29-13	Jul-29-13	
Silicon, total	<b>8.6</b>	0.5	mg/L	Jul-29-13	Jul-29-13	
Silver, total	< 0.00005	0.00005	mg/L	Jul-29-13	Jul-29-13	
Sodium, total	<b>11.7</b>	0.02	mg/L	Jul-29-13	Jul-29-13	
Strontium, total	<b>0.652</b>	0.001	mg/L	Jul-29-13	Jul-29-13	
Sulfur, total	<b>2</b>	1	mg/L	Jul-29-13	Jul-29-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Jul-29-13	Jul-29-13	
Thallium, total	< 0.00002	0.00002	mg/L	Jul-29-13	Jul-29-13	
Thorium, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Tin, total	< 0.0002	0.0002	mg/L	Jul-29-13	Jul-29-13	
Titanium, total	< 0.005	0.005	mg/L	Jul-29-13	Jul-29-13	
Uranium, total	<b>0.0208</b>	0.00002	mg/L	Jul-29-13	Jul-29-13	
Vanadium, total	<b>0.002</b>	0.001	mg/L	Jul-29-13	Jul-29-13	
Zinc, total	<b>0.128</b>	0.004	mg/L	Jul-29-13	Jul-29-13	
Zirconium, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	

**Sample ID: Trout Creek (3071639-03) [Water] Sampled: Jul-24-13**

Aluminum, total	<b>0.102</b>	0.005	mg/L	Jul-29-13	Jul-29-13	
Antimony, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Arsenic, total	< 0.0005	0.0005	mg/L	Jul-29-13	Jul-29-13	
Barium, total	<b>0.035</b>	0.005	mg/L	Jul-29-13	Jul-29-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Boron, total	< 0.004	0.004	mg/L	Jul-29-13	Jul-29-13	
Cadmium, total	<b>0.00001</b>	0.00001	mg/L	Jul-29-13	Jul-29-13	
Calcium, total	<b>13.9</b>	0.2	mg/L	Jul-29-13	Jul-29-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Trout Creek (3071639-03) [Water] Sampled: Jul-24-13, Continued**

Chromium, total	< 0.0005	0.0005	mg/L	Jul-29-13	Jul-29-13	
Cobalt, total	< 0.00005	0.00005	mg/L	Jul-29-13	Jul-29-13	
Copper, total	<b>0.0014</b>	0.0002	mg/L	Jul-29-13	Jul-29-13	
Iron, total	<b>0.22</b>	0.01	mg/L	Jul-29-13	Jul-29-13	
Lead, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Lithium, total	<b>0.0015</b>	0.0001	mg/L	Jul-29-13	Jul-29-13	
Magnesium, total	<b>2.57</b>	0.01	mg/L	Jul-29-13	Jul-29-13	
Manganese, total	<b>0.0195</b>	0.0002	mg/L	Jul-29-13	Jul-29-13	
Mercury, total	< 0.00002	0.00002	mg/L	Jul-29-13	Jul-29-13	
Molybdenum, total	<b>0.0027</b>	0.0001	mg/L	Jul-29-13	Jul-29-13	
Nickel, total	< 0.0002	0.0002	mg/L	Jul-29-13	Jul-29-13	
Phosphorus, total	< 0.020	0.020	mg/L	Jul-29-13	Jul-29-13	
Potassium, total	<b>1.43</b>	0.02	mg/L	Jul-29-13	Jul-29-13	
Selenium, total	< 0.0005	0.0005	mg/L	Jul-29-13	Jul-29-13	
Silicon, total	<b>8.4</b>	0.5	mg/L	Jul-29-13	Jul-29-13	
Silver, total	< 0.00005	0.00005	mg/L	Jul-29-13	Jul-29-13	
Sodium, total	<b>3.80</b>	0.02	mg/L	Jul-29-13	Jul-29-13	
Strontium, total	<b>0.191</b>	0.001	mg/L	Jul-29-13	Jul-29-13	
Sulfur, total	< 1	1	mg/L	Jul-29-13	Jul-29-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Jul-29-13	Jul-29-13	
Thallium, total	< 0.00002	0.00002	mg/L	Jul-29-13	Jul-29-13	
Thorium, total	< 0.0001	0.0001	mg/L	Jul-29-13	Jul-29-13	
Tin, total	< 0.0002	0.0002	mg/L	Jul-29-13	Jul-29-13	
Titanium, total	< 0.005	0.005	mg/L	Jul-29-13	Jul-29-13	
Uranium, total	<b>0.00159</b>	0.00002	mg/L	Jul-29-13	Jul-29-13	
Vanadium, total	<b>0.001</b>	0.001	mg/L	Jul-29-13	Jul-29-13	
Zinc, total	< 0.004	0.004	mg/L	Jul-29-13	Jul-29-13	
Zirconium, total	<b>0.0004</b>	0.0001	mg/L	Jul-29-13	Jul-29-13	

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup):** Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS):** A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM):** A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Anions, Batch B3G1172</b>									
<b>Blank (B3G1172-BLK1)</b>				Prepared: Jul-26-13, Analyzed: Jul-26-13					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.005	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.005	0.010 mg/L							
Phosphate, Ortho as P	< 0.005	0.01 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3G1172-BLK2)</b>				Prepared: Jul-26-13, Analyzed: Jul-26-13					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.005	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.005	0.010 mg/L							
Phosphate, Ortho as P	< 0.005	0.01 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3G1172-BLK3)</b>				Prepared: Jul-27-13, Analyzed: Jul-27-13					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.005	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.005	0.010 mg/L							
Phosphate, Ortho as P	< 0.005	0.01 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3G1172-BLK4)</b>				Prepared: Jul-27-13, Analyzed: Jul-27-13					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.005	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.005	0.010 mg/L							
Phosphate, Ortho as P	< 0.005	0.01 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>LCS (B3G1172-BS1)</b>				Prepared: Jul-26-13, Analyzed: Jul-26-13					
Chloride	15.9	0.10 mg/L		16.0	100	85-115			
Fluoride	3.96	0.10 mg/L		4.00	99	85-115			
Nitrogen, Nitrate as N	3.95	0.010 mg/L		4.00	99	85-115			

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3071639**  
**REPORTED** Aug-01-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Anions, Batch B3G1172, Continued

<b>LCS (B3G1172-BS1), Continued</b>			Prepared: Jul-26-13, Analyzed: Jul-26-13						
Nitrogen, Nitrite as N	2.07	0.010 mg/L	2.00		103	85-115			
Phosphate, Ortho as P	1.93	0.01 mg/L	2.00		96	85-115			
Sulfate	15.9	1.0 mg/L	16.0		100	85-115			

<b>LCS (B3G1172-BS2)</b>			Prepared: Jul-26-13, Analyzed: Jul-26-13						
Chloride	16.0	0.10 mg/L	16.0		100	85-115			
Fluoride	3.98	0.10 mg/L	4.00		99	85-115			
Nitrogen, Nitrate as N	4.00	0.010 mg/L	4.00		100	85-115			
Nitrogen, Nitrite as N	2.06	0.010 mg/L	2.00		103	85-115			
Phosphate, Ortho as P	1.93	0.01 mg/L	2.00		97	85-115			
Sulfate	16.1	1.0 mg/L	16.0		101	85-115			

<b>LCS (B3G1172-BS3)</b>			Prepared: Jul-27-13, Analyzed: Jul-27-13						
Chloride	15.9	0.10 mg/L	16.0		100	85-115			
Fluoride	4.06	0.10 mg/L	4.00		101	85-115			
Nitrogen, Nitrate as N	3.99	0.010 mg/L	4.00		100	85-115			
Nitrogen, Nitrite as N	2.07	0.010 mg/L	2.00		103	85-115			
Phosphate, Ortho as P	1.95	0.01 mg/L	2.00		98	85-115			
Sulfate	16.0	1.0 mg/L	16.0		100	85-115			

<b>LCS (B3G1172-BS4)</b>			Prepared: Jul-27-13, Analyzed: Jul-27-13						
Chloride	16.0	0.10 mg/L	16.0		100	85-115			
Fluoride	4.09	0.10 mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	3.90	0.010 mg/L	4.00		97	85-115			
Nitrogen, Nitrite as N	2.11	0.010 mg/L	2.00		105	85-115			
Phosphate, Ortho as P	1.98	0.01 mg/L	2.00		99	85-115			
Sulfate	16.0	1.0 mg/L	16.0		100	85-115			

### Anions, Batch B3G1187

<b>Blank (B3G1187-BLK1)</b>			Prepared: Jul-26-13, Analyzed: Jul-26-13						
Alkalinity, Total as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1 mg/L							

<b>LCS (B3G1187-BS1)</b>			Prepared: Jul-26-13, Analyzed: Jul-26-13						
Alkalinity, Total as CaCO <sub>3</sub>	101	1 mg/L	100		101	96-108			

<b>Duplicate (B3G1187-DUP1)</b>			<b>Source: 3071639-03</b>		Prepared: Jul-26-13, Analyzed: Jul-26-13				
Alkalinity, Total as CaCO <sub>3</sub>	45	1 mg/L		45			< 1	10	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1 mg/L		< 1				10	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1 mg/L		< 1				10	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	45	1 mg/L		45			< 1	10	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1 mg/L		< 1				10	

### Dissolved Metals, Batch B3G1201

<b>Blank (B3G1201-BLK1)</b>			Prepared: Jul-29-13, Analyzed: Jul-29-13						
Aluminum, dissolved	< 0.005	0.005 mg/L							
Antimony, dissolved	< 0.0001	0.0001 mg/L							
Arsenic, dissolved	< 0.0005	0.0005 mg/L							
Barium, dissolved	< 0.005	0.005 mg/L							
Beryllium, dissolved	< 0.0001	0.0001 mg/L							
Bismuth, dissolved	< 0.0001	0.0001 mg/L							
Boron, dissolved	< 0.004	0.004 mg/L							



## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Dissolved Metals, Batch B3G1201, Continued

#### Blank (B3G1201-BLK1), Continued

Prepared: Jul-29-13, Analyzed: Jul-29-13

Cadmium, dissolved	< 0.00001	0.00001 mg/L							
Calcium, dissolved	< 0.2	0.2 mg/L							
Chromium, dissolved	< 0.0005	0.0005 mg/L							
Cobalt, dissolved	< 0.00005	0.00005 mg/L							
Copper, dissolved	< 0.0002	0.0002 mg/L							
Iron, dissolved	< 0.010	0.010 mg/L							
Lead, dissolved	< 0.0001	0.0001 mg/L							
Lithium, dissolved	< 0.0001	0.0001 mg/L							
Magnesium, dissolved	< 0.01	0.01 mg/L							
Manganese, dissolved	< 0.0002	0.0002 mg/L							
Mercury, dissolved	< 0.00002	0.00002 mg/L							
Molybdenum, dissolved	< 0.0001	0.0001 mg/L							
Nickel, dissolved	< 0.0002	0.0002 mg/L							
Phosphorus, dissolved	< 0.02	0.02 mg/L							
Potassium, dissolved	< 0.02	0.02 mg/L							
Selenium, dissolved	< 0.0005	0.0005 mg/L							
Silicon, dissolved	< 0.5	0.5 mg/L							
Silver, dissolved	< 0.00005	0.00005 mg/L							
Sodium, dissolved	< 0.02	0.02 mg/L							
Strontium, dissolved	< 0.001	0.001 mg/L							
Sulfur, dissolved	< 1	1 mg/L							
Tellurium, dissolved	< 0.0002	0.0002 mg/L							
Thallium, dissolved	< 0.00002	0.00002 mg/L							
Thorium, dissolved	< 0.0001	0.0001 mg/L							
Tin, dissolved	< 0.0002	0.0002 mg/L							
Titanium, dissolved	< 0.005	0.005 mg/L							
Uranium, dissolved	< 0.00002	0.00002 mg/L							
Vanadium, dissolved	< 0.001	0.001 mg/L							
Zinc, dissolved	< 0.004	0.004 mg/L							
Zirconium, dissolved	< 0.0001	0.0001 mg/L							

#### Matrix Spike (B3G1201-MS1)

Source: 3071639-01

Prepared: Jul-29-13, Analyzed: Jul-29-13

Antimony, dissolved	0.370	0.0001 mg/L	0.400	0.0003	92	76-114
Arsenic, dissolved	0.198	0.0005 mg/L	0.200	0.0007	99	81-115
Barium, dissolved	1.04	0.005 mg/L	1.00	0.066	98	80-113
Beryllium, dissolved	0.0968	0.0001 mg/L	0.100	< 0.0001	97	69-109
Cadmium, dissolved	0.101	0.00001 mg/L	0.100	< 0.00001	100	83-110
Chromium, dissolved	0.400	0.0005 mg/L	0.400	< 0.0005	100	85-115
Cobalt, dissolved	0.406	0.00005 mg/L	0.400	< 0.00005	102	86-114
Copper, dissolved	0.418	0.0002 mg/L	0.400	0.0017	104	82-119
Iron, dissolved	2.03	0.010 mg/L	2.00	0.031	100	80-116
Lead, dissolved	0.200	0.0001 mg/L	0.200	< 0.0001	100	83-112
Manganese, dissolved	0.400	0.0002 mg/L	0.400	0.0119	97	62-131
Nickel, dissolved	0.394	0.0002 mg/L	0.400	0.0003	99	81-115
Selenium, dissolved	0.103	0.0005 mg/L	0.100	< 0.0005	103	79-115
Silver, dissolved	0.0999	0.0005 mg/L	0.100	< 0.00005	100	69-121
Thallium, dissolved	0.104	0.00002 mg/L	0.100	< 0.00002	104	84-115
Vanadium, dissolved	0.394	0.001 mg/L	0.400	0.001	98	83-113
Zinc, dissolved	1.02	0.004 mg/L	1.00	0.004	101	82-115

#### Reference (B3G1201-SRM1)

Prepared: Jul-29-13, Analyzed: Jul-29-13

Aluminum, dissolved	0.234	0.005 mg/L	0.233		100	58-142
Antimony, dissolved	0.0493	0.0001 mg/L	0.0430		115	75-125
Arsenic, dissolved	0.446	0.0005 mg/L	0.438		102	81-119
Barium, dissolved	3.61	0.005 mg/L	3.35		108	83-117
Beryllium, dissolved	0.209	0.0001 mg/L	0.213		98	80-120
Boron, dissolved	1.81	0.004 mg/L	1.74		104	74-117

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3071639**  
**REPORTED** Aug-01-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Dissolved Metals, Batch B3G1201, Continued

Reference (B3G1201-SRM1), Continued			Prepared: Jul-29-13, Analyzed: Jul-29-13						
Cadmium, dissolved	0.229	0.00001 mg/L	0.224		102	83-117			
Calcium, dissolved	8.1	0.2 mg/L	7.69		105	76-124			
Chromium, dissolved	0.457	0.0005 mg/L	0.437		105	81-119			
Cobalt, dissolved	0.132	0.00005 mg/L	0.128		103	76-124			
Copper, dissolved	0.898	0.0002 mg/L	0.844		106	84-116			
Iron, dissolved	1.32	0.010 mg/L	1.29		102	74-126			
Lead, dissolved	0.113	0.0001 mg/L	0.112		101	72-128			
Lithium, dissolved	0.108	0.0001 mg/L	0.104		104	60-140			
Magnesium, dissolved	7.18	0.01 mg/L	6.92		104	81-119			
Manganese, dissolved	0.347	0.0002 mg/L	0.345		100	84-116			
Molybdenum, dissolved	0.415	0.0001 mg/L	0.426		97	83-117			
Nickel, dissolved	0.871	0.0002 mg/L	0.840		104	74-126			
Phosphorus, dissolved	0.47	0.02 mg/L	0.495		95	68-132			
Potassium, dissolved	3.20	0.02 mg/L	3.19		100	74-126			
Selenium, dissolved	0.0326	0.0005 mg/L	0.0331		98	70-130			
Sodium, dissolved	19.4	0.02 mg/L	19.1		102	72-128			
Strontium, dissolved	0.923	0.001 mg/L	0.916		101	84-113			
Thallium, dissolved	0.0385	0.00002 mg/L	0.0393		98	57-143			
Uranium, dissolved	0.268	0.00002 mg/L	0.266		101	85-115			
Vanadium, dissolved	0.883	0.001 mg/L	0.869		102	87-113			
Zinc, dissolved	0.907	0.004 mg/L	0.881		103	72-128			

### General Parameters, Batch B3G1104

Blank (B3G1104-BLK1)			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Conductivity (EC)	< 2	2 uS/cm							
pH	< 0.01	0.01 pH units							
Blank (B3G1104-BLK2)			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Conductivity (EC)	< 2	2 uS/cm							
pH	< 0.01	0.01 pH units							
Blank (B3G1104-BLK3)			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Conductivity (EC)	< 2	2 uS/cm							
pH	< 0.01	0.01 pH units							
Blank (B3G1104-BLK4)			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Conductivity (EC)	< 2	2 uS/cm							
pH	< 0.01	0.01 pH units							
LCS (B3G1104-BS5)			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Conductivity (EC)	1410	2 uS/cm	1410		100	93-104			
LCS (B3G1104-BS6)			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Conductivity (EC)	1420	2 uS/cm	1410		100	93-104			
LCS (B3G1104-BS7)			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Conductivity (EC)	1410	2 uS/cm	1410		100	93-104			
LCS (B3G1104-BS8)			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Conductivity (EC)	1430	2 uS/cm	1410		101	93-104			
Duplicate (B3G1104-DUP4)			Source: 3071639-03 Prepared: Jul-25-13, Analyzed: Jul-25-13						
Conductivity (EC)	103	2 uS/cm	103				< 1	5	
pH	7.85	0.01 pH units	7.81				< 1	5	
Reference (B3G1104-SRM1)			Prepared: Jul-25-13, Analyzed: Jul-25-13						
pH	7.00	0.01 pH units	7.00		100	98-102			

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3071639  
Aug-01-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### General Parameters, Batch B3G1104, Continued

<b>Reference (B3G1104-SRM2)</b>			Prepared: Jul-25-13, Analyzed: Jul-25-13						
pH	6.99	0.01 pH units	7.00		100	98-102			
<b>Reference (B3G1104-SRM3)</b>			Prepared: Jul-25-13, Analyzed: Jul-25-13						
pH	7.00	0.01 pH units	7.00		100	98-102			
<b>Reference (B3G1104-SRM4)</b>			Prepared: Jul-25-13, Analyzed: Jul-25-13						
pH	7.00	0.01 pH units	7.00		100	98-102			

### General Parameters, Batch B3G1113

<b>Blank (B3G1113-BLK1)</b>			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Dissolved	< 5	5 mg/L							
<b>Blank (B3G1113-BLK2)</b>			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Dissolved	< 5	5 mg/L							
<b>Reference (B3G1113-SRM1)</b>			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Dissolved	236	5 mg/L	240		98	85-115			
<b>Reference (B3G1113-SRM2)</b>			Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Dissolved	242	5 mg/L	240		101	85-115			

### Total Recoverable Metals, Batch B3G1203

<b>Blank (B3G1203-BLK1)</b>			Prepared: Jul-29-13, Analyzed: Jul-29-13						
Aluminum, total	< 0.005	0.005 mg/L							
Antimony, total	< 0.0001	0.0001 mg/L							
Arsenic, total	< 0.0005	0.0005 mg/L							
Barium, total	< 0.005	0.005 mg/L							
Beryllium, total	< 0.0001	0.0001 mg/L							
Bismuth, total	< 0.0001	0.0001 mg/L							
Boron, total	< 0.004	0.004 mg/L							
Cadmium, total	< 0.00001	0.00001 mg/L							
Calcium, total	< 0.2	0.2 mg/L							
Chromium, total	< 0.0005	0.0005 mg/L							
Cobalt, total	< 0.00005	0.00005 mg/L							
Copper, total	< 0.0002	0.0002 mg/L							
Iron, total	< 0.01	0.01 mg/L							
Lead, total	< 0.0001	0.0001 mg/L							
Lithium, total	< 0.0001	0.0001 mg/L							
Magnesium, total	< 0.01	0.01 mg/L							
Manganese, total	< 0.0002	0.0002 mg/L							
Mercury, total	< 0.00002	0.00002 mg/L							
Molybdenum, total	< 0.0001	0.0001 mg/L							
Nickel, total	< 0.0002	0.0002 mg/L							
Phosphorus, total	0.023	0.020 mg/L							
Potassium, total	< 0.02	0.02 mg/L							
Selenium, total	< 0.0005	0.0005 mg/L							
Silicon, total	< 0.5	0.5 mg/L							
Silver, total	< 0.00005	0.00005 mg/L							
Sodium, total	< 0.02	0.02 mg/L							
Strontium, total	< 0.001	0.001 mg/L							
Sulfur, total	< 1	1 mg/L							
Tellurium, total	< 0.0002	0.0002 mg/L							
Thallium, total	< 0.00002	0.00002 mg/L							
Thorium, total	< 0.0001	0.0001 mg/L							
Tin, total	< 0.0002	0.0002 mg/L							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3071639**  
**REPORTED** Aug-01-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Total Recoverable Metals, Batch B3G1203, Continued

#### Blank (B3G1203-BLK1), Continued

Prepared: Jul-29-13, Analyzed: Jul-29-13

Titanium, total	< 0.005	0.005 mg/L							
Uranium, total	< 0.00002	0.00002 mg/L							
Vanadium, total	< 0.001	0.001 mg/L							
Zinc, total	< 0.004	0.004 mg/L							
Zirconium, total	< 0.0001	0.0001 mg/L							

#### Duplicate (B3G1203-DUP1)

Source: 3071639-03

Prepared: Jul-29-13, Analyzed: Jul-29-13

Aluminum, total	0.082	0.005 mg/L		0.102			21	29	
Antimony, total	< 0.0001	0.0001 mg/L		< 0.0001				31	
Arsenic, total	< 0.0005	0.0005 mg/L		< 0.0005				15	
Barium, total	0.035	0.005 mg/L		0.035			1	9	
Beryllium, total	< 0.0001	0.0001 mg/L		< 0.0001				16	
Bismuth, total	< 0.0001	0.0001 mg/L		< 0.0001				20	
Boron, total	< 0.004	0.004 mg/L		< 0.004				29	
Cadmium, total	< 0.00001	0.00001 mg/L		0.00001				33	
Calcium, total	13.7	0.2 mg/L		13.9			1	12	
Chromium, total	< 0.0005	0.0005 mg/L		< 0.0005				12	
Cobalt, total	0.00005	0.00005 mg/L		0.00005				13	
Copper, total	0.0012	0.0002 mg/L		0.0014			14	37	
Iron, total	0.21	0.01 mg/L		0.22			7	18	
Lead, total	< 0.0001	0.0001 mg/L		0.0001				23	
Lithium, total	0.0014	0.0001 mg/L		0.0015			2	19	
Magnesium, total	2.48	0.01 mg/L		2.57			4	10	
Manganese, total	0.0182	0.0002 mg/L		0.0195			6	13	
Mercury, total	< 0.00002	0.00002 mg/L		< 0.00002				24	
Molybdenum, total	0.0025	0.0001 mg/L		0.0027			7	20	
Nickel, total	< 0.0002	0.0002 mg/L		< 0.0002				28	
Phosphorus, total	< 0.020	0.020 mg/L		< 0.020				24	
Potassium, total	1.35	0.02 mg/L		1.43			6	13	
Selenium, total	< 0.0005	0.0005 mg/L		< 0.0005				24	
Silicon, total	8.1	0.5 mg/L		8.4			4	11	
Silver, total	< 0.00005	0.00005 mg/L		< 0.00005				18	
Sodium, total	3.62	0.02 mg/L		3.80			5	10	
Strontium, total	0.183	0.001 mg/L		0.191			4	9	
Sulfur, total	< 1	1 mg/L		< 1				24	
Tellurium, total	< 0.0002	0.0002 mg/L		< 0.0002				20	
Thallium, total	< 0.00002	0.00002 mg/L		< 0.00002				24	
Thorium, total	< 0.0001	0.0001 mg/L		< 0.0001				18	
Tin, total	< 0.0002	0.0002 mg/L		< 0.0002				18	
Titanium, total	< 0.005	0.005 mg/L		< 0.005				32	
Uranium, total	0.00155	0.00002 mg/L		0.00159			2	14	
Vanadium, total	0.001	0.001 mg/L		0.001				17	
Zinc, total	< 0.004	0.004 mg/L		< 0.004				8	
Zirconium, total	0.0003	0.0001 mg/L		0.0004				60	

#### Reference (B3G1203-SRM1)

Prepared: Jul-29-13, Analyzed: Jul-29-13

Aluminum, total	0.298	0.005 mg/L	0.296	101	81-129
Antimony, total	0.0497	0.0001 mg/L	0.0505	98	88-114
Arsenic, total	0.123	0.0005 mg/L	0.122	101	88-114
Barium, total	0.762	0.005 mg/L	0.777	98	72-104
Beryllium, total	0.0464	0.0001 mg/L	0.0488	95	76-131
Boron, total	3.49	0.004 mg/L	3.40	103	75-121
Cadmium, total	0.0497	0.00001 mg/L	0.0490	101	89-111
Calcium, total	10.1	0.2 mg/L	10.2	99	86-121
Chromium, total	0.245	0.0005 mg/L	0.242	101	89-114
Cobalt, total	0.0385	0.00005 mg/L	0.0366	105	91-113
Copper, total	0.516	0.0002 mg/L	0.487	106	91-115

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3071639**  
**REPORTED** Aug-01-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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**Total Recoverable Metals, Batch B3G1203, Continued**

Reference (B3G1203-SRM1), Continued				Prepared: Jul-29-13, Analyzed: Jul-29-13					
Iron, total	0.49	0.01 mg/L	0.469		105	77-124			
Lead, total	0.195	0.0001 mg/L	0.193		101	92-113			
Lithium, total	0.393	0.0001 mg/L	0.390		101	85-115			
Magnesium, total	3.47	0.01 mg/L	3.31		105	78-120			
Manganese, total	0.109	0.0002 mg/L	0.109		100	90-114			
Mercury, total	0.00450	0.00002 mg/L	0.00456		99	50-150			
Molybdenum, total	0.186	0.0001 mg/L	0.197		94	90-111			
Nickel, total	0.246	0.0002 mg/L	0.242		102	90-111			
Phosphorus, total	0.212	0.020 mg/L	0.233		91	85-115			
Potassium, total	6.20	0.02 mg/L	5.93		105	84-113			
Selenium, total	0.115	0.0005 mg/L	0.115		100	85-115			
Sodium, total	7.95	0.02 mg/L	7.64		104	82-123			
Strontium, total	0.361	0.001 mg/L	0.363		100	88-112			
Thallium, total	0.0823	0.00002 mg/L	0.0794		104	91-114			
Uranium, total	0.0184	0.00002 mg/L	0.0192		96	85-120			
Vanadium, total	0.372	0.001 mg/L	0.376		99	86-111			
Zinc, total	2.56	0.004 mg/L	2.42		106	85-111			



**REPORTED TO** Golder Associates Ltd. (Kelowna)  
220 - 1755 Springfield Road  
Kelowna, BC V1Y 5V5

**TEL** (250) 860-8424  
**FAX** (250) 860-9874

**ATTENTION** Pattie Amison

**WORK ORDER** 3091560

**PO NUMBER** 13-1493-0055

**RECEIVED / TEMP** Sep-25-13 12:15 / 7°C

**PROJECT** 13-1493-0055

**REPORTED** Oct-02-13

**PROJECT INFO** Faulder

**COC NUMBER** 02510

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**General Comments:**

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

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Issued By:

**Jennifer Shanko, ASCT**  
Administration Coordinator

*Please contact CARO if more information is needed or to provide feedback on our services.*

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**Locations:**

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17225 109 Avenue  
Edmonton, AB T5S 1H7  
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[www.caro.ca](http://www.caro.ca)

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091560  
Oct-02-13

Analysis Description	Method Reference (* = modified from)		Location
	Preparation	Analysis	
Alkalinity, speciated	N/A	APHA 2320 B	Kelowna
Chloride in Water by IC	N/A	APHA 4110 B	Kelowna
Conductivity in Water	N/A	APHA 2510 B	Kelowna
Dissolved Metals	APHA 3030 B	APHA 3125 B	Richmond
Fluoride in Water by IC	N/A	APHA 4110 B	Kelowna
Hardness as CaCO <sub>3</sub> (CALC)	N/A	APHA 2340 B	Richmond
Nitrate-N in Water by IC	N/A	APHA 4110 B	Kelowna
Nitrite-N in Water by IC	N/A	APHA 4110 B	Kelowna
Orthophosphate as P by IC	N/A	APHA 4110 B	Kelowna
pH in Water	N/A	APHA 4500-H+ B	Kelowna
Potability, IH Comp (Excludes Micro) Pkg	N/A	APHA 1030 E	Kelowna
Potability, IH Comprehensive Pkg	N/A	APHA 1030 E	Kelowna
Sulfate in Water by IC	N/A	APHA 4110 B	Kelowna
Total Dissolved Solids	N/A	APHA 2540 C	Kelowna
Total Recoverable Metals	APHA 3030E *	APHA 3125 B	Richmond

**Note:** The numbers in brackets represent the year that the method was published/approved

### Method Reference Descriptions:

APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Association

### Glossary of Terms:

MRL Method Reporting Limit  
 < Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences  
 mg/L Milligrams per litre  
 pH units pH < 7 = acidic, pH > 7 = basic  
 uS/cm Microsiemens per centimeter

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091560  
Oct-02-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Anions

**Sample ID: 1139 Fish Lake Rd. (3091560-01) [Water] Sampled: Sep-24-13 09:10**

Alkalinity, Total as CaCO <sub>3</sub>	227	1	mg/L	N/A	Sep-30-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Sep-30-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Sep-30-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	227	1	mg/L	N/A	Sep-30-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Sep-30-13	
Chloride	1.38	0.10	mg/L	N/A	Sep-26-13	
Fluoride	0.15	0.10	mg/L	N/A	Sep-26-13	
Nitrogen, Nitrate as N	0.036	0.010	mg/L	N/A	Sep-26-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Sep-26-13	
Phosphate, Ortho as P	< 0.01	0.01	mg/L	N/A	Sep-26-13	
Sulfate	6.4	1.0	mg/L	N/A	Sep-26-13	

### General Parameters

**Sample ID: 1139 Fish Lake Rd. (3091560-01) [Water] Sampled: Sep-24-13 09:10**

Conductivity (EC)	432	2	uS/cm	N/A	Sep-25-13	
pH	7.87	0.01	pH units	N/A	Sep-25-13	
Solids, Total Dissolved	255	5	mg/L	N/A	Sep-26-13	

### Calculated Parameters

**Sample ID: 1139 Fish Lake Rd. (3091560-01) [Water] Sampled: Sep-24-13 09:10**

Hardness, Total (Total as CaCO <sub>3</sub> )	213	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	205	0.50	mg/L	N/A	N/A	

### Dissolved Metals

**Sample ID: 1139 Fish Lake Rd. (3091560-01) [Water] Sampled: Sep-24-13 09:10**

Aluminum, dissolved	< 0.005	0.005	mg/L	N/A	Sep-27-13	
Antimony, dissolved	0.0005	0.0001	mg/L	N/A	Sep-27-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Sep-27-13	
Barium, dissolved	0.199	0.005	mg/L	N/A	Sep-27-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Sep-27-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Sep-27-13	
Boron, dissolved	0.008	0.004	mg/L	N/A	Sep-27-13	
Cadmium, dissolved	0.00002	0.00001	mg/L	N/A	Sep-27-13	
Calcium, dissolved	57.9	0.2	mg/L	N/A	Sep-27-13	
Chromium, dissolved	0.0007	0.0005	mg/L	N/A	Sep-27-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Sep-27-13	
Copper, dissolved	0.0015	0.0002	mg/L	N/A	Sep-27-13	
Iron, dissolved	< 0.010	0.010	mg/L	N/A	Sep-27-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Sep-27-13	
Lithium, dissolved	0.0061	0.0001	mg/L	N/A	Sep-27-13	
Magnesium, dissolved	14.7	0.01	mg/L	N/A	Sep-27-13	
Manganese, dissolved	0.0062	0.0002	mg/L	N/A	Sep-27-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091560  
Oct-02-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: 1139 Fish Lake Rd. (3091560-01) [Water] Sampled: Sep-24-13 09:10, Continued**

Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Sep-27-13
Molybdenum, dissolved	<b>0.0076</b>	0.0001	mg/L	N/A	Sep-27-13
Nickel, dissolved	< 0.0002	0.0002	mg/L	N/A	Sep-27-13
Phosphorus, dissolved	<b>0.05</b>	0.02	mg/L	N/A	Sep-27-13
Potassium, dissolved	<b>3.50</b>	0.02	mg/L	N/A	Sep-27-13
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Sep-27-13
Silicon, dissolved	<b>7.7</b>	0.5	mg/L	N/A	Sep-27-13
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Sep-27-13
Sodium, dissolved	<b>11.2</b>	0.02	mg/L	N/A	Sep-27-13
Strontium, dissolved	<b>1.61</b>	0.001	mg/L	N/A	Sep-27-13
Sulfur, dissolved	< 1	1	mg/L	N/A	Sep-27-13
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Sep-27-13
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Sep-27-13
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Sep-27-13
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Sep-27-13
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Sep-27-13
Uranium, dissolved	<b>0.0352</b>	0.00002	mg/L	N/A	Sep-27-13
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Sep-27-13
Zinc, dissolved	<b>0.007</b>	0.004	mg/L	N/A	Sep-27-13
Zirconium, dissolved	< 0.0001	0.0001	mg/L	N/A	Sep-27-13

### *Total Recoverable Metals*

**Sample ID: 1139 Fish Lake Rd. (3091560-01) [Water] Sampled: Sep-24-13 09:10**

Aluminum, total	< 0.005	0.005	mg/L	Sep-26-13	Sep-27-13
Antimony, total	< 0.0001	0.0001	mg/L	Sep-26-13	Sep-27-13
Arsenic, total	< 0.0005	0.0005	mg/L	Sep-26-13	Sep-27-13
Barium, total	<b>0.208</b>	0.005	mg/L	Sep-26-13	Sep-27-13
Beryllium, total	< 0.0001	0.0001	mg/L	Sep-26-13	Sep-27-13
Bismuth, total	< 0.0001	0.0001	mg/L	Sep-26-13	Sep-27-13
Boron, total	<b>0.005</b>	0.004	mg/L	Sep-26-13	Sep-27-13
Cadmium, total	<b>0.00002</b>	0.00001	mg/L	Sep-26-13	Sep-27-13
Calcium, total	<b>60.1</b>	0.2	mg/L	Sep-26-13	Sep-27-13
Chromium, total	< 0.0005	0.0005	mg/L	Sep-26-13	Sep-27-13
Cobalt, total	< 0.00005	0.00005	mg/L	Sep-26-13	Sep-27-13
Copper, total	<b>0.0012</b>	0.0002	mg/L	Sep-26-13	Sep-27-13
Iron, total	<b>0.02</b>	0.01	mg/L	Sep-26-13	Sep-27-13
Lead, total	< 0.0001	0.0001	mg/L	Sep-26-13	Sep-27-13
Lithium, total	<b>0.0063</b>	0.0001	mg/L	Sep-26-13	Sep-27-13
Magnesium, total	<b>15.3</b>	0.01	mg/L	Sep-26-13	Sep-27-13
Manganese, total	<b>0.0070</b>	0.0002	mg/L	Sep-26-13	Sep-27-13
Mercury, total	< 0.00002	0.00002	mg/L	Sep-26-13	Sep-27-13
Molybdenum, total	<b>0.0082</b>	0.0001	mg/L	Sep-26-13	Sep-27-13
Nickel, total	< 0.0002	0.0002	mg/L	Sep-26-13	Sep-27-13
Phosphorus, total	< 0.020	0.020	mg/L	Sep-26-13	Sep-27-13

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091560  
Oct-02-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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**Total Recoverable Metals, Continued**

**Sample ID: 1139 Fish Lake Rd. (3091560-01) [Water] Sampled: Sep-24-13 09:10, Continued**

Potassium, total	3.57	0.02	mg/L	Sep-26-13	Sep-27-13	
Selenium, total	< 0.0005	0.0005	mg/L	Sep-26-13	Sep-27-13	
Silicon, total	7.5	0.5	mg/L	Sep-26-13	Sep-27-13	
Silver, total	< 0.00005	0.00005	mg/L	Sep-26-13	Sep-27-13	
Sodium, total	11.8	0.02	mg/L	Sep-26-13	Sep-27-13	
Strontium, total	1.67	0.001	mg/L	Sep-26-13	Sep-27-13	
Sulfur, total	< 1	1	mg/L	Sep-26-13	Sep-27-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Sep-26-13	Sep-27-13	
Thallium, total	< 0.00002	0.00002	mg/L	Sep-26-13	Sep-27-13	
Thorium, total	< 0.0001	0.0001	mg/L	Sep-26-13	Sep-27-13	
Tin, total	< 0.0002	0.0002	mg/L	Sep-26-13	Sep-27-13	
Titanium, total	< 0.005	0.005	mg/L	Sep-26-13	Sep-27-13	
Uranium, total	0.0377	0.00002	mg/L	Sep-26-13	Sep-27-13	
Vanadium, total	0.001	0.001	mg/L	Sep-26-13	Sep-27-13	
Zinc, total	0.005	0.004	mg/L	Sep-26-13	Sep-27-13	
Zirconium, total	< 0.0001	0.0001	mg/L	Sep-26-13	Sep-27-13	



## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091560  
Oct-02-13

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup):** Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS):** A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM):** A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Anions, Batch B3I0955</b>									
<b>Blank (B3I0955-BLK1)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.005	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.002	0.010 mg/L							
Phosphate, Ortho as P	< 0.01	0.01 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3I0955-BLK2)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.005	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.002	0.010 mg/L							
Phosphate, Ortho as P	< 0.01	0.01 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3I0955-BLK3)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.005	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.002	0.010 mg/L							
Phosphate, Ortho as P	< 0.01	0.01 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>LCS (B3I0955-BS1)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	3.89	0.10 mg/L	4.00		97	85-115			
Fluoride	4.00	0.10 mg/L	4.00		100	85-115			
Nitrogen, Nitrate as N	4.17	0.010 mg/L	4.00		104	85-115			
Nitrogen, Nitrite as N	4.16	0.010 mg/L	4.00		104	85-115			
Phosphate, Ortho as P	4.15	0.01 mg/L	4.00		104	85-115			
Sulfate	4.0	1.0 mg/L	4.00		99	85-115			
<b>LCS (B3I0955-BS2)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	3.91	0.10 mg/L	4.00		98	85-115			
Fluoride	4.02	0.10 mg/L	4.00		100	85-115			
Nitrogen, Nitrate as N	4.12	0.010 mg/L	4.00		103	85-115			

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091560  
Oct-02-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Anions, Batch B3I0955, Continued

<b>LCS (B3I0955-BS2), Continued</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Nitrogen, Nitrite as N	4.10	0.010 mg/L	4.00		103	85-115			
Phosphate, Ortho as P	4.08	0.01 mg/L	4.00		102	85-115			
Sulfate	4.0	1.0 mg/L	4.00		99	85-115			

<b>LCS (B3I0955-BS3)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	3.90	0.10 mg/L	4.00		98	85-115			
Fluoride	4.01	0.10 mg/L	4.00		100	85-115			
Nitrogen, Nitrate as N	4.09	0.010 mg/L	4.00		102	85-115			
Nitrogen, Nitrite as N	4.15	0.010 mg/L	4.00		104	85-115			
Phosphate, Ortho as P	4.06	0.01 mg/L	4.00		101	85-115			
Sulfate	4.0	1.0 mg/L	4.00		99	85-115			

<b>Duplicate (B3I0955-DUP3)</b>			<b>Source: 3091560-01</b>		Prepared: Sep-26-13, Analyzed: Sep-26-13				
Chloride	1.29	0.10 mg/L		1.38			6	10	
Fluoride	0.14	0.10 mg/L		0.15				10	
Nitrogen, Nitrate as N	0.033	0.010 mg/L		0.036			9	10	
Nitrogen, Nitrite as N	< 0.002	0.010 mg/L		< 0.002				10	
Phosphate, Ortho as P	< 0.01	0.01 mg/L		< 0.01				20	
Sulfate	6.7	1.0 mg/L		6.4			4	10	

### Anions, Batch B3I1143

<b>Blank (B3I1143-BLK1)</b>			Prepared: Sep-30-13, Analyzed: Sep-30-13						
Alkalinity, Total as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1 mg/L							

<b>LCS (B3I1143-BS1)</b>			Prepared: Sep-30-13, Analyzed: Sep-30-13						
Alkalinity, Total as CaCO <sub>3</sub>	102	1 mg/L	100		102	96-108			

### Dissolved Metals, Batch B3I1005

<b>Blank (B3I1005-BLK1)</b>			Prepared: Sep-27-13, Analyzed: Sep-27-13						
Aluminum, dissolved	< 0.005	0.005 mg/L							
Antimony, dissolved	< 0.0001	0.0001 mg/L							
Arsenic, dissolved	< 0.0005	0.0005 mg/L							
Barium, dissolved	< 0.005	0.005 mg/L							
Beryllium, dissolved	< 0.0001	0.0001 mg/L							
Bismuth, dissolved	< 0.0001	0.0001 mg/L							
Boron, dissolved	< 0.004	0.004 mg/L							
Cadmium, dissolved	< 0.00001	0.00001 mg/L							
Calcium, dissolved	< 0.2	0.2 mg/L							
Chromium, dissolved	< 0.0005	0.0005 mg/L							
Cobalt, dissolved	< 0.00005	0.00005 mg/L							
Copper, dissolved	< 0.0002	0.0002 mg/L							
Iron, dissolved	< 0.010	0.010 mg/L							
Lead, dissolved	< 0.0001	0.0001 mg/L							
Lithium, dissolved	< 0.0001	0.0001 mg/L							
Magnesium, dissolved	< 0.01	0.01 mg/L							
Manganese, dissolved	< 0.0002	0.0002 mg/L							
Mercury, dissolved	< 0.00002	0.00002 mg/L							
Molybdenum, dissolved	< 0.0001	0.0001 mg/L							
Nickel, dissolved	< 0.0002	0.0002 mg/L							
Phosphorus, dissolved	< 0.02	0.02 mg/L							
Potassium, dissolved	< 0.02	0.02 mg/L							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3091560**  
**REPORTED** Oct-02-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Dissolved Metals, Batch B311005, Continued</b>									
<b>Blank (B311005-BLK1), Continued</b>			Prepared: Sep-27-13, Analyzed: Sep-27-13						
Selenium, dissolved	< 0.0005	0.0005 mg/L							
Silicon, dissolved	< 0.5	0.5 mg/L							
Silver, dissolved	< 0.00005	0.00005 mg/L							
Sodium, dissolved	< 0.02	0.02 mg/L							
Strontium, dissolved	< 0.001	0.001 mg/L							
Sulfur, dissolved	< 1	1 mg/L							
Tellurium, dissolved	< 0.0002	0.0002 mg/L							
Thallium, dissolved	< 0.00002	0.00002 mg/L							
Thorium, dissolved	< 0.0001	0.0001 mg/L							
Tin, dissolved	< 0.0002	0.0002 mg/L							
Titanium, dissolved	< 0.005	0.005 mg/L							
Uranium, dissolved	< 0.00002	0.00002 mg/L							
Vanadium, dissolved	< 0.001	0.001 mg/L							
Zinc, dissolved	< 0.004	0.004 mg/L							
Zirconium, dissolved	< 0.0001	0.0001 mg/L							
<b>Matrix Spike (B311005-MS1)</b>			<b>Source: 3091560-01</b>		Prepared: Sep-27-13, Analyzed: Sep-27-13				
Antimony, dissolved	0.358	0.0001 mg/L	0.400	0.0005	89	76-114			
Arsenic, dissolved	0.191	0.0005 mg/L	0.200	< 0.0005	95	81-115			
Barium, dissolved	1.16	0.005 mg/L	1.00	0.199	96	80-113			
Beryllium, dissolved	0.0891	0.0001 mg/L	0.100	< 0.0001	89	69-109			
Cadmium, dissolved	0.0996	0.00001 mg/L	0.100	0.00002	100	83-110			
Chromium, dissolved	0.375	0.0005 mg/L	0.400	0.0007	93	85-115			
Cobalt, dissolved	0.398	0.00005 mg/L	0.400	< 0.00005	99	86-114			
Copper, dissolved	0.368	0.0002 mg/L	0.400	0.0015	92	82-119			
Iron, dissolved	2.00	0.010 mg/L	2.00	< 0.010	100	80-116			
Lead, dissolved	0.184	0.0001 mg/L	0.200	< 0.0001	92	83-112			
Manganese, dissolved	0.373	0.0002 mg/L	0.400	0.0062	92	62-131			
Nickel, dissolved	0.391	0.0002 mg/L	0.400	< 0.0002	98	81-115			
Selenium, dissolved	0.0969	0.0005 mg/L	0.100	< 0.0005	97	79-115			
Silver, dissolved	0.0940	0.00005 mg/L	0.100	< 0.00005	94	69-121			
Thallium, dissolved	0.0975	0.00002 mg/L	0.100	< 0.00002	98	84-115			
Vanadium, dissolved	0.369	0.001 mg/L	0.400	< 0.001	92	83-113			
Zinc, dissolved	0.980	0.004 mg/L	1.00	0.007	97	82-115			
<b>Reference (B311005-SRM1)</b>			Prepared: Sep-27-13, Analyzed: Sep-27-13						
Aluminum, dissolved	0.220	0.005 mg/L	0.233		95	58-142			
Antimony, dissolved	0.0484	0.0001 mg/L	0.0430		113	75-125			
Arsenic, dissolved	0.416	0.0005 mg/L	0.438		95	81-119			
Barium, dissolved	3.59	0.005 mg/L	3.35		107	83-117			
Beryllium, dissolved	0.202	0.0001 mg/L	0.213		95	80-120			
Boron, dissolved	1.86	0.004 mg/L	1.74		107	74-117			
Cadmium, dissolved	0.215	0.00001 mg/L	0.224		96	83-117			
Calcium, dissolved	7.8	0.2 mg/L	7.69		101	76-124			
Chromium, dissolved	0.402	0.0005 mg/L	0.437		92	81-119			
Cobalt, dissolved	0.119	0.00005 mg/L	0.128		93	76-124			
Copper, dissolved	0.848	0.0002 mg/L	0.844		100	84-116			
Iron, dissolved	1.26	0.010 mg/L	1.29		97	74-126			
Lead, dissolved	0.105	0.0001 mg/L	0.112		94	72-128			
Lithium, dissolved	0.105	0.0001 mg/L	0.104		101	60-140			
Magnesium, dissolved	6.50	0.01 mg/L	6.92		94	81-119			
Manganese, dissolved	0.318	0.0002 mg/L	0.345		92	84-116			
Molybdenum, dissolved	0.388	0.0001 mg/L	0.426		91	83-117			
Nickel, dissolved	0.830	0.0002 mg/L	0.840		99	74-126			
Phosphorus, dissolved	0.51	0.02 mg/L	0.495		103	68-132			
Potassium, dissolved	2.95	0.02 mg/L	3.19		92	74-126			
Selenium, dissolved	0.0321	0.0005 mg/L	0.0331		97	70-130			

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091560  
Oct-02-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### *Dissolved Metals, Batch B3I1005, Continued*

<b>Reference (B3I1005-SRM1), Continued</b>			Prepared: Sep-27-13, Analyzed: Sep-27-13						
Sodium, dissolved	18.5	0.02 mg/L	19.1		97	72-128			
Strontium, dissolved	0.875	0.001 mg/L	0.916		96	84-113			
Thallium, dissolved	0.0347	0.00002 mg/L	0.0393		88	57-143			
Uranium, dissolved	0.263	0.00002 mg/L	0.266		99	85-115			
Vanadium, dissolved	0.827	0.001 mg/L	0.869		95	87-113			
Zinc, dissolved	0.850	0.004 mg/L	0.881		97	72-128			

### *General Parameters, Batch B3I0956*

<b>Blank (B3I0956-BLK1)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	< 2	2 uS/cm							
<b>Blank (B3I0956-BLK2)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	< 2	2 uS/cm							
<b>Blank (B3I0956-BLK3)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	< 2	2 uS/cm							
<b>Blank (B3I0956-BLK4)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	< 2	2 uS/cm							
<b>LCS (B3I0956-BS5)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	1390	2 uS/cm	1410		99	93-104			
<b>LCS (B3I0956-BS6)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	1410	2 uS/cm	1410		100	93-104			
<b>LCS (B3I0956-BS7)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	1400	2 uS/cm	1410		99	93-104			
<b>LCS (B3I0956-BS8)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	1410	2 uS/cm	1410		100	93-104			
<b>Reference (B3I0956-SRM1)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
pH	6.99	0.01 pH units	7.00		100	98-102			
<b>Reference (B3I0956-SRM2)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
pH	6.98	0.01 pH units	7.00		100	98-102			
<b>Reference (B3I0956-SRM3)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
pH	6.98	0.01 pH units	7.00		100	98-102			
<b>Reference (B3I0956-SRM4)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
pH	6.98	0.01 pH units	7.00		100	98-102			

### *General Parameters, Batch B3I0999*

<b>Blank (B3I0999-BLK1)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Solids, Total Dissolved	< 5	5 mg/L							
<b>Blank (B3I0999-BLK2)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Solids, Total Dissolved	< 5	5 mg/L							
<b>Reference (B3I0999-SRM1)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Solids, Total Dissolved	242	5 mg/L	240		101	85-115			
<b>Reference (B3I0999-SRM2)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Solids, Total Dissolved	257	5 mg/L	240		107	85-115			

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3091560**  
**REPORTED** Oct-02-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Total Recoverable Metals, Batch B31003

<b>Blank (B31003-BLK1)</b>			Prepared: Sep-26-13, Analyzed: Sep-27-13						
Aluminum, total	< 0.005	0.005 mg/L							
Antimony, total	< 0.0001	0.0001 mg/L							
Arsenic, total	< 0.0005	0.0005 mg/L							
Barium, total	< 0.005	0.005 mg/L							
Beryllium, total	< 0.0001	0.0001 mg/L							
Bismuth, total	< 0.0001	0.0001 mg/L							
Boron, total	< 0.004	0.004 mg/L							
Cadmium, total	< 0.00001	0.00001 mg/L							
Calcium, total	< 0.2	0.2 mg/L							
Chromium, total	< 0.0005	0.0005 mg/L							
Cobalt, total	< 0.00005	0.00005 mg/L							
Copper, total	< 0.0002	0.0002 mg/L							
Iron, total	< 0.01	0.01 mg/L							
Lead, total	< 0.0001	0.0001 mg/L							
Lithium, total	< 0.0001	0.0001 mg/L							
Magnesium, total	< 0.01	0.01 mg/L							
Manganese, total	< 0.0002	0.0002 mg/L							
Mercury, total	< 0.00002	0.00002 mg/L							
Molybdenum, total	< 0.0001	0.0001 mg/L							
Nickel, total	< 0.0002	0.0002 mg/L							
Phosphorus, total	< 0.020	0.020 mg/L							
Potassium, total	< 0.02	0.02 mg/L							
Selenium, total	< 0.0005	0.0005 mg/L							
Silicon, total	< 0.5	0.5 mg/L							
Silver, total	< 0.00005	0.00005 mg/L							
Sodium, total	< 0.02	0.02 mg/L							
Strontium, total	< 0.001	0.001 mg/L							
Sulfur, total	< 1	1 mg/L							
Tellurium, total	< 0.0002	0.0002 mg/L							
Thallium, total	< 0.00002	0.00002 mg/L							
Thorium, total	< 0.0001	0.0001 mg/L							
Tin, total	< 0.0002	0.0002 mg/L							
Titanium, total	< 0.005	0.005 mg/L							
Uranium, total	< 0.00002	0.00002 mg/L							
Vanadium, total	< 0.001	0.001 mg/L							
Zinc, total	< 0.004	0.004 mg/L							
Zirconium, total	< 0.0001	0.0001 mg/L							

<b>Reference (B31003-SRM1)</b>			Prepared: Sep-26-13, Analyzed: Sep-27-13						
Aluminum, total	0.294	0.005 mg/L	0.296		99	81-129			
Antimony, total	0.0472	0.0001 mg/L	0.0505		93	88-114			
Arsenic, total	0.119	0.0005 mg/L	0.122		98	88-114			
Barium, total	0.737	0.005 mg/L	0.777		95	72-104			
Beryllium, total	0.0459	0.0001 mg/L	0.0488		94	76-131			
Boron, total	3.65	0.004 mg/L	3.40		107	75-121			
Cadmium, total	0.0485	0.00001 mg/L	0.0490		99	89-111			
Calcium, total	9.9	0.2 mg/L	10.2		97	86-121			
Chromium, total	0.230	0.0005 mg/L	0.242		95	89-114			
Cobalt, total	0.0361	0.00005 mg/L	0.0366		99	91-113			
Copper, total	0.509	0.0002 mg/L	0.487		104	91-115			
Iron, total	0.51	0.01 mg/L	0.469		109	77-124			
Lead, total	0.186	0.0001 mg/L	0.193		96	92-113			
Lithium, total	0.389	0.0001 mg/L	0.390		100	85-115			
Magnesium, total	3.29	0.01 mg/L	3.31		100	78-120			
Manganese, total	0.103	0.0002 mg/L	0.109		95	90-114			
Mercury, total	0.00407	0.00002 mg/L	0.00456		89	50-150			
Molybdenum, total	0.180	0.0001 mg/L	0.197		92	90-111			



## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3091560**  
**REPORTED Oct-02-13**

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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**Total Recoverable Metals, Batch B3I1003, Continued**

Reference (B3I1003-SRM1), Continued				Prepared: Sep-26-13, Analyzed: Sep-27-13					
Nickel, total	0.246	0.0002 mg/L	0.242		102	90-111			
Phosphorus, total	0.199	0.020 mg/L	0.233		85	85-115			
Potassium, total	5.94	0.02 mg/L	5.93		100	84-113			
Selenium, total	0.114	0.0005 mg/L	0.115		99	85-115			
Sodium, total	7.79	0.02 mg/L	7.64		102	82-123			
Strontium, total	0.341	0.001 mg/L	0.363		94	88-112			
Thallium, total	0.0766	0.00002 mg/L	0.0794		97	91-114			
Uranium, total	0.0171	0.00002 mg/L	0.0192		89	85-120			
Vanadium, total	0.349	0.001 mg/L	0.376		93	86-111			
Zinc, total	2.39	0.004 mg/L	2.42		99	85-111			

**CERTIFICATE OF ANALYSIS**

**REPORTED TO** Golder Associates Ltd. (Kelowna)  
220 - 1755 Springfield Road  
Kelowna, BC V1Y 5V5

**TEL** (250) 860-8424  
**FAX** (250) 860-9874

**ATTENTION** Pattie Amison

**WORK ORDER** 3091561

**PO NUMBER** 13-1493-0055

**RECEIVED / TEMP** Sep-25-13 12:15 / 7°C

**PROJECT** 13-1493-0055

**REPORTED** Oct-02-13

**PROJECT INFO** Faulder

**COC NUMBER** B02511

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**General Comments:**

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.



Issued By:

**Jennifer Shanko, ASCT**  
Administration Coordinator

*Please contact CARO if more information is needed or to provide feedback on our services.*

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**Locations:**

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Richmond, BC V6V 2K9  
Tel: 604-279-1499 Fax: 604-279-1599

#102 3677 Highway 97N  
Kelowna, BC V1X 5C3  
Tel: 250-765-9646 Fax: 250-765-3893

17225 109 Avenue  
Edmonton, AB T5S 1H7  
Tel: 780-489-9100 Fax: 780-489-9700

[www.caro.ca](http://www.caro.ca)

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091561  
Oct-02-13

Analysis Description	Method Reference (* = modified from)		Location
	Preparation	Analysis	
Alkalinity, speciated	N/A	APHA 2320 B	Kelowna
Chloride in Water by IC	N/A	APHA 4110 B	Kelowna
Conductivity in Water	N/A	APHA 2510 B	Kelowna
Dissolved Metals	APHA 3030 B	APHA 3125 B	Richmond
Fluoride in Water by IC	N/A	APHA 4110 B	Kelowna
Hardness as CaCO <sub>3</sub> (CALC)	N/A	APHA 2340 B	Richmond
Nitrate-N in Water by IC	N/A	APHA 4110 B	Kelowna
Nitrite-N in Water by IC	N/A	APHA 4110 B	Kelowna
Orthophosphate as P by IC	N/A	APHA 4110 B	Kelowna
pH in Water	N/A	APHA 4500-H+ B	Kelowna
Potability, IH Comp (Excludes Micro) Pkg	N/A	APHA 1030 E	Kelowna
Potability, IH Comprehensive Pkg	N/A	APHA 1030 E	Kelowna
Sulfate in Water by IC	N/A	APHA 4110 B	Kelowna
Total Dissolved Solids	N/A	APHA 2540 C	Kelowna
Total Recoverable Metals	APHA 3030E *	APHA 3125 B	Richmond

**Note:** The numbers in brackets represent the year that the method was published/approved

### Method Reference Descriptions:

APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Association

### Glossary of Terms:

MRL Method Reporting Limit  
 < Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences  
 mg/L Milligrams per litre  
 pH units pH < 7 = acidic, pH > 7 = basic  
 uS/cm Microsiemens per centimeter

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091561  
Oct-02-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Anions

**Sample ID: 23 Agur Crt (3091561-01) [Water] Sampled: Sep-24-13 12:30**

Alkalinity, Total as CaCO <sub>3</sub>	137	1	mg/L	N/A	Sep-30-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Sep-30-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Sep-30-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	137	1	mg/L	N/A	Sep-30-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Sep-30-13	
Chloride	6.12	0.10	mg/L	N/A	Sep-26-13	
Fluoride	0.18	0.10	mg/L	N/A	Sep-26-13	
Nitrogen, Nitrate as N	0.375	0.010	mg/L	N/A	Sep-26-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Sep-26-13	
Phosphate, Ortho as P	< 0.01	0.01	mg/L	N/A	Sep-26-13	
Sulfate	5.1	1.0	mg/L	N/A	Sep-26-13	

### General Parameters

**Sample ID: 23 Agur Crt (3091561-01) [Water] Sampled: Sep-24-13 12:30**

Conductivity (EC)	290	2	uS/cm	N/A	Sep-25-13	
pH	7.97	0.01	pH units	N/A	Sep-25-13	
Solids, Total Dissolved	160	5	mg/L	N/A	Sep-26-13	

### Calculated Parameters

**Sample ID: 23 Agur Crt (3091561-01) [Water] Sampled: Sep-24-13 12:30**

Hardness, Total (Total as CaCO <sub>3</sub> )	132	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	123	0.50	mg/L	N/A	N/A	

### Dissolved Metals

**Sample ID: 23 Agur Crt (3091561-01) [Water] Sampled: Sep-24-13 12:30**

Aluminum, dissolved	< 0.005	0.005	mg/L	N/A	Sep-27-13	
Antimony, dissolved	0.0004	0.0001	mg/L	N/A	Sep-27-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Sep-27-13	
Barium, dissolved	0.057	0.005	mg/L	N/A	Sep-27-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Sep-27-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Sep-27-13	
Boron, dissolved	0.008	0.004	mg/L	N/A	Sep-27-13	
Cadmium, dissolved	0.00001	0.00001	mg/L	N/A	Sep-27-13	
Calcium, dissolved	35.2	0.2	mg/L	N/A	Sep-27-13	
Chromium, dissolved	0.0009	0.0005	mg/L	N/A	Sep-27-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Sep-27-13	
Copper, dissolved	0.0042	0.0002	mg/L	N/A	Sep-27-13	
Iron, dissolved	0.028	0.010	mg/L	N/A	Sep-27-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Sep-27-13	
Lithium, dissolved	0.0043	0.0001	mg/L	N/A	Sep-27-13	
Magnesium, dissolved	8.62	0.01	mg/L	N/A	Sep-27-13	
Manganese, dissolved	0.0019	0.0002	mg/L	N/A	Sep-27-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091561  
Oct-02-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: 23 Agur Crt (3091561-01) [Water] Sampled: Sep-24-13 12:30, Continued**

Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Sep-27-13
Molybdenum, dissolved	<b>0.0065</b>	0.0001	mg/L	N/A	Sep-27-13
Nickel, dissolved	<b>0.0011</b>	0.0002	mg/L	N/A	Sep-27-13
Phosphorus, dissolved	<b>0.04</b>	0.02	mg/L	N/A	Sep-27-13
Potassium, dissolved	<b>3.05</b>	0.02	mg/L	N/A	Sep-27-13
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Sep-27-13
Silicon, dissolved	<b>9.2</b>	0.5	mg/L	N/A	Sep-27-13
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Sep-27-13
Sodium, dissolved	<b>9.59</b>	0.02	mg/L	N/A	Sep-27-13
Strontium, dissolved	<b>0.357</b>	0.001	mg/L	N/A	Sep-27-13
Sulfur, dissolved	< 1	1	mg/L	N/A	Sep-27-13
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Sep-27-13
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Sep-27-13
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Sep-27-13
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Sep-27-13
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Sep-27-13
Uranium, dissolved	<b>0.0121</b>	0.00002	mg/L	N/A	Sep-27-13
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Sep-27-13
Zinc, dissolved	<b>0.005</b>	0.004	mg/L	N/A	Sep-27-13
Zirconium, dissolved	< 0.0001	0.0001	mg/L	N/A	Sep-27-13

### *Total Recoverable Metals*

**Sample ID: 23 Agur Crt (3091561-01) [Water] Sampled: Sep-24-13 12:30**

Aluminum, total	<b>0.031</b>	0.005	mg/L	Sep-26-13	Sep-27-13
Antimony, total	<b>0.0001</b>	0.0001	mg/L	Sep-26-13	Sep-27-13
Arsenic, total	< 0.0005	0.0005	mg/L	Sep-26-13	Sep-27-13
Barium, total	<b>0.063</b>	0.005	mg/L	Sep-26-13	Sep-27-13
Beryllium, total	< 0.0001	0.0001	mg/L	Sep-26-13	Sep-27-13
Bismuth, total	< 0.0001	0.0001	mg/L	Sep-26-13	Sep-27-13
Boron, total	<b>0.008</b>	0.004	mg/L	Sep-26-13	Sep-27-13
Cadmium, total	<b>0.00002</b>	0.00001	mg/L	Sep-26-13	Sep-27-13
Calcium, total	<b>37.8</b>	0.2	mg/L	Sep-26-13	Sep-27-13
Chromium, total	<b>0.0056</b>	0.0005	mg/L	Sep-26-13	Sep-27-13
Cobalt, total	<b>0.00016</b>	0.00005	mg/L	Sep-26-13	Sep-27-13
Copper, total	<b>0.0163</b>	0.0002	mg/L	Sep-26-13	Sep-27-13
Iron, total	<b>4.97</b>	0.01	mg/L	Sep-26-13	Sep-27-13
Lead, total	<b>0.0018</b>	0.0001	mg/L	Sep-26-13	Sep-27-13
Lithium, total	<b>0.0047</b>	0.0001	mg/L	Sep-26-13	Sep-27-13
Magnesium, total	<b>9.13</b>	0.01	mg/L	Sep-26-13	Sep-27-13
Manganese, total	<b>0.0583</b>	0.0002	mg/L	Sep-26-13	Sep-27-13
Mercury, total	< 0.00002	0.00002	mg/L	Sep-26-13	Sep-27-13
Molybdenum, total	<b>0.0069</b>	0.0001	mg/L	Sep-26-13	Sep-27-13
Nickel, total	<b>0.0037</b>	0.0002	mg/L	Sep-26-13	Sep-27-13
Phosphorus, total	< 0.020	0.020	mg/L	Sep-26-13	Sep-27-13



## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091561  
Oct-02-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

Sample ID: 23 Agur Crt (3091561-01) [Water] Sampled: Sep-24-13 12:30, Continued

Potassium, total	3.13	0.02	mg/L	Sep-26-13	Sep-27-13	
Selenium, total	< 0.0005	0.0005	mg/L	Sep-26-13	Sep-27-13	
Silicon, total	9.4	0.5	mg/L	Sep-26-13	Sep-27-13	
Silver, total	< 0.00005	0.00005	mg/L	Sep-26-13	Sep-27-13	
Sodium, total	9.96	0.02	mg/L	Sep-26-13	Sep-27-13	
Strontium, total	0.372	0.001	mg/L	Sep-26-13	Sep-27-13	
Sulfur, total	< 1	1	mg/L	Sep-26-13	Sep-27-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Sep-26-13	Sep-27-13	
Thallium, total	< 0.00002	0.00002	mg/L	Sep-26-13	Sep-27-13	
Thorium, total	< 0.0001	0.0001	mg/L	Sep-26-13	Sep-27-13	
Tin, total	0.0003	0.0002	mg/L	Sep-26-13	Sep-27-13	
Titanium, total	< 0.005	0.005	mg/L	Sep-26-13	Sep-27-13	
Uranium, total	0.0141	0.00002	mg/L	Sep-26-13	Sep-27-13	
Vanadium, total	0.002	0.001	mg/L	Sep-26-13	Sep-27-13	
Zinc, total	0.008	0.004	mg/L	Sep-26-13	Sep-27-13	
Zirconium, total	< 0.0001	0.0001	mg/L	Sep-26-13	Sep-27-13	

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091561  
Oct-02-13

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup):** Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS):** A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM):** A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Anions, Batch B3I0955</b>									
<b>Blank (B3I0955-BLK1)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.005	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.002	0.010 mg/L							
Phosphate, Ortho as P	< 0.01	0.01 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3I0955-BLK2)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.005	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.002	0.010 mg/L							
Phosphate, Ortho as P	< 0.01	0.01 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3I0955-BLK3)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.005	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.002	0.010 mg/L							
Phosphate, Ortho as P	< 0.01	0.01 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>LCS (B3I0955-BS1)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	3.89	0.10 mg/L	4.00		97	85-115			
Fluoride	4.00	0.10 mg/L	4.00		100	85-115			
Nitrogen, Nitrate as N	4.17	0.010 mg/L	4.00		104	85-115			
Nitrogen, Nitrite as N	4.16	0.010 mg/L	4.00		104	85-115			
Phosphate, Ortho as P	4.15	0.01 mg/L	4.00		104	85-115			
Sulfate	4.0	1.0 mg/L	4.00		99	85-115			
<b>LCS (B3I0955-BS2)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	3.91	0.10 mg/L	4.00		98	85-115			
Fluoride	4.02	0.10 mg/L	4.00		100	85-115			
Nitrogen, Nitrate as N	4.12	0.010 mg/L	4.00		103	85-115			

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091561  
Oct-02-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Anions, Batch B3I0955, Continued

<b>LCS (B3I0955-BS2), Continued</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Nitrogen, Nitrite as N	4.10	0.010 mg/L	4.00		103	85-115			
Phosphate, Ortho as P	4.08	0.01 mg/L	4.00		102	85-115			
Sulfate	4.0	1.0 mg/L	4.00		99	85-115			

<b>LCS (B3I0955-BS3)</b>			Prepared: Sep-26-13, Analyzed: Sep-26-13						
Chloride	3.90	0.10 mg/L	4.00		98	85-115			
Fluoride	4.01	0.10 mg/L	4.00		100	85-115			
Nitrogen, Nitrate as N	4.09	0.010 mg/L	4.00		102	85-115			
Nitrogen, Nitrite as N	4.15	0.010 mg/L	4.00		104	85-115			
Phosphate, Ortho as P	4.06	0.01 mg/L	4.00		101	85-115			
Sulfate	4.0	1.0 mg/L	4.00		99	85-115			

### Anions, Batch B3I1143

<b>Blank (B3I1143-BLK1)</b>			Prepared: Sep-30-13, Analyzed: Sep-30-13						
Alkalinity, Total as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1 mg/L							

<b>LCS (B3I1143-BS1)</b>			Prepared: Sep-30-13, Analyzed: Sep-30-13						
Alkalinity, Total as CaCO <sub>3</sub>	102	1 mg/L	100		102	96-108			

### Dissolved Metals, Batch B3I1005

<b>Blank (B3I1005-BLK1)</b>			Prepared: Sep-27-13, Analyzed: Sep-27-13						
Aluminum, dissolved	< 0.005	0.005 mg/L							
Antimony, dissolved	< 0.0001	0.0001 mg/L							
Arsenic, dissolved	< 0.0005	0.0005 mg/L							
Barium, dissolved	< 0.005	0.005 mg/L							
Beryllium, dissolved	< 0.0001	0.0001 mg/L							
Bismuth, dissolved	< 0.0001	0.0001 mg/L							
Boron, dissolved	< 0.004	0.004 mg/L							
Cadmium, dissolved	< 0.00001	0.00001 mg/L							
Calcium, dissolved	< 0.2	0.2 mg/L							
Chromium, dissolved	< 0.0005	0.0005 mg/L							
Cobalt, dissolved	< 0.00005	0.00005 mg/L							
Copper, dissolved	< 0.0002	0.0002 mg/L							
Iron, dissolved	< 0.010	0.010 mg/L							
Lead, dissolved	< 0.0001	0.0001 mg/L							
Lithium, dissolved	< 0.0001	0.0001 mg/L							
Magnesium, dissolved	< 0.01	0.01 mg/L							
Manganese, dissolved	< 0.0002	0.0002 mg/L							
Mercury, dissolved	< 0.00002	0.00002 mg/L							
Molybdenum, dissolved	< 0.0001	0.0001 mg/L							
Nickel, dissolved	< 0.0002	0.0002 mg/L							
Phosphorus, dissolved	< 0.02	0.02 mg/L							
Potassium, dissolved	< 0.02	0.02 mg/L							
Selenium, dissolved	< 0.0005	0.0005 mg/L							
Silicon, dissolved	< 0.5	0.5 mg/L							
Silver, dissolved	< 0.00005	0.00005 mg/L							
Sodium, dissolved	< 0.02	0.02 mg/L							
Strontium, dissolved	< 0.001	0.001 mg/L							
Sulfur, dissolved	< 1	1 mg/L							
Tellurium, dissolved	< 0.0002	0.0002 mg/L							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091561  
Oct-02-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Dissolved Metals, Batch B3I1005, Continued

<b>Blank (B3I1005-BLK1), Continued</b>			Prepared: Sep-27-13, Analyzed: Sep-27-13						
Thallium, dissolved	< 0.00002	0.00002 mg/L							
Thorium, dissolved	< 0.0001	0.0001 mg/L							
Tin, dissolved	< 0.0002	0.0002 mg/L							
Titanium, dissolved	< 0.005	0.005 mg/L							
Uranium, dissolved	< 0.00002	0.00002 mg/L							
Vanadium, dissolved	< 0.001	0.001 mg/L							
Zinc, dissolved	< 0.004	0.004 mg/L							
Zirconium, dissolved	< 0.0001	0.0001 mg/L							

<b>Reference (B3I1005-SRM1)</b>			Prepared: Sep-27-13, Analyzed: Sep-27-13						
Aluminum, dissolved	0.220	0.005 mg/L	0.233		95	58-142			
Antimony, dissolved	0.0484	0.0001 mg/L	0.0430		113	75-125			
Arsenic, dissolved	0.416	0.0005 mg/L	0.438		95	81-119			
Barium, dissolved	3.59	0.005 mg/L	3.35		107	83-117			
Beryllium, dissolved	0.202	0.0001 mg/L	0.213		95	80-120			
Boron, dissolved	1.86	0.004 mg/L	1.74		107	74-117			
Cadmium, dissolved	0.215	0.00001 mg/L	0.224		96	83-117			
Calcium, dissolved	7.8	0.2 mg/L	7.69		101	76-124			
Chromium, dissolved	0.402	0.0005 mg/L	0.437		92	81-119			
Cobalt, dissolved	0.119	0.00005 mg/L	0.128		93	76-124			
Copper, dissolved	0.848	0.0002 mg/L	0.844		100	84-116			
Iron, dissolved	1.26	0.010 mg/L	1.29		97	74-126			
Lead, dissolved	0.105	0.0001 mg/L	0.112		94	72-128			
Lithium, dissolved	0.105	0.0001 mg/L	0.104		101	60-140			
Magnesium, dissolved	6.50	0.01 mg/L	6.92		94	81-119			
Manganese, dissolved	0.318	0.0002 mg/L	0.345		92	84-116			
Molybdenum, dissolved	0.388	0.0001 mg/L	0.426		91	83-117			
Nickel, dissolved	0.830	0.0002 mg/L	0.840		99	74-126			
Phosphorus, dissolved	0.51	0.02 mg/L	0.495		103	68-132			
Potassium, dissolved	2.95	0.02 mg/L	3.19		92	74-126			
Selenium, dissolved	0.0321	0.0005 mg/L	0.0331		97	70-130			
Sodium, dissolved	18.5	0.02 mg/L	19.1		97	72-128			
Strontium, dissolved	0.875	0.001 mg/L	0.916		96	84-113			
Thallium, dissolved	0.0347	0.00002 mg/L	0.0393		88	57-143			
Uranium, dissolved	0.263	0.00002 mg/L	0.266		99	85-115			
Vanadium, dissolved	0.827	0.001 mg/L	0.869		95	87-113			
Zinc, dissolved	0.850	0.004 mg/L	0.881		97	72-128			

### General Parameters, Batch B3I0956

<b>Blank (B3I0956-BLK1)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	< 2	2 uS/cm							
<b>Blank (B3I0956-BLK2)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	< 2	2 uS/cm							
<b>Blank (B3I0956-BLK3)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	< 2	2 uS/cm							
<b>Blank (B3I0956-BLK4)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	< 2	2 uS/cm							
<b>LCS (B3I0956-BS5)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	1390	2 uS/cm	1410		99	93-104			
<b>LCS (B3I0956-BS6)</b>			Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	1410	2 uS/cm	1410		100	93-104			

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091561  
Oct-02-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### General Parameters, Batch B3I0956, Continued

<b>LCS (B3I0956-BS7)</b>				Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	1400	2	uS/cm	1410		99	93-104			
<b>LCS (B3I0956-BS8)</b>				Prepared: Sep-25-13, Analyzed: Sep-25-13						
Conductivity (EC)	1410	2	uS/cm	1410		100	93-104			
<b>Reference (B3I0956-SRM1)</b>				Prepared: Sep-25-13, Analyzed: Sep-25-13						
pH	6.99	0.01	pH units	7.00		100	98-102			
<b>Reference (B3I0956-SRM2)</b>				Prepared: Sep-25-13, Analyzed: Sep-25-13						
pH	6.98	0.01	pH units	7.00		100	98-102			
<b>Reference (B3I0956-SRM3)</b>				Prepared: Sep-25-13, Analyzed: Sep-25-13						
pH	6.98	0.01	pH units	7.00		100	98-102			
<b>Reference (B3I0956-SRM4)</b>				Prepared: Sep-25-13, Analyzed: Sep-25-13						
pH	6.98	0.01	pH units	7.00		100	98-102			

### General Parameters, Batch B3I0999

<b>Blank (B3I0999-BLK1)</b>				Prepared: Sep-26-13, Analyzed: Sep-26-13						
Solids, Total Dissolved	< 5	5	mg/L							
<b>Blank (B3I0999-BLK2)</b>				Prepared: Sep-26-13, Analyzed: Sep-26-13						
Solids, Total Dissolved	< 5	5	mg/L							
<b>Reference (B3I0999-SRM1)</b>				Prepared: Sep-26-13, Analyzed: Sep-26-13						
Solids, Total Dissolved	242	5	mg/L	240		101	85-115			
<b>Reference (B3I0999-SRM2)</b>				Prepared: Sep-26-13, Analyzed: Sep-26-13						
Solids, Total Dissolved	257	5	mg/L	240		107	85-115			

### Total Recoverable Metals, Batch B3I1003

<b>Blank (B3I1003-BLK1)</b>				Prepared: Sep-26-13, Analyzed: Sep-27-13						
Aluminum, total	< 0.005	0.005	mg/L							
Antimony, total	< 0.0001	0.0001	mg/L							
Arsenic, total	< 0.0005	0.0005	mg/L							
Barium, total	< 0.005	0.005	mg/L							
Beryllium, total	< 0.0001	0.0001	mg/L							
Bismuth, total	< 0.0001	0.0001	mg/L							
Boron, total	< 0.004	0.004	mg/L							
Cadmium, total	< 0.00001	0.00001	mg/L							
Calcium, total	< 0.2	0.2	mg/L							
Chromium, total	< 0.0005	0.0005	mg/L							
Cobalt, total	< 0.00005	0.00005	mg/L							
Copper, total	< 0.0002	0.0002	mg/L							
Iron, total	< 0.01	0.01	mg/L							
Lead, total	< 0.0001	0.0001	mg/L							
Lithium, total	< 0.0001	0.0001	mg/L							
Magnesium, total	< 0.01	0.01	mg/L							
Manganese, total	< 0.0002	0.0002	mg/L							
Mercury, total	< 0.00002	0.00002	mg/L							
Molybdenum, total	< 0.0001	0.0001	mg/L							
Nickel, total	< 0.0002	0.0002	mg/L							
Phosphorus, total	< 0.020	0.020	mg/L							
Potassium, total	< 0.02	0.02	mg/L							
Selenium, total	< 0.0005	0.0005	mg/L							
Silicon, total	< 0.5	0.5	mg/L							



## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3091561  
Oct-02-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Total Recoverable Metals, Batch B311003, Continued

#### Blank (B311003-BLK1), Continued

Prepared: Sep-26-13, Analyzed: Sep-27-13

Silver, total	< 0.00005	0.00005 mg/L							
Sodium, total	< 0.02	0.02 mg/L							
Strontium, total	< 0.001	0.001 mg/L							
Sulfur, total	< 1	1 mg/L							
Tellurium, total	< 0.0002	0.0002 mg/L							
Thallium, total	< 0.00002	0.00002 mg/L							
Thorium, total	< 0.0001	0.0001 mg/L							
Tin, total	< 0.0002	0.0002 mg/L							
Titanium, total	< 0.005	0.005 mg/L							
Uranium, total	< 0.00002	0.00002 mg/L							
Vanadium, total	< 0.001	0.001 mg/L							
Zinc, total	< 0.004	0.004 mg/L							
Zirconium, total	< 0.0001	0.0001 mg/L							

#### Reference (B311003-SRM1)

Prepared: Sep-26-13, Analyzed: Sep-27-13

Aluminum, total	0.294	0.005 mg/L	0.296		99	81-129			
Antimony, total	0.0472	0.0001 mg/L	0.0505		93	88-114			
Arsenic, total	0.119	0.0005 mg/L	0.122		98	88-114			
Barium, total	0.737	0.005 mg/L	0.777		95	72-104			
Beryllium, total	0.0459	0.0001 mg/L	0.0488		94	76-131			
Boron, total	3.65	0.004 mg/L	3.40		107	75-121			
Cadmium, total	0.0485	0.00001 mg/L	0.0490		99	89-111			
Calcium, total	9.9	0.2 mg/L	10.2		97	86-121			
Chromium, total	0.230	0.0005 mg/L	0.242		95	89-114			
Cobalt, total	0.0361	0.00005 mg/L	0.0366		99	91-113			
Copper, total	0.509	0.0002 mg/L	0.487		104	91-115			
Iron, total	0.51	0.01 mg/L	0.469		109	77-124			
Lead, total	0.186	0.0001 mg/L	0.193		96	92-113			
Lithium, total	0.389	0.0001 mg/L	0.390		100	85-115			
Magnesium, total	3.29	0.01 mg/L	3.31		100	78-120			
Manganese, total	0.103	0.0002 mg/L	0.109		95	90-114			
Mercury, total	0.00407	0.00002 mg/L	0.00456		89	50-150			
Molybdenum, total	0.180	0.0001 mg/L	0.197		92	90-111			
Nickel, total	0.246	0.0002 mg/L	0.242		102	90-111			
Phosphorus, total	0.199	0.020 mg/L	0.233		85	85-115			
Potassium, total	5.94	0.02 mg/L	5.93		100	84-113			
Selenium, total	0.114	0.0005 mg/L	0.115		99	85-115			
Sodium, total	7.79	0.02 mg/L	7.64		102	82-123			
Strontium, total	0.341	0.001 mg/L	0.363		94	88-112			
Thallium, total	0.0766	0.00002 mg/L	0.0794		97	91-114			
Uranium, total	0.0171	0.00002 mg/L	0.0192		89	85-120			
Vanadium, total	0.349	0.001 mg/L	0.376		93	86-111			
Zinc, total	2.39	0.004 mg/L	2.42		99	85-111			

**CERTIFICATE OF ANALYSIS**

**REPORTED TO** Golder Associates Ltd. (Kelowna)  
220 - 1755 Springfield Road  
Kelowna, BC V1Y 5V5

**TEL** (250) 860-8424  
**FAX** (250) 860-9874

**ATTENTION** Pattie Amison

**WORK ORDER** 3100339

**PO NUMBER** 13-1493-0055

**RECEIVED / TEMP** Oct-04-13 11:55 / 7°C

**PROJECT** 13-1493-0055

**REPORTED** Oct-10-13

**PROJECT INFO** Faulder

**COC NUMBER** B14552

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**General Comments:**

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.



Issued By:

**Jennifer Shanko, ASCT**  
Administration Coordinator

*Please contact CARO if more information is needed or to provide feedback on our services.*

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**Locations:**

#110 4011 Viking Way  
Richmond, BC V6V 2K9  
Tel: 604-279-1499 Fax: 604-279-1599

#102 3677 Highway 97N  
Kelowna, BC V1X 5C3  
Tel: 250-765-9646 Fax: 250-765-3893

17225 109 Avenue  
Edmonton, AB T5S 1H7  
Tel: 780-489-9100 Fax: 780-489-9700

[www.caro.ca](http://www.caro.ca)

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analysis Description	Method Reference (* = modified from)		Location
	Preparation	Analysis	
Alkalinity, speciated	N/A	APHA 2320 B	Kelowna
Chloride in Water by IC	N/A	APHA 4110 B	Kelowna
Conductivity in Water	N/A	APHA 2510 B	Kelowna
Dissolved Metals	APHA 3030 B	APHA 3125 B	Richmond
Fluoride in Water by IC	N/A	APHA 4110 B	Kelowna
Hardness as CaCO <sub>3</sub> (CALC)	N/A	APHA 2340 B	Richmond
Nitrate-N in Water by IC	N/A	APHA 4110 B	Kelowna
Nitrite-N in Water by IC	N/A	APHA 4110 B	Kelowna
Orthophosphate as P by IC	N/A	APHA 4110 B	Kelowna
pH in Water	N/A	APHA 4500-H+ B	Kelowna
Potability, Comprehensive (Excludes Micro) Pkg	N/A	APHA 1030 E	Kelowna
Potability, IH Comprehensive Pkg	N/A	APHA 1030 E	Kelowna
Sulfate in Water by IC	N/A	APHA 4110 B	Kelowna
Total Dissolved Solids	N/A	APHA 2540 C	Kelowna
Total Recoverable Metals	APHA 3030E *	APHA 3125 B	Richmond

**Note:** The numbers in brackets represent the year that the method was published/approved

### Method Reference Descriptions:

APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Association

### Glossary of Terms:

MRL Method Reporting Limit  
 < Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences  
 MAC Maximum acceptable concentration (health-related guideline)  
 mg/L Milligrams per litre  
 pH units pH < 7 = acidic, pH > 7 = basic  
 uS/cm Microsiemens per centimeter

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Anions

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13**

Alkalinity, Total as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	163	1	mg/L	N/A	Oct-07-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Chloride	6.84	0.10	mg/L	N/A	Oct-05-13	
Fluoride	0.14	0.10	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Sulfate	2.8	1.0	mg/L	N/A	Oct-05-13	

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30**

Alkalinity, Total as CaCO <sub>3</sub>	50	1	mg/L	N/A	Oct-07-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	50	1	mg/L	N/A	Oct-07-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Chloride	1.18	0.10	mg/L	N/A	Oct-05-13	
Fluoride	< 0.10	0.10	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrate as N	0.011	0.010	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Sulfate	3.8	1.0	mg/L	N/A	Oct-05-13	

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20**

Alkalinity, Total as CaCO <sub>3</sub>	49	1	mg/L	N/A	Oct-07-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	49	1	mg/L	N/A	Oct-07-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Chloride	1.19	0.10	mg/L	N/A	Oct-05-13	
Fluoride	< 0.10	0.10	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Sulfate	3.8	1.0	mg/L	N/A	Oct-05-13	

### General Parameters

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13**

Conductivity (EC)	315	2	uS/cm	N/A	Oct-04-13	
pH	8.22	0.01	pH units	N/A	Oct-04-13	
Solids, Total Dissolved	211	5	mg/L	N/A	Oct-04-13	

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30**

Conductivity (EC)	106	2	uS/cm	N/A	Oct-04-13	
pH	7.83	0.01	pH units	N/A	Oct-04-13	
Solids, Total Dissolved	103	5	mg/L	N/A	Oct-04-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### General Parameters, Continued

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20**

Conductivity (EC)	106	2	uS/cm	N/A	Oct-04-13	
pH	7.82	0.01	pH units	N/A	Oct-04-13	
Solids, Total Dissolved	87	5	mg/L	N/A	Oct-04-13	

### Calculated Parameters

**Sample ID: Darke Creek 5 (3100339-01) [Water] Sampled: Oct-03-13 15:20**

Hardness, Total (Total as CaCO <sub>3</sub> )	95.3	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	97.8	0.50	mg/L	N/A	N/A	

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13**

Hardness, Total (Total as CaCO <sub>3</sub> )	149	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	152	0.50	mg/L	N/A	N/A	

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30**

Hardness, Total (Total as CaCO <sub>3</sub> )	49.7	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	45.3	0.50	mg/L	N/A	N/A	

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20**

Hardness, Total (Total as CaCO <sub>3</sub> )	44.8	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	46.2	0.50	mg/L	N/A	N/A	

### Dissolved Metals

**Sample ID: Darke Creek 5 (3100339-01) [Water] Sampled: Oct-03-13 15:20**

Aluminum, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Barium, dissolved	0.051	0.005	mg/L	N/A	Oct-07-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Boron, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Oct-07-13	
Calcium, dissolved	30.7	0.2	mg/L	N/A	Oct-07-13	
Chromium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Copper, dissolved	0.0012	0.0002	mg/L	N/A	Oct-07-13	
Iron, dissolved	0.109	0.010	mg/L	N/A	Oct-07-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Lithium, dissolved	0.0017	0.0001	mg/L	N/A	Oct-07-13	
Magnesium, dissolved	5.13	0.01	mg/L	N/A	Oct-07-13	
Manganese, dissolved	0.0635	0.0002	mg/L	N/A	Oct-07-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Molybdenum, dissolved	0.0029	0.0001	mg/L	N/A	Oct-07-13	
Nickel, dissolved	0.0005	0.0002	mg/L	N/A	Oct-07-13	
Phosphorus, dissolved	< 0.02	0.02	mg/L	N/A	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: Darke Creek 5 (3100339-01) [Water] Sampled: Oct-03-13 15:20, Continued**

Potassium, dissolved	2.35	0.02	mg/L	N/A	Oct-07-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Silicon, dissolved	10.7	0.5	mg/L	N/A	Oct-07-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Sodium, dissolved	7.84	0.02	mg/L	N/A	Oct-07-13	
Strontium, dissolved	0.277	0.001	mg/L	N/A	Oct-07-13	
Sulfur, dissolved	< 1	1	mg/L	N/A	Oct-07-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Uranium, dissolved	0.00276	0.00002	mg/L	N/A	Oct-07-13	
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Oct-07-13	
Zinc, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Zirconium, dissolved	0.0001	0.0001	mg/L	N/A	Oct-07-13	

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13**

Aluminum, dissolved	0.031	0.005	mg/L	N/A	Oct-07-13	
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Barium, dissolved	0.085	0.005	mg/L	N/A	Oct-07-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Boron, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Oct-07-13	
Calcium, dissolved	46.2	0.2	mg/L	N/A	Oct-07-13	
Chromium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Copper, dissolved	0.0010	0.0002	mg/L	N/A	Oct-07-13	
Iron, dissolved	0.114	0.010	mg/L	N/A	Oct-07-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Lithium, dissolved	0.0038	0.0001	mg/L	N/A	Oct-07-13	
Magnesium, dissolved	8.84	0.01	mg/L	N/A	Oct-07-13	
Manganese, dissolved	0.0153	0.0002	mg/L	N/A	Oct-07-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Molybdenum, dissolved	0.0043	0.0001	mg/L	N/A	Oct-07-13	
Nickel, dissolved	0.0003	0.0002	mg/L	N/A	Oct-07-13	
Phosphorus, dissolved	< 0.02	0.02	mg/L	N/A	Oct-07-13	
Potassium, dissolved	3.34	0.02	mg/L	N/A	Oct-07-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Silicon, dissolved	10.7	0.5	mg/L	N/A	Oct-07-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Sodium, dissolved	10.4	0.02	mg/L	N/A	Oct-07-13	
Strontium, dissolved	0.569	0.001	mg/L	N/A	Oct-07-13	



## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13, Continued**

Sulfur, dissolved	< 1	1	mg/L	N/A	Oct-07-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Uranium, dissolved	<b>0.0116</b>	0.00002	mg/L	N/A	Oct-07-13	
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Oct-07-13	
Zinc, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Zirconium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30**

Aluminum, dissolved	<b>0.027</b>	0.005	mg/L	N/A	Oct-07-13	
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Barium, dissolved	<b>0.030</b>	0.005	mg/L	N/A	Oct-07-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Boron, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Oct-07-13	
Calcium, dissolved	<b>14.3</b>	0.2	mg/L	N/A	Oct-07-13	
Chromium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Copper, dissolved	<b>0.0011</b>	0.0002	mg/L	N/A	Oct-07-13	
Iron, dissolved	<b>0.180</b>	0.010	mg/L	N/A	Oct-07-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Lithium, dissolved	<b>0.0012</b>	0.0001	mg/L	N/A	Oct-07-13	
Magnesium, dissolved	<b>2.35</b>	0.01	mg/L	N/A	Oct-07-13	
Manganese, dissolved	<b>0.0097</b>	0.0002	mg/L	N/A	Oct-07-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Molybdenum, dissolved	<b>0.0025</b>	0.0001	mg/L	N/A	Oct-07-13	
Nickel, dissolved	<b>0.0003</b>	0.0002	mg/L	N/A	Oct-07-13	
Phosphorus, dissolved	<b>0.03</b>	0.02	mg/L	N/A	Oct-07-13	
Potassium, dissolved	<b>1.40</b>	0.02	mg/L	N/A	Oct-07-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Silicon, dissolved	<b>7.8</b>	0.5	mg/L	N/A	Oct-07-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Sodium, dissolved	<b>3.80</b>	0.02	mg/L	N/A	Oct-07-13	
Strontium, dissolved	<b>0.188</b>	0.001	mg/L	N/A	Oct-07-13	
Sulfur, dissolved	< 1	1	mg/L	N/A	Oct-07-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30, Continued**

Uranium, dissolved	0.00121	0.00002	mg/L	N/A	Oct-07-13	
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Oct-07-13	
Zinc, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Zirconium, dissolved	0.0002	0.0001	mg/L	N/A	Oct-07-13	

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20**

Aluminum, dissolved	0.027	0.005	mg/L	N/A	Oct-07-13	
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Barium, dissolved	0.026	0.005	mg/L	N/A	Oct-07-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Boron, dissolved	0.007	0.004	mg/L	N/A	Oct-07-13	
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Oct-07-13	
Calcium, dissolved	14.4	0.2	mg/L	N/A	Oct-07-13	
Chromium, dissolved	0.0008	0.0005	mg/L	N/A	Oct-07-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Copper, dissolved	0.0015	0.0002	mg/L	N/A	Oct-07-13	
Iron, dissolved	0.190	0.010	mg/L	N/A	Oct-07-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Lithium, dissolved	0.0014	0.0001	mg/L	N/A	Oct-07-13	
Magnesium, dissolved	2.50	0.01	mg/L	N/A	Oct-07-13	
Manganese, dissolved	0.0106	0.0002	mg/L	N/A	Oct-07-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Molybdenum, dissolved	0.0025	0.0001	mg/L	N/A	Oct-07-13	
Nickel, dissolved	0.0003	0.0002	mg/L	N/A	Oct-07-13	
Phosphorus, dissolved	< 0.02	0.02	mg/L	N/A	Oct-07-13	
Potassium, dissolved	1.38	0.02	mg/L	N/A	Oct-07-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Silicon, dissolved	8.0	0.5	mg/L	N/A	Oct-07-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Sodium, dissolved	5.06	0.02	mg/L	N/A	Oct-07-13	
Strontium, dissolved	0.169	0.001	mg/L	N/A	Oct-07-13	
Sulfur, dissolved	< 1	1	mg/L	N/A	Oct-07-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Uranium, dissolved	0.00095	0.00002	mg/L	N/A	Oct-07-13	
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Oct-07-13	
Zinc, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Zirconium, dissolved	0.0002	0.0001	mg/L	N/A	Oct-07-13	

### *Total Recoverable Metals*

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Darke Creek 5 (3100339-01) [Water] Sampled: Oct-03-13 15:20**

Aluminum, total	0.028	0.005	mg/L	Oct-07-13	Oct-07-13	
Antimony, total	0.0004	0.0001	mg/L	Oct-07-13	Oct-07-13	
Arsenic, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Barium, total	0.058	0.005	mg/L	Oct-07-13	Oct-07-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Boron, total	0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Cadmium, total	0.00001	0.00001	mg/L	Oct-07-13	Oct-07-13	
Calcium, total	29.6	0.2	mg/L	Oct-07-13	Oct-07-13	
Chromium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Cobalt, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Copper, total	0.0007	0.0002	mg/L	Oct-07-13	Oct-07-13	
Iron, total	0.23	0.01	mg/L	Oct-07-13	Oct-07-13	
Lead, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Lithium, total	0.0016	0.0001	mg/L	Oct-07-13	Oct-07-13	
Magnesium, total	5.17	0.01	mg/L	Oct-07-13	Oct-07-13	
Manganese, total	0.0954	0.0002	mg/L	Oct-07-13	Oct-07-13	
Mercury, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Molybdenum, total	0.0030	0.0001	mg/L	Oct-07-13	Oct-07-13	
Nickel, total	0.0003	0.0002	mg/L	Oct-07-13	Oct-07-13	
Phosphorus, total	0.021	0.020	mg/L	Oct-07-13	Oct-07-13	
Potassium, total	2.16	0.02	mg/L	Oct-07-13	Oct-07-13	
Selenium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Silicon, total	9.9	0.5	mg/L	Oct-07-13	Oct-07-13	
Silver, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Sodium, total	5.81	0.02	mg/L	Oct-07-13	Oct-07-13	
Strontium, total	0.287	0.001	mg/L	Oct-07-13	Oct-07-13	
Sulfur, total	1	1	mg/L	Oct-07-13	Oct-07-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Thallium, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Thorium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Tin, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Titanium, total	< 0.005	0.005	mg/L	Oct-07-13	Oct-07-13	
Uranium, total	0.00310	0.00002	mg/L	Oct-07-13	Oct-07-13	
Vanadium, total	0.001	0.001	mg/L	Oct-07-13	Oct-07-13	
Zinc, total	< 0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Zirconium, total	0.0003	0.0001	mg/L	Oct-07-13	Oct-07-13	

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13**

Aluminum, total	0.119	0.005	mg/L	Oct-07-13	Oct-07-13	
Antimony, total	0.0002	0.0001	mg/L	Oct-07-13	Oct-07-13	
Arsenic, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Barium, total	0.093	0.005	mg/L	Oct-07-13	Oct-07-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13, Continued**

Boron, total	0.006	0.004	mg/L	Oct-07-13	Oct-07-13	
Cadmium, total	< 0.00001	0.00001	mg/L	Oct-07-13	Oct-07-13	
Calcium, total	44.2	0.2	mg/L	Oct-07-13	Oct-07-13	
Chromium, total	0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Cobalt, total	0.00006	0.00005	mg/L	Oct-07-13	Oct-07-13	
Copper, total	0.0009	0.0002	mg/L	Oct-07-13	Oct-07-13	
Iron, total	0.23	0.01	mg/L	Oct-07-13	Oct-07-13	
Lead, total	0.0002	0.0001	mg/L	Oct-07-13	Oct-07-13	
Lithium, total	0.0036	0.0001	mg/L	Oct-07-13	Oct-07-13	
Magnesium, total	9.32	0.01	mg/L	Oct-07-13	Oct-07-13	
Manganese, total	0.0282	0.0002	mg/L	Oct-07-13	Oct-07-13	
Mercury, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Molybdenum, total	0.0044	0.0001	mg/L	Oct-07-13	Oct-07-13	
Nickel, total	0.0003	0.0002	mg/L	Oct-07-13	Oct-07-13	
Phosphorus, total	< 0.020	0.020	mg/L	Oct-07-13	Oct-07-13	
Potassium, total	3.17	0.02	mg/L	Oct-07-13	Oct-07-13	
Selenium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Silicon, total	10.1	0.5	mg/L	Oct-07-13	Oct-07-13	
Silver, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Sodium, total	9.19	0.02	mg/L	Oct-07-13	Oct-07-13	
Strontium, total	0.583	0.001	mg/L	Oct-07-13	Oct-07-13	
Sulfur, total	3	1	mg/L	Oct-07-13	Oct-07-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Thallium, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Thorium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Tin, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Titanium, total	< 0.005	0.005	mg/L	Oct-07-13	Oct-07-13	
Uranium, total	0.0119	0.00002	mg/L	Oct-07-13	Oct-07-13	
Vanadium, total	0.001	0.001	mg/L	Oct-07-13	Oct-07-13	
Zinc, total	0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Zirconium, total	0.0003	0.0001	mg/L	Oct-07-13	Oct-07-13	

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30**

Aluminum, total	0.062	0.005	mg/L	Oct-07-13	Oct-07-13	
Antimony, total	0.0002	0.0001	mg/L	Oct-07-13	Oct-07-13	
Arsenic, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Barium, total	0.033	0.005	mg/L	Oct-07-13	Oct-07-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Boron, total	< 0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Cadmium, total	< 0.00001	0.00001	mg/L	Oct-07-13	Oct-07-13	
Calcium, total	15.6	0.2	mg/L	Oct-07-13	Oct-07-13	
Chromium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Cobalt, total	0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Copper, total	0.0012	0.0002	mg/L	Oct-07-13	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30, Continued**

Iron, total	0.29	0.01	mg/L	Oct-07-13	Oct-07-13	
Lead, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Lithium, total	0.0015	0.0001	mg/L	Oct-07-13	Oct-07-13	
Magnesium, total	2.56	0.01	mg/L	Oct-07-13	Oct-07-13	
Manganese, total	0.0282	0.0002	mg/L	Oct-07-13	Oct-07-13	
Mercury, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Molybdenum, total	0.0026	0.0001	mg/L	Oct-07-13	Oct-07-13	
Nickel, total	0.0003	0.0002	mg/L	Oct-07-13	Oct-07-13	
Phosphorus, total	< 0.020	0.020	mg/L	Oct-07-13	Oct-07-13	
Potassium, total	1.32	0.02	mg/L	Oct-07-13	Oct-07-13	
Selenium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Silicon, total	7.5	0.5	mg/L	Oct-07-13	Oct-07-13	
Silver, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Sodium, total	3.65	0.02	mg/L	Oct-07-13	Oct-07-13	
Strontium, total	0.188	0.001	mg/L	Oct-07-13	Oct-07-13	
Sulfur, total	4	1	mg/L	Oct-07-13	Oct-07-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Thallium, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Thorium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Tin, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Titanium, total	< 0.005	0.005	mg/L	Oct-07-13	Oct-07-13	
Uranium, total	0.00145	0.00002	mg/L	Oct-07-13	Oct-07-13	
Vanadium, total	0.001	0.001	mg/L	Oct-07-13	Oct-07-13	
Zinc, total	< 0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Zirconium, total	0.0004	0.0001	mg/L	Oct-07-13	Oct-07-13	

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20**

Aluminum, total	0.074	0.005	mg/L	Oct-07-13	Oct-07-13	
Antimony, total	0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Arsenic, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Barium, total	0.034	0.005	mg/L	Oct-07-13	Oct-07-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Boron, total	< 0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Cadmium, total	0.00001	0.00001	mg/L	Oct-07-13	Oct-07-13	
Calcium, total	13.6	0.2	mg/L	Oct-07-13	Oct-07-13	
Chromium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Cobalt, total	0.00007	0.00005	mg/L	Oct-07-13	Oct-07-13	
Copper, total	0.0026	0.0002	mg/L	Oct-07-13	Oct-07-13	
Iron, total	0.32	0.01	mg/L	Oct-07-13	Oct-07-13	
Lead, total	0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Lithium, total	0.0013	0.0001	mg/L	Oct-07-13	Oct-07-13	
Magnesium, total	2.60	0.01	mg/L	Oct-07-13	Oct-07-13	
Manganese, total	0.0353	0.0002	mg/L	Oct-07-13	Oct-07-13	
Mercury, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3100339**  
**REPORTED** Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20, Continued**

Molybdenum, total	0.0026	0.0001	mg/L	Oct-07-13	Oct-07-13	
Nickel, total	0.0004	0.0002	mg/L	Oct-07-13	Oct-07-13	
Phosphorus, total	< 0.020	0.020	mg/L	Oct-07-13	Oct-07-13	
Potassium, total	1.52	0.02	mg/L	Oct-07-13	Oct-07-13	
Selenium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Silicon, total	7.8	0.5	mg/L	Oct-07-13	Oct-07-13	
Silver, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Sodium, total	3.74	0.02	mg/L	Oct-07-13	Oct-07-13	
Strontium, total	0.192	0.001	mg/L	Oct-07-13	Oct-07-13	
Sulfur, total	4	1	mg/L	Oct-07-13	Oct-07-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Thallium, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Thorium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Tin, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Titanium, total	< 0.005	0.005	mg/L	Oct-07-13	Oct-07-13	
Uranium, total	0.00127	0.00002	mg/L	Oct-07-13	Oct-07-13	
Vanadium, total	0.001	0.001	mg/L	Oct-07-13	Oct-07-13	
Zinc, total	0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Zirconium, total	0.0005	0.0001	mg/L	Oct-07-13	Oct-07-13	



**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup):** Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS):** A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM):** A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Anions, Batch B3J0217</b>									
<b>Blank (B3J0217-BLK1)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3J0217-BLK2)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3J0217-BLK3)</b>				Prepared: Oct-05-13, Analyzed: Oct-05-13					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3J0217-BLK4)</b>				Prepared: Oct-05-13, Analyzed: Oct-05-13					
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>LCS (B3J0217-BS1)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Chloride	3.93	0.10 mg/L	4.00		98	85-115			
Fluoride	4.10	0.10 mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	4.07	0.010 mg/L	4.00		102	85-115			
Nitrogen, Nitrite as N	2.04	0.010 mg/L	2.00		102	85-115			
Sulfate	3.9	1.0 mg/L	4.00		99	85-115			

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3100339**  
**REPORTED** Oct-10-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Anions, Batch B3J0217, Continued</b>									
<b>LCS (B3J0217-BS2)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Chloride	3.89	0.10 mg/L	4.00		97	85-115			
Fluoride	4.09	0.10 mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	4.08	0.010 mg/L	4.00		102	85-115			
Nitrogen, Nitrite as N	2.01	0.010 mg/L	2.00		101	85-115			
Sulfate	3.9	1.0 mg/L	4.00		97	85-115			
<b>LCS (B3J0217-BS3)</b>				Prepared: Oct-05-13, Analyzed: Oct-05-13					
Chloride	3.90	0.10 mg/L	4.00		97	85-115			
Fluoride	4.08	0.10 mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	4.03	0.010 mg/L	4.00		101	85-115			
Nitrogen, Nitrite as N	2.04	0.010 mg/L	2.00		102	85-115			
Sulfate	3.9	1.0 mg/L	4.00		98	85-115			
<b>LCS (B3J0217-BS4)</b>				Prepared: Oct-05-13, Analyzed: Oct-05-13					
Chloride	3.86	0.10 mg/L	4.00		96	85-115			
Fluoride	4.06	0.10 mg/L	4.00		101	85-115			
Nitrogen, Nitrate as N	4.01	0.010 mg/L	4.00		100	85-115			
Nitrogen, Nitrite as N	2.05	0.010 mg/L	2.00		102	85-115			
Sulfate	3.9	1.0 mg/L	4.00		97	85-115			
<b>Duplicate (B3J0217-DUP4)</b>				<b>Source: 3100339-03</b>		Prepared: Oct-05-13, Analyzed: Oct-05-13			
Chloride	1.19	0.10 mg/L		1.18			< 1	10	
Fluoride	< 0.10	0.10 mg/L		0.10				10	
Nitrogen, Nitrate as N	0.010	0.010 mg/L		0.011				10	
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L		< 0.010				10	
Sulfate	3.8	1.0 mg/L		3.8				10	

### Anions, Batch B3J0284

<b>Blank (B3J0284-BLK1)</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Alkalinity, Total as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1 mg/L							
<b>LCS (B3J0284-BS1)</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Alkalinity, Total as CaCO <sub>3</sub>	101	1 mg/L	100		101	96-108			

### Dissolved Metals, Batch B3J0241

<b>Blank (B3J0241-BLK1)</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Aluminum, dissolved	< 0.005	0.005 mg/L							
Antimony, dissolved	< 0.0001	0.0001 mg/L							
Arsenic, dissolved	< 0.0005	0.0005 mg/L							
Barium, dissolved	< 0.005	0.005 mg/L							
Beryllium, dissolved	< 0.0001	0.0001 mg/L							
Bismuth, dissolved	< 0.0001	0.0001 mg/L							
Boron, dissolved	< 0.004	0.004 mg/L							
Cadmium, dissolved	< 0.00001	0.00001 mg/L							
Calcium, dissolved	< 0.2	0.2 mg/L							
Chromium, dissolved	< 0.0005	0.0005 mg/L							
Cobalt, dissolved	< 0.00005	0.00005 mg/L							
Copper, dissolved	< 0.0002	0.0002 mg/L							
Iron, dissolved	< 0.010	0.010 mg/L							
Lead, dissolved	< 0.0001	0.0001 mg/L							
Lithium, dissolved	< 0.0001	0.0001 mg/L							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3100339**  
**REPORTED** Oct-10-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Dissolved Metals, Batch B3J0241, Continued

#### Blank (B3J0241-BLK1), Continued

Prepared: Oct-07-13, Analyzed: Oct-07-13

Magnesium, dissolved	< 0.01	0.01 mg/L							
Manganese, dissolved	< 0.0002	0.0002 mg/L							
Mercury, dissolved	< 0.00002	0.00002 mg/L							
Molybdenum, dissolved	< 0.0001	0.0001 mg/L							
Nickel, dissolved	< 0.0002	0.0002 mg/L							
Phosphorus, dissolved	< 0.02	0.02 mg/L							
Potassium, dissolved	< 0.02	0.02 mg/L							
Selenium, dissolved	< 0.0005	0.0005 mg/L							
Silicon, dissolved	< 0.5	0.5 mg/L							
Silver, dissolved	< 0.00005	0.00005 mg/L							
Sodium, dissolved	< 0.02	0.02 mg/L							
Strontium, dissolved	< 0.001	0.001 mg/L							
Sulfur, dissolved	< 1	1 mg/L							
Tellurium, dissolved	< 0.0002	0.0002 mg/L							
Thallium, dissolved	< 0.00002	0.00002 mg/L							
Thorium, dissolved	< 0.0001	0.0001 mg/L							
Tin, dissolved	< 0.0002	0.0002 mg/L							
Titanium, dissolved	< 0.005	0.005 mg/L							
Uranium, dissolved	< 0.00002	0.00002 mg/L							
Vanadium, dissolved	< 0.001	0.001 mg/L							
Zinc, dissolved	< 0.004	0.004 mg/L							
Zirconium, dissolved	< 0.0001	0.0001 mg/L							

#### Duplicate (B3J0241-DUP1)

Source: 3100339-01

Prepared: Oct-07-13, Analyzed: Oct-07-13

Aluminum, dissolved	0.006	0.005 mg/L		0.005				11	
Antimony, dissolved	0.0001	0.0001 mg/L		< 0.0001				44	
Arsenic, dissolved	< 0.0005	0.0005 mg/L		< 0.0005				8	
Barium, dissolved	0.056	0.005 mg/L		0.051			9	7	RPD
Beryllium, dissolved	< 0.0001	0.0001 mg/L		< 0.0001				14	
Bismuth, dissolved	< 0.0001	0.0001 mg/L		< 0.0001				20	
Boron, dissolved	< 0.004	0.004 mg/L		< 0.004				13	
Cadmium, dissolved	< 0.00001	0.00001 mg/L		< 0.00001				27	
Calcium, dissolved	30.3	0.2 mg/L		30.7			1	8	
Chromium, dissolved	< 0.0005	0.0005 mg/L		< 0.0005				14	
Cobalt, dissolved	< 0.00005	0.00005 mg/L		< 0.00005				10	
Copper, dissolved	0.0012	0.0002 mg/L		0.0012			4	28	
Iron, dissolved	0.117	0.010 mg/L		0.109			7	14	
Lead, dissolved	< 0.0001	0.0001 mg/L		< 0.0001				26	
Lithium, dissolved	0.0017	0.0001 mg/L		0.0017			< 1	14	
Magnesium, dissolved	5.47	0.01 mg/L		5.13			6	6	
Manganese, dissolved	0.0677	0.0002 mg/L		0.0635			6	9	
Mercury, dissolved	< 0.00002	0.00002 mg/L		< 0.00002				19	
Molybdenum, dissolved	0.0031	0.0001 mg/L		0.0029			7	19	
Nickel, dissolved	0.0003	0.0002 mg/L		0.0005				21	
Phosphorus, dissolved	< 0.02	0.02 mg/L		< 0.02				14	
Potassium, dissolved	2.50	0.02 mg/L		2.35			6	8	
Selenium, dissolved	< 0.0005	0.0005 mg/L		< 0.0005				36	
Silicon, dissolved	11.6	0.5 mg/L		10.7			7	12	
Silver, dissolved	< 0.00005	0.00005 mg/L		< 0.00005				20	
Sodium, dissolved	8.29	0.02 mg/L		7.84			6	6	
Strontium, dissolved	0.300	0.001 mg/L		0.277			8	6	RPD
Sulfur, dissolved	< 1	1 mg/L		< 1				26	
Tellurium, dissolved	< 0.0002	0.0002 mg/L		< 0.0002				20	
Thallium, dissolved	< 0.00002	0.00002 mg/L		< 0.00002				13	
Thorium, dissolved	< 0.0001	0.0001 mg/L		< 0.0001				30	
Tin, dissolved	< 0.0002	0.0002 mg/L		< 0.0002				6	
Titanium, dissolved	< 0.005	0.005 mg/L		< 0.005				20	

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Dissolved Metals, Batch B3J0241, Continued</b>									
<b>Duplicate (B3J0241-DUP1), Continued</b>		<b>Source: 3100339-01</b>		<b>Prepared: Oct-07-13, Analyzed: Oct-07-13</b>					
Uranium, dissolved	0.00276	0.00002 mg/L		0.00276			< 1	14	
Vanadium, dissolved	< 0.001	0.001 mg/L		< 0.001				20	
Zinc, dissolved	< 0.004	0.004 mg/L		< 0.004				11	
Zirconium, dissolved	0.0001	0.0001 mg/L		0.0001				36	
<b>Matrix Spike (B3J0241-MS1)</b>		<b>Source: 3100339-02</b>		<b>Prepared: Oct-07-13, Analyzed: Oct-07-13</b>					
Antimony, dissolved	0.379	0.0001 mg/L	0.400	< 0.0001	95	76-114			
Arsenic, dissolved	0.192	0.0005 mg/L	0.200	< 0.0005	96	81-115			
Barium, dissolved	1.07	0.005 mg/L	1.00	0.085	98	80-113			
Beryllium, dissolved	0.0943	0.0001 mg/L	0.100	< 0.0001	94	69-109			
Cadmium, dissolved	0.0991	0.00001 mg/L	0.100	< 0.00001	99	83-110			
Chromium, dissolved	0.389	0.0005 mg/L	0.400	< 0.0005	97	85-115			
Cobalt, dissolved	0.406	0.00005 mg/L	0.400	0.00005	101	86-114			
Copper, dissolved	0.374	0.0002 mg/L	0.400	0.0010	93	82-119			
Iron, dissolved	2.10	0.010 mg/L	2.00	0.114	99	80-116			
Lead, dissolved	0.189	0.0001 mg/L	0.200	< 0.0001	94	83-112			
Manganese, dissolved	0.400	0.0002 mg/L	0.400	0.0153	96	62-131			
Nickel, dissolved	0.379	0.0002 mg/L	0.400	0.0003	95	81-115			
Selenium, dissolved	0.0948	0.0005 mg/L	0.100	< 0.0005	95	79-115			
Silver, dissolved	0.0978	0.00005 mg/L	0.100	< 0.00005	98	69-121			
Thallium, dissolved	0.0980	0.00002 mg/L	0.100	< 0.00002	98	84-115			
Vanadium, dissolved	0.386	0.001 mg/L	0.400	< 0.001	96	83-113			
Zinc, dissolved	0.990	0.004 mg/L	1.00	< 0.004	99	82-115			
<b>Reference (B3J0241-SRM1)</b>		<b>Prepared: Oct-07-13, Analyzed: Oct-07-13</b>							
Aluminum, dissolved	0.244	0.005 mg/L	0.233		105	58-142			
Antimony, dissolved	0.0516	0.0001 mg/L	0.0430		120	75-125			
Arsenic, dissolved	0.433	0.0005 mg/L	0.438		99	81-119			
Barium, dissolved	3.61	0.005 mg/L	3.35		108	83-117			
Beryllium, dissolved	0.227	0.0001 mg/L	0.213		107	80-120			
Boron, dissolved	1.98	0.004 mg/L	1.74		114	74-117			
Cadmium, dissolved	0.223	0.00001 mg/L	0.224		99	83-117			
Calcium, dissolved	8.0	0.2 mg/L	7.69		104	76-124			
Chromium, dissolved	0.450	0.0005 mg/L	0.437		103	81-119			
Cobalt, dissolved	0.129	0.00005 mg/L	0.128		100	76-124			
Copper, dissolved	0.795	0.0002 mg/L	0.844		94	84-116			
Iron, dissolved	1.32	0.010 mg/L	1.29		102	74-126			
Lead, dissolved	0.112	0.0001 mg/L	0.112		100	72-128			
Lithium, dissolved	0.115	0.0001 mg/L	0.104		111	60-140			
Magnesium, dissolved	6.64	0.01 mg/L	6.92		96	81-119			
Manganese, dissolved	0.345	0.0002 mg/L	0.345		100	84-116			
Molybdenum, dissolved	0.413	0.0001 mg/L	0.426		97	83-117			
Nickel, dissolved	0.822	0.0002 mg/L	0.840		98	74-126			
Phosphorus, dissolved	0.50	0.02 mg/L	0.495		102	68-132			
Potassium, dissolved	3.26	0.02 mg/L	3.19		102	74-126			
Selenium, dissolved	0.0334	0.0005 mg/L	0.0331		101	70-130			
Sodium, dissolved	19.9	0.02 mg/L	19.1		104	72-128			
Strontium, dissolved	0.933	0.001 mg/L	0.916		102	84-113			
Thallium, dissolved	0.0376	0.00002 mg/L	0.0393		96	57-143			
Uranium, dissolved	0.267	0.00002 mg/L	0.266		100	85-115			
Vanadium, dissolved	0.883	0.001 mg/L	0.869		102	87-113			
Zinc, dissolved	0.886	0.004 mg/L	0.881		101	72-128			

### General Parameters, Batch B3J0214

<b>Blank (B3J0214-BLK1)</b>		<b>Prepared: Oct-04-13, Analyzed: Oct-04-13</b>							
Conductivity (EC)	< 2	2 uS/cm							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>General Parameters, Batch B3J0214, Continued</b>									
<b>Blank (B3J0214-BLK2)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Conductivity (EC)	< 2	2 uS/cm							
<b>LCS (B3J0214-BS3)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Conductivity (EC)	1410	2 uS/cm	1410		100	93-104			
<b>LCS (B3J0214-BS4)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Conductivity (EC)	1420	2 uS/cm	1410		101	93-104			
<b>Reference (B3J0214-SRM1)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
pH	6.99	0.01 pH units	7.00		100	98-102			
<b>Reference (B3J0214-SRM2)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
pH	6.99	0.01 pH units	7.00		100	98-102			
<b>General Parameters, Batch B3J0218</b>									
<b>Blank (B3J0218-BLK1)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Solids, Total Dissolved	< 5	5 mg/L							
<b>Blank (B3J0218-BLK2)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Solids, Total Dissolved	< 5	5 mg/L							
<b>Reference (B3J0218-SRM1)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Solids, Total Dissolved	250	5 mg/L	240		104	85-115			
<b>Reference (B3J0218-SRM2)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Solids, Total Dissolved	248	5 mg/L	240		103	85-115			
<b>Total Recoverable Metals, Batch B3J0242</b>									
<b>Blank (B3J0242-BLK1)</b>			Prepared: Oct-07-13, Analyzed: Oct-07-13						
Aluminum, total	< 0.005	0.005 mg/L							
Antimony, total	< 0.0001	0.0001 mg/L							
Arsenic, total	< 0.0005	0.0005 mg/L							
Barium, total	< 0.005	0.005 mg/L							
Beryllium, total	< 0.0001	0.0001 mg/L							
Bismuth, total	< 0.0001	0.0001 mg/L							
Boron, total	< 0.004	0.004 mg/L							
Cadmium, total	< 0.00001	0.00001 mg/L							
Calcium, total	< 0.2	0.2 mg/L							
Chromium, total	< 0.0005	0.0005 mg/L							
Cobalt, total	< 0.00005	0.00005 mg/L							
Copper, total	< 0.0002	0.0002 mg/L							
Iron, total	< 0.01	0.01 mg/L							
Lead, total	< 0.0001	0.0001 mg/L							
Lithium, total	< 0.0001	0.0001 mg/L							
Magnesium, total	< 0.01	0.01 mg/L							
Manganese, total	< 0.0002	0.0002 mg/L							
Mercury, total	< 0.00002	0.00002 mg/L							
Molybdenum, total	< 0.0001	0.0001 mg/L							
Nickel, total	< 0.0002	0.0002 mg/L							
Phosphorus, total	< 0.020	0.020 mg/L							
Potassium, total	< 0.02	0.02 mg/L							
Selenium, total	< 0.0005	0.0005 mg/L							
Silicon, total	< 0.5	0.5 mg/L							
Silver, total	< 0.00005	0.00005 mg/L							
Sodium, total	< 0.02	0.02 mg/L							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3100339**  
**REPORTED** Oct-10-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Total Recoverable Metals, Batch B3J0242, Continued</b>									
<b>Blank (B3J0242-BLK1), Continued</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Strontium, total	< 0.001	0.001 mg/L							
Sulfur, total	< 1	1 mg/L							
Tellurium, total	< 0.0002	0.0002 mg/L							
Thallium, total	< 0.00002	0.00002 mg/L							
Thorium, total	< 0.0001	0.0001 mg/L							
Tin, total	< 0.0002	0.0002 mg/L							
Titanium, total	< 0.005	0.005 mg/L							
Uranium, total	< 0.00002	0.00002 mg/L							
Vanadium, total	< 0.001	0.001 mg/L							
Zinc, total	< 0.004	0.004 mg/L							
Zirconium, total	< 0.0001	0.0001 mg/L							
<b>Duplicate (B3J0242-DUP1)</b>				<b>Source: 3100339-02</b>		Prepared: Oct-07-13, Analyzed: Oct-07-13			
Aluminum, total	0.119	0.005 mg/L		0.119			< 1	29	
Antimony, total	< 0.0001	0.0001 mg/L		0.0002				31	
Arsenic, total	< 0.0005	0.0005 mg/L		< 0.0005				15	
Barium, total	0.093	0.005 mg/L		0.093			< 1	9	
Beryllium, total	< 0.0001	0.0001 mg/L		< 0.0001				16	
Bismuth, total	< 0.0001	0.0001 mg/L		< 0.0001				20	
Boron, total	0.005	0.004 mg/L		0.006				29	
Cadmium, total	< 0.00001	0.00001 mg/L		< 0.00001				33	
Calcium, total	44.3	0.2 mg/L		44.2			< 1	12	
Chromium, total	0.0005	0.0005 mg/L		0.0005				12	
Cobalt, total	0.00006	0.00005 mg/L		0.00006				13	
Copper, total	0.0009	0.0002 mg/L		0.0009				37	
Iron, total	0.24	0.01 mg/L		0.23			2	18	
Lead, total	0.0002	0.0001 mg/L		0.0002				23	
Lithium, total	0.0035	0.0001 mg/L		0.0036			2	19	
Magnesium, total	9.35	0.01 mg/L		9.32			< 1	10	
Manganese, total	0.0279	0.0002 mg/L		0.0282			1	13	
Mercury, total	< 0.00002	0.00002 mg/L		< 0.00002				24	
Molybdenum, total	0.0045	0.0001 mg/L		0.0044			< 1	20	
Nickel, total	0.0003	0.0002 mg/L		0.0003				28	
Phosphorus, total	< 0.020	0.020 mg/L		< 0.020				24	
Potassium, total	3.23	0.02 mg/L		3.17			2	13	
Selenium, total	< 0.0005	0.0005 mg/L		< 0.0005				24	
Silicon, total	10.5	0.5 mg/L		10.1			4	11	
Silver, total	< 0.00005	0.00005 mg/L		< 0.00005				18	
Sodium, total	9.23	0.02 mg/L		9.19			< 1	10	
Strontium, total	0.597	0.001 mg/L		0.583			3	9	
Sulfur, total	3	1 mg/L		3				24	
Tellurium, total	< 0.0002	0.0002 mg/L		< 0.0002				20	
Thallium, total	< 0.00002	0.00002 mg/L		< 0.00002				24	
Thorium, total	< 0.0001	0.0001 mg/L		< 0.0001				18	
Tin, total	< 0.0002	0.0002 mg/L		< 0.0002				18	
Titanium, total	< 0.005	0.005 mg/L		< 0.005				32	
Uranium, total	0.0119	0.00002 mg/L		0.0119			< 1	14	
Vanadium, total	0.001	0.001 mg/L		0.001				17	
Zinc, total	0.004	0.004 mg/L		0.004				8	
Zirconium, total	0.0003	0.0001 mg/L		0.0003				60	
<b>Matrix Spike (B3J0242-MS1)</b>				<b>Source: 3100339-03</b>		Prepared: Oct-07-13, Analyzed: Oct-07-13			
Antimony, total	0.403	0.0001 mg/L	0.400	0.0002	101	84-125			
Arsenic, total	0.193	0.0005 mg/L	0.200	< 0.0005	96	85-116			
Barium, total	1.01	0.005 mg/L	1.00	0.033	98	87-114			
Beryllium, total	0.0920	0.0001 mg/L	0.100	< 0.0001	92	72-116			
Cadmium, total	0.0997	0.00001 mg/L	0.100	< 0.00001	100	90-112			



## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-10-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Total Recoverable Metals, Batch B3J0242, Continued</b>									
<b>Matrix Spike (B3J0242-MS1), Continued</b>		<b>Source: 3100339-03</b>		<b>Prepared: Oct-07-13, Analyzed: Oct-07-13</b>					
Chromium, total	0.383	0.0005 mg/L	0.400	< 0.0005	96	89-120			
Cobalt, total	0.404	0.00005 mg/L	0.400	0.00005	101	88-120			
Copper, total	0.419	0.0002 mg/L	0.400	0.0012	105	88-125			
Iron, total	2.27	0.01 mg/L	2.00	0.29	99	88-119			
Lead, total	0.195	0.0001 mg/L	0.200	< 0.0001	97	89-118			
Manganese, total	0.408	0.0002 mg/L	0.400	0.0282	95	84-120			
Nickel, total	0.380	0.0002 mg/L	0.400	0.0003	95	87-119			
Selenium, total	0.0950	0.0005 mg/L	0.100	< 0.0005	95	85-113			
Silver, total	0.0999	0.00005 mg/L	0.100	< 0.00005	100	89-119			
Thallium, total	0.101	0.00002 mg/L	0.100	< 0.00002	101	92-119			
Vanadium, total	0.380	0.001 mg/L	0.400	0.001	95	87-117			
Zinc, total	0.984	0.004 mg/L	1.00	< 0.004	98	85-116			
<b>Reference (B3J0242-SRM1)</b>		<b>Prepared: Oct-07-13, Analyzed: Oct-07-13</b>							
Aluminum, total	0.303	0.005 mg/L	0.296		102	81-129			
Antimony, total	0.0533	0.0001 mg/L	0.0505		106	88-114			
Arsenic, total	0.123	0.0005 mg/L	0.122		101	88-114			
Barium, total	0.758	0.005 mg/L	0.777		98	72-104			
Beryllium, total	0.0478	0.0001 mg/L	0.0488		98	76-131			
Boron, total	3.72	0.004 mg/L	3.40		109	75-121			
Cadmium, total	0.0498	0.00001 mg/L	0.0490		102	89-111			
Calcium, total	10.2	0.2 mg/L	10.2		100	86-121			
Chromium, total	0.242	0.0005 mg/L	0.242		100	89-114			
Cobalt, total	0.0383	0.00005 mg/L	0.0366		105	91-113			
Copper, total	0.527	0.0002 mg/L	0.487		108	91-115			
Iron, total	0.49	0.01 mg/L	0.469		104	77-124			
Lead, total	0.199	0.0001 mg/L	0.193		103	92-113			
Lithium, total	0.395	0.0001 mg/L	0.390		101	85-115			
Magnesium, total	3.46	0.01 mg/L	3.31		105	78-120			
Manganese, total	0.107	0.0002 mg/L	0.109		98	90-114			
Mercury, total	0.00506	0.00002 mg/L	0.00456		111	50-150			
Molybdenum, total	0.195	0.0001 mg/L	0.197		99	90-111			
Nickel, total	0.242	0.0002 mg/L	0.242		100	90-111			
Phosphorus, total	0.219	0.020 mg/L	0.233		94	85-115			
Potassium, total	6.15	0.02 mg/L	5.93		104	84-113			
Selenium, total	0.115	0.0005 mg/L	0.115		100	85-115			
Sodium, total	7.96	0.02 mg/L	7.64		104	82-123			
Strontium, total	0.363	0.001 mg/L	0.363		100	88-112			
Thallium, total	0.0836	0.00002 mg/L	0.0794		105	91-114			
Uranium, total	0.0186	0.00002 mg/L	0.0192		97	85-120			
Vanadium, total	0.368	0.001 mg/L	0.376		98	86-111			
Zinc, total	2.57	0.004 mg/L	2.42		106	85-111			

### QC Qualifiers:

RPD Relative percent difference (RPD) of duplicate analysis are outside of control limits for unknown reason(s).

**REPORTED TO** Golder Associates Ltd. (Kelowna)  
220 - 1755 Springfield Road  
Kelowna, BC V1Y 5V5

**TEL** (250) 860-8424  
**FAX** (250) 860-9874

**ATTENTION** Pattie Amison

**WORK ORDER** 3100339

**PO NUMBER** 13-1493-0055

**RECEIVED / TEMP** Oct-04-13 11:55 / 7°C

**PROJECT** 13-1493-0055

**REPORTED** Oct-11-13

**PROJECT INFO** Faulder

**COC NUMBER** B14552

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**General Comments:**

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

**Work Order Comments:**

Oct.11/13- This is an amended report, the T-Alkalinity result for 3100339-02 has been corrected.



Issued By:

**Jennifer Shanko, ASCT**  
Administration Coordinator

***Please contact CARO if more information is needed or to provide feedback on our services.***

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**Locations:**

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Tel: 604-279-1499 Fax: 604-279-1599

#102 3677 Highway 97N  
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17225 109 Avenue  
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[www.caro.ca](http://www.caro.ca)

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analysis Description	Method Reference (* = modified from)		Location
	Preparation	Analysis	
Alkalinity, speciated	N/A	APHA 2320 B	Kelowna
Chloride in Water by IC	N/A	APHA 4110 B	Kelowna
Conductivity in Water	N/A	APHA 2510 B	Kelowna
Dissolved Metals	APHA 3030 B	APHA 3125 B	Richmond
Fluoride in Water by IC	N/A	APHA 4110 B	Kelowna
Hardness as CaCO <sub>3</sub> (CALC)	N/A	APHA 2340 B	Richmond
Nitrate-N in Water by IC	N/A	APHA 4110 B	Kelowna
Nitrite-N in Water by IC	N/A	APHA 4110 B	Kelowna
pH in Water	N/A	APHA 4500-H+ B	Kelowna
Sulfate in Water by IC	N/A	APHA 4110 B	Kelowna
Total Dissolved Solids	N/A	APHA 2540 C	Kelowna
Total Recoverable Metals	APHA 3030E *	APHA 3125 B	Richmond

*Note: The numbers in brackets represent the year that the method was published/approved*

### Method Reference Descriptions:

APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Association

### Glossary of Terms:

MRL Method Reporting Limit  
 < Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences  
 MAC Maximum acceptable concentration (health-related guideline)  
 mg/L Milligrams per litre  
 pH units pH < 7 = acidic, pH > 7 = basic  
 uS/cm Microsiemens per centimeter

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Anions

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13**

Alkalinity, Total as CaCO <sub>3</sub>	163	1	mg/L	N/A	Oct-07-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	163	1	mg/L	N/A	Oct-07-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Chloride	6.84	0.10	mg/L	N/A	Oct-05-13	
Fluoride	0.14	0.10	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Sulfate	2.8	1.0	mg/L	N/A	Oct-05-13	

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30**

Alkalinity, Total as CaCO <sub>3</sub>	50	1	mg/L	N/A	Oct-07-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	50	1	mg/L	N/A	Oct-07-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Chloride	1.18	0.10	mg/L	N/A	Oct-05-13	
Fluoride	< 0.10	0.10	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrate as N	0.011	0.010	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Sulfate	3.8	1.0	mg/L	N/A	Oct-05-13	

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20**

Alkalinity, Total as CaCO <sub>3</sub>	49	1	mg/L	N/A	Oct-07-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	49	1	mg/L	N/A	Oct-07-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Chloride	1.19	0.10	mg/L	N/A	Oct-05-13	
Fluoride	< 0.10	0.10	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Sulfate	3.8	1.0	mg/L	N/A	Oct-05-13	

### General Parameters

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13**

Conductivity (EC)	315	2	uS/cm	N/A	Oct-04-13	
pH	8.22	0.01	pH units	N/A	Oct-04-13	
Solids, Total Dissolved	211	5	mg/L	N/A	Oct-04-13	

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30**

Conductivity (EC)	106	2	uS/cm	N/A	Oct-04-13	
pH	7.83	0.01	pH units	N/A	Oct-04-13	
Solids, Total Dissolved	103	5	mg/L	N/A	Oct-04-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### General Parameters, Continued

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20**

Conductivity (EC)	106	2	uS/cm	N/A	Oct-04-13	
pH	7.82	0.01	pH units	N/A	Oct-04-13	
Solids, Total Dissolved	87	5	mg/L	N/A	Oct-04-13	

### Calculated Parameters

**Sample ID: Darke Creek 5 (3100339-01) [Water] Sampled: Oct-03-13 15:20**

Hardness, Total (Total as CaCO <sub>3</sub> )	95.3	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	97.8	0.50	mg/L	N/A	N/A	

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13**

Hardness, Total (Total as CaCO <sub>3</sub> )	149	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	152	0.50	mg/L	N/A	N/A	

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30**

Hardness, Total (Total as CaCO <sub>3</sub> )	49.7	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	45.3	0.50	mg/L	N/A	N/A	

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20**

Hardness, Total (Total as CaCO <sub>3</sub> )	44.8	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	46.2	0.50	mg/L	N/A	N/A	

### Dissolved Metals

**Sample ID: Darke Creek 5 (3100339-01) [Water] Sampled: Oct-03-13 15:20**

Aluminum, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Barium, dissolved	0.051	0.005	mg/L	N/A	Oct-07-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Boron, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Oct-07-13	
Calcium, dissolved	30.7	0.2	mg/L	N/A	Oct-07-13	
Chromium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Copper, dissolved	0.0012	0.0002	mg/L	N/A	Oct-07-13	
Iron, dissolved	0.109	0.010	mg/L	N/A	Oct-07-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Lithium, dissolved	0.0017	0.0001	mg/L	N/A	Oct-07-13	
Magnesium, dissolved	5.13	0.01	mg/L	N/A	Oct-07-13	
Manganese, dissolved	0.0635	0.0002	mg/L	N/A	Oct-07-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Molybdenum, dissolved	0.0029	0.0001	mg/L	N/A	Oct-07-13	
Nickel, dissolved	0.0005	0.0002	mg/L	N/A	Oct-07-13	
Phosphorus, dissolved	< 0.02	0.02	mg/L	N/A	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: Darke Creek 5 (3100339-01) [Water] Sampled: Oct-03-13 15:20, Continued**

Potassium, dissolved	2.35	0.02	mg/L	N/A	Oct-07-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Silicon, dissolved	10.7	0.5	mg/L	N/A	Oct-07-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Sodium, dissolved	7.84	0.02	mg/L	N/A	Oct-07-13	
Strontium, dissolved	0.277	0.001	mg/L	N/A	Oct-07-13	
Sulfur, dissolved	< 1	1	mg/L	N/A	Oct-07-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Uranium, dissolved	0.00276	0.00002	mg/L	N/A	Oct-07-13	
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Oct-07-13	
Zinc, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Zirconium, dissolved	0.0001	0.0001	mg/L	N/A	Oct-07-13	

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13**

Aluminum, dissolved	0.031	0.005	mg/L	N/A	Oct-07-13	
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Barium, dissolved	0.085	0.005	mg/L	N/A	Oct-07-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Boron, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Oct-07-13	
Calcium, dissolved	46.2	0.2	mg/L	N/A	Oct-07-13	
Chromium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Copper, dissolved	0.0010	0.0002	mg/L	N/A	Oct-07-13	
Iron, dissolved	0.114	0.010	mg/L	N/A	Oct-07-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Lithium, dissolved	0.0038	0.0001	mg/L	N/A	Oct-07-13	
Magnesium, dissolved	8.84	0.01	mg/L	N/A	Oct-07-13	
Manganese, dissolved	0.0153	0.0002	mg/L	N/A	Oct-07-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Molybdenum, dissolved	0.0043	0.0001	mg/L	N/A	Oct-07-13	
Nickel, dissolved	0.0003	0.0002	mg/L	N/A	Oct-07-13	
Phosphorus, dissolved	< 0.02	0.02	mg/L	N/A	Oct-07-13	
Potassium, dissolved	3.34	0.02	mg/L	N/A	Oct-07-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Silicon, dissolved	10.7	0.5	mg/L	N/A	Oct-07-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Sodium, dissolved	10.4	0.02	mg/L	N/A	Oct-07-13	
Strontium, dissolved	0.569	0.001	mg/L	N/A	Oct-07-13	



## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13, Continued**

Sulfur, dissolved	< 1	1	mg/L	N/A	Oct-07-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Uranium, dissolved	<b>0.0116</b>	0.00002	mg/L	N/A	Oct-07-13	
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Oct-07-13	
Zinc, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Zirconium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30**

Aluminum, dissolved	<b>0.027</b>	0.005	mg/L	N/A	Oct-07-13	
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Barium, dissolved	<b>0.030</b>	0.005	mg/L	N/A	Oct-07-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Boron, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Oct-07-13	
Calcium, dissolved	<b>14.3</b>	0.2	mg/L	N/A	Oct-07-13	
Chromium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Copper, dissolved	<b>0.0011</b>	0.0002	mg/L	N/A	Oct-07-13	
Iron, dissolved	<b>0.180</b>	0.010	mg/L	N/A	Oct-07-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Lithium, dissolved	<b>0.0012</b>	0.0001	mg/L	N/A	Oct-07-13	
Magnesium, dissolved	<b>2.35</b>	0.01	mg/L	N/A	Oct-07-13	
Manganese, dissolved	<b>0.0097</b>	0.0002	mg/L	N/A	Oct-07-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Molybdenum, dissolved	<b>0.0025</b>	0.0001	mg/L	N/A	Oct-07-13	
Nickel, dissolved	<b>0.0003</b>	0.0002	mg/L	N/A	Oct-07-13	
Phosphorus, dissolved	<b>0.03</b>	0.02	mg/L	N/A	Oct-07-13	
Potassium, dissolved	<b>1.40</b>	0.02	mg/L	N/A	Oct-07-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Silicon, dissolved	<b>7.8</b>	0.5	mg/L	N/A	Oct-07-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Sodium, dissolved	<b>3.80</b>	0.02	mg/L	N/A	Oct-07-13	
Strontium, dissolved	<b>0.188</b>	0.001	mg/L	N/A	Oct-07-13	
Sulfur, dissolved	< 1	1	mg/L	N/A	Oct-07-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30, Continued**

Uranium, dissolved	0.00121	0.00002	mg/L	N/A	Oct-07-13	
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Oct-07-13	
Zinc, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Zirconium, dissolved	0.0002	0.0001	mg/L	N/A	Oct-07-13	

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20**

Aluminum, dissolved	0.027	0.005	mg/L	N/A	Oct-07-13	
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Barium, dissolved	0.026	0.005	mg/L	N/A	Oct-07-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Boron, dissolved	0.007	0.004	mg/L	N/A	Oct-07-13	
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Oct-07-13	
Calcium, dissolved	14.4	0.2	mg/L	N/A	Oct-07-13	
Chromium, dissolved	0.0008	0.0005	mg/L	N/A	Oct-07-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Copper, dissolved	0.0015	0.0002	mg/L	N/A	Oct-07-13	
Iron, dissolved	0.190	0.010	mg/L	N/A	Oct-07-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Lithium, dissolved	0.0014	0.0001	mg/L	N/A	Oct-07-13	
Magnesium, dissolved	2.50	0.01	mg/L	N/A	Oct-07-13	
Manganese, dissolved	0.0106	0.0002	mg/L	N/A	Oct-07-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Molybdenum, dissolved	0.0025	0.0001	mg/L	N/A	Oct-07-13	
Nickel, dissolved	0.0003	0.0002	mg/L	N/A	Oct-07-13	
Phosphorus, dissolved	< 0.02	0.02	mg/L	N/A	Oct-07-13	
Potassium, dissolved	1.38	0.02	mg/L	N/A	Oct-07-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Silicon, dissolved	8.0	0.5	mg/L	N/A	Oct-07-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Sodium, dissolved	5.06	0.02	mg/L	N/A	Oct-07-13	
Strontium, dissolved	0.169	0.001	mg/L	N/A	Oct-07-13	
Sulfur, dissolved	< 1	1	mg/L	N/A	Oct-07-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Uranium, dissolved	0.00095	0.00002	mg/L	N/A	Oct-07-13	
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Oct-07-13	
Zinc, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Zirconium, dissolved	0.0002	0.0001	mg/L	N/A	Oct-07-13	

### *Total Recoverable Metals*

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Darke Creek 5 (3100339-01) [Water] Sampled: Oct-03-13 15:20**

Aluminum, total	0.028	0.005	mg/L	Oct-07-13	Oct-07-13	
Antimony, total	0.0004	0.0001	mg/L	Oct-07-13	Oct-07-13	
Arsenic, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Barium, total	0.058	0.005	mg/L	Oct-07-13	Oct-07-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Boron, total	0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Cadmium, total	0.00001	0.00001	mg/L	Oct-07-13	Oct-07-13	
Calcium, total	29.6	0.2	mg/L	Oct-07-13	Oct-07-13	
Chromium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Cobalt, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Copper, total	0.0007	0.0002	mg/L	Oct-07-13	Oct-07-13	
Iron, total	0.23	0.01	mg/L	Oct-07-13	Oct-07-13	
Lead, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Lithium, total	0.0016	0.0001	mg/L	Oct-07-13	Oct-07-13	
Magnesium, total	5.17	0.01	mg/L	Oct-07-13	Oct-07-13	
Manganese, total	0.0954	0.0002	mg/L	Oct-07-13	Oct-07-13	
Mercury, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Molybdenum, total	0.0030	0.0001	mg/L	Oct-07-13	Oct-07-13	
Nickel, total	0.0003	0.0002	mg/L	Oct-07-13	Oct-07-13	
Phosphorus, total	0.021	0.020	mg/L	Oct-07-13	Oct-07-13	
Potassium, total	2.16	0.02	mg/L	Oct-07-13	Oct-07-13	
Selenium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Silicon, total	9.9	0.5	mg/L	Oct-07-13	Oct-07-13	
Silver, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Sodium, total	5.81	0.02	mg/L	Oct-07-13	Oct-07-13	
Strontium, total	0.287	0.001	mg/L	Oct-07-13	Oct-07-13	
Sulfur, total	1	1	mg/L	Oct-07-13	Oct-07-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Thallium, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Thorium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Tin, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Titanium, total	< 0.005	0.005	mg/L	Oct-07-13	Oct-07-13	
Uranium, total	0.00310	0.00002	mg/L	Oct-07-13	Oct-07-13	
Vanadium, total	0.001	0.001	mg/L	Oct-07-13	Oct-07-13	
Zinc, total	< 0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Zirconium, total	0.0003	0.0001	mg/L	Oct-07-13	Oct-07-13	

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13**

Aluminum, total	0.119	0.005	mg/L	Oct-07-13	Oct-07-13	
Antimony, total	0.0002	0.0001	mg/L	Oct-07-13	Oct-07-13	
Arsenic, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Barium, total	0.093	0.005	mg/L	Oct-07-13	Oct-07-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Darke Creek Sec 7 (3100339-02) [Water] Sampled: Oct-03-13, Continued**

Boron, total	0.006	0.004	mg/L	Oct-07-13	Oct-07-13	
Cadmium, total	< 0.00001	0.00001	mg/L	Oct-07-13	Oct-07-13	
Calcium, total	44.2	0.2	mg/L	Oct-07-13	Oct-07-13	
Chromium, total	0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Cobalt, total	0.00006	0.00005	mg/L	Oct-07-13	Oct-07-13	
Copper, total	0.0009	0.0002	mg/L	Oct-07-13	Oct-07-13	
Iron, total	0.23	0.01	mg/L	Oct-07-13	Oct-07-13	
Lead, total	0.0002	0.0001	mg/L	Oct-07-13	Oct-07-13	
Lithium, total	0.0036	0.0001	mg/L	Oct-07-13	Oct-07-13	
Magnesium, total	9.32	0.01	mg/L	Oct-07-13	Oct-07-13	
Manganese, total	0.0282	0.0002	mg/L	Oct-07-13	Oct-07-13	
Mercury, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Molybdenum, total	0.0044	0.0001	mg/L	Oct-07-13	Oct-07-13	
Nickel, total	0.0003	0.0002	mg/L	Oct-07-13	Oct-07-13	
Phosphorus, total	< 0.020	0.020	mg/L	Oct-07-13	Oct-07-13	
Potassium, total	3.17	0.02	mg/L	Oct-07-13	Oct-07-13	
Selenium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Silicon, total	10.1	0.5	mg/L	Oct-07-13	Oct-07-13	
Silver, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Sodium, total	9.19	0.02	mg/L	Oct-07-13	Oct-07-13	
Strontium, total	0.583	0.001	mg/L	Oct-07-13	Oct-07-13	
Sulfur, total	3	1	mg/L	Oct-07-13	Oct-07-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Thallium, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Thorium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Tin, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Titanium, total	< 0.005	0.005	mg/L	Oct-07-13	Oct-07-13	
Uranium, total	0.0119	0.00002	mg/L	Oct-07-13	Oct-07-13	
Vanadium, total	0.001	0.001	mg/L	Oct-07-13	Oct-07-13	
Zinc, total	0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Zirconium, total	0.0003	0.0001	mg/L	Oct-07-13	Oct-07-13	

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30**

Aluminum, total	0.062	0.005	mg/L	Oct-07-13	Oct-07-13	
Antimony, total	0.0002	0.0001	mg/L	Oct-07-13	Oct-07-13	
Arsenic, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Barium, total	0.033	0.005	mg/L	Oct-07-13	Oct-07-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Boron, total	< 0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Cadmium, total	< 0.00001	0.00001	mg/L	Oct-07-13	Oct-07-13	
Calcium, total	15.6	0.2	mg/L	Oct-07-13	Oct-07-13	
Chromium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Cobalt, total	0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Copper, total	0.0012	0.0002	mg/L	Oct-07-13	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Trout Creek Sec1 (3100339-03) [Water] Sampled: Oct-03-13 09:30, Continued**

Iron, total	0.29	0.01	mg/L	Oct-07-13	Oct-07-13	
Lead, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Lithium, total	0.0015	0.0001	mg/L	Oct-07-13	Oct-07-13	
Magnesium, total	2.56	0.01	mg/L	Oct-07-13	Oct-07-13	
Manganese, total	0.0282	0.0002	mg/L	Oct-07-13	Oct-07-13	
Mercury, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Molybdenum, total	0.0026	0.0001	mg/L	Oct-07-13	Oct-07-13	
Nickel, total	0.0003	0.0002	mg/L	Oct-07-13	Oct-07-13	
Phosphorus, total	< 0.020	0.020	mg/L	Oct-07-13	Oct-07-13	
Potassium, total	1.32	0.02	mg/L	Oct-07-13	Oct-07-13	
Selenium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Silicon, total	7.5	0.5	mg/L	Oct-07-13	Oct-07-13	
Silver, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Sodium, total	3.65	0.02	mg/L	Oct-07-13	Oct-07-13	
Strontium, total	0.188	0.001	mg/L	Oct-07-13	Oct-07-13	
Sulfur, total	4	1	mg/L	Oct-07-13	Oct-07-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Thallium, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Thorium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Tin, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Titanium, total	< 0.005	0.005	mg/L	Oct-07-13	Oct-07-13	
Uranium, total	0.00145	0.00002	mg/L	Oct-07-13	Oct-07-13	
Vanadium, total	0.001	0.001	mg/L	Oct-07-13	Oct-07-13	
Zinc, total	< 0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Zirconium, total	0.0004	0.0001	mg/L	Oct-07-13	Oct-07-13	

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20**

Aluminum, total	0.074	0.005	mg/L	Oct-07-13	Oct-07-13	
Antimony, total	0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Arsenic, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Barium, total	0.034	0.005	mg/L	Oct-07-13	Oct-07-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Boron, total	< 0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Cadmium, total	0.00001	0.00001	mg/L	Oct-07-13	Oct-07-13	
Calcium, total	13.6	0.2	mg/L	Oct-07-13	Oct-07-13	
Chromium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Cobalt, total	0.00007	0.00005	mg/L	Oct-07-13	Oct-07-13	
Copper, total	0.0026	0.0002	mg/L	Oct-07-13	Oct-07-13	
Iron, total	0.32	0.01	mg/L	Oct-07-13	Oct-07-13	
Lead, total	0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Lithium, total	0.0013	0.0001	mg/L	Oct-07-13	Oct-07-13	
Magnesium, total	2.60	0.01	mg/L	Oct-07-13	Oct-07-13	
Manganese, total	0.0353	0.0002	mg/L	Oct-07-13	Oct-07-13	
Mercury, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Trout Creek Sec 2 (3100339-04) [Water] Sampled: Oct-03-13 11:20, Continued**

Molybdenum, total	0.0026	0.0001	mg/L	Oct-07-13	Oct-07-13	
Nickel, total	0.0004	0.0002	mg/L	Oct-07-13	Oct-07-13	
Phosphorus, total	< 0.020	0.020	mg/L	Oct-07-13	Oct-07-13	
Potassium, total	1.52	0.02	mg/L	Oct-07-13	Oct-07-13	
Selenium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Silicon, total	7.8	0.5	mg/L	Oct-07-13	Oct-07-13	
Silver, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Sodium, total	3.74	0.02	mg/L	Oct-07-13	Oct-07-13	
Strontium, total	0.192	0.001	mg/L	Oct-07-13	Oct-07-13	
Sulfur, total	4	1	mg/L	Oct-07-13	Oct-07-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Thallium, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Thorium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Tin, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Titanium, total	< 0.005	0.005	mg/L	Oct-07-13	Oct-07-13	
Uranium, total	0.00127	0.00002	mg/L	Oct-07-13	Oct-07-13	
Vanadium, total	0.001	0.001	mg/L	Oct-07-13	Oct-07-13	
Zinc, total	0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Zirconium, total	0.0005	0.0001	mg/L	Oct-07-13	Oct-07-13	



**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup):** Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS):** A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM):** A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Anions, Batch B3J0217</b>									
<b>Blank (B3J0217-BLK1)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3J0217-BLK2)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3J0217-BLK3)</b>			Prepared: Oct-05-13, Analyzed: Oct-05-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3J0217-BLK4)</b>			Prepared: Oct-05-13, Analyzed: Oct-05-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>LCS (B3J0217-BS1)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Chloride	3.93	0.10 mg/L	4.00		98	85-115			
Fluoride	4.10	0.10 mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	4.07	0.010 mg/L	4.00		102	85-115			
Nitrogen, Nitrite as N	2.04	0.010 mg/L	2.00		102	85-115			
Sulfate	3.9	1.0 mg/L	4.00		99	85-115			

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3100339**  
**REPORTED** Oct-11-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Anions, Batch B3J0217, Continued</b>									
<b>LCS (B3J0217-BS2)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Chloride	3.89	0.10 mg/L	4.00		97	85-115			
Fluoride	4.09	0.10 mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	4.08	0.010 mg/L	4.00		102	85-115			
Nitrogen, Nitrite as N	2.01	0.010 mg/L	2.00		101	85-115			
Sulfate	3.9	1.0 mg/L	4.00		97	85-115			
<b>LCS (B3J0217-BS3)</b>				Prepared: Oct-05-13, Analyzed: Oct-05-13					
Chloride	3.90	0.10 mg/L	4.00		97	85-115			
Fluoride	4.08	0.10 mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	4.03	0.010 mg/L	4.00		101	85-115			
Nitrogen, Nitrite as N	2.04	0.010 mg/L	2.00		102	85-115			
Sulfate	3.9	1.0 mg/L	4.00		98	85-115			
<b>LCS (B3J0217-BS4)</b>				Prepared: Oct-05-13, Analyzed: Oct-05-13					
Chloride	3.86	0.10 mg/L	4.00		96	85-115			
Fluoride	4.06	0.10 mg/L	4.00		101	85-115			
Nitrogen, Nitrate as N	4.01	0.010 mg/L	4.00		100	85-115			
Nitrogen, Nitrite as N	2.05	0.010 mg/L	2.00		102	85-115			
Sulfate	3.9	1.0 mg/L	4.00		97	85-115			
<b>Duplicate (B3J0217-DUP4)</b>				<b>Source: 3100339-03</b>		Prepared: Oct-05-13, Analyzed: Oct-05-13			
Chloride	1.19	0.10 mg/L		1.18			< 1	10	
Fluoride	< 0.10	0.10 mg/L		0.10				10	
Nitrogen, Nitrate as N	0.010	0.010 mg/L		0.011				10	
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L		< 0.010				10	
Sulfate	3.8	1.0 mg/L		3.8				10	

### Anions, Batch B3J0284

<b>Blank (B3J0284-BLK1)</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Alkalinity, Total as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1 mg/L							
<b>LCS (B3J0284-BS1)</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Alkalinity, Total as CaCO <sub>3</sub>	101	1 mg/L	100		101	96-108			

### Dissolved Metals, Batch B3J0241

<b>Blank (B3J0241-BLK1)</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Aluminum, dissolved	< 0.005	0.005 mg/L							
Antimony, dissolved	< 0.0001	0.0001 mg/L							
Arsenic, dissolved	< 0.0005	0.0005 mg/L							
Barium, dissolved	< 0.005	0.005 mg/L							
Beryllium, dissolved	< 0.0001	0.0001 mg/L							
Bismuth, dissolved	< 0.0001	0.0001 mg/L							
Boron, dissolved	< 0.004	0.004 mg/L							
Cadmium, dissolved	< 0.00001	0.00001 mg/L							
Calcium, dissolved	< 0.2	0.2 mg/L							
Chromium, dissolved	< 0.0005	0.0005 mg/L							
Cobalt, dissolved	< 0.00005	0.00005 mg/L							
Copper, dissolved	< 0.0002	0.0002 mg/L							
Iron, dissolved	< 0.010	0.010 mg/L							
Lead, dissolved	< 0.0001	0.0001 mg/L							
Lithium, dissolved	< 0.0001	0.0001 mg/L							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3100339**  
**REPORTED** Oct-11-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Dissolved Metals, Batch B3J0241, Continued</b>									
<b>Blank (B3J0241-BLK1), Continued</b>			Prepared: Oct-07-13, Analyzed: Oct-07-13						
Magnesium, dissolved	< 0.01	0.01 mg/L							
Manganese, dissolved	< 0.0002	0.0002 mg/L							
Mercury, dissolved	< 0.00002	0.00002 mg/L							
Molybdenum, dissolved	< 0.0001	0.0001 mg/L							
Nickel, dissolved	< 0.0002	0.0002 mg/L							
Phosphorus, dissolved	< 0.02	0.02 mg/L							
Potassium, dissolved	< 0.02	0.02 mg/L							
Selenium, dissolved	< 0.0005	0.0005 mg/L							
Silicon, dissolved	< 0.5	0.5 mg/L							
Silver, dissolved	< 0.00005	0.00005 mg/L							
Sodium, dissolved	< 0.02	0.02 mg/L							
Strontium, dissolved	< 0.001	0.001 mg/L							
Sulfur, dissolved	< 1	1 mg/L							
Tellurium, dissolved	< 0.0002	0.0002 mg/L							
Thallium, dissolved	< 0.00002	0.00002 mg/L							
Thorium, dissolved	< 0.0001	0.0001 mg/L							
Tin, dissolved	< 0.0002	0.0002 mg/L							
Titanium, dissolved	< 0.005	0.005 mg/L							
Uranium, dissolved	< 0.00002	0.00002 mg/L							
Vanadium, dissolved	< 0.001	0.001 mg/L							
Zinc, dissolved	< 0.004	0.004 mg/L							
Zirconium, dissolved	< 0.0001	0.0001 mg/L							
<b>Duplicate (B3J0241-DUP1)</b>			<b>Source: 3100339-01</b>		Prepared: Oct-07-13, Analyzed: Oct-07-13				
Aluminum, dissolved	0.006	0.005 mg/L		0.005				11	
Antimony, dissolved	0.0001	0.0001 mg/L		< 0.0001				44	
Arsenic, dissolved	< 0.0005	0.0005 mg/L		< 0.0005				8	
Barium, dissolved	0.056	0.005 mg/L		0.051			9	7	RPD
Beryllium, dissolved	< 0.0001	0.0001 mg/L		< 0.0001				14	
Bismuth, dissolved	< 0.0001	0.0001 mg/L		< 0.0001				20	
Boron, dissolved	< 0.004	0.004 mg/L		< 0.004				13	
Cadmium, dissolved	< 0.00001	0.00001 mg/L		< 0.00001				27	
Calcium, dissolved	30.3	0.2 mg/L		30.7			1	8	
Chromium, dissolved	< 0.0005	0.0005 mg/L		< 0.0005				14	
Cobalt, dissolved	< 0.00005	0.00005 mg/L		< 0.00005				10	
Copper, dissolved	0.0012	0.0002 mg/L		0.0012			4	28	
Iron, dissolved	0.117	0.010 mg/L		0.109			7	14	
Lead, dissolved	< 0.0001	0.0001 mg/L		< 0.0001				26	
Lithium, dissolved	0.0017	0.0001 mg/L		0.0017			< 1	14	
Magnesium, dissolved	5.47	0.01 mg/L		5.13			6	6	
Manganese, dissolved	0.0677	0.0002 mg/L		0.0635			6	9	
Mercury, dissolved	< 0.00002	0.00002 mg/L		< 0.00002				19	
Molybdenum, dissolved	0.0031	0.0001 mg/L		0.0029			7	19	
Nickel, dissolved	0.0003	0.0002 mg/L		0.0005				21	
Phosphorus, dissolved	< 0.02	0.02 mg/L		< 0.02				14	
Potassium, dissolved	2.50	0.02 mg/L		2.35			6	8	
Selenium, dissolved	< 0.0005	0.0005 mg/L		< 0.0005				36	
Silicon, dissolved	11.6	0.5 mg/L		10.7			7	12	
Silver, dissolved	< 0.00005	0.00005 mg/L		< 0.00005				20	
Sodium, dissolved	8.29	0.02 mg/L		7.84			6	6	
Strontium, dissolved	0.300	0.001 mg/L		0.277			8	6	RPD
Sulfur, dissolved	< 1	1 mg/L		< 1				26	
Tellurium, dissolved	< 0.0002	0.0002 mg/L		< 0.0002				20	
Thallium, dissolved	< 0.00002	0.00002 mg/L		< 0.00002				13	
Thorium, dissolved	< 0.0001	0.0001 mg/L		< 0.0001				30	
Tin, dissolved	< 0.0002	0.0002 mg/L		< 0.0002				6	
Titanium, dissolved	< 0.005	0.005 mg/L		< 0.005				20	

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Dissolved Metals, Batch B3J0241, Continued

<b>Duplicate (B3J0241-DUP1), Continued</b>		<b>Source: 3100339-01</b>		Prepared: Oct-07-13, Analyzed: Oct-07-13					
Uranium, dissolved	0.00276	0.00002 mg/L		0.00276			< 1	14	
Vanadium, dissolved	< 0.001	0.001 mg/L		< 0.001				20	
Zinc, dissolved	< 0.004	0.004 mg/L		< 0.004				11	
Zirconium, dissolved	0.0001	0.0001 mg/L		0.0001				36	

<b>Matrix Spike (B3J0241-MS1)</b>		<b>Source: 3100339-02</b>		Prepared: Oct-07-13, Analyzed: Oct-07-13					
Antimony, dissolved	0.379	0.0001 mg/L	0.400	< 0.0001	95	76-114			
Arsenic, dissolved	0.192	0.0005 mg/L	0.200	< 0.0005	96	81-115			
Barium, dissolved	1.07	0.005 mg/L	1.00	0.085	98	80-113			
Beryllium, dissolved	0.0943	0.0001 mg/L	0.100	< 0.0001	94	69-109			
Cadmium, dissolved	0.0991	0.00001 mg/L	0.100	< 0.00001	99	83-110			
Chromium, dissolved	0.389	0.0005 mg/L	0.400	< 0.0005	97	85-115			
Cobalt, dissolved	0.406	0.00005 mg/L	0.400	0.00005	101	86-114			
Copper, dissolved	0.374	0.0002 mg/L	0.400	0.0010	93	82-119			
Iron, dissolved	2.10	0.010 mg/L	2.00	0.114	99	80-116			
Lead, dissolved	0.189	0.0001 mg/L	0.200	< 0.0001	94	83-112			
Manganese, dissolved	0.400	0.0002 mg/L	0.400	0.0153	96	62-131			
Nickel, dissolved	0.379	0.0002 mg/L	0.400	0.0003	95	81-115			
Selenium, dissolved	0.0948	0.0005 mg/L	0.100	< 0.0005	95	79-115			
Silver, dissolved	0.0978	0.00005 mg/L	0.100	< 0.00005	98	69-121			
Thallium, dissolved	0.0980	0.00002 mg/L	0.100	< 0.00002	98	84-115			
Vanadium, dissolved	0.386	0.001 mg/L	0.400	< 0.001	96	83-113			
Zinc, dissolved	0.990	0.004 mg/L	1.00	< 0.004	99	82-115			

<b>Reference (B3J0241-SRM1)</b>		Prepared: Oct-07-13, Analyzed: Oct-07-13							
Aluminum, dissolved	0.244	0.005 mg/L	0.233		105	58-142			
Antimony, dissolved	0.0516	0.0001 mg/L	0.0430		120	75-125			
Arsenic, dissolved	0.433	0.0005 mg/L	0.438		99	81-119			
Barium, dissolved	3.61	0.005 mg/L	3.35		108	83-117			
Beryllium, dissolved	0.227	0.0001 mg/L	0.213		107	80-120			
Boron, dissolved	1.98	0.004 mg/L	1.74		114	74-117			
Cadmium, dissolved	0.223	0.00001 mg/L	0.224		99	83-117			
Calcium, dissolved	8.0	0.2 mg/L	7.69		104	76-124			
Chromium, dissolved	0.450	0.0005 mg/L	0.437		103	81-119			
Cobalt, dissolved	0.129	0.00005 mg/L	0.128		100	76-124			
Copper, dissolved	0.795	0.0002 mg/L	0.844		94	84-116			
Iron, dissolved	1.32	0.010 mg/L	1.29		102	74-126			
Lead, dissolved	0.112	0.0001 mg/L	0.112		100	72-128			
Lithium, dissolved	0.115	0.0001 mg/L	0.104		111	60-140			
Magnesium, dissolved	6.64	0.01 mg/L	6.92		96	81-119			
Manganese, dissolved	0.345	0.0002 mg/L	0.345		100	84-116			
Molybdenum, dissolved	0.413	0.0001 mg/L	0.426		97	83-117			
Nickel, dissolved	0.822	0.0002 mg/L	0.840		98	74-126			
Phosphorus, dissolved	0.50	0.02 mg/L	0.495		102	68-132			
Potassium, dissolved	3.26	0.02 mg/L	3.19		102	74-126			
Selenium, dissolved	0.0334	0.0005 mg/L	0.0331		101	70-130			
Sodium, dissolved	19.9	0.02 mg/L	19.1		104	72-128			
Strontium, dissolved	0.933	0.001 mg/L	0.916		102	84-113			
Thallium, dissolved	0.0376	0.00002 mg/L	0.0393		96	57-143			
Uranium, dissolved	0.267	0.00002 mg/L	0.266		100	85-115			
Vanadium, dissolved	0.883	0.001 mg/L	0.869		102	87-113			
Zinc, dissolved	0.886	0.004 mg/L	0.881		101	72-128			

### General Parameters, Batch B3J0214

<b>Blank (B3J0214-BLK1)</b>		Prepared: Oct-04-13, Analyzed: Oct-04-13							
Conductivity (EC)	< 2	2 uS/cm							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3100339**  
**REPORTED** Oct-11-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>General Parameters, Batch B3J0214, Continued</b>									
<b>Blank (B3J0214-BLK2)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Conductivity (EC)	< 2	2 uS/cm							
<b>LCS (B3J0214-BS3)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Conductivity (EC)	1410	2 uS/cm	1410		100	93-104			
<b>LCS (B3J0214-BS4)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Conductivity (EC)	1420	2 uS/cm	1410		101	93-104			
<b>Reference (B3J0214-SRM1)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
pH	6.99	0.01 pH units	7.00		100	98-102			
<b>Reference (B3J0214-SRM2)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
pH	6.99	0.01 pH units	7.00		100	98-102			
<b>General Parameters, Batch B3J0218</b>									
<b>Blank (B3J0218-BLK1)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Solids, Total Dissolved	< 5	5 mg/L							
<b>Blank (B3J0218-BLK2)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Solids, Total Dissolved	< 5	5 mg/L							
<b>Reference (B3J0218-SRM1)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Solids, Total Dissolved	250	5 mg/L	240		104	85-115			
<b>Reference (B3J0218-SRM2)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13					
Solids, Total Dissolved	248	5 mg/L	240		103	85-115			
<b>Total Recoverable Metals, Batch B3J0242</b>									
<b>Blank (B3J0242-BLK1)</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Aluminum, total	< 0.005	0.005 mg/L							
Antimony, total	< 0.0001	0.0001 mg/L							
Arsenic, total	< 0.0005	0.0005 mg/L							
Barium, total	< 0.005	0.005 mg/L							
Beryllium, total	< 0.0001	0.0001 mg/L							
Bismuth, total	< 0.0001	0.0001 mg/L							
Boron, total	< 0.004	0.004 mg/L							
Cadmium, total	< 0.00001	0.00001 mg/L							
Calcium, total	< 0.2	0.2 mg/L							
Chromium, total	< 0.0005	0.0005 mg/L							
Cobalt, total	< 0.00005	0.00005 mg/L							
Copper, total	< 0.0002	0.0002 mg/L							
Iron, total	< 0.01	0.01 mg/L							
Lead, total	< 0.0001	0.0001 mg/L							
Lithium, total	< 0.0001	0.0001 mg/L							
Magnesium, total	< 0.01	0.01 mg/L							
Manganese, total	< 0.0002	0.0002 mg/L							
Mercury, total	< 0.00002	0.00002 mg/L							
Molybdenum, total	< 0.0001	0.0001 mg/L							
Nickel, total	< 0.0002	0.0002 mg/L							
Phosphorus, total	< 0.020	0.020 mg/L							
Potassium, total	< 0.02	0.02 mg/L							
Selenium, total	< 0.0005	0.0005 mg/L							
Silicon, total	< 0.5	0.5 mg/L							
Silver, total	< 0.00005	0.00005 mg/L							
Sodium, total	< 0.02	0.02 mg/L							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3100339**  
**REPORTED** Oct-11-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Total Recoverable Metals, Batch B3J0242, Continued</b>									
<b>Blank (B3J0242-BLK1), Continued</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Strontium, total	< 0.001	0.001 mg/L							
Sulfur, total	< 1	1 mg/L							
Tellurium, total	< 0.0002	0.0002 mg/L							
Thallium, total	< 0.00002	0.00002 mg/L							
Thorium, total	< 0.0001	0.0001 mg/L							
Tin, total	< 0.0002	0.0002 mg/L							
Titanium, total	< 0.005	0.005 mg/L							
Uranium, total	< 0.00002	0.00002 mg/L							
Vanadium, total	< 0.001	0.001 mg/L							
Zinc, total	< 0.004	0.004 mg/L							
Zirconium, total	< 0.0001	0.0001 mg/L							
<b>Duplicate (B3J0242-DUP1)</b>				<b>Source: 3100339-02</b>		Prepared: Oct-07-13, Analyzed: Oct-07-13			
Aluminum, total	0.119	0.005 mg/L		0.119			< 1	29	
Antimony, total	< 0.0001	0.0001 mg/L		0.0002				31	
Arsenic, total	< 0.0005	0.0005 mg/L		< 0.0005				15	
Barium, total	0.093	0.005 mg/L		0.093			< 1	9	
Beryllium, total	< 0.0001	0.0001 mg/L		< 0.0001				16	
Bismuth, total	< 0.0001	0.0001 mg/L		< 0.0001				20	
Boron, total	0.005	0.004 mg/L		0.006				29	
Cadmium, total	< 0.00001	0.00001 mg/L		< 0.00001				33	
Calcium, total	44.3	0.2 mg/L		44.2			< 1	12	
Chromium, total	0.0005	0.0005 mg/L		0.0005				12	
Cobalt, total	0.00006	0.00005 mg/L		0.00006				13	
Copper, total	0.0009	0.0002 mg/L		0.0009				37	
Iron, total	0.24	0.01 mg/L		0.23			2	18	
Lead, total	0.0002	0.0001 mg/L		0.0002				23	
Lithium, total	0.0035	0.0001 mg/L		0.0036			2	19	
Magnesium, total	9.35	0.01 mg/L		9.32			< 1	10	
Manganese, total	0.0279	0.0002 mg/L		0.0282			1	13	
Mercury, total	< 0.00002	0.00002 mg/L		< 0.00002				24	
Molybdenum, total	0.0045	0.0001 mg/L		0.0044			< 1	20	
Nickel, total	0.0003	0.0002 mg/L		0.0003				28	
Phosphorus, total	< 0.020	0.020 mg/L		< 0.020				24	
Potassium, total	3.23	0.02 mg/L		3.17			2	13	
Selenium, total	< 0.0005	0.0005 mg/L		< 0.0005				24	
Silicon, total	10.5	0.5 mg/L		10.1			4	11	
Silver, total	< 0.00005	0.00005 mg/L		< 0.00005				18	
Sodium, total	9.23	0.02 mg/L		9.19			< 1	10	
Strontium, total	0.597	0.001 mg/L		0.583			3	9	
Sulfur, total	3	1 mg/L		3				24	
Tellurium, total	< 0.0002	0.0002 mg/L		< 0.0002				20	
Thallium, total	< 0.00002	0.00002 mg/L		< 0.00002				24	
Thorium, total	< 0.0001	0.0001 mg/L		< 0.0001				18	
Tin, total	< 0.0002	0.0002 mg/L		< 0.0002				18	
Titanium, total	< 0.005	0.005 mg/L		< 0.005				32	
Uranium, total	0.0119	0.00002 mg/L		0.0119			< 1	14	
Vanadium, total	0.001	0.001 mg/L		0.001				17	
Zinc, total	0.004	0.004 mg/L		0.004				8	
Zirconium, total	0.0003	0.0001 mg/L		0.0003				60	
<b>Matrix Spike (B3J0242-MS1)</b>				<b>Source: 3100339-03</b>		Prepared: Oct-07-13, Analyzed: Oct-07-13			
Antimony, total	0.403	0.0001 mg/L		0.400	0.0002	101	84-125		
Arsenic, total	0.193	0.0005 mg/L		0.200	< 0.0005	96	85-116		
Barium, total	1.01	0.005 mg/L		1.00	0.033	98	87-114		
Beryllium, total	0.0920	0.0001 mg/L		0.100	< 0.0001	92	72-116		
Cadmium, total	0.0997	0.00001 mg/L		0.100	< 0.00001	100	90-112		



## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100339  
Oct-11-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Total Recoverable Metals, Batch B3J0242, Continued

Matrix Spike (B3J0242-MS1), Continued		Source: 3100339-03		Prepared: Oct-07-13, Analyzed: Oct-07-13					
Chromium, total	0.383	0.0005 mg/L	0.400	< 0.0005	96	89-120			
Cobalt, total	0.404	0.00005 mg/L	0.400	0.00005	101	88-120			
Copper, total	0.419	0.0002 mg/L	0.400	0.0012	105	88-125			
Iron, total	2.27	0.01 mg/L	2.00	0.29	99	88-119			
Lead, total	0.195	0.0001 mg/L	0.200	< 0.0001	97	89-118			
Manganese, total	0.408	0.0002 mg/L	0.400	0.0282	95	84-120			
Nickel, total	0.380	0.0002 mg/L	0.400	0.0003	95	87-119			
Selenium, total	0.0950	0.0005 mg/L	0.100	< 0.0005	95	85-113			
Silver, total	0.0999	0.00005 mg/L	0.100	< 0.00005	100	89-119			
Thallium, total	0.101	0.00002 mg/L	0.100	< 0.00002	101	92-119			
Vanadium, total	0.380	0.001 mg/L	0.400	0.001	95	87-117			
Zinc, total	0.984	0.004 mg/L	1.00	< 0.004	98	85-116			

Reference (B3J0242-SRM1)		Prepared: Oct-07-13, Analyzed: Oct-07-13							
Aluminum, total	0.303	0.005 mg/L	0.296		102	81-129			
Antimony, total	0.0533	0.0001 mg/L	0.0505		106	88-114			
Arsenic, total	0.123	0.0005 mg/L	0.122		101	88-114			
Barium, total	0.758	0.005 mg/L	0.777		98	72-104			
Beryllium, total	0.0478	0.0001 mg/L	0.0488		98	76-131			
Boron, total	3.72	0.004 mg/L	3.40		109	75-121			
Cadmium, total	0.0498	0.00001 mg/L	0.0490		102	89-111			
Calcium, total	10.2	0.2 mg/L	10.2		100	86-121			
Chromium, total	0.242	0.0005 mg/L	0.242		100	89-114			
Cobalt, total	0.0383	0.00005 mg/L	0.0366		105	91-113			
Copper, total	0.527	0.0002 mg/L	0.487		108	91-115			
Iron, total	0.49	0.01 mg/L	0.469		104	77-124			
Lead, total	0.199	0.0001 mg/L	0.193		103	92-113			
Lithium, total	0.395	0.0001 mg/L	0.390		101	85-115			
Magnesium, total	3.46	0.01 mg/L	3.31		105	78-120			
Manganese, total	0.107	0.0002 mg/L	0.109		98	90-114			
Mercury, total	0.00506	0.00002 mg/L	0.00456		111	50-150			
Molybdenum, total	0.195	0.0001 mg/L	0.197		99	90-111			
Nickel, total	0.242	0.0002 mg/L	0.242		100	90-111			
Phosphorus, total	0.219	0.020 mg/L	0.233		94	85-115			
Potassium, total	6.15	0.02 mg/L	5.93		104	84-113			
Selenium, total	0.115	0.0005 mg/L	0.115		100	85-115			
Sodium, total	7.96	0.02 mg/L	7.64		104	82-123			
Strontium, total	0.363	0.001 mg/L	0.363		100	88-112			
Thallium, total	0.0836	0.00002 mg/L	0.0794		105	91-114			
Uranium, total	0.0186	0.00002 mg/L	0.0192		97	85-120			
Vanadium, total	0.368	0.001 mg/L	0.376		98	86-111			
Zinc, total	2.57	0.004 mg/L	2.42		106	85-111			

### QC Qualifiers:

RPD Relative percent difference (RPD) of duplicate analysis are outside of control limits for unknown reason(s).

**REPORTED TO** Golder Associates Ltd. (Kelowna)  
220 - 1755 Springfield Road  
Kelowna, BC V1Y 5V5

**TEL** (250) 860-8424  
**FAX** (250) 860-9874

**ATTENTION** Pattie Amison

**WORK ORDER** 3100341

**PO NUMBER** 13-1493-0055

**RECEIVED / TEMP** Oct-04-13 11:55 / 7°C

**PROJECT** 13-1493-0055

**REPORTED** Oct-10-13

**PROJECT INFO** Faulder

**COC NUMBER** B02508

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**General Comments:**

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

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Issued By:

**Jennifer Shanko, ASCT**  
Administration Coordinator

*Please contact CARO if more information is needed or to provide feedback on our services.*

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**Locations:**

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[www.caro.ca](http://www.caro.ca)

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100341  
Oct-10-13

Analysis Description	Method Reference (* = modified from)		Location
	Preparation	Analysis	
Alkalinity, speciated	N/A	APHA 2320 B	Kelowna
Alkalinity, total	N/A	APHA 2320 B	Kelowna
Chloride in Water by IC	N/A	APHA 4110 B	Kelowna
Conductivity in Water	N/A	APHA 2510 B	Kelowna
Dissolved Metals	APHA 3030 B	APHA 3125 B	Richmond
Fluoride in Water by IC	N/A	APHA 4110 B	Kelowna
Hardness as CaCO <sub>3</sub> (CALC)	N/A	APHA 2340 B	Richmond
Nitrate-N in Water by IC	N/A	APHA 4110 B	Kelowna
Nitrite-N in Water by IC	N/A	APHA 4110 B	Kelowna
pH in Water	N/A	APHA 4500-H+ B	Kelowna
Potability, Comprehensive (Excludes Micro) Pkg	N/A	APHA 1030 E	Kelowna
Potability, IH Comprehensive Pkg	N/A	APHA 1030 E	Kelowna
Sulfate in Water by IC	N/A	APHA 4110 B	Kelowna
Total Dissolved Solids	N/A	APHA 2540 C	Kelowna
Total Recoverable Metals	APHA 3030E *	APHA 3125 B	Richmond

**Note:** The numbers in brackets represent the year that the method was published/approved

### Method Reference Descriptions:

APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Association

### Glossary of Terms:

MRL Method Reporting Limit  
 < Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences  
 mg/L Milligrams per litre  
 pH units pH < 7 = acidic, pH > 7 = basic  
 uS/cm Microsiemens per centimeter

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100341  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Anions

**Sample ID: Acland Cr 2 (3100341-01) [Water] Sampled: Oct-03-13 13:15**

Alkalinity, Total as CaCO <sub>3</sub>	182	1	mg/L	N/A	Oct-07-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	182	1	mg/L	N/A	Oct-07-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Chloride	6.39	0.10	mg/L	N/A	Oct-05-13	
Fluoride	0.15	0.10	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrate as N	1.10	0.010	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Oct-05-13	
Sulfate	7.5	1.0	mg/L	N/A	Oct-05-13	

### General Parameters

**Sample ID: Acland Cr 2 (3100341-01) [Water] Sampled: Oct-03-13 13:15**

Conductivity (EC)	388	2	uS/cm	N/A	Oct-04-13	
pH	7.89	0.01	pH units	N/A	Oct-04-13	
Solids, Total Dissolved	234	5	mg/L	N/A	Oct-04-13	

### Calculated Parameters

**Sample ID: Acland Cr 2 (3100341-01) [Water] Sampled: Oct-03-13 13:15**

Hardness, Total (Total as CaCO <sub>3</sub> )	177	0.50	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO <sub>3</sub> )	175	0.50	mg/L	N/A	N/A	

### Dissolved Metals

**Sample ID: Acland Cr 2 (3100341-01) [Water] Sampled: Oct-03-13 13:15**

Aluminum, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Barium, dissolved	0.078	0.005	mg/L	N/A	Oct-07-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Boron, dissolved	0.008	0.004	mg/L	N/A	Oct-07-13	
Cadmium, dissolved	0.00001	0.00001	mg/L	N/A	Oct-07-13	
Calcium, dissolved	54.0	0.2	mg/L	N/A	Oct-07-13	
Chromium, dissolved	0.0007	0.0005	mg/L	N/A	Oct-07-13	
Cobalt, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Copper, dissolved	0.0007	0.0002	mg/L	N/A	Oct-07-13	
Iron, dissolved	< 0.010	0.010	mg/L	N/A	Oct-07-13	
Lead, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Lithium, dissolved	0.0054	0.0001	mg/L	N/A	Oct-07-13	
Magnesium, dissolved	9.66	0.01	mg/L	N/A	Oct-07-13	
Manganese, dissolved	0.0008	0.0002	mg/L	N/A	Oct-07-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100341  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: Acland Cr 2 (3100341-01) [Water] Sampled: Oct-03-13 13:15, Continued**

Molybdenum, dissolved	0.0029	0.0001	mg/L	N/A	Oct-07-13	
Nickel, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Phosphorus, dissolved	< 0.02	0.02	mg/L	N/A	Oct-07-13	
Potassium, dissolved	3.04	0.02	mg/L	N/A	Oct-07-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Silicon, dissolved	9.5	0.5	mg/L	N/A	Oct-07-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Sodium, dissolved	11.2	0.02	mg/L	N/A	Oct-07-13	
Strontium, dissolved	0.550	0.001	mg/L	N/A	Oct-07-13	
Sulfur, dissolved	< 1	1	mg/L	N/A	Oct-07-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Uranium, dissolved	0.0113	0.00002	mg/L	N/A	Oct-07-13	
Vanadium, dissolved	0.001	0.001	mg/L	N/A	Oct-07-13	
Zinc, dissolved	< 0.004	0.004	mg/L	N/A	Oct-07-13	
Zirconium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	

### *Total Recoverable Metals*

**Sample ID: Acland Cr 2 (3100341-01) [Water] Sampled: Oct-03-13 13:15**

Aluminum, total	< 0.005	0.005	mg/L	Oct-07-13	Oct-07-13	
Antimony, total	0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Arsenic, total	0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Barium, total	0.084	0.005	mg/L	Oct-07-13	Oct-07-13	
Beryllium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Bismuth, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Boron, total	0.010	0.004	mg/L	Oct-07-13	Oct-07-13	
Cadmium, total	0.00001	0.00001	mg/L	Oct-07-13	Oct-07-13	
Calcium, total	53.7	0.2	mg/L	Oct-07-13	Oct-07-13	
Chromium, total	0.0013	0.0005	mg/L	Oct-07-13	Oct-07-13	
Cobalt, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Copper, total	0.0005	0.0002	mg/L	Oct-07-13	Oct-07-13	
Iron, total	< 0.01	0.01	mg/L	Oct-07-13	Oct-07-13	
Lead, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Lithium, total	0.0051	0.0001	mg/L	Oct-07-13	Oct-07-13	
Magnesium, total	10.4	0.01	mg/L	Oct-07-13	Oct-07-13	
Manganese, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Mercury, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Molybdenum, total	0.0031	0.0001	mg/L	Oct-07-13	Oct-07-13	
Nickel, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Phosphorus, total	< 0.020	0.020	mg/L	Oct-07-13	Oct-07-13	
Potassium, total	3.00	0.02	mg/L	Oct-07-13	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100341  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: Acland Cr 2 (3100341-01) [Water] Sampled: Oct-03-13 13:15, Continued**

Selenium, total	< 0.0005	0.0005	mg/L	Oct-07-13	Oct-07-13	
Silicon, total	<b>9.2</b>	0.5	mg/L	Oct-07-13	Oct-07-13	
Silver, total	< 0.00005	0.00005	mg/L	Oct-07-13	Oct-07-13	
Sodium, total	<b>10.2</b>	0.02	mg/L	Oct-07-13	Oct-07-13	
Strontium, total	<b>0.572</b>	0.001	mg/L	Oct-07-13	Oct-07-13	
Sulfur, total	<b>4</b>	1	mg/L	Oct-07-13	Oct-07-13	
Tellurium, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Thallium, total	< 0.00002	0.00002	mg/L	Oct-07-13	Oct-07-13	
Thorium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	
Tin, total	< 0.0002	0.0002	mg/L	Oct-07-13	Oct-07-13	
Titanium, total	< 0.005	0.005	mg/L	Oct-07-13	Oct-07-13	
Uranium, total	<b>0.0120</b>	0.00002	mg/L	Oct-07-13	Oct-07-13	
Vanadium, total	<b>0.002</b>	0.001	mg/L	Oct-07-13	Oct-07-13	
Zinc, total	< 0.004	0.004	mg/L	Oct-07-13	Oct-07-13	
Zirconium, total	< 0.0001	0.0001	mg/L	Oct-07-13	Oct-07-13	



**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100341  
Oct-10-13

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup):** Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS):** A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM):** A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Anions, Batch B3J0217</b>									
<b>Blank (B3J0217-BLK1)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3J0217-BLK2)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3J0217-BLK3)</b>			Prepared: Oct-05-13, Analyzed: Oct-05-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>Blank (B3J0217-BLK4)</b>			Prepared: Oct-05-13, Analyzed: Oct-05-13						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010 mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>LCS (B3J0217-BS1)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Chloride	3.93	0.10 mg/L	4.00		98	85-115			
Fluoride	4.10	0.10 mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	4.07	0.010 mg/L	4.00		102	85-115			
Nitrogen, Nitrite as N	2.04	0.010 mg/L	2.00		102	85-115			
Sulfate	3.9	1.0 mg/L	4.00		99	85-115			

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100341  
Oct-10-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Anions, Batch B3J0217, Continued

<b>LCS (B3J0217-BS2)</b>			Prepared: Oct-04-13, Analyzed: Oct-04-13						
Chloride	3.89	0.10 mg/L	4.00		97	85-115			
Fluoride	4.09	0.10 mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	4.08	0.010 mg/L	4.00		102	85-115			
Nitrogen, Nitrite as N	2.01	0.010 mg/L	2.00		101	85-115			
Sulfate	3.9	1.0 mg/L	4.00		97	85-115			
<b>LCS (B3J0217-BS3)</b>			Prepared: Oct-05-13, Analyzed: Oct-05-13						
Chloride	3.90	0.10 mg/L	4.00		97	85-115			
Fluoride	4.08	0.10 mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	4.03	0.010 mg/L	4.00		101	85-115			
Nitrogen, Nitrite as N	2.04	0.010 mg/L	2.00		102	85-115			
Sulfate	3.9	1.0 mg/L	4.00		98	85-115			
<b>LCS (B3J0217-BS4)</b>			Prepared: Oct-05-13, Analyzed: Oct-05-13						
Chloride	3.86	0.10 mg/L	4.00		96	85-115			
Fluoride	4.06	0.10 mg/L	4.00		101	85-115			
Nitrogen, Nitrate as N	4.01	0.010 mg/L	4.00		100	85-115			
Nitrogen, Nitrite as N	2.05	0.010 mg/L	2.00		102	85-115			
Sulfate	3.9	1.0 mg/L	4.00		97	85-115			

### Anions, Batch B3J0284

<b>Blank (B3J0284-BLK1)</b>			Prepared: Oct-07-13, Analyzed: Oct-07-13						
Alkalinity, Total as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1 mg/L							
<b>LCS (B3J0284-BS1)</b>			Prepared: Oct-07-13, Analyzed: Oct-07-13						
Alkalinity, Total as CaCO <sub>3</sub>	101	1 mg/L	100		101	96-108			

### Dissolved Metals, Batch B3J0241

<b>Blank (B3J0241-BLK1)</b>			Prepared: Oct-07-13, Analyzed: Oct-07-13						
Aluminum, dissolved	< 0.005	0.005 mg/L							
Antimony, dissolved	< 0.0001	0.0001 mg/L							
Arsenic, dissolved	< 0.0005	0.0005 mg/L							
Barium, dissolved	< 0.005	0.005 mg/L							
Beryllium, dissolved	< 0.0001	0.0001 mg/L							
Bismuth, dissolved	< 0.0001	0.0001 mg/L							
Boron, dissolved	< 0.004	0.004 mg/L							
Cadmium, dissolved	< 0.00001	0.00001 mg/L							
Calcium, dissolved	< 0.2	0.2 mg/L							
Chromium, dissolved	< 0.0005	0.0005 mg/L							
Cobalt, dissolved	< 0.00005	0.00005 mg/L							
Copper, dissolved	< 0.0002	0.0002 mg/L							
Iron, dissolved	< 0.010	0.010 mg/L							
Lead, dissolved	< 0.0001	0.0001 mg/L							
Lithium, dissolved	< 0.0001	0.0001 mg/L							
Magnesium, dissolved	< 0.01	0.01 mg/L							
Manganese, dissolved	< 0.0002	0.0002 mg/L							
Mercury, dissolved	< 0.00002	0.00002 mg/L							
Molybdenum, dissolved	< 0.0001	0.0001 mg/L							
Nickel, dissolved	< 0.0002	0.0002 mg/L							
Phosphorus, dissolved	< 0.02	0.02 mg/L							
Potassium, dissolved	< 0.02	0.02 mg/L							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100341  
Oct-10-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### Dissolved Metals, Batch B3J0241, Continued

#### Blank (B3J0241-BLK1), Continued

Prepared: Oct-07-13, Analyzed: Oct-07-13

Selenium, dissolved	< 0.0005	0.0005 mg/L							
Silicon, dissolved	< 0.5	0.5 mg/L							
Silver, dissolved	< 0.00005	0.00005 mg/L							
Sodium, dissolved	< 0.02	0.02 mg/L							
Strontium, dissolved	< 0.001	0.001 mg/L							
Sulfur, dissolved	< 1	1 mg/L							
Tellurium, dissolved	< 0.0002	0.0002 mg/L							
Thallium, dissolved	< 0.00002	0.00002 mg/L							
Thorium, dissolved	< 0.0001	0.0001 mg/L							
Tin, dissolved	< 0.0002	0.0002 mg/L							
Titanium, dissolved	< 0.005	0.005 mg/L							
Uranium, dissolved	< 0.00002	0.00002 mg/L							
Vanadium, dissolved	< 0.001	0.001 mg/L							
Zinc, dissolved	< 0.004	0.004 mg/L							
Zirconium, dissolved	< 0.0001	0.0001 mg/L							

#### Reference (B3J0241-SRM1)

Prepared: Oct-07-13, Analyzed: Oct-07-13

Aluminum, dissolved	0.244	0.005 mg/L	0.233	105	58-142
Antimony, dissolved	0.0516	0.0001 mg/L	0.0430	120	75-125
Arsenic, dissolved	0.433	0.0005 mg/L	0.438	99	81-119
Barium, dissolved	3.61	0.005 mg/L	3.35	108	83-117
Beryllium, dissolved	0.227	0.0001 mg/L	0.213	107	80-120
Boron, dissolved	1.98	0.004 mg/L	1.74	114	74-117
Cadmium, dissolved	0.223	0.00001 mg/L	0.224	99	83-117
Calcium, dissolved	8.0	0.2 mg/L	7.69	104	76-124
Chromium, dissolved	0.450	0.0005 mg/L	0.437	103	81-119
Cobalt, dissolved	0.129	0.00005 mg/L	0.128	100	76-124
Copper, dissolved	0.795	0.0002 mg/L	0.844	94	84-116
Iron, dissolved	1.32	0.010 mg/L	1.29	102	74-126
Lead, dissolved	0.112	0.0001 mg/L	0.112	100	72-128
Lithium, dissolved	0.115	0.0001 mg/L	0.104	111	60-140
Magnesium, dissolved	6.64	0.01 mg/L	6.92	96	81-119
Manganese, dissolved	0.345	0.0002 mg/L	0.345	100	84-116
Molybdenum, dissolved	0.413	0.0001 mg/L	0.426	97	83-117
Nickel, dissolved	0.822	0.0002 mg/L	0.840	98	74-126
Phosphorus, dissolved	0.50	0.02 mg/L	0.495	102	68-132
Potassium, dissolved	3.26	0.02 mg/L	3.19	102	74-126
Selenium, dissolved	0.0334	0.0005 mg/L	0.0331	101	70-130
Sodium, dissolved	19.9	0.02 mg/L	19.1	104	72-128
Strontium, dissolved	0.933	0.001 mg/L	0.916	102	84-113
Thallium, dissolved	0.0376	0.00002 mg/L	0.0393	96	57-143
Uranium, dissolved	0.267	0.00002 mg/L	0.266	100	85-115
Vanadium, dissolved	0.883	0.001 mg/L	0.869	102	87-113
Zinc, dissolved	0.886	0.004 mg/L	0.881	101	72-128

### General Parameters, Batch B3J0214

#### Blank (B3J0214-BLK1)

Prepared: Oct-04-13, Analyzed: Oct-04-13

Conductivity (EC)	< 2	2 uS/cm			
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#### Blank (B3J0214-BLK2)

Prepared: Oct-04-13, Analyzed: Oct-04-13

Conductivity (EC)	< 2	2 uS/cm			
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#### LCS (B3J0214-BS3)

Prepared: Oct-04-13, Analyzed: Oct-04-13

Conductivity (EC)	1410	2 uS/cm	1410	100	93-104
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## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100341  
Oct-10-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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### General Parameters, Batch B3J0214, Continued

<b>LCS (B3J0214-BS4)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13						
Conductivity (EC)	1420	2	uS/cm	1410		101	93-104			
<b>Duplicate (B3J0214-DUP2)</b>				<b>Source: 3100341-01</b>		Prepared: Oct-04-13, Analyzed: Oct-04-13				
Conductivity (EC)	389	2	uS/cm		388			< 1	5	
pH	7.91	0.01	pH units		7.89			< 1	5	
<b>Reference (B3J0214-SRM1)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13						
pH	6.99	0.01	pH units	7.00		100	98-102			
<b>Reference (B3J0214-SRM2)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13						
pH	6.99	0.01	pH units	7.00		100	98-102			

### General Parameters, Batch B3J0218

<b>Blank (B3J0218-BLK1)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13						
Solids, Total Dissolved	< 5	5	mg/L							
<b>Blank (B3J0218-BLK2)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13						
Solids, Total Dissolved	< 5	5	mg/L							
<b>Duplicate (B3J0218-DUP2)</b>				<b>Source: 3100341-01</b>		Prepared: Oct-04-13, Analyzed: Oct-04-13				
Solids, Total Dissolved	243	5	mg/L		234			4	16	
<b>Reference (B3J0218-SRM1)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13						
Solids, Total Dissolved	250	5	mg/L	240		104	85-115			
<b>Reference (B3J0218-SRM2)</b>				Prepared: Oct-04-13, Analyzed: Oct-04-13						
Solids, Total Dissolved	248	5	mg/L	240		103	85-115			

### Total Recoverable Metals, Batch B3J0242

<b>Blank (B3J0242-BLK1)</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13						
Aluminum, total	< 0.005	0.005	mg/L							
Antimony, total	< 0.0001	0.0001	mg/L							
Arsenic, total	< 0.0005	0.0005	mg/L							
Barium, total	< 0.005	0.005	mg/L							
Beryllium, total	< 0.0001	0.0001	mg/L							
Bismuth, total	< 0.0001	0.0001	mg/L							
Boron, total	< 0.004	0.004	mg/L							
Cadmium, total	< 0.00001	0.00001	mg/L							
Calcium, total	< 0.2	0.2	mg/L							
Chromium, total	< 0.0005	0.0005	mg/L							
Cobalt, total	< 0.00005	0.00005	mg/L							
Copper, total	< 0.0002	0.0002	mg/L							
Iron, total	< 0.01	0.01	mg/L							
Lead, total	< 0.0001	0.0001	mg/L							
Lithium, total	< 0.0001	0.0001	mg/L							
Magnesium, total	< 0.01	0.01	mg/L							
Manganese, total	< 0.0002	0.0002	mg/L							
Mercury, total	< 0.00002	0.00002	mg/L							
Molybdenum, total	< 0.0001	0.0001	mg/L							
Nickel, total	< 0.0002	0.0002	mg/L							
Phosphorus, total	< 0.020	0.020	mg/L							
Potassium, total	< 0.02	0.02	mg/L							
Selenium, total	< 0.0005	0.0005	mg/L							
Silicon, total	< 0.5	0.5	mg/L							
Silver, total	< 0.00005	0.00005	mg/L							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3100341**  
**REPORTED** Oct-10-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Total Recoverable Metals, Batch B3J0242, Continued</b>									
<b>Blank (B3J0242-BLK1), Continued</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Sodium, total	< 0.02	0.02 mg/L							
Strontium, total	< 0.001	0.001 mg/L							
Sulfur, total	< 1	1 mg/L							
Tellurium, total	< 0.0002	0.0002 mg/L							
Thallium, total	< 0.00002	0.00002 mg/L							
Thorium, total	< 0.0001	0.0001 mg/L							
Tin, total	< 0.0002	0.0002 mg/L							
Titanium, total	< 0.005	0.005 mg/L							
Uranium, total	< 0.00002	0.00002 mg/L							
Vanadium, total	< 0.001	0.001 mg/L							
Zinc, total	< 0.004	0.004 mg/L							
Zirconium, total	< 0.0001	0.0001 mg/L							
<b>Reference (B3J0242-SRM1)</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Aluminum, total	0.303	0.005 mg/L	0.296		102	81-129			
Antimony, total	0.0533	0.0001 mg/L	0.0505		106	88-114			
Arsenic, total	0.123	0.0005 mg/L	0.122		101	88-114			
Barium, total	0.758	0.005 mg/L	0.777		98	72-104			
Beryllium, total	0.0478	0.0001 mg/L	0.0488		98	76-131			
Boron, total	3.72	0.004 mg/L	3.40		109	75-121			
Cadmium, total	0.0498	0.00001 mg/L	0.0490		102	89-111			
Calcium, total	10.2	0.2 mg/L	10.2		100	86-121			
Chromium, total	0.242	0.0005 mg/L	0.242		100	89-114			
Cobalt, total	0.0383	0.00005 mg/L	0.0366		105	91-113			
Copper, total	0.527	0.0002 mg/L	0.487		108	91-115			
Iron, total	0.49	0.01 mg/L	0.469		104	77-124			
Lead, total	0.199	0.0001 mg/L	0.193		103	92-113			
Lithium, total	0.395	0.0001 mg/L	0.390		101	85-115			
Magnesium, total	3.46	0.01 mg/L	3.31		105	78-120			
Manganese, total	0.107	0.0002 mg/L	0.109		98	90-114			
Mercury, total	0.00506	0.00002 mg/L	0.00456		111	50-150			
Molybdenum, total	0.195	0.0001 mg/L	0.197		99	90-111			
Nickel, total	0.242	0.0002 mg/L	0.242		100	90-111			
Phosphorus, total	0.219	0.020 mg/L	0.233		94	85-115			
Potassium, total	6.15	0.02 mg/L	5.93		104	84-113			
Selenium, total	0.115	0.0005 mg/L	0.115		100	85-115			
Sodium, total	7.96	0.02 mg/L	7.64		104	82-123			
Strontium, total	0.363	0.001 mg/L	0.363		100	88-112			
Thallium, total	0.0836	0.00002 mg/L	0.0794		105	91-114			
Uranium, total	0.0186	0.00002 mg/L	0.0192		97	85-120			
Vanadium, total	0.368	0.001 mg/L	0.376		98	86-111			
Zinc, total	2.57	0.004 mg/L	2.42		106	85-111			

**REPORTED TO** Golder Associates Ltd. (Kelowna)  
220 - 1755 Springfield Road  
Kelowna, BC V1Y 5V5

**TEL** (250) 860-8424  
**FAX** (250) 860-9874

**ATTENTION** Pattie Amison

**WORK ORDER** 3100349

**PO NUMBER** 13-1493-0055

**RECEIVED / TEMP** Oct-04-13 11:55 / 6°C

**PROJECT** 13-1493-0055

**REPORTED** Oct-10-13

**PROJECT INFO** Faulder

**COC NUMBER** B02509

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**General Comments:**

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.



Issued By:

**Jennifer Shanko, ASCT**  
Administration Coordinator

*Please contact CARO if more information is needed or to provide feedback on our services.*

---

**Locations:**

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Richmond, BC V6V 2K9  
Tel: 604-279-1499 Fax: 604-279-1599

#102 3677 Highway 97N  
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Tel: 250-765-9646 Fax: 250-765-3893

17225 109 Avenue  
Edmonton, AB T5S 1H7  
Tel: 780-489-9100 Fax: 780-489-9700

[www.caro.ca](http://www.caro.ca)



**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100349  
Oct-10-13

Analysis Description	Method Reference (* = modified from)		Location
	Preparation	Analysis	
Alkalinity, speciated	N/A	APHA 2320 B	Kelowna
Dissolved Metals	APHA 3030 B	APHA 3125 B	Richmond
Hardness as CaCO <sub>3</sub> (CALC)	N/A	APHA 2340 B	Richmond

**Note: The numbers in brackets represent the year that the method was published/approved**

**Method Reference Descriptions:**

APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Association

**Glossary of Terms:**

MRL Method Reporting Limit  
 < Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences  
 mg/L Milligrams per litre

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100349  
Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Anions

**Sample ID: 852 Fish Lake Rd. (3100349-01) [Water] Sampled: Oct-03-13 17:30**

Alkalinity, Total as CaCO <sub>3</sub>	156	1	mg/L	N/A	Oct-07-13	
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	156	1	mg/L	N/A	Oct-07-13	
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1	mg/L	N/A	Oct-07-13	

### Calculated Parameters

**Sample ID: 852 Fish Lake Rd. (3100349-01) [Water] Sampled: Oct-03-13 17:30**

Hardness, Total (Diss. as CaCO <sub>3</sub> )	136	0.50	mg/L	N/A	N/A	
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### Dissolved Metals

**Sample ID: 852 Fish Lake Rd. (3100349-01) [Water] Sampled: Oct-03-13 17:30**

Aluminum, dissolved	0.006	0.005	mg/L	N/A	Oct-07-13	
Antimony, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Arsenic, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Barium, dissolved	0.109	0.005	mg/L	N/A	Oct-07-13	
Beryllium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Bismuth, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	
Boron, dissolved	0.012	0.004	mg/L	N/A	Oct-07-13	
Cadmium, dissolved	< 0.00001	0.00001	mg/L	N/A	Oct-07-13	
Calcium, dissolved	41.5	0.2	mg/L	N/A	Oct-07-13	
Chromium, dissolved	0.0051	0.0005	mg/L	N/A	Oct-07-13	
Cobalt, dissolved	0.00006	0.00005	mg/L	N/A	Oct-07-13	
Copper, dissolved	0.0347	0.0002	mg/L	N/A	Oct-07-13	
Iron, dissolved	0.034	0.010	mg/L	N/A	Oct-07-13	
Lead, dissolved	0.0003	0.0001	mg/L	N/A	Oct-07-13	
Lithium, dissolved	0.0040	0.0001	mg/L	N/A	Oct-07-13	
Magnesium, dissolved	7.74	0.01	mg/L	N/A	Oct-07-13	
Manganese, dissolved	0.0923	0.0002	mg/L	N/A	Oct-07-13	
Mercury, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Molybdenum, dissolved	0.0016	0.0001	mg/L	N/A	Oct-07-13	
Nickel, dissolved	0.0041	0.0002	mg/L	N/A	Oct-07-13	
Phosphorus, dissolved	< 0.02	0.02	mg/L	N/A	Oct-07-13	
Potassium, dissolved	3.42	0.02	mg/L	N/A	Oct-07-13	
Selenium, dissolved	< 0.0005	0.0005	mg/L	N/A	Oct-07-13	
Silicon, dissolved	10.4	0.5	mg/L	N/A	Oct-07-13	
Silver, dissolved	< 0.00005	0.00005	mg/L	N/A	Oct-07-13	
Sodium, dissolved	9.10	0.02	mg/L	N/A	Oct-07-13	
Strontium, dissolved	0.506	0.001	mg/L	N/A	Oct-07-13	
Sulfur, dissolved	< 1	1	mg/L	N/A	Oct-07-13	
Tellurium, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Thallium, dissolved	< 0.00002	0.00002	mg/L	N/A	Oct-07-13	
Thorium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER** 3100349  
**REPORTED** Oct-10-13

Analyte	Result / Recovery	MRL / Limit	Units	Prepared	Analyzed	Notes
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### *Dissolved Metals, Continued*

**Sample ID: 852 Fish Lake Rd. (3100349-01) [Water] Sampled: Oct-03-13 17:30, Continued**

Tin, dissolved	< 0.0002	0.0002	mg/L	N/A	Oct-07-13	
Titanium, dissolved	< 0.005	0.005	mg/L	N/A	Oct-07-13	
Uranium, dissolved	<b>0.00288</b>	0.00002	mg/L	N/A	Oct-07-13	
Vanadium, dissolved	< 0.001	0.001	mg/L	N/A	Oct-07-13	
Zinc, dissolved	<b>0.044</b>	0.004	mg/L	N/A	Oct-07-13	
Zirconium, dissolved	< 0.0001	0.0001	mg/L	N/A	Oct-07-13	

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER REPORTED** 3100349  
Oct-10-13

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup):** Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS):** A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM):** A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
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**Anions, Batch B3J0284**

<b>Blank (B3J0284-BLK1)</b>			Prepared: Oct-07-13, Analyzed: Oct-07-13						
Alkalinity, Total as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Phenolphthalein as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Carbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Bicarbonate as CaCO <sub>3</sub>	< 1	1 mg/L							
Alkalinity, Hydroxide as CaCO <sub>3</sub>	< 1	1 mg/L							
<b>LCS (B3J0284-BS1)</b>			Prepared: Oct-07-13, Analyzed: Oct-07-13						
Alkalinity, Total as CaCO <sub>3</sub>	101	1 mg/L	100		101	96-108			

**Dissolved Metals, Batch B3J0241**

<b>Blank (B3J0241-BLK1)</b>			Prepared: Oct-07-13, Analyzed: Oct-07-13						
Aluminum, dissolved	< 0.005	0.005 mg/L							
Antimony, dissolved	< 0.0001	0.0001 mg/L							
Arsenic, dissolved	< 0.0005	0.0005 mg/L							
Barium, dissolved	< 0.005	0.005 mg/L							
Beryllium, dissolved	< 0.0001	0.0001 mg/L							
Bismuth, dissolved	< 0.0001	0.0001 mg/L							
Boron, dissolved	< 0.004	0.004 mg/L							
Cadmium, dissolved	< 0.00001	0.00001 mg/L							
Calcium, dissolved	< 0.2	0.2 mg/L							
Chromium, dissolved	< 0.0005	0.0005 mg/L							
Cobalt, dissolved	< 0.00005	0.00005 mg/L							
Copper, dissolved	< 0.0002	0.0002 mg/L							
Iron, dissolved	< 0.010	0.010 mg/L							
Lead, dissolved	< 0.0001	0.0001 mg/L							
Lithium, dissolved	< 0.0001	0.0001 mg/L							
Magnesium, dissolved	< 0.01	0.01 mg/L							
Manganese, dissolved	< 0.0002	0.0002 mg/L							
Mercury, dissolved	< 0.00002	0.00002 mg/L							
Molybdenum, dissolved	< 0.0001	0.0001 mg/L							
Nickel, dissolved	< 0.0002	0.0002 mg/L							
Phosphorus, dissolved	< 0.02	0.02 mg/L							
Potassium, dissolved	< 0.02	0.02 mg/L							

## QUALITY CONTROL DATA

**REPORTED TO PROJECT** Golder Associates Ltd. (Kelowna)  
13-1493-0055

**WORK ORDER 3100349**  
**REPORTED** Oct-10-13

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
<b>Dissolved Metals, Batch B3J0241, Continued</b>									
<b>Blank (B3J0241-BLK1), Continued</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Selenium, dissolved	< 0.0005	0.0005 mg/L							
Silicon, dissolved	< 0.5	0.5 mg/L							
Silver, dissolved	< 0.00005	0.00005 mg/L							
Sodium, dissolved	< 0.02	0.02 mg/L							
Strontium, dissolved	< 0.001	0.001 mg/L							
Sulfur, dissolved	< 1	1 mg/L							
Tellurium, dissolved	< 0.0002	0.0002 mg/L							
Thallium, dissolved	< 0.00002	0.00002 mg/L							
Thorium, dissolved	< 0.0001	0.0001 mg/L							
Tin, dissolved	< 0.0002	0.0002 mg/L							
Titanium, dissolved	< 0.005	0.005 mg/L							
Uranium, dissolved	< 0.00002	0.00002 mg/L							
Vanadium, dissolved	< 0.001	0.001 mg/L							
Zinc, dissolved	< 0.004	0.004 mg/L							
Zirconium, dissolved	< 0.0001	0.0001 mg/L							
<b>Reference (B3J0241-SRM1)</b>				Prepared: Oct-07-13, Analyzed: Oct-07-13					
Aluminum, dissolved	0.244	0.005 mg/L	0.233		105	58-142			
Antimony, dissolved	0.0516	0.0001 mg/L	0.0430		120	75-125			
Arsenic, dissolved	0.433	0.0005 mg/L	0.438		99	81-119			
Barium, dissolved	3.61	0.005 mg/L	3.35		108	83-117			
Beryllium, dissolved	0.227	0.0001 mg/L	0.213		107	80-120			
Boron, dissolved	1.98	0.004 mg/L	1.74		114	74-117			
Cadmium, dissolved	0.223	0.00001 mg/L	0.224		99	83-117			
Calcium, dissolved	8.0	0.2 mg/L	7.69		104	76-124			
Chromium, dissolved	0.450	0.0005 mg/L	0.437		103	81-119			
Cobalt, dissolved	0.129	0.00005 mg/L	0.128		100	76-124			
Copper, dissolved	0.795	0.0002 mg/L	0.844		94	84-116			
Iron, dissolved	1.32	0.010 mg/L	1.29		102	74-126			
Lead, dissolved	0.112	0.0001 mg/L	0.112		100	72-128			
Lithium, dissolved	0.115	0.0001 mg/L	0.104		111	60-140			
Magnesium, dissolved	6.64	0.01 mg/L	6.92		96	81-119			
Manganese, dissolved	0.345	0.0002 mg/L	0.345		100	84-116			
Molybdenum, dissolved	0.413	0.0001 mg/L	0.426		97	83-117			
Nickel, dissolved	0.822	0.0002 mg/L	0.840		98	74-126			
Phosphorus, dissolved	0.50	0.02 mg/L	0.495		102	68-132			
Potassium, dissolved	3.26	0.02 mg/L	3.19		102	74-126			
Selenium, dissolved	0.0334	0.0005 mg/L	0.0331		101	70-130			
Sodium, dissolved	19.9	0.02 mg/L	19.1		104	72-128			
Strontium, dissolved	0.933	0.001 mg/L	0.916		102	84-113			
Thallium, dissolved	0.0376	0.00002 mg/L	0.0393		96	57-143			
Uranium, dissolved	0.267	0.00002 mg/L	0.266		100	85-115			
Vanadium, dissolved	0.883	0.001 mg/L	0.869		102	87-113			
Zinc, dissolved	0.886	0.004 mg/L	0.881		101	72-128			

**REPORTED TO** Regional District of Okanagan Similkameen  
101 Martin Street  
Penticton, BC V2A 5J9

**TEL** 1-250-490-4106  
**FAX** 1-250-492-0063

**ATTENTION** Rob Palmer

**WORK ORDER** 3100350

**PO NUMBER**

**PROJECT** 13-1493-0055

**PROJECT INFO** Faulder

**RECEIVED / TEMP** Oct-04-13 11:55 / 6°C

**REPORTED** Oct-11-13

**COC NUMBER** B02509

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**General Comments:**

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Issued By:

**Jennifer Shanko, ASCT**  
Administration Coordinator

*Please contact CARO if more information is needed or to provide feedback on our services.*

---

**Locations:**

#110 4011 Viking Way  
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Tel: 604-279-1499 Fax: 604-279-1599

#102 3677 Highway 97N  
Kelowna, BC V1X 5C3  
Tel: 250-765-9646 Fax: 250-765-3893

17225 109 Avenue  
Edmonton, AB T5S 1H7  
Tel: 780-489-9100 Fax: 780-489-9700

[www.caro.ca](http://www.caro.ca)



**REPORTED TO PROJECT** Regional District of Okanagan Similkameen  
13-1493-0055

**WORK ORDER REPORTED** 3100350  
Oct-11-13

Analysis Description	Method Reference (* = modified from)		Location
	Preparation	Analysis	
Alkalinity, total	N/A	APHA 2320 B	Kelowna
Chloride in Water by IC	N/A	APHA 4110 B	Kelowna
Colour, True at 410 nm	N/A	APHA 2120 C *	Kelowna
Conductivity in Water	N/A	APHA 2510 B	Kelowna
Cyanide, Total in Liquids	APHA 4500-CN C	APHA 4500-CN E	Kelowna
E. coli (by CCA)	N/A	APHA 9222 *	Kelowna
Fluoride in Water by IC	N/A	APHA 4110 B	Kelowna
Hardness as CaCO <sub>3</sub> (CALC)	N/A	APHA 2340 B	Richmond
Nitrate-N in Water by IC	N/A	APHA 4110 B	Kelowna
Nitrite-N in Water by IC	N/A	APHA 4110 B	Kelowna
pH in Water	N/A	APHA 4500-H+ B	Kelowna
Sulfate in Water by IC	N/A	APHA 4110 B	Kelowna
Total Coliforms (by CCA)	N/A	APHA 9222 *	Kelowna
Total Recoverable Metals	APHA 3030E *	APHA 3125 B	Richmond
Transmissivity at 254nm	N/A	APHA 5910 B	Kelowna
Turbidity	N/A	APHA 2130 B	Kelowna

**Note:** The numbers in brackets represent the year that the method was published/approved

### Method Reference Descriptions:

APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Association

### Glossary of Terms:

MRL	Method Reporting Limit
<	Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences
AO	Aesthetic objective
MAC	Maximum acceptable concentration (health-related guideline)
%	Percent W/W
CFU/100mL	Colony Forming Units per 100 mL
Color Unit	Colour referenced against a platinum cobalt standard
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
pH units	pH < 7 = acidic, pH > 7 = basic
uS/cm	Microsiemens per centimeter

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Regional District of Okanagan Similkameen  
13-1493-0055

**WORK ORDER REPORTED** 3100350  
Oct-11-13

Analyte	Result / Recovery	Canadian DW Guideline	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Anions

**Sample ID: 852 Fish Lk Rd (3100350-01) [Water] Sampled: Oct-03-13 17:30**

Alkalinity, Total as CaCO <sub>3</sub>	143		1	mg/L	N/A	Oct-04-13	
Chloride	5.62	AO ≤ 250	0.10	mg/L	N/A	Oct-05-13	
Fluoride	0.10	MAC = 1.5	0.10	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrate as N	0.142	MAC = 10	0.010	mg/L	N/A	Oct-05-13	
Nitrogen, Nitrite as N	< 0.010	MAC = 1	0.010	mg/L	N/A	Oct-05-13	
Sulfate	2.7	AO ≤ 500	1.0	mg/L	N/A	Oct-05-13	

### General Parameters

**Sample ID: 852 Fish Lk Rd (3100350-01) [Water] Sampled: Oct-03-13 17:30**

Colour, True	7	AO ≤ 15	5	Color Unit	N/A	Oct-04-13	
Conductivity (EC)	303		2	uS/cm	N/A	Oct-04-13	
Cyanide, total	< 0.010	MAC = 0.2	0.010	mg/L	Oct-11-13	Oct-11-13	
pH	7.69	AO = 6.5 - 8.5	0.01	pH units	N/A	Oct-04-13	
Turbidity	1.9	See Guidelines	0.1	NTU	N/A	Oct-08-13	HT
UV Transmittance @ 254nm	83.6		0.1	%	N/A	Oct-08-13	

### Calculated Parameters

**Sample ID: 852 Fish Lk Rd (3100350-01) [Water] Sampled: Oct-03-13 17:30**

Hardness, Total (Total as CaCO <sub>3</sub> )	140		5.0	mg/L	N/A	N/A	
Solids, Total Dissolved	158		2.0	mg/L	N/A	N/A	

### Total Recoverable Metals

**Sample ID: 852 Fish Lk Rd (3100350-01) [Water] Sampled: Oct-03-13 17:30**

Aluminum, total	< 0.05	AO ≤ 0.1	0.05	mg/L	Oct-07-13	Oct-08-13	
Antimony, total	< 0.001	MAC = 0.006	0.001	mg/L	Oct-07-13	Oct-08-13	
Arsenic, total	< 0.005	MAC = 0.01	0.005	mg/L	Oct-07-13	Oct-08-13	
Barium, total	0.11	MAC = 1	0.05	mg/L	Oct-07-13	Oct-08-13	
Beryllium, total	< 0.001		0.001	mg/L	Oct-07-13	Oct-08-13	
Bismuth, total	< 0.001		0.001	mg/L	Oct-07-13	Oct-08-13	
Boron, total	< 0.04	MAC = 5	0.04	mg/L	Oct-07-13	Oct-08-13	
Cadmium, total	< 0.0001	MAC = 0.005	0.0001	mg/L	Oct-07-13	Oct-08-13	
Calcium, total	43		2	mg/L	Oct-07-13	Oct-08-13	
Chromium, total	0.012	MAC = 0.05	0.005	mg/L	Oct-07-13	Oct-08-13	
Cobalt, total	< 0.0005		0.0005	mg/L	Oct-07-13	Oct-08-13	
Copper, total	0.162	AO ≤ 1	0.002	mg/L	Oct-07-13	Oct-08-13	
Iron, total	0.2	AO ≤ 0.3	0.1	mg/L	Oct-07-13	Oct-08-13	
Lead, total	0.001	MAC = 0.01	0.001	mg/L	Oct-07-13	Oct-08-13	
Lithium, total	0.003		0.001	mg/L	Oct-07-13	Oct-08-13	
Magnesium, total	8.1		0.1	mg/L	Oct-07-13	Oct-08-13	
Manganese, total	0.099	AO ≤ 0.05	0.002	mg/L	Oct-07-13	Oct-08-13	
Mercury, total	< 0.0002	MAC = 0.001	0.0002	mg/L	Oct-07-13	Oct-08-13	
Molybdenum, total	0.001		0.001	mg/L	Oct-07-13	Oct-08-13	

## SAMPLE ANALYTICAL DATA

**REPORTED TO PROJECT** Regional District of Okanagan Similkameen  
13-1493-0055

**WORK ORDER REPORTED** 3100350  
Oct-11-13

Analyte	Result / Recovery	Canadian DW Guideline	MRL / Limit	Units	Prepared	Analyzed	Notes
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### Total Recoverable Metals, Continued

**Sample ID: 852 Fish Lk Rd (3100350-01) [Water] Sampled: Oct-03-13 17:30, Continued**

Nickel, total	0.007		0.002	mg/L	Oct-07-13	Oct-08-13	
Phosphorus, total	< 0.2		0.2	mg/L	Oct-07-13	Oct-08-13	
Potassium, total	3.0		0.2	mg/L	Oct-07-13	Oct-08-13	
Selenium, total	< 0.005	MAC = 0.01	0.005	mg/L	Oct-07-13	Oct-08-13	
Silicon, total	8		5	mg/L	Oct-07-13	Oct-08-13	
Silver, total	< 0.0005		0.0005	mg/L	Oct-07-13	Oct-08-13	
Sodium, total	7.6	AO ≤ 200	0.2	mg/L	Oct-07-13	Oct-08-13	
Strontium, total	0.52		0.01	mg/L	Oct-07-13	Oct-08-13	
Sulfur, total	< 10		10	mg/L	Oct-07-13	Oct-08-13	
Tellurium, total	< 0.002		0.002	mg/L	Oct-07-13	Oct-08-13	
Thallium, total	< 0.0002		0.0002	mg/L	Oct-07-13	Oct-08-13	
Thorium, total	< 0.001		0.001	mg/L	Oct-07-13	Oct-08-13	
Tin, total	< 0.002		0.002	mg/L	Oct-07-13	Oct-08-13	
Titanium, total	< 0.05		0.05	mg/L	Oct-07-13	Oct-08-13	
Uranium, total	0.0028	MAC = 0.02	0.0002	mg/L	Oct-07-13	Oct-08-13	
Vanadium, total	< 0.01		0.01	mg/L	Oct-07-13	Oct-08-13	
Zinc, total	0.07	AO ≤ 5	0.04	mg/L	Oct-07-13	Oct-08-13	
Zirconium, total	< 0.001		0.001	mg/L	Oct-07-13	Oct-08-13	

### Microbiological Parameters

**Sample ID: 852 Fish Lk Rd (3100350-01) [Water] Sampled: Oct-03-13 17:30**

Coliforms, Total	550	MAC < 1	1	CFU/100mL	Oct-04-13	Oct-05-13	MIC15
Background Colonies	> 200		200	CFU/100mL	Oct-04-13	Oct-05-13	
E. coli	< 1	MAC < 1	1	CFU/100mL	Oct-04-13	Oct-05-13	

#### Sample / Analysis Qualifiers:

HT The sample was prepared / analyzed past the recommended holding time.  
MIC15 Due to a high bacterial count, the final result is estimated.

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