



**REGIONAL  
DISTRICT  
NORTH  
OKANAGAN**

# STAFF REPORT

**TO: Board of Directors**

**FROM: Planning Department**

**SUBJECT: Zoning Amendment Bylaw No. 2850, 2019**

**File No: 19-0906-C-RZ**

**Date: July 27, 2023**

## **RECOMMENDATION:**

That Final Adoption of Zoning Amendment Bylaw No. 2850 which proposes to rezone the property legally described as Lot 1, Sec 25, Twp 8, ODYD, Plan 2558, Except Plan 37038 and Plan EPP74629 and located at 7500 McLennan Road, Electoral Area "C" from the Non-Urban (N.U) zone to the Country Residential (C.R) zone be withheld until the applicant has registered a covenant against the title of the subject property which would:

1. prohibit subdivision of the property until a professional hydrologist has verified that all wells proposed to service all new lots are proven to meet the quantity and quality standards of the Regional District of North Okanagan Subdivision Servicing Bylaw No. 2600 and that the extraction of water from the wells will not negatively impact the water supply of neighbouring wells.
2. require that all wells proposed to service all new lots be pump tested for a minimum of 72 hours to confirm that they meet the quantity standards of Subdivision Servicing Bylaw No. 2600;
3. require that all wells proposed to service all new lots be located so that they are at least 50 m from each other and from neighbouring wells.
4. require as a condition of subdivision approval that at least one observation well be monitored during the pumping test for wells that would service new lots. The observation well must be located no more than 300 m from the wells that would service the new lots or a distance established by a professional hydrologist with technical justification for the distance.

## **BACKGROUND:**

The subject application proposes to rezone an approximately 17 ha property located at 7500 McLennan Road from the Non-Urban (N.U) zone to the Country Residential (C.R) zone. If successful in rezoning the property, the applicant is proposing an eight (8) lot subdivision.

At the Regular Meeting held on December 11, 2019, the Board of Directors considered the application and gave First Reading to the associated Zoning Amendment Bylaw No. 2850, 2019. The Board resolved that Second Reading of Bylaw No. 2850 be withheld until the Regional District completes the Keddleston Groundwater Study and the study has confirmed the adequacy of water supply for the level of potential development in the study area. The Board further resolved that Final Adoption of Bylaw No. 2850 be withheld until the applicant has made suitable arrangements with the Regional District to provide an approximate 0.5 m to 1.0 m wide public hiking trail within a 6 m wide Statutory Right of Way that would link McLennan Road through the subject property to the existing Grey Canal Trail.

At the Regular Meeting held on May 20, 2020, the Board of Directors again resolved that further consideration of Bylaw No. 2850 be withheld until the comprehensive review of the water supply in Aquifer 351 had been completed.

At the Regular Meeting held on July 20, 2022, the Board of Directors endorsed a report from Golder Associates Ltd titled “Keddleston Groundwater Study – Phase 2” and dated June 29, 2022. After considering the report, the Board passed the following resolution:

*That staff be directed to bring back a report on the implications of the recommendations contained in the report on in-process land use applications for properties in Electoral Area “C”.*

At the Regular Meeting held on December 14, 2022, the Board considered the subject application along with the Phase 2 Keddleston Groundwater Study and other in-process land use applications for properties in Electoral Area “C”. After considering the subject application and the reports, the Board resolved that further consideration of the application be withheld until the applicant has submitted a hydrogeological report that provides an evaluation of how the proposal aligns with the findings and recommendations of the Keddleston Groundwater Study – Phase 2 and which demonstrates:

1. that groundwater sources would be available to service the full buildout potential of the subject property (8 lots) in accordance with the provisions of Subdivision Servicing Bylaw No. 2600; and
2. that the use of the groundwater supplies would not have a negative impact on the use of existing wells that obtain water from Aquifers 349 and 351.

At the Regular Meeting held on March 22, 2023, the Board considered the subject application along with a report from Interior Geoscience Inc. dated January 23, 2023. The report takes into account the Golder Report – Phase 2 and provides a comparison of the findings of the assessment for the subject property against the findings and recommendations contained within the Golder Report. The report from Interior Geoscience Inc. concludes that “groundwater sources are available to service the full buildout potential of eight lots in accordance with the provisions of Subdivision Servicing Bylaw No. 2600, and the use of groundwater supplies for the proposed development at full buildout (8 Lots) will not have a negative impact on the use of existing wells that are completed into Aquifer 351.” After considering the application along with the report from Interior Geoscience Inc., the Board resolved to give Second Reading to Zoning Amendment Bylaw No. 2850 and to forward the Bylaw to a Delegated Public Hearing.

## **DISCUSSION:**

The Regional District has commissioned WSP Canada Inc to provide high level comments on whether the information in the hydrogeological reports submitted for in-process land use applications for properties in Electoral Area “C” are generally consistent with the objectives of the proposed changes to the Subdivision Servicing Bylaw for Electoral Area “C”, as outlined in Subdivision Servicing Amendment Bylaw No. 2930, 2022.

In March 2023, the Regional District commissioned WSP Canada Inc to provide comments on the above noted Interior Geoscience Inc. hydrogeological report dated January 23, 2023. Staff shared the findings of the review with the applicant. In response, the applicant commissioned Interior Geoscience Inc. to prepare the attached hydrogeological report dated July 18, 2023. The report provides an overview of the additional works that were done to further align the findings of the hydrogeological assessment of the proposed development with the proposed changes to the Subdivision Servicing Bylaw. The report states that the “results of the additional hydrogeological assessment support the conclusions made during the earlier investigations.” The report also provides recommendations related to the proposed subdivision, including the following:

1. prior to subdivision approval, a well should be drilled on each lot;

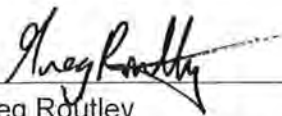
2. each of the new wells should be pump tested for a minimum of 48-72 hours to confirm capacity, with oversight and reporting of the tests provided by a qualified professional;
3. locate wells so that they are at least 50 m from each other and from neighbouring wells, if possible, to minimize the potential for well interference.

Staff recommend that a water supply covenant be registered as a condition of rezoning the property to ensure that wells are drilled and tested on each property at the time of subdivision. This would be supported by the recommendations in the above noted report and by the proposed amendments to the Subdivision Servicing Bylaw which, in its current form, would permit the subdivision of the property based on the submission of a hydrologist report and the registration of a covenant which requires that water supplies be proven at the time of Building Permit. Subdivision Servicing Amendment Bylaw No. 2930, 2022 proposes to amend the Subdivision Servicing Bylaw by removing this as an option for proof of water at the time of subdivision for properties within Electoral Area "C". This option is proposed to be removed for subdivisions in Electoral Area "C" due to concerns related to groundwater availability and sustainability of the resource.

Staff also recommend that the water supply covenant include a condition that would require that each of the new wells be pump tested for a minimum of 72 hours to confirm capacity, that each of the new wells be located so that they are at least 50 m from each other and from neighbouring wells and that an observation well be monitored while the wells that would service the proposed new lots are being pump tested. This would be supported by the recommendations in the above noted report and in part by the proposed amendments to the Subdivision Servicing Bylaw which, in its current form, would require that a 72 hour pump test be conducted for a well completed in a bedrock aquifer and that an observation well be monitored while the wells are being pump tested.

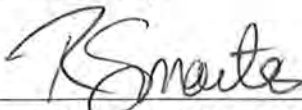
The Board previously resolved to forward Zoning Amendment Bylaw No. 2850 to a Delegated Public Hearing. Should the Board support the above noted recommendation, the Bylaw would be forwarded to a Delegated Public Hearing and a water supply covenant would be required to be registered prior to adoption of Zoning Amendment Bylaw No. 2850 along with the requirement that the applicant make suitable arrangements with the Regional District to provide a public trail that would link McLennan Road through the subject property to the existing Grey Canal Trail.

Submitted by:



Greg Routley  
Deputy Planning Manager

Endorsed by:



Rob Smailes, RPP, MCIP  
General Manager, Planning and Building

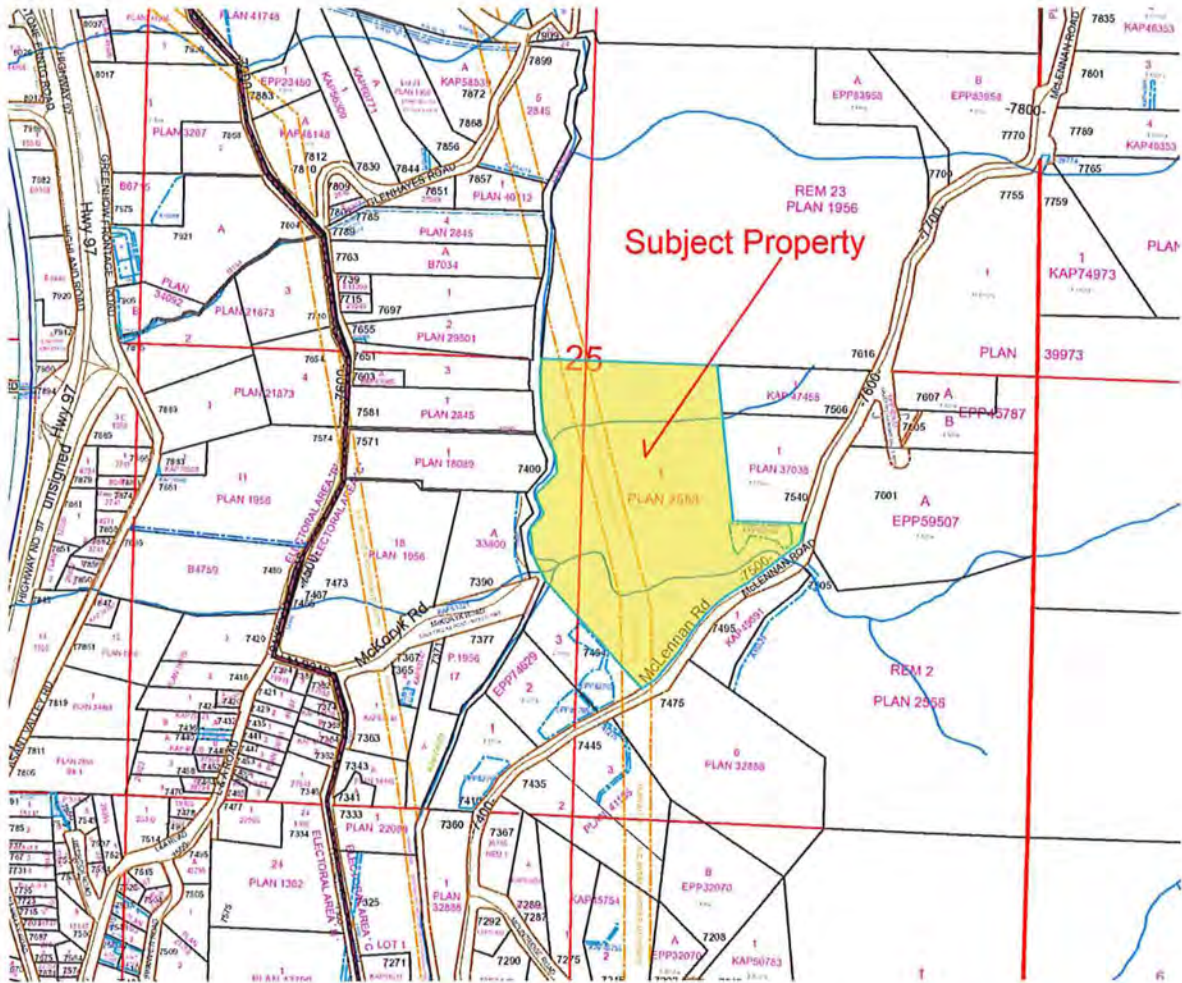
Approved for Inclusion:



David Sewell  
Chief Administrative Officer

# SUBJECT PROPERTY MAP

File: 19-0906-C-RZ  
Owner/Applicant: Viktor Malyakin  
Location: 7500 McLennan Road





Interior Geoscience Inc  
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July 18, 2023  
Job Number 2022-006  
Viktor Malyakin (Owner)

## Technical Memorandum

7500 McLennan Rd.  
Vernon BC.  
V1B 3S7

Dear Mr. Malyakin,

**Re: HYDROGEOLOGICAL ASSESSMENT OF GROUNDWATER SUPPLY IN SUPPORT OF REZONING APPLICATION, AT 7500 MCLENNAN RD, ELECTORAL AREA C, IN THE REGIONAL DISTRICT OF THE NORTH OKAKAGAN.**

### Introduction

Interior Geoscience Inc. (IGI) was initially retained to complete a hydrogeological assessment of groundwater resources to support an initial two lot subdivision and a groundwater feasibility study in support of a rezoning application that would allow for an additional six lots, at 7500 McLennan Rd in Electoral Area 'C' within the Regional District of the North Okanagan (RDNO). These assessments were completed in April 2022<sup>1</sup> (Attachment E) and December 2022<sup>2</sup>, respectively. The general location the proposed development is presented in Figure 1 below. A revised site plan showing the proposed lot lines and location of existing wells is presented as Attachment A.

Both initial assessments were completed in accordance with the applicable RDNO bylaw 2600 section 406 and 407, which pertains to private water sources from proposed subdivisions<sup>3</sup>. Section 406 states that if the proposed water source is a groundwater well then there must be evidence that each well can produce 6,550 litres/day [1.0 Imperial gallons/minute] year-round, that the water be potable, and that the well not interfere with neighbouring wells. Section 407 stipulates, that in cases where proposed lots are 2 ha (4.942

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<sup>1</sup> Interior Geoscience (IGI), 2022. Hydrogeological assessment of groundwater supply (well Plate ID 66090) in support of subdivision application, at 7500 McLennan Rd. Electoral Areas C, in the Regional District of the North Okanagan. April. 2022.

<sup>2</sup> Interior Geoscience (IGI), 2022. Hydrogeological Assessment inf Groundwater Supply in support of a rezoning application, at 7500 McLennan Rd, Electoral Area 'C', in the RDNO. December 2022

<sup>3</sup> Regional District of North Okanagan (RDNO). 2013. Subdivision Servicing Bylaw No. 2600, 2013.



acres) or larger (which applies to this project) a hydrogeological report that addresses general groundwater availability is typically acceptable prior to rezoning approval. Either before or after final subdivision approval, water sources (wells) must still be installed and quantity and potability confirmed, prior to final subdivision and/or a building permit being issued.

Since the completion of these assessments, the RDNO has published a proposed amended bylaw<sup>4</sup> based on the findings/recommendations of a Groundwater Study completed in June 2022 by WSP Canada Inc (WSP) (Previously operating as Golder Associates)<sup>5</sup>. At the request of the RDNO, IGI revised the groundwater feasibility study to address the recommendations in the WSP report (Attachment F).

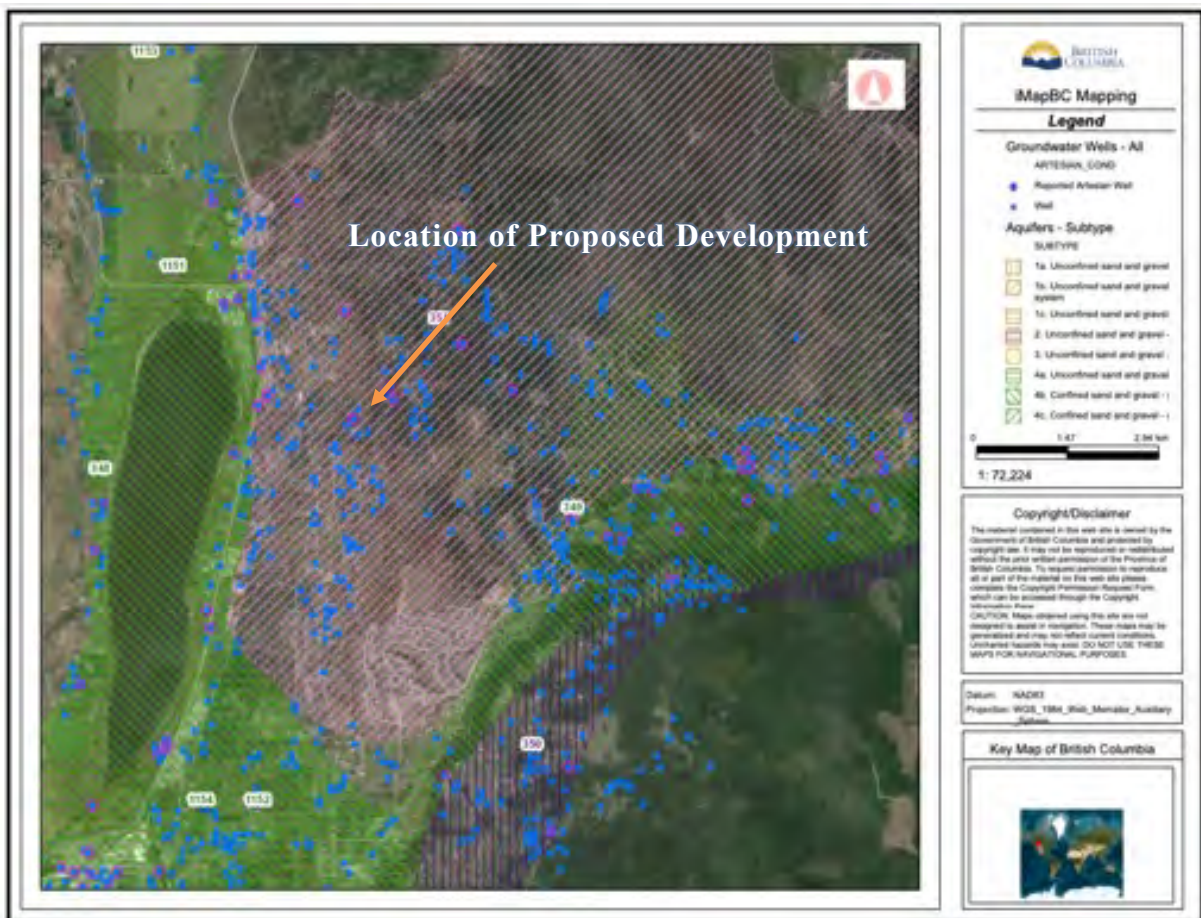


Figure 1: Ima ge showing the Mapped aquifer 351 and wells in relation to the subject site.

<sup>4</sup> Regional District of North Okanagan Subdivision Servicing Amendment Bylaw No. 2930, 2022

<sup>5</sup> Golder Associates. 2022. Report – Keddlestone Groundwater Study – Phase 2, Electoral Area C, Regional District of North Okanagan, B.C. 29 June 2022.



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The proposed changes to the Subdivision Servicing Bylaw for Electoral Area “C” include the following:

- At least one year of continuous groundwater level monitoring be conducted and the results analyzed and interpreted by a Qualified Professional;
- Well pumping tests must be supervised by a Qualified Professional;
- 48-72 hour pumping tests at the current bylaw rate of 6,550 litres of water per day (1.0 Imperial Gallon per Minute) per parcel, depending on the aquifer type;
- Water level recovery must be monitored for the same period of time as the pumping test (48-72 hours) and achieve 90 to 95% recovery;
- At least one observation well must be monitored in the same aquifer and within the same fracture network, during the pumping test and recovery period;
- Pumping tests are to be conducted in the dry months of the year (August 1 st –March 1st);
- Where an application to the RDNO includes more than one proposed lot, the pumping test must be conducted simultaneously at all wells proposed to service each lot;
- A Qualified Professional must submit a signed and stamped hydrogeological report and Schedule A: Qualified Professional - Proof of Water Form, confirming all requirements of the Bylaw have been met.

It is our further understanding that in the spring of 2023 the RDNO retained WSP Canada Inc (WSP) to complete a preliminary third-party review of the previously completed hydrogeological studies for the proposed development and provided comment on whether the IGI reports are consistent with the proposed changes to the subdivision servicing bylaw for the Electoral Area C which has yet to be adopted. Not surprisingly, there were several components of the study’s that do not meet the proposed Bylaw requirements, as it was not intended to. WSP’s comments are attached (Attachment G).

## Scope of Work

In response to WSP’s review, and in consultation with the planners at the RDNO, it was decided to complete further study to satisfy some of the additional requirements of proposed bylaw changes to further support the proposed rezoning and development.

Additional scope included the following:

- Review the well logs and confirm that both of the existing wells comply with the minimum standards of the Groundwater Protection Regulation (GWPR) and the Bylaw Amendment,
- Revise the existing site plan of the proposed 8-lot develop to include the location of the existing wells (Attached),



- Complete a minimum 72-hour pumping test on each of the existing wells located on the subject property,
- Monitored recovery after each of the pumping tests to ensure that water levels in the wells reach 90 to 95% recovery within the same amount of time the well was tested for, and until full recovery was observed,
- Monitoring water level data in at least one, off-site well for the duration of the pumping tests and recovery,
- Monitor water level data in each of the wells for one month after the pumping test,
- Review the pumping test data assess whether each of the wells have a sustainable yield of at least 6550 L/day,
- Complete a technical Memorandum outlining the methods and results of the additional work completed (This document).

## Methods

### Pumping Tests

To meet the *water supply* requirements of the proposed bylaw amendments, IGI completed two simultaneous pumping test on the two existing wells on the site. Between May 29<sup>th</sup> and June 1<sup>st</sup>, Well Plate ID (WPID) 66090 was pumped for 72-hours at a rate of 7.57 L/min (2 USgpm) and WPID 47667 was pumped for 96-hours at a rate of 15.14 L/min (5 USgpm). WPID 47667 was tested for a longer period due to changes in flow rate during the testing period. Although timing did not allow for the pumping tests to be completed between August 1<sup>st</sup> and March 1<sup>st</sup> as per the requirement of the amended bylaw, this was accounted for in the analysis of the results.

WPID 66090 was tested using the existing pumping that is currently supplying an existing residence, and WPID 47667 was tested using a temporary pump installed three meters above the bottom of the well. The flow rate was controlled with a gate valve on the discharge line. Flow rates were measured using a calibrated pail and stopwatch.

Water depth in each well was measured manually with a water level tape at regular intervals as well as with an automated pressure transducer. Water levels and flow rates were measured and recorded throughout the test, with the most frequent readings made early in the test and again at the beginning of recovery.

During the pumping tests water levels were also monitored in a neighbouring well (WTN 52401) located 270 meters south of WPID 47667 (Figure 2). Attempts were made to monitor other wells in the area, however, due to either a lack of permission, or a lack of access this was not possible at the time. A summary of each of the test parameters is summarized in Table 1 below.





Table 1: Summary of Pumping test parameters.

Well ID	Discharge Rate Lpm (US gpm)	Test Duration (Hours)	Total Volume of water pumped (Litres)	Depth of Pump (m btoc)
WPID 66090	7.57 (2.0)	72	32,702	118.0
WPID 69447	15.14 (4.0)	96	87,206	146.0



Figure 2: Image showing the site boundaries, proposed lot lines and location of existing wells onsite and the off-site monitoring well.



Each of the tests were overseen by IGI personnel who remained on site for the duration of each test and collected flow and water level measurements at specified intervals. Water from the test was discharged at a down-slope location approximately 15 m (50 feet) from the well. Following pump shutoff after, water level recovery measurements were collected manually at regular intervals for at least 72 hours after each test, or until 90% recovery was observed. Transducers were deployed in each of the wells to continue monitoring water develops for an additional month after the pumping tests.

Following pumping, the data from each pumping test were analyzed following the methods outlined in the B.C. Certification of Public Convenience and Necessity (CPCN)<sup>6</sup>. This method extrapolates water levels to 100 days and calculates a sustainable pumping rate based on this extrapolation. The sustainable pumping rate is then reduced by a safety factor, often 30%, which is reserved for (1) housing the submersible pump, (2) seasonal and drought water levels that may occur, and (3) accommodating any future drop in well efficiency during operation.

## WELL INTERFERENCE AND LONG-TERM GROUNDWATER LEVEL TRENDS

Due to the timeline of the proposed development and the introduction of the amended bylaw, it was not feasible to monitoring the existing wells for a whole year as per the proposed bylaw law amendment. However, pressure transducers were used to monitoring water levels in each of the existing wells during the pumping tests and for over one month after the end of the pumping tests. In addition, water levels in one other off site well (WTN<sup>7</sup> 52401) were recorded manually during the pumping test<sup>8</sup>. Due to either a lack of access, lack of permission, or distance from the pumping wells, no other wells were monitored during this assessment.

## Results

### Long-Term Well Yield Assessment

#### WPID 66090

To assess the long-term sustainable yield of the well, WPID 66090 was pumped at a rate of 0.13L/s (2.0 US gpm) for 72-hours, which is equivalent to 1.7 times the long-term bylaw requirement. During this time the well drew down 17.26 m. Table 2 outlines the specifications and results of the pumping test on WPID 66090. Pumping test data and figures showing test

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<sup>6</sup> British Columbia Ministry of Environment (MOE). 2007a. Evaluating Long-term Well Capacity for a Certificate of Public Convenience and Necessity: a guidance document. [http://www.env.gov.bc.ca/wsd/plan\\_protect\\_sustain/groundwater/library/eval\\_well/index.html](http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/library/eval_well/index.html) (accessed July 10, 2023).

<sup>7</sup> WTN denotes Well Tag Number, as assigned by the Ministry of Forests

<sup>8</sup> Unfortunately, due to the nature the well, a transducer was not able to be installed and only manual measurement were made during the pumping tests.



results are provided as Attachment B. Based on the CPCN method the sustainable yield was calculated to be an estimated 0.24 L/s (4.0 US gpm), or 20,810 L/day. After adding in a 30% safety factor to account for the seasonal variability in the water levels and well interference as per the CPCN guidelines, the sustainable pumping rate calculated is 0.17L/s (2.7 US gpm). Or 14,567 L/day (over 2 times the bylaw requirement).

It should be noted that the static water level prior to the pumping test was recorded at 17.98 m below the top of casing (mbtoc). This is significantly lower than the static water level recorded (10.96 mbtoc) prior to the first test completed in March 2022. The likely reason for this is the fact that the first test was completed prior to the wells being used for the existing residence. The pumping results of the initial test completed in 2022 indicated a sustainable yield of 0.14L/sec (12,418 L/day).

#### WPID 47667

To assess the long-term sustainable yield of the well, WPID 47667 was pumped at a rate of 0.3 L/sec (5 USgpm) for the first 80 minutes, and 0.25L/s (4.0 US gpm) for the remainder of the 96-hour test. This is equivalent to 3.3 times the long-term bylaw requirement. During this time the well drew down 32.42 m. Table 2 outlines the specifications and results of the pumping test on WPID 47667. Pumping test data and figures showing test results are provided in Attachment C. Based on the CPCN method the sustainable yield was calculated to be an estimated 0.29 L/s (5.0 US gpm), or 25,186 L/day. After adding in a 30% safety factor to account for the seasonal variability in the water levels and well interference as per the CPCN guidelines, the sustainable pumping rate calculated is 0.20L/s (3.2 US gpm). Or 17,630 L/day (2.7 times the bylaw requirement).

#### Recovery

Recovery data is included in Figures B-1 and C-1 (Attached). WPID 66090 reached 91% within 72 hours after the pump was turned off and WPID 47667 reach 100% within 96 hours of the end of the pumping test, indicated that both wells satisfy the requirement that water levels in the wells reach 90 to 95% recovery within the same amount of time the well was tested for.



Table 2: Summary of CPCN calculations based on pumping test results.

	WPID 66090	WPID 47667
<b>PUMPING SPECIFICATIONS</b>		
Pumping rate (L/s)	0.13	0.25
Test duration (hours)	72	96
Depth of pump intake (mbtoc)	146.00	65.00
Static water level (mbtoc)	17.98	21.94
Depth to top of primary fracture (mbtoc)	85.30	5.00
Depth of well (mbgl)	152.00	68.58
<b>RECOVERY</b>		
Recovery after 72 and 96 hours (%)	91	100+
<b>RECOVERY (continued)</b>		
Pumping rate (L/s)	0.13	0.25
Available drawdown (m)	66.70	46.64
Drawdown at 100 days (m)	36	40
<b>CPCN OUTPUTS</b>		
100-day specific capacity (L/s/m)	0.004	0.006
Sustainable pumping rate (L/s)	0.24	0.29
Sustainable pumping rate with BC safety factor of 30% (L/s)	0.17	0.20
Sustainable pumping rate (L/d)	20,810	25,186
Sustainable pumping rate with BC safety factor of 30% (L/d)	14,567	17,630
Sustainable pumping rate (USGPM)	4	5
Sustainable pumping rate with BC safety factor of 30% (USGPM)	2.7	3.2

Notes:

1. m btoc = metres below top of casing.
2. The available drawdown is the difference between static water level and depth to the dominant water bearing fracture (85.3 m btoc).
3. The drawdown at 100 days (100-day drawdown) is the extrapolated drawdown in the pumping well.
4. A 30% safety factor was applied to the calculated sustainable pumping rate, as per the CPCN Guideline. This is intended to account for seasonal variability and future wells drilled in the area.

## Well Interference

Due to the nature of simultaneous tests, it is difficult to determine the level of influence between the two wells that were being pumped during the pumping test. Furthermore, due to the construction of the neighbouring well used for monitoring, it was decided to not drop either the water level tape or a pressure transducer down the well. As an alternative an acoustic sounder was used to determine water levels throughout the test. Data from monitoring well is presented in Table 3 below and included in the pumping test plots (Figures



B-1 and C-1, attached). Unfortunately, due to the well being in use for domestic and outdoor use the data is not conclusive. While the pump was running, the drawdown observed in the monitoring well ranged from 3.16 to 5.76 m. During times when the pump was not running, the water level was stable with little to no sign of influence from the subject pumping tests.

Table 3: Summary table of water level data in off-site monitoring well (WTN 52401)

Monitoring Well Water Level Data (WTN 52401)		
Clock Time	Water Level (m)	Comments
5-29-23 12:20 PM	16.72	Water pump off
5-29-23 1:20 PM	16.88	Water pump off
5-29-23 4:20 PM	22.14	Water Pump On
5-29-23 8:20 PM	16.71	Water pump off
5-30-23 8:30 AM	16.61	Water pump off
5-30-23 11:20 AM	18.2	Water pump off
5-30-23 3:20 PM	16.22	Water pump off
5-30-23 7:40 PM	21.45	Water Pump On
5-31-23 10:05 AM	22.11	Water Pump On
5-31-23 6:30 PM	16.12	Water pump off
6-1-23 8:30 AM	18.95	Water pump off
6-1-23 6:30 PM	19.88	Water pump off
6-2-23 9:46 AM	23.04	Water Pump On
6-2-23 7:32 PM	16.7	Water pump off
6-3-23 10:10 AM	17.01	Water pump off
6-4-23 8:42 AM	22.48	Water Pump On
6-5-23 9:34 AM	18.22	Water Pump On

To determine whether water used from any of the existing wells surrounding the proposed development showed any influence on the subject wells, pressure transducers were used to monitoring water levels in the subject wells for one month after the pumping test (Attachment D).

#### WPID 66090

With the exception of the daily drawdown in response to the domestic demand in WPID 66090 there no evidence of influence between the subject wells and any ongoing water use in any of the neighbouring wells. It should be noted that the significant draw down observed in WPID 66090 approximately 77 hours after the end of the pumping test is due to a combination of refilling the existing homes water cistern, and a hose being unintentionally left on for 47 hours. During this time, it is estimated that between 64,050 and 96,073 liters (two to three times the volume that was pumped during the pumping test) of additional water was discharged. Due to the excess pumping, the water levels dropped below the height of the transducer (approximately 100 m below top of casing). Based on the drawdown trend, we



can estimate that the water level likely dropped to an estimated 113 m btoc, with a total drawdown of 95 meters from the wells original static water level. Once the water was turned off, 90% recovery was reached within 31.5 hours.

#### WPID 47667

The long-term water level data from WPID 47667 indicate very little to no influence from neighbouring wells or the ongoing pumping in WPID 66090 except for a small change in the recharge rate as indicated on figure D-1 (Attached). This apparent increased rate in recharge loosely coincides with when the WPID 66090 was turned off after it was let run for some time, indicating that there may be some degree of connection. However, when WPID 66090 was under normal use, the water levels in WPID 47667 was observed to be very stable over time.

## Conclusions

The results of this additional hydrogeological assessment support the conclusions made during the earlier investigations and, it is reasonable to conclude that groundwater sources are available to service the full buildout potential of eight lots in accordance with the provisions of Subdivision Servicing Bylaw No. 2600, and the use of groundwater supplies for the proposed development at full buildout (8 Lots), will not have a negative impact on the use of existing wells that are completed into Aquifer 351. The following conclusions support this assessment:

- A review of the drillers well logs and observations made of the well head indicate that the subject wells meet the applicable GWPR's.
- WPID 66090 and WPID 47667 were pump tested for a minimum of 72-hours long at rates of 0.13 and 0.25 L/sec respectively and therefore satisfies the bylaw amendment that requires a minimum test length of 48-72 hours at a rate of 0.076 L/sec.
- The results of the pumping test analysis indicate that WPID 66090 has a long-term sustainable yield of 14,567 L/day, respectively, and therefore meets the bylaw requirement of a sustainable yield of 6550 L/day. Comparing the result of this most recent pumping test, to the results of the pumping test, and analysis completed in March of 2022 which rated the well at 12,418L/day, we can conclude that although the pumping test completed during a drier time of year did result in a slightly lower estimate (8.5% difference) of the sustainable yield, the difference is not significant enough to alter the conclusions.
- The results of the pumping test analysis indicate that WPID 47667 has a long-term sustainable yield of and 17,630 L/day which is greater than the required 6550 L/day. If we reduce the sustainable yield an additional 10% to account for the fact that the test was not completed between August 1<sup>st</sup> and March 1<sup>st</sup> (15,867 L/day) the well still is more than capacity of meeting the bylaw requirements.



- Using the most conservative values of sustainable yields, the WPID 66090 and 47667 have an estimated yield of 12,418 and 15,867 liters per day. Just these two wells are enough water to supply over half of the eight proposed lots based on the required bylaw amount of 6,550 L/day without having an impact on each other, or any of the neighbouring wells in the area.
- Recovery data indicates that both wells reached at least 90% recovery within the same amount of time that they were pumped for and reached full recovery shortly thereafter.
- WTN 52401 was monitored during the pumping tests and the recovery period. Monitoring data indicate that there is little to no well interference between the two onsite and the neighbouring well that were monitored.
- Long-term monitoring of the pumping wells indicates that over the course of the monitoring period there is little to no apparent interference between the existing wells onsite and the ongoing use occurring in the neighbour wells.
- As concluded in the previous phase of this investigation, the efforts and conclusions of the 2022 Golder report are primarily focused on the areas of Wilson-Jackson-Upper, Keddleston-Clearview Road, and include little evidence to support the conclusions made with respect to the 'Western' (downgradient) portion of Aquifer 351. Although, no doubt there are portions of Aquifer 351, and/or individual wells that may be limited with respect to groundwater availability, the fact that the proposed development is within a separate catchment from the remainder of Aquifer 351, with evidence of highly fractured bedrock as a result of a known fault in the area, suggests that the assumptions that may be applied to some areas of Aquifer 351 are not entirely relevant to the aquifer conditions near the proposed development.

Based on the results of this hydrogeological assessment, IGI provides the following recommendations:

- Permit the subject parcel of land to be rezoned to allow for the potential to develop the land into a maximum buildout of 8 lots, with the understanding that the proposed development will still be required to meet the subdivision servicing bylaw requirements prior to approval.
- Prior to subdivision approval, a well should be drilled on each lot.
- After drilling, well drillers reports should be reviewed by a qualified professional to ensure the well construction meets the GPWR.
- Each of the new wells should be pump tested for a minimum of 48-72 hours to confirm capacity, with oversight and reporting of the test(s) provided by a qualified professional.
- During each pumping test, a water quality sample should be taken to determine whether each well meet the applicable potability standards.
- Locate wells so that they are at least 50 m (165 ft) from each other and from neighbouring wells, if possible, to minimize the potential for well interference; and
- Locate wells at least 30 m (100 ft) from existing or proposed septic tanks and sewage disposal fields.



Interior Geoscience Inc  
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## Closure

This report was prepared for Victor Malyakin to provide a hydrogeological assessment in support of a rezoning application at 7500 McLennan Road, in the North Okanagan Regional District.

The services provided by Interior Geoscience Inc. The preparation of this report was conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,

July 20/2023

Tony Friesen M.Sc., P.Ge  
Hydrogeologist

Permit To Practice Number 1004322

### **Attachments:**

- Attachment A – Site Plan showing proposed layout for 8 lots and locations of existing wells
- Attachment B – 72-hour pumping test and recovery data and plots for WPID 66090
- Attachment C – 96-hour pumping test and recovery data and plots for WPID 47667
- Attachment D – Long-Term Monitoring data from WPID 66090 and WPID 47667
- Attachment E – Hydrogeological Assessment of Groundwater Supply in support of two lot subdivision application, at 7500 McLennan Rd, Electoral Area 'C' in the RDNO.
- Attachment F – Groundwater Feasibility study in support of the rezoning application, at 7500 McLennan Rd, Electoral Area 'C' in the RDNO.
- Attachment G – Preliminary Review of the Hydrogeological reports submitted for proposed residential development at 7500 McLennan Rd, RDNO, BC

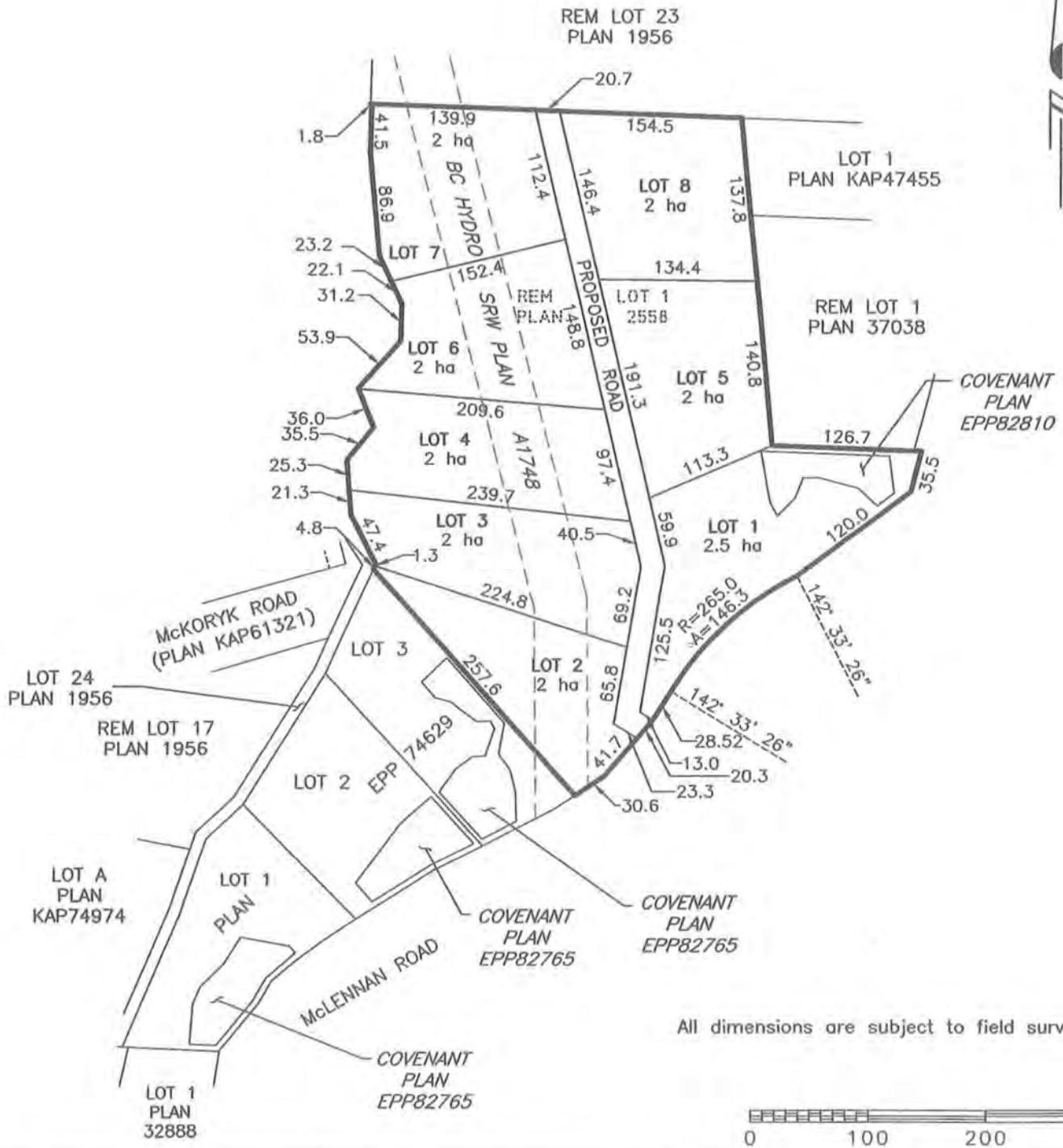




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**Attachment A – Site Plan showing proposed layout for 8 lots and locations of existing wells.**

ALL DISTANCES ARE IN METRES.



All dimensions are subject to field survey.

PLAN OF PROPOSED REZONING AND SUBDIVISION OF LOT 1, PLAN 2558, SEC 25, TP 8, ODYD EXCEPT PLANS 37038 & EPP74629

SCALE: 1 : 5000 OUR FILE: R10675

DATE: 30 Sep 2019 DRAWN: KG

Dacron Enterprises Ltd

MADDOX & COMPANY  
 LAND SURVEYORS  
 3500 - 30th STREET  
 VERNON, BC V1T 5E8  
 TELEPHONE: (250) 542-4343

106750A01



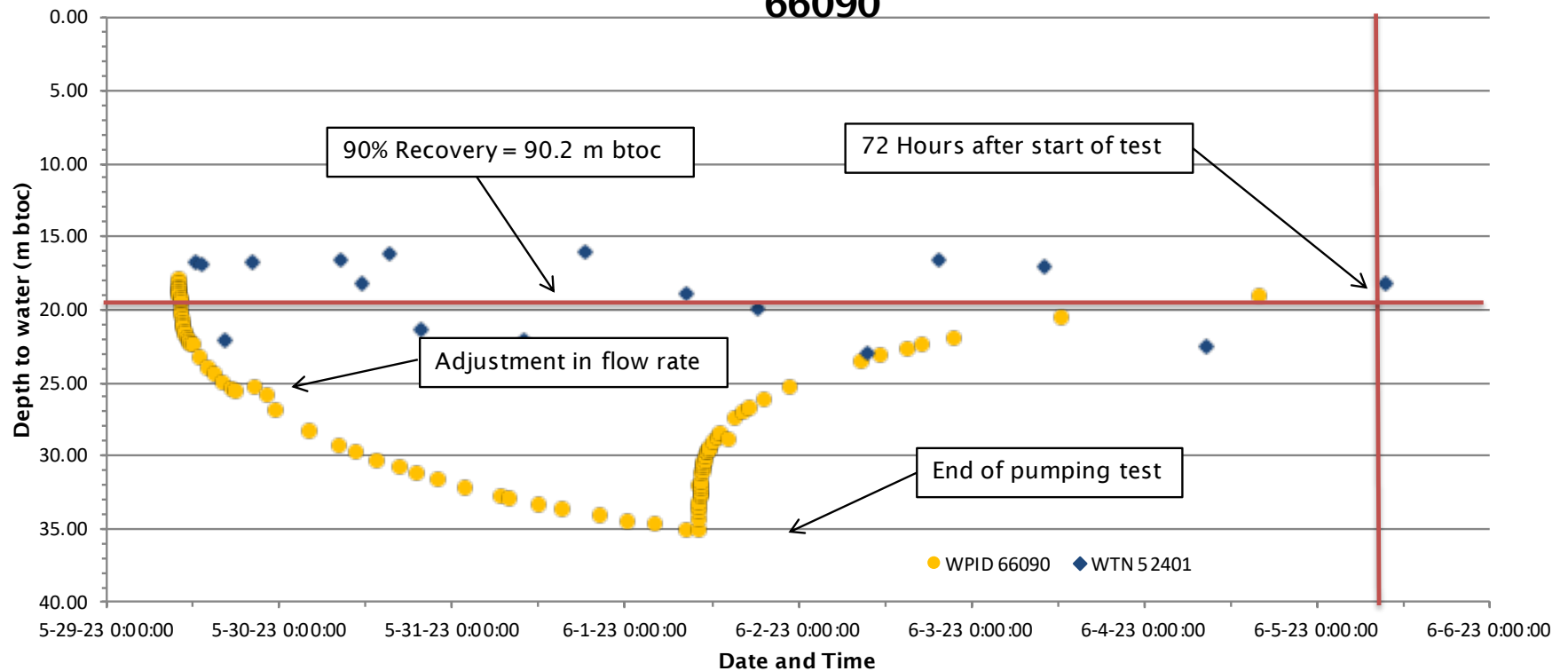
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**Attachment B – WPID 66090: 72–Hour Constant Rate Pumping Test Data and Data Plots**

Project Number	2022-006		Test Type	Constant Rate Test
Client Name	Viktor Malyakin		Test Duration (hours)	72
Hydrogeologist	Tony Friesen		Well Depth (m)	152
Pumping Test Contractor	Interior Geoscience Inc		Static Water Level (mbtoc)	17.98
Location	7500 McLennan Rd		Pump Intake Depth (mbtoc)	146.00
Well Identification	WPID 66090		Pumping Rate (L/s)	0.15
			Test Start Time	5-29-23 10:10 AM
Clock Time	Time Elapsed (min)	Depth to Water (m btoC)	Drawdown (m)	Comments
5-29-23 10:10:00	0	17.98	0.00	Start of Test
5-29-23 10:11:00	1	18.32	0.34	
5-29-23 10:12:00	2	18.56	0.58	
5-29-23 10:13:00	3	18.67	0.69	
5-29-23 10:14:00	4	18.75	0.77	
5-29-23 10:15:00	5	18.92	0.94	
5-29-23 10:16:00	6	19.07	1.09	
5-29-23 10:17:00	7	19.22	1.24	
5-29-23 10:18:00	8	19.35	1.37	
5-29-23 10:19:00	9	19.45	1.47	
5-29-23 10:20:00	10	19.57	1.59	
5-29-23 10:25:00	15	20.14	2.16	
5-29-23 10:30:00	20	20.50	2.52	
5-29-23 10:35:00	25	20.77	2.79	
5-29-23 10:40:00	30	20.99	3.01	
5-29-23 10:45:00	35	21.19	3.21	
5-29-23 10:50:00	40	21.34	3.36	
5-29-23 11:00:00	50	21.59	3.61	
5-29-23 11:10:00	60	21.79	3.81	
5-29-23 11:20:00	70	21.98	4.00	
5-29-23 11:30:00	80	22.13	4.15	
5-29-23 11:40:00	90	22.29	4.31	
5-29-23 11:55:00	105	22.41	4.43	
5-29-23 12:10:00	120	22.51	4.53	
5-29-23 13:10:00	180	23.37	5.39	
5-29-23 14:10:00	240	24.00	6.02	
5-29-23 15:15:00	305	24.53	6.55	Flow observed to be 0.2 US gpm low. Flow Adjusted back to 2.0 Usqpm
5-29-23 16:20:00	370	25.01	7.03	
5-29-23 17:30:00	440	25.45	7.47	
5-29-23 18:00:00	470	25.67	7.69	
5-29-23 20:45:00	635	25.33	7.35	
5-29-23 22:30:00	740	25.99	8.01	
5-29-23 23:30:00	800	26.94	8.96	
5-30-23 4:20:00	1090	28.43	10.45	
5-30-23 8:20:00	1330	29.33	11.35	
5-30-23 10:45:00	1475	29.85	11.87	
5-30-23 13:40:00	1650	30.40	12.42	
5-30-23 16:45:00	1835	30.84	12.86	
5-30-23 19:15:00	1985	31.27	13.29	
5-30-23 22:00:00	2150	31.71	13.73	
5-31-23 2:00:00	2390	32.28	14.30	
5-31-23 6:50:00	2680	32.87	14.89	
5-31-23 8:00:00	2750	32.99	15.01	
5-31-23 12:15:00	3005	33.43	15.45	
5-31-23 15:30:00	3200	33.73	15.75	
5-31-23 20:45:00	3515	34.18	16.20	
6-1-23 0:30:00	3740	34.53	16.55	
6-1-23 4:20:00	3970	34.80	16.82	
6-1-23 8:45:00	4235	35.16	17.18	
6-1-23 10:20:00	4330	35.24	17.26	End of 72-hour test
6-1-23 10:27:00	4337	34.46	16.48	
6-1-23 10:28:00	4338	33.83	15.85	
6-1-23 10:29:00	4339	33.58	15.60	
6-1-23 10:30:00	4340	33.25	15.27	
6-1-23 10:31:00	4341	32.09	14.11	
6-1-23 10:33:00	4343	32.89	14.91	
6-1-23 10:34:00	4344	32.67	14.69	
6-1-23 10:35:00	4345	32.52	14.54	
6-1-23 10:36:00	4346	32.35	14.37	
6-1-23 10:37:00	4347	32.20	14.22	
6-1-23 10:40:00	4350	31.83	13.85	
6-1-23 10:45:00	4355	31.34	13.36	
6-1-23 10:50:00	4360	31.07	13.09	
6-1-23 10:55:00	4365	30.85	12.87	
6-1-23 11:00:00	4370	30.66	12.68	
6-1-23 11:05:00	4375	30.50	12.52	
6-1-23 11:10:00	4380	30.35	12.37	
6-1-23 11:21:00	4391	30.10	12.12	
6-1-23 11:27:00	4397	29.89	11.91	
6-1-23 11:37:00	4407	29.79	11.81	
6-1-23 11:47:00	4417	29.62	11.64	
6-1-23 11:57:00	4427	29.49	11.51	
6-1-23 12:27:00	4457	29.09	11.11	
6-1-23 12:57:00	4487	28.77	10.79	
6-1-23 13:27:00	4517	28.49	10.51	
6-1-23 14:27:00	4577	28.98	11.00	
6-1-23 15:27:00	4637	27.54	9.56	
6-1-23 16:27:00	4697	27.16	9.18	

<b>Project Number</b>	2022-006		<b>Test Type</b>	Constant Rate Test
<b>Client Name</b>	Viktor Malyakin		<b>Test Duration (hours)</b>	72
<b>Hydrogeologist</b>	Tony Friesen		<b>Well Depth (m)</b>	152
<b>Pumping Test Contractor</b>	Interior Geoscience Inc		<b>Static Water Level (mbtoc)</b>	17.98
<b>Location</b>	7500 McLennan Rd		<b>Pump Intake Depth (mbtoc)</b>	146.00
<b>Well Identification</b>	WPID 66090		<b>Pumping Rate (L/s)</b>	0.15
			<b>Test Start Time</b>	5-29-23 10:10 AM
<b>Clock Time</b>	<b>Time Elapsed (min)</b>	<b>Depth to Water (m btoc)</b>	<b>Drawdown (m)</b>	<b>Comments</b>
6-1-23 17:27:00	4757	26.82	8.84	
6-1-23 19:27:00	4877	26.21	8.23	
6-1-23 22:55:00	5085	25.37	7.39	
6-2-23 9:00:00	5690	23.59	5.61	
6-2-23 11:27:00	5837	23.26	5.28	
6-2-23 15:27:00	6077	22.76	4.78	
6-2-23 17:27:00	6197	22.53	4.55	
6-2-23 21:53:00	6463	21.99	4.01	
6-3-23 12:44:00	7354	20.62	2.64	
6-4-23 16:10:00	9000	19.2	1.22	

**Figure B-1: Plot of 72-Hour Constant Rate Pumping Data for WPID 66090**

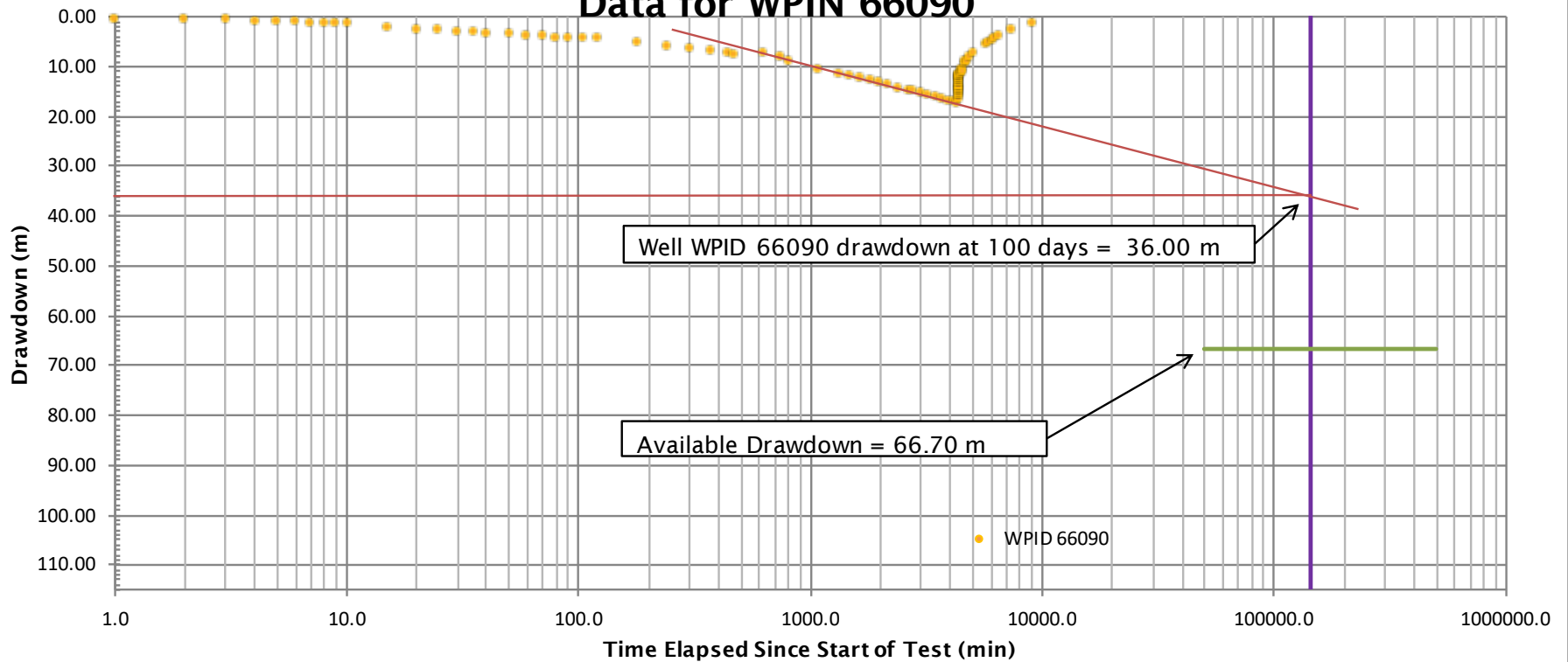


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 tony@interiorgeoscience.com

Project Number	2022-006
Client	Viktor Malyakin
Date Drawn:	18-Jul-23
Drawn By:	Tony Friesen

WPID	66090
Location	7500 McLennan
Date of Test	29-May-23
Contractor	IGI

### Figure B-2: Semi Log Plot of 72-Hour Constant Rate Pumping Test Data for WPIN 66090



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Project Number	2022-006	WPID	66090
Client	Viktor Malyakin	Location	7500 McLennan
Date Drawn:	18-Jul-23	Date of Test	29-May-23
Drawn By:	Tony Friesen	Contractor	IGI



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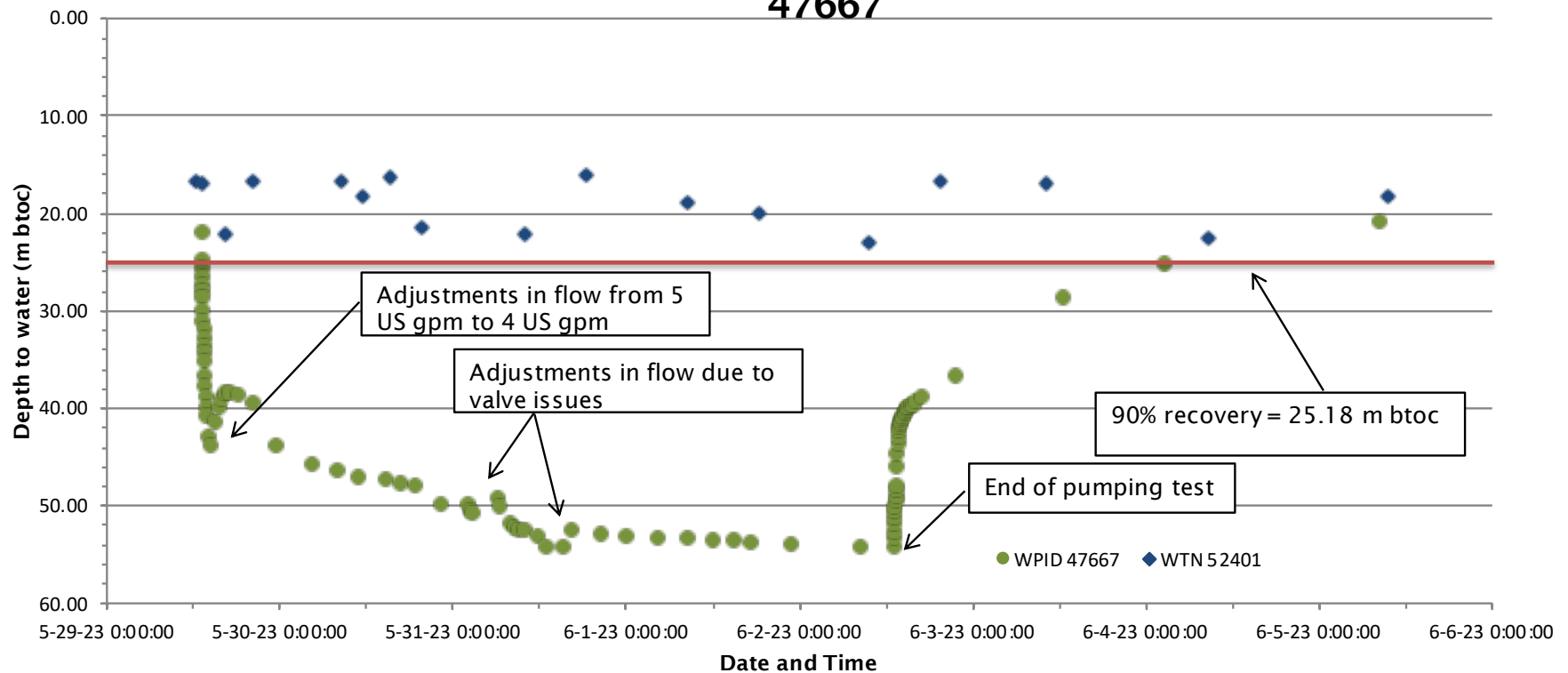
**Attachment C – WPID 47667: 96–Hour Constant Rate Pumping Test Data and Data Plots**



Project Number	2022-006		Test Type	Constant Rate Test
Client Name	Viktor Malyakin		Test Duration (hours)	96
Hydrogeologist	Tony Friesen		Well Depth (m)	68.58
Pumping Test Contractor	Interior Geoscience Inc		Static Water Level (mbtoc)	21.94
Location	7500 McLennan Rd		Pump Intake Depth (mbtoc)	65.00
Well Identification	WPID 47667		Pumping Rate (L/s)	0.25
			Test Start Time	5-29-23 1:20 PM
Clock Time	Time Elapsed (min)	Depth to Water (m btoC)	Drawdown (m)	Comments
5-29-23 13:20:00	0	21.94	0.00	Start of Test
5-29-23 13:21:00	1	24.76	2.82	
5-29-23 13:22:00	2	25.71	3.77	
5-29-23 13:23:00	3	26.52	4.58	
5-29-23 13:24:00	4	27.44	5.50	
5-29-23 13:25:00	5	28.12	6.18	
5-29-23 13:26:00	6	28.80	6.86	
5-29-23 13:28:00	8	29.95	8.01	
5-29-23 13:30:00	10	31.03	9.09	
5-29-23 13:32:00	12	32.01	10.07	
5-29-23 13:34:00	14	32.91	10.97	
5-29-23 13:32:00	12	33.81	11.87	
5-29-23 13:36:00	16	34.46	12.52	
5-29-23 13:38:00	18	35.15	13.21	
5-29-23 13:40:00	20	36.64	14.70	
5-29-23 13:45:00	25	37.88	15.94	
5-29-23 13:50:00	30	38.99	17.05	
5-29-23 13:55:00	35	39.97	18.03	
5-29-23 14:00:00	40	40.80	18.86	
5-29-23 14:22:00	62	42.99	21.05	
5-29-23 14:40:00	80	43.83	21.89	Changed to 4 US gpm
5-29-23 15:05:00	105	41.60	19.66	
5-29-23 15:35:00	135	39.97	18.03	
5-29-23 16:00:00	160	39.04	17.10	
5-29-23 16:30:00	190	38.43	16.49	
5-29-23 17:15:00	235	38.44	16.50	
5-29-23 18:25:00	305	38.61	16.67	
5-29-23 20:30:00	430	39.61	17.67	
5-29-23 23:33:00	613	43.80	21.86	
5-30-23 4:30:00	910	45.80	23.86	
5-30-23 8:00:00	1120	46.51	24.57	
5-30-23 11:00:00	1300	47.07	25.13	
5-30-23 14:40:00	1520	47.38	25.44	
5-30-23 16:45:00	1645	47.70	25.76	
5-30-23 19:00:00	1780	47.90	25.96	
5-30-23 22:20:00	1980	49.99	28.05	low by .025 Usgpm adjusted up
5-31-23 2:20:00	2220	50.04	28.10	low by 0.3 US gpm
5-31-23 2:33:00	2233	50.62	28.68	4 Usgpm
5-31-23 2:40:00	2240	50.79	28.85	
5-31-23 6:10:00	2450	49.40	27.46	Flow down 0.5 Usgpm
5-31-23 6:40:00	2480	50.25	28.31	
5-31-23 8:10:00	2570	51.90	29.96	
5-31-23 8:45:00	2605	52.37	30.43	
5-31-23 9:20:00	2640	52.60	30.66	
5-31-23 10:00:00	2680	52.63	30.69	4 USgpm
5-31-23 12:00:00	2800	53.10	31.16	
5-31-23 13:00:00	2860	54.20	32.26	4.25
5-31-23 15:30:00	3010	54.30	32.36	
5-31-23 16:30:00	3070	52.46	30.52	
5-31-23 20:30:00	3310	52.97	31.03	
6-1-23 0:15:00	3535	53.19	31.25	
6-1-23 4:30:00	3790	53.36	31.42	
6-1-23 8:30:00	4030	53.45	31.51	
6-1-23 12:00:00	4240	53.61	31.67	
6-1-23 15:00:00	4420	53.69	31.75	
6-1-23 17:30:00	4570	53.80	31.86	
6-1-23 23:05:00	4905	54.04	32.10	
6-2-23 8:40:00	5480	54.35	32.41	
6-2-23 13:20:00	5760	54.36	32.42	End of Pumping Test
6-2-23 13:21:00	5761	53.44	31.50	
6-2-23 13:22:00	5762	52.68	30.74	
6-2-23 13:23:00	5763	52.00	30.06	
6-2-23 13:24:00	5764	51.28	29.34	
6-2-23 13:25:00	5765	50.68	28.74	
6-2-23 13:26:00	5766	50.06	28.12	
6-2-23 13:27:00	5767	49.52	27.58	
6-2-23 13:28:00	5768	49.02	27.08	
6-2-23 13:29:00	5769	48.52	26.58	
6-2-23 13:30:00	5770	48.04	26.10	
6-2-23 13:35:00	5775	46.14	24.2	
6-2-23 13:40:00	5780	44.71	22.77	
6-2-23 13:45:00	5785	43.7	21.76	
6-2-23 13:50:00	5790	42.98	21.04	
6-2-23 13:55:00	5795	42.44	20.5	
6-2-23 14:00:00	5800	42.03	20.09	
6-2-23 14:05:00	5805	41.71	19.77	
6-2-23 14:10:00	5810	41.45	19.51	
6-2-23 14:15:00	5815	41.24	19.3	
6-2-23 14:20:00	5820	41.07	19.13	

Project Number	2022-006		Test Type	Constant Rate Test
Client Name	Viktor Malyakin		Test Duration (hours)	96
Hydrogeologist	Tony Friesen		Well Depth (m)	68.58
Pumping Test Contractor	Interior Geoscience Inc		Static Water Level (mbtoc)	21.94
Location	7500 McLennan Rd		Pump Intake Depth (mbtoc)	65.00
Well Identification	WPID 47667		Pumping Rate (L/s)	0.25
			Test Start Time	5-29-23 1:20 PM
Clock Time	Time Elapsed (min)	Depth to Water (m btoc)	Drawdown (m)	Comments
6-2-23 14:30:00	5830	40.77	18.83	
6-2-23 14:40:00	5840	40.54	18.6	
6-2-23 14:50:00	5850	40.35	18.41	
6-2-23 15:00:00	5860	40.19	18.25	
6-2-23 15:10:00	5870	40.05	18.11	
6-2-23 15:20:00	5880	39.92	17.98	
6-2-23 15:40:00	5900	39.67	17.73	
6-2-23 16:00:00	5920	39.74	17.8	
6-2-23 16:20:00	5940	39.29	17.35	
6-2-23 17:00:00	5980	38.93	16.99	
6-2-23 21:45:00	6265	36.73	14.79	
6-3-23 12:50:00	7170	28.63	6.69	
6-4-23 2:40:00	8000	25.2	3.26	
6-5-23 8:30:00	9790	20.9	-1.04	

**Figure C-1: Plot of 96-Hour Constant Rate Pumping Data for WPID 47667**

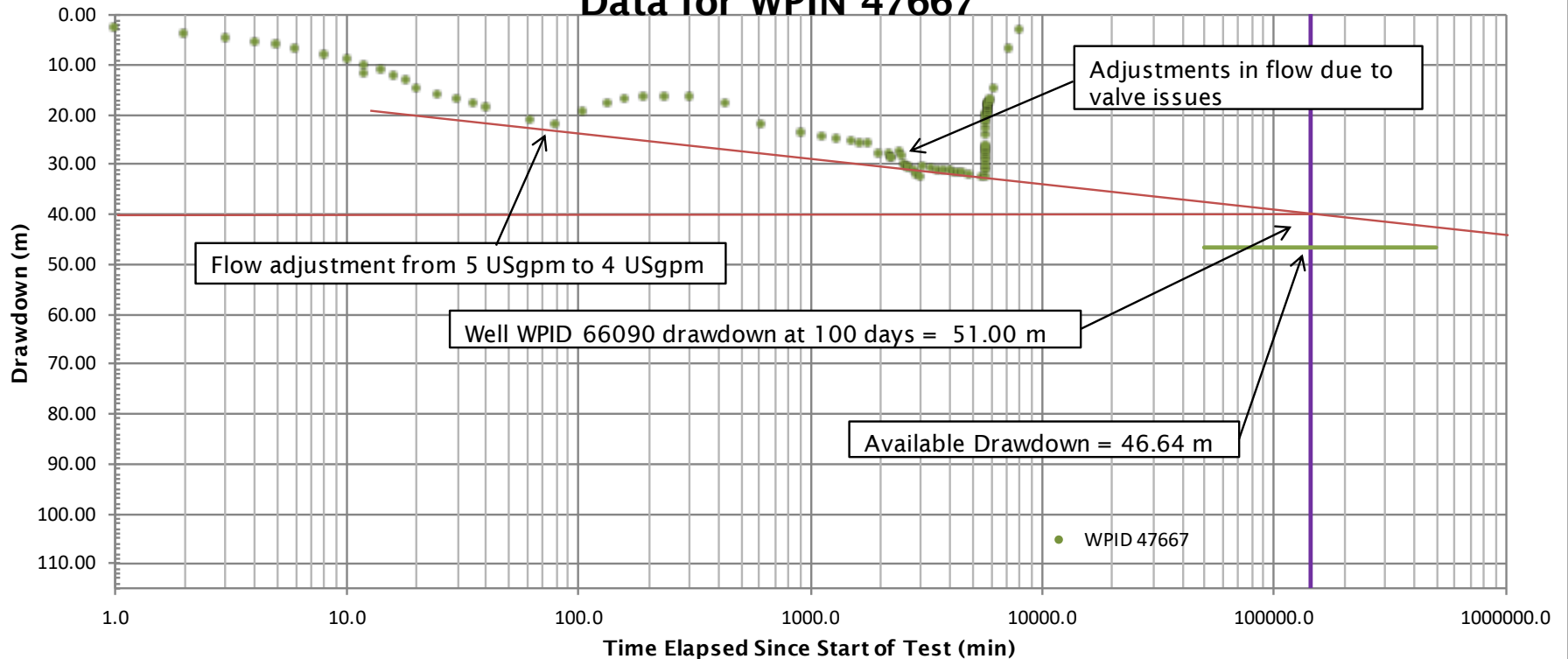


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tony@interiorgeoscience.com

Project Number	2022-006
Client	Viktor Malyakin
Date Drawn:	18-Jul-23
Drawn By:	Tony Friesen

WPID	47667
Location	7500 McLennan
Date of Test	29-May-23
Contractor	IGI

**Figure C-2: Semi Log Plot of 96-Hour Constant Rate Pumping Test Data for WPIN 47667**



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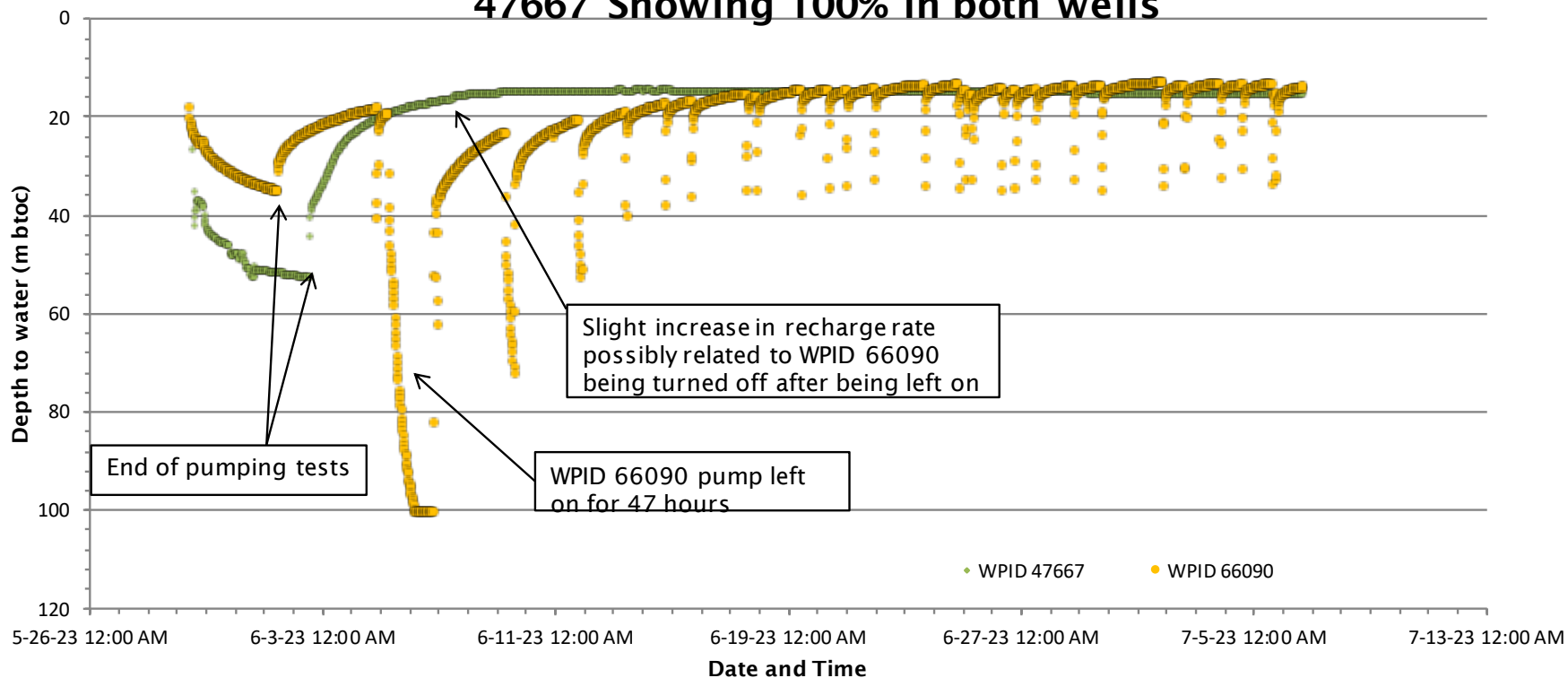
Project Number	2022-006	WPID	47667
Client	Viktor Malyakin	Location	7500 McLennan
Date Drawn:	18-Jul-23	Date of Test	29-May-23
Drawn By:	Tony Friesen	Contractor	IGI



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**Attachment D – Long-Term Monitoring data from WPID 66090 and WPID 47667**

**Figure D-1: Long-Term Monitoring Data for WPID 66090 and WPID 47667 Showing 100% in both wells**



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Project Number	2022-006
Client	Viktor Malyakin
Date Drawn:	18-Jul-23
Drawn By:	Tony Friesen

WPID	66090/47667
Location	7500 McLennan
Date of Test	29-May-23
Contractor	IGI



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**Attachment E – Hydrogeological Assessment of Groundwater Supply in support of two lot subdivision application, at 7500 McLennan Rd, Electoral Area ‘C’ in the RDNO.**



Interior Geoscience Inc  
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April 4, 2022  
Job Number 2022-006  
Viktor Malyakin (Owner)

7500 McLennan Rd.  
Vernon BC.  
V1B 3S7

**Re: HYDROGEOLOGICAL ASSESSMENT OF GROUNDWATER SUPPLY (WELL  
PLATE ID NUMBER 66090) IN SUPPORT OF SUBDIVISION APPLICATION, AT  
7500 MCLENNAN RD, ELECTORAL AREA C, IN THE REGIONAL DISTRICT OF  
THE NORTH OKAKAGAN.**

Dear Viktor,

Interior Geoscience Inc. (IGI) has completed a hydrogeological assessment of one well (WPID 660690) located at 7500 McLennan Rd, near Vernon, BC in Electoral Area "C" of the Regional District of North Okanagan (RDNO). Legal description: Lot 1, Sec 25, Twp 8, ODYD, Plan 2558, Except Plan 37038 and Plan EPP74629. General Location of Proposed subdivision shown in Attachment A.

This report details the findings of our assessment.

## **1 BACKGROUND AND OBJECTIVES**

We understand that you intent to apply to have your 24.21 ha property (Subject Property) subdivided into two lots. Each lot will have its own water supply well. One of the lots will be serviced by WPID 47667, and the remainder lot will be serviced by well WPID 66090. The driller's well logs are provided in Attachment B.

To complete the subdivision application, the RDNO requires that a hydrogeological assessment be completed and a report (this report) be prepared by a Qualified Professional (QP) and submitted to the Regional District. The preparation of this report was completed by a Professional Hydrogeologist registered with Engineers and Geoscientists BC. The hydrogeological assessment is intended to satisfy the applicable sections of the RDNO Subdivision Servicing Bylaw No. 2600, 2013 (the Bylaw) regarding quantity and year-round availability of potable groundwater (RDNO 2013). Section 406-2 of the Bylaw, which deals with groundwater supply and water quality, requires the following conditions:

- A site plan (Attachment C) must be provided indicating the location of a constructed well which must be tested by a well yield test conducted by a Qualified Well Driller,





Qualified Well Pump Installer or a person working under the direct supervision of a Qualified Well Driller, a Qualified Well Pump Installer, or Qualified Professional.

- Groundwater wells that have a reported well yield of less than 14 liter/min (3.7 US gpm) must be tested using a pumping test to show that the well is capable of supplying 4.6 litres/minute (1.2 US gpm) or at least 6,550 litres/day on a year-round basis. The year-round availability of groundwater must consider interference effects on or from nearby wells, and seasonal fluctuations in water level.
- The water must be potable (i.e., safe for human consumption). Water quality samples are to be collected and evaluated against the Canadian Guidelines for Drinking Water Quality (GCDWQ).
- Proof of groundwater quantity and availability must be submitted to the approving officer (RDNO) prior to subdivision approval, in the form of a report by a hydrogeologist or professional engineer.

## 2 SCOPE OF WORK

To meet the requirements of the Bylaw, IGI completed the hydrogeological assessment, which included the following scope of work:

- **Proof of Water Quantity:** reviewed available geological information for the local area, oversaw a pumping test on WPID 66090 and results were interpreted to estimate the sustainable yield on a year-round basis including assessment of interference effects and seasonal fluctuations in water levels.
- **Proof of water quality:** collected water samples from WPID 66090 and evaluated the water quality results against GCDWQ and assessed water treatment options.
- **Report:** Prepared a report (this document) outlining the methods and results of the hydrogeological assessment to be submitted to RDNO.

## 3 METHODS

### 3.1 PROOF OF WATER QUANTITY

IGI first reviewed available climate, hydrogeology, geology, well and aquifer information for the local area to get an understanding of the existing groundwater use in the area and aquifer properties.

#### 3.1.1 Pumping Test

Following the desktop study, on March 16-22, 2022 IGI designed and carried out two constant rate pumping test on WPID 66090. Based on the drillers yield estimate the first test was a 24-hour constant rate test completed at a rate of 9.46 l/minute (2.5 US gpm). At your



request, a second 8.5 hour constant rate was completed at 28.39 l/minute (7.5 US gpm) to help with designing the water distribution system for the home. Discharge rates were controlled with a ball-valve and measured using a calibrated bucket and stop watch. Groundwater was discharged approximately 30 m downgradient using 1-inch garden hose. Groundwater levels were monitored with an electronic well sounder and a water level transducer during pumping and after pump shut-off (recovery) at schedules set by IGI.

The data from both of the pumping tests were interpreted following the methods outlined in the Guidelines for Evaluation Long-Term Well Capacity for a or a Certificate of Public Convenience and Necessity (CPCN) (MOE 2007). This method extrapolates pumping water levels to 100-days and calculates a sustainable pumping rate based on this extrapolated drawdown multiplied by available drawdown. The sustainable pumping rate is then reduced by a safety factor, often 30%, which is reserved for: (1) housing the submersible pump, (2) seasonal and drought water levels that may occur, and (3) accommodating any future drop in well efficiency during operation.

Because the test was completed in March, when groundwater levels are typically higher than in late summer and winter, we also evaluated yearly fluctuations in groundwater levels using data from the nearby Ministry of Environment Observation Well 311, which is approximately 2 km south of the WPID 66090. The observation well has a depth of 94 m bgs and is completed in the same aquifer as the subject well. The groundwater levels in Observation Well 172 indicate an average annual fluxuation of close to 0.5 m and has been incorporated into this analysis.

### **3.1.2 Well Recovery Test**

Water level recovery was monitored after each pumping test every 5 minutes for a minimum of 24-hours after the end of each test. Recovery data was analyzed by a Qualified Professional generally following industry standard practice to determine if recovery was adequate to support the minimum requirement of 6550 L/day.

### **3.1.3 Well Interference**

One way to determine if the proposed water use would have potential adverse effects on neighbouring wells is to monitor the neighbouring wells that are completed nearby the pumping well during the pumping test. A search of the ministry database indicates that there are 21 wells within 0.5 km of the subject well. The nearest wells (WTN 62362 and WTN 49632), are located 98 m northeast and 105 m east of subject well, respectively. An attempt was made to monitor both of these wells, however it was not possible due to access issues and the existing artesian conditions of each of the wells (i.e. the well caps were welded shut to close in head pressure). In lue of this, the secondary well located on the subject property was used as a monitoring well and was recorded every 5 minutes for the duration of both pumping tests, using a programable water level transducer.



### 3.2 WATER QUALITY

To meet the water quality requirements of the Bylaw, water quality samples were collected during the last 30 minutes of the pumping test as per the British Columbia Field Sampling Manual (MOE 2003). Samples were submitted to CARO Analytical Services (CARO) in Kelowna, BC under Chain of Custody procedures.

RDNO Bylaw 2600 states that the water must be “potable water,” which is defined in the Bylaw as “water that meets the microbiological parameters and the health-based chemical and physical parameters of the Guidelines for Canadian Drinking Water Quality” for a select list of parameters. Based on the Bylaw requirements and IGI’s recommendations, water samples were analyzed for the following parameters:

- alkalinity
- chloride
- colour
- conductivity
- cyanide (total)
- fluoride
- hardness
- Langelier index
- pH
- nitrate
- nitrite
- sulphate
- total dissolved solids
- turbidity
- *Escherichia coli* (*E. coli*)
- total coliforms
- metals (total)

The results were compared with the GCDWQ (Health Canada 2020). Guideline levels specified in the GCDWQ are designated as a maximum acceptable concentration (MAC), an aesthetic objective (AO), or an operational guidance (OG). The MAC guidelines are health-risk-based and determined based on the known health effects associated with the substance. The AO guidelines apply to those variables that adversely affect taste or intended, typical water uses (e.g., staining of laundry) but do not pose a health hazard. The OG guidelines apply to parameters that may interfere with water treatment processes.

## 4 RESULTS

### 4.1 SITE PHYSIOGRAPHY

The subject site is located the approximately 5 km north of the City of Vernon on the east side of the valley over looking Swan Lake to the west. The property itself is sloped east to west with elevations ranging from 600 m asl on the west boundary to 655 masl at the most eastern point. The site comprises some cleared grassland areas situated between mature forested areas. The land surrounding the subject parcel is primary acreage estates with similar vegetation.

Climate normal data are available for 1981-2010 from the North Vernon climate station (Climate ID 1128583), located at 50° 20'39.600" N and -119° 16' 17.000" W, at an elevation of 538 m asl (Table 1). According to the climate normal data, daily average temperatures range from -2.8 °C in January to 21.0 °C in July, with an average annual temperature of 8.8°C. The average annual precipitation is 487.0 mm, with the majority occurring as snowfall from October to April (142.1 cm) and rainfall year-round (344.9 mm) (ECCC 2022).



Table 1:  
 Summary of Climate data from Climate Station ID 11258583

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
Temperature													Yearly Average
Monthly Ave (C°)	-2.8	-0.2	4.2	9.4	13.9	17.4	21.0	20.5	15.3	7.9	1.8	-2.2	8.8
Precipitation													Yearly Total
Rainfall (mm)	11.6	11.7	17.0	27.2	46.3	49.6	35.4	31.9	32.7	40.7	31.1	9.7	344.9
Snowfall (cm)	40.5	13.5	11.7	1.8	0.0	0.0	0.0	0.0	0.0	0.9	26.5	47.3	142.1
Total (mm)	52.2	25.2	28.7	29.0	46.3	49.6	35.4	31.9	32.7	41.5	57.5	57.0	487.0

## 4.2 GEOLOGY

The subject well on the property is completed in a bedrock formation that is defined as an metamorphic rock within the Silvercreek formation from the proterozoic to Paleozoic period. The formation is described as an undivided quartzfeldpathic gneiss, biotite-quartz schist, (ENV 2022). The overburden at the location of the water supply wells is not mapped; however, available well logs in the area indicate about 10-12 metres of till material above bedrock (ENV 2022).

## 4.3 AQUIFER AND WELLS

There are two wells on the property. WPID 47667 which is located at the southwest boundary of the parcel, and WPID 66090 (pumping well) which is located at the Southeast corner of the subject parcel of land (Attachment 3). A summary of both wells is presented in table 2 below. Both wells are situated in a mapped aquifer 351, which is a bedrock aquifer, 21.8 km<sup>2</sup> in area with low demand, low vulnerability and low productivity (ENV 2022). Reported well yields range from 0.27 L/s to 0.07 L/s with an average yield of 0.1L/s (compared to the Bylaw rate of 0.076 L/s). The average yield for wells within 500 m of the subject well is 1.17 L/s (15 times the bylaw rate). There are no currently records of conflicts between users and the aquifer is described as being not likely hydraulically connected to the surface water (ENV 2022).



Table 2:  
Summary of wells located on the Subject Parcel

Well Tag Number	Well Plate ID Number	Finished Well Depth (m)	Static Water Level (m btoc) <sup>1</sup>	Depth to Bedrock	Estimated Well Yield L/sec (US gpm)
125513	66090	152.0	4.36	10.67	0.16 (2.5)
114421	47667	67.10	23.16	5.00	0.315 (5)

There are 21 mapped wells located within 500 m of WPID 66090 (Attachment 4). The nearest wells (WTN 62362 and WTN 49632), are located 98 m northeast and 105 m east of subject well, respectively. An attempt was made to monitor both of these wells, however it was not possible due to access issues and the existing artesian conditions of each of the wells (i.e. the well caps were welded shut to close in head pressure). The artesian conditions at each of these well, and there relative elevation to the subject well (higher) suggests that they are completed into a different fracture network.

In lue of this, the secondary well located on the subject property (WPID 47667) was recorded every 5 minutes for the duration of both pumping tests, using a programable water level transducer.

#### 4.4 PUMPING TEST RESULTS

The first constant rate pumping test was completed at a pumping rate of 0.16 L/s (2.5 US gpm). This was based on the drillers well yield estimate. The well was pumped for 24 hours. Table 3 outlines the specifications and results of the pumping test on WPID 66090. Raw pumping test data, figures showing water levels in pumping wells and observation wells, and drawdown data extrapolated to 100 days are provided in Attachment E. Based on the CPCN method the sustainable yield was calculated to be an estimated 0.21 L/s (3.0 US gpm). To account for th seasonal variability in the water levels and well interference a 30% safety factor as per the CPCN guidelines. After the 30% safety factor was applied, the sustainable pumping rated calculated is 0.14 L/s (2.3 US gpm). Or 12,418 L/day (1.9 times the bylaw requirement).

The second constant rate test was complete at your request to help determine the optimal design for the water supply system for their home and landscaping. The second test was completed at a rate of 0.47 L/sec (7.5 US gpm) for a total of 8.5 hours. Raw pumping test data, figures showing water levels in pumping wells and observation wells, and drawdown data extrapolated to 100 days are provided in Attachment F. Based on the CPCN method the sustainable yield was calculated to be an estimated 0.23 L/s (4.0 US gpm). To account for th seasonal variability in the water levels and well interference a 30% safety factor as per the CPCN guidelines. After the 30% safety factor was applied, the sustainable pumping rated calculated is 0.16 L/s (2.5 US gpm). Or 13,827 L/day (2.1 times the bylaw requirement).



Table 3:  
 WTN 66090 long-term CPCN sustainable yield calculations for both constant rate tests.

	WPID 66090	WPID 66090
<b>PUMPING SPECIFICATIONS</b>		
Pumping rate (L/s)	0.16	0.47
Test duration (hours)	24	8.5
Depth of pump intake (mbtoc)	146.00	146.00
Static water level (mbtoc)	10.96	14.33
Depth to top of primary fracture (mbtoc)	85.30	85.30
Depth of well (mbgl)	152.00	152.00
<b>RECOVERY</b>		
Recovery after 24 hours (%)	67	89
<b>RECOVERY</b>		
Pumping rate (L/s)	0.16	0.47
Available drawdown (m)	66.70	66.70
Drawdown at 100 days (m)	51	138
<b>CPCN OUTPUTS</b>		
100 day specific capacity (L/s/m)	0.003	0.003
Sustainable pumping rate (L/s)	0.21	0.23
Sustainable pumping rate with BC safety factor of 30% (L/s)	0.14	0.16
Sustainable pumping rate (L/d)	17,741	19,752
Sustainable pumping rate with BC safety factor of 30% (L/d)	12,418	13,827
Sustainable pumping rate (USGPM)	3	4
Sustainable pumping rate with BC safety factor of 30% (USGPM)	2.3	2.5

Notes:

1. m btoc = metres below top of casing.
2. The available drawdown is the difference between static water level and depth to the dominant water bearing fracture (85.3 m btoc).
3. The drawdown at 100 days (100-day drawdown) is the extrapolated drawdown in the pumping well.
4. A 30% safety factor was applied to the calculated sustainable pumping rate, as per the CPCN Guideline. This is intended to account for seasonal variability and future wells drilled in the area.



#### **4.5 WELL RECOVERY**

A recovery test was completed on the Subject Well after both tests. After the first pumping test, the water levels in the Subject Well were monitored for 48 hours. After 24 hours, the well recovered 67% and after 48 hours the well had recovered to 80% of its original static. It should be noted that twice the bylaw requirement was pumped out over the course of the 24-hours. After the second test the water levels in the Subject Well were monitored for 34 hours. After the second test, the Subject Well reached 89% recovery within 24 hours. The reason for the difference between the two recovery test results is likely due to the fact that the static water level observed prior to the first pumping test is representative of the Subject Well sitting dormant since it was drilled five months earlier. For this assessment, it is more practical to use the lower static water observed prior to the second pumping test since this is likely more representative of the 'operational' static water level once the well is in use. Wells with 85% to 89% recovery are still considered acceptable because of the dual porosity nature of bedrock aquifers; during recovery, the larger, water-bearing fractures account for most of the recovery, whereas the small-scale matrix of the aquifer can take slightly longer to recover (Kruseman and de Ridder 1992).

#### **4.6 WELL INTERFERENCE**

The subject wells on the Subject Property are located 300 m apart from each other and groundwater levels in both were monitored during each pumping test. No change in groundwater level was observed in the monitoring well during either of the pumping tests. This indicates that the water bearing fractures in each of the wells are either not connected or both the radius of influence for the duration of the pumping test, and as a result, the sustainable pumping rate is inclusive of this factor.

#### **4.7 WATER QUALITY ASSESSMENT**

Water quality results were compared to GCDWQ described as either "maximum acceptable concentrations" (MAC), "aesthetic objectives" (AO) or operational guidance value (OG). The MAC guidelines are health-based and are determined based on the known health effects associated with the substance. The AO guidelines apply to those variables that affect taste or laundry (e.g. by staining), but do not pose a health hazard. The OG guidelines are established based on operational considerations regarding treatment requirements. The laboratory results are included as Attachment G.

There were no exceedances of the MAC indicating the water is potable. However, total dissolved solids (TDS) concentrations exceeded the AO guideline and Turbidity exceeds the operations guideline (Table 4) (Health Canada 2020).



Table 4:  
Concentrations of parameters that exceeded the GCDWQ in WTN 66090

Analyte	Guideline Value	Guideline Type	WTN 66090
Total Dissolved Solids	610	AO	<500
Turbidity	12.4	OG	<1

Elevated TDS concentrations can be naturally occurring, but can affect taste and cause excessive scaling of water pipes, boilers, and appliances (Health Canada 1991).

The turbidity was high in all nine wells and exceed the GCDWQ operational guidance of 1.0 NTU. In some cases, turbidity is an indication of natural-occurring organic and/or inorganic particles in the water (e.g., metals, organics, and/or microorganisms). It may also be the case that much of the turbidity is a result of residual fines from the drilling process still present in the wells, and these may clean up with additional pumping when the permanent pump is installed. Particles can harbour microorganisms and shield them from disinfection. For operational efficiencies, Health Canada suggests turbidity should be below 1.0 NTU in groundwater but that a responsible party may choose to allow turbidity increases for individual systems, in light of a risk assessment that takes into account local knowledge of the system's capabilities and performance (Health Canada 2012). Turbidity does not have a maximum acceptable concentration (health-based) guideline.

Helpful guidance documents for the treatment of the exceeding parameters are available on Health Canada's website, as follows:

**TDS** (Health Canada 1991): <https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-total-dissolved-solids-tds.html>.

**Turbidity** (Health Canada 2012): <https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-turbidity.html>.

It should be noted that although not in exceedance of the MAC, fluoride concentrations were measured to be equal to the MAC of 1.5 mg/L. Helpful guidance documents for the treatment of flouride are available on Health Canada's website, as follows:

**Fluoride** (Health Canada 2010): <https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-fluoride.html>.





## 5 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this hydrogeological assessment, IGI provides the following conclusions:

- The sustainable well yield calculated for Well WTN 66090 based on the 24 hours pumping test (12,418 L/day), meets the Bylaw minimum requirement of 6,550 L/day.
- The recovery in the well was good. Data from the second test indicated 89% recovery within 24 hours after pumping out well over two times the bylaw requirement within 8.5 hours.
- Seasonal fluctuation in water levels and drawdown in neighbouring wells (well interference) was considered when calculating the sustainable yield for both wells and the results indicate that the proposed well use will not interfere with existing users in the area.
- Water quality results indicate that there are no exceedances of the MAC guidelines. However the concentrations of fluoride are at the MAC of 1.5 mg/L.
- Water quality results indicate that the water quality does exceed the AO for TDS and the OG for Turbidity.

Based on the results of this hydrogeological assessment, IGI provides the following recommendations and treatment options:

- Due to the elevated turbidity and TDS in the well, we advise pre-filtering the water using a point of enter system. Once the well have been in use for some time, these parameters can be re-assesst to determine if this is still nessecary.
- Once the well is in operation, complete a water quality test on the well a minimum of once per year to ensure that there is no significant change to the water quality that could result in a health hazard.



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## 6 CLOSURE

This report was prepared for Victor Malyakin to provide a hydrogeological assessment of WPID 66090 in support of a proposed subdivision application at 7500 McLennan Road, in the Norht Okanagan Regional District.

The services provided by Interior Geoscience Inc. The preparation of this report was conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,

  
  
April 4, 2022  
Tony Friesen M.Sc., P.Geo  
Hydrogeologist

### Attachments:

- Attachment A – Figure showing general location of the Subject Parcel and Aquifer Boundaries.
- Attachment B – Drillers Logs for WPID 66090 and WPID 47667.
- Attachment C – Site Plan showing location of WPID 66090 and WPID 47667 and surrounding wells.
- Attachment D – Table Summarizing Wells information within 500 m of WPID 66090
- Attachment E – 24-hour pumping test data and Data Plots
- Attachment F – 8.5-hour pumping test data and Data Plots
- Attachment G – Laboratory reports



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**Attachment A:  
Figure Showing General Location of Subject Property and Aquifer Boundaries.**





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**Attachment B**  
**Drillers Well Logs for WPID 66090 and WPID 47667**



# Groundwater Wells and Aquifers

## Well Summary

Well Tag Number: 125513  
 Well Identification Plate Number: 66090  
 Owner Name: Viktor Malyakin  
 Intended Water Use: Private Domestic  
 Artesian Condition: No

Well Status: New  
 Well Class: Water Supply  
 Well Subclass: Not Applicable  
 Aquifer Number:

Observation Well Number:  
 Observation Well Status:  
 Environmental Monitoring System (EMS) ID:  
 Alternative specs submitted: No

## Licensing Information

Licensed Status: Unlicensed

Licence Number:

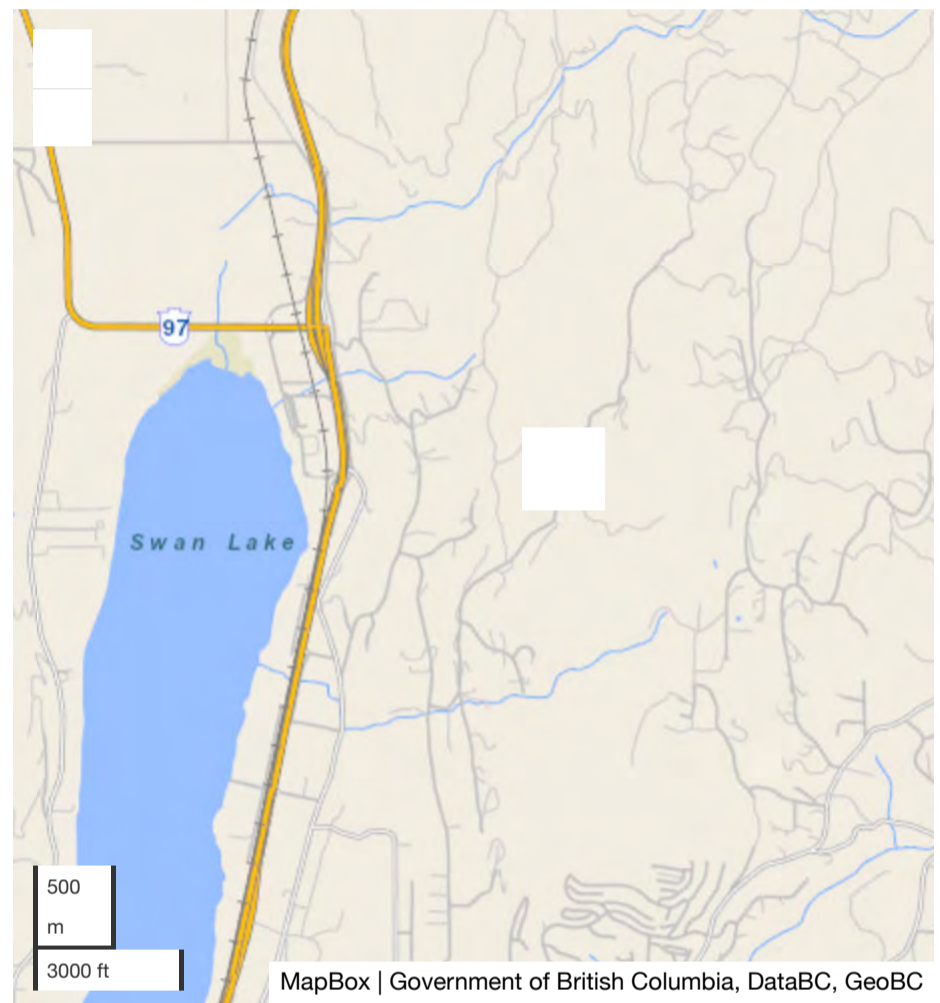
## Location Information

Street Address: 7500 McLennan Rd  
 Town/City: Vernon

Legal Description:

Lot	
Plan	
District Lot	
Block	
Section	
Township	
Range	
Land District	
Property Identification Description (PID)	

Description of Well Location:



Geographic Coordinates - North American Datum of 1983 (NAD 83)

Latitude: 50.33028

Longitude: -119.22389

UTM Easting: 341722

UTM Northing: 5577719

Zone: 11

Coordinate Acquisition Code: (10 m accuracy) Handheld GPS with accuracy of +/- 10 metres

## Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Construction report	2021-10-15	2021-10-22	Integrity Drilling Inc.	April 4th 2022 at 7:16 PM

## Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
2021-10-15	2021-10-22				

## Well Completion Data

**Total Depth Drilled:** 500 ft bgl  
**Finished Well Depth:** 500 ft bgl  
**Final Casing Stick Up:** 29 inches  
**Depth to Bedrock:** 34 feet bgl  
**Ground elevation:** 2099 feet

**Estimated Well Yield:** 2 USgpm  
**Well Cap:** vermine proof  
**Well Disinfected Status:** Disinfected  
**Drilling Method:** Air Rotary  
**Method of determining elevation:** GPS

**Static Water Level (BTOC):** 120 feet btoc  
**Artesian Flow:**  
**Artesian Pressure (head):**  
**Artesian Pressure (PSI):**  
**Orientation of Well:** VERTICAL

## Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0	34	til						
34	35	sasnd/gravel						
35	40	light grey bedrock						
40	77	light brn bedrock						
77	80	dark grey bedriock						
80	100	grey		Damp				
100	200	dark grey						1.2
200	220	dark grey						
220	240	dark grey and white		Wet				
240	300	grey						
300	400	grey and white						
400	500	grey and white						0.8

## Casing Details

From (ft bgl)	To (ft bgl)	Casing Type	Casing Material	Diameter (in)	Wall Thickness (in)	Drive Shoe
0	35	Surface casing	Steel	6		Installed

## Surface Seal and Backfill Details

**Surface Seal Material:** Bentonite clay  
**Surface Seal Installation Method:** Poured  
**Surface Seal Thickness:** 1 inches  
**Surface Seal Depth:** 15 feet

**Backfill Material Above Surface Seal:**  
**Backfill Depth:**

## Liner Details

**Liner Material:** PVC  
**Liner Diameter:** 5 inches  
**Liner from:** 10 (ft bgl)

**Liner Thickness:**  
**Liner to:** 500 (ft bgl)

### Liner perforations

From (ft bgl)	To (ft bgl)
170	175
270	275
370	375
470	475

## Screen Details

**Intake Method:**  
**Type:**  
**Material:**  
**Opening:**  
**Bottom:**

### Installed Screens

From (ft bgl)	To (ft bgl)	Diameter (in)	Assembly Type	Slot Size
There are no records to show				

## Well Development

**Developed by:** Air lifting

**Development Total Duration:** 3 hours

## Well Yield

---

**Estimation Method:** Air Lifting

**Static Water Level Before Test:** 120 ft (btoc)

**Hydrofracturing Performed:** Yes

**Estimation Rate:** 2 USgpm

**Drawdown:** 500 ft (btoc)

**Increase in Yield Due to Hydrofracturing:**

**Estimation Duration:** 2 hours

## Well Decommission Information

---

**Reason for Decommission:**

**Sealant Material:**

**Decommission Details:**

**Method of Decommission:**

**Backfill Material:**

## Comments

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No comments submitted

**Alternative Specs Submitted:** Yes

## Documents

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No additional documentation available for this well.

## Disclaimer

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The information provided should not be used as a basis for making financial or any other commitments. The Government of British Columbia accepts no liability for the accuracy, availability, suitability, reliability, usability, completeness or timeliness of the data or graphical depictions rendered from the data.



- Well Construction Report**  
 **Well Closure Report**  
 **Well Alteration Report**

Dan-Gare  
 Stamp company name/address/  
 phone/fax/e-mail here, if desired.

Ministry Well ID Plate Number: 47667  
 Ministry Well Tag Number: 114421  
 Confirmation/alternative specs. attached  
 Original well construction report attached

Red lettering indicates minimum mandatory information.

See reverse for notes & definitions of abbreviations.

**Owner name:** Dacron Enterprises Ltd.

**Mailing address:** 7566 McLennan Rd. Town Vernon Prov. B.C. Postal Code \_\_\_\_\_

**Well Location: Address:** Street no. 7566 Street name McLennan Rd. Town Vernon

**Legal description:** Lot 4 Plan \_\_\_\_\_ D.L. \_\_\_\_\_ Block \_\_\_\_\_ Sec. \_\_\_\_\_ Twp. \_\_\_\_\_ Rg. \_\_\_\_\_ Land District \_\_\_\_\_

**PID:** \_\_\_\_\_  **Description of well location (attach sketch, if nec.):** lot 4 of proposed subdivision of 7566 McLennan Rd.

**NAD 83: Zone:** 11U  **UTM Northing:** 6341434 m  **Latitude (see note 3):** \_\_\_\_\_  
 **UTM Easting:** 5577576 m  **Longitude:** \_\_\_\_\_

**Method of drilling:**  air rotary  cable tool  mud rotary  auger  driving  jetting  excavating  other (specify): \_\_\_\_\_

**Orientation of well:**  vertical  horizontal Ground elevation: 1964 ft (asl) Method (see note 4): GPS

**Class of well (see note 5):** Water Supply **Sub-class of well:** Domestic

Water supply wells: indicate intended water use:  private domestic  water supply system  irrigation  commercial or industrial  other (specify): \_\_\_\_\_

**Lithologic description (see notes 7-14) or closure description (see notes 15 and 16)**

From ft (bgl)	To ft (bgl)	Relative Hardness	Colour	Material Description (Use recommended terms on reverse. List in order of decreasing amount, if applicable)	Water-bearing Estimated Flow (USgpm)	Observations (e.g., fractured, weathered, well sorted, silty wash), closure details
<u>0</u>	<u>5</u>		<u>Brown</u>	<u>Clay &amp; Rocks</u>		
<u>5</u>	<u>220</u>		<u>White</u>	<u>Bedrock</u>		
<u>180</u>	<u>220</u>			<u>Bedrock</u>	<u>5</u>	

Recommended Pump Setting 200'

**Casing details**

From ft (bgl)	To ft (bgl)	Dia in	Casing Material / Open Hole	Wall Thickness in	Drive Shoe
<u>12</u>	<u>16</u>	<u>6</u>	<u>Steel</u>	<u>.219</u>	<u>Yes</u>

Surface seal: Type:  Bentonite  Depth:  16  ft

Method of installation:  Poured  Pumped Thickness:  1  in

Backfill: Type: \_\_\_\_\_ Depth: \_\_\_\_\_ ft

Liner:  PVC  Other (specify): \_\_\_\_\_

Diameter:  4  in Thickness:  .250  in

From:  6  ft (bgl) To:  220  ft (bgl) Perforated: From:  180  ft (bgl) To:  220  ft (bgl)

**Developed by:**

Air lifting  Surging  Jetting  Pumping  Bailing  
 Other (specify): \_\_\_\_\_ Total duration: \_\_\_\_\_ hrs

Notes: \_\_\_\_\_

**Well yield estimated by:**

Pumping  Air lifting  Bailing  Other (specify): \_\_\_\_\_

Rate:  5  USgpm Duration: \_\_\_\_\_ hrs

SWL before test: \_\_\_\_\_ ft (btoc) Pumping water level: \_\_\_\_\_ ft (btoc)

**Obvious water quality characteristics:**

Fresh  Salty  Clear  Cloudy  Sediment  Gas

Colour/odour:  No  Water sample collected:

**Well driller (print clearly):**

**Name (first, last) (see note 19):**  Logan Flett

Registration no. (see note 20):  08042501

Consultant (if applicable; name and company): \_\_\_\_\_

**DECLARATION:** Well construction, well alteration or well closure, as the case may be, has been done in accordance with the requirements in the Water Act and the Ground Water Protection Regulation.

**Signature of Driller Responsible**

Logan Flett

**PLEASE NOTE:** The information recorded in this well report describes the works and hydrogeologic conditions at the time of construction, alteration or closure, as the case may be. Well yield, well performance and water quality are not guaranteed as they are influenced by a number of factors, including natural variability, human activities and condition of the works, which may change over time.

**Screen details**

From ft (bgl)	To ft (bgl)	Dia in	Type (see note 18)	Slot Size

Intake:  Screen  Open bottom  Uncased hole

Screen type:  Telescope  Pipe size

Screen material:  Stainless steel  Plastic  Other (specify): \_\_\_\_\_

Screen opening:  Continuous slot  Slotted  Perforated pipe

Screen bottom:  Bail  Plug  Plate  Other (specify): \_\_\_\_\_

Filter pack: From: \_\_\_\_\_ ft To: \_\_\_\_\_ ft Thickness: \_\_\_\_\_ in

Type and size of material: \_\_\_\_\_

**Final well completion data:**

Total depth drilled:  220  ft Finished well depth:  220  ft (bgl)

Final stick up:  24  in Depth to bedrock:  5  ft (bgl)

SWL:  76  ft (btoc) Estimated well yield:  5  USgpm

Artesian flow: \_\_\_\_\_ USgpm, or Artesian pressure: \_\_\_\_\_ ft

Type of well cap:  Aluminum  Well disinfected:  Yes  No

Where well ID plate is attached:  Stick-up

**Well closure information:**

Reason for closure: \_\_\_\_\_

Method of closure:  Poured  Pumped

Sealant material: \_\_\_\_\_ Backfill material: \_\_\_\_\_

Details of closure (see note 17): \_\_\_\_\_

**Date of work (YYYY/MM/DD):**

**Started:**  2017/08/28  **Completed:**  2017/09/29

Comments: \_\_\_\_\_

## Well Completion Data

**Total Depth Drilled:** 500 ft bgl  
**Finished Well Depth:** 500 ft bgl  
**Final Casing Stick Up:** 29 inches  
**Depth to Bedrock:** 34 feet bgl  
**Ground elevation:** 2099 feet

**Estimated Well Yield:** 2 USgpm  
**Well Cap:** vermine proof  
**Well Disinfected Status:** Disinfected  
**Drilling Method:** Air Rotary  
**Method of determining elevation:** GPS

**Static Water Level (BTOC):** 120 feet btoc  
**Artesian Flow:**  
**Artesian Pressure (head):**  
**Artesian Pressure (PSI):**  
**Orientation of Well:** VERTICAL

## Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0	34	til						
34	35	sasnd/gravel						
35	40	light grey bedrock						
40	77	light brn bedrock						
77	80	dark grey bedriock						
80	100	grey		Damp				
100	200	dark grey						1.2
200	220	dark grey						
220	240	dark grey and white		Wet				
240	300	grey						
300	400	grey and white						
400	500	grey and white						0.8

## Casing Details

From (ft bgl)	To (ft bgl)	Casing Type	Casing Material	Diameter (in)	Wall Thickness (in)	Drive Shoe
0	35	Surface casing	Steel	6		Installed

## Surface Seal and Backfill Details

**Surface Seal Material:** Bentonite clay  
**Surface Seal Installation Method:** Poured  
**Surface Seal Thickness:** 1 inches  
**Surface Seal Depth:** 15 feet

**Backfill Material Above Surface Seal:**  
**Backfill Depth:**

## Liner Details

**Liner Material:** PVC  
**Liner Diameter:** 5 inches  
**Liner from:** 10 (ft bgl)

**Liner Thickness:**  
**Liner to:** 500 (ft bgl)

### Liner perforations

From (ft bgl)	To (ft bgl)
170	175
270	275
370	375
470	475

## Screen Details

**Intake Method:**  
**Type:**  
**Material:**  
**Opening:**  
**Bottom:**

### Installed Screens

From (ft bgl)	To (ft bgl)	Diameter (in)	Assembly Type	Slot Size
There are no records to show				

## Well Development

**Developed by:** Air lifting

**Development Total Duration:** 3 hours

## Well Yield

---

**Estimation Method:** Air Lifting

**Static Water Level Before Test:** 120 ft (btoc)

**Hydrofracturing Performed:** Yes

**Estimation Rate:** 2 USgpm

**Drawdown:** 500 ft (btoc)

**Increase in Yield Due to Hydrofracturing:**

**Estimation Duration:** 2 hours

## Well Decommission Information

---

**Reason for Decommission:**

**Sealant Material:**

**Decommission Details:**

**Method of Decommission:**

**Backfill Material:**

## Comments

---

No comments submitted

**Alternative Specs Submitted:** Yes

## Documents

---

No additional documentation available for this well.

## Disclaimer

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The information provided should not be used as a basis for making financial or any other commitments. The Government of British Columbia accepts no liability for the accuracy, availability, suitability, reliability, usability, completeness or timeliness of the data or graphical depictions rendered from the data.



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**Attachment C**  
**Figure Showing Property Boundaries and Locations of WPID 66090, WPID 47667 and Surrounding Wells**





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**Attachment D**  
**Table Summarizing Wells information within 500 m of WPID 66090**

Well Tag Number	Well Plate ID Number	Finished Well Depth (m)	Static Water Level (m btoc) <sup>1</sup>	Depth to Bedrock	Estimated Well Yield L/sec (US gpm)
124356	62172	153.3144	24.0792	18	4.41 (70)
113890	47649	182.88	31.0896	30	0.2835 (4.5)
111905	39422	128.016	30.7848	7	1.89 (30)
111902	39421	121.92	31.0896	14	0.63 (10)
120202	50399	73.152	19.14144	18	0.189 (3)
120193	50393	91.44	19.5834	6	0.63 (10)
120201	50398	103.632	20.1168	16	0.0945 (1.5)
120195	50395	110.3376	NA	10	0.1575 (2.5)
114421	47667	67.056	23.1648	5	0.315 (5)
109890	38543	54.864	14.9352	3	0.567 (9)
120196	50396	68.8848	0.9144	7	6.3 (100)
120198	50397	79.248	3.6576	21	0.504 (8)
109891	38542	67.056	11.8872	78	1.89 (30)
109892	38541	60.96	6.096	47	0.819 (13)
109889	38544	103.632	33.8328	38	0.0945 (1.5)
113891	47647	140.208	28.3464	na	0.378 (6)
113933	47648	54.864	NA	12	0.315 (5)
52401	NA	48.768	NA	NA	0.378 (6)
49633	NA	73.152	NA	0	NA
49632	NA	64.008	NA	6	3.15 (50)
62362	NA	93.8784	NA	NA	0.315 (5)

Notes:

m btoc – metres below top of casing

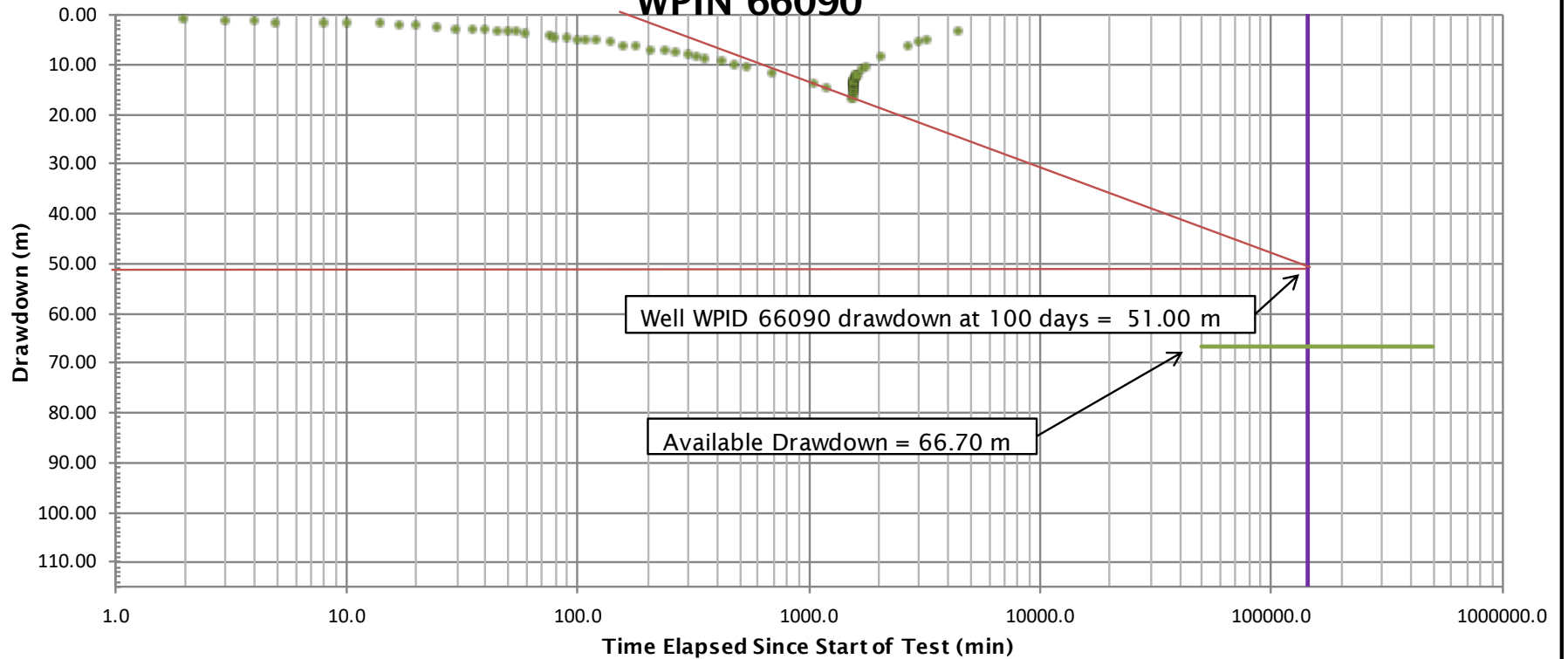


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**Attachment E**  
**24- Hour Constant Rate Pumping Test Data and Data Plots**

Project Number	2022-006		Test Type	Constant Rate Test
Client Name	Viktor Malyakin		Test Duration (hours)	24
Hydrogeologist	Tony Friesen		Well Depth (m)	152
Pumping Test Contractor	Moore's Well and Pump		Static Water Level (mbtoc)	10.96
Location	7500 McLennan Rd		Pump Intake Depth (mbtoc)	146.00
Well Identification	WPID 66090		Pumping Rate (L/s)	0.16
			Test Start Time	3-16-22 11:15 AM
Clock Time	Time Elapsed (min)	Depth to Water (m btoc)	Drawdown (m)	Comments
3-16-22 11:15:00	0	10.96	0.00	Start of Test
3-16-22 11:16:00	1	11.90		
3-16-22 11:17:00	2	12.10	1.14	
3-16-22 11:18:00	3	12.34	1.38	
3-16-22 11:19:00	4	12.43	1.47	
3-16-22 11:20:00	5	12.60	1.64	
3-16-22 11:21:00	6		-10.96	
3-16-22 11:22:00	7		-10.96	
3-16-22 11:23:00	8	12.65	1.69	
3-16-22 11:24:00	9		-10.96	
3-16-22 11:25:00	10	12.74	1.78	
3-16-22 11:27:00	12		-10.96	
3-16-22 11:29:00	14	12.95	1.99	
3-16-22 11:31:00	16		-10.96	
3-16-22 11:32:00	17	13.10	2.14	
3-16-22 11:35:00	20	13.35	2.39	
3-16-22 11:40:00	25	13.69	2.73	
3-16-22 11:45:00	30	13.93	2.97	
3-16-22 11:50:00	35	14.08	3.12	
3-16-22 11:55:00	40	14.21	3.25	
3-16-22 12:00:00	45	14.34	3.38	
3-16-22 12:05:00	50	14.45	3.49	
3-16-22 12:10:00	55	14.54	3.58	
3-16-22 12:15:00	60	14.75	3.79	
3-16-22 12:32:00	77	15.51	4.55	
3-16-22 12:35:00	80	15.56	4.60	
3-16-22 12:45:00	90	15.82	4.86	
3-16-22 12:55:00	100	15.97	5.01	
3-16-22 13:05:00	110	16.13	5.17	
3-16-22 13:15:00	120	16.31	5.35	
3-16-22 13:35:00	140	16.64	5.68	
3-16-22 13:55:00	160	17.22	6.26	
3-16-22 14:15:00	180	17.58	6.62	
3-16-22 14:45:00	210	18.04	7.08	
3-16-22 15:15:00	240	18.42	7.46	
3-16-22 15:45:00	270	18.82	7.86	
3-16-22 16:15:00	300	19.14	8.18	
3-16-22 16:45:00	330	19.36	8.40	
3-16-22 17:15:00	360	19.79	8.83	
3-16-22 18:15:00	420	20.42	9.46	
3-16-22 19:15:00	480	21.03	10.07	
3-16-22 20:15:00	540	21.58	10.62	
3-16-22 22:55:00	700	22.78	11.82	
3-17-22 4:45:00	1050	25.08	14.12	
3-17-22 7:15:00	1200	26.02	15.06	
3-17-22 13:00:00	1545	27.73	16.77	
3-17-22 13:15:00	1560	27.74	16.78	
3-17-22 13:16:00	1561	27.17	16.21	Pump Shut off
3-17-22 13:17:00	1562	26.79	15.83	
3-17-22 13:18:00	1563	26.40	15.44	
3-17-22 13:19:00	1564	26.11	15.15	
3-17-22 13:20:00	1565	25.86	14.90	
3-17-22 13:21:00	1566	25.65	14.69	
3-17-22 13:22:00	1567	25.45	14.49	
3-17-22 13:23:00	1568	25.29	14.33	
3-17-22 13:24:00	1569	25.16	14.20	
3-17-22 13:25:00	1570	25.05	14.09	
3-17-22 13:27:00	1572	24.86	13.90	
3-17-22 13:29:00	1574	24.73	13.77	
3-17-22 13:31:00	1576	24.60	13.64	
3-17-22 13:33:00	1578	24.51	13.55	
3-17-22 13:35:00	1580	24.42	13.46	
3-17-22 13:40:00	1585	24.02	13.06	
3-17-22 13:45:00	1590		-10.96	
3-17-22 13:50:00	1595		-10.96	
3-17-22 13:55:00	1600	23.75	12.79	
3-17-22 14:00:00	1605	23.66	12.70	
3-17-22 14:05:00	1610	23.58	12.62	
3-17-22 14:10:00	1615	23.49	12.53	
3-17-22 14:15:00	1620	23.41	12.45	
3-17-22 14:25:00	1630	23.25	12.29	
3-17-22 15:45:00	1710	21.97	11.01	
3-17-22 16:55:00	1780	21.7	10.74	
3-17-22 22:00:00	2085	19.44	8.48	
3-18-22 8:30:00	2715	17.2	6.24	
3-18-22 13:52:00	3037	16.47	5.51	Around 24 hours after shut off
3-18-22 17:58:00	3283	15.95	4.99	
3-19-22 14:00:00	4485	14.33	3.37	

## Semi Log Plot of 24-Hour Constant Rate Pumping Test Data for WPIN 66090

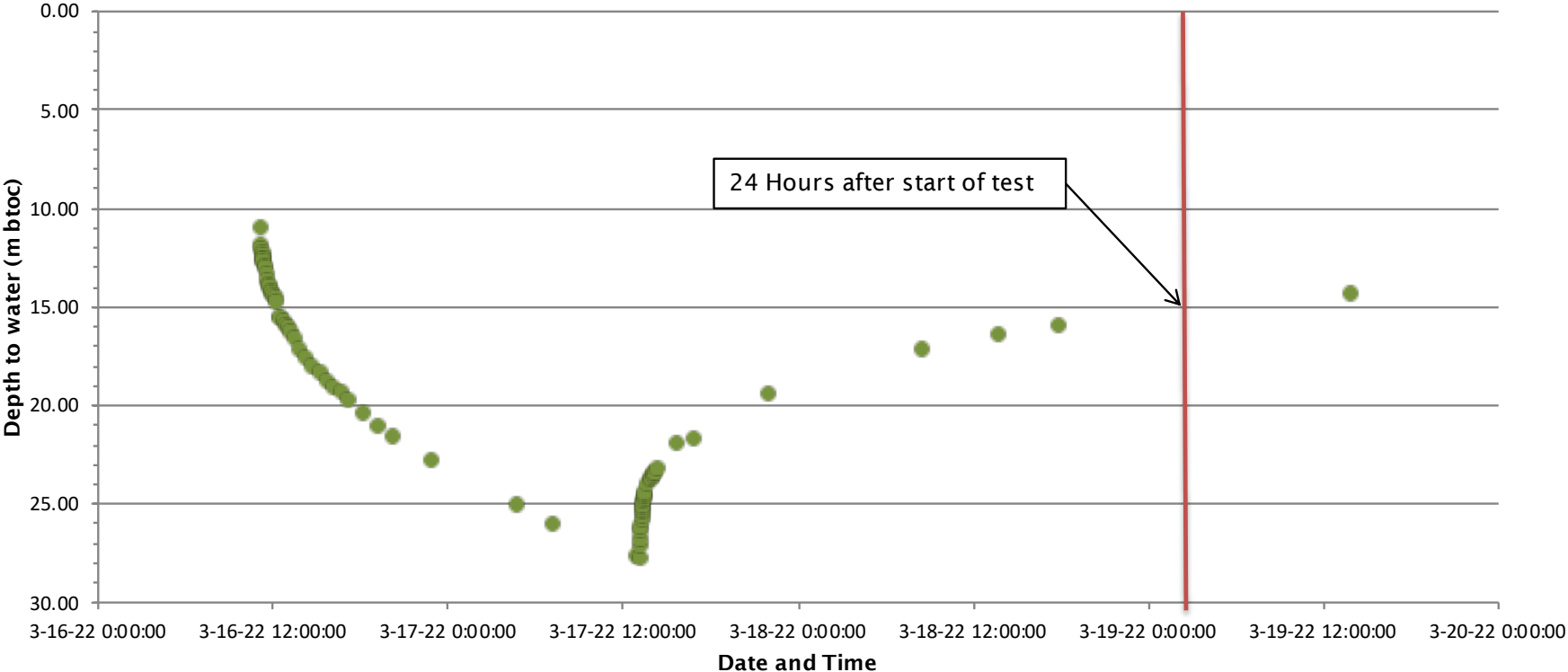


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PROJECT:	2022-006	WPID	66090
Client	Viktor Malyakin	Location	Vernon BC
DATE:	06-Apr-22	Date of Test	16-Mar-22
DRAWN BY:	Tony Friesen	Contractor	IGI



## Plot of 24-Hour Constant Rate Pumping Data for WPID 66090



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 tony@interiorgeoscience.com

PROJECT:	2022-006
Client	Viktor Malyakin
DATE:	06-Apr-22
DRAWN BY:	Tony Friesen

WPID	66090
Location	7500 McLennan
Date of Test	16-Mar-22
Contractor	IGI

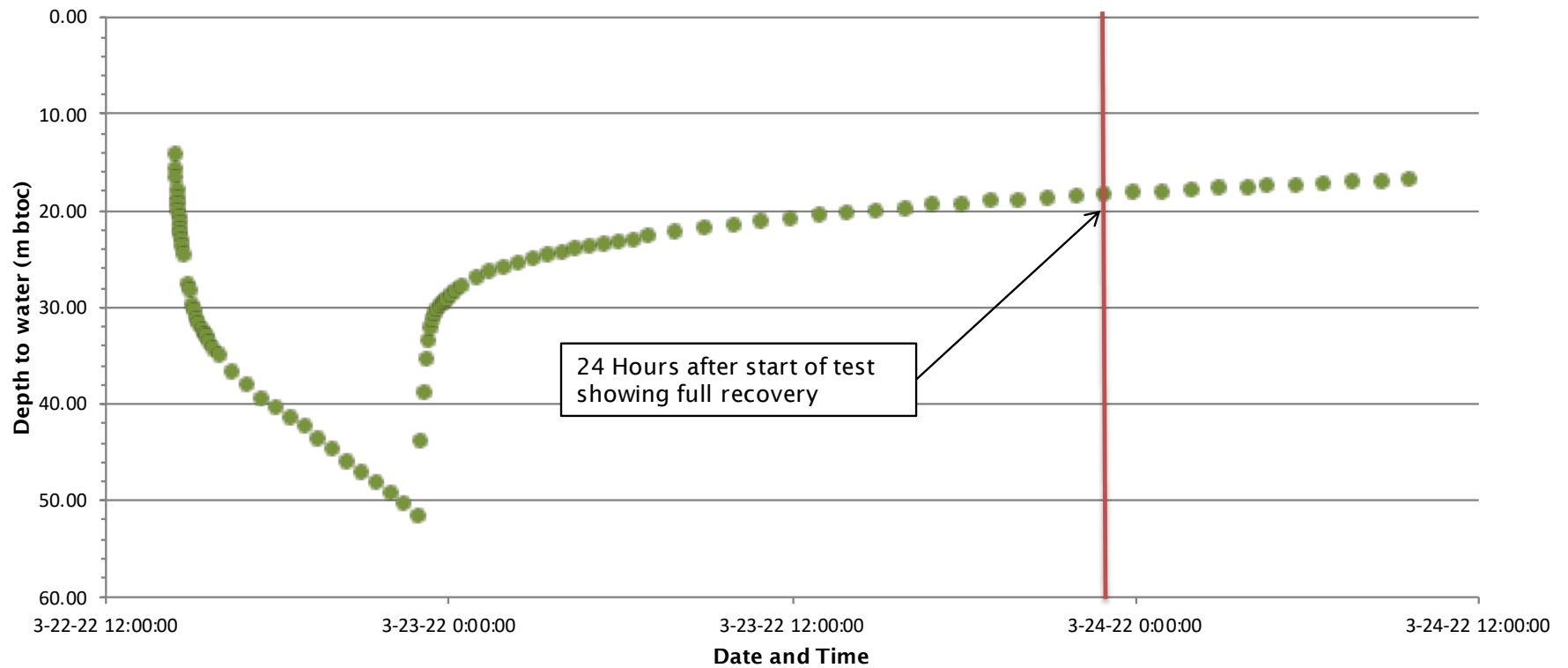


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**Attachment F**  
**8.5. - Hour Constant Rate Pumping Test Data and Data Plots**

Project Number	2022-006		Test Type	Constant Rate Test
Client Name	Viktor Malyakin		Test Duration (hours)	5.5
Hydrogeologist	Tony Friesen		Well Depth (m)	152
Pumping Test Contractor	Moore's Well and Pump		Static Water Level (mbtoc)	14.33
Location	7500 McLennan Rd		Pump Intake Depth (mbtoc)	146.00
Well Identification	WPID 66090		Pumping Rate (L/s)	0.47
			Test Start Time	3-22-22 2:30 PM
Clock Time	Time Elapsed (min)	Depth to Water (m btoC)	Drawdown (m)	Comments
3-22-22 14:30:00	0	14.33	0.00	Start of Test
3-22-22 14:31:00	1	15.91	1.58	
3-22-22 14:32:00	2	16.82	2.49	
3-22-22 14:33:00	3	17.96	3.63	
3-22-22 14:34:00	4	18.95	4.62	
3-22-22 14:35:00	5	19.50	5.17	
3-22-22 14:36:00	6	20.17	5.84	
3-22-22 14:37:00	7	20.85	6.52	
3-22-22 14:38:00	8	21.46	7.13	
3-22-22 14:39:00	9	22.07	7.74	
3-22-22 14:40:00	10	22.52	8.19	
3-22-22 14:42:00	12	23.19	8.86	
3-22-22 14:45:00	15	23.90	9.57	
3-22-22 14:47:00	17	24.67	10.34	
3-22-22 14:48:00	18		-14.33	
3-22-22 14:50:00	20		-14.33	
3-22-22 14:55:00	25	27.75	13.42	
3-22-22 15:00:00	30	28.30	13.97	
3-22-22 15:05:00	35	29.86	15.53	
3-22-22 15:10:00	40	30.67	16.34	
3-22-22 15:15:00	45	31.36	17.03	
3-22-22 15:20:00	50	31.91	17.58	
3-22-22 15:25:00	55	32.45	18.12	
3-22-22 15:30:00	60	32.95	18.62	
3-22-22 15:35:00	65	33.27	18.94	
3-22-22 15:40:00	70	33.75	19.42	
3-22-22 15:50:00	80	34.50	20.17	
3-22-22 16:00:00	90	35.02	20.69	
3-22-22 16:30:00	120	36.77	22.44	
3-22-22 17:00:00	150	38.07	23.74	
3-22-22 17:30:00	180	39.56	25.23	
3-22-22 18:00:00	210	40.53	26.20	
3-22-22 18:30:00	240	41.52	27.19	
3-22-22 19:00:00	270	42.50	28.17	
3-22-22 19:30:00	300	43.70	29.37	
3-22-22 20:00:00	330	44.77	30.44	
3-22-22 20:30:00	360	46.18	31.85	
3-22-22 21:00:00	390	47.31	32.98	
3-22-22 21:30:00	420	48.38	34.05	
3-22-22 22:00:00	450	49.42	35.09	
3-22-22 22:30:00	480	50.39	36.06	
3-22-22 23:00:00	510	51.80	37.47	
3-22-22 23:05:00	515	43.98	29.65	Pump Shut off
3-22-22 23:10:00	520	38.97	24.64	
3-22-22 23:15:00	525	35.63	21.30	
3-22-22 23:20:00	530	33.59	19.26	
3-22-22 23:25:00	535	32.32	17.99	
3-22-22 23:30:00	540	31.48	17.15	
3-22-22 23:35:00	545	30.86	16.53	
3-22-22 23:40:00	550	30.39	16.06	
3-22-22 23:45:00	555	30.03	15.70	
3-22-22 23:50:00	560	29.71	15.38	
3-22-22 23:55:00	565	29.44	15.11	
3-23-22 0:00:00	570	29.19	14.86	
3-23-22 0:10:00	580	28.75	14.42	
3-23-22 0:20:00	590	28.38	14.05	
3-23-22 0:30:00	600	28.04	13.71	
3-23-22 1:00:00	630	27.21	12.88	
3-23-22 1:30:00	660	26.56	12.23	
3-23-22 2:00:00	690	26.01	11.68	
3-23-22 2:30:00	720	25.54	11.21	
3-23-22 3:00:00	750	25.12	10.79	
3-23-22 3:30:00	780	24.74	10.41	
3-23-22 4:00:00	810	24.41	10.08	
3-23-22 4:30:00	840	24.08	9.75	
3-23-22 5:00:00	870	23.79	9.46	
3-23-22 5:30:00	900	23.56	9.23	
3-23-22 6:00:00	930	23.34	9.01	
3-23-22 6:30:00	960	23.14	8.81	
3-23-22 7:00:00	990	22.85	8.52	
3-23-22 8:00:00	1050	22.40	8.07	
3-23-22 9:00:00	1110	21.98	7.65	
3-23-22 10:00:00	1170	21.61	7.28	
3-23-22 11:00:00	1230	21.27	6.94	
3-23-22 12:00:00	1290	20.96	6.63	
3-23-22 13:00:00	1350	20.65	6.32	
3-23-22 14:00:00	1410	20.38	6.05	
3-23-22 15:00:00	1470	20.13	5.80	
3-23-22 16:00:00	1530	19.88	5.55	
3-23-22 17:00:00	1590	19.64	5.31	
3-23-22 18:00:00	1650	19.44	5.11	
3-23-22 19:00:00	1710	19.20	4.87	
3-23-22 20:00:00	1770	19.00	4.67	
3-23-22 21:00:00	1830	18.79	4.46	
3-23-22 22:00:00	1890	18.62	4.29	
3-23-22 23:00:00	1950	18.45	4.12	
3-24-22 0:00:00	2010	18.29	3.96	Around 24 hours after shut off
3-24-22 1:00:00	2070	18.15	3.82	
3-24-22 2:00:00	2130	18.01	3.68	
3-24-22 3:00:00	2190	17.86	3.53	
3-24-22 4:00:00	2250	17.73	3.40	
3-24-22 4:40:00	2290	17.64	3.31	
3-24-22 5:40:00	2350	17.49	3.16	
3-24-22 6:40:00	2410	17.37	3.04	
3-24-22 7:40:00	2470	17.25	2.92	
3-24-22 8:40:00	2530	17.13	2.80	
3-24-22 9:40:00	2590	17.02	2.69	

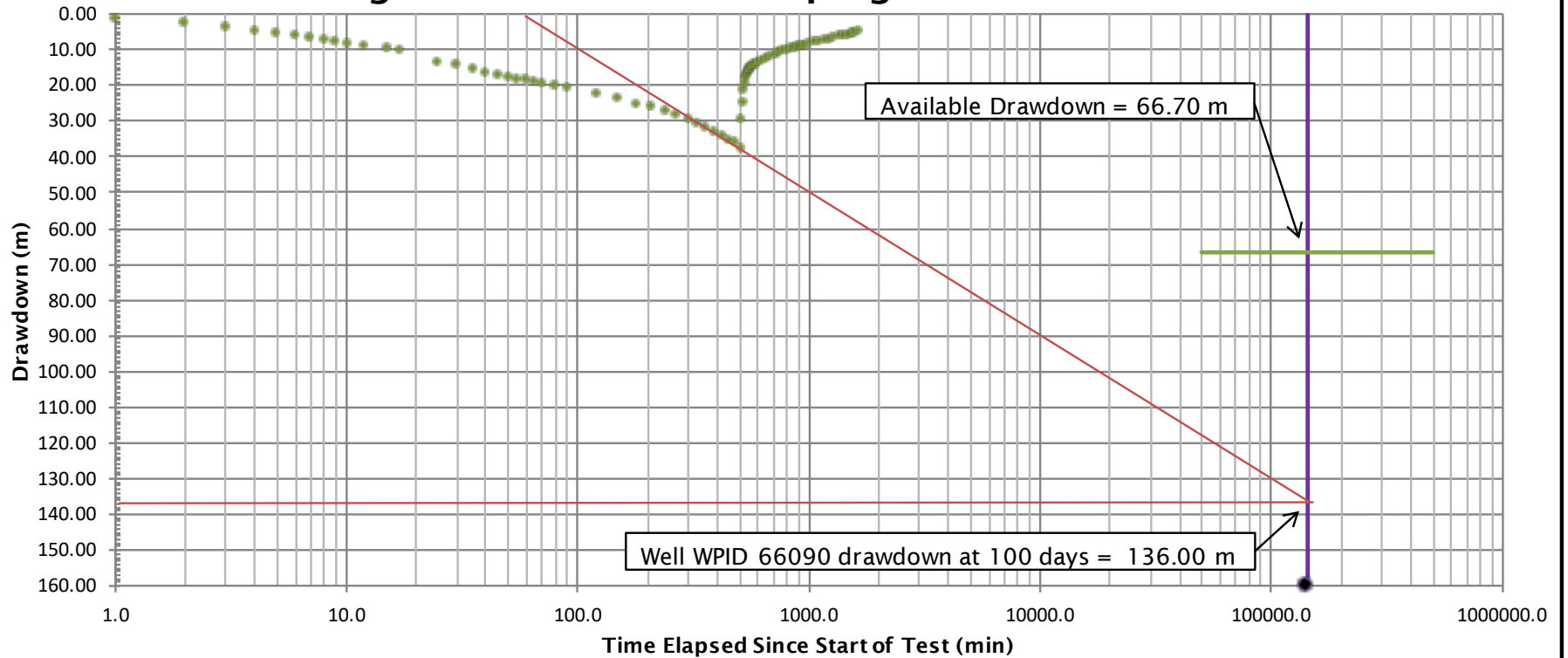
## Plot of 8.5 Hour Constant Rate Pumping Data for WPID 66090



Interior Geoscience Inc.  
Anthony Friesen M.Sc., P. Geo  
250-306-4477  
tony@interiorgeoscience.com

PROJECT:	2022-006	WPID	66090
Client	Viktor Malyakin	Location	7500 McLennan
DATE:	06-Apr-22	Date of Test	16-Mar-22
DRAWN BY:	Tony Friesen	Contractor	IGI

## Semi Log Plot of 8.5 Hour Pumping Test Data for WPIN 66090



Interior Geoscience Inc.  
 Anthony Friesen M.Sc., P.Geo  
 250-306-4477  
 tony@interiorgeoscience.com

PROJECT:	2022-006		WPID	66090
Client	Viktor Malyakin		Location	Vernon BC
DATE:	06-Apr-22		Date of Test	16-Mar-22
DRAWN BY:	Tony Friesen		Contractor	IGI



Interior Geoscience Inc  
Anthony Friesen M.Sc., P.Geo  
250-306-4477  
tony@interiorgeoscience.com

**Attachment G**  
**Lab Report**



## CERTIFICATE OF ANALYSIS

<b>REPORTED TO</b>	Interior Geoscience Inc. 8544 Greenaway Rd. Vernon, BC V1B 3M6	<b>WORK ORDER</b>	22C2535
<b>ATTENTION</b>	Tony Friesen	<b>RECEIVED / TEMP REPORTED</b>	2022-03-18 09:06 / 1.8°C
<b>PO NUMBER</b>		<b>REPORTED</b>	2022-04-04 10:09
<b>PROJECT</b>	General Potability	<b>COC NUMBER</b>	No Number
<b>PROJECT INFO</b>			

### Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

#### *Big Picture Sidekicks*



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

#### *We've Got Chemistry*



It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

#### *Ahead of the Curve*



Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

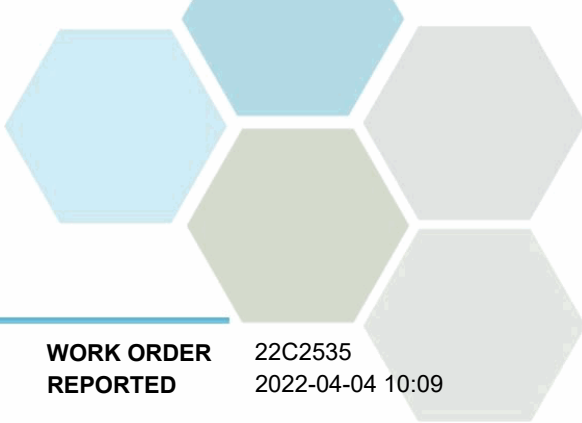
If you have any questions or concerns, please contact me at [teamcaro@caro.ca](mailto:teamcaro@caro.ca)

### Authorized By:

Team CARO  
Client Service Representative

1-888-311-8846 | [www.caro.ca](http://www.caro.ca)

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7 | #108 4475 Wayburne Drive Burnaby, BC V5G 4X4



# TEST RESULTS

**REPORTED TO PROJECT** Interior Geoscience Inc.  
General Potability

**WORK ORDER REPORTED** 22C2535  
2022-04-04 10:09

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
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**WPID 66090 (22C2535-01) | Matrix: Water | Sampled: 2022-03-17 13:00**

**Anions**

Chloride	11.4	AO ≤ 250	0.10 mg/L	2022-03-20	
Fluoride	1.50	MAC = 1.5	0.10 mg/L	2022-03-20	
Nitrate (as N)	0.015	MAC = 10	0.010 mg/L	2022-03-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2022-03-20	
Sulfate	235	AO ≤ 500	1.0 mg/L	2022-03-20	

**Calculated Parameters**

Hardness, Total (as CaCO3)	399	None Required	0.500 mg/L	N/A	
Langelier Index	< -5.0	N/A	-5.0	2022-03-25	
Solids, Total Dissolved	610	AO ≤ 500	10.0 mg/L	N/A	

**General Parameters**

Alkalinity, Total (as CaCO3)	290	N/A	1.0 mg/L	2022-03-22	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0 mg/L	2022-03-22	
Alkalinity, Bicarbonate (as CaCO3)	290	N/A	1.0 mg/L	2022-03-22	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0 mg/L	2022-03-22	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0 mg/L	2022-03-22	
Colour, True	5.4	AO ≤ 15	5.0 CU	2022-03-21	HT1
Conductivity (EC)	949	N/A	2.0 µS/cm	2022-03-22	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020 mg/L	2022-03-24	
pH	8.08	7.0-10.5	0.10 pH units	2022-03-22	HT2
Temperature, at pH	22.4	N/A	°C	2022-03-22	HT2
Turbidity	12.4	OG < 1	0.10 NTU	2022-03-21	HT1

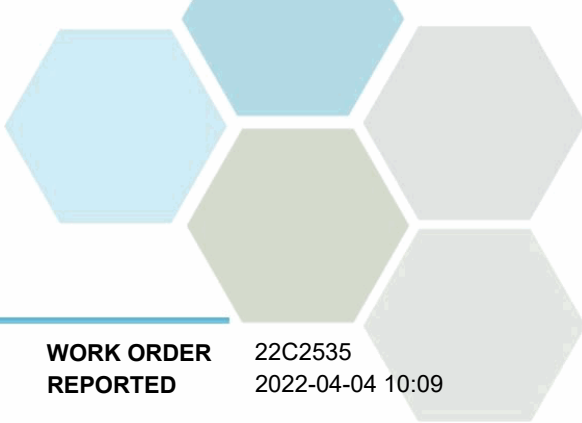
**Microbiological Parameters**

Coliforms, Total	< 1	MAC = 0	1 CFU/100 mL	2022-03-18	
E. coli	< 1	MAC = 0	1 CFU/100 mL	2022-03-18	

**Total Metals**

Aluminum, total	0.0499	OG < 0.1	0.0050 mg/L	2022-03-23	
Antimony, total	< 0.00020	MAC = 0.006	0.00020 mg/L	2022-03-23	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050 mg/L	2022-03-23	
Barium, total	0.0260	MAC = 2	0.0050 mg/L	2022-03-23	
Boron, total	< 0.0500	MAC = 5	0.0500 mg/L	2022-03-23	
Cadmium, total	0.000015	MAC = 0.005	0.000010 mg/L	2022-03-23	
Calcium, total	64.5	None Required	0.20 mg/L	2022-03-23	
Chromium, total	0.00111	MAC = 0.05	0.00050 mg/L	2022-03-23	
Cobalt, total	0.00043	N/A	0.00010 mg/L	2022-03-23	
Copper, total	0.00534	MAC = 2	0.00040 mg/L	2022-03-23	
Iron, total	0.293	AO ≤ 0.3	0.010 mg/L	2022-03-23	
Lead, total	0.00029	MAC = 0.005	0.00020 mg/L	2022-03-23	
Magnesium, total	57.8	None Required	0.010 mg/L	2022-03-23	
Manganese, total	0.0279	MAC = 0.12	0.00020 mg/L	2022-03-23	
Mercury, total	< 0.000010	MAC = 0.001	0.000010 mg/L	2022-03-24	





## TEST RESULTS

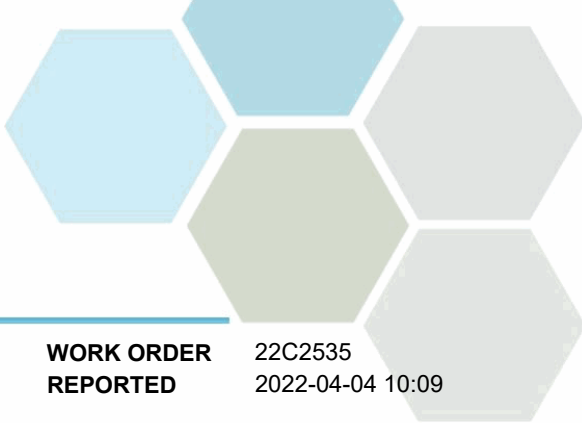
**REPORTED TO PROJECT** Interior Geoscience Inc.  
General Potability

**WORK ORDER REPORTED** 22C2535  
2022-04-04 10:09

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
<b>WPID 66090 (22C2535-01)   Matrix: Water   Sampled: 2022-03-17 13:00, Continued</b>						
<i>Total Metals, Continued</i>						
Molybdenum, total	0.00276	N/A	0.00010	mg/L	2022-03-23	
Nickel, total	0.00238	N/A	0.00040	mg/L	2022-03-23	
Potassium, total	8.05	N/A	0.10	mg/L	2022-03-23	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2022-03-23	
Sodium, total	56.6	AO ≤ 200	0.10	mg/L	2022-03-23	
Strontium, total	2.65	MAC = 7	0.0010	mg/L	2022-03-23	
Uranium, total	0.000446	MAC = 0.02	0.000020	mg/L	2022-03-23	
Zinc, total	0.0336	AO ≤ 5	0.0040	mg/L	2022-03-23	

**Sample Qualifiers:**

- HT1 The sample was prepared and/or analyzed past the recommended holding time.
- HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.



## APPENDIX 1: SUPPORTING INFORMATION

**REPORTED TO PROJECT** Interior Geoscience Inc.  
General Potability

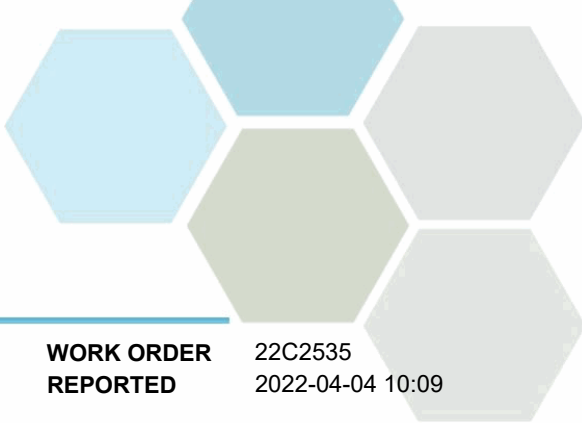
**WORK ORDER REPORTED** 22C2535  
2022-04-04 10:09

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	✓	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Coliforms, Total in Water	SM 9222* (2017)	Membrane Filtration / Chromocult Agar	✓	Kelowna
Colour, True in Water	SM 2120 C (2017)	Spectrophotometry (456 nm)	✓	Kelowna
Conductivity in Water	SM 2510 B (2017)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
E. coli in Water	SM 9222* (2017)	Membrane Filtration / Chromocult Agar	✓	Kelowna
Hardness in Water	SM 2340 B* (2017)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Langelier Index in Water	SM 2330 B (2017)	Calculation		N/A
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	✓	Richmond
pH in Water	SM 4500-H+ B (2017)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2017)	SM 1030 E (2011)		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Turbidity in Water	SM 2130 B (2017)	Nephelometry	✓	Kelowna

*Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method*

### Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
°C	Degrees Celcius
AO	Aesthetic Objective
CFU/100 mL	Colony Forming Units per 100 millilitres
CU	Colour Units (referenced against a platinum cobalt standard)
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, pH > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association



## APPENDIX 1: SUPPORTING INFORMATION

**REPORTED TO** Interior Geoscience Inc.  
**PROJECT** General Potability

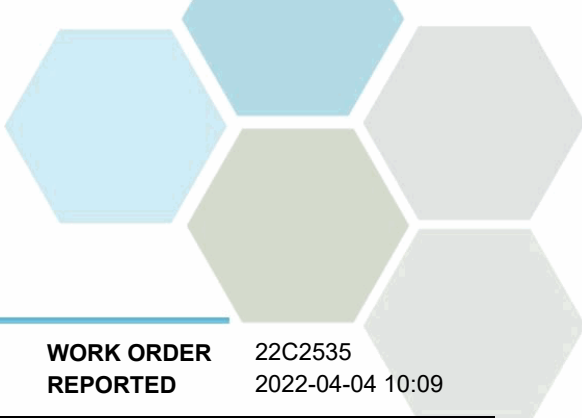
**WORK ORDER** 22C2535  
**REPORTED** 2022-04-04 10:09

**General Comments:**

The results in this report apply to the samples analyzed in accordance with the Chain of Custody 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 or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: [teamcaro@caro.ca](mailto:teamcaro@caro.ca)

*Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.*



## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO PROJECT** Interior Geoscience Inc.  
General Potability

**WORK ORDER REPORTED** 22C2535  
2022-04-04 10:09

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):** A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup):** An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS):** A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS):** A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM):** A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is 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 10-20 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	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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### Anions, Batch B2C2122

Blank (B2C2122-BLK1)			Prepared: 2022-03-19, Analyzed: 2022-03-19						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							

Blank (B2C2122-BLK2)			Prepared: 2022-03-20, Analyzed: 2022-03-20						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							

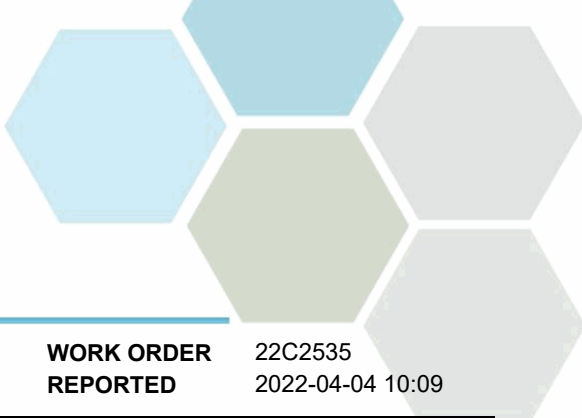
LCS (B2C2122-BS1)			Prepared: 2022-03-19, Analyzed: 2022-03-19						
Chloride	15.7	0.10 mg/L	16.0		98	90-110			
Fluoride	4.02	0.10 mg/L	4.00		100	88-108			
Nitrate (as N)	3.86	0.010 mg/L	4.00		97	90-110			
Nitrite (as N)	2.06	0.010 mg/L	2.00		103	85-115			
Sulfate	15.9	1.0 mg/L	16.0		99	90-110			

LCS (B2C2122-BS2)			Prepared: 2022-03-20, Analyzed: 2022-03-20						
Chloride	15.8	0.10 mg/L	16.0		99	90-110			
Fluoride	4.01	0.10 mg/L	4.00		100	88-108			
Nitrate (as N)	3.87	0.010 mg/L	4.00		97	90-110			
Nitrite (as N)	2.02	0.010 mg/L	2.00		101	85-115			
Sulfate	15.9	1.0 mg/L	16.0		100	90-110			

### General Parameters, Batch B2C2174

Blank (B2C2174-BLK1)			Prepared: 2022-03-21, Analyzed: 2022-03-21						
Colour, True	< 5.0	5.0 CU							

Blank (B2C2174-BLK2)			Prepared: 2022-03-21, Analyzed: 2022-03-21						
Colour, True	< 5.0	5.0 CU							



## APPENDIX 2: QUALITY CONTROL RESULTS

<b>REPORTED TO PROJECT</b>	Interior Geoscience Inc. General Potability	<b>WORK ORDER REPORTED</b>	22C2535 2022-04-04 10:09
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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
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**General Parameters, Batch B2C2174, Continued**

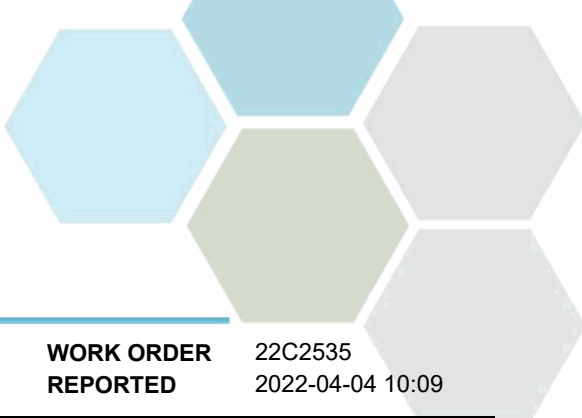
<b>LCS (B2C2174-BS1)</b>			Prepared: 2022-03-21, Analyzed: 2022-03-21						
Colour, True	21	5.0 CU	20.0		107	85-115			
<b>LCS (B2C2174-BS2)</b>			Prepared: 2022-03-21, Analyzed: 2022-03-21						
Colour, True	22	5.0 CU	20.0		111	85-115			

**General Parameters, Batch B2C2262**

<b>Blank (B2C2262-BLK1)</b>			Prepared: 2022-03-21, Analyzed: 2022-03-21						
Turbidity	< 0.10	0.10 NTU							
<b>Blank (B2C2262-BLK2)</b>			Prepared: 2022-03-21, Analyzed: 2022-03-21						
Turbidity	< 0.10	0.10 NTU							
<b>LCS (B2C2262-BS1)</b>			Prepared: 2022-03-21, Analyzed: 2022-03-21						
Turbidity	38.6	0.10 NTU	40.0		96	90-110			
<b>LCS (B2C2262-BS2)</b>			Prepared: 2022-03-21, Analyzed: 2022-03-21						
Turbidity	39.7	0.10 NTU	40.0		99	90-110			

**General Parameters, Batch B2C2385**

<b>Blank (B2C2385-BLK1)</b>			Prepared: 2022-03-22, Analyzed: 2022-03-22						
Alkalinity, Total (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Temperature, at pH	23.2	°C							
<b>Blank (B2C2385-BLK2)</b>			Prepared: 2022-03-22, Analyzed: 2022-03-22						
Alkalinity, Total (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Temperature, at pH	24.3	°C							
<b>LCS (B2C2385-BS1)</b>			Prepared: 2022-03-22, Analyzed: 2022-03-22						
Alkalinity, Total (as CaCO3)	107	1.0 mg/L	100		107	80-120			
<b>LCS (B2C2385-BS2)</b>			Prepared: 2022-03-22, Analyzed: 2022-03-22						
Alkalinity, Total (as CaCO3)	107	1.0 mg/L	100		107	80-120			
<b>LCS (B2C2385-BS3)</b>			Prepared: 2022-03-22, Analyzed: 2022-03-22						
Conductivity (EC)	1440	2.0 µS/cm	1410		102	95-105			
<b>LCS (B2C2385-BS4)</b>			Prepared: 2022-03-22, Analyzed: 2022-03-22						
Conductivity (EC)	1460	2.0 µS/cm	1410		103	95-105			
<b>Reference (B2C2385-SRM1)</b>			Prepared: 2022-03-22, Analyzed: 2022-03-22						
pH	7.00	0.10 pH units	7.01		100	98-102			
<b>Reference (B2C2385-SRM2)</b>			Prepared: 2022-03-22, Analyzed: 2022-03-22						
pH	7.00	0.10 pH units	7.01		100	98-102			

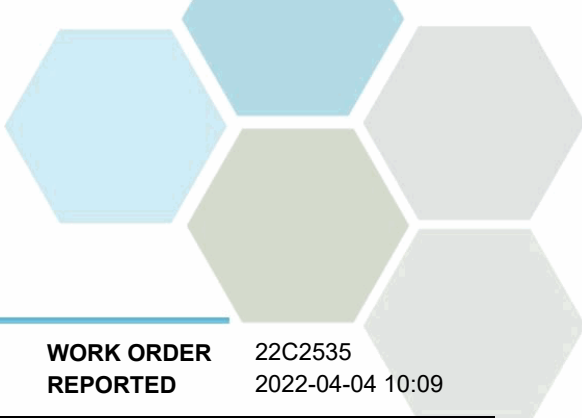


## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO PROJECT** Interior Geoscience Inc.  
General Potability

**WORK ORDER REPORTED** 22C2535  
2022-04-04 10:09

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<b>General Parameters, Batch B2C2676</b>									
<b>Blank (B2C2676-BLK1)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	< 0.0020	0.0020 mg/L							
<b>Blank (B2C2676-BLK2)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	< 0.0020	0.0020 mg/L							
<b>LCS (B2C2676-BS1)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	0.0191	0.0020 mg/L	0.0200		96	82-120			
<b>LCS (B2C2676-BS2)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	0.0191	0.0020 mg/L	0.0200		96	82-120			
<b>LCS Dup (B2C2676-BSD1)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	0.0193	0.0020 mg/L	0.0200		97	82-120	1	10	
<b>LCS Dup (B2C2676-BSD2)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	0.0200	0.0020 mg/L	0.0200		100	82-120	5	10	
<b>Microbiological Parameters, Batch B2C2077</b>									
<b>Blank (B2C2077-BLK1)</b>			Prepared: 2022-03-18, Analyzed: 2022-03-18						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2C2077-BLK2)</b>			Prepared: 2022-03-18, Analyzed: 2022-03-18						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2C2077-BLK3)</b>			Prepared: 2022-03-18, Analyzed: 2022-03-18						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2C2077-BLK4)</b>			Prepared: 2022-03-18, Analyzed: 2022-03-18						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2C2077-BLK5)</b>			Prepared: 2022-03-18, Analyzed: 2022-03-18						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Total Metals, Batch B2C2428</b>									
<b>Blank (B2C2428-BLK1)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-23						
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Boron, total	< 0.0500	0.0500 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							

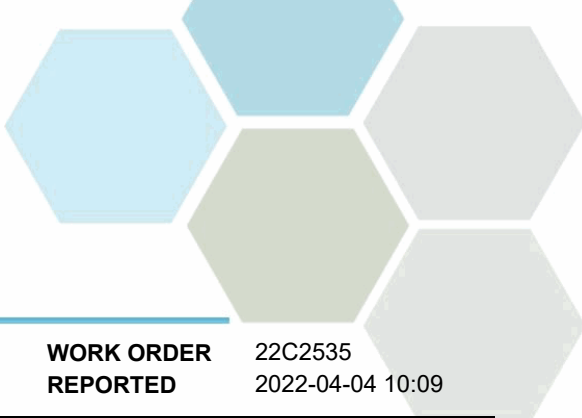


## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO PROJECT** Interior Geoscience Inc.  
General Potability

**WORK ORDER REPORTED** 22C2535  
2022-04-04 10:09

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<b>Total Metals, Batch B2C2428, Continued</b>									
<b>Blank (B2C2428-BLK1), Continued</b>					Prepared: 2022-03-23, Analyzed: 2022-03-23				
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00040	0.00040 mg/L							
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
<b>LCS (B2C2428-BS1)</b>					Prepared: 2022-03-23, Analyzed: 2022-03-23				
Aluminum, total	0.0161	0.0050 mg/L	0.0200		81	80-120			
Antimony, total	0.0191	0.00020 mg/L	0.0200		95	80-120			
Arsenic, total	0.0190	0.00050 mg/L	0.0200		95	80-120			
Barium, total	0.0172	0.0050 mg/L	0.0200		86	80-120			
Boron, total	< 0.0500	0.0500 mg/L	0.0200		97	80-120			
Cadmium, total	0.0192	0.000010 mg/L	0.0200		96	80-120			
Calcium, total	1.78	0.20 mg/L	2.00		89	80-120			
Chromium, total	0.0187	0.00050 mg/L	0.0200		94	80-120			
Cobalt, total	0.0188	0.00010 mg/L	0.0200		94	80-120			
Copper, total	0.0213	0.00040 mg/L	0.0200		107	80-120			
Iron, total	2.02	0.010 mg/L	2.00		101	80-120			
Lead, total	0.0200	0.00020 mg/L	0.0200		100	80-120			
Magnesium, total	1.88	0.010 mg/L	2.00		94	80-120			
Manganese, total	0.0184	0.00020 mg/L	0.0200		92	80-120			
Molybdenum, total	0.0206	0.00010 mg/L	0.0200		103	80-120			
Nickel, total	0.0197	0.00040 mg/L	0.0200		99	80-120			
Potassium, total	1.95	0.10 mg/L	2.00		98	80-120			
Selenium, total	0.0194	0.00050 mg/L	0.0200		97	80-120			
Sodium, total	2.01	0.10 mg/L	2.00		100	80-120			
Strontium, total	0.0173	0.0010 mg/L	0.0200		87	80-120			
Uranium, total	0.0189	0.000020 mg/L	0.0200		95	80-120			
Zinc, total	0.0188	0.0040 mg/L	0.0200		94	80-120			
<b>Reference (B2C2428-SRM1)</b>					Prepared: 2022-03-23, Analyzed: 2022-03-23				
Aluminum, total	0.194	0.0050 mg/L	0.198		98	70-130			
Antimony, total	0.0243	0.00020 mg/L	0.0230		106	70-130			
Arsenic, total	0.0214	0.00050 mg/L	0.0200		107	70-130			
Barium, total	0.0147	0.0050 mg/L	0.0161		91	70-130			
Boron, total	0.184	0.0500 mg/L	0.191		97	70-130			
Cadmium, total	0.00412	0.000010 mg/L	0.00404		102	70-130			
Calcium, total	0.94	0.20 mg/L	0.938		100	70-130			
Chromium, total	0.0251	0.00050 mg/L	0.0256		98	70-130			
Cobalt, total	0.0222	0.00010 mg/L	0.0214		104	70-130			
Copper, total	0.0330	0.00040 mg/L	0.0322		102	70-130			
Iron, total	0.064	0.010 mg/L	0.0580		111	70-130			
Lead, total	0.00878	0.00020 mg/L	0.00796		110	70-130			
Magnesium, total	0.108	0.010 mg/L	0.112		97	70-130			
Manganese, total	0.0117	0.00020 mg/L	0.0120		97	70-130			
Molybdenum, total	0.0451	0.00010 mg/L	0.0438		103	70-130			
Nickel, total	0.0415	0.00040 mg/L	0.0394		105	70-130			
Potassium, total	0.87	0.10 mg/L	0.820		106	70-130			
Selenium, total	0.123	0.00050 mg/L	0.117		105	70-130			
Sodium, total	0.53	0.10 mg/L	0.490		108	70-130			
Strontium, total	0.258	0.0010 mg/L	0.276		93	70-130			
Uranium, total	0.00995	0.000020 mg/L	0.00970		103	70-130			
Zinc, total	0.0843	0.0040 mg/L	0.0884		95	70-130			



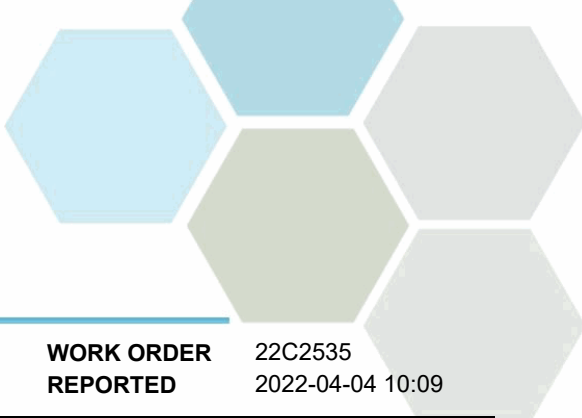
## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO PROJECT** Interior Geoscience Inc.  
General Potability

**WORK ORDER REPORTED** 22C2535  
2022-04-04 10:09

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<b>Total Metals, Batch B2C2643</b>									
<b>Blank (B2C2643-BLK1)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	< 0.000010	0.000010 mg/L							
<b>Blank (B2C2643-BLK2)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	< 0.000010	0.000010 mg/L							
<b>Blank (B2C2643-BLK3)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	< 0.000010	0.000010 mg/L							
<b>Reference (B2C2643-SRM1)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	0.000268	0.000010 mg/L	0.000250		107	0-200			
<b>Reference (B2C2643-SRM2)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	0.000260	0.000010 mg/L	0.000250		104	0-200			
<b>Reference (B2C2643-SRM3)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	0.000265	0.000010 mg/L	0.000250		106	0-200			



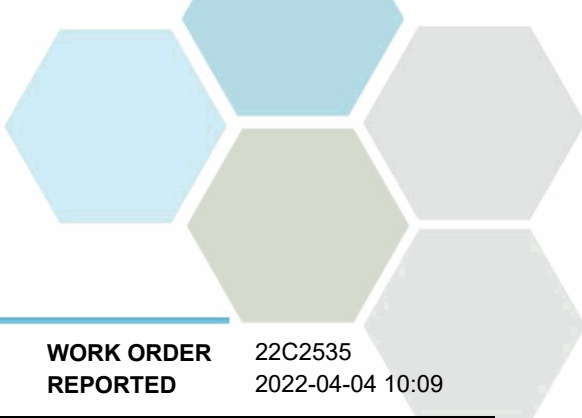


## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO PROJECT** Interior Geoscience Inc.  
General Potability

**WORK ORDER REPORTED** 22C2535  
2022-04-04 10:09

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<b>General Parameters, Batch B2C2676</b>									
<b>Blank (B2C2676-BLK1)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	< 0.0020	0.0020 mg/L							
<b>Blank (B2C2676-BLK2)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	< 0.0020	0.0020 mg/L							
<b>LCS (B2C2676-BS1)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	0.0191	0.0020 mg/L	0.0200		96	82-120			
<b>LCS (B2C2676-BS2)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	0.0191	0.0020 mg/L	0.0200		96	82-120			
<b>LCS Dup (B2C2676-BSD1)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	0.0193	0.0020 mg/L	0.0200		97	82-120	1	10	
<b>LCS Dup (B2C2676-BSD2)</b>			Prepared: 2022-03-24, Analyzed: 2022-03-24						
Cyanide, Total	0.0200	0.0020 mg/L	0.0200		100	82-120	5	10	
<b>Microbiological Parameters, Batch B2C2077</b>									
<b>Blank (B2C2077-BLK1)</b>			Prepared: 2022-03-18, Analyzed: 2022-03-18						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2C2077-BLK2)</b>			Prepared: 2022-03-18, Analyzed: 2022-03-18						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2C2077-BLK3)</b>			Prepared: 2022-03-18, Analyzed: 2022-03-18						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2C2077-BLK4)</b>			Prepared: 2022-03-18, Analyzed: 2022-03-18						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2C2077-BLK5)</b>			Prepared: 2022-03-18, Analyzed: 2022-03-18						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Total Metals, Batch B2C2428</b>									
<b>Blank (B2C2428-BLK1)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-23						
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Boron, total	< 0.0500	0.0500 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							

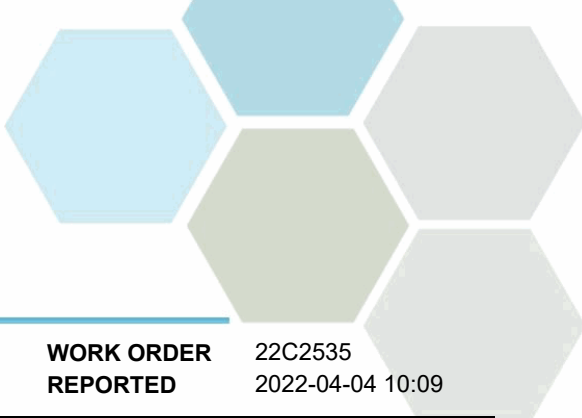


## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO PROJECT** Interior Geoscience Inc.  
General Potability

**WORK ORDER REPORTED** 22C2535  
2022-04-04 10:09

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<b>Total Metals, Batch B2C2428, Continued</b>									
<b>Blank (B2C2428-BLK1), Continued</b>					Prepared: 2022-03-23, Analyzed: 2022-03-23				
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00040	0.00040 mg/L							
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
<b>LCS (B2C2428-BS1)</b>					Prepared: 2022-03-23, Analyzed: 2022-03-23				
Aluminum, total	0.0161	0.0050 mg/L	0.0200		81	80-120			
Antimony, total	0.0191	0.00020 mg/L	0.0200		95	80-120			
Arsenic, total	0.0190	0.00050 mg/L	0.0200		95	80-120			
Barium, total	0.0172	0.0050 mg/L	0.0200		86	80-120			
Boron, total	< 0.0500	0.0500 mg/L	0.0200		97	80-120			
Cadmium, total	0.0192	0.000010 mg/L	0.0200		96	80-120			
Calcium, total	1.78	0.20 mg/L	2.00		89	80-120			
Chromium, total	0.0187	0.00050 mg/L	0.0200		94	80-120			
Cobalt, total	0.0188	0.00010 mg/L	0.0200		94	80-120			
Copper, total	0.0213	0.00040 mg/L	0.0200		107	80-120			
Iron, total	2.02	0.010 mg/L	2.00		101	80-120			
Lead, total	0.0200	0.00020 mg/L	0.0200		100	80-120			
Magnesium, total	1.88	0.010 mg/L	2.00		94	80-120			
Manganese, total	0.0184	0.00020 mg/L	0.0200		92	80-120			
Molybdenum, total	0.0206	0.00010 mg/L	0.0200		103	80-120			
Nickel, total	0.0197	0.00040 mg/L	0.0200		99	80-120			
Potassium, total	1.95	0.10 mg/L	2.00		98	80-120			
Selenium, total	0.0194	0.00050 mg/L	0.0200		97	80-120			
Sodium, total	2.01	0.10 mg/L	2.00		100	80-120			
Strontium, total	0.0173	0.0010 mg/L	0.0200		87	80-120			
Uranium, total	0.0189	0.000020 mg/L	0.0200		95	80-120			
Zinc, total	0.0188	0.0040 mg/L	0.0200		94	80-120			
<b>Reference (B2C2428-SRM1)</b>					Prepared: 2022-03-23, Analyzed: 2022-03-23				
Aluminum, total	0.194	0.0050 mg/L	0.198		98	70-130			
Antimony, total	0.0243	0.00020 mg/L	0.0230		106	70-130			
Arsenic, total	0.0214	0.00050 mg/L	0.0200		107	70-130			
Barium, total	0.0147	0.0050 mg/L	0.0161		91	70-130			
Boron, total	0.184	0.0500 mg/L	0.191		97	70-130			
Cadmium, total	0.00412	0.000010 mg/L	0.00404		102	70-130			
Calcium, total	0.94	0.20 mg/L	0.938		100	70-130			
Chromium, total	0.0251	0.00050 mg/L	0.0256		98	70-130			
Cobalt, total	0.0222	0.00010 mg/L	0.0214		104	70-130			
Copper, total	0.0330	0.00040 mg/L	0.0322		102	70-130			
Iron, total	0.064	0.010 mg/L	0.0580		111	70-130			
Lead, total	0.00878	0.00020 mg/L	0.00796		110	70-130			
Magnesium, total	0.108	0.010 mg/L	0.112		97	70-130			
Manganese, total	0.0117	0.00020 mg/L	0.0120		97	70-130			
Molybdenum, total	0.0451	0.00010 mg/L	0.0438		103	70-130			
Nickel, total	0.0415	0.00040 mg/L	0.0394		105	70-130			
Potassium, total	0.87	0.10 mg/L	0.820		106	70-130			
Selenium, total	0.123	0.00050 mg/L	0.117		105	70-130			
Sodium, total	0.53	0.10 mg/L	0.490		108	70-130			
Strontium, total	0.258	0.0010 mg/L	0.276		93	70-130			
Uranium, total	0.00995	0.000020 mg/L	0.00970		103	70-130			
Zinc, total	0.0843	0.0040 mg/L	0.0884		95	70-130			

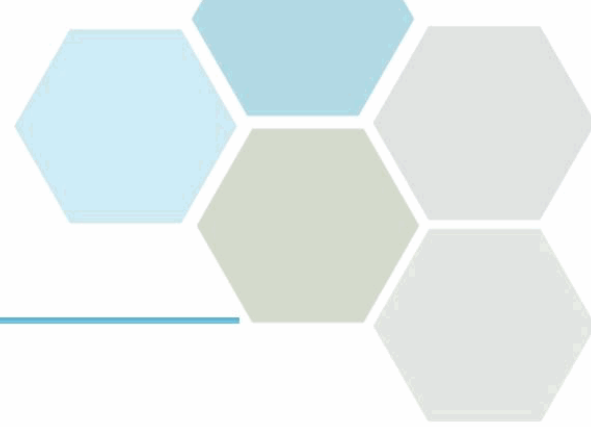


## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO PROJECT** Interior Geoscience Inc.  
General Potability

**WORK ORDER REPORTED** 22C2535  
2022-04-04 10:09

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<b>Total Metals, Batch B2C2643</b>									
<b>Blank (B2C2643-BLK1)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	< 0.000010	0.000010 mg/L							
<b>Blank (B2C2643-BLK2)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	< 0.000010	0.000010 mg/L							
<b>Blank (B2C2643-BLK3)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	< 0.000010	0.000010 mg/L							
<b>Reference (B2C2643-SRM1)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	0.000268	0.000010 mg/L	0.000250		107	0-200			
<b>Reference (B2C2643-SRM2)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	0.000260	0.000010 mg/L	0.000250		104	0-200			
<b>Reference (B2C2643-SRM3)</b>			Prepared: 2022-03-23, Analyzed: 2022-03-24						
Mercury, total	0.000265	0.000010 mg/L	0.000250		106	0-200			



## CERTIFICATE OF ANALYSIS

**REPORTED TO** Tony Friesen (Interior Geoscience Inc.)  
8544 Greenaway Rd.  
Vernon, BC V1B 3M6

**SITE INFO**  
**CARO WO#** 22K0663

**RECEIVED / TEMP** 2022-11-04 14:30 / 8.9°C  
**REPORTED** 2022-11-09

### Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

#### Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

#### We've Got Chemistry



It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

#### Ahead of the Curve



Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

### Report Highlights:

The results in this report apply to the samples analyzed in accordance with your submission. The following parameter(s) exceed the Guidelines for Canadian Drinking Water Quality (Jan 2020):

Sample Name: WIPD 47667

1. Iron, total (AO)
2. Solids, Total Dissolved (AO)
3. Turbidity (OG)

For more information, please visit <http://www.caro.ca/reports/>

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here: <https://www.caro.ca/terms-conditions>

#### Laboratory Recommendations:

For assistance reading your report, please visit

<https://www.caro.ca/wp-content/uploads/2020/07/How-to-read-your-report-1.pdf>

For information about bacteria in water results, please visit

<https://www.caro.ca/you-need-to-know-about-bacteria-in-water-analytical-report/>

If you have any additional questions or concerns, please contact us at [TeamCaro@caro.ca](mailto:TeamCaro@caro.ca).

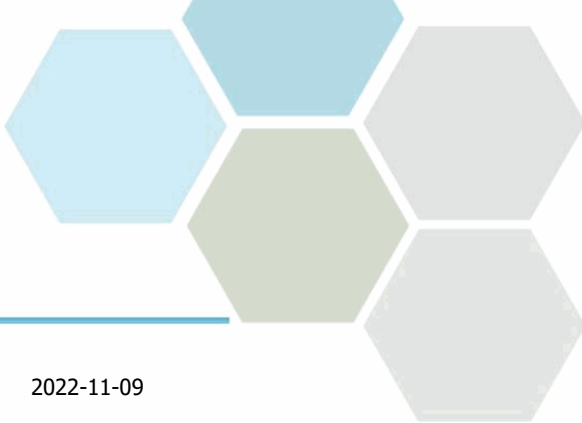
#### Authorized By:

Team CARO

Client Service Representative

1-888-311-8846 | [www.caro.ca](http://www.caro.ca)

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7 |  
#108 4475 Wayburne Drive Burnaby, BC V5G 4X4



## TEST RESULTS

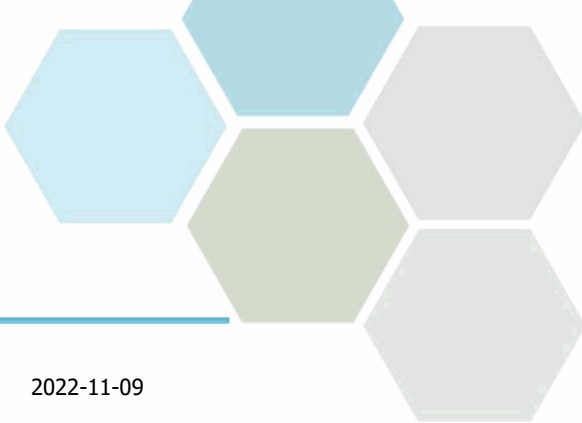
**REPORTED TO** Tony Friesen (Interior Geoscience Inc.)  
**CARO WO#** 22K0663

**REPORTED** 2022-11-09

Parameter	Result	Guideline	RL Units	Analyzed	Note
<b>Sample Name: WIPD 47667   Matrix: Water   Sampled: 2022-11-03 21:00</b>					
<b>Anions</b>					
Chloride	12.2	AO ≤ 250	0.10 mg/L	2022-11-05	
Fluoride	1.33	MAC = 1.5	0.10 mg/L	2022-11-05	
Nitrate (as N)	< 0.010	MAC = 10	0.010 mg/L	2022-11-05	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2022-11-05	
Sulfate	237	AO ≤ 500	1.0 mg/L	2022-11-05	
<b>Calculated Parameters</b>					
Hardness, Total (as CaCO3)	411	None Required	0.500 mg/L	N/A	
Solids, Total Dissolved	619	AO ≤ 500	10.0 mg/L	N/A	
<b>General Parameters</b>					
Alkalinity, Total (as CaCO3)	283	N/A	1.0 mg/L	2022-11-07	
Conductivity (EC)	974	N/A	2.0 µS/cm	2022-11-07	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020 mg/L	2022-11-08	
pH	8.15	7.0-10.5	0.10 pH units	2022-11-07	HT2
Turbidity	2.61	OG < 1	0.10 NTU	2022-11-06	
<b>Microbiological Parameters</b>					
Coliforms, Total	< 1	MAC = 0	1 CFU/100 mL	2022-11-04	
E. coli	< 1	MAC = 0	1 CFU/100 mL	2022-11-04	
<b>Total Metals</b>					
Aluminum, total	0.0065	OG < 0.1	0.0050 mg/L	2022-11-08	
Antimony, total	< 0.00020	MAC = 0.006	0.00020 mg/L	2022-11-08	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050 mg/L	2022-11-08	
Barium, total	0.0256	MAC = 2	0.0050 mg/L	2022-11-08	
Boron, total	< 0.0500	MAC = 5	0.0500 mg/L	2022-11-08	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010 mg/L	2022-11-08	
Calcium, total	74.2	None Required	0.20 mg/L	2022-11-08	
Chromium, total	0.00200	MAC = 0.05	0.00050 mg/L	2022-11-08	
Copper, total	0.0116	MAC = 2	0.00040 mg/L	2022-11-08	
Iron, total	0.469	AO ≤ 0.3	0.010 mg/L	2022-11-08	
Lead, total	0.00057	MAC = 0.005	0.00020 mg/L	2022-11-08	
Magnesium, total	54.8	None Required	0.010 mg/L	2022-11-08	
Manganese, total	0.0482	MAC = 0.12	0.00020 mg/L	2022-11-08	
Potassium, total	9.41	N/A	0.10 mg/L	2022-11-08	
Selenium, total	< 0.00050	MAC = 0.05	0.00050 mg/L	2022-11-08	
Sodium, total	59.4	AO ≤ 200	0.10 mg/L	2022-11-08	
Strontium, total	1.83	MAC = 7	0.0010 mg/L	2022-11-08	
Uranium, total	0.00193	MAC = 0.02	0.000020 mg/L	2022-11-08	
Zinc, total	0.0099	AO ≤ 5	0.0040 mg/L	2022-11-08	

**Note Descriptions:**

HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.



## APPENDIX 1: SUPPORTING INFORMATION

**REPORTED TO** Tony Friesen (Interior Geoscience Inc.)  
**CARO WO#** 22K0663

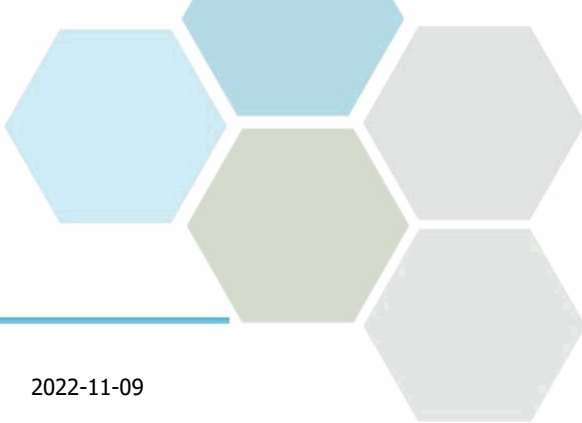
**REPORTED** 2022-11-09

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	✓	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	✓	Kelowna
Coliforms, Total in Water	SM 9222* (2017)	Membrane Filtration / Chromocult Agar	✓	Kelowna
Conductivity in Water	SM 2510 B (2017)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
E. coli in Water	SM 9222* (2017)	Membrane Filtration / Chromocult Agar	✓	Kelowna
Hardness in Water	SM 2340 B* (2017)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
pH in Water	SM 4500-H+ B (2017)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2017)	SM 1030 E (2011)		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Turbidity in Water	SM 2130 B (2017)	Nephelometry	✓	Kelowna

*Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method*

### Glossary:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
CFU/100 mL	Colony Forming Units per 100 millilitres
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, pH > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association



## APPENDIX 1: SUPPORTING INFORMATION

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**CARO WO#** 22K0663

**REPORTED** 2022-11-09

### General Comments:

For assistance reading your report, please visit

<https://www.caro.ca/wp-content/uploads/2020/07/How-to-read-your-report-1.pdf>

For information about bacteria in water results, please visit

<https://www.caro.ca/you-need-to-know-about-bacteria-in-water-analytical-report/>

The results in this report apply to the samples analyzed in accordance with the Chain of Custody 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 or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: [TeamCaro@caro.ca](mailto:TeamCaro@caro.ca)

*Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.*



## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO** Tony Friesen (Interior Geoscience Inc.)  
**CARO WO#** 22K0663

**REPORTED** 2022-11-09

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):** A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup):** An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS):** A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS):** A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM):** A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is 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 10-20 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 B2K0597</b>									
<b>Blank (B2K0597-BLK1)</b>			Prepared: 2022-11-05, Analyzed: 2022-11-05						
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
<b>LCS (B2K0597-BS1)</b>			Prepared: 2022-11-05, Analyzed: 2022-11-05						
Chloride	15.2	0.10 mg/L	16.0		95	90-110			
Fluoride	4.02	0.10 mg/L	4.00		101	88-108			
Nitrate (as N)	4.05	0.010 mg/L	4.00		101	90-110			
Nitrite (as N)	1.84	0.010 mg/L	2.00		92	85-115			
Sulfate	15.3	1.0 mg/L	16.0		95	90-110			
<b>General Parameters, Batch B2K0743</b>									
<b>Blank (B2K0743-BLK1)</b>			Prepared: 2022-11-06, Analyzed: 2022-11-06						
Turbidity	< 0.10	0.10 NTU							
<b>LCS (B2K0743-BS1)</b>			Prepared: 2022-11-06, Analyzed: 2022-11-06						
Turbidity	43.1	0.10 NTU	40.0		108	90-110			
<b>General Parameters, Batch B2K0844</b>									
<b>Blank (B2K0844-BLK1)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
Alkalinity, Total (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
<b>Blank (B2K0844-BLK2)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
Alkalinity, Total (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0 mg/L							





## APPENDIX 2: QUALITY CONTROL RESULTS

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Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
<b>General Parameters, Batch B2K0844, Continued</b>									
<b>Blank (B2K0844-BLK2), Continued</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
<b>Blank (B2K0844-BLK3)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
Alkalinity, Total (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
<b>LCS (B2K0844-BS1)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
Alkalinity, Total (as CaCO3)	96.7	1.0 mg/L	100		97	80-120			
<b>LCS (B2K0844-BS2)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
Alkalinity, Total (as CaCO3)	99.0	1.0 mg/L	100		99	80-120			
<b>LCS (B2K0844-BS3)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
Alkalinity, Total (as CaCO3)	99.8	1.0 mg/L	100		100	80-120			
<b>LCS (B2K0844-BS4)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
Conductivity (EC)	1410	2.0 µS/cm	1410		100	95-105			
<b>LCS (B2K0844-BS6)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
Conductivity (EC)	1410	2.0 µS/cm	1410		100	95-105			
<b>Reference (B2K0844-SRM1)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
pH	7.02	0.10 pH units	7.01		100	98-102			
<b>Reference (B2K0844-SRM2)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
pH	7.01	0.10 pH units	7.01		100	98-102			
<b>Reference (B2K0844-SRM3)</b>			Prepared: 2022-11-07, Analyzed: 2022-11-07						
pH	7.02	0.10 pH units	7.01		100	98-102			
<b>General Parameters, Batch B2K0924</b>									
<b>Blank (B2K0924-BLK1)</b>			Prepared: 2022-11-08, Analyzed: 2022-11-08						
Cyanide, Total	< 0.0020	0.0020 mg/L							
<b>Blank (B2K0924-BLK2)</b>			Prepared: 2022-11-08, Analyzed: 2022-11-08						
Cyanide, Total	< 0.0020	0.0020 mg/L							
<b>LCS (B2K0924-BS1)</b>			Prepared: 2022-11-08, Analyzed: 2022-11-08						
Cyanide, Total	0.0204	0.0020 mg/L	0.0200		102	82-120			
<b>LCS (B2K0924-BS2)</b>			Prepared: 2022-11-08, Analyzed: 2022-11-08						
Cyanide, Total	0.0194	0.0020 mg/L	0.0200		97	82-120			
<b>LCS Dup (B2K0924-BSD1)</b>			Prepared: 2022-11-08, Analyzed: 2022-11-08						
Cyanide, Total	0.0203	0.0020 mg/L	0.0200		102	82-120	< 1	10	
<b>LCS Dup (B2K0924-BSD2)</b>			Prepared: 2022-11-08, Analyzed: 2022-11-08						
Cyanide, Total	0.0203	0.0020 mg/L	0.0200		101	82-120	4	10	

**Microbiological Parameters, Batch B2K0570**



## APPENDIX 2: QUALITY CONTROL RESULTS

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**REPORTED** 2022-11-09

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
<b>Microbiological Parameters, Batch B2K0570, Continued</b>									
<b>Blank (B2K0570-BLK1)</b>					Prepared: 2022-11-04, Analyzed: 2022-11-04				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2K0570-BLK2)</b>					Prepared: 2022-11-04, Analyzed: 2022-11-04				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2K0570-BLK3)</b>					Prepared: 2022-11-04, Analyzed: 2022-11-04				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2K0570-BLK4)</b>					Prepared: 2022-11-04, Analyzed: 2022-11-04				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Blank (B2K0570-BLK5)</b>					Prepared: 2022-11-04, Analyzed: 2022-11-04				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
<b>Total Metals, Batch B2K0967</b>									
<b>Blank (B2K0967-BLK1)</b>					Prepared: 2022-11-08, Analyzed: 2022-11-08				
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Boron, total	< 0.0500	0.0500 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
<b>LCS (B2K0967-BS1)</b>					Prepared: 2022-11-08, Analyzed: 2022-11-08				
Aluminum, total	3.99	0.0050 mg/L	4.00		100	80-120			
Antimony, total	0.0384	0.00020 mg/L	0.0400		96	80-120			
Arsenic, total	0.0404	0.00050 mg/L	0.0400		101	80-120			
Barium, total	0.0388	0.0050 mg/L	0.0400		97	80-120			
Boron, total	< 0.0500	0.0500 mg/L	0.0400		106	80-120			
Cadmium, total	0.0389	0.000010 mg/L	0.0400		97	80-120			
Calcium, total	4.08	0.20 mg/L	4.00		102	80-120			
Chromium, total	0.0397	0.00050 mg/L	0.0400		99	80-120			
Copper, total	0.0398	0.00040 mg/L	0.0400		99	80-120			
Iron, total	3.97	0.010 mg/L	4.00		99	80-120			
Lead, total	0.0392	0.00020 mg/L	0.0400		98	80-120			
Magnesium, total	3.89	0.010 mg/L	4.00		97	80-120			
Manganese, total	0.0398	0.00020 mg/L	0.0400		99	80-120			



## APPENDIX 2: QUALITY CONTROL RESULTS

**REPORTED TO** Tony Friesen (Interior Geoscience Inc.)  
**CARO WO#** 22K0663

**REPORTED** 2022-11-09

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
<i>Total Metals, Batch B2K0967, Continued</i>									
<b>LCS (B2K0967-BS1), Continued</b>					Prepared: 2022-11-08, Analyzed: 2022-11-08				
Potassium, total	4.08	0.10 mg/L	4.00		102	80-120			
Selenium, total	0.0396	0.00050 mg/L	0.0400		99	80-120			
Sodium, total	3.97	0.10 mg/L	4.00		99	80-120			
Strontium, total	0.0398	0.0010 mg/L	0.0400		99	80-120			
Uranium, total	0.0396	0.000020 mg/L	0.0400		99	80-120			
Zinc, total	0.0394	0.0040 mg/L	0.0400		98	80-120			

## 4.0 STUDY LIMITATIONS

WSP Canada Inc. (WSP) has prepared this technical memorandum in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and geoscience professions currently practicing in British Columbia, subject to the time limits and physical constraints applicable to this technical memorandum. No other warranty, express or implied is made.

The technical memorandum is of a summary nature and is not intended to stand alone without reference to the instructions given to WSP by the Client, communications between WSP and the Client, and to any other deliverables prepared by WSP for the Client relative to the specific site described in the technical memorandum. In order to properly understand the suggestions, recommendations and opinions expressed in this technical memorandum, reference must be made to the whole of the technical memorandum.

WSP cannot be responsible for use by any party of portions of the technical memorandum without reference to the entire technical memorandum and other relevant communications between WSP and the Client.

In preparing this technical memorandum, WSP has relied in good faith on information provided by the individuals and agencies noted in this technical memorandum. We accept no responsibility for any deficiency or inaccuracy contained in this technical memorandum as a result of errors, omissions, misinterpretations or fraudulent acts of the persons or agencies contacted.

The information, recommendations and opinions expressed in this technical memorandum are for the sole benefit of the Client.

No other party may use or rely on this technical memorandum or any portion thereof without WSP's express written consent.

The technical memorandum, all plans, data, drawings and other documents as well as all electronic media prepared by WSP are considered its professional work product and shall remain the copyright property of WSP, who authorizes only the Client to make copies of the technical memorandum, and only in such quantities as are reasonably necessary for the use of the technical memorandum by those parties. The Client may not give, lend, sell, or otherwise make available the technical memorandum or any portion thereof to any other party without the express written permission of WSP. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of WSP's technical memorandum or other work products.

If new information is discovered in the future, WSP should be requested to re-evaluate the content of this technical memorandum and provide amendments as required prior to any reliance upon the information presented herein.



Interior Geoscience Inc  
Anthony Friesen M.Sc., P.Ge  
250-306-4477  
tony@interiorgeoscience.com

**Attachment G – Preliminary Review of the Hydrogeological reports submitted for proposed residential development at 7500 McLennan Rd, RDNO, BC.**



DRAFT

## TECHNICAL MEMORANDUM

Reference No. 20144760-012-TM-RevA

DATE 15 March 2023

TO Rob Smailes, General Manager, Planning and Building  
Regional District of North Okanagan

CC Zee Marcolin, General Manager, Utilities

FROM Mark Bolton, WSP Canada Inc.

EMAIL [mark.bolton@wsp.com](mailto:mark.bolton@wsp.com)

### PRELIMINARY REVIEW OF HYDROGEOLOGICAL REPORTS SUBMITTED FOR PROPOSED RESIDENTIAL DEVELOPMENT AT 7500 MCLENNAN ROAD, REGIONAL DISTRICT OF NORTH OKANAGAN, BC

Dear Mr. Smailes,

As requested by the Regional District of North Okanagan (RDNO), WSP Canada Inc. (WSP) has conducted a preliminary review of a hydrogeological report regarding a proposed development at 7500 McLennan Road in RDNO Electoral Area "C" (the Development). This technical memorandum should be interpreted and used in accordance with the limitations and considerations set out in WSP's *Study Limitations*, provided at the end of this memo.

## 1.0 BACKGROUND AND OBJECTIVE

WSP understands that the Development is located at 7505 McLennan Road, within RDNO Electoral Area "C", has a legal description of Lot 1: Sec 25, Twp 8, ODYD, Plan 2558, Except Plan 37038 and Plan EPP74629, and is 24.21 hectares (ha) in size. The owner proposes to subdivide the parcel into two lots (Lot 1 and Lot 2) under the current zoning of Non-Urban (NU) and then rezone the lots to Country Residential (CR), which would allow for subdivision into a total of eight lots, each 2 ha or larger, to be developed. Each lot would be serviced by a private individual well.

In support of the Development, Interior Geoscience Inc. (IGI) was retained to provide hydrogeological services, as documented in the following reports:

- Hydrogeological Assessment of Groundwater Supply (Well Plate ID Number 66090) in Support of Subdivision Application, at 7500 McLennan Rd, Electoral Area C, in the Regional District of North Okanagan, dated 4 April 2022. (IGI Job Number 2022-006)
- Hydrogeological Assessment of Groundwater Supply in Support of Rezoning Application, at 7500 McLennan Rd., Electoral Area C, in the Regional District of the North Okanagan, dated 5 December 2022 (IGI Job Number 2022-006)

- Hydrogeological Assessment of Groundwater Supply in Support of Rezoning Application, at 7500 McLennan Rd., Electoral Area C, in the Regional District of the North Okanagan, dated 23 January 2023 (IGI Job Number 2022-006)

The objective of this preliminary review was to provide high level comments regarding whether the information provided in the IGI reports is generally consistent with the objectives of proposed changes to the Subdivision Servicing Bylaw for Electoral Area "C", as outlined in Subdivision Servicing Amendment Bylaw No. 2930, 2022 (herein referred to as "the Bylaw Amendment"); this preliminary review is not an independent third-party technical review of the hydrogeological reports. We recognize that the Bylaw Amendment was issued after IGI had conducted the hydrogeological assessment that included a pumping test and was reported in the April 2022 report.

## 2.0 RESULTS OF PRELIMINARY REVIEW

Based on the preliminary review of the information presented in the IGI reports, the following comments are provided:

- The hydrogeological assessments were prepared by a Qualified Professional, in accordance with the Bylaw Amendment.
- A site plan with the proposed lots is presented by IGI. It is understood that two wells are located at the Development, identified with Well Plate ID (WPID) No.s 47667 and 66090; wells are herein referred to by PID No. The locations of these wells are presented on a map that was generated with iMapBC but are not presented on the site plan, as required by the Bylaw Amendment.
  - IGI did not confirm if the existing wells comply with the minimum construction requirements of the BC Groundwater Protection Regulation (GWPR) and the Bylaw Amendment; however, the logs that were provided by IGI for WPID 47667 and 66090 indicate that each well was completed with a surface seal and more than the minimum casing stickup that is required by the GWPR.
  - As the Development is in the early stages, it is understood that septic systems have not yet been constructed. The Bylaw Amendment will require that septic systems be designed by a Qualified Professional or Registered Onsite Wastewater Practitioner and located with appropriate setbacks from wells.
- IGI did not present water level monitoring for wells at the Development; monitoring for a minimum period of one year is required in the Bylaw Amendment. IGI presented water level data for BC Observation Well 311 (OBW 311), located approximately 2 km from the Development and provide analysis of the data available from 1991 to the time of the report. IGI noted the seasonal fluctuation in water levels and the general recovery of water levels in this well from the lowest reported levels in 2011; however, the bedrock in the area is variable both in terms of lithology and a fault extends north-south between the Development and the area of the OBW 311. Therefore, the water level patterns at OBW 311 may not reflect conditions at the Development.

- Although IGI notes that RDNO Bylaw 2600 currently enables subdivision of lots 2 has in size or larger without provision of a potable water supply (Section 407) if a report is obtained from a Qualified Professional, the Bylaw Amendment requires that a minimum of 6,550 litres per day (1.0 Imperial gallon per minute; 1 gpm) be demonstrated per parcel. For wells that are proposed as a source of water supply, a pumping test must be conducted.
  - IGI reported that a pumping test was conducted for WPID 66090, located on proposed Lot 1, with details provided in the report dated 4 April 2022:
    - The pumping test was conducted in March 2022. As discussed above, IGI did not provide water static water level monitoring data for WPID 66090. IGI reported that groundwater levels are typically higher in late summer and winter and therefore incorporated an annual fluctuation of 0.5 m into the analysis of the pumping test data.
    - The pumping test program comprised two constant rate pumping tests; one was conducted for a duration of 24 hours at a rate of approximately 9.5 L/min (2.1 l gpm) and a second test was conducted for a duration of 8.5 hours at a rate of 28.4 L/min (6.2 l gpm). The Bylaw Amendment requires that wells completed in bedrock aquifers be tested for a minimum duration of 72 hours.
    - IGI did not present monitoring data for the pumping well for a minimum of one week prior to the pumping test to assess pre-test trends, as is now required by the Bylaw Amendment.
    - IGI analysed the results of the pumping test and estimated the sustainable yield for WPID 66090 to be 0.14 L/s (1.8 l gpm), greater than the minimum per parcel requirement.
    - IGI report that water levels in the pumping well were monitored for periods of 48 and 34 hours following the 24-hour and 8.5-hour pumping tests, respectively. The water level in the pumping well did not fully recover to static conditions during the monitored periods. The Bylaw Amendment requires that, if full recovery is not achieved following pumping, further assessment be conducted by the Qualified Professional. IGI attributed the recovery patterns observed to the well having been unused prior to testing. They also attributed the failure of the well to achieve full recovery to the dual porosity of bedrock, whereby recovery related to the primary porosity (rock matrix) requires a longer time than recovery related to the secondary porosity (fractures).
    - IGI reported that during the pumping test for WPID 66090, water levels were monitored in WPID 47667, meeting the Bylaw Amendment requirement to monitor at least one observation well. The Bylaw Amendment also requires that the observation well(s) must be within 100 m of the pumping well and, for bedrock aquifers, completed within the same fracture network, which is uncertain for WPID 47667 as no response was reported for this well during the pumping test. It is understood that the two wells at the Development are separated by a distance of approximately 300 m. IGI reported that wells that are located on adjacent properties and approximately 100 m from WPID 66090 were not accessible for water level monitoring.
  - IGI did not conduct a pumping test for WPID 47667 because the driller-estimated yield was reported to be 5 US gpm. This estimate is greater than the minimum value of 3 l gpm that was identified in the Subdivision Servicing Bylaw at the time of IGI's report dated April 2023; however, the Bylaw Amendment now requires that a pumping test be conducted for each well to demonstrate that it can satisfy the minimum per parcel requirement.



- IGI report that groundwater samples from WPID 47667 and WPID 66090 exceeded the Guidelines for Canadian Drinking Water Quality (GCDWQ) aesthetic objective (AO) criteria for total dissolved solids (TDS) and the sample from WPID 47667 exceeded the GCDWQ criteria for iron. The samples from both wells exceeded the GCDWQ operational guidance (OG) value for turbidity and IGI noted that the concentration of fluoride in the samples from both wells were equal to (but did not exceed) the GCDWQ maximum allowable concentration (MAC) value. IGI provided links to guidance documents provided by Health Canada regarding treatment for the water quality parameters identified above.

WSP acknowledges that the Bylaw Amendment was issued after IGI had conducted the pumping test for WPID 66090.

### 3.0 CLOSURE

We trust that this technical memorandum meets your needs at this time. Should you have any questions, please do not hesitate to contact the undersigned.

**WSP Canada Inc.**

Mark Bolton, MSc, PGeo  
*Senior Principal Hydrogeologist*

Jillian Sacré, MSc, PGeo  
*Senior Principal Hydrogeologist*

MB/JS/jcc

[https://golderassociates.sharepoint.com/sites/127973/project files/6 deliverables/3.0\\_issued/20144760-012-tm-reva/20144760-012-tm-reva preliminary review 15mar\\_23.docx.docx](https://golderassociates.sharepoint.com/sites/127973/project%20files/6%20deliverables/3.0_issued/20144760-012-tm-reva/20144760-012-tm-reva%20preliminary%20review%2015mar_23.docx)

## 4.0 STUDY LIMITATIONS

WSP Canada Inc. (WSP) has prepared this technical memorandum in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and geoscience professions currently practicing in British Columbia, subject to the time limits and physical constraints applicable to this technical memorandum. No other warranty, express or implied is made.

The technical memorandum is of a summary nature and is not intended to stand alone without reference to the instructions given to WSP by the Client, communications between WSP and the Client, and to any other deliverables prepared by WSP for the Client relative to the specific site described in the technical memorandum. In order to properly understand the suggestions, recommendations and opinions expressed in this technical memorandum, reference must be made to the whole of the technical memorandum.

WSP cannot be responsible for use by any party of portions of the technical memorandum without reference to the entire technical memorandum and other relevant communications between WSP and the Client.

In preparing this technical memorandum, WSP has relied in good faith on information provided by the individuals and agencies noted in this technical memorandum. We accept no responsibility for any deficiency or inaccuracy contained in this technical memorandum as a result of errors, omissions, misinterpretations or fraudulent acts of the persons or agencies contacted.

The information, recommendations and opinions expressed in this technical memorandum are for the sole benefit of the Client.

No other party may use or rely on this technical memorandum or any portion thereof without WSP's express written consent.

The technical memorandum, all plans, data, drawings and other documents as well as all electronic media prepared by WSP are considered its professional work product and shall remain the copyright property of WSP, who authorizes only the Client to make copies of the technical memorandum, and only in such quantities as are reasonably necessary for the use of the technical memorandum by those parties. The Client may not give, lend, sell, or otherwise make available the technical memorandum or any portion thereof to any other party without the express written permission of WSP. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of WSP's technical memorandum or other work products.

If new information is discovered in the future, WSP should be requested to re-evaluate the content of this technical memorandum and provide amendments as required prior to any reliance upon the information presented herein.

# REGIONAL DISTRICT OF NORTH OKANAGAN

## BYLAW No. 2850

A bylaw to rezone lands and amend the Zoning Map attached to the Regional District of North Okanagan Zoning Bylaw No. 1888, 2003 to change a zone designation

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**WHEREAS** pursuant to Section 479 [Zoning bylaws] of the *Local Government Act*, the Board of the Regional District of North Okanagan may, by Bylaw, divide the whole or part of the Regional District into zones, name each zone, establish boundaries for the zones and regulate uses within those zones;

**AND WHEREAS** the Board has created zones, named each zone, established boundaries for these zones and regulated uses within those zones by Bylaw No. 1888, being the “*Regional District of North Okanagan Zoning Bylaw No. 1888, 2003*” as amended;

**AND WHEREAS**, pursuant to Section 460 [*Development approval procedures*] of the *Local Government Act*, the Board must, by bylaw, define procedures under which an owner of land may apply for an amendment to a Zoning Bylaw and must consider every application for an amendment to the bylaw;

**AND WHEREAS** the Board has enacted the “*Regional District of North Okanagan Development Application Procedures and Administrative Fees Bylaw No. 2677, 2018*” as amended to establish procedures to amend an Official Community Plan, a Zoning Bylaw, or a Rural Land Use Bylaw, or to issue a Permit:

**AND WHEREAS** the Board has received an application to rezone property;

**NOW THEREFORE**, the Board of the Regional District of North Okanagan in open meeting assembled, hereby **ENACTS AS FOLLOWS**:

### CITATION

1. This Bylaw may be cited as “**Zoning Amendment Bylaw No. 2850, 2019**”.

### AMENDMENTS

2. The zoning of the property legally described as Lot 1, Sec 25, Twp 8, ODYD, Plan 2558, Except Plan 37038 and Plan EPP74629 and located at McLennan Road, Electoral Area “C” is hereby changed on Schedule “A” of the *Regional District of North Okanagan Zoning Bylaw No. 1888, 2003* from the **Non-Urban Zone [N.U]** to the **Country Residential Zone [C.R]**.

<b>Read a First Time</b>	this	11th	day of	December, 2019
<b>Read a Second Time</b>	this	22nd	day of	March, 2023
Advertised on	this		day of	, 2023
	this		day of	, 2023
Public Hearing held	this		day of	, 2023
<b>Read a Third Time</b>	this		day of	, 2023

**ADOPTED**

this

day of

, 2023

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Chair

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Corporate Officer