

**APPENDIX A**

**Well Completion Report Well BW06-01  
Back-up Well**

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**-01- 23 2007**

**MN06-066**

**Quest Engineering Group**

**WATER WELL COMPLETION REPORT  
BACK-UP SUPPLY WELL  
WILLOW CREEK SUBDIVISION  
PELLY CROSSING, YUKON**

**1260026**

**January 2007**

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## EXECUTIVE SUMMARY

EBA Engineering Consultants Ltd. (EBA) was retained by Quest Engineering Group Ltd. (Quest) on behalf of the Selkirk First Nation (SFN) to provide hydrogeological consulting services related to the drilling and construction of a back-up well for the proposed piped distribution system.

The purpose of this project was to provide the Selkirk First Nation with a back-up well capable of supplying the community with 1.9 L/s (26 Igpm) of potable drinking water from the same aquifer as the truck fill station well, and the primary supply well (PW05-01).

The back-up well, BW06-01, is sited in a location such that compliance with applicable guidance document setbacks from potential sources of contamination have been satisfied. BW06-01 was drilled between September 27 and October 10, 2006 by Double D Drilling of Terrace, BC. BW06-01 has been constructed and tested in accordance with INAC guidelines for well construction, and is capable of supplying the village with potable drinking water. This new well can supply 4.1 L/s (54 Igpm) which is 2 times the desired flow rate of 1.9 L/s (26 Igpm).

Water from BW06-01 meets all Canadian Drinking Water Quality Guidelines (CDWQG) for health based and aesthetic objectives; the water is a hard calcium-bicarbonate type with a slight tendency to scale.

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## 1.0 INTRODUCTION

EBA Engineering Consultants Ltd. (EBA) was retained by Quest Engineering Group (Quest) on behalf of the Selkirk First Nation (SFN) to provide hydrogeological consulting services in support of the design and construction of a low-flow/ low-pressure water supply system to supply the SFN community in Pelly Crossing, Yukon (Figure 1). Following the recommendations provided within the EBA report entitled "Community Water Well Assessment" (June 2005) and the installation of the new community water supply well PW05-1 as documented in the EBA report entitled "Water Well Completion Report (October 2005); EBA coordinated the construction and testing of a new back-up community well ("BW06-01") located in the vicinity of the Willow Creek Subdivision (Figure 1).

The purpose of this project was to provide the SFN with a back-up supply well capable of independently meeting the demand of the piped distribution system. In addition to providing a mechanical back-up, this well would increase the totally supply capacity of the system.

The location of BW06-01 was selected a sufficient distance away from PW05-01 such that if either well were to be impacted by a potential contamination event, there would be sufficient separation (and thus response time) to ensure the safety of the other well. BW06-01 is located approximately 225 m east (and cross-gradient) of PW05-1.

The test well location was chosen based on characterization of the groundwater flow regime (from the Preliminary Hydrogeological Assessment). Proximity to existing and future (upon development) sources of contamination was also taken into consideration. Additionally, the new well was constructed in accordance with current Indian and Northern Affairs Canada (INAC) well construction guidelines, and sited in a location to ensure compliance with current guidance document setback distances from potential sources of contamination. A site plan showing the location of existing wells and the new back-up well is shown on Figure 1.

### 1.1 SCOPE OF WORK

The scope of work for the well construction, testing and completion involved the following tasks:

- Reviewing background information;
- Coordinating and supervising the drilling, construction and development of new back-up water supply well BW06-01;
- Coordinating and supervising testing of BW06-01;

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- Collecting water samples from BW06-01 for potability and water treatment analyses and submitting to a certified laboratory;
- Interpreting the results of pumping test and water chemistry analyses;
- Preparation of this report summarizing the results, interpretation and recommendations.

## 2.0 FIELD PROGRAM

### 2.1 WELL DRILLING, COMPLETION AND DEVELOPMENT

BW06-01 was drilled by Double D Drilling Ltd. (Double D) of Terrace, B.C. from September 26 – October 9, 2006. The drilling was completed using the dual air rotary method whereby the well casing and drill bit are simultaneously rotated into the ground. During the drilling process drill cuttings are air lifted through the casing to the surface.

Representatives from EBA were on site as necessary during the project duration to supervise and co-ordinate the drilling and pump testing program. Samples were collected and retained continuously during drilling for soil classification and well screen design as necessary. A drill log containing details of sediments encountered and well completion details is included as Figure 2. The lithology encountered is summarized in Table 1 as follows:

**TABLE 1: BOREHOLE SOIL LITHOLOGY SUMMARY**

Depth (mbgl)	Soil Description
0.0 m to 7.6 m	SAND – brown, dry to moist, trace silt.
7.6 m to 16.8 m	SAND AND GRAVEL – fine, trace medium sand,
16.8 m to 20.4 m	GRAVEL – medium to coarse sand, trace silt.
20.4 m to 21.0 m	CLAY - silty, brown, dry.
21.0 m to 33.5 m	GRAVEL – well graded sand, fine gravel.

The target aquifer zone was encountered between 21.0 and 33.5 meters below ground level (mbgl). Below 33.5 m clay till was observed, and as such the drilling was stopped at this depth. Prior to proceeding with well screen design and installation, preliminary field chemistry tests for water quality were conducted by Ms. Jenifer Kelly, E.I.T. of EBA. Field chemistry testing involved colour comparator screening tests for iron (Fe) and manganese (Mn) which are known to commonly exceed Canadian Drinking Water Quality Guidelines (CDWQG) in the region. The field screening involved dissolving a sachet of reactant to a known volume of filtered water and then comparing the observed colour of the water sample to a colour comparator. A filtered sample was used rather than a raw sample to

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eliminate any false positive results attributed to turbidity. The rationale for using a filtered sample was that a properly designed, constructed and developed well would provide water with low turbidity. The results of the field screening and accuracy of the tests are included in Table 2 below:

<b>TABLE 2: SUMMARY OF FIELD TESTING RESULTS</b>			
<b>Parameter</b>	<b>Concentration</b>	<b>Estimated Uncertainty</b>	<b>GCDWQ Criteria</b>
Dissolved Iron	<1.0 mg/L	±0.1	0.3
Dissolved Manganese	<0.5 mg/L	±0.05	0.05
Total Dissolved Solids	187 mg/L		500
Conductivity (EC)	386 microS		
pH	7.83		8.5
Temperature	6.6 °C		

The field screening results indicated non-detectable dissolved manganese and dissolved iron concentrations (<1.0 and <0.5 mg/L). With the results indicating water quality was likely acceptable, it was decided to proceed with the well completion.

EBA completed grain size analyses on two samples collected from the aquifer zone between 27.4 and 29.0 mbgl. Grain size results are included in Appendix A, and indicate that the aquifer material is a well graded gravel with some sand.

Based on the grain size analysis results, drill hole lithology and available drawdown, EBA designed an appropriate well screen assembly consisting of 3.0 m of Johnson V-wire screen with 3.81 mm (0.150") openings. To ensure an adequate seal between the well casing and aquifer formation, a 1.0 m section of riser pipe and k-packer was installed above the screen section.

In accordance with INAC well construction specifications, Table 3 on the following page provides the required information on well construction and completion details.

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**TABLE 3: REQUIRED DETAILS FOR WELL CONSTRUCTION REPORT**

REQUIRED DETAILS	DETAILS OR REPORT REFERENCE
Date of construction:	Well was completed between September 26 <sup>th</sup> , and October 9 <sup>th</sup> 2006.
Name and address of the owner of the well:	Selkirk First Nation Box 40, Pelly Crossing, Yukon, Y0B 1P0
Legal description of the property:	Willow Creek Subdivision, SFN Village, between Lot 15 and Lot 16, Pelly Crossing, Yukon
Location of the well on the property:	See Figure 1.
Method of construction:	Dual Air Rotary.
Description, depth and thickness of geologic materials encountered during construction:	See Well log BW06-01 (Figure 2). Double D Drilling log for this well is also included in Appendix C.
Depth and diameter of the well:	The well construction details are provided on Well log (Figure 2).
Type of casing materials and thickness:	Steel Casing – 0.150 inches (6.35 mm) thick.
Static water level:	15.12 mbgl
Type, size, length and location of screen:	Stainless steel V-wire 150 (0.150") slot Johnson screen. Total screen length is 3.0 m. Screen set between 28.3 m and 31.4 mbgl (29.4 and 32.5 m below top of casing)
Location of major water-bearing zones:	Major water bearing gravel zone from 21.0 to 33.5 mbgl.
Presence of any poor quality water or gas encountered:	None encountered.
Results of any hydrofracturing undertaken:	No hydrofracturing completed.
Location, type and thickness of grout sealant placed around the well:	Bentonite seal was placed between annulus of conductor pipe and native sand and gravel. Seal is completed from grade to 6.0 mbgl.
Name, address and signature of person completing the work:	The well was constructed by Double D Drilling Ltd. Address: 5275 Arthur Rd, Terrace, BC, V8G 4R1. Primary Driller was Doug Stanvick. Well drilling was supervised by Jenifer Kelly, EBA Engineering Consultants Ltd.

BW06-01 was air-developed for 12 hrs following well screen installation. The purpose of well development is to maximize well yield and efficiency by removing fine particles from the aquifer material directly adjacent to the well screen. After approximately 12 hours of development, water clarity ceased to improve and development was stopped.

## 2.2 WELL AND AQUIFER TESTING

Double D supplied and installed a well pump and necessary piping, flow meters and discharge line to complete the pumping test. The pump was installed at a depth of 32.0 m, and 100 m of layflat hose was used to convey pumped water to an appropriate discharge area outside the anticipated capture zone.

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A step rate test was conducted by Double D under the supervision of EBA on October 11th, 2006. The purpose of the step test was to get an initial specific capacity of the well and to select an appropriate discharge rate for the constant rate test. Flow rate was adjusted for each step by adjusting the gate valve until the desired rate was observed on the flow meter; flow was double checked at the discharge point using a graduated barrel and stopwatch.

The step test was started on October 11, 2005 at 12:00 PM. Three steps were completed for one hour each at flow rates of 2.3, 4.6 and 6.9 L/s (30, 60, and 90 Igpm) respectively. Recovery was monitored in BW06-01 for 45 minutes upon termination of the step rate test. Water level data was collected continuously during the step test and recovery, and a graph indicating drawdown vs. time is provided as the upper portion of Figure 3.

The constant rate pumping test was initiated on October 11, 2006 at 4:00 PM at a rate of 4.6 L/s (60 Igpm). The water level in BW06-01 was monitored continuously during the constant rate test, water level data collected is included in Appendix B, and a graph of drawdown vs. time during the constant rate test is included as Figure 4.

The nearby well (PW05-1) at Lot 15 was used as an observation well during the step test, constant rates test and recovery intervals. A Solinst Levellogger™ automated datalogger was used to continuously record total pressure in the observation well. A Solinst Barologger™ was also installed above ground at the observation well head to continuously monitor barometric pressure during the pumping tests. The Levellogger records total pressure (water plus atmospheric); using the measured depth to water, depth of setting and barometric pressure data. Levellogger readings have corrected to an equivalent depth to water in the observation well. Water level observations from the observation well are plotted on Figure 5.

## 2.3 GROUNDWATER SAMPLING

Groundwater samples were collected from BW06-01 at the end of the constant rate pumping test by Double D Drilling. All samples were collected from a hose connection located at the well head. Samples were collected in accordance with specific laboratory recommendations. All samples were shipped to Vancouver by air cargo for analysis at ALS Environmental. ALS is a member of the Canadian Association of Environmental Analytical Laboratories (CAEAL). The following parameters were analyzed:

- Physical tests;
- Dissolved Anions;
- Nutrients;
- Total and Dissolved Metals;
- Trihalomethane and Haloacetic acid formation potential;

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- Organic Parameters; and,
- Radiological Screening.

Analytical results are summarized in Table 6. Laboratory reports and certificates are included as Appendix C.

## 3.0 RESULTS

### 3.1 STEP TEST

A plot of observed drawdown in BW06-01 during the step rate pumping test is included as the upper portion of Figure 3. The flow rate vs. maximum drawdown and specific capacity observed at the end of each step is also plotted on the lower portion of Figure 3. The specific capacity increased slightly during the step rate test from 0.60 to 0.77 L/s/m.

### 3.2 CONSTANT RATE TEST

Drawdown and recovery observed in BW06-01 during the constant rate pumping test is plotted on Figure 3. Figure 5 shows the water level in PW05-01 as observed with the datalogger during the pumping test- no significant drawdown was observed in PW05-01 during the test.

The drawdown during the constant rate pumping test appeared to stabilize at 7.67 m after approximately 100 min of pumping. Minor water level fluctuations were observed between 100 and 1440 min. The maximum drawdown observed during the pumping test was 7.72 m.

Water level recovery data or residual drawdown versus residual time factor ( $t/r^2$ ) is also included on Figure 5. BW06-01 recovered to greater than 95% of the total observed drawdown within 20 minutes of pumping test termination.

The observed and residual drawdown data was analyzed using the Cooper-Jacob straight line method which assumes the following:

- The aquifer is infinite in aerial extent, and uniform in thickness;
- The aquifer is homogeneous and isotropic;
- The pumping well fully penetrates the aquifer thickness, and pumps at a constant rate;
- The piezometric surface was horizontal prior to pumping;
- Water is released instantaneously from storage with a decline in hydraulic head;
- The well diameter is small such that well storage is negligible; and,

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- Flow is laminar.

The results of the Cooper-Jacob analysis method for the constant rate pumping test are included on Figure 5.

The straight line approximation was separately applied for the mid and late pumping data and for the recovery interval. Transmissivity values obtained from pumping test results are summarized in Table 4 below:

TABLE 4: AQUIFER TRANSMISSIVITY AND HYDRAULIC CONDUCTIVITY		
TEST INTERVAL	T TRANSMISSIVITY	K CONDUCTIVITY
EARLY PUMPING (T <sub>1</sub> ,K <sub>1</sub> )	40 m <sup>2</sup> /day	2.8 x 10 <sup>-5</sup> m/sec
MID-LATE PUMPING (T <sub>2</sub> ,K <sub>2</sub> )	<b>3000 m<sup>2</sup>/day</b>	<b>2.0 x 10<sup>-3</sup> m/sec</b>
EARLY RECOVERY (T <sub>3</sub> ,K <sub>3</sub> )	50 m <sup>2</sup> /day	3.7 x 10 <sup>-5</sup> m/sec
MID-LATE RECOVERY (T <sub>4</sub> ,K <sub>4</sub> )	<b>750 m<sup>2</sup>/day</b>	<b>5.1 x 10<sup>-4</sup> m/sec</b>

The transmissivity values calculated for the mid to late pumping and recovery intervals range from 750 m<sup>2</sup>/day to 3000 m<sup>2</sup>/day. The straight line approximations for pumping and recovery intervals are approximately parallel indicating a reasonable agreement between the two analyses. Using an aquifer thickness of 16.9 m, the hydraulic conductivity (K) of the aquifer based on mid to late pumping and recovery data ranges from 5.1 x 10<sup>-4</sup> m/s to 2.0 x 10<sup>-3</sup> m/s.

Conductivity results shown in bold above (from the mid to late pumping and recovery data) are more representative of aquifer characteristics than earlier interpretations (due to the effects of well loss).

These values are in agreement with conductivity values interpreted from pumping tests and grain size analysis with PW05-1 which range between 1.0 x 10<sup>-1</sup> and 3.1 x 10<sup>-3</sup> m/s (EBA 2005).

#### 4.0 WELL CAPACITY

To calculate the safe yield of a well, the specific capacity of the well is multiplied by the safe available drawdown. The specific capacity of the well (at a given pumping rate) is based on the projection of the constant rate drawdown to 100 days (see Figure 4). This conservatively assumes that BW06-01 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 available drawdown. In some cases, the safe yield of a well may be limited by what the well screen is capable of safely delivering based on the maximum recommended screen entrance velocity. Table 5 below provides the detailed safe yield calculations for BW06-01.

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<b>TABLE 5: SAFE YIELD CALCULATIONS</b>			
<b>WELL PARAMETER</b>	<b>VALUE</b>	<b>UNIT</b>	<b>KEY</b>
Constant Rate Pumping Test Discharge Rate	4.5	L/s	a
Projected 100-Day Drawdown (Figure 5)	7.8	m	b
Specific Capacity (Based on 100-Day Drawdown)	0.57	L/s/m	c = a / b
Lowest Expected Seasonal Water Table (2.0 m fluctuation)	17.1	m	d
Depth to top of Screen Interval	28.3	m	e
Available Drawdown	10.1	m	f = e-d
Safety Factor	70	%	g
Safe Available Drawdown	7.1	m	h = f x g
<b>Safe Yield Based on Constant Rate Pumping Test</b>			
Theoretical Sustainable Yield	4.1	L/s	c x h
Theoretical Sustainable Yield	54	lgpm	
<b>Check for Screen Entrance Velocity</b>			
Recommended Maximum Screen Entrance Velocity	0.03	m/s	
Intake Area (m <sup>2</sup> / m of 0.150" Well Screen)	0.34	m <sup>2</sup> /m	j
Total Intake Area for 3 m Screen	1.02	m <sup>2</sup>	k = j x 3
Screen Entrance Velocity at Safe Estimated Sustainable Yield	0.004	m/s	(i/1000)/k
Check: Less than Recommended Maximum Velocity (0.03 m/s)	<b>YES</b>		< 0.03

Based on specific capacity and available drawdown BW06-01 could theoretically be pumped at a rate of 4.1 L/s (54 lgpm) which is much higher than the required projected daily demand for the Pelly Crossing Area of 1.94 L/s. At a pumping rate of 4.1 L/s, the screen entrance velocity is 0.004 m/s, which is less than the maximum recommended screen entrance velocity of 0.03 m/s.

## 5.0 GROUNDWATER ANALYTIC RESULTS

Groundwater analytic results are presented in Table 5; laboratory results and certificates can be found in Appendix D. As expected, based on water quality data from the nearby truck fill well, the water from BW06-01 meets all Canadian Drinking Water Quality Guidelines (CDWQG) for health based and aesthetic objectives. Water from BW06-01 is a hard calcium-bicarbonate type water with a slight tendency to scale as indicated by a positive saturation index of 0.198.

## 6.0 GROUNDWATER UNDER THE DIRECT INFLUENCE OF SURFACE WATER ASSESSMENT

Well water or groundwater under the direct influence of surface water (GUDI) refers to groundwater supply sources that are hydraulically connected to nearby surface waters, and are thus vulnerable to contamination by pathogens. The implication of a well being

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classified GUDI is a requirement for treatment equivalent to that required for surface water sources.

The Yukon Department of Health and Social Services has drafted an "Assessment Guideline for Well Water or Groundwater Under the Direct Influence of Surface Water" (GUDI) to determine if a well is potentially under the influence of surface water (YTG 2005). As BW06-01 is completed within an unconfined aquifer it meets one of the four criteria for being potentially GUDI, and requires a Phase 2 assessment.

A Phase 2 travel time assessment has been completed below:

$$t = d\theta / K * (dh / dl)$$

where:

- t = travel time in days
- d = distance to Willow Creek in m (300 m)
- K = aquifer hydraulic conductivity in m/day (108 m/day) based on average of mid to late pumping and recovery data
- dh/dl = hydraulic gradient (0.0015 from EBA 2005)
- $\theta$  = effective porosity (assumed to be 0.3)

Substitution of well and aquifer parameters into the above equation yields a travel time of 553 days which is greater than the potential GUDI travel time of 90 days.

INAC has also developed a GUDI assessment guideline, which takes into account well construction, aquifer type, and well yield. By definition of INAC's GUDI assessment (INAC 2006) BW06-01 is defined as NON-GUDI, as it is more than 100 m from a surface water body.

## 7.0 CONCLUSIONS/ RECOMMENDATIONS

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

- In October 2006, a new back-up drinking water well (BW06-01) was drilled for the Selkirk First Nation in Pelly Crossing. The well was drilled to a depth of 33.5 m below ground (mbgl), and a screen was set from 28.3 to 31.4 mbgl (29.4 to 32.5 meters below top of casing) within a gravel aquifer.
- The new well was constructed in accordance with current and proposed INAC specifications for water well construction.
- The new well is sited at a location ensuring compliance with current and proposed guidance documents for setback distances from existing and potential sources of contamination.

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- Pumping test results indicate aquifer transmissivity ranging from 750 m<sup>2</sup>/day to 3000 m<sup>2</sup>/day.
- The safe sustainable yield for BW06-01 is 4.1 L/s (54 Igpm), which is sufficient to meet the required demand of 1.9 L/s (26 Igpm).
- Water from BW06-01 meets all CDWQG for health based and aesthetic objectives and is considered to be of good quality.
- BW06-01 is considered to be NON-GUDI based on the draft Yukon Assessment Guideline (YTG 2006) and based on the INAC Protocol (INAC 2006).

The following recommendations are included to ensure the performance and safety of the water supply wells and aquifer:

- The pump should be set with the intake positioned near the top of the screen assembly at 27.2 mbgl (28.3 meters below top of casing);
- A regular well monitoring program should be implemented; and,
- An aquifer and wellhead protection plan should be completed to ensure the safety of the water supply wells and aquifer, especially in consideration of the SFN's investment in the Willow Creek Aquifer.

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**8.0 CLOSURE**

Conclusions and recommendations in this report are based upon the Hydrogeological Investigations as described in the previous sections. This report has been prepared for the use of Quest Engineering Group on behalf of the Selkirk First Nation. It has been prepared in accordance with generally accepted hydrogeological practices. For further limitations regarding the use of the report, reference should be made to the EBA Environmental Report – General Conditions attached, which form a part of this report.

EBA trusts that this report satisfies your present requirements. Should you have any questions or comments please do not hesitate to contact the undersigned.

Respectfully submitted,

EBA Engineering Consultants Ltd.

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## ENVIRONMENTAL REPORT – GENERAL CONDITIONS

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

### 1.0 USE OF REPORT

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 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed on site at the time of EBA's investigation. The client, and any other parties using this report with the express written consent of the client and EBA, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The client, and any other party using this report with the express written consent of the client and EBA, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

### 2.1 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of this report, EBA may have relied 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.

### 3.0 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of EBA providing the services requested, the client agrees that EBA's liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

1. With respect to any claims brought against EBA by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to EBA under this Agreement, whether the action is based on breach of contract or tort;
2. With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless EBA from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by EBA, whether the claim be brought against EBA for breach of contract or tort.

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**4.0 JOB SITE SAFETY**

EBA is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of EBA personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

**5.0 DISCLOSURE OF INFORMATION BY CLIENT**

The client agrees to fully cooperate with EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for EBA to properly provide the service, EBA is relying upon the full disclosure and accuracy of any such information.

**6.0 STANDARD OF CARE**

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

**7.0 EMERGENCY PROCEDURES**

The client undertakes to inform EBA of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of EBA may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect EBA employees, other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The client agrees to pay EBA for any expenses incurred as a result of such discoveries and to compensate EBA through payment of additional fees and expenses for time spent by EBA to deal with the consequences of such discoveries.

**8.0 NOTIFICATION OF AUTHORITIES**

The client acknowledges that 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.

**9.0 OWNERSHIP OF INSTRUMENTS OF SERVICE**

The client acknowledges that all reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

**10.0 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), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

The Client agrees that 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.

The Client recognizes and agrees that 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.

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# TABLES

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**TABLE 6: SUMMARY OF LABORATORY CHEMISTRY RESULTS**

	Units	PW05-1	PW05-1	BW06-01	Canadian Drinking Water Quality Guidelines	
		Date	Date	Date	MAC <sup>2</sup>	AO <sup>3</sup>
		10-Jul-05	12-Jul-05	12-Oct-06		
<b>Physical Tests</b>						
Color	CU	- <sup>4</sup>	<5.0	<5.0		15
Conductivity (Lab)	uS/cm	-	338	364		
Total Dissolved Solids	mg/L	-	180	219		500
Hardness (CaCO <sub>3</sub> )	mg/L	-	158	181		
pH		-	8.14	8.04		6.5 - 8.5
Turbidity	NTU	-	0.52	0.38		5
UV Absorbance	mg/L	-	0.0440	-		
<b>Dissolved Anions</b>						
Alkalinity-Total (CaCO <sub>3</sub> )	mg/L	-	160	182		
Chloride	mg/L	-	1.05	0.55		250
Flouride	mg/L	-	0.206	0.185	1.5	
Sulphate	mg/L	-	17.7	17.0		500
<b>Nutrients</b>						
Nitrate	mg/L	-	0.13	0.0680	10	
Nitrite	mg/L	-	<0.10	<0.0010	3.2	
<b>Total Metals</b>						
Aluminum	mg/L	-	0.166	<0.010		
Antimony	mg/L	-	<0.00050	<0.00050	0.006	
Arsenic	mg/L	-	0.00067	0.00018	0.01	
Barium	mg/L	-	0.072	0.083	1	
Boron	mg/L	-	<0.10	<0.10	5	
Cadmium	mg/L	-	<0.00020	<0.00020	0.005	
Calcium	mg/L	-	41.9	55.3		
Chromium	mg/L	-	<0.0020	<0.0020	0.05	
Copper	mg/L	-	0.0029	0.0013		1
Iron	mg/L	-	<0.030	<0.030		0.3
Lead	mg/L	-	<0.0010	<0.0010	0.01	
Magnesium	mg/L	-	12.8	15.4		
Manganese	mg/L	-	0.0058	<0.0020		0.05
Mercury	mg/L	-	<0.00020	<0.00020	0.001	
Potassium	mg/L	-	1.51	2.27		
Selenium	mg/L	-	<0.0010	<0.0010	0.01	
Sodium	mg/L	-	6.8	5.4		200
Uranium	mg/L	-	0.00131	0.00174	0.02	
Zinc	mg/L	-	<0.050	<0.050		5
<b>Dissolved Metals</b>						
Aluminum	mg/L	-	-	<0.010		
Antimony	mg/L	-	-	<0.00050	0.006	
Arsenic	mg/L	-	-	0.00027	0.01	
Barium	mg/L	-	-	0.085	1	
Boron	mg/L	-	-	<0.10	5	
Cadmium	mg/L	-	-	<0.00020	0.005	
Calcium	mg/L	-	-	48.3		
Chromium	mg/L	-	-	0.0038	0.05	
Copper	mg/L	-	-	0.0011		1
Iron	mg/L	-	-	<0.030		0.3
Lead	mg/L	-	-	<0.0010	0.01	
Magnesium	mg/L	-	-	14.7		
Manganese	mg/L	-	-	<0.0020		0.05
Mercury	mg/L	-	-	<0.00020	0.001	
Potassium	mg/L	-	-	2.00		
Selenium	mg/L	-	-	<0.0010	0.01	
Sodium	mg/L	-	-	6.0		200
Uranium	mg/L	-	-	0.00163	0.02	
Zinc	mg/L	-	-	<0.050		5
<b>Trihalomethanes</b>						
Bromodichloromethane	mg/L	-	0.0047	0.0044		
Bromoform	mg/L	-	<0.0010	<0.0010		
Chloroform	mg/L	-	0.0964	0.0525		
Dibromochloromethane	mg/L	-	<0.0010	<0.0010		
<b>Haloacetic Acids</b>						
Bromoacetic Acid	mg/L	-	-	<0.0020		
Bromohloroacetic Acid	mg/L	-	-	<0.0020		
Chloroacetic Acid	mg/L	-	-	<0.020		
Dibromoacetic Acid	mg/L	-	-	<0.0020		
Dichloroaceti Acid	mg/L	-	-	0.0232		
Trichloroacetic Acid (TCA)	mg/L	-	-	0.0337		
<b>Organic Parameters</b>						
Tannin and Lignin	mg/L	-	-	0.2		
Total Organic Carbon	mg/L	-	2.95	2.03		
<b>Radiological Parameters</b>						
Gross Alpha	Bq/L	-	0.14	0.16	0.1 <sup>2</sup>	
Gross Beta	Bq/L	-	0.2	0.13	1	
Lead-210	Bq/L	-	<0.02	<0.02	0.1	
Thorium-232	Bq/L	-	<0.01	<0.01	0.1	
<b>Bacteriological</b>						
E. coli	counts/100mL	0	0	-	0	
Total Coliforms	counts/100mL	0	1	-	0	

Notes:

- 1) GCDWQ criteria are taken from the "Guidelines for Canadian Drinking Water Quality, April 2004."
- 2) MAC refers to the Maximum Acceptable Concentration according to the GCDWQ criteria.
- 3) AO refers to the Aesthetic Objective according to the GCDWQ criteria.
- 4) "-" indicates not analyzed.
- 5) Gross alpha is used as a radiological screening tool, examination of radiological constituents with MACs of 0.1 mg/L shows no exceedences.



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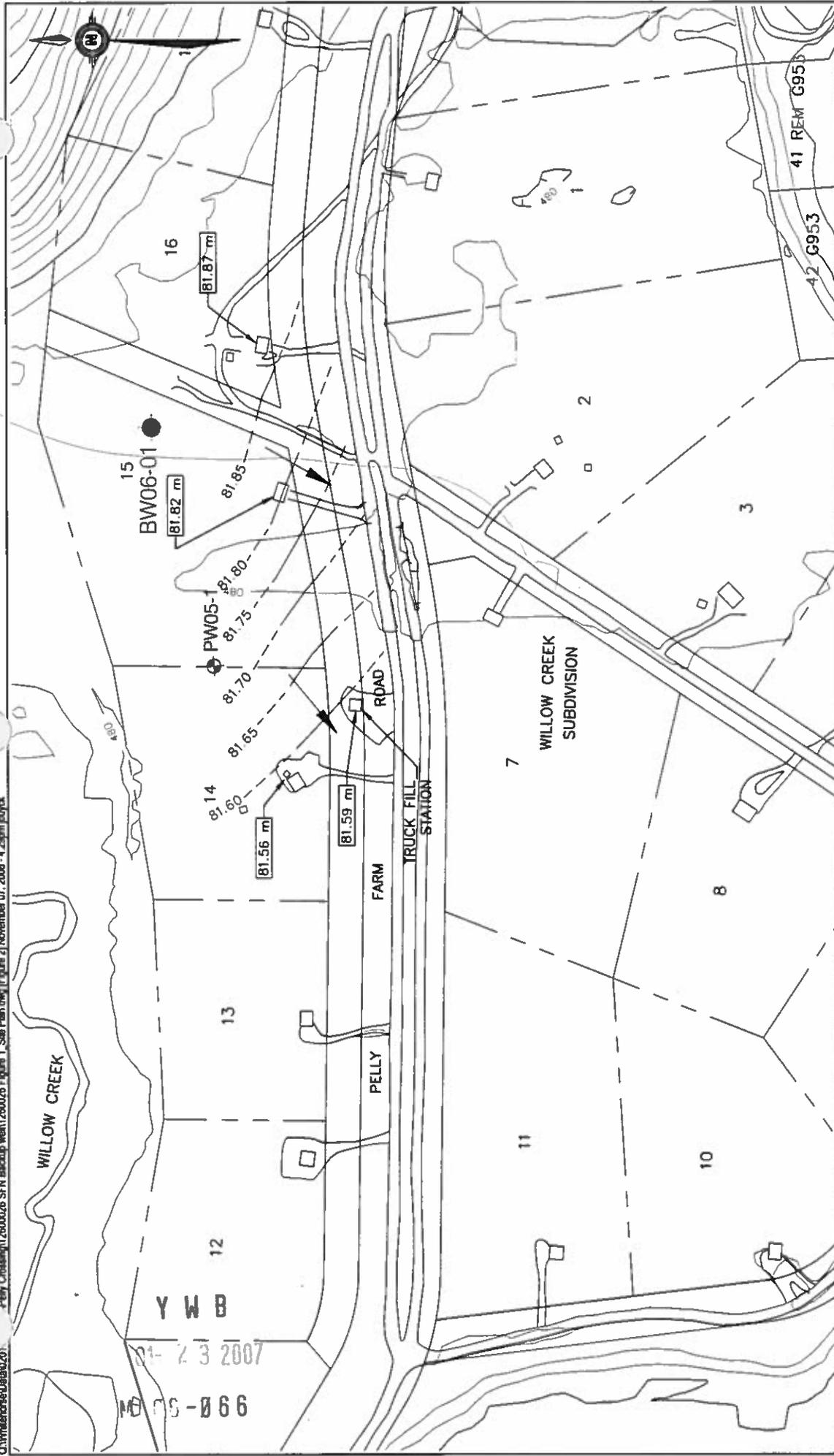
# FIGURES

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CLIENT

**WELL COMPLETION REPORT FOR SELKIRK FIRST NATION COMMUNITY WELL - PELLY CROSSING, YT.**

**SITE PLAN SHOWING BW06-01 LOCATION AND GROUNDWATER FLOW DIRECTION**

**Quest Engineering Group**



**EBA Engineering Consultants Ltd.**



**LEGEND:**

- 81.59 m [ ] WATER WELL ELEVATION IN METRES - VISTA TEK LTD. - JUNE 9, 2005.
- 81.65 [ - - - ] INTERPRETED GROUNDWATER ELEVATION CONTOUR.
- [ - - - ] INFERRED GROUNDWATER ELEVATION CONTOUR.
- [ - - - ] INTERPRETED DIRECTION OF GROUNDWATER FLOW

NOTE: ELEVATION DATUM WAS ARBITRARILY SELECTED AND IS NOT TIED TO GEODETIC.

SCALE 1:300



PROJECT NO.	DWN	CKD	REV
1260026	JSB	KSJ/BEP	0
OFFICE	DATE		
EBA-WHSE	November 7, 2006		

**Figure 1**

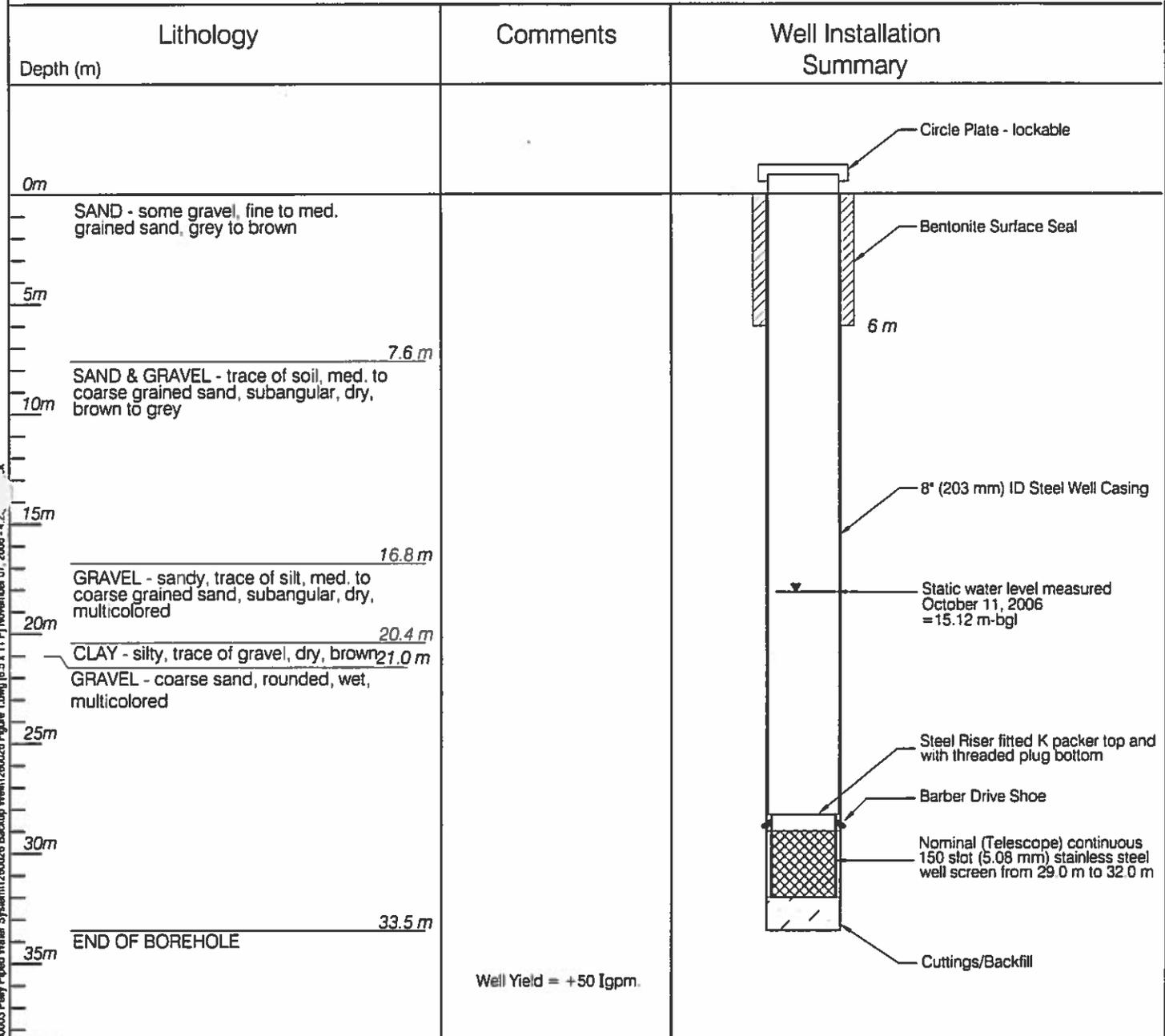
# HYDROGEOLOGIC LOG

BOREHOLE NO.

**BW06-01**

PURPOSE OF HOLE: Water Supply Well  
 DRILLING METHOD: Dual Air Rotary  
 START DRILLING: Sept. 27, 2006  
 SCREEN INSTALLED: Oct. 10, 2006  
 CONTRACTOR: Double 'D' Drilling Ltd.

GROUND ELEV. : 97.0 m-geod (approx.)  
 TOP OF CASING: 98.07 m-geod (approx.)  
 CASING STICK UP (m): 1.07 m above grd.  
 DEPTH TO STATIC (m): 15.08 m below grd.  
 DEPTH TO SCREEN TOP (m): 29.0 m



Q:\Whitehorse\Delia\0201\Jelly Cross\ng\1260026 Pelly Piped Water System\1260026 Backup Well\1260026 Figure 1.dwg [B.5 x 11 P] November 07, 2006 - 4:24

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CLIENT



**Quest Engineering Group**

**WELL COMPLETION REPORT FOR SELKIRK  
 FIRST NATION BACK-UP WELL - PELLY CROSSING, YT.**

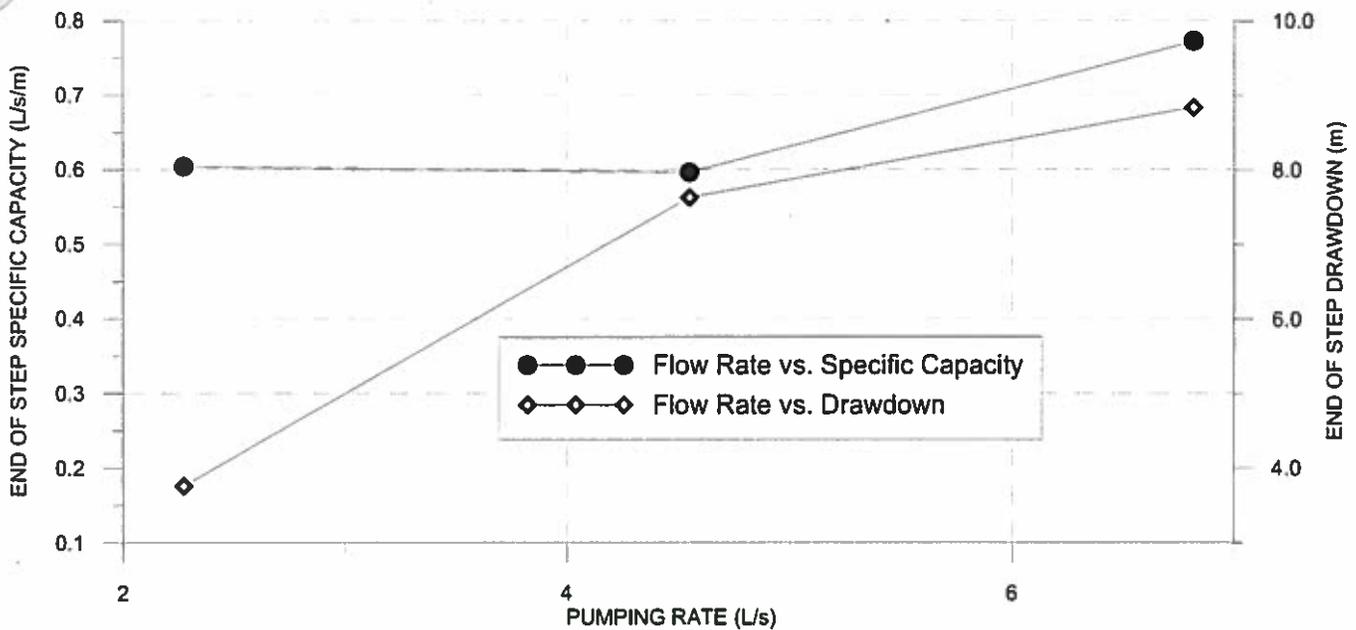
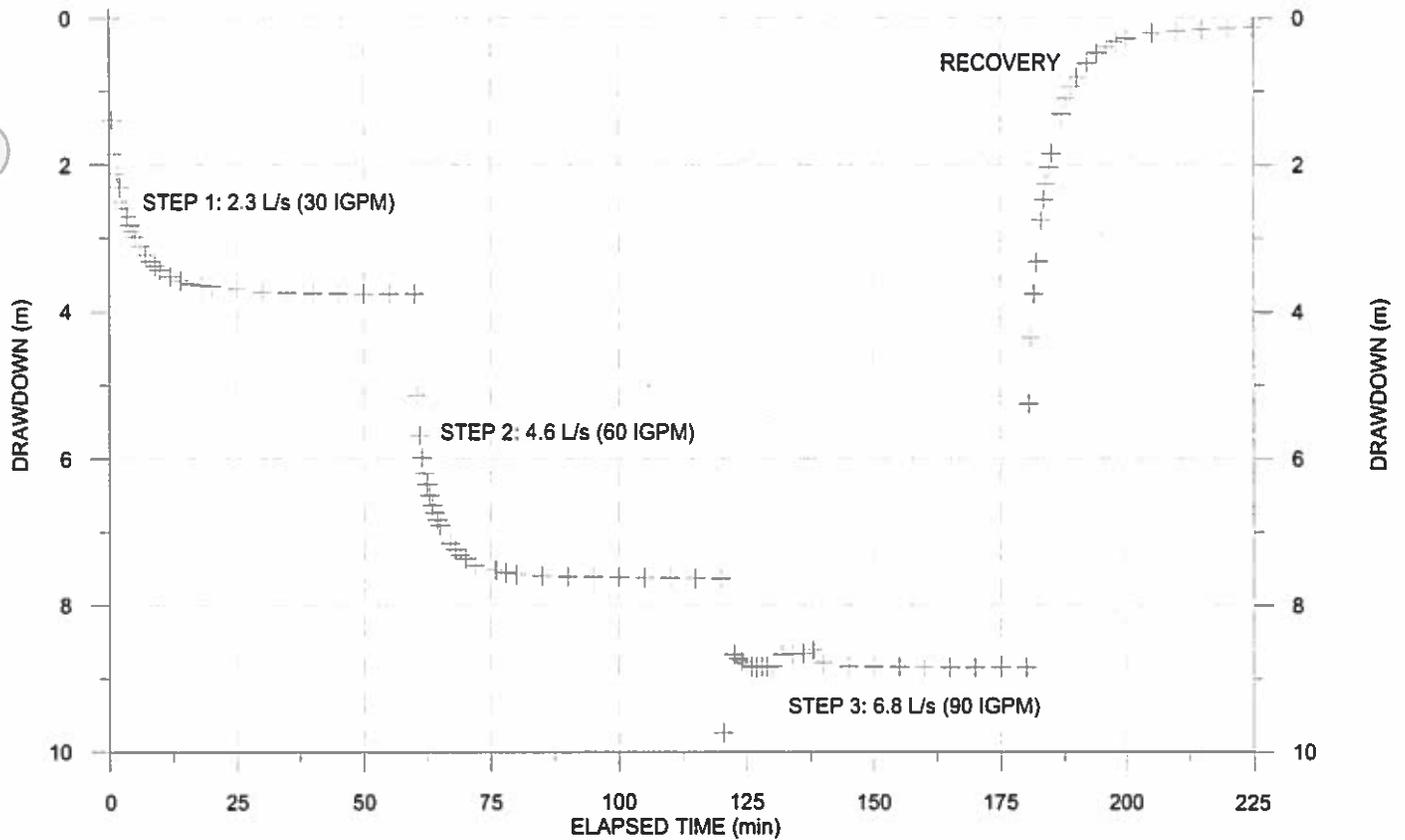
**WATER WELL RECORD**

**EBA Engineering Consultants Ltd.**



PROJECT NO. 1260026	DWN JSB	CKD KSJ	REV 0
OFFICE EBA-WHSE	DATE November 7, 2006		

**Figure 2**



**EBA Engineering Consultants Ltd.**

PROJECT WATER WELL COMPLETION REPORT WILLOW CREEK SUBDIVISION, PELLY CROSSING, YT

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 MN06-886

TITLE  
**STEP TEST WITH BW06-01**

DATE NOV 2006 DWN. KSJ CHKD. RMM

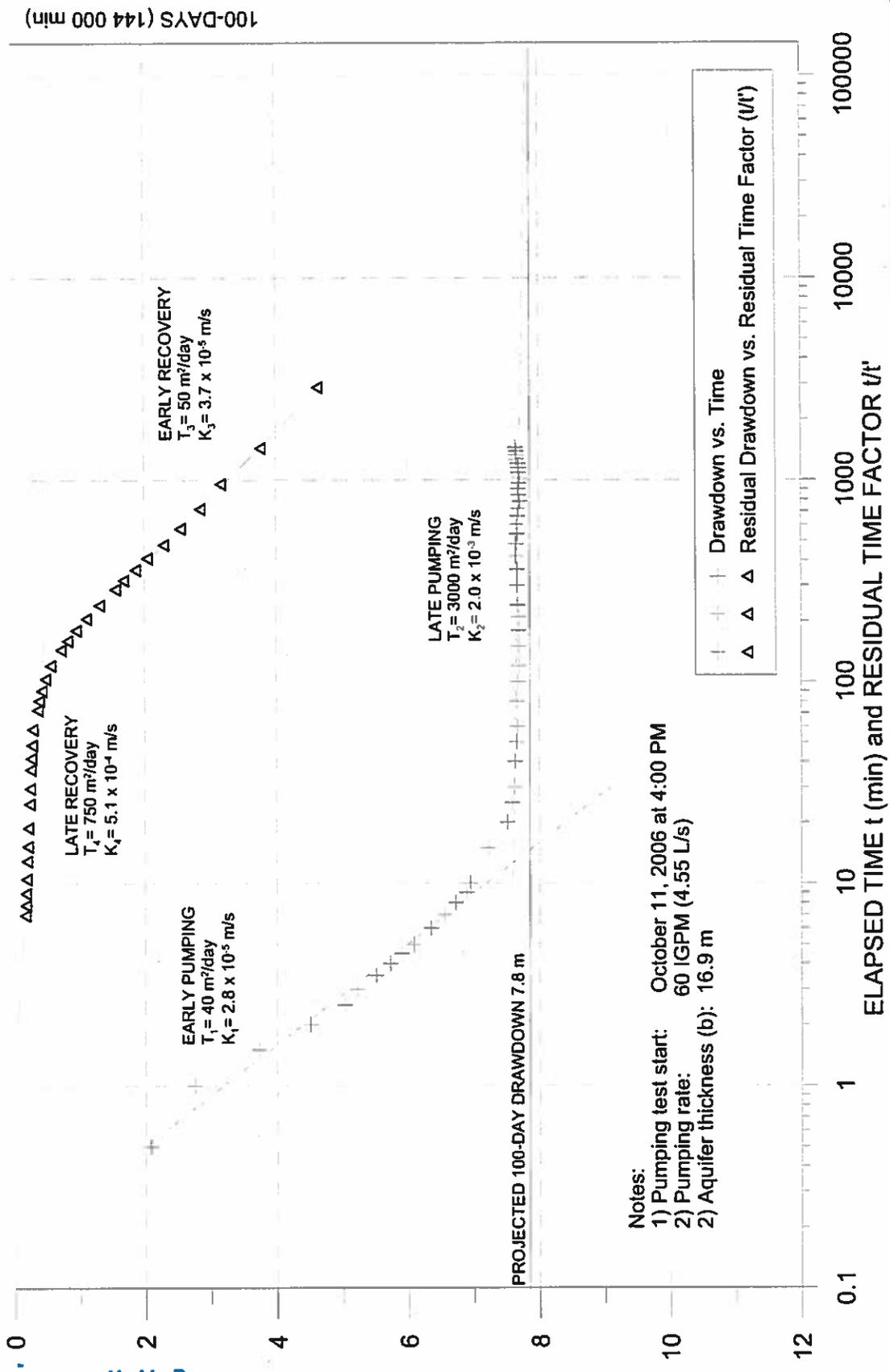
FILE NO. 1260026 DRWG. FIGURE 3

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DRAWDOWN/RESIDUAL DRAWDOWN IN WELL BW06-01

1002 E 7-10-2007



- Notes:
- 1) Pumping test start: October 11, 2006 at 4:00 PM
  - 2) Pumping rate: 60 IGPM (4.55 L/s)
  - 2) Aquifer thickness (b): 16.9 m

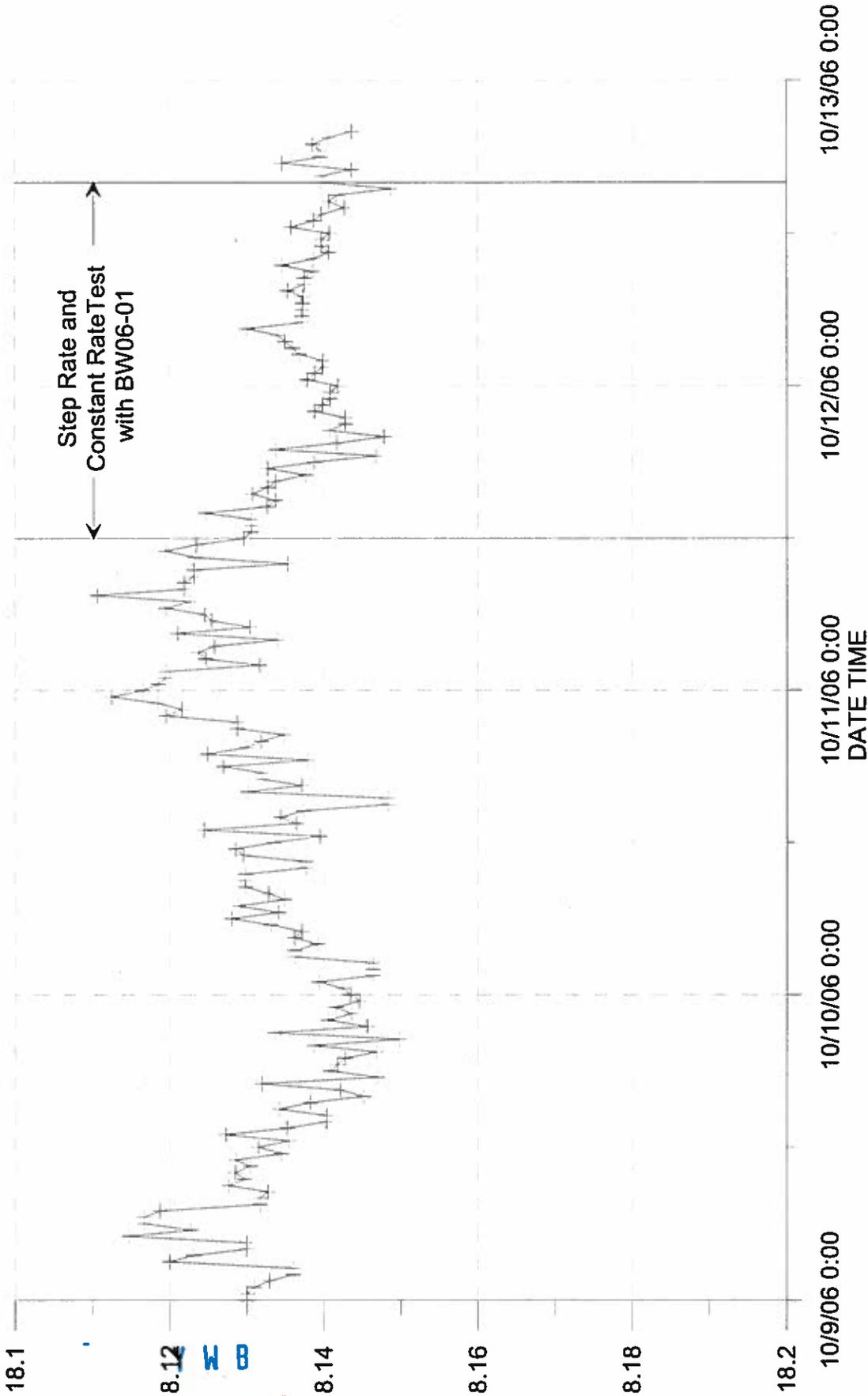
**EBA Engineering Consultants Ltd.**  
 CLIENT   
 Quest Engineering Group

DATE NOV 2006 DWN. KSJ CHKD. RMM

PROJECT WATER WELL COMPLETION REPORT, WILLOW CREEK SUBDIVISION, PELLY CROSSING, YT

TITLE CONSTANT RATE PUMPING TEST WITH BW06-01

FILE NO. 12600026 DRWG. FIGURE 4



**EBA Engineering Consultants Ltd.**

CLIENT



DATE NOV 2006

DWN.

KSJ

CHKD.

RMM

PROJECT WATER WELL COMPLETION REPORT, WILLOW CREEK SUBDIVISION, PELLY CROSSING, YT

TITLE WATER LEVEL IN PW05-01 DURING PUMPING TEST WITH BW06-01

FILE NO. 12600026

DRWG. FIGURE 5



# APPENDIX A

DRILLERS WELL LOG AND GRAIN SIZE ANALYSIS

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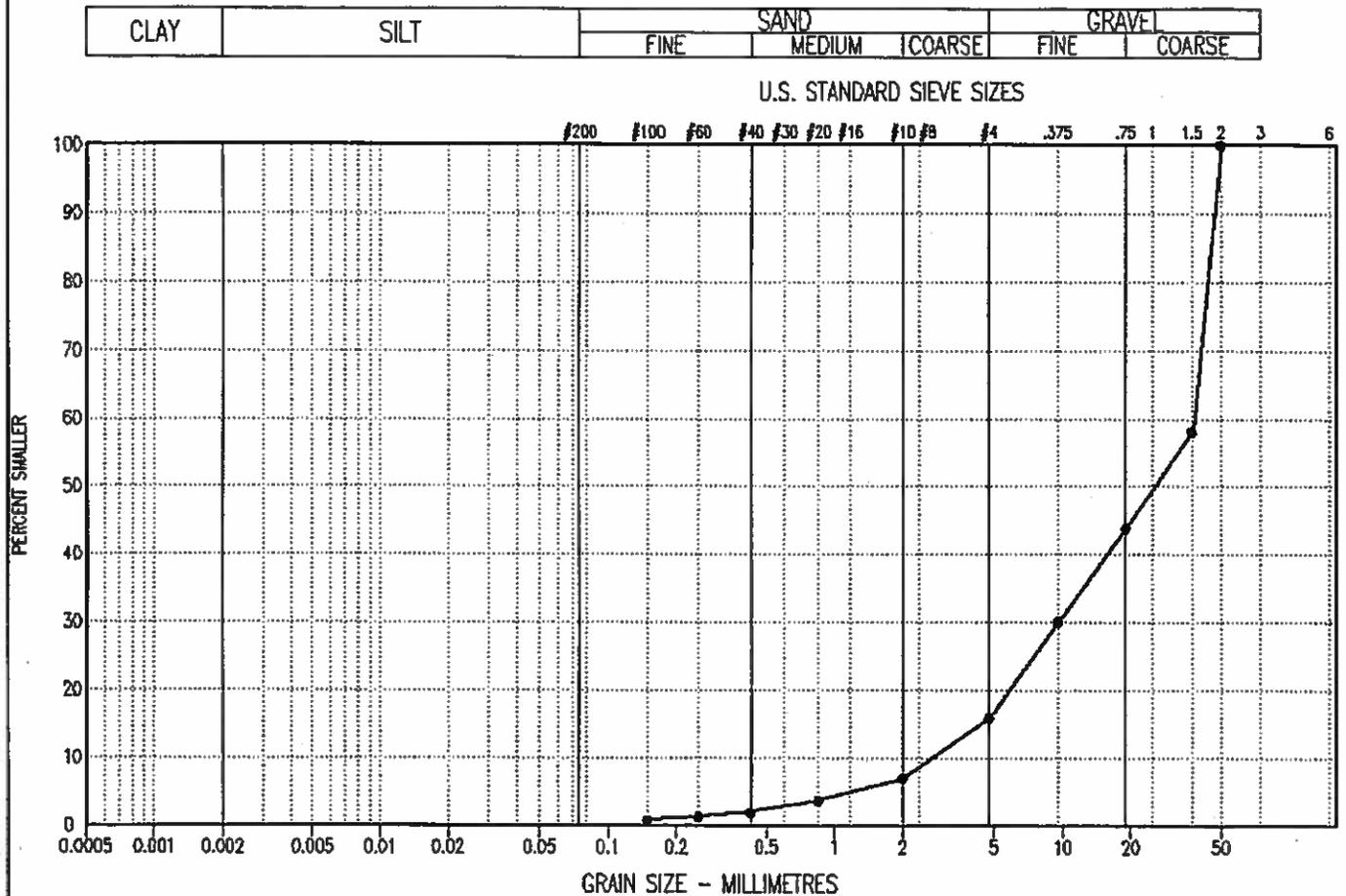
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## PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	BW06-01	90.00	---	1	14	85	12.9	0.8	GP

Project: 0201-1260076

Date Tested: 06/10/08

BY: JK

Tested in accordance with ASTM D422 unless otherwise noted.

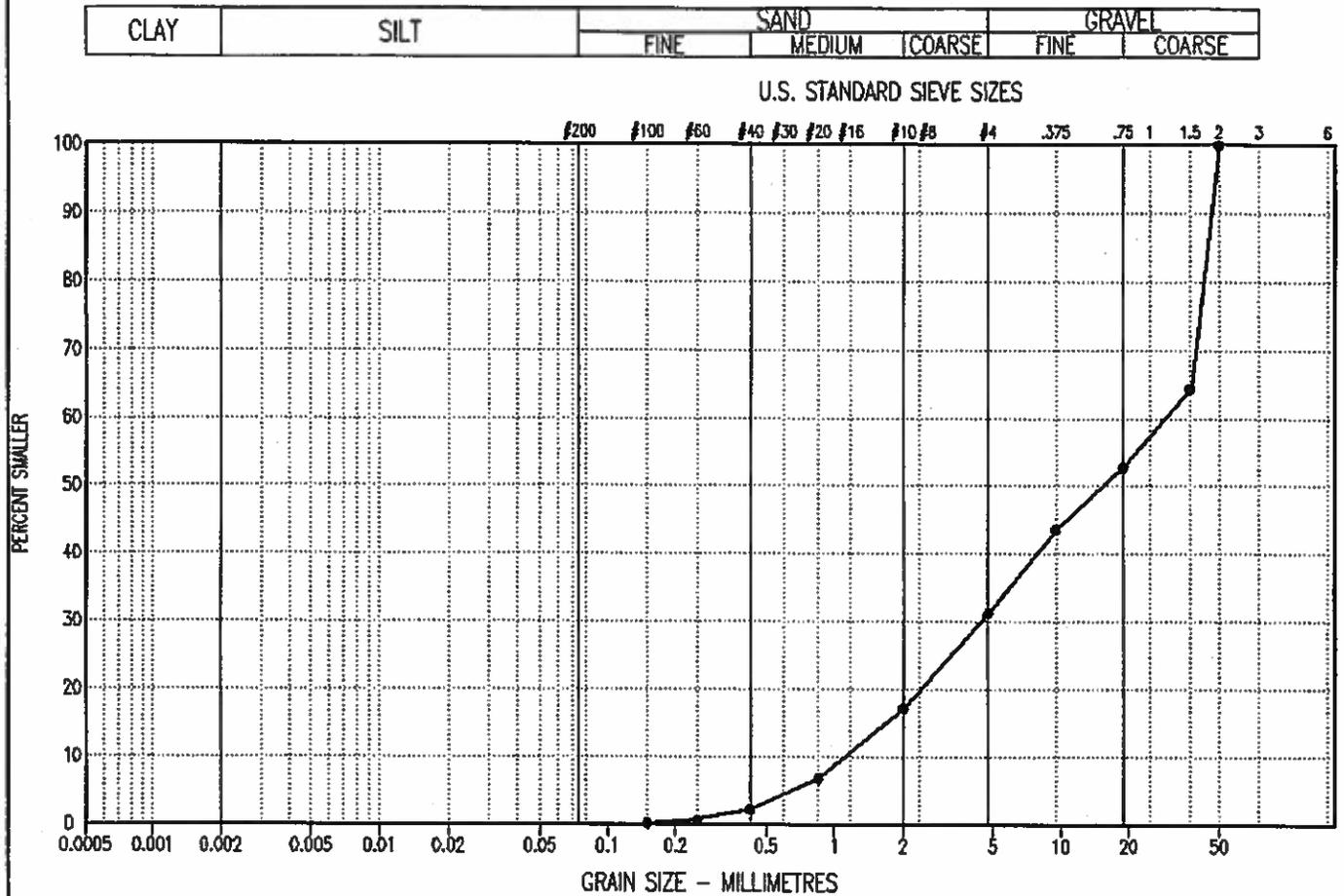
Data presented hereon is for the sole use of the stipulated client. EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of EBA.

The testing services reported herein have been performed by an EBA technician to recognized industry standards, unless otherwise noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, EBA will provide it upon written request.

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## PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●	BW06-D1	95.00	---	0	31	69	25.2	0.6	GP

Project: 0201-1260026

Date Tested: 06/10/06

BY: JK

Tested in accordance with ASTM D422 unless otherwise noted.

Data presented hereon is for the sole use of the stipulated client. EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of EBA.

The testing services reported herein have been performed by an EBA technician to recognized industry standards, unless otherwise noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, EBA will provide it upon written request.





# APPENDIX B

PUMPING TEST DATA

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**APPENDIX B1: STEP DRAWDOWN PUMPING TEST DATA**

EPA PROJECT NUMBER: 126026  
 WELL NAME: BW06-01  
 STATIC WATER LEVEL (m): 16.15 m bws  
 DATUM DESCRIPTION: Top of Soundm. Tube  
 DATUM STICK-UP (m): 147 m above ground level  
 WELL DIAMETER: 152 mm (6 in)  
 TOTAL WELL DEPTH: 33.5 m (110 ft)

PROJECT LOCATION: Public Housing, Aukun  
 PUMP INTAKE DEPTH (m): 33.0 m  
 SCREEN INTERVAL: 29.0 - 32.0 m (95 - 105 ft)  
 SLOT SIZE (µ): 0.015 in  
 AVAILABLE DRAWDOWN (m): 12.9 m  
 SCREEN DIAMETER (mm): 152 mm (6 in)  
 OPERATORS NAME: Jen Kelly

DATE	TIME	ELAPSED TIME (min)	DEPTH TO WATER (m)	DEPTH TO WATER (ft)	DRAWDOWN (ft)	DRAWDOWN (m)	METER READING 1	FLOW RATE (USGPM)	FLOW RATE (IGPM)	FLOW RATE (L/s)	SPECIFIC CAPACITY (L/s/m)	COMMENTS
11-Oct-08	12:00:00	0	53.94	16.167	0.000	0.000	3788.3	36.01	29.99633	2.273		Start Step 1
11-Oct-08	12:00:30	0.5	57.80	17.556	4.980	1.390	-	36.01	29.99633	2.273	1.64	30 USGPM
11-Oct-08	12:01:00	1	59.13	18.023	6.080	1.856	-	36.01	29.99633	2.273	1.22	
11-Oct-08	12:01:30	1.5	60.00	18.288	6.980	2.121	-	36.01	29.99633	2.273	1.07	
11-Oct-08	12:02:00	2	60.61	18.474	7.570	2.307	-	36.01	29.99633	2.273	0.99	
11-Oct-08	12:02:30	2.5	61.23	18.663	8.180	2.496	-	36.01	29.99633	2.273	0.91	
11-Oct-08	12:03:00	3	61.45	18.760	8.510	2.594	-	36.01	29.99633	2.273	0.88	
11-Oct-08	12:03:30	3.5	61.92	18.873	8.860	2.707	-	36.01	29.99633	2.273	0.84	
11-Oct-08	12:04:00	4	62.31	18.982	9.270	2.825	-	36.01	29.99633	2.273	0.80	
11-Oct-08	12:04:30	4.5	62.56	19.058	9.520	2.902	-	36.01	29.99633	2.273	0.78	
11-Oct-08	12:05:00	5	62.83	19.151	9.790	2.984	-	36.01	29.99633	2.273	0.76	
11-Oct-08	12:05:30	5.5	63.24	19.278	10.200	3.108	-	36.01	29.99633	2.273	0.73	
11-Oct-08	12:07:00	7	63.63	19.384	10.590	3.228	-	36.01	29.99633	2.273	0.70	
11-Oct-08	12:08:00	8	63.92	19.463	10.880	3.318	-	36.01	29.99633	2.273	0.69	
11-Oct-08	12:09:00	9	64.12	19.544	11.080	3.377	-	36.01	29.99633	2.273	0.67	
11-Oct-08	12:10:00	10	64.31	19.602	11.270	3.435	-	36.01	29.99633	2.273	0.66	
11-Oct-08	12:12:00	12	64.60	19.690	11.580	3.523	-	36.01	29.99633	2.273	0.65	
11-Oct-08	12:14:00	14	64.78	19.745	11.740	3.578	-	36.01	29.99633	2.273	0.64	
11-Oct-08	12:16:00	16	64.92	19.788	11.880	3.621	-	36.01	29.99633	2.273	0.63	
11-Oct-08	12:18:00	18	65.00	19.812	11.980	3.645	-	36.01	29.99633	2.273	0.62	
11-Oct-08	12:20:00	20	65.06	19.827	12.010	3.661	-	36.01	29.99633	2.273	0.62	
11-Oct-08	12:25:00	25	65.14	19.856	12.100	3.686	-	36.01	29.99633	2.273	0.62	
11-Oct-08	12:30:00	30	65.26	19.897	12.240	3.731	-	36.01	29.99633	2.273	0.61	
11-Oct-08	12:35:00	35	65.33	19.913	12.290	3.746	-	36.01	29.99633	2.273	0.61	
11-Oct-08	12:40:00	40	65.36	19.922	12.320	3.756	-	36.01	29.99633	2.273	0.61	
11-Oct-08	12:45:00	45	65.37	19.925	12.330	3.758	-	36.01	29.99633	2.273	0.60	
11-Oct-08	12:50:00	50	65.38	19.928	12.340	3.761	-	36.01	29.99633	2.273	0.60	
11-Oct-08	12:55:00	55	65.39	19.931	12.350	3.764	-	36.01	29.99633	2.273	0.60	
11-Oct-08	13:00:00	60	65.39	19.931	12.350	3.764	-	36.01	29.99633	2.273	0.60	Start Step 2
11-Oct-08	13:00:30	60.5	69.90	21.308	16.860	5.130	-	72.03	60.00090	4.547	0.86	60 USGPM
11-Oct-08	13:01:00	61	71.70	21.854	16.660	5.680	-	72.03	60.00090	4.547	0.80	
11-Oct-08	13:01:30	61.5	72.68	22.153	19.640	5.986	-	72.03	60.00090	4.547	0.78	
11-Oct-08	13:02:00	62	73.39	22.369	20.350	6.203	-	72.03	60.00090	4.547	0.73	
11-Oct-08	13:02:30	62.5	73.88	22.519	20.840	6.352	-	72.03	60.00090	4.547	0.72	
11-Oct-08	13:03:00	63	74.37	22.668	21.330	6.501	-	72.03	60.00090	4.547	0.70	
11-Oct-08	13:03:30	63.5	74.82	22.805	21.780	6.639	-	72.03	60.00090	4.547	0.68	
11-Oct-08	13:04:00	64	75.15	22.908	22.110	6.739	-	72.03	60.00090	4.547	0.67	
11-Oct-08	13:04:30	64.5	75.47	23.003	22.430	6.837	-	72.03	60.00090	4.547	0.67	
11-Oct-08	13:05:00	65	75.71	23.076	22.670	6.910	-	72.03	60.00090	4.547	0.66	
11-Oct-08	13:07:00	67	76.53	23.326	23.490	7.180	3823.55	72.03	60.00090	4.547	0.64	
11-Oct-08	13:08:00	68	76.90	23.409	23.760	7.242	-	72.03	60.00090	4.547	0.63	
11-Oct-08	13:09:00	69	77.05	23.465	24.010	7.316	-	72.03	60.00090	4.547	0.62	
11-Oct-08	13:10:00	70	77.30	23.531	24.160	7.384	-	72.03	60.00090	4.547	0.62	
11-Oct-08	13:12:00	72	77.50	23.622	24.480	7.456	-	72.03	60.00090	4.547	0.61	
11-Oct-08	13:16:00	76	77.71	23.686	24.870	7.519	-	72.03	60.00090	4.547	0.60	
11-Oct-08	13:18:00	78	77.83	23.723	24.780	7.556	-	72.03	60.00090	4.547	0.60	
11-Oct-08	13:20:00	80	77.90	23.744	24.860	7.577	-	72.03	60.00090	4.547	0.60	
11-Oct-08	13:25:00	85	77.97	23.765	24.830	7.599	-	72.03	60.00090	4.547	0.60	
11-Oct-08	13:30:00	90	78.01	23.777	24.870	7.611	-	72.03	60.00090	4.547	0.60	
11-Oct-08	13:35:00	95	78.02	23.780	24.980	7.614	-	72.03	60.00090	4.547	0.60	
11-Oct-08	13:40:00	100	78.04	23.787	25.000	7.620	1627.9	72.03	60.00090	4.547	0.60	
11-Oct-08	13:45:00	105	78.06	23.793	25.020	7.626	-	72.03	60.00090	4.547	0.60	
11-Oct-08	13:50:00	110	78.07	23.798	25.030	7.629	-	72.03	60.00090	4.547	0.60	
11-Oct-08	13:55:00	115	78.08	23.799	25.040	7.632	-	72.03	60.00090	4.547	0.60	
11-Oct-08	14:00:00	120	78.09	23.802	25.050	7.635	3873.8	72.03	60.00090	4.547	0.60	Start Step 3
11-Oct-08	14:00:30	120.5	85.00	25.908	31.960	8.741	-	108.04	89.89732	6.821	0.70	80 USGPM
11-Oct-08	14:02:30	122.5	81.50	24.841	28.460	8.675	-	108.04	89.89732	6.821	0.78	
11-Oct-08	14:03:00	123	81.62	24.878	28.560	8.711	-	108.04	89.89732	6.821	0.78	
11-Oct-08	14:03:30	123.5	81.70	24.902	28.660	8.736	-	108.04	89.89732	6.821	0.78	
11-Oct-08	14:04:00	124	81.78	24.927	28.740	8.760	-	108.04	89.89732	6.821	0.78	
11-Oct-08	14:04:30	124.5	81.85	24.948	28.810	8.781	-	108.04	89.89732	6.821	0.78	
11-Oct-08	14:05:00	125	81.92	24.969	28.860	8.803	-	108.04	89.89732	6.821	0.77	

**APPENDIX B1: STEP DRAWDOWN PUMPING TEST DATA**

TRS PROJECT NUMBER: 1260026  
 WELL NAME: HW06-01  
 STATIC WATER LEVEL (m): 16.15 m b.t.c.  
 DATUM DESCRIPTION: Top of Sanding Tube  
 DATUM STICK-UP (m): 1.07 m above ground level  
 WELL DIAMETER: 152 mm (6 in)  
 TOTAL WELL DEPTH: 33.5 m (110 ft)

PROJECT LOCATION: Pella Crossing, Yukon  
 PUMP INTAKE DEPTH (m): 33.0 m  
 SCREEN INTERVAL: 29.0 - 32.0 m (95.1 - 105 ft)  
 SLIT SIZE (µ): 0.015 m  
 AVAILABLE DRAWDOWN (m): 12.9 m  
 SCREEN DIAMETER (mm): 152 mm (6 in)  
 OBSERVERS NAME: Jay Kull

DATE	TIME	ELAPSED TIME (min)	DEPTH TO WATER (ft)	DEPTH TO WATER (m)	DRAWDOWN (ft)	DRAWDOWN (m)	METER READING <sup>1</sup>	FLOW RATE (USGPM)	FLOW RATE (GPM)	FLOW RATE (L/s)	SPECIFIC CAPACITY (L/s/m)	COMMENTS
11-Oct-06	14 06 00	126	82.03	25 003	28 990	8 836	-	108 04	89 99732	6 821	0 77	
11-Oct-06	14 07 00	127	82.06	25 012	29 020	8 843	-	108 04	89 99732	6 821	0 77	
11-Oct-06	14 08 00	128	82.04	25 008	29 000	8 839	-	108 04	89 99732	6 821	0 77	
11-Oct-06	14 09 00	129	82.04	25 008	29 000	8 839	-	108 04	89 99732	6 821	0 77	
11-Oct-06	14 10 00	130	82.03	25 003	28 990	8 836	-	108 04	89 99732	6 821	0 77	
11-Oct-06	14 12 00	132	81.50	24 841	28 460	6 675	-	108 04	89 99732	6 821	0 79	
11-Oct-06	14 14 00	134	81.48	24 833	28 440	6 680	-	108 04	89 99732	6 821	0 79	
11-Oct-06	14 16 00	136	81.45	24 828	28 410	6 658	-	108 04	89 99732	6 821	0 79	
11-Oct-06	14 18 00	138	81.30	24 780	28 260	6 614	-	108 04	89 99732	6 821	0 79	
11-Oct-06	14 20 00	140	81.86	24 951	28 820	6 784	-	108 04	89 99732	6 821	0 78	
11-Oct-06	14 25 00	145	82.03	25 003	28 990	8 836	-	108 04	89 99732	6 821	0 77	
11-Oct-06	14 30 00	150	82.04	25 006	29 000	8 839	-	108 04	89 99732	6 821	0 77	
11-Oct-06	14 35 00	155	82.05	25 009	29 010	8 842	-	108 04	89 99732	6 821	0 77	
11-Oct-06	14 40 00	160	82.06	25 012	29 020	8 845	-	108 04	89 99732	6 821	0 77	
11-Oct-06	14 45 00	165	82.07	25 015	29 030	8 848	3923 15	108 04	89 99732	6 821	0 77	
11-Oct-06	14 50 00	170	82.07	25 015	29 030	8 848	-	108 04	89 99732	6 821	0 77	
11-Oct-06	14 55 00	175	82.07	25 015	29 030	8 848	-	108 04	89 99732	6 821	0 77	
11-Oct-06	15 00 00	180	82.07	25 015	29 030	8 848	3640 35	108 04	89 99732	6 821	0 77	
11-Oct-06	15 00 30	180.5	70.30	21 427	17 260	5 261	-	0	0	0 00	0 00	Start Recovery
11-Oct-06	15 01 00	181	67.33	20 522	14 290	4 356	-	0	0	0 00	0 00	
11-Oct-06	15 01 30	181.5	65.40	19 934	12 360	3 767	-	0	0	0 00	0 00	
11-Oct-06	15 02 00	182	64.00	19 507	10 960	3 341	-	0	0	0 00	0 00	
11-Oct-06	15 02 30	182.5	63.04	19 492	10 910	3 325	-	0	0	0 00	0 00	
11-Oct-06	15 03 00	183	62.01	18 928	9 060	2 761	-	0	0	0 00	0 00	
11-Oct-06	15 03 30	183.5	61.20	18 854	8 160	2 487	-	0	0	0 00	0 00	
11-Oct-06	15 04 00	184	60.48	18 434	7 440	2 268	-	0	0	0 00	0 00	
11-Oct-06	15 04 30	184.5	59.75	18 212	6 710	2 045	-	0	0	0 00	0 00	
11-Oct-06	15 05 00	185	59.15	18 029	6 110	1 862	-	0	0	0 00	0 00	
11-Oct-06	15 07 00	187	57.37	17 486	4 330	1 320	-	0	0	0 00	0 00	
11-Oct-06	15 08 00	188	56.65	17 287	3 610	1 100	-	0	0	0 00	0 00	
11-Oct-06	15 08 00	189	56.15	17 115	3 110	948	-	0	0	0 00	0 00	
11-Oct-06	15 10 00	190	55.72	16 963	2 660	817	-	0	0	0 00	0 00	
11-Oct-06	15 12 00	192	55.10	16 784	2 060	628	-	0	0	0 00	0 00	
11-Oct-06	15 14 00	194	54.65	16 657	1 610	481	-	0	0	0 00	0 00	
11-Oct-06	15 16 00	196	54.35	16 566	1 310	399	-	0	0	0 00	0 00	
11-Oct-06	15 18 00	198	54.14	16 502	1 100	335	-	0	0	0 00	0 00	
11-Oct-06	15 20 00	200	54.01	16 459	980	293	-	0	0	0 00	0 00	
11-Oct-06	15 25 00	205	53.75	16 363	970	246	-	0	0	0 00	0 00	
11-Oct-06	15 30 00	210	53.64	16 349	900	183	-	0	0	0 00	0 00	
11-Oct-06	15 35 00	215	53.57	16 328	830	162	-	0	0	0 00	0 00	
11-Oct-06	15 40 00	220	53.51	16 310	870	143	-	0	0	0 00	0 00	
11-Oct-06	15 45 00	225	53.47	16 298	830	131	-	0	0	0 00	0 00	

Notes:  
 1) Depth to Water below top of sanding tube. Stick up = 1.07 m  
 2) "-" indicates no data or not applicable  
 3) Alert for a flow measurement, instantaneous flow rates or rates method of flow rate measuring



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## APPENDIX B2: CONSTANT RATE PUMPING TEST DATA

EBA PROJECT NUMBER: 1260026  
 WELL NAME: BW76-01  
 STATIC WATER LEVEL (m): 16.15 m bwc  
 DATUM DESCRIPTION: Top of Sounding Tube  
 DATUM STICK-UP(m): 1.07 m above ground level  
 WELL DIAMETER: 152 mm (6 in)  
 TOTAL WELL DEPTH: 33.5 m (110 ft)

PROJECT LOCATION: Pelle Crossing, Yukon  
 PUMP INTAKE DEPTH (m): 33.0 m  
 SCREEN INTERVAL: 29.0 - 32.0 m (95 - 105 ft)  
 SLOT SIZE ("): 0.015 in  
 AVAILABLE DRAWDOWN(m): 12.9 m  
 SCREEN DIAMETER (mm): 152 mm (6 in)  
 OBSERVER'S NAME: Ian Kelly

DATE	TIME	ELAPSED TIME (min)	DEPTH TO WATER (ft)	DEPTH TO WATER (m)	DRAWDOWN (m)	METER READING <sup>3</sup>	FLOW RATE (IGPM)	FLOW RATE (L/s)	SPECIFIC CAPACITY (L/s/m)	pH	EC	TEMP	COMMENTS
11-Oct-06	16:00:00	0	52.98	16.152	0.000	3940.35	-	-	-	-	-	-	
11-Oct-06	16:00:30	0.5	59.8	18.232	2.079	-	60	4.55	2.19	-	-	-	60 IGPM
11-Oct-06	16:01:00	1	62	18.902	2.750	-	60	4.55	1.65	-	-	-	
11-Oct-06	16:01:30	1.5	65.2	19.878	3.726	-	60	4.55	1.22	-	-	-	
11-Oct-06	16:02:00	2	67.78	20.665	4.512	-	60	4.55	1.01	-	-	-	
11-Oct-06	16:02:30	2.5	69.5	21.189	5.037	-	60	4.55	0.90	-	-	-	
11-Oct-06	16:03:00	3	70.1	21.372	5.220	-	60	4.55	0.87	-	-	-	
11-Oct-06	16:03:30	3.5	71.05	21.662	5.509	-	60	4.55	0.83	-	-	-	
11-Oct-06	16:04:00	4	71.75	21.875	5.723	-	60	4.55	0.79	-	-	-	
11-Oct-06	16:04:30	4.5	72.33	22.052	5.899	-	60	4.55	0.77	-	-	-	
11-Oct-06	16:05:00	5	72.94	22.238	6.085	-	60	4.55	0.75	-	-	-	
11-Oct-06	16:06:00	6	73.8	22.500	6.348	-	60	4.55	0.72	-	-	-	
11-Oct-06	16:07:00	7	74.46	22.701	6.549	-	60	4.55	0.69	-	-	-	
11-Oct-06	16:08:00	8	75.02	22.872	6.720	-	60	4.55	0.68	-	-	-	
11-Oct-06	16:09:00	9	75.58	23.043	6.890	-	60	4.55	0.66	-	-	-	
11-Oct-06	16:10:00	10	75.77	23.101	6.948	-	60	4.55	0.65	-	-	-	
11-Oct-06	16:15:00	15	76.68	23.378	7.226	-	60	4.55	0.63	-	-	-	
11-Oct-06	16:20:00	20	77.63	23.668	7.515	-	60	4.55	0.60	-	-	-	
11-Oct-06	16:25:00	25	77.86	23.738	7.585	-	60	4.55	0.60	-	-	-	
11-Oct-06	16:30:00	30	77.97	23.771	7.619	-	60	4.55	0.60	-	-	-	
11-Oct-06	16:40:00	40	78.01	23.784	7.631	-	60	4.55	0.60	-	-	-	
11-Oct-06	16:50:00	50	78.1	23.811	7.659	-	60	4.55	0.59	-	-	-	
11-Oct-06	17:00:00	60	78.13	23.820	7.668	-	60	4.55	0.59	-	-	-	
11-Oct-06	17:20:00	80	78.12	23.817	7.665	-	60	4.55	0.59	7.97	336	7.9	
11-Oct-06	17:40:00	100	78.17	23.832	7.680	-	60	4.55	0.59	-	-	-	
11-Oct-06	18:00:00	120	78.21	23.845	7.692	-	60	4.55	0.59	-	-	-	
11-Oct-06	18:30:00	150	78.21	23.845	7.692	-	60	4.55	0.59	-	-	-	
11-Oct-06	19:00:00	180	78.21	23.845	7.692	-	60	4.55	0.59	-	-	-	
11-Oct-06	19:30:00	210	78.22	23.848	7.695	-	60	4.55	0.59	-	-	-	
11-Oct-06	20:00:00	240	78.17	23.832	7.680	-	60	4.55	0.59	-	-	-	
11-Oct-06	21:00:00	300	78.14	23.823	7.671	-	60	4.55	0.59	10.68	329	3.3	
11-Oct-06	22:00:00	360	78.14	23.823	7.671	-	60	4.55	0.59	-	-	-	
11-Oct-06	23:00:00	420	78.07	23.802	7.649	-	60	4.55	0.59	-	-	-	
12-Oct-06	0:00:00	480	78.09	23.808	7.655	-	60	4.55	0.59	-	-	-	
12-Oct-06	1:00:00	540	78.14	23.823	7.671	44570	60	4.55	0.59	-	-	-	
12-Oct-06	2:00:00	600	78.13	23.820	7.668	45160	60	4.55	0.59	-	-	-	
12-Oct-06	3:00:00	660	78.17	23.832	7.680	-	60	4.55	0.59	7.7	350	7.9	
12-Oct-06	4:00:00	720	78.19	23.838	7.686	-	60	4.55	0.59	7.6	505	7.2	
12-Oct-06	5:00:00	780	78.29	23.869	7.716	-	60	4.55	0.59	7.6	630	7.3	
12-Oct-06	6:00:00	840	78.23	23.851	7.698	47488	60	4.55	0.59	-	-	-	
12-Oct-06	7:00:00	900	78.2	23.841	7.689	-	60	4.55	0.59	7.78	376	6.2	
12-Oct-06	8:00:00	960	78.26	23.860	7.707	-	60	4.55	0.59	-	-	-	
12-Oct-06	9:00:00	1020	78.28	23.866	7.713	-	60	4.55	0.59	-	-	-	
12-Oct-06	10:00:00	1080	78.22	23.848	7.695	-	60	4.55	0.59	7.83	386	6.6	
12-Oct-06	11:00:00	1140	78.23	23.851	7.698	50384	60	4.55	0.59	-	-	-	
12-Oct-06	12:00:00	1200	78.21	23.845	7.692	-	60	4.55	0.59	-	-	-	
12-Oct-06	13:00:00	1260	78.11	23.814	7.662	51532	60	4.55	0.59	-	-	-	
12-Oct-06	14:00:00	1320	78.12	23.817	7.665	-	60	4.55	0.59	-	-	-	

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## APPENDIX B2: CONSTANT RATE PUMPING TEST DATA

EBA PROJECT NUMBER: <u>1260026</u>	PROJECT LOCATION: <u>Pelle Crossing, Yukon</u>
WELL NAME: <u>BW06-01</u>	PUMP INTAKE DEPTH (m): <u>33.0 m</u>
STATIC WATER LEVEL (m): <u>16.15 m bwc</u>	SCREEN INTERVAL: <u>20.0 - 32.0 m (65 - 105 ft)</u>
DATUM DESCRIPTION: <u>Top of Sounding Tube</u>	SLOT SIZE ("): <u>0.015 in</u>
DATUM STICK UP (m): <u>1.07 m above ground level</u>	AVAILABLE DRAWDOWN (m): <u>12.9 m</u>
WELL DIAMETER: <u>152 mm (6 in)</u>	SCREEN DIAMETER (mm): <u>152 mm (6 in)</u>
TOTAL WELL DEPTH: <u>33.5 m (110 ft)</u>	OBSERVER'S NAME: <u>Ian Kelly</u>

12-Oct-06	15:00:00	1380	78.11	23.814	7.662	-	60	4.55	0.59	-	-	-	-
12-Oct-06	16:00:00	1440	78.08	23.800	7.648	53279	60	4.55	0.59	-	-	-	Start Recovery
12-Oct-06	16:00:30	1440.5	68.31	20.820	4.668	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:01:00	1441	65.45	19.950	3.798	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:01:30	1441.5	63.48	19.350	3.198	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:02:00	1442	62.43	19.030	2.878	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:02:30	1442.5	61.45	18.730	2.578	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:03:00	1443	60.63	18.480	2.328	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:03:30	1443.5	59.81	18.230	2.078	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:04:00	1444	59.22	18.050	1.898	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:04:30	1444.5	58.63	17.870	1.718	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:05:00	1445	58.20	17.740	1.588	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:06:00	1446	57.41	17.500	1.348	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:07:00	1447	56.76	17.300	1.148	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:08:00	1448	56.23	17.140	0.988	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:09:00	1449	55.81	17.010	0.858	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:10:00	1450	55.48	16.910	0.758	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:12:00	1452	54.95	16.750	0.598	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:14:00	1454	54.69	16.670	0.518	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:16:00	1456	54.49	16.610	0.458	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:18:00	1458	54.36	16.570	0.418	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:20:00	1460	54.30	16.550	0.398	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:25:00	1465	54.04	16.470	0.318	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:30:00	1470	54.00	16.460	0.308	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:35:00	1475	53.97	16.450	0.298	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:40:00	1480	53.94	16.440	0.288	-	0	0.00	0.00	-	-	-	-
12-Oct-06	16:50:00	1490	53.90	16.430	0.278	-	0	0.00	0.00	-	-	-	-
12-Oct-06	17:00:00	1500	53.87	16.420	0.268	-	0	0.00	0.00	-	-	-	-
12-Oct-06	17:20:00	1520	53.81	16.400	0.248	-	0	0.00	0.00	-	-	-	-
12-Oct-06	17:40:00	1540	53.77	16.390	0.238	-	0	0.00	0.00	-	-	-	-
12-Oct-06	18:00:00	1560	53.74	16.380	0.228	-	0	0.00	0.00	-	-	-	-
12-Oct-06	18:30:00	1590	53.71	16.370	0.218	-	0	0.00	0.00	-	-	-	-
12-Oct-06	19:00:00	1620	53.67	16.360	0.208	-	0	0.00	0.00	-	-	-	-
12-Oct-06	19:30:00	1650	53.67	16.360	0.208	-	0	0.00	0.00	-	-	-	-
12-Oct-06	20:00:00	1680	53.64	16.350	0.198	-	0	0.00	0.00	-	-	-	-

Notes:

- 1) Depth to Water below top of sounding tube (Stick up = 1.07 m)
- 2) "-" indicates no data or not applicable
- 3) May be a flow totalizer, instantaneous flow meter or other method of flow rate monitoring



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# APPENDIX C

LABORATORY REPORTS AND CERTIFICATES

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Environmental Division

**ANALYTICAL REPORT**

EBA ENGINEERING CONSULTANTS LTD.  
ATTN: KATHERINE JOHNSTON  
CALCITE BUSINESS CENTRE  
UNIT 6 - 151 INDUSTRIAL ROAD  
WHITEHORSE YT Y1A 2V3

Reported On: 11-DEC-06 09:31 PM

Lab Work Order #: **L445331** Date Received: **18-OCT-06**

Project P.O. #:  
Job Reference: **PELLLY CROSSING 1260026**  
Legal Site Desc:  
CofC Numbers: **47894**

Other Information:

Comments: Radiological analyses were subcontracted to SRC analytical in Saskatoon, Saskatchewan. Refer to the appendix for detail.

Joyce Chow  
General Manager, Vancouver

For any questions about this report please contact your Account Manager:

**CAN DANG**

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.  
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU  
REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

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-01- 2 3 2007

**ALS Canada Ltd.**  
Part of the **ALS Laboratory Group**  
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Phone: +1 604 253 4188 Fax: +1 604 253 6700 [www.alsglobal.com](http://www.alsglobal.com)  
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MN06-066

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L445331-1
Description	
Sampled Date	12-OCT-06
Sampled Time	
Client ID	BW06-01
Grouping	Analyte
<b>WATER</b>	
<b>Physical Tests</b>	Hardness (as CaCO <sub>3</sub> ) (mg/L)
	181
	Colour, True (CU)
	<5.0
	Conductivity (uS/cm)
	364
	pH (pH)
	8.04
	Total Dissolved Solids (mg/L)
	219
	Turbidity (NTU)
	0.38
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO <sub>3</sub> ) (mg/L)
	182
	Chloride (Cl) (mg/L)
	0.55
	Fluoride (F) (mg/L)
	0.185
	Sulfate (SO <sub>4</sub> ) (mg/L)
	17.0
	Nitrate (as N) (mg/L)
	0.0680
	Nitrite (as N) (mg/L)
	<0.0010
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)
	<0.010
	Antimony (Sb)-Total (mg/L)
	<0.00050
	Arsenic (As)-Total (mg/L)
	0.00018
	Barium (Ba)-Total (mg/L)
	0.083
	Boron (B)-Total (mg/L)
	<0.10
	Cadmium (Cd)-Total (mg/L)
	<0.00020
	Calcium (Ca)-Total (mg/L)
	55.3
	Chromium (Cr)-Total (mg/L)
	<0.0020
	Copper (Cu)-Total (mg/L)
	0.0013
	Iron (Fe)-Total (mg/L)
	<0.030
	Lead (Pb)-Total (mg/L)
	<0.0010
	Magnesium (Mg)-Total (mg/L)
	15.4
	Manganese (Mn)-Total (mg/L)
	<0.0020
	Mercury (Hg)-Total (mg/L)
	<0.00020
	Potassium (K)-Total (mg/L)
	2.27
	Selenium (Se)-Total (mg/L)
	<0.0010
	Sodium (Na)-Total (mg/L)
	5.4
	Uranium (U)-Total (mg/L)
	0.00174
	Zinc (Zn)-Total (mg/L)
	<0.050
<b>Dissolved Metals</b>	Aluminum (Al)-Dissolved (mg/L)
	<0.010
	Antimony (Sb)-Dissolved (mg/L)
	<0.00050
	Arsenic (As)-Dissolved (mg/L)
	0.00027
	Barium (Ba)-Dissolved (mg/L)
	0.085
	Boron (B)-Dissolved (mg/L)
	<0.10
	Cadmium (Cd)-Dissolved (mg/L)
	<0.00020
	Calcium (Ca)-Dissolved (mg/L)
	48.3
	Chromium (Cr)-Dissolved (mg/L)
	0.0038

## ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L445331-1		12-OCT-06		BW06-01
<b>WATER</b>						
Dissolved Metals	Copper (Cu)-Dissolved (mg/L)	0.0011				
	Iron (Fe)-Dissolved (mg/L)	<0.030				
	Lead (Pb)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	14.7				
	Manganese (Mn)-Dissolved (mg/L)	<0.0020				
	Mercury (Hg)-Dissolved (mg/L)	<0.00020				
	Potassium (K)-Dissolved (mg/L)	2.00				
	Selenium (Se)-Dissolved (mg/L)	<0.0010				
	Sodium (Na)-Dissolved (mg/L)	6.0				
	Uranium (U)-Dissolved (mg/L)	0.00163				
	Zinc (Zn)-Dissolved (mg/L)	<0.050				
Trihalomethanes	Bromodichloromethane (mg/L)	0.0044				
	Bromoform (mg/L)	<0.0010				
	Chloroform (mg/L)	0.0525				
	Dibromochloromethane (mg/L)	<0.0010				
Organic Parameters	Tannin & lignin (mg/L)	0.2				
	Total Organic Carbon (mg/L)	2.03				
Haloacetic Acids	Bromoacetic Acid (mg/L)	<0.0020				
	Bromochloroacetic Acid (mg/L)	<0.0020				
	Chloroacetic Acid (mg/L)	<0.020				
	Dibromoacetic Acid (mg/L)	<0.0020				
	Dichloroacetic Acid (mg/L)	0.0232				
	Trichloroacetic Acid (TCA) (mg/L)	0.0337				

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## Reference Information

## Methods Listed (if applicable):

Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	APHA 310.2
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 "Determination of Anions by IC
This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.			
ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 "Determination of Anions by IC
This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.			
ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 "Determination of Anions by IC
This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.			
ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 "Determination of Anions by IC
This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.			
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 "Determination of Anions by IC
This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG18 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". All fractions of carbon are determined by the combustion-infrared method. Total carbon includes organic carbon (covalently bonded in organic molecules) and inorganic carbon (carbonate, bicarbonate and dissolved carbon dioxide). Total organic carbon is the calculated difference between the total carbon and the inorganic carbon determination. Dissolved carbon fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	APHA 2120 "Color"
This analysis is carried out using procedures adapted from APHA Method 2120 "Color". Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Apparent Colour is determined without prior sample filtration. Colour is pH dependent. Unless otherwise indicated, reported colour results pertain to the pH of the sample as received, to within +/- 1 pH unit.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
HAA-SE-ECD-VA	Water	Haloacetic Acids in Waters	EPA/600/ 4-90/020, JULY 1990, METHOD 552
This analysis is carried out using a procedure adapted from "Methods for the Determination of Organic Compounds in Drinking Water, Supplement I", EPA/600/ 4-90/020, July 1990, Method 552 and "Standard Methods for the Examination of Water and Wastewater", American Public Health Association, 20th Edition, 1998, Method 6251. An aliquot of the water sample is acidified and extracted with methyl tertiary-butyl ether (MTBE). The extract is then methylated and analyzed by capillary column gas chromatography with electron capture detection (ECD).			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.			

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## Reference Information

## Methods Listed (if applicable):

Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
HG-DIS-DW-CVAFS-VA	Water	Dissolved Mercury in Water by CVAFS	EPA 3005A/245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).			
HG-TOT-DW-CVAFS-VA	Water	Total Mercury in Water by CVAFS	EPA 245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).			
MET-DIS-DW-ICP-VA	Water	Dissolved Metals in Water by ICPAES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-DIS-DW-MS-VA	Water	Dissolved Metals in Water by ICPMS	EPA SW-846 3005A/6020
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - mass spectrometry (EPA Method 6020).			
MET-TOT-DW-ICP-VA	Water	Total Metals in Water by ICPAES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-TOT-DW-MS-VA	Water	Total Metals in Water by ICPMS	EPA SW-846 3005A/6020
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020).			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode			
T+L-COL-VA	Water	Tannin & Lignins by Extraction & Colour	APHA 5550 "TANNIN & LIGNIN"
This analysis is carried out using procedures adapted from APHA Method 5550 "Tannin & Lignin".			
TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.			
THM-PT-MS-VA	Water	VOC (THM) by Purge and Trap with GCMS	EPA SW-846, METHOD 8260
This procedure is suitable for the analysis of trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) in chlorinated waters that have been treated to prevent the formation of trihalomethanes after sample collection. The analysis involves the purge and trap extraction of the sample prior to analysis by capillary column gas chromatography with mass spectrometric detection (GC/MS). The trihalomethanes analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8260, published by the United States Environmental Protection Agency (EPA).			
TURB-MET-VA	Water	Turbidity by Meter	APHA 2130 "Turbidity"
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

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## Reference Information

Methods Listed (if applicable):

Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies. The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:			
Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

## GLOSSARY OF REPORT TERMS

*Surr* - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in environmental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.

The reported surrogate recovery value provides a measure of method efficiency.

mg/kg (units) - unit of concentration based on mass, parts per million

mg/L (units) - unit of concentration based on volume, parts per million

N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

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MN06-066

# SRC ANALYTICAL

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

Nov-01-2006

ALS  
Aurora Laboratory Services Ltd.  
1988 Triumph Street  
Vancouver, British Columbia V5L 1K5  
Attn: Can Dang

Date Samples Received: Oct-20-2006 Client P.O.: LW07188

SAMPLE	CLIENT DESCRIPTION
29076	BW06-1 L445331-1 *WATER*

ANALYTE	UNITS	RESULT
RADIO CHEMISTRY		
Gross alpha	Bq/L	0.16±0.07
Gross beta	Bq/L	0.13±0.03

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-01- 23 2007

MN06-066

SRC Group: 2006-7374

**SRC ANALYTICAL**

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

ALS  
 Aurora Laboratory Services Ltd.  
 1988 Triumph Street  
 Vancouver, British Columbia V5L 1K5  
 Attn: Can Dang

Nov-30-2006

Date Samples Received: Nov-08-2006 Client P.O.: LW07188

SAMPLE	CLIENT DESCRIPTION
31763	L445331-1 BW06-1 (PREV SRC GR# 06-6900 LAB# 06-29076) *WATER*

ANALYTE	UNITS	RESULT
RADIO CHEMISTRY		
Lead-210	Bq/L	<0.02
Thorium-232	Bq/L	<0.01

"<": not detected at level stated above

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MN06-066

**CHAIN OF CUSTODY FORM**

PAGE 1 OF 1

SEND REPORT TO: CLIENT: EBA Engineering ATTN: Katherine Johnston  
 ADDRESS: Unit 6 - 161 Industrial Rd POSTAL CODE: V1A 2V3  
 CITY: Whitehorse PROV: YT  
 TELEPHONE: (867) 667-3068 FAX: (867) 668-1319 SAMPLER: D.S.  
 PROJECT NAME & NO.: Poly Crossing 12400 2b QUOTE NO.:  
 PO NO.:  
 ALS CONTACT: Con Dorny  
 REPORT FORMAT:  HARD COPY  EMAIL ADDRESS: Kjohnston@eba.ca  
446331  FAX  EXCEL  PDF  OTHER:

SAMPLE IDENTIFICATION	DATE COLLECTED	MATRIX	ANALYSIS REQUESTED		RECEIVED BY	DATE	TIME	RECEIVED BY	DATE	TIME	COOLING METHOD
			RELINQUISHED BY	RELINQUISHED BY							
BW016-01	2007-10-12	water	<u>JWA</u>	<u>Full Drinking Water Biology</u>	<u>HJD</u>	10/13/06	3:00 pm	<u>HJD</u>	10/13/06	3:30	COOLER SEAL INTACT? <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> NA
				<u>Biological metals</u>							SAMPLE TEMPERATURE: <u>5</u> °C
				<u>TOC</u>							FROZEN? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
				<u>Ammonia and Nitrogen</u>							ICEPACKS <input type="checkbox"/> ICE <input type="checkbox"/> NONE
				<u>Halogenated acid formation</u>							SEE WHITEPAPER FOR SOURCE VERSION 06
				<u>Toluene formation</u>							
				<u>Biological screening</u>							

TURN AROUND REQUIRED:  ROUTINE  RUSH - SPECIFY DATE: \_\_\_\_\_ (surcharge may apply)  
 SEND INVOICE TO:  SAME AS REPORT  DIFFERENT FROM REPORT (provide details below)  
 INVOICE FORMAT:  HARD COPY  PDF  FAX

LAB INSTRUCTIONS:  
 FOR LAB USE ONLY