

COMMUNITY SERVICES, GOVERNMENT OF YUKON

WELL COMPLETION REPORT FOR TEST WELL GV-1 GRIZZLY VALLEY, YUKON



REPORT

DECEMBER 2012
ISSUED FOR USE
EBA FILE: W23101599

creating & delivering | BETTER SOLUTIONS


A TETRA TECH COMPANY

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Government of Yukon and their agents. EBA Engineering Consultants Ltd. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the Government of Yukon, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's General Conditions that are provided in Appendix A of this report.

EXECUTIVE SUMMARY

EBA Engineering Consultants Ltd., operating as EBA, A Tetra Tech Company (EBA), provided hydrogeological services to the Department of Community Services, Government of Yukon (GY) to assist with selecting a site for a bulk truck fill station to supply residents of the Ta'an Kwach'an First Nation, Horse Creek, Grizzly Valley, and Deep Creek areas north of Whitehorse. For this current phase of the project, EBA coordinated the drilling, construction, and testing of new cold water test wells in the Deep Creek and Grizzly Valley Areas. This report addresses the completion of the well at Grizzly Valley.

The scope of work for this project included: selection of the well location, preparing specifications for drilling, well construction and testing, oversight of the well drilling, construction and testing, data analysis, and preparation of this well completion report.

Hydraulic test results from a pumping test completed on the test well show that it is completed within a fairly productive aquifer. The long-term sustainable yield based on projection of the water level drawdown to 100 days is 0.5 L/s (8 USgpm), serving between 140 (based on 2006 Canadian National Average water usage) and 309 people (based on cold regions utility monograph). GY has projected the total population of the area to reach about 300 people.

Laboratory results from water samples collected on September 7, 2012 from the well GV-1 show that water quality of the well met the Guidelines for Canadian Drinking Water Quality (GCDWQ) for the analyzed health-based parameters (maximum allowable concentrations). However, the sample exceeded the aesthetic objectives (AO) for manganese (observed concentration: 0.245 mg/L; AO: 0.05 mg/L), sulfate (observed concentration: 540 mg/L; AO: 500 mg/L) and total dissolved solids (TDS; observed concentration: 1,110 mg/L; AO: 500 mg/L). The water is also extremely hard (936 mg/L) and although there is no aesthetic objective, water with a hardness exceeding 500 mg/L is usually considered unacceptable for most domestic purposes. Significant treatment would likely be required to lower the hardness and TDS, manganese, and sulfate concentrations. Water quality and well performance results indicate that the Deep Creek location is preferable to Grizzly Valley.

Should this well be developed, the submersible pump should be installed at a depth of approximately 47 m bgs (1 m above the water-bearing fracture at 48 m bgs) to maximize drawdown and well performance. The pump to be installed in the well should be capable of pumping at rates not in excess of 1.3 L/s (20 USgpm) overcoming a head of 47 m plus pipe friction losses and possible additional elevation gains to the water treatment plant. Information for this well is summarized below.

Well Information Summary Table

| Well ID | GV-1 |
|--------------------------------------|--------------------|
| Date of Completion | August 31, 2012 |
| Static Water Level (August 19, 2011) | 7.48 m bgs |
| Recommended Maximum Pump Rate | 1.1 L/s (17 USgpm) |
| Depth to Top of Screen | 40.54 m bgs |
| Recommended Depth to Pump Intake | 47 m bgs |
| Well Liner Diameter | 125.5 mm |
| Screen Length | 60.96 m |

TABLE OF CONTENTS

EXECUTIVE SUMMARY i

1.0 INTRODUCTION 1

2.0 FIELD PROGRAM 1

 2.1 Well Location Selection 1

 2.2 Well Drilling and Construction..... 1

 2.3 Well and Aquifer Testing..... 2

 2.3.1 Hydraulic Testing Method 2

 2.3.2 Step Rate Pumping Test..... 3

 2.3.3 Constant Rate Pumping Test..... 3

 2.4 Water Sample Collection 3

3.0 RESULTS..... 3

 3.1 Hydraulic Testing Results 3

 3.1.1 Pumping Test Results..... 3

 3.1.2 Well Capacity 4

 3.2 Results of Laboratory Analysis 5

4.0 GROUNDWATER UNDER THE DIRECT INFLUENCE (GUDI) ASSESSMENT 6

5.0 CONCLUSIONS..... 6

6.0 RECOMMENDATIONS..... 7

7.0 CLOSURE..... 8

REFERENCES..... 9

TABLES

Table 4 Summary of Water Quality Results for Test Well GV-1

FIGURES

Figure 1A Site Location Map

Figure 1B Site Plan with Well Location

Figure 2 Well Log Including Well Construction Details

Figure 3 Pumping Test Data

Figure 4 Extrapolated 100-Day Drawdown

APPENDICES

| | |
|------------|--------------------------|
| Appendix A | EBA's General Conditions |
| Appendix B | Pumping Test Data |
| Appendix C | Pumping Test Analysis |
| Appendix D | Laboratory Reports |
| Appendix E | Drillers Well Log |

1.0 INTRODUCTION

EBA Engineering Consultants Ltd., operating as EBA, A Tetra Tech Company (EBA), was retained by the Department of Community Services, Government of Yukon to provide hydrogeological services for the selection of a site to construct a groundwater supplied bulk truck fill station for residents of the Ta'an Kwach'an First Nation, Horse Creek, Grizzly Valley North and South, and Deep Creek areas. As per EBA's letter report of November 2011 (EBA File W23101405), the Grizzly Valley and Deep Creek subdivisions were considered the best possible options for the completion of a drinking water supply well.

In 2012, EBA provided hydrogeological consulting and project management services for the installation and completion of a test water well at each location (Grizzly Valley and Deep Creek) to determine which location had the best potential to support a bulk truck fill station.

The purpose of this project was to provide the proper design, coordinate and oversee the installation and testing of the test well for the purpose of assessing water quantity and quality for a potential truck fill station in the Grizzly Valley Area. The test well was to be constructed in accordance with the Canadian Groundwater Association Guidelines for Water Well Construction.

This report summarizes the results of well drilling and testing at the site selected in Grizzly Valley. A site location map is provided as Figure 1A. Figure 1B shows the actual Grizzly Valley well location.

2.0 FIELD PROGRAM

2.1 Well Location Selection

The well location was selected in accordance with the requirements outlined in the guidelines by the Canadian Groundwater Association and the Yukon Drinking Water Regulation (Public Health and Safety Act, Part I – Large Public Drinking Water Systems). These guidelines and regulations require the well to be located:

- 60 metres from any part of a sewage disposal system, or other potential sources of pollution that may pose a health and safety risk;
- 120 metres from a solid waste site or dump, and cemetery; and
- 300 metres from a sewage lagoon or pit.

The drilling site was selected by a representative of GY and confirmed by EBA to comply with setback distances specified above and considering existing geological and hydrogeological information. The well location is shown on Figure 1B.

2.2 Well Drilling and Construction

The test well GV-1 was drilled from August 28-30, 2012 by Double D Drilling of Terrace, BC, using a dual air rotary drill rig. During drilling an EBA hydrogeologist monitored drilling operations and recorded the subsurface conditions encountered. Figure 2 summarizes the subsurface conditions encountered at GV-1.

Construction details for GV-1 are included in Figure 2; the driller’s well log is attached in Appendix E. The well was developed for seven hours by airlifting and surging. The well development was stopped after seven hours when the water was clear and turbidity measurements were around 10 NTU.

A summary of relevant well construction details is presented in Table 1.

Table 1: Summary of Well Information and Construction Details for Test Well GV-1

| | |
|---|--|
| Date of construction: | August 28-30, 2012 |
| Owner of the well: | Government of Yukon |
| GPS Coordinates (NAD83): | UTM Zone 8N E 0487803 N 6768194 |
| Location of well on the property: | See Figure 1B |
| Drilling contractor: | Double D Drilling, Terrace, BC |
| Method of construction: | Dual Air Rotary |
| Description, depth, and thickness of geologic materials encountered during construction: | See well log in Figure 2 and drillers well log in Appendix E. |
| Depth and diameter of the well: | Total depth of well completion is 101.5 m bgs. Nominal diameter of steel casing to 12.5 m bgs: 203 mm (8"). Nominal diameter of PVC Liner to 101.5 mbgs: 114 mm (4.5"). Construction details are included on Figure 2. |
| Type of casing materials and thickness: | Steel casing: 0.250" (6.35 mm) wall thickness; Schedule 40 PVC liner |
| Static water level: | 7.48 m bgs (September 4, 2012) |
| Type, size, length and location of the screen: | Slotted PVC liner: 0.020" slot size; 40.5-101.5 m bgs |
| Location of major water-bearing zones: | Water-bearing fractures at about 30 m, 48 m and 60 m bgs. |
| Location, type and thickness of grout sealant placed around the well: | Bentonite seal was placed between the annulus of the casing and native sediments. Seal is completed from grade to 5.6 m (18.5 ft) bgs with a radial thickness of 51 mm (2"). |

2.3 Well and Aquifer Testing

2.3.1 Hydraulic Testing Method

Hydraulic testing was conducted on GV-1 from September 4-6, 2012 by Double D Drilling and overseen by EBA. A temporary submersible pump was installed in the well at a depth of about 80 m. A pressure transducer and data logger was deployed in the pumping well to monitor the groundwater level during the pumping. Water levels were also measured manually on specified intervals using a water level sounder.

Double D Drilling monitored flow during the pumping test using a digital flow meter. Flow was confirmed by measuring the time to fill a 5-gal bucket. Water removed from the well during pumping was conveyed to an area approximately 60 m south of the well and disposed of via infiltration.

Manual data collected during the pumping tests are included as Appendix B.

2.3.2 Step Rate Pumping Test

A step rate pumping test was conducted to determine the optimal rate at which to perform the constant rate pumping test. The step rate test at GV-1 consisted of four 60 minute steps at rates of 0.6 L/s (10 USgpm), 1.0 L/s (15 USgpm), 1.3 L/s (20 USgpm), and 1.9 L/s (30 USgpm). 95% recovery occurred within 1 hour. The results from the step rate test are presented in Figure 3.

2.3.3 Constant Rate Pumping Test

A constant rate pumping test was conducted after 95% recovery of the groundwater level from the step rate pumping test (see Figure 3). Based on the step rate test results and the pump capacity, it was determined that the well could be pumped at 1.3 L/s (20 USgpm) for the 48 h constant rate test. The groundwater level recovered to 90% of the initial static water level within 4 hours of stopping the pump.

2.4 Water Sample Collection

EBA collected water samples from well GV-1 at the end of the constant rate pumping test. The samples were collected in laboratory supplied sample containers in accordance with laboratory sampling procedures. Samples were shipped on ice by air cargo to Exova in Surrey, B.C., for detailed potability analysis and hydrocarbon screening. The Exova laboratory in Surrey is an accredited ISO/IEC 17025 testing laboratory.

Samples were also sent to the Saskatchewan Research Council (SRC) Analytical Lab to test for radiological parameters. Samples for bacteriological analysis were submitted to Environmental Health Services, Whitehorse within the 24 hour holding time.

3.0 RESULTS

3.1 Hydraulic Testing Results

3.1.1 Pumping Test Results

The observed drawdown in GV-1 during the step rate and constant rate pumping tests and the subsequent recovery periods are shown in Figure 3. The maximum drawdown in the well during the constant rate pumping test was about 51.43 m.

The observed drawdown with changing drawdown rates suggests that several aquifer boundaries were encountered during the 48-hour constant rate pumping test:

- The first low flow boundary was observed at about $t=0.05$ days and a drawdown of $d=21$ m with an increase in the drawdown rate (steepening of the curve in Figure 4);
- The second low flow boundary was observed at about $t=0.9$ days and a drawdown of $d=39$ m with another increase in the drawdown rate;
- A recharge boundary was observed at about $t=1.2$ days and a drawdown of $d=50$ m when the drawdown rate changed to nil and the drawdown has remained fairly constant throughout the remainder of the pumping test.

Recovery of the groundwater level in the pumping well to within about 90% of the initial static water level occurred in approximately 4 hours.

The drawdown data during the pumping test were analyzed using the Theis recovery and Cooper-Jacob Straight-Line Time-Drawdown Methods (e.g., Fetter, 2001). Both interpretation methods were applied using the software AquiferTest (by WHI, v3.5), which was used to analyze the pumping test data (see Appendix C).

The results of the pumping test are presented in Table 2. The inferred hydraulic conductivity of about 4.7×10^{-7} m/s is typical for bedrock as encountered in the test well.

Table 2: Pumping Test Results

| Well | Method | T | K |
|------|---------------------|---------------------|---------|
| | | [m ² /s] | [m/s] |
| GV-1 | Theis Late Recovery | 5.0E-05 | 8.3E-07 |
| | Cooper-Jacob | 1.6E-05 | 2.7E-07 |
| | Geometric Mean | 2.8E-05 | 4.7E-07 |

3.1.2 Well Capacity

The safe yield of a well is determined by the available drawdown above the pump intake, the capacity of the screen installed in the well, and the transmissivity of the aquifer around the well screen.

To calculate the safe yield of a well, the 100-day specific capacity was multiplied by the safe available drawdown. The 100-day specific capacity of the well (at a given pumping rate) is based on the projection of the observed drawdown at the end of the constant rate pumping test extrapolated to 100 days as shown on Figure 4. This conservatively assumes that the well would be continuously pumped at the same rate for 100-days with no recharge to the aquifer. The safe available drawdown of the well is determined by applying a safety factor of 70% to the physical available drawdown after an allowance has been made for seasonal fluctuations in static water level. The water level in the well should also not be lowered to below the water-bearing fractures that are located within the screened section of the well at about 48 and 60 m bgs. Therefore the lowest recommended water level during pumping is about 47 m bgs at which depth the pump should be installed.

The safe yield of a well can also be limited by what the well screen is capable of delivering based on the maximum recommended screen entrance velocity. However, since GV-1 was completed as a bedrock well with a well screen of more than 40 m length, the screen will not limit the well capacity in this case. Table 3 details the safe yield calculations for the well.

EBA determined the long-term sustainable yield of the test well to be 0.52 L/s (8.3 USgpm). Short-term pumping at rates up to 1.3 L/s (20 USgpm) are possible as long as daily average remains below 0.52 L/s (8.3 USgpm).

Table 3: Summary of Safe Yield Calculations

| WELL PARAMETER | VALUE | UNIT | KEY |
|--|-------|-------|-----------|
| Constant Rate Pumping Test Discharge Rate | 1.3 | L/s | a |
| Projected 100-Day Drawdown | 68 | m | b |
| Projected 100-Day Specific Capacity | 0.02 | L/s/m | c=a/b |
| Lowest Expected Seasonal Water Table (1 m below static) | 8.48 | m | d |
| Recommended Depth of Pump Intake | 47 | m | e |
| Available Drawdown | 38.52 | m | f = e-d |
| Safety Factor | 70 | % | g |
| Safe Available Drawdown | 26.96 | m | h = f x g |
| Theoretical Yield Based on Constant Rate Pumping Test | | | |
| Theoretical Sustainable Yield | 0.52 | L/s | i = c x h |
| Theoretical Sustainable Yield | 8.3 | USgpm | |

3.2 Results of Laboratory Analysis

Groundwater analytical results and a comparison with Guidelines for Canadian Drinking Water Quality (GCDWQ) are presented in Table 4, attached. The laboratory reports and certificates are included as Appendix D.

Based on the analytical results, the sample met the health-related GCDWQ (maximum allowable concentrations) for all parameters tested at the date of sample collection. However, the sample exceeded the aesthetic objectives (AO) for manganese (observed concentration: 0.245 mg/L; AO: 0.05 mg/L), sulfate (observed concentration: 540 mg/L; AO: 500 mg/L) and total dissolved solids (TDS; observed concentration: 1,110 mg/L; AO: 500 mg/L). The water is also extremely hard (936 mg/L) and although there is no aesthetic objective, water with a hardness exceeding 500 mg/L is usually considered unacceptable for most domestic purposes.

Due to the very high TDS, hardness, sulfate and manganese, significant water treatment will likely be required should the well be used for drinking water supply. According to Health Canada, TDS are not appreciably removed using conventional water treatment processes. Demineralization processes are required for significant TDS removal. Although the technology is available to reduce TDS levels significantly, the economic cost may be a major constraint. Reverse osmosis and electro dialysis would probably be the most economical processes for removing TDS from public water supplies.

A bacteriological sample taken from the well was submitted to the Environmental Health Services department. Sample results showed no presence of total coliforms or E.coli on the date sampled.

Sample results for radiological parameters were also below the GCDWQ (<0.5 Bq/L for gross alpha and <1.0 Bq/L for gross beta).

4.0 GROUNDWATER UNDER THE DIRECT INFLUENCE (GUDI) ASSESSMENT

Well water or groundwater under the direct influence of surface water (GUDI) refers to groundwater sources that have a direct hydraulic connection to surface water sources and are therefore vulnerable to contamination by surface water organisms. The implication of a well being classified GUDI means that the well water source requires water treatment equivalent to that required for surface water sources.

EBA conducted a Phase 1 Initial GUDI Screening and determined that GV-1 is potentially GUDI according to the guidelines outlined in YG (2006). The following criteria were considered in the Phase 1 Initial GUDI Screening:

- The aquifer is considerably deeper than 15 m; however, the bedrock aquifer is overlain by silty gravel overburden deposits. Since there is no indication for a low permeability layer overlying bedrock, the aquifer is considered unconfined;
- The well is located 60 m away from all surface water bodies;
- The well was constructed in accordance with the Guidelines for Water Well Construction published by the Canadian Ground Water Association; and
- The water sample collected following the pump test was negative for total coliforms and *E. coli*.

Further assessment would be necessary to determine whether the well GV-1 should be considered GUDI or non-GUDI.

5.0 CONCLUSIONS

The following conclusions are based on the information presented in this well completion report:

- In August 2012, the test well GV-1 was drilled for GY in the Deep Creek area to a depth of 101.5 m bgs. The well was completed in an unconfined bedrock aquifer with a PVC liner and a well screen set from 40.5-101.5 m bgs;
- The well was constructed in accordance with the Canadian Groundwater Association's Guidelines for Water Well Construction (CGWA 1995) and Yukon Drinking Water Regulation, Part I – Large Public Drinking Water Systems;
- Pumping test results from the well indicate an aquifer transmissivity in the order of $2.8 \times 10^{-5} \text{ m}^2/\text{s}$ (2.4 m^2/day);
- The long-term sustainable yield of GV-1 is 0.52 L/s (8.3 USgpm); however, the short-term pumping rate may exceed the long-term sustainable yield but should not be in excess of 1.3 L/s (20 USgpm) and a daily average of 0.52 L/s (8.3 USgpm);
- Based on the long-term sustainable yield, the well would be able to serve between 140 (based on 2006 Canadian National Average water usage of 335 L/day) and 309 people (based on cold regions utility monograph of about 145 L/day). YG has estimated the total population of the area following development of the Grizzly Valley Subdivision at 300 people;

- EBA identified the well as being potentially GUDI based on a Phase 1 Initial GUDI Screening;
- Laboratory results from water samples collected at the end of the 48-hour pumping test show that the water quality of the well met all health-based GCDWQ for the parameters tested; however, the sample exceeded the aesthetic objectives (AO) for manganese (observed concentration: 0.245 mg/L; AO: 0.05 mg/L), sulfate (observed concentration: 540 mg/L; AO: 500 mg/L) and total dissolved solids (TDS; observed concentration: 1,110 mg/L; AO: 500 mg/L). The water is also extremely hard (936 mg/L);
- Well yield and water quality of the well drilled at Deep Creek (DC-1) are better suited to serve a public water system than the yield and quality of the test water well drilled at Grizzly Valley (GV-1) as part of this program;
- This well could be used for a domestic water supply; however, water treatment would be required to make the water palatable. Point of entry or point of use (RO) systems could be considered.

6.0 RECOMMENDATIONS

Proper well commissioning, operation and maintenance are fundamental to ensuring a reliable potable water source. Recommendations pertinent to the commissioning, operation and maintenance of GV-1 as a potable water supply are presented below:

- The pump should be installed with the pump intake at a depth of 47 m bgs (positioned about 1 m above the upper most water bearing fracture);
- The pump should be able to pump at a rate not exceeding 1.3 L/s (20 USgpm) overcoming a head of about 47 m plus pipe friction losses and possible additional elevation gain;
- The well should be disinfected (“shock chlorinated”) prior to commissioning;
- The water quality should be monitored again in one year. In case the well will be continued to be used in the future, it should be sampled every five years in accordance with the guidelines for Public Drinking Water Regulations to ensure that all health-based parameters meet the drinking water guidelines;
- Any alterations to the well should be in compliance with the Public Drinking Water Regulations and the Canadian Groundwater Association’s Guidelines for Water Well Construction (CGWA 1995).

7.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact the undersigned at your convenience.

Respectfully submitted,
EBA Engineering Consultants Ltd.

Prepared by:



Kristen Range, B.Sc., GIT
Junior Hydrogeologist
Whitehorse Environment Group
Phone: 867.668.3068
Email: krange@eba.ca



Stephan Klump, Ph.D.
Hydrogeologist
Whitehorse Environment Group
Direct Line: 867.668.2071 x 250
Email: sklump@eba.ca

Ryan Martin, M.Eng., P.Eng.
Project Director
Whitehorse Environment Group
Direct Line: 867.668.2071 x 250
Email: sklump@eba.ca



REFERENCES

Canadian Groundwater Association (1995) Guidelines for Water Well Construction.

Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment (2012) Guidelines for Canadian Drinking Water Quality – Summary Table.

Fetter, C.W. (2001) Applied Hydrogeology. 4th Ed., Prentice-Hall Inc., Upper Saddle River, New Jersey.

Government of Yukon, Health and Social Services (2007) Guidelines for Part I – Large Public Drinking Water Systems.

Government of Yukon, Health and Social Services. (2006) Assessment Guideline for Well Water or Groundwater Under the Direct Influence of Surface Water (GUDI).

TABLES

Table 4 Summary of Water Quality Results for Test Well GV-1

Table 4: Summary of Water Quality Results for Test Well GV-1

| Parameter Group | Parameter | Unit | Detection Limit | Canadian Drinking Water Guidelines | Results | |
|-----------------------------------|-------------------------------|----------|-----------------|------------------------------------|-------------|--------------|
| | | | | | Well ID | GV-1 |
| | | | | | Sample Date | 9/7/2012 |
| Routine Parameters | Colour | T.C.U. | 5 | 15 (AO) | | 10 |
| | Turbidity | NTU | 0.1 | | | 1.6 |
| | Electrical conductivity (Lab) | uS/cm | 1 | | | 1460 |
| | pH (Lab) | pH_Units | 0.01 | 6.5-8.5 (T) | | 7.31 |
| | Total Dissolved Solids | mg/L | 1 | 500 (AO) | | <u>1110</u> |
| | Alkalinity (total) as CaCO3 | mg/L | 5 | | | 383 |
| | Hardness as CaCO3 | mg/L | 1 | | | 936 |
| | Calcium | mg/L | 0.1 | | | 144 |
| | Magnesium | mg/L | 0.1 | | | 140 |
| | Potassium | mg/L | 0.1 | | | 0.7 |
| | Sodium | mg/L | 0.1 | 200 (AO) | | 28.5 |
| | Bicarbonate | mg/L | 5 | | | 467 |
| | Carbonate | mg/L | 6 | | | <6 |
| | Hydroxide | mg/L | 5 | | | <5 |
| | Chloride (Filtered) | mg/L | 0.05 | 250 (AO) | | 9.14 |
| | Sulphate (Filtered) | mg/L | 0.5 | 500 (AO) | | <u>540</u> |
| | Nitrate (as N) (Filtered) | mg/L | 0.01 | 10 (MAC) | | <0.1 |
| | Nitrite (as N) (Filtered) | mg/L | 0.01 | 1 (MAC) | | <0.1 |
| Fluoride (Filtered) | mg/L | 0.01 | 1.5 (MAC) | | <0.1 | |
| PHCs and Other | Total Organic Carbon | mg/L | 0.5 | | | 7.5 |
| Metals | Aluminium | mg/L | 0.005 | 0.1 (OG) | | <0.005 |
| | Antimony | mg/L | 0.0002 | 0.006 (MAC) | | 0.0005 |
| | Arsenic | mg/L | 0.0002 | 0.01 (MAC) | | 0.001 |
| | Barium | mg/L | 0.001 | 1 (MAC) | | 0.016 |
| | Boron | mg/L | 0.005 | 5 (MAC) | | 0.03 |
| | Cadmium | mg/L | 0.00007 | 0.005 (MAC) | | <0.00007 |
| | Chromium (III+VI) | mg/L | 0.0005 | 0.05 (MAC) | | 0.0043 |
| | Copper | mg/L | 0.001 | 1.0 (AO) | | <0.001 |
| | Iron | mg/L | 0.005 | 0.3 (AO) | | 0.265 |
| | Lead | mg/L | 0.0001 | 0.01 (MAC) | | 0.0004 |
| | Manganese | mg/L | 0.001 | 0.05 (AO) | | <u>0.245</u> |
| | Mercury | mg/L | 0.00001 | 0.001 (MAC) | | <0.00001 |
| | Selenium | mg/L | 0.0006 | 0.01 (MAC) | | <0.0006 |
| | Silicon | mg/L | 0.05 | | | 6.12 |
| | Uranium | mg/L | 0.0005 | 0.02 (MAC) | | 0.0038 |
| | Vanadium | mg/L | 0.0001 | | | 0.0012 |
| Zinc | mg/L | 0.001 | 5 (AO) | | 0.129 | |
| Radiological Parameters | Gross Alpha | Bq/L | 0.54 | 0.5 | | <0.54 |
| | Gross Beta | Bq/L | 0.35 | 1 | | <0.35 |
| Bacteriological Parameters | Total Coliform | | | | | Absent |
| | E.Coli | | | | | Absent |

MAC - Maximum Acceptable Concentration

AO - Aesthetic Objective

OG - Operational Guideline

T - Treatment-related Guideline

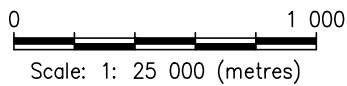
FIGURES

| | |
|-----------|--|
| Figure 1A | Site Location Map |
| Figure 1B | Site Plan with Well Location |
| Figure 2 | Well Log Including Well Construction Details |
| Figure 3 | Pumping Test Data |
| Figure 4 | Extrapolated 100-Day Drawdown |

C:\Whitehorse\Data\021\drawings\Deep Creek\W23101599 Specifications for Well Construction and Testing\Report #2\Grizzly Valley\W23101599 Fig.1_R0.dwg [FIGURE 1A] April 19, 2013 - 10:36:19 am (BY: BUCHAN, CAMERON)



NOTE : THE IMAGERY CONTAINED ON THIS PLAN WAS PROVIDED BY THE YUKON GOVERNMENT DEPARTMENT OF ENERGY, MINES AND RESOURCES (DATED 2007)



CLIENT
Yukon
 Government
 Department of Community Services



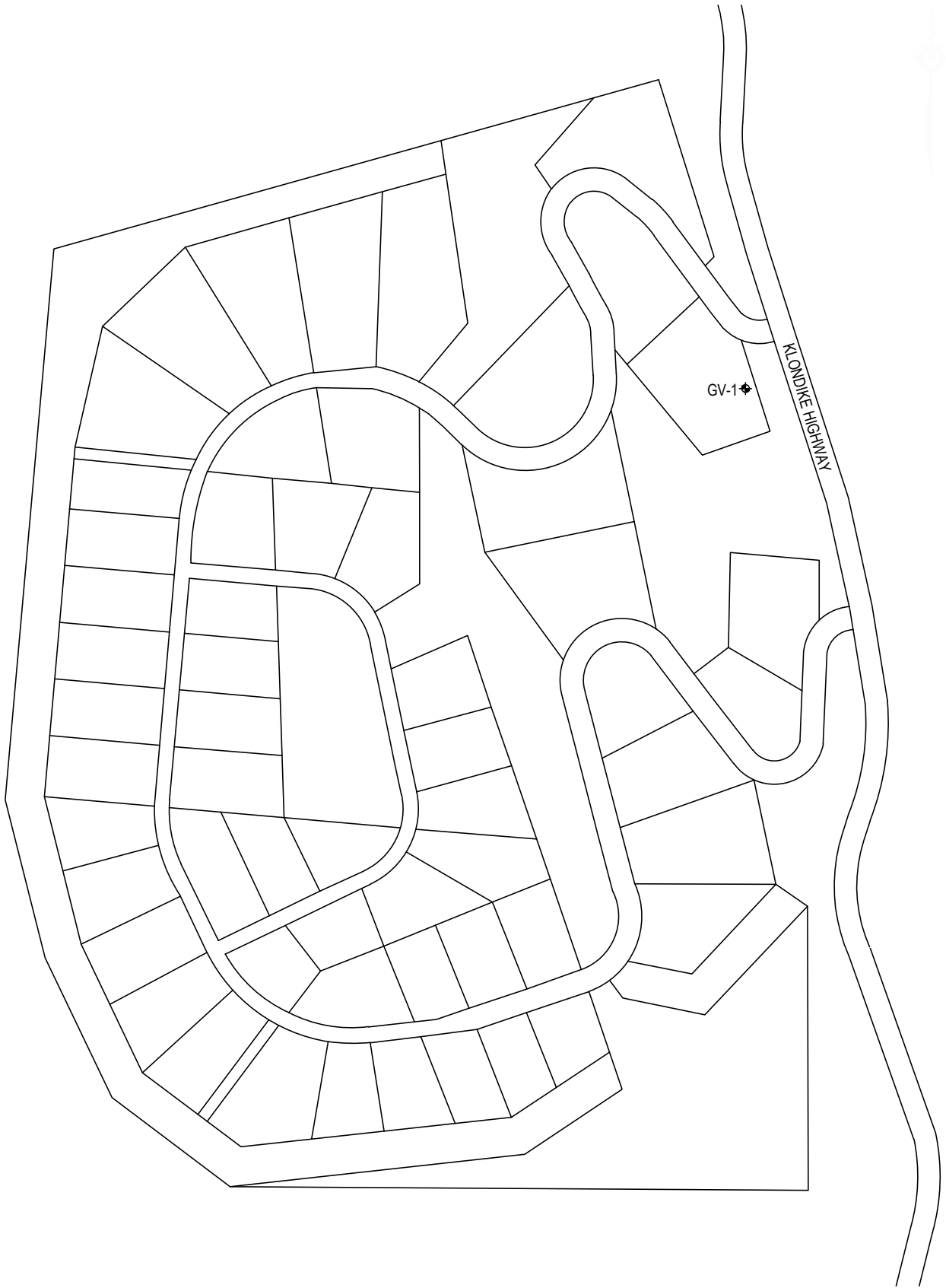
GRIZZLY VALLEY TEST WELL

LOCATION PLAN

| | | | |
|------------------------------|--------------------------|------------|----------|
| PROJECT NO. W23101599.001 | DWN CB | CKD KRR | REV 0 |
| OFFICE EBA-WHSE | DATE November 2, 2012 | | |

Figure 1A

C:\Whitehorse\Drawings\Deep Creek\W23101599 Specifications for Well Construction and Testing\Report #2\Grizzly Valley\W23101599 Fig.1_RD.dwg [FIGURE 1B] April 19, 2013 - 10:35:52 am (BY: BUCHAN, CAMERON)



0 500
 Scale: 1: 15 000 (metres)

CLIENT



GRIZZLY VALLEY TEST WELL

SITE PLAN SHOWING WELL LOCATION

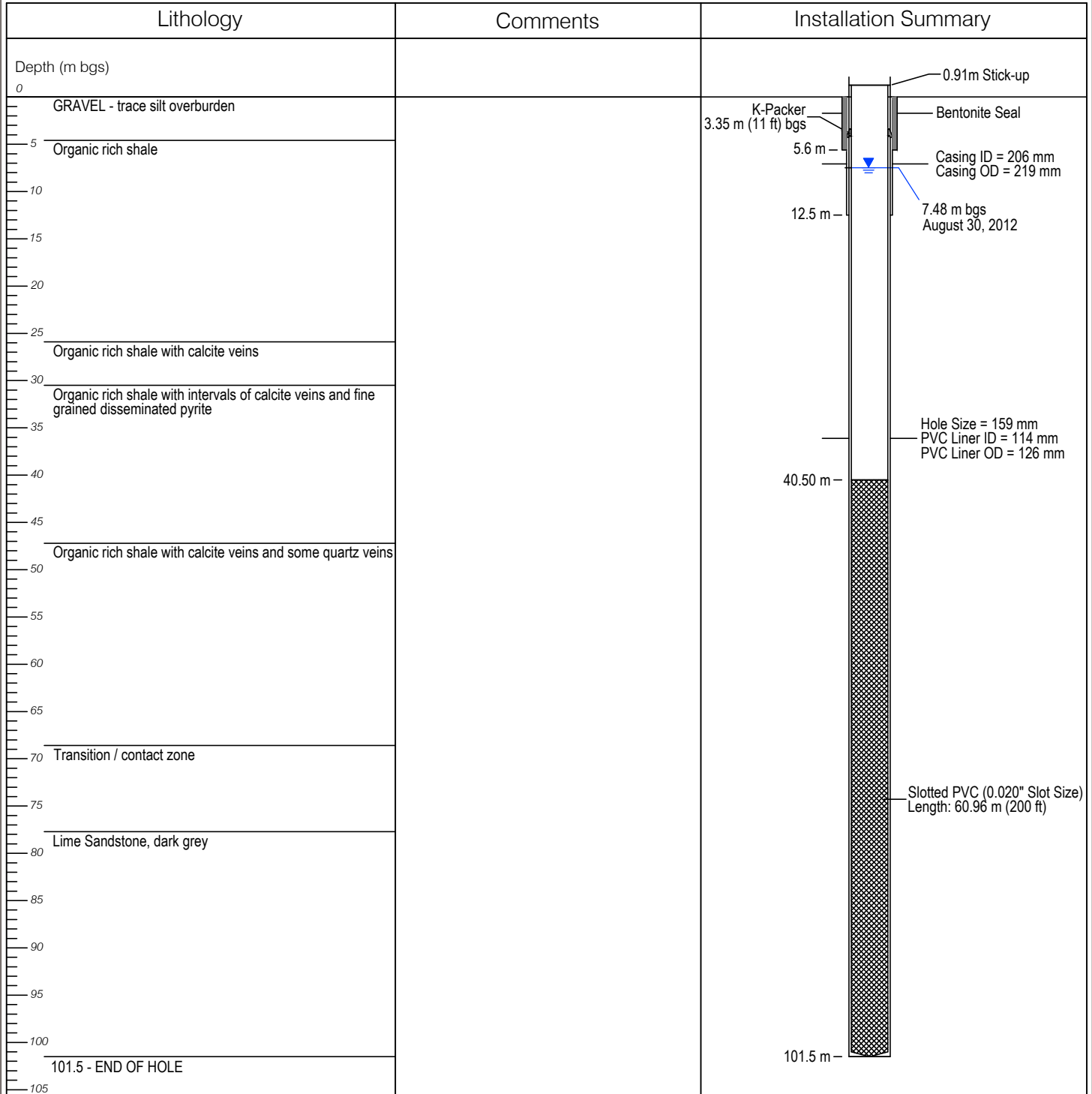
| | | | |
|------------------------------|--------------------------|------------|----------|
| PROJECT NO. W23101599.001 | DWN CB | CKD KRR | REV 0 |
| OFFICE EBA-WHSE | DATE November 2, 2012 | | |

Figure 1B

BOREHOLE LOG

PROJECT NAME: Grizzly Valley Test Well Installation
 LOCATION: Grizzly Valley, Yukon
 CLIENT: Government of Yukon - Department of Community Services
 DRILL TYPE: Dual Air Rotary
 DRILL DATE: August 28 - 30, 2012

PROJECT NO.: W23101599
 UTM (NAD83, Zone 8): 6768194 N;
 487803 E



C:\Whitehorse\Drawings\Deep Creek\W23101599 Specifications for Well Construction and Testing\Report#2\Grizzly Valley\W23101599 Fig.2_R0.dwg [FIGURE 2] November 23, 2012 - 4:16:33 pm (BY: BUCHAN, CAMERON)

CLIENT

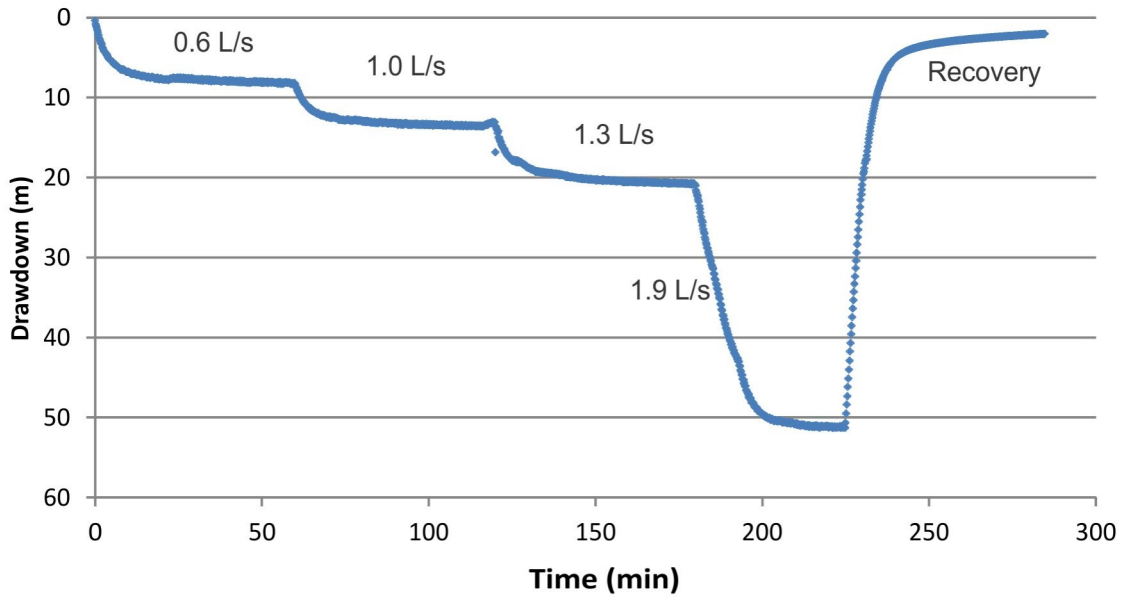
GRIZZLY VALLEY TEST WELL

WELL LOG FOR GV-1

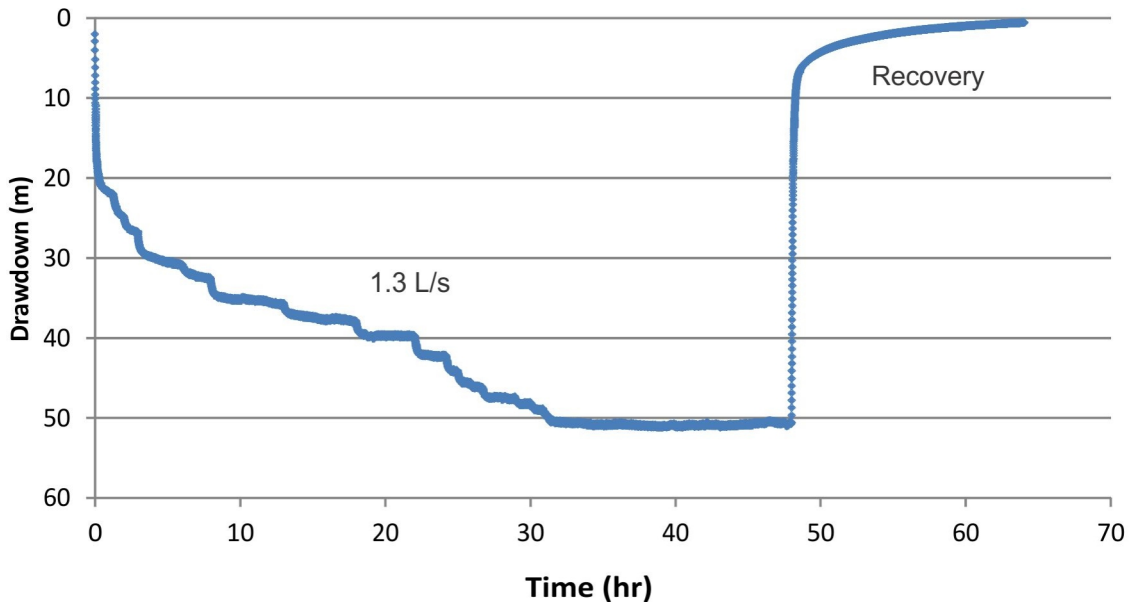
| | | | |
|------------------------------|--------------------------|------------|----------|
| PROJECT NO. W23101599.001 | DWN CB | CKD KRR | REV 0 |
| OFFICE EBA-WHSE | DATE November 2, 2012 | | |

Figure 2

Step Rate Pumping Test - Datalogger Data



Constant Rate Pumping Test - Datalogger Data



LEGEND

NOTES

CLIENT



**WATER WELL COMPLETION REPORT
GRIZZLY VALLEY**

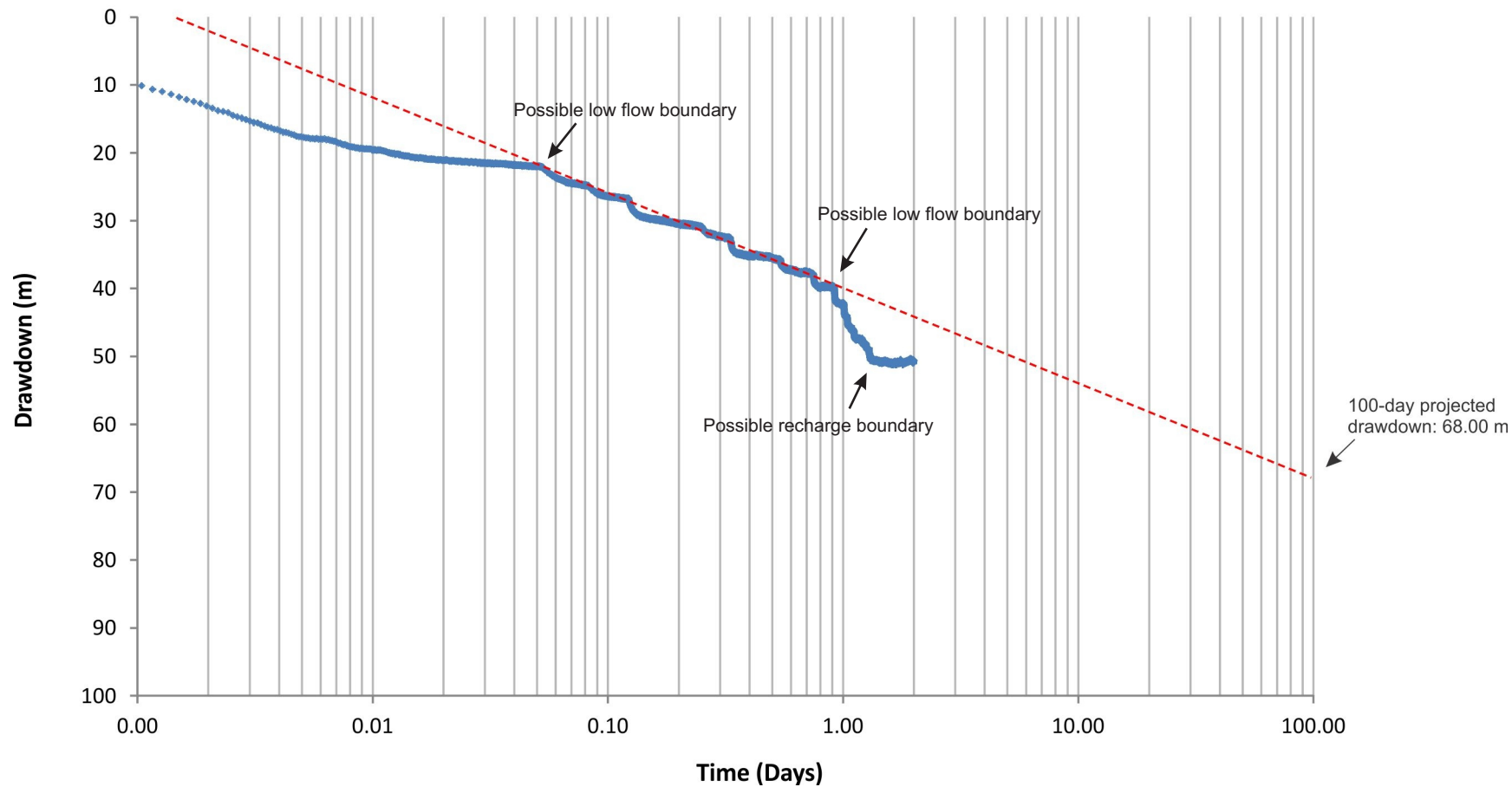
Observed Drawdown During Pump Tests

STATUS
ISSUED FOR USE



| | | | | |
|--------------------------|--------------------------|-----------|-------------|----------|
| PROJECT NO. W23101599 | DWN KRR | CKD TR | APVD XXX | REV 0 |
| OFFICE EBA-WHSE | DATE November 1, 2012 | | | |

Figure 3



LEGEND

- ◆ Drawdown in pumping well during constant rate pumping test
- ◆ Extrapolation of drawdown to 100 days

NOTES

STATUS
ISSUED FOR USE

CLIENT



**WATER WELL COMPLETION REPORT
GRIZZLY VALLEY WELL**

**Extrapolation of Drawdown During
Constant Rate Pumping Test to 100 Days**

| | | | | |
|---------------------------------|---------------------------------|------------------|--------------------|-----------------|
| PROJECT NO. W23101599 | DWN KRR | CKD TR | APVD XXX | REV 0 |
| OFFICE EBA-WHSE | DATE November 1, 2012 | | | |

Figure 4

APPENDIX A

EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEO-ENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B

PUMPING TEST DATA

STEP-DRAWDOWN PUMPING TEST DATA

| | | | |
|---------------------------------|----------------|--|----------------|
| EBA Project Number: | W23101599.001 | Project Location: | Grizzly Valley |
| Well Name: | Grizzly Valley | Pump Intake Depth (m): | 83.23 m |
| Static Water Level* (m): | 8.39 | Screen Interval (X to Y depth): | 40 m – 100 m |
| Ref. Point Description: | Top of 1" PVC | Screen Slot Size ("): | 0.020 |
| Ref. Point Stick-Up (m): | 0.91m | Safe Available Drawdown** (m): | 56.86 m |
| Well Diameter (mm): | 6" drill hole | Screen Diameter (mm): | 4.94" |
| Total Well Depth (m): | 101.52 m | Observer's Name: | Kristen Range |

*below reference point

**equal to (pump depth m – SWL m) x 0.7

| Date | Time | Elapsed Time (min) | Depth to Water (m) | Drawdown (m) | Meter Reading ³ | Flow Rate (IGPM) | Flow Rate (L/s) | Specific Capacity (L/s/m) | Comments |
|------------|----------|--------------------|--------------------|--------------|----------------------------|------------------|-----------------|---------------------------|----------|
| Sept 4, 12 | 11:20 AM | 0 | 8.38 | - | - | - | - | - | |
| | 11:20 AM | 0.5 | 9.6 | 1.22 | 10.4 | 8.66 | 0.55 | 0.45 | |
| | 11:21 AM | 1 | 10.36 | 1.98 | 10.45 | 8.70 | 0.55 | 0.28 | |
| | 11:21 AM | 1.5 | 11.1 | 2.72 | 10.4 | 8.66 | 0.55 | 0.20 | |
| | 11:22 AM | 2 | 11.72 | 3.34 | 10.5 | 8.75 | 0.55 | 0.17 | |
| | 11:22 AM | 2.5 | 12.22 | 3.84 | 10.4 | 8.66 | 0.55 | 0.14 | |
| | 11:23 AM | 3 | 12.66 | 4.28 | 10.3 | 8.58 | 0.54 | 0.13 | |
| | 11:23 AM | 3.5 | 13.02 | 4.64 | 10.3 | 8.58 | 0.54 | 0.12 | |
| | 11:24 AM | 4 | 13.32 | 4.94 | 10.2 | 8.50 | 0.54 | 0.11 | |
| | 11:24 AM | 4.5 | 13.58 | 5.2 | 10.3 | 8.58 | 0.54 | 0.10 | |
| | 11:25 AM | 5 | 13.84 | 5.46 | 10.2 | 8.50 | 0.54 | 0.10 | |
| | 11:26 AM | 6 | 14.25 | 5.87 | 10.1 | 8.41 | 0.53 | 0.09 | |
| | 11:27 AM | 7 | 14.57 | 6.19 | 10.1 | 8.41 | 0.53 | 0.09 | |
| | 11:28 AM | 8 | 14.82 | 6.44 | 10.1 | 8.41 | 0.53 | 0.08 | |
| | 11:29 AM | 9 | 15.03 | 6.65 | 10.1 | 8.41 | 0.53 | 0.08 | |
| | 11:30 AM | 10 | 15.2 | 6.82 | 10 | 8.33 | 0.53 | 0.08 | |
| | 11:32 AM | 12 | 15.46 | 7.08 | 10.1 | 8.41 | 0.53 | 0.07 | |
| | 11:34 AM | 14 | 15.66 | 7.28 | 10 | 8.33 | 0.53 | 0.07 | |
| | 11:36 AM | 16 | 15.82 | 7.44 | 9.9 | 8.25 | 0.52 | 0.07 | |
| | 11:38 AM | 18 | 15.93 | 7.55 | 10 | 8.33 | 0.53 | 0.07 | |
| | 11:40 AM | 20 | 16.02 | 7.64 | 9.9 | 8.25 | 0.52 | 0.07 | |
| | 11:45 AM | 25 | 16.24 | 7.86 | 9.9 | 8.25 | 0.52 | 0.07 | |
| | 11:50 AM | 30 | 16.4 | 8.02 | 9.9 | 8.25 | 0.52 | 0.06 | |
| | 11:55 AM | 35 | 16.52 | 8.14 | 9.9 | 8.25 | 0.52 | 0.06 | |
| | 12:00 PM | 40 | 16.62 | 8.24 | 9.9 | 8.25 | 0.52 | 0.06 | |
| | 12:05 PM | 45 | 16.735 | 8.355 | 10 | 8.33 | 0.53 | 0.06 | |
| | 12:10 PM | 50 | 16.82 | 8.44 | 10 | 8.33 | 0.53 | 0.06 | |
| | 12:15 PM | 55 | 16.89 | 8.51 | 10 | 8.33 | 0.53 | 0.06 | |

STEP-DRAWDOWN PUMPING TEST DATA

| | | | | | | | | | |
|--|----------|-------|-------|-------|-------|-------|------|------|--|
| | 12:20 PM | 60 | 16.95 | 8.57 | - | - | - | - | |
| | 12:20 PM | 60.5 | 17.53 | 9.15 | 15.16 | 12.63 | 0.80 | 0.09 | |
| | 12:21 PM | 61 | 18.04 | 9.66 | 15.2 | 12.66 | 0.80 | 0.08 | |
| | 12:21 PM | 61.5 | 18.5 | 10.12 | 15.1 | 12.58 | 0.79 | 0.08 | |
| | 12:22 PM | 62 | 18.86 | 10.48 | 15.1 | 12.58 | 0.79 | 0.08 | |
| | 12:22 PM | 62.5 | 19.18 | 10.8 | 15 | 12.50 | 0.79 | 0.07 | |
| | 12:23 PM | 63 | 19.45 | 11.07 | 15 | 12.50 | 0.79 | 0.07 | |
| | 12:23 PM | 63.5 | - | - | - | - | - | - | |
| | 12:24 PM | 64 | 19.91 | 11.53 | 14.9 | 12.41 | 0.78 | 0.07 | |
| | 12:24 PM | 64.5 | 20.08 | 11.7 | 14.8 | 12.33 | 0.78 | 0.07 | |
| | 12:25 PM | 65 | 20.25 | 11.87 | 14.7 | 12.25 | 0.77 | 0.07 | |
| | 12:26 PM | 66 | - | - | - | - | - | - | |
| | 12:27 PM | 67 | 20.74 | 12.36 | 14.7 | 12.25 | 0.77 | 0.06 | |
| | 12:28 PM | 68 | 20.9 | 12.52 | 14.6 | 12.16 | 0.77 | 0.06 | |
| | 12:29 PM | 69 | 21.03 | 12.65 | 14.6 | 12.16 | 0.77 | 0.06 | |
| | 12:30 PM | 70 | 21.16 | 12.78 | 14.5 | 12.08 | 0.76 | 0.06 | |
| | 12:32 PM | 72 | 21.34 | 12.96 | 14.5 | 12.08 | 0.76 | 0.06 | |
| | 12:34 PM | 74 | 21.46 | 13.08 | 14.5 | 12.08 | 0.76 | 0.06 | |
| | 12:36 PM | 76 | 21.56 | 13.18 | 14.4 | 12.00 | 0.76 | 0.06 | |
| | 12:38 PM | 78 | 21.64 | 13.26 | 14.4 | 12.00 | 0.76 | 0.06 | |
| | 12:40 PM | 80 | 21.7 | 13.32 | 14.5 | 12.08 | 0.76 | 0.06 | |
| | 12:45 PM | 85 | 21.84 | 13.46 | 14.5 | 12.08 | 0.76 | 0.06 | |
| | 12:50 PM | 90 | 21.96 | 13.58 | 14.4 | 12.00 | 0.76 | 0.06 | |
| | 12:55 PM | 95 | 22.06 | 13.68 | 14.5 | 12.08 | 0.76 | 0.06 | |
| | 1:00 PM | 100 | 22.13 | 13.75 | 14.1 | 11.75 | 0.74 | 0.05 | |
| | 1:05 PM | 105 | 22.2 | 13.82 | 13.9 | 11.58 | 0.73 | 0.05 | |
| | 1:10 PM | 110 | 22.25 | 13.87 | 13.8 | 11.50 | 0.73 | 0.05 | |
| | 1:15 PM | 115 | 22.31 | 13.93 | 13.4 | 11.16 | 0.70 | 0.05 | |
| | 1:20 PM | 120 | 21.82 | 13.44 | - | - | - | - | |
| | 1:20 PM | 120.5 | - | - | - | - | - | - | |
| | 1:21 PM | 121 | 23.55 | 15.17 | 21 | 17.49 | 1.10 | 0.07 | |
| | 1:21 PM | 121.5 | 24.11 | 15.73 | 20.9 | 17.41 | 1.10 | 0.07 | |
| | 1:22 PM | 122 | 24.59 | 16.21 | 20.8 | 17.33 | 1.09 | 0.07 | |
| | 1:22 PM | 122.5 | 25.1 | 16.72 | 20.6 | 17.16 | 1.08 | 0.06 | |
| | 1:23 PM | 123 | 25.44 | 17.06 | 20.5 | 17.08 | 1.08 | 0.06 | |
| | 1:23 PM | 123.5 | 25.8 | 17.42 | 20.5 | 17.08 | 1.08 | 0.06 | |
| | 1:24 PM | 124 | 26.07 | 17.69 | 20.4 | 16.99 | 1.07 | 0.06 | |
| | 1:24 PM | 124.5 | 26.34 | 17.96 | 20.4 | 16.99 | 1.07 | 0.06 | |
| | 1:25 PM | 125 | 26.52 | 18.14 | 20.3 | 16.91 | 1.07 | 0.06 | |
| | 1:26 PM | 126 | 26.65 | 18.27 | 20.2 | 16.83 | 1.06 | 0.06 | |
| | 1:27 PM | 127 | 26.76 | 18.38 | 20.2 | 16.83 | 1.06 | 0.06 | |

STEP-DRAWDOWN PUMPING TEST DATA

| | | | | | | | | | |
|--|---------|-------|-------|-------|-------|-------|------|------|-----------------------|
| | 1:28 PM | 128 | - | - | - | - | - | - | |
| | 1:29 PM | 129 | 27.24 | 18.86 | 20.2 | 16.83 | 1.06 | 0.06 | |
| | 1:30 PM | 130 | 27.51 | 19.13 | 20.1 | 16.74 | 1.06 | 0.06 | |
| | 1:32 PM | 132 | 27.91 | 19.53 | 20 | 16.66 | 1.05 | 0.05 | |
| | 1:34 PM | 134 | 28.09 | 19.71 | 20 | 16.66 | 1.05 | 0.05 | |
| | 1:36 PM | 136 | 28.18 | 19.8 | 19.9 | 16.58 | 1.05 | 0.05 | |
| | 1:38 PM | 138 | 28.28 | 19.9 | 19.9 | 16.58 | 1.05 | 0.05 | |
| | 1:40 PM | 140 | 28.4 | 20.02 | 20 | 16.66 | 1.05 | 0.05 | |
| | 1:45 PM | 145 | 28.81 | 20.43 | 20 | 16.66 | 1.05 | 0.05 | |
| | 1:50 PM | 150 | 29.02 | 20.64 | 20 | 16.66 | 1.05 | 0.05 | |
| | 1:55 PM | 155 | 29.13 | 20.75 | 19.9 | 16.58 | 1.05 | 0.05 | |
| | 2:00 PM | 160 | 29.21 | 20.83 | 19.8 | 16.49 | 1.04 | 0.05 | |
| | 2:05 PM | 165 | 29.31 | 20.93 | 19.8 | 16.49 | 1.04 | 0.05 | |
| | 2:10 PM | 170 | 29.36 | 20.98 | 19.7 | 16.41 | 1.04 | 0.05 | |
| | 2:15 PM | 175 | 29.44 | 21.06 | 19.7 | 16.41 | 1.04 | 0.05 | |
| | 2:20 PM | 180 | 29.56 | 21.18 | 31.4 | 26.16 | 1.65 | 0.08 | |
| | 2:20 PM | 180.5 | 30.77 | 22.39 | 31.1 | 25.91 | 1.63 | 0.07 | |
| | 2:21 PM | 181 | 31.93 | 23.55 | - | - | - | - | |
| | 2:21 PM | 181.5 | 33.39 | 25.01 | 30 | 24.99 | 1.58 | 0.06 | |
| | 2:22 PM | 182 | - | - | - | - | - | - | |
| | 2:22 PM | 182.5 | 35.26 | 26.88 | 29.2 | 24.32 | 1.53 | 0.06 | |
| | 2:23 PM | 183 | 37.28 | 28.9 | 29.1 | 24.24 | 1.53 | 0.05 | |
| | 2:23 PM | 183.5 | 37.23 | 28.85 | 28.9 | 24.07 | 1.52 | 0.05 | |
| | 2:24 PM | 184 | 38.08 | 29.7 | - | - | - | - | |
| | 2:24 PM | 184.5 | 39.65 | 31.27 | - | - | - | - | |
| | 2:25 PM | 185 | 39.65 | 31.27 | 27.69 | 23.07 | 1.46 | 0.05 | |
| | 2:26 PM | 186 | 41.42 | 33.04 | 30.5 | 25.41 | 1.60 | 0.05 | Adjust flow |
| | 2:27 PM | 187 | 43.16 | 34.78 | - | - | - | - | |
| | 2:28 PM | 188 | 45.2 | 36.82 | - | - | - | - | |
| | 2:29 PM | 189 | 47.05 | 38.67 | 29.3 | 24.41 | 1.54 | 0.04 | |
| | 2:30 PM | 190 | 48.47 | 40.09 | - | - | - | - | |
| | 2:32 PM | 192 | 50.87 | 42.49 | 26 | 21.66 | 1.37 | 0.03 | |
| | 2:34 PM | 194 | 53.46 | 45.08 | 30 | 24.99 | 1.58 | 0.03 | Adjust flow |
| | 2:36 PM | 196 | 55.93 | 47.55 | - | - | - | - | Valve open |
| | 2:38 PM | 198 | 57.37 | 48.99 | 25 | 20.83 | 1.31 | 0.03 | |
| | 2:40 PM | 200 | 58.24 | 49.86 | - | - | - | - | |
| | 2:45 PM | 205 | 59.23 | 50.85 | 24.5 | 20.41 | 1.29 | 0.03 | |
| | 2:50 PM | 210 | 59.56 | 51.18 | 24.12 | 20.09 | 1.27 | 0.02 | |
| | 2:55 PM | 215 | 59.85 | 51.47 | - | - | - | - | |
| | 3:00 PM | 220 | 59.94 | 51.56 | 23.5 | 19.58 | 1.24 | 0.02 | |
| | 3:05 PM | 225 | 60.01 | 51.63 | 23.1 | 19.24 | 1.21 | 0.02 | Pump Off, Recovery |

STEP-DRAWDOWN PUMPING TEST DATA

| | | | | | | | | | |
|--|---------|-------|-------|-------|--|--|--|--|--|
| | 3:05 PM | 225.5 | 59.99 | 51.61 | | | | | |
| | 3:06 PM | 226 | 56.81 | 48.43 | | | | | |
| | 3:06 PM | 226.5 | 53.43 | 45.05 | | | | | |
| | 3:07 PM | 227 | 50.06 | 41.68 | | | | | |
| | 3:07 PM | 227.5 | 46.98 | 38.60 | | | | | |
| | 3:08 PM | 228 | 43.62 | 35.24 | | | | | |
| | 3:08 PM | 228.5 | 40.84 | 32.46 | | | | | |
| | 3:09 PM | 229 | 37.76 | 29.38 | | | | | |
| | 3:09 PM | 229.5 | 34.93 | 26.55 | | | | | |
| | 3:10 PM | 230 | 31.94 | 23.56 | | | | | |
| | 3:11 PM | 231 | 30.08 | 21.70 | | | | | |
| | 3:12 PM | 232 | 26.79 | 18.41 | | | | | |
| | 3:13 PM | 233 | 24.26 | 15.88 | | | | | |
| | 3:14 PM | 234 | 21.46 | 13.08 | | | | | |
| | 3:15 PM | 235 | 19.43 | 11.05 | | | | | |
| | 3:17 PM | 237 | 17.68 | 9.30 | | | | | |
| | 3:19 PM | 239 | 15.59 | 7.21 | | | | | |
| | 3:21 PM | 241 | 14.31 | 5.93 | | | | | |
| | 3:23 PM | 243 | 13.51 | 5.13 | | | | | |
| | 3:25 PM | 245 | 13.03 | 4.65 | | | | | |
| | 3:30 PM | 250 | 12.56 | 4.18 | | | | | |
| | 3:35 PM | 255 | 12.08 | 3.70 | | | | | |
| | 3:40 PM | 260 | 11.77 | 3.39 | | | | | |
| | 3:45 PM | 265 | 11.57 | 3.19 | | | | | |
| | 3:50 PM | 270 | 11.38 | 3.00 | | | | | |
| | 3:55 PM | 275 | 11.22 | 2.84 | | | | | |
| | 4:00 PM | 280 | 11.08 | 2.70 | | | | | |
| | 4:05 PM | 285 | 10.95 | 2.57 | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Notes:

- 1) Depth to Water below reference point (e.g., top of sounding tube).
- 2) "-" indicates no data or not applicable.
- 3) May be from a flow totalizer, instantaneous flow meter or other method of flow rate monitoring. Note in comment column.

CONSTANT RATE PUMPING TEST DATA

| | | | |
|---------------------------------|----------------|--|----------------|
| EBA Project Number: | W23101599 | Project Location: | Grizzly Valley |
| Well Name: | Grizzly Valley | Pump Intake Depth (m): | 89.63 m |
| Static Water Level* (m): | 8.39 m | Screen Interval (X to Y depth): | 42 – 102 m |
| Ref. Point Description: | Top of 1" PVC | Screen Slot Size ("): | .020" |
| Ref. Point Stick-Up (m): | 0.91 m | Safe Available Drawdown** (m): | 56.86 m |
| Well Diameter (mm): | 152.4 mm | Screen Diameter (mm): | 125.48 mm |
| Total Well Depth (m): | 101.52 m | Observer's Name: | Kristen Range |

*below reference point

**equal to (pump depth m – SWL m) x 0.7

| Date | Time | Elapsed Time (min) | Depth to Water (m) | Drawdown (m) | Meter Reading ³ | Flow Rate (IGPM) | Flow Rate (L/s) | pH | EC | Temp | Comments |
|------|-------|--------------------|--------------------|--------------|----------------------------|------------------|-----------------|----|----|------|-------------|
| | 16:05 | 0 | 10.8 | 2.41 | | | | | | | |
| | 16:05 | 0.5 | 14.42 | 6.03 | 29.0 | 29.0 | 1.8 | | | | Adjust flow |
| | 16:06 | 1 | 17.23 | 8.84 | | | | | | | |
| | 16:06 | 1.5 | | | | | | | | | |
| | 16:07 | 2 | 20.28 | 11.89 | 21.53 | 21.53 | 1.4 | | | | |
| | 16:07 | 2.5 | 21.31 | 12.92 | 21.15 | 21.15 | 1.3 | | | | |
| | 16:08 | 3 | 22.45 | 14.06 | | | | | | | |
| | 16:08 | 3.5 | 23.05 | 14.66 | | | | | | | |
| | 16:09 | 4 | 23.72 | 15.33 | 20.78 | 20.78 | 1.3 | | | | |
| | 16:09 | 4.5 | | | | | | | | | |
| | 16:10 | 5 | 24.79 | 16.40 | | | | | | | |
| | 16:11 | 6 | 25.66 | 17.27 | 20.25 | 20.25 | 1.3 | | | | |
| | 16:12 | 7 | 26.35 | 17.96 | | | | | | | |
| | 16:13 | 8 | 26.64 | 18.25 | | | | | | | |
| | 16:14 | 9 | 26.77 | 18.38 | | | | | | | |
| | 16:15 | 10 | 27.15 | 18.76 | 20.02 | 20.02 | 1.3 | | | | |
| | 16:17 | 12 | 27.95 | 19.56 | | | | | | | |
| | 16:19 | 14 | 28.22 | 19.83 | 19.7 | 19.7 | 1.2 | | | | |
| | 16:21 | 16 | 28.5 | 20.11 | | | | | | | |
| | 16:23 | 18 | 28.92 | 20.53 | | | | | | | |
| | 16:25 | 20 | 29.23 | 20.84 | 19.47 | 19.47 | 1.2 | | | | |
| | 16:30 | 25 | 29.67 | 21.28 | 19.46 | 19.46 | 1.2 | | | | |
| | 16:35 | 30 | 29.89 | 21.50 | 19.3 | 19.3 | 1.2 | | | | |
| | 16:40 | 35 | 30.04 | 21.65 | | | | | | | |
| | 16:45 | 40 | 30.18 | 21.79 | 19.3 | 19.3 | 1.2 | | | | |
| | 16:50 | 45 | 30.27 | 21.88 | | | | | | | |
| | 16:55 | 50 | 30.27 | 21.88 | 19.3 | 19.3 | 1.2 | | | | |
| | 17:00 | 55 | 30.34 | 21.95 | | | | | | | |

CONSTANT RATE PUMPING TEST DATA

| Date | Time | Elapsed Time (min) | Depth to Water (m) | Drawdown (m) | Meter Reading ³ | Flow Rate (IGPM) | Flow Rate (L/s) | pH | EC | Temp | Comments |
|------|-------|--------------------|--------------------|--------------|----------------------------|------------------|-----------------|------|------|------|-------------|
| | 17:05 | 60 | 30.48 | 22.09 | | | | | | | |
| | 17:15 | 70 | 30.74 | 22.35 | | | | | | | |
| | 17:25 | 80 | 31.57 | 23.18 | | | | | | | |
| | 17:35 | 90 | 32.35 | 23.96 | 19.7 | 19.7 | 1.2 | 7.65 | 1865 | 5.2 | |
| | 17:45 | 100 | 33.15 | 24.76 | | | | | | | |
| | 17:55 | 110 | 33.4 | 25.01 | | | | | | | |
| | 18:05 | 120 | 33.7 | 25.31 | | | | | | | |
| | 18:35 | 150 | 35.23 | 26.84 | | | | | | | |
| | 19:05 | 180 | 36.54 | 28.15 | 20.5 | 20.5 | 1.3 | 7.48 | 1802 | 5.1 | |
| | 19:35 | 210 | 38.3 | 29.91 | | | | | | | |
| | 20:05 | 240 | 38.66 | 30.27 | | | | | | | |
| | 20:35 | 270 | | | | | | | | | |
| | 21:05 | 300 | 39.22 | 30.83 | 19.7 | 19.7 | 1.2 | 7.60 | 1825 | 5.0 | |
| | 21:35 | 330 | 39.41 | 31.02 | | | | | | | |
| | 22:05 | 360 | 39.66 | 31.27 | 19.7 | 19.7 | 1.2 | | | | |
| | 23:05 | 420 | 41.07 | 32.68 | 20.5 | 20.5 | 1.3 | 7.47 | 1800 | 5.9 | |
| | 0:05 | 480 | 41.86 | 33.47 | 19.9 | 19.9 | 1.3 | | | | Adjust flow |
| | 1:05 | 540 | 43.69 | 35.30 | 19.7 | 19.7 | 1.2 | 7.12 | 1837 | 5.2 | |
| | 2:05 | 600 | 43.93 | 35.54 | 19.7 | 19.7 | 1.2 | | | | |
| | 3:05 | 660 | 43.95 | 35.56 | 19.6 | 19.6 | 1.2 | 7.50 | 1812 | 5.4 | |
| | 4:05 | 720 | 44.24 | 35.85 | 19.5 | 19.5 | 1.2 | | | | |
| | 5:05 | 780 | 44.51 | 36.12 | 20.1 | 20.1 | 1.3 | 7.85 | 1827 | 5.1 | |
| | 6:05 | 840 | 45.85 | 37.46 | 19.7 | 19.7 | 1.2 | | | | Adjust flow |
| | 7:05 | 900 | 46.11 | 37.72 | 19.5 | 19.5 | 1.2 | 7.63 | 1813 | 5.2 | |
| | 8:05 | 960 | 46.37 | 37.98 | 19.38 | 19.38 | 1.2 | | | | |
| | 9:05 | 1020 | 46.4 | 38.01 | 19.34 | 19.34 | 1.2 | | | | |
| | 10:05 | 1080 | 46.64 | 38.25 | 19.69 | 19.69 | 1.2 | 7.62 | 1813 | 4.5 | Adjust flow |
| | 11:05 | 1140 | 48.56 | 40.17 | | | | | | | |
| | 12:05 | 1200 | 48.41 | 40.02 | 19.32 | 19.32 | 1.2 | 7.72 | 1820 | 4.9 | |
| | 13:05 | 1260 | 48.64 | 40.25 | 19.25 | 19.25 | 1.2 | | | | |
| | 14:05 | 1320 | 48.61 | 40.22 | 19.47 | 19.47 | 1.2 | 7.68 | 1801 | 5.3 | |
| | 15:05 | 1380 | 50.9 | 42.51 | 19.42 | 19.42 | 1.2 | | | | Adjust flow |
| | 16:05 | 1440 | 50.96 | 42.57 | 19.32 | 19.32 | 1.2 | 7.93 | 1711 | 16.8 | Adjust flow |
| | 17:05 | 1500 | 53.08 | 44.69 | 19.7 | 19.7 | 1.2 | | | | |
| | 18:05 | 1560 | 54.76 | 46.37 | 19.8 | 19.8 | 1.2 | 7.63 | 1796 | 5.6 | Adjust flow |
| | 19:05 | 1620 | 56.09 | 47.70 | 19.31 | 19.31 | 1.2 | | | | |
| | 20:05 | 1680 | 56.11 | 47.72 | 19.7 | 19.7 | 1.2 | 7.95 | 1429 | 5.5 | |
| | 21:05 | 1740 | 56.53 | 48.14 | 20.07 | 20.07 | 1.3 | | | | Adjust flow |
| | 22:05 | 1800 | 56.89 | 48.50 | 2.27 | 2.27 | 0.1 | 7.66 | 1763 | 5.6 | Adjust flow |

CONSTANT RATE PUMPING TEST DATA

| Date | Time | Elapsed Time (min) | Depth to Water (m) | Drawdown (m) | Meter Reading ³ | Flow Rate (IGPM) | Flow Rate (L/s) | pH | EC | Temp | Comments |
|------|-------|--------------------|--------------------|--------------|----------------------------|------------------|-----------------|------|------|------|-------------|
| | 23:05 | 1860 | 58.24 | 49.85 | 20.13 | 20.13 | 1.3 | | | | Adjust flow |
| | 0:05 | 1920 | 59.22 | 50.83 | 19.9 | 19.9 | 1.3 | | | | |
| | 1:05 | 1980 | 59.4 | 51.01 | 19.8 | 19.8 | 1.2 | 7.65 | | 6.0 | |
| | 2:05 | 2040 | 59.51 | 51.12 | 19.7 | 19.7 | 1.2 | | | | |
| | 3:05 | 2100 | 59.6 | 51.21 | 19.7 | 19.7 | 1.2 | 7.69 | 1766 | 5.9 | |
| | 4:05 | 2160 | 59.52 | 51.13 | 19.8 | 19.8 | 1.2 | | | | |
| | 5:05 | 2220 | 59.63 | 51.24 | 19.8 | 19.8 | 1.2 | 7.59 | 1767 | 5.6 | |
| | 6:05 | 2280 | 59.71 | 51.32 | 19.7 | 19.7 | 1.2 | | | | |
| | 7:05 | 2340 | 59.82 | 51.43 | 19.7 | 19.7 | 1.2 | 7.64 | 1757 | 5.3 | |
| | 8:05 | 2400 | 59.78 | 51.39 | 19.7 | 19.7 | 1.2 | | | | |
| | 9:05 | 2460 | 59.59 | 51.20 | 19.8 | 19.8 | 1.2 | 7.68 | 1779 | 6.6 | |
| | 10:05 | 2520 | 59.65 | 51.26 | | | | | | | |
| | 11:05 | 2580 | 59.66 | 51.27 | 19.7 | 19.7 | 1.2 | 7.82 | 1784 | 6.6 | |
| | 12:05 | 2640 | 59.64 | 51.25 | | | | | | | |
| | 13:05 | 2700 | 59.5 | 51.11 | 19.64 | 19.64 | 1.2 | 7.80 | 1778 | 6.5 | |
| | 14:05 | 2760 | 59.35 | 50.96 | | | | | | | |
| | 15:05 | 2820 | 59.31 | 50.92 | 19.7 | 19.7 | 1.2 | 7.80 | 1803 | 5.3 | |
| | 16:05 | 2880 | 59.3 | 50.91 | | | | | | | |
| | | | | | | | | | | | Pump Off |
| | | | | | | | | | | | Recovery |

Notes:

- 1) Depth to Water below reference point (e.g., top of sounding tube).
- 2) "-" indicates no data or not applicable.
- 3) May be from a flow totalizer, instantaneous flow meter or other method of flow rate monitoring. Note in comment column.

APPENDIX C

PUMPING TEST ANALYSIS



EBA, A TetraTech Company
 6-151 Industrial Road
 Whitehorse, YT Y1A 2V3

Pumping Test Analysis Report

Project: Deep Creek Water Project

Number: W23101599

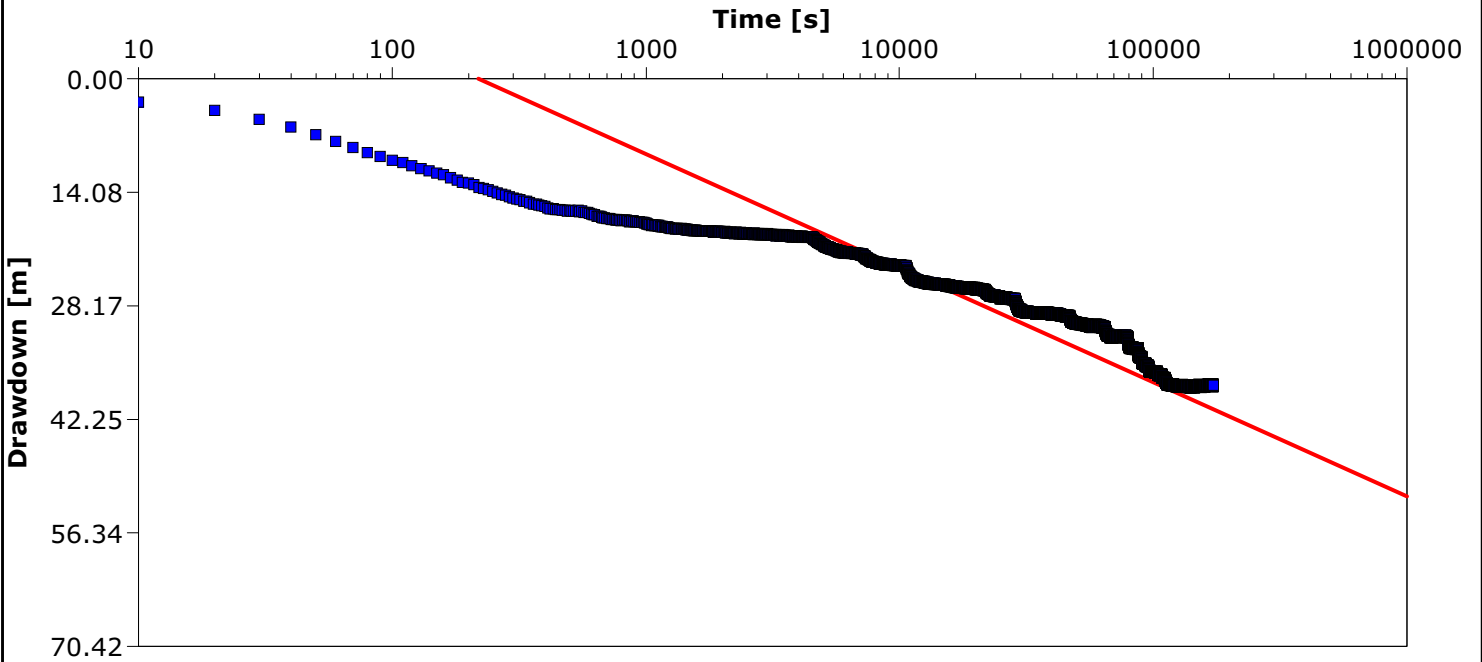
Client: Yukon Government

Location: Whitehorse Pumping Test: Pumping Test 1 Pumping Well: Grizzly Valley Well

Test Conducted by: KRR Test Date: 9/4/2012

Analysis Performed by: KRR Cooper & Jacob Analysis Date: 10/30/2012

Aquifer Thickness: 60 m Discharge: variable, average rate 20 [U.S. gal/min]



Calculation using COOPER & JACOB

| Observation Well | Transmissivity [m ² /s] | Hydraulic Conductivity [m/s] | | | |
|---------------------|---------------------------------------|---------------------------------|--|--|--|
| Grizzly Valley Well | 1.63 × 10 ⁻⁵ | 2.72 × 10 ⁻⁷ | | | |



EBA, A TetraTech Company
 6-151 Industrial Road
 Whitehorse, YT Y1A 2V3

Pumping Test Analysis Report

Project: Deep Creek Water Project

Number: W23101599

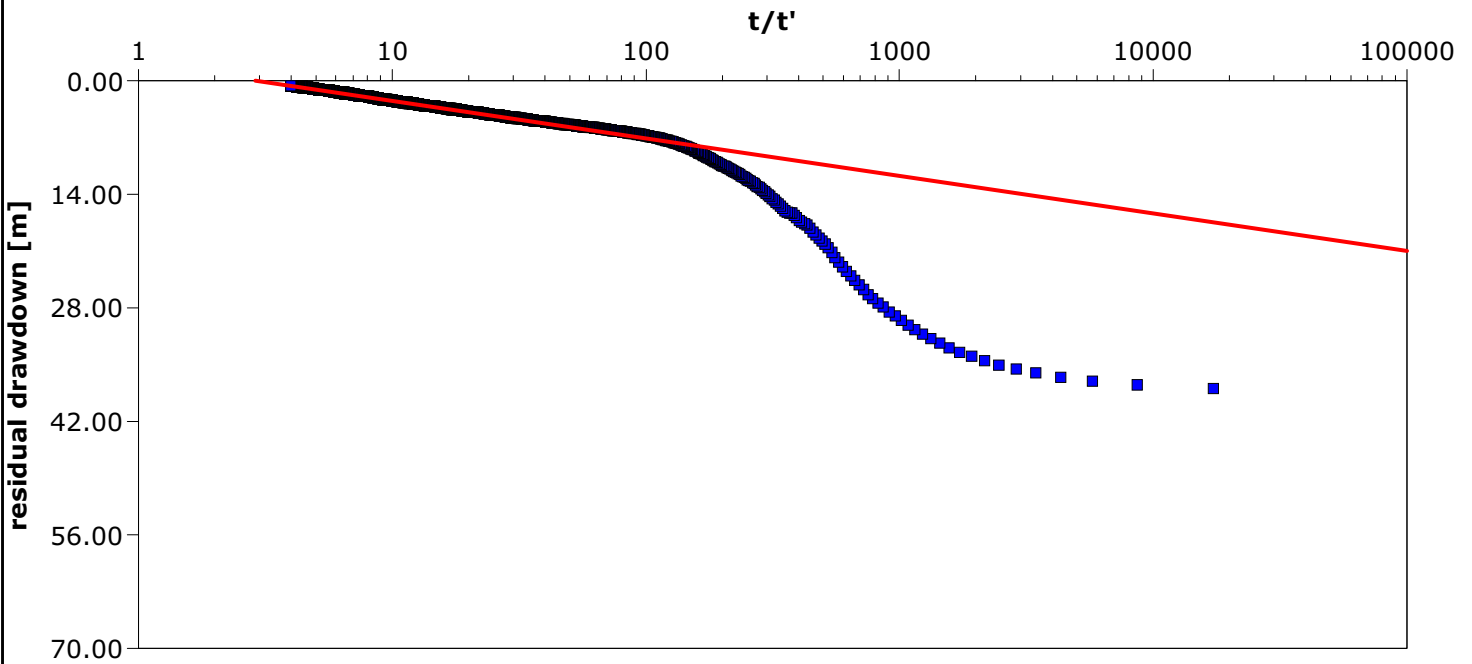
Client: Yukon Government

Location: Whitehorse Pumping Test: Pumping Test 1 Pumping Well: Grizzly Valley Well

Test Conducted by: KRR Test Date: 9/4/2012

Analysis Performed by: KRR Theis Late Recovery Analysis Date: 10/30/2012

Aquifer Thickness: 60 m Discharge: variable, average rate 20 [U.S. gal/min]



Calculation using THEIS

| Observation Well | Transmissivity [m ² /s] | Hydraulic Conductivity [m/s] | | |
|---------------------|---------------------------------------|---------------------------------|--|--|
| Grizzly Valley Well | 4.99×10^{-5} | 8.32×10^{-7} | | |



EBA, A TetraTech Company
 6-151 Industrial Road
 Whitehorse, YT Y1A 2V3

Pumping Test Analysis Report

Project: Deep Creek Water Project

Number: W23101599

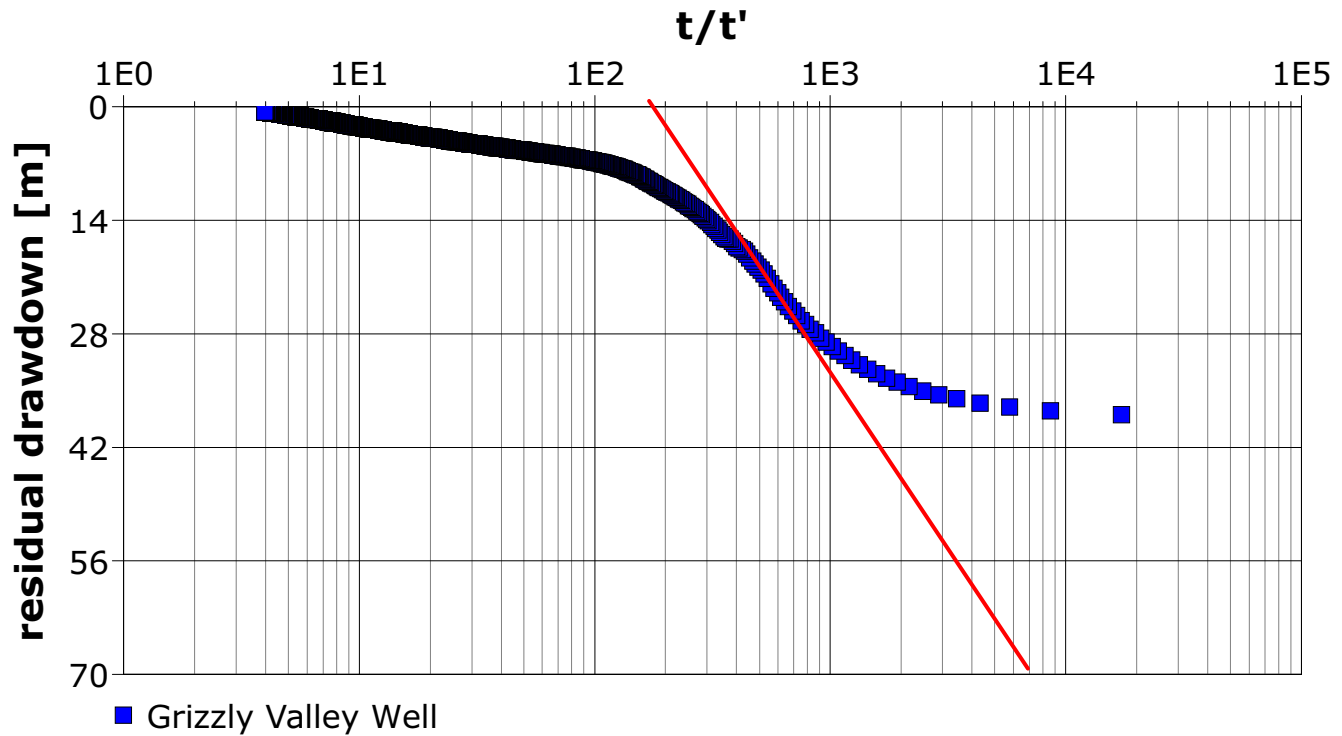
Client: Yukon Government

Location: Whitehorse Pumping Test: Pumping Test 1 Pumping Well: Grizzly Valley Well

Test Conducted by: KRR Test Date: 9/4/2012

Analysis Performed by: KRR Theis Early Recovery Analysis Date: 10/30/2012

Aquifer Thickness: 60 m Discharge: variable, average rate 20 [U.S. gal/min]



Calculation using THEIS

| Observation Well | Transmissivity [m ² /s] | Hydraulic Conductivity [m/s] | | |
|---------------------|---------------------------------------|---------------------------------|--|--|
| Grizzly Valley Well | 5.31×10^{-6} | 8.85×10^{-8} | | |

APPENDIX D

LABORATORY REPORTS

Report Transmission Cover Page

| | | |
|--|----------------------|-----------------------------|
| Bill To: EBA Engineering Consultants | Project: | Lot ID: 892594 |
| Report To: EBA Engineering Consultants | ID: W23101599 | Control Number: A245050 |
| Calcite Business Centre | Name: | Date Received: Sep 11, 2012 |
| Unit 6, 151 Industrial Road | Location: Deep Creek | Date Reported: Sep 19, 2012 |
| Whitehorse, YT, Canada | LSD: | Report Number: 1764993 |
| Y1A 2V3 | P.O.: | |
| Attn: Tamra Reynolds | Acct code: | |
| Sampled By: Kristen Range | | |
| Company: EBA | | |

| Contact & Affiliation | Address | Delivery Commitments |
|---|---|--|
| Tamra Reynolds EBA Engineering Consultants Ltd - | Unit 6, 151 Industrial Road, Calcite Business Centre Whitehorse, Yukon Territory Y1A 2V3 Phone: (867) 668-2071 Fax: (867) 668-4349 Email: tareynolds@eba.ca | On [Lot Verification] send (COA) by Email - Single Report On [Report Approval] send (COC, Test Report) by Email - Merge Reports On [Report Approval] send (Test Report) by Email - Single Report On [Report Approval] send (Test Report) by Email - Single Report On [Lot Creation] send (COR) by Email - Single Report |
| Ingrid Fuller EBA Engineering Consultants Ltd - | Unit 6, 151 Industrial Road, Calcite Business Centre Whitehorse, Yukon Territory Y1A 2V3 Phone: (867) 668-2071 Fax: (867) 668-4349 Email: ifuller@eba.ca | On [Lot Approval and Final Test Report Approval] send (Invoice) by Email - Single Report |

Notes To Clients:

- pH analysis was performed past the recommended holding time of 15 minutes from sample collection.

Analytical Report

| | | |
|--|----------------------|-----------------------------|
| Bill To: EBA Engineering Consultants | Project: | Lot ID: 892594 |
| Report To: EBA Engineering Consultants | ID: W23101599 | Control Number: A245050 |
| Calcite Business Centre | Name: | Date Received: Sep 11, 2012 |
| Unit 6, 151 Industrial Road | Location: Deep Creek | Date Reported: Sep 19, 2012 |
| Whitehorse, YT, Canada | LSD: | Report Number: 1764993 |
| Y1A 2V3 | P.O.: | |
| Attn: Tamra Reynolds | Acct code: | |
| Sampled By: Kristen Range | | |
| Company: EBA | | |

| | |
|---------------------------|--------------------|
| Reference Number | 892594-1 |
| Sample Date | September 07, 2012 |
| Sample Time | NA |
| Sample Location | |
| Sample Description | Deep Creek Well #1 |
| Sample Matrix | Water |

| Analyte | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments | |
|---|--------------------|--------------|-------------------------|-----------------|--------------------|-----------|
| Inorganic Nonmetallic Parameters | | | | | | |
| Organic Carbon | Total Nonpurgeable | mg/L | 0.7 | 0.5 | | |
| Metals Extractable | | | | | | |
| Aluminum | Extractable | mg/L | <0.005 | 0.005 | 0.1 | Below OG |
| Antimony | Extractable | mg/L | 0.0018 | 0.0002 | 0.006 | Below MAC |
| Arsenic | Extractable | mg/L | 0.0016 | 0.0002 | 0.010 | Below MAC |
| Barium | Extractable | mg/L | 0.009 | 0.001 | 1 | Below MAC |
| Boron | Extractable | mg/L | 0.032 | 0.005 | 5 | Below MAC |
| Cadmium | Extractable | mg/L | <0.00007 | 0.00007 | 0.005 | Below MAC |
| Chromium | Extractable | mg/L | 0.0016 | 0.0005 | 0.05 | Below MAC |
| Copper | Extractable | mg/L | <0.001 | 0.001 | 1.0 | Below AO |
| Lead | Extractable | mg/L | 0.0005 | 0.0001 | 0.01 | Below MAC |
| Selenium | Extractable | mg/L | <0.0006 | 0.0006 | 0.01 | Below MAC |
| Uranium | Extractable | mg/L | <0.0005 | 0.0005 | 0.02 | Below MAC |
| Vanadium | Extractable | mg/L | 0.0004 | 0.0001 | | |
| Zinc | Extractable | mg/L | 0.046 | 0.001 | 5.0 | Below AO |
| Metals Total | | | | | | |
| Mercury | Total | mg/L | <0.00001 | 0.00001 | 0.001 | Below MAC |
| Physical and Aggregate Properties | | | | | | |
| Turbidity | | NTU | 3.8 | 0.1 | | |
| Colour | Apparent | Colour units | 11 | 5 | | |
| Polycyclic Aromatic Hydrocarbons - Water | | | | | | |
| Acenaphthene | | ug/L | <0.1 | 0.1 | | |
| Acenaphthylene | | ug/L | <0.1 | 0.1 | | |
| Acridine | | ug/L | <0.05 | 0.05 | | |
| Anthracene | | ug/L | <0.1 | 0.1 | | |
| Benzo(a)anthracene | | ug/L | <0.01 | 0.01 | | |
| Benzo(a)pyrene | | ug/L | <0.01 | 0.01 | 0.01 | Below MAC |
| Benzo(b)fluoranthene | | ug/L | <0.01 | 0.01 | | |
| Benzo(g,h,i)perylene | | ug/L | <0.1 | 0.1 | | |
| Benzo(k)fluoranthene | | ug/L | <0.02 | 0.02 | | |
| Chrysene | | ug/L | <0.1 | 0.1 | | |
| Dibenzo(a,h)anthracene | | ug/L | <0.01 | 0.01 | | |
| Fluoranthene | | ug/L | <0.1 | 0.1 | | |
| Fluorene | | ug/L | <0.1 | 0.1 | | |
| Indeno(1,2,3-c,d)pyrene | | ug/L | <0.1 | 0.1 | | |
| Naphthalene | | ug/L | <0.1 | 0.1 | | |

Analytical Report

| | | |
|--|----------------------|-----------------------------|
| Bill To: EBA Engineering Consultants | Project: | Lot ID: 892594 |
| Report To: EBA Engineering Consultants | ID: W23101599 | Control Number: A245050 |
| Calcite Business Centre | Name: | Date Received: Sep 11, 2012 |
| Unit 6, 151 Industrial Road | Location: Deep Creek | Date Reported: Sep 19, 2012 |
| Whitehorse, YT, Canada | LSD: | Report Number: 1764993 |
| Y1A 2V3 | P.O.: | |
| Attn: Tamra Reynolds | Acct code: | |
| Sampled By: Kristen Range | | |
| Company: EBA | | |

| | |
|---------------------------|--------------------|
| Reference Number | 892594-1 |
| Sample Date | September 07, 2012 |
| Sample Time | NA |
| Sample Location | |
| Sample Description | Deep Creek Well #1 |
| Sample Matrix | Water |

| Analyte | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|------------------|--------|-------------------------|-----------------|--------------------|
| Polycyclic Aromatic Hydrocarbons - Water - Continued | | | | | |
| Phenanthrene | ug/L | <0.1 | 0.1 | | |
| Pyrene | ug/L | <0.02 | 0.02 | | |
| Quinoline | ug/L | <3.4 | 3.4 | | |
| Routine Water | | | | | |
| pH | at 25 °C | 7.72 | | 6.5-8.5 | Within AO |
| Electrical Conductivity | µS/cm at 25 C | 898 | 1 | | |
| Calcium | Extractable mg/L | 72.7 | 0.1 | | |
| Iron | Extractable mg/L | 0.250 | 0.005 | 0.3 | Below AO |
| Magnesium | Extractable mg/L | 52.7 | 0.1 | | |
| Manganese | Extractable mg/L | 0.012 | 0.001 | 0.05 | Below AO |
| Potassium | Extractable mg/L | 1.0 | 0.1 | | |
| Silicon | Extractable mg/L | 6.08 | 0.05 | | |
| Sodium | Extractable mg/L | 60.6 | 0.1 | 200 | Below AO |
| Bicarbonate | mg/L | 234 | 5 | | |
| Carbonate | mg/L | <6 | 6 | | |
| Hydroxide | mg/L | <5 | 5 | | |
| T-Alkalinity | as CaCO3 mg/L | 192 | 5 | | |
| Chloride | Dissolved mg/L | 7.78 | 0.05 | 250 | Below AO |
| Fluoride | Dissolved mg/L | 0.17 | 0.01 | 1.5 | Below MAC |
| Nitrate - N | Dissolved mg/L | <0.01 | 0.01 | 10 | Below MAC |
| Nitrite - N | Dissolved mg/L | <0.01 | 0.01 | 1 | Below MAC |
| Sulfate (SO4) | Dissolved mg/L | 316 | 0.5 | 500 | Below AO |
| Hardness | as CaCO3 mg/L | 398 | 1 | | |
| Total Dissolved Solids | Extractable mg/L | 643 | 1 | | |
| Volatile Petroleum Hydrocarbons - Water | | | | | |
| VPW (VHW6-10 minus BTEX) | ug/L | <50 | 50 | | |
| VHW6-10 | ug/L | <50 | 50 | | |
| Extractable Petroleum Hydrocarbons - Water | | | | | |
| LEPHW | ug/L | <100 | 100 | | |
| HEPHW | ug/L | <100 | 100 | | |
| Mono-Aromatic Hydrocarbons - Water | | | | | |
| Benzene | ug/L | <1 | 1 | 5 | Below MAC |
| Ethylbenzene | ug/L | <1 | 1 | 2.4 | Below AO |
| Methyl t-Butyl Ether | ug/L | <1 | 1 | 15 | Below AO |
| Styrene | ug/L | <1 | 1 | | |

Analytical Report

| | | |
|--|----------------------|-----------------------------|
| Bill To: EBA Engineering Consultants | Project: | Lot ID: 892594 |
| Report To: EBA Engineering Consultants | ID: W23101599 | Control Number: A245050 |
| Calcite Business Centre | Name: | Date Received: Sep 11, 2012 |
| Unit 6, 151 Industrial Road | Location: Deep Creek | Date Reported: Sep 19, 2012 |
| Whitehorse, YT, Canada | LSD: | Report Number: 1764993 |
| Y1A 2V3 | P.O.: | |
| Attn: Tamra Reynolds | Acct code: | |
| Sampled By: Kristen Range | | |
| Company: EBA | | |

| | |
|---------------------------|--------------------|
| Reference Number | 892594-1 |
| Sample Date | September 07, 2012 |
| Sample Time | NA |
| Sample Location | |
| Sample Description | Deep Creek Well #1 |
| Sample Matrix | Water |

| Analyte | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|-----------------|--------|-------------------------|-----------------|--------------------|
| Mono-Aromatic Hydrocarbons - Water - Continued | | | | | |
| Toluene | ug/L | <1 | 1 | 24 | Below AO |
| Total Xylenes (m,p,o) | ug/L | <1 | 1 | 300 | Below AO |
| PAH - Water - Surrogate Recovery | | | | | |
| 2-Fluorobiphenyl | PAH - Surrogate | % | 76 | 50-130 | |
| p-Terphenyl-d14 | PAH - Surrogate | % | 71 | 60-130 | |
| Naphthalene-d8 | PAH - Surrogate | % | 78 | 50-130 | |

Analytical Report

| | | |
|--|----------------------|-----------------------------|
| Bill To: EBA Engineering Consultants | Project: | Lot ID: 892594 |
| Report To: EBA Engineering Consultants | ID: W23101599 | Control Number: A245050 |
| Calcite Business Centre | Name: | Date Received: Sep 11, 2012 |
| Unit 6, 151 Industrial Road | Location: Deep Creek | Date Reported: Sep 19, 2012 |
| Whitehorse, YT, Canada | LSD: | Report Number: 1764993 |
| Y1A 2V3 | P.O.: | |
| Attn: Tamra Reynolds | Acct code: | |
| Sampled By: Kristen Range | | |
| Company: EBA | | |

| | |
|---------------------------|--------------------|
| Reference Number | 892594-2 |
| Sample Date | September 10, 2012 |
| Sample Time | NA |
| Sample Location | |
| Sample Description | Deep Creek Well #2 |
| Sample Matrix | Water |

| Analyte | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|--|--------------------|---------------|-------------------------|-----------------|--------------------|
| Inorganic Nonmetallic Parameters | | | | | |
| Organic Carbon | Total Nonpurgeable | mg/L | 7.5 | 0.5 | |
| Metals Extractable | | | | | |
| Aluminum | Extractable | mg/L | <0.005 | 0.005 | 0.1 Below OG |
| Antimony | Extractable | mg/L | 0.0005 | 0.0002 | 0.006 Below MAC |
| Arsenic | Extractable | mg/L | 0.0010 | 0.0002 | 0.010 Below MAC |
| Barium | Extractable | mg/L | 0.016 | 0.001 | 1 Below MAC |
| Boron | Extractable | mg/L | 0.030 | 0.005 | 5 Below MAC |
| Cadmium | Extractable | mg/L | <0.00007 | 0.00007 | 0.005 Below MAC |
| Chromium | Extractable | mg/L | 0.0043 | 0.0005 | 0.05 Below MAC |
| Copper | Extractable | mg/L | <0.001 | 0.001 | 1.0 Below AO |
| Lead | Extractable | mg/L | 0.0004 | 0.0001 | 0.01 Below MAC |
| Selenium | Extractable | mg/L | <0.0006 | 0.0006 | 0.01 Below MAC |
| Uranium | Extractable | mg/L | 0.0038 | 0.0005 | 0.02 Below MAC |
| Vanadium | Extractable | mg/L | 0.0012 | 0.0001 | |
| Zinc | Extractable | mg/L | 0.129 | 0.001 | 5.0 Below AO |
| Metals Total | | | | | |
| Mercury | Total | mg/L | <0.00001 | 0.00001 | 0.001 Below MAC |
| Physical and Aggregate Properties | | | | | |
| Turbidity | | NTU | 1.6 | 0.1 | |
| Colour | Apparent | Colour units | 10 | 5 | |
| Routine Water | | | | | |
| pH | at 25 °C | | 7.31 | | 6.5-8.5 Within AO |
| Electrical Conductivity | | µS/cm at 25 C | 1460 | 1 | |
| Calcium | Extractable | mg/L | 144 | 0.1 | |
| Iron | Extractable | mg/L | 0.265 | 0.005 | 0.3 Below AO |
| Magnesium | Extractable | mg/L | 140 | 0.1 | |
| Manganese | Extractable | mg/L | 0.245 | 0.001 | 0.05 Above AO |
| Potassium | Extractable | mg/L | 0.7 | 0.1 | |
| Silicon | Extractable | mg/L | 6.12 | 0.05 | |
| Sodium | Extractable | mg/L | 28.5 | 0.1 | 200 Below AO |
| Bicarbonate | | mg/L | 467 | 5 | |
| Carbonate | | mg/L | <6 | 6 | |
| Hydroxide | | mg/L | <5 | 5 | |
| T-Alkalinity | as CaCO3 | mg/L | 383 | 5 | |
| Chloride | Dissolved | mg/L | 9.14 | 0.05 | 250 Below AO |
| Fluoride | Dissolved | mg/L | <0.10 | 0.01 | 1.5 Below MAC |


Analytical Report

Bill To: EBA Engineering Consultants Project:
Report To: EBA Engineering Consultants ID: W23101599
Calcite Business Centre Name:
Unit 6, 151 Industrial Road Location: Deep Creek
Whitehorse, YT, Canada LSD:
Y1A 2V3 P.O.:
Attn: Tamra Reynolds Acct code:
Sampled By: Kristen Range
Company: EBA

Lot ID: **892594**
Control Number: A245050
Date Received: Sep 11, 2012
Date Reported: Sep 19, 2012
Report Number: 1764993

Reference Number 892594-2
Sample Date September 10, 2012
Sample Time NA
Sample Location
Sample Description Deep Creek Well #2
Sample Matrix Water

| Analyte | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments | |
|----------------------------------|-------------|--------|-------------------------|-----------------|--------------------|-----------|
| Routine Water - Continued | | | | | | |
| Nitrate - N | Dissolved | mg/L | <0.10 | 0.01 | 10 | Below MAC |
| Nitrite - N | Dissolved | mg/L | <0.10 | 0.01 | 1 | Below MAC |
| Sulfate (SO4) | Dissolved | mg/L | 540 | 0.5 | 500 | Above AO |
| Hardness | as CaCO3 | mg/L | 936 | 1 | | |
| Total Dissolved Solids | Extractable | mg/L | 1110 | 1 | | |

Approved by: 
Aaron Zentner, B.Sc., P.Chem.
Team Leader - Organics

Methodology and Notes

| | | |
|--|----------------------|-----------------------------|
| Bill To: EBA Engineering Consultants | Project: | Lot ID: 892594 |
| Report To: EBA Engineering Consultants | ID: W23101599 | Control Number: A245050 |
| Calcite Business Centre | Name: | Date Received: Sep 11, 2012 |
| Unit 6, 151 Industrial Road | Location: Deep Creek | Date Reported: Sep 19, 2012 |
| Whitehorse, YT, Canada | LSD: | Report Number: 1764993 |
| Y1A 2V3 | P.O.: | |
| Attn: Tamra Reynolds | Acct code: | |
| Sampled By: Kristen Range | | |
| Company: EBA | | |

Method of Analysis

| Method Name | Reference | Method | Date Analysis Started | Location |
|---|-----------|--|-----------------------|----------------|
| Alk, pH, EC, Turb in water | APHA | * Alkalinity - Titration Method, 2320 B | 11-Sep-12 | Exova Surrey |
| Alk, pH, EC, Turb in water | APHA | * Conductivity, 2510 B | 11-Sep-12 | Exova Surrey |
| Alk, pH, EC, Turb in water | APHA | * pH - Electrometric Method, 4500-H+ B | 11-Sep-12 | Exova Surrey |
| Alk, pH, EC, Turb in water | APHA | * Turbidity - Nephelometric Method, 2130 B | 11-Sep-12 | Exova Surrey |
| Anions by IEC in water (Surrey) | APHA | * Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B | 12-Sep-12 | Exova Surrey |
| Apparent Color | APHA | * Spectrophotometric - Single Wavelength Method, 2120 C | 12-Sep-12 | Exova Surrey |
| BTEX-VPH - Water (MS) | BCELM | * Volatile Hydrocarbons in Water by GC/FID, VH Water | 17-Sep-12 | Exova Surrey |
| Carbon Organic (Total) in water (TOC) | APHA | * High-Temperature Combustion Method, 5310 B | 13-Sep-12 | Exova Edmonton |
| EPH - Water | BCELM | * Extractable Petroleum Hydrocarbons (EPH) in Water by GC/FID, EPH Water | 16-Sep-12 | Exova Surrey |
| Mercury Low Level (Total) in water | EPA | * Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7 | 13-Sep-12 | Exova Surrey |
| Metals SemiTrace (Extractable) in water | US EPA | * Metals & Trace Elements by ICP-AES, 6010C | 12-Sep-12 | Exova Surrey |
| PAH - Water (Surrey) | BCELM | * Polycyclic Aromatic Hydrocarbons in Water by GC/MS - PBM, PAH Water | 16-Sep-12 | Exova Surrey |
| Trace Metals (extractable) in Water | US EPA | * Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8 | 12-Sep-12 | Exova Surrey |

* Reference Method Modified

References

| | |
|-----------|--|
| APHA | Standard Methods for the Examination of Water and Wastewater |
| B.C.M.O.E | B.C. Ministry of Environment |
| BCELM | B.C. Environmental Laboratory Manual |
| US EPA | US Environmental Protection Agency Test Methods |

Guidelines

| | |
|-----------------------|---|
| Guideline Description | Health Canada GCDWQ |
| Guideline Source | Guidelines for Canadian Drinking Water Quality, Health Canada, May 2008 |
| Guideline Comments | MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants Refer to Health Canada GCDWQ for complete guidelines and additional drinking water information at www.hc-sc.gc.ca |

Methodology and Notes

| | | | | | |
|-------------|-----------------------------|------------|------------|-----------------|---------------|
| Bill To: | EBA Engineering Consultants | Project: | | Lot ID: | 892594 |
| Report To: | EBA Engineering Consultants | ID: | W23101599 | Control Number: | A245050 |
| | Calcite Business Centre | Name: | | Date Received: | Sep 11, 2012 |
| | Unit 6, 151 Industrial Road | Location: | Deep Creek | Date Reported: | Sep 19, 2012 |
| | Whitehorse, YT, Canada | LSD: | | Report Number: | 1764993 |
| | Y1A 2V3 | P.O.: | | | |
| Attn: | Tamra Reynolds | Acct code: | | | |
| Sampled By: | Kristen Range | | | | |
| Company: | EBA | | | | |

Comments:

- pH analysis was performed past the recommended holding time of 15 minutes from sample collection.

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services group.

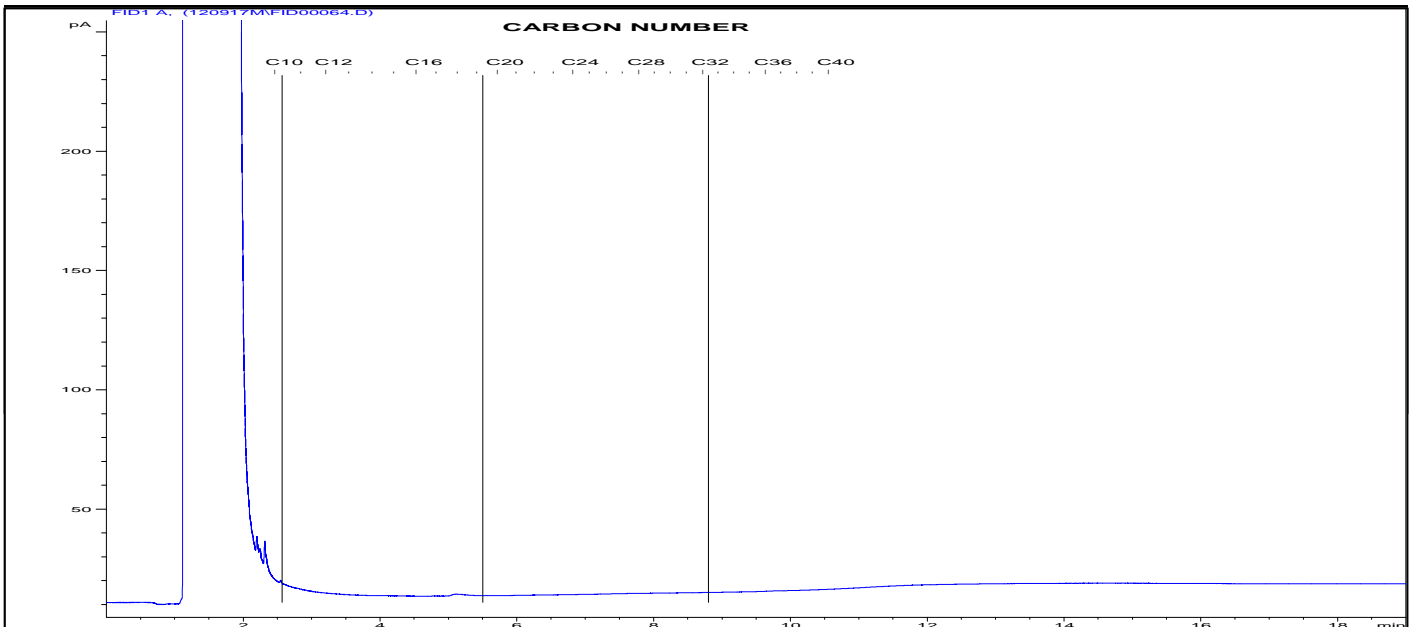
Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

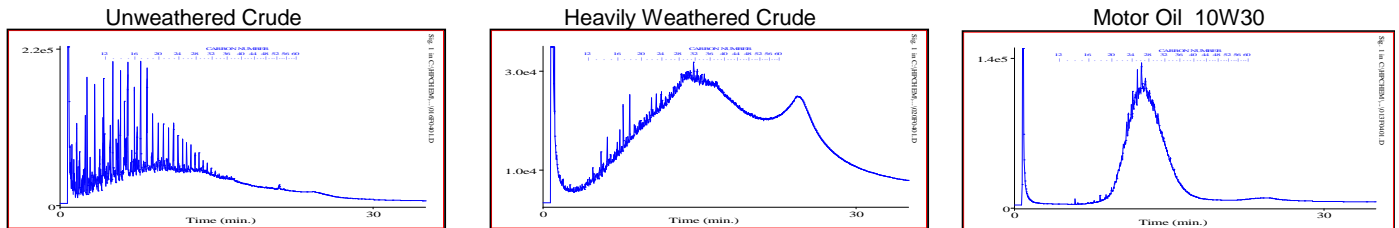
Hydrocarbon Chromatogram

| | | |
|---|-----------------------|-----------------------------|
| Bill To: EBA Engineering Consultants Lt | Project ID: W23101599 | Lot ID: 892594 |
| Report To: EBA Engineering Consultants Lt | Name: | Control Number: A245050 |
| Calcite Business Centre | Location: Deep Creek | Date Received: Sep 11, 2012 |
| Unit 6, 151 Industrial Road | LSD: | Date Reported: Sep 19, 2012 |
| Whitehorse, YT, Canada | P.O.: | Report Number: 1764993 |
| Y1A 2V3 | | |
| Attn: Tamra Reynolds | | |
| Sampled by: Kristen Range | | |
| Company: EBA | | |

Exova Number: 892594-1 Sample Description: Deep Creek Well #1
 Sample Date: Sep 7, 2012



TYPICAL PRODUCT CHROMATOGRAMS



Product Carbon Number Ranges

| | | | | | |
|----------|--------|----------|--------|------------------|---------|
| Gasoline | C4-C12 | Kerosene | C7-C16 | Lubricating Oils | C20-C40 |
| Varsol | C8-C12 | Diesel | C8-C22 | Crude Oils | C3-C60+ |



Health and Social Services
Santé et Affaires sociales
Environmental Health Services
Service d'hygiène du milieu

BACTERIOLOGICAL ANALYSIS OF DRINKING WATER
ANALYSE BACTÉRIOLOGIQUE DE L'EAU POTABLE

#2 Hospital Road, Whitehorse, Yukon Y1A 3H8
phone : (867) 667-8391 fax : (867) 667-8322
Toll free: 1-800-661-0408 ext.8391

2 Hospital Road, Whitehorse (Yukon) Y1A 3H8
Tél. : 867-667-8391 Téléc. : 867-667-8322
Sans frais au Yukon 1-800-661-0408, poste 8391

Contact Information - Coordonnées de la personne-ressource

Contact Person / Personne-ressource: Kristen Range Phone / Téléphone: 867-366823
Mailing address / Adresse postale: 6151 Industrial Rd Fax / Télécopieur: 868-4749
Postal code / Code postal: _____
First Nation, Municipal or Business Name / Nom de la Première nation, de la municipalité ou de l'entreprise: EBA Business Consultants
Agent / Agent: _____ Fax / Télécopieur: _____

Sampling Location - Lieu de la prise d'échantillon

Municipal Address / Adresse municipale: Deep Creek #2 Subdivision / Lotissement: Deep Creek
Legal Description Lot / Désignation officielle Lot: _____ Quad / Quadrilatère: _____ Plan no: _____
Other Information (e.g., Location, Business / Building Name) / Autres renseignements (ex.: emplacement, nom de l'entreprise, nom de l'édifice): _____

Sample Collection / Prélèvement de l'échantillon

Sample Collected By / Échantillon prélevé par: Kristen Range Date / Date: 12/7/06 Time / Heure: 10:05 am
Point d'échantillonnage (ex.: robinet de cuisine) / Point d'échantillonnage: Drill hole
Is this a Resample from a Previous Test? / Est-ce un deuxième échantillon d'un test antérieur? Yes / Oui No / Non Previous Sample Number / Numéro de l'échantillon précédent: _____

Sample Supply / Source d'approvisionnement en eau

Public Supply / Municipal - par canalisation Bulk Water Distributor / Municipal - par camion Business / Privé - entreprise Private Residence / Privé - résidence

Sample Source / Provenance de l'échantillon

Dug Well / Puits creusé Driven Well / Puits tubulaire Drilled Well / Puits foré à la sondeuse Depth of Well / Profondeur du puits: 100m
 Water Holding Tank / Réservoir d'eau Other (explain) / Autre (précisez): _____

Water Treatment / Traitement de l'eau

Is the Water Chlorinated? / L'eau contient-elle du chlore? Yes / Oui No / Non Free Available Chlorine / Chlore libre disponible: _____ p.p.m. / mg/L
Other Treatment Systems (e.g., UV, softener, filter) / Autre dispositif de traitement (ex.: désinfection aux rayons UV, adoucisseur d'eau, filtre): _____

For Laboratory Use Only / À l'usage du laboratoire seulement

Receipt of Sample / Réception de l'échantillon: Date / Date: 12/09/06 Time / Heure: 10:45 am By / Par: LA
Condition of Sample / État de l'échantillon: Satisfactory / Satisfaisant Unsatisfactory / Non satisfaisant Details / Précisez: 14.2
Incubation / Incubation: Date / Date: 12-09-06 Time / Heure: 11:00 am By / Par: SS Incubator / Incubateur: 4
Analysis Completed / Analyse terminée: Date / Date: 12-09-07 Time / Heure: 12:45 pm By / Par: SS

Results (See Reverse Side for Interpretation) / Résultats (Voir au verso l'interprétation des résultats)

Total Coliforms / Coliformes totaux: Present / Présence Absent / Absence
E. coli / E. coli: Present / Présence Absent / Absence

Comments / Commentaires

Colisure test method

Report Authorized By / Rapport autorisé par: L. Swin Position / Poste: WLT Date / Date: 12-09-07

Oct 22, 2012

SRC ANALYTICAL

422 Downey Road
Saskatoon, Saskatchewan, Canada
S7N 4N1
(306) 933-6932 or 1-800-240-8808

EBA Engineering Consultants Ltd.
6-151 Industrial Rd
Whitehorse, YT Y1A 2V3
Attn: Sarah Sternbergh

Date Samples Received: Oct-05-2012

Client P.O.: W23101568.003 +
W23101599

This is a final report.

Organics results have been authorized by Pat Moser, Supervisor

ICP results have been authorized by Keith Gipman, Supervisor

Inorganics and Radiochemistry results have been authorized by Jeff Zimmer, Supervisor

SLOWPOKE-2 results have been authorized by Dave Chorney

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as

- * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
- * Environment Canada
- * US EPA
- * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

Oct 22, 2012

SRC ANALYTICAL

422 Downey Road
 Saskatoon, Saskatchewan, Canada
 S7N 4N1
 (306) 933-6932 or 1-800-240-8808

EBA Engineering Consultants Ltd.
 6-151 Industrial Rd
 Whitehorse, YT Y1A 2V3
 Attn: Sarah Sternbergh

Date Samples Received: Oct-05-2012

Client P.O.: W23101568.003 + W23101599

38289
 38290
 38291



| Analyte | Units | 38289 | 38290 | 38291 |
|------------------------|-------|-------|-------|-------|
| Radio Chemistry | | | | |
| Gross alpha | Bq/L | <0.20 | <0.46 | <0.32 |
| Gross beta | Bq/L | 0.15 | <0.26 | <0.20 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SRC ANALYTICAL

EBA Engineering Consultants Ltd.

38292 **09/06/2012 DEEP CREEK #2, YUKON *WATER***

| Analyte | Units | 38292 |
|------------------------|-------|-------|
| Radio Chemistry | | |
| Gross alpha | Bq/L | <0.54 |
| Gross beta | Bq/L | <0.35 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

APPENDIX E

DRILLERS WELL LOG

Surface / Environmental Seal (depth below ground surface, please circle appropriate units)

C8 Seal Material Type: 370 BENT (i.e. Bentonite)
C9 Diameter of Seal: 4 (cm / in)
C10 Seal Depth from: 0 (m / ft)
C11 Seal Depth to: 20 (m / ft)
C12 Volume Placed: (m³ / ft³)

Gravel Pack (depth below ground surface, please circle appropriate units)

C13 Gravel Pack: YES if yes, indicated depth (m / ft): from: to: Indicate diameter of material: (mm / inches) Material type: (i.e. silica)

Well Screen Information (depth below ground surface, please circle appropriate units)

C14 Outside Diameter: 4.94 (cm / in)
C15 Screen Material: Plastic
C16 Screen Type: Perforated
C17 Depth from: 135 (m / ft)
C18 Depth to: 333 (m / ft)
Slot Size / Perforation Dia: 0.20 (mm / inches)
C19 Screen Comments: 6" THREADS CAP BOTTOM

WELL DEVELOPMENT AND STATUS

D1 Well Developed by: Air Jetting / Air Lifting
D2 Well Head Completion: Well Pit (NOT PERMITTED)
D3 Well Head Stick-up: 2 (m / ft)
D4 Static Water Level: 24.24 (m / ft)
D5 Well Yield Estimate: 20 (Lps / gpm)
D7 Well Abandonment Status: YES
D8 Method Used to Estimate Well Yield: Pumping Test

PUMPING TEST RECORD AND GROUNDWATER QUALITY

(All depths below ground, circle appropriate units)

E1 Pumping Test Information

Pumping Test Start Date: 2012 09 04

Static Water Level (SWL): 24 (m / ft)

Pump Intake Set at: 294 (m / ft)

Duration of pumping: 48 hrs STEP TEST

Final Water Level (FWL) at end of Pumping Test: 54.30 (m / ft)

G1 GROUNDWATER QUALITY

Date Measurements Taken: 2012/09/10

Electrical Conductivity: 1503 uS
pH: 7.80
Temperature: 3.8 °C

Groundwater Type

Other: (empty box)

RECOMMENDATIONS

Recomm. Pump Depth: (empty box)
Recomm. Pumping Rate: (empty box)
If flowing, provide rate: (empty box)

Turbidity/Sand Content

Clear
Slightly turbid/cloudy
Moderately turbid/cloudy
Turbid/cloudy
Trace sand present
No sand present

Well Disinfection

Was the well disinfected upon completion of the pump installation? YES NO

Briefly describe method of well disinfection.

F1 Well Water Level Drawdown/Recovery DATA

Table with 4 columns: Time (min), Water Level (m/ft) Drawdown, Time (min), Water Level (m/ft) Recovery. Data points from 0 to 60 minutes.

Bacteria Testing

Was a sample taken? YES NO

Date Sample Taken: 2012/09/06 Env. Health

Chemical Analysis of Water

Was a sample taken? YES NO

Date Sample Taken: 2012/09/06 EXOVA

Clear Form

Print Form

WELL CONTRACTOR

H1 Name of Contractor / Drilling Company: Double Drilling
H2 Name of Driller(s): Rob Stricker
H3 Address of Driller: 2407 BEAUCHESSE TERRACE

CONSULTANT (If applicable)

I1 Company Name: ERA ENGINEERING
I2 Company Address:
I3 Report Reference:
I4 Report Date:

ADDITIONAL INSTRUCTIONS

Upon completing this form, please mail or fax it to:

Water Resources Section (V-310), Department of Environment, Government of Yukon Box 2703, Whitehorse, Yukon, Canada Y1A 2C6

Please feel free to contact us at: Phone: (867) 667-3171, Toll free (in Yukon): (1-800) 661-0408, local 3171

Personal information contained on this form is collected under the authority of the Access to Information and Protection of Privacy (ATIP/PA) Act, Section 29 (c) and will be used to compile a public database of well and ground water information.

I have read the above clause and understand the purpose for collection of personal information.

Signature of Well Owner