Hope Bay 2010 Westbay Program Data and Installation Report

Report Prepared for

Hope Bay Mining Ltd.

Report Prepared by

SRK Consulting (Canada) Inc.
1CH008.052
February 2011

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SRK Project Number 1CH008.052

February 2011

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Executive Summary

This report describes the 2010 hydrogeology data collection and Westbay installation program completed by SRK Consulting (Canada) Inc. (SRK) for Hope Bay Mining Ltd. (HBML), at the Hope Bay Project in Nunavut, Canada. The program included drilling, geological and geotechnical logging by HBML, hydraulic injection testing (packer testing), and the design, installation, pressure monitoring, development, and sampling of multi-level monitoring wells.

This report describes the background of the project, outlines the field work completed in 2010 including a description of field methods, and presents the data obtained from the investigation. Some preliminary interpretation of water quality data available at the time of writing is provided in this report; however, conclusions should be considered preliminary until additional sampling and interpretation has been completed as part of the planned 2011 Westbay program.

Hydrogeological and geotechnical data obtained during drilling are presented for each drill hole. Three new drill holes were instrumented with the Westbay Multi-Port (MP) System at the Doris Central, Doris North, and Boston deposits, respectively. A fourth drill hole at the Patch 14 deposit was completed with hydraulic testing, but no instrumentation installed.

Pressure and temperature profiles were completed on all Westbay wells, all indicating a generally upward groundwater gradient. Zones of each Westbay well were selected for development and sampling to determine water qualities at different depths in talik and beneath permafrost. Data from the selected sampling zones are summarised below, with details provided in main text and appendices:

Doris Central

Three zones were selected for sampling at Doris Central to provide water quality samples from shallow, medium and deep talik water. Considerable volumes were developed from all zones, using the airlifting method. The initial lab results indicate that development has removed most of the drilling fluids; however all parameters are not fully stable yet. The groundwater in all three zones is saline. Isotope data is not yet available. Further review of the development effectiveness and conclusions on the representative water quality with depth at Doris Central will be provided in the 2011 Westbay Program Data Report.

Doris North

One zone was selected for sampling at Doris North Lower to characterize deep sub permafrost groundwater quality. The zone has very low hydraulic conductivity, which provided technical challenges to development. Evidence suggests that very little water was removed from the formation during development; instead water is being drawn down around the packer separating the zone above. The zone has had some time for natural flushing; however the samples collected could be affected by drilling water.

Lab results indicate very high concentrations of major ions. Differences in ratios of parameter concentrations between the sampled groundwater and drilling brines suggest that the high concentrations are a result of natural formation concentrations, and not drilling residues. However, comparison of the data to other Canadian Shield sites shows that the waters have different compositions. The data obtained to date is inconclusive. No further development is recommended due to the low hydraulic conductivity of the sampling zone, but additional sampling is recommended

to observe trends and further assess the water source. Further review of the development effectiveness and conclusions on the representative water quality with depth at Doris North will be provided in the 2011 Westbay Program Data Report.

Boston

One zone was selected for sampling at Boston to characterize deep sub permafrost / near talik groundwater quality. Only one zone volume was removed during development; however considerable natural flushing of the zone took place. Lab results indicate that most of the drilling water has been removed but additional development is required. Preliminary results indicate saline groundwater, somewhat similar to the Doris Central zones. Further review of the development effectiveness and conclusions on the representative water quality with depth at Boston will be provided in the 2011 Westbay Program Data Report.

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1 Introduction

This report describes the 2010 hydrogeology data collection and Westbay Installation program completed by SRK Consulting (Canada) Inc. (SRK) for Hope Bay Mining Limited (HBML), at the Hope Bay Project in Nunavut, Canada. The program included drilling, geological and geotechnical logging by HBML, hydraulic injection testing, and the design, installation, pressure monitoring, development and sampling of multi-level monitoring wells. Three new drill holes were instrumented with the Westbay Multi-Port (MP) System at the Doris Central, Doris North and Boston deposits, respectively. A fourth drill hole at the Patch 14 deposit was completed, including hydraulic testing, but it was decided not to install a Westbay well due to low hydraulic conductivities encountered throughout the drill hole.

The 2010 hydrogeological field program had two primary objectives:

- Characterization of hydrogeological and geotechnical parameters during drilling; and
- Characterization of groundwater quality using a system allowing repeatable sample collection.

The information from the program will be used for environmental baseline monitoring, as well as for designing mine water management strategies and permitting water discharges from the sites.

2 Scope of Report

This report describes the background of the project, outlines the field work completed in 2010 including a description of field methods, and presents the data obtained from the investigation. Some preliminary interpretation of water quality data available at the time of writing is provided in this report; however conclusions should be considered preliminary until additional sampling and interpretation has been completed as part of the planned 2011 Westbay program.

Full interpretation of the data will be presented in separate reports, to be issued at a later date. All available hydrogeological data will be interpreted as part of the Stage 2 Doris Deposit Report, to be completed late in 2011. Interpretation on development effectiveness and representative water qualities will be provided in the 2011 Westbay Program Data Report.

3 Background

3.1 2008 Field Investigations

In 2008, SRK completed a geotechnical drilling program which included drilling, hydraulic testing and thermistor installations at Boston, Doris North, Doris Central, and the group of deposits at Madrid (Suluk, Naartok, and Rand). Permafrost and hydrogeological conditions were investigated to develop initial hydrogeological conceptual models, estimate inflow rates, inflow water quality, and pore pressures. The primary focus of this program was hydrogeological and permafrost conditions surrounding and/or influencing the proposed developments.

Descriptions of the field programs, results and inflow estimates can be found in the following documents:

- Geotechnical and Hydrogeological Assessment for the Doris North Open Pit and Doris Central Underground, SRK, June 2009.

- Geotechnical and Hydrogeological Assessment for the Boston Open Pit, SRK, June 2009.
- Geotechnical and Hydrogeological Assessment for the Madrid Open Pit and Underground, SRK, June 2009.

The 2008 field program collected mostly hydraulic conductivity (K) data to help characterize the range of K values that might be encountered in the different lithologies at each of the geographic areas of interest at the time. The field program also collected temperature data to assist in approximating permafrost depths at the relevant mining areas. Very little groundwater chemistry data was obtained in 2008, therefore one of the key data needs identified for 2010 was to characterize the talik and sub-permafrost groundwater quality at each of the mining areas.

3.2 Mine Plan Updates Since 2008

Since 2008, the mine plans and proposed mining locations have changed. As a result, additional geographic areas required hydrogeological characterisation. At the planning phase of the 2010 Westbay program the following changes had been made to mine plans:

- The proposed Doris North open pit had been changed to an underground mine with potential to go deeper than the previously planned pit; and
- Patch 14 and Wolverine underground mines had been added. These are two adjacent deposits further south of the previously investigated Madrid deposits, where there was no available hydrogeological data. Naartok, Suluk and Rand open pits and underground were no longer included in the development plans.

During the course of the 2010 field program and subsequent analysis, other mine plan changes evolved, including:

- Adding two new underground mining areas in the Doris area: Doris Connector and Doris Lower; and
- Revising plans for Boston, including an additional underground mining development.

The 2010 field program was developed to obtain additional hydrogeological data at the planned mine areas as of early 2010. This report will present the results of the 2010 work, but interpretation of these data and previously obtained data in relation to the current mining areas will be provided in separate reports. The potential mining areas and depths continue to change as the project develops. Additional fieldwork is being completed in 2011 to address the data gaps resulting from the changes to mine plans, changes to the level of detail required and to address the recommendations in this report.

4 Work Program and Methods

4.1 Drill Holes

Four drill holes were completed as part of the 2010 hydrogeology field program. The locations of drill holes 10WBW001 at Doris Central and 10WBW002 at Doris North are shown on Figure 1. 10WBW003 at Patch 14 is shown on Figure 2 and 10WBW004 at Boston on Figure 3. Table 1 below provides the drill hole locations, depths, dip and dip directions, a description of the purpose of the drill hole, the number of packer tests completed and indicates if a Westbay multi-port monitoring well was installed.

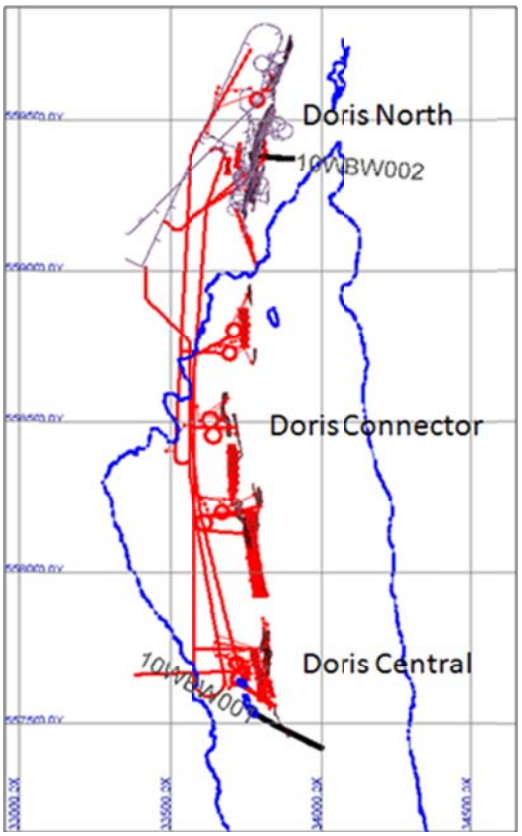

Figure 1: Location of Westbay Wells 10WBW001 and 10WBW002 in Relation to the Proposed Mining Areas at Doris

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Showing mining areas, declines and ramps proposed as of January 2011.

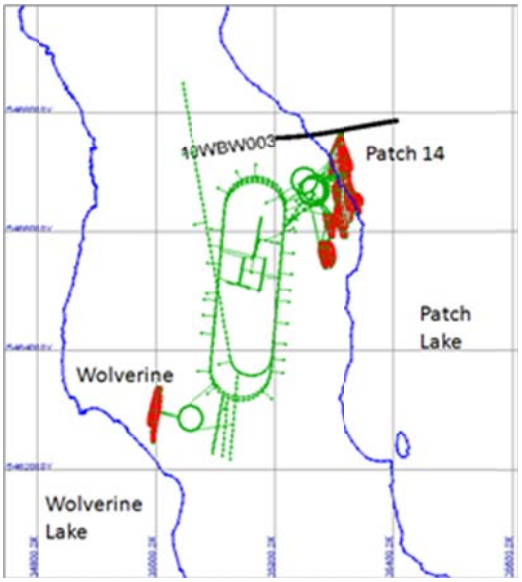

Figure 2: Location of 10WBW003 vs. Proposed Mining Areas at Patch 14

Showing mining areas, declines and ramps proposed as of January 2011.

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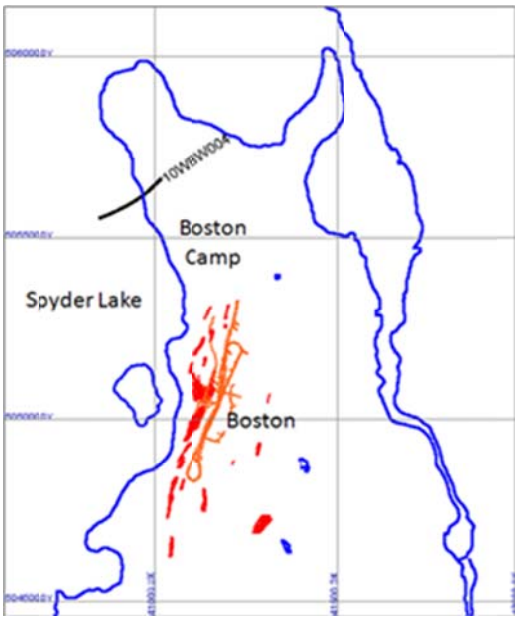

Figure 3: Location of Westbay 10WBW004 in Relation to the Proposed Mining areas at Boston

Showing mining areas, declines and ramps proposed as of January 2011.

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Table 1: Drill Holes Completed During the 2010 Hydrogeology Field Program

Drill Hole ID		10WBW001	10WBW002	10WBW003	10WBW004
Deposit		Doris Central	Doris North	Patch 14	Boston
Westbay Installed?		Yes	Yes	No	Yes
Purpose		Talik groundwater quality	Sub-permafrost groundwater quality	Sub-permafrost, near talik groundwater quality	Sub-permafrost, near talik groundwater quality
Number of packer tests		14	5	7	9
Length	Metres	564.0	600.6	548.2	470.0
Vertical depth	Metres	495.0	578.0	505.6	421.0
Easting at collar	Metres tUTM	33778	33913	35202	41018
Northing at collar	Metres tUTM	557537	559375	546758	505665
Elevation at collar	Metres tUTM	5026	5030	5039	5068
Dip at collar	Degrees	-65.2	-74.4	-70.2	-71.2
Dip at EOH	Degrees	-60.2	-76.5	-62.0	-55.4*
Dip deviation	Degrees	5.0	2.1	8.2	15.8
Azimuth at collar	Degrees	121.6	271.9	87.9	223.0
Azimuth at EOH	Degrees	115.8	278.5	80.9	249.5*
Azimuth deviation	Degrees	5.8	6.6	7.0	26.5

* From last EZ shot at 452m, last maxibor data was not completed and last EZ shot reading was lost.
EOH = End of hole

Source: \01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\Table 1 Drill holes from 2010 Program.xlsx

The drill holes were all HQ diameter (96mm) boreholes, drilled by Orbit Drilling using a diamond coring rig. All holes were drilled using triple-tubes (also referred to as 'split tubes') to preserve the condition of natural fractures and faults as much as possible prior to logging. Core was oriented using the Reflex ACT core orientation tool.

Hole 10WBW001 was drilled from a small island in the middle of Doris Lake, though the Doris Lake talik (the area under the lake where permafrost is not present); therefore, hole freezing was not a concern and fresh lake water was used as a drilling fluid. The other three holes were drilled on land through significant depths of permafrost, and a brine mixture of approximately 18% salinity (varied) was utilised for drilling fluids to prevent the drill rods freezing in place.

All drill holes were surveyed by HBML contractors, Bluebear, to provide easting, northing, azimuth and dip at the collar. Drill hole dip was monitored during drilling using a Reflex 'EZ Shot' approximately every 30 m, or once per shift. All holes shallowed during drilling. HBML staff completed a hole survey at 30 m into bedrock, at 200 m for holes 400 m and greater, and at the end of hole using the Reflex 'maxibor' tool. The 'maxibor' provided X, Y, Z, azimuth and dip at roughly every 3 m along the hole. Data from the maxibor was calibrated using the surveyed drill hole collar, and the final hole length (based on drill rods used).

All coordinates at the Hope Bay Project utilize a truncated UTM (tUTM) system, where the first two digits of the eastings and northings in UTM coordinates are dropped, and 5000m is added to all elevations.

4.2 Geotechnical and Geological Logging

Geotechnical logging was completed by HBML geotechnical staff at the rig, on a run-by-run basis while the core was still in the split tubes. The logging method was similar to that which was implemented during the larger 2008 SRK geotechnical drill program, including parameters such as total core recovery (TCR), rock quality designation (RQD), rock strength, natural joint counts, measurement of joint, foliation and fault orientations, categorisation of joint characteristics (roughness, alteration, and fill), and descriptions of structures. The geotechnical logging process was not managed by SRK, nor were the geotechnical logs reviewed by SRK. The logs were provided by HBML to SRK to assist in the interpretation of packer test results and the design of the Westbay multi-point monitoring wells, discussed further below.

The deeper portions of 10WBW004 were logged after the core had been placed into the core boxes instead of being logged on a run-by-run basis in the split tubes, due to a HBML staffing issue near the end of the program.

Geological logging was completed by HBML Geologists following the same procedures as for regular exploration drill holes, and data was provided to SRK. All drill core was digitally photographed both in the split tubes and in the core boxes. The boxed core will be stored on site with all other core.

4.3 Packer Testing

Hydraulic packer testing was conducted on all drill holes by an SRK Hydrogeologist, using a single packer IPI Standard Wireline Permeability System (SWiPS).

The packer gland in this system is inflated with water pumped down the drill rods. Each test zone was in an open borehole, with the rods pulled up to selected depth to expose the test zone and a single hydraulic packer was inflated at 500 psi to seal the test zone just below the drill bit of the rod string. Targets included testing the K of bulk rock, lithological contacts, or specific structures or broken areas encountered in the hole.

Packer testing results in permafrost are affected by the frozen nature of the bedrock which greatly decrease the hydraulic conductivity even if highly fractured. Consequently, the sections of the drill holes in talik (i.e. all of 10WBW001) or below the expected permafrost depth, were more rigorously tested order to better establish the hydraulic conductivity of bedrock in these areas unaffected by permafrost.

The operation of the IPI SWPS packer testing system followed the standard IPI equipment manual (SRK, 2010), as produced by SRK for the manufacturer. The following general procedure was used:

1. The packer tool was deployed down the HQ hole to create a seal with a modified landing ring in the core barrel.
2. A leak test was completed to measure any loss from the closed system through the rod joints.
3. The packer element was inflated to create a seal with the bedrock wall below the drill bit.
4. Water was injected through the packer into the exposed formation at incrementally increasing and decreasing injection pressures. Five constant injection pressures were normally used per test. The highest pressure was held for a longer period (typically 10-20 minutes).
5. Injection pressures and water flow rates pumped into the rock formation were recorded and the resulting flow vs. pressure relationship was used to estimate the K of the zone tested, as well as the possible characteristics of the fractures in the rock.

Injection pressures were manually read at the surface by the operator from 200-psi and 1000-psi analogue pressure gauges to the nearest 5 psi and 10 psi, respectively. Pressures in the test zone were recorded continuously by a Troll data logger placed in a special housing below the inflation sub of the packer. Water flow rates were manually recorded from an analogue cumulative flow meter to the nearest 0.01 liters over 30 second intervals, and once flow had stabilized, the flow rate was determined.

The overall low flow limit of the system is approximately 0.02 L/min and in a typical test zone this means $1x10^{-10}$ m/s is the lowest measureable hydraulic conductivity assumed to be correct. As a policy, SRK considers that all apparent hydraulic conductivity values below $1x10^{-10}$ m/s are below the sensitivity of the equipment. Where no flow was observed in a test, a flow of 0.01 L/m was entered in to the calculation sheets, typically producing a result around $1x10^{-11}$ m/s, below the reasonable limit of the system. The results appended to this report are the values generated from the numeric calculation sheets; however, it is reasonable to assume that any result lower than $1x10^{-10}$ m/s is very low hydraulic conductivity and should be considered “equal to or less than $1x10^{-10}$ m/s”. However; the hydraulic conductivity of solid, competent rock may be much lower than this minimum measurable limit in some tests.

4.4 Westbay Installations

Westbay multi-point monitoring wells were installed in the bore holes at Doris Central (10WBW001), Doris North (10WBW002), and Boston (10WBW004). The hole at Patch14 was not completed with a Westbay well due to the low hydraulic conductivities encountered during packer testing throughout

the entire drill hole profile. In such conditions, development and sampling can be slow and costly, as well as being less relevant than locations with higher K features, given that the lower K rock encountered is not likely to dominate the actual mine inflows. A number of Westbay parts were left on site as a result of the Patch 14 Westbay not being installed. As of February 2011, they were being stored in the 'SRK Container' opposite the geology core shack at Doris Camp. A list of the items left over is provided in Appendix A.

Installation equipment was rented from the manufacturer. Newmont purchased the winch and probe used to monitor and sample from the Westbay wells, as a monitoring program will likely continue for a number of years. Part numbers and other references that came with the purchased equipment are also provided in Appendix A.

This section provides a description of the Westbay system, describes the installation process, and the methods for development and sampling, pressure and temperature monitoring.

4.4.1 Description of Westbay System

The Westbay wells can be thought of as multi-level piezometers. That is, each installation has multiple, hydraulically isolated "monitoring zones" at various depths allowing sampling, water level measurement, or hydraulic testing at each zone. The zones are designed during drilling and allow virtually complete flexibility over length and position. Each zone is separated from others by hydraulic packers that are inflated following strict QA/QC guidelines.

The basis of the MP System is that the fluid inside the PVC pipe is isolated from zone fluids outside the pipe by valved couplings that are always in a closed (hydraulically sealed) position unless specifically opened temporarily by a probe. The MP well is operated with internal fluid pressures lower than the external zone pressures, so that any fluid movement during valve operation is into the pipe, and not in to the zone (thus avoiding contamination).

After installation, all of the zones are accessed through a single PVC standpipe via a single wireline tool operated from the Surface. This tool is used to collect pressure data and fluid samples from inside and outside of the normally sealed pipe. A benefit of this system, which is of particular importance in the Canadian north, is that the inside of the PVC is hydraulically isolated from all of the sampling zones, allowing the internal volume to be protected from freezing using a mix of propylene glycol and water; unlike a conventional piezometer, water does not rise up inside the PVC to the static water level. Water pressure can be measured at all monitoring zones and provides a vertical pressure profile.

During sampling and monitoring, a proprietary tool called a 'Mosdax' sampler/pressure probe is operated on a wireline from surface and activated by a hand held electronic controller (called a 'MAGI') to land the probe at the desired valved coupling within the Westbay well. The probe has the ability to read pressure, temperature (of the probe), or to open and close an internal valve, allowing water to flow through the probe into pre-attached sample bottles that hang below it in the well.

The operator typically uses the probe to land on two different types of ports that may be installed within a zone:

- Measurement ports, which have a small valve that can be opened to access the external water in the zone, only when the Mosdax probe pushes and seals against it. This type of port is used to take samples of the water sitting outside the Westbay, or to read the pressure and temperature of water in the zone. In zones with permafrost, this type of port may be used for

development by essentially taking multiple discrete 'samples'. The port can also be used for conducting pressure pulse tests to calculate hydraulic conductivity in low K zones.

- Pumping ports, which have a sliding gate-like valve around the full circumference of the well, which the operator can to slide open to expose a 10cm long screened section to the formation, somewhat like a traditional screened section of a monitoring well. This type of port is used to pump larger volumes of water out of the zone, but unlike a traditional well, it can be closed again after use, once again separating the external formation groundwater in the zone from the internal Westbay column of water.

4.4.2 Design of Westbay Wells

Westbay monitoring zones and related Westbay packer locations were designed based on packer testing results during drilling and the geological and geotechnical logs. The number of monitoring zones for each drill hole was based on a combination of observed features of hydrogeological interest and logical spacing for reasonable sample collection ability in low K rock. As a minimum, one packer was installed every 100m to support the weight of the PVC pipe.

4.4.3 Installation Procedures

Installation of the Westbay MP well typically proceeds as follows:

1. Design of modular component layout for each well based on drill core observations;
2. Lowering and field testing of components to design depth;
3. Conducting a pre-inflation pressure profile;
4. Individual inflation of hydraulic packers to hydraulically isolate the sampling zones;
5. Hydraulic integrity testing of MP casing (verify it can maintain a differential water level between it and the open drill hole) to check for leaks; and
6. Initial pressure profile to test for ability to maintain differential pressures across packers.

As the Westbay well casing is watertight, it is buoyant in the drill hole and has to be sunk into position by adding clean water. Propylene glycol was also added to protect the water in the casing from freezing in the permafrost zone. The antifreeze will not enter the sampling zone as the internal fluid pressure in Westbay well casing is lower than the zone pressure, so any fluid movement will be into the casing when the valve is opened by the probe, as discussed above.

4.5 Westbay Monitoring Methods

4.5.1 Pressure and Temperature Profiles

After installation, an initial pressure and temperature profile was completed on each of the three Westbays. This was typically only a day after installation and; therefore, most of the zones were not yet stabilised to their natural temperatures and pressures. The initial pressure profiles demonstrate that the packer inflation process was successful and zones are now isolated, and also to provide a starting point to track trends as the zones stablise.

Later in the field season, while SRK was on site completing the development and sampling of selected zones, additional pressure and temperature profiles were completed on each of the three Westbays to obtain stabilised readings.

4.5.2 Zones Targeted for Development and Sampling

All of the Westbay zones are used for temperature and pressure monitoring; however only some of the zones were strategically selected by SRK for development and sampling efforts. Table 2 below shows which zones were targeted and what they represent. Figure 4 shows the depths of the four targeted zones at the Doris deposit in relation to the mine workings. The same figure is not presented for Boston as that Westbay is located further from the mine workings.

Table 2: Zones Targeted for Water Quality Sampling

Well	Zone	Vertical Depth (m)	Deposit	Representative Of
10WBW001	10	57-97m	Doris Central	Shallow talik water, near the upper parts of the proposed Doris Central stopes.
	6	221-246m		Medium depth talik water, around the area of the proposed Doris Central stopes, possibly influenced by the nearby Alpha Fault.
	1	485-495m	Doris Central Lower	Deep talik water, below the diabase.
10WBW002	1	575-578m	Doris North Lower	Deep sub permafrost groundwater at Doris North Lower.
10WBW004	6	272-282m	Boston	Deep sub permafrost / near talik groundwater at Boston.

Source:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\Table 2 Zones targeted for sampling.xlsx

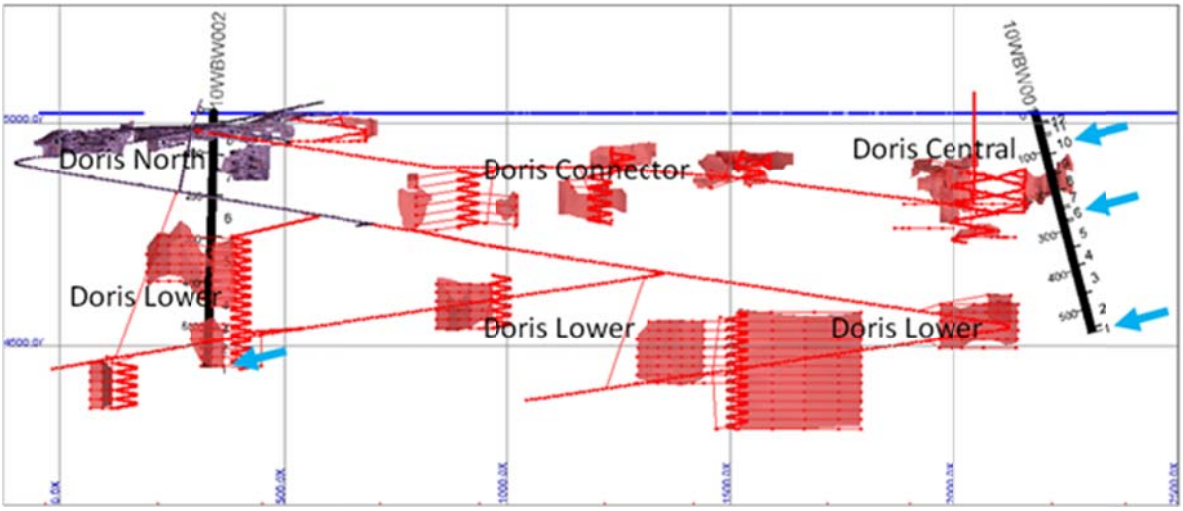

Figure 4: Doris Mine Design Showing Wells 10WBW001 and 10WBW002 and Sampled Zones (Blue Arrows)

Source:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\020_Project_Data\SRK\12_GEMS screenshots and figures\2010-12-10_Doris Westbay cross sections.pptx

4.5.3 Methods for Developing Drilling Water from the Targeted Zones

SRK field staff developed the drilling water from each of the target zones, monitoring field parameters and taking laboratory samples to measure water quality changes as the drill water in the zone was replaced with formation water. The speed of the development process, the development and sampling method, and the number of samples taken varied by location, depended on the presence or absence of permafrost in the hole and the K of the rock within the zone. Table 3 below shows the volumes developed and the methods used at each of the targeted sampling zones.

The following developing methods were used:

- The airlift pumping method: This procedure involved opening the pumping port in a target zone and then injecting compressed air into the internal Westbay PVC pipe at a depth above that of the pumping port, to eject water and lower the water level inside the pipe. This caused water to flow from the zone into the Westbay internal pipe to replace the water removed. Initially the discharged water from the airlift system is the glycol water that was sitting inside the Westbay pipe, but over time the recharging groundwater provides a continuous flow of water up through the Westbay.
- The sample bottle method: This procedure involved using the Mosdax sampler probe with attached sampling water bottles to land at the measurement ports and take a 1L samples. The bottle was then returned to the surface, emptied, re-attached and sent down the hole again to grab another 1L from the formation. This process continued repetitively for days or weeks in some cases, to develop water from the zones. While slow, the benefit of this method is that the glycol water mix inside the Westbay is not displaced by the formation water (as is the case with the airlift pumping method), therefore the Westbay wells located in permafrost do not freeze solid.

Table 3: Development Volumes and Methods Used

Deposit	Well	Zone	Volume of Zone (L)	Volume Removed (L)	# of Zone Volumes Removed*	Significant Permafrost in Hole?	Development Method
Doris Central	10WBW001	10	264	3014	11.0	No	Airlift
		6	168	Initially 8,096 L; after bulk sample 13,592 L	Initially 46.6; after bulk sample 79.3		Airlift
		1	96	3192	27.5		Airlift
Doris North	10WBW002	1	37.2	52	1.4	Yes	Westbay Sampler
Boston	10WBW004	6	73.2	84	1.15	Yes	Westbay Sampler

* Note that for zones developed using the airlift method, the volume of glycol water developed from inside the Westbay was subtracted from the calculation of # of zone volumes removed.

Source: \01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\Table 3 Development volumes all targeted zones.xlsx

4.5.4 Sampling Methods

There were two development and sampling methods used at Doris Central: the airlift pumping method and the Westbay sampler "discrete" method. The Doris North and Boston Westbay wells only used the discrete method. When reviewing the water quality sample results, the method used to obtain the sample should be considered, as it has an effect on certain parameters:

- Airlift Samples: grab samples of the airlift discharge taken at the surface have undergone considerable aeration before sampling. The addition of air to the water changes the concentration of the parameters (e.g.: alkalinity, redox, isotopes, and other parameters) for chemical analysis. The water samples that were collected during airlifting may not be representative of the formation water. However, as the inflowing mine water would likely be aerated through pumping in the mine, they do provide an interesting comparison with the discrete samples. This is discussed further in the QA/QC section.
- Discrete Samples: samples collected directly from the zones down hole using a specialised tool do not come into contact with the atmosphere until they are poured into sample bottles at the surface. However, the sample does "degas" and experiences some aeration when the bottle valve is opened and the fluid depressurizes when filling the sample bottles. For most parameters, they are considered to be more representative of actual formation water than the airlifted samples. Aeration and degassing of the sample can be minimised by using direct transfer techniques. Additionally, the samples can be shipped to the lab for analysis at zone pressure if thought to be necessary, although this is very rarely done, except in the case of radon sampling carried out by SRK on uranium projects, according to the manufacturer.

Throughout the development, the SRK crew monitored field parameters to track the development process. At Doris Central, the progress was monitored from grab samples of the airlift discharge; at the other two wells samples from the measurement port samples were used, where airlifting was not possible. Field parameter monitoring at Doris Central included only pH and electrical conductivity; however the other two Westbay wells were developed later in the season and were monitored using a probe with a wider range of parameters.

Water quality samples for lab analysis were collected during and at the end of the development to allow assessment of development progress, or stabilization of water quality, over time. Samples were also taken for QA/QC including duplicates, rinsate blanks, samples of the drilling water and samples of the water inside the Westbay.

4.5.5 Lab Analysis Methods

Samples were analysed for routine parameters: total dissolved solids (TDS), total metals, dissolved metals, nutrients, and isotopes.

Initial samples, taken during the development process, were analyzed using the traditional methods of ion chromatography, Inductively Coupled Plasma Mass Spectrometry (ICP-MS), and Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES). These samples had high detection limits and some spurious results, and therefore have not been included in the groundwater quality assessment; they have only been used to evaluate the development process. To achieve better detection limits, the analysis method was changed after the initial sampling rounds. All subsequent groundwater samples collected were analyzed using High Resolution Inductively Coupled Plasma

Mass Spectrometry (HR-ICPMS). These are labelled 'seawater' analysis in the water quality results table presented in Appendix L.

The stable isotope samples for oxygen and deuterium were analyzed by Gas Isotope Ratio Mass Spectrometry (GIRMS).

5 Drill Hole Data, Westbay Well As-builts, and Preliminary Results

5.1 Summary

Selected geotechnical and geological parameters for all drill holes, along with packer test results and Westbay zone information (where applicable), are presented in the SRK compiled drill logs provided in Appendix B. SRK packer testing field check lists are provided in Appendix C and results data sheets are provided in Appendix D. Photos of the core that was tested with each packer test and a review of the factors contributing to the observed flows are included in Appendix E.

For Westbay wells 10WBW001, 10WBW002, and 10WBW004, the well installation forms and packer inflation records are provided in Appendix F and Appendix G. The final as-built designs and monitoring zone depths are in Appendix H. Data sheets from pressure and temperature profiles are provided in Appendix I, sheets from sampling are in Appendix J. Field parameters and calibration records from developing each zone are provided in Appendix K.

All sample results and summaries of key parameters from each zone, are provided in the tables in Appendix L. Interpretive graphs of the water quality data are provided in Appendix M. Comparisons of samples for QA/QC purposes are provided in Appendix N. The original lab reports are presented in Appendix O.

5.2 10WBW001 Doris Central

5.2.1 Lithology and Structures

Hole 10WBW001 was located mostly in basalt with varying degrees of alteration. A section with quartz veining, part of the main Doris Central ore body was intersected between 244m and 266m along drill hole. A number of small (3m to 9m) intermediate and mafic dykes were encountered at various depths. The main, large diabase separating Doris Central deposit from Doris Lower was found at 381 to 549m along drill hole. A short section of slightly vuggy basalt was located below the diabase, before the hole was terminated at 564m length.

The drill hole intersected the currently modeled Alpha Fault at a depth of approximately 100m. This fault had not been identified during drilling and initial analysis, but was interpreted and modeled by HBML geologists and electronically provided to SRK late in 2010. In the core it could be represented by shears present at 113m and 133m, shown in the core photos from packer test 6 in Appendix E. Notably, neither of these small shears was reported in either the geotechnical or geological logs, indicating that the logs alone cannot be relied on for detailed packer test results interpretation. Without more information on what the modeled Alpha Fault looks like in other locations, or what type of structure it is, it is difficult to say with certainty where, or even if, it was intersected in drill hole 10WBW001. This information, along with an updated fault model, is expected to become available from HBML in February 2011, when the Doris Central and Connector model review is complete. A

number of other small rubble zones or minor faults were reported in either the geology or geotechnical logs (though notably not noted in both logs). Table 4 summarises the key structural features listed in the logs.

Figure 5 below shows a cross section along the drill hole in relation to the modeled geology, also indicating the packer test results and the Westbay zones. Note that the diabase shown in Figure 5 is not as deep as HBML has modeled it at this location (see note on Figure 6 below). Figure 6 shows the drill hole in plan view, in relation to the currently proposed mining areas.

Table 4: Faults, Rubble Zones and Major Lithological Contacts in 10WBW001

From	To	Length	Comments	Source
72.88	72.93	0.05	Fault / Rubble zone	Geotech log
87.70	87.80	0.10	Rubble zone	Geotech log
96.00	96.20	0.20	Rubble zone	Geotech log
107.11	107.13	0.02	Rubble zone	Geotech log
141.53	142.46	0.93	Possible fault area, increase in strain and minor gouge	Geology log
143.20	143.60	0.40	Rubble zone	Geotech log
165.25	165.30	0.05	Rubble zone	Geotech log
190.87	190.89	0.02	Possible fault	Geotech log
192.17	192.32	0.15	Rubble zone	Geotech log
281.50	281.87	0.37	Fault and rubble zone	Geotech log
283.89	284.00	0.11	Small flault with gouge	Geotech log
284.35	284.40	0.05	Rubble zone	Geotech log
285.10	285.40	0.30	Rubble zone	Geotech log
304.80	305.10	0.30	Fault / rubble zone near geological contact < 1mm total gouge present	Geotech log
312.80	313.00	0.20	Fault / Rubble zone	Geotech log
357.70	357.83	0.13	Fault / Rubble zone	Geotech log
358.23	358.48	0.25	Fault / Rubble zone	Geotech log
397.14	397.50	0.36	Vuggy jointed zone with very coarse fill	Geotech log
381.03	381.03	0.00	Upper diabase contact	Geology log
549.28	549.28	0.00	Lower diabase contact	Geology log
551.06	564.00	12.94	Vuggy zone, vugs infilled with clay. Some hematite-altered bands.	Geology log

Source Y:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\Table 4 Faults, rubble zones and major litho contacts in 10WBW001.xlsx

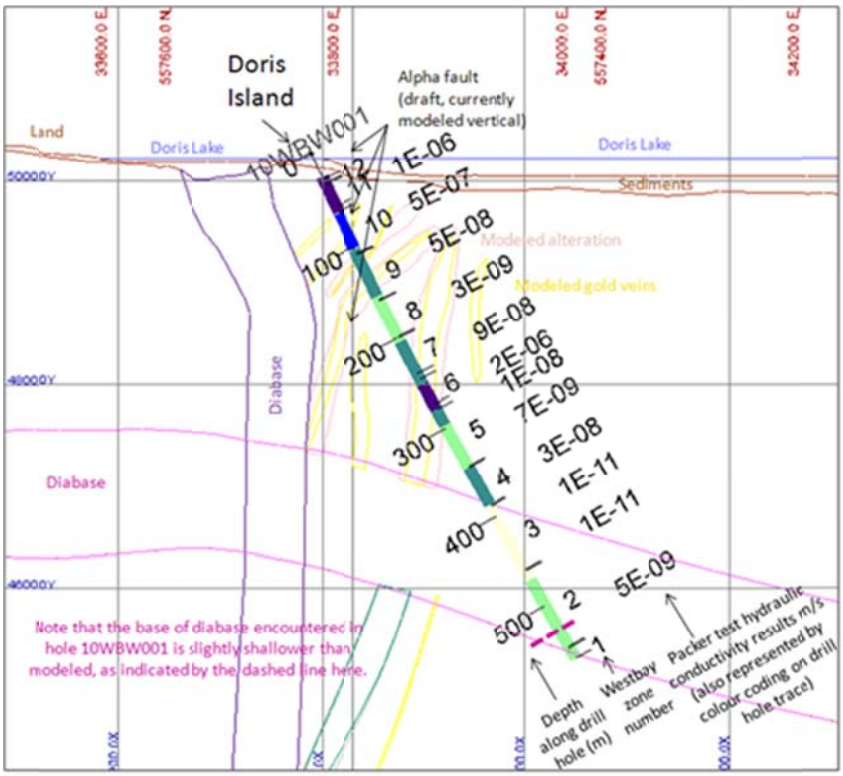

Figure 5: Cross Section Along Drill Hole 10WBW001, Showing Modeled Geology (as of Dec 2010), the Draft Modeled Alpha Fault, Westbay Zones, and the Packer Test Results

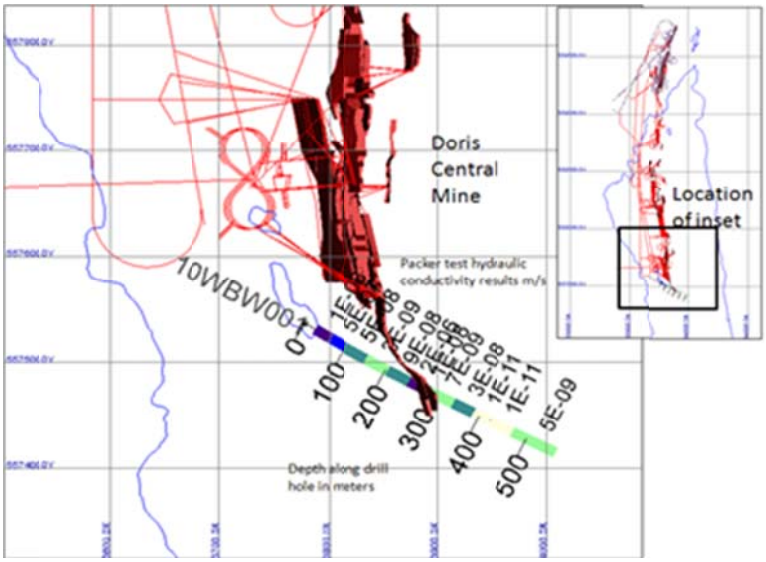

Figure 6: Plan View of Drill Hole 10WBW001, Showing Doris Central Mine Plans (as of Dec 2010) and the Packer Test Results

Figure 5 and 6 sources:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\020_Project_Data\SRK\12_GEMS screenshots and figures\ 2011-01-21 Figures used in report.pptx

5.2.2 Packer Testing

Packer test results for 10WBW001 are presented in Table 5 and Figure 7 below. Appendix E provides core photos from packer test intervals which highlight what types of features are included in each text zone. The packer testing in 10WBW001 showed the following:

- Moderately high K values in the two shallowest tests, to a depth of 90m vertical depth below ground surface, possibly associated with the Alpha Fault.
- Higher K around the ore body, possibly associated with the Alpha Fault, possibly with a few open and connected fractures near the quartz veins.
- Very low K in the main diabase unit separating Doris Central and Connector.
- Some sections of broken core associated with small intermediate dykes that are not currently modelled. These did not consistently show above average K values, but they could be influencing the flow observed in the tests where they are present.
- A broken section of basalt in the middle of the limbs of altered basalt within the main ore body fold, although not directly showing any influence on K.

The interpretation of these results, in combination with data from previous field programs will be presented in the Stage 2 Doris Report, later in the 2011.

Table 5: Packer Test Results for 10WBW001

Test #	Along Drill Hole		Vertical Depth			Test Zone Lithology	Hydraulic Conductivity (m/s)
	Test Zone Top (m)	Test Zone Bottom (m)	Test Zone Top (mbgs)	Test Zone Bottom (mbgs)	Test Zone Vertical Length (m)		
1	25.0	63.0	22.1	55.8	33.6	Fractured basalt. Loss of circulation during drilling in this zone.	1E-06
2	64.0	102.0	56.7	90.3	33.6	Fractured basalt with foliation. Jointed diabase in test zone, contact also jointed.	5E-07
3	121.5	144.5	107.6	127.9	20.4	[packer bypass: ignore results]	
4	103.0	144.5	91.2	127.9	36.7	[packer bypass: ignore results]	
5	154.0	204.8	136.4	181.3	45.0	Altered and foliated basalt, some heavy foliation but low joint frequency.	3E-09
6	103.0	154.0	91.2	136.4	45.2	Same as test 6a and 5.	5E-08
6a	103.0	204.8	91.2	181.3	90.1	Competent basalt, small shears possible including Alpha Fault? foliation. Test result determined by subtracting result from test 6a from test 5.	3E-08
7	203.0	252.0	179.7	223.1	43.4	Basalt with quartz veins and two small dykes. Higher FF/m around dykes. Slow artesian flow from rods before test, shut in pressure low, artesian head ~ 3m above Doris Lk level estimate. Formation could be pressurized from other drills.	9E-08
8	252.0	279.0	223.1	247.0	23.9	Basalt, quartz and dolomite veins (2m) with fractures (no recovery). Main ore body. Loss of pressure during drilling, artesian flow source, and also reach limit of injection rate.	2E-06
8a	252.0	297.0	223.1	263.0	39.8	Same as test 8 and 9.	9E-07
9	279.0	297.0	247.0	263.0	15.9	Basalt, a few rubble zones or small faults between the altered basalt zones.	1E-08
10	297.0	345.0	263.0	305.5	42.5	Altered foliated basalt, intermediate dyke with broken contact, unaltered basalt.	7E-09
11	345.0	387.0	305.5	342.6	37.2	Basalt with rubble zone / small fault. Major diabase upper contact with only minor jointing.	3E-08
12	387.0	422.5	342.6	374.1	31.4	Diabase, very low FF/m.	1E-11
13	423.0	471.0	374.5	417.0	42.5	Diabase, very low FF/m.	1E-11
14a	548.0	564.0	485.2	499.4	14.2	The result from test 14 if flow only came from the vuggy basalt below the diabase.	3E-08
14	471.0	564.0	417.0	499.4	82.3	Major diabase lower contact, then fractured foliated vuggy basalt below. 83% of test zone is low FF/m diabase.	5E-09

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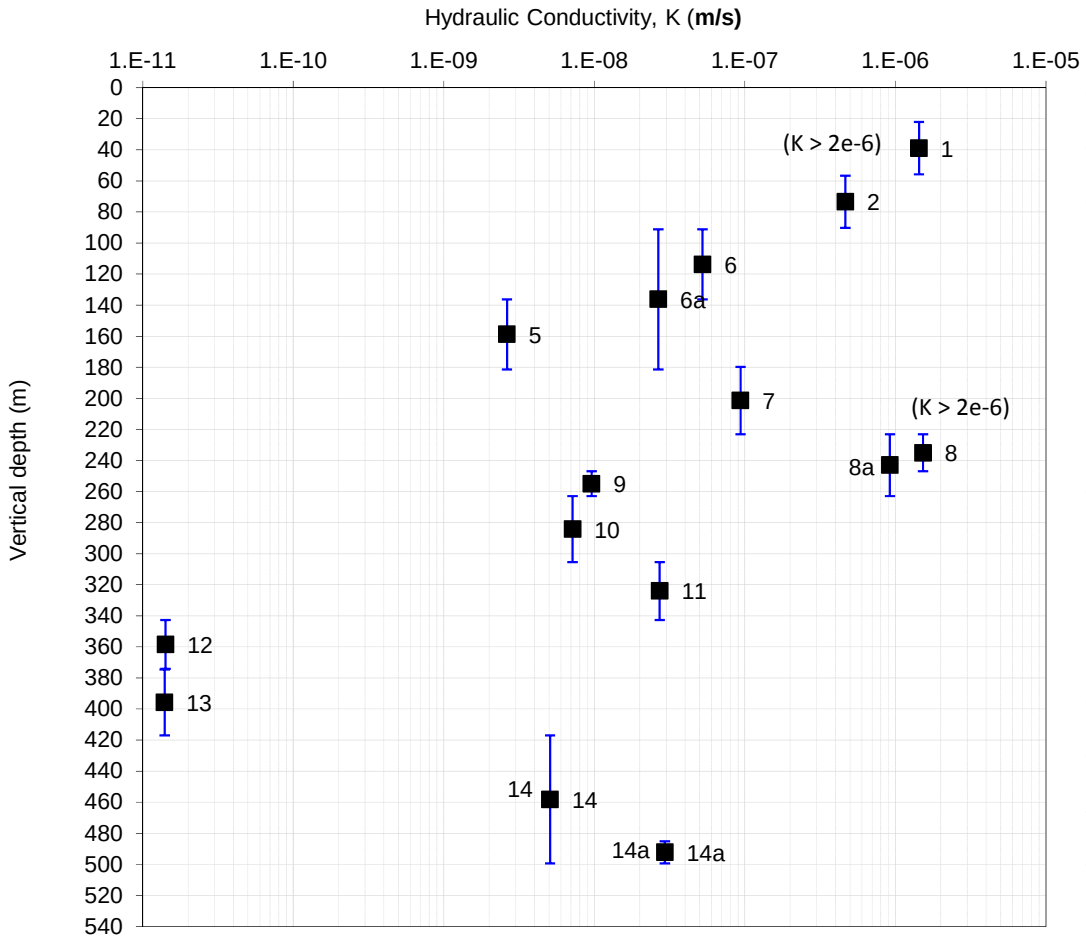

Test 1: Fractured basalt. Loss of circulation during drilling in this zone.
Test 2: Fractured basalt with foliation. Jointed diabase in test zone, contact also jointed.
Test 3 and 4: Packer bypass, ignore results (not shown).
Test 6: Competent basalt, small shears possible including alpha fault?, foliation. Test result determined by subtracting result from test 6a from test 5.
Test 6a: Same as test 6 and 5.
Test 5: Altered and foliated basalt, some heavy foliation but low joint frequency.
Test 7: Basalt with quartz veins and two small dykes. Higher FF/m around dykes. Slow artesian flow from rods before test, shut in pressure low, artesian head ~ 3m above Doris Lk level estimate. Formation could be pressurized from other drills.
Test 8: Basalt, quartz and dolomite veins (2m) with fractures (no recovery). Main ore body. Loss of pressue during drilling, artesian flow source, and also reach limit of injection rate.
Test 8a: Same as test 8 and 9.
Test 9: Basalt, a few rubble zones or small faults between the altered baslat zones.
Test 10: Altered foliated basalt, intermediate dyke with broken contact, unaltered basalt.
Test 11: Basalt with rubble zone / small fault. Major diabase upper contact with only minor jointing.
Test 12 and13: Diabase, very low FF/m.
Test 14: Major diabase lower contact, then fractured foliated vuggy basalt below. 83% of test zone is low FF/m diabase.
Test 14a: The result from test 14 if flow only came from the vuggy basalt below the diabase.

Figure 7: Packer Test Results for 10WBW001

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5.2.3 Westbay Design

The Doris Central Westbay well was designed to provide pressure and temperature profiles throughout the talik under Doris Lake and to provide three water samples from different depths to characterize the chemical profile and the interaction between deep connate groundwater and the fresh lake water at the surface. The deepest sampling zone was set in mafic volcanics below the diabase to provide water quality from the underlying hydrogeological unit. The middle sampling zone was set in the area where water was lost during drilling and the packer testing indicated high hydraulic conductivities, possibly associated with the Alpha Fault.

Monitoring zones are numbered from the bottom up. Therefore, Zone 1 is at the bottom of the well, and higher numbered zones are shallower. Table 6 below summarises zone depths for 10WBW001. The depths of the measurement ports within the zones are provided in Appendix H.

Table 6: Monitoring Zone Depths in Westbay Well 10WBW001

Hole ID	Zone	From	To	From	To	Sampled zones only	
		Down Hole Distance (m)	Down Hole Distance (m)	Vertical Distance (m)	Vertical Distance (m)	Length of Zone (m)	Volume of Zone Annulus Between Westbay and Borehole (L)
10WBW001	12	27.0	31.5	24.5	28.6		
10WBW001	11	33.0	57.5	29.9	52.0		
10WBW001	10	63.5	107.5	57.4	97.1	44.0	264
10WBW001	9	109.0	158.0	98.4	142.6		
10WBW001	8	159.0	199.0	143.5	179.3		
10WBW001	7	200.5	240.0	180.6	215.7		
10WBW001	6	246.0	274.0	221.1	245.8	28.0	168
10WBW001	5	280.0	343.5	251.1	306.7		
10WBW001	4	345.0	388.0	308.0	345.5		
10WBW001	3	389.5	459.5	346.8	407.8		
10WBW001	2	461.0	546.5	409.2	483.5		
10WBW001	1	548.0	564.0	484.8	495.2	16.0	96

Source: Y:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110113 Westbay Data Report\Tables\Table 6 13 and 20 Westbay Zones.xlsx

5.2.4 Temperature Profile

Temperature profiles were completed during installation (both before and after packers were inflated, when the temperatures were likely affected by drilling) and on three separate occasions when the temperatures had stabilized. Figure 8 shows the temperature profiles from 10WBW001.

All readings from the Westbay measurement ports were above zero, although a small pod of permafrost at around 14 to 20m below the island was discovered above the shallowest port, by reading the probe when hanging in the open hole. On July 23, 2010, when the outside air temperature was +17C and the top of the Westbay pipe had been open to the surface, the following temperatures were noted: -0.23C at 15.88m along drill hole, -0.26C at 17.07m, -0.28C at 18.64m.

Figure 8 shows the temperatures generally increasing with depth, with a slight warming effect between 50-100m likely caused by the presence of the lake, and then a cooling effect in the top 50m near the pod of permafrost under Doris Island.

Interestingly, the temperatures in Zone 6 are consistently slightly higher than the zones above and below, perhaps associated with higher flows (supported by packer testing results) coming from deeper waters. This may be along the sub-vertical faulting thought to be intersecting Zone 6.

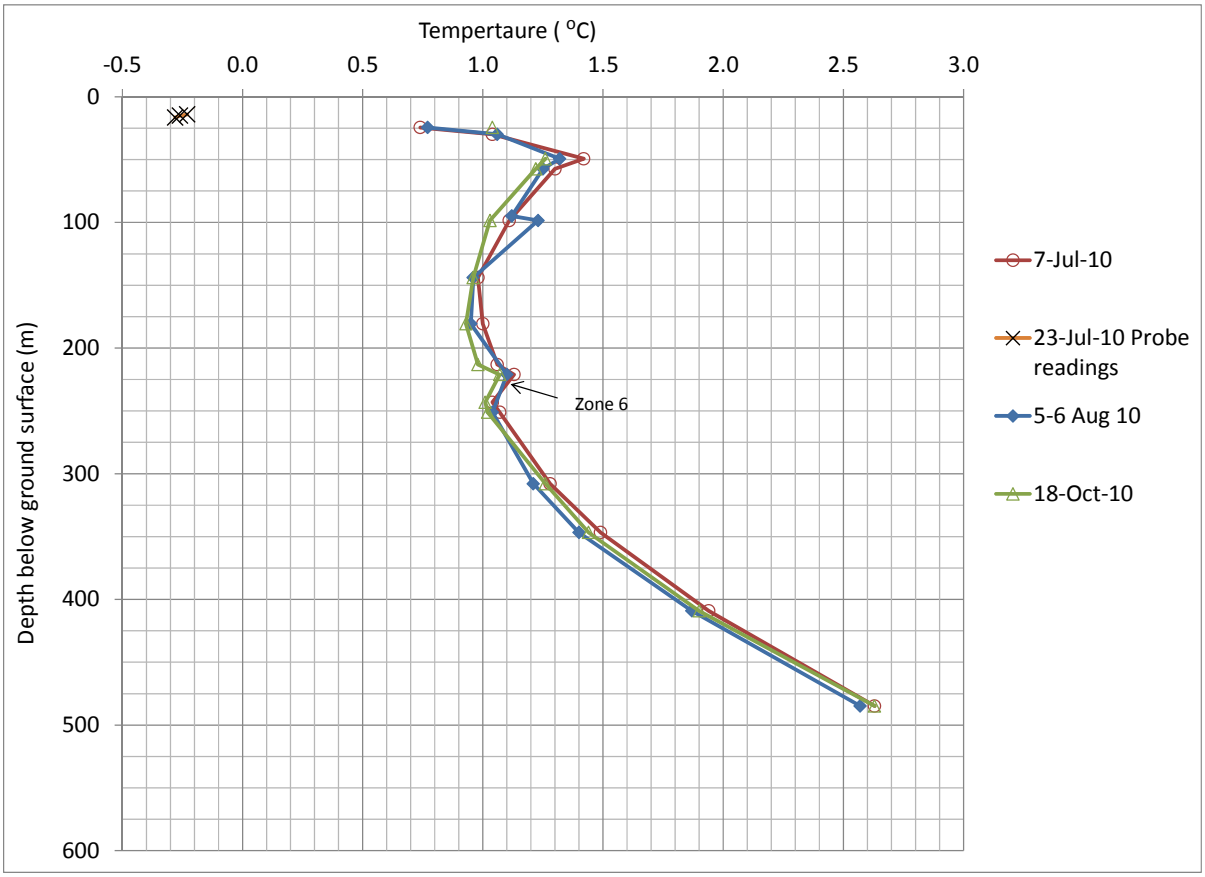

Figure 8: Temperature profile for 10WBW001

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5.2.5 Pressure Profile

Pressure profiles were completed both pre- and post- packer inflation, and on three separate occasions after the Westbay pressures had time to stabilize. Figure 9 shows the results from all profiles, also indicating the depth of the diabase and the lake surface pressure. All readings have been corrected for density using 1020 kg/m^3 for all depths, based on the measured density of water samples from zones 1, 6, and 10.

Note that the deepest Westbay zone includes both diabase and basalt below the diabase. The actual measurement port is in the diabase unit. The pumping port for the same zone is located lower, in the basalt below the diabase.

The piezometric pressures in the pre-inflation profile should all show the same elevation head (or "water level") in an open drill hole as the water column above each port in the open hole is the same.

However, it is likely that there was some stratification in the drill hole with the mixing of briny groundwater and fresh, less dense drilling water..

Following inflation of the packers, the pressure profiles show that the highest pressures are within the diabase, but that there is a downward pressure gradient through the diabase unit. Above the diabase there is an upward pressure gradient towards the lake. The shallowest port (Zone 12) has a piezometric level of 1.5m below the top of casing on the Westbay, which is approximately equal to the lake level.

An inflow test was carried out in three zones, although transient data were not collected. The following observations were made to help 'calibrate' the pressure data below:

- Zone 10: Ten minutes after opening the port for the first time, the water level inside the Westbay was 8.9m below top of casing. After being left open overnight, the water level was 3.09m below top of casing. On other mornings after being left overnight it was 1.85m and 2.10m below top of casing.
- Zone 6: Half an hour after opening the port for the first time, the water level inside the Westbay was 1.85m below top of casing. After being left open overnight, the water level was 1.10m below top of casing. In October, 12 minutes after opening again in October it was 4.75m below top of casing. On another occasion, half an hour after opening the port it was 1.47m below top of casing.
- Zone 1: Half an hour after opening the port for the first time, the water level inside the Westbay was 9.4m below top of casing.

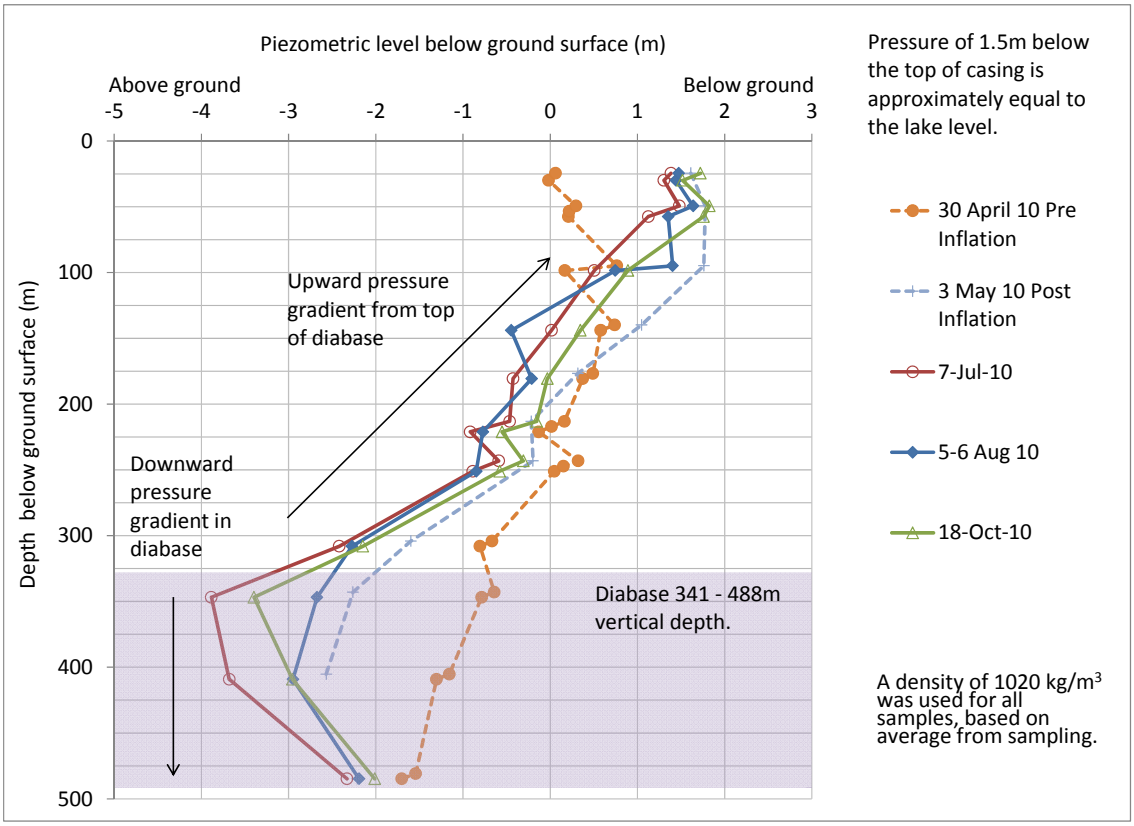

Figure 9: Pressure Profile for 10WBW001

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5.2.6 Development to Remove Drilling Fluids

To develop the wells, or remove/reduce influence of drilling water on the zone chemistry, water were removed from each of the three targeted zones at 10WBW001 using the airlift process. Table 3 provided in section 4.5.3 shows that 3,014L (11 x the zone volume) was removed from Zone 10 and 3,192L (28 x the zone volume) was removed from Zone 1. Initially, 8,096L (47 x the zone volume) was removed from Zone 6, however in October, SRK returned to the Doris Central Westbay well to obtain bulk samples of groundwater to conduct treatability testing and fish toxicity testing. This required further airlifting from Zone 6 only, bringing the total removed from this zone to 13,592L (79 x the zone volume).

Table 7 to Table 9 below summarise the samples taken from each of the targeted zones at Doris Central. When evaluating the water quality sample results, the method used to obtain the sample should be considered, as it has an effect on certain parameters. The airlift pumping method was used for development and a final sample was taken at the end of this process. This process will aerate the water being sampled. The Westbay sampler bottle method was used for initial samples, some interim development samples, and all end-of-development samples. This method does not expose the water sample to aeration. In both cases the water sample will potentially degas as it is brought from deep, zone pressure to atmospheric pressure at the surface.

Zone 1

Zone 1 was developed using the airlifting method at an average rate of 6.1 L/minute. A total of 3,192 L or 27.5 times the zone volume of 96L was removed from the zone. During development, pH and EC were monitored from the airlift discharge; however, EC readings were mostly above the 20mS/cm limit of the field probe. Initially the fluid inside the Westbay was a mix of propylene glycol and lake water. The early part of the graph (Figure 10) shows that mix being removed by the airlift process before the groundwater with a higher pH is observed. It is difficult to see any development progress or significant changes in pH between the lake water used in drilling, the initial port samples and the final development samples, therefore additional parameters from the samples submitted for lab analysis were reviewed to verify that the zone was sufficiently developed. Table 7 below summarises the samples that were analysed and how they were collected.

Figure 11 shows the changes in concentration of total dissolved solids (TDS) during development for Zone 1. The graph shows that even the initial port sample, before any development of drilling water took place, is much more concentrated than the drilling water (fresh water used for drilling, not brine). Therefore the zone has naturally undergone some development in the months between when it was drilled (April) and when it was first sampled (July). The concentration of TDS does not change significantly throughout the development, remaining around 33,000mg/L. An increase in TDS was observed in the final port sample at the end of development, and a further increase when the same port was sampled again two months later; however this is all considered within natural variation and sampling error.

Graphs showing trends for pH, conductivity, magnesium, chloride, calcium, sulphate, sodium and barium for Zone 1 are provided in Appendix M. Concentrations for conductivity, chloride, calcium, sulphate, and sodium remained relatively stable during development and were significantly higher in concentrations than the drilling water, even for the initial port samples. The concentration of magnesium decreased during development, starting at 181mg/L with the initial port sample and decreasing to 43-80mg/L for the remainder of the development process. All zone samples were

significantly higher in magnesium concentration than the drilling water samples, and it is likely that the initially high concentration reported for the port is a function of the lab analysis method error, which required considerable dilution of the briny samples. Overall the Zone 1 concentrations for most of the major ions are significantly higher than the drill water and Doris Lake water concentrations, showing that the water that is currently in Zone 1 represents formation water and not drilling water. We consider Zone 1 to be sufficiently developed and samples from 10WBW001-35 and onwards (after 3,189L had been removed) are likely representative of natural formation water.

After the development process, we returned to the site in October 2010 and obtained two additional samples from Zone 1. No additional development occurred between the three 'final' port samples (August sample plus two October samples), therefore the concentrations were expected to be similar. A comparison of the repeatability of the samples is provided in Table N1 of Appendix N. The findings were that all three samples had similar concentrations. A few of the trace metals demonstrated variability at low concentrations, but the major ion concentrations for the three samples all had a relative percent difference (RPD) of less than 20%.

Table 7: Samples taken from Westbay well 10WBW001 Zone 1 in 2010

Field Sample ID	Sample Method	Date	Sample Develop-ment Status	Location of Port in Zone	Zone Port Drillhole Depth (m)	Sample Comments	Cumulative Total Developed from Zone before Sample was Taken (L)	Zone Volumes Developed before Sample was Taken
10WBW001-01b	Westbay Sampler	8-Jul-10	Initial sample	Top	548	n/a	0	0.0
10WBW001-17	Westbay Sampler	25-Jul-10	Develop-ment sample	Top	548	Pumping port had been open all night, potential for glycol contamination.	1189	6.6
10WBW001-20	Airlift discharge	25-Jul-10	Develop-ment sample	Middle	554	n/a	1368	8.5
10WBW001-25	Airlift discharge	25-Jul-10	Final Sample	Middle	554	Duplicate of 10WBW001-26	3065	26.2
10WBW001-26	Airlift discharge	25-Jul-10	Final Sample	Middle	554	Duplicate of 10WBW001-25	3065	26.2
10WBW001-35	Westbay Sampler	4-Aug-10	Final Sample	Top	548	n/a	3186	27.4
10WBW001-100	Westbay Port	19-Oct-10	Final Sample	Top	548	After leaving zone sitting for 2 months.	3189	27.4
10WBW001-106	Westbay Port	30-Oct-10	Final Sample	Top	548	After airlifting water from zone 6 (diff zone). Should be same as S100.	3192	27.5

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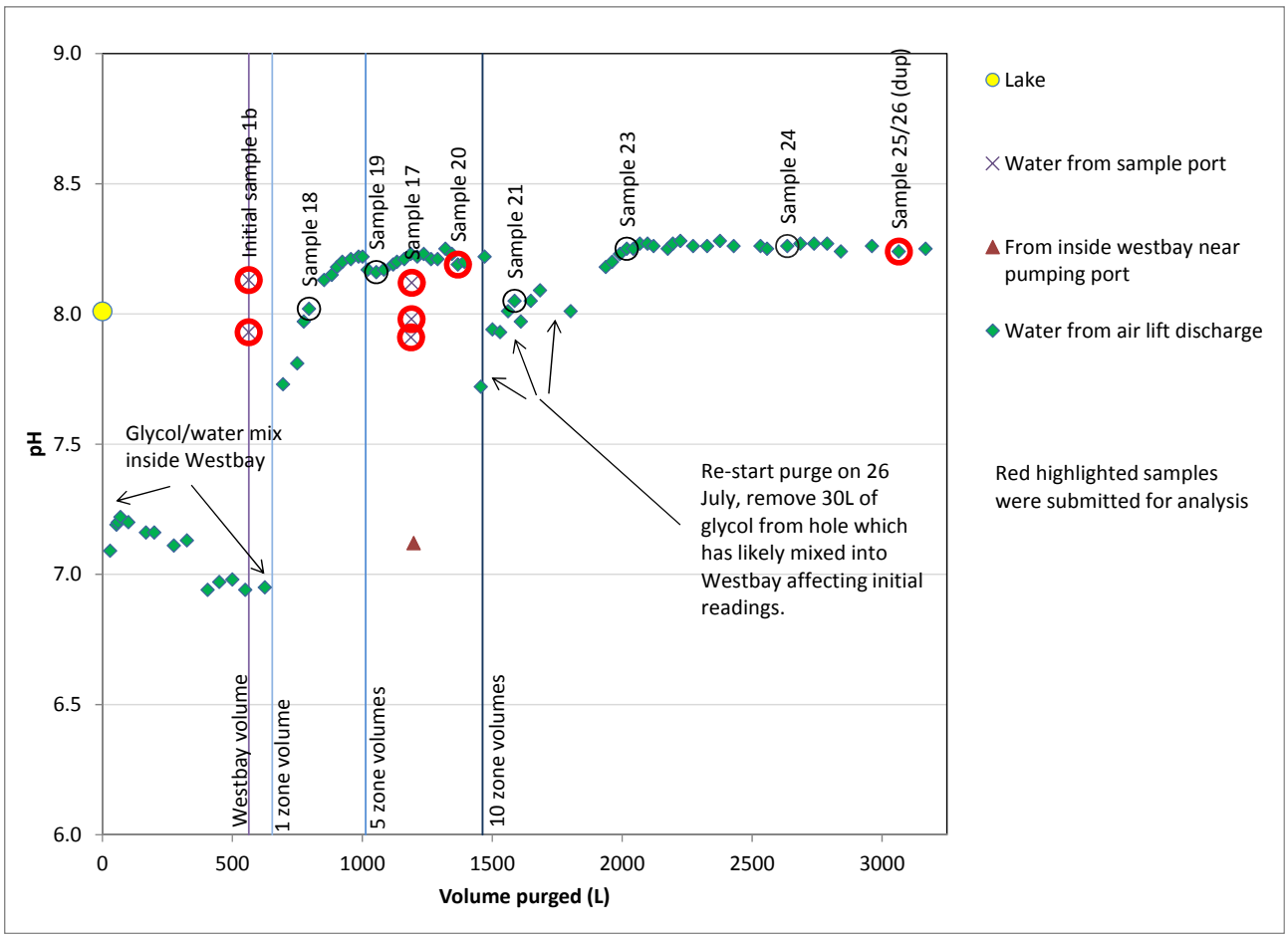

Figure 10: pH Trends during Development 10WBW001 Zone 1

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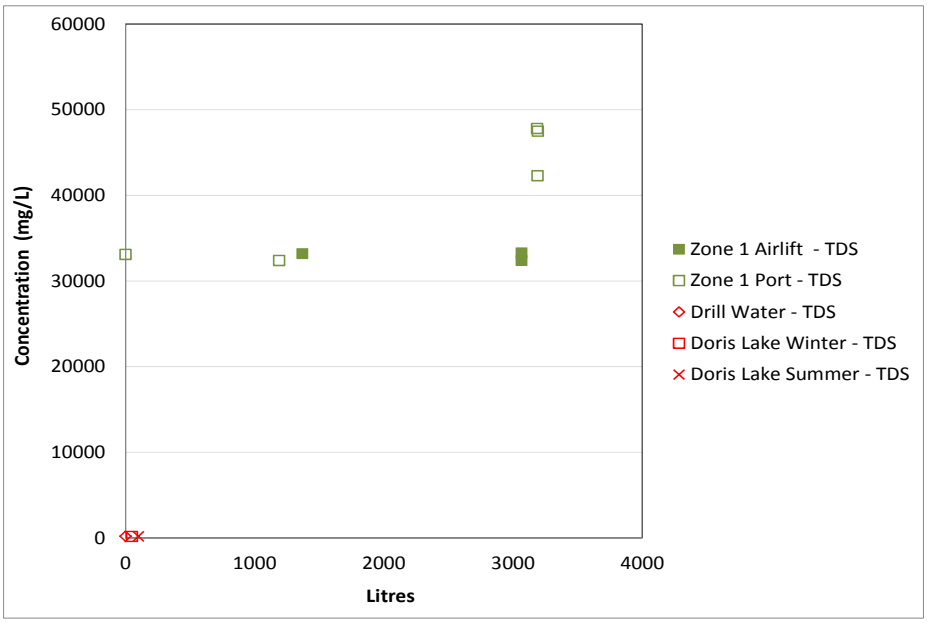

Figure 11: Concentration of Total Dissolved Solids during Development 10WBW001 Zone 1

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Zone 6

Zone 6 was initially developed using the airlifting method at an average rate of 15.4 L/minute. For the July-August 2010 development effort, 8,096L or 46.6 times the zone volume of 168L was removed from the zone. In October 2010 we revisited the site to take additional water for two bulk samples from this zone. The pumping rates achieved were 20.7 L/min and 21.4 L/min respectively. After the second and third stages of airlifting, the total removed from Zone 6 was 13,592L or 79.3 times the zone volume.

During the initial development, pH and EC were monitored from the airlift discharge; however, EC readings were mostly above the 20 mS/cm limit of the field probe. Figure 12 below shows the field pH readings. Initially the fluid inside the Westbay was a mix of glycol and lake water and the early part of the graph shows that mix being removed by the airlift process before the groundwater with a higher pH is observed. Interestingly, the pH appears to drop over the development process and be close to stable after around 6000 L. It is possible that the apparent drop in pH is just calibration drift over the course of the day. The port sample at the end of the development (Sample 36 in Figure 12) was taken a number of days after the actual development; the significant jump in apparent pH could also be attributed to pH meter calibration.

In October 2010 when the bulk samples were being taken, a Horiba Multi-Parameter Probe with the ability to monitor pH, dissolved oxygen (DO), turbidity, electrical conductivity (EC), total dissolved solids (TDS), and salinity (calculated based on EC) was used to measure field parameters. During airlifting, the initial 273 L of water discharged at the surface was the internal Westbay glycol water. The figures in Appendix K show the field parameters of water developed before the bulk sample was taken. Additional data obtained during the second bulk sample development showed a similar pattern.

Table 7 below summarises all of the samples that were analysed for Zone 6, and how they were collected. Figure 13 shows the changes in concentration of total dissolved solids (TDS) during development for Zone 6. The graph shows that the initial port sample, before any development of drilling water took place, is much more concentrated than the drilling water. This suggests the zone has naturally undergone some development in the months between when it was drilled (April) and when it was first sampled (July). The concentration of TDS varies throughout the development, between 19,000 and 39,000 mg/L, indicating some variability in the different sampling methods (airlift vs. port samples), lab analysis methods (water vs. seawater analysis). However TDS concentrations are generally still increasing over time and with additional development.

Graphs showing Zone 6 trends for pH, conductivity, dissolved magnesium, chloride, dissolved calcium, sulphate, dissolved sodium and total barium are provided in Appendix M (Figures M.4 through M.6). Concentrations for each of these parameters except total barium followed a similar pattern to TDS, showing variability throughout the development, but still increasing slightly, although all at much higher concentrations than the drilling water samples. The graphs in show that all parameters are close to being stable, but are not fully stabilized. Barium, along with other metals, showed some difference in concentrations between airlift and port samples, making any overall concentration trends difficult to determine.

As mentioned previously, after the July-August 2010 development process we returned to the site in October and obtained two additional port samples from Zone 6. Two bulk samples were also obtained from this zone using the airlift method after the first discrete sample and prior to the second

discrete sample, and in doing so, additional water was developed from Zone 6 between collecting the two discrete samples. As the zone had already been developed (July-August 2010), the concentrations of all three discrete samples (one in August and two in October) were expected to be similar. A comparison of the variability of the discrete samples is provided in Table N1 in Appendix N. The findings were:

- The final August discrete sample (sample 36) was considerably less concentrated than a sample taken from the same zone 2.5 months later (sample 101), after no activity had occurred on site. The major ions were typically 30-40% higher in the second sample, even though both used the same sampling method and lab analysis method.
- The two samples taken in October, either side of the bulk sampling development process (samples 101 and 108) were quite similar. The major ion concentrations all had a RPD of less than 20%, and only a few trace metals at low concentrations exceeded this RPD.

This, combined with the other sample results, indicate that either:

a) Even after development 79 zone volumes, some fresh drilling water is present and the percentage of saline formation water in the zone is still increasing; or
b) There is a considerable variability in natural concentrations, some of which may be induced by the pumping and drawing in groundwater from locations further from the well.

Substantial volumes have been developed and the high K rock in the zone is also providing some natural flushing. However, during drilling, return water was lost when drilling through this zone, so it is likely that thousands of litres of lake water (no brine used in this drill hole) were pumped into the area. Therefore, it is difficult to conclude the cause of the variation in sampling results.

We do not recommend further time is spent developing. Instead, we suggest ongoing monitoring over time to observe the trends from additional natural flushing of the zone and the natural variability. We currently consider the samples from 10WBW001-36 and onwards (after 8,096L had been removed) are likely representative of the range of concentrations expected in natural formation water; although, we consider it likely that the high end of the range may increase with additional natural flushing over time. Going forward, samples collected from the zone with no further development are expected to be representative of formation water at this depth, due to natural flushing of the zone with regional groundwater movement (lateral flow), rather than radial and possible vertical flow that occurs during development. These data will be reviewed following the 2011 sampling rounds, and discussed in the 2011 Westbay program data report.

Table 8: Samples Taken from Westbay Well 10WBW001 Zone 6 in 2010

Field Sample ID	Sample From	Date	Sample Development Status	Location of Port in Zone	Zone Port Drillhole Depth (m)	Sample Comments	Cumulative Total Developed from Zone before Sample was Taken (L)	Zone Volumes Developed before Sample was Taken (L)
10WBW001-02b	Westbay Port	9-Jul-10	Initial sample	Top	246		0	0.0
10WBW001-28	Airlift discharge	26-Jul-10	Development sample	Bottom	274		516	1.4
10WBW001-31	Airlift discharge	27-Jul-10	Development sample	Bottom	274		1515	7.4
10WBW001-33	Airlift discharge	27-Jul-10	Final Sample	Bottom	274		6433	36.7
10WBW001-36	Westbay Port	5-Aug-10	Final Sample	Top	246		8096	46.6
10WBW001-101	Westbay Port	19-Oct-10	Final Sample	Top	246	After leaving zone sitting for 2 months	8099	46.6
10WBW001-103	Airlift discharge	25-Oct-10	Final Sample	Bottom	274	Part of 160L toxicity sample.	10639	61.7
10WBW001-107	Airlift discharge	30-Oct-10	Final Sample	Bottom	274	Part of airlifting water from zone 6 for 80L bulk sample	13589	79.3
10WBW001-108	Westbay Port	1-Nov-10	Final Sample	Top	246	After airlifting water from zone 6.	13592	79.3

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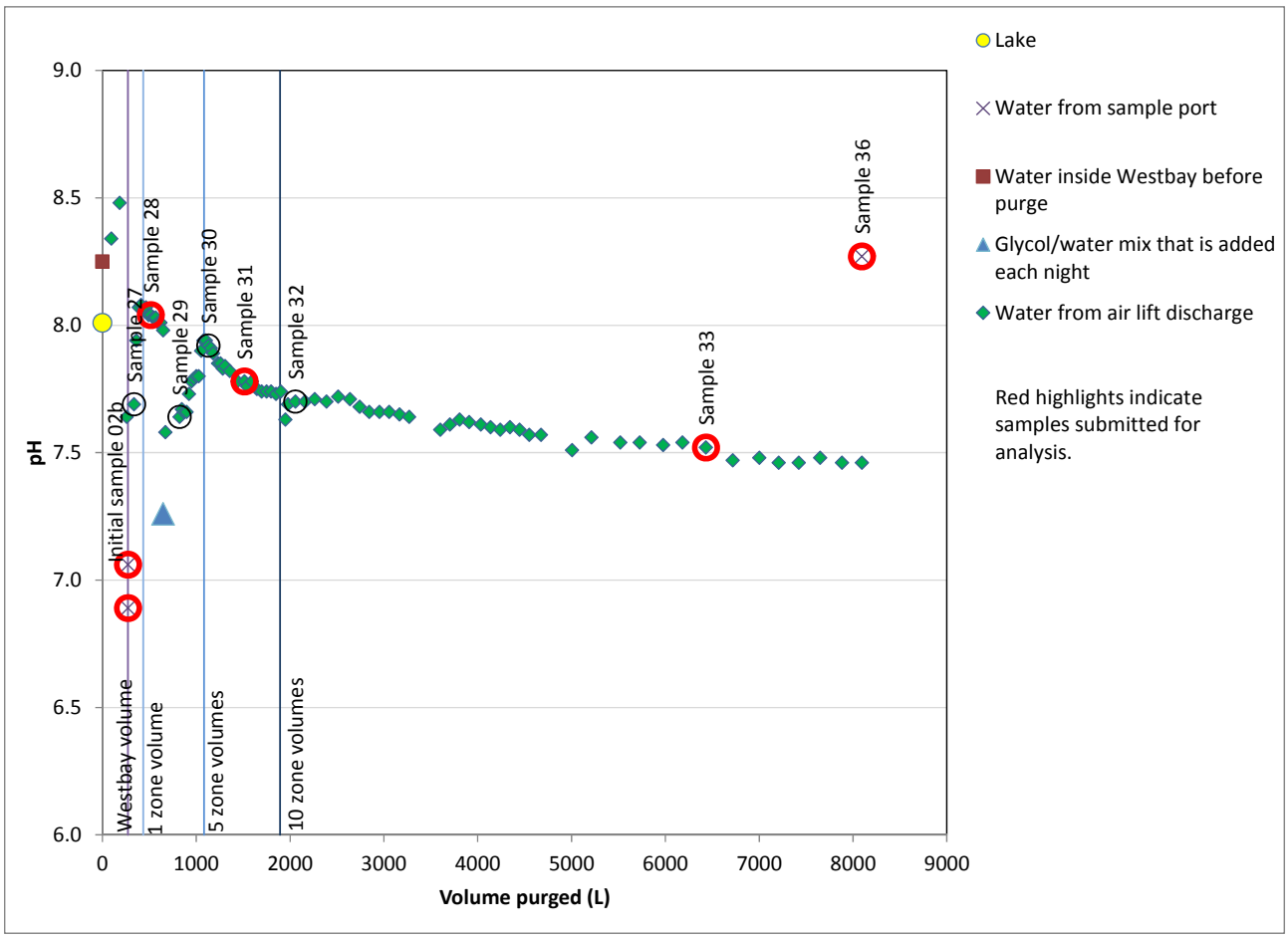

Figure 12: pH Trends during Initial Development (July-August 2010) 10WBW001 Zone 6

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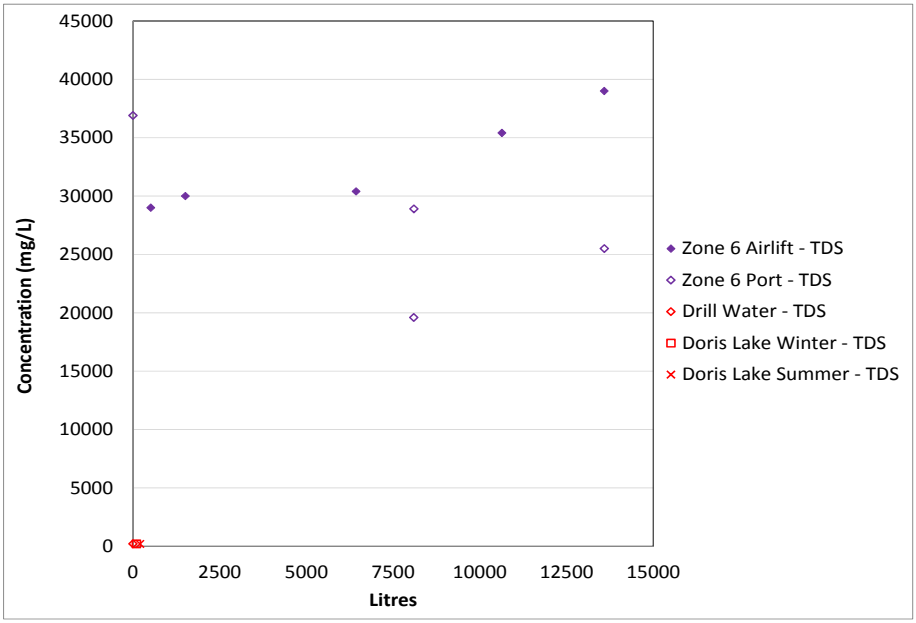

Figure 13: Concentration of Total Dissolved Solids during Development 10WBW001 Zone 6

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Zone 10

Zone 10 was developed in July-August using the airlifting method at an average rate of 3.2 L/minute. A total of 3,014 L or 11 times the zone volume of 264 L was removed from the zone. During development, pH and EC were monitored from the airlift discharge; however, EC readings were mostly above the 20 mS/cm limit of the field probe. Figure 14 below shows the field pH readings. The pH appears to drop over the development process as the higher pH lake water is removed and replaced with formation water. The pH appears to still be dropping after 11 zone volumes have been removed, although it is possible that the drop in pH is just calibration drift over the course of the day. It is difficult to conclude that the zone has been fully developed using only the pH data, therefore we reviewed additional parameters from the samples submitted for lab analysis. Table 9 below summarises the samples that were analysed and how they were collected. Note that sample 12 is likely contaminated with glycol water from inside the Westbay and should be treated with some suspicion.

Figure 15 shows the changes in concentration of total dissolved solids (TDS) during development for Zone 10. The graph shows that even the initial discrete sample, before any development of drilling water took place, is much more concentrated than the drilling water. This indicates that the zone has naturally undergone some development due to regional groundwater movement in the months between when it was drilled (April) and when it was first sampled (July). The intermediate development volume samples slowly increased in concentration as the drilling water was removed. The concentrations increased through the final samples collected, although the amount of increase was within the range of measurement error and natural variability.

Graphs showing trends for pH, conductivity, dissolved magnesium, chloride, dissolved calcium, sulphate, dissolved sodium, and total barium are provided in Appendix M (Figures M.7 through M.9). Concentrations for each of these parameters, except barium, followed a similar pattern to TDS; slowly increasing over the course of the development, with some variability in the final samples collected using sampler, but all significantly higher concentrations than the drilling water samples. Barium, along with other metals, showed some difference in concentrations between airlift and discrete samples, making any overall concentration trends difficult to determine. We consider Zone 10 to be sufficiently developed and samples from 10WBW001-37 and onwards (after 3,008L had been removed) are likely representative of natural formation water.

As mentioned earlier, after the development process, we returned to the site in October 2010 and obtained two additional discrete samples from Zone 10. No additional development occurred between the three ‘final’ samples (one in August and two in October), therefore the concentrations were expected to be similar. A comparison of the repeatability of the samples is provided in Table N1 of Appendix N. The findings were:

- The final August discrete sample (sample 37) was very similar to a sample taken from the same zone 2.5 months later (sample 102), after no activity had occurred on site. The major ion concentrations all had a relative percent difference of less than 20%, and only a few trace metals at low concentrations exceeded this RPD.
- The two samples taken in October (samples 102 and 105) were considerably different, even though there had been no activity within the zone and the samples were taken only 9 days apart using the same sampling method and lab analysis method. The major ions were typically 25-50% higher in the second sample, and many trace metals had considerably higher RPDs

than this. It is unknown why the second sample is considerably more concentrated, it is unlikely that the groundwater concentrations changed in that time, but more conceivably a lab or sample handling induced error. Given this uncertainty, the range of results obtained from Zone 10 should be used in assessments going forward, until further data is available.

Table 9: 10WBW001: Zone 10 Samples (2010)

Field Sample ID	Sample From	Date	Sample Development Status	Location of Port in Zone	Zone Port Drillhole Depth (m)	Sample Comments	Cumulative Total Developed from Zone before Sample was Taken (L)	Zone Volumes Developed before Sample was Taken
10WBW001-03b	Westbay Port	9-Jul-10	Initial sample	Top	63.5	Duplicate of 10WBW001-04b	0	0.0
10WBW001-04b	Westbay Port	9-Jul-10	Initial sample	Top	63.5	Duplicate of 10WBW001-03b	2	0.3
10WBW001-12	Airlift discharge	20-Jul-10	Development sample	Bottom	107.5	Isotope sample stopped	849	2.8
10WBW001-14	Airlift discharge	20-Jul-10	Development sample	Bottom	107.5	n/a	2051	7.4
10WBW001-15	Airlift discharge	21-Jul-10	Development sample	Bottom	107.5	Duplicate of 10WBW001-16	3008	11.0
10WBW001-16	Airlift discharge	21-Jul-10	Final Sample	Bottom	107.5	Duplicate of 10WBW001-15	3008	11.0
10WBW001-37	Westbay Port	5-Aug-10	Final Sample	Top	63.5	n/a	3008	11.0
10WBW001-102	Westbay Port	20-Oct-10	Final Sample	Top	63.5	After leaving zone sitting for 2 months	3011	11.0
10WBW001-105	Westbay Port	29-Oct-10	Final Sample	Top	63.5	After airlifting water from zone 6 (diff zone). Should be same as S102	3014	11.0

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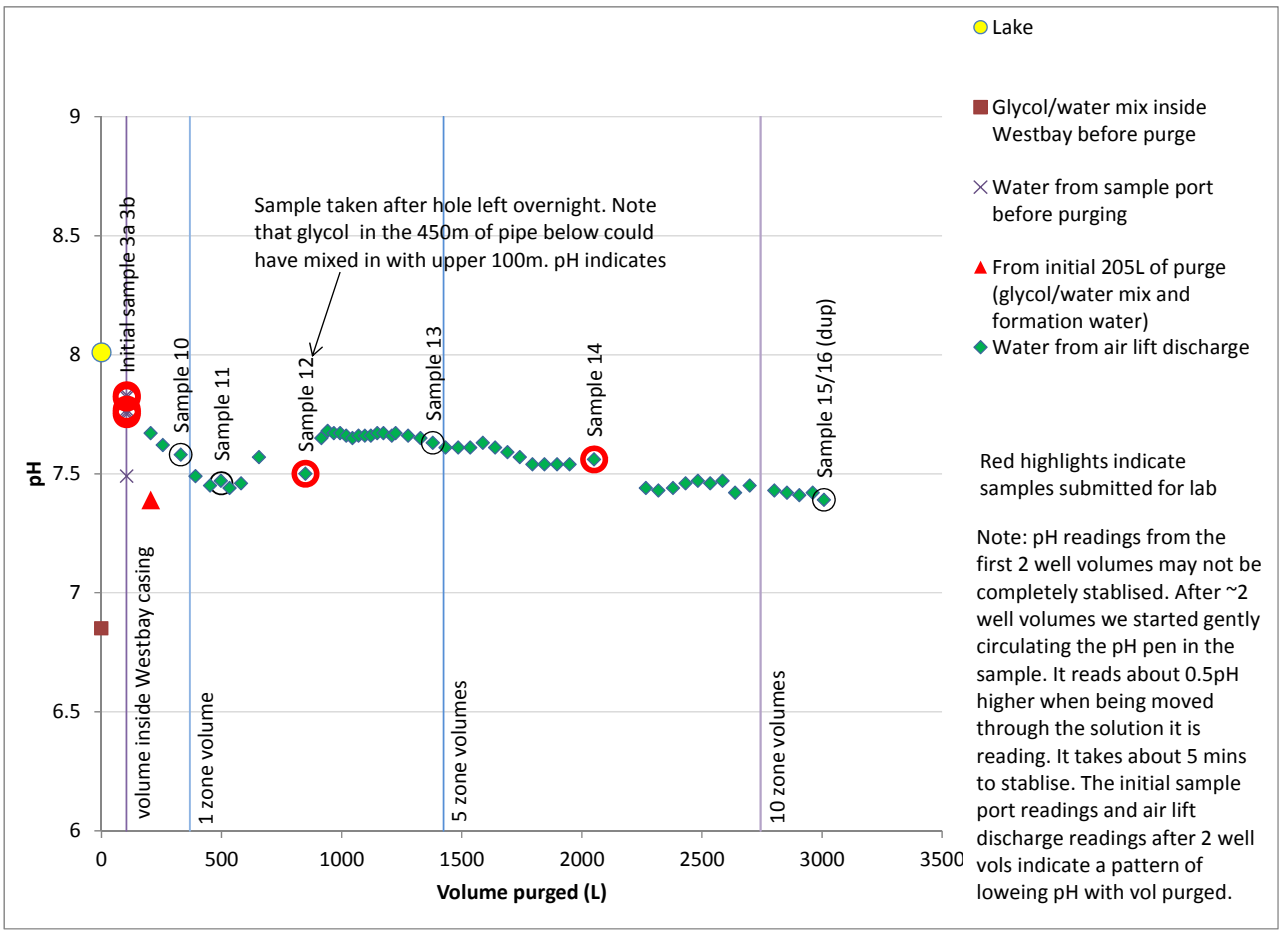

Figure 14: pH Trends during Development 10WBW001 Zone 10

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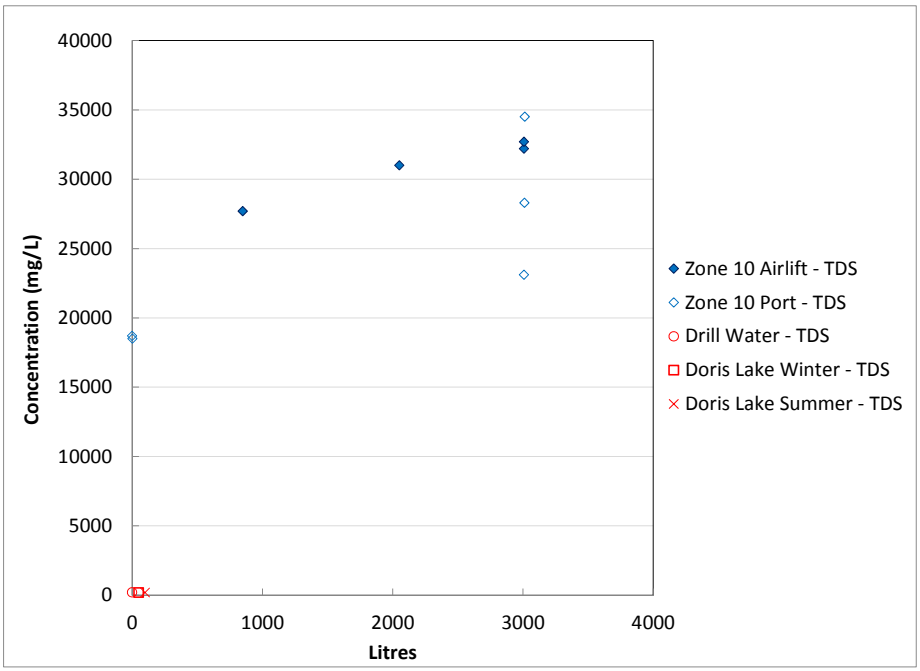

Figure 15: Concentration of Total Dissolved Solids during Development 10WBW001 Zone 10

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5.2.7 Groundwater Chemistry

Table 10 presents the water quality data ranges for the three sampled zones at 10WBW001. Only water samples collected after development, from the Westbay port (as opposed to the airlift discharge), and using the HR-ICPMS (or 'seawater') analysis method are presented. All three zones are considered to be saline, with Zone 1 being a calcium, sodium, chloride rich water and Zones 6 and 10 being a sodium chloride rich water. Appendix L provides a table with all results for all developed, representative samples from Doris Central, including those collected by airlift.

Isotope samples were collected, but are not presented in this report since the full data set has yet to be analyzed and reported. This data and interpretation on water quality and development effectiveness will be included in the 2011 Westbay Program Data Report.

Table 10: Summary of Representative Groundwater Quality Results for 10WBW001

Parameter	Units	10WBW001-Zone 10	10WBW001-Zone 6	10WBW001-Zone 1
		(n=3)	(n=3)	(n=3)
pH	pH units	7.44 to 7.47	7.59 to 7.83	7.38 to 7.69
TDS	mg/L	23100 to 34500	19600 to 28900	42300 to 47800
Alkalinity, Total	mg/L	77.3 to 106	43.7 to 44.2	<2
Conductivity	uS/cm	30300 to 43300	24600 to 37000	46600 to 46900
Calcium	mg/L	1010 to 1560	749 to 1160	4960 to 4730
Magnesium	mg/L	849 to 1250	702 to 1080	70 to 64
Potassium	mg/L	160 to 249	117 to 172	39 to 40
Sodium	mg/L	5400 to 8700	4130 to 6810	6910 to 7290
Alkalinity, Bicarbonate	mg/L	77.3 to 106	44.2 to 43.7	<2
Chloride	mg/L	11500 to 16500	9130 to 14200	18400 to 19000
Sulphate	mg/L	1160 to 1580	940 to 1500	935 to 981
Bromide	mg/L	27.6 to 41	21.2 to 41.3	100 to 101
Barium	mg/L	0.122 to 0.169	0.120 to 0.169	0.0526 to 0.053
Aluminum	mg/L	<0.005	<0.005	<0.005 to 0.005
Arsenic	mg/L	<0.002	<0.002	<0.002
Cadmium	mg/L	<0.00005	<0.00005	<0.00012 to 0.000097
Chromium	mg/L	<0.0001	<0.001 to <0.0001	<0.001 to <0.0001
Cobalt	mg/L	0.000102 to 0.000187	0.000087 to 0.000091	<0.0005 to <0.00005
Copper	mg/L	<0.0005 to 0.00296	<0.0005	<0.001 to 0.00067
Iron	mg/L	2.68 to 8.94	0.06 to 0.503	<0.5 to <0.075
Lead	mg/L	<0.0003	<0.0003	<0.001 to <0.0003
Manganese	mg/L	1.04 to 1.69	0.53 to 0.94	0.69 to 0.725
Molybdenum	mg/L	0.0044 to 0.0259	0.0345 to 0.037	0.009 to 0.0128
Nickel	mg/L	<0.0005 to 0.0006	<0.0005 to 0.00158	<0.0005 to 0.00237
Selenium	mg/L	<0.002	<0.002	<0.002
Zinc	mg/L	0.0504 to 0.0851	0.02 to 0.0705	0.0897 to 0.137
All reported metal concentrations are dissolved.				

Source:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\ Table 10 Representative water quality for Doris Central.xlsx

5.3 10WBW002 Doris North

5.3.1 Geology

Hole 10WBW002 was located mostly in basalt with varying degrees of alteration. A major diabase unit was intersected between 190 and 280m along drill hole. Just above this zone was 8m of vuggy basalt. A section with quartz veining, part of the main Doris North ore body was located below the diabase between 291m and 293m along drill hole. A number of small (3m to 9m) diabase dykes were encountered at various depths.

A number of small faults were reported in the logs but these have not been reviewed in detail as they were all in the permafrost section and therefore not of significant interest from a hydrogeological perspective. Table 11 summarizes the key structural features listed in the logs.

Figure 16 below shows a cross section along the drill hole in relation to the modeled geology, also indicating the packer test results and the Westbay zones. Figure 17 shows the drill hole in plan view, in relation to the currently proposed mining areas.

Table 11: Faults, Rubble Zones and Major Lithological Contacts in 10WBW002

From (m)	To (m)	Length (m)	Comments	Source
7.55	7.60	0.05	Rubble zone	Geotech Log
7.69	7.75	0.06	Fault with 2cm gouge	Geotech Log
9.15	9.30	0.15	Rubble zone	Geotech Log
12.73	12.87	0.14	Rubble zone	Geotech Log
32.00	32.40	0.40	Rubble zone along foliation plane	Geotech Log
68.78	68.96	0.18	Rubble zone along foliation plane	Geotech Log
75.37	75.45	0.08	Fault	Geotech Log
156.34	156.44	0.10	Fault with 2cm gouge	Geotech Log
184.00	192.83	8.83	Vuggy section above diabase	Geology log
187.16	187.24	0.08	Fault	Geotech Log
192.83	192.83	0.00	Major diabase contact	Geology log
280.75	280.75	0.00	Major diabase contact	Geology log
298.00	298.10	0.10	Fault	Geology log
302.06	302.09	0.03	Fault	Geotech Log
303.16	303.25	0.09	Fault	Geotech Log
306.66	306.72	0.06	Rubble zone along foliation plane	Geotech Log
308.46	308.51	0.05	Fault	Geotech Log
314.64	314.93	0.29	Rubble zone	Geotech Log

Source: Y:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\ Table 11 Faults, rubble zones and major litho contacts in 10WBW002.xlsx

5.3.2 Drilling Conditions and Fluid

Due to permafrost conditions, this hole was drilled using brine.

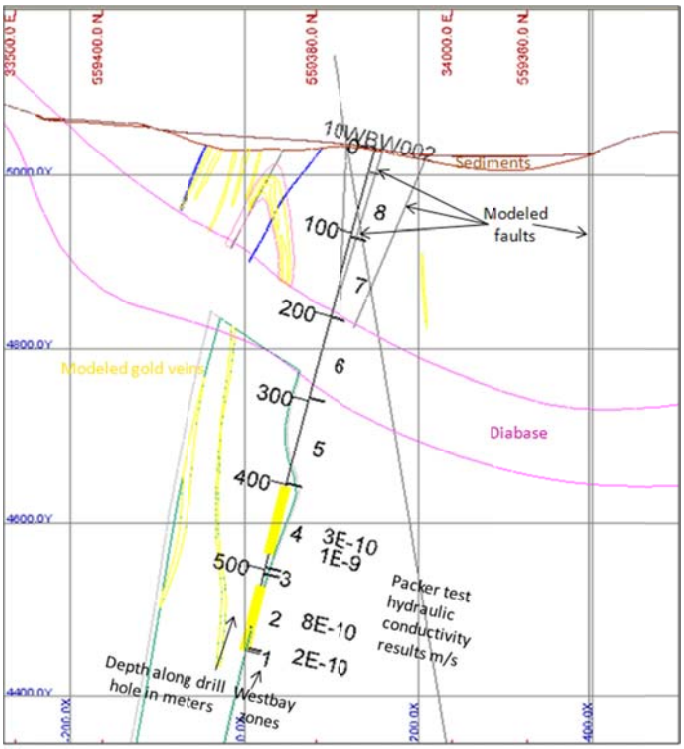

Figure 16: Cross Section along Drill Hole 10WBW002, Showing Modeled Geology (as of Dec 2010), Faults, Westbay Zones and the Packer Test Results

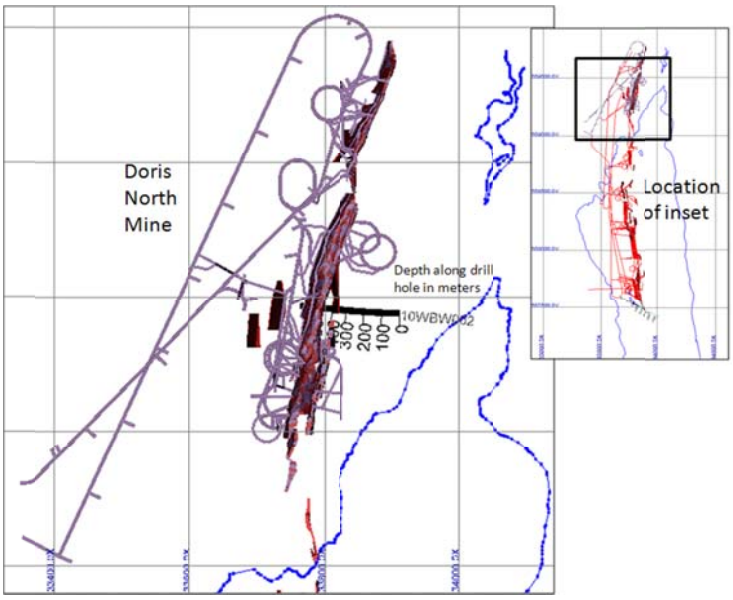

Figure 17: Plan View of Drill Hole 10WBW002, Showing Doris North Mine Plans (as of Dec 2010)

Figure sources:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\020_Project_Data\SRK\12_GEMS screenshots and figures\ 2011-01-21 Figures used in report.pptx

5.3.3 Packer Testing

Packer test results for 10WBW002 are presented in Table 12 and Figure 18 below. Appendix E provides core photos from packer test intervals which highlight what types of features are included in each text zone.

The packer testing in 10WBW002 showed very low hydraulic conductivities in the two tests completed in low fracture frequency basalt below the permafrost. Three other tests were completed in shallower sections that were possibly partially frozen as they were between the 0^{o}C and -2 ^{o}C isotherms. The interpretation of these results, in combination with data from previous field programs will be presented in the Stage 2 Doris Report later in 2011.

All injection tests were performed using brine water.

Table 12: Packer Test Results for 10WBW002

Test #	Along drill hole		Vertical depth			Test Zone Lithology	Hydraulic Conductivity (m/s)
	Test Zone Top (m)	Test Zone Bottom (m)	Test Zone Top (mbgs)	Test Zone Bottom (mbgs)	Test Zone Vertical Length (m)		
1	402.3	482	389.3	466.4	77.1	Basalt, foliated and unfoliated. Small diabase dyke. Very low fracture frequency. Possibly in permafrost	3E-10
2	447.3	482	432.9	466.4	33.6	Unfoliated basalt. Small diabase dyke. Very low fracture frequency. Possibly in permafrost.	1E-09
3	483.3	518	467.7	501.3	33.6	Basalt with small diabase dykes. Possibly in permafrost	No flow
4	519.3	569	502.5	550.6	48.1	Basalt, unfoliated. Low fracture frequency.	8E-10
5	570.3	602	551.9	582.6	30.7	Basalt, unfoliated. Low fracture frequency.	2E-10

Source:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\Table 12 Packer test results 10WBW002.xlsx

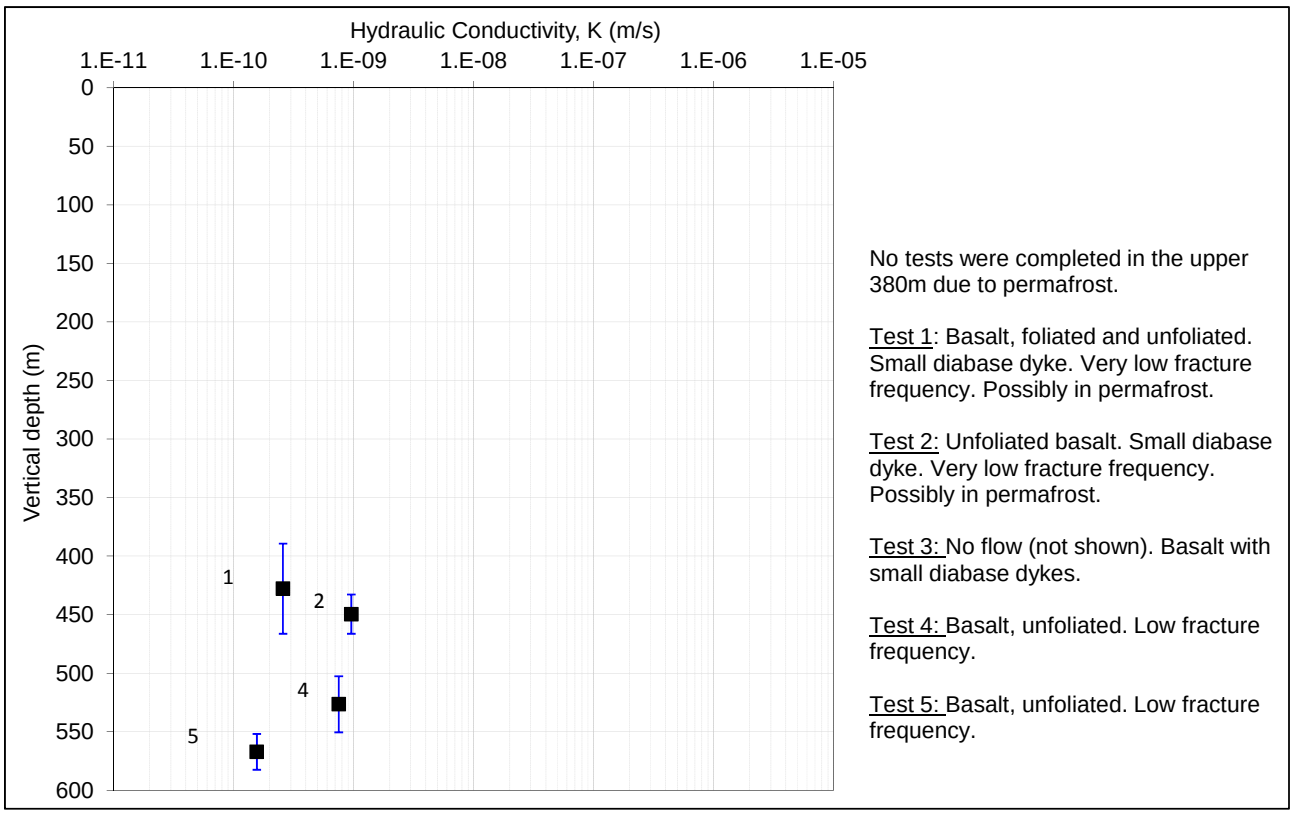

Figure 18: Packer Test Results for 10WBW002

Source:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\020_Project_Data\SRK\02_Hydraulic Conductivity and Inflow Estimates\01_Field data by drill hole\10WBW002_Packer Test Field Data\PackerTests_10WBW002_FINAL.xlsx

5.3.4 Westbay Design

The Doris North Westbay well was designed to provide pressure and temperature profiles throughout the permafrost in the vicinity of the Doris North mine, and to provide water quality data from below the permafrost, near the Doris Lower mine. The deepest Westbay zone (Zone 1) was designed to be short to allow for faster development and sampling. Table 13 below summarises zone depths for 10WBW002. The depths of the measurement ports within the zones are provided in Appendix H.

Table 13: 10WBW002 Westbay Monitoring Zone Depths

Hole ID	Zone	From	To	From	To	Sampled Zones Only	
		Down Hole Distance (m)	Down Hole Distance (m)	Vertical Distance (m)	Vertical Distance (m)	Length of Zone (m)	Volume of Zone Annulus between Westbay and Borehole (L)
10WBW002	8	27.5	103.7	26.5	100.0		
10WBW002	7	105.2	199.7	101.5	192.7		
10WBW002	6	201.2	295.7	194.1	285.4		
10WBW002	5	297.2	397.8	286.8	384.1		
10WBW002	4	399.3	496.9	385.6	480.3		
10WBW002	3	498.4	504.5	481.8	487.7		
10WBW002	2	506.0	592.9	489.2	573.6		
10WBW002	1	594.4	600.6	575.1	577.6	6.2	37

Table source: Y:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110113 Westbay Data Report\Tables\ Table 6 13 and 20 Westbay Zones.xlsx

5.3.5 Temperature Profile

Temperature profiles were completed during installation (both before and after packers were inflated, when the temperatures were likely affected by drilling) and on one other occasion when the temperatures had stabilised. Figure 19 below shows the temperature profiles from 10WBW002.

The first two readings were completed soon after drilling and the data is still stabilising. The stabilised profile from November 7, 2010, shows the 0°C isotherm at around 500m and the -2°C isotherm at 355m vertical depth below ground surface. The actual permafrost boundary is likely to be around -2°C, depending on the salinity of the groundwater in this area. The coldest permafrost temperature in the drill hole was -7.1°C, consistent with expected permafrost temperatures in this region, away from the active zone at the surface.

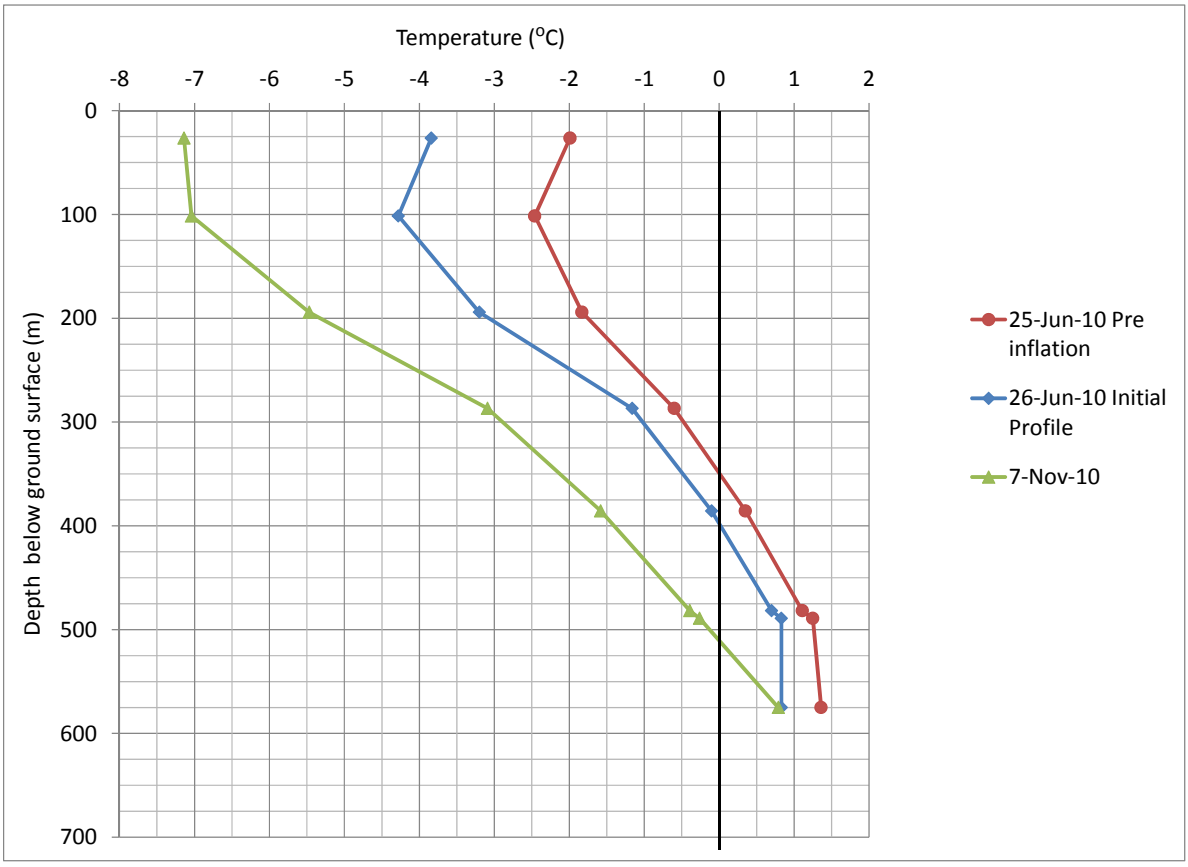

Figure 19: Temperature Profile for 10WBW002

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5.3.6 Pressure Profile

Pressure profiles were completed both pre- and post- packer inflation and on November 7, 2010, after the Westbay pressures had time to stabilize. Additional interim readings of certain zones of interest were also during the development process. Figure 20 shows the results from all profiles. All readings have been corrected for density using 1,170 kg/m^3 for all depths, based on the measured density of the final discrete water sample. For comparison, the initial discrete sample had a density of 1,130kg /m^3 and the Boston drilling brine had a density of 1,000 kg/m^3.

Extremely high pressures were observed in the permafrost section, to a depth of approximately 350m. This is likely due to re-freezing and expansion of drilling fluids that are trapped in the zones within permafrost. Due to concern for the Westbay casing integrity under such pressures, and in consultation with the manufacturer, SRK attempted to relieve the pressure in one of the zones. We landed on Zone 5, opened the valve and allowed the excess saline fluid to flow out. This reduced the pressure by the equivalent of about 30m of head in the highest pressure zone (see orange symbol on Figure 20). We did not have time to complete this process repeatedly at Zone 5 or at any other zones; however additional pressure relief in the high pressure permafrost zones is recommended for a future field visit.

The profile on November 7 shows generally a downward gradient in the zones below the permafrost (below approximately 350-400m), although given the low hydraulic conductivity of the rock, it is also possible that the zones were still recovering from installation and drilling pressures. Additional profiles should be completed to verify. When comparing the changes from pre inflation to post inflation, Zone 3 (around 480 below ground) appears to have recovered more quickly than Zone 1 (at the bottom- 578m below ground).

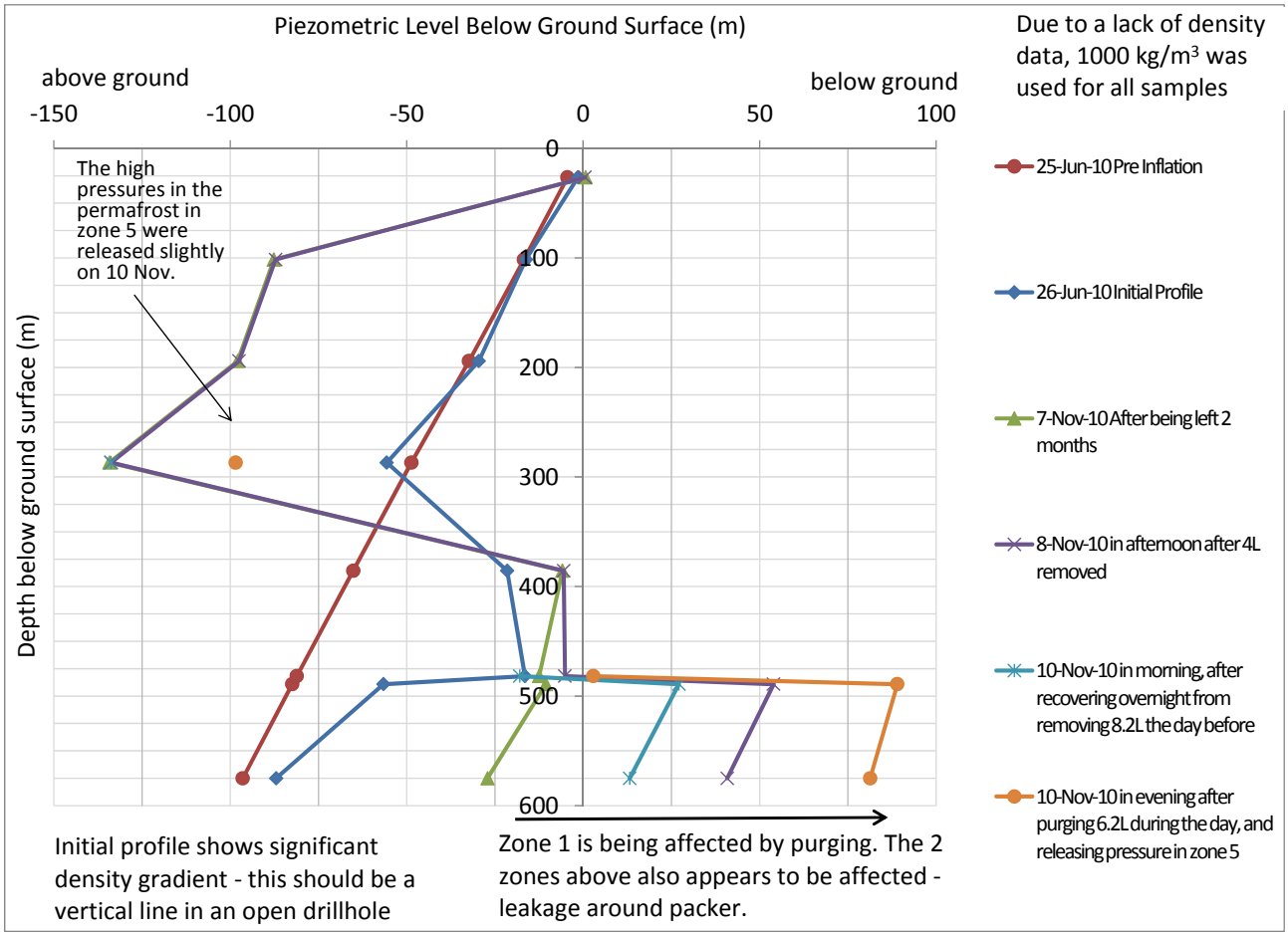

Figure 20: Pressure Profile for 10WBW002

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Zone 1 was targeted for development and sampling. Between the June 26 and November 7 profiles, 26L was removed from Zone 1 and the pressure in the zone dropped. Additional water was removed

between the multiple readings in November (see the figure key for details) and the pressure in the zone would drop considerably with each volume removed. Some recovery was noted between development days. Of particular note is that the pressures in the two adjacent zones above were also dropping, despite being over 100m shallower. This and other observations are discussed further in the next section.

5.3.7 Development to Remove Drilling Fluids

The Doris North Westbay is located in considerable depths of permafrost (~350-400m), therefore the Westbay sample bottle method was used for development the drilling water out of the targeted Zone 1. The development commenced soon after the installation in June 2010, when 26L were removed from Zone 1, representing 0.7% of one zone volume. Due to slow progress and time constraints in the summer, the development of Doris North was postponed and efforts focussed on the talik hole at Doris Central instead. In November 2010, SRK returned to Doris North, taking a sample for comparison with the water quality in the zone in June 2010, to determine how much, if any, natural development has taken place. SRK completed an additional nine days of development efforts, bringing the total developed volume to 52.1L, or 1.4 times the zone volume.

During development, after each removal of 1L from Zone 1, the pressure in the zone was not recovering. Within 10 to 30mins of each 1L sample being taken, the pressure was still 6 PSI to 140 PSI lower than before sampling, averaging around 40 PSI lower. During the day, the zone pressure would get lower and lower with each 1L removed. Overnight it would recover to within 10 to 20 PSI of the original pressure, but never fully recover within the time between sampling. This indicates that the rock within the zone is very low hydraulic conductivity, taking many hours to recover from removing only 1L from a 6m long zone.

The very slow recovery times placed the Westbay well system beyond its technical limits, as the packer separating Zone 1 from the zone above could only withstand a pressure difference of 75 PSI, and the measurement port valves can only withstand an internal to external pressure difference of approximately 100-150 PSI (varies by port). Pressure profiles in Figure 20 indicate that the pressure in Zones 2 and 3 above was dropping as water was removed from Zone 1, despite being over 100m shallower, indicating that much of the ‘recovery’ of Zone 1 was likely the drilling water in Zone 2 moving around the packer into Zone 1, or perhaps through interconnecting fractures, caused by the pressure difference from the slow Zone 1 recovery.

In addition, during the November development process some unusual observations were noted with the pressure changes *inside* the Westbay. The pressure inside the Westbay casing was dropping by an average of 1.3 PSI with each 1.1L of water removed from the zone. A 1.3 PSI pressure drop equates to 0.9L of fluid, indicating that water was being removed from the internal Westbay casing while attempting to sample water from Zone 1 with the probe landed at the measurement port. It was very important that this be resolved, as it brings into question the quality and source of the ‘sample’ being returned to the surface.

To investigate, SRK completed the following:

1. The probe actuator nut, shoe, face seal o-ring and plunger were all cleaned or replaced as applicable to ensure the sampler was in best possible working order. The problem still existed.
2. The probe face seal and bottle connection seals were tested by lowering the probe with four Westbay sample bottles attached to a similar depth to that of the Zone 1, landing in a ‘blank’

coupling, opening and then closing the valve. The system behaved as expected and no leaks in the sealed bottle system were detected.

3. The weight of the probe and sample bottles, combined with the drill hole angle and orientation of the measurement port valve were assessed to determine whether they were acting to lever the probe away from the measurement port valve enough to pry open a gap between the face seal and the port. This was done by lowering the probe with only one sample bottle attached and monitoring the pressure change after sampling 250mL from the zone. The internal pressure drop of 0.19 PSI was inconclusive (within the margin of measurement error), so this step was repeated 3 more times. Cumulatively, 4 runs taking 250mL had the same internal Westbay pressure change as one run of 1L, indicating that the weight of the sample bottles was not the issue.
4. The seal of the pumping port in the zone was tested. This port was lower than the measurement port, had never been opened, but after speaking with the manufacturer it was conceivable that it could have been forced open during installation. To ensure it was closed, we descended to the port with the appropriate probe configuration and executed the procedures for closing the port. The pressure dropping during sampling from Zone 1 continued, indicating that the pumping port was closed all along, as it should be.
5. The Westbay well internal water level was monitored while all ports were closed, to make sure there were no leaks anywhere else in the system. No leaks were detected.
6. A sample of the water inside the Westbay (glycol and lake water) was taken, and a sample was created by mixing 20% glycol with the water from the supply system at the camp (originating from the lake), to compare the water we are getting during sampling Zone 1 with what is inside the Westbay and what should be inside the Westbay. Given that the drilling water and formation water in the zone is saline and the water inside the Westbay is not, this should help diagnose the source of water being ‘developed’ from the Westbay.

The results, presented in the tables in Appendix L, show that the water being sampled from the zone was saline and had much higher concentrations of major ions than the internal Westbay well glycol/water. This affirms the water being sampled from the Zone 1 port by the Westbay probe is formation water or drilling water (discussed further below), and not glycol water, so the probe is acting as designed and is holding its seal against the port.

An additional finding was that the glycol water mix prepared at camp had lower concentrations of major ions than the internal Westbay water, indicating that the internal Westbay had some formation or drilling water flow into it. This is consistent with activities at site: During the trouble shooting phase at one point the probe was landed at Zone 1 and the valve opened with the internal water level depressed, to see if water would flow into the casing. A small amount did, and this can now be seen in the sample from inside the Westbay well casing.

After discussing the above trouble shooting steps and observations with the Westbay manufacturer, SRK hypothesise that the very low hydraulic conductivity (and therefore slow recovery) of Zone 1 is causing a pressure drop beyond that which the packer can withstand, which in turn is causing a pressure drop in Zone 2 above and an internal to external pressure differential greater than the 100-150 PSI that the measurement port is rated to. As a result, the Zone 2 measurement port valve is opening and allowing water to flow from the internal Westbay casing out into Zone 2 until the pressure gradient drops below 100-150 PSI. A similar pattern is observed to a lesser extent in Zone 3. This means that if water is removed repetitively over a scale of hours to days (as occurs

during development), and Zone 1 cannot recover between samples, a loop is created where the water developed from Zone 1 would eventually be the glycol water from inside the Westbay that is escaping into Zone 2. Unfortunately, this means that there is no way of development drilling water from Zone 1 other than allowing natural slow zone flushing over time. Isolated samples can still be taken from the zone, but continuous removal of multiple samples (i.e. development) is not recommended.

Table 14 summarizes the samples submitted for lab analysis. After spending 9 days working on development this zone, SRK moved on to work on Boston, while awaiting the lab results to assist with making a plan going forward.

Figure 21 to Figure 22 show the chloride and sodium concentrations trends during development Zone 1 of 10WBW002, compared with drilling brine concentrations. Additional graphs for pH, TDS, conductivity, dissolved calcium, dissolved magnesium and total barium are presented in Appendix M (Figures M.10 and M.11). Drilling water samples were not taken during the drilling of 10WBW002; however the hole was drilled with Doris Lake water and a calcium chloride drilling additive to prevent the rods from freezing in the permafrost. The same drilling additive was used with Spyder lake water at Boston where drilling brine samples were taken. The concentrations of major ions in the drilling water vary depending on when the drilling salts are added and when the sample is taken.

Chloride concentrations in Zone 1 of 10WBW002 were considerably higher than the drilling brine concentrations at Boston. They *increased* throughout the development process to 8-18 times the concentration of the Boston drilling brine. TDS was 9-18 times higher in the final Zone 1 samples than the Boston drilling brines. Electrical conductivity was 5 to 9 times higher in Zone 1 than the Boston drilling brines and increased during development. Calcium was also 9 to 17 times higher and fluctuated throughout the development process.

However, other parameters were not elevated at the same ratios as chloride, TDS, EC and calcium. For example, magnesium concentrations in Zone 1 were 1 to 6 times higher than the drilling brine, and fluctuated around 110-125 mg/L throughout the develop. Sodium varied considerably over the development process, with the final sample at around 1 to 8 times the concentration of the drilling brines.

Comparing data from Doris North to Doris Central shows that the chloride concentrations are seven times more concentrated than the highest natural groundwater results from the Doris Central samples. TDS were a factor of five times higher than those from Doris Central. Conductivity values were four times higher than those from Doris Central, calcium values were seventeen times higher and chloride was seven times higher.

Comparing data from Doris North to other Canadian Shield sites, as reported in Frape and Fritz (1987), shows that the waters have different compositions. The sodium and magnesium concentrations are lower at Doris North than the other Canadian Shield brines. Calcium is slightly higher at Doris North and chloride is within the high end of the range of reported concentrations at other sites. Given the different relative concentrations of these parameters, the water sampled in zone 1 of Doris North does not appear to be similar to other Canadian Shield brines.

The very high concentrations of all major ions in Zone 1 at Doris North could be a result of the following:

a) Significantly higher concentration drilling brines may have been used at Doris North. This would explain the high concentrations of some parameters, and the differences to reported concentrations at other Canadian Shield sites, but not the increasing concentrations, nor the differences in ratios between parameters;

b) The sub-permafrost groundwater has significantly higher concentrations of major ions than the talik water Doris Central; or

c) The drilling water in Zone 1 is slowly being replaced by the drilling water from Zone 2, which may be of a higher concentration if the drilling brines used when drilling that depth were more concentrated. Note that the data does not yet indicate any influence of glycol/water or more fresh water coming into Zone 1 through the measurement port losses into Zone 2 (see discussion above about hypothesized leakage around Zone 1 packer). As with theory ‘a’, this would explain the high concentrations of some parameters, but not the increasing concentrations, nor the differences in ratios between parameters.

The data obtained to date is inconclusive. Isotope data from this hole was not available at the time of report finalisation. As discussed previously, the low hydraulic conductivity and dropping pressures in Zone 1 means that no additional development can be completed in this zone. The recommended way forward for this zone is to continue to take groundwater samples with each sampling round and monitor water chemistry. Over very long time periods the zone will naturally flush itself. The 2011 Westbay Data Report will present the 2010 isotope data and additional 2011 sampling results, along with interpretation to determine the effectiveness of development to date and the deep sub-permafrost groundwater quality at Doris North on the source of the water.

An additional option is to attempt to develop Zone 3, a 6m long zone from 481 to 487m below ground vertically. Although it is around the zero degree isotherm, the pressure and water quality data indicate that it is likely unfrozen. The packer testing from 467-501m found no flow in this zone, so it will likely be unsuccessful, but if we monitor the pressure as we remove water from the zone during a single sampling round we will be able to quickly determine if it is recovering or responding in a similar manner to Zone 1.

Table 14: Samples Taken from Westbay Well 10WBW002 Zone 1 in 2010

Field Sample ID	Sample From	Date	Sample Development Status	Location of Port in Zone	Zone Port Drillhole Depth (m)	Sample Comments	Total Developed from Zone Before Sample was Taken (L)	Zone Volumes Developed Before Sample was Taken
10WBW002-01	Westbay Port	3-Jul-10	Initial sample	Top	594.4	n/a	0	0
10WBW002-02	Westbay Port	4-Jul-10	Development sample	Top	594.4	n/a	26	0.7
10WBW002-109a	Westbay Port	7-Nov-10	Development sample	Top	594.4	Total metals sampled twice - one was clear, one was rusty with sediment (unsure which is which)	27.1	0.7
10WBW002-109b	Westbay Port	8-Nov-10	Development sample	Top	594.4	Total metals sampled twice - one was clear, one was rusty with sediment (unsure which is which)	27.1	0.7
10WBW002-120	Other	12-Nov-10	Other	n/a	594.4	Sample of water INSIDE Westbay using regular WB sampler probe near zone 1 depth, for comparison with what we are getting outside.	n/a	n/a
10WBW002-121	Westbay Port	13-Nov-10	Development sample	Top	594.4	At end of Nov development process	52.1	1.4
10WBW002-122	Other	14-Nov-11	Other	n/a	n/a	A mix from glycol & lake water prepared at camp (from site ST-7), created to compare with what is inside the Westbay	n/a	n/a

Source: \01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\ Table 14 Samples Taken from 10WBW002 zone 1.xlsx

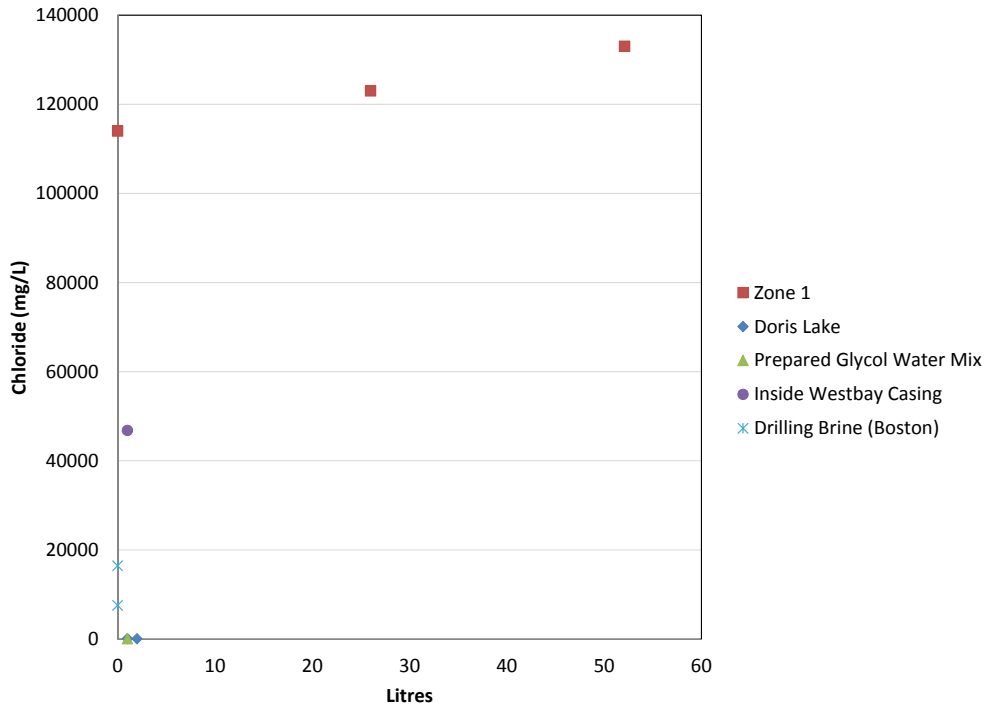

Figure 21: Concentration of Chloride during Development 10WBW002 Zone 1

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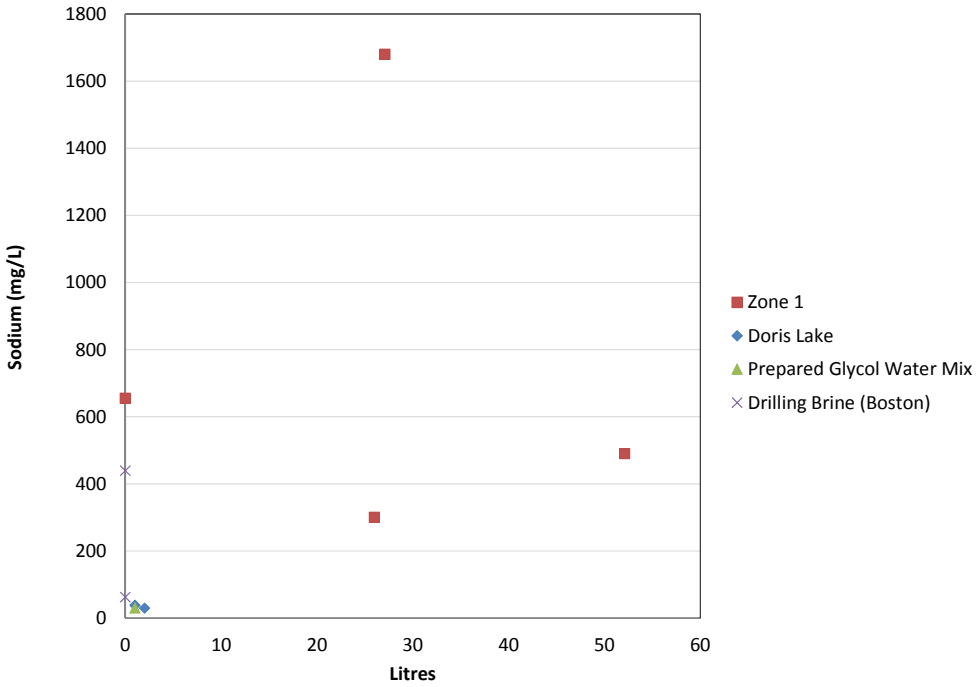

Figure 22: Concentration of Sodium during Development 10WBW002 Zone 1

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Table 15: Variations in the Ratios and Concentrations of Parameters in Doris North Development Samples and Drilling Brines

Parameter	Units	10WBW002-Zone 1-Port Initial-S01	10WBW002-Zone 1-Port Develop-S02	10WBW002-Zone 1-Port Develop-S109a	10WBW002-Zone 1-Port Develop-S121	10WBW004 - Drill Tank Beginning	10WBW004 - Drill Tank End	Ratio of Final Development Sample to Drill Tank Sample Initial	Ratio of Final Development Sample to Drill Tank Sample End
Conductivity (EC)	uS/cm	160000	182000		182000	39600	19800	4.6	9.2
Hardness (as $CaCO_3$)	mg/L	180000	200000	187000	183000	21100	10900	8.7	16.8
Total Dissolved Solids	mg/L	250000	225000		223000	26000	12400	8.6	18.0
Alkalinity, Total (as $CaCO_3$)	mg/L	56.0	59.5		59.0	41.9	13.0	1.4	4.5
Chloride (Cl)	mg/L	114000	123000		133000	16400	7530	8.1	17.7
Sulfate (SO^4)	mg/L	<100	<100		<2500	50	5.28		
Calcium (Ca)-Dissolved	mg/L	72100	79800	74700	73100	8320	4330	8.8	16.9
Magnesium (Mg)-Dissolved	mg/L	113	124	110	113	84.7	18.7	1.3	6.0
Potassium (K)-Dissolved	mg/L	39	52	<200	<200	83.0	12.6		
Sodium (Na)-Dissolved	mg/L	655	300	1680	490	439	62.7	1.1	7.8

Source: Y:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\Table 15 Doris North comparison of develop samples and drill water.xlsx

5.4 10WBW003 Patch 14

5.4.1 Geology

The hole encountered intermediate pillow basalts to a depth of 211m along drill hole and then a large, pink, strongly sheared porphyry. The porphyry was followed by a sequence of strongly sheared basalt flows and porphyry. The shearing could be an extension of the Madrid deformation zone.

HBML informs that there are currently no major faults modeled or thought to be present in the Patch 14 area; however a number of minor features were noted in both the geotechnical and geology logs. Table 16 below summarizes these. Notable features included faults at 207m at 387m down hole.

Table 16: Faults and rubble zones in 10WBW003

From (m)	To (m)	Length (m)	Comments	Source
187.83	187.90	0.07	Gouge	Geotech Log
207.70	207.78	0.08	Hard clay gouge	Geotech Log
207.7	207.78	0.08	Strong strain, fault breccia	Geology Log
249.75	249.87	0.12	Hard clay gouge	Geotech Log
251.07	251.13	0.06	Gouge and rubble zone	Geotech Log
262.95	263.16	0.21	Rubble zone	Geotech Log
266.11	266.20	0.09	Rubble zone	Geotech Log
387.74	387.86	0.12	Fault with gouge	Geotech Log
387.74	387.87	0.13	Very strong strain, fault	Geology Log
402.24	402.35	0.11	Hard clay gouge	Geotech Log
471.00	471.13	0.13	Jointed	Geotech Log
500.54	500.66	0.12	Open cemented joint	Geotech Log
500.72	500.76	0.04	Jointed	Geotech Log

Source: Y:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\Table 16 Faults, rubble zones and major litho contacts in 10WBW003.xlsx

5.4.2 Packer Testing

Packer test results for 10WBW003 are presented in Table 17 and Figure 23 to Figure 26 below. A cross section along the drill hole and a plan view, both showing the packer test results spatially, are provided in Figure 24 and Figure 25. All results demonstrated low hydraulic conductivity, below the limit of the packer testing system, with many tests reporting higher leakages than actual flow into the formation. The upper 100m was expected to be within permafrost, but below this depth the drill hole was in the talik under Patch Lake. The highest packer test result was 5 x 10-9 m/s, indicating low hydraulic conductivity rock. This is the first drill hole to conduct hydraulic testing in the Patch 14 and Wolverine deposits, so further testing is needed to determine the spatial variability of hydraulic conductivity.

Table 17: Packer Test Results for 10WBW003

Test #	Along Drill Hole		Vertical Depth			Test Zone Lithology	Hydraulic Conductivity (m/s)
	Test Zone Top (m)	Test Zone Bottom (m)	Test Zone Top (mbgs)	Test Zone Bottom (mbgs)	Test Zone Vertical Length (m)		
1	96.4	173.2	88.9	159.7	70.8	Unstrained volcanics. Permafrost at top of interval.	4E-09
2	171.4	248.2	158.1	228.9	70.8	Weakly strained, complex metavolcanics. Overall competent rock.	5E-09
3	246.4	293.2	227.2	270.4	43.2	Widely intercalated felsic and mafic metavolcanics. Increasing strain. Very low / no flow despite broken zones and faults. Pre-plug blowout flows exceeded injection test flows.	2E-11
4	291.4	392.2	268.7	361.7	93.0	Widely intercalated highly strained felsic and mafic metavolcanics. Some qtz/carbonate veining, some veins brecciated. Increasing straing. Otherwise competent rock. Pre-plug blowout flows exceeded injection test flows.	6E-11
5	393.4	458.2	362.8	422.6	59.8	Widely intercalated highly strained felsic and mafic metavolcanics. Permeability consistent with observations.	3E-09
6	456.4	500.2	420.9	461.3	40.4	Continuation of metavolcanics. Permeability could be significantly less than shown. Pre-test leakage exceeded injection test flows.	7E-10
7	498.4	548.2	459.7	505.6	45.9	Mafic metavolcancis and carbonate/qtz veinings. Low fracture count. Pre-plug blowout flows exceeded injection test fows.	1E-09

Source: Y:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\Table 17 Packer test results 10WBW003.xlsx

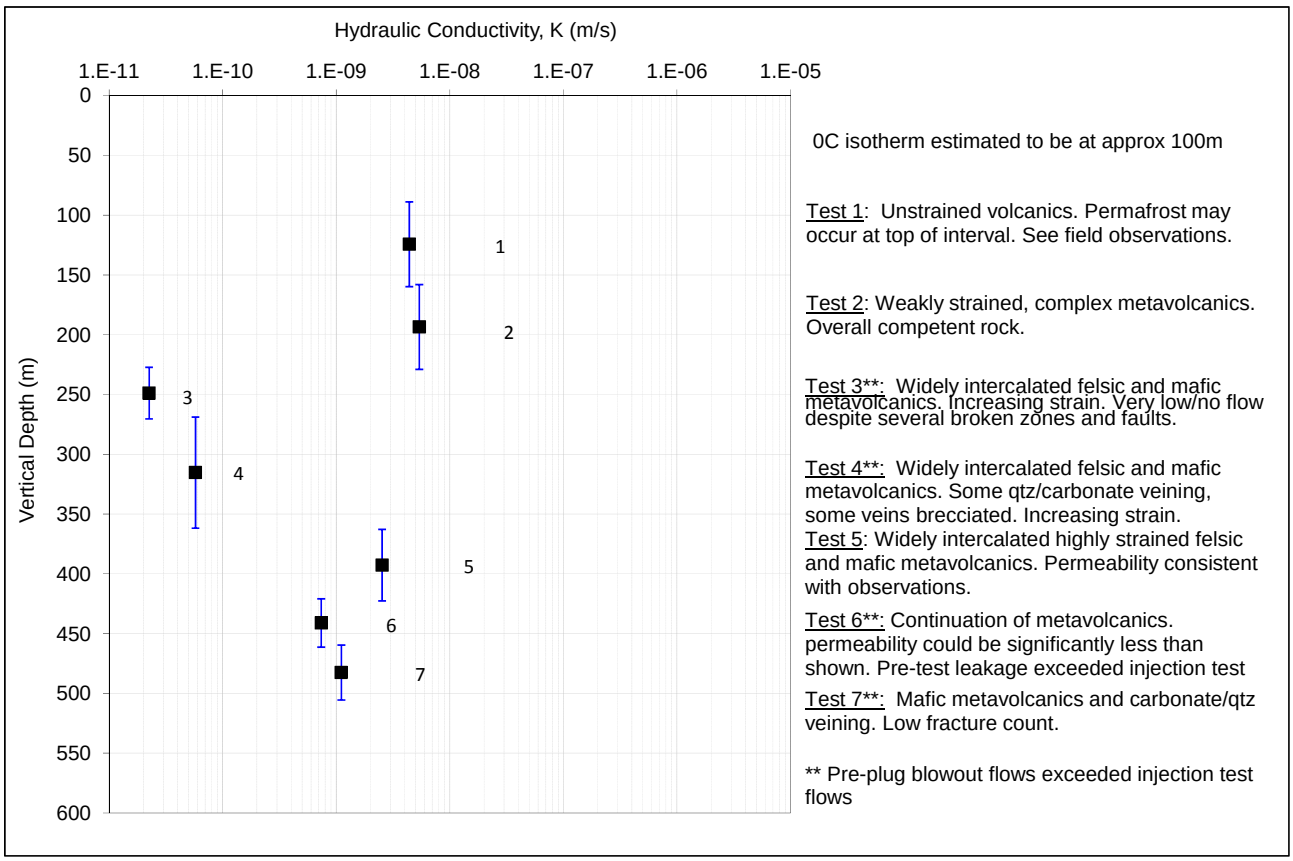

Figure 23: Packer Test Results for Drill Hole 10WBW003

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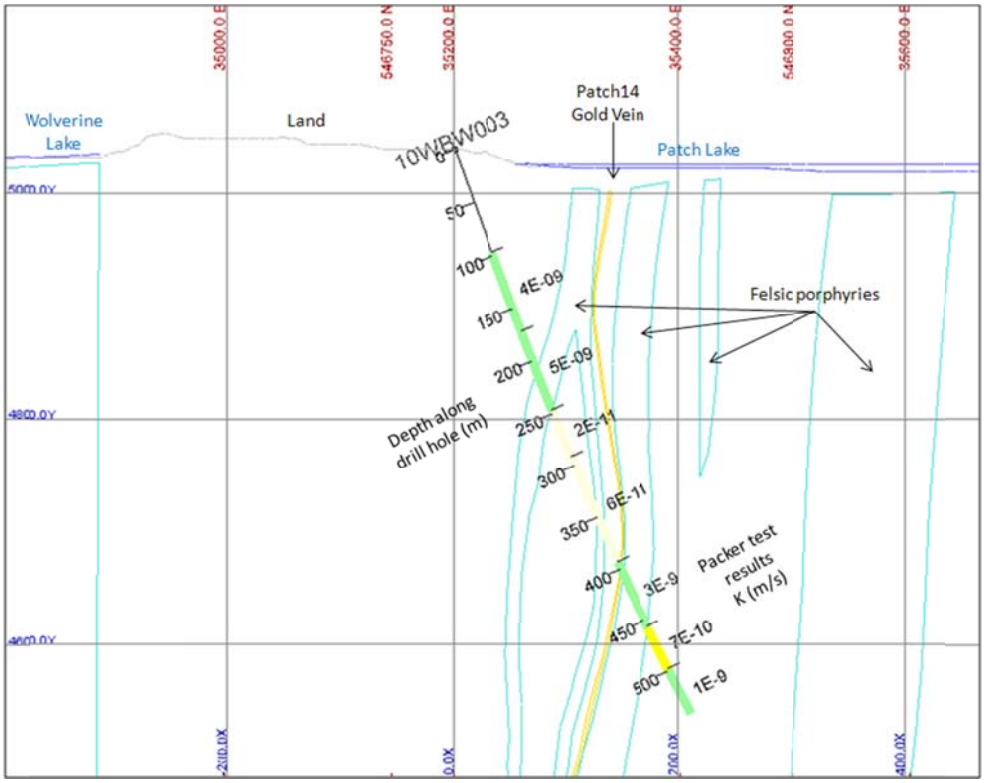

Figure 24: Cross Section through Drill Hole 10WBW003 Showing Packer Test Results and Geology

Sources:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\020_Project_Data\SRK\12_GEMS screenshots and figures\ 2011-01-21 Figures used in report.pptx

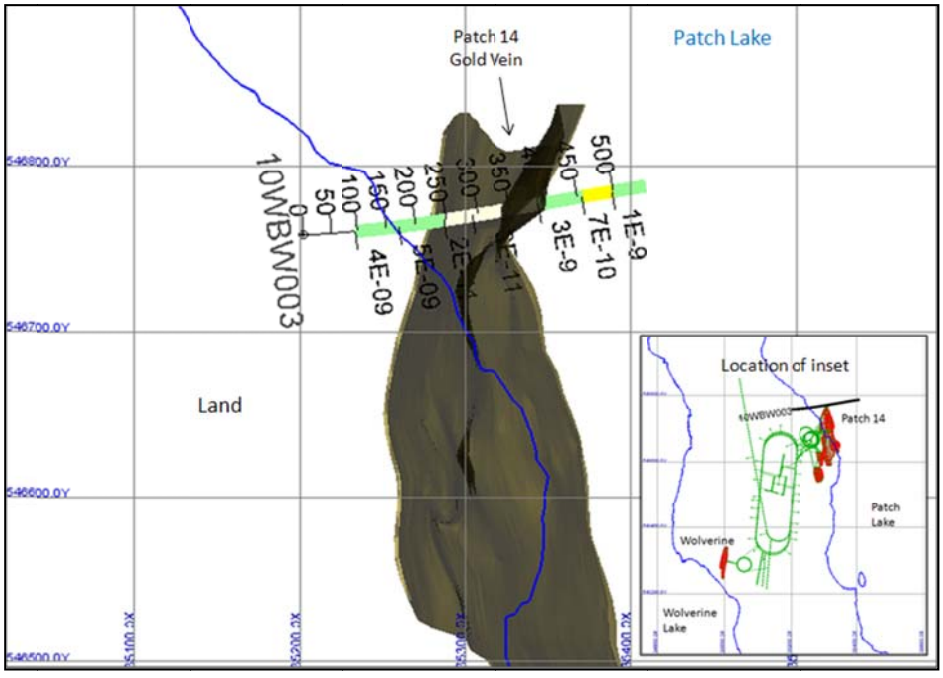

Figure 25: Plan View of Drill Hole 10WBW003 Showing Packer Test Results

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5.5 10WBW004 Boston

5.5.1 Geology

The geology at Boston is quite different to the Madrid and Doris deposits, with a series of sediments within folded basalts. The Westbay drill hole 10WBW004 was drilled north of the main ore body, through alternating wacke and argillite, sometimes with quartz veining. Some inter-bedded siltstone and graphite was also present.

The geology log noted two faults at 357 m and 419 m down hole respectively. The geotechnical log did not identify the same faults, but described other features with gouge or rubble at various depths as shown on Table 18 below. A major structural feature with gouge and rubble was noted at 322.40m down hole.

Table 18: Faults and Rubble Zones in 10WBW004

From (m Along Hole)	To (m Along Hole)	Length (m)	Comments	Source
91.60	91.80	0.20	Fault - 2mm fault gouge along foliation and discontinuous veining	Geotech Log
302.83	302.84	0.01	Joint with 1cm fill	Geotech Log
322.40	323.00	0.60	Gouge and rubble zone	Geotech Log
357.36	357.50	0.14	Fault	Geology log
357.42	357.45	0.03	Broken section along foliation	Geotech Log
374.51	374.54	0.03	Graphitic small amount of gouge	Geotech Log
392.64	392.66	0.02	Graphitic jointed section	Geotech Log
419.40	420.00	0.60	Fault	Geology log

Source:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Tables\ Table 18 Faults, rubble zones and major litho contacts in 10WBW004.xlsx

5.5.2 Packer Testing

Packer test results for 10WBW004 are presented in Table 19 and **Error! Reference source not found.**A cross section along the drill hole and a plan view of the results is provided in Figure 27. Tests 1 to 4 were all in permafrost. Test 5 was likely partially in permafrost, with some flow observed. Test 6 isolated a deeper section from test 5 and observed higher flows through a jointed section with some gouge. It may be connected to the faults observed just below this test zone. Test 7 covered the faulted section but produces slightly lower flows than test 6. Tests 8 and 9 were very low flow. Appendix E provides core photos from packer test intervals which highlight what types of features are included in each text zone.

Table 19: Packer Test Results for 10WBW004

Test #	Along Drill Hole		Vertical Depth			Test Zone Lithology	Hydraulic Conductivity (m/s)
	Test Zone Top (m)	Test Zone Bottom (m)	Test Zone Top (mbgs)	Test Zone Bottom (mbgs)	Test Zone Vertical Length (m)		
1	39.2	77.0	35.5	69.8	34.3	Greywacke with quartz and argillite. Permafrost.	8E-11
2	75.2	125.0	68.2	113.3	45.1	Greywacke and argillite with gougey fault. Permafrost.	4E-11
3	123.2	182.0	111.7	164.9	53.3	Greywacke and siltstone, quartz. Permafrost.	2E-10
4	180.2	242.0	163.3	219.3	56.0	Greywacke with argillite and siltstone, quartz veining. Permafrost.	3E-10
5	240.2	308.0	217.7	279.1	61.4	Greywacke with argillite and siltstone, quartz veining. Partially in permafrost?	1E-08
6	291.2	308.0	263.9	279.1	15.2	Siltstone with wacke interbeds. Talik.	5E-08
7	300.2	362.0	272.1	328.1	56.0	Greywacke and argillite, quartz veining and fault 60cm gouge. Talik.	1E-08
8	318.2	362.0	288.4	328.1	39.7	Greywacke and argillite, fault 60cm gouge. Talik.	5E-10
9	360.2	415.5	326.5	376.6	50.1	Greywacke and argillite. Talik.	1E-11

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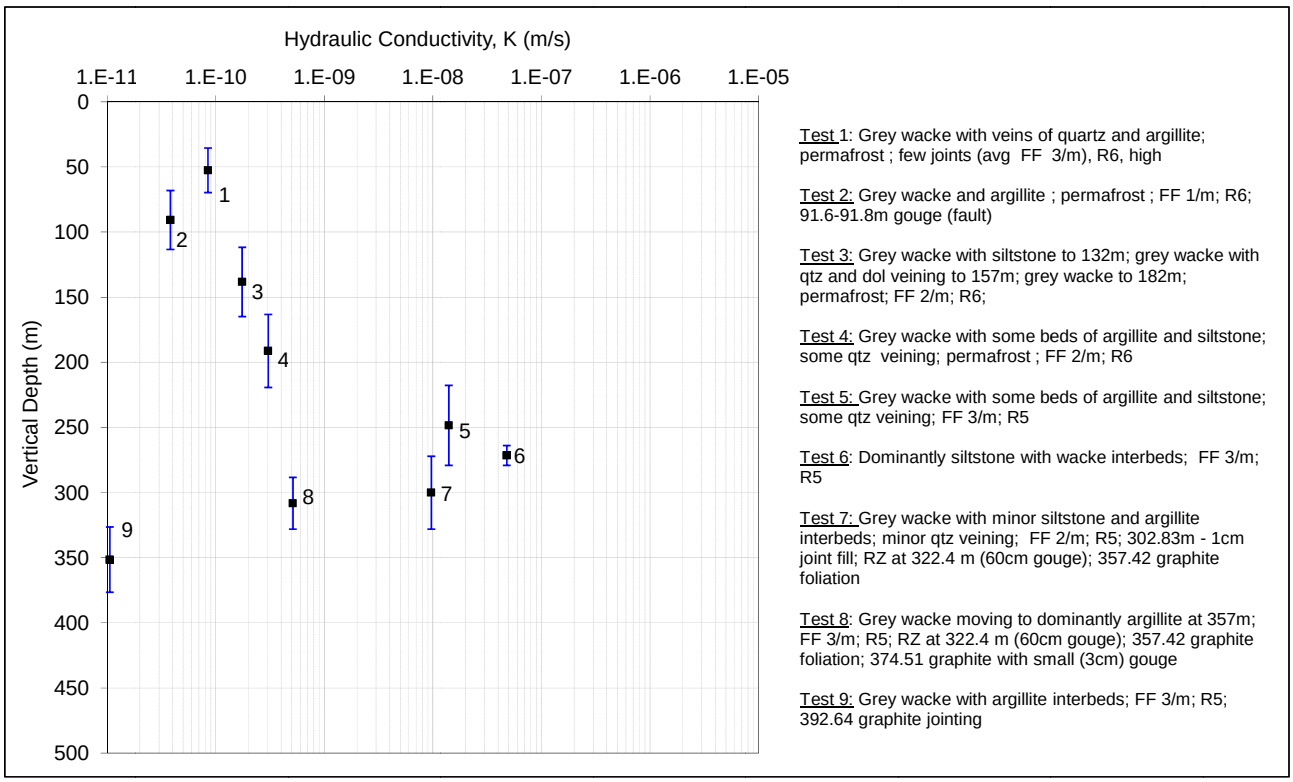

Figure 26: Packer Test Results for 10WBW004

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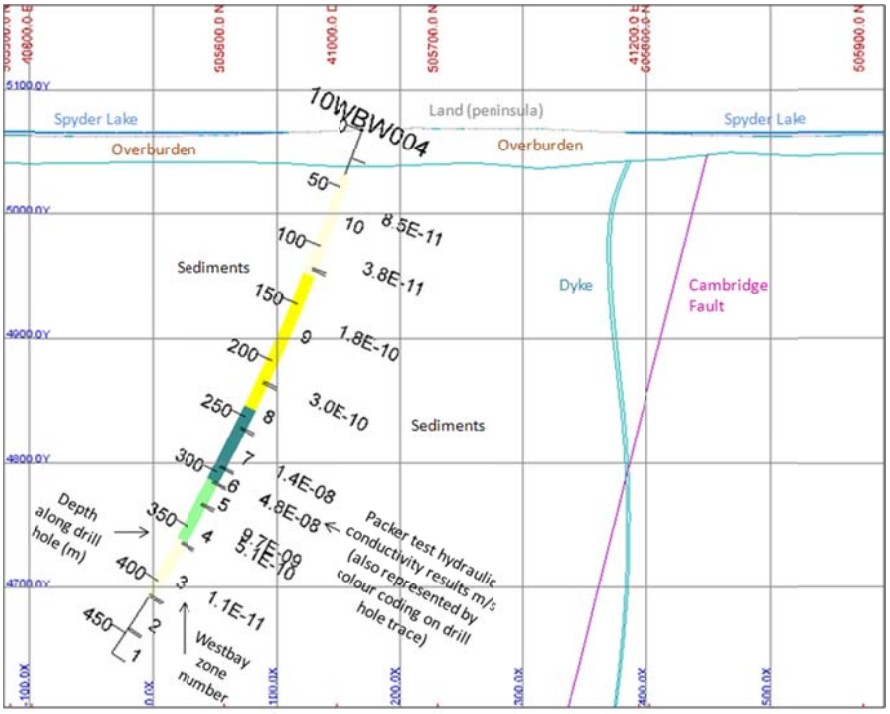

Figure 27: Cross Section along Drill Hole 10WBW004, Showing Modeled Geology (as of Jan 2011), Faults, Westbay Zones and the Packer Test Results

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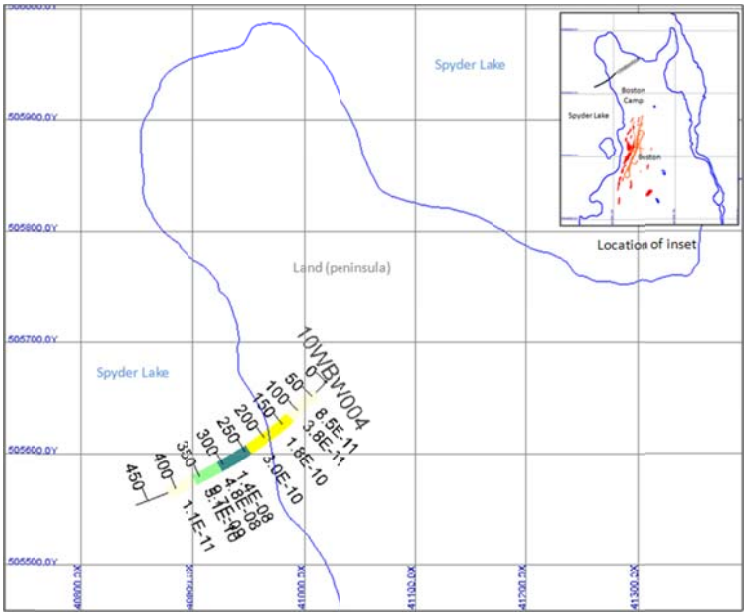

Figure 28: Plan View of 10WBW004, Showing the Packer Test Results

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5.5.3 Westbay Design

The Boston Westbay well was designed to provide pressure and temperature profiles throughout the permafrost in the vicinity of the Boston mine and to provide water quality data from below the permafrost. Westbay Zone 6 was targeted for development and sampling at a vertical depth of 272 to 282m below ground surface, to correspond with the base of permafrost and the highest packer testing K values encountered in the hole. Another short zone just below Zone 6 was designed at 284 – 300m below ground as an alternative sampling zone. It bracketed the faulted section and rock with moderate K values from packer testing.

Table 20 below summarises zone depths for 10WBW004. The depths of the measurement ports within the zones are provided in Appendix E.

Table 20: Westbay Monitoring Zone Depths 10WBW004

Hole ID	Zone	From	To	From	To	Sampled Zones Only	
		Down Hole Distance (m)	Down Hole Distance (m)	Vertical Distance (m)	Vertical Distance (m)	Length of Zone (m)	Volume of Zone Annulus between Westbay and Borehole (L)
10WBW004	10	24.4	118.9	22.8	110.9		
10WBW004	9	120.4	217.9	112.3	201.8		
10WBW004	8	219.4	259.1	203.2	239.0		
10WBW004	7	260.6	294.2	240.3	270.2		
10WBW004	6	295.7	307.9	271.5	282.3	12.2	73
10WBW004	5	309.4	327.7	283.7	299.9		
10WBW004	4	329.3	362.8	301.3	330.7		
10WBW004	3	364.3	413.1	332.0	373.8		
10WBW004	2	414.6	445.1	375.0	400.5		
10WBW004	1	446.7	470.0	401.8	421.0		

Table source: Y:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110113 Westbay Data Report\Tables\ Table 6 13 and 20 Westbay Zones.xlsx

5.5.4 Temperature Profile

Temperature profiles were completed during installation after the packers were inflated, when the temperatures were likely affected by drilling, and on one other occasion when the temperatures had stabilised. Figure 29 below shows the temperature profiles from 10WBW004. The stabilised profile from November 15, 2010, shows the 0°C isotherm at around 325m and the -2°C isotherm at 215m vertical depth below ground surface. The actual permafrost boundary is likely to be around -2°C, depending on the salinity of the groundwater in this area. The coldest permafrost temperature in the drill hole was -6.1°C, consistent with expected permafrost temperatures in this region, away from the active zone at the surface.

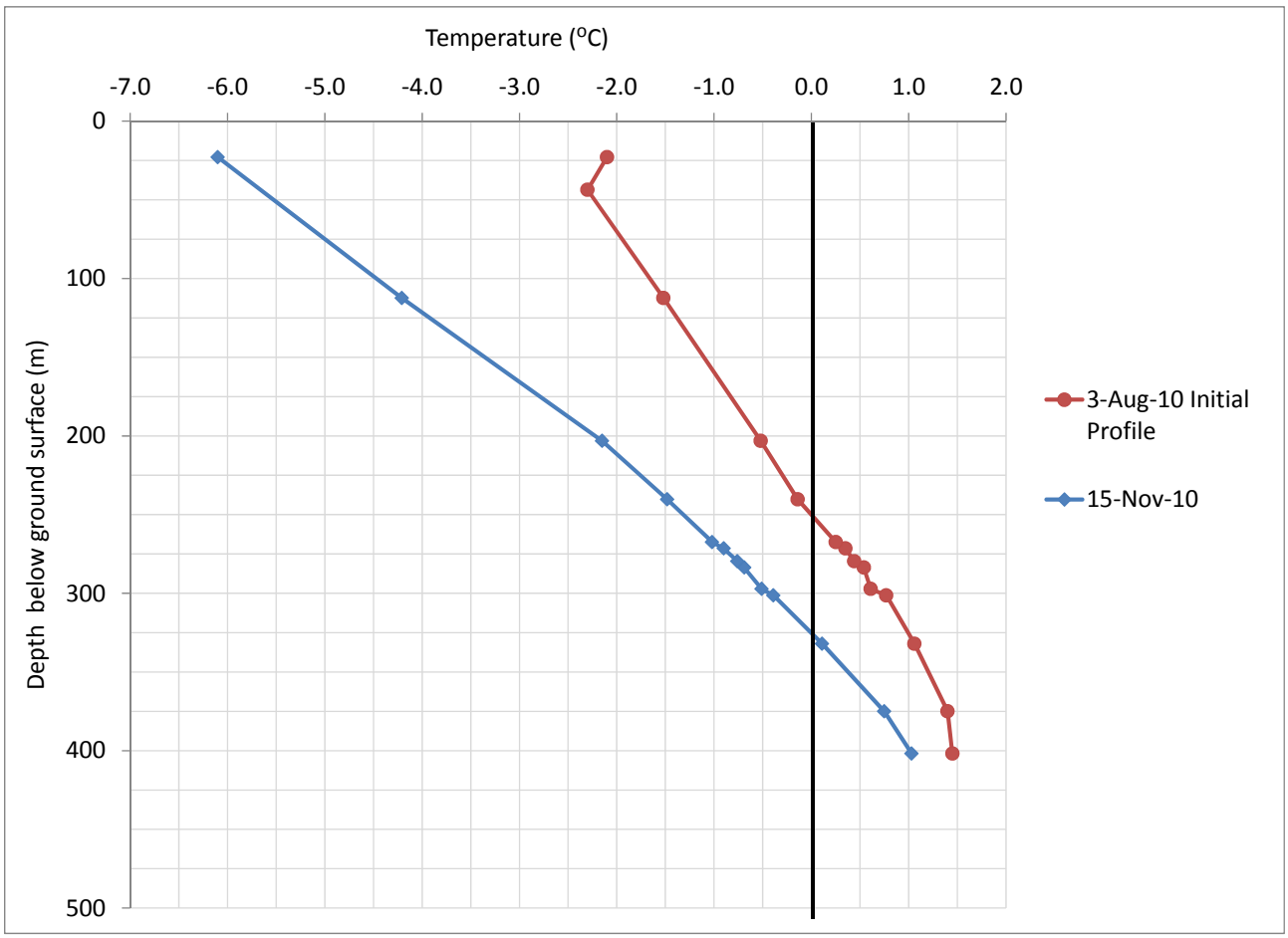

Figure 29: Temperature Profile for 10WBW004

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5.5.5 Pressure Profile

Pressure profiles were completed post- packer inflation and on November 15, 2010, after the Westbay pressures had time to stabilise. Figure 30 shows the results from all profiles. A density using 1,020 kg/m^3 was assumed for all readings, based on the results from analysed groundwater samples. The profile on November 15, 2010 shows an upward gradient. The shallowest reading, at 23m vertical depth, shows a piezometric head 5.28m below top of casing, similar to the lake level.

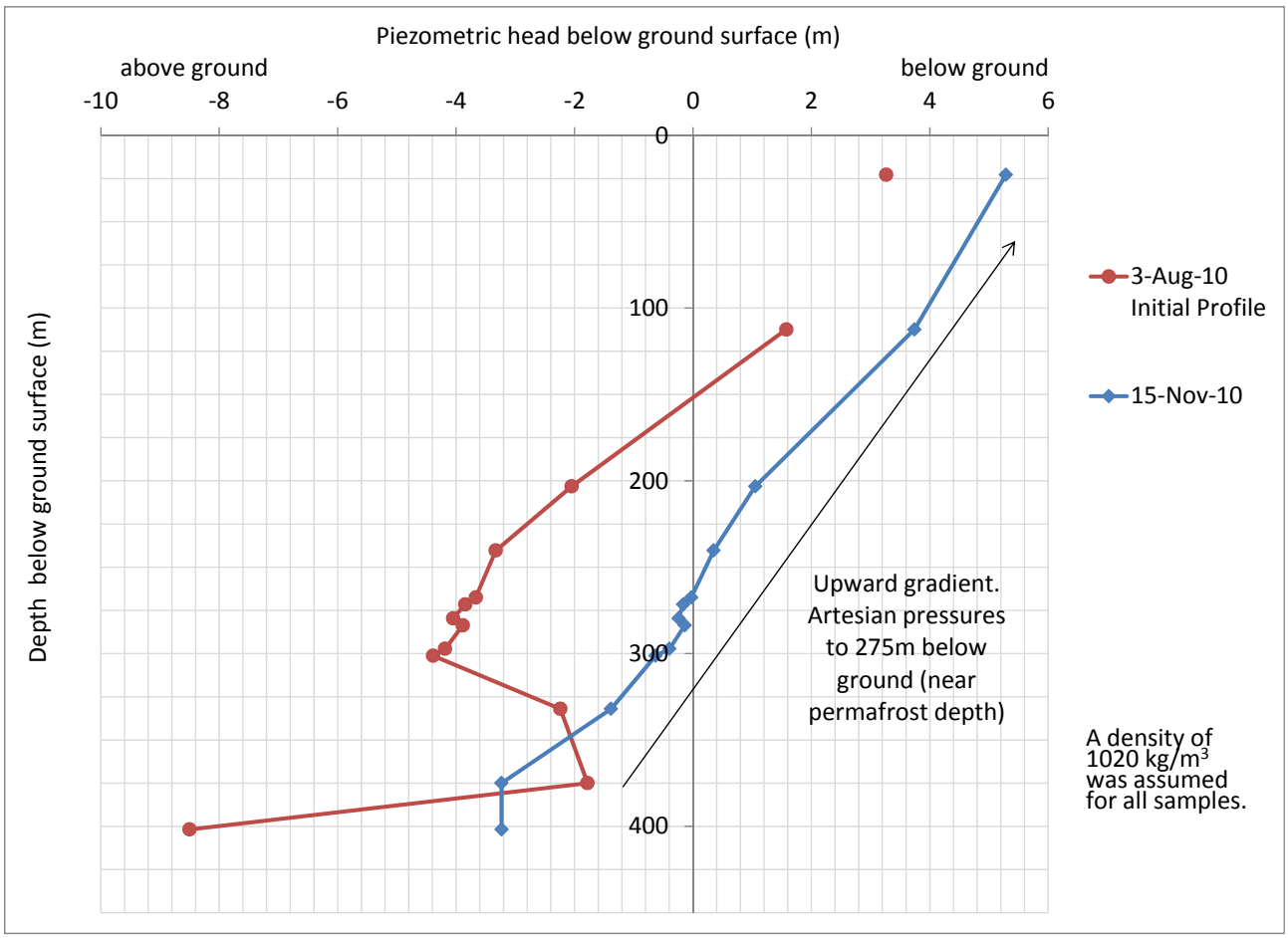

Figure 30: Pressure Profile for 10WBW004

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5.5.6 Development to Remove Drilling Fluids

The Boston Westbay well is located in considerable depths of permafrost (~215m), therefore the Westbay sample bottle method was used for development the drilling water out of the targeted zone. In November 2010, 84L was removed from Zone 6, representing 1.15% of one zone volume. There are two measurement ports in Zone 6 and the initial field parameters indicated a difference between the water at the top of the zone and the bottom of the zone (see Appendix K), which had been left undisturbed since installation. To reduce the likelihood of one higher K feature creating a stagnant area within the zone, SRK developed water from both the upper and lower ports in Zone 6. Over time, the water at the two ports became more similar, as shown in both the field parameter readings and the lab results, discussed below.

The water in Zone 6, at 271-282m below ground surface was below 0°C, typically around -1°C. The zone recovered with each 1L sampled, indicating that the saline groundwater is likely depressing the permafrost in this area to colder than -1°C. All samples removed from the zone froze inside the Westbay sample bottles while they were being returned to the surface, travelling through the section of colder permafrost. To enable sampling at the surface, the bottles were heated to around +3°C before field parameters were read and lab sample bottles were filled.

As agreed by HBML, SRK completed about nine days of development effort and decided to leave the site after this to await the lab results which would indicate the rate of development progress. Table 21 below describes the samples that were taken at various stages during the development. Figure 31 and Figure 32 show the chloride and sulphate concentrations trends during development Zone 6 of 10WBW004. Additional graphs for pH, TDS, conductivity, total barium, dissolved magnesium and dissolved sodium are presented in Appendix M (Figures M.12 through M.14).

Concentrations for TDS were initially quite high in the zone (28,500 mg/L), slightly higher than the drill water brine concentrations, and over the development process they increased and remained relatively stable (31,000 to 34,000 mg/L). Some variation was noted between the two ports in Zone 6, with the middle port providing higher concentrations than the top port; however the difference was small compared to drilling water and lake water concentrations, and over the development the difference between the ports became smaller. However, the results do indicate that there was some stratification in the zone, possibly caused by water flowing in from a fracture or a group of fractures clustered in one part of the zone.

The conductivity, calcium and chloride concentrations remained within the range of the drilling water samples throughout the development. Conductivity and chloride concentrations remained relatively stable during the development process, again with the middle port having higher concentrations than the upper port, and the difference between them reducing over the development process. Calcium concentrations decreased slightly after the initial sample and then remained relatively stable during the development process between 4,100 and 4,600 mg/L.

In comparison, sulphate, magnesium and sodium concentrations were significantly higher than the concentrations observed in the drilling fluids, even for the initial sample. Sulphate was initially 244 mg/L and increased to 330 mg/L in the upper port, compared with a range of 5-50mg/L in the drilling fluids. The final concentrations were six to sixty times the concentration of the drilling fluids. Sodium was initially 1820 mg/L, more than four times higher than the highest drilling water concentration of 439 mg/L. Over the development, the concentration of sodium in the zone increased to 2600 mg/L at the middle port and 2,330 mg/L at the top port. The concentration appeared to be stabilising as more water was removed, but not yet fully developed. Magnesium trend followed a very similar pattern – the zone was initially four times more concentrated than drilling water and increased over the develop, although did not stabilize before development was halted.

From analysis of the data, we make the following conclusions:

- The differences in the ratios of concentrations from drilling water to development water for different parameters are likely caused by increasing amounts of formation water in the samples, i.e. The concentrations of sulphate, magnesium and sodium were many times higher in the zone than the drilling fluids, while calcium and chloride concentrations at the zone remained within the range of the sample drilling fluids.
- Some natural flushing of the drilling water in the zone took place between the Westbay installation in August and the development in November. This is evident from the jump in concentrations of sulphate, magnesium and sodium between the drilling samples and the initial discrete sample.
- The trends of concentrations of key parameters present in groundwater but not drilling fluid (sodium, magnesium, sulphate, possibly silicon) began to stabilise as additional water was developed, but they did not fully stabilise. Additionally, there remained small differences in

concentrations between the upper and middle ports within the zone at the end of development, indicating all drilling fluids have not yet been removed or that water within the zone remains stratified to some degree. Some additional development will be required to fully develop the zone, but considerable progress has already been made.

Isotope data from this hole was not available at the time of report finalisation. When available, it is will be reviewed to assess whether it supports the current hypothesis that the zone water is currently mostly groundwater, with some drilling water still present. Interpretation will be provided in the 2011 Westbay Program Data Report.

5.5.7 Preliminary Comparison of Boston and Doris Central Water Quality

Tables in Appendix L present the water quality data from Doris Central (10WBW001), Boston Zone 6, Boston drilling fluid and Spyder Lake. Graphs comparing preliminary water chemistry from Boston Zone 6 and the three zones sampled at Doris Central are provided in Appendix M (Figures M.15 thorugh M.17). The pH, sodium, sulphate, and bromide concentrations were lower at Boston. Concentrations for cobalt, molybdenum, and nickel were higher at Boston than at Doris Central. Chloride and iron concentrations for Boston were similar to those for Zone 10 at Doris Central. Conductivity values were comparable to those in Zone 6 for Doris Central. Calcium concentrations were comparable to those of Doris Central Zone 1. The TDS, alkalinity and manganese concentrations are comparable to those from Zone 6 and Zone 10 from Doris Central. The magnesium concentrations were greater than the deepest zone at Doris, but less than the two shallower zones.

Table 21: Samples Taken from Westbay Well 10WBW004 Zone 6

Field Sample ID	Sample From	Date	Sample Development Status	Location of Port in Zone	Zone Port Drill Hole Depth (m)	Cumulative Total Developed from Zone before Sample was Taken (L)	Zone Volumes Developed before Sample was Taken
10WBW004-123	Westbay Port	18-Nov-10	Initial sample	Top	295.7	1.1	0
10WBW004-124	Westbay Port	25-Nov-10	Development sample	Top	295.7	38	0.52
10WBW004-125	Westbay Port	25-Nov-10	Development sample	Top	295.7	38	0.52
10WBW004-126	Westbay Port	26-Nov-10	Development sample	Middle	304.8	44	0.60
10WBW004-128	Westbay Port	27-Nov-10	Development sample	Top	295.7	52	0.71
10WBW004-129	Westbay Port	28-Nov-10	Development sample	Middle	304.8	59	0.81
10WBW004-130	Westbay Port	29-Nov-10	Development sample	Middle	304.8	72	0.98
10WBW004-131	Westbay Port	30-Nov-10	Development sample	Top	295.7	84	1.15

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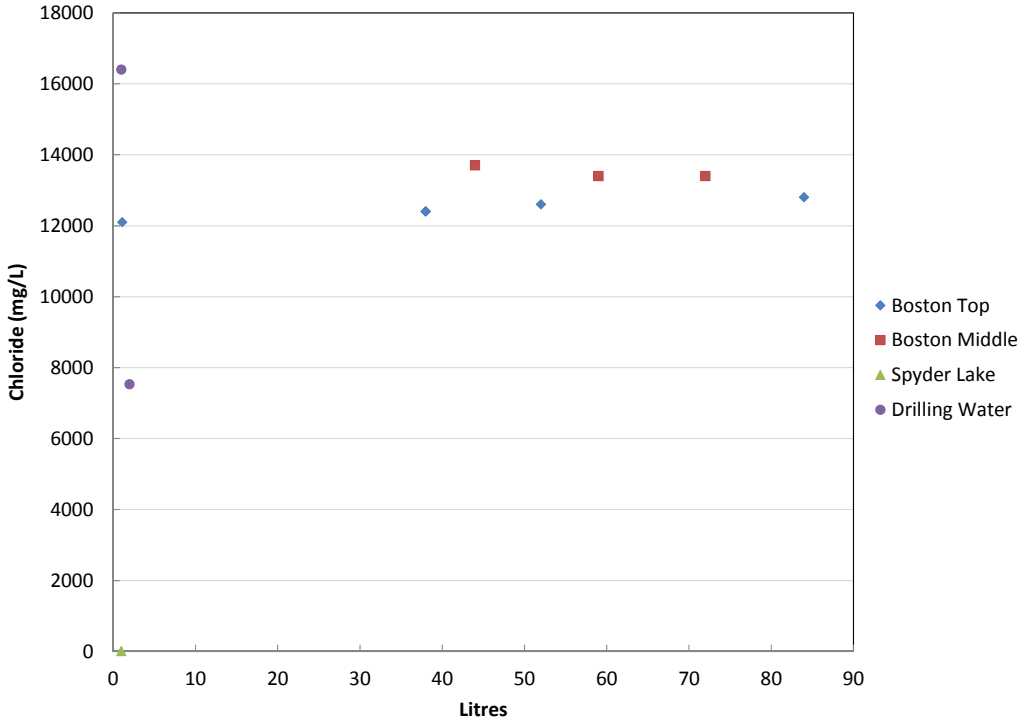

Figure 31: Concentration of chloride during development 10WBW004 Zone 6

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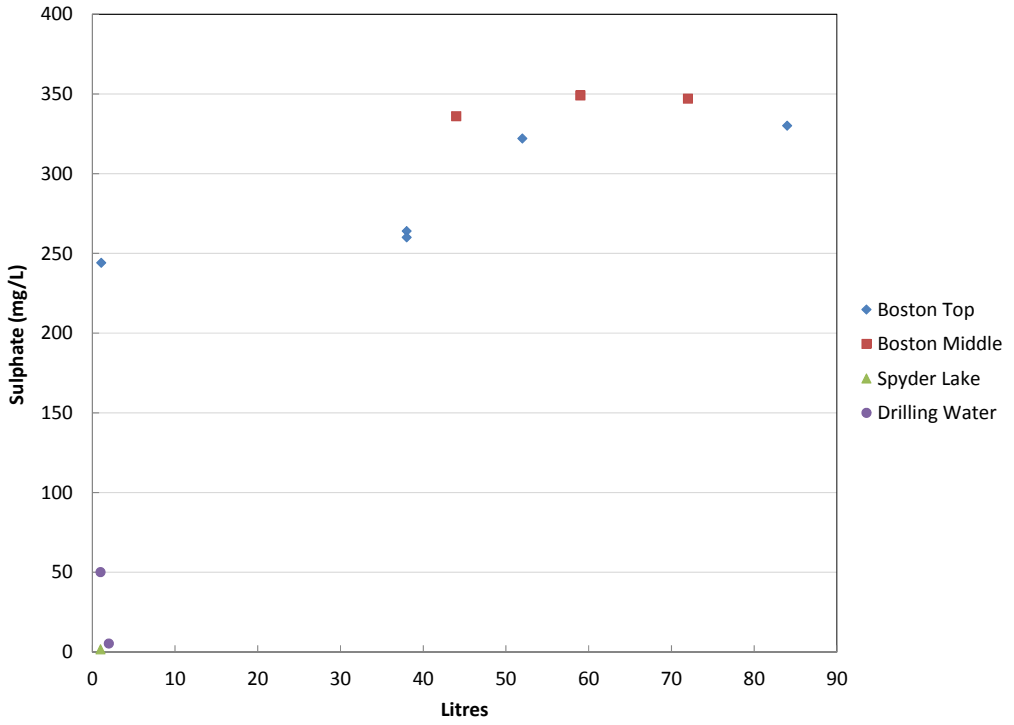

Figure 32: Concentration of sulphate during development 10WBW004 Zone 6

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5.6 QA/QC of Water Samples

The quality assurance and quality checking procedures for this data collection program consisted of the following:

- Collecting and analysing duplicate samples, to evaluate field variability and to test consistency in lab analytical methods;
- Calculating cation and anion balances, to check completeness of analytical results;
- Asking the lab to analyse blank samples of the deionised (DI) water before it was sent to site, which was used to rinse the Westbay sample bottles to confirm that the water used is low in the parameters of interest for the groundwater samples;
- Collecting and analysing blank samples of the DI water, used to rinse the Westbay sample bottles, to evaluate the degree of contamination introduced by the sampling and handling procedures;
- Collecting and analysing rinsate blank samples, to confirm that the rinsing process used between samples was sufficient and did not lead to cross-contamination of samples, and that the sampling handling procedures were sufficient to prevent sample contamination;
- Comparing samples taken using different collection methods (airlifted samples vs. discrete samples), to understand how the method of collection affects the results;
- Comparing repeated samples over time to determine variability of results;
- Collecting and analysing 'background' samples of lake water used for drilling, drilling brines and the glycol/water mix inside the Westbay wells, for comparison with groundwater samples taken from the Westbay ports; and
- At the Boston Westbay well, collecting and analysing samples from two ports within one zone, to test for consistency or stratification of water quality within the zone.

Tables showing the results of these comparisons are presented in Appendix N. The QA/QC results are discussed in the following sections.

5.6.1 Duplicates

Duplicate samples were analysed from Doris Central Zone 10 initial discrete sample, final airlift development sample from the same zone and Zone 1 final airlift sample, see Table N2 of Appendix N. A duplicate of the drilling water at Doris Central was also analysed. Duplicate samples were reviewed for relative percent differences (RPD) and the majority of parameters had an RPD less than 20%, with the following exceptions:

- The airlifted sample from 10WBW001 Zone 10 had a 35% relative difference in dissolved potassium, one of the major ions. One sample had a concentration of 206 mg/L; the duplicate had a concentration of 294 mg/L. Two other duplicates had an RPD less than 4% for this parameter; however this potential analysis method-induced variability or field variability should be taken into account when reviewing the dissolved potassium results.
- Other exceptions were from metals with low concentrations in the discrete samples analysed: total arsenic (RPD 98%, concentrations of 0.296 and 0.101 mg/L), dissolved titanium (RPD 50%), dissolved chromium (RPD 41% and 39% in two different duplicate pairs) and dissolved vanadium (RPD 35% and 25%). As these are in low concentrations in the water being analysed,

the analysis-induced variability is of minor importance and may be the result of natural field variability.

- The drilling water duplicate from Doris Central was generally low in total and dissolved metal concentrations; however the RPDs were greater than 20% for many of the metals above detection limits, indicating variability in results at low concentrations. The following RPDs exceeded 20%: total lead (RPD 111%), total zinc (RPD 63%), total aluminum (RPD 40%), dissolved selenium (RPD 31%), total cobalt (RPD 30%), total iron (RPD 23%), and dissolved lead (RPD 22%).

5.6.2 Ion Balance

An ion balance is used to check completeness of analytical results. Total anions must be in balance with total cations, therefore the sum of the concentrations of anions should equal the total concentration of cations and the ratio of total anions to total cations should be one. The concentrations in this case must be in terms of ion equivalents. Analyses which yield an ion balance of less than 10% are generally considered to be acceptable. Ion balances were calculated for each sample (see table N3 of Appendix N) and all were found to have a balance within 7%, indicating acceptable results.

5.6.3 Blanks

Between samples, Westbay sample bottles were tripled rinsed. When available, DI water provided by ALS was used for all rinsing. At times when the available quantity of ALS DI water was limited on site, the reverse osmosis (RO) water from the camp water supply system was used for the first and second bottle rinses, followed by DI water as a final rinse. On occasion, lake water was also used for a pre-rinse.

Appendix N summarises the blank samples taken. The data shows the following:

- The field blank DI water was below detection limits for all metals.
- The RO blank sample had detectable levels of zinc which should be taken into consideration when reviewing the other data. Total zinc concentration was 0.0408 mg/L, which, for comparison equates to 21% of the final discrete sample concentration at 10WBW001 Zone 6. Dissolved zinc was 0.003 mg/L or 16% of the discrete sample concentration. It appears that the RO treatment process contributes to trace levels of zinc.
- Other parameters were detected in the RO blank sample, but at low concentrations compared to the parameters of concern in the groundwater, such that they are of no importance to the overall results. These include: total copper (0.0807 mg/L), total lead (0.00244 mg/L), dissolved calcium (0.75 mg/L), dissolved copper (0.0031 mg/L), dissolved magnesium (0.12 mg/L) and dissolved sodium (1.4 mg/L).
- Two rinsate blank samples were taken from the Westbay sample bottles to determine how effective the triple rinsing process was and the level of cross contamination between samples or from rinsing water. The concentrations of major ions were low or below detection, indicating that the overall rinsing process was sufficient. However, dissolved and total zinc were detected in the Westbay sample bottle rinsate blank, at similar concentrations to the RO water used for rinsing, despite the final rinse being with DI water. Rinsate blank zinc concentrations were 15-17% the concentrations of the discrete sample.

- Other parameters were detected in the rinsate blank sample, but at low concentrations compared to concentrations in the groundwater, such that they are of no importance to the overall results. These include: total cadmium, iron and manganese, and dissolved magnesium and sodium.
- The airlifted bulk samples (80L and 160L respectively) submitted to Newmont for additional testing were taken using 20L plastic gas cans. As with the Westbay sample bottles, they were triple rinsed before use, initially with RO water, and the final rinse with DI water. A rinsate blank from the gas cans showed elevated levels of zinc and aluminum. Total aluminum was 0.0086 mg/L, which, for comparison equates to 30.6% of the final discrete sample concentration at 10WBW001 Zone 6. Dissolved zinc was 0.0031 or 16.7% of the discrete sample; the zinc result is similar to that noted above for RO water and rinsate blanks.
- Other parameters were detected in the gas can rinsate blank sample, but at low concentrations relative to concentrations in the groundwater, such that they are of likely of low importance to the overall results. It should be noted; however that SRK does not have lab results from the actual samples submitted using these gas can containers, and the rinsate blank results should also be compared to those directly. Detected parameters in the gas can sample blank include: total barium, boron, copper, lead, silver and uranium, and dissolved cadmium and copper.

5.6.4 Airlifted vs. Discrete Samples

Table N5 of Appendix N provides a comparison of samples taken at a similar stage in the development process using both the airlift discharge and discrete samples collected using the sampling probe. Currently it is difficult to thoroughly compare the airlift samples to the discrete measured samples, since three of the repeated samples were also analysed using different methods (water vs. seawater). We have data from one set of samples from Zone 6 using the same analysis method and detection limits. When comparing the airlifted samples to measurement discrete samples for Zone 6 only, where the same analysis method was used, the most notable differences are that:

- The airlifting method tends to have 30 to 80 % higher concentrations of many parameters than the samples from the measurement ports (i.e. higher TDS, EC, hardness, alkalinity, sulphate, chloride, bromide, silicate, total arsenic, boron, calcium, lithium, magnesium, manganese, potassium, sodium, and strontium);
- Total iron concentrations are higher in the airlifted sample (4.5 mg/L airlifted compared with 2.3 mg/L from measurement ports);
- The difference between total and dissolved iron is much less in the airlifted sample. The discrete sample method has large differences between average total iron (2.3 mg/L) and dissolved iron (0.23 mg/L), compared with a difference of only 4.5 mg/L to 4.4 mg/L from total to dissolved for the airlifted method;
- Lower pH in the airlift samples; and
- Lower turbidity in the airlift samples.

A full list of the RPD of parameters sampled using these two methods is provided in Table N5 of Appendix N.

5.6.5 Variability over Time

Samples were repeated from the same port over time to determine variability of results when a Westbay zone is left to sit for a period of time. A comparison of repeated samples was provided in the chemistry results sections for each Westbay. A table calculating the RPD for each repeated sample is provided in Table N1 of Appendix N. Overall, considerable variability was observed, indicating that a wide range of values should be used in the interpretation going forward, until further data is available. Total dissolved solids varied up to 38%. For the major ions, calcium varied up to 38%, magnesium up to 43%, potassium up to 45%, and sodium up to 48%. Other metals at lower concentrations varied considerably more than this.

5.6.6 Variability between Ports in the Same Zone

At the Boston Westbay well, groundwater samples were collected from both the top and the middle ports of Zone 6, to test for consistency or stratification of water quality within the zone. This data was discussed previously in the Boston water quality section. The middle port, near the midpoint of the zone, initially had higher concentrations of most parameters than the upper port, indicating that a stagnant or stratified area may occur within the Westbay zone. This could potentially be the result of groundwater flowing along fractures in only one part of the zone and not fully mixing with the drilling water. Over the development process, the concentrations between the ports became more similar, but not the same.

Table N6 in Appendix N includes a table which compares samples from the top and middle ports after similar, but not the same, amounts had been developed. Although not directly comparable, they provide an indication of the magnitude of variability between the two ports.

When 0.5 to 0.6 zone volumes had been removed, the middle port had about 30% higher concentrations of the major ions, and similar differences with metals at lower concentrations. Some metals were lower in concentration in the middle port than the upper port. After 1 zone volume had been removed, the differences were less. The middle port was 2 to11 % higher in concentration than the upper port, indicating some mixing within the zone. The differences between the two ports are within the typical variability that is observed even when sampling from the same port; however, given that multiple samples were obtained from both ports and every time for most parameters the middle port had higher concentrations than the upper port, some stratification in the zone appeared to exist.

This is important to consider when reviewing the data from other zones, where only one measurement port has been sampled, typically at the top of the zone. The sampling from the top of zones where mixed density fluids are involved (drilling water and natural groundwater) may be understating the concentration of parameters by 2 to 30%, possibly more. After development, when theoretically only one type of water is present in the zone, this stratification resulting in lower concentrations at the uppermost port within a zone should not occur.

5.6.7 Background Samples

Two background samples were collected from Doris Lake and one from Spyder Lake. One sample was collected from drill water used at Doris Central (no salt added) and two drilling water brine samples were collected at different stages of the drilling process at Boston. The drilling water and lake water samples were compared to samples taken from the measurement ports to determine development progress. These comparisons were provided under the chemistry results sections for each Westbay. Spyder Lake and Doris Lake had low anion, cation and metals concentrations. The

drilling water for Doris Central also had low concentrations. The drilling water from Boston was a brine, to prevent the rods from freezing, and had high calcium, chloride, and sodium concentrations.

6 Recommendations

6.1 10WBW001 Doris Central

We recommend:

- The isotope data should be reviewed when available and the conclusions on the water sources considered in light of this additional data;
- Completing two additional sampling rounds in 2011 to characterize any changes in water quality over time and to build on the database of baseline water quality, which currently shows some variability;
- Pressure and temperature profiles should be completed on each of the sampling rounds, until profiles demonstrate repeated stable results;
- While on site, sequentially opening and closing pumping ports from a number of key zones to obtain static water levels to calibrate pressure data; and
- As each pumping port is opened, recovery data (rising head slug test) should be collected for analysis of zone hydraulic conductivity.

6.2 10WBW002 Doris North

We recommend the following:

- The isotope data should be reviewed when available and the conclusions on the water sources considered in light of this additional data;
- The lab should re-run all development and drilling water samples for missing parameters that would assist in analysis. These should include sulphate, strontium, silicon and alkalinity for all samples;
- No further development be completed on Zone 1 due to the risk of introducing glycol water from Zone 2, due to the low hydraulic conductivity and dropping pressures in Zone 1;
- An additional sample be obtained, without further development, to assess whether concentrations are increasing as the zone naturally flushes itself, and to further understand the variability in results;
- Any further samples taken from Zone 1 should be of a reduced sample size (currently 3L) to minimize the risk of introducing fluids from Zone 2 into Zone 1. The lab should be consulted to determine the minimum amount required. Field parameters should not be taken on samples from this zone, to minimize the volumes required;
- For all samples taken from Zone 1, the pressure in Zones 1, 2, 3 and 4 should also be monitored as a QA/QC. Pressure changes inside the Westbay casing should continue to be monitored with each volume removed from Zone 1;
- During the next sampling round at Zone 1, a sample should also be taken from Zone 3, and the pressures in that zone and the zones above and below should be noted. If it responding in a similar manner to Zone 1 (very slow recovery, inducing pressure drops in the zone above), no

development should be completed on Zone 3, but samples should be taken for at least the next three sampling rounds as a comparison with the Zone 1 water. If Zone 3 is recovering over a maximum period of an hour (the time taken between sampling runs), then Zone 3 should be developed and targeted for sampling, possibly in addition to the ongoing grab samples from Zone 1. The frequency of sampling and the need for one or both of these zones would need to be considered after the initial water quality results have been reviewed;

- Depending on the results of the first sampling round at Zone 1, a second and possibly third sampling round is likely to be needed later in the year for ongoing baseline monitoring;
- The very high pressures in some of the zones in permafrost should be alleviated during the next sampling round, by using the Westbay probe to allow small amounts of saline water to flow through the probe into the internal Westbay casing. The pressures should be reduced to the manufacturers recommendations, for long term protection of the Westbay well materials;
- Pressure and temperature profiles should be completed on each of the sampling rounds, until profiles demonstrate repeated stable results;
- While on site for other tasks, further investigation should be undertaken into the variation in concentrations for the drilling brines used by Orbit. This should include reviewing the salt use records for holes 10WBW002 and 10WBW004, and taking four additional grab samples of drilling brines. Alternatively, samples could be prepared of lake water and CaCl drilling additive to represent the range of target brine concentrations used in drilling; and
- If at some point in the future any additional development or repetitive sampling is completed on Zone 1, a tracer should be used on the water inside the Westbay. That tracer could be the glycol itself (requiring the addition of organics into the analysis suite), a fluorescent dye or lithium bromide. Some investigation would be required to ascertain the most appropriate method given the expected concentrations and lab detection limits.

6.3 10WBW004 Boston

We recommend the following:

- The isotope data should be reviewed when available and the conclusions on the water sources considered in light of this additional data;
- The lab should be asked to re-run all development and drilling water samples for missing parameters that would assist in analysis. These should include sulphate, strontium, silicon, and alkalinity for all samples;
- An additional sample, without further development, should be taken from Zone 6 (both ports), to assess how much additional flushing of the drilling water from the zone has occurred naturally since late 2010;
- During the same field visit, at least an additional 40L should be developed from the zone (this would take approximately five working days on site), and 3 additional samples should be taken from each of the ports within the zone. This would bring the total additional samples in 2011 to 8 samples (4 samples x 2 ports within Zone 6);
- After the results are available from the additional sampling, the trends in key parameters present in the formation water and not elevated in the drilling water (i.e. sulphate, sodium, magnesium) should be reviewed to look for parameter stabilisation over the additional development;

- A second, and possibly third, sampling round should be completed for baseline monitoring in 2011. Both ports within the zone should continue to be analysed until repeated samples show no difference in concentrations between the upper and middle ports;
- For all samples, the full suite of parameters should be analysed, including isotopes, sulphate, silicon, strontium and alkalinity;
- Pressure and temperature profiles should be completed on each of the sampling rounds, until profiles demonstrate repeated stable results; and
- As mentioned under the Doris North recommendations, while on site for other tasks, further investigation should be undertaken into the variation in concentrations for the drilling brines used by Orbit.

6.4 Additional Westbay Wells Required

An additional Westbay well should be installed at Patch 14 to a vertical depth of at least 500m below lake level. The well should be used to obtain vertical pressure profile information and baseline groundwater quality for the Patch Lake talik.

6.5 Maintenance of the Sampling Equipment

All sampling equipment should be stored in a protected, dry environment. Additionally, the sampler probe and electronics **MUST NOT FREEZE**, as this will damage/destroy certain electronic components and small fluid passages within the instruments.

The corrosive nature of the brine drilling and formation water will corrode equipment, so rinsing with fresh water during and after must be carried out to reduce damage/wear over time. Annually, the Newmont owned Westbay probe and winch should be sent for routine cleaning and maintenance by the manufacturer, to prevent problems during use on site.

Disclaimer

"This report and the opinions and conclusions contained herein ("Report") contains the expression of the professional opinion of SRK Consulting (Canada) Inc. ("SRK") as to the matters set out herein, subject to the terms and conditions of the agreement dated [HBML.BOC-CM.PSA.003, September 30, 2008] (the "Agreement") between Consultant and Hope Bay Mining Ltd. ("Hope Bay Mining"), the methodology, procedures and sampling techniques used, SRK's assumptions, and the circumstances and constraints under which Services under the Agreement were performed by SRK. This Report is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of Hope Bay Mining, whose remedies are limited to those set out in the Agreement. This Report is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context. In addition, this report is based in part on information not within the control of SRK. Accordingly, use of such report shall be at the user's sole risk. Such use by users other than Hope Bay Mining and its corporate affiliates shall constitute a release and agreement to defend and indemnify SRK from and against any liability (including but not limited to liability for special, indirect or consequential damages) in connection with such use. Such release from and indemnification against liability shall apply in contract, tort (including negligence of SRK whether active, passive, joint or concurrent), strict liability, or other theory of legal liability; provided, however, such release, limitation and indemnity provisions shall be effective to, and only to, the maximum extent, scope or amount allowable by law."

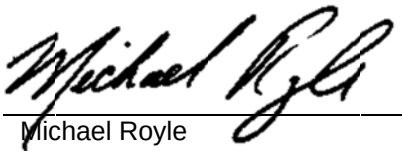
This report, "**Hope Bay 2010 Westbay Program, Data and Installation Report**", has been prepared by SRK Consulting (Canada) Inc.

Prepared by

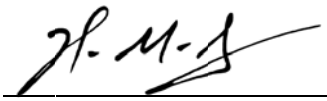
Jenny Henshaw
Consultant (Hydrogeology)

Per Melissa Pitz
Consultant (Geochemistry)

Reviewed by



Michael Royle
Principal Consultant (Hydrogeology)



Dylan MacGregor
Senior Consultant (Geochemistry)

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Appendix A:
Westbay Components Currently on Site

Table A1: Westbay components left at Doris Camp as of December 2011

Item	Units	Total length of casing and packers (m)	Cost/Unit	Total	Where is it now?	Notes
3 m Casing	326	978	$ 108	$ 35,208	SRK container	
3m casing, coupling already attached	67	201	$ 190	$ 12,730	SRK container	
1.5 m Casing	67	100.5	$ 75	$ 5,025	SRK container	
0.6m Casing	28	16.8	$ 61	$ 1,708	SRK container	
0.3 m Casing	1	0.3	$ 53	$ 53	SRK container	
Packers	75	112.5	$ 700	$ 52,500	Warehouse	
Couplings	411		$ 82	$ 33,702	SRK container	
Measurement Port	24		$ 340	$ 8,160	SRK container	
Hydraulic Pumping Port	15		$ 1,980	$ 29,700	SRK container	
Mechanical Pumping Port	2		$ 1,980	$ 3,960	SRK container	Cost estimated
Magnetic Location Collar	12		$ 68	$ 816	SRK container	
End Cap	8		$ 35	$ 280	SRK container	
Monopod Bracket	2		$ 500	$ 1,000	SRK container	
Shear wires	765		$ -	$ -	SRK container	Included in couplings
Silicone	5		$ -	$ -	SRK container	Included in couplings
Zap straps	130		$ -	$ -	SRK container	
Well Seal	2		$ -	$ -	SRK container	
Filler Sock	105		$ -	$ -	SRK container	Included in measurement ports
Metal Part for Location Collar	7		$ -	$ -	SRK container	Included in mag collars
"Item 4" small film cannister	2		$ -	$ -	SRK container	
Totals		1409		$ 184,842		

Schlumberger

INVOICE

Invoice: CA159299

Schlumberger Canada Ltd
(Westbay Instruments)
110-3480 Gilmore Way
Burnaby, BC V5G 4Y1
Canada
604-430-4272
604-430-3538
Bill-To: wbnam150
GST Nbr: 11937 7125 RT0002

Date: April 9 2010

Page: 1

Ship-To: 00100972
Hope Bay Mining Ltd
c/o Braden Bury Expediting
Edmonton Intnl Airport
Service Road and 6th Ave.
Edmonton, AB T5J 2T2
Canada

Sold-To: wbnam150
Hope Bay Mining Ltd
1655 Mountain City Highway
Elko
Nevada, NV 89801
United States of America

Kathy Smiley
775 778 4214

Sales Order: 10028848

Payment Terms:

Ship Via: Braden Bury Expedite

Line	Lic	Part Number	Description	Quantity	UM	Unit Price in CAD	Total Price in CAD
The Canadian-origin commodities, technology or software listed were exported from Canada according to the Canadian Export Administration Regulations. Diversion contrary to Canadian law prohibited.							
SO#: 10028848			PO#: H00852		SL Owner: wbnam150 Region: 3DOM		Site: 511
			********** DO NOT PAY. THIS IS A SHIPPING DOCUMENT ONLY ********				
			**********				
			Job# - WB874 PO# H00852				
			**********				
			Ship to Info - Collect - Call for pick up				
			Attn: John Pruden Tel:780-890-8613				
			**********				
			3 boxes, 375 lbs., F.I.F $ 150.				
13		2536-00	MOSDAX MAGI S.N. MGI4315 Software Registration #: - MLOG-000204-000D8 - MPRF-000204-000FE - WNGT-000204-000F8 Lot/Serial: EPC MGI 155	1.00	EA	6,400.000	6,400.00
14		2408	Non-Vented Sample Container, 250 ml S.N. SB4267 - SB4270	4.00	EA	770.000	3,080.00
15		9015	Motorized Winch - S.N. MER4312 / DCB4313	1.00	ea	18,500.000	18,500.00
16		4001	MP38 Sampling Kit S.N. SK4306	1.00	ea	660.000	660.00
17		3025	Aluminum Monopod S.N. TMI4217	1.00	ea	2,900.000	2,900.00
18		Shipping Charges	to Edmonton, AB	1.00	lt	175.000	175.00
						TOTAL EX-WORKS	31,715.00
						PACKING COST	0.00

*** CONTINUED ***

Schlumberger

INVOICE

Invoice: CA159299

Schlumberger Canada Ltd
(Westbay Instruments)
110-3480 Gilmore Way
Burnaby, BC V5G 4Y1
Canada
604-430-4272
604-430-3538
Bill-To: wbnam150
GST Nbr: 11937 7125 RT0002

Date: April 9 2010

Page: 2

Ship-To: 00100972
Hope Bay Mining Ltd
c/o Braden Bury Expediting
Edmonton Intnl Airport
Service Road and 6th Ave.
Edmonton, AB T5J 2T2
Canada

Sold-To: wbnam150
Hope Bay Mining Ltd
1655 Mountain City Highway
Elko
Nevada, NV 89801
United States of America

Kathy Smiley
775 778 4214

Sales Order: 10028848

Payment Terms:

Ship Via: Braden Bury Expedite

Line	Lic	Part Number	Description	Quantity	UM	Unit Price in CAD	Total Price in CAD

The Canadian-origin commodities, technology or software listed were exported from Canada according to the Canadian Export Administration Regulations.
Diversion contrary to Canadian law prohibited.

OTHER	0.00
TOTAL TAX	1,585.75
TOTAL FOB	33,300.75
FREIGHT CHARGE	0.00
TOTAL C&F	33,300.75

Customer Service: David Huang

REMIT TO: Schlumberger Canada Ltd
(Westbay Instruments)
460 Phillip Street,Suite 101
Waterloo, ON N2L 5J2
Canada

Wire Transfers To: CITIBANK CANADA
123 Front Street West
Toronto, ON M5J2M3

ABA: 00082
Account #: 2014498002
Bank Number: 00260

FINAL PAGE

Checklist for
MOSDAX Sampler System

Client: Hope Bay/Nunn
Job#: 874

B/O ☐ MOSDAX Sampler (2531 / (2532)) S/N: _____
B/O ☐ MOSDAX Sampler Manual Rev. _____
B/O ☐ Calibration Certificate for Sampler
B/O ☐ Spare Parts Kit
B/O ☐ End Cap, both ends (Vinyl)
☑ MOSDAX MAGI (No Module) (2536) S/N: MG14315 EPCMG1155
☑ MAGI32 Software Suite S/N: MLOG-000204-000D8 Rev: 031215
☑ MAGI Manual Rev: 1.44
☑ 12Vdc, 3.3 Amp Power Supply with 3 pin MS Connector (PS7012PW) S/N: EJ776657
B/O ☐ Sampler Pelican Case (PC1700SG)
B/O ☐ Sampler Foam Insert (SAMFOAM2)
N/A ☐ Large Westbay label for above Pelican case (WBLOGO1)
☑ Manual / Cable Case (PC1500SG)
N/A ☐ Small Westbay label for above Pelican case (WBLOGO2)
☑ Serial Number Labels for Cases
☑ Power Cable (WD0220MF)
☑ Data Cable (WD0220NF)
☑ Computer Cable (WV0926AZ)
☑ Non-Vented Sample Bottle (2) & Manual(2408) S/N: SB4267-4268
☑ Non-Vented Sample Bottle (2) & Manual(2408) S/N: SB4269-4270
☑ Sampling Kit (4001/4005) S/N: SK4306
N/A ☐ Tripod (9012) S/N: _____
N/A ☐ Sheave & Counter I / M (3034 / 3035) S/N: _____
N/A ☐ Manual Cable Reel with _____ cable (3033) S/N: _____
~~B/O~~ ☑ 3025 Monopod w/counter (metric) S/N IMI4217
N/A ☐ Open / Close Tool (6012S) S/N: _____
☑ Motorized Cable Reel with 1000 m cable (9015 / 9019) S/N: MER4312/DCR4315
N/A ☐ MP55 Conversion Kit w/Sheave Block

☑ System check with cable reel, sampler & MAGI
☑ Are all parts correctly deducted from inventory?

Date: Apr 8/19 Signature: _____

By Julie Kiechle
March 8, 2007

In Transit Temperature Sensor

ATTENTION:
This shipment has been monitored by a "ColdSNAP telatemp" sensor.

Before using the Westbay Sampler or Pressure Probe, please check the sensor to see if it has turned **RED** in colour.
Please contact Westbay Instruments with the status of the sensor.

The transducer in the Westbay Sampler or Pressure Probe can be damaged if it is exposed to temperatures below freezing.

If the ColdSNAP sensor has turned RED, the transducer in the Westbay Sampler or Pressure probe has been exposed to a temperature below freezing (0 degrees C./32 degrees F.)., please contact Westbay Instruments Inc. at 1-800-663-8770 as the sampler or pressure probe may need calibration.

If the sensor has not turned red, please sign the form to indicate that the shipment has not been exposed to freezing temperatures
(0 degrees C./32 degrees F. or colder). If replying by fax, please fill out the information below, before sending.

Date Received: Apr 20 2010 Name: Jacek Scibek

Is Sensor Red? _____YES ✓ NO

When the Westbay Sampler or Pressure Probe is to be returned to Westbay Instruments Inc., please indicate if the ColdSNAP sensor has turned RED after use. Please return this form with the shipment.

Date Shipped: _____ Name: _____

Is Sensor Red? _____YES _____NO

Email: cantonson@slb.com
Phone: 1-800-663-8770
Fax: 1-604-430-3538

Schlumberger
WATER SERVICES

Packing Slip

Sold to:	Ship to:
Hope Bay Mining Limited 1655 Mountain City Highway Elko, NV 89801	Newmont Hope Bay Mines c/o Braden-Burry Expediting 6th Avenue and Service Road Edmonton International Airport Edmonton, AB T5J 2T2 Attn: John Pruden / 780-890-8613 / jpruden@bbex.com

Invoice Date		Ship Via	Acc't No.	Contact	Project No.
		Call for pick up			WB874
Ship Date		**FCA**	**Collect / Prepaid**	**P.O. Number**	**Salesman**
8-Apr-10		Ex Works SCL	XXX	H00852	WHB

Quantity Ordered	Quantity Shipped	Back Ordered	Model No.	Description	Unit Price	Per	Amount
909	600	309	020110	MP38 Casing 1 (5F/3M)			
94	40 ✓	54	020105	MP38 Casing 2 (5F/1.5M) (2 boxes)			
41	41 ✓	0	020102	MP38 Casing 3(5F/.6M) ←	shown not 5F... (0.6m ok)		
0		0	020101	MP38 Casing 4(5F/.3M) X			
94	60 ✓	34	0238	MP38 Packer - 74 mm(5F/1.5M)			
1022	650 ✓	372	0202	MP38 Regular Coupling			
94	60 ✓	34	0205	MP38 Measurement Port			
35	35 ✓	0	0206	MP38 Hydraulic Pumping Port 4 boxes			
12	12 ✓	0	0203	MP38 End Cap			
46	46 ✓	0	0216	MP38 Magnetic Location Collar			
5	0	5		MP38 wellhead completion with monopod bracket X			
				~~Hobart~~ boxes have Various contents:			
				1000 0202 regular coupling			
				160 0205 measr. port			
				160 cheap nipples			
				160 pump adapters			
				120 cap ends			
				(1) bottom			
						Total	

Apr 20 paid

not here yet

Shipping Charges Paid By: SCL (Westbay)

Completed By: W. Black Date: 6-Apr-10

Appendix B
Drill Hole Logs

BOREHOLE LOG

10WBW001

		Easting at collar	13 N 33778	m UTM
Dip at collar	-65.2	Northing at collar	557537	m UTM
Azimuth at collar	121.6	Elevation at collar	26	masl
		UTM Zone 13N		

Notes:
[1] horizontal green line indicates Westbay packer location
[2] Hydraulic conductivity (m/s)
[3] Of-All (open fractures, all as logged)
[4] Of-Joints (open fractures - joints only)
[5] RQD_%
[6] TCR_%
[7] possible major structures

BOREHOLE LOG

10WBW002

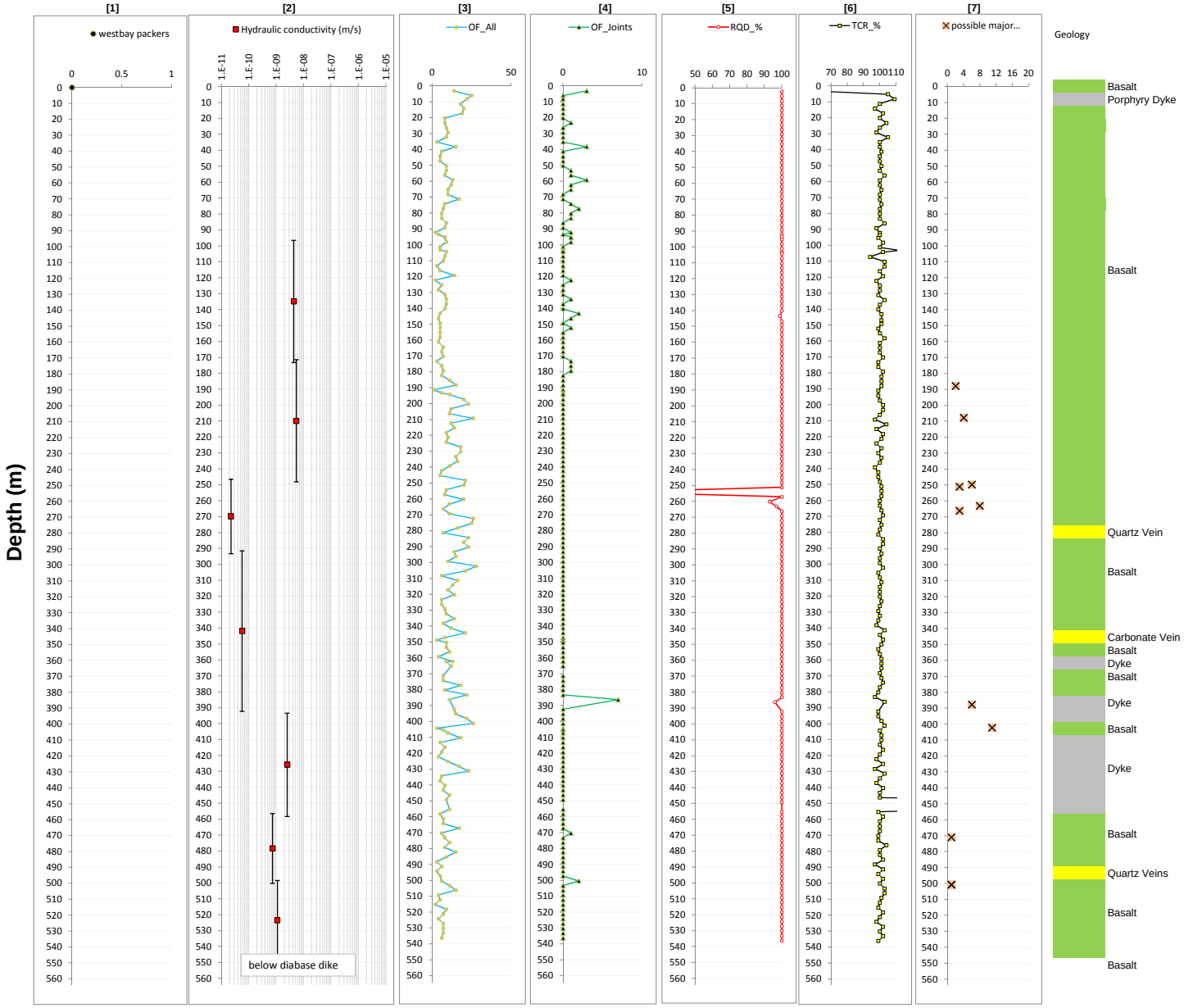
		Easting at collar	13 N 33913	m UTM
Dip at collar	-74.4	Northing at collar	559375	m UTM
Azimuth at collar	271.9	Elevation at collar	30	masl
		UTM Zone 13N		

Notes:
[1] horizontal green line indicates Westbay packer location
[2] Hydraulic conductivity (m/s)
[3] Of-All (open fractures, all as logged)
[4] Of-Joints (open fractures - joints only)
[5] RQD_%
[6] TCR_%
[7] possible major structures

BOREHOLE LOG

10WBW003

		Easting at collar	13 N 35021	m UTM
Dip at collar	-70.1	Northing at collar	546758	m UTM
Azimuth at collar	87.9	Elevation at collar	39	masl
		UTM Zone 13N		



No Westbay MP well was installed in this location due to very low conductivity throughout the drill hole profile.

Notes:
[1] horizontal green line indicates Westbay packer location
[2] Hydraulic conductivity (m/s)
[3] Of-All (open fractures, all as logged)
[4] Of-Joints (open fractures - joints only)
[5] RQD_%
[6] TCR_%
[7] possible major structures

BOREHOLE LOG

10WBW004

		Easting at collar	13 N 41018	m UTM
Dip at collar	-71.2	Northing at collar	505665	m UTM
Azimuth at collar	223.0	Elevation at collar	68	masl
		UTM Zone 13 N		

Notes:
[1] horizontal green line indicates Westbay packer location
[2] Hydraulic conductivity (m/s)
[3] Of-Joints (open fractures - joints only)
[4] RQD_%
[5] TCR_%
[6] possible major structures

Appendix C
Packer Testing Field Checklists

IPI SWiPS Packer Testing Checklist (**Surface Test Only**)

Borehole ID: 10-WBW-001 Date / time: Apr 17 2010 14:00 Location: Doris Operator: JS

Rod size: HQ Packer type: single / straddle Temp= +5 C Type of water used: Fresh

Purpose of test: test fit to new core barrel at this rig

1. Inspection of packer equipment

- ☑ O-rings (including red test seal)
- ☑ Deflation valve (opens/closes and mandrel holds)
- ☑ Packer element rubber in good condition

2. Inspection of core barrel

- ☑ Measure core barrel length inside and verify that it is correct length, check all core barrel subs present as required and correct size of reaming shells, other subs
- ☑ Was the MLR installed properly? yes
- ☐ Position core barrel for test (horizontally) tested vertically

3. Correct assembly and installation

- ☑ Single / straddle packer components connected correctly
- ☑ Inform drillers about what the installation plan is
- ☑ Insert packer tool into core barrel into borehole. vertically
- ☑ Put drill rod around packer element. (in casing downhole)
- ☑ Connect flow meter, high/low P gauge(s), connect hoses
- ☑ On flow meter: open bypass valve, open shutoff valve, close isolation valve to low P gauge on flow meter

4. Inflation and seal testing

- ☑ Start water pump and bring to about 300 psi
- ☑ Seal test consist of observing if water flow out of drill bit in core barrel. There should be no water flow out of barrel.
- ☑ Packer inflated at P= 300 psi Infl. time= 3 min
- ☑ Increase pressure to blow shear pin.
- ☑ shear pin blown at P= 500 psi
- ☐ Check again for leaks out of core barrel. ✓ test done downhole system holds Pressure before shear pin blows

5. Packer Injection Flow Check

- ☑ Confirm blow out plug or spring in injection sub
- ☑ Pump water through tool and observe flow and pressure
- ☐ - can increase flow rate with no sig pressure increase? (Y/N) ____ (this hole has loss of circulation)

6. Deflation & removal

- ☑ Stop water pump.
- ☑ Remove swivel head from core barrel.
- ☑ Using wrench or overshot tool, pull up hard on head assembly spearhead to unlatch tool, pull enough to open deflation valve and wait to deflate.
- ☑ Disconnect and drain flow meter / hoses.
- ☑ Disassemble packer, drain water from ALL parts.

all good

Test result and comments:

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IPI SWiPS acker Testing Checklist (**Downhole Test**)

Borehole ID: 10-WBW-001 Test # 1 Date: Apr 17, 2010
Zone depth along hole (m/ft units?) start time: 15:40
from 24+1 to: 63 m end time: 17:30
Location / project ID: Doris (Hope Bay)
Zone description: foliated meta volc (no water return this interval) assume clean (no circ!)

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 50 (psi) ~ low P <50
Planned P steps: (psi)
Packer type: single / straddle

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 10 (min)
  Before/after water quality (color, EC): _____
- ☑ Rods pulled up and depth verified with drillers: # rods _____

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: —
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 500
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. unknown assume lake level
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time 1 (min:ss)
  until landing felt (or estimate sink time if not felt)
  - ☑ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems) perfect

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 300 psi Inflation time= 2 min) no leak
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi) reading 1000 psi and 200 psi gauges
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: —

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 1.5 (min)

Unlatching problems: needed to creep rods 1 cm up to unlatch

- ☑ Remove packer tool & inspect: ok
- ☑ Follow cleanup and disassembly procedures.

good test

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IPI SWIPS acker Testing Checklist (**Downhole Test**)

Borehole ID: 10-WBW-001 Test # 2 Date: Apr 18, 2010
Zone depth along hole (m/ft units?) start time: 15:15
from 62+1 to: 102 end time: 16:45
Location / project ID: Doris (Hope Bay)
Zone description: fractured metavole + diabase near zone bottom, high J freq., a few RZ's
- loss of circulation during drilling

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 80 (psi)
Planned P steps: 50, 30, 10 (psi)
Packer type: single / straddle

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 10 (min)
  Before/after water quality (color, EC): clear
- ☑ Rods pulled up and depth verified with drillers: # rods 39m

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: —
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. lake level
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time 1:25 (min:ss) until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 300 psi Inflation time= 4 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: —

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 2 (min)

Unlatching problems: —

- ☑ Remove packer tool & inspect: OK
- ☑ Follow cleanup and disassembly procedures.

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IPI SWiPS acker Testing Checklist (**Downhole Test**)

Borehole ID: 10 WBIV-001 Test # 3 Date: Apr 19 2010
Zone depth along hole (m/ft units?)
from 120.5 to: 144.5
Location / project ID: Hope Bay - Doris Lk
Zone description: fdicted wetfavolegnic - competent

start time: 14:00
end time: 15:00

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 100 (psi)
Planned P steps: 30, 60, 100 (psi)
Packer type: single / straddle

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 15 (min)
  Before/after water quality (color, EC): clear
- ☑ Rods pulled up and depth verified with drillers: # rods 8 (24m)

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time 2:30 (min:ss) until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems) perfect

bypass around packer thru fractures likely

Troll 500

lake

packer was fully inflated, pulled E-pins during retrieval

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 350 psi Inflation time= 4 min) <0.1 L/min
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks leak from casing ~ 50% of injected flow
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: — max P ~ 150 so not complete packer bypass

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☑ Optional: E-pin break
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 2 (min)

Unlatching problems: tried to pull E-pins, could not unlatch

- ☑ Remove packer tool & inspect: ok - check epins ... looks closed
- ☑ Follow cleanup and disassembly procedures.

E pins intact to good pull helped unlatch only ...

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IPI SWiPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10 WBW-001 Test # 4 Date: Apr 19 2010
Zone depth along hole (m/ft units?) start time: 15:00
from 103 to: 144.5 m end time: 16:15
Location / project ID: Hope Bay – Doris Lk
Zone description: metavole, diabase, foliated to highly foliated (includes Test 3 zone)

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip= 66 degrees
Rod size: HQ

same as Test 3 to be able to subtract flows

Shear pin strength: 500 (psi)
Max P 80 (psi)
Planned P steps: 30, 60, 100 (psi)
Packer type: single / straddle

subtract flows from Test 3 to calc Test 4 zone 103–125 m inflows

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time _____(min)
  Before/after water quality (color, EC): _____
- ☑ Rods pulled up and depth verified with drillers: # rods 7

right after Test 3

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: E-pins (were slightly bent, not broken)
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect ok

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 500
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. lake
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time ~ 2 (min:ss)
  until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems) good

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 300 psi Inflation time= 3 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded leak from casing again

Pressurizing problems: —

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☑ Optional: E-pin break (tried after no unlatch)
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: ? (min) quick

Unlatching problems: pull rod up 20 cm ...
E pins not broken but helped

- ☑ Remove packer tool & inspect: unlatch this way...
- ☑ Follow cleanup and disassembly procedures. ok

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IPI SWIPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10-WBW-001 Test # 5 Date: Apr 20 2010 Test supervisor: JS Shear pin strength: 500 (psi)
Zone depth along hole (m/ft units?) start time: 13:15 Rig #/driller: Orbit 24 Max P 150 (psi)
from 154 to: 204.8 end time: 15:10 Hole dip= 66 degrees Planned P steps: 40 80, 120 (psi)
Location / project ID: Doris LK Rod size: HQ Packer type: single / straddle
Zone description: metavolc, competent, foliated, 1 possible RZ at 191m (unlikely water bearing) - expect low flow

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 10 (min) clean
  Before/after water quality (color, EC): _____
- ☑ Rods pulled up and depth verified with drillers: # rods_____

2. Inspection of packer equipment

- ☑ O-rings (including red test seal) rubber; o-ring (part #)
  List of replaced parts: 7AM ~~rods~~
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 500
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. lake level
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time ~1:30 (min:ss) pull X rods
  until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☐ Landing ring seal test; (no seal, leaky, good seal, landing problems) perfect

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 4 psi Inflation time= 250 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: —

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break did not work as deflation valve already opened
- ☐ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 10 (min)

Unlatching problems: possibly packer stuck in bit after unlatching, pull all rods

- ☑ Remove packer tool & inspect: all ok, no damage, no scratches ...
- ☑ Follow cleanup and disassembly procedures.

change defl. method to e-pin (1 pin) from now on

- take out 1 e-pin, next test with deflate with e-pins as precaution

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IPI SWiPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10 WBW-001 Test # 6 Date: Apr 20 2010
Zone depth along hole (m/ft units?)
from 103 to: 204.8 start time: 15:10 end time: 16:45
Location / project ID: Hope Bay - Doris LK
Zone description: metavolc; mostly competent, high foliation domain ~ 145 m * includes test 5 zone

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 120 (psi)
Planned P steps: 40 80 120 (psi)
Packer type: single / straddle

1. Test zone preparation

right after test 5

- ☑ Flush hole before pulling rods. Development time_____(min)
  Before/after water quality (color, EC): _____
- ☑ Rods pulled up and depth verified with drillers: # rods_____ after pulling all rods, put back 102 m

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: 1 e-pin taken out
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect no damage, no scratches

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed continue from test 5
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. lake level
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time 2:04 (min:ss) until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☐ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☐ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 300 psi Inflation time= 5 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☐ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: —

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break tried, did not break
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 3 (min)

Unlatching problems: —

- ☑ Remove packer tool & inspect: ok, e-pin damaged but not broken
- ☑ Follow cleanup and disassembly procedures.

replaced shear pin - packer dragging in hole?
+ e-pin before next test

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IPI SWiPS acker Testing Checklist (**Downhole Test**)

Borehole ID: 10 WBW-001 Test # 7 Date: Apr 21 2010
Zone depth along hole (m/ft units?)
from 202 to: 252 start time: 15:00 end time: 17:10
Location / project ID: Hope Bay (Doris Lk)
Zone description: metavolcanic, competent, low FF, one mech RZ near 225m

Test supervisor: JS
Rig #/driller: Orbit 24 (Allain)
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 500 (psi)
Planned P steps: 40, 80, 120 (psi)
Packer type: (single) / straddle

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 10 (min)
  Before/after water quality (color, EC): clean
- ☑ Rods pulled up and depth verified with drillers: # rods 17

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ (Single) / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. top of rod, 3m above lake level + flowing
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time ~3 (min:ss) until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 300 psi Inflation time= 5 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi) leak 0.5 L/0.5 min = 1 L/min at 100psi
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks no leak
- ☑ P and flow measurements completed and data recorded } swivel } measured 0.08 L/min
  Pressurizing problems: _____

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break tried, packer sliding
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 10 (min)
  Unlatching problems: can't unlatch; pull few rods in hope packer will catch on something and break e pin
- ☑ Remove packer tool & inspect: ok, e pin intact
- ☑ Follow cleanup and disassembly procedures.

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IPI SWiPS acker Testing Checklist (**Downhole Test**)

Borehole ID: 10WBW-001 Test # 8 Date: Apr 22 2010
Zone depth along hole (m/ft units?)
from 252 to: 297 m start time: 12:45 end time: 14:05
Location / project ID: Doris Lk.
Zone description: metavolc., small RZ's / J's, most is competent rock, at 254m there is Qz vein with pieces of J, 20 cm (this Qz vein is 2m wide) core loss, pyrite on Qz at 254m drill lost pressure so expect water bearing fractures

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P > 200 (psi)
Planned P steps: 40 80 120 (psi)
Packer type: single / straddle

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 15 (min)
  Before/after water quality (color, EC): clear — measured artesian flow also. (fresh w. not purged rods yet)
- ☑ Rods pulled up and depth verified with drillers: # rods _____

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☐ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 500
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. artesian at 7psi
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time n/a (few min > 2 min) (min:ss) until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☐ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 300 psi Inflation time= 5 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: _____

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: _____ (min)

Unlatching problems: —

- ☑ Remove packer tool & inspect: ok
- ☑ Follow cleanup and disassembly procedures.

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IPI SWiPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: ID WBW-001 Test # 9 Date: Apr 22 2010
Zone depth along hole (m/ft units?) start time: 14:05
from 279 to: 297 end time: 15:30
Location / project ID:
Zone description: metavolc, few small R2's, some J's, competent rock, this test is below zone where rig lost pressure at 254 m ±

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip=66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P >200 (psi)
Planned P steps: 20, 40, 50, 100 (psi)
Packer type: single / straddle

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time >30 (min) right after test 8
  Before/after water quality (color, EC): clean
- ☑ Rods pulled up and depth verified with drillers: # rods 6 rods remain 18m off bottom of hole

2. Inspection of packer equipment

- ☐ O-rings (including red test seal)
  List of replaced parts:
- ☐ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☐ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☐ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 500
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. artesian flow
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time ≈4 mn (min:ss)
  until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps no leak at 100 psi
- ☑ Packer inflation (P=250 psi Inflation time=4 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P=500 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test:
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☐ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: —

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 1 (min)

Unlatching problems: move rods up 10 cm to help unlatch; unlatched after that

- ☐ Remove packer tool & inspect: ok
- ☑ Follow cleanup and disassembly procedures.

artesian flow started after unlatching

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IPI SWiPS acker Testing Checklist (**Downhole Test**)

Borehole ID: 10 WBW 001 Test # 10 Date: Apr 23 2010
Zone depth along hole (m/ft units?) start time: 14:15
from 297 to: 345 m end time: 16:05
Location / project ID: Hope Bay, Doris Lk.
Zone description: metavolc, altered / nearing diabase dyke?)

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 400 (psi)
Planned P steps: 40, 80, 120 (psi)
Packer type: single / straddle

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 10 (min)
  Before/after water quality (color, EC): _____
- ☑ Rods pulled up and depth verified with drillers: # rods 16 (48m)

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Trol 500
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. Artesian flow (slow) ~2 L/min
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time >5 min (min:ss)
  until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☑ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps no leaks at 150 psi
- ☑ Packer inflation (P= 6 psi Inflation time= _____ min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

artesian flow from casing 10 L/min at all P ranges during test, even at 0 psi and no flow injected

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: —

- injection flow very low < 1 L/min so flow down casing is artesian

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 2 (min)

Unlatching problems: —

- ☑ Remove packer tool & inspect: ok
- ☑ Follow cleanup and disassembly procedures.

note: to unlatch, ~~open defl.~~ after defl. valve open, let slack wireline completely (drop down) then pull up

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IPI SWiPS acker Testing Checklist (**Downhole Test**)

Borehole ID: IDWBW-001 Test # 11 Date: Apr 24, 2010
Zone depth along hole (m/ft units?)
from 345 to: 387 m start time: 12:50 end time: 14:46
Location / project ID: Hope Bay, Doris Lk.
Zone description: altered basalts, diabase contact at 381 m, diabase dyke

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 400 (psi)
Planned P steps: 40 80 120 (psi)
Packer type: single / straddle

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 10 (min)
  Before/after water quality (color, EC): _____
- ☑ Rods pulled up and depth verified with drillers: # rods _____

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☐ Optional: Pressure transducer started and installed Troll 500
- ☑ Remind (or instruct) drillers about what the installation plan is (flowing artesian)
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time ~ 6 (min:ss)
  until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 250 psi Inflation time= 3 min)
  + 400 psi 1 min
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☐ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: —

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: _____ (min)

Unlatching problems: had to pull on backend a few times

- ☐ Remove packer tool & inspect: ok
- ☑ Follow cleanup and disassembly procedures.

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IPI SWiPS acker Testing Checklist (**Downhole Test**)

Borehole ID: 10WBW 001 Test # 12 Date: Apr 25 2010
Zone depth along hole (m/ft units?)
from 387 to: 422.5 start time: 15:05
Location / project ID: Hope Bay, Doris Lk. end time: 17:30
Zone description: diabase, very competent — water sampling took most of this time

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip=66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 500 (psi)
Planned P steps: 40, 80, 120 (psi)
Packer type: single / straddle

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 10 (min)
  Before/after water quality (color, EC): clear
- ☑ Rods pulled up and depth verified with drillers: # rods 12 (36m)

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: inspected shear pin and e. replaced (1)
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 700
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. Flowing artesian
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time >6 (min:ss) until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 300 psi Inflation time= 3 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 700 psi) loud audible break — P↑ to 800psi to make sure
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☐ P and flow measurements completed and data recorded

Pressurizing problems: —

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 3 (min)

Unlatching problems: —

- ☑ Remove packer tool & inspect: ok
- ☑ Follow cleanup and disassembly procedures.

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IPI SWiPS acker Testing Checklist (**Downhole Test**)

Borehole ID: IDWBW001 Test # 13
Zone depth along hole (m/ft units?)
from 423 to: 471
Location / project ID: Doris Lk.
Zone description: diabase, very competent, a few joints

Date: Apr 26 2010
start time: 15:50
end time: 17:15

Test supervisor: JS
Rig #/driller: Orbit 24
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 550 (psi)
Planned P steps: 50, 100, 200, 300 (psi)
Packer type: single / straddle

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 5 (min)
  Before/after water quality (color, EC): clean
- ☑ Rods pulled up and depth verified with drillers: # rods ok

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 700
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. Artesian flow
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time or pump-in time ~8 min (min:ss) until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 300 psi Inflation time= 6 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 575 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

small swivel leak (measured)

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: —

6. Deflation & removal

- ☑ Follow deflation procedures in manual for specific conditions.
  - ☐ Optional: E-pin break
- ☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: _____ (min)

Unlatching problems: difficult to unlatch, multiple attempts

- ☑ Remove packer tool & inspect: ok
- ☑ Follow cleanup and disassembly procedures.

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IPI SWiPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: IDWBW001 Test # 14 Date: Apr 28 2010 Test supervisor: JS Shear pin strength: 500 (psi)
Zone depth along hole (m/ft units?) start time: 16:05 Rig #/driller: Orbit 24 Max P 600 (psi)
from 471 to: 564 m (EOH) end time: Hole dip= 66 degrees Planned P steps: 40, 80, 120 (psi)
Location / project ID: Rod size: HQ Packer type: single / straddle
Zone description: diabase (competent, solid rock) to 551.5 m, contact (sharp), basalt (foliated, some joints) from vuggs at 558.5 m +

1. Test zone preparation

(did maxibor before)

- ☑ Flush hole before pulling rods. Development time 10 (min)
  Before/after water quality (color, EC): _____
- ☑ Rods pulled up and depth verified with drillers: # rods to 471 m

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☑ Optional: Valve taped shut for insertion
- ☐ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☐ Flow meter system components connected
- ☑ Single / straddle packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 700
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline. artesian flow (slow) from rods
- ☑ Insert packer tool into borehole, **following procedures in manual.**
- ☑ Packer tool sink time or pump-in time ~10 min (min:ss) flow from casing continues
  until landing felt (or estimate sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☑ Optional: Tool pumped into place after, artesian small leak of
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)
  leak (artesian flow out) initially, just a trickle

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 350 psi Inflation time= 3 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test.
- ☐ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☐ Check packer seal at each P step during test and note any leaks
- ☐ P and flow measurements completed and data recorded
  Pressurizing problems: —

6. Deflation & removal

- ☐ Follow deflation procedures in manual for specific conditions.
  - ☑ Optional: E-pin break attempt ↓ artesian water when rods ↑ then packer free
- ☐ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: >5 (min)
  Unlatching problems: hard to unlatch
- ☑ Remove packer tool & inspect: Ok, small drill bit marks on packer element, no damage
- ☑ Follow cleanup and disassembly procedures.

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IPI SWPS Packer Testing Checklist (**Surface Test Only**)

Borehole ID: DHZW002 Date / time: 21 June 2010 / 08:30 Location: Hope Bay

Rod size: HQ Packer type: single / double Temp= 4 C Type of water used: drink Operator: JA

Purpose of test: Core barrel configuration (just put in binding ring)

1. Inspection of packer equipment

- [x] O-rings (including red test seal)
- [x] Deflation valve (opens/closes and mandrel holds)
- [x] Packer element rubber in good condition

2. Inspection of core barrel

- [x] Measure core barrel length inside and verify that it is correct length, check all core barrel subs present as required and correct size of reaming shells, other subs
- [x] Was the MLR installed properly?
- [x] Position core barrel for test (horizontally)

3. Correct assembly and installation

- [x] Single / double packer components connected correctly
- [x] Inform drillers about what the installation plan is
- [x] Insert packer tool into core barrel into borehole.
- [x] Put drill rod around packer element.
- [x] Connect flow meter, high/low P gauge(s), connect hoses
- [x] On flow meter: open bypass valve, open shutoff valve, close isolation valve to low P gauge on flow meter

4. Inflation and seal testing

- [x] Start water pump and bring to about 300 psi
- [x] Seal test consits of observing if water flow out of drill bit in core barrel. There should be no water flow out of barrel.
- [ ] Packer inflated at P=_____psi Infl.time=_____ min
- [ ] Increase pressure to blow shear pin.
- [ ] shear pin blown at P=_____psi
- [ ] Check again for leaks out of core barrel.

Did not complete ↓ see notes

5. Deflation & removal

- [ ] Stop water pump.
- [ ] Remove swivel head from core barrel.
- [ ] Using wrench or overshot tool, pull up hard on backend arrowhead to unlatch tool, pull enough to open deflation valve and wait to deflate.
- [ ] Disconnect and drain flowmeter / hoses.

Disassemble packer, drain water from ALL parts.

Test result and comments:

Did not continue surface test once core barrel seal was determined because of water (bottle) potentially spilling onto tundra without the ability to contain much flow (swivel seal had contained, but not much volume possible). seal was good, so decided to start first test.

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IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10WBH602 Test # 1 Date: 21 June 2010
Zone depth along hole (m/ft units?)
from 401 to: 482 start time: 11:00 (9:30 put rods down) end time: 13:30
Location / project ID: Hope Bay Test supervisor: SA
Zone description: basalt; competent rock Rig #/driller: Orbit 23/Alain
Hole dip= -74 degrees
Rod size: HQ
Shear pin strength: 500 (psi)
Max P 580 (psi)
Planned P steps: 200/300/400 (psi)
Packer type: single / double

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 15 (min)
  Before/after water quality (color, EC): _____
- ☑ Rods pulled up and depth verified with drillers: # rods 134 (put down)

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: red seal
- ☑ Tool landing ring greased
- ☐ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / double packer components connected correctly
  - N/A ☐ Optional: Pressure transducer started and installed
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time ~5:00 (min:ss) (1 min)
  until landing felt (or double estim.sink time if not felt)
  - N/A ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 450 psi Infl.time= 1:30 min)
- ☑ Flow meter recording flow and P gauges functional during packer inflation
- ☑ Shear pin blown (P= 600 psi)
- ☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: ✓

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline
- ☑ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 1 (min)

Unlatching problems: didn't unlatch → dropped all tension, then quick jolt to release

- ☑ Remove packer tool & inspect: _____
- ☑ Follow cleanup and disassembly procedures.

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+1.3m

PACKER ISOLATED INJECTION TEST

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Borehole ID	10W3W002	Test From (ft):	401m	To	482m
Test No.	1	Test Zone Length (ft)	81m	TD	500
Project:	Hope Bay	Start Date:	21 June 2010	End	21 June 2010
UTM (x,y)		Start Time:	9:30	End	
Datum:		Testing Personnel:	JA		
Elevation:		Falling Head After Inflate	—		

DTW (ft) (E or M)	unknown	Packer Type	S.Pkr	Zone Geology	conglomerate (low)
Bedrock Depth (ft)		Shear Pin (psi)	500	Core Frac Freq and Quality	
Hole Angle (from Vert)	-74	Gauge height (m)	2m	Flow Meter System Problems	none

Length of discharge pipe		Radius of discharge pipe (1"=0.0127m)		Radius of influence (10 m is standard value)	
Borehole radius (HQ=0.048m, NQ=0.038m)	HQ				

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	11:00	Start Swim	0:00	Start	9:00	Start	13:00	Start	50:00
Stop	12:30	Stop Swim	~5:00	Stop	10:30	Stop	15:00	Stop	57:00
Volume	lots	Total Time	5:00	Pin Break (psi)	600	Leaks	none	Method Removed	wireline
Comment	cuttings/cool	Seal	good	Exceed Max Test Step	yes			E-Pin Shear	—

Q (Liters / 30sec) (Use Last 3 to 5 Readings)

Pressure Range	Low	75	200	300	400	75		
	High	225	400	500	600	250		
Pressure Step (psi)		150	200	100	200	150		
Leak Q (L/30sec)								
1		731.20	732.70	735.00	737.00	736.45		
2		731.25 / 0.05	732.92 / 0.12	35.48 / 0.48	37.00 / 0	36.45 / 0.0		
3		731.30 / 0.05	733.05 / 0.13	35.81 / 0.33	37.04 / 0.04	36.53 / 0.08		
4		731.30 / 0.0	733.18 / 0.13	36.15 / 0.34	37.15 / 0.11	36.65 / 0.12		
5		731.35 / 0.05	733.25 / 0.07	36.75 / 0.40	37.18 / 0.03	36.78 / 0.13		
6		731.46 / 0.05	733.37 / 0.12	36.83 / 0.08	37.28 / 0.10	36.82 / 0.04		
7				37.12 / 0.29	37.40 / 0.12	39.90 / 0.08		
8				37.48 / 0.36	37.53 / 0.13			
9				37.80 / 0.32				
10								
11								
Stable Q (L/30sec)								

NOTES

* water flowing up and out of rods - wasn't happening prior to hole development
* NB: Last pressure step caused flow back into system (backwards); left to stabalize 2 min then looked at flow
* very low flow
* hard to pull packer out - dropped all tension & pulled abruptly for successful release
* long hole development as brine solution chemistry wasn't good & needed to stabalize
* no flow out of rods after test

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10WBW002 Test # 2
Zone depth along hole (m/ft units?)
from 447.3 to: 482
Location / project ID: Hope Bay
Zone description: Basalt

Date: 21 June 2012
start time: 14:00 (13:20 for development)
end time: 15:30

Test supervisor: JA
Rig #/driller: Orbit 23 / Alain
Hole dip= 74 degrees
Rod size: HQ

Shear pin strength: 560 (psi)
Max P 645 (psi)
Planned P steps: 200/300/400 (psi)
Packer type: single / double

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 30 (min)
  Before/after water quality (color, EC): _____
- ☑ Rods pulled up and depth verified with drillers: # rods 15

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 300
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / double packer components connected correctly
  - ☐ Optional: Pressure transducer started and installed
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time _____ (min:ss)
  until landing felt (or double estim.sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)
  1st attempt - no seal; possible deflation valve open as no shear or pin; 2nd attempt - good

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 153 psi Infl.time= 2 min)
- ☑ Flow meter recording flow and P gauges functional during packer inflation
- ☑ Shear pin blown (P= 600 psi)
- ☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: _____

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline
- ☑ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 305 (min)

Unlatching problems: dynamic; slack & significant jolt for release

- ☑ Remove packer tool & inspect: _____
- ☑ Follow cleanup and disassembly procedures.

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Borehole ID	MW3W002
Test No.	
Project:	HB
UTM (x,y)	
Datum:	
Elevation:	

PACKER ISOLATED INJECTION TEST

Test From (ft):	447.3 m	To	492 m	DTW (ft) (E or M)	1 m
Test Zone Length (ft)	3hm	TD	600 m	Bedrock Depth (ft)	0 m
Start Date:	2/06/10	End	2/06/10	Hole Angle (from Vert)	74
Start Time:	14:00	End	15:30		
Testing Personnel:	JA				
Falling Head After Inflate					

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Packer Type	Mylo	Length of discharge pipe	2m	Zone Geology	basalt
Shear Pin (psi)	500	Radius of discharge pipe (1"=0.0127m)	.0127	Core Frac Freq and Quality	low
Gauge height (m)	2m	Radius of influence (10 m is standard value)	10m	Flow Meter System Problems	none
		Borehole radius (HQ=0.048m, NQ=0.038m)	HR		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start		Start Swim		Start		Start		Start	
Stop		Stop Swim		Stop		Stop		Stop	
Volume		Total Time		Pin Break (psi)		Leaks		Method Removed	
Comment		Seal		Exceed Max Test Step				E-Pin Shear	

		Q (Liters / 30sec) (Use Last 3 to 5 Readings)						
Pressure Range	Low		75	200	300	400	125	
	High		250	400	500	600	225	
Pressure Step (psi)			200	200	200	200	100	
Leak Q (L/30sec)			74.94					
1			75.89 0 86	80.25	82.98	83.51	82.86	
2			76.50 0 76	80.79 0 52	83.27 0 24	83.56 05	82.91 05	
3			77.10 0 60	81.00 0 30	83.49 0 27	83.68 0 12	83.61 0 10	
4			77.72 0 62	81.21 0 21	83.76 0 27	83.84 0 14	83.15 0 14	
5			77.28 0 56	81.39 18		84.00 13	83.22 0 07	
6								
7								
8								
9								
10								
11								
Stable Q (L/30sec)								

NOTES

* Hole development about 10 min for brine conditions
* Again, had flow from rods, but stopped after initial seal test
* First attempt at seal unsuccessful - no blown pin, no seal, may deflation valve open; 2nd attempt no problems with seal

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: DWBW007 Test # 3 Date: 22 June 2010
Zone depth along hole (m/ft units?) start time: 14:30
from 483.3 to: 514 end time: _____
Location / project ID: Hope Bay
Zone description: Basalt/Diabase contact @ 504m Diabase → 511m ~ Basalt → 514m

Test supervisor: JA
Rig #/driller: Orbit 23[illegible] Alain
Hole dip= 74 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P _____(psi)
Planned P steps: 50/100/150 (psi)
Packer type: single / double

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 30 (min)
  Before/after water quality (color, EC): _____
- ☑ Rods pulled up and depth verified with drillers: # rods 11

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: _____
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / double packer components connected correctly
  - ☐ Optional: Pressure transducer started and installed
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time _____ (min:ss)
  until landing felt (or double estim.sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 100 psi Infl.time= 10 min) rod kept test
- ☑ Flow meter recording flow and P gauges functional during packer inflation
- ☑ Shear pin blown (P= 750 psi)
- ☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: _____

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline
- ☑ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 305 (min)

Unlatching problems: _____

- ☑ Remove packer tool & inspect: _____
- ☑ Follow cleanup and disassembly procedures.

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Borehole ID	10WBW002
Test No.	3
Project:	HB
UTM (x,y)	
Datum:	
Elevation:	

PACKER ISOLATED INJECTION TEST

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Test From (ft):	483	To	518	DTW (ft) (E or M)	0 m
Test Zone Length (ft)	36 m	TD	600	Bedrock Depth (ft)	0 m
Start Date:	22 June 10	End	22 June 2010	Hole Angle (from Vert)	74
Start Time:	14:30	End			
Testing Personnel:	JA				
Falling Head After Inflate	—				

Packer Type	Single	Length of discharge pipe	2m	Zone Geology	Basalt/diabase
Shear Pin (psi)	500	Radius of discharge pipe (1"=0.0127m)	0.0127	Core Frac Freq and Quality	1 ft / 3 m
Gauge height (m)	2m	Radius of influence (10 m is standard value)	10	Flow Meter System Problems	none
		Borehole radius (HQ=0.048m, NQ=0.038m)	HQ		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	14:30	Start Swim	0:00	Start	20:30	Start	27:00	Start	1:00:00
Stop	15:60	Stop Swim	9:00	Stop	27:00	Stop	55:00	Stop	1:05
Volume	—	Total Time	pumped down	Pin Break (psi)	750	Leaks	see below	Method Removed	overshot
Comment	—	Seal		Exceed Max Test Step				E-Pin Shear	—

Q (Liters / 30sec) (Use Last 3 to 5 Readings)

Pressure Range	Low	70	80	120	80	55	HOD →	no pin shear	
	High	60	100	170	120	100	LEAK		
Pressure Step (psi)		75	100	150	100	75	75	100	150
Leak Q (L/30sec)							?		
1		46.80	48.08	48.76	48.58	48.45	37.55	40.15	43.25
2		46.92	48.16	48.76	48.58	48.42	37.80	40.55	44.0
		0 | 12	0 | 08	0	0	0 | 03	0.25 | 40		0 | 75
3		47.02	48.25	48.76	48.58	48.46	37.80	40.71	44.38
		0 | 10	0 | 09	0	0	0 | 0	0.16	0 | 23	0 | 38
4		47.13	48.34	48.76	48.58	48.46	37.94	40.95	44.58
		0 | 11	0 | 09	0	0	0 | 0	0.14	27	20
5		47.23					38.05	41.14	44.78
		0 | 10					0.11	19	20
6									
7									
8									
9									
10									
11									
Stable Q (L/30sec)									

NOTES

- see rod leak (greater than flow)
- had to pump packer into position

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10NBW002 Test # 4
Zone depth along hole (m/ft units?)
from 59.3 to: 569
Location / project ID: Hope Bay
Zone description: Basalt

Date: 23 June 2010
start time: 16:45
end time: _____

Test supervisor: JA
Rig #/driller: Orbit 23/Alvin
Hole dip= 90 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P _____(psi)
Planned P steps: 75/100/150 (psi)
Packer type: single / double

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 30 (min)
  Before/after water quality (color, EC): white
- ☑ Rods pulled up and depth verified with drillers: # rods 17

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / double packer components connected correctly
  - ☐ Optional: Pressure transducer started and installed
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time _____ (min:ss)
  until landing felt (or double estim.sink time if not felt)
  - ☑ Optional: Tool lowered with wireline
  - ☑ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 100 psi Infl.time= 20 min) rod leak test conducted
- ☑ Flow meter recording flow and P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: _____

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline
- ☑ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 1 (min)

Unlatching problems: requires strong pull

- ☑ Remove packer tool & inspect: _____
- ☑ Follow cleanup and disassembly procedures.

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Borehole ID	DDH BH0002
Test No.	4
Project:	HH
UTM (x,y)	
Datum:	
Elevation:	

PACKER ISOLATED INJECTION TEST

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Test From (ft):	517.3	To	569	DTW (ft) (E or M)	
Test Zone Length (ft)		TD	600	Bedrock Depth (ft)	
Start Date:	23 June 2010	End		Hole Angle (from Vert)	
Start Time:	15:45	End			
Testing Personnel:	JA				
Falling Head After Inflate	–				

Packer Type	Single	Length of discharge pipe	2cm	Zone Geology	Diorite ft
Shear Pin (psi)	500	Radius of discharge pipe (1"=0.0127m)	0.0127	Core Frac Freq and Quality	low
Gauge height (m)	2m	Radius of influence (10 m is standard value)	10	Flow Meter System Problems	none
		Borehole radius (HQ=0.048m, NQ=0.038m)	HQ		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	16:45	Start Swim	0:07	Start	11:00	Start	25:00	Start	58:00
Stop	17:15	Stop Swim	4:00	Stop	25:00	Stop	45:00	Stop	45:00
Volume	–	Total Time	4:00	Pin Break (psi)	800	Leaks		Method Removed	unhooked
Comment	–	Seal	needed to pump	Exceed Max Test Step				E-Pin Shear	

Q (Liters / 30sec) (Use Last 3 to 5 Readings)

Pressure Range	Low	65	90	120	0	20		
	High	80	120	150	180	140		
Pressure Step (psi)		75	105	135	100	75		
Leak Q (L/30sec)								
1		76.30	76.96	79.58	80.05	81.09		
2		76.70 0	77.19 0 23	78.95 0 37	80.40 0 35	81.24 0 16		
3		76.30 0	77.45 0 26	79.31 0 35	80.77 0 37	81.45 0 21		
4		76.30 0	77.63 0 18	79.68 0 37	81.14 0 37	81.69 0 24		
5			77.87 0 24					
6								
7								
8								
9								
10								
11								
Stable Q (L/30sec)								

NOTES

*Post Leak:
75 67.01 / 67.25 / 67.42 / 67.64
100 68.55 / 68.78 / 69.05
150 69.00 / 69.94 / 70.25

Hitched to pump into bucket

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: MW 007 Test # 5 Date: 24/04/10
Zone depth along hole (m/ft units?) start time: 13:00
from 570.3 to: 602 ft end time: 15:30
Location / project ID: MB
Zone description: Basalt

Test supervisor: DA
Rig #/driller: Orbit 23 / Alan
Hole dip= 74 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 822 (psi)
Planned P steps: 75/100/150 (psi)
Packer type: single / double

1. Test zone preparation

- ☐ Flush hole before pulling rods. Development time_____(min)
  Before/after water quality (color, EC): _____
- ☐ Rods pulled up and depth verified with drillers: # rods_____

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: _____
- ☐ Packer element rubber inspect

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☐ Single / double packer components connected correctly
  - ☐ Optional: Pressure transducer started and installed
- ☐ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual.**
- ☑ Packer tool sink time 6 (min:ss)
  until landing felt (or double estim.sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place (pumped down)
- ☐ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 100 psi Infl.time= 45 min)
- ☑ Flow meter recording flow and P gauges functional during packer inflation
- ☑ Shear pin blown (P= 750 psi)
- ☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: _____

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline
- ☐ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time:_____ (min)

Unlatching problems: _____

- ☐ Remove packer tool & inspect: _____
- ☑ Follow cleanup and disassembly procedures.

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Borehole ID	10NBW002
Test No.	5
Project:	MB
UTM (x,y)	
Datum:	
Elevation:	

PACKER ISOLATED INJECTION TEST

Test From (ft):	30.3m	To	602 cohr
Test Zone Length (ft)		TD	60~2
Start Date:	24/06/16	End	
Start Time:		End	
Testing Personnel:			
Falling Head After Inflate			

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DTW (ft) (E or M)	1m
Bedrock Depth (ft)	1m
Hole Angle (from Vert)	74

Packer Type	sing 6
Shear Pin (psi)	500
Gauge height (m)	2m

Length of discharge pipe	
Radius of discharge pipe (1"=0.0127m)	
Radius of influence (10 m is standard value)	
Borehole radius (HQ=0.048m, NQ=0.038m)	HQ

Zone Geology	basalt
Core Frac Freq and Quality	low
Flow Meter System Problems	none

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start		Start Swim		Start	17:00	Start	29:00	Start	
Stop		Stop Swim		Stop	29:30	Stop		Stop	
Volume		Total Time		Pin Break (psi)	750	Leaks		Method Removed	
Comment		Seal		Exceed Max Test Step				E-Pin Shear	

Q (Liters / 30sec) (Use Last 3 to 5 Readings)

Pressure Range	Low	55	60	60	0	20			
	High	95	140	200	200	200			
Pressure Step (psi)		75	100	150	150	75			
Leak Q (L/30sec)		0.08	0.21	0.46	0.21	0.09			
1		48.0	48.50	48.75	49.25	49.65			
2		48.11	48.54	48.88	49.37	49.75			
		0 11	0 04	0 13	0 13	0 10			
3		48.22	48.54	49.01	49.48	49.85			
		0 11	0 00	0 13	0 11	0 10			
4		48.33	48.54	49.11	49.59	49.98			
		0 11	0 0	0 14	0 11	0 13			
5									
6									
7									
8									
9									
10									
11									
Stable Q (L/30sec)									

NOTES

* Rod Leak: 75: 43.40/43.48 → 0.08 L/30s
100: 43.97/43.98 → 0.21 L/30s
150: 44.69/45.15 → 1.46

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10 WBW-003 Patch 14 Test # 1 Date: 1/6/10
Zone depth along hole (m)/ft units?) start time: 1715
from 96.4 to: 173.2 end time: 2000
Location / project ID: Patch Lake HBML
Zone description: _____

Test supervisor: R Bowder Shear pin strength: 500 (psi)
Rig #/driller: #23 Richard Max P 250 (psi)
Hole dip= 70 degrees Planned P steps: 50/100/150 (psi)
Rod size: HQ Packer type: single / double

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 60 (min)
  Before/after water quality (color, EC): clear, brine
- ☑ Rods pulled up and depth verified with drillers: # rods 26, counted

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: none blew out pin
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500 psi
- ☑ Packer element rubber inspect ok

3. *Assembly and installation downhole*

- ☑ Flow meter system components connected 3 connection converters
- ☑ Single / double packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time 2:30 (min:ss) ~~v=5m/sec~~ based on transducer data
  until landing felt (or double estim.sink time if not felt) ~~(good slowly)~~ 1752
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps No leaks @ 200psi for 3 min
- ☑ Packer inflation (P= 200 psi Infl.time= 4 min)
- ☑ Flow meter recording flow and P gauges functional during packer inflation used oil-filled 600 psi max gauge
- ☑ Shear pin blown (P= 500 psi) 1833
- ☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks none hoses ✓ casing ✓
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: none

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline
- ☑ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: X WL↑ (min) 2min, WL↑ 2min, rods↑ 6cm, 2min
  Unlatching problems: WL 2min, WL↑, rods↑ 10cm, 2min, WL↑, WL=0,
- ☑ Remove packer tool & inspect: rods↓ 3cm, 2min, WL↑
- ☑ Follow cleanup and disassembly procedures. out of hole 1957 hrs

- no damage
- E pins intact.

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1613

Borehole ID	10WBW003
Test No.	1
Project:	HBML-WBW
UTM (x,y)	435202 / 7546758
Datum:	
Elevation:	

PACKER ISOLATED INJECTION TEST

Test From (ft): m	96.4	To	173.2	DTW (ft) (E or M)	?
Test Zone Length (ft) m	76.8	TD		Bedrock Depth (ft) m	0
Start Date:	1/7/2010	End	1/7/2010	Hole Angle (from Vert)	70
Start Time:	1715	End	2000	dip	
Testing Personnel:	R. Bowden				
Falling Head After Inflate	no leaks				

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Packer Type	HQ SWP	Length of discharge pipe	1 m	Zone Geology	
Shear Pin (psi)	500	Radius of discharge pipe (1"=0.0127m)	0.0127	Core Frac Freq and Quality	
Gauge height (m)	-1.2m	Radius of influence (10 m is standard value)	10	Flow Meter System Problems	none
		Borehole radius (HQ=0.048m, NQ=0.038m)	0.048		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	1615	Start Swim		Start	1800	Start	1820	Start	1930
Stop	1715	Stop Swim		Stop	1812	Stop	1917	Stop	1952
Volume		Total Time	240 sec	Pin Break (psi)	500	Leaks	none	Method Removed	regular+++
Comment	clean	Seal	excellent	Exceed Max Test Step	150			E-Pin Shear	no

		Q (Liters / 30sec) (Use Last 3 to 5 Readings)						
Pressure Range	Low	60	120	143	115	50		
	High	70	140	167	135	70		
Pressure Step (psi)		65	130	155	125	60		
Leak Q (L/30sec)								
1		779.90 .30	789.60 .80	803.00 1.56	840.60 1.40	851.10 0.64		
2		780.20 .26	790.40 .78	804.56 1.52	842.00 1.40	851.74 0.66		
3		780.46 .30	791.18 .71	806.08 1.49	843.40 1.40	852.40 0.63		
4		780.76 .28	791.99 .86	807.57 1.53	844.80 1.40	853.13 0.72		
5		781.04 .26	792.85 .83	809.10 1.55	846.20 1.42	853.85 0.70		
6		781.30 .25	793.68	810.65	847.62	854.55 0.74		
7		781.55 .24				855.29		
8		781.79 .25						
9		782.04						
10								
11								
Stable Q (L/30sec)		0.25	0.82	1.53	1.40	0.70		

NOTES

- unlatching / deflation was cranky
  - several pulls with wireline
  - 2 x rod pulls of 6cm & 10cm
  - 1 rod push of 2cm, which caused deflation using wireline
  - E pins intact.
- no packer damage

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: LDNBW003 Test # 2 Date: Jul 2
Zone depth along hole (m/ft units?) start time: ~~1750~~ 1730
from 171.4 to: 248.2 end time: 1942
Location / project ID:
Zone description:

Test supervisor: R Bowden
Rig #/driller: Richard/Max
Hole dip= 70 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 250 (psi)
Planned P steps: 75/150/225 (psi)
Packer type: (single) / double

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 60 (min)
  Before/after water quality (color, EC): slightly cloudy
- ☑ Rods pulled up and depth verified with drillers: # rods 26 counted

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: blow out pin
- ☑ Tool landing ring greased easy to open
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect slight bulge

3. Assembly and installation downhole

- ☑ Flow meter system components connected + 3 connectors
- ☑ (Single) / double packer components connected correctly
  - ☐ Optional: Pressure transducer started and installed Troll500
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- 1800 ☑ Packer tool sink time ? (min:ss) waited 9 min, attached swivel, filled until landing felt (or double estim.sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal), leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump 0.4 l/min @ 200 psi, 0.36 " " "
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 200 psi Infl.time= 4+ min)
- ☑ Flow meter recording flow and P gauges functional during packer inflation
- 1840 ☑ Shear pin blown (P= 5 26 psi)
- ☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

- 1845 ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: none

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline
- ☑ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 3 (min) 1934 WL=0, WL↑, 3 min; WL=0, 1942
  Unlatching problems: rods ↑ 4cm; broke E pin;
- ☑ Remove packer tool & inspect: 1 E pin - broken
- ☑ Follow cleanup and disassembly procedures. replaced E pin

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Borehole ID	10WBW003
Test No.	2
Project:	HBML-WB
UTM (x,y)	
Datum:	
Elevation:	39.265

PACKER ISOLATED INJECTION TEST

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Test From (ft): m	171.4	To	248.2	DTW (ft) (E or M)	?
Test Zone Length (ft) m	76.8 m	ft		Bedrock Depth (ft)	0
Start Date:	2/7/2010	End		Hole Angle (from Vert)	70
Start Time:	2/7/2010	End			
Testing Personnel:	E Bowden				
Falling Head After Inflate					

Packer Type	Gurum SWP	Length of discharge pipe	1.0	Zone Geology	
Shear Pin (psi)	560	Radius of discharge pipe (1"=0.0127m)	0.0127	Core Frac Freq and Quality	
Gauge height (m)	2m	Radius of influence (10 m is standard value)	10	Flow Meter System Problems	none
		Borehole radius (HQ=0.048m, NQ=0.038m)	0.048		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	1630	Start Swim	? <9min	Start		Start	1845	Start	1934
Stop	1730	Stop Swim		Stop		Stop	1916	Stop	1942
Volume		Total Time	<9min	Pin Break (psi)		Leaks	0.38 l/min	Method Removed	E-pin
Comment		Seal	excellent	Exceed Max Test Step				E-Pin Shear	yes (1)

		Q (Liters / 30sec) (Use Last 3 to 5 Readings)						
Pressure Range	Low	78	145	230	150	73		
	High	82	155	240	160	77		
Pressure Step (psi)		80	150	235	155	75		
Leak Q (L/30sec)								
1		88.00	10.30	33.00	54.00	69.00		
		.76	1.55	2.90	1.90	0.85		
2		88.76	11.85	35.90	55.90	69.85		
		.76	1.50	3.10	1.90	1.03		
3		89.52	13.35	39.00	57.80	70.88		
		.78	1.55	3.10	1.82	0.97		
4		90.30	14.90	42.10	59.62	71.85		
		.80	1.40	2.95	1.73	1.03		
5		91.10	16.30	45.105	61.35	72.88		
		.50	1.35	3.05	1.80	1.06		
6		97.60	17.65	48.10	63.15	73.94		
		.50	1.60		1.85			
7		92.10	19.25		65.00			
		.85	1.20		1.85			
8		92.95	20.45		66.85			
		.90	1.35		1.70			
9		93.65	21.75		68.55			
		.70						
10		94.35						
11								
Stable Q (L/30sec)		0.75	1.40	3.02	1.80	1.03		

NOTES

- could not deflate using inline
- ~~deflated~~ pulled rods to deflate, (1) shear pin, sheared.
-

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10WBW003 Test # 3 Date: July 3/2010
Zone depth along hole (m/ft units?) start time: 1230
from 246.4 to: 293.2 end time: 1445
Location / project ID: _____
Zone description: _____

Test supervisor: R Bowden
Rig #/driller: Richard, rig 23
Hole dip= 70 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 360 (psi)
Planned P steps: 100/200/300 (psi)
Packer type: (single) / double

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 25 (min)
  Before/after water quality (color, EC): cloudy but clean
- ☑ Rods pulled up and depth verified with drillers: # rods 116 (48m) (counted)

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect slight bulge (no per tests 1 & 2)

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ (Single) / double packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 500 started in camp
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- 1257 ☐ Packer tool sink time 7.6 <8 min (min:ss) based on transducer data until landing felt (or double estim.sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place

1320 ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)
perfect

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump 115psi, 3min, 1.0l = 0.33l/min ~~240psi, 3m, 1.9l. = 0.63 l/m~~
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 200 psi Infl.time= 3 min)
- ☑ Flow meter recording flow and P gauges functional during packer inflation
- 1335 ☐ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test

1340 **5. Injection testing**

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks ✓ none
- ☑ P and flow measurements completed and data recorded After steps 1 & 2 PP to 800-900psi
  Pressurizing problems: _____

1430 **6. Deflation & removal**

- ☑ Remove swivel head and lock to backend with wireline
- ☐ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 2 (min), WL ↑, very tight
  Unlatching problems: yes, pulled rods 10cm, head thump, 2min, packer free
- 1445 ☑ Remove packer tool & inspect: 1 E-pin sheared
- ☑ Follow cleanup and disassembly procedures. 1445 out of hole

↳ replaced E pin (1 only)
- checked every O-ring + TAM + mandrel
- washed all parts.

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Borehole ID	10WBW003
Test No.	3
Project:	HBML - WBW
UTM (x,y)	
Datum:	
Elevation:	39.265

PACKER ISOLATED INJECTION TEST

SRK Consulting
Engineers and Scientists

Test From (ft):	246.2	To	293.2		
Test Zone Length (ft)	46.8	TD		DTW (ft) (E or M)	
Start Date:	3/7/2010	End	3/7/2010	Bedrock Depth (ft/m)	0
Start Time:	3/7/2010 1230	End		Hole Angle (from Vert)	70
Testing Personnel:	R Brandon				
Falling Head After Inflate	static				

Packer Type	SWIP	Length of discharge pipe	1	Zone Geology	
Shear Pin (psi)	500	Radius of discharge pipe (1"=0.0127m)	0.0127	Core Frac Freq and Quality	0-1/m
Gauge height (m)	2	Radius of influence (10 m is standard value)	10	Flow Meter System Problems	none
		Borehole radius (HQ=0.048m, NQ=0.038m)	HQ 0.048		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	1200	Start Swim	1257	Start 1330		Start	1340	Start 1417	1438
Stop	1225	Stop Swim		Stop 1333		Stop	1412	Stop	1445
Volume		Total Time	<12	Pin Break (psi) 550		Leaks	none	Method Removed	E-Pin
Comment		Seal	excellent	Exceed Max Test Step				E-Pin Shear	yes (1)

		Q (Liters / 30sec) (Use Last 3 to 5 Readings) *						
Pressure Range	Low	100	208	300	190	100		
	High	110	212	310	200	110		
Pressure Step (psi)		105	210	305	195	105		
Leak Q (L/30sec)								
1		141.90 Ø	143.04 Ø	143.40 Ø	142.75 Ø	142.20 Ø		
2		141.90 Ø	143.04 Ø	.40 Ø	.75 Ø	.20 Ø		
3		141.90 Ø	143.04 Ø	.40 ~~.40~~ Ø	.75 Ø	.20 Ø		
4		141.90 Ø	143.05 Ø	.40 Ø	.75 Ø	.20 Ø		
5		141.90	143.05 Ø	.40 Ø	.75	.20		
6			143.05 Ø	.40 Ø				
7								
8								
9								
10								
11								
Stable Q (L/30sec)								

NOTES

- * no flow @ 100 & 200 psi during testing, suspicions, so increased ~~P~~ to 800-900 psi to confirm pin/plug
- confirmed that plug blew out
- V. tight
- flow meter was working
- leakage before blowing out plug ~~was~~ did not occur during the staged testing.

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10WBW003 Test # 4 Date: 5/7/10
Zone depth along hole (m/ft units?) start time: 1020
from 291.4 to: 292.2 end time: 1226
Location / project ID: _____
Zone description: _____

Test supervisor: R Bowden Shear pin strength: 500 (psi)
Rig #/driller: #23, Richard/Max Max P 450 (psi)
Hole dip= 70 degrees Planned P steps: 100/250/400 (psi)
Rod size: HQ Packer type: (single) / double

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 40 (min)
  Before/after water quality (color, EC): cloudy, clean
- ☑ Rods pulled up and depth verified with drillers: # rods 34 = 102 m

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: all seals checked
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☐ Shear pin replaced; pin strength: 500 psi
- ☑ Packer element rubber inspect slight bulge, as per tests 1-3

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ (Single) / double packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 500
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☑ Packer tool sink time 8 min 42 – based on transducer data (min:ss) waited 10 min until landing felt (or double estim.sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☐ Optional: Tool pumped into place
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)
  1042 excellent

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps 0.13-0.16 l/min @ 150 psi, 200, 250, 300, 350
- ☑ Packer inflation (P= ~~8~~ 200-350 psi Infl.time= 12 min)
- ☑ Flow meter recording flow and P gauges functional during packer inflation
- ☑ Shear pin blown (P= 500 psi)
- ☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: none

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline
- ☐ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: _____ (min)

Unlatching problems: difficult. Various combinations w/ Wireline and
- ☐ Remove packer tool & inspect: rod pulls, alone and together
  - no damage
  - deflation valve open
  - Epin (1) intact.
- ☐ Follow cleanup and disassembly procedures.

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Borehole ID	10wBW 003
Test No.	4
Project:	HBML-WBT
UTM (x,y)	
Datum:	
Elevation: m	39.265

PACKER ISOLATED INJECTION TEST

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Test From (ft): m	291.2	To	392.2	DTW (ft) (E or M)	?
Test Zone Length (ft) m	97.8 m	TD		Bedrock Depth (ft)	0
Start Date:	5/7/10	End	5/7/10	Hole Angle (from Vert)	70
Start Time:	1000	End			
Testing Personnel:	R Bowden				
Falling Head After Inflate					

Packer Type	SWIP-HQ	Length of discharge pipe	1	Zone Geology	
Shear Pin (psi)	500	Radius of discharge pipe (1"=0.0127m)	0.0127	Core Frac Freq and Quality	0-1 (based on photos)
Gauge height (m)	1	Radius of influence (10 m is standard value)	10 m	Flow Meter System Problems	none
		Borehole radius (HQ=0.048m, NQ=0.038m)	0.048		

Hole Development		Packer Install		Packer Inflation w leakage tests		Injection Test		Packer Deflation	
Start	0910	Start Swim	1027	Start 1052		Start	1130	Start	1204
Stop	0950	Stop Swim	10~~27~~ min est.	Stop 1118	1	Stop	1156	Stop	1226
Volume		Total Time	7 min	Pin Break (psi)	500	Leaks	0.13-0.16	Method Removed	deflate valve
Comment		Seal	excellent	Exceed Max Test Step			L/min	E-Pin Shear	intact

		Q (Liters / 30sec) (Use last 3 to 5 Readings)						
Pressure Range	Low	150	260	~~340~~ 350	230	140		
	High	160	280	~~390~~ 400	250	150		
Pressure Step (psi)		155	~~270~~	375	240	145		
Leak Q (L/30sec)								
1		98.04	99.40	401.00	400.80	400.38		
		.06	0.06	0.16	0.10	0.00		
2		.10	99.46	.10	.90	400.38		
		0.05	0.06	0.10	0.08	0.04		
3		.15	.52	.20	.98	400.42		
		0.03	0.03	0.04	0.06	0.03		
4		.18	.55	.24	401.04	400.45		
		0.02	0.03	0.04	0.03	0.03		
5		.20	.58	.28	401.07	400.48		
		0.02	0.0	0.07	0.03	0.03		
6		.22	.64	.35	401.10	.51		
		0.02		0.10	0.04	0.04		
7		.24		.145	401.14	.55		
				0.00				
8				.145				
			0.04	0.03				
9				.48				
				.08				
10				.56				
				.08				
11			.48	0.64				
Stable Q (L/30sec)		0.02	0.04	0.06	0.04	0.03		
						1156 hrs		

NOTES

- extensive leakage testing 0.13 - 0.16 L/min 155 to 350 psi, NOT pressure sensitive
- leakage not observed during injection testing.

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 16WBW003 Test # 5 Date: 6/7/2016
Zone depth along hole (m/ft units?)
from 398.4 to: ~~458.4~~ 458.2
Location / project ID:
Zone description: foliated mafic sediments, v. few joints

start time: 1600
end time: 1800

Test supervisor: RBowden
Rig #/driller: 23, Richard/Max
Hole dip= 70 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 580 (psi)
Planned P steps: 200/400/550 (psi)
Packer type: single / double

1. Test zone preparation

1540 ☑ Flush hole before pulling rods. Development time 20 (min)
Before/after water quality (color, EC): cloudy, clean

☑ Rods pulled up and depth verified with drillers: # rods 22 = 66m

2. Inspection of packer equipment

☑ O-rings (including red test seal)
List of replaced parts: red ring replaced

☑ Tool landing ring greased

☑ Deflation valve (greased/opens & closes easily & mandrel holds)

☐ Optional: Valve taped shut for insertion

☑ Shear pin replaced; pin strength: 500

☑ Packer element rubber inspect slight bulge ea per tests 1-4

3. Assembly and installation downhole

☑ Flow meter system components connected

☐ single / double packer components connected correctly

☑ Optional: Pressure transducer started and installed Troll 500

☑ Remind (or instruct) drillers about what the installation plan is

☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.

☑ Insert packer tool into borehole, **following procedures in manual**.

1630 ☐ Packer tool sink time 11:08 (min:ss) from transducer data until landing felt (or double estim.sink time if not felt)

☐ Optional: Tool lowered with wireline

☐ Optional: Tool pumped into place

1640 ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)
perfect

3 min @ 145 psi ⇒ 0.21 l/min
2 " @ 220 0.30 l/min
4 " @ 275 0.28 l/min
2 " @ 200 0.14 l/min

4. Inflation and seal testing

☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump

☑ Measure system leak before shear pin blown at planned P steps

☑ Packer inflation (P= 150/275 psi Infl.time= 12 min)

☑ Flow meter recording flow and P gauges functional during packer inflation

1705 ☐ Shear pin blown (P= 500 psi)

☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

1707 ☑ Use bypass valve to control flow and pressure for test pressure steps.

☑ Check packer seal at each P step during test and note any leaks

☑ P and flow measurements completed and data recorded

Pressurizing problems: none

6. Deflation & removal

1745 ☑ Remove swivel head and lock to backend with wireline

☐ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 2 (min) WL pull, w rod pull x 2, released

Unlatching problems: minor

☑ Remove packer tool & inspect: fine, defl.n open, E pin intact

1800 ☑ Follow cleanup and disassembly procedures.

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Borehole ID	10WBW003
Test No.	5
Project:	
UTM (x,y)	
Datum:	
Elevation:	39.265

PACKER ISOLATED INJECTION TEST

SRK Consulting
Engineers and Scientists

Test From (ft): m	393.4	To	458.2		
Test Zone Length (ft)	~~64.8~~	TD		DTW (ft) (E or M)	
Start Date:	6/7/10	End	6/7/10	Bedrock Depth (ft)	0
Start Time:	~~1647~~ 1600	End	1800	Hole Angle (from Vert)	70
Testing Personnel:	R Bowden				
Falling Head After Inflate	no				

Packer Type	SWP	Length of discharge pipe	1	Zone Geology	meta sediments.
Shear Pin (psi)	500	Radius of discharge pipe (1"=0.0127m)	0.0127	Core Frac Freq and Quality	0-1 frac/m
Gauge height (m)	1	Radius of influence (10 m is standard value)	10	Flow Meter System Problems	none
		Borehole radius (HQ=0.048m, NQ=0.038m)	0.048		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	1540	Start Swim	1630	Start	1648	Start	1707	Start	1750
Stop	1600	Stop Swim	1641	Stop	1705	Stop	1740	Stop	1800 at ground surface.
Volume		Total Time	11	Pin Break (psi)	as part of leakage tests	Leaks	none visible	Method Removed	def 1" sub/WL
Comment		Seal	excellent	Exceed Max Test Step	~~1725~~			E-Pin Shear	intact

		1707		1719 Q (Liters / 30sec) (Use Last 3 to 5 Readings) ~~1724~~ 1732				
Pressure Range	Low	180	340	~~460~~	~~360~~ 340	~~270~~ 280		
	High	200	400	~~540~~	380	~~280~~ 290		
Pressure Step (psi)		190	370	500	360	285		
Leak Q (L/30sec)								
1		429.80 / .90	444.00 / 2.80	479.00 / 2.70	493.80 / .84	498.70 / ~~1.99~~ 0.60		
2		430.70 / .95	446.80 / 2.00	481.70 / 2.75	494.64 / 1.01	499.30 / 0.75		
3		431.65 / 1.00	~~448.60~~ / 1.95	484.45 / 2.80	~~495.65~~ / 1.10	500.05 / 0.90		
4		432.65 / 0.95	450.75 / 2.40	487.25 / 2.95	~~496.75~~ / 1.20	500.95 / 0.55		
5		~~433.60~~ / 0.93	453.15 / 2.05	~~490.20~~ / 3.00	497.95 / 1.20	501.50 / 0.55		
6		~~434.53~~ / 0.93	455.20 / 2.05	493.20	499.15 / 1.25	502.05 / 0.57		
7		435.40	457.25		500.40	502.62 / 0.63		
8						503.25 / 0.63		
9						503.88		
10						~~1740~~		
11						t= 1740		
Stable Q (L/30sec)								

NOTES

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10WBW0023 Test # 6 Date: 7/7/10
Zone depth along hole (m)/ft units?) start time: 1600
from 456.2 to: 500.2 end time: 1810
Location / project ID:
Zone description:

Test supervisor: R Bowden Shear pin strength: 500 (psi)
Rig #/driller: 23 / Richard, Max Max P 660 (psi)
Hole dip= 70 degrees Planned P steps: 200/400/600 (psi)
Rod size: HQ Packer type: (single) / double

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 3 hrs (min)
  Before/after water quality (color, EC): cloudy, clean
- ☑ Rods pulled up and depth verified with drillers: # rods 15, 45 ea

455.2
+ 1.2
456.4

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: none.
- ☐ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect slight bulge, as per tests 1–5

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ (Single) / double packer components connected correctly
  - ☐ Optional: Pressure transducer started and installed No transducer – too deep.
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.
- ☐ Packer tool sink time_____ (min:ss) est 12min
  until landing felt (or double estim.sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☑ Optional: Tool pumped into place, leaking seal, tapped w overshot ⇒ perfect seal
- ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

psi	leakage/. L/min
130	0.40 @ 3min
230	0.42 2min
335	0.73 3min

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☐ Measure system leak before shear pin blown at planned P steps yes – see field notes.
- ☐ Packer inflation (P=130-335 psi Infl.time= 7 min)
- ☑ Flow meter recording flow and P gauges functional during packer inflation
- ☑ Shear pin blown (P= 560 psi)
- ☐ Remind the drillers not to move or rotate rods during test

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: none

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline
- ☑ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time:_____ (min)

Unlatching problems: yes. Pulled rods + WL 3X. E pin broke on 3rd.

- ☑ Remove packer tool & inspect: Packer fine. Def'n open. E pin sheared.
- ☑ Follow cleanup and disassembly procedures.

1810 packer @ ground surface.

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Borehole ID	LOW BW 003
Test No.	6
Project:	Hope Bay WBI
UTM (x,y)	
Datum:	
Elevation:	

PACKER ISOLATED INJECTION TEST

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Test From (ft): m	456.4	To	509.7 FOR		
Test Zone Length (ft) m	53.2	TD		DTW (ft) (E or M)	
Start Date:	7/7/10	End	1600	Bedrock Depth (ft) m	0
Start Time:	7/7/10	End	1810	Hole Angle (from Vert)	70
Testing Personnel:	R Bowden				
Falling Head After Inflate	no				

Packer Type	HQ SWP	Length of discharge pipe	1	Zone Geology	meta sediments
Shear Pin (psi)	500	Radius of discharge pipe (1"=0.0127m)	0.0127	Core Frac Freq and Quality	0-2 frac, 0 joints/run
Gauge height (m)	1	Radius of influence (10 m is standard value)	10	Flow Meter System Problems	none.
		Borehole radius (HQ=0.048m, NQ=0.038m)	0.048		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	3 hrs	Start Swim	1612	Start	1706	Start	1724	Start	1754
Stop	during rig	Stop Swim	?	Stop	1722	Stop	1746	Stop	1810
Volume	maintenance	Total Time		Pin Break (psi)	560	Leaks	none visible	Method Removed	
Comment		Seal	excellent	Exceed Max Test Step				E-Pin Shear	

		1724 hrs		1730 Liters / 30sec) (Use Last 3 to 5 Readings)				
Pressure Range	Low	190	370	520	370	210		
	High	210	430	590	430	220		
Pressure Step (psi)		200	400	555	400	215		
Leak Q (L/30sec)								
1		39.55 / 0.15	43.20 / 0.37	49.40 / 0.41	51.12 / 0.34	51.68 / 0.21		
2		39.70 / 0.14	43.57 / 0.36	49.81 / 0.42	51.46 / 0.34	51.89 / 0.22		
3		39.84 / 0.16	43.93 / 0.35	50.23 / 0.42	51.80 / 0.33	52.11 / 0.23		
4		40.00 / 0.14	44.28 / 0.32	50.65 / 0.41	52.13 / 0.31	52.34 / 0.22		
5		41.14 / 0.14	44.60 / 0.32	51.06 / 0.42	52.44 / 0.32	52.58 / ~~52.5~~ 0.23		
6		41.28	44.92	51.48	52.76	52.81		
7						1746 hrs.		
8								
9								
10								
11								
Stable Q (L/30sec)		0.14	0.34	0.42	0.32	0.22		

NOTES

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10WBW003 Test # 7 Date: July 8/10
Zone depth along hole (m/ft units?) start time: 1000
from 498.4 to: 548.2 FOH end time: 1145
Location / project ID:
Zone description:

Test supervisor: R Beaudoin Shear pin strength: 500 (psi)
Rig #/driller: 23, Richard Max P 750 (psi)
Hole dip= 70 degrees Planned P steps: 200/400/600 (psi)
Rod size: HQ Packer type: single / double

1. Test zone preparation

0940 ☑ Flush hole before pulling rods. Development time 20 (min)
Before/after water quality (color, EC): cloudy, clean

1005 ☑ Rods pulled up and depth verified with drillers: # rods 17 rods = 51m

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts: none
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☐ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect slight bulge, as per tests 1-6

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / double packer components connected correctly
  - ☐ Optional: Pressure transducer started and installed – None.
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual**.

1011 ☐ Packer tool sink time unknown (min:ss)
until landing felt (or double estim.sink time if not felt)

- ☐ Optional: Tool lowered with wireline
- ☑ Optional: Tool pumped into place

1034 ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems) perfect

psi	Flow rate (L/min)	durat= (min)	
160	0.75	2	no casing leaks.
270	1.14	2	
325	1.42	2	
250	0.88	2	

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☐ Packer inflation (P= 200-350 psi Infl.time= 10 min)
- ☑ Flow meter recording flow and P gauges functional during packer inflation

1057 ☑ Shear pin blown (P= 540 psi)

- ☑ Remind the drillers not to move or rotate rods during test

5. Injection testing 1101 – 1129

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☐ P and flow measurements completed and data recorded

Pressurizing problems: none

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline

1136 ☑ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: _____ (min)

Unlatching problems: minor, pulled in LWL 3 rods 3x

1145 ☑ Remove packer tool & inspect: no damage, defl^ open, Epin intact.

- ☑ Follow cleanup and disassembly procedures.

everything packed up and photographed for move to Boston, 10WBW004

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Borehole ID	10WBW003
Test No.	7
Project:	HBML-WBI
UTM (x,y)	
Datum:	
Elevation:	39.265

PACKER ISOLATED INJECTION TEST

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Test From (ft)	498.4	To	548.2	DTW (ft) (E or M)	
Test Zone Length (ft)	49.8	TD	548.2	Bedrock Depth (ft)	0
Start Date:	July 9/10	End	July 9/10	Hole Angle (from Vert)	70
Start Time:	1000	End			
Testing Personnel:	R Bowden, Rig 23, Driller Richard				
Falling Head After Inflate	no				

Packer Type	HQ	Length of discharge pipe	1	Zone Geology	meta ocdis
Shear Pin (psi)	500	Radius of discharge pipe (1"=0.0127m)	0.0127	Core Frac Freq and Quality	none
Gauge height (m)	?	Radius of influence (10 m is standard value)	10	Flow Meter System Problems	
		Borehole radius (HQ=0.048m, NQ=0.038m)	0.048		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	0940	Start Swim	1011	Start ~~1039~~	1045	Start	1101	Start	1136
Stop	1000	Stop Swim	?	Stop ~~1047~~	1057	Stop	1129	Stop	1145
Volume		Total Time		Pin Break (psi)	540	Leaks		Method Removed	left in
Comment		Seal	excellent	Exceed Max Test Step	no			E-Pin Shear	intact

		1101 hrs.		Q (Liters / 30sec) (Use Last 3 to 5 Readings)				
Pressure Range	Low	210	320	590	480	250		
	High	220	330	660	530	290		
Pressure Step (psi)		215	250	625	450	275		
Leak Q (L/30sec)				603.00				
1		591.00	594.30	603.00	615.00	621.80		
		0.20	0.38	1.20	0.90	0.43		
2		.20	594.68	604.20	615.90	622.23		
		0.23	0.37	1.00	~~0.78~~ 0.88	0.36		
3		.43	595.05	605.20	616.78	622.59		
		0.21	0.38	0.98	0.98	0.36		
4		.64	.43	606.18	617.66	622.95		
		0.20	0.38	1.20	PL 0.57	0.37		
5		.84	595.81	607.38	618.23	623.32		
		0.24	0.36	1.20	0.62	0.38		
6		592.08	6.17	608.58	618.75	623.70		
				1.20	0.70			
7				609.78	619.45			
				1.00	0.80			
8				.68	620.25			
				1.00	0.73			
9				611.68	620.98			
				1.15	0.72			
10				2.83	621.70			
				1.15	0.70			
11				613.98	622.40			
						1129 hrs.		
Stable Q (L/30sec)								

NOTES

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10WBW004 Test # 1 Date: 18/7/10
Zone depth along hole (m/ft units?) start time: 0745
from 39.2 to: 77 end time: 0945
Location / project ID:
Zone description:

Test supervisor: R. Bowden Shear pin strength: 500 (psi)
Rig #/driller: 23, Richard Max P 58 (psi)
Hole dip= 70 degrees Planned P steps: 10/30/50 (psi)
Rod size: HQ Packer type: single / double

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 15 (min)
  Before/after water quality (color, EC): cloudy but clear
- ☑ Rods pulled up and depth verified with drillers: # rods ~~40~~ 13

2. Inspection of packer equipment

- ☑ O-rings (including red test seal)
  List of replaced parts:
- ☑ Tool landing ring greased
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500 psi
- ☑ Packer element rubber inspect fine

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ Single / double packer components connected correctly
  - ☑ Optional: Pressure transducer started and installed Troll 500
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual.**
- 0847 ☐ Packer tool sink time ? (min:ss)
  until landing felt (or double estim.sink time if not felt)
  - ☐ Optional: Tool lowered with wireline
  - ☑ Optional: Tool pumped into place + rotat^{n} + top w/ wireline

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0900 ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

psi	flow (l)	durat^{n} (min)	leakage (l/m)
30	0.15	2	6.075
50	0.36	3	0.12

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
- ☑ Measure system leak before shear pin blown at planned P steps
- ☑ Packer inflation (P= 600 ~~300~~ psi Infl.time= 2 min)
- ☑ Flow meter recording flow and P gauges functional during packer inflation
- ☑ Shear pin blown (P= 600 psi)
- ☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

- ☑ Use bypass valve to control flow and pressure for test pressure steps.
- ☑ Check packer seal at each P step during test and note any leaks
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: fine until near end of stage 3, then P↓ and leakage up through casing.

6. Deflation & removal

- ☑ Remove swivel head and lock to backend with wireline
- ☐ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: (min)

Unlatching problems: minor. Used WL + rod pull combo

0945 ☑ Remove packer tool & inspect: defl^{n} open, Epoxi intact

- ☑ Follow cleanup and disassembly procedures.

- changed red ring

- removed and downloaded Troll 500.

PACKER ISOLATED INJECTION TEST

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Borehole ID	LOWBW-003	Test From (m)	39.2	To	77.4		
Test No.	1	Test Zone Length (m)	37.8	TD		DTW (m) (E only)	7
Project	HBML - WBW	Start Date	18/7/10	End	18/7/10	Bedrock Depth (m)	29
UTM (x,y)		Start Time	0745	End		Hole Angle (from Vert)	70
Datum		Testing Personnel	RBond				
Elevation		Falling Head After Inflate	no				

Packer Type	HQ-SWP	Length of discharge pipe	1	Zone Geology	altered mafics in gneiss, veins
Shear Pin (psi)	500	Radius of discharge pipe (1" = 0.0127m)	0.0127	Core Frac Freq and Quality	0-2 FF/m
Gauge height (m)	1	Radius of influence (10 m is standard value)	10	Flow Meter System Problems	none
		Borehole radius (HQ=0.048m, NQ=0.038m)	0.048		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	0745	Start Swim	0834	Start	0913	Start	0917	Start	0940
Stop	0805	Stop Swim	?	Stop	0915	Stop	0932	Stop	
Volume		Total Time		Pin Break (psi)	600	Leaks	yes, loss of seal, Step 3	Method Removed	left in
Comment		Seal		Exceed Max Test Step				E-Pin Shear	No — intact

		Q (Liters / 30sec) (Use Last 3 to 5 Readings)						
Pressure Range	Low	33	48	58				
	High	37	52	62				
Pressure Step (psi)		35	50	60				
Leak Q (L/30sec)								
1		33.18	33.90	34.08				
		Ø	Ø	Ø				
2		.18	33.90	.08				
		Ø	Ø	Ø				
3		.18	33.90	.08				
		Ø	Ø	0.02				
4		.18	33.90	0.10				
		Ø	Ø	0.07				
5		.18	33.90	0.12				
			Ø					
6			.90	loss of seal Pb casing flow ↑				
7								
8				0932				
9								
10								
11								
Stable Q (L/30sec)								

NOTES

IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10-WB-WD04 Test # 2 Date: 19/7/10
Zone depth along hole (m/ft units?)
from 75.2 to: 125.0 start time: 0930 end time: 1104
Location / project ID:
Zone description: mafics & greywacke, v.low FF, 0-1 L/min

Test supervisor: R Bowden
Rig #/driller: 23, Richard
Hole dip= 70 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 110 (psi)
Planned P steps: 50/75/100 (psi)
Packer (type) single / double

1. Test zone preparation

0930 ☑ Flush hole before pulling rods. Development time 15 (min)
Before/after water quality (color, EC): cloudy, clean

☑ Rods pulled up and depth verified with drillers: # rods 17, =51 m

2. Inspection of packer equipment

☑ O-rings (including red test seal)
List of replaced parts: replaced before test

☑ Tool landing ring greased

☑ Deflation valve (greased/opens & closes easily & mandrel holds)

☐ Optional: Valve taped shut for insertion

☑ Shear pin replaced; pin strength: 500

☑ Packer element rubber inspect - fine

3. Assembly and installation downhole

☑ Flow meter system components connected

☑ (Single) / double packer components connected correctly

☑ Optional: Pressure transducer started and installed Troll 500

☑ Remind (or instruct) drillers about what the installation plan is

☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.

☑ Insert packer tool into borehole, **following procedures in manual**.

1008 ☑ Packer tool sink time ____ (min:ss)
until landing felt (or double estim.sink time if not felt)

☐ Optional: Tool lowered with wireline

☐ Optional: Tool pumped into place

☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)
excellent.

psi	Δ P	t	leakage rate (l/min)
40	9.83 → 9.15 = 0.68	2	0.68/2 = 0.34
70	4.90 → 3.50 = 1.4	2	= 0.70
100	8.40 → 7.00 = 1.4	2	= 0.70

4. Inflation and seal testing

☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump

1023 ☐ Measure system leak before shear pin blown at planned P steps

1033 ☐ Packer inflation (P= 200 psi Infl.time= 3 min)

☑ Flow meter recording flow and P gauges functional during packer inflation

☑ Shear pin blown (P= 600 psi)

☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

1039 ~~1057~~

☑ Use bypass valve to control flow and pressure for test pressure steps.

☑ Check packer seal at each P step during test and note any leaks

☑ P and flow measurements completed and data recorded

1057 Pressurizing problems: none

6. Deflation & removal

☑ Remove swivel head and lock to backend with wireline

☐ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: ____ (min)

Unlatching problems: pulled WL & rods together

☐ Remove packer tool & inspect: defl² open, E pin sheared

☑ Follow cleanup and disassembly procedures.
- replaced E pin & blew out plug pin
- removed & downloaded transducer

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Borehole ID	DW3W004
Test No.	2
Project	MBML-WBT
UTM (x,y)	
Datum	
Elevation	

PACKER ISOLATED INJECTION TEST

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Test From (ft)	75.2	To	125.0		
Test Zone Length (ft)	49.8	TD	125.0	DTW (ft) (E or M)	~~224~~
Start Date:	19/7/10	End	19/7/10	Bedrock Depth (ft)	29
Start Time:		End		Hole Angle (from Vert)	70
Testing Personnel:	R Beard				
Falling Head After Inflate	nil				

Packer Type	HQ-SWP	Length of discharge pipe	1	Zone Geology	veined mafics / greywacke
Shear Pin (psi)	500	Radius of discharge pipe (1"=0.0127m)	0.012	Core Frac Freq and Quality	0-3 FF/m, 0-1 BI/run
Gauge height (m)	1	Radius of influence (10 m is standard value)	10	Flow Meter System Problems	none.
		Borehole radius (HQ=0.048m, NQ=0.038m)	0.048		

Hole Development		Packer Install		Packer Inflation		Injection Test		Packer Deflation	
Start	0930	Start Swim	1008	Start	1033	Start	1039	Start	1103
Stop	0940	Stop Swim	?	Stop	37	Stop	1057	Stop	1107
Volume		Total Time		Pin Break (psi)		Leaks	none	Method Removed	WL+rods
Comment		Seal	excellent	Exceed Max Test Step				E-Pin Shear	Sheared

		Q (Liters / 30sec) (Use Last 3 to 5 Readings)						
Pressure Range	Low	48	72	100	79	49		
	High	52	78	106	81	51		
Pressure Step (psi)		50	75	103	80	50		
Leak Q (L/30sec)								
1		2.08 Ø	2.75 0.01	3.28 Ø	2.89 Ø	2.34 0.01		
2		2.08 0.01	2.76 0.01	3.28 Ø	2.89 Ø	2.35 Ø		
3		2.09 0.01	2.76 0.01	3.28 Ø	2.89 Ø	2.35 Ø		
4		2.10 0.01	2.76 0.01	3.28 0.01	2.89 Ø	2.35		
5		2.10	2.76 0.01	3.29 0.01	2.89			
6			2.76	3.30				
7								
8								
9								
10								
11								
Stable Q (L/30sec)								

NOTES

IPI SWiPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: LowBlW004 Test # 3 Date: 21/7/10
Zone depth along hole (m/ft units?) start time: 1600
from 123.2 to: 182 m end time: 1748
Location / project ID:
Zone description: ~~FF~~ greywacke, FF 1-3/m, OJ = 0-1/m no MS, tight, minor foliat ±

Test supervisor: RBowden
Rig #/driller: 23, Richard
Hole dip= 66 degrees (reflex @ 182)
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 180 (psi)
Planned P steps: 100/135/170 (psi)
Packer type: (single) / straddle

1. Test zone preparation

1600 ☑ Flush hole before pulling rods. Development time 10 (min)
Before/after water quality (color, EC): cloudy, clean

1610 ☑ Rods pulled up and depth verified with drillers: # rods 20, counted.

2. Inspection of packer equipment

☑ O-rings (including red test seal) new before test
List of replaced parts:

☑ Tool landing ring greased

☑ Deflation valve (greased/opens & closes easily & mandrel holds)

☐ Optional: Valve taped shut for insertion

☑ Shear pin replaced; pin strength: 500

☑ Packer element rubber inspect fine

3. Assembly and installation downhole

☑ Flow meter system components connected

☐ (Single) / straddle packer components connected correctly

☑ Optional: Pressure transducer started and installed 1 roll 500

☑ Remind (or instruct) drillers about what the installation plan is

☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.

☐ Insert packer tool into borehole, **following procedures in manual.**

1638 ☑ Packer tool sink time or pump-in time ? (min:ss) pump + rotate until landing felt (or estimate sink time if not felt)

☐ Optional: Tool lowered with wireline

☑ Optional: Tool pumped into place

☑ Landing ring seal test; (no seal, leaky, good seal, landing problems) excellent

4. Inflation and seal testing

1654 ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump

☑ Measure system leak before shear pin blown at planned P steps see below

1710 ☐ Packer inflation (P= 250 psi Inflation time= 3 min)

☑ Flow meter recording flow & P gauges functional during packer inflation

1714 ☐ Shear pin blown (P= 560 psi)

☑ Remind the drillers not to move or rotate rods during test.

☐ Optional: airlift or other test:

☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

1718 ☑ Use bypass valve to control flow and pressure for test pressure steps.

☑ Check packer seal at each P step during test and note any leaks

1736 ☑ P and flow measurements completed and data recorded
Pressurizing problems:

6. Deflation & removal

1743 ☑ Follow deflation procedures in manual for specific conditions.

☑ Optional: E-pin break

☐ NA Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: (min)

Unlatching problems: could not deflate in WL only. Pulled rods 2 x 5 cm
Felt shear def?

1748 ☑ at ground surface Remove packer tool & inspect: fine

☑ Follow cleanup and disassembly procedures. - Troll 500 removed & downloaded
- shear pin + 1 E-pin replaced.

Leakage before blowing plug

P psi	V_1	Δ_2	t_{min}	γ (l/mi)
55	7.20	1.05	318	0.35
110	4.80	2.10	3	0.70
160	5.90	1.85	2	0.94

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IPI SWPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10WBW0044 Test # 4
Zone depth along hole (m)/ft units?)
from 180.2 to: 242
Location / project ID: _____
Zone description: _____

Date: 23/7/10
start time: 1510
end time: 1651

Test supervisor: R Bowden
Rig #/driller: 23/Rickard
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 270 (psi)
Planned P steps: 150/200/250 (psi)
Packer type: single / double

1. Test zone preparation

1510 ☑ Flush hole before pulling rods. Development time 15 (min)
Before/after water quality (color, EC): cloudy, clear

1530 ☑ Rods pulled up and depth verified with drillers: # rods 21 = 63m counted

2. Inspection of packer equipment

☑ O-rings (including red test seal)
List of replaced parts: _____

☑ Tool landing ring greased

☑ Deflation valve (greased/opens & closes easily & mandrel holds)

☐ Optional: Valve taped shut for insertion

☑ Shear pin replaced; pin strength: 500

☑ Packer element rubber inspect fine

3. Assembly and installation downhole

☑ Flow meter system components connected

☑ Single / double packer components connected correctly

☑ Optional: Pressure transducer started and installed Troll 500

☑ Remind (or instruct) drillers about what the installation plan is

☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.

☑ Insert packer tool into borehole, **following procedures in manual**.

☐ Packer tool sink time ? (min:ss)
until landing felt (or double estim.sink time if not felt)

☐ Optional: Tool lowered with wireline

☑ Optional: Tool pumped into place pumped + rotated

☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)
- perfect.

4. Inflation and seal testing

1555 ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump

☑ Measure system leak before shear pin blown at planned P steps see below

☑ Packer inflation (P= 200/250 psi Infl.time= 3/3 min)

☑ Flow meter recording flow and P gauges functional during packer inflation

1611 ☑ Shear pin blown (P= 500 psi)

☑ Remind the drillers not to move or rotate rods during test

5. Injection testing

☑ Use bypass valve to control flow and pressure for test pressure steps.

☐ Check packer seal at each P step during test and note any leaks

☑ P and flow measurements completed and data recorded

1638 Pressurizing problems: none

6. Deflation & removal

1642 ☑ Remove swivel head and lock to backend with wireline

1645 ☑ Pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 2 (min)

Unlatching problems: none

1651 ☑ Remove packer tool & inspect: _____

☑ Follow cleanup and disassembly procedures.

Leakage

psi	flow	Δ	t	flow rate (l/min)
95	7.10 / 7.12	> 0.02	2	0.01 l/min
200	8.00 / 8.60	> 0.60	2	0.30
250	9.60 / 10.20	> 0.60	2	0.30

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IPI SWiPS Packer Testing Checklist (Downhole Test)

Borehole ID: 10WBH004 Test # 5 Date: 24/7/10
Zone depth along hole (m/ft units?)
from 240.2 to: 308m start time: ~~1100~~ 1045
end time: 1215
Location / project ID:
Zone description: greywacke, R3-R6, FR=2-5/m OJ = 0-1m, no ms; 1cm shimagme @ ~303m

Test supervisor: RBlondo
Rig #/driller: 23, Richard
Hole dip= 66 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 360 (psi)
Planned P steps: 150/250/350 (psi)
Packer type: single / straddle

1. Test zone preparation

1045 ☑ Flush hole before pulling rods. Development time 15 (min)
Before/after water quality (color, EC): cloudy, clear

☑ Rods pulled up and depth verified with drillers: # rods 23 = 69m

2. Inspection of packer equipment

☑ O-rings (including red test seal)
List of replaced parts: ~~shear pin~~ none

☑ Tool landing ring greased

☑ Deflation valve (greased/opens & closes easily & mandrel holds)

☐ Optional: Valve taped shut for insertion

☑ Shear pin replaced; pin strength: 500

☑ Packer element rubber inspect fine

3. Assembly and installation downhole

☑ Flow meter system components connected

☑ Single / straddle packer components connected correctly

☐ Optional: Pressure transducer started and installed

☑ Remind (or instruct) drillers about what the installation plan is

☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.

☑ Insert packer tool into borehole, **following procedures in manual.**

☑ Packer tool sink time or pump-in time ? (min:ss)
1116 until landing felt (or estimate sink time if not felt)

☐ Optional: Tool lowered with wireline

☑ Optional: Tool pumped into place

☑ Landing ring seal test; (no seal, leaky, good seal, landing problems) no leaks

4. Inflation and seal testing

☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump

1125 ☐ Measure system leak before shear pin blown at planned P steps see data below

1134 ☑ Packer inflation (P= 300 psi Inflation time= 2 min)

☑ Flow meter recording flow & P gauges functional during packer inflation

☑ Shear pin blown (P= 500 psi)

☑ Remind the drillers not to move or rotate rods during test.

☐ Optional: airlift or other test: none

☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

1138 ☐ Use bypass valve to control flow and pressure for test pressure steps.

☐ Check packer seal at each P step during test and note any leaks

☐ P and flow measurements completed and data recorded

1205 Pressurizing problems:

6. Deflation & removal

☑ Follow deflation procedures in manual for specific conditions.

☐ Optional: E-pin break

☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: 2 (min)

Unlatching problems: minor

1215 ☑ Remove packer tool & inspect: fine, E-pin intact

☑ Follow cleanup and disassembly procedures.

Leakage Test

psi	reading	ΔQ	t	l/min
100	0.83 / 0.20	.63	2	0.32
200	3.88 / 2.55	18 2.10	3	0.70

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ISWBW004 Test 6

July 28 R Berndt 208 II

2918.2 - 3085 6 rods = 18m

Overlaps w Test 5

1300 adding rods

1330 swivel pump

1338 perforated. leakage 250/0.8 gal/min

1346 500 psi plug.

1407 injection done.

1430 @ ground surface

psi / ft	①	②	③	④	⑤
	165	240	360 ~~385~~	~~280~~	155
	3	5	10	8	4
0	~~45.0~~	79.0	118.0	170.5	210.50
30	47.60 > 4.60	84.6 > 5.6	> 7.6	> 5.5	> 3.20
60	52.10 > 4.50	90.1 > 5.5	125.6 > 7.5	176.0 > 5.4	213.70 > 3.25
90	56.65 > 4.50	95.55 > 5.45	133.1 > 7.4	181.4 > 5.4	216.95 > 3.25
120	60.90 > 4.35	100.9 > 5.45	140.5 > 7.5	186.8 > 5.4	220.20 > 3.~~25~~
150	65.20 > 4.30	106.35 > 5.45	148.0	192.2 > 5.3	223.~~50~~ > 3.~~30~~
	69.5 > 4.30	✓	✓	197.5 > 5.3	226.80 > 3.30
	casing ✓	0.0~~5~~	0.1	✓	230.10 > 3.30
	accu 0.~~05~~		tzp	0.1	✓
					0.03

1407

Test 7 cont'd 308.2 - 362.0

[15]

[14]

[1824]

1DW8W004 Test 7 cont'd

psi				
0	4.10	7	0.44	200 ①
60	4.54	7	0.46	
90	5.00	7	0.45	
95	5.65	7	0.65	
60	6.90	7	0.60	
25	7.10	7	0.20	
15	8.25	7	1.15	
23	8.88	7	0.63	
72	9.80	7	0.92	
105	10.85	7	1.05	
55	12.00	7	1.15	
40	14.40	2	2.40	
40	16.40	2	2.00	

- casing leak. Test stopped by pump trip

1832 leaking casing ②

1840 WL had little resistance to unlatching
This also happened for 2 preceding tests.

1900 changed the TRM + shear pin.
removed 2 Rods ③

Test 7 300.2 - 362.0m - Attempt 4

1910 4th swim started.
└ pumped, rotated
└ tapped it down, tap x 30 ④

1935 - seated.
Leakage Test
200 ~~2.80~~ 3.80 0.37/2min
300 ~~4.70~~ 4.70 0/2min ⑤
1946 blew out @ 540 psi

Test 7 cont'd. 380.2 - 362.0

psi +/-	① 240	② 340	③ 440 10	④ 2560	③ 1905
0	64.00 < 4.0	88.5 < 5.0	27.0 < 6.2	17,000 ± 20.0 < 3.0	92.0 < 2.4
30	68.0 < 3.9	98.5 < 5.0	33.2 < 6.0	23.0 < 3.25	94.4 < 2.5
60	71.9 < 3.9	103.4 < 4.9	39.2 < 5.8	26.25 < 3.40	96.9 < 2.55
90	75.8 < 3.9	108.3 < 5.1	45.0 < 5.8	29.65 < 3.30	99.45 < 2.55
120	79.7 < 3.9	113.4 < 4.8	50.8 < 5.9	32.95 < 3.35	102.0 < 2.55
	No Leak	No Leak	No Leak	No Leak	104.8 < 2.80
	0.02	0.04	0.05	0.03	107.6 < 2.80
	2008				No Leak

- after test, antonic 8½ coffee cups/min = 2.4 ℓ/min

2018 WL x rods↑ broke Fips.

Successful Test

[11]

Test 8 318.2 - 362.0

[16]

- added 6 rods to Test 7
- replaced red ring + shear pin + Epin.

1400 swimming; chased by overshot w plug
2112 perfect seal, check 2x
2115 leakage test
155 psi (3.00) ø/2min. } ⇒ No leakage.
300 (4.30) ø/2min }
~~2~~ intfl - 4min @ 155-300 psi
2125 shear pin blew @ 500 psi.

July 27, 1530 hrs. drill
383.0 - 383.4 new bit, highly stressed & fractured rock. Frac do not go thru. Sharp edges, tight, no fill, no alt.

LOWBWOOK reflex data

depth (m)	dip (°)
152	-68
182	-66
241	-64.5
302	-62.3
332	-62.1
362	-61.4
392	-58.3

Test 8 cont'd

	①	②	③	④	⑤
	252	151	440	920	2200
	5		20	10	5
0	4.20 ± .02	8.10 ± .30	81.70 ± 3.3	4.05 ± .17	4.20 ± .20
30	15.20 ± .20	8.40 ± .22	82.00 ± 1.2	4.40 ± .14	20.20 ± .20
60	21.10 ± .20	8.85 ± .22	82.55 ± .71	4.55 ± .15	40.20 ± .22
90	27.32 ± .22	9.13 ± .26	83.18 ± .94	4.88 ± .14	40.00 ± .07
120	33.52 ± .20	9.45 ± .24	83.96 ± .76	5.17 ± .11	40.20 ± .14
150	39.54 ± .20	9.88 ± .24	84.14 ± .74	5.54 ± .12	40.20 ± .07
180	45.57 ± .14	9.90 ± .24	84.32 ± .74	5.57 ± .14	40.20 ± .07
	0.01 fragment adjustments to balance off miniscule flaws	0.01	0.01	0.01	0.01

2150 2208 @ ground surface
E-Pi sheared, packer fine, transducer cement

IPI SWiPS Packer Testing Checklist (Downhole Test)

stopped/blocked 0.5m short of full run. (416).

Borehole ID: 10WBIN004 Test # 9 Date: 26/7/10
Zone depth along hole (m/ft units?)
from 360.2 to: 446 m 415.5 ×
start time: 1120
end time: 1245
Test supervisor: RBoyde
Rig #/driller: 23, Richard
Hole dip= 66 degrees
Rod size: HQ
Shear pin strength: 500 (psi)
Max P 440 (psi)
Planned P steps: 250/350/450 (psi)
Packer type: (single) / straddle
~~Location / project ID:~~ greywacke, typ FF 3/m, OJ 0-1/m
Zone description: moderately to strongly foliated, tight clean fractures, no MS

1120 Packer element & red ring are 1 test old. Missing 1 of 2 deflt valve O rings.

1. Test zone preparation

- ☑ Flush hole before pulling rods. Development time 10 (min)
  Before/after water quality (color, EC): cloudy but clean
- ☑ Rods pulled up and depth verified with drillers: # rods 19 = 57m, centred

2. Inspection of packer equipment

- ☐ O-rings (including red test seal)
  List of replaced parts: _____
- ☑ Tool landing ring greased — missing one O-ring (135120) no spares.
- ☑ Deflation valve (greased/opens & closes easily & mandrel holds)
  - ☐ Optional: Valve taped shut for insertion
- ☑ Shear pin replaced; pin strength: 500
- ☑ Packer element rubber inspect fine. Is 1 test old.

3. Assembly and installation downhole

- ☑ Flow meter system components connected
- ☑ (Single) / straddle packer components connected correctly
  - ☐ Optional: Pressure transducer started and installed
- ☑ Remind (or instruct) drillers about what the installation plan is
- ☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
- ☑ Insert packer tool into borehole, **following procedures in manual.**

1145 ☐ Packer tool sink time or pump-in time 9 min (min:ss). Felt 'clunk' in rig floor boards.
until landing felt (or estimate sink time if not felt)

- ☐ Optional: Tool lowered with wireline
- 1154 ☑ Optional: Tool pumped into place

☑ Landing ring seal test; (no seal, leaky, good seal, landing problems)

4. Inflation and seal testing

- ☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump

1201 ☑ Measure system leak before shear pin blown at planned P steps see below

- ☑ Packer inflation (P=200-325 psi Inflation time= 4 min)
- ☑ Flow meter recording flow & P gauges functional during packer inflation

1210 ☑ Shear pin blown (P= 560 psi)

- ☑ Remind the drillers not to move or rotate rods during test.
- ☒ Optional: airlift or other test: _____
  - ☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

1211 ☑ Use bypass valve to control flow and pressure for test pressure steps.

- ☑ Check packer seal at each P step during test and note any leaks none
- ☑ P and flow measurements completed and data recorded

Pressurizing problems: none.

6. Deflation & removal 1227

- ☑ Follow deflation procedures in manual for specific conditions. Removed swivel. Static WL at top of rods.
  - ☑ Optional: E-pin break
- ☐ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: _____ (min)

Unlatching problems: Used WL + rod pull (0.2m)

- ☑ Remove packer tool & inspect: packer fine. E pin sheared
- ☑ Follow cleanup and disassembly procedures. 1245

Leakage Test: 200 psi, ~~(7.57)~~, 0 l/min (2 min)
325 psi (8.94), 2 min, 0.02 l/min

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IPI SWiPS Packer Testing Checklist (**Downhole Test**)

Borehole ID: 10WBH0804 Test # 10
Zone depth along hole (m/ft units?)
from 414.2 to: 443
Location / project ID:
Zone description: greywacke, FF 1-3/m, OJ = 0-1/m, tight clean joints. 2 MS @ 420m 0.4 m, highly altered

Date: 29/7/10
start time: 16:45
end time: 1830

Test supervisor: R Beaudry
Rig #/driller: 23 Richard
Hole dip= 58 degrees
Rod size: HQ

Shear pin strength: 500 (psi)
Max P 1650 (psi)
Planned P steps: 4/500/600 (psi)
Packer type: (single) / straddle

1. Test zone preparation

1645 ☑ Flush hole before pulling rods. Development time 10 (min)
Before/after water quality (color, EC): cloudy, clean
☑ Rods pulled up and depth verified with drillers: # rods 10 = 30 m

2. Inspection of packer equipment

☑ O-rings (including red test seal) ok
List of replaced parts: none
☑ Tool landing ring greased
☑ Deflation valve (greased/opens & closes easily & mandrel holds)
☐ Optional: Valve taped shut for insertion
☑ Shear pin replaced; pin strength: 580
☑ Packer element rubber inspect fine

3. Assembly and installation downhole

☑ Flow meter system components connected
☐ Single / straddle packer components connected correctly
☐ Optional: Pressure transducer started and installed none - too deep
☑ Remind (or instruct) drillers about what the installation plan is
☑ Measure water level in rods OR fill rods with water if water level unknown. If not possible to fill or measure, lower tool with wireline.
1715 ☑ Insert packer tool into borehole, **following procedures in manual.**
☑ Packer tool sink time or pump-in time ? (min:ss) until landing felt (or estimate sink time if not felt)
☐ Optional: Tool lowered with wireline
☑ Optional: Tool pumped into place tapped w WL.
1737 ☑ Landing ring seal test; (no seal, leaky, good seal, landing problems) perfect

4. Inflation and seal testing

☑ On flow meter: **open** bypass valve, **open** shutoff valve, **close** isolation valve to low P gauge, start water pump
☑ Measure system leak before shear pin blown at planned P steps see data below
☑ Packer inflation (P= 200-300 psi Inflation time= 5 min)
☑ Flow meter recording flow & P gauges functional during packer inflation OK.
☑ Shear pin blown (P= 580 psi)
☑ Remind the drillers not to move or rotate rods during test.
☐ Optional: airlift or other test: no
☐ Fill rods with water before injection test to remove air bubble

5. Injection testing

1752 ☑ Use bypass valve to control flow and pressure for test pressure steps.
☑ Check packer seal at each P step during test and note any leaks none
☑ P and flow measurements completed and data recorded field book pg 18.
1814 Pressurizing problems: none.

6. Deflation & removal

1826 ☐ Follow deflation procedures in manual for specific conditions.
☑ Optional: E-pin break
☑ Standard method: pull up with wireline to unlatch tool & open deflation valve. Wait to deflate. Deflation time: (min)
Unlatching problems: minor, WL + rods ⇒
☑ Remove packer tool & inspect: OK. E pin sheared.
☑ Follow cleanup and disassembly procedures. - replaced sheem pin + 1E pin.

Leakage Test: 200 psi [2.47], 2 min, 0.50 l
320 psi [4.72], 2 mi, 0.95
18'

1830

dip = 57.3°

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10WBW004 Test 10 414.2-443
29/7/10 R Bowden

[19]
[1752]

psi +/-	① 320 8	② ~~480~~ 440 12	③ 500 15	④ ~~480~~ 440 15	⑤ 325 10
0	6.70 > 0.20	9.90 > 0.32	2.30 > 0.36	4.00 > 0.37	4.84 Padj
30	6.90 > 0.19	0.22 > 0.28	2.66 > 0.32	4.37 > 0.31	4.90 > ∅
60	7.09 > 0.27	9.50 > 0.28	2.98 > 0.30	4.68 adjusted > 0.07	P4.90 > ∅
90	7.36 > 0.24	0.78 > 0.28	3.28 > 0.30	4.75 > 0.30	4.90 > 0.09
120 sec	7.60 > 0.25	1.10 > 0.32	3.58 > 0.30	5.05 > 0.32	4.99 > 0.20
etc	7.85 > 0.23	1.42 > 0.32	> 0.28	5.37 > 0.28	0.19 > 0.19
	8.08 > 0.22		3.85 > 0.30	5.65 > 0.30	0.38 > 0.20
	8.30		4.15	5.95	0.59 > 0.19
	coping no leaks - ✓	✓	✓	✓	0.78 > 0.20
	accuracy 0.01	0.01	0.01	0.01	0.98 ✓
					0.01

[1814]

Appendix D
Packer Testing Data Sheets

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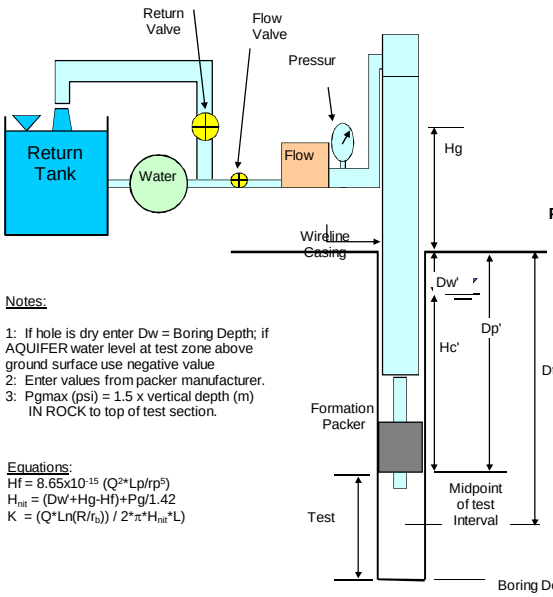
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**25.0**	**to**	**63.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**17-Apr**	**Time:**	**14:45**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**17-Apr**	**Time:**	**17:30**	**Test N°**	**1**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**63.0**

Max Injection P (psi): 33

Depth to wedge: 0 m



Notes:

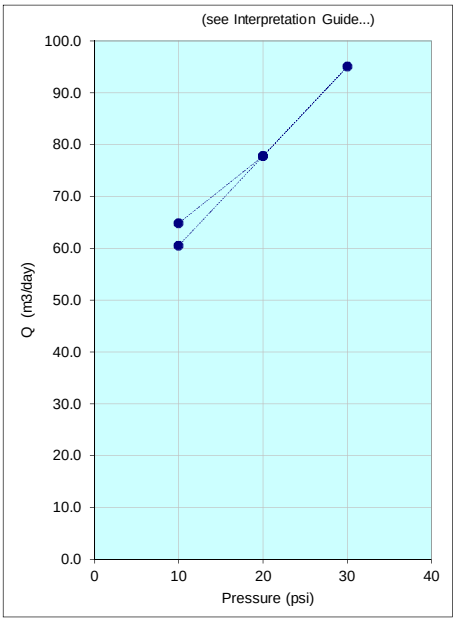
1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	2.0 m
Dbr	Measured vertical depth to bedrock	2.0 m
Dp	Measured depth to packer	**25.0** m
Dt	Measured depth to midpoint of test	**44.0** m
ß	Inclination from horizontal (degrees)	62 °
Dw'	Vertical depth to static water level	**1.8** m
	Rod stickup above ground	**0.0** m
Dp'	Vertical depth to packer	**22.1** m
Dt'	Vertical depth to midpoint of test	**39.0** m
SP	Shear Pin Rating (psi)	500 psi
Prods	Water column pressure in drill rods	**31** psi
Paquifer	Water column pressure in aquifer (unc.)	**29** psi
Pdiff	Existing differential shear pressure	**3** psi
Pshear	Shear pressure required at pump	**497** psi
Hg	Gauge height	0.0 m
Lp	Length of discharge pipe	5.00 m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127 m
R	Radius of influence (10 m is standard value)	10 m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048 m
L	Length of test section	**38.0** m
Hf	Friction Loss	
Hnit	Net injection head at midpoint of test	
K	Hydraulic conductivity	

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4×10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	10	**20**	**30**	**20**	**10**
1	**44.0**	**54.0**	**68.0**	**54.0**	**42.0**
2	**44.0**	**52.0**	**68.0**	**54.0**	**40.0**
3	**45.0**	**53.0**	**66.0**	**54.0**	**42.0**
4		**46.0**	**66.0**		
5		**54.0**			
Stable Q **(L/min)**	**45.0**	**54.0**	**66.0**	**54.0**	**42.0**
Leak Q (L/min)	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Q (m^3/day)	64.8	77.8	95.0	77.8	60.5
Hf (m)	0.55	0.79	1.18	0.79	0.48
Hnit (m)	8.3	15.1	21.7	15.1	8.3
K (m/day)	1.8E-01	1.2E-01	9.8E-02	1.2E-01	1.6E-01
K (m/s)	**2.0E-06**	**1.3E-06**	**1.1E-06**	**1.3E-06**	**1.9E-06**
+/- (m/s)	3.5E-07	1.5E-07	1.3E-07	1.5E-07	5.1E-07
+/- order of mag.	0.07	0.05	0.05	0.05	0.10



Field Observations

zone geology: metavolcanics
zone fracture freq & quality (from core): high FF, heavily foliated, jointed
packer seal quality: good
flow meter system problems: None
measurement accuracy: Good
other problems that may affect results:

Test Interpretation

K values: 1**E-6 m/s**

"type curve" interpretation: **nearly ideal**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**1**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	8	18	27	18	8
Max P during step	12	22	33	22	12
average pressure +/- psi	**2**	**2**	**3**	**2**	**2**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**

High estimate of K

Q_{avg} (m^3/day)	65.52	78.48	95.76	78.48	61.20
Hf (m)	0.56	0.81	1.20	0.81	0.49
Hnit (m)	6.8	13.6	19.6	13.6	6.9
K (m/sec)	2.5E-06	1.5E-06	1.3E-06	1.5E-06	2.3E-06

Low estimate of K

Q_{avg} (m^3/day)	63.36	76.32	93.60	76.32	59.04
Hf (m)	0.53	0.76	1.15	0.76	0.46
Hnit (m)	9.7	16.5	23.9	16.5	9.8
K (m/sec)	1.7E-06	1.2E-06	1.0E-06	1.2E-06	1.6E-06

K averages for P step

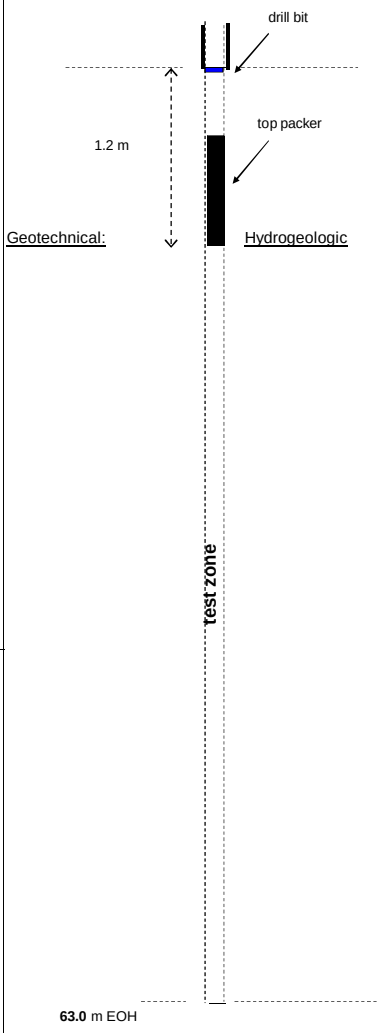
P	10	20	30
high est of K	2.E-06	1.E-06	1.E-06
average K	2.E-06	1.E-06	1.E-06
low est of K	2.E-06	1.E-06	1.E-06

K avg all P steps

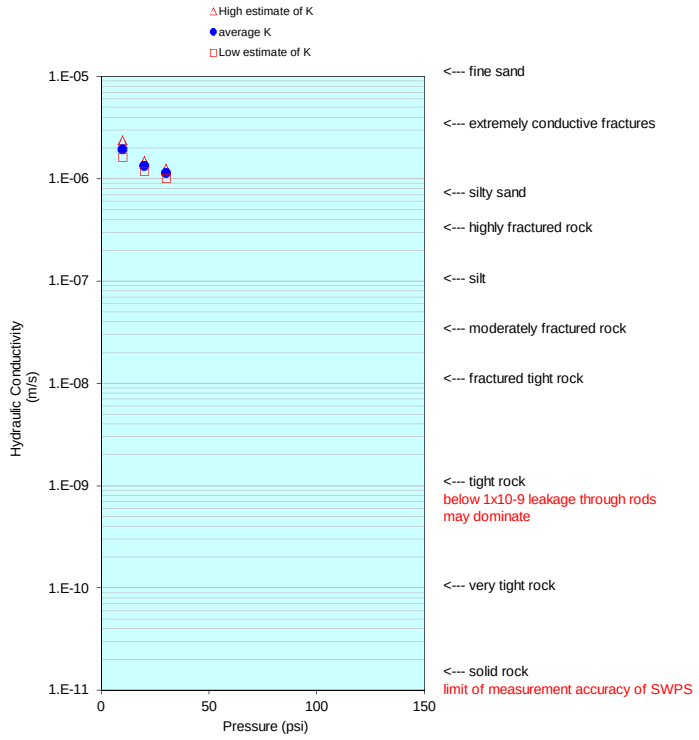
MAX	**2.E-06**
geomean	**1.E-06**
MIN	**1.E-06**

Comments: during drilling through this interval there was loss of circulation

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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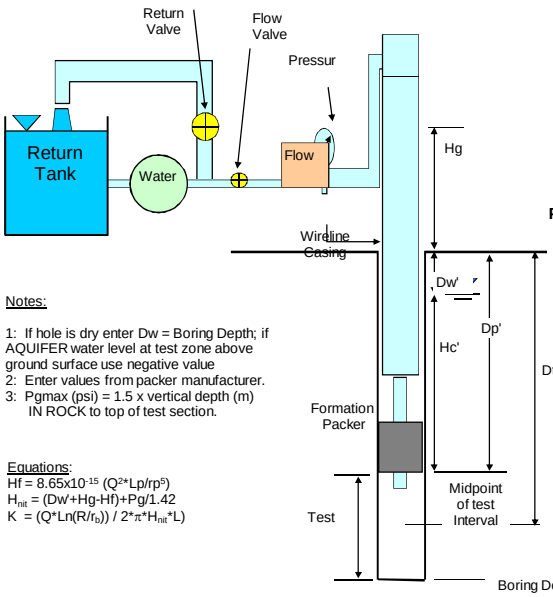
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**64.0**	**to**	**102.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**18-Apr**	**Time:**	**15:15**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**18-Apr**	**Time:**	**16:45**	**Test N°**	**2**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**102.0**

Max Injection P (psi): 85

Depth to wedge: 0 m



Notes:

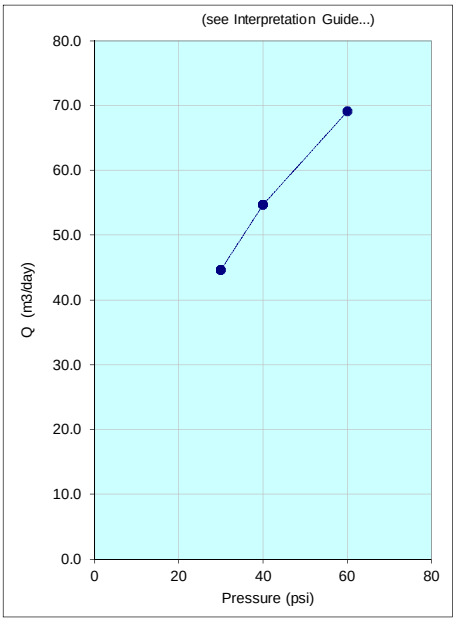
1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**64.0**	m
Dt	Measured depth to midpoint of test	**83.0**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**1.8**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**56.7**	m
Dt'	Vertical depth to midpoint of test	**73.5**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**80**	psi
Paquifer	Water column pressure in aquifer (unc.)	**78**	psi
Pdiff	Existing differential shear pressure	**3**	psi
Pshear	Shear pressure required at pump	**497**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**38.0**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	30	40	60	40	30
1	**31.0**	**38.0**	**48.0**	**39.0**	**29.0**
2	**31.0**	**37.0**	**48.0**	**38.0**	**31.0**
3	**31.0**	**40.0**	**48.0**	**38.0**	**31.0**
4		**36.0**			**31.0**
5		**38.0**			
Stable Q **(L/min)**	**31.0**	**38.0**	**48.0**	**38.0**	**31.0**
Leak Q (L/min)					
Q (m^3/day)	44.6	54.7	69.1	54.7	44.6
Hf (m)	0.26	0.39	0.63	0.39	0.26
Hnit (m)	22.6	29.5	43.4	29.5	22.6
K (m/day)	4.4E-02	4.1E-02	3.6E-02	4.1E-02	4.4E-02
K (m/s)	**5.1E-07**	**4.8E-07**	**4.1E-07**	**4.8E-07**	**5.1E-07**
+/- (m/s)	5.2E-08	4.4E-08	4.1E-08	4.4E-08	5.2E-08
+/- order of mag.	0.04	0.04	0.04	0.04	0.04



Field Observations

zone geology: metavolcanics, some diabase at bottom of test zone
zone fracture freq & quality (from core): fractured, jointed
packer seal quality: good
measurement accuracy: Good
other problems that may affect results: none

Test Interpretation

K values: **5E-7 m/s**

"type curve" interpretation: **ideal**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**2**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	27	37	55	37	28
Max P during step	33	43	65	43	32
average pressure +/- psi	**3**	**3**	**5**	**3**	**2**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**

High estimate of K

Q_{avg} (m^3/day)	45.36	55.44	69.84	55.44	45.36
Hf (m)	0.27	0.40	0.64	0.40	0.27
Hnit (m)	20.5	27.4	39.9	27.4	21.2
K (m/sec)	5.7E-07	5.2E-07	4.5E-07	5.2E-07	5.5E-07

Low estimate of K

Q_{avg} (m^3/day)	43.20	53.28	67.68	53.28	43.20
Hf (m)	0.24	0.37	0.60	0.37	0.24
Hnit (m)	24.8	31.7	46.9	31.7	24.1
K (m/sec)	4.5E-07	4.4E-07	3.7E-07	4.4E-07	4.6E-07

K averages for P step

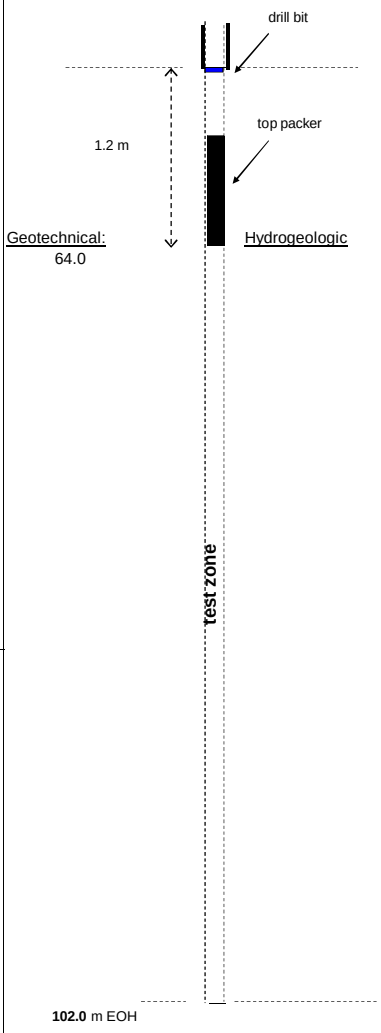
P	30	40	60
high est of K	6.E-07	5.E-07	5.E-07
average K	5.E-07	5.E-07	4.E-07
low est of K	5.E-07	4.E-07	4.E-07

K avg all P steps

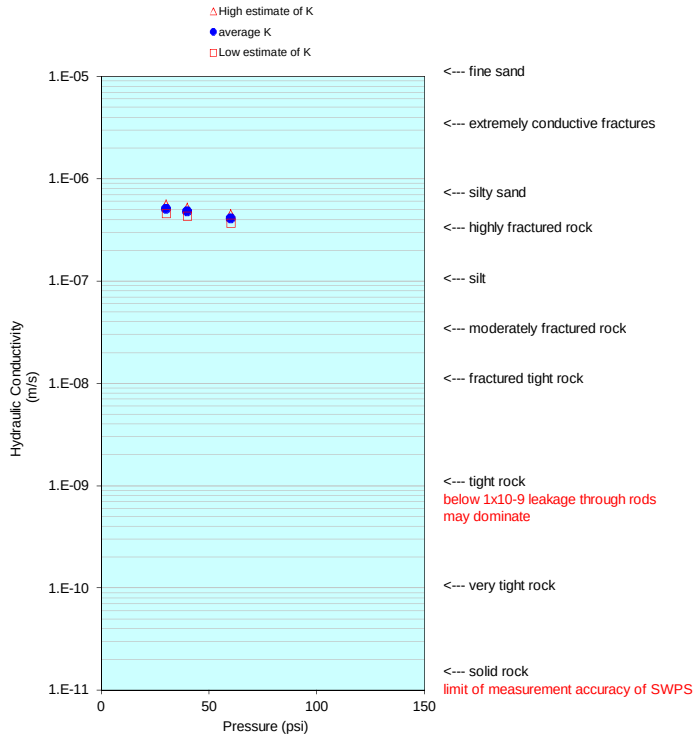
MAX	**6.E-07**
geomean	**5.E-07**
MIN	**4.E-07**

Comments: during drilling through this interval there was loss of circulation

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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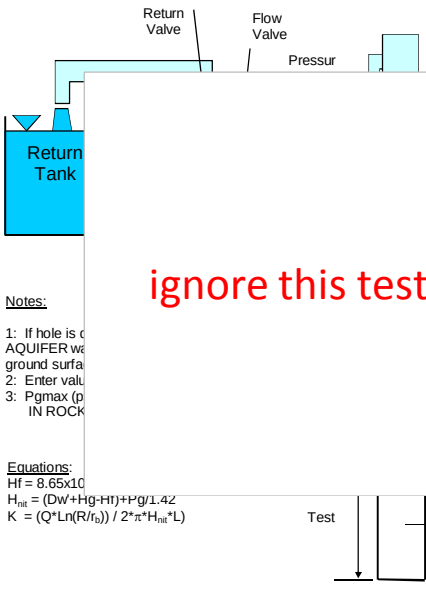
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**121.5**	**to**	**144.5**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**19-Apr**	**Time:**	**14:00**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**19-Apr**	**Time:**	**15:00**	**Test N°**	**3**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**144.5**

Max Injection P (psi): 161

Depth to wedge: 0 m



ignore this test (packer bypass)

Dw	Measured depth of static water level (1)	2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**121.5**	m
Dt	Measured depth to midpoint of test	**133.0**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**1.8**	m
		0.0	m
		107.6	m
	f test	**117.8**	m
		500	psi
	rill rods	**153**	psi
	quifer (unc.)	**150**	psi
	ressure	**3**	psi
	pump	**497**	psi
		0.0	m
		5.00	m
	L"=0.0127m)	0.0127	m
	s standard value)	10	m
	3m, NQ=0.038m)	0.048	m
		23.0	m

int of test

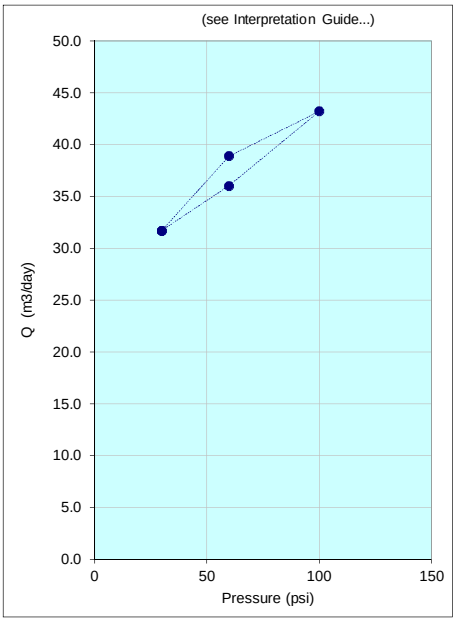
Notes:

1: If hole is d
AQUIFER wa
ground surfa
2: Enter valu
3: Pgmax (p
IN ROCK

Equations:
Hf = 8.65x10
H_{nit} = (Dw'+Hg-Hf)+Pg/1.42
K = (Q*Ln(R/r_b)) / 2*π*H_{nit}*L)

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	30	60	100	60	30
1	**22.0**	**37.0**	**60.0**	**35.0**	**23.0**
2	**23.0**	**38.0**	**46.0**	**35.0**	**22.0**
3	**22.0**	**37.0**	**50.0**	**35.0**	**22.0**
4			**48.0**	**35.0**	
5			**50.0**		
Stable Q **(L/min)**	**22.0**	**37.0**	**50.0**	**35.0**	**22.0**
Leak Q (L/min)		**10.0**	**20.0**	**10.0**	
Q (m^3/day)	31.7	38.9	43.2	36.0	31.7
Hf (m)	0.13	0.20	0.24	0.17	0.13
Hnit (m)	22.8	43.8	71.9	43.9	22.8
K (m/day)	5.1E-02	3.3E-02	2.2E-02	3.0E-02	5.1E-02
K (m/s)	**6.0E-07**	**3.8E-07**	**2.6E-07**	**3.5E-07**	**6.0E-07**
+/- (m/s)	5.4E-08	2.5E-08	3.7E-08	5.4E-08	5.4E-08
+/- order of mag.	0.04	0.03	0.06	0.06	0.04



Field Observations

zone geology: metavolcanics
zone fracture freq & quality (from core): foliated but competent
packer seal quality: not good, packer probably deflated due to sand under TAM rubber seal
measurement accuracy: ok but not applicable
other problems that may affect results: high leak rate from casing (return flow), which is indication of packer leak because no return flow even during drilling, also flow from casing directly proportional to measured injection flow

Test Interpretation

K values: **4E-7 m/s**

"type curve" interpretation: **NA because inaccuracy in leak flow rate**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**3**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	28	55	90	55	28
Max P during step	32	65	110	65	32
average pressure +/- psi	**2**	**5**	**10**	**5**	**2**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.5**	**0.5**	**1**	**0.5**	**0.5**

High estimate of K

Q_{avg} (m^3/day)	32.40	39.60	44.64	36.72	32.40
Hf (m)	0.14	0.21	0.26	0.18	0.14
Hnit (m)	21.4	40.3	64.9	40.3	21.4
K (m/sec)	6.5E-07	4.2E-07	2.9E-07	3.9E-07	6.5E-07

Low estimate of K

Q_{avg} (m^3/day)	30.24	37.44	40.32	34.56	30.24
Hf (m)	0.12	0.18	0.21	0.16	0.12
Hnit (m)	24.2	47.4	79.0	47.4	24.2
K (m/sec)	5.3E-07	3.4E-07	2.2E-07	3.1E-07	5.3E-07

K averages for P step

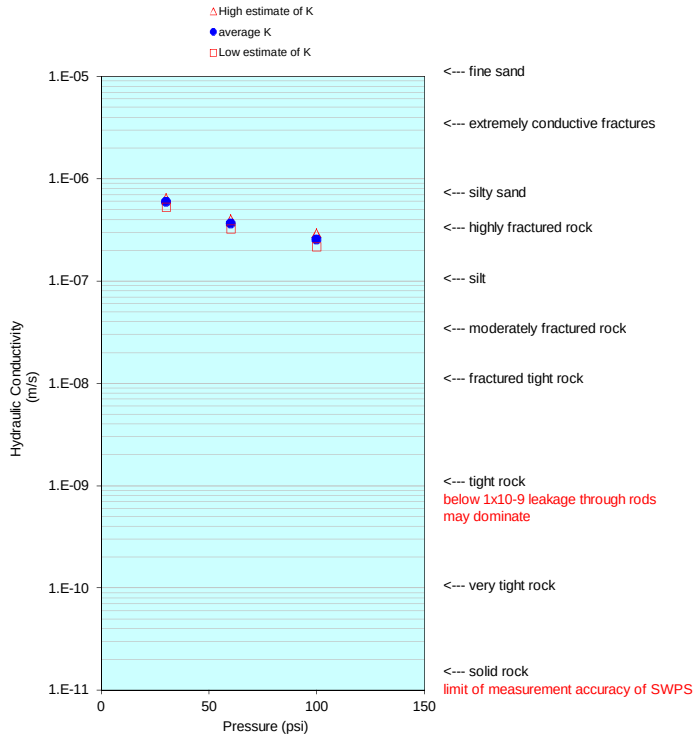
P	30	60	100
high est of K	6.E-07	4.E-07	3.E-07
average K	6.E-07	4.E-07	3.E-07
low est of K	5.E-07	3.E-07	2.E-07

K avg all P steps

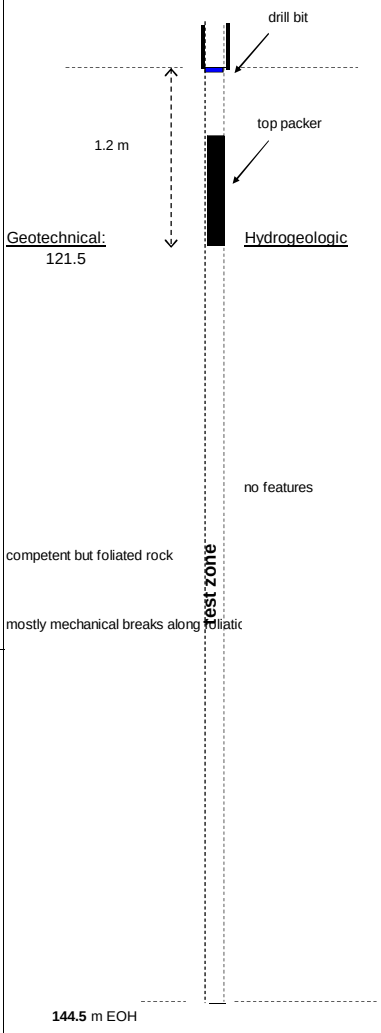
MAX	**6.E-07**
geomean	**4.E-07**
MIN	**2.E-07**

Comments: during drilling through this interval there was loss of circulation

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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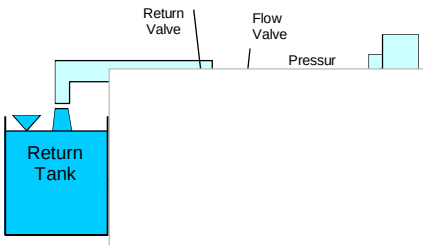
PACKER INJECTION TEST *(modified from HCI)*

Project:	Hope Bay - Doris	**Test Interval (m):**	103.0	to	144.5	**Drillhole N°**	10-WBW-001
UTM (x,y)	33780E; 557535N	**Start Date:**	19-Apr	**Time:**	15:00	**Target**	10-WBW-001
Datum:	UTM	**End Date:**	19-Apr	**Time:**	16:15	**Test N°**	4
GS Elevation:		**Supervisor:**	JS			**DH Depth (m)**	144.5

Max Injection P (psi): 137

Depth to wedge: 0 m



ignore this test (packer bypass)

Dw	Measured depth of static water level (1)	2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**103.0**	m
Dt	Measured depth to midpoint of test	**123.8**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**1.8**	m
		0.0	m
		91.2	m
	est	**109.6**	m
		500	psi
	rods	**129**	psi
	ifer (unc.)	**127**	psi
	ssure	**3**	psi
	mp	**497**	psi
		0.0	m
		5.00	m
	0.0127m)	0.0127	m
	tandard value)	10	m
	, NQ=0.038m)	0.048	m
		41.5	m

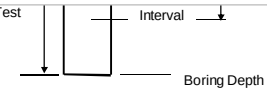
Notes:

1: If hole is dry e
AQUIFER water
ground surface u
2: Enter values f
3: Pgmax (psi) =
IN ROCK to t

of test

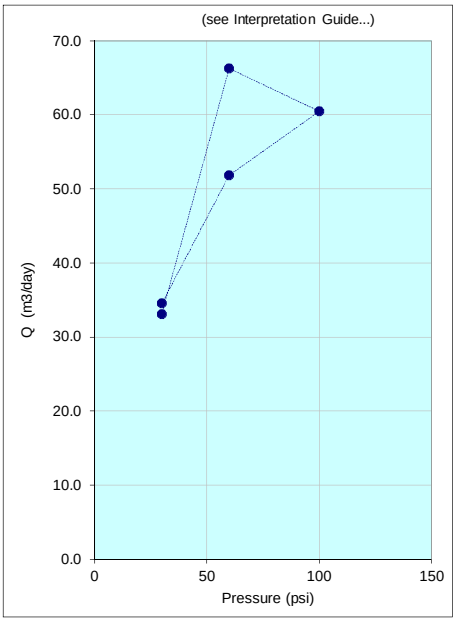
Equations:

Hf = 8.65x10^{-15} (
H_{nit} = (Dw'+Hg-H
K = (Q*Ln(R/r_b)) / 2*π*H_{nit}*L)



Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m^3/day

Measurement (show last 3 to 5 flow meter readings)	Q (Liters / min) *see flow calc. sheet				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	30	60	100	60	30
1	**28.0**	**56.0**	**46.0**	**46.0**	**29.0**
2	**28.5**	**56.0**	**86.0**	**46.0**	**28.0**
3	**28.0**	**56.0**	**64.0**	**46.0**	**29.0**
4			**62.0**		**29.0**
5			**62.0**		
Stable Q **(L/min)**	**28.0**	**56.0**	**62.0**	**46.0**	**29.0**
Leak Q (L/min)	**5.0**	**10.0**	**20.0**	**10.0**	**5.0**
Q (m^3/day)	33.1	66.2	60.5	51.8	34.6
Hf (m)	0.14	0.57	0.48	0.35	0.16
Hnit (m)	22.8	43.4	71.7	43.7	22.7
K (m/day)	3.0E-02	3.1E-02	1.7E-02	2.4E-02	3.1E-02
K (m/s)	**3.4E-07**	**3.6E-07**	**2.0E-07**	**2.8E-07**	**3.6E-07**
+/- (m/s)	3.9E-08	-3.0E-09	1.5E-08	7.7E-08	2.4E-08
+/- order of mag.	0.05	0.00	0.03	0.11	0.03



Field Observations

zone geology: metavolcanic, diabase
zone fracture freq & quality (from core): foliated to highly foliated competent rock, occasionally high mechanical damage
packer seal quality: not good, packer probably deflated due to sand under TAM rubber seal
measurement accuracy: ok but not applicable
other problems that may affect results: high leak rate from casing (return flow), which is indication of packer leak because no return flow even during drilling, also flow from casing directly proportional to measured injection flow

Test Interpretation

K values: **3E-7 m/s**

"type curve" interpretation: **N/A due to inaccuracy in leak flow rate**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**4**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	28	55	95	55	28
Max P during step	32	65	105	65	32
average pressure +/- psi	**2**	**5**	**5**	**5**	**2**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.5**	**1**	**1**	**1**	**0.5**

High estimate of K

Q_{avg} (m^3/day)	33.84	67.68	61.92	53.28	35.28
Hf (m)	0.15	0.60	0.50	0.37	0.16
Hnit (m)	21.3	39.9	68.2	40.1	21.3
K (m/sec)	3.8E-07	4.0E-07	2.2E-07	3.1E-07	3.9E-07

Low estimate of K

Q_{avg} (m^3/day)	31.68	63.36	57.60	48.96	33.12
Hf (m)	0.13	0.53	0.43	0.31	0.14
Hnit (m)	24.2	47.0	75.3	47.2	24.2
K (m/sec)	3.1E-07	3.2E-07	1.8E-07	2.5E-07	3.2E-07

K averages for P step

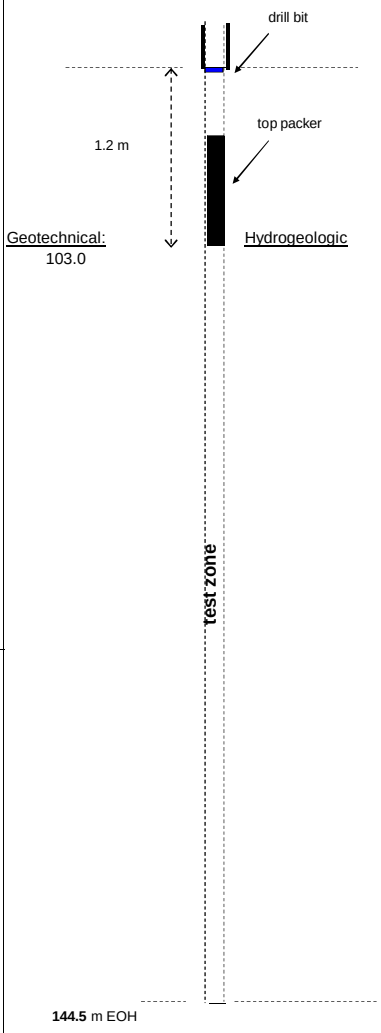
P	30	60	100
high est of K	4.E-07	4.E-07	2.E-07
average K	4.E-07	3.E-07	2.E-07
low est of K	3.E-07	3.E-07	2.E-07

K avg all P steps

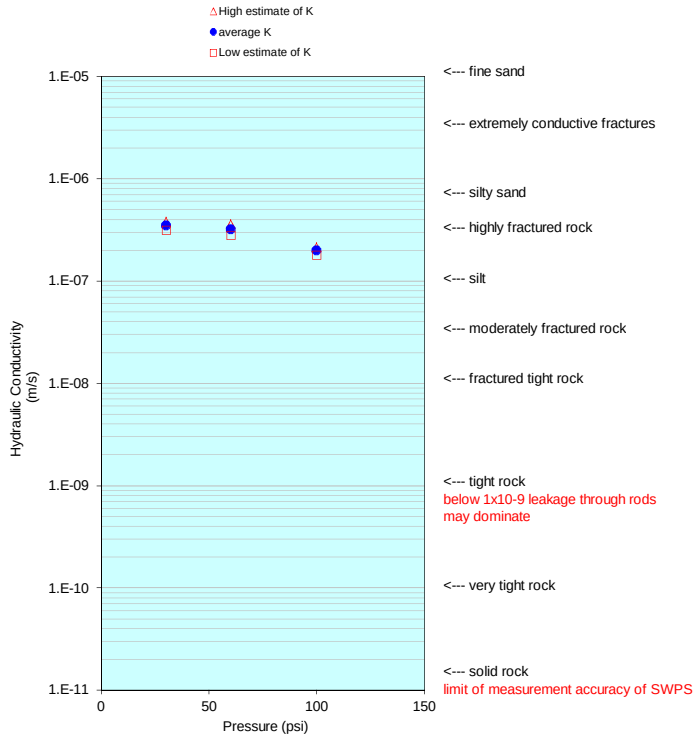
MAX	**4.E-07**
geomean	**3.E-07**
MIN	**2.E-07**

Comments: during drilling through this interval there was loss of circulation

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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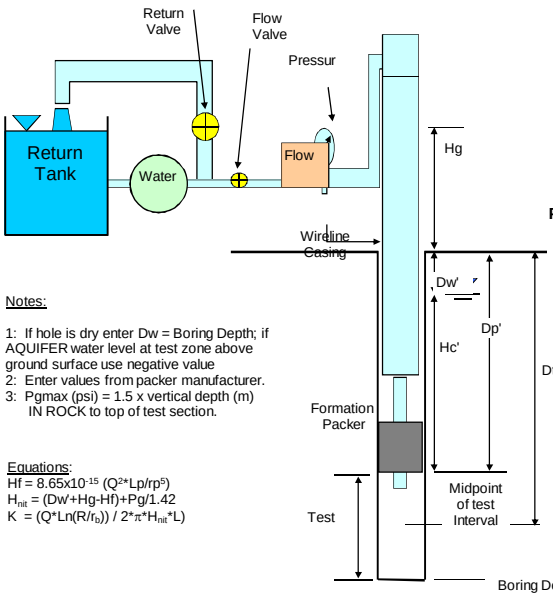
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**154.0**	**to**	**204.8**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**20-Apr**	**Time:**	**13:15**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**20-Apr**	**Time:**	**15:10**	**Test N°**	**5**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**204.8**

Max Injection P (psi): 205

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

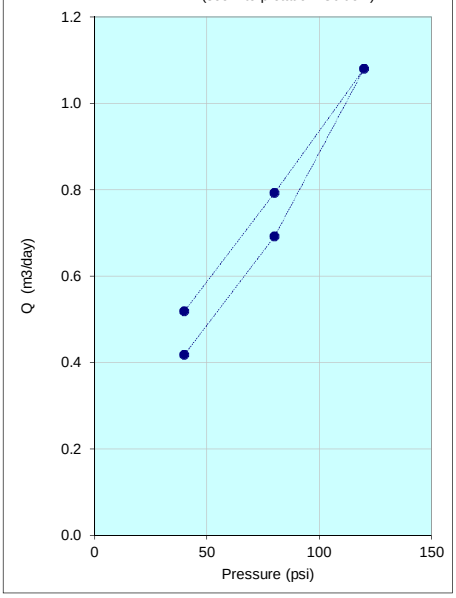
Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**154.0**	m
Dt	Measured depth to midpoint of test	**179.4**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**1.8**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**136.4**	m
Dt'	Vertical depth to midpoint of test	**158.8**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**194**	psi
Paquifer	Water column pressure in aquifer (unc.)	**191**	psi
Pdiff	Existing differential shear pressure	**3**	psi
Pshear	Shear pressure required at pump	**497**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**50.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	40	**80**	**120**	**80**	**40**
1	**0.38**	**0.64**	**0.86**	**0.53**	**0.17**
2	**0.32**	**0.60**	**0.86**	**0.55**	**0.30**
3	**0.38**	**0.54**	**0.82**	**0.53**	**0.29**
4	**0.32**	**0.66**	**0.81**		**0.28**
5	**0.36**	**0.56**	**0.80**		**0.29**
Stable Q **(L/min)**	**0.36**	**0.60**	**0.80**	**0.53**	**0.29**
Leak Q (L/min)		**0.05**	**0.05**	**0.05**	
Q (m^3/day)	0.5	0.8	1.1	0.7	0.4
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	29.9	58.1	86.3	58.1	29.9
K (m/day)	2.9E-04	2.3E-04	2.1E-04	2.0E-04	2.3E-04
K (m/s)	**3.4E-09**	**2.6E-09**	**2.4E-09**	**2.3E-09**	**2.7E-09**
+/- (m/s)	-7.9E-11	2.5E-11	2.9E-10	3.6E-10	5.7E-10
+/- order of mag.	-0.01	0.00	0.05	0.06	0.08

(see Interpretation Guide...)



Field Observations

zone geology: metavolcanics,
zone fracture freq & quality (from core): competent, foliated (mechanical breaks in core), 1 possible rubble zone at 191m but looks unlikely to be water bearing (confirmed by this test result)
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results: after test 4, the TAM rubber was replaced and sand cleaned out from it, also o-rings in TAM valve replaced (packer was deflating in tests 3 and 4) but no leak from casing during this test and low injection flow (very well sealed test zone)

Test Interpretation

K values: **3E-9 m/s**

"type curve" interpretation: **almost ideal, slight clogging of fractures during test**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**5**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	38	77	110	77	38
Max P during step	42	83	130	83	42
average pressure +/- psi	**2**	**3**	**10**	**3**	**2**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.02**	**0.02**	**0.02**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	0.53	0.82	1.11	0.72	0.43
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	28.5	56.0	79.2	56.0	28.5
K (m/sec)	3.6E-09	2.8E-09	2.7E-09	2.5E-09	2.9E-09

Low estimate of K

Q_{avg} (m^3/day)	0.49	0.73	1.02	0.63	0.39
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	31.3	60.2	93.3	60.2	31.3
K (m/sec)	3.0E-09	2.4E-09	2.1E-09	2.0E-09	2.4E-09

K averages for P step

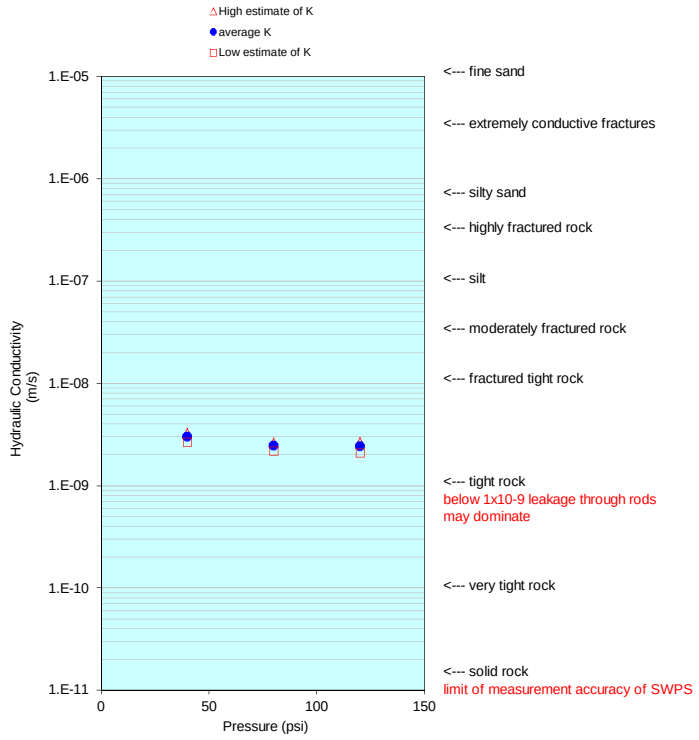
P	40	80	120
high est of K	3.E-09	3.E-09	3.E-09
average K	3.E-09	2.E-09	2.E-09
low est of K	3.E-09	2.E-09	2.E-09

K avg all P steps

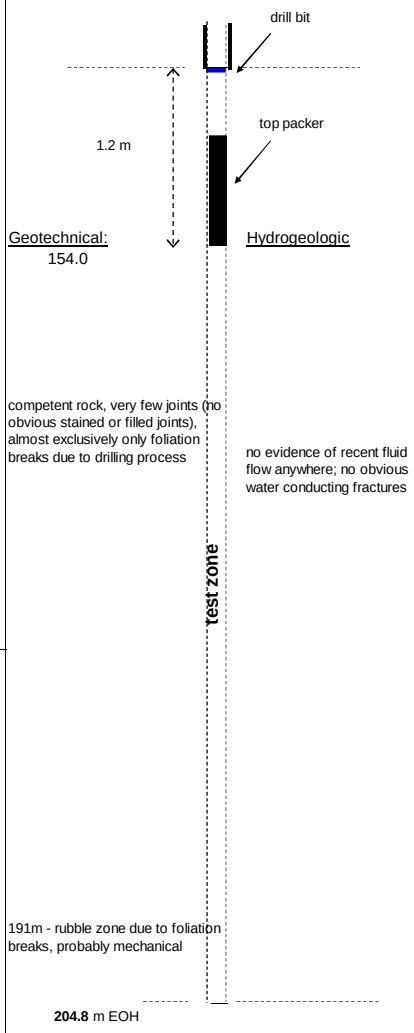
MAX	**3.E-09**
geomean	**3.E-09**
MIN	**2.E-09**

Comments: during drilling through this interval there was loss of circulation, probably caused by upper zone just below lake and water dissipating into that, not caused by rock below 100m depth

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**103.0**	**to**	**204.8**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**20-Apr**	**Time:**	**15:10**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**20-Apr**	**Time:**	**16:45**	**Test N°**	**6a**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**204.8**

Max Injection P (psi): 137

Depth to wedge: 0 m

This is test was on zone that includes test 5 zone, but also pull more rods to go back up to 103m; calculate "Test 6" as difference in inflow at each P step between this test 6a and test 5.

At each P step (same steps in Test 5 and 6a):

flow (test 6) = flow (test 6a) - flow (test5)

Test 6a (raw data) is kept here but graphed is Test 6, which was the target. Only one packer was used so this requires this subtraction of flows.

Assumpition: fractures dont change between test 5 and 6

Dw	Measured depth of static water level (1)	2.0 m
Dbr	Measured vertical depth to bedrock	2.0 m
Dp	Measured depth to packer	**103.0** m
Dt	Measured depth to midpoint of test	**153.9** m
ß	Inclination from horizontal (degrees)	62 °
Dw'	Vertical depth to static water level	**1.8** m
	Rod stickup above ground	**0.0** m
Dp'	Vertical depth to packer	**91.2** m
Dt'	Vertical depth to midpoint of test	**136.3** m
SP	Shear Pin Rating (psi)	500 psi
Prods	Water column pressure in drill rods	**129** psi
Paquifer	Water column pressure in aquifer (unc.)	**127** psi
Pdiff	Existing differential shear pressure	**3** psi
Pshear	Shear pressure required at pump	**497** psi
Hg	Gauge height	0.0 m
Lp	Length of discharge pipe	5.00 m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127 m
R	Radius of influence (10 m is standard value)	10 m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048 m
L	Length of test section	**101.8** m
Hf	Friction Loss	
Hnit	Net injection head at midpoint of test	
K	Hydraulic conductivity	

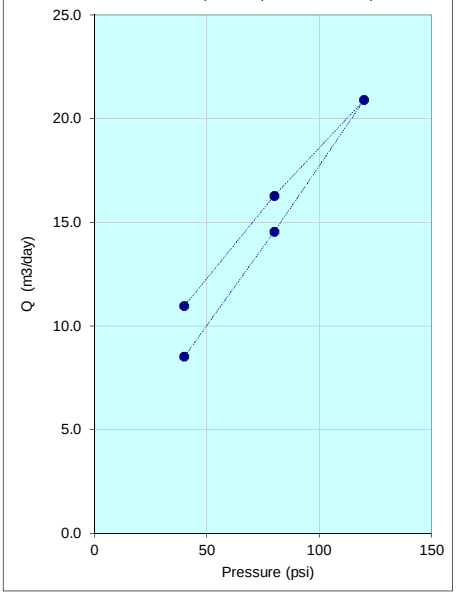
Dt'

Depth

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	Q (Liters / min) *see flow calc. sheet				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	40	80	120	80	40
1	**8.20**	**11.60**	**14.60**	**10.80**	**6.20**
2	**8.00**	**12.40**	**16.00**	**10.40**	**6.10**
3	**8.00**	**12.30**	**14.90**	**11.00**	**6.10**
4	**7.80**	**11.80**	**15.00**	**10.60**	
5	**7.80**	**11.80**	**15.00**	**10.60**	
Stable Q **(L/min)**	**7.80**	**11.80**	**15.00**	**10.60**	**6.10**
Leak Q (L/min)	**0.20**	**0.50**	**0.50**	**0.50**	**0.20**
Q (m^3/day)	10.9	16.3	20.9	14.5	8.5
Hf (m)	0.02	0.03	0.06	0.03	0.01
Hnit (m)	29.9	58.1	86.2	58.1	29.9
K (m/day)	3.1E-03	2.3E-03	2.0E-03	2.1E-03	2.4E-03
K (m/s)	**3.5E-08**	**2.7E-08**	**2.3E-08**	**2.4E-08**	**2.7E-08**
+/- (m/s)	-1.3E-09	7.3E-10	2.4E-09	3.6E-09	6.6E-09
+/- order of mag.	-0.02	0.01	0.04	0.06	0.09

(see Interpretation Guide...)



Field Observations

zone geology: metavolcanics
zone fracture freq & quality (from core): competent, one highly foliated domain at 145m
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results: none

Test Interpretation

K values: **3E-8 m/s**

"type curve" interpretation: **almost ideal, slight clogging of fractures**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**6a**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	37	75	110	75	37
Max P during step	43	85	130	85	43
average pressure +/- psi	**3**	**5**	**10**	**5**	**3**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.05**	**0.2**	**0.2**	**0.2**	**0.05**

High estimate of K

Q_{avg} (m^3/day)	11.02	16.56	21.17	14.83	8.57
Hf (m)	0.02	0.04	0.06	0.03	0.01
Hnit (m)	27.8	54.6	79.2	54.6	27.8
K (m/sec)	3.8E-08	2.9E-08	2.6E-08	2.6E-08	3.0E-08

Low estimate of K

Q_{avg} (m^3/day)	10.80	15.70	20.30	13.97	8.35
Hf (m)	0.02	0.03	0.05	0.03	0.01
Hnit (m)	32.0	61.6	93.3	61.6	32.0
K (m/sec)	3.3E-08	2.5E-08	2.1E-08	2.2E-08	2.5E-08

K averages for P step

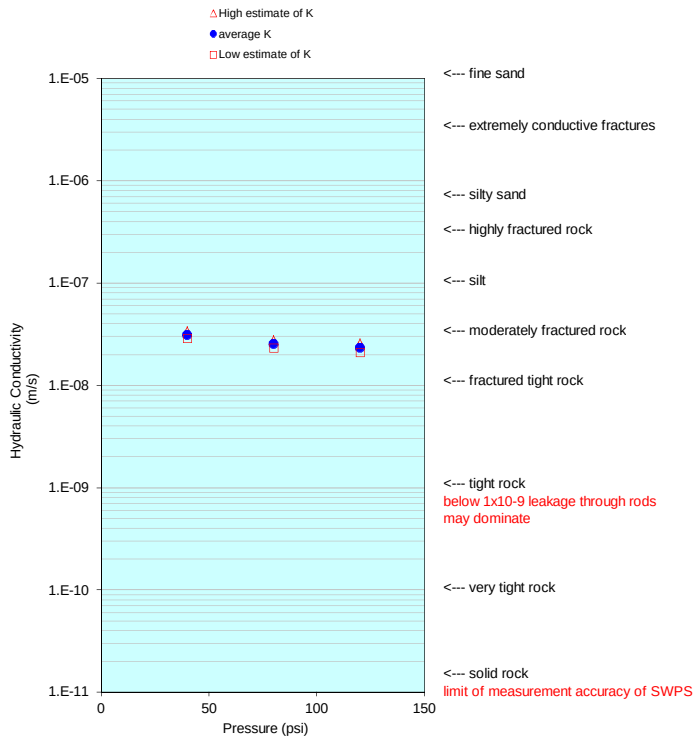
P	40	80	120
high est of K	3.E-08	3.E-08	3.E-08
average K	3.E-08	3.E-08	2.E-08
low est of K	3.E-08	2.E-08	2.E-08

K avg all P steps

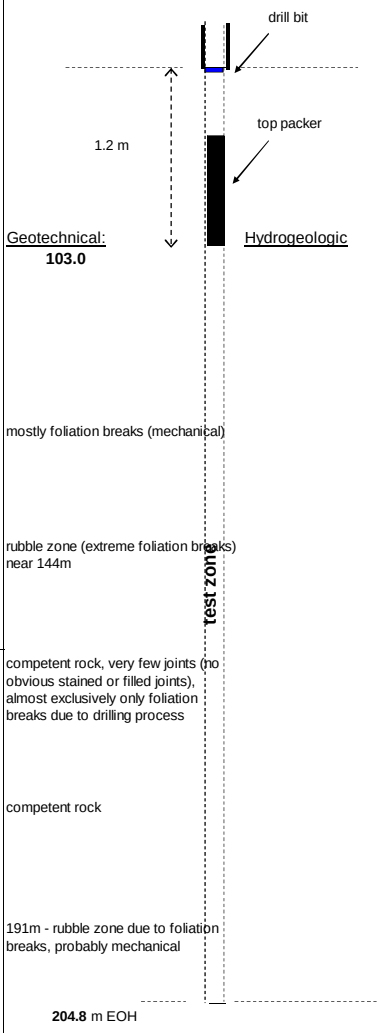
MAX	**3.E-08**
geomean	**3.E-08**
MIN	**2.E-08**

Comments: : during drilling through this interval there was loss of circulation, probably caused by upper zone just below lake and water dissipating into that, not caused by rock below 100m depth

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**103.0**	**to**	**154.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**20-Apr**	**Time:**	**15:10**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**20-Apr**	**Time:**	**16:45**	**Test N°**	**6**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**154.0**

Max Injection P (psi): 137

Depth to wedge: 0 m

This is difference between test 6a and test 5, to calculate contribution of inflow to zone 103 to 154m (target of test 6).

Dw	Measured depth of static water level (1)	2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**103.0**	m
Dt	Measured depth to midpoint of test	**128.5**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**1.8**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**91.2**	m
Dt'	Vertical depth to midpoint of test	**113.8**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**129**	psi
Paquifer	Water column pressure in aquifer (unc.)	**127**	psi
Pdiff	Existing differential shear pressure	**3**	psi
Pshear	Shear pressure required at pump	**497**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**51.0**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

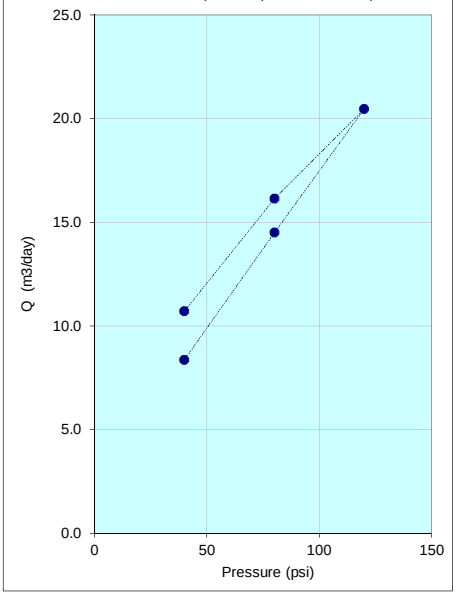
Dt'

Depth

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	40	80	120	80	40
1	**8.20**	**11.60**	**14.60**	**10.80**	**6.20**
2	**8.00**	**12.40**	**16.00**	**10.40**	**6.10**
3	**8.00**	**12.30**	**14.90**	**11.00**	**6.10**
4	**7.80**	**11.80**	**15.00**	**10.60**	
5	**7.80**	**11.80**	**15.00**	**10.60**	
Stable Q **(L/min)**	**7.44**	**11.20**	**14.20**	**10.07**	**5.81**
Leak Q (L/min)					
Q (m^3/day)	10.7	16.1	20.4	14.5	8.4
Hf (m)	0.02	0.03	0.05	0.03	0.01
Hnit (m)	29.9	58.1	86.2	58.1	29.9
K (m/day)	6.0E-03	4.6E-03	4.0E-03	4.2E-03	4.7E-03
K (m/s)	**6.9E-08**	**5.4E-08**	**4.6E-08**	**4.8E-08**	**5.4E-08**
+/- (m/s)	-2.4E-09	1.6E-09	4.8E-09	7.0E-09	1.3E-08
+/- order of mag.	-0.02	0.01	0.04	0.06	0.09

(see Interpretation Guide...)



Field Observations

zone geology: metavolcanics
zone fracture freq & quality (from core): competent, one highly foliated domain at 145m
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results: assumes that fracture properties did not change between test 5 and 6; testing at the same pressure steps and do difference in injection flows to calculate inflow to zone 103-154 in test 6 (which had zone 103-204.8; Test 5 had zone 154-204.8 so was within test 6 interval)

Test Interpretation

K values: **5E-8 m/s**

"type curve" interpretation: **almost ideal, slight clogging of fractures**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**6**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	37	75	110	75	37
Max P during step	43	85	130	85	43
average pressure +/- psi	**3**	**5**	**10**	**5**	**3**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.05**	**0.2**	**0.2**	**0.2**	**0.05**

High estimate of K

Q_{avg} (m^3/day)	10.79	16.42	20.74	14.79	8.44
Hf (m)	0.02	0.04	0.06	0.03	0.01
Hnit (m)	27.8	54.6	79.2	54.6	27.8
K (m/sec)	7.5E-08	5.8E-08	5.1E-08	5.2E-08	5.8E-08

Low estimate of K

Q_{avg} (m^3/day)	10.57	15.55	19.87	13.92	8.22
Hf (m)	0.01	0.03	0.05	0.03	0.01
Hnit (m)	32.0	61.6	93.3	61.6	32.0
K (m/sec)	6.4E-08	4.9E-08	4.1E-08	4.4E-08	4.9E-08

K averages for P step

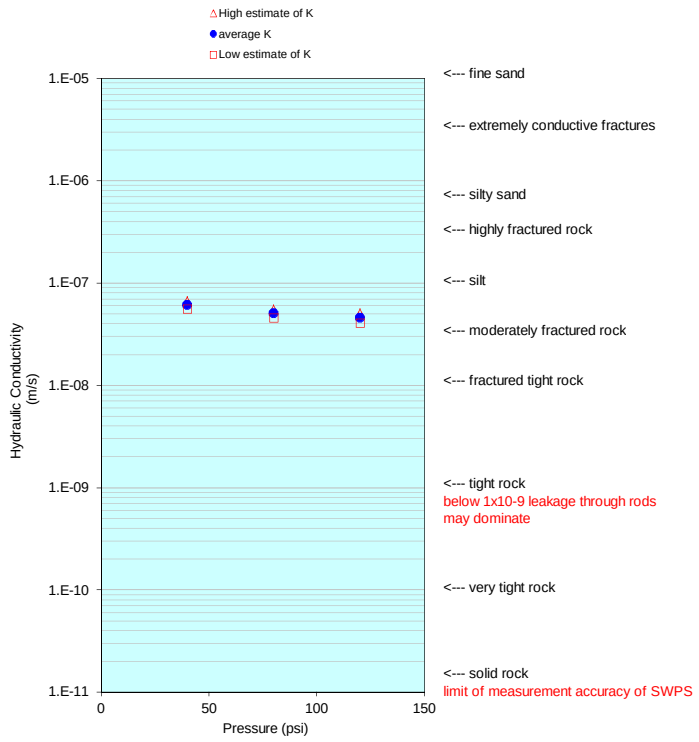
P	40	80	120
high est of K	7.E-08	6.E-08	5.E-08
average K	6.E-08	5.E-08	5.E-08
low est of K	6.E-08	5.E-08	4.E-08

K avg all P steps

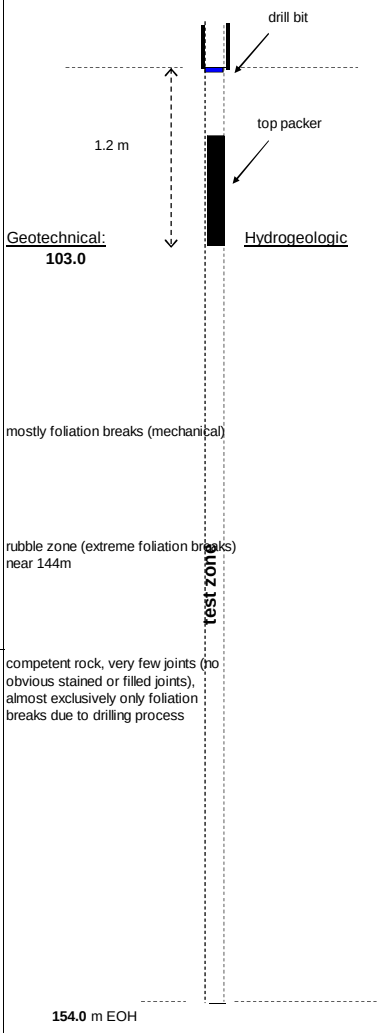
MAX	**7.E-08**
geomean	**5.E-08**
MIN	**4.E-08**

Comments: : during drilling through this interval there was loss of circulation, probably caused by upper zone just below lake and water dissipating into that, not caused by rock below 100m depth

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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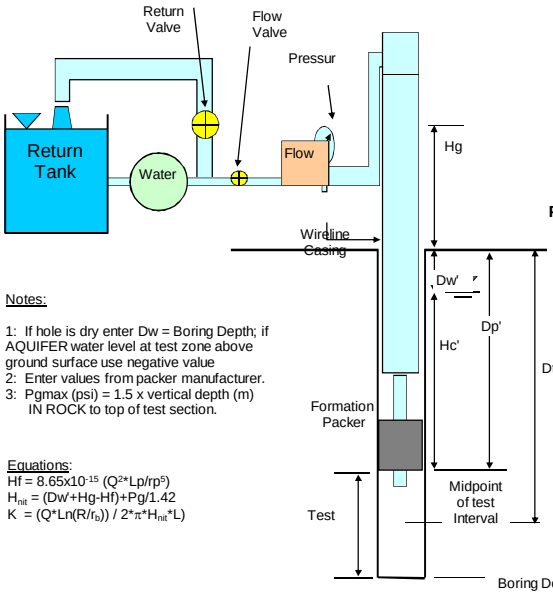
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**203.0**	**to**	**252.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**21-Apr**	**Time:**	**15:00**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**21-Apr**	**Time:**	**17:10**	**Test N°**	**7**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**252.0**

Max Injection P (psi): 270

Depth to wedge: 0 m



Notes:

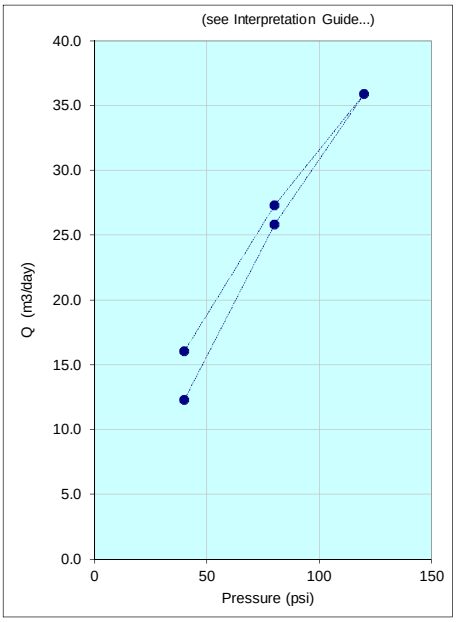
1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	-2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**203.0**	m
Dt	Measured depth to midpoint of test	**227.5**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**179.7**	m
Dt'	Vertical depth to midpoint of test	**201.4**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**255**	psi
Paquifer	Water column pressure in aquifer (unc.)	**258**	psi
Pdiff	Existing differential shear pressure	**-3**	psi
Pshear	Shear pressure required at pump	**503**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**49.0**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	40	**80**	**120**	**80**	**40**
1	**11.20**	**19.00**	**24.00**	**17.00**	**9.80**
2	**11.20**	**19.00**	**26.00**	**18.00**	**8.60**
3	**11.00**	**19.00**	**27.00**	**18.00**	**8.60**
4	**10.40**		**25.00**		**8.40**
5	**11.40**				**8.60**
Stable Q **(L/min)**	**11.20**	**19.00**	**25.00**	**18.00**	**8.60**
Leak Q (L/min)	**0.06**	**0.06**	**0.08**	**0.06**	**0.06**
Q (m^3/day)	16.0	27.3	35.9	25.8	12.3
Hf (m)	0.03	0.10	0.17	0.09	0.02
Hnit (m)	28.1	56.2	84.3	56.3	28.1
K (m/day)	9.9E-03	8.4E-03	7.4E-03	8.0E-03	7.6E-03
K (m/s)	**1.1E-07**	**9.7E-08**	**8.5E-08**	**9.2E-08**	**8.8E-08**
+/- (m/s)	4.0E-09	1.4E-08	1.9E-08	1.9E-08	3.1E-08
+/- order of mag.	0.01	0.06	0.09	0.08	0.13



Field Observations

zone geology: metavolcanics, Qz veins
zone fracture freq & quality (from core): competent rock
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results:

Test Interpretation

K values: **9E-8 m/s**

"type curve" interpretation: **almost ideal, slight clogging of fractures**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**7**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	35	70	100	70	35
Max P during step	45	90	140	90	45
average pressure +/- psi	**5**	**10**	**20**	**10**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.2**	**0.5**	**0.5**	**0.5**	**0.3**

High estimate of K

Q_{avg} (m^3/day)	16.33	27.99	36.60	26.55	12.73
Hf (m)	0.03	0.10	0.18	0.09	0.02
Hnit (m)	24.6	49.2	70.2	49.2	24.6
K (m/sec)	1.3E-07	1.1E-07	1.0E-07	1.1E-07	1.0E-07

Low estimate of K

Q_{avg} (m^3/day)	15.47	25.83	34.44	24.39	11.43
Hf (m)	0.03	0.09	0.16	0.08	0.02
Hnit (m)	31.7	63.3	98.4	63.3	31.7
K (m/sec)	9.8E-08	8.2E-08	7.0E-08	7.7E-08	7.2E-08

K averages for P step

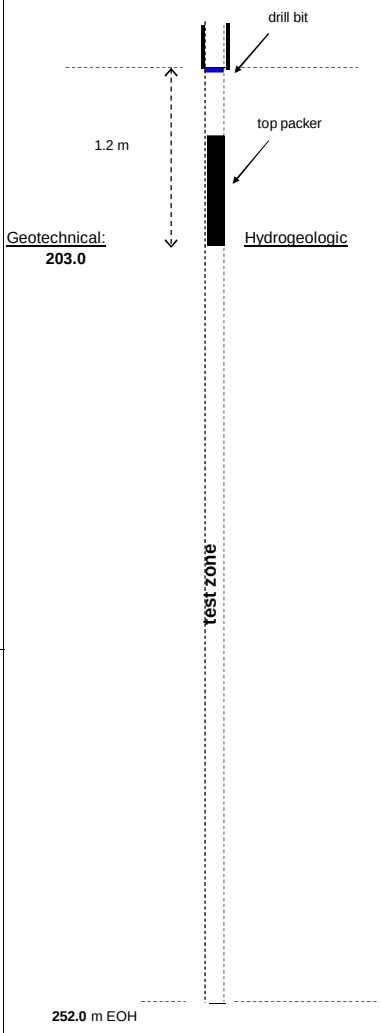
P	40	80	120
high est of K	1.E-07	1.E-07	1.E-07
average K	1.E-07	9.E-08	9.E-08
low est of K	9.E-08	8.E-08	7.E-08

K avg all P steps

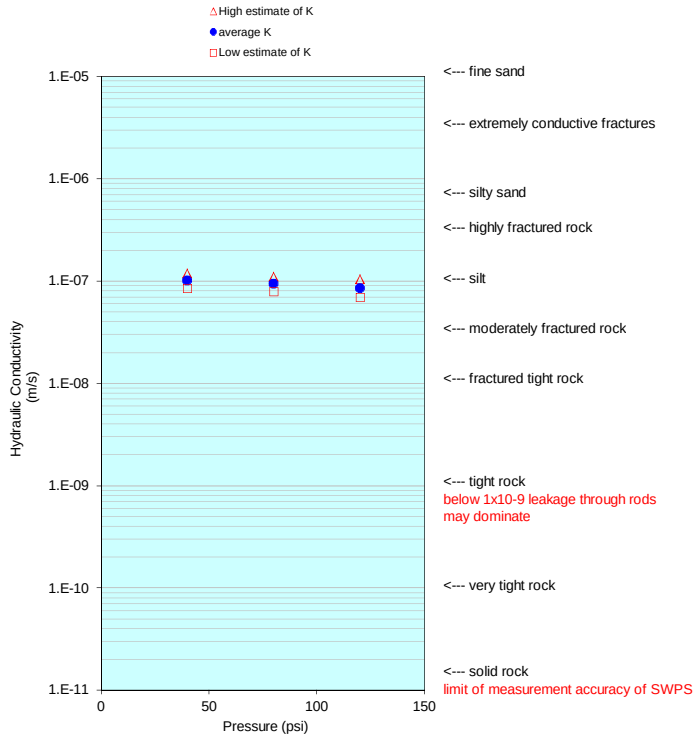
MAX	**1.E-07**
geomean	**9.E-08**
MIN	**7.E-08**

Comments: during drilling through this interval there was loss of circulation, probably caused by upper zone just below lake and water dissipating into that, not caused by rock below 100m depth

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**252.0**	**to**	**297.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**22-Apr**	**Time:**	**12:45**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**22-Apr**	**Time:**	**14:05**	**Test N°**	**8**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**297.0**

Max Injection P (psi): 335

Depth to wedge: 0 m

This is test was on zone that includes test 9 zone, because only 1 packer was used

At each P step (same steps in Test 8 and 9):

flow (test 8) = flow (test 8a) - flow (test 9)

Test 8a (raw data) is kept here but graphed is Test 8, which was the target. Only one packer was used so this requires this subtraction of flows.

Assumption: Fractures dont change between test 8 and 9

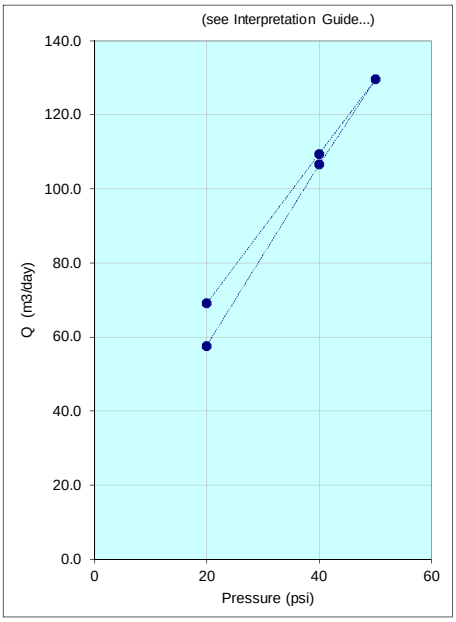
Dw	Measured depth of static water level (1)	-2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**252.0**	m
Dt	Measured depth to midpoint of test	**274.5**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**223.1**	m
Dt'	Vertical depth to midpoint of test	**243.0**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**317**	psi
Paquifer	Water column pressure in aquifer (unc.)	**320**	psi
Pdiff	Existing differential shear pressure	**-3**	psi
Pshear	Shear pressure required at pump	**503**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**45.0**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Dt'

Depth

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	20	**40**	**50**	**40**	**20**
1	**47.00**	**78.00**	**90.00**	**72.00**	**40.00**
2	**46.00**	**78.00**	**90.00**	**74.00**	**40.00**
3	**48.00**	**74.00**		**74.00**	**40.00**
4		**76.00**			
5					
Stable Q **(L/min)**	**48.00**	**76.00**	**90.00**	**74.00**	**40.00**
Leak Q (L/min)					
Q (m^3/day)	69.1	109.4	129.6	106.6	57.6
Hf (m)	0.63	1.57	2.20	1.49	0.43
Hnit (m)	13.5	26.6	33.0	26.7	13.7
K (m/day)	9.7E-02	7.8E-02	7.4E-02	7.5E-02	8.0E-02
K (m/s)	**1.1E-06**	**9.0E-07**	**8.6E-07**	**8.7E-07**	**9.2E-07**
+/- (m/s)	1.0E-07	1.3E-07	1.1E-07	1.6E-07	3.0E-07
+/- order of mag.	0.04	0.06	0.05	0.07	0.12



Field Observations

zone geology: metavolcanics,
zone fracture freq & quality (from core): competent rock with a few rubble zones and joints
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results:

Test Interpretation

K values: **9E-7 m/s**

"type curve" interpretation: **almost ideal, slight clogging of fractures**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	10-WBW-001
Test hole N°	10-WBW-001
Test N°	8

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	17	35	45	35	17
Max P during step	23	45	55	45	23
average pressure +/- psi	**3**	**5**	**5**	**5**	**3**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.5**	**1**	**1**	**0.5**	**0.3**

High estimate of K

Q_{avg} (m^3/day)	69.84	110.88	131.04	107.28	58.03
Hf (m)	0.64	1.61	2.25	1.51	0.44
Hnit (m)	11.3	23.0	29.4	23.1	11.5
K (m/sec)	1.3E-06	1.1E-06	9.7E-07	1.0E-06	1.1E-06

Low estimate of K

Q_{avg} (m^3/day)	67.68	106.56	126.72	105.12	56.74
Hf (m)	0.60	1.49	2.10	1.45	0.42
Hnit (m)	15.6	30.2	36.6	30.2	15.8
K (m/sec)	9.5E-07	7.7E-07	7.6E-07	7.6E-07	7.9E-07

K averages for P step

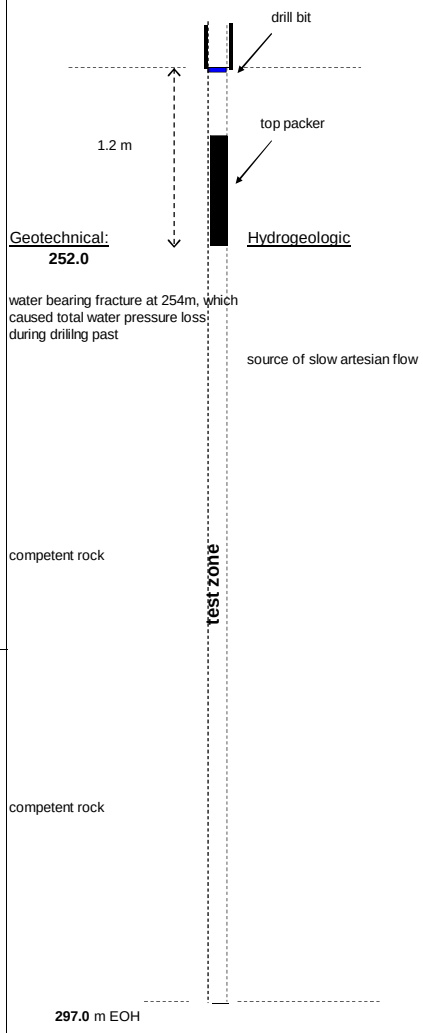
P	20	40	50
high est of K	1.E-06	1.E-06	1.E-06
average K	1.E-06	9.E-07	9.E-07
low est of K	9.E-07	8.E-07	8.E-07

K avg all P steps

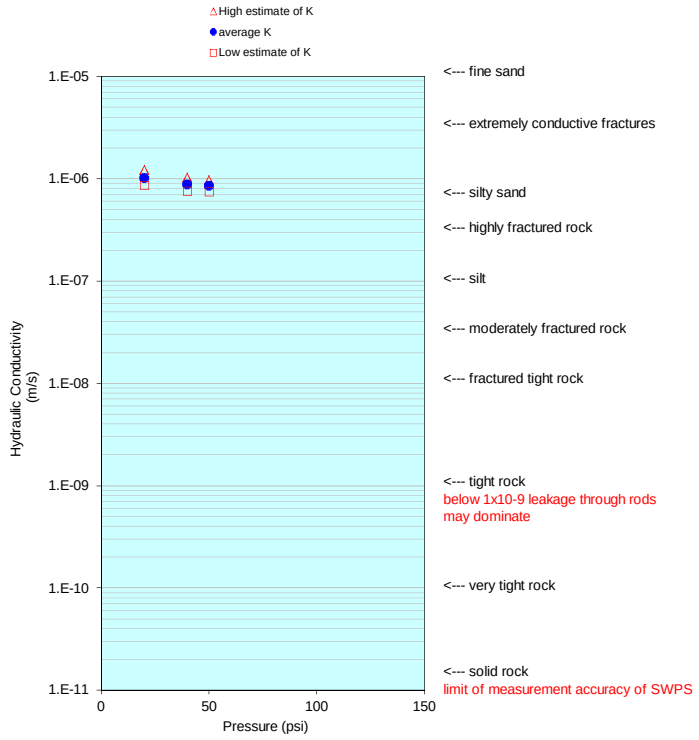
MAX	**1.E-06**
geomean	**9.E-07**
MIN	**8.E-07**

Comments: this zone length avarages solid rock with one (or a few) fractures which have high permeability (greater than avg for this interval)

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**252.0**	**to**	**279.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**22-Apr**	**Time:**	**12:45**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**22-Apr**	**Time:**	**14:05**	**Test N°**	**8**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**297.0**

Max Injection P (psi): 335

Depth to wedge: 0 m

This is difference between test 8a and test 8, to calculate contribution of inflow to zone 252 to 279m (target of test 8).

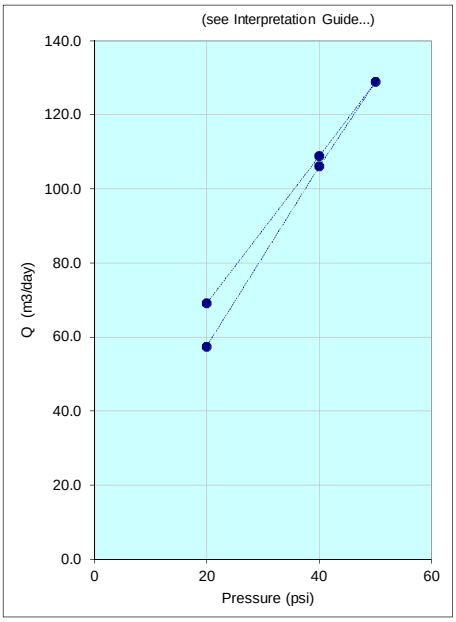
Dw	Measured depth of static water level (1)	-2.0 m
Dbr	Measured vertical depth to bedrock	2.0 m
Dp	Measured depth to packer	**252.0** m
Dt	Measured depth to midpoint of test	**265.5** m
ß	Inclination from horizontal (degrees)	62 °
Dw'	Vertical depth to static water level	**0.0** m
	Rod stickup above ground	**0.0** m
Dp'	Vertical depth to packer	**223.1** m
Dt'	Vertical depth to midpoint of test	**235.1** m
SP	Shear Pin Rating (psi)	500 psi
Prods	Water column pressure in drill rods	**317** psi
Paquifer	Water column pressure in aquifer (unc.)	**320** psi
Pdiff	Existing differential shear pressure	**-3** psi
Pshear	Shear pressure required at pump	**503** psi
Hg	Gauge height	0.0 m
Lp	Length of discharge pipe	5.00 m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127 m
R	Radius of influence (10 m is standard value)	10 m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048 m
L	Length of test section	**27.0** m
Hf	Friction Loss	
Hnit	Net injection head at midpoint of test	
K	Hydraulic conductivity	

Dt'

Depth

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	Q (Liters / min) *see flow calc. sheet				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	20	40	50	40	20
1					
2					
3					
4					
5					
Stable Q **(L/min)**	**48.00**	**75.58**	**89.52**	**73.64**	**39.87**
Leak Q (L/min)					
Q (m^3/day)	69.1	108.8	128.9	106.0	57.4
Hf (m)	0.63	1.55	2.18	1.47	0.43
Hnit (m)	13.5	26.6	33.0	26.7	13.7
K (m/day)	1.6E-01	1.3E-01	1.2E-01	1.3E-01	1.3E-01
K (m/s)	**1.9E-06**	**1.5E-06**	**1.4E-06**	**1.4E-06**	**1.5E-06**
+/- (m/s)	1.7E-07	2.2E-07	1.9E-07	2.6E-07	5.0E-07
+/- order of mag.	0.04	0.06	0.05	0.07	0.12



Field Observations

zone geology: metavolcanics,
zone fracture freq & quality (from core): competent rock with a few rubble zones and joints
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results:

Test Interpretation

K values: **9E-7 m/s**

"type curve" interpretation: **almost ideal, slight clogging of fractures**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**8**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	17	35	45	35	17
Max P during step	23	45	55	45	23
average pressure +/- psi	**3**	**5**	**5**	**5**	**3**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.5**	**1**	**1**	**0.5**	**0.3**

High estimate of K

Q_{avg} (m^3/day)	69.84	110.28	130.35	106.76	57.84
Hf (m)	0.64	1.59	2.22	1.49	0.44
Hnit (m)	11.3	23.1	29.5	23.2	11.5
K (m/sec)	2.2E-06	1.7E-06	1.6E-06	1.7E-06	1.8E-06

Low estimate of K

Q_{avg} (m^3/day)	67.68	105.96	126.03	104.60	56.55
Hf (m)	0.60	1.47	2.08	1.43	0.42
Hnit (m)	15.6	30.2	36.7	30.3	15.8
K (m/sec)	1.6E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06

K averages for P step

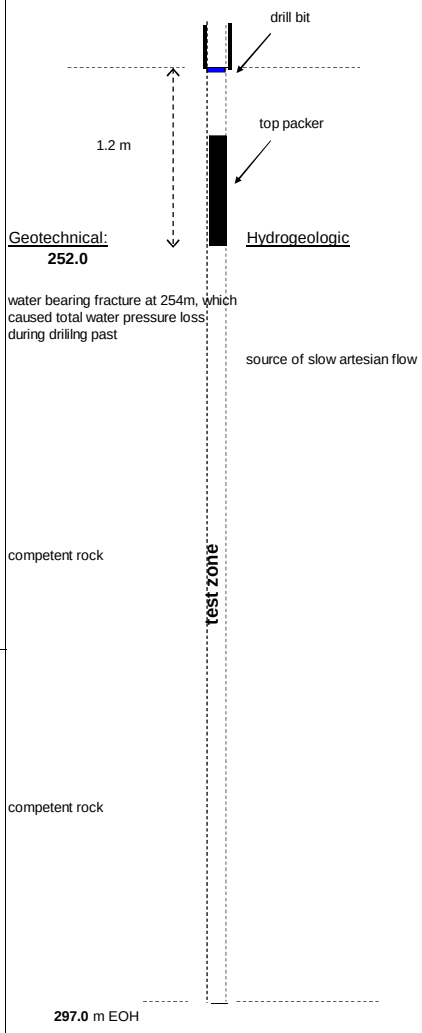
P	20	40	50
high est of K	2.E-06	2.E-06	2.E-06
average K	2.E-06	1.E-06	1.E-06
low est of K	1.E-06	1.E-06	1.E-06

K avg all P steps

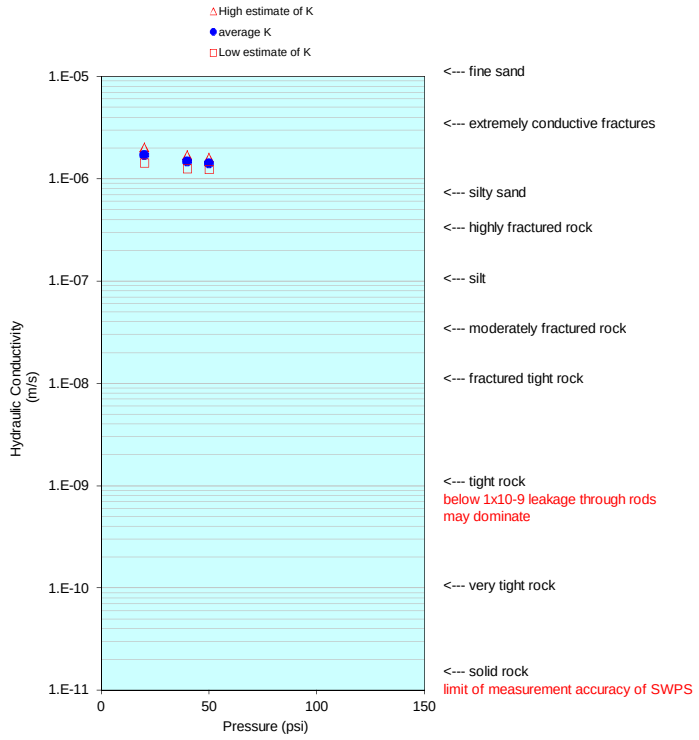
MAX	**2.E-06**
geomean	**2.E-06**
MIN	**1.E-06**

Comments: this zone length avarages solid rock with one (or a few) fractures which have high permeability (greater than avg for this interval)

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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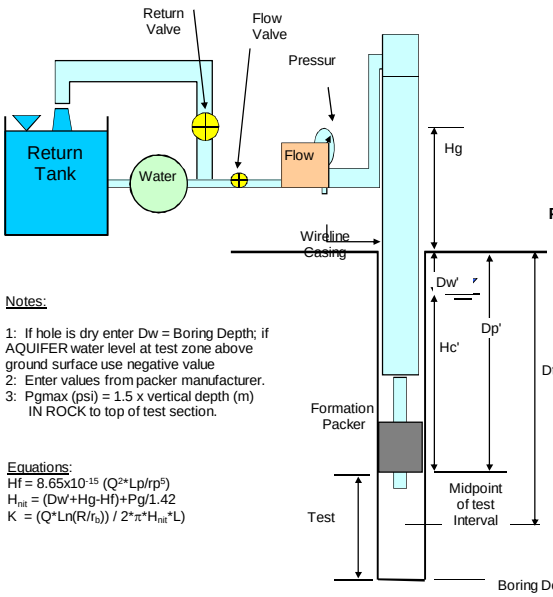
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**279.0**	**to**	**297.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**22-Apr**	**Time:**	**12:45**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**22-Apr**	**Time:**	**14:05**	**Test N°**	**9**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**297.0**

Max Injection P (psi): 371

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

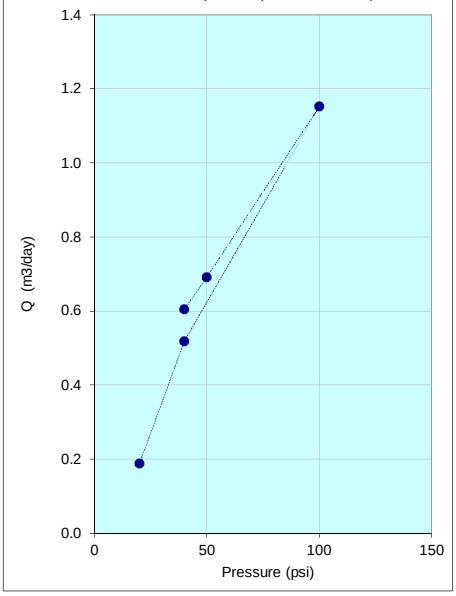
Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	-2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**279.0**	m
Dt	Measured depth to midpoint of test	**288.0**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**247.0**	m
Dt'	Vertical depth to midpoint of test	**255.0**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**351**	psi
Paquifer	Water column pressure in aquifer (unc.)	**354**	psi
Pdiff	Existing differential shear pressure	**-3**	psi
Pshear	Shear pressure required at pump	**503**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**18.0**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	40	**50**	**100**	**40**	**20**
1	**0.44**	**0.50**	**0.86**	**0.48**	**0.12**
2	**0.42**	**0.49**	**0.78**	**0.32**	**0.13**
3	**0.46**	**0.46**	**0.88**	**0.36**	**0.13**
4	**0.40**	**0.48**	**0.72**	**0.28**	
5	**0.42**		**0.80**	**0.36**	
Stable Q **(L/min)**	**0.42**	**0.48**	**0.80**	**0.36**	**0.13**
Leak Q (L/min)					
Q (m^3/day)	0.6	0.7	1.2	0.5	0.2
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	28.2	35.2	70.4	28.2	14.1
K (m/day)	1.0E-03	9.3E-04	7.7E-04	8.7E-04	6.3E-04
K (m/s)	**1.2E-08**	**1.1E-08**	**8.9E-09**	**1.0E-08**	**7.3E-09**
+/- (m/s)	-8.9E-10	1.5E-09	1.2E-09	2.2E-09	3.6E-09
+/- order of mag.	-0.03	0.06	0.06	0.09	0.17

(see Interpretation Guide...)



Field Observations

zone geology: metavolcanics,
zone fracture freq & quality (from core): competent rock with a few rubble zones and joints
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results:

Test Interpretation

K values: **4E-9 m/s**

"type curve" interpretation: **almost ideal, slight clogging of fractures**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**9**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	37	45	90	35	18
Max P during step	43	55	110	45	22
average pressure +/- psi	**3**	**5**	**10**	**5**	**2**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.02**	**0.02**	**0.02**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	0.62	0.72	1.18	0.55	0.20
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	26.1	31.7	63.4	24.6	12.7
K (m/sec)	1.3E-08	1.2E-08	1.0E-08	1.2E-08	8.7E-09

Low estimate of K

Q_{avg} (m^3/day)	0.58	0.63	1.09	0.46	0.16
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	30.3	38.7	77.5	31.7	15.5
K (m/sec)	1.0E-08	8.9E-09	7.7E-09	7.9E-09	5.6E-09

K averages for P step

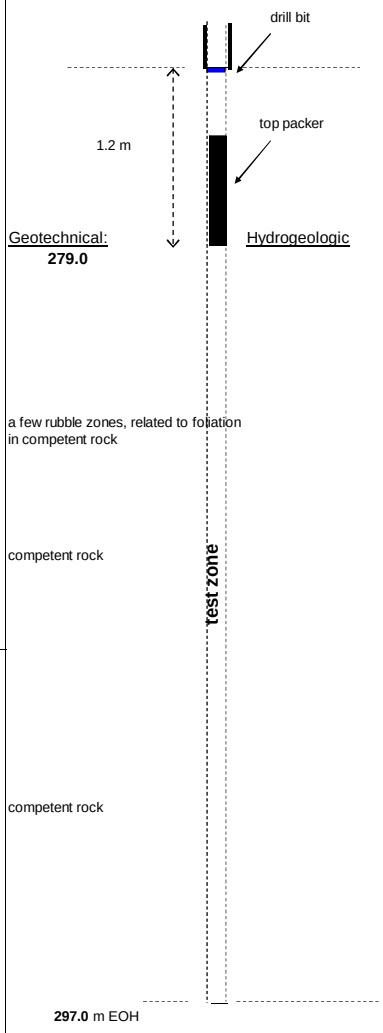
P	40	50	100
high est of K	1.E-08	1.E-08	1.E-08
average K	9.E-09	1.E-08	9.E-09
low est of K	8.E-09	8.E-09	8.E-09

K avg all P steps

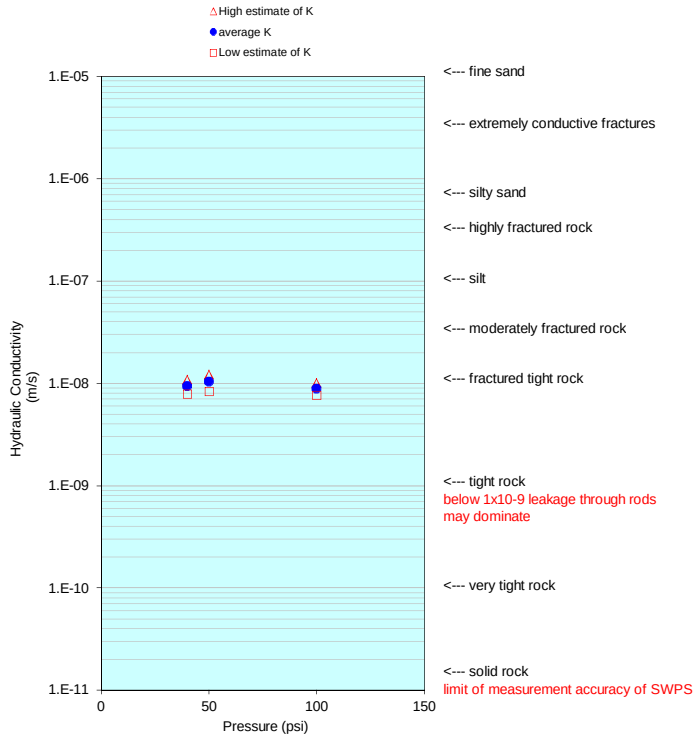
MAX	**1.E-08**
geomean	**1.E-08**
MIN	**8.E-09**

Comments:

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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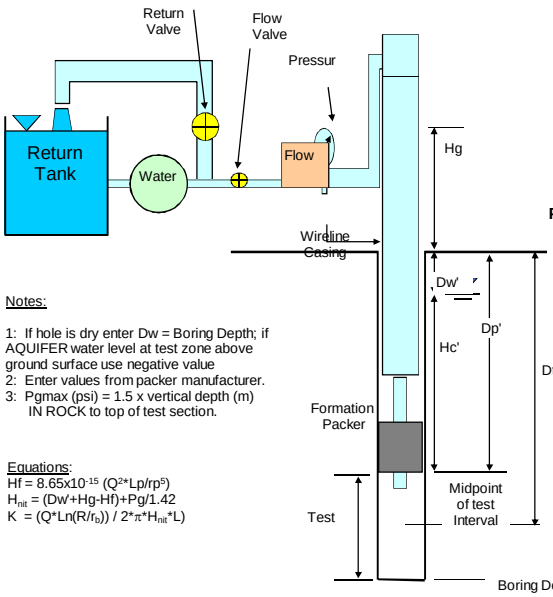
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**297.0**	**to**	**345.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**23-Apr**	**Time:**	**14:15**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**23-Apr**	**Time:**	**16:05**	**Test N°**	**10**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**345.0**

Max Injection P (psi): 394

Depth to wedge: 0 m



Notes:

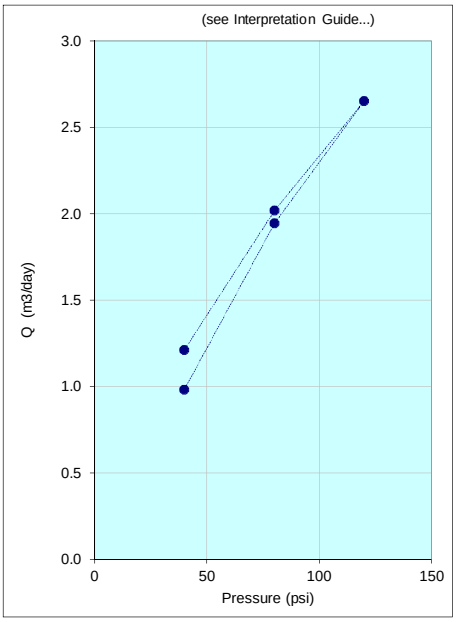
1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	-2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**297.0**	m
Dt	Measured depth to midpoint of test	**321.0**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**263.0**	m
Dt'	Vertical depth to midpoint of test	**284.2**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**373**	psi
Paquifer	Water column pressure in aquifer (unc.)	**377**	psi
Pdiff	Existing differential shear pressure	**-3**	psi
Pshear	Shear pressure required at pump	**503**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**48.0**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4×10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	40	**80**	**120**	**80**	**40**
1	**0.92**	**1.36**	**1.92**	**1.32**	**0.66**
2	**0.88**	**1.40**	**1.92**	**1.38**	**0.70**
3	**0.86**	**1.40**	**1.80**	**1.40**	**0.66**
4	**0.80**		**1.80**	**1.33**	**0.68**
5	**0.84**		**1.84**	**1.35**	
Stable Q **(L/min)**	**0.84**	**1.40**	**1.84**	**1.35**	**0.68**
Leak Q (L/min)					
Q (m^3/day)	1.2	2.0	2.6	1.9	1.0
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	28.2	56.3	84.5	56.3	28.2
K (m/day)	7.6E-04	6.3E-04	5.6E-04	6.1E-04	6.2E-04
K (m/s)	**8.8E-09**	**7.3E-09**	**6.4E-09**	**7.1E-09**	**7.1E-09**
+/- (m/s)	-2.5E-10	4.6E-10	6.6E-10	7.2E-10	1.4E-09
+/- order of mag.	-0.01	0.03	0.04	0.04	0.08



Field Observations

zone geology: metavolcanics, altered basalt (zone nearing diabase dyke)
zone fracture freq & quality (from core): competent rock, foliated, few real joints
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results: artesian flow from zone above packer was seen from casing before, during test at all pressure steps (flow from casing was constant), and after test; water conductivity was that of brackish water (2800 micro S)

Test Interpretation

K values: **7E-9 m/s**

"type curve" interpretation: **nearly ideall**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**10**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	38	75	110	75	38
Max P during step	42	85	130	85	42
average pressure +/- psi	**2**	**5**	**10**	**5**	**2**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.02**	**0.02**	**0.02**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	1.22	2.04	2.68	1.97	1.01
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	26.8	52.8	77.5	52.8	26.8
K (m/sec)	9.4E-09	7.9E-09	7.1E-09	7.7E-09	7.7E-09

Low estimate of K

Q_{avg} (m^3/day)	1.18	1.96	2.59	1.89	0.92
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	29.6	59.9	91.5	59.9	29.6
K (m/sec)	8.2E-09	6.7E-09	5.8E-09	6.5E-09	6.4E-09

K averages for P step

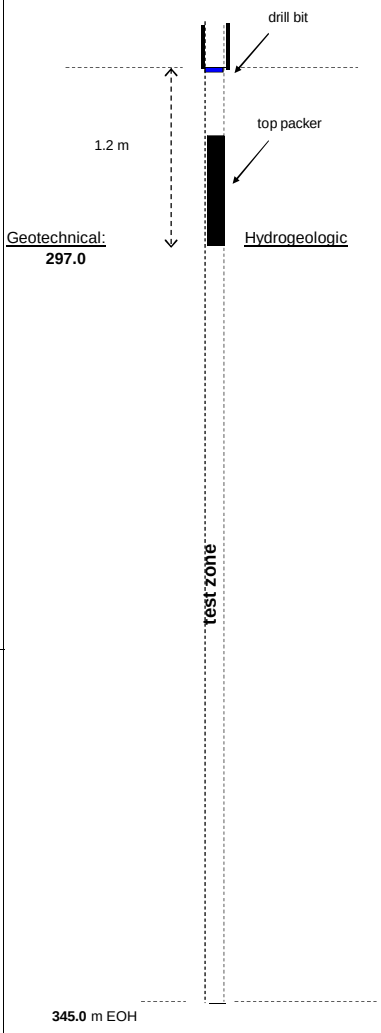
P	40	80	120
high est of K	9.E-09	8.E-09	7.E-09
average K	8.E-09	7.E-09	6.E-09
low est of K	7.E-09	7.E-09	6.E-09

K avg all P steps

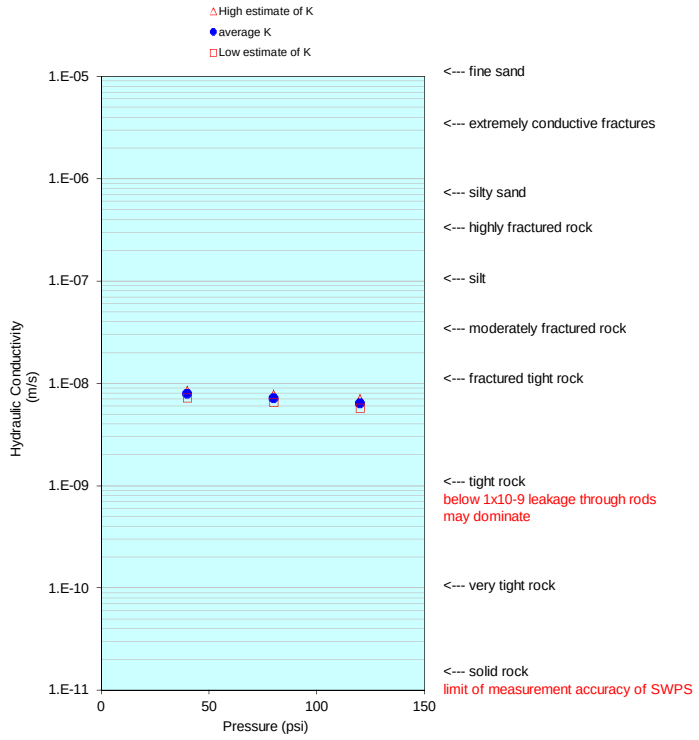
MAX	**9.E-09**
geomean	**7.E-09**
MIN	**6.E-09**

Comments:

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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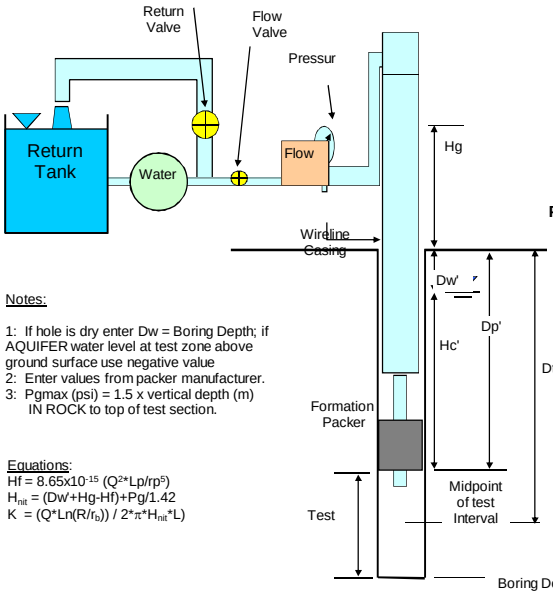
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**345.0**	**to**	**387.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**24-Apr**	**Time:**	**12:50**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**24-Apr**	**Time:**	**14:40**	**Test N°**	**11**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**387.0**

Max Injection P (psi): 458

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

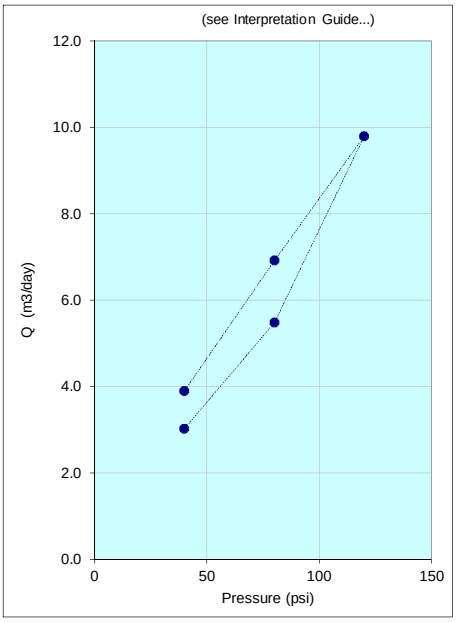
$H_{nit} = (Dw+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	-2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**345.0**	m
Dt	Measured depth to midpoint of test	**366.0**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**305.5**	m
Dt'	Vertical depth to midpoint of test	**324.1**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**434**	psi
Paquifer	Water column pressure in aquifer (unc.)	**437**	psi
Pdiff	Existing differential shear pressure	**-3**	psi
Pshear	Shear pressure required at pump	**503**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**42.0**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	40	**80**	**120**	**80**	**40**
1	**2.60**	**4.60**	**6.80**	**4.00**	**2.00**
2	**2.85**	**4.70**	**7.20**	**3.80**	**2.20**
3	**2.77**	**4.80**	**6.80**	**3.90**	**1.96**
4		**4.60**	**6.80**	**3.70**	**2.04**
5		**4.80**		**3.80**	**2.10**
Stable Q **(L/min)**	**2.70**	**4.80**	**6.80**	**3.80**	**2.10**
Leak Q (L/min)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Q (m^3/day)	3.9	6.9	9.8	5.5	3.0
Hf (m)	0.00	0.01	0.01	0.00	0.00
Hnit (m)	28.2	56.3	84.5	56.3	28.2
K (m/day)	2.8E-03	2.5E-03	2.3E-03	2.0E-03	2.2E-03
K (m/s)	**3.2E-08**	**2.9E-08**	**2.7E-08**	**2.3E-08**	**2.5E-08**
+/- (m/s)	7.2E-10	9.2E-10	4.3E-09	6.9E-09	7.9E-09
+/- order of mag.	0.01	0.01	0.06	0.12	0.12



Field Observations

zone geology: metavolcanics above diabase dyke, upper contact, and diabase dyke
zone fracture freq & quality (from core): competent rock, low Joint freq
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results: artesian flow from zone above packer was seen from casing before, during test at all pressure steps (flow from casing was constant), and after test; water conductivity was that of brackish water (EC = 2450 micro S); drillers were using diluted bentonite mix in water to help lubricate rods (too dilute to have large effect on results and hole was washed)

Test Interpretation

K values: **3E-8 m/s**

"type curve" interpretation: **nearly ideal, possible slight clogging of fractures**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**11**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	35	70	105	70	35
Max P during step	45	90	135	90	45
average pressure +/- psi	**5**	**10**	**15**	**10**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**					
	0.01	**0.02**	**0.1**	**0.05**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	3.90	6.94	9.94	5.54	3.05
Hf (m)	0.00	0.01	0.01	0.00	0.00
Hnit (m)	24.6	49.3	73.9	49.3	24.6
K (m/sec)	3.7E-08	3.3E-08	3.1E-08	2.6E-08	2.9E-08

Low estimate of K

Q_{avg} (m^3/day)	3.86	6.85	9.50	5.33	2.97
Hf (m)	0.00	0.01	0.01	0.00	0.00
Hnit (m)	31.7	63.4	95.1	63.4	31.7
K (m/sec)	2.9E-08	2.5E-08	2.3E-08	2.0E-08	2.2E-08

K averages for P step

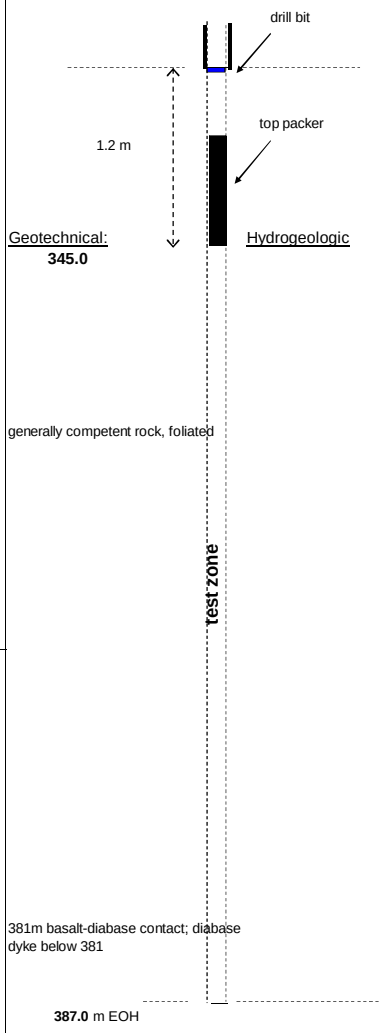
P	40	80	120
high est of K	3.E-08	3.E-08	3.E-08
average K	3.E-08	3.E-08	3.E-08
low est of K	3.E-08	2.E-08	2.E-08

K avg all P steps

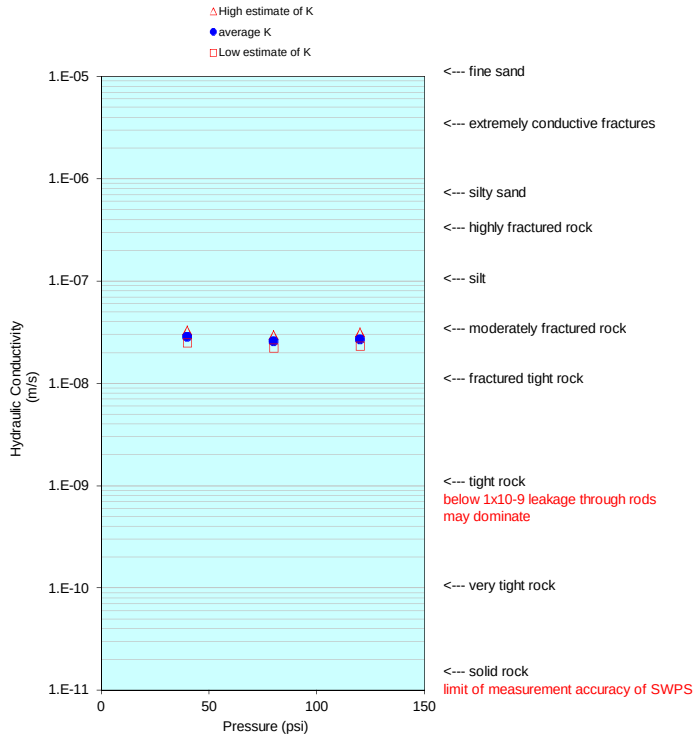
MAX	**3.E-08**
geomean	**3.E-08**
MIN	**2.E-08**

Comments:

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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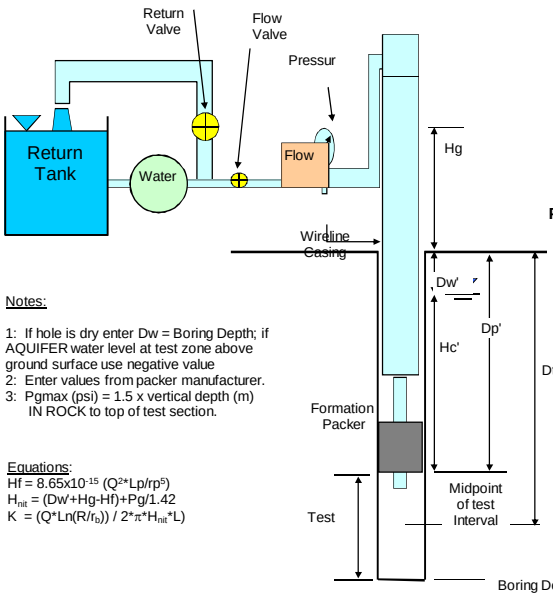
PACKER INJECTION TEST *(modified from HCI)*

Project:	Hope Bay - Doris	**Test Interval (m):**	387.0	to	422.5	**Drillhole N°**	10-WBW-001
UTM (x,y)	33780E; 557535N	**Start Date:**	25-Apr	**Time:**	15:05	**Target**	10-WBW-001
Datum:	UTM	**End Date:**	25-Apr	**Time:**	17:30	**Test N°**	12
GS Elevation:		**Supervisor:**	JS			**DH Depth (m)**	422.5

Max Injection P (psi): 514

Depth to wedge: 0 m



Notes:

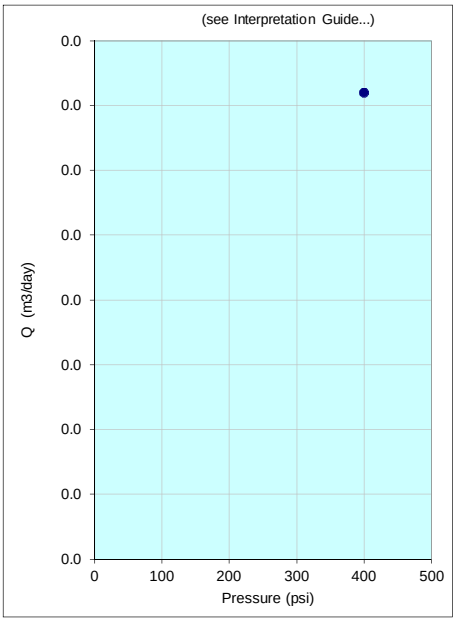
1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	-2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**387.0**	m
Dt	Measured depth to midpoint of test	**404.8**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**342.6**	m
Dt'	Vertical depth to midpoint of test	**358.4**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**487**	psi
Paquifer	Water column pressure in aquifer (unc.)	**490**	psi
Pdiff	Existing differential shear pressure	**-4**	psi
Pshear	Shear pressure required at pump	**504**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**35.5**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4×10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	Q (Liters / min) *see flow calc. sheet				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	40	80	120	200	400
1	**<0.01**	**<0.01**	**0.01**	**<0.01**	**0.14**
2			**<0.01**		**<0.01**
3					**0.01**
4					**<0.01**
5					
Stable Q **(L/min)**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**
Leak Q (L/min)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Q (m^3/day)	#N/A	#N/A	#N/A	#N/A	0.0
Hf (m)	#N/A	#N/A	#N/A	#N/A	0.00
Hnit (m)	#N/A	#N/A	#N/A	#N/A	281.7
K (m/day)	#N/A	#N/A	#N/A	#N/A	1.2E-06
K (m/s)	**#N/A**	**#N/A**	**#N/A**	**#N/A**	**1.4E-11**
+/- (m/s)	#N/A	#VALUE!	#VALUE!	#VALUE!	1.5E-11
+/- order of mag.	#N/A	#VALUE!	#VALUE!	#VALUE!	0.31



Field Observations

zone geology: diabase
zone fracture freq & quality (from core): competent rock, no fractures, solid core
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results: artesian flow from zone above packer was seen from casing before, during test at all pressure steps (flow from casing was constant),brackish water; could not inject any measurable water into this interval

Test Interpretation

K values: **1E-11 m/s**

"type curve" interpretation: **N/A**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**12**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	35	70	100	190	395
Max P during step	45	90	140	210	405
average pressure +/- psi	**5**	**10**	**20**	**10**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	#N/A	#N/A	#N/A	#N/A	0.03
Hf (m)	#N/A	#N/A	#N/A	#N/A	0.00
Hnit (m)	#N/A	#N/A	#N/A	#N/A	278.2
K (m/sec)	#N/A	#N/A	#N/A	#N/A	2.9E-11

Low estimate of K

Q_{avg} (m^3/day)	#N/A	#N/A	#N/A	#N/A	-0.01
Hf (m)	#N/A	#N/A	#N/A	#N/A	0.00
Hnit (m)	#N/A	#N/A	#N/A	#N/A	285.2
K (m/sec)	#N/A	#N/A	#N/A	#N/A	#N/A

K averages for P step

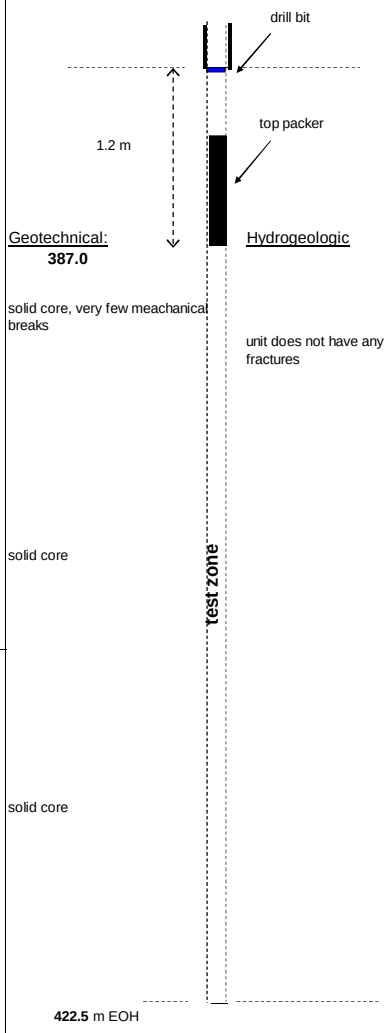
P	40	80	120
high est of K	3.E-11		
average K	1.E-11		
low est of K			

K avg all P steps

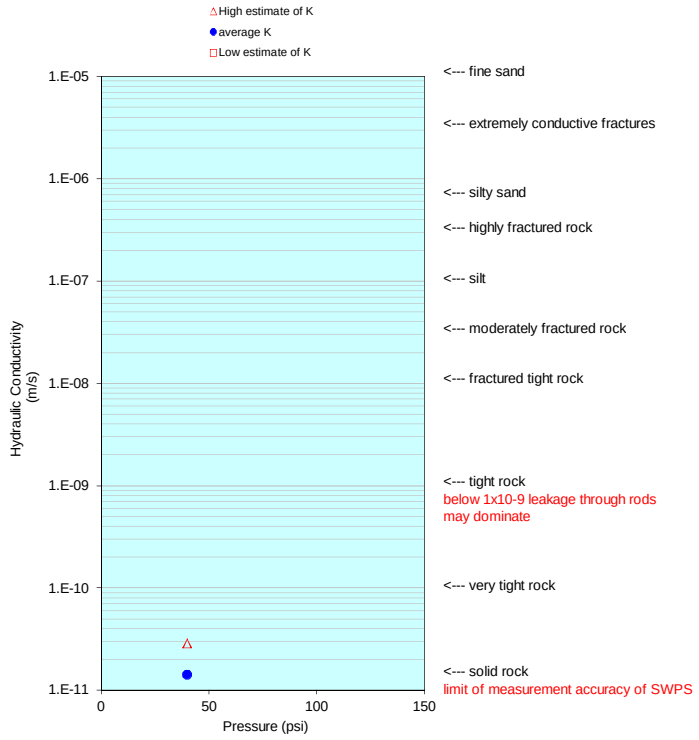
MAX	**3.E-11**
geomean	**1.E-11**
MIN	**#N/A**

Comments: results are within system leak in rods, therefore K might be lower than shown because 0.01 l/min recorded is within reading error on flow meter; basically this zone is solid rock and has only porosity and extremely low permeability

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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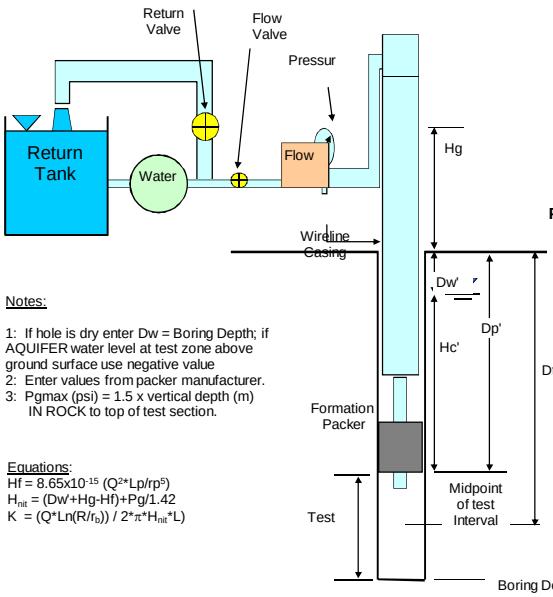
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**423.0**	**to**	**471.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**26-Apr**	**Time:**	**15:50**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**26-Apr**	**Time:**	**17:15**	**Test N°**	**13**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**471.0**

Max Injection P (psi): 562

Depth to wedge: 0 m



Notes:

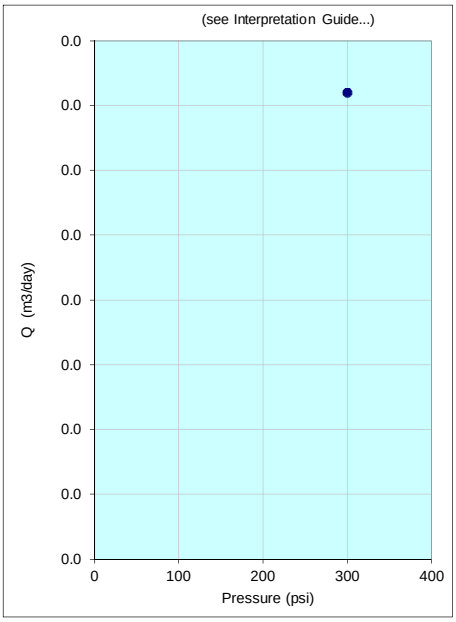
1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	-2.0 m
Dbr	Measured vertical depth to bedrock	2.0 m
Dp	Measured depth to packer	**423.0** m
Dt	Measured depth to midpoint of test	**447.0** m
ß	Inclination from horizontal (degrees)	62 °
Dw'	Vertical depth to static water level	**0.0** m
	Rod stickup above ground	**0.0** m
Dp'	Vertical depth to packer	**374.5** m
Dt'	Vertical depth to midpoint of test	**395.8** m
SP	Shear Pin Rating (psi)	500 psi
Prods	Water column pressure in drill rods	**532** psi
Paquifer	Water column pressure in aquifer (unc.)	**535** psi
Pdiff	Existing differential shear pressure	**-4** psi
Pshear	Shear pressure required at pump	**504** psi
Hg	Gauge height	0.0 m
Lp	Length of discharge pipe	5.00 m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127 m
R	Radius of influence (10 m is standard value)	10 m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048 m
L	Length of test section	**48.0** m
Hf	Friction Loss	
Hnit	Net injection head at midpoint of test	
K	Hydraulic conductivity	

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4×10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	50	100	200	300	
1	**<0.01**	**<0.01**	**<0.01**	**<0.01**	
2					
3					
4					
5					
Stable Q **(L/min)**	**0.00**	**0.00**	**0.00**	**0.01**	
Leak Q (L/min)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Q (m^3/day)	#N/A	#N/A	#N/A	0.0	#N/A
Hf (m)	#N/A	#N/A	#N/A	0.00	#N/A
Hnit (m)	#N/A	#N/A	#N/A	211.3	#N/A
K (m/day)	#N/A	#N/A	#N/A	1.2E-06	#N/A
K (m/s)	**#N/A**	**#N/A**	**#N/A**	**1.4E-11**	**#N/A**
+/- (m/s)	#VALUE!	#N/A	#VALUE!	8.5E-12	#VALUE!
+/- order of mag.	#VALUE!	#N/A	#VALUE!	0.21	#VALUE!



Field Observations

zone geology: diabase
zone fracture freq & quality (from core): competent rock, some joints and CJs
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results: artesian flow from zone above packer was seen from casing before, during test at all pressure steps (flow from casing was constant),brackish water; could not inject any measurable water into this interval

Test Interpretation

K values: <**1E-11 m/s**

"type curve" interpretation: **N/A**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**13**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	45	90	190	280	0
Max P during step	55	110	210	320	0
average pressure +/- psi	**5**	**10**	**10**	**20**	

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.005**	**0.005**	**0.005**	**0.005**	

High estimate of K

Q_{avg} (m^3/day)	#N/A	#N/A	#N/A	0.02	#N/A
Hf (m)	#N/A	#N/A	#N/A	0.00	#N/A
Hnit (m)	#N/A	#N/A	#N/A	197.2	#N/A
K (m/sec)	#N/A	#N/A	#N/A	2.2E-11	#N/A

Low estimate of K

Q_{avg} (m^3/day)	#N/A	#N/A	#N/A	0.00	#N/A
Hf (m)	#N/A	#N/A	#N/A	0.00	#N/A
Hnit (m)	#N/A	#N/A	#N/A	225.4	#N/A
K (m/sec)	#N/A	#N/A	#N/A	#N/A	#N/A

K averages for P step

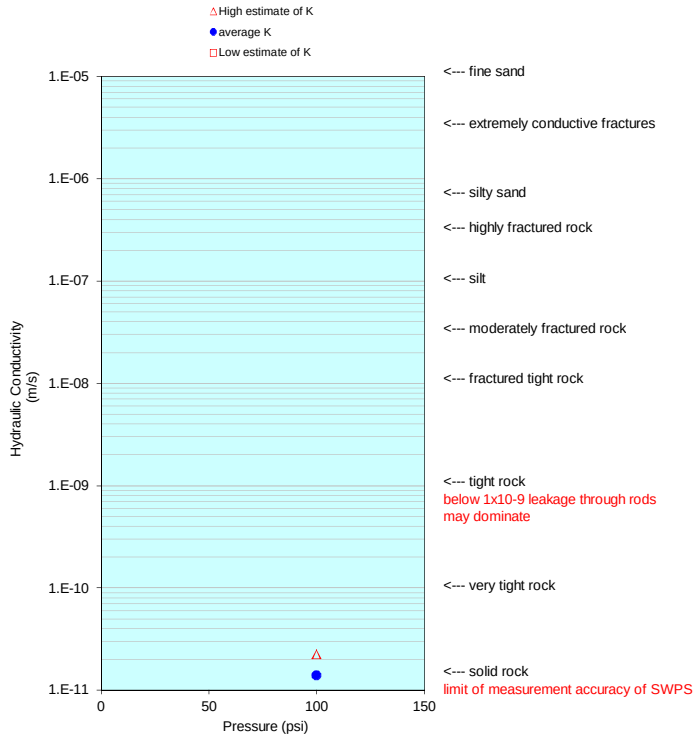
P	50	100	200
high est of K		2.E-11	
average K		1.E-11	
low est of K			

K avg all P steps

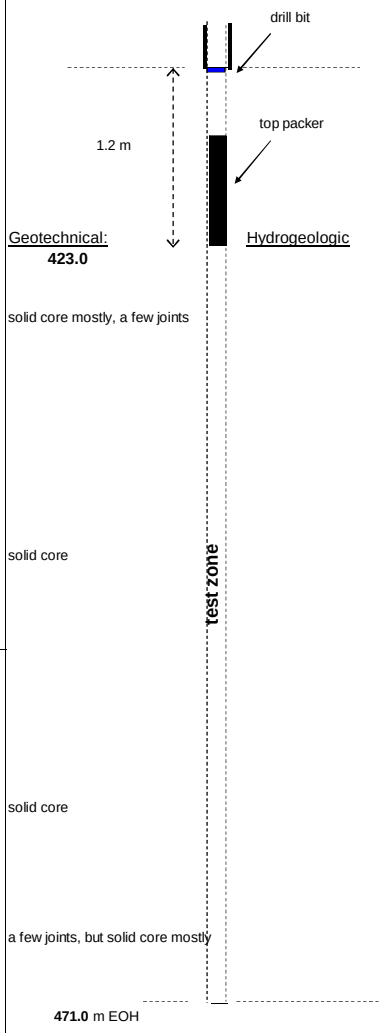
MAX	**2.E-11**
geomean	**1.E-11**
MIN	**#N/A**

Comments: results are within system leak in rods, therefore K might be lower than shown because 0.01 l/min recorded is within reading error on flow meter; basically this zone is solid rock and has only porosity and extremely low permeability

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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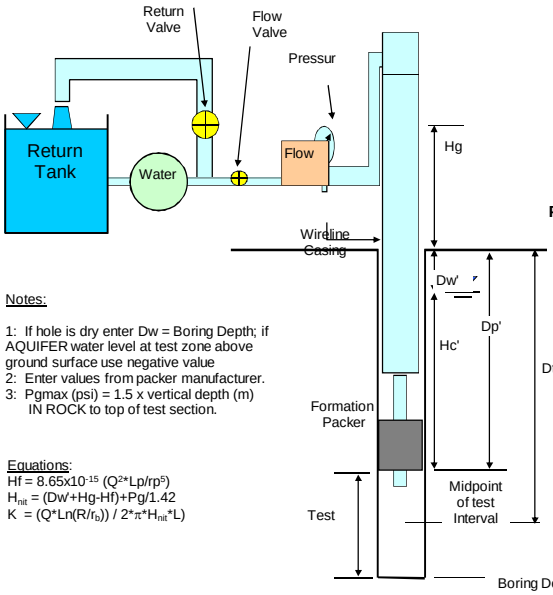
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - Doris**	**Test Interval (m):**	**471.0**	**to**	**564.0**	**Drillhole N°**	**10-WBW-001**
UTM (x,y)	**33780E; 557535N**	**Start Date:**	**28-Apr**	**Time:**	**16:05**	**Target**	**10-WBW-001**
Datum:	**UTM**	**End Date:**	**28-Apr**	**Time:**	**17:30**	**Test N°**	**14**
GS Elevation:		**Supervisor:**	**JS**			**DH Depth (m)**	**564.0**

Max Injection P (psi): 626

Depth to wedge: 0 m



Notes:

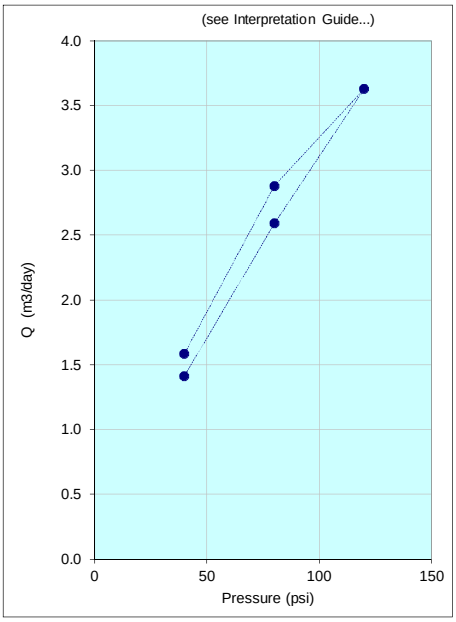
1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	-2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**471.0**	m
Dt	Measured depth to midpoint of test	**517.5**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**417.0**	m
Dt'	Vertical depth to midpoint of test	**458.2**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**592**	psi
Paquifer	Water column pressure in aquifer (unc.)	**596**	psi
Pdiff	Existing differential shear pressure	**-4**	psi
Pshear	Shear pressure required at pump	**504**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**93.0**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4×10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	40	**80**	**120**	**80**	**40**
1	**1.12**	**2.08**	**2.56**	**1.86**	**1.54**
2	**1.10**	**1.92**	**2.60**	**1.84**	**0.98**
3	**1.08**	**2.00**	**2.50**	**1.82**	**0.99**
4		**2.00**	**2.52**	**1.78**	**0.95**
5		**1.96**		**1.80**	**0.98**
Stable Q **(L/min)**	**1.10**	**2.00**	**2.52**	**1.80**	**0.98**
Leak Q (L/min)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Q (m^3/day)	1.6	2.9	3.6	2.6	1.4
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	28.2	56.3	84.5	56.3	28.2
K (m/day)	5.1E-04	4.7E-04	3.9E-04	4.2E-04	4.6E-04
K (m/s)	**5.9E-09**	**5.4E-09**	**4.5E-09**	**4.9E-09**	**5.3E-09**
+/- (m/s)	4.2E-10	5.3E-10	4.5E-10	1.1E-09	1.1E-09
+/- order of mag.	0.03	0.04	0.04	0.09	0.08



Field Observations

zone geology: diabase to 471m, basalt contact, foliated and jointed basalt below diabase
zone fracture freq & quality (from core): competent diabase, solid, basalt is foliated, higher FF, jointed, mostly CJs, vuggs at 558m in Qz veins and basalt
packer seal quality: perfect
measurement accuracy: Good
other problems that may affect results: artesian flow from zone above packer was seen from casing before, during test at all pressure steps (flow from casing was constant),brackish water; could not inject any measurable water into this interval

Test Interpretation

K values: **5E-9 m/s**

"type curve" interpretation: **ideal**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10-WBW-001**
Test hole N°	**10-WBW-001**
Test N°	**14**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	37	70	110	70	35
Max P during step	43	90	130	90	45
average pressure +/- psi	**3**	**10**	**10**	**10**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	1.61	2.91	3.66	2.62	1.44
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	26.1	49.3	77.5	49.3	24.6
K (m/sec)	6.5E-09	6.2E-09	5.0E-09	5.6E-09	6.2E-09

Low estimate of K

Q_{avg} (m^3/day)	1.53	2.82	3.57	2.53	1.35
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	30.3	63.4	91.5	63.4	31.7
K (m/sec)	5.3E-09	4.7E-09	4.1E-09	4.2E-09	4.5E-09

K averages for P step

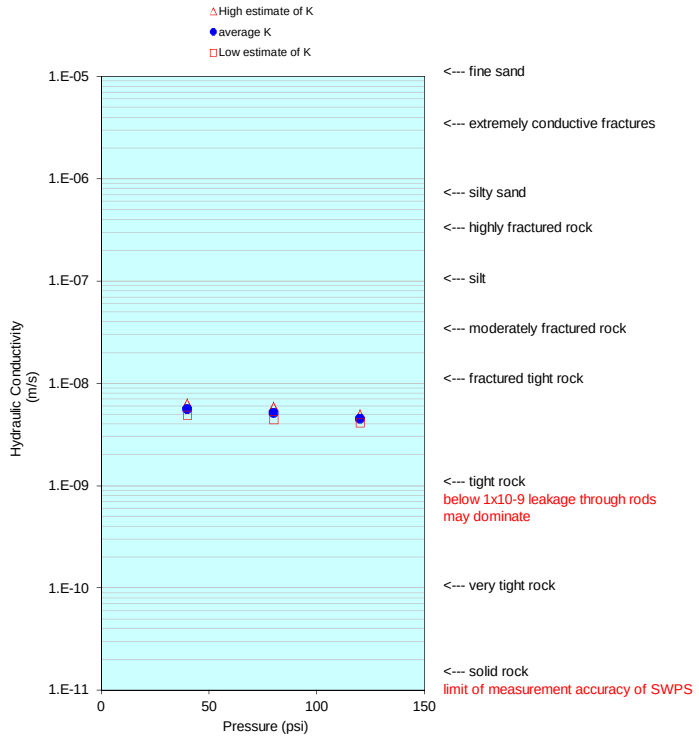
P	40	80	120
high est of K	6.E-09	6.E-09	5.E-09
average K	6.E-09	5.E-09	5.E-09
low est of K	5.E-09	4.E-09	4.E-09

K avg all P steps

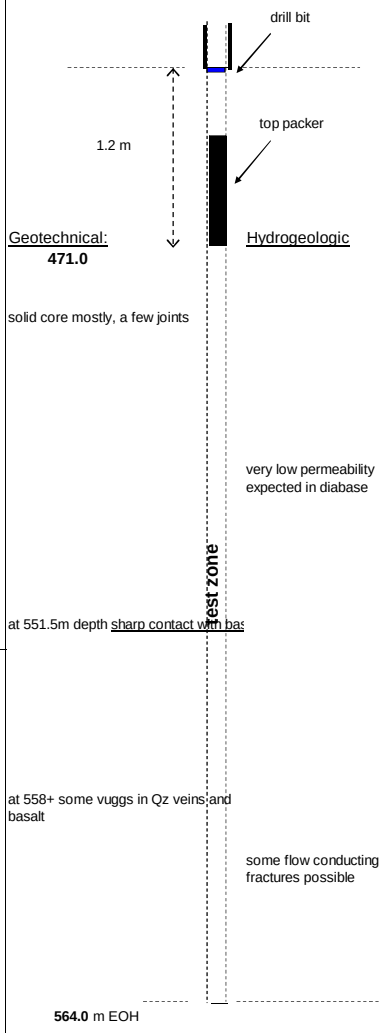
MAX	**6.E-09**
geomean	**5.E-09**
MIN	**4.E-09**

Comments:

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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PACKER INJECTION TEST *(modified from HCI)*

Project:	Hope Bay - Doris	**Test Interval (m):**	548.0	to	564.0	**Drillhole N°**	10-WBW-001
UTM (x,y)	33780E; 557535N	**Start Date:**	28-Apr	**Time:**	16:05	**Target**	10-WBW-001
Datum:	UTM	**End Date:**	28-Apr	**Time:**	17:30	**Test N°**	14a
GS Elevation:		**Supervisor:**	JS			**DH Depth (m)**	564.0

Max Injection P (psi): 728

Depth to wedge: 0 m

This is the flow results from test 14, attributed to only the portion of test 14 that was below the diabase.

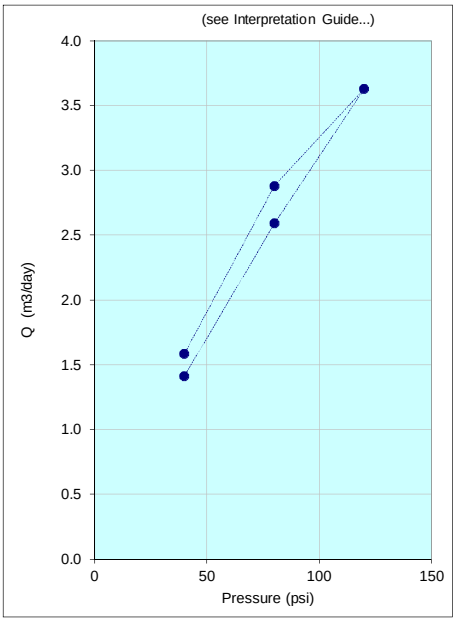
Dw	Measured depth of static water level (1)	-2.0	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**548.0**	m
Dt	Measured depth to midpoint of test	**556.0**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**485.2**	m
Dt'	Vertical depth to midpoint of test	**492.3**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**689**	psi
Paquifer	Water column pressure in aquifer (unc.)	**693**	psi
Pdiff	Existing differential shear pressure	**-4**	psi
Pshear	Shear pressure required at pump	**504**	psi
Hg	Gauge height	0.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**16.1**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Dt'

Depth

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm² = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec
1 US gpm = 3.785 lit/min = 5.45 m³/day

Measurement (show last 3 to 5 flow meter readings)	Q (Liters / min) *see flow calc. sheet				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	40	80	120	80	40
1	**1.12**	**2.08**	**2.56**	**1.86**	**1.54**
2	**1.10**	**1.92**	**2.60**	**1.84**	**0.98**
3	**1.08**	**2.00**	**2.50**	**1.82**	**0.99**
4		**2.00**	**2.52**	**1.78**	**0.95**
5		**1.96**		**1.80**	**0.98**
Stable Q **(L/min)**	**1.10**	**2.00**	**2.52**	**1.80**	**0.98**
Leak Q (L/min)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Q (m^3/day)	1.6	2.9	3.6	2.6	1.4
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	28.2	56.3	84.5	56.3	28.2
K (m/day)	3.0E-03	2.7E-03	2.3E-03	2.4E-03	2.7E-03
K (m/s)	**3.4E-08**	**3.1E-08**	**2.6E-08**	**2.8E-08**	**3.1E-08**
+/- (m/s)	2.4E-09	3.0E-09	2.6E-09	6.2E-09	6.2E-09
+/- order of mag.	0.03	0.04	0.04	0.09	0.08



Field Observations

This is difference between test 6a and test 5, to calculate contribution of inflow to zone 103 to 154m (target of test 6).

stly CJs, vuggs at 558m

as seen from casing
sh water; could not inject

Test Interpretation

K values: 3E-**8 m/s**

"type curve" interpretation: **ideal**

TEST	Drillhole N°	10-WBW-001
	Test hole N°	10-WBW-001
	Test N°	14a

					P_g (psi) Step 5
					35
					45
					5
					0.02
Q_{avg} (m^3/day)	1.61	2.91	3.66	2.62	1.44
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	26.1	49.3	77.5	49.3	24.6
K (m/sec)	3.8E-08	3.6E-08	2.9E-08	3.3E-08	3.6E-08

Low estimate of K

Q_{avg} (m^3/day)	1.53	2.82	3.57	2.53	1.35
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	30.3	63.4	91.5	63.4	31.7
K (m/sec)	3.1E-08	2.7E-08	2.4E-08	2.5E-08	2.6E-08

K averages for P step

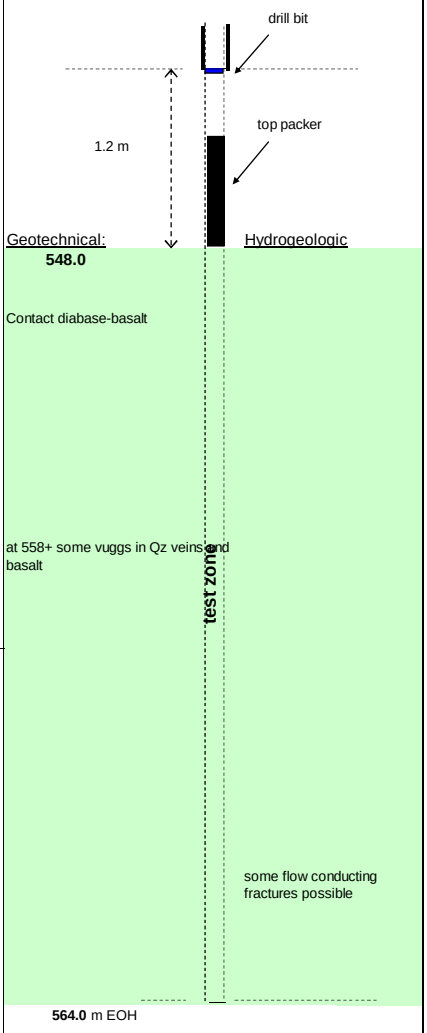
P	40	80	120
high est of K	4.E-08	3.E-08	3.E-08
average K	3.E-08	3.E-08	3.E-08
low est of K	3.E-08	3.E-08	2.E-08

K avg all P steps

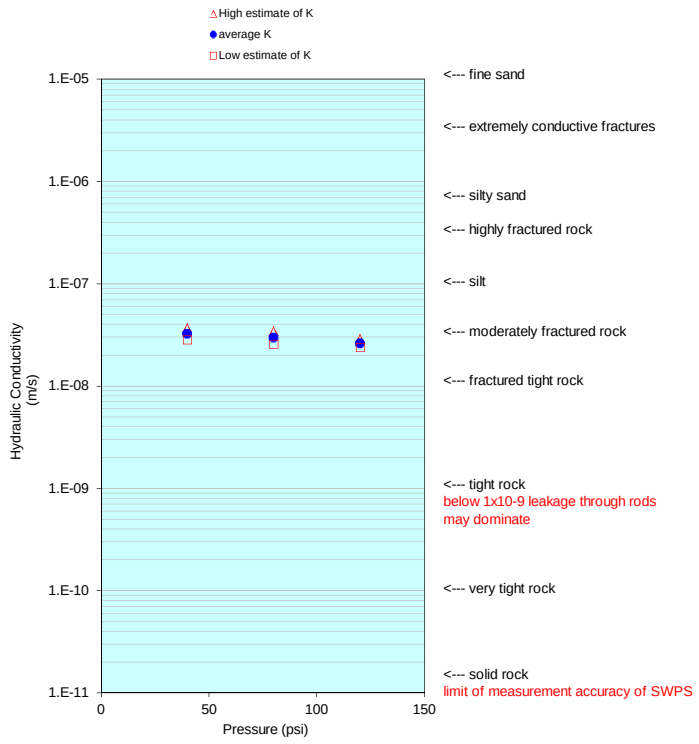
MAX	**4.E-08**
geomean	**3.E-08**
MIN	**2.E-08**

Comments:

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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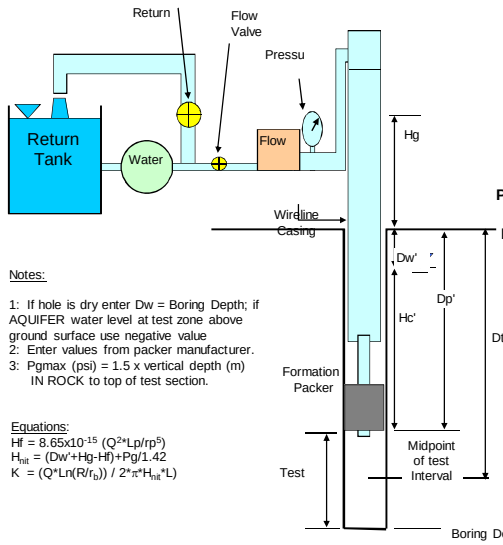
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**402.3**	**to**	**482.0**	**Drillhole N°**	**10WBW002**
UTM (x,y)	**433913.037, 7559375.**	**Start Date:**	**21-Jun-10**	**Time:**	**11:00**	**Target**	**Permafrost**
Datum:	**UTM**	**End Date:**	**21-Jun-10**	**Time:**	**13:30**	**Test N°**	**1**
GS Elevation:	**30m**	**Supervisor:**	**JA**			**DH Depth (m)**	**482.0**

Max Injection P (psi): 584

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

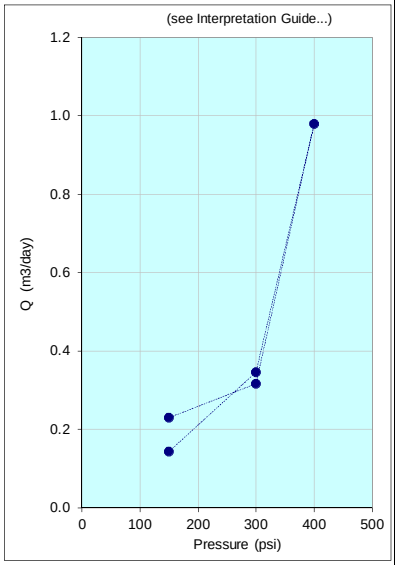
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	0.0	m
Dp	Measured depth to packer	**402.3**	m
Dt	Measured depth to midpoint of test	**442.2**	m
ß	Inclination from horizontal (degrees)	75	°
Dw'	Vertical depth to static water level	**1.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**389.3**	m
Dt'	Vertical depth to midpoint of test	**427.9**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**553**	psi
Paquifer	Water column pressure in aquifer (unc.)	**552**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	2.0	m
Lp	Length of discharge pipe	2.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**79.7**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	150	**300**	**400**	**300**	**150**
1	**0.10**	**0.24**	**0.66**	**0.22**	**0.16**
2	**0.10**	**0.26**	**0.68**	**0.06**	**0.24**
3	**0.00**	**0.26**	**0.58**	**0.20**	**0.26**
4	**0.10**	**0.14**	**0.72**	**0.24**	**0.14**
5	**0.10**	**0.24**	**0.64**	**0.26**	**0.16**
Stable Q **(L/min)**	**0.10**	**0.24**	**0.68**	**0.22**	**0.16**
Leak Q (L/min)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Q (m^3/day)	0.1	0.3	1.0	0.3	0.2
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	108.6	214.2	284.7	214.2	108.6
K (m/day)	1.4E-05	1.7E-05	3.7E-05	1.6E-05	2.3E-05
K (m/s)	**1.6E-10**	**2.0E-10**	**4.2E-10**	**1.8E-10**	**2.6E-10**
+/- (m/s)	3.1E-10	1.1E-10	1.6E-10	1.3E-10	2.2E-10
+/- order of mag	0.47	0.19	0.14	0.23	0.26



Field Observations

zone geology: basalt
zone fracture freq & quality (from core): very low - maybe 1 joint/6m in some places
packer seal quality: good
flow meter system problems: none
measurement accuracy: about 0.02L
other problems that may affect results: Hole development occurred for about an hour and half due to brine solution chemistry being unstable. After this hole development, there was continuous flow out of the rods for about 10 mins. Decided to go through with test, all went well, but the flow from the rods was gone after the test. Believe this water flow was from hole

Test Interpretation

K values: **3E-10 m/s**

"type curve" interpretation: **Type a - very low flow, and what flow occurred was directly proportional to pressure. Flow may have even been due to forced storage and stretching within rods.**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10WBW002**
Test hole N°	**Permafrost**
Test N°	**1**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	75	200	300	200	75
Max P during step	225	400	500	400	225
average pressure +/- psi	**75**	**100**	**100**	**100**	**75**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	0.17	0.37	1.01	0.35	0.26
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	55.8	143.8	214.2	143.8	55.8
K (m/sec)	3.8E-10	3.2E-10	5.8E-10	3.0E-10	5.7E-10

Low estimate of K

Q_{avg} (m^3/day)	0.09	0.29	0.92	0.26	0.17
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	161.4	284.7	355.1	284.7	161.4
K (m/sec)	6.6E-11	1.2E-10	3.2E-10	1.1E-10	1.3E-10

K averages for P step

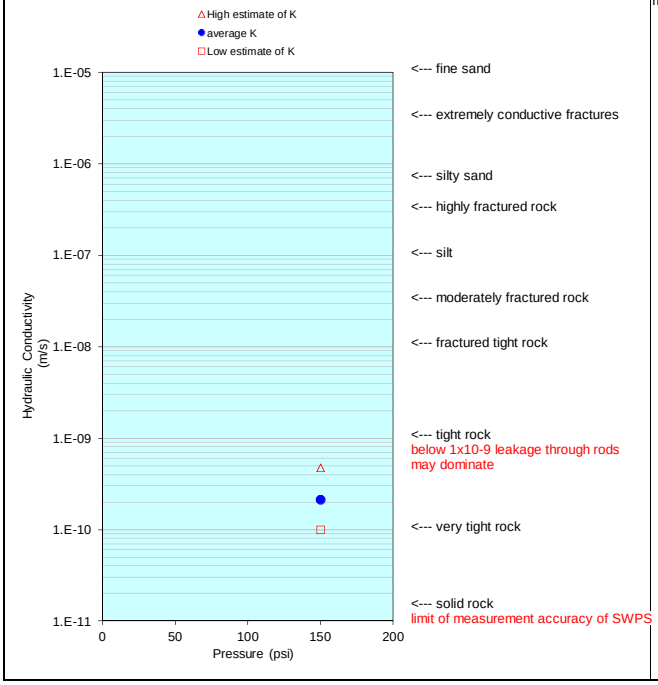
P	150	300	400
high est of K	5.E-10	3.E-10	6.E-10
average K	2.E-10	2.E-10	4.E-10
low est of K	1.E-10	1.E-10	3.E-10

K avg all P steps

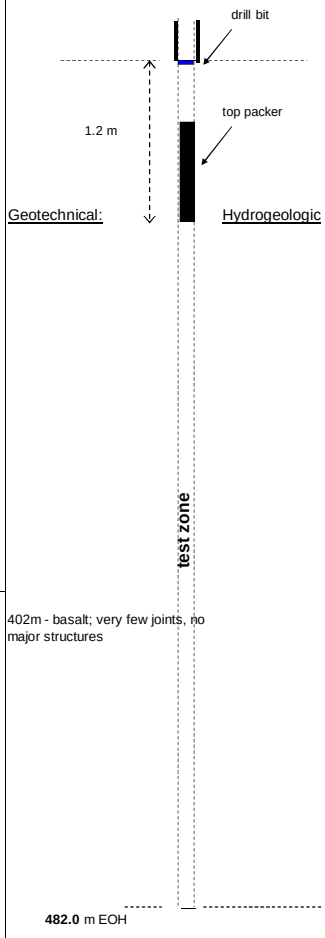
MAX	**6.E-10**
geomean	**3.E-10**
MIN	**1.E-10**

Comments: Due to low flow, during the pressure steps down, the system would actually flow backwards with the lower pressure and further injection was difficult, flow was permitted to equalize for a couple of mins, but often once reading began again, there had actually been less water through flow meter (ie readings at 731 L were followed by readings as 730 L). Flow is so low it could be that water is stretching pipes, which is why flow not possible after pressure step down.

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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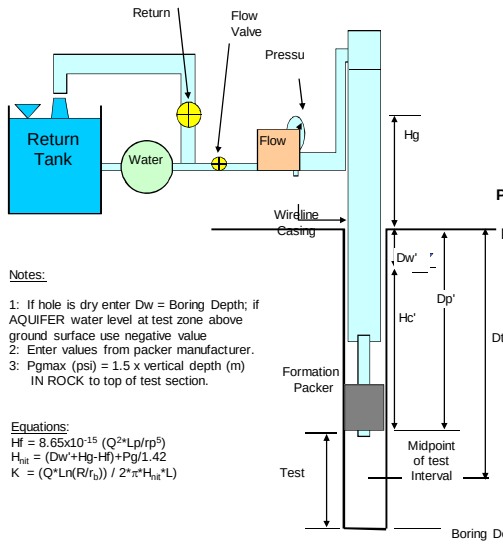
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**447.3**	**to**	**482.0**	**Drillhole N°**	**10WBW002**
UTM (x,y)	**433913.037, 7559375.**	**Start Date:**	**21-Jun-10**	**Time:**	**14:00**	**Target**	**Permafrost**
Datum:	**UTM**	**End Date:**	**21-Jun-10**	**Time:**	**15:30**	**Test N°**	**2**
GS Elevation:	**30m**	**Supervisor:**	**JA**			**DH Depth (m)**	**482.0**

Max Injection P (psi): 649

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

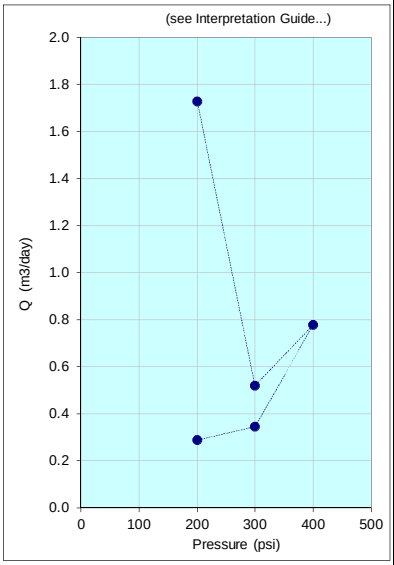
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	0.0	m
Dp	Measured depth to packer	**447.3**	m
Dt	Measured depth to midpoint of test	**464.7**	m
ß	Inclination from horizontal (degrees)	75	°
Dw'	Vertical depth to static water level	**1.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**432.9**	m
Dt'	Vertical depth to midpoint of test	**449.6**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**615**	psi
Paquifer	Water column pressure in aquifer (unc.)	**614**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	2.0	m
Lp	Length of discharge pipe	2.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**34.7**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	200	**300**	**400**	**300**	**200**
1	**1.40**	**0.60**	**0.48**	**0.24**	**0.20**
2	**1.20**	**0.42**	**0.54**	**0.18**	**0.28**
3	**1.24**	**0.36**	**0.54**	**0.26**	**0.14**
4	**1.12**				
5					
Stable Q **(L/min)**	**1.20**	**0.36**	**0.54**	**0.24**	**0.20**
Leak Q (L/min)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Q (m^3/day)	1.7	0.5	0.8	0.3	0.3
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	143.8	214.2	284.7	214.2	143.8
K (m/day)	2.9E-04	5.9E-05	6.7E-05	4.0E-05	4.9E-05
K (m/s)	**3.4E-09**	**6.9E-10**	**7.7E-10**	**4.6E-10**	**5.7E-10**
+/- (m/s)	-1.8E-10	2.2E-10	2.9E-10	4.5E-10	2.7E-09
+/- order of mag	-0.02	0.12	0.14	0.30	0.76



Field Observations

zone geology: basalt
zone fracture freq & quality (from core): very low; less than 1jt/3m
packer seal quality: good
flow meter system problems: none
measurement accuracy: 0.02L
other problems that may affect results: none

Test Interpretation

K values: **1E-9 m/s**

"type curve" interpretation: **type a -** flow generally controlled by pressure. Initial step was likely pressure forcing more storage on rods or rock, not actual flow into formation

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PACKER INJECTION TEST
(page 2)

Drillhole N°	10WBW002
Test hole N°	Permafrost
Test N°	2

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	125	200	300	200	125
Max P during step	275	400	500	400	275
average pressure +/- psi	**75**	**100**	**100**	**100**	**75**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	1.76	0.55	0.81	0.37	0.32
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	91.0	143.8	214.2	143.8	91.0
K (m/sec)	5.5E-09	1.1E-09	1.1E-09	7.4E-10	9.9E-10

Low estimate of K

Q_{avg} (m^3/day)	1.67	0.46	0.72	0.29	0.23
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	196.6	284.7	355.1	284.7	196.6
K (m/sec)	2.4E-09	4.6E-10	5.7E-10	2.9E-10	3.3E-10

K averages for P step

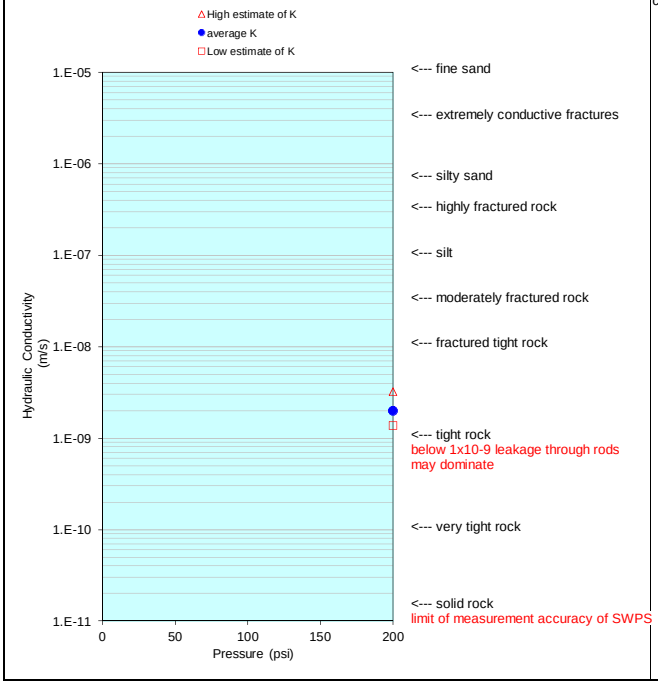
P	200	300	400
high est of K	3.E-09	9.E-10	1.E-09
average K	2.E-09	6.E-10	8.E-10
low est of K	1.E-09	4.E-10	6.E-10

K avg all P steps

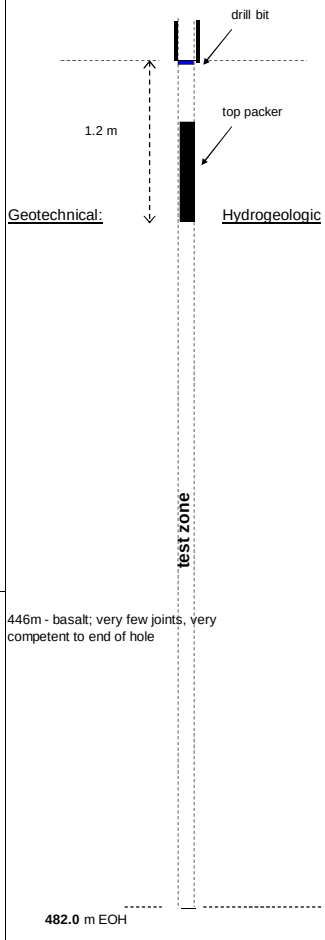
MAX	**3.E-09**
geomean	**1.E-09**
MIN	**4.E-10**

Comments: First attempt at sealing packer didn't work. Again, there was about 20 mins of hole development and water flow prior to test. Seal didn't work, pin didn't break, put packer back down and no more problems. No flow out of rods after first attempt to seal

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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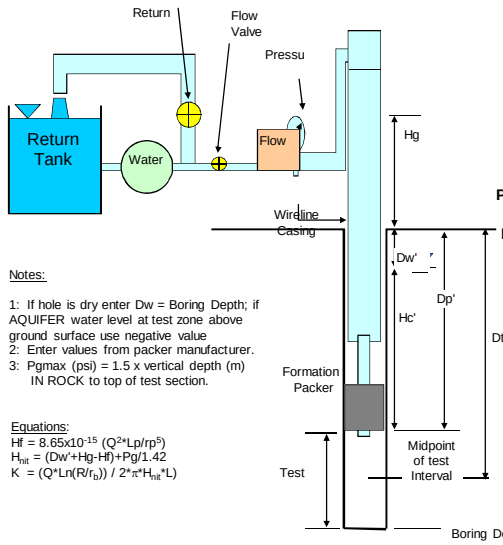
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**483.3**	**to**	**518.0**	**Drillhole N°**	**10WBW002**
UTM (x,y)	**433913.037, 7559375.**	**Start Date:**	**22-Jun-10**	**Time:**	**14:30**	**Target**	**permafrost**
Datum:	**UTM**	**End Date:**	**22-Jun-10**	**Time:**	**16:30**	**Test N°**	**3**
GS Elevation:	**30m**	**Supervisor:**	**JA**			**DH Depth (m)**	**518.0**

Max Injection P (psi): 702

Depth to wedge: 0 m



Notes:

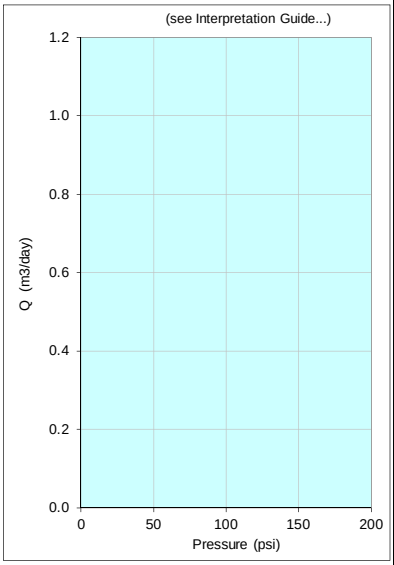
1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	0.0	m
Dp	Measured depth to packer	**483.3**	m
Dt	Measured depth to midpoint of test	**500.7**	m
ß	Inclination from horizontal (degrees)	75	°
Dw'	Vertical depth to static water level	**1.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**467.7**	m
Dt'	Vertical depth to midpoint of test	**484.5**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**664**	psi
Paquifer	Water column pressure in aquifer (unc.)	**664**	psi
Pdiff	Existing differential shear pressure	**0**	psi
Pshear	Shear pressure required at pump	**500**	psi
Hg	Gauge height	2.0	m
Lp	Length of discharge pipe	2.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**34.7**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	75	**100**	**150**	**100**	**75**
1	**0.24**	**0.16**	**0.00**	**0.00**	**0.00**
2	**0.20**	**0.18**	**0.00**	**0.00**	**0.00**
3	**0.22**	**0.18**	**0.00**	**0.00**	**0.00**
4	**0.20**				
5					
Stable Q **(L/min)**	**0.20**	**0.18**	**0.00**	**0.00**	**0.00**
Leak Q (L/min)	**0.20**	**0.18**	**0.40**	**0.18**	**0.20**
Q (m^3/day)	#N/A	#N/A	#N/A	#N/A	#N/A
Hf (m)	#N/A	#N/A	#N/A	#N/A	#N/A
Hnit (m)	#N/A	#N/A	#N/A	#N/A	#N/A
K (m/day)	#N/A	#N/A	#N/A	#N/A	#N/A
K (m/s)	**#N/A**	**#N/A**	**#N/A**	**#N/A**	**#N/A**
+/- (m/s)	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
+/- order of mag	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!



Field Observations

zone geology: basalt - diabase contact @ 504m and 516m
zone fracture freq & quality (from core): 1 jt/3m
packer seal quality: good
flow meter system problems: none
measurement accuracy: 0.02
other problems that may affect results: none

Test Interpretation

K values: no flow

"type curve" interpretation: **no flow**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	10WBW002
Test hole N°	permafrost
Test N°	3

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	65	80	130	80	55
Max P during step	85	120	170	120	95
average pressure +/- psi	**10**	**20**	**20**	**20**	**20**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	#N/A	#N/A	#N/A	#N/A	#N/A
Hf (m)	#N/A	#N/A	#N/A	#N/A	#N/A
Hnit (m)	#N/A	#N/A	#N/A	#N/A	#N/A
K (m/sec)	#N/A	#N/A	#N/A	#N/A	#N/A

Low estimate of K

Q_{avg} (m^3/day)	#N/A	#N/A	#N/A	#N/A	#N/A
Hf (m)	#N/A	#N/A	#N/A	#N/A	#N/A
Hnit (m)	#N/A	#N/A	#N/A	#N/A	#N/A
K (m/sec)	#N/A	#N/A	#N/A	#N/A	#N/A

K averages for P step

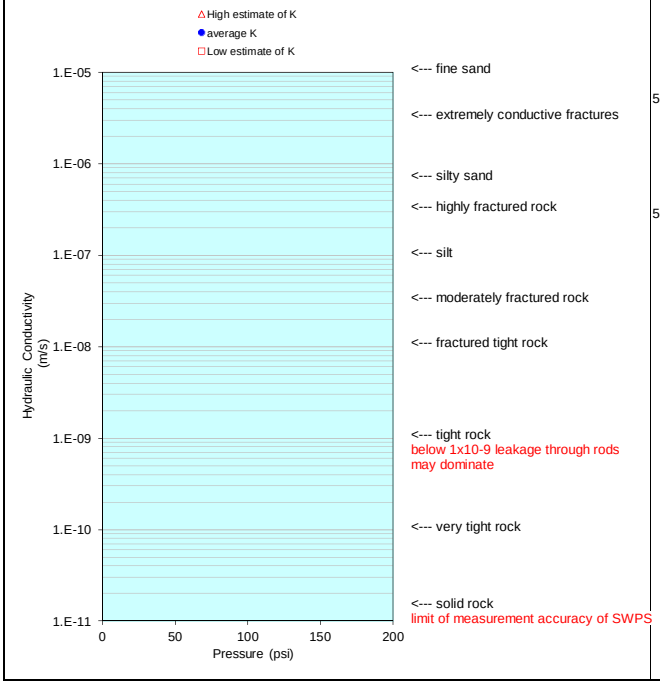
P	75	100	150
high est of K			
average K			
low est of K			

K avg all P steps

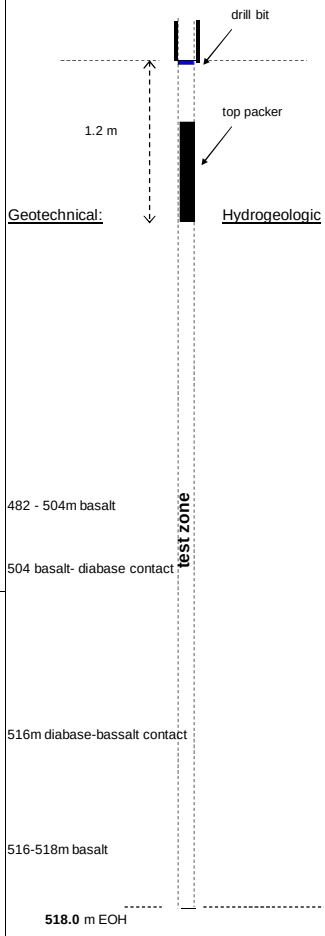
MAX	**#N/A**
geomean	**#N/A**
MIN	**#N/A**

Comments: Had to pump packer downhole to successfully seal.

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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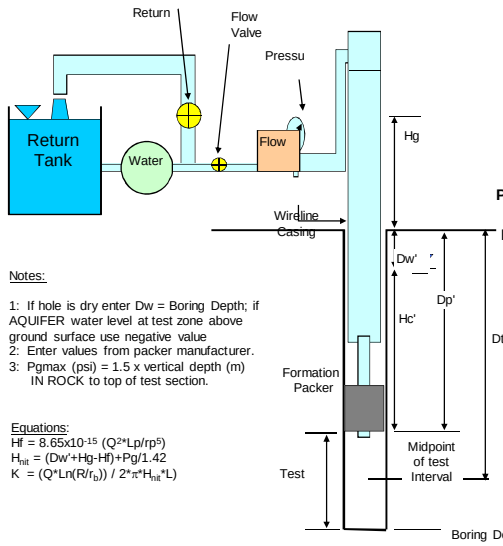
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**519.3**	**to**	**569.0**	**Drillhole Nº**	**10WBW002**
UTM (x,y)	**433913.037, 7559375.**	**Start Date:**	**23-Jun-10**	**Time:**	**16:45**	**Target**	**Permafrost**
Datum:	**UTM**	**End Date:**	**23-Jun-10**	**Time:**	**18:15**	**Test Nº**	**4**
GS Elevation:	**30m**	**Supervisor:**	**JA**			**DH Depth (m)**	**569.0**

Max Injection P (psi): 754

Depth to wedge: 0 m



Notes:

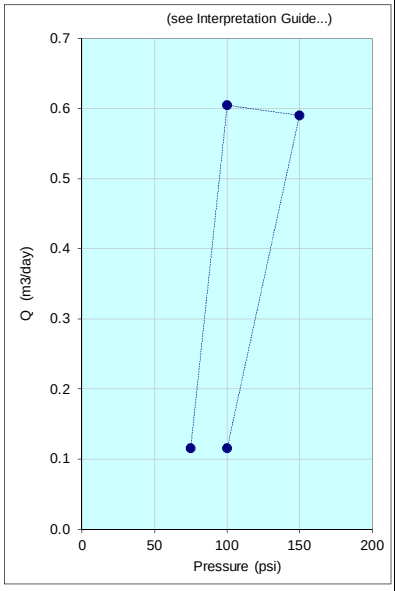
1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:
$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	0.0	m
Dp	Measured depth to packer	**519.3**	m
Dt	Measured depth to midpoint of test	**544.2**	m
ß	Inclination from horizontal (degrees)	75	º
Dw'	Vertical depth to static water level	**1.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**502.5**	m
Dt'	Vertical depth to midpoint of test	**526.6**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**714**	psi
Paquifer	Water column pressure in aquifer (unc.)	**713**	psi
Pdiff	Existing differential shear pressure	**0**	psi
Pshear	Shear pressure required at pump	**500**	psi
Hg	Gauge height	2.0	m
Lp	Length of discharge pipe	2.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**49.7**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = $1kg/cm^2$ = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4×10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	75	**100**	**150**	**100**	**75**
1	**0.00**	**0.46**	**0.72**	**0.70**	**0.32**
2	**0.00**	**0.52**	**0.70**	**0.72**	**0.42**
3	**0.00**	**0.36**	**0.72**	**0.70**	**0.48**
4		**0.48**			
5					
Stable Q **(L/min)**	**0.00**	**0.36**	**0.72**	**0.70**	**0.42**
Leak Q (L/min)	**0.34**	**0.28**	**0.31**	**0.28**	**0.34**
Q (m^3/day)	#N/A	0.1	0.6	0.6	0.1
Hf (m)	#N/A	0.00	0.00	0.00	0.00
Hnit (m)	#N/A	73.4	108.6	73.4	55.8
K (m/day)	#N/A	2.7E-05	9.3E-05	1.4E-04	3.5E-05
K (m/s)	**#N/A**	**3.1E-10**	**1.1E-09**	**1.6E-09**	**4.1E-10**
+/- (m/s)	#N/A	3.6E-09	3.2E-10	2.3E-09	1.7E-09
+/- order of mag	#N/A	1.10	0.11	0.38	0.71



Field Observations

zone geology: basalt
zone fracture freq & quality (from core): very low
packer seal quality: good
flow meter system problems: none
measurement accuracy: 0.02L
other problems that may affect results: pressure had very high variance

Test Interpretation

K values: 8**E-10 m/s**

"type curve" interpretation: **type a - flow direction related to pressure, likely as part of rod leak and significant pressure**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10WBW002**
Test hole N°	**Permafrost**
Test N°	**4**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	65	80	120	20	15
Max P during step	85	120	180	180	135
average pressure +/- psi	**10**	**20**	**30**	**80**	**60**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	#N/A	0.14	0.62	0.63	0.14
Hf (m)	#N/A	0.00	0.00	0.00	0.00
Hnit (m)	#N/A	59.3	87.5	17.1	13.5
K (m/sec)	#N/A	4.8E-10	1.4E-09	7.4E-09	2.1E-09

Low estimate of K

Q_{avg} (m^3/day)	#N/A	0.06	0.53	0.55	0.06
Hf (m)	#N/A	0.00	0.00	0.00	0.00
Hnit (m)	#N/A	87.5	129.7	129.7	98.0
K (m/sec)	#N/A	1.3E-10	8.1E-10	8.3E-10	1.2E-10

K averages for P step

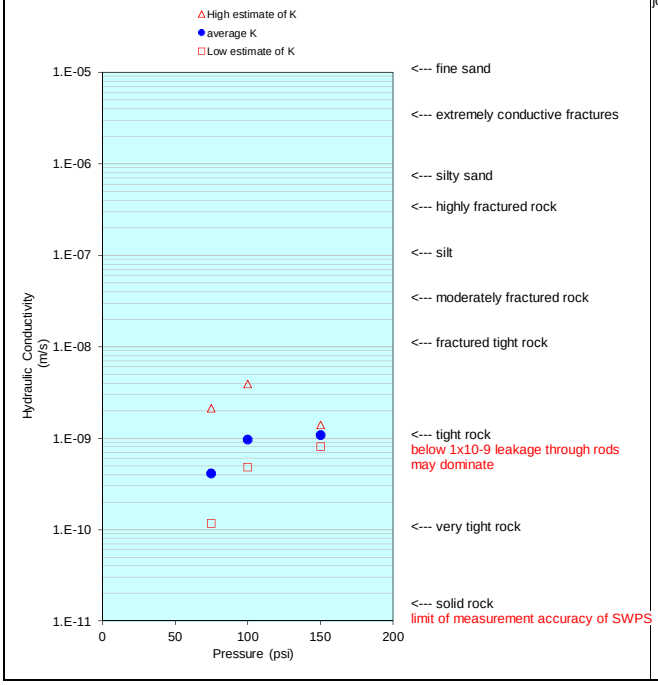
P	75	100	150
high est of K	2.E-09	4.E-09	1.E-09
average K	4.E-10	1.E-09	1.E-09
low est of K	1.E-10	5.E-10	8.E-10

K avg all P steps

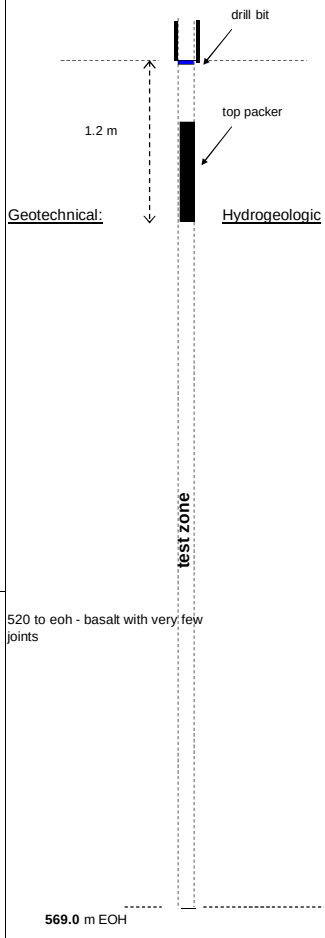
MAX	**4.E-09**
geomean	**8.E-10**
MIN	**1.E-10**

Comments:

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



Geotechnical: Hydrogeologic

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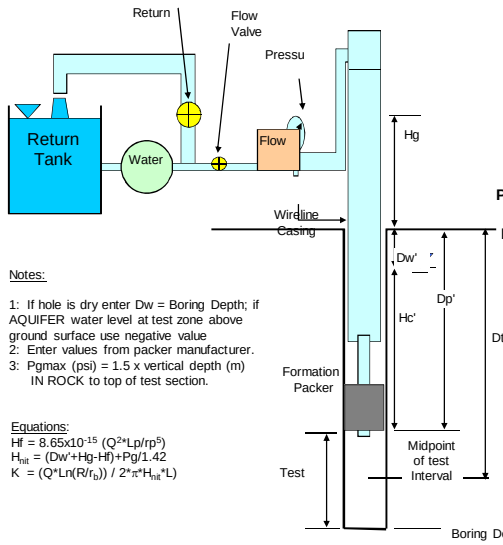
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**570.3**	**to**	**602.0**	**Drillhole N°**	**10WBW002**
UTM (x,y)	**433913.037, 7559375.**	**Start Date:**	**24-Jun-10**	**Time:**	**13:00**	**Target**	**Lithology**
Datum:	**UTM**	**End Date:**	**24-Jun-10**	**Time:**	**15:30**	**Test N°**	**5**
GS Elevation:	**30m**	**Supervisor:**	**JA**			**DH Depth (m)**	**602.0**

Max Injection P (psi): 828

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

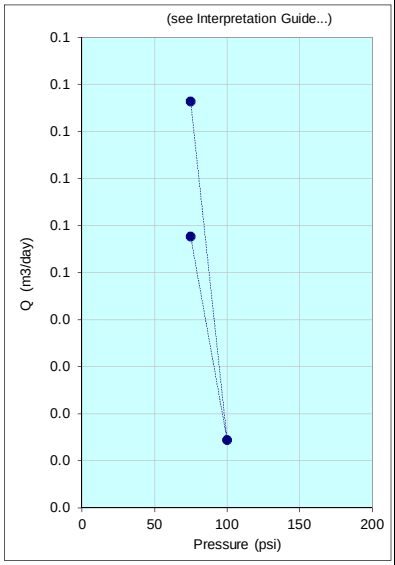
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	0.0	m
Dp	Measured depth to packer	**570.3**	m
Dt	Measured depth to midpoint of test	**586.2**	m
ß	Inclination from horizontal (degrees)	75	°
Dw'	Vertical depth to static water level	**1.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**551.9**	m
Dt'	Vertical depth to midpoint of test	**567.2**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**784**	psi
Paquifer	Water column pressure in aquifer (unc.)	**783**	psi
Pdiff	Existing differential shear pressure	**0**	psi
Pshear	Shear pressure required at pump	**500**	psi
Hg	Gauge height	2.0	m
Lp	Length of discharge pipe	2.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**31.7**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	75	**100**	**150**	**100**	**75**
1	**0.22**	**0.08**	**0.26**	**0.26**	**0.20**
2	**0.22**	**0.00**	**0.26**	**0.22**	**0.20**
3	**0.22**	**0.00**	**0.20**	**0.22**	**0.26**
4					
5					
Stable Q **(L/min)**	**0.22**	**0.00**	**0.26**	**0.22**	**0.20**
Leak Q (L/min)	**0.16**	**0.21**	**0.46**	**0.21**	**0.16**
Q (m^3/day)	0.1	#N/A	#N/A	0.0	0.1
Hf (m)	0.00	#N/A	#N/A	0.00	0.00
Hnit (m)	55.8	#N/A	#N/A	73.4	55.8
K (m/day)	4.2E-05	#N/A	#N/A	5.3E-06	2.8E-05
K (m/s)	**4.8E-10**	**#N/A**	**#N/A**	**6.1E-11**	**3.2E-10**
+/- (m/s)	3.8E-10	#N/A	#VALUE!	4.5E-09	5.4E-10
+/- order of mag	0.25	#N/A	#VALUE!	1.87	0.43



Field Observations

zone geology: basalt
zone fracture freq & quality (from core): very low
packer seal quality: good
flow meter system problems: none
measurement accuracy: 0.02L
other problems that may affect results: rod leak meets/exceeds flow; high variation on pressure likely reason for flow exceeding leaks

Test Interpretation

K values: **2E-10 m/s**

"type curve" interpretation: **type a - actually very little flow if any; mostly dominated by rod leak, which is directly proportional to pressure applied**

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PACKER INJECTION TEST
(page 2)

Drillhole N°	**10WBW002**
Test hole N°	**Lithology**
Test N°	**5**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	55	60	100	0	-25
Max P during step	95	140	200	200	175
average pressure +/- psi	**20**	**40**	**50**	**100**	**100**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	0.12	#N/A	#N/A	0.04	0.09
Hf (m)	0.00	#N/A	#N/A	0.00	0.00
Hnit (m)	41.7	#N/A	#N/A	3.0	-14.6
K (m/sec)	8.6E-10	#N/A	#N/A	4.5E-09	#N/A

Low estimate of K

Q_{avg} (m^3/day)	0.03	#N/A	#N/A	-0.04	0.00
Hf (m)	0.00	#N/A	#N/A	0.00	0.00
Hnit (m)	69.9	#N/A	#N/A	143.8	126.2
K (m/sec)	1.3E-10	#N/A	#N/A	#N/A	#N/A

K averages for P step

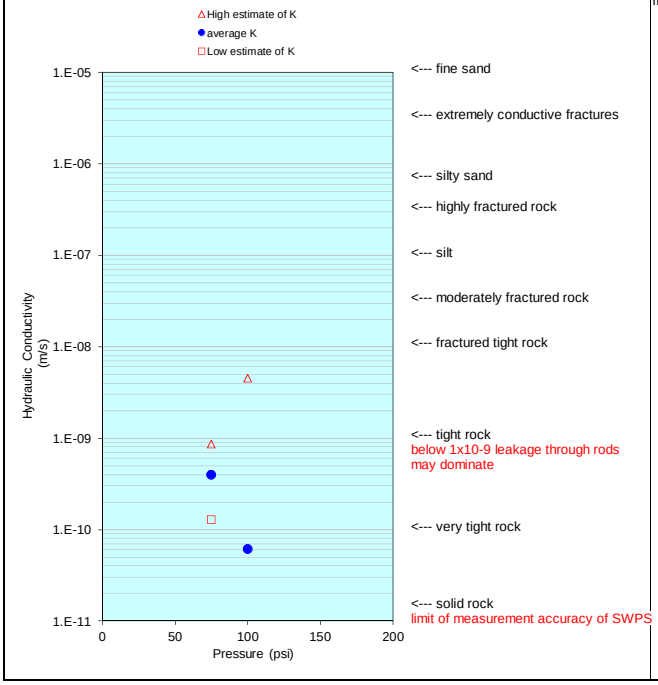
P	75	100	150
high est of K	9.E-10	5.E-09	
average K	4.E-10	6.E-11	
low est of K	1.E-10		

K avg all P steps

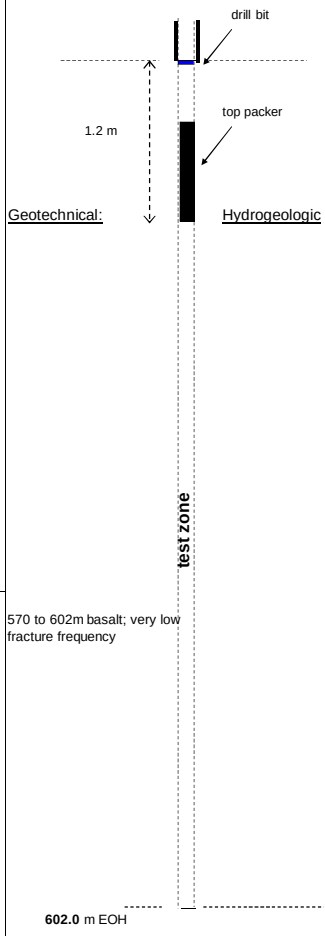
MAX	**5.E-09**
geomean	**2.E-10**
MIN	**1.E-10**

Comments: Essentially no flow.

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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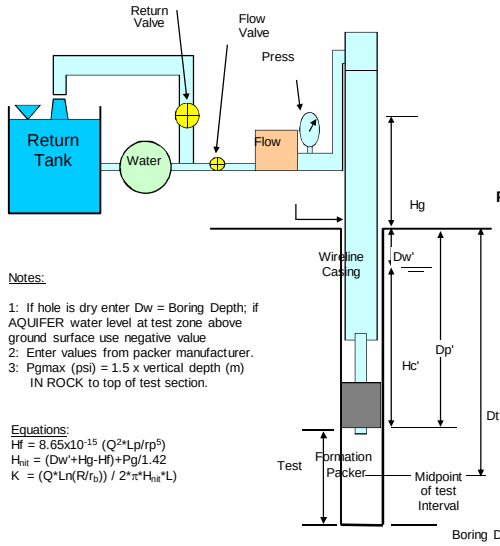
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**96.4**	**to**	**173.2**	**Drillhole Nº**	**10WBW003**
UTM (x,y)	**435202.505, 7546758.**	**Start Date:**	**1-Jul-10**	**Time:**	**17:15**	**Target**	**Lithology**
Datum:	**UTM**	**End Date:**	**1-Jul-10**	**Time:**	**20:00**	**Test Nº**	**1**
GS Elevation:	**39.265m**	**Supervisor:**	**RB**			**DH Depth (m)**	**173.2**

Max Injection P (psi): 133

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

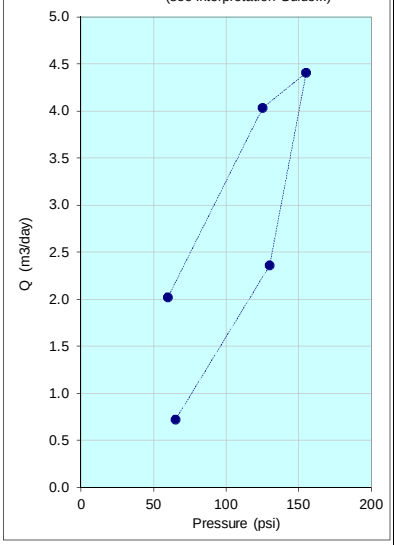
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	0.0	m
Dp	Measured depth to packer	**96.4**	m
Dt	Measured depth to midpoint of test	**134.8**	m
ß	Inclination from horizontal (degrees)	67	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**88.9**	m
Dt'	Vertical depth to midpoint of test	**124.3**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**126**	psi
Paquifer	Water column pressure in aquifer (unc.)	**125**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	2.0	m
Lp	Length of discharge pipe	2.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**76.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	Q (Liters / min) *see flow calc. sheet				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	65	130	155	125	60
1	**0.56**	**1.60**	**3.12**	**2.80**	**1.32**
2	**0.52**	**1.56**	**3.04**	**2.80**	**1.36**
3	**0.50**	**1.42**	**2.98**	**2.80**	**1.44**
4	**0.48**	**1.72**	**3.06**	**2.80**	**1.40**
5	**0.50**	**1.66**	**3.10**	**2.84**	**1.48**
Stable Q **(L/min)**	**0.50**	**1.64**	**3.06**	**2.80**	**1.40**
Leak Q (L/min)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Q (m^3/day)	0.7	2.4	4.4	4.0	2.0
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	48.7	94.5	112.1	90.9	45.2
K (m/day)	1.6E-04	2.8E-04	4.4E-04	4.9E-04	4.9E-04
K (m/s)	**1.9E-09**	**3.2E-09**	**5.0E-09**	**5.7E-09**	**5.7E-09**
+/- (m/s)	2.6E-09	1.6E-09	4.5E-10	-8.3E-10	-1.2E-09
+/- order of mag	0.375461	0.18	0.04	-0.07	-0.10

(see Interpretation Guide...)



Field Observations

zone geology: complex metavolcanics
zone fracture freq & quality (from core): 2-3/m, on foliations, very few real joints
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: about 0.02L
other problems that may affect results: Hole flushed for approx 1 hour. NS/DS drillers new to packering; training required. All equipment worked well. Slightly high Step 3 pressure may have opened fractures. Cranky deflation process. Several wireline pull-sequences, 2X rod pulls (6cm, 10cm), and finally 1 rod push (2cm) activated deflation. No damage. E pin intact.

Test Interpretation

K values: **4E-10 m/s**

"type curve" interpretation: low flow with some cleaning/opening of fractures.

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PACKER INJECTION TEST

(page 2)

Drillhole N°	10WBW003
Test hole N°	Lithology
Test N°	1

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	60	120	143	115	50
Max P during step	70	140	167	135	70
average pressure +/- psi	**5**	**10**	**12**	**10**	**10**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	0.75	2.39	4.44	4.06	2.04
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	45.2	87.4	103.6	83.9	38.1
K (m/sec)	2.1E-09	3.5E-09	5.5E-09	6.2E-09	6.9E-09

Low estimate of K

Q_{avg} (m^3/day)	0.66	2.30	4.35	3.97	1.96
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	52.2	101.5	120.5	98.0	52.2
K (m/sec)	1.6E-09	2.9E-09	4.6E-09	5.2E-09	4.8E-09

K averages for P step

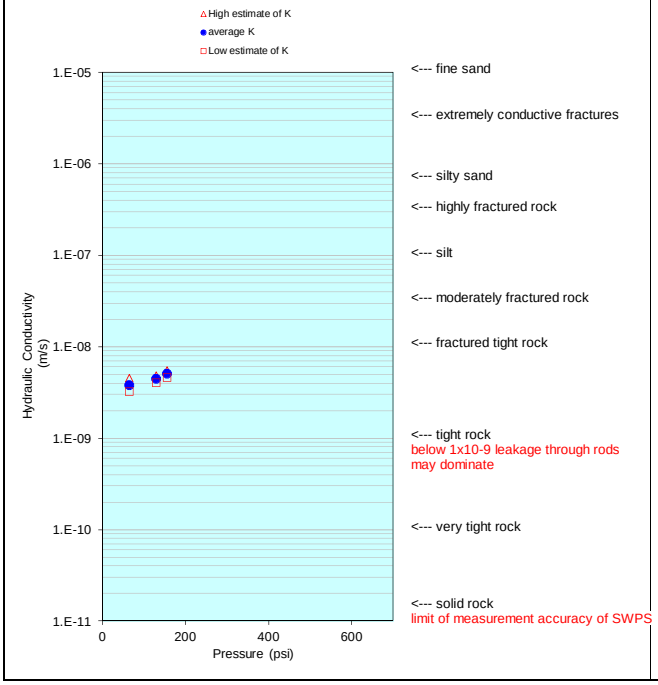
P	65	130	155
high est of K	4.E-09	5.E-09	5.E-09
average K	4.E-09	4.E-09	5.E-09
low est of K	3.E-09	4.E-09	5.E-09

K avg all P steps

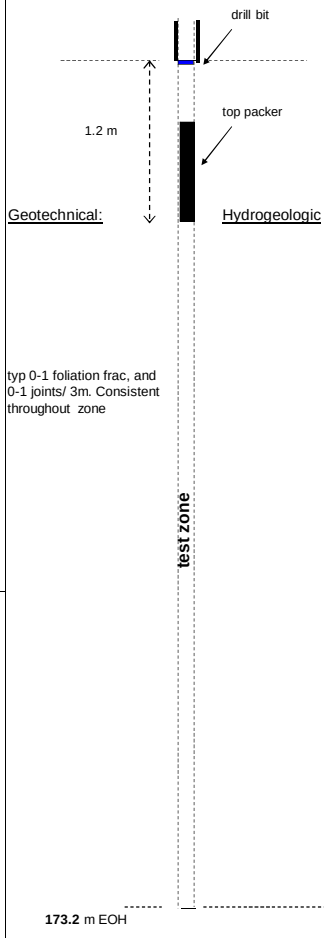
MAX	**5.E-09**
geomean	**4.E-09**
MIN	**3.E-09**

Comments: Permeability consistent with core logs.

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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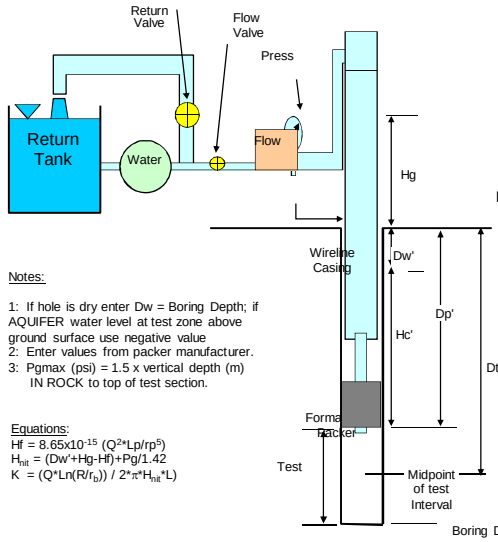
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**171.4**	**to**	**248.2**	**Drillhole Nº**	**10WBW003**
UTM (x,y)	**435202.505, 7546758.**	**Start Date:**	**2-Jul-10**	**Time:**	**17:30**	**Target**	**Lithology**
Datum:	**UTM**	**End Date:**	**2-Jul-10**	**Time:**	**19:42**	**Test Nº**	**2**
GS Elevation:	**39.265m**	**Supervisor:**	**RB**			**DH Depth (m)**	**248.2**

Max Injection P (psi): 237

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

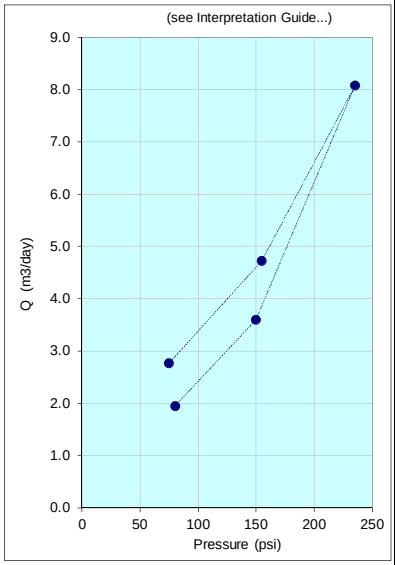
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	0.0	m
Dp	Measured depth to packer	**171.4**	m
Dt	Measured depth to midpoint of test	**209.8**	m
ß	Inclination from horizontal (degrees)	67	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**158.1**	m
Dt'	Vertical depth to midpoint of test	**193.5**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**224**	psi
Paquifer	Water column pressure in aquifer (unc.)	**223**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	2.0	m
Lp	Length of discharge pipe	2.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**76.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	80	**150**	**235**	**155**	**75**
1	**1.70**	**2.80**	**5.80**	**3.46**	**2.06**
2	**1.40**	**2.70**	**6.20**	**3.60**	**1.94**
3	**1.40**	**3.20**	**6.20**	**3.70**	**2.06**
4		**2.40**	**5.90**	**3.70**	**2.12**
5		**2.70**	**6.10**	**3.40**	
Stable Q **(L/min)**	**1.50**	**2.80**	**6.04**	**3.60**	**2.06**
Leak Q - see note	**0.15**	**0.30**	**0.43**	**0.32**	**0.14**
Q (m^3/day)	1.9	3.6	8.1	4.7	2.8
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	59.3	108.6	168.4	112.1	55.7
K (m/day)	3.6E-04	3.7E-04	5.3E-04	4.7E-04	5.5E-04
K (m/s)	**4.2E-09**	**4.2E-09**	**6.1E-09**	**5.4E-09**	**6.4E-09**
+/- (m/s)	1.3E-09	7.7E-10	1.5E-10	-3.8E-10	-8.8E-10
+/- order of mag	0.12	0.07	0.01	-0.03	-0.06



Field Observations

zone geology: complex metavolcanics
zone fracture freq & quality (from core): 0-7 foliation fractures /m, (2 typical), 3 joints in test interval.
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: 0.02L
other problems that may affect results: none

Test Interpretation

K values: **1E-9 m/s**

"type curve" interpretation: Type b - low flow with some cleaning/opening of fractures.

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10WBW003**
Test hole N°	**Lithology**
Test N°	**2**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	78	145	230	150	73
Max P during step	82	155	240	160	77
average pressure +/- psi	**2**	**5**	**5**	**5**	**2**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	1.97	3.63	8.11	4.75	2.79
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	57.9	105.0	164.9	108.6	54.3
K (m/sec)	4.4E-09	4.4E-09	6.3E-09	5.6E-09	6.6E-09

Low estimate of K

Q_{avg} (m^3/day)	1.89	3.54	8.02	4.67	2.71
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	60.7	112.1	171.9	115.6	57.1
K (m/sec)	4.0E-09	4.0E-09	6.0E-09	5.2E-09	6.1E-09

K averages for P step

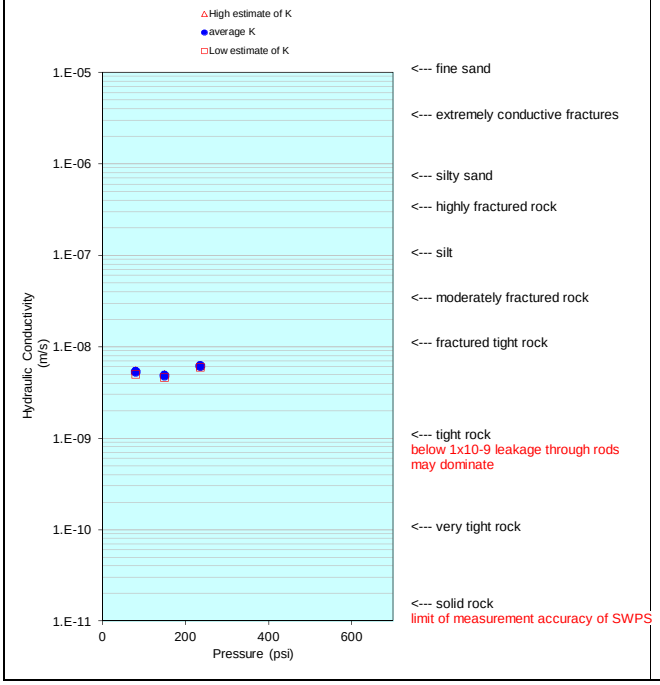
P	80	150	235
high est of K	5.E-09	5.E-09	6.E-09
average K	5.E-09	5.E-09	6.E-09
low est of K	5.E-09	5.E-09	6.E-09

K avg all P steps

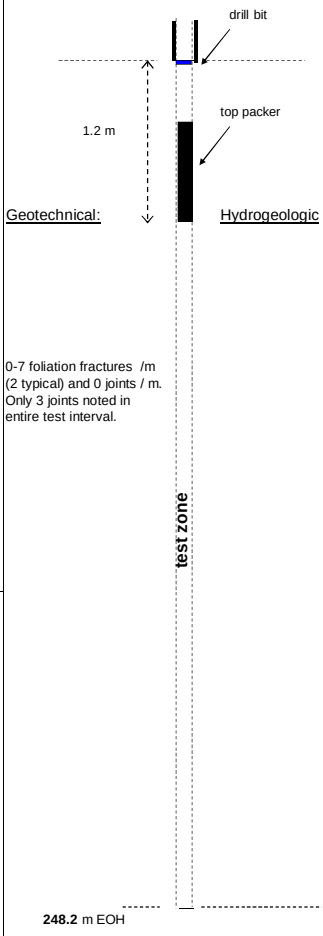
MAX	**6.E-09**
geomean	**5.E-09**
MIN	**5.E-09**

Comments: Permeability consistent with core logs.

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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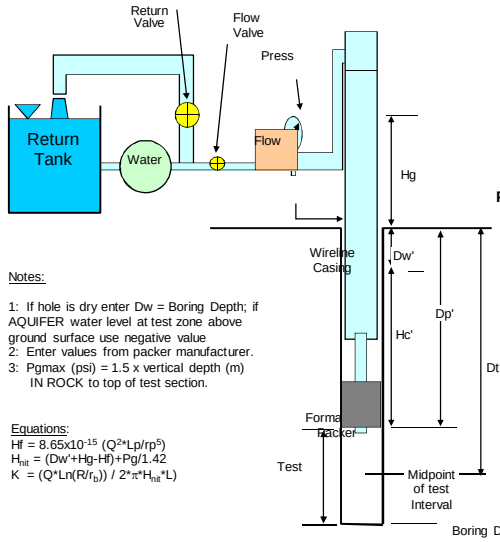
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**246.4**	**to**	**293.2**	**Drillhole Nº**	**10WBW003**
UTM (x,y)	**435202.505, 7546758.**	**Start Date:**	**3-Jul-10**	**Time:**	**12:39**	**Target**	**Lithology**
Datum:	**UTM**	**End Date:**	**3-Jul-10**	**Time:**	**14:45**	**Test Nº**	**3**
GS Elevation:	**39.265m**	**Supervisor:**	**RB**			**DH Depth (m)**	**293.2**

Max Injection P (psi): 341

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

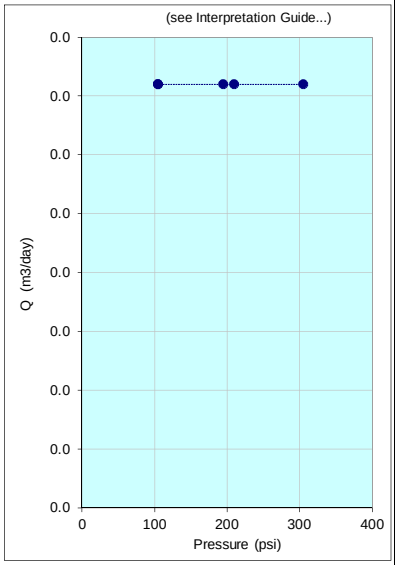
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	0.0	m
Dp	Measured depth to packer	**246.4**	m
Dt	Measured depth to midpoint of test	**269.8**	m
ß	Inclination from horizontal (degrees)	67	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**227.2**	m
Dt'	Vertical depth to midpoint of test	**248.8**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**323**	psi
Paquifer	Water column pressure in aquifer (unc.)	**322**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	2.0	m
Lp	Length of discharge pipe	2.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**46.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	105	**210**	**305**	**195**	**105**
1	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
2	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
3	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
4	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
5	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Stable Q **(L/min)**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
Leak Q - See note at right					
Q (m^3/day)	0.0	0.0	0.0	0.0	0.0
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	76.9	150.8	217.7	140.2	76.9
K (m/day)	3.4E-06	1.7E-06	1.2E-06	1.9E-06	3.4E-06
K (m/s)	**3.9E-11**	**2.0E-11**	**1.4E-11**	**2.2E-11**	**3.9E-11**
+/- (m/s)	6.0E-12	3.2E-12	1.6E-12	1.7E-12	6.0E-12
+/- order of mag	0.06	0.07	0.05	0.03	0.06



Field Observations

zone geology: complex metavolcanics
zone fracture freq & quality (from core): 1-7 open foliation fractures / m (4 typical). 0 joints in test interval.
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: 0.001
other problems that may affect results: pre-plug blow out flows exceeded injection test flows.

Test Interpretation

K values: no flow

"type curve" interpretation: **no flow**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	10WBW003
Test hole N°	Lithology
Test N°	3

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	100	208	300	190	100
Max P during step	110	212	310	200	110
average pressure +/- psi	**5**	**2**	**5**	**5**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**

High estimate of K

Q_{avg} (m^3/day)	0.02	0.02	0.02	0.02	0.02
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	73.3	149.4	214.2	136.7	73.3
K (m/sec)	4.5E-11	2.2E-11	1.6E-11	2.4E-11	4.5E-11

Low estimate of K

Q_{avg} (m^3/day)	0.01	0.01	0.01	0.01	0.01
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	80.4	152.2	221.2	143.8	80.4
K (m/sec)	3.0E-11	1.6E-11	1.1E-11	1.7E-11	3.0E-11

K averages for P step

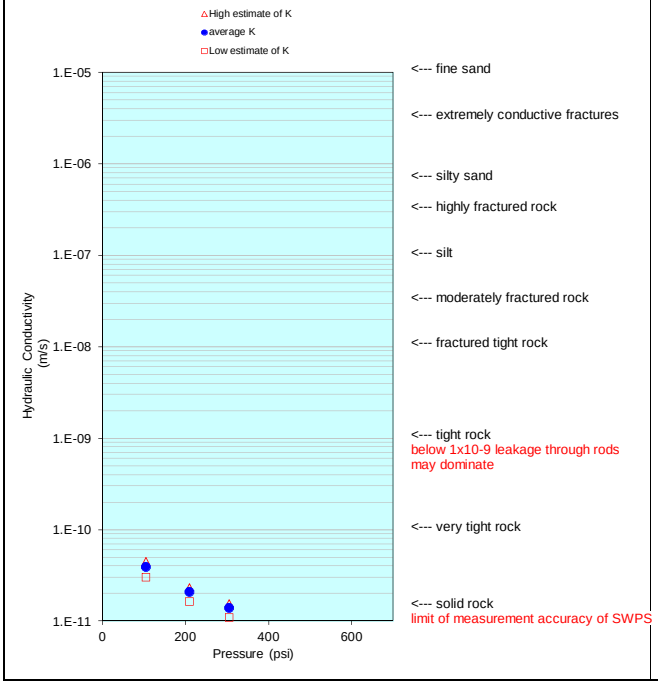
P	105	210	305
high est of K	5.E-11	2.E-11	2.E-11
average K	4.E-11	2.E-11	1.E-11
low est of K	3.E-11	2.E-11	1.E-11

K avg all P steps

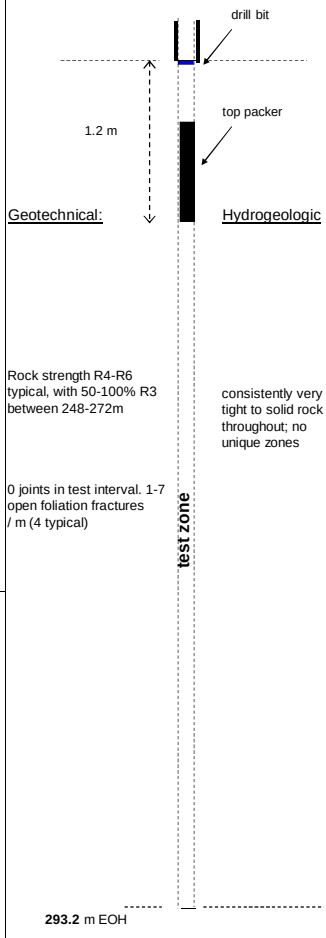
MAX	**5.E-11**
geomean	**2.E-11**
MIN	**1.E-11**

Comments: Leakage observed before blowing out plug was not observed after blowing out the plug. No flow was observed at all. Flow meter was working. Plug was blown.
Stable Q values of 0.01 l/min were used to generate calc K, however flows were

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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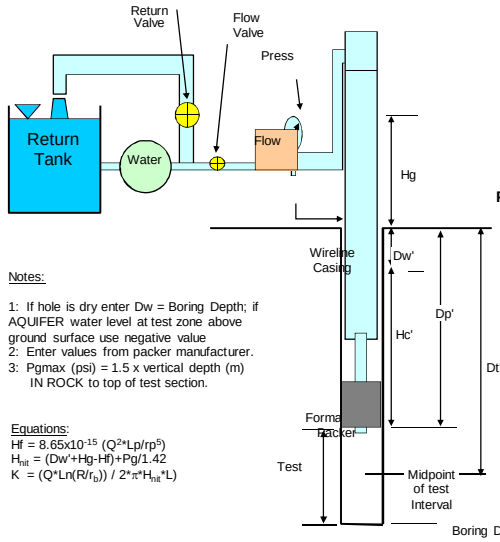
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**291.4**	**to**	**392.2**	**Drillhole Nº**	**10WBW003**
UTM (x,y)	**435202.505, 7546758.**	**Start Date:**	**5-Jul-10**	**Time:**	**10:00**	**Target**	**Lithology**
Datum:	**UTM**	**End Date:**	**5-Jul-10**	**Time:**	**12:26**	**Test Nº**	**4**
GS Elevation:	**39.265m**	**Supervisor:**	**RB**			**DH Depth (m)**	**392.2**

Max Injection P (psi): 403

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

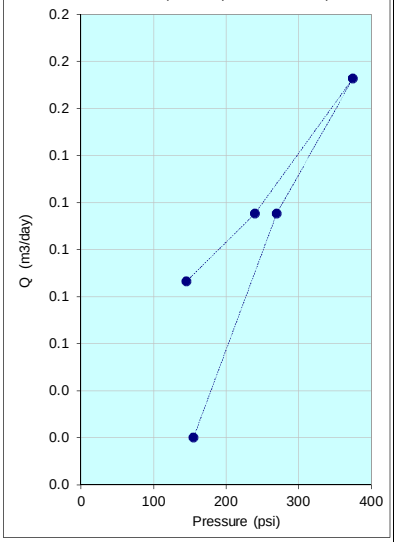
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	0.0	m
Dp	Measured depth to packer	**291.4**	m
Dt	Measured depth to midpoint of test	**341.8**	m
ß	Inclination from horizontal (degrees)	67	º
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**268.7**	m
Dt'	Vertical depth to midpoint of test	**315.2**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**382**	psi
Paquifer	Water column pressure in aquifer (unc.)	**381**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	2.0	m
Lp	Length of discharge pipe	2.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**100.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	155	**270**	**375**	**240**	**145**
1	**0.04**	**0.06**	**0.06**	**0.06**	**0.06**
2	**0.04**	**0.08**	**0.06**	**0.06**	**0.08**
3	**0.04**	**0.04**	**0.16**	**0.06**	**0.06**
4		**0.04**	**0.16**	**0.08**	**0.06**
5			**0.16**		
Stable Q **(L/min)**	**0.04**	**0.08**	**0.12**	**0.08**	**0.06**
Leak Q - See note at right					
Q (m^3/day)	0.0	0.1	0.2	0.1	0.1
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	112.1	193.1	267.0	171.9	105.0
K (m/day)	1.5E-06	5.0E-06	5.5E-06	5.6E-06	6.9E-06
K (m/s)	**1.7E-11**	**5.8E-11**	**6.3E-11**	**6.5E-11**	**8.0E-11**
+/- (m/s)	4.6E-11	1.4E-11	1.0E-11	7.0E-12	-1.6E-11
+/- order of mag	0.56	0.09	0.06	0.04	-0.10

(see Interpretation Guide...)



Field Observations

zone geology: complex metavolcanics
zone fracture freq & quality (from core): 2-3 foliation fracs/m. 0 joints in test interval. R3-R6
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: 0.01 litre
other problems that may affect results: pre-plug blow out flows exceeded injection test flows

Test Interpretation

K values: 8**E-10 m/s**

"type curve" interpretation: no significant flow; pre-plug blow out flows exceeded injection test flows.

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PACKER INJECTION TEST

(page 2)

Drillhole N°	10WBW003
Test hole N°	Lithology
Test N°	4

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	150	260	350	230	140
Max P during step	160	280	400	250	150
average pressure +/- psi	**5**	**10**	**25**	**10**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	0.03	0.13	0.19	0.13	0.10
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	108.6	186.0	249.4	164.9	101.5
K (m/sec)	3.1E-11	6.8E-11	7.3E-11	7.7E-11	9.7E-11

Low estimate of K

Q_{avg} (m^3/day)	-0.01	0.09	0.14	0.09	0.06
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	115.6	200.1	284.6	179.0	108.6
K (m/sec)	#N/A	4.2E-11	4.9E-11	4.7E-11	5.2E-11

K averages for P step

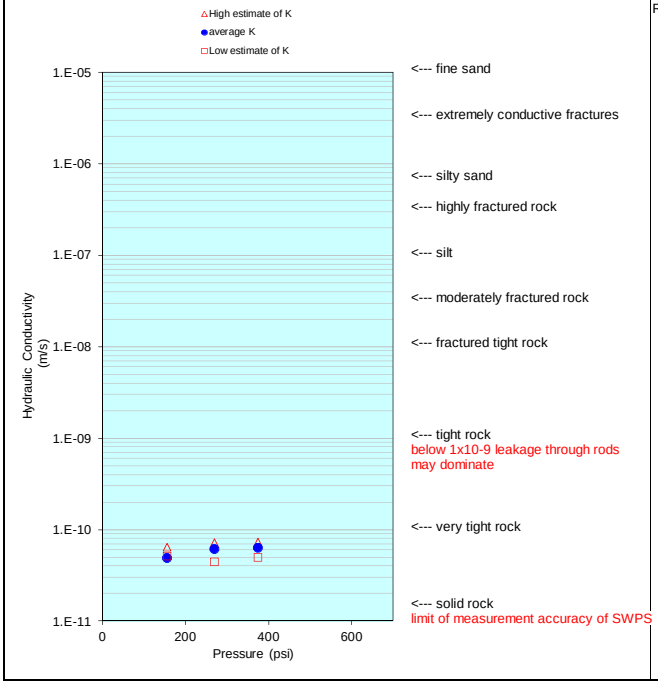
P	155	270	375
high est of K	6.E-11	7.E-11	7.E-11
average K	5.E-11	6.E-11	6.E-11
low est of K	5.E-11	4.E-11	5.E-11

K avg all P steps

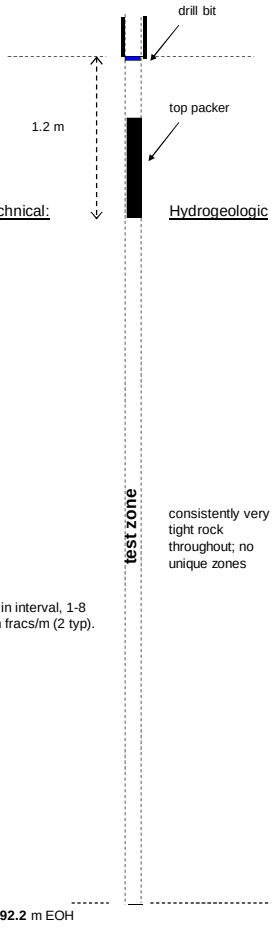
MAX	**7.E-11**
geomean	**6.E-11**
MIN	**4.E-11**

Comments: Leakage was tested extensively before blowing out the plug. Data reported above, right. Leakage decreased after inflating the packer to 350 psi. Leakage flows exceeded injection test flows.

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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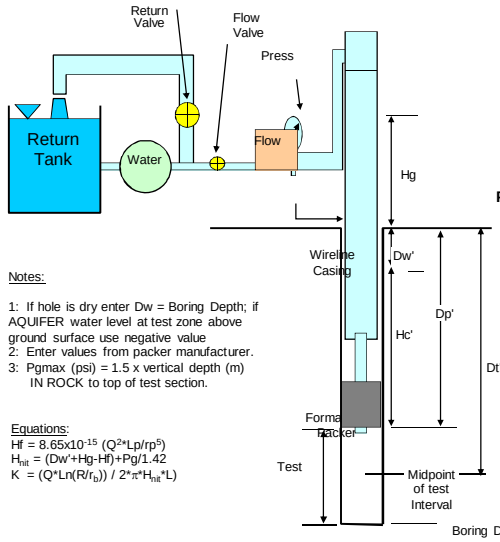
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**393.4**	**to**	**458.2**	**Drillhole Nº**	**10WBW003**
UTM (x,y)	**435202.505, 7546758.**	**Start Date:**	**6-Jul-10**	**Time:**	**16:00**	**Target**	**Lithology**
Datum:	**UTM**	**End Date:**	**6-Jul-10**	**Time:**	**18:00**	**Test Nº**	**5**
GS Elevation:	**39.265m**	**Supervisor:**	**RB**			**DH Depth (m)**	**458.2**

Max Injection P (psi): 544

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

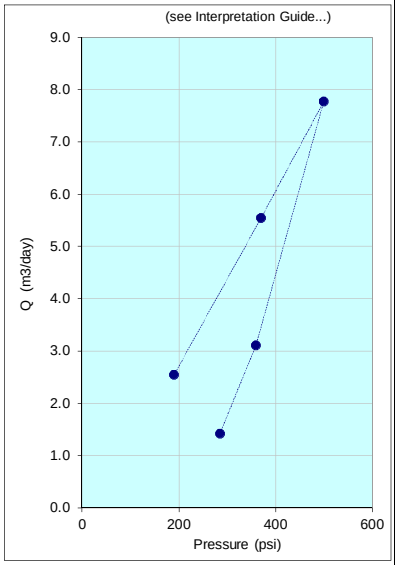
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0 m
Dbr	Measured vertical depth to bedrock	0.0 m
Dp	Measured depth to packer	**393.4** m
Dt	Measured depth to midpoint of test	**425.8** m
ß	Inclination from horizontal (degrees)	67 °
Dw'	Vertical depth to static water level	**0.9** m
	Rod stickup above ground	**0.0** m
Dp'	Vertical depth to packer	**362.8** m
Dt'	Vertical depth to midpoint of test	**392.7** m
SP	Shear Pin Rating (psi)	500 psi
Prods	Water column pressure in drill rods	**515** psi
Paquifer	Water column pressure in aquifer (unc.)	**515** psi
Pdiff	Existing differential shear pressure	**1** psi
Pshear	Shear pressure required at pump	**499** psi
Hg	Gauge height	2.0 m
Lp	Length of discharge pipe	2.00 m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127 m
R	Radius of influence (10 m is standard value)	10 m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048 m
L	Length of test section	**64.8** m
Hf	Friction Loss	
Hnit	Net injection head at midpoint of test	
K	Hydraulic conductivity	

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	190	**370**	**500**	**360**	**285**
1	**1.90**	**4.00**	**5.40**	**2.02**	**1.10**
2	**2.00**	**3.90**	**5.50**	**2.20**	**1.10**
3	**1.90**	**4.80**	**5.60**	**2.40**	**1.14**
4	**1.86**	**4.10**	**5.90**	**2.40**	**1.26**
5	**1.86**	**4.10**	**6.00**	**2.50**	**1.26**
Stable Q **(L/min)**	**1.90**	**4.10**	**5.80**	**2.40**	**1.20**
Leak Q (L/min)	**0.13**	**0.25**	**0.40**	**0.24**	**0.21**
Q (m^3/day)	2.5	5.5	7.8	3.1	1.4
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	136.7	263.5	355.0	256.4	203.6
K (m/day)	2.4E-04	2.8E-04	2.9E-04	1.6E-04	9.2E-05
K (m/s)	**2.8E-09**	**3.2E-09**	**3.3E-09**	**1.8E-09**	**1.1E-09**
+/- (m/s)	-7.7E-10	-4.6E-10	3.1E-10	9.0E-10	1.0E-09
+/- order of mag	-0.14	-0.07	0.04	0.17	0.29



Field Observations

zone geology: foliated metavolcanics
zone fracture freq & quality (from core): 1-7 foliation fracs/m (1 typ). 0 joints in the test interval. R3-R6, strengthening with deptp
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: 0.04L at max pressure step
other problems that may affect results: none

Test Interpretation

K values: **2E-10 m/s**

"type curve" interpretation:
progressive blocking of fractures

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PACKER INJECTION TEST
(page 2)

Drillhole N°	10WBW003
Test hole N°	Lithology
Test N°	5

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	180	340	460	340	280
Max P during step	200	400	540	380	290
average pressure +/- psi	**10**	**30**	**40**	**20**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.02**	**0.03**	**0.04**	**0.03**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	2.58	5.59	7.83	3.15	1.45
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	129.7	242.4	326.9	242.4	200.1
K (m/sec)	3.0E-09	3.5E-09	3.6E-09	2.0E-09	1.1E-09

Low estimate of K

Q_{avg} (m^3/day)	2.49	5.46	7.66	3.02	1.37
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	143.8	284.6	383.2	270.5	207.1
K (m/sec)	2.6E-09	2.9E-09	3.0E-09	1.7E-09	1.0E-09

K averages for P step

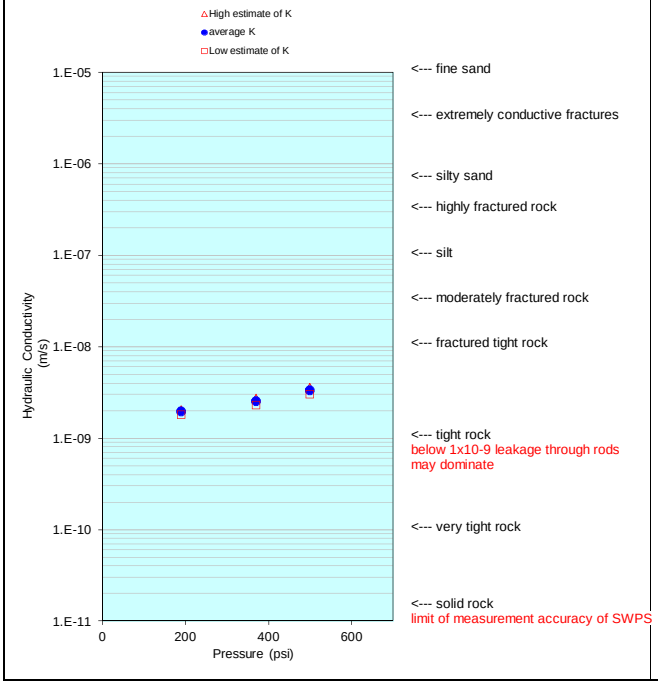
P	190	370	500
high est of K	2.E-09	3.E-09	4.E-09
average K	2.E-09	3.E-09	3.E-09
low est of K	2.E-09	2.E-09	3.E-09

K avg all P steps

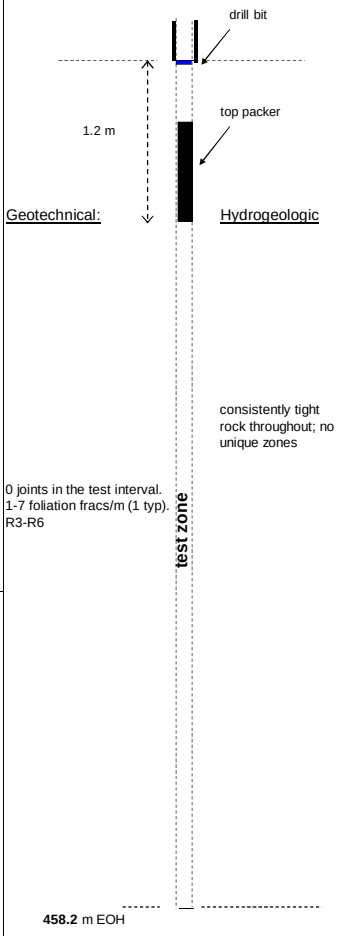
MAX	**4.E-09**
geomean	**3.E-09**
MIN	**2.E-09**

Comments: Permeability consistent with core logs.

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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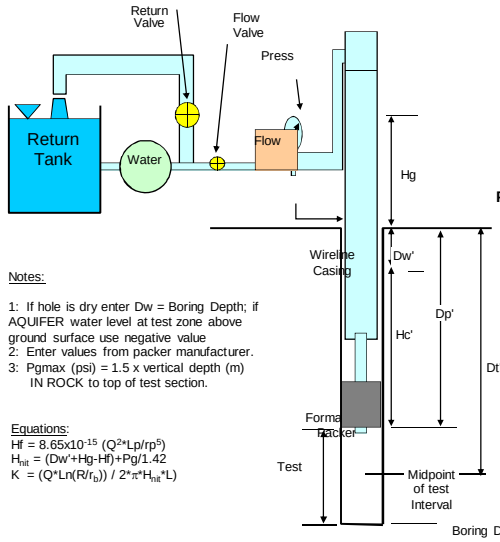
PACKER INJECTION TEST *(modified from HCl)*

Project:	**Hope Bay**	**Test Interval (m):**	**456.4**	**to**	**500.2**	**Drillhole Nº**	**10WBW003**
UTM (x,y)	**435202.505, 7546758.**	**Start Date:**	**7-Jul-10**	**Time:**	**16:00**	**Target**	**Lithology**
Datum:	**UTM**	**End Date:**	**7-Jul-10**	**Time:**	**18:10**	**Test Nº**	**6**
GS Elevation:	**39.265m**	**Supervisor:**	**RB**			**DH Depth (m)**	**500.2**

Max Injection P (psi): 631

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

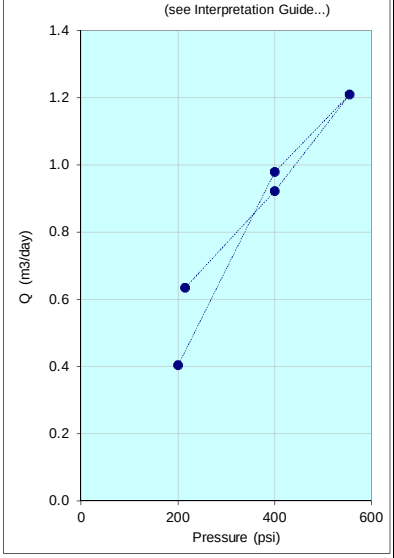
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	0.0	m
Dp	Measured depth to packer	**456.4**	m
Dt	Measured depth to midpoint of test	**478.3**	m
ß	Inclination from horizontal (degrees)	67	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**420.9**	m
Dt'	Vertical depth to midpoint of test	**441.1**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**598**	psi
Paquifer	Water column pressure in aquifer (unc.)	**597**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	2.0	m
Lp	Length of discharge pipe	2.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**43.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	200	**400**	**555**	**400**	**215**
1	**0.30**	**0.74**	**0.82**	**0.64**	**0.42**
2	**0.28**	**0.72**	**0.84**	**0.64**	**0.44**
3	**0.32**	**0.70**	**0.84**	**0.66**	**0.46**
4	**0.28**	**0.64**	**0.82**	**0.62**	**0.44**
5	**0.28**	**0.64**	**0.84**	**0.64**	**0.46**
Stable Q **(L/min)**	**0.28**	**0.68**	**0.84**	**0.64**	**0.44**
Leak Q - see note at right					
Q (m^3/day)	0.4	1.0	1.2	0.9	0.6
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	143.8	284.6	393.8	284.6	154.3
K (m/day)	5.4E-05	6.7E-05	6.0E-05	6.3E-05	8.0E-05
K (m/s)	**6.3E-10**	**7.7E-10**	**6.9E-10**	**7.3E-10**	**9.2E-10**
+/- (m/s)	2.0E-10	5.0E-11	5.5E-11	9.5E-11	-9.7E-11
+/- order of mag	0.12	0.03	0.03	0.05	-0.05

(see Interpretation Guide...)



Field Observations

zone geology: generally foliated metavolcanics, however some non-foliated, harder and denser metamorphic rock below 490m
zone fracture freq & quality (from core): 0-5 foliation fracs/m. 0 joints in the test interval. R3-R6.
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: 0.01L throughout the test
other problems that may affect results: pre-plug blow out flows exceeded injection test flows

Test Interpretation

K values: **7E-10 m/s**

"type curve" interpretation: flow proportional to pressure and flow, however, pre-plug blow out flows exceeded injection test flows.

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10WBW003**
Test hole N°	**Lithology**
Test N°	**6**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	190	370	520	370	210
Max P during step	210	430	590	430	220
average pressure +/- psi	**10**	**30**	**35**	**30**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	0.42	0.99	1.22	0.94	0.65
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	136.7	263.5	369.1	263.5	150.8
K (m/sec)	6.9E-10	8.5E-10	7.4E-10	8.0E-10	9.6E-10

Low estimate of K

Q_{avg} (m^3/day)	0.37	0.95	1.18	0.89	0.60
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	150.8	305.7	418.4	305.7	157.9
K (m/sec)	5.6E-10	7.0E-10	6.3E-10	6.6E-10	8.6E-10

K averages for P step

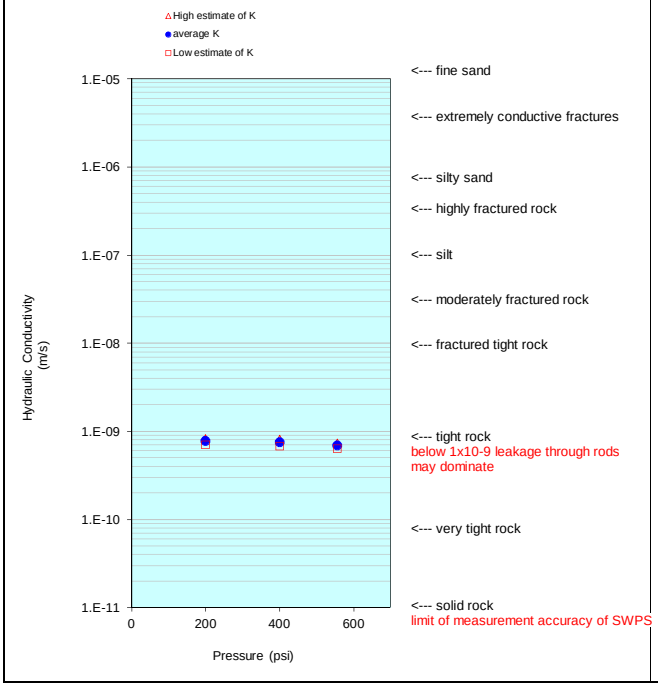
P	200	400	555
high est of K	8.E-10	8.E-10	7.E-10
average K	8.E-10	7.E-10	7.E-10
low est of K	7.E-10	7.E-10	6.E-10

K avg all P steps

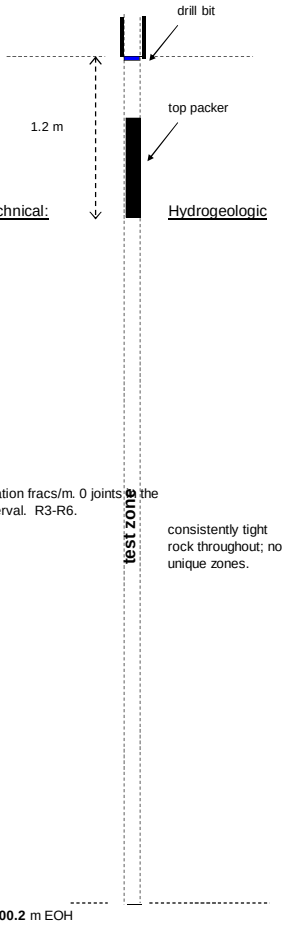
MAX	**8.E-10**
geomean	**7.E-10**
MIN	**6.E-10**

Comments: Permeability consistent with core logs.

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



0-5 foliation fracs/m. 0 joints in the test interval. R3-R6.

consistently tight rock throughout; no unique zones.

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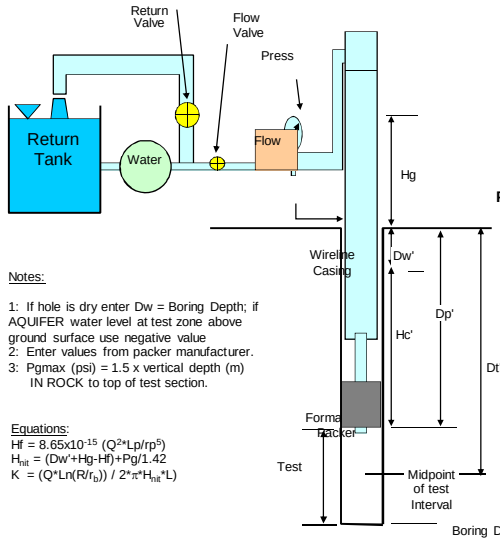
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay**	**Test Interval (m):**	**498.4**	**to**	**548.2**	**Drillhole Nº**	**10WBW003**
UTM (x,y)	**435202.505, 7546758.**	**Start Date:**	**9-Jul-10**	**Time:**	**10:00**	**Target**	**Lithology**
Datum:	**UTM**	**End Date:**	**9-Jul-10**	**Time:**	**11:45**	**Test Nº**	**7**
GS Elevation:	**39.265m**	**Supervisor:**	**RB**			**DH Depth (m)**	**548.2**

Max Injection P (psi): 689

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

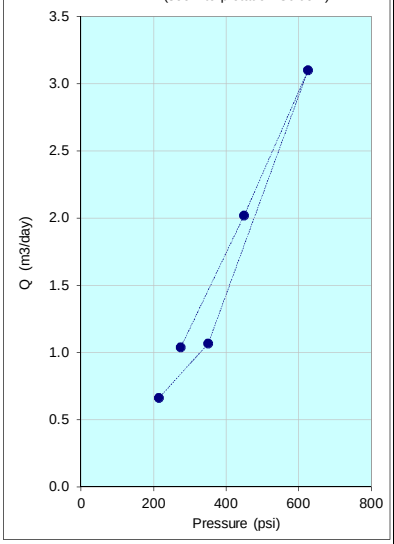
$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0 m
Dbr	Measured vertical depth to bedrock	0.0 m
Dp	Measured depth to packer	**498.4** m
Dt	Measured depth to midpoint of test	**523.3** m
ß	Inclination from horizontal (degrees)	67 °
Dw'	Vertical depth to static water level	**0.9** m
	Rod stickup above ground	**0.0** m
Dp'	Vertical depth to packer	**459.7** m
Dt'	Vertical depth to midpoint of test	**482.6** m
SP	Shear Pin Rating (psi)	500 psi
Prods	Water column pressure in drill rods	**653** psi
Paquifer	Water column pressure in aquifer (unc.)	**652** psi
Pdiff	Existing differential shear pressure	**1** psi
Pshear	Shear pressure required at pump	**499** psi
Hg	Gauge height	2.0 m
Lp	Length of discharge pipe	2.00 m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127 m
R	Radius of influence (10 m is standard value)	10 m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048 m
L	Length of test section	**49.8** m
Hf	Friction Loss	
Hnit	Net injection head at midpoint of test	
K	Hydraulic conductivity	

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	**P_g (psi) Step 2**	**P_g (psi) Step 3**	**P_g (psi) Step 4**	**P_g (psi) Step 5**
	215	**350**	**625**	**450**	**275**
1	**0.40**	**0.76**	**2.20**	**1.40**	**0.86**
2	**0.46**	**0.74**	**2.00**	**1.60**	**0.72**
3	**0.42**	**0.76**	**2.00**	**1.46**	**0.72**
4	**0.40**	**0.76**	**2.30**	**1.44**	**0.74**
5	**0.48**	**0.72**	**2.30**	**1.40**	**0.72**
Stable Q **(L/min)**	**0.46**	**0.74**	**2.15**	**1.40**	**0.72**
Leak Q - See note at right					
Q (m^3/day)	0.7	1.1	3.1	2.0	1.0
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	154.3	249.4	443.1	319.8	196.6
K (m/day)	7.3E-05	7.3E-05	1.2E-04	1.1E-04	9.0E-05
K (m/s)	**8.5E-10**	**8.4E-10**	**1.4E-09**	**1.2E-09**	**1.0E-09**
+/- (m/s)	1.6E-10	3.0E-10	9.5E-11	-1.0E-10	-3.0E-11
+/- order of mag	0.08	0.13	0.03	-0.04	-0.01

(see Interpretation Guide...)



Field Observations

zone geology: foliated metavolcanics
zone fracture freq & quality (from core): 1-4 foliation fracs/m. 2 joints in test interval. R3-R6.
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: 0.02 litre at max pressure step
other problems that may affect results: pre-plug blow out flows exceeded injection test flows

Test Interpretation

K values: **2E-10 m/s**

"type curve" interpretation: flow proportional to pressure, however, pre-plug blow out flows exceeded injection test flows

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PACKER INJECTION TEST

(page 2)

Drillhole N°	10WBW003
Test hole N°	Lithology
Test N°	7

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	210	320	590	425	255
Max P during step	220	380	660	475	295
average pressure +/- psi	**5**	**30**	**35**	**25**	**20**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.02**	**0.02**	**0.02**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	0.68	1.09	3.12	2.04	1.05
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	150.8	228.3	418.4	302.2	182.5
K (m/sec)	8.9E-10	9.5E-10	1.5E-09	1.3E-09	1.1E-09

Low estimate of K

Q_{avg} (m^3/day)	0.63	1.01	3.04	1.96	1.01
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	157.9	270.5	467.7	337.4	210.7
K (m/sec)	7.9E-10	7.4E-10	1.3E-09	1.1E-09	9.4E-10

K averages for P step

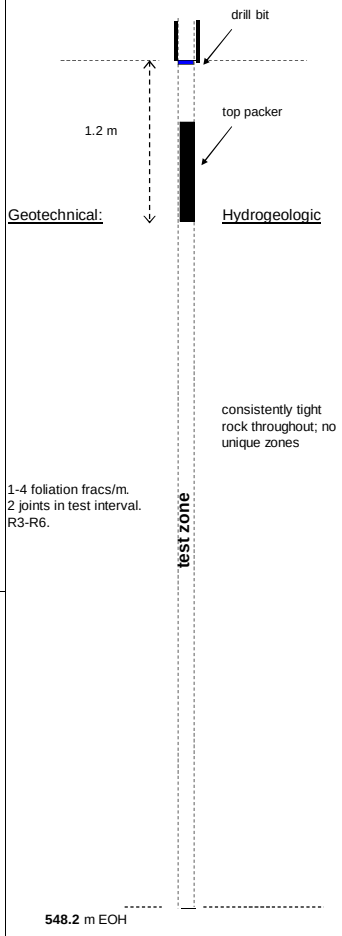
P	215	350	625
high est of K	1.E-09	1.E-09	1.E-09
average K	9.E-10	1.E-09	1.E-09
low est of K	9.E-10	9.E-10	1.E-09

K avg all P steps

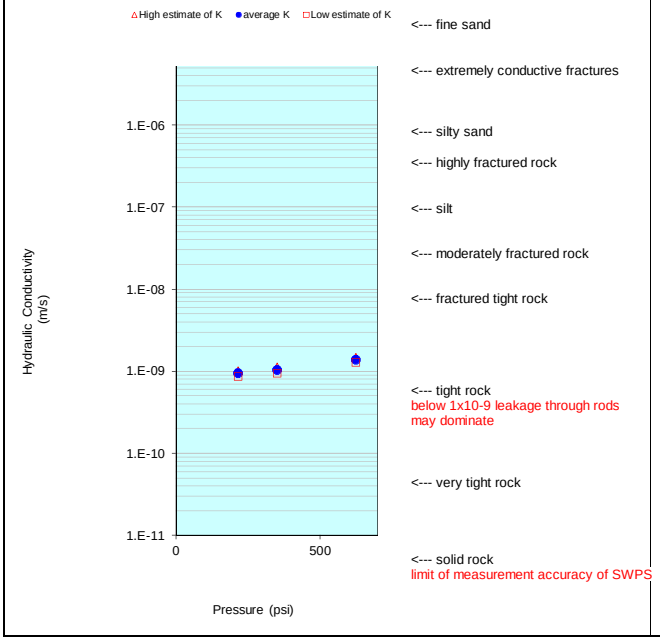
MAX	**1.E-09**
geomean	**1.E-09**
MIN	**9.E-10**

Comments: Permeability consistent with core logs.

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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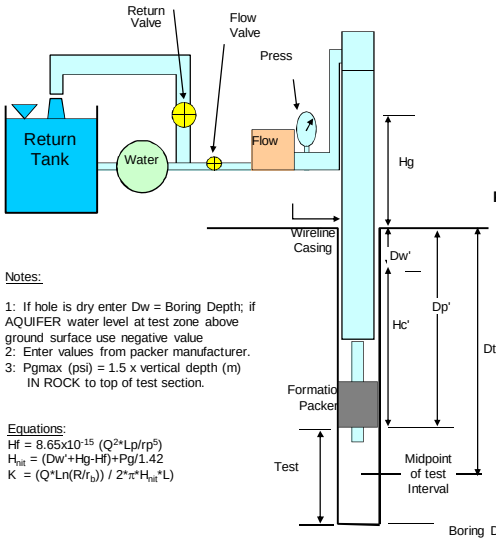
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - WBI**	**Test Interval (m):**	**39.2**	**to**	**77.0**	**Drillhole Nº**	**10WBW004**
UTM (x,y)	**41018.49E; 505664.6N**	**Start Date:**	**18-Jul**	**Time:**	**7:45**	**Target**	
Datum:	**UTM**	**End Date:**	**18-Jul**	**Time:**	**9:45**	**Test Nº**	**1**
GS Elevation:	**5067.721**	**Supervisor:**	**RB**			**DH Depth (m)**	**77.0**

Max Injection P (psi): 53

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

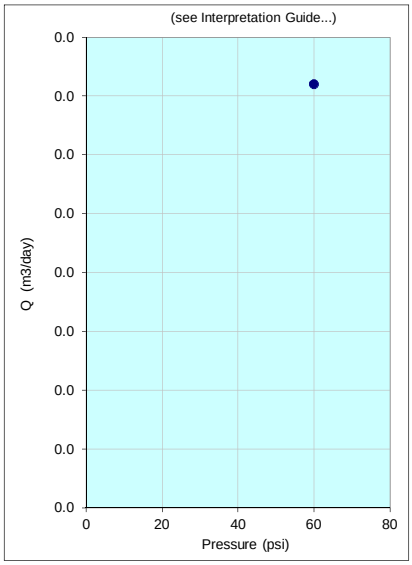
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	29.0	m
Dp	Measured depth to packer	**39.2**	m
Dt	Measured depth to midpoint of test	**58.1**	m
ß	Inclination from horizontal (degrees)	65	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**35.5**	m
Dt'	Vertical depth to midpoint of test	**52.7**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**50**	psi
Paquifer	Water column pressure in aquifer (unc.)	**49**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	1.0	m
Lp	Length of discharge pipe	1.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**37.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	35	50	60		
1	**0.0**	**0.0**	**0.0**		
2	**0.0**	**0.0**	**0.0**		
3	**0.0**	**0.0**	**0.0**		
4	**0.0**	**0.0**			
5	**0.0**	**0.0**			
Stable Q **(L/min)**	**0.00**	**0.00**	**0.01**		
Leak Q (L/min)	**0.00**	**0.00**	**0.0**		
Q (m^3/day)	#N/A	#N/A	0.0	#N/A	#N/A
Hf (m)	#N/A	#N/A	0.00	#N/A	#N/A
Hnit (m)	#N/A	#N/A	44.2	#N/A	#N/A
K (m/day)	#N/A	#N/A	7.3E-06	#N/A	#N/A
K (m/s)	**#N/A**	**#N/A**	**8.5E-11**	**#N/A**	**#N/A**
+/- (m/s)	#VALUE!	#VALUE!	9.3E-11	#VALUE!	#VALUE!
+/- order of mag	#VALUE!	#VALUE!	0.32	#VALUE!	#VALUE!



Field Observations

zone geology: altered mafics with quartz veining above 54m, greywacke below
zone fracture freq & quality (from core): 0-3 OF /m, 0-1 OJ /m, weak to no foliations, tight, R6
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: excellent
other problems that may affect results: water out of top of casing near the end of Step 3. Packer was only 9m below top of bedrock.

Test Interpretation

K values: <1**E-11 m/s**

no flows, no curve

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PACKER INJECTION TEST

(page 2)

Drillhole Nº	**10WBW004**
Test hole N°	**#N/A**
Test Nº	**1**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	33	48	57	0	0
Max P during step	37	52	63	0	0
average pressure +/- psi	**2**	**2**	**3**		

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.01**	**0.01**		

High estimate of K

Q_{avg} (m^3/day)	#N/A	#N/A	0.03	#N/A	#N/A
Hf (m)	#N/A	#N/A	0.00	#N/A	#N/A
Hnit (m)	#N/A	#N/A	42.0	#N/A	#N/A
K (m/sec)	#N/A	#N/A	1.8E-10	#N/A	#N/A

Low estimate of K

Q_{avg} (m^3/day)	#N/A	#N/A	-0.01	#N/A	#N/A
Hf (m)	#N/A	#N/A	0.00	#N/A	#N/A
Hnit (m)	#N/A	#N/A	46.3	#N/A	#N/A
K (m/sec)	#N/A	#N/A	#N/A	#N/A	#N/A

K averages for P step

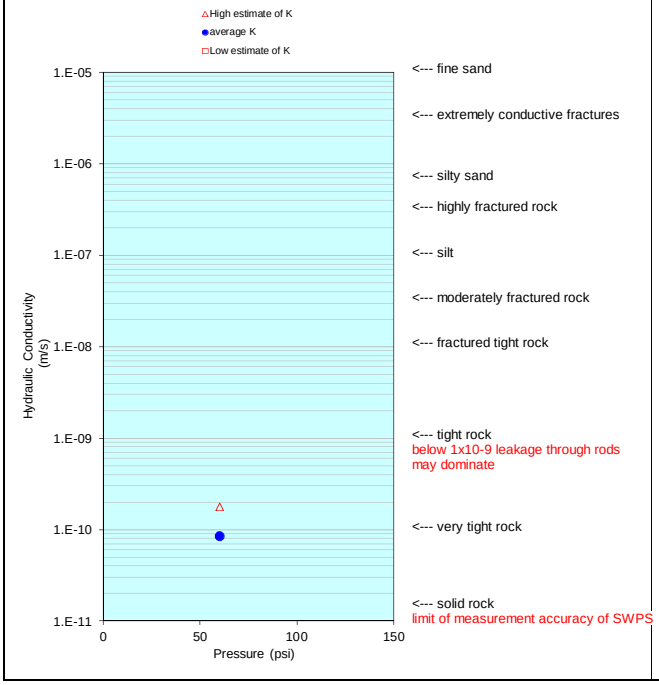
P	35	50	60
high est of K			2.E-10
average K			8.E-11
low est of K			

K avg all P steps

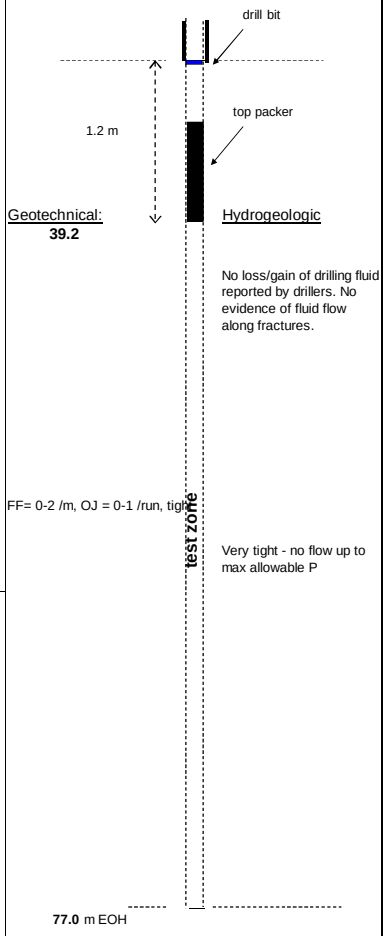
MAX	**2.E-10**
geomean	**8.E-11**
MIN	**#N/A**

Comments:

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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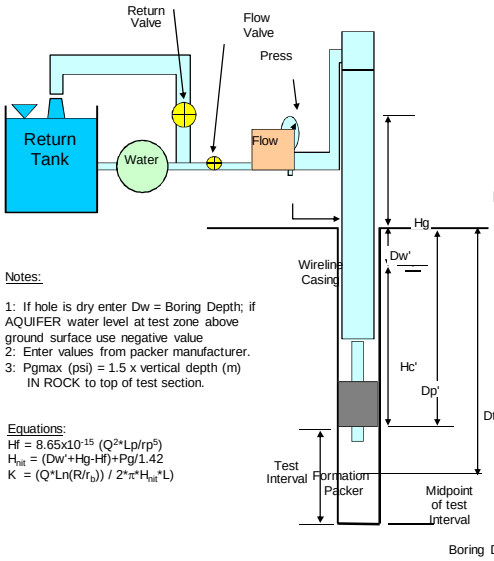
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - WBI**	**Test Interval (m):**	**75.2**	**to**	**125.0**	**Drillhole Nº**	**10WBW004**
UTM (x,y)	**41018.49E; 505664.6N**	**Start Date:**	**19-Jul**	**Time:**	**9:30**	**Target**	
Datum:	**UTM**	**End Date:**	**19-Jul**	**Time:**	**11:04**	**Test Nº**	**2**
GS Elevation:	**5067.721**	**Supervisor:**	**RB**			**DH Depth (m)**	**125.0**

Max Injection P (psi): 102

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

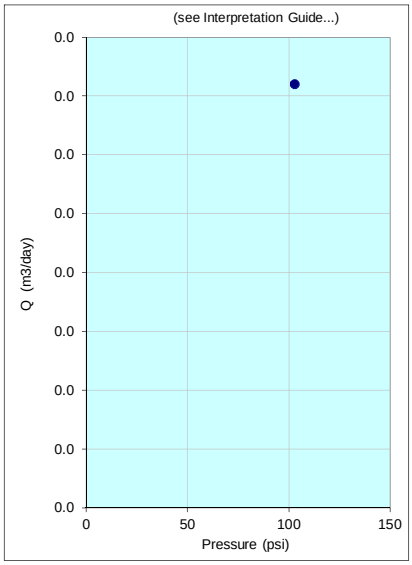
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	29.0	m
Dp	Measured depth to packer	**75.2**	m
Dt	Measured depth to midpoint of test	**100.1**	m
ß	Inclination from horizontal (degrees)	65	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**68.2**	m
Dt'	Vertical depth to midpoint of test	**90.7**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**97**	psi
Paquifer	Water column pressure in aquifer (unc.)	**95**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	1.0	m
Lp	Length of discharge pipe	1.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**49.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	Q (Liters / min) *see flow calc. sheet				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	50	75	103	80	50
1	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.01	0.0	
5	0.0	0.0	0.01		
Stable Q **(L/min)**	0.0	0.0	0.0	0.0	0.0
Leak Q (L/min)	0.0	0.0	0.0	0.0	0.0
Q (m^3/day)	#N/A	#N/A	0.0	#N/A	#N/A
Hf (m)	#N/A	#N/A	0.00	#N/A	#N/A
Hnit (m)	#N/A	#N/A	74.4	#N/A	#N/A
K (m/day)	#N/A	#N/A	3.3E-06	#N/A	#N/A
K (m/s)	**#N/A**	**#N/A**	**3.8E-11**	**#N/A**	**#N/A**
+/- (m/s)	#VALUE!	#VALUE!	4.0E-11	#VALUE!	#VALUE!
+/- order of mag	#VALUE!	#VALUE!	0.31	#VALUE!	#VALUE!



Field Observations

zone geology: altered mafics with quartz veining above 54m, greywacke below
zone fracture freq & quality (from core): 0-3 OF /m, 0-1 OJ /m, weak to no foliations, tight, R6
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: excellent
other problems that may affect results:

Test Interpretation

K values: <1E-11 m/s

interpretation: **no flows, no curve**

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10WBW004**
Test hole N°	**#N/A**
Test N°	**2**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	48	72	100	79	49
Max P during step	52	78	106	81	51
average pressure +/- psi	**2**	**3**	**3**	**1**	**1**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	#N/A	#N/A	0.03	#N/A	#N/A
Hf (m)	#N/A	#N/A	0.00	#N/A	#N/A
Hnit (m)	#N/A	#N/A	72.3	#N/A	#N/A
K (m/sec)	#N/A	#N/A	7.9E-11	#N/A	#N/A

Low estimate of K

Q_{avg} (m^3/day)	#N/A	#N/A	-0.01	#N/A	#N/A
Hf (m)	#N/A	#N/A	0.00	#N/A	#N/A
Hnit (m)	#N/A	#N/A	76.6	#N/A	#N/A
K (m/sec)	#N/A	#N/A	#N/A	#N/A	#N/A

K averages for P step

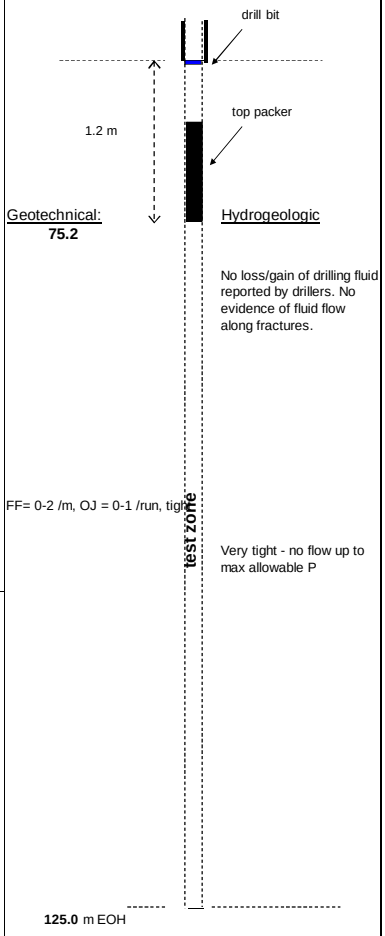
P	50	75	103
high est of K			8.E-11
average K			4.E-11
low est of K			

K avg all P steps

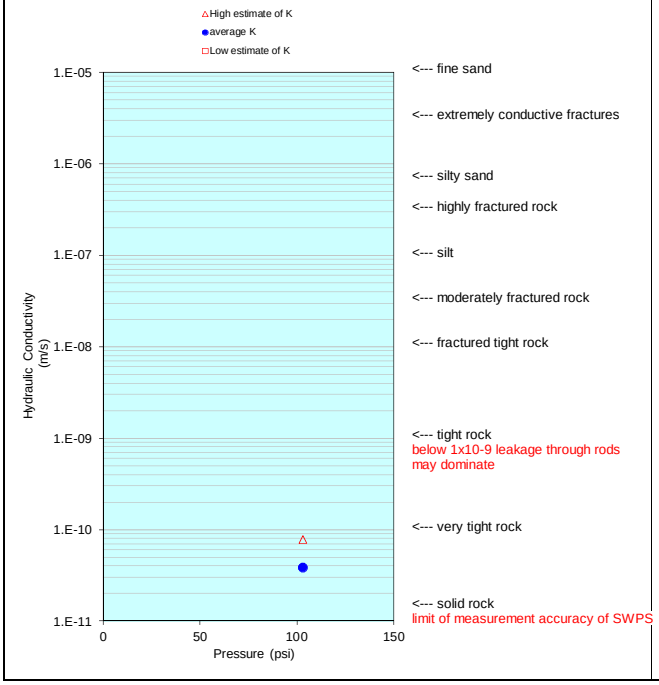
MAX	**8.E-11**
geomean	**4.E-11**
MIN	**#N/A**

Comments: Blocky drilling. Low angle mechanical fractures. No loss of drilling water at anytime. Flow meter system performed well, and flows 'back-pedalled' when pressure was reduced.

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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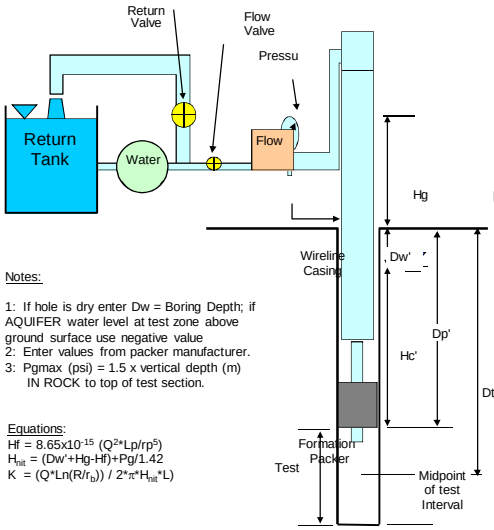
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - WBI**	**Test Interval (m):**	**123.2**	**to**	**182.0**	**Drillhole Nº**	**10WBW004**
UTM (x,y)	**41018.49E; 505664.6N**	**Start Date:**	**21-Jul**	**Time:**	**16:00**	**Target**	
Datum:	**UTM**	**End Date:**	**21-Jul**	**Time:**	**17:48**	**Test Nº**	**3**
GS Elevation:	**5067.721**	**Supervisor:**	**RB**			**DH Depth (m)**	**182.0**

Max Injection P (psi): 169

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

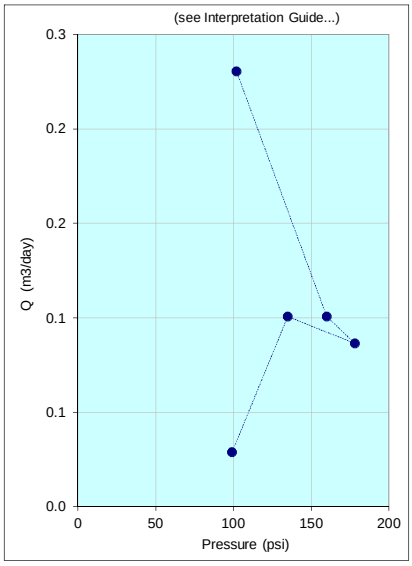
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	29.0	m
Dp	Measured depth to packer	**123.2**	m
Dt	Measured depth to midpoint of test	**152.6**	m
ß	Inclination from horizontal (degrees)	66	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**112.5**	m
Dt'	Vertical depth to midpoint of test	**139.4**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**160**	psi
Paquifer	Water column pressure in aquifer (unc.)	**159**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	1.0	m
Lp	Length of discharge pipe	5.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**58.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	102	160	178	135	99
1	**0.72**	**1.04**	**1.04**	**0.86**	**0.72**
2	**0.82**	**1.00**	**1.04**	**0.84**	**0.62**
3	**0.76**	**1.04**	**1.00**	**0.84**	**0.62**
4	**0.80**	**1.00**	**0.98**	**0.86**	**0.62**
5	**0.76**	**0.96**	**1.04**	**0.84**	**0.60**
Stable Q **(L/min)**	**0.76**	**1.00**	**1.04**	**0.85**	**0.62**
Leak Q (L/min)	**0.6**	**0.9**	**1.0**	**0.8**	**0.6**
Q (m^3/day)	0.2	0.1	0.1	0.1	0.0
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	73.7	114.6	127.3	97.0	71.6
K (m/day)	4.5E-05	1.3E-05	9.8E-06	1.5E-05	5.8E-06
K (m/s)	**5.2E-10**	**1.5E-10**	**1.1E-10**	**1.7E-10**	**6.7E-11**
+/- (m/s)	-1.9E-10	4.2E-11	2.2E-11	1.5E-11	2.7E-10
+/- order of mag	-0.19	0.11	0.08	0.04	0.70



Field Observations

zone geology: greywacke, turbidite sequence, minor quartz veining, occasional low angle foliations
zone fracture freq & quality (from core): 0-3 OF /m, 0-1 OJ /m, occasionally weakly foliatiated, R6
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: excellent
other problems that may affect results: none

Test Interpretation

K values: 2E-10 **m/s**

"curve type" governed by leakage flows which were similar in magnitude to injection test flows

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PACKER INJECTION TEST

(page 2)

Drillhole Nº	**10WBW004**
Test hole N°	**#N/A**
Test Nº	**3**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	100	155	174	131	96
Max P during step	104	165	182	139	102
average pressure +/- psi	**2**	**5**	**4**	**4**	**3**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	0.24	0.12	0.10	0.12	0.04
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	72.3	111.1	124.4	94.2	69.5
K (m/sec)	5.7E-10	1.7E-10	1.4E-10	2.0E-10	1.0E-10

Low estimate of K

Q_{avg} (m^3/day)	0.20	0.07	0.06	0.07	0.00
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	75.2	118.1	130.1	99.8	73.7
K (m/sec)	4.5E-10	1.0E-10	7.4E-11	1.2E-10	6.3E-26

K averages for P step

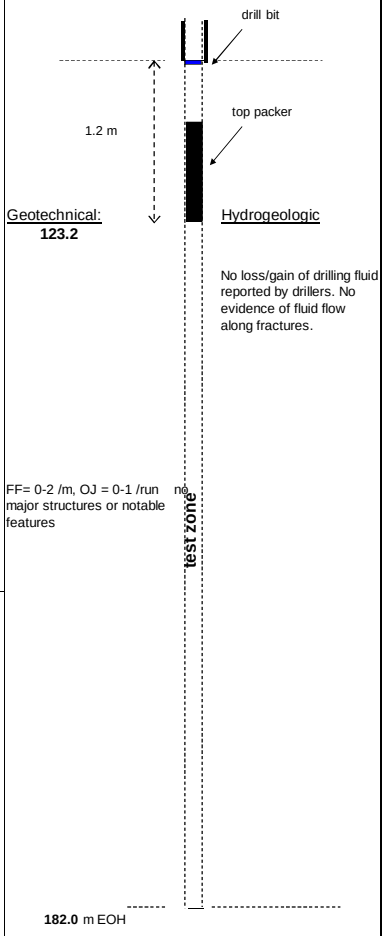
P	102	160	178
high est of K	3.E-10	2.E-10	1.E-10
average K	3.E-10	2.E-10	1.E-10
low est of K	2.E-10	1.E-10	7.E-11

K avg all P steps

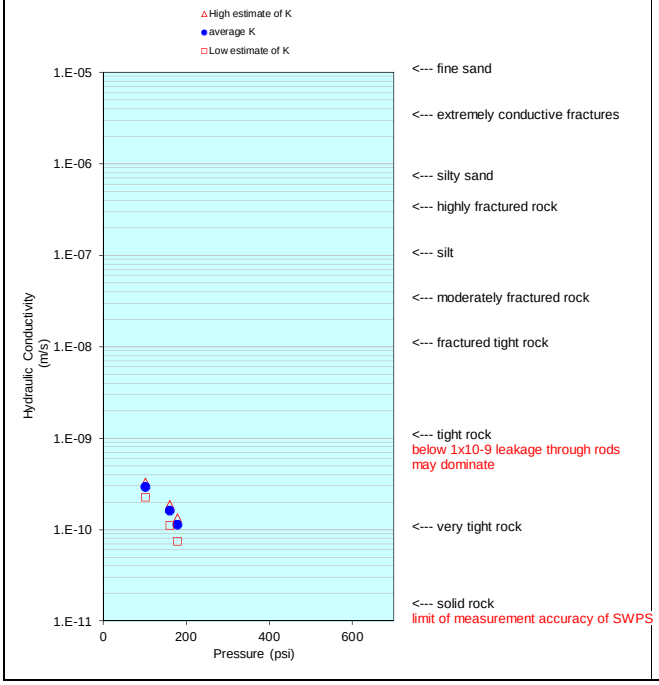
MAX	**3.E-10**
geomean	**2.E-10**
MIN	**7.E-11**

Comments: Equipment performed well. No casing leaks. Consistent flow rates in each test. Low conductivity is consistent with core.

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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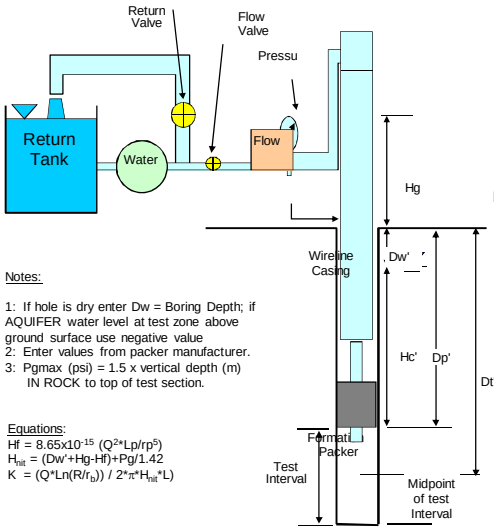
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - WBI**	**Test Interval (m):**	**180.2**	**to**	**242.0**	**Drillhole Nº**	**10WBW004**
UTM (x,y)	**41018.49E; 505664.6N**	**Start Date:**	**23-Jul**	**Time:**	**15:10**	**Target**	
Datum:	**UTM**	**End Date:**	**23-Jul**	**Time:**	**16:51**	**Test Nº**	**4**
GS Elevation:	**5067.721**	**Supervisor:**	**RB**			**DH Depth (m)**	**242.0**

Max Injection P (psi): 245

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

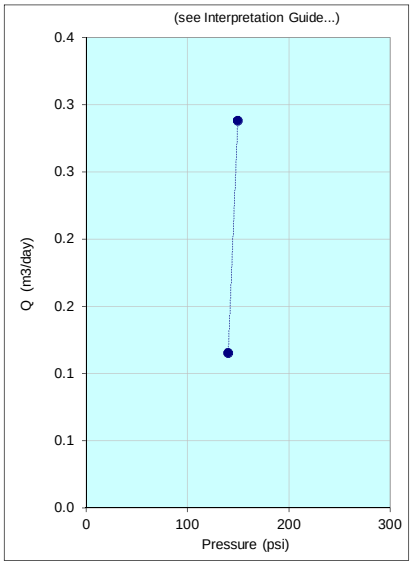
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	29.0	m
Dp	Measured depth to packer	**180.2**	m
Dt	Measured depth to midpoint of test	**211.1**	m
ß	Inclination from horizontal (degrees)	65	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**163.3**	m
Dt'	Vertical depth to midpoint of test	**191.3**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**232**	psi
Paquifer	Water column pressure in aquifer (unc.)	**231**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	1.0	m
Lp	Length of discharge pipe	1.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**61.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	Q (Liters / min) *see flow calc. sheet				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	150	195	245	190	140
1	0.34	0.28	0.44	0.28	0.20
2	0.30	0.32	0.40	0.26	0.18
3	0.30	0.28	0.40	0.28	0.16
4	0.30	0.26	0.38	0.30	0.20
5	0.32	0.34	0.40	0.28	0.16
Stable Q **(L/min)**	0.30	0.34	0.40	0.28	0.18
Leak Q (L/min)	0.1	0.6	0.6	0.6	0.1
Q (m^3/day)	0.3	#N/A	#N/A	#N/A	0.1
Hf (m)	0.00	#N/A	#N/A	#N/A	0.00
Hnit (m)	107.5	#N/A	#N/A	#N/A	100.5
K (m/day)	3.7E-05	#N/A	#N/A	#N/A	1.6E-05
K (m/s)	**4.3E-10**	**#N/A**	**#N/A**	**#N/A**	**1.8E-10**
+/- (m/s)	-8.9E-11	#VALUE!	#VALUE!	#VALUE!	1.6E-10
+/- order of mag	-0.10	#VALUE!	#VALUE!	#VALUE!	0.27



Field Observations

zone geology: greywacke, minor quartz veining, moderate low-angle foliations
zone fracture freq & quality (from core): FF = 0-3/m, OJ = 0-1/m, occasionally weakly foliatiated, R6
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: excellent
other problems that may affect results: none

Test Interpretation

K values: **<3E-10 m/s**

no significant flows, no curve. Leakage flows equalled or exceeded injection test flows. All flows were small.

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PACKER INJECTION TEST

(page 2)

Drillhole Nº	**10WBW004**
Test hole Nº	**#N/A**
Test Nº	**4**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	145	190	237	184	135
Max P during step	155	200	253	196	145
average pressure +/- psi	**5**	**5**	**8**	**6**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	0.30	#N/A	#N/A	#N/A	0.13
Hf (m)	0.00	#N/A	#N/A	#N/A	0.00
Hnit (m)	104.0	#N/A	#N/A	#N/A	97.0
K (m/sec)	4.6E-10	#N/A	#N/A	#N/A	2.1E-10

Low estimate of K

Q_{avg} (m^3/day)	0.26	#N/A	#N/A	#N/A	0.09
Hf (m)	0.00	#N/A	#N/A	#N/A	0.00
Hnit (m)	111.1	#N/A	#N/A	#N/A	104.0
K (m/sec)	3.7E-10	#N/A	#N/A	#N/A	1.3E-10

K averages for P step

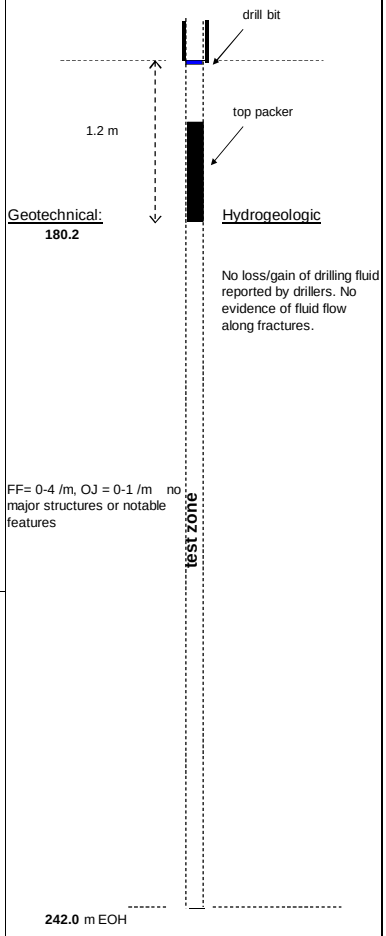
P	150	195	245
high est of K	3.E-10		
average K	3.E-10		
low est of K	3.E-10		

K avg all P steps

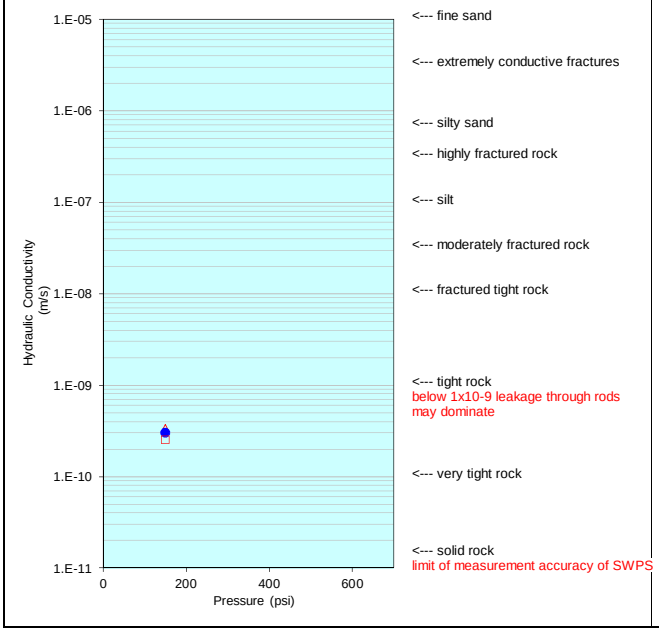
MAX	**3.E-10**
geomean	**3.E-10**
MIN	**3.E-10**

Comments: Equipment performed well. No casing leaks. Consistent flow rates in each test. Low conductivity is consistent with core.

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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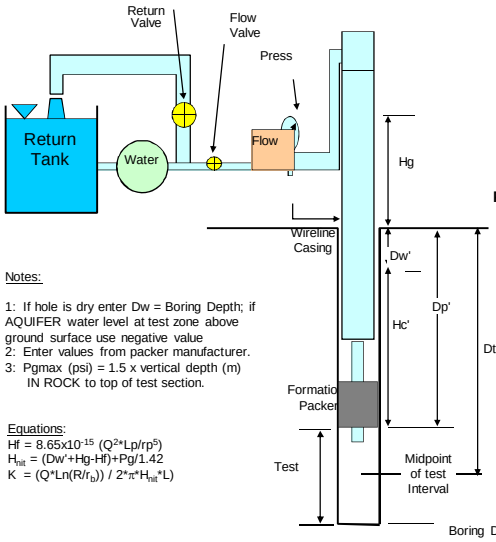
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - WBI**	**Test Interval (m):**	**240.2**	**to**	**308.0**	**Drillhole Nº**	**10WBW004**
UTM (x,y)	**41018.49E; 505664.6N**	**Start Date:**	**25-Jul**	**Time:**	**13:15**	**Target**	
Datum:	**UTM**	**End Date:**	**25-Jul**	**Time:**	**15:10**	**Test Nº**	**5**
GS Elevation:	**5067.721**	**Supervisor:**	**RB**			**DH Depth (m)**	**308.0**

Max Injection P (psi): 319

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

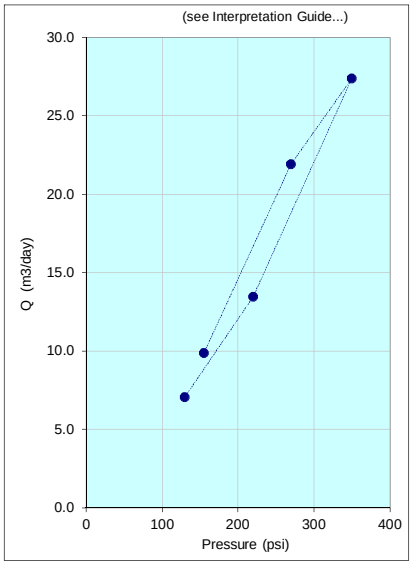
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	29.0	m
Dp	Measured depth to packer	**240.2**	m
Dt	Measured depth to midpoint of test	**274.1**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**212.7**	m
Dt'	Vertical depth to midpoint of test	**242.7**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**302**	psi
Paquifer	Water column pressure in aquifer (unc.)	**301**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	1.0	m
Lp	Length of discharge pipe	1.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**67.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	155	270	350	220	130
1	7.6	16.4	20.6	9.7	5.0
2	7.6	16.0	20.2	10.1	5.1
3	7.4	16.0	20.4	10.0	5.3
4	7.2	15.8	20.0	10.1	5.3
5	7.4	15.8	20.0	10.1	5.3
Stable Q **(L/min)**	7.4	16.0	20.2	10.1	5.3
Leak Q (L/min)	0.55	0.8	1.2	0.8	0.40
Q (m^3/day)	9.9	21.9	27.4	13.5	7.1
Hf (m)	0.00	0.01	0.02	0.00	0.00
Hnit (m)	111.0	192.0	248.3	156.8	93.4
K (m/day)	1.1E-03	1.4E-03	1.4E-03	1.1E-03	9.5E-04
K (m/s)	**1.3E-08**	**1.7E-08**	**1.6E-08**	**1.2E-08**	**1.1E-08**
+/- (m/s)	-5.4E-10	-1.4E-09	7.5E-10	2.7E-09	1.4E-09
+/- order of mag	-0.02	-0.04	0.02	0.09	0.05



Field Observations

zone geology: greywacke
zone fracture freq & quality (from core): FF = 0-3/m, OJ = 0-1/m, occasionally weakly foliatiated, R6, 1 cm gouge-filled joint at 303m
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: excellent
other problems that may affect results: none

Test Interpretation

K values: **2E-8 m/s**
"type curve" interpretation: ideal laminar flow

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PACKER INJECTION TEST

(page 2)

Drillhole Nº	**10WBW004**
Test hole N°	**#N/A**
Test Nº	**5**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	152	260	335	210	124
Max P during step	158	280	365	230	136
average pressure +/- psi	**3**	**10**	**15**	**10**	**6**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.02**	**0.04**	**0.05**	**0.04**	**0.02**

High estimate of K

Q_{avg} (m^3/day)	9.89	21.95	27.43	13.52	7.08
Hf (m)	0.00	0.01	0.02	0.00	0.00
Hnit (m)	108.9	185.0	237.8	149.8	89.2
K (m/sec)	1.3E-08	1.7E-08	1.7E-08	1.3E-08	1.2E-08

Low estimate of K

Q_{avg} (m^3/day)	9.81	21.77	27.22	13.35	7.00
Hf (m)	0.00	0.01	0.02	0.00	0.00
Hnit (m)	113.2	199.1	258.9	163.9	97.7
K (m/sec)	1.3E-08	1.6E-08	1.5E-08	1.2E-08	1.0E-08

K averages for P step

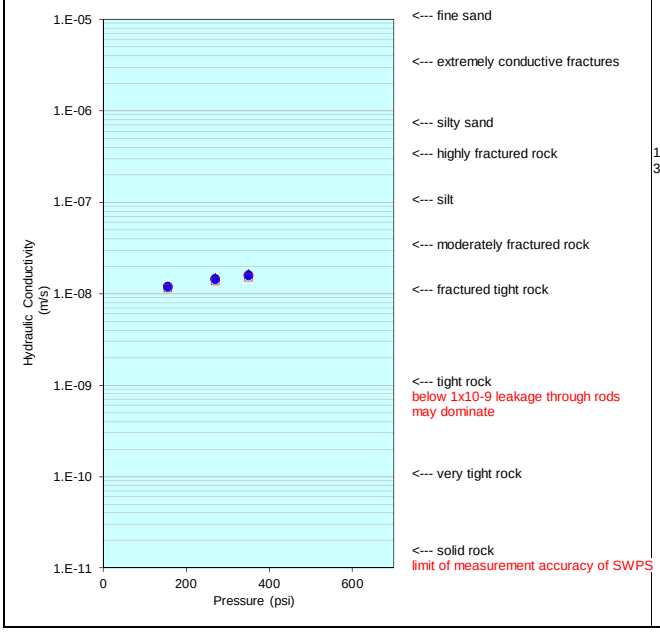
P	155	270	350
high est of K	1.E-08	2.E-08	2.E-08
average K	1.E-08	1.E-08	2.E-08
low est of K	1.E-08	1.E-08	2.E-08

K avg all P steps

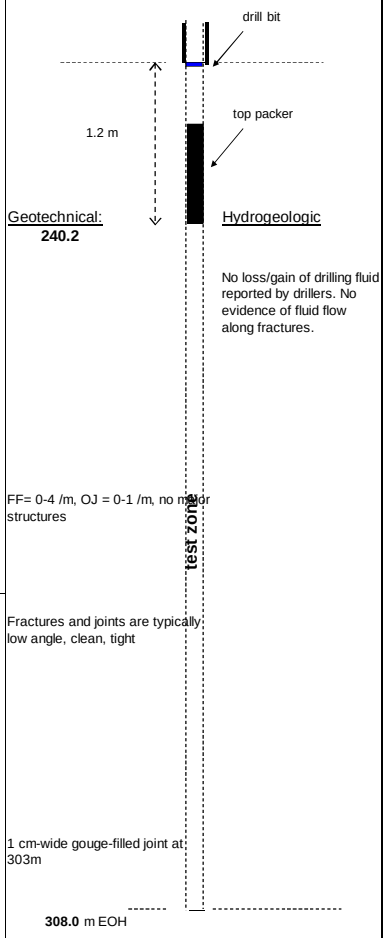
MAX	**2.E-08**
geomean	**1.E-08**
MIN	**1.E-08**

Comments: equipment performed well

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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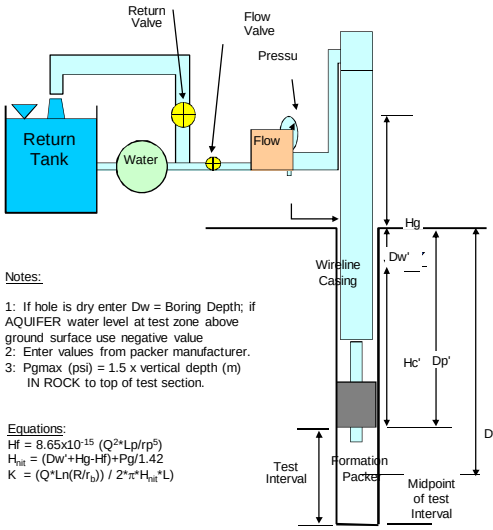
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - WBI**	**Test Interval (m):**	**291.2**	**to**	**308.0**	**Drillhole Nº**	**10WBW004**
UTM (x,y)	**41018.49E; 505664.6N**	**Start Date:**	**25-Jul**	**Time:**	**13:00**	**Target**	
Datum:	**UTM**	**End Date:**	**25-Jul**	**Time:**	**14:30**	**Test Nº**	**6**
GS Elevation:	**5067.721**	**Supervisor:**	**RB**			**DH Depth (m)**	**154.0**

Max Injection P (psi): 387

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

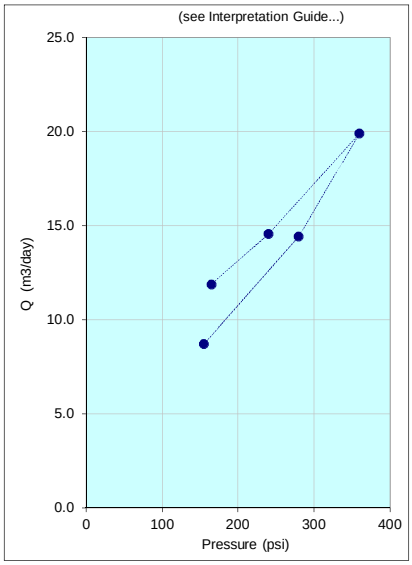
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	29.0	m
Dp	Measured depth to packer	**291.2**	m
Dt	Measured depth to midpoint of test	**299.6**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**257.8**	m
Dt'	Vertical depth to midpoint of test	**265.3**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**366**	psi
Paquifer	Water column pressure in aquifer (unc.)	**365**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	1.0	m
Lp	Length of discharge pipe	1.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**16.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	Q (Liters / min) *see flow calc. sheet				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	165	240	360	280	155
1	9.0	11.2	15.2	10.8	6.0
2	9.0	11.0	15.0	10.8	6.6
3	8.7	10.9	14.8	10.8	6.6
4	8.6	10.9	15.0	10.6	6.6
5	8.6	10.9		10.6	6.6
Stable Q **(L/min)**	8.80	10.90	15.00	10.90	6.60
Leak Q (L/min)	0.55	0.80	1.20	0.90	0.55
Q (m^3/day)	11.9	14.5	19.9	14.4	8.7
Hf (m)	0.00	0.01	0.01	0.01	0.00
Hnit (m)	118.1	170.9	255.4	199.1	111.0
K (m/day)	5.1E-03	4.3E-03	3.9E-03	3.7E-03	4.0E-03
K (m/s)	**5.9E-08**	**5.0E-08**	**4.6E-08**	**4.2E-08**	**4.6E-08**
+/- (m/s)	-5.1E-09	-2.3E-09	1.6E-09	5.2E-09	7.9E-09
+/- order of mag	-0.04	-0.02	0.02	0.05	0.07



Field Observations

zone geology: greywacke
zone fracture freq & quality (from core): FF = 0-4/m, OJ = 0-1/m, occasionally weakly foliatiated, R6, occasional R3
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: excellent
other problems that may affect results: none

Test Interpretation

K values: **5E-8 m/s**
"type curve" interpretation: almost ideal, slight clogging of fractures

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PACKER INJECTION TEST

(page 2)

Drillhole Nº	**10WBW004**
Test hole Nº	**#N/A**
Test Nº	**6**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	162	235	350	272	151
Max P during step	168	245	370	288	159
average pressure +/- psi	**3**	**5**	**10**	**8**	**4**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.05**	**0.05**	**0.1**	**0.1**	**0.03**

High estimate of K

Q_{avg} (m^3/day)	11.95	14.62	20.02	14.54	8.76
Hf (m)	0.00	0.01	0.01	0.01	0.00
Hnit (m)	116.0	167.4	248.4	193.4	108.2
K (m/sec)	6.0E-08	5.1E-08	4.7E-08	4.4E-08	4.7E-08

Low estimate of K

Q_{avg} (m^3/day)	11.74	14.40	19.58	14.11	8.63
Hf (m)	0.00	0.01	0.01	0.01	0.00
Hnit (m)	120.2	174.4	262.4	204.7	113.9
K (m/sec)	5.7E-08	4.8E-08	4.4E-08	4.0E-08	4.4E-08

K averages for P step

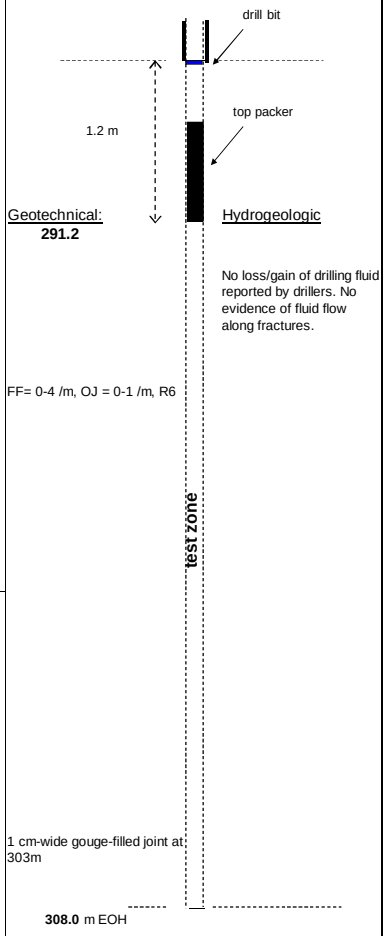
P	165	240	360
high est of K	5.E-08	5.E-08	5.E-08
average K	5.E-08	5.E-08	5.E-08
low est of K	5.E-08	4.E-08	4.E-08

K avg all P steps

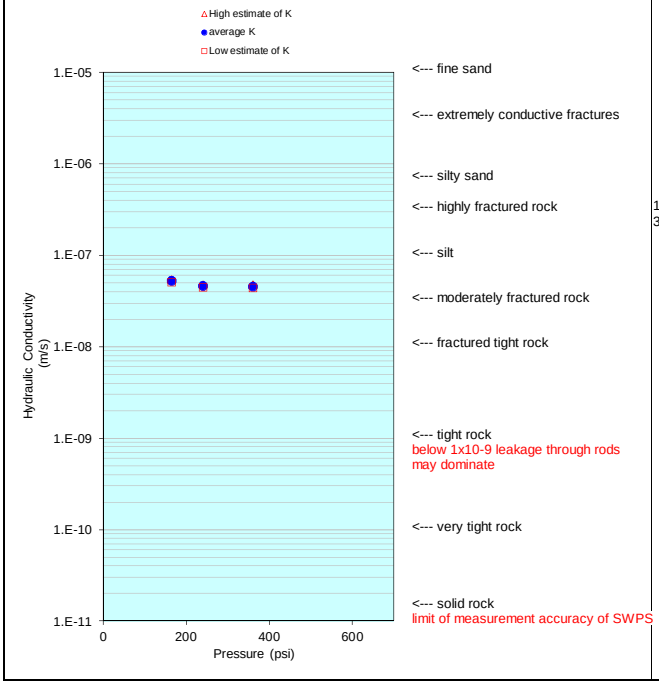
MAX	**5.E-08**
geomean	**5.E-08**
MIN	**4.E-08**

Comments: equipment performed well

Drawing of zone tested, including geotech / hydrogeo. conditions:



Graph of estimated hydraulic conductivity and error bounds.



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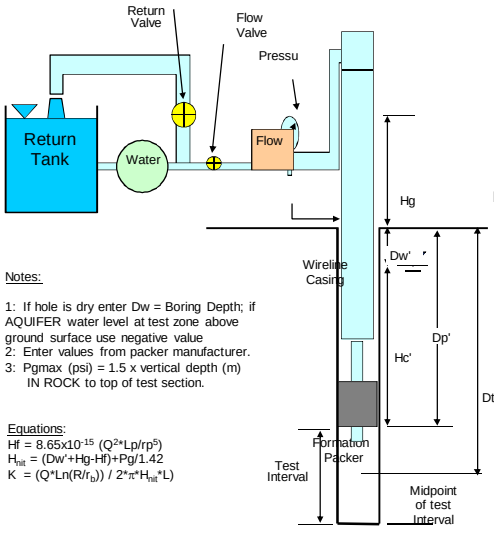
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - WBI**	**Test Interval (m):**	**300.2**	**to**	**362.0**	**Drillhole Nº**	**10WBW004**
UTM (x,y)	**41018.49E; 505664.6N**	**Start Date:**	**26-Jul**	**Time:**	**19:00**	**Target**	
Datum:	**UTM**	**End Date:**	**26-Jul**	**Time:**	**20:20**	**Test Nº**	**7**
GS Elevation:	**5067.721**	**Supervisor:**	**JS**			**DH Depth (m)**	**362.0**

Max Injection P (psi): 398

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

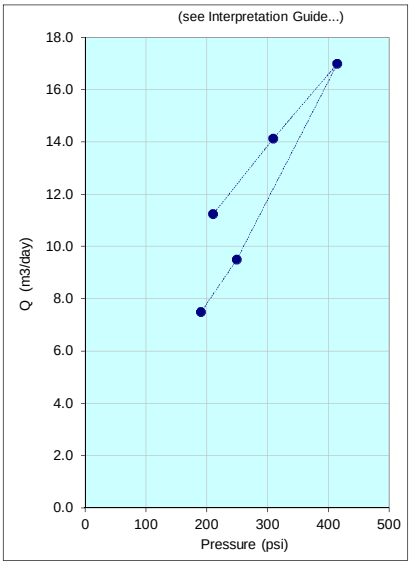
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	-1.5	m
Dbr	Measured vertical depth to bedrock	2.0	m
Dp	Measured depth to packer	**300.2**	m
Dt	Measured depth to midpoint of test	**331.1**	m
ß	Inclination from horizontal (degrees)	62	°
Dw'	Vertical depth to static water level	**0.0**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**265.3**	m
Dt'	Vertical depth to midpoint of test	**292.6**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**377**	psi
Paquifer	Water column pressure in aquifer (unc.)	**379**	psi
Pdiff	Existing differential shear pressure	**-3**	psi
Pshear	Shear pressure required at pump	**503**	psi
Hg	Gauge height	1.0	m
Lp	Length of discharge pipe	1.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**61.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	Q (Liters / min) *see flow calc. sheet				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	210	310	415	250	190
1	**8.00**	**10.00**	**12.40**	**6.50**	**5.00**
2	**7.80**	**9.80**	**12.00**	**6.80**	**5.10**
3	**7.80**	**10.20**	**11.60**	**6.60**	**5.30**
4	**7.80**	**9.60**	**11.80**	**6.50**	**5.40**
5		**9.60**	**11.80**	**6.70**	**5.20**
Stable Q **(L/min)**	**7.80**	**9.80**	**11.80**	**6.60**	**5.20**
Leak Q (L/min)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Q (m^3/day)	11.2	14.1	17.0	9.5	7.5
Hf (m)	0.00	0.01	0.01	0.00	0.00
Hnit (m)	148.9	219.3	293.2	177.1	134.8
K (m/day)	1.0E-03	8.8E-04	8.0E-04	7.4E-04	7.6E-04
K (m/s)	**1.2E-08**	**1.0E-08**	**9.2E-09**	**8.5E-09**	**8.8E-09**
+/- (m/s)	-1.3E-09	-5.5E-10	2.7E-10	1.1E-09	1.9E-09
+/- order of mag	-0.05	-0.02	0.01	0.05	0.08



Field Observations

zone geology: greywacke
zone fracture freq & quality (from core): FF = 1-3/m, OJ = 0-1/m, occasionally weakly foliatiated, R6
packer seal quality: excellent (after 3 attempts)
flow meter system problems: none
measurement accuracy: excellent, 0.03-0.05 l/min
other problems that may affect results: none

Test Interpretation

K values: **1E-8 m/s**

"type curve" interpretation: almost ideal, slight clogging of fractures

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10WBW004**
Test hole N°	**#N/A**
Test N°	**7**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	205	302	405	243	185
Max P during step	215	318	425	257	195
average pressure +/- psi	**5**	**8**	**10**	**7**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.03**	**0.04**	**0.05**	**0.03**	**0.03**

High estimate of K

Q_{avg} (m^3/day)	11.28	14.17	17.06	9.55	7.53
Hf (m)	0.00	0.01	0.01	0.00	0.00
Hnit (m)	145.4	213.7	286.2	172.1	131.3
K (m/sec)	1.2E-08	1.1E-08	9.5E-09	8.8E-09	9.1E-09

Low estimate of K

Q_{avg} (m^3/day)	11.15	14.00	16.85	9.42	7.40
Hf (m)	0.00	0.01	0.01	0.00	0.00
Hnit (m)	152.4	224.9	300.3	182.0	138.3
K (m/sec)	1.2E-08	9.9E-09	8.9E-09	8.2E-09	8.5E-09

K averages for P step

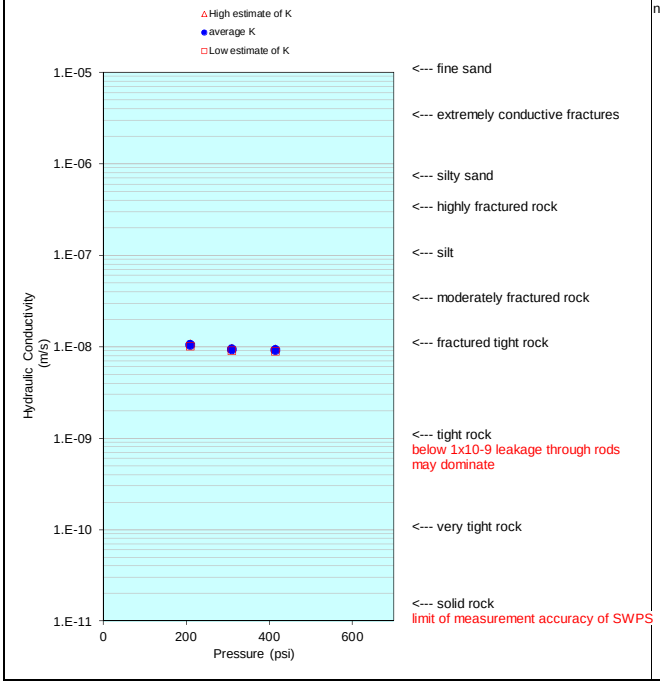
P	210	310	415
high est of K	1.E-08	1.E-08	9.E-09
average K	1.E-08	9.E-09	9.E-09
low est of K	1.E-08	9.E-09	9.E-09

K avg all P steps

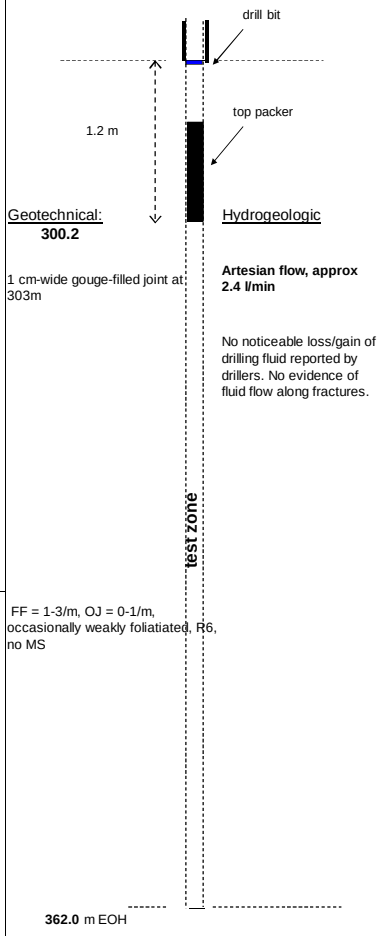
MAX	**1.E-08**
geomean	**1.E-08**
MIN	**9.E-09**

Comments: difficulty locking in the backend. 3 tests were stopped during injection due to accelerating casing leakage. For these, the packer offered no resistance to the wireline during retrieval. The 4th attempt was successfu and yielded the data above. No casing leakage during testing. Artesian flow, approx 2.4 l/min.

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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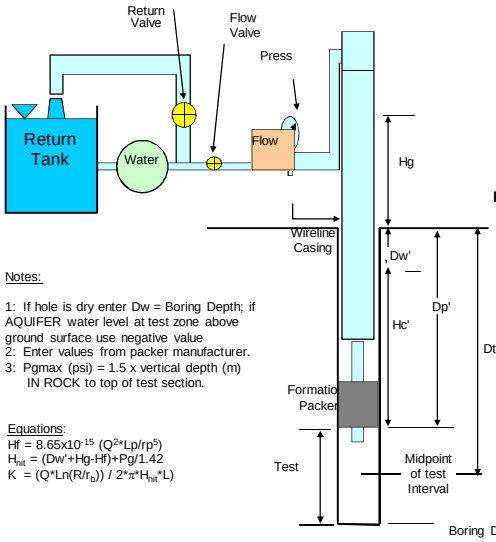
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - WBI**	**Test Interval (m):**	**318.2**	**to**	**362.0**	**Drillhole Nº**	**10WBW004**
UTM (x,y)	**41018.49E; 505664.6N**	**Start Date:**	**26-Jul**	**Time:**	**20:30**	**Target**	
Datum:	**UTM**	**End Date:**	**26-Jul**	**Time:**	**22:10**	**Test Nº**	**8**
GS Elevation:	**5067.721**	**Supervisor:**	**JS**			**DH Depth (m)**	**362.0**

Max Injection P (psi): 418

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65 \times 10^{-15} (Q^2 * Lp / rp^5)$

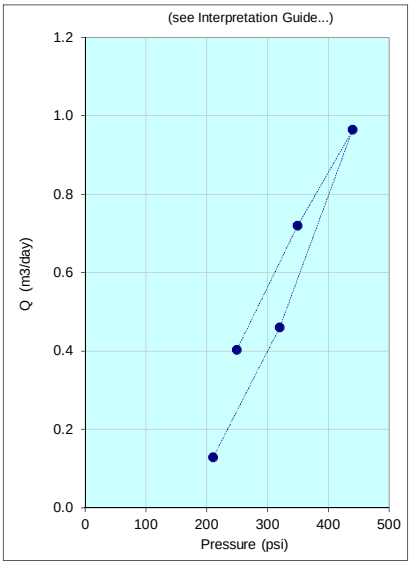
$H_{nit} = (Dw' + Hg - Hf) + Pg / 1.42$

$K = (Q * Ln(R/r_b)) / 2 * \pi * H_{nit} * L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	29.0	m
Dp	Measured depth to packer	**318.2**	m
Dt	Measured depth to midpoint of test	**340.1**	m
ß	Inclination from horizontal (degrees)	61	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**278.6**	m
Dt'	Vertical depth to midpoint of test	**297.7**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**396**	psi
Paquifer	Water column pressure in aquifer (unc.)	**395**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	1.0	m
Lp	Length of discharge pipe	1.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**43.8**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	250	350	440	320	210
1	0.24	0.52	0.62	0.34	0.09
2	0.34	0.52	0.62	0.34	0.09
3	0.28	0.48	0.72	0.30	0.09
4	0.24	0.48	0.72	0.32	0.09
5	0.28			0.34	
Stable Q **(L/min)**	0.28	0.50	0.67	0.32	0.09
Leak Q (L/min)	0.00	0.00	0.00	0.00	0.00
Q (m^3/day)	0.4	0.7	1.0	0.5	0.1
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	177.9	248.4	311.7	227.2	149.8
K (m/day)	4.4E-05	5.6E-05	6.0E-05	3.9E-05	1.7E-05
K (m/s)	**5.1E-10**	**6.5E-10**	**6.9E-10**	**4.6E-10**	**1.9E-10**
+/- (m/s)	-1.3E-10	-6.2E-11	4.4E-11	1.3E-10	1.9E-10
+/- order of mag	-0.13	-0.04	0.03	0.11	0.29



Field Observations

zone geology: greywacke
zone fracture freq & quality (from core): FF = 1-3/m, OJ = 0-1/m, occasionally weakly foliatiated, R6
packer seal quality: excellent
flow meter system problems: none
measurement accuracy: good. Pressure adjustmentts required to maintain constant value
other problems that may affect results: none

Test Interpretation

K values: **5E-10 m/s**

"type curve" interpretation: slight clogging of fractures

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10WBW004**
Test hole N°	
Test N°	**8**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	245	335	420	310	205
Max P during step	255	365	460	330	215
average pressure +/- psi	**5**	**15**	**20**	**10**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	0.42	0.73	0.98	0.48	0.14
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	174.4	237.8	297.7	220.2	146.2
K (m/sec)	5.4E-10	6.9E-10	7.4E-10	4.8E-10	2.2E-10

Low estimate of K

Q_{avg} (m^3/day)	0.37	0.69	0.94	0.43	0.10
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	181.5	258.9	325.8	234.3	153.3
K (m/sec)	4.6E-10	6.0E-10	6.5E-10	4.1E-10	1.5E-10

K averages for P step

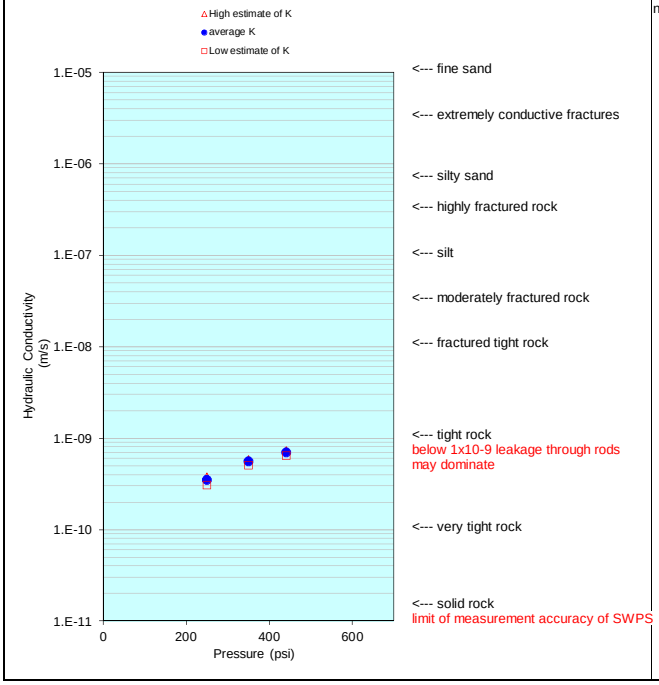
P	250	350	440
high est of K	4.E-10	6.E-10	7.E-10
average K	4.E-10	6.E-10	7.E-10
low est of K	3.E-10	5.E-10	6.E-10

K avg all P steps

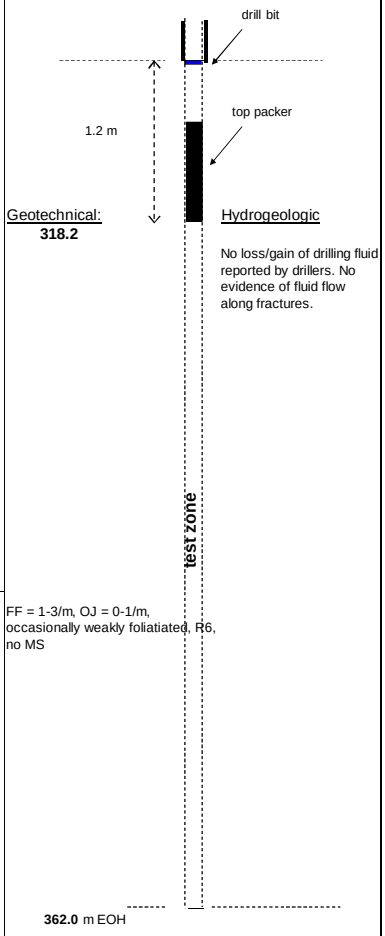
MAX	**7.E-10**
geomean	**5.E-10**
MIN	**3.E-10**

Comments: subset of Test 7

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



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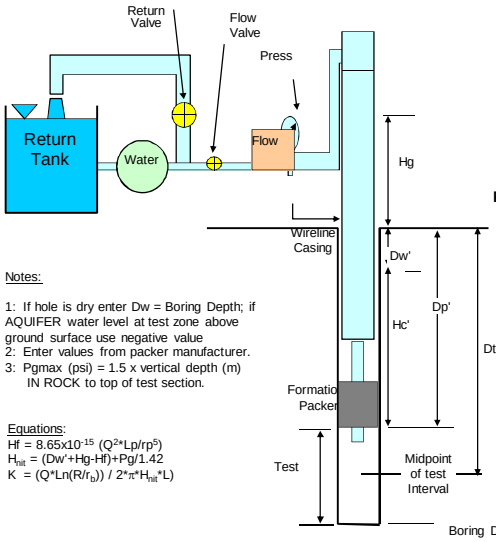
PACKER INJECTION TEST *(modified from HCI)*

Project:	**Hope Bay - WBI**	**Test Interval (m):**	**360.2**	**to**	**415.5**	**Drillhole Nº**	**10WBW004**
UTM (x,y)	**41018.49E; 505664.6N**	**Start Date:**	**28-Jul**	**Time:**	**11:20**	**Target**	
Datum:	**UTM**	**End Date:**	**28-Jul**	**Time:**	**12:45**	**Test Nº**	**9**
GS Elevation:	**5067.721**	**Supervisor:**	**RB**			**DH Depth (m)**	**415.5**

Max Injection P (psi): 460

Depth to wedge: 0 m



Notes:

1: If hole is dry enter Dw = Boring Depth; if AQUIFER water level at test zone above ground surface use negative value
2: Enter values from packer manufacturer.
3: Pgmax (psi) = 1.5 x vertical depth (m) IN ROCK to top of test section.

Equations:

$Hf = 8.65x10^{-15} (Q^2*Lp/rp^5)$

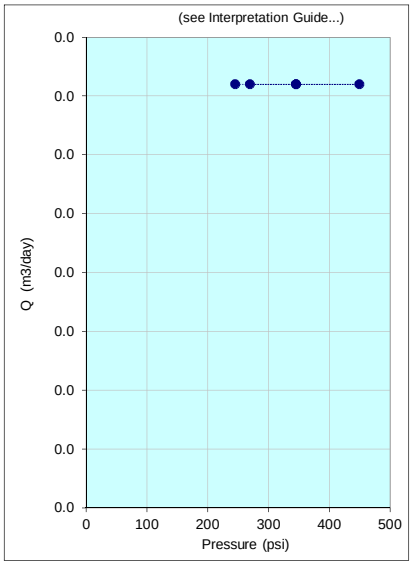
$H_{nit} = (Dw'+Hg-Hf)+Pg/1.42$

$K = (Q*Ln(R/r_b)) / 2*\pi*H_{nit}*L)$

Dw	Measured depth of static water level (1)	1.0	m
Dbr	Measured vertical depth to bedrock	29.0	m
Dp	Measured depth to packer	**360.2**	m
Dt	Measured depth to midpoint of test	**387.9**	m
ß	Inclination from horizontal (degrees)	58	°
Dw'	Vertical depth to static water level	**0.9**	m
	Rod stickup above ground	**0.0**	m
Dp'	Vertical depth to packer	**306.5**	m
Dt'	Vertical depth to midpoint of test	**330.0**	m
SP	Shear Pin Rating (psi)	500	psi
Prods	Water column pressure in drill rods	**435**	psi
Paquifer	Water column pressure in aquifer (unc.)	**434**	psi
Pdiff	Existing differential shear pressure	**1**	psi
Pshear	Shear pressure required at pump	**499**	psi
Hg	Gauge height	1.0	m
Lp	Length of discharge pipe	1.00	m
rp	Radius of discharge pipe (1"=0.0127m)	0.0127	m
R	Radius of influence (10 m is standard value)	10	m
rb	Borehole radius (HQ=0.048m, NQ=0.038m)	0.048	m
L	Length of test section	**55.3**	m
Hf	Friction Loss		
Hnit	Net injection head at midpoint of test		
K	Hydraulic conductivity		

Conversion Factors:
10 m of water = 0.9807 bar = 1kg/cm^2 = 14.2 psi
1 cm/sec = 864 m/day
1 Lugeon = 1 lit/min per meter at 10 bar, which is approx. 1.4 x 10^{-5} cm/sec

Measurement (show last 3 to 5 flow meter readings)	**Q (Liters / min) *see flow calc. sheet**				
	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
	270	345	450	345	245
1	**0.00**	**0.00**	**0.04**	**0.00**	**0.00**
2	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
3	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
4	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
5	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Stable Q **(L/min)**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
Leak Q (L/min)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Q (m^3/day)	0.0	0.0	0.0	0.0	0.0
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	192.0	244.8	318.8	244.8	174.4
K (m/day)	1.2E-06	9.0E-07	6.9E-07	9.0E-07	1.3E-06
K (m/s)	**1.3E-11**	**1.0E-11**	**8.0E-12**	**1.0E-11**	**1.5E-11**
+/- (m/s)	1.5E-11	1.1E-11	8.4E-12	1.1E-11	1.4E-11
+/- order of mag	0.33	0.31	0.31	0.31	0.29



Field Observations

zone geology: greywacke
zone fracture freq & quality (from core): typical FF = 2-3/m, OJ = 0-1/m, moderately to strongly foliatiated, R6
packer seal quality: excellent
flow meter system problems: none. Flow occurred during pressure increases, and then reversed entirely during pressure decreases (ie stages 4 and 5).
measurement accuracy: good. Pressure adjustmentts required to maintain constant value because of miniscule flows
other problems that may affect results: none

Test Interpretation

K values: **1E-11 m/s**

no flow, no curve

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PACKER INJECTION TEST

(page 2)

Drillhole N°	**10WBW004**
Test hole N°	
Test N°	**9**

Pressure oscillation during test

Pressure step	P_g (psi) Step 1	P_g (psi) Step 2	P_g (psi) Step 3	P_g (psi) Step 4	P_g (psi) Step 5
Min P during step	265	337	440	338	240
Max P during step	275	353	460	352	250
average pressure +/- psi	**5**	**8**	**10**	**7**	**5**

Flowmeter measurement reading accuracy

volume +/- Liters / **min**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**

High estimate of K

Q_{avg} (m^3/day)	0.03	0.03	0.03	0.03	0.03
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	188.5	239.2	311.7	239.9	170.9
K (m/sec)	2.7E-11	2.1E-11	1.6E-11	2.1E-11	3.0E-11

Low estimate of K

Q_{avg} (m^3/day)	-0.01	-0.01	-0.01	-0.01	-0.01
Hf (m)	0.00	0.00	0.00	0.00	0.00
Hnit (m)	195.5	250.4	325.8	249.7	177.9
K (m/sec)	#N/A	#N/A	#N/A	#N/A	#N/A

K averages for P step

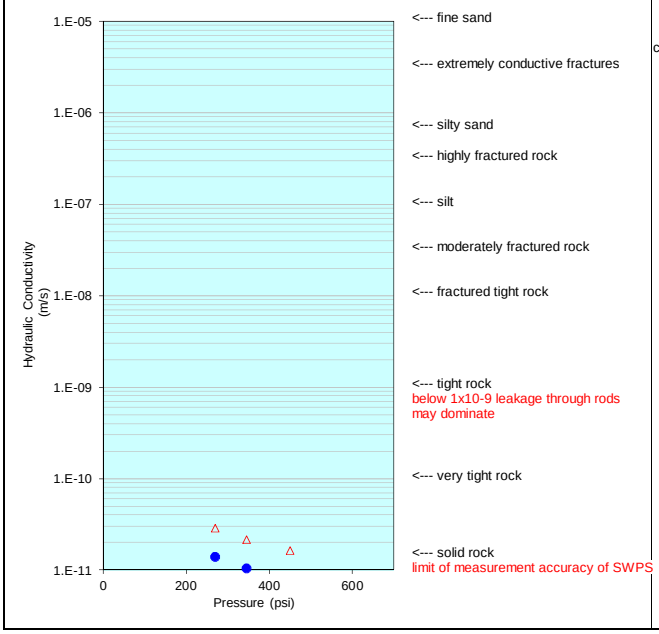
P	270	345	450
high est of K	3.E-11	2.E-11	2.E-11
average K	1.E-11	1.E-11	8.E-12
low est of K			

K avg all P steps

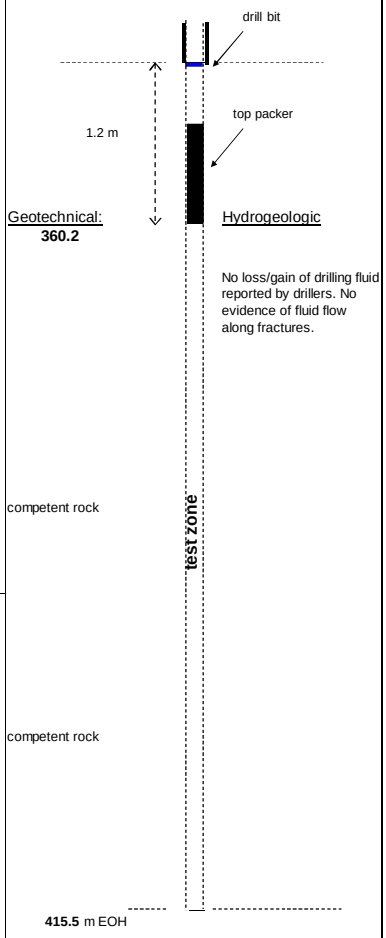
MAX	**3.E-11**
geomean	**1.E-11**
MIN	**#N/A**

Comments: Virtually no flow during the entire test; ie net 0.04 litres . Flow values assigned as 0.01 l/min to enable calculating and plotting K values. Lack of flow is consistent with core characteristics.

Graph of estimated hydraulic conductivity and error bounds.



Drawing of zone tested, including geotech / hydrogeo. conditions:



Appendix E
Packer Testing Core Photo Reviews

Hole 10WBW001: 15.58 to 26.72m: basalt with minimal fractures

Hole 10WBW001: 26.72 to 37.44m: basalt with increase in foliation and fractures

Hole 10WBW001: 37.44 to 48.35m: foliated basalt with sericite and dolomite alteration; increased section of fracture frequency

Hole 10WBW001: 48.35 to 59.1m: foliated basalt decreasing alteration after 54m

Hole 10WBW001: Minor quartz veining causing higher fracture frequency and possible conduit for water movement

Hole 10WBW001: 59.1 to 70.0m: foliated basalt

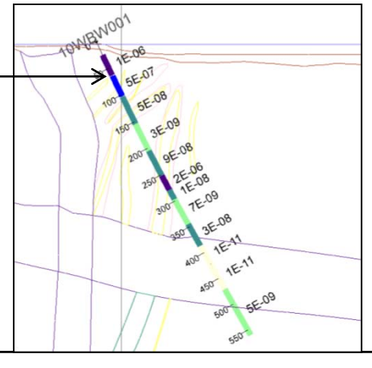
10WBW001 Packer Test 1 Summary

Test from 25.0 to 62.0m
K = 1.4E-06 m/s

Lithologies included: basalt with increasing foliation from top of hole; some sericite and dolomite alteration; minor pyrite

Potential conduits of water: Increasing foliation causing more fractures; more probable in section of quartz veining with fracture along joint . Note that there was loss of circulation during drilling on this interval.

Test 1



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hope Bay Project (Doris)

Hole 10WBW001
Packer Test 1: 25.0m to 63.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	1

Hole 10WBW001: 59.10 to 70.0m

Hole 10WBW001: 70.0 to 80.70m; section with higher foliation breaks

Increased foliation breaks and weak calcite veining visible

Hole 10WBW001: 80.70 to 91.34m; increased fractures just above diabase contact

Increased fracture frequency above contact.

Hole 10WBW001: 91.34 to 102.0; section with increased fractures, although probably mechanical

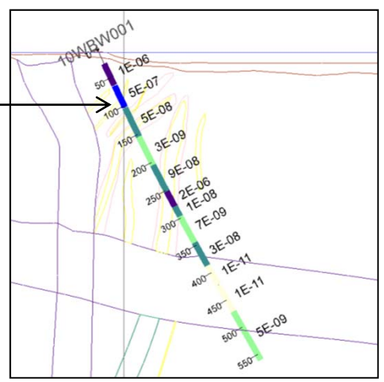
10WBW001 Packer Test 2 Summary

Test from 64.0 to 102.0m
K = 4.6 E-07 m/s

Lithologies included: basalt-diabase contact at 91.34m and diabase-basalt at 100.90m

Potential conduits of water: increased fracture frequency above contact and in section of foliation.

Test 2



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW001
Packer Test 2: 64.0m to 102.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	2

Hole 10WBW001: 144.66 to 155.79m

Hole 10WBW001: 155.79 to 166.70m

Hole 10WBW001: 166.70 to 177.38m

Hole 10WBW001: 177.37 to 188.20m

Hole 10WBW001: 188.20 to 198.80m

Hole 10WBW001: 198.8 to 209.92m

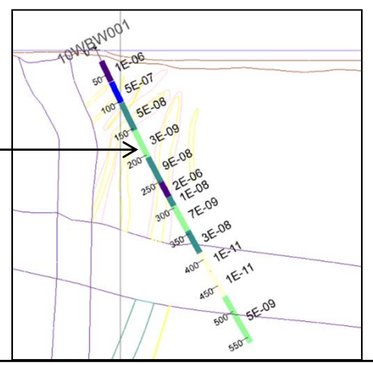
10WBW001 Packer Test 5 Summary

Test from 154.0 to 204.8m
K = 2.6E-09m/s

Lithologies included: foliated basalt

Potential conduits of water: low flow, results representative of general conductivity of the foliated basalt.

Test 5 →



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW001
Packer Test 5: 154.0m to 204.8m

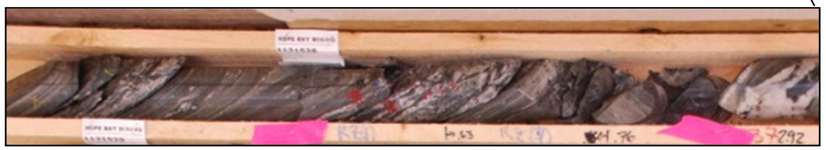
PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	3

Hole 10WBW001: 102.0 to 113.10m

Hole 10WBW001: 113.10 to 123.82m

Hole 10WBW001: 123.82 to 133.9m

Hole 10WBW001: 133.90 to 144.66m; rubble zone from foliation breaks around 144m.



Shearing at 113.10 to 113.60m.

Shearing at 133.3 to 133.6m.

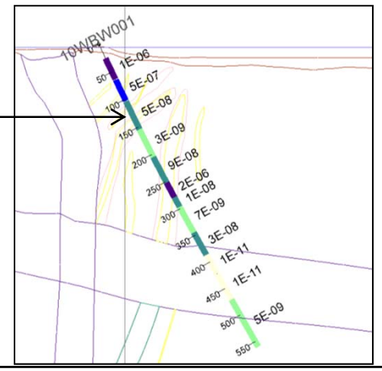
Hole 10WBW001: 144.66 to 155.79m

10WBW001 Packer Test 6 Summary

Test from 103.0 to 154.0m
K = 5.2E-08 m/s

Lithologies included: basalt with varied alteration minerals and veining.

Potential conduits of water: Small shears, possible alpha fault at 113m and 133m. Foliation rubble zone at 144m;



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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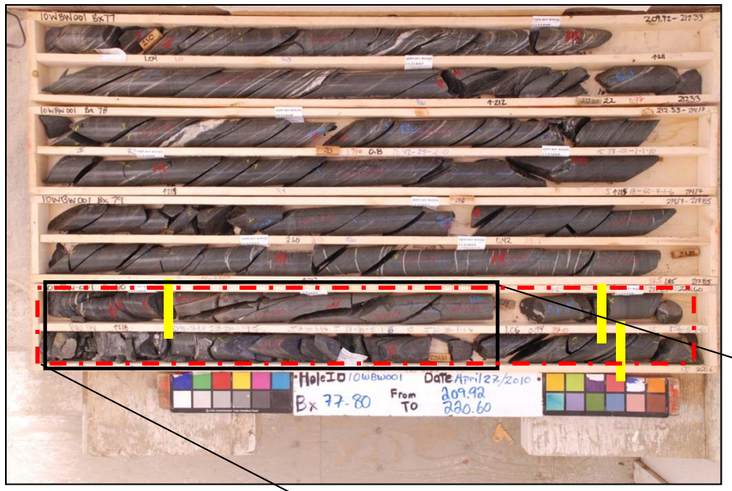
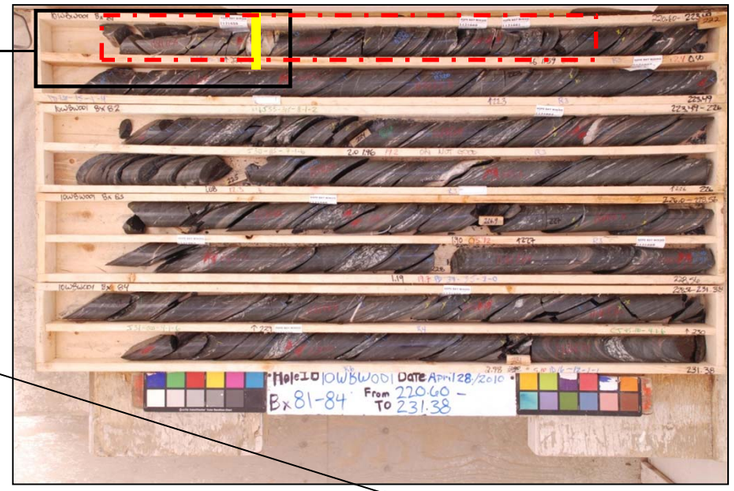
Hole 10WBW001
Packer Test 6: 103.0m to 154.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	4

Hole 10WBW001: 198.80 to 209.92m: Continuation of basalt



Hole 10WBW001: 209.92 to 220.60m: Two small intermediate dykes – 218.11 to 219.31m and 220.5 to 220.94m



Hole 10WBW001: 220.60 to 231.38m: Fracture counts decrease somewhat after dykes.

Hole 10WBW001: 231.38 to 241.76m

Hole 10WBW001: 241.76 to 252.60m: Continuation of basalt. Increase in qtz/dol veining.

Hole 10WBW001: Close-up of intermediate dykes. Healed breccia noted at bottom contact in box 81.

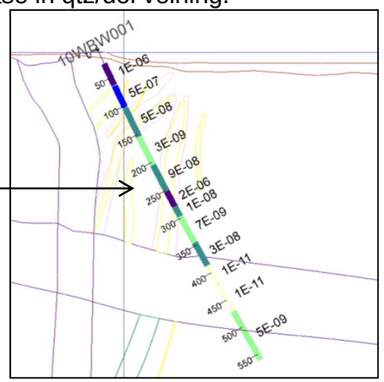
10WBW001 Packer Test 7 Summary

Test from 203.0 to 252.0m
K = 9.4E-08 m/s

Lithologies included: Fine-grained flow basalt. Qtz/dol veins begin to show sericite alteration halos. Two intermediate dykes exist at 218 – 221m.

Potential conduits of water: Fracture counts are highest around dykes, but dykes themselves are cohesive. Heavy veining around bottom of test.

Test 7



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hope Bay Project (Doris)

Hole 10WBW001
Packer Test 7: 203.0m to 252.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	5

Hole 10WBW001: 241.76 to 252.60m

Hole 10WBW001: 252.60 to 263.84m: Source of slow artesian flow

Hole 10WBW001: 263.84 to 274.86m

Hole 10WBW001: 274.86 to 285.40m: Continuation of basalt.

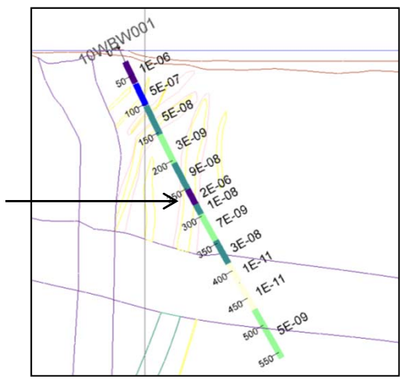
Hole 10WBW001: 252.60 to 260m: Close-up of veining, and of the 254m mark where water pressure was lost during drilling.

10WBW001 Packer Test 8 Summary

Test from 252.0 to 279.0m
K = 1.5E-06 m/s

Lithologies included: Fine-grained flow basalt. Weak to moderately altered. Qtz and dolomite veins cut across foliation.
Potential conduits of water: Increase in strain producing more prominent foliation. Water bearing fracture at 254m caused total water pressure loss during drilling past. No significant increase in # fractures or change in lithology.

Test 8



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW001
Packer Test 8: 252.0m to 279.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	6

Hole 10WBW001: 274.86 to 285.40m: Basalt. A few rubble zones related to foliation in competent rock

Hole 10WBW001: 285.40 to 296.14m

Hole 10WBW001: 296.14 to 307.00m

Hole 10WBW001: 280.37 to 285.40m: Basalt. Close-up of rubble zones.

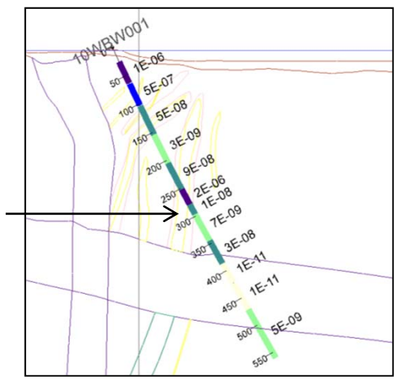
10WBW001 Packer Test 9 Summary

Test from 279.0 to 297.0m
K = 9.6E-09 m/s

Lithologies included: Fine-grained flow basalt with irregular cc veining.

Potential conduits of water: Foliation-related rubble zones/small faulting from 281.5 to 285.4m.

Test 9



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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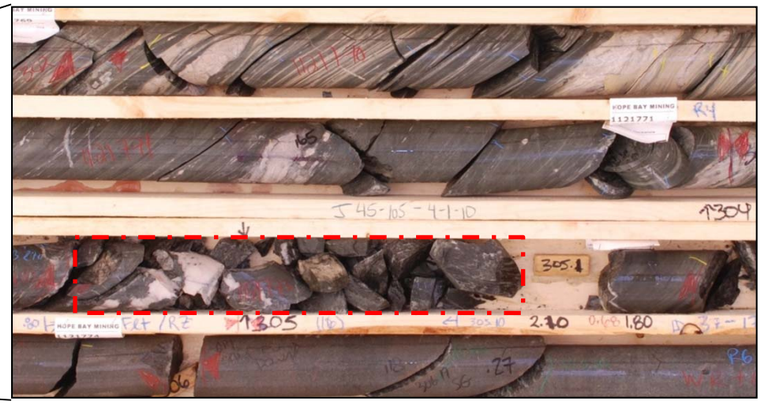
Hole 10WBW001
Packer Test 9: 279.0m to 297.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	7

Hole 10WBW001: 296.14 to 307.00m: Contact with intermediate dyke at 305.19m



Hole 10WBW001: Close-up of jointed fault/rubble zone at 304.8-305.1m associated with dyke contact at 305.19m. Sericite-altered foliated basalt also shown (top).

Hole 10WBW001: 307.00 to 318.00m: Contact with intermediate dyke at 308.27m. 20cm jointed fault/rubble zone 312.8 – 313m.

Hole 10WBW001: 318.00 to 328.95m

Hole 10WBW001: 328.95 to 339.93m

Hole 10WBW001: 339.93 to 351.00m

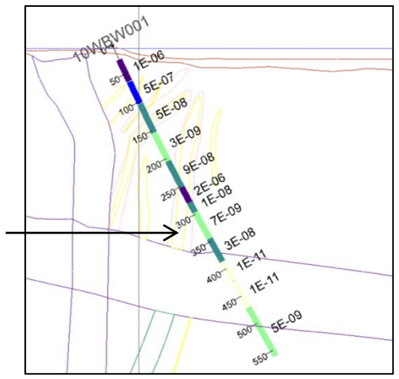
10WBW001 Packer Test 10 Summary

Test from 297.0 to 345.0m
K = 7.2E-09 m/s

Lithologies included: Fine grained flow basalt. From 305.19 to 308.27m, medium-grained, equigranular intermediate dyke.

Potential conduits of water: Low flow. Conduits for increased flow may include small fault/rubble zones around dyke near top of test zone.

Test 10



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW001
Packer Test 10: 297.0m to 345.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	8

Hole 10WBW001: 339.93 to 351.00m: Basalt unit

Hole 10WBW001: 351.00 to 361.65m: Heavily jointed region at 357.70 – 358.48m

Hole 10WBW001: Close-up of jointed region/rubble zone/faulting at 357.70 to 357.83m and 358.23 to 358.48m

Hole 10WBW001: 361.65 to 372.59m

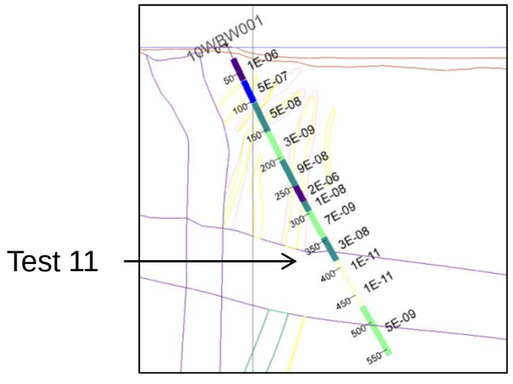
Hole 10WBW001: 372.59 to 383.65m: Diabase upper contact with basalt

Hole 10WBW001: 383.65 to 394.75m

10WBW001 Packer Test 11 Summary

Test from 345.0 to 387.0m
K = 2.7E-08 m/s

Lithologies included: Fine grained flow basalt with irregular cc veining. Metamorphic contact aureole begins at 338m, just above test zone. Competent, fine-medium grained diabase unit begins at 381.03m, near bottom of test zone.
Potential conduits of water: Fracture/joint frequency increases around the fault/rubble at 358m. Not a significant increase in fracture frequency at lower contact.



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW001
Packer Test 11: 345.0m to 387.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	9

Hole 10WBW001: 383.65 to 394.75m: Competent diabase unit

Hole 10WBW001: 394.75 to 406.28m

Close-up of vuggy jointed zone with very coarse fill at 397.14 – 397.5m

Hole 10WBW001: 406.28 to 417.65m

Hole 10WBW001: 417.65 to 429.12m: Continuation of diabase

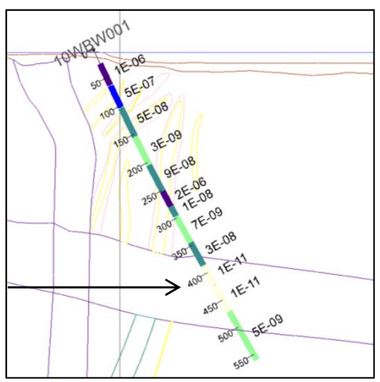
10WBW001 Packer Test 12 Summary

Test from 387.0 to 422.5m
K = 1.4E-11 m/s

Lithologies included: Competent diabase unit

Potential conduits of water: Small jointed section at 397.14 – 397.5m does not appear to significantly affect low K packer test result.

Test 12



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW001
Packer Test 12: 387.0m to 422.5m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	10

Hole 10WBW001: 417.65 to 429.12m: Fine-medium grained diabase

Hole 10WBW001: 429.12 to 440.81m

Hole 10WBW001: 440.81 to 452.18m

Hole 10WBW001: 452.18 to 463.13m

Hole 10WBW001: 463.13 to 475.39m: Fine-medium grained diabase

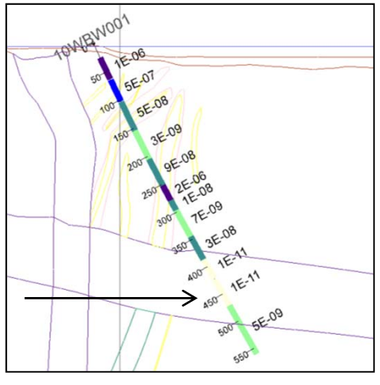
10WBW001 Packer Test 13 Summary

Test from 423.0 to 471.0m
K = 1.4E-11 m/s

Lithologies included: Continuation of coherent diabase unit

Potential conduits of water: None specific. Very low flow.

Test 13



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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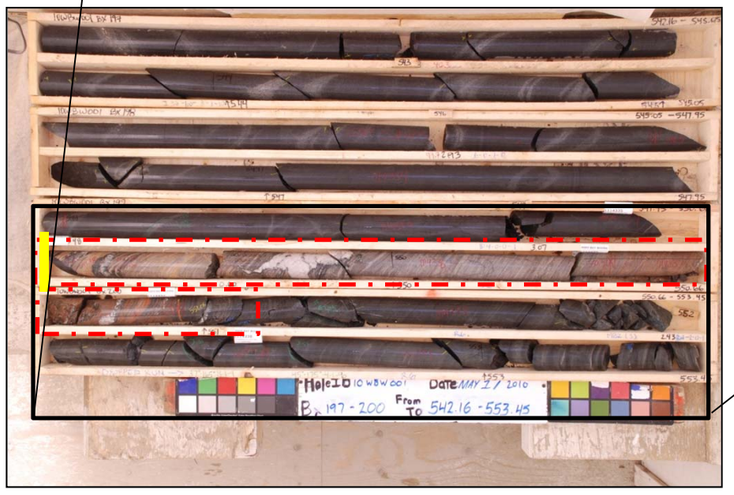
Hole 10WBW001
Packer Test 13: 423.0m to 471.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	11

Hole 10WBW001: 463.13 to 475.39m: Continuation of fine-medium grained diabase. Very coherent rock.

Hole 10WBW001: 547.95 to 553.45m: Contact extremely well defined. Basalt significantly more fractured than diabase.

Hole 10WBW001: 530.55 to 542.16m: Continuation of diabase



542.16 to 553.45m: Sharp diabase/ cooked basalt contact

Hole 10WBW001: 553.45 to 564.00m: Fine-grained cooked flow basalt, slightly vuggy in areas, vugs infilled with clay. EOH

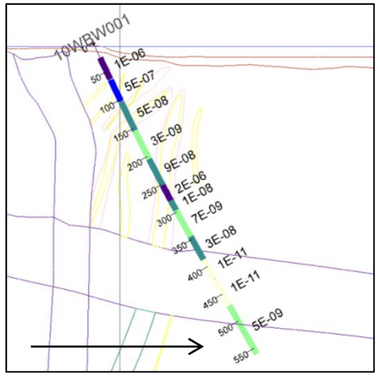
10WBW001 Packer Test 14 Summary

Test from 471.0 to 564.0m
K = 5.1E-09 m/s

Lithologies included: -Strong diabase with very few fractures. –Banded, moderately sericitized basalt with strong silicic overprinting.

Potential conduits of water: Rock significantly more fractured and slightly vuggy below diabase/basalt contact at 549.28m.

Test 14



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW001
Packer Test 14: 471.0m to 564.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	12

Hole 10WBW002: 399.19 to 409.48m: Foliated basalt

Hole 10WBW002: 409.48 to 420.25m

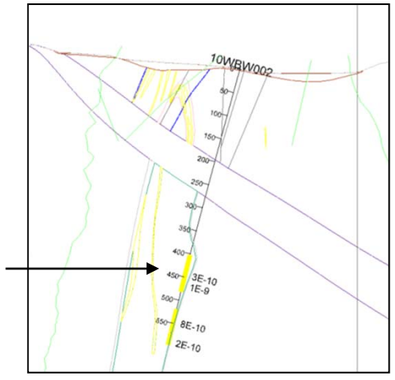
Hole 10WBW002: 420.25 to 431.00m

Hole 10WBW002: 431.00 to 442.04m: Continuation of foliated basalt. Veining chaotic. Number of natural joints and fractures remains consistent.

Hole 10WBW002: 442.04 to 452.80m: Unfoliated pillow basalts begin at 443.3 after a meter of brecciated stockwork.

Hole 10WBW002: 452.80 to 464.00m: A magnetic diabase dyke exists from 456.35m to 456.83m. Contacts sharp. No effect on fracture frequency.

Continued on the next page…



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW002
Packer Test 1: 402.3m to 482.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	13

Hole 10WBW002: 464.00 to 474.11m

Hole 10WBW002: 474.11 to 483.30m: Pillow basalts continue.

10WBW002 Packer Test 1 Summary

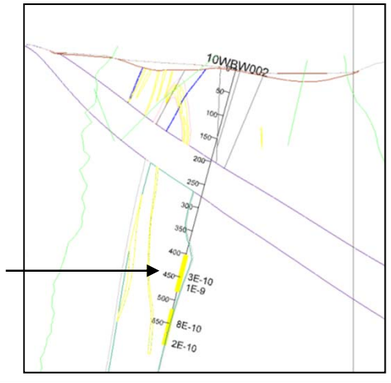
Test from 402.3m to 482.0m
K = 2.6E-10 m/s

Lithologies included: Fine grained, strongly foliated basalt , fine to medium grained weakly foliated or unfoliated pillow basalts, and a 0.5m diabase dyke.

Potential conduits of water: No major structures. Rock is fairly competent, averaging 1 joint per 3m. Test interval overlap exists with test 2. Both tests contained the unfoliated pillow basalts but the foliated and strained basalts are found only in test 1. Rock strength and the level of fractures and joints is consistent through both units. Possibilities for explaining the lower permeability in test 1 include:
- Increased permeability of the grain matrix in the unfoliated basalt; however, test 4 was taken wholly in the unfoliated basalt unit 50 meters downhole and a result similar to that of test 1 was obtained.
- Permafrost was expected to a depth of 400m but there is the possibility of its continuation to greater depths.

Continued from previous page…

Test 1



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hope Bay Project (Doris)

Hole 10WBW002
Packer Test 1: 402.3m to 482.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	14

Hole 10WBW002: 442.04 to 452.80m: Pillow basalts.

Hole 10WBW002: 452.80 to 464.00m: A magnetic diabase dyke exists from 456.35m to 456.83m. Contacts sharp. No effect on fracture frequency.

Hole 10WBW002: 464.00 to 474.11m

Hole 10WBW002: 474.11 to 483.30m: Pillow basalts continue.

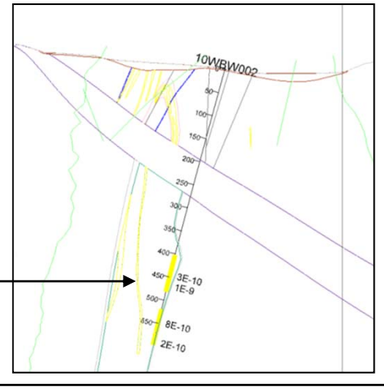
10WBW002 Packer Test 2 Summary

Test from 447.3 to 482.0m
K = 9.6E-10 m/s

Lithologies included: Fine to medium grained pillow basalt. Weakly foliated to unfoliated. Calcite veinlets throughout . 0.5m diabase dyke.

Potential conduits of water: Low fracture frequency in competent rock with appropriately low flow.

Test 2



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW002
Packer Test 2: 447.3m to 482.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	15

Hole 10WBW002: 514.89 to 525.42m: Test interval begins in basalt, 5m after a contact with diabase dyke.

Hole 10WBW002: 525.45 to 535.38m

Hole 10WBW002: 535.38 to 545.00m: Calcite/dolomite/quartz stockwork at 542.18m does not affect fracture counts.

Hole 10WBW002: 545.00 to 555.39m

Hole 10WBW002: 555.39 to 566.00m

Hole 10WBW002: 566.00 to 576.34m: Continuation of basalt

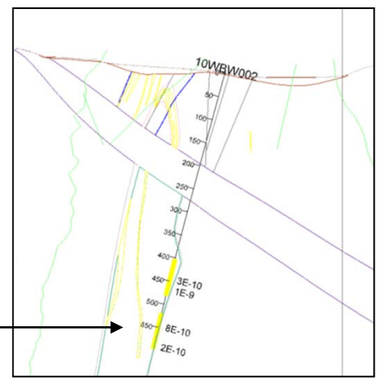
10WBW002 Packer Test 4 Summary

Test from 519.3 to 569.0m
K = 7.5E-10 m/s

Lithologies included: Fine-grained pillow basalt

Potential conduits of water: Very low fracture frequency in competent rock with appropriately low flow.

Test 4 →



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW002
Packer Test 4: 519.3m to 569.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	16

Hole 10WBW002: 566.00 to 576.34m: Continuation of basalt

Hole 10WBW002: 576.34 to 585.94m

Hole 10WBW002: 585.94 to 596.98m

Hole 10WBW002: 596.98 to 602.00m: Basalt to EOH

A carbonate/quartz vein occurs at 581.57 to 581.76m. The geotech interval from 581-584m records 2 open foliation fractures, the only two in the test interval. However, this close-up shows they may not be associated.

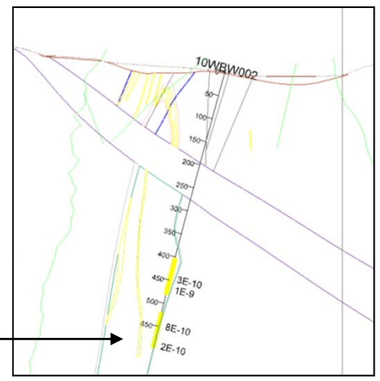
10WBW002 Packer Test 5 Summary

Test from 570.3 to 602.0m
K = 1.6E-10 m/s

Lithologies included: Fine-grained pillow basalt

Potential conduits of water: Very low fracture frequency. Competent rock with appropriately low flow.

Test 5 →



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW002
Packer Test 5: 570.3m to 602.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	17

Hole 10WBW003: 89.73 to 101.20m – Unstrained volcanics

Hole 10WBW003: 101.20 to 112.76m

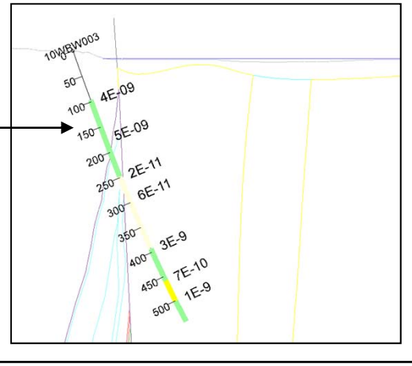
Hole 10WBW003: 112.76 to 123.0m

Hole 10WBW003: 123.0 to 134.13m

Close-up of the run with by far the most significant number of fractures over the test (119-122m). One of two quartz/carbonate veins noted along the length of the test is also in this run. Still rather competent rock.

Continued on next page…

Test 1 →



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hope Bay Project (Doris)

Hole 10WBW003
Packer Test 1: 96.4m to 173.2m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	18

Hole 10WBW003: 134.15 to 145.13m: Continuation of volcanics

Hole 10WBW003: 145.13 to 156.29m

Hole 10WBW003: 156.29 to 167.20m

Hole 10WBW003: 167.20 to 178.43m

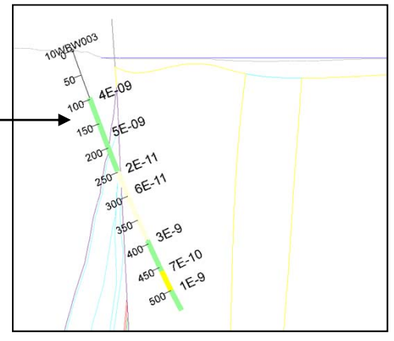
10WBW003 Packer Test 1 Summary

Test from 96.4 to 173.2m
K = 4.4E-09 m/s

Lithologies included: Unstrained intermediate pillow volcanics

Potential conduits of water: Low, representative flow over competent rock. Permafrost may occur around the top of the test interval.

Test 1 →



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hope Bay Project (Doris)

Hole 10WBW003
Packer Test 1: 96.4m to 173.2m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	19

Hole 10WBW003: 167.20 to 178.43m: Continuation of intermediate volcanics. Weakly strained.

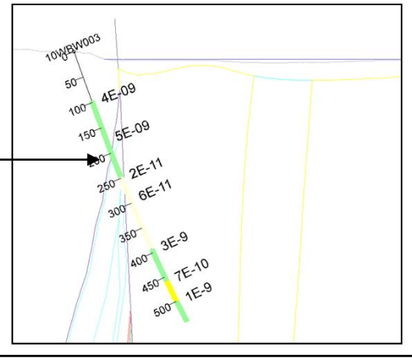
Hole 10WBW003: 178.43 to 189.23m: 7cm gouge from 187.83m to 187.9m.

Hole 10WBW003: 189.23 to 200.20m: continuation of intermediate volcanics until sharp contact with weakly strained, medium-grained mafic dyke at 191.1m. Lower contact with strongly strained mafic volcanics at 193.19m.

Hole 10WBW003: 200.20 to 210.80m: Continuation of mafic volcanics. Hard clay gouge from 207.7 to 207.78m. Mafic dyke from 208.86 to 209.2m.

Close-up of mafic dyke and 7cm hard clay gouge. Note strong foliation in these volcanics as compared with the intermediates at the top of the test interval.

Continued on next page…



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW003
Packer Test 2: 171.4m to 248.2m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	20

Hole 10WBW003: 210.8 to 222.0m: Contact between mafic volcanics and strongly strained felsic intrusion at 211.45m.

Close-up of mafic volcanic/felsic intrusive contact.

Hole 10WBW003: 222.0 to 233.20m: Continuation of felsic intrusives.

Hole 10WBW003: 233.20 to 244.60m

Hole 10WBW003: 244.60 to 255.05m. Small mafic flow at end. Gradational contact.

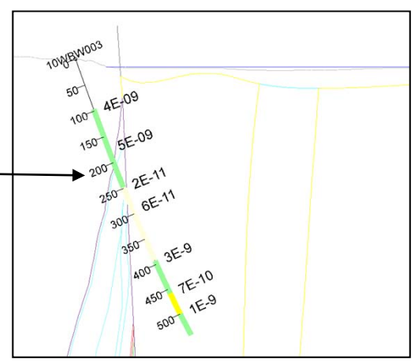
10WBW003 Packer Test 2 Summary

Test from 171.4 to 248.2m
K = 5.4E-09 m/s

Lithologies included: Weakly strained intermediate volcanics, mafic volcanics, felsic porphyry intrusion

Potential conduits of water: Fracture count highest in the mafic volcanic unit and somewhat lower in felsic intrusive. Overall competent rock. Low flow.

Test 2



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW003
Packer Test 2: 171.4m to 248.2m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	21

Hole 10WBW003: 244.6 to 255.05m: Continuation of felsic volcanics. Hard clay gouge at 249.75 and gouge/rubble zone at 251.07m. Contact with mafic volcanic flow at 253.98m.

Hole 10WBW003: 255.05 to 265.10m: Mafic flow, possible deformation zone. Broken-up rubble zone at 262.95 to 263.16m. Sharp contact with felsic unit at 264.73m.

Hole 10WBW003: 265.10 to 275.43m: Felsic/mafic contact at 268.75m. Broken zone at 266.11 to 266.2m.

Hole 10WBW003: 275.43 to 286.52m: Strongly strained mafics. Felsics present from 280.91 to 283.44m. Contacts sharp.

Hole 10WBW003: 286.52 to 297.55m: Continuation of strained mafics.

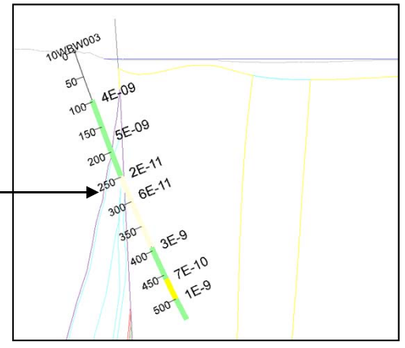
10WBW003 Packer Test 3 Summary

Test from 246.4 to 293.2m
K = 2.2E-11 m/s

Lithologies included: Widely intercalated felsic and mafic metavolcanics. A few quartz/carbonate veins.

Potential conduits of water: Very low/no flow despite several broken zones/gouges/faults. No joints present over test interval.

Test 3



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hope Bay Project (Doris)

Hole 10WBW003
Packer Test 3: 246.4m to 293.2m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	22

Hole 10WBW003: 286.52 to 297.55m: Continuation of strained mafic volcanics.

Hole 10WBW003: 297.55 to 308.20m: Mafics. Quartz veins are brecciated. Highest fracture counts in test interval in bottom two boxes.

Hole 10WBW003: 340.45 to 351.50m: Continuation of strained mafics. Veining present. Sharp felsic intrusive contact at 348.7m.

Hole 10WBW003: 351.50 to 362.20m: Continuation of felsics with strongly strained mafics at 359.2 to 361.44m. Contacts blurry.

Hole 10WBW003: 362.20 to 373.12m: Contact with mafics at 362.95m.

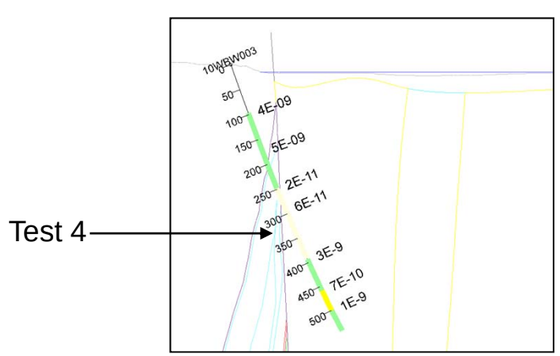
Hole 10WBW003: 383.78 to 395.20m: Continuation of mafics. Felsic unit begins with fault gouge at 387.74m

10WBW003 Packer Test 4 Summary

Test from 291.4 to 392.2m
K = 5.8E-11 m/s

Lithologies included: Continuation of widely intercalated mafic and felsic metavolcanics. Some qtz/carbonate veining, some veins brecciated.

Potential conduits of water: Very low flow.



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW003
Packer Test 4: 291.4m to 392.2m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	23

Hole 10WBW003: 383.78 to 395.20m: Continuation of felsic volcanics.

Hole 10WBW003: 395.20 to 406.17m: Continuation of felsics; Mafics from 399.32 to 401.17m, and 404.11 to 404.96m. Contacts relatively sharp except at 404.96m. Gouge at 404.24m is hard clay.

Hole 10WBW003: 406.17 to 417.00m: Continuation of felsic unit.

Hole 10WBW003: 417.00 to 428.10m

Hole 10WBW003: 428.10 to 439.2m

Hole 10WBW003: 450.30 to 461.20m: Felsics to end of test interval.

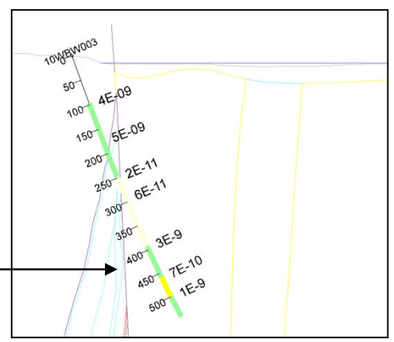
10WBW003 Packer Test 5 Summary

Test from 393.4 to 458.2m
K = 2.5E-09 m/s

Lithologies included: Continuation of alternating strongly strained mafic and felsic metavolcanics.

Potential conduits of water: No logged joints in test interval. Permeability consistent with observations and logs.

Test 5 →



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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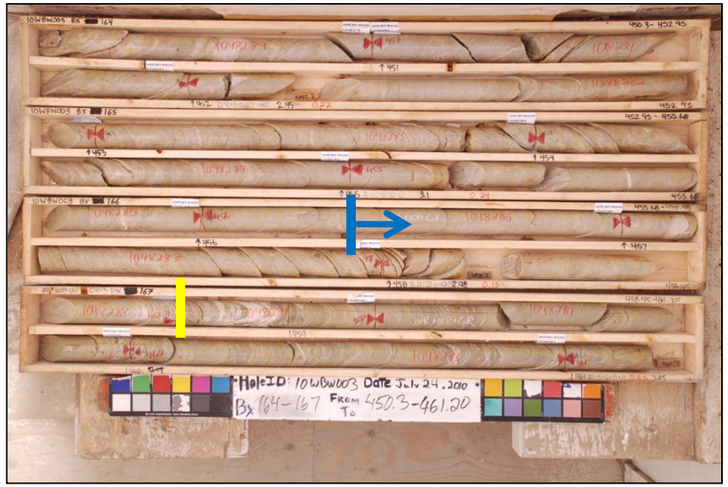
Hole 10WBW003
Packer Test 5: 393.4m to 458.2m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	24



Hole 10WBW003: 450.30 to 461.20m: Felsic volcanic unit continues until contact with mafic volcanic unit at 458.71m.

Hole 10WBW003: 461.20 to 471.69m: Mafics continue. Short jointed region at the edge of quartz/carbonate vein at 471.00m.

Hole 10WBW003: 471.69 to 482.69m

Hole 10WBW003: 482.69 to 494.10m: Mafics continue. Carbonaceous zones from 487.98 to 489.81m, and from 491.75m.

Close-up of mafics, carbonaceous zone, and contact. Carbonaceous veining is 95% dolomite, fractured and healed with quartz.

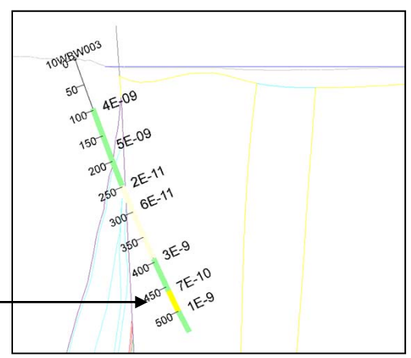
Hole 10WBW003: 494.10 to 505.15m: Continuation of dolomite veining until end of test interval.

10WBW003 Packer Test 6 Summary

Test from 456.4 to 500.2m
K = 7.4E-10 m/s

Lithologies included: Continuation of metavolcanics*:* Felsic (2m top of interval), predominant mafic flow , carbonate veins fractured and healed with quartz.

Potential conduits of water: Consistently tight rock. Low flow.



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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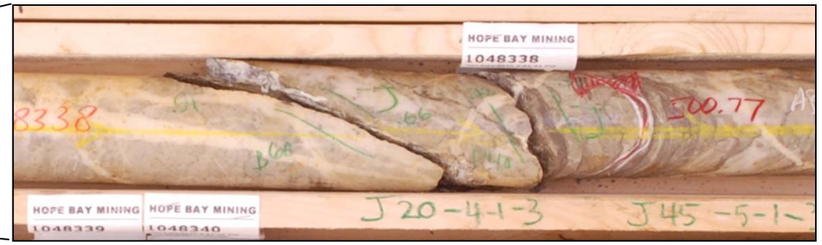
Hole 10WBW003
Packer Test 6: 456.4m to 500.2m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	25



Close-up of dolomite zone/mafic volcanic contact and associated jointing.

Hole 10WBW003: 494.10 to 505.15m: Dolomite veining, fractured and healed with quartz, gives way to mafic volcanics at 500.77m.

Hole 10WBW003: 505.15 to 516.05m: Mafics. Sharp contact with dolomite vein (fractured and healed with quartz) at 515.49m.

Hole 10WBW003: 516.05 to 527.06m: Mafics. Sharp contact with dolomite vein (fractured and healed with quartz) at 518.75m.

Hole 10WBW003: 527.06 to 536.51m: Mafic metavolcanics to EOH.

Hole 10WBW003: 536.51 to 548.20m: EOH

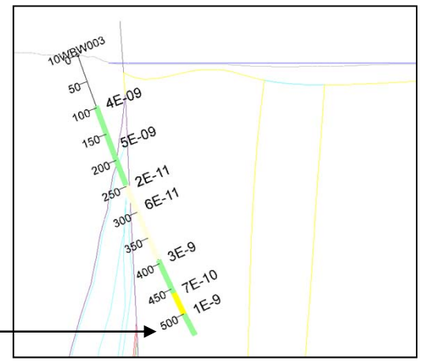
10WBW003 Packer Test 7 Summary

Test from 498.4 to 548.2m
K = 1.1E-09 m/s

Lithologies included: Mafic metavolcanic flow hosting a few carbonate/quartz veins.

Potential conduits of water: Low fracture counts, low flow. Water may occur faster via jointing at vein/volcanic contact near top of test interval.

Test 7 →



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW003
Packer Test 7: 498.4m to 548.2m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	26

Hole 10WBW004: 230.60 to 243.52m: Competent grey wacke

Hole 10WBW004: 243.52 to 257.0m: Minor foliation with longer axial joints present

Hole 10WBW004: 257.0 to 270.82m: Permafrost base expected at approximately 270m

Hole 10WBW004: 270.82 to 284.0m

Hole 10WBW004: 284.0 to 297.57m: Very few fractures

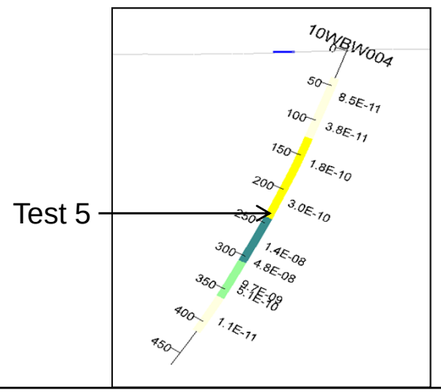
Hole 10WBW004: 297.57 to 310.0m: Increased fracture frequency

10WBW001 Packer Test 5 Summary

Test from 240.2 to 308.0m
K = 1.4x10^{-8} m/s

Lithologies included: Grey wacke with beds of argillite and siltstone; some quartz veining; permafrost to approximately 270m

Potential conduits of water: low water movement; fractures near 302m probable water source



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW004
Packer Test 5: 240.2m to 308.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	27

Hole 10WBW004: 284.0 to 297.57m

Hole 10WBW004: 297.57 to 310.0m

Typical competent, low fracture frequency grey wacke

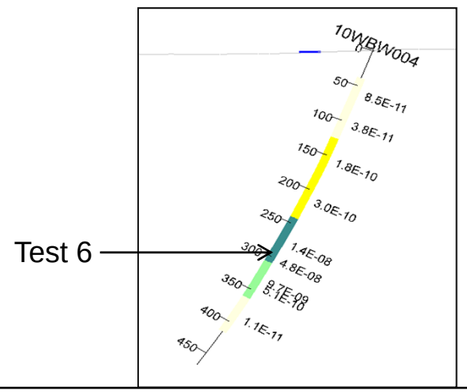
Section of jointed/foliated broken core that is probable source of water movement for this packer test.

10WBW001 Packer Test 6 Summary

Test from 291.0 to 308.0m
K = 4.8x10^{-8} m/s

Lithologies included: Dominantly wacke and siltstone interbeds

Potential conduits of water: Jointed/foliated section of core pictured at right. Bedding in rock becomes more dominant.



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW004
Packer Test 6: 291.0m to 308.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	28

Hole 10WBW004: 297.57 to 310.0m: increased jointing and fracture frequency.

Increased fractures probable flow source in this test. With this section removed (next test), hydraulic conductivity decreases.

Hole 10WBW004: 310.0 to 323.36m; quartz veining present in last box.

Hole 10WBW004: 323.36 to 337.07m

Hole 10WBW004: 337.07 to 350.10m

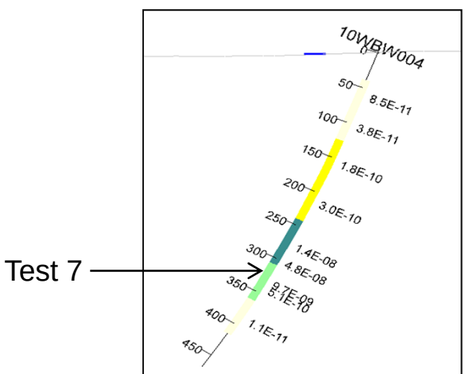
Hole 10WBW004: 350.10 to 363.10m

10WBW001 Packer Test 7 Summary

Test from 300.2 to 362.0m
K = 9.7x10^{-9} m/s

Lithologies included: Grey wacke with minor siltstone and argillite interbeds; minor quartz veining

Potential conduits of water: Increased jointing near 300 – 310m as shown above.



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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Hole 10WBW004
Packer Test 7: 300.2m to 362.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	29

Hole 10WBW004: 310.0 to 323.36m

Example of mechanical breaks in core, due to increased quartz veining.

Hole 10WBW004: 323.36 to 337.07m

Hole 10WBW004: 337.07 to 350.10m

Section of graphite gouge at 374m, although this had little affect on water flow.

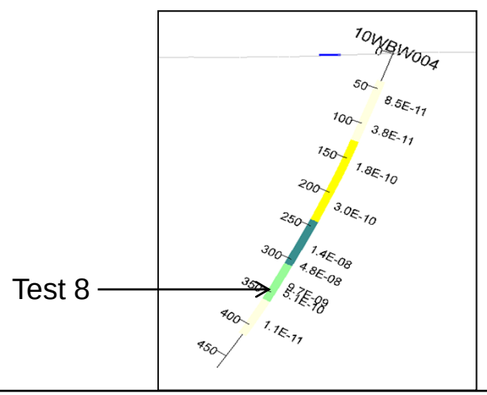
Hole 10WBW004: 350.10 to 363.10m

10WBW001 Packer Test 8 Summary

Test from 318.2 to 362.0m
K = 5.1x10^{-10} m/s

Lithologies included: Grey wacke moving to dominantly argyrillite at 357m; 357.42 graphite foliation; 374.51 graphite with small (3cm) gouge

Potential conduits of water: No major conduits, low flow. Low flow displays that section around 300-310m probably source of water due to drecreased hydraulic conductivity in this test.



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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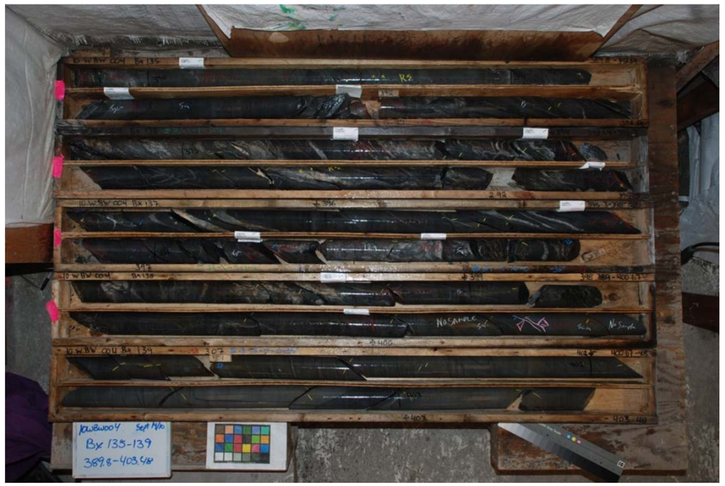
Hole 10WBW004
Packer Test 8: 318.2m to 362.0m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	30

Hole 10WBW004: 350.10 to 363.10m

Hole 10WBW004: 363.101 to 376.40m

Hole 10WBW004: 376.40 to 389.80m



Hole 10WBW004: 389.80 to 403.48m

Hole 10WBW004: 403.48 to 416.75m

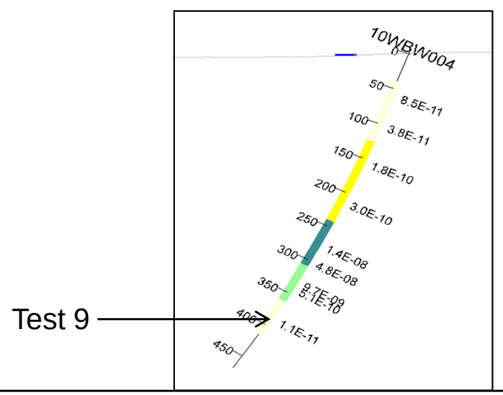
Typical argillite and grey wacke bedding; very low fracture frequency; tight rock

10WBW004 Packer Test 9 Summary

Test from 360.2 to 415.5m
K = 1.1x10^{-11} m/s

Lithologies included: Grey wacke with argillite interbeds

Potential conduits of water: No major conduits, low flow.



Legend

Features that could be source of water in packer test (see description for details)

Packer test zone

Lithology change (see description for details)

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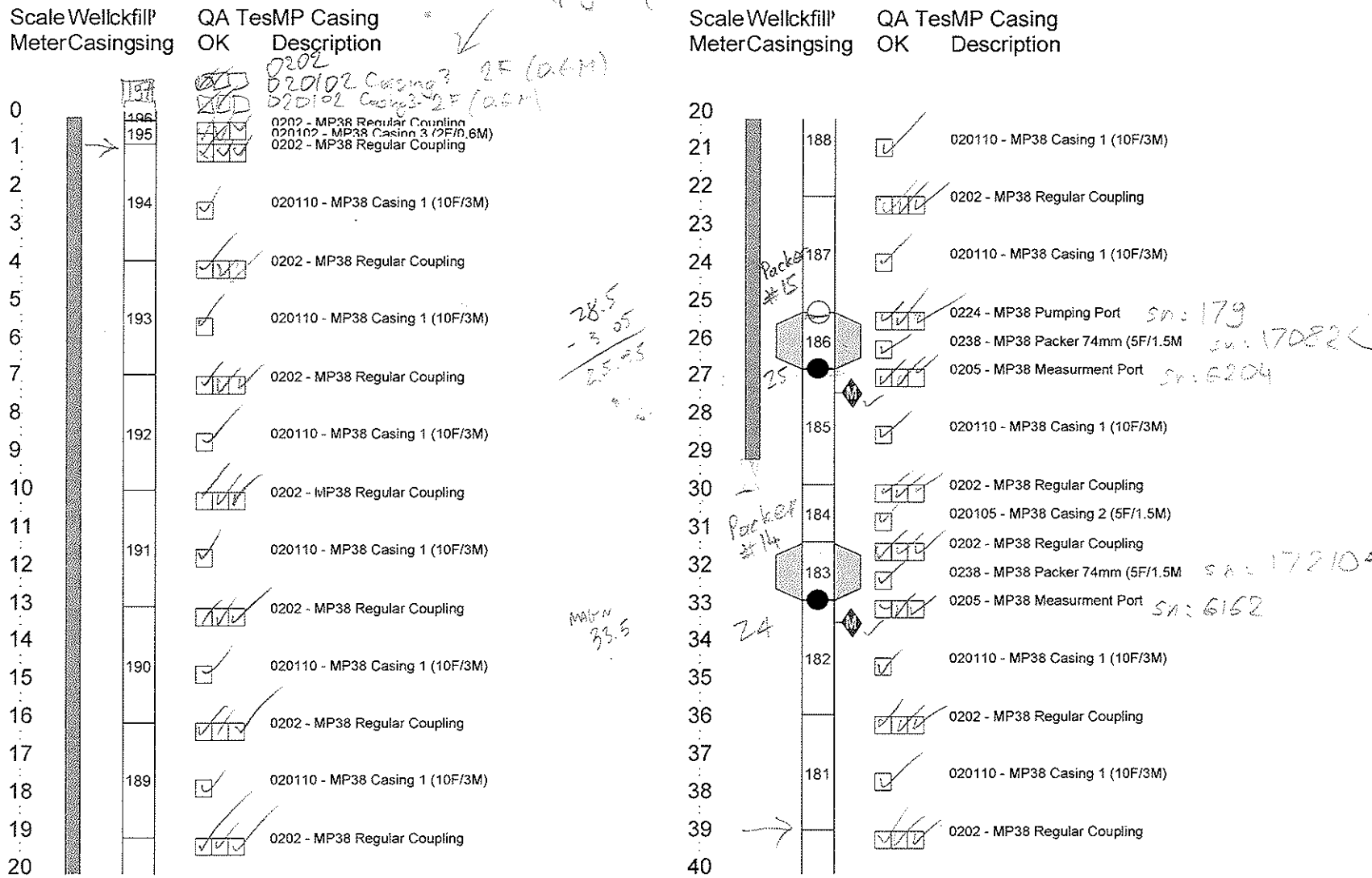
Hole 10WBW004
Packer Test 9: 360.2m to 415.5m

PROJECT:	DATE:	APPROVED:	FIGURE:
1CH008.013	Oct. 2010	JH	31

Appendix F
Westbay Installation Records

10WBW001 Rev1
SRK

Job No: 1CH008.013
Well: 10WBW001



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Thu Apr 29 03:32:46 2010

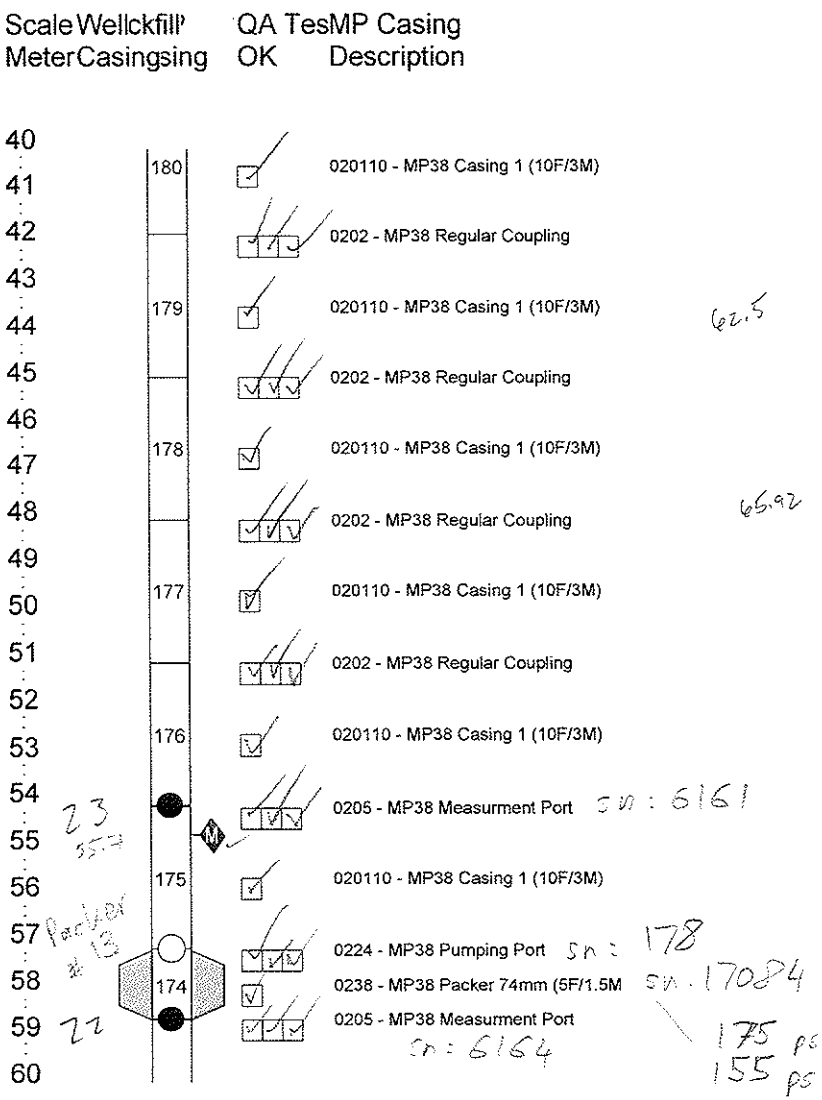
#13 up 1.5 = 62.4 − 1.5 = 60.9 | QA 5.0 − 3.0 = 57.7 − 0.5 = 57.2

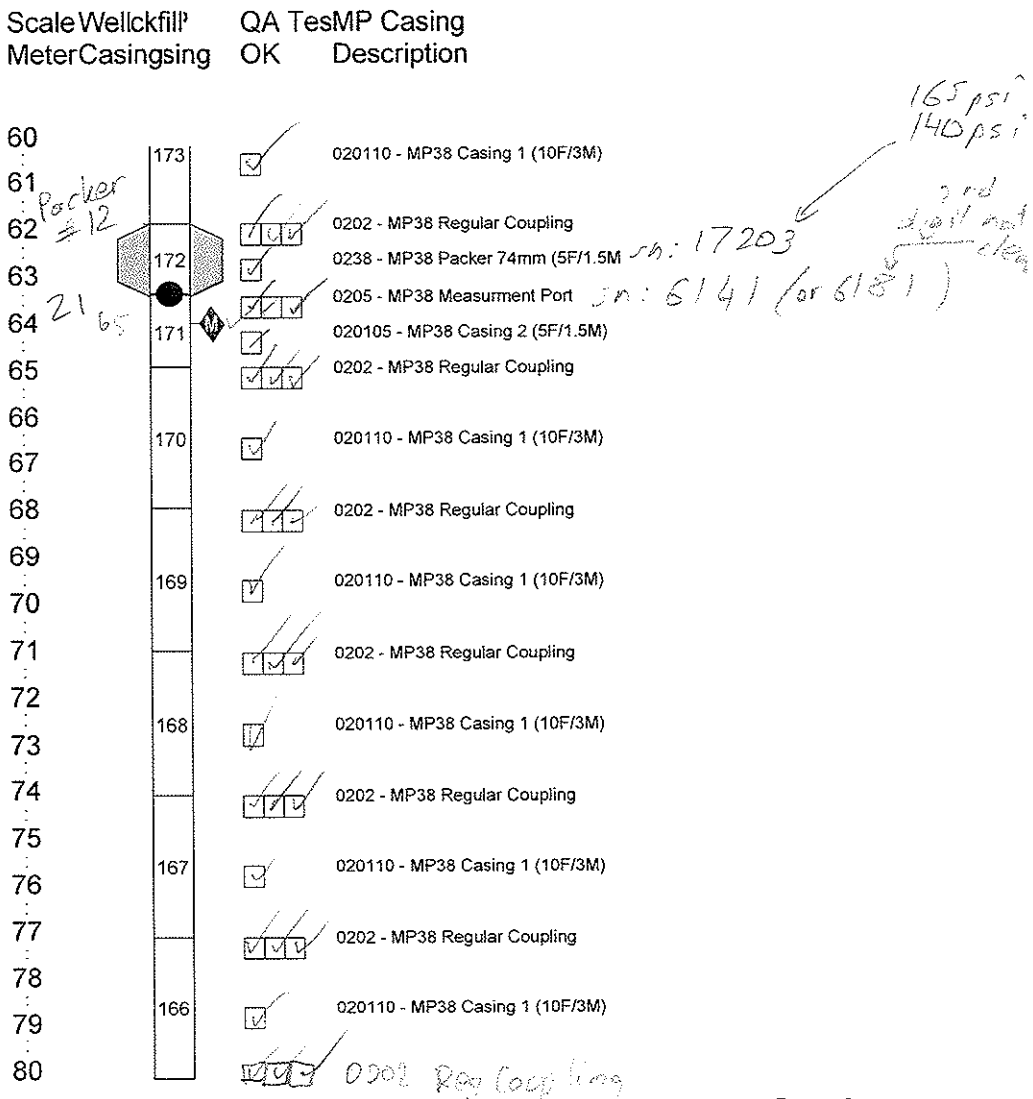
#12 MGE 69.95

61.7

10WBW001 Rev1
SRK

Job No: 1CH008.013
Well: 10WBW001





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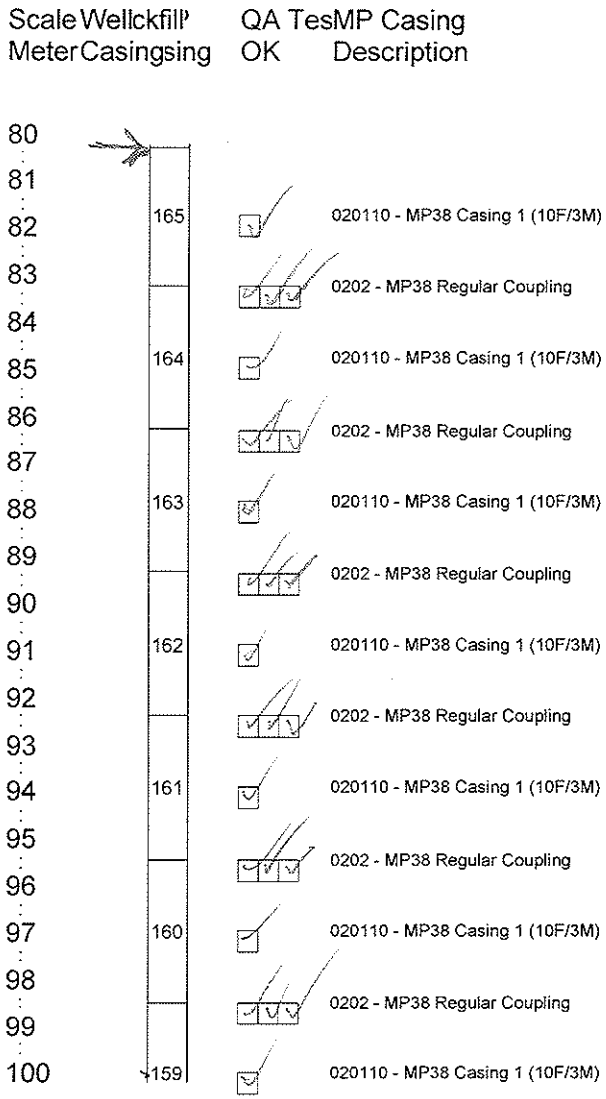
Thu Apr 29 03:32:46 2010

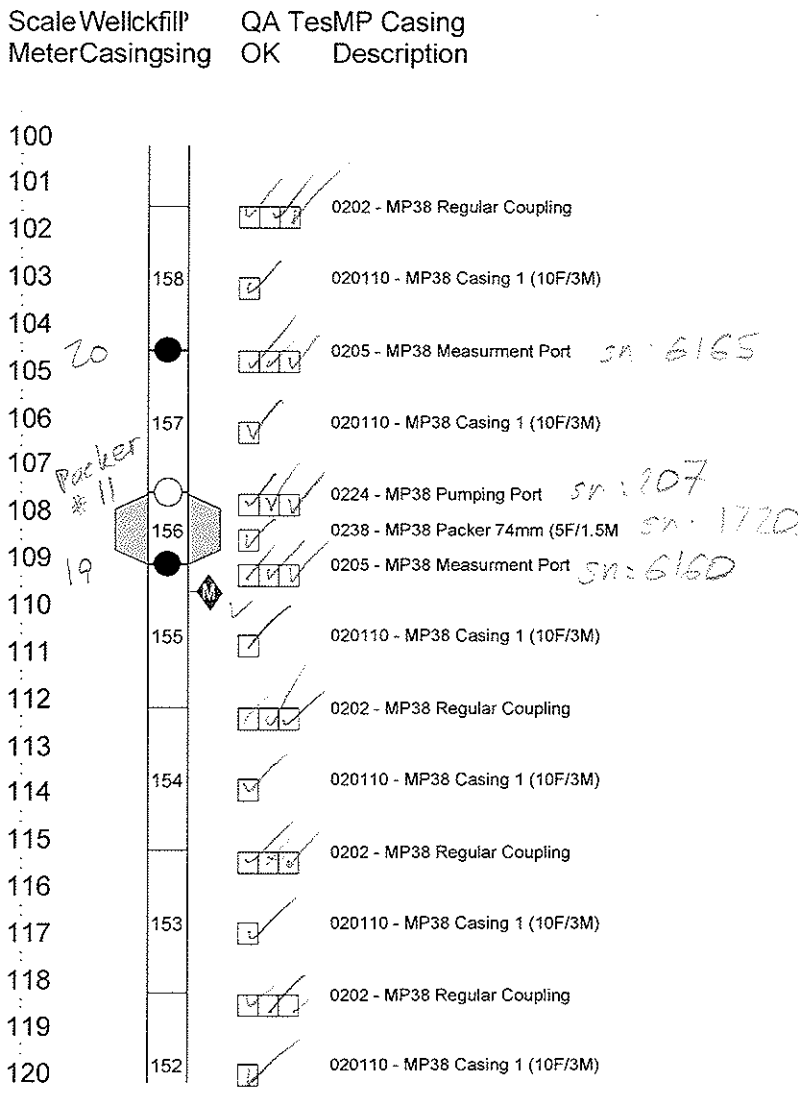
#11 MAST @ 110.5 = BOTTOM PC 155 @ 108.1
LAND @ 110.8
108.1 + 1.95 = 110.05

110.05
- 2.5
107.3
+ 1.95
109.25 ☑

10WBW001 Rev1
SRK

Job No: 1CH008.013
Well: 10WBW001





165 ft
140 ft

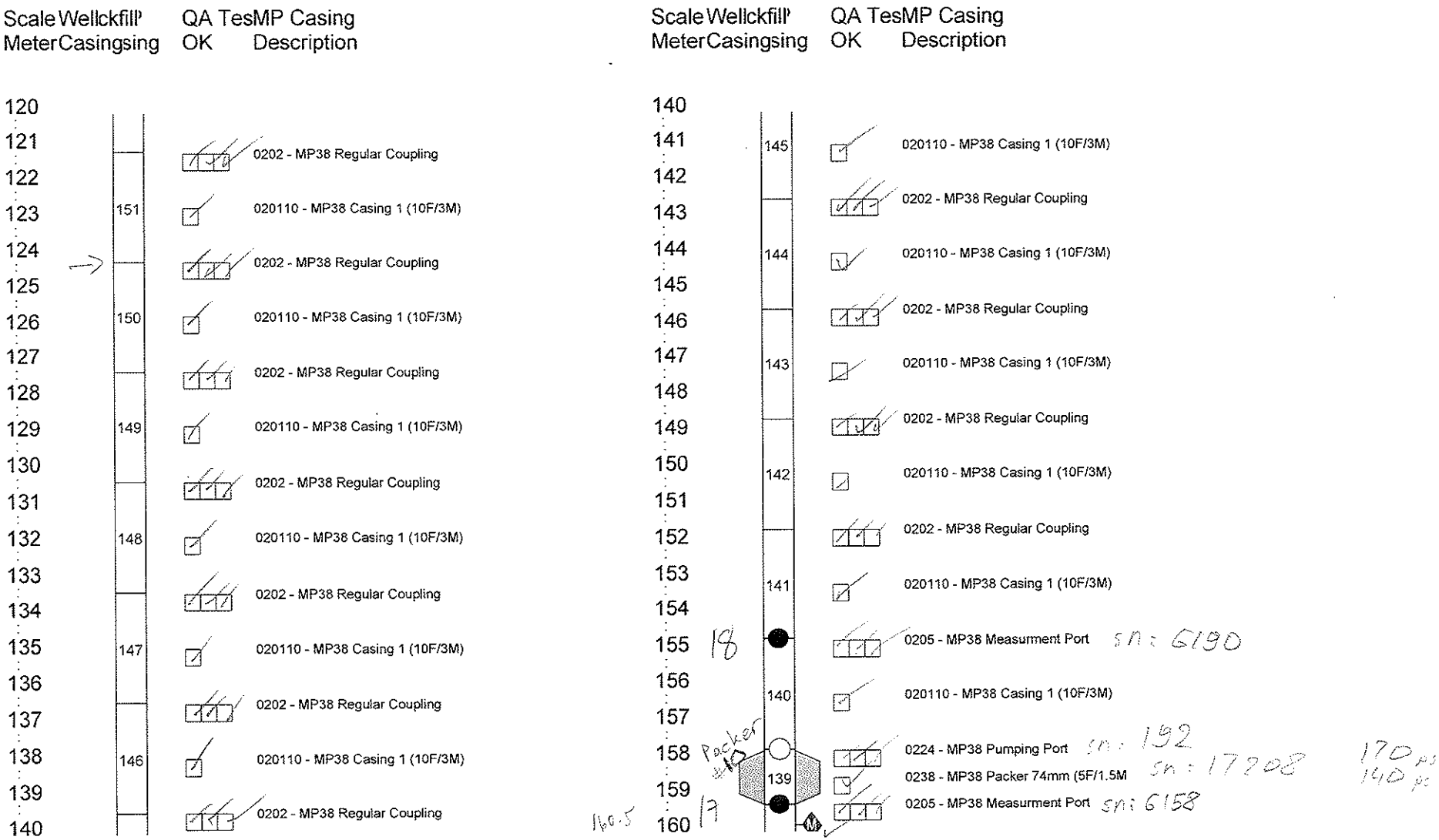
(c) Westbay Instruments Inc. 2000

Thu Apr 29 03:32:46 2010

LANDED ON PC 138
DEPTH = 161.1
GO UP 3.5m = 161.1 − 3.5 = 157.6
157.6 + 1.95 AMM AT 159.55

10WBW001 Rev1
SRK

Job No: 1CH008.013
Well: 10WBW001



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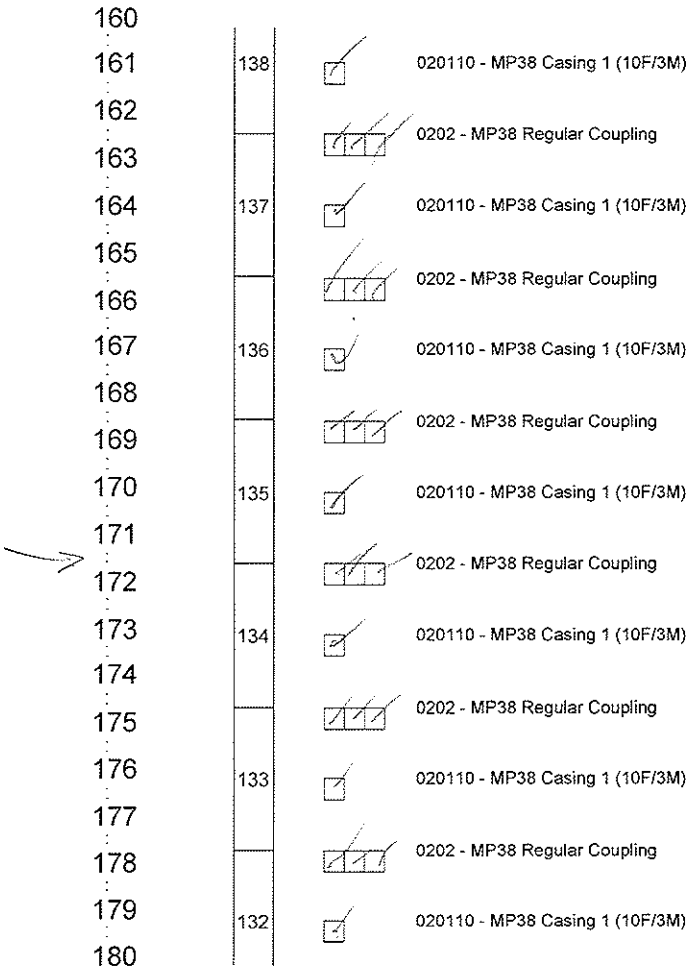
Thu Apr 29 03:32:46 2010


Scale Wellckfill' QA TesMP Casing
Meter Casingsing OK Description
160
161
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138
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134
133
132
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
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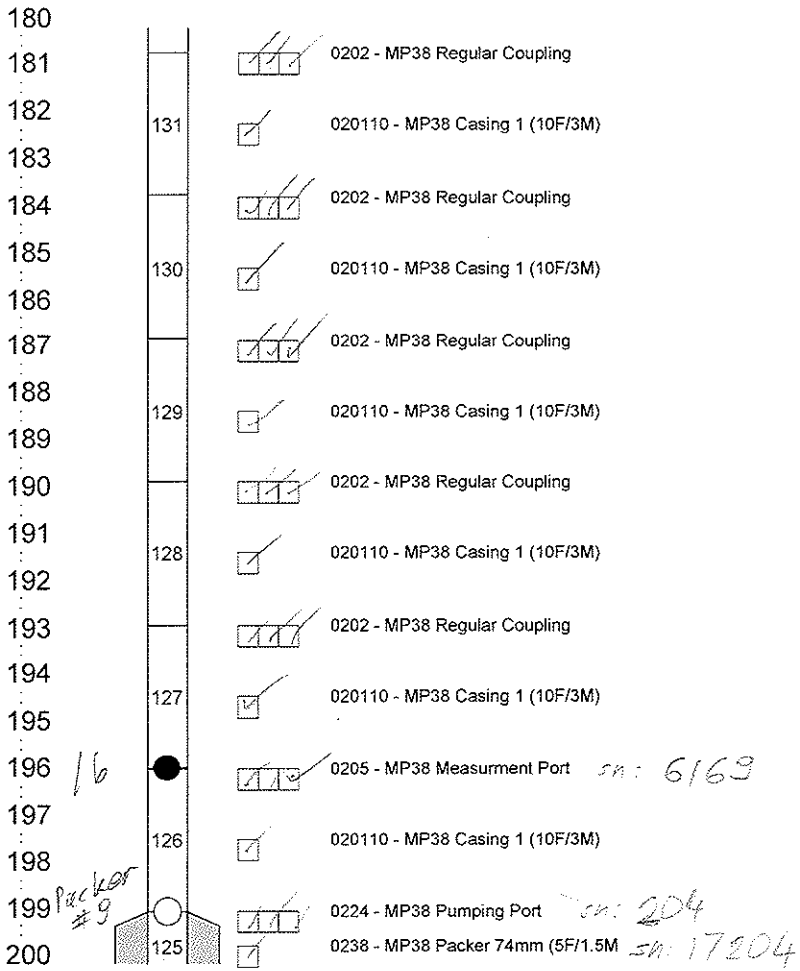
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)


Scale Wellckfill' QA TesMP Casing
Meter Casingsing OK Description
180
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197
198
199
200
16
Packer #9
131
130
129
128
127
126
125
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0205 - MP38 Measurment Port sn: 6169
020110 - MP38 Casing 1 (10F/3M)
0224 - MP38 Pumping Port sn: 204
0238 - MP38 Packer 74mm (5F/1.5M sn: 17204

@ 202.2 + 1.95 = 204.15 Arm e

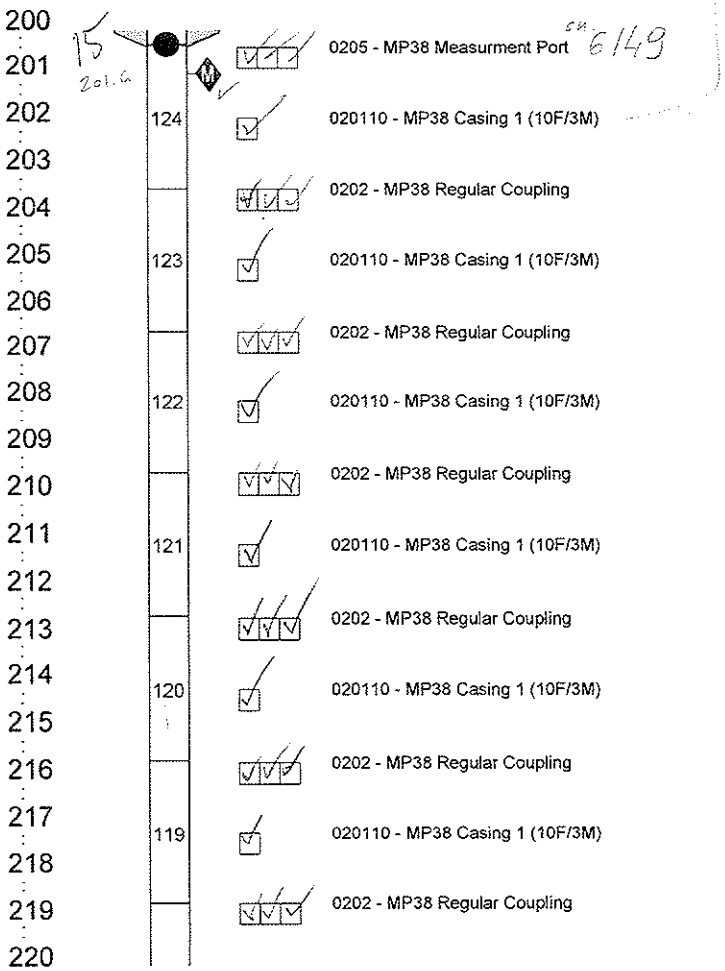
MPG ~ 202.2 − 5.5 = 198.7

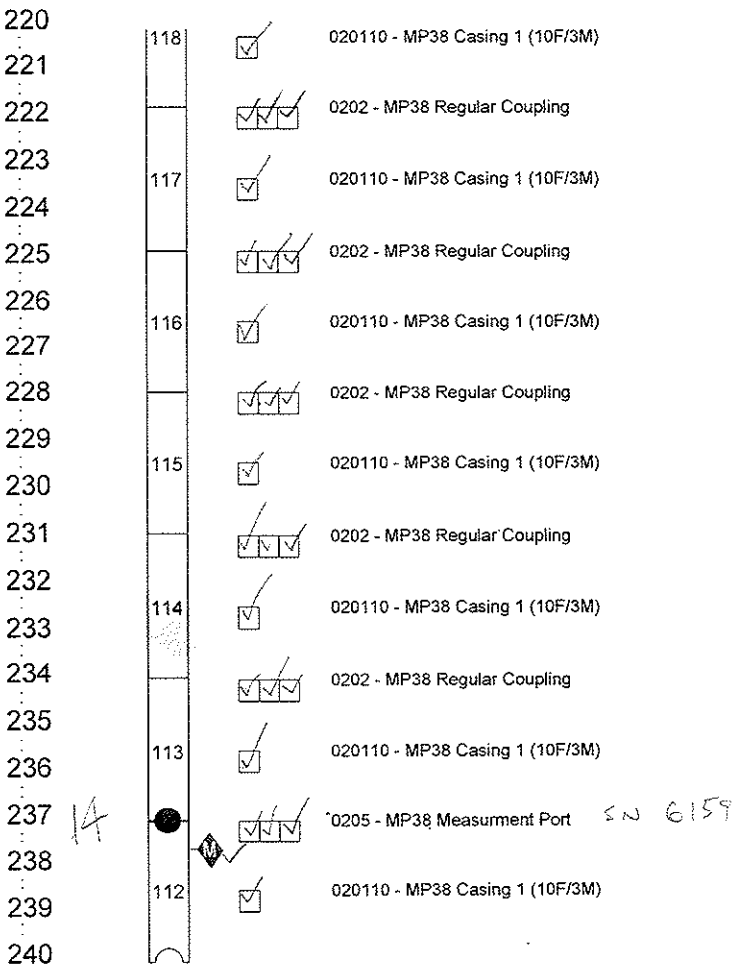
@ 199.2 + 1.95 = 201.15

rods iced at below drill head. pvc stuck on way down / up bring it tight. took to heat up rods and melt ice around pvc

10WBW001 Rev1
SRK

Job No: 1CH008.013
Well: 10WBW001





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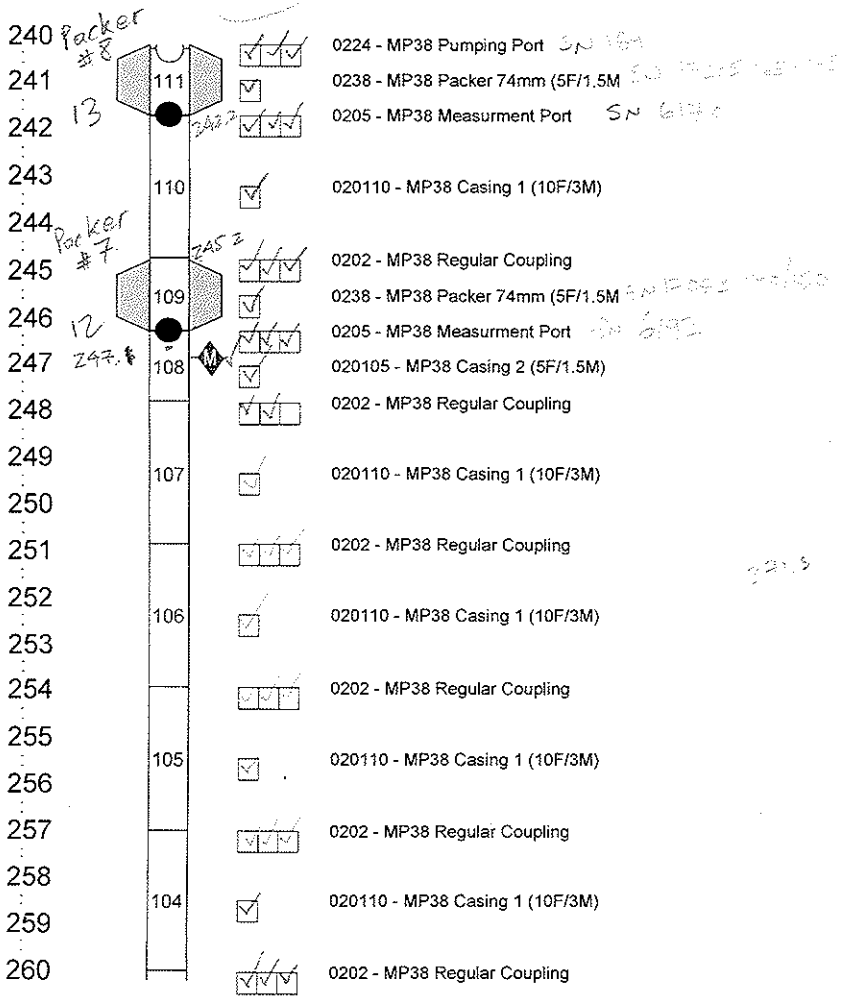
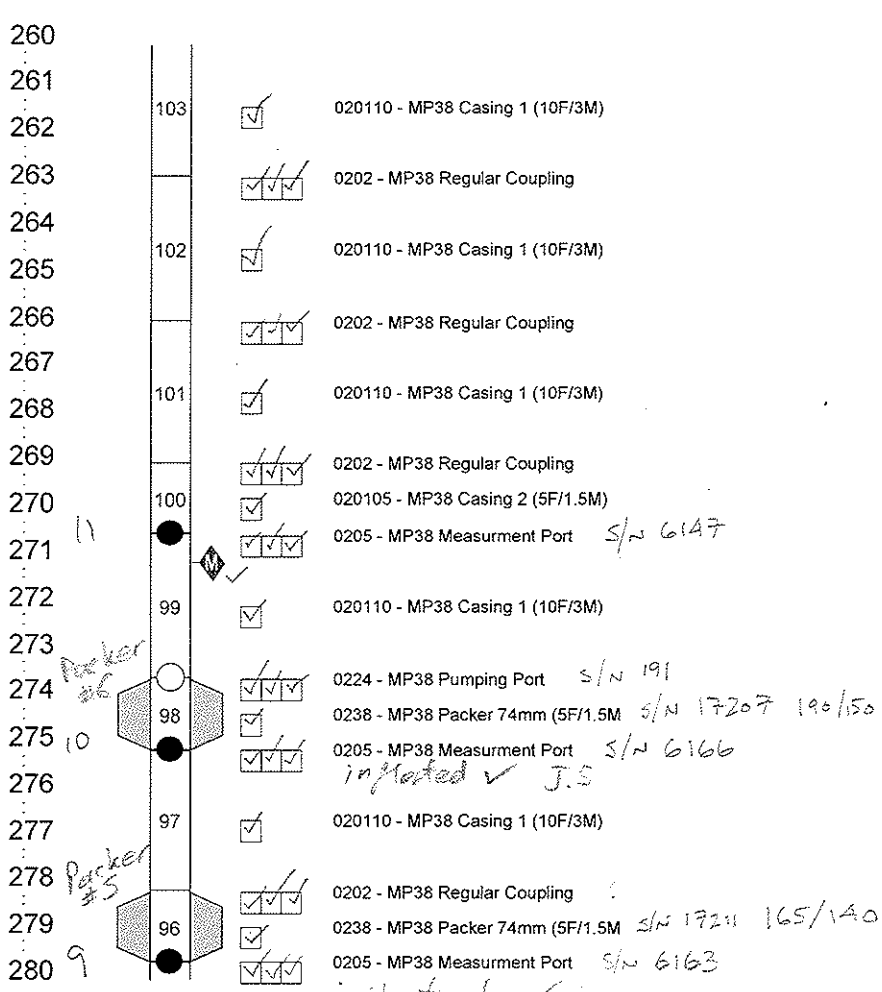
Thu Apr 29 03:34:26 2010

10WBW001 Rev1
SRK

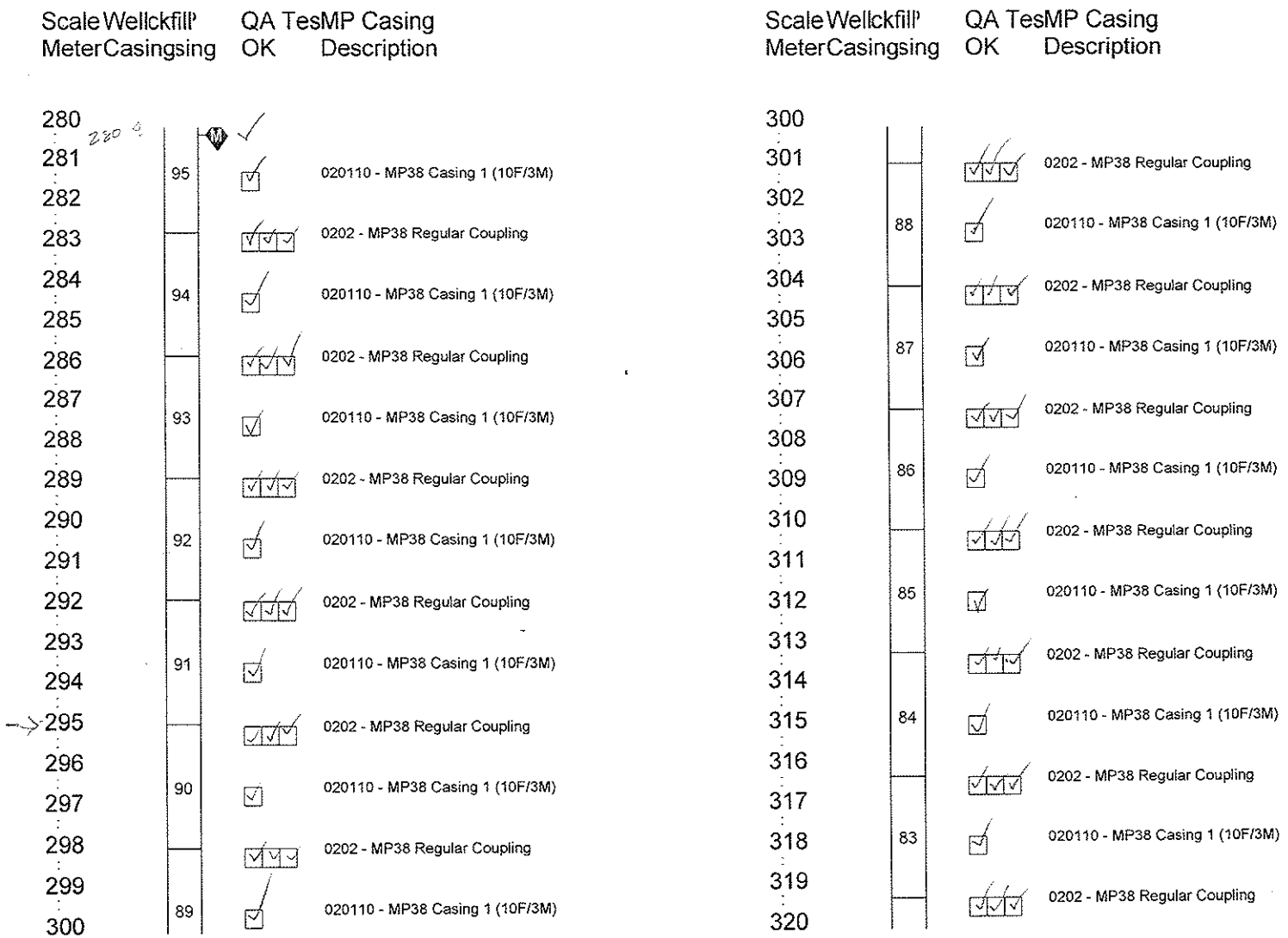
Job No: 1CH008.013
Well: 10WBW001





(c) Westbay Instruments Inc. 2000

Thu Apr 29 03:34:26 2010

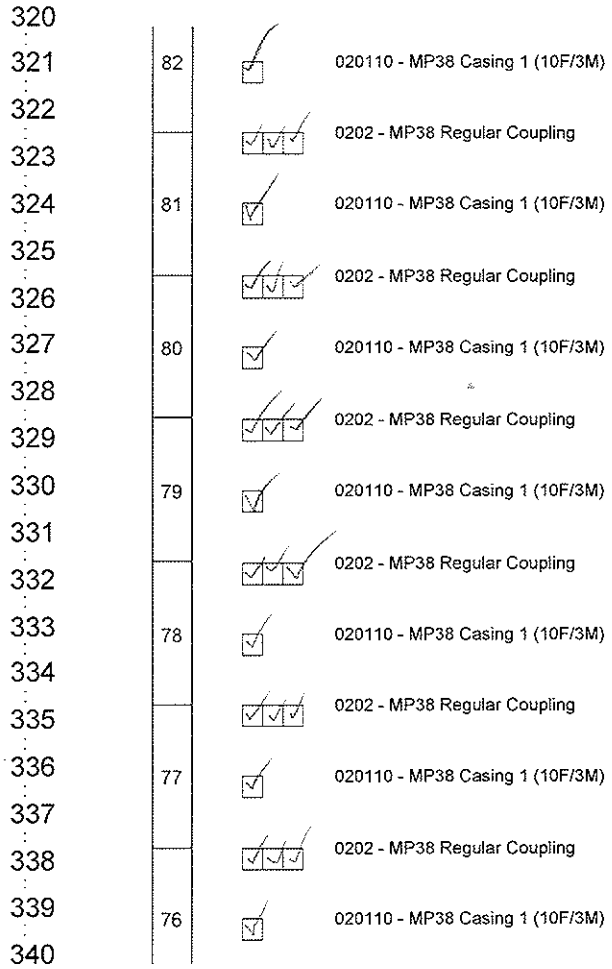


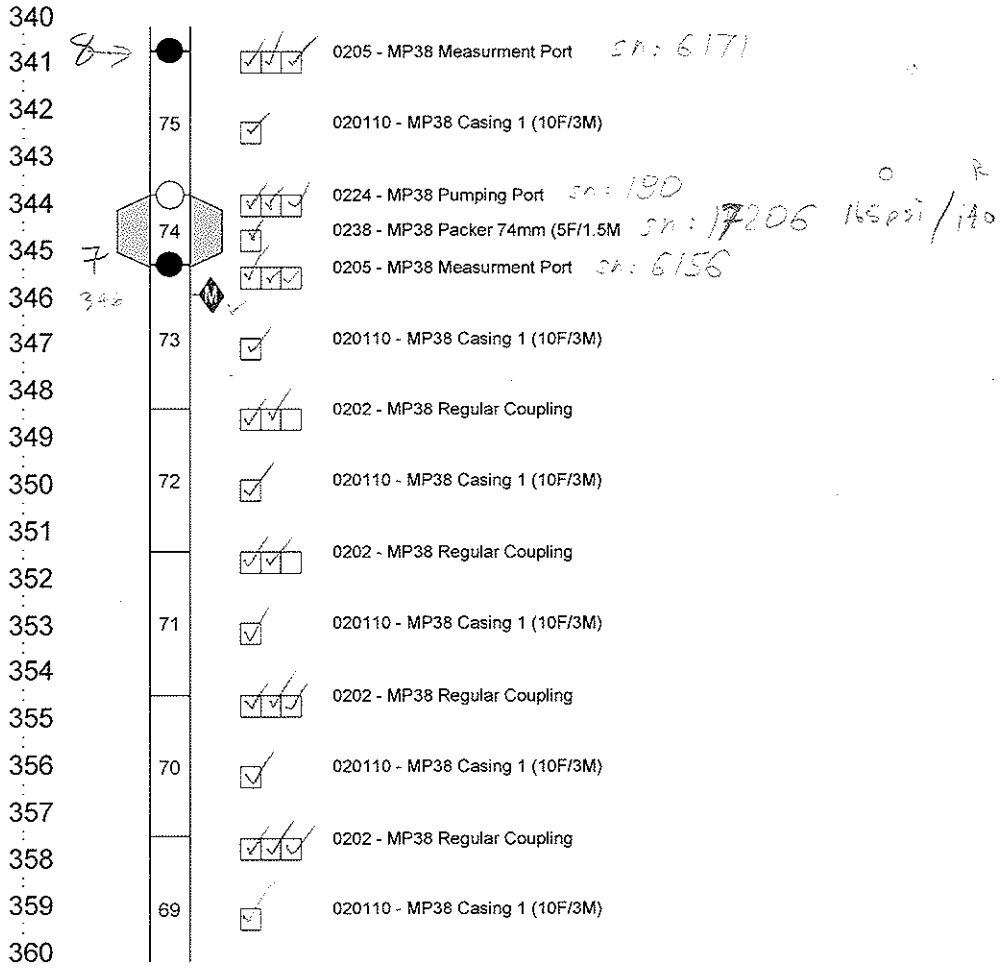
(c) Westbay Instruments Inc. 2000

Thu Apr 29 03:34:26 2010

10WBW001 Rev1
SRK

Job No: 1CH008.013
Well: 10WBW001





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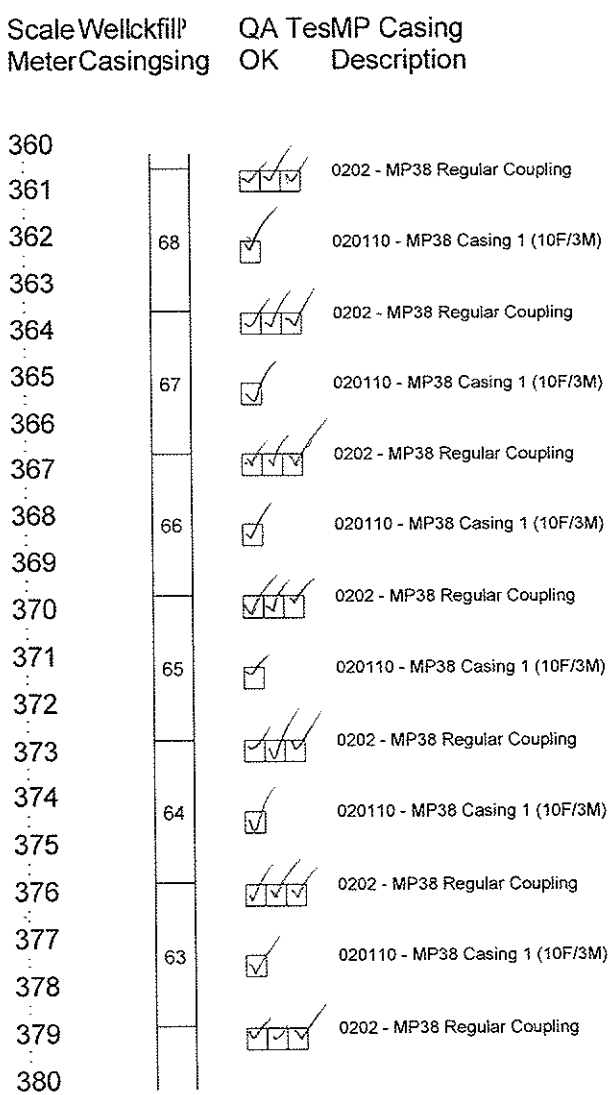
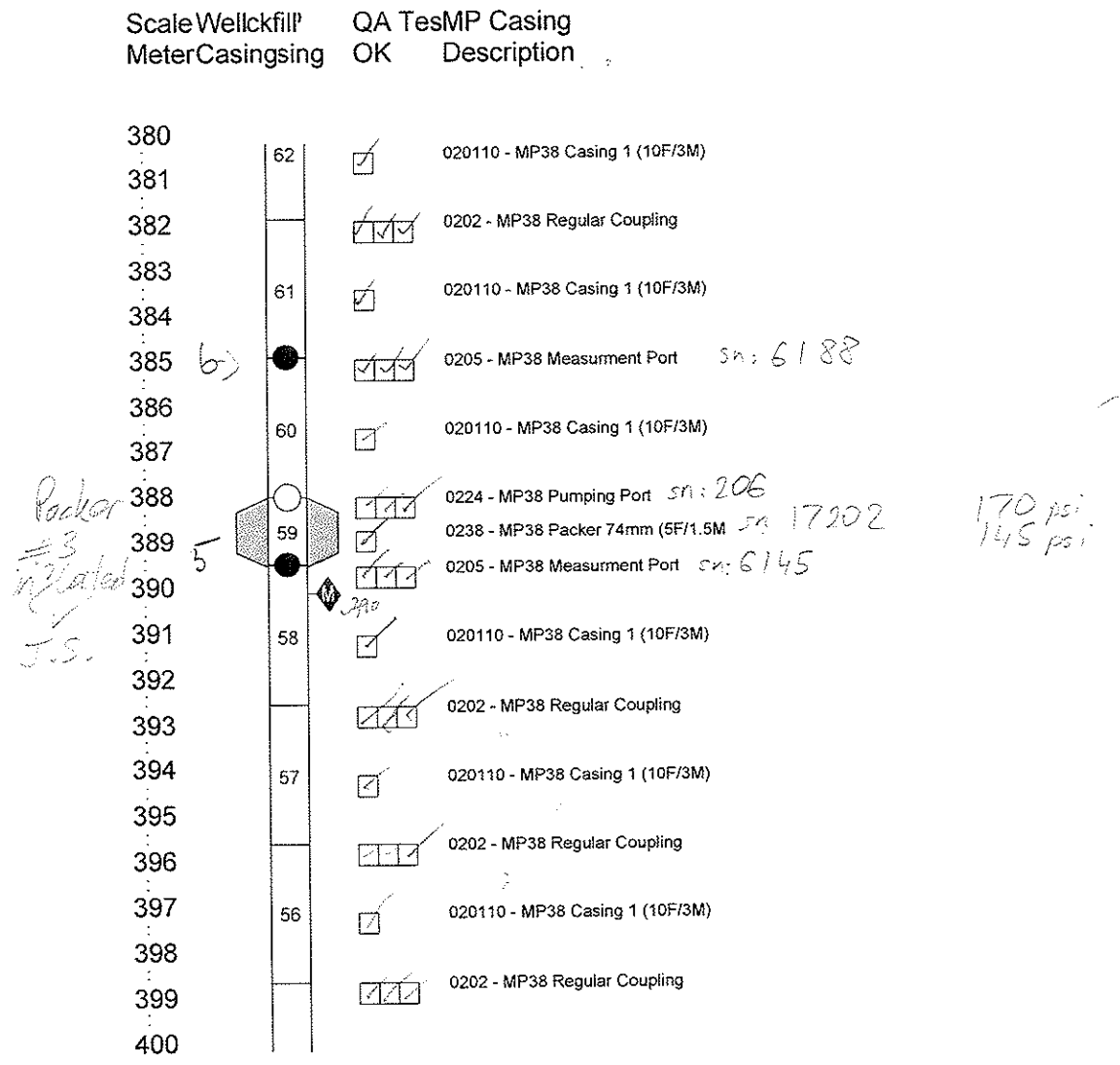
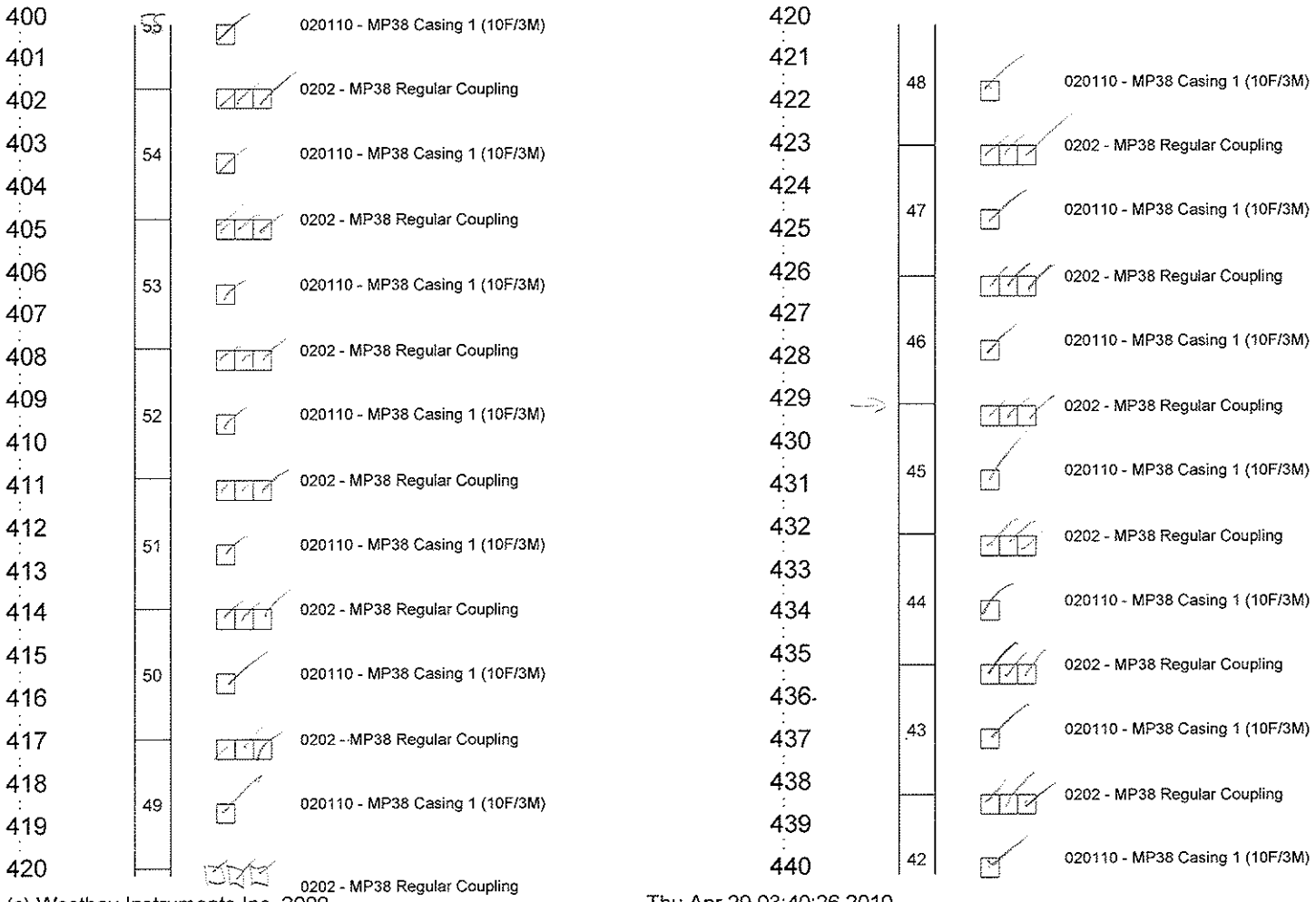
Thu Apr 29 03:49:24 2010



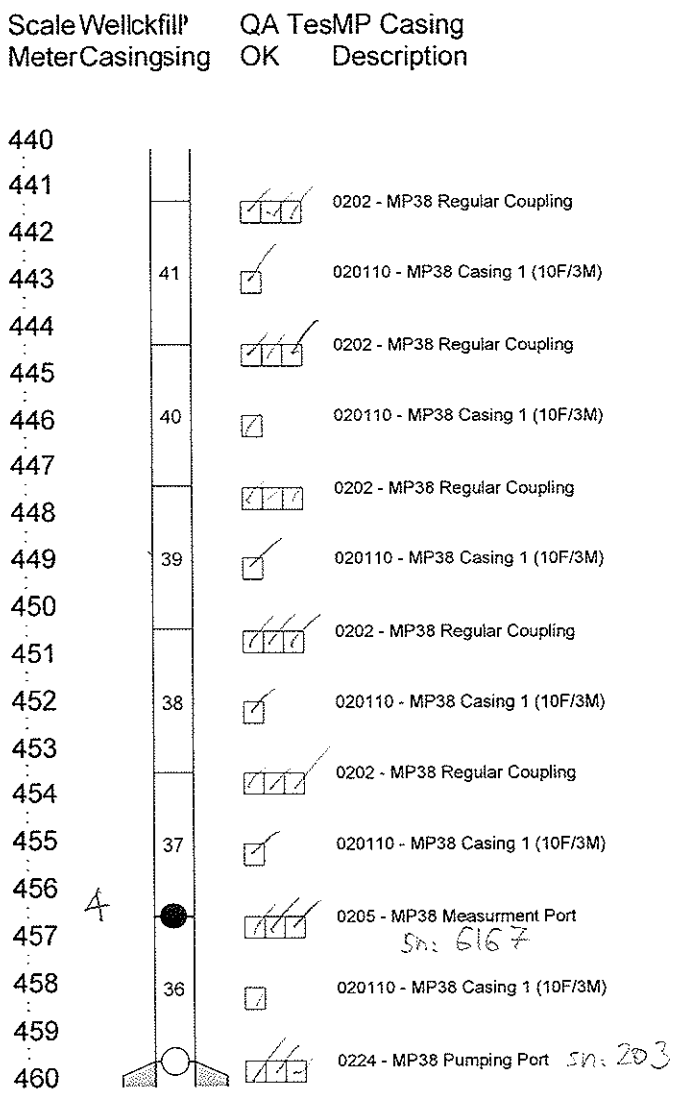


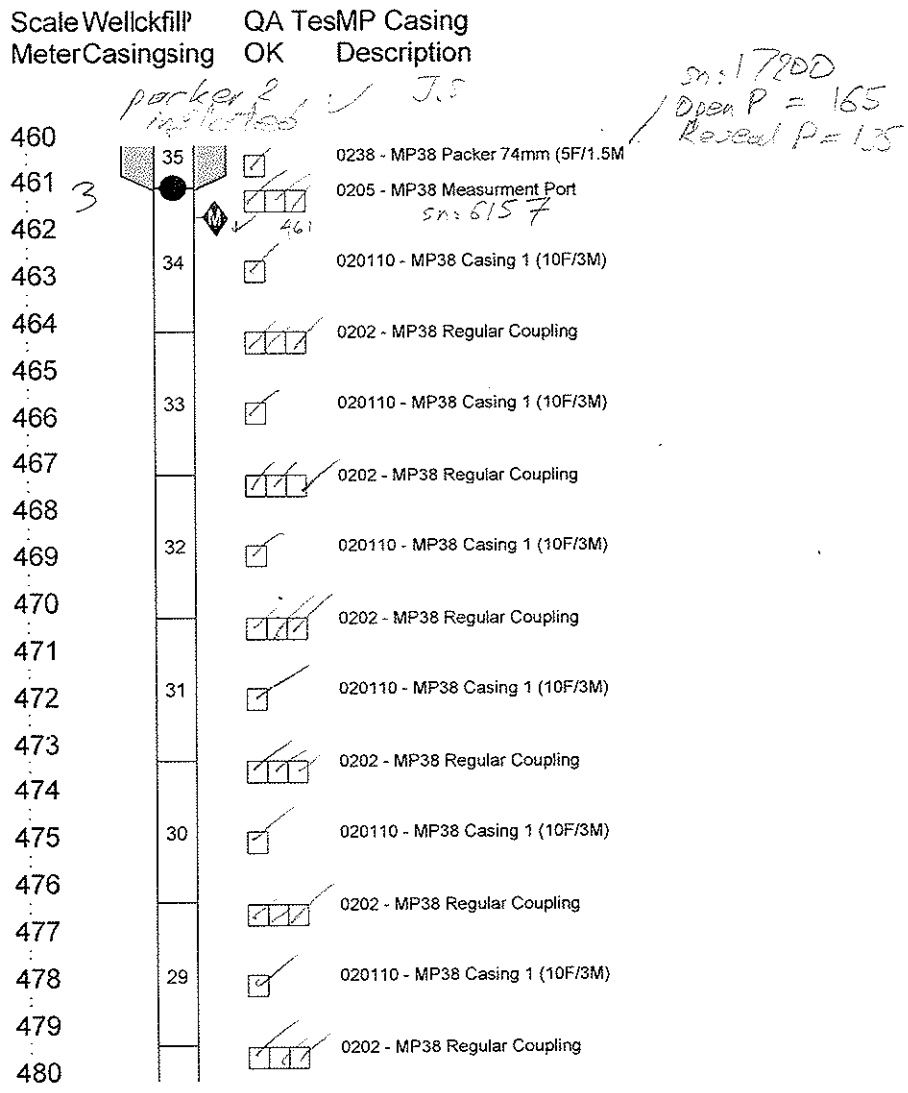
(c) Westbay Instruments Inc. 2000

Thu Apr 29 03:40:26 2010



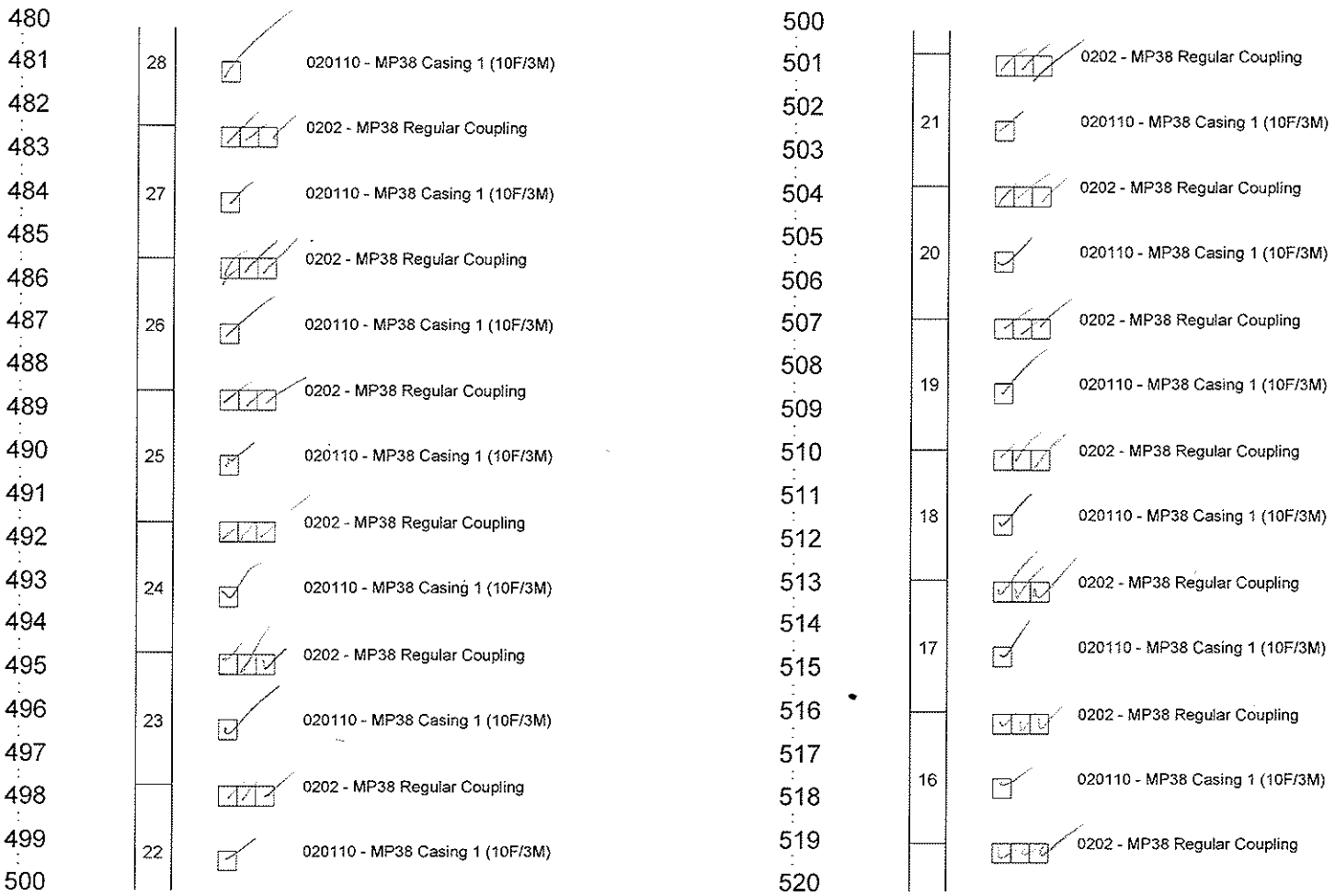
(c) Westbay Instruments Inc. 2000



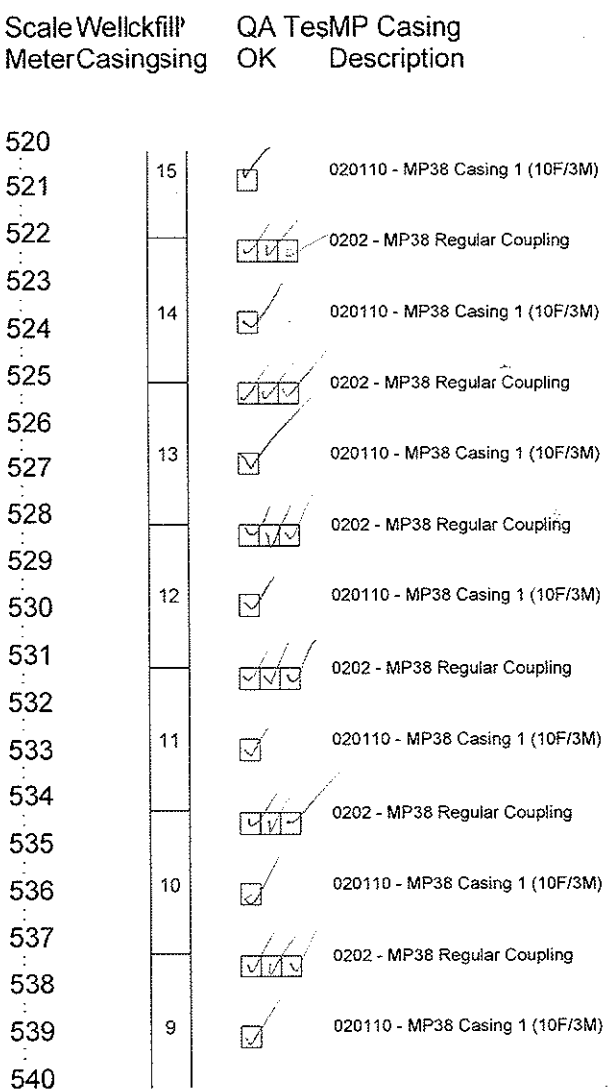


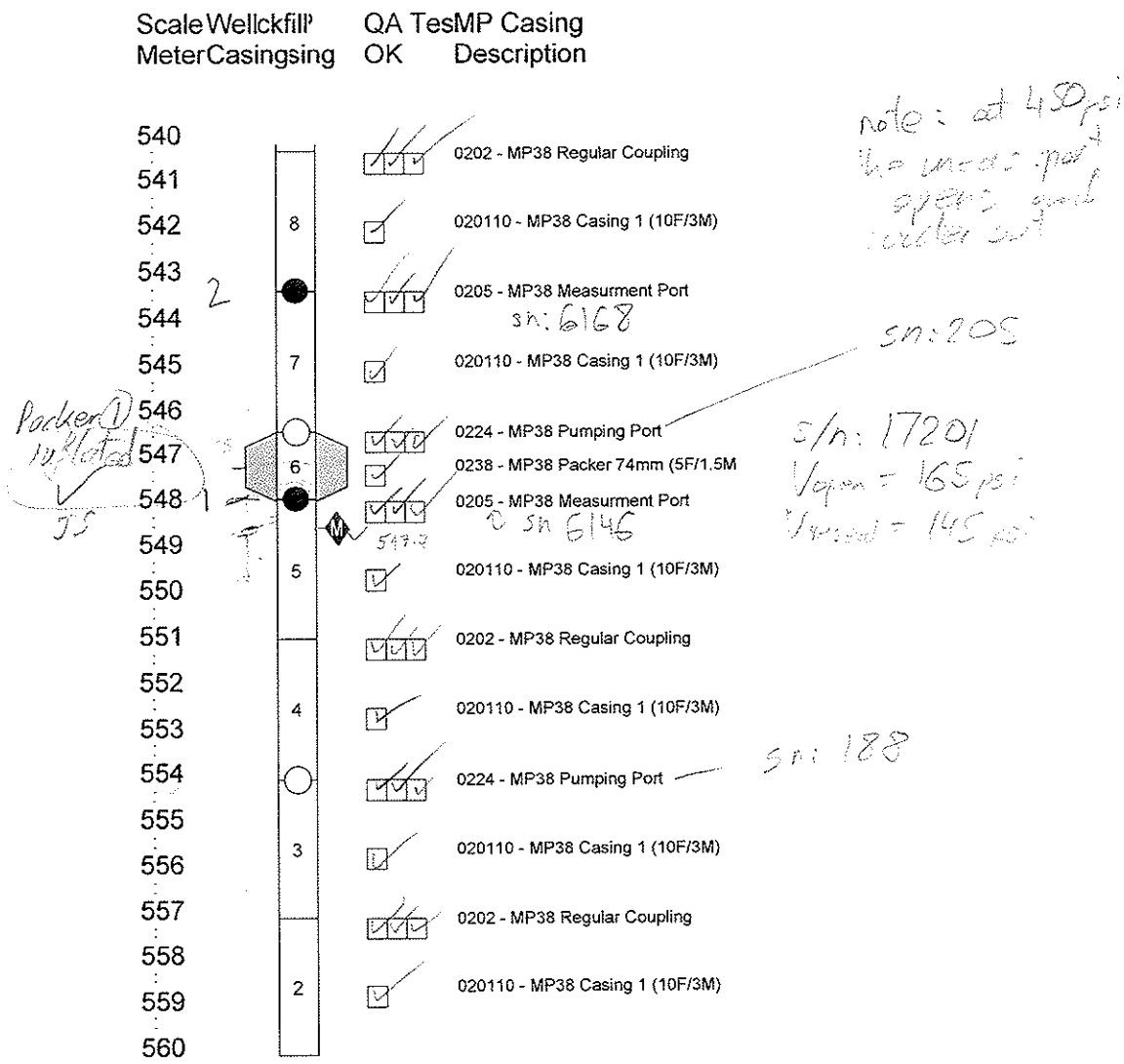
(c) Westbay Instruments Inc. 2000

Thu Apr 29 03:40:26 2010



(c) Westbay Instruments Inc. 2000


Scale Wellckfill' QA TesMP Casing
Meter Casingsing OK Description
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
15
14
13
12
11
10
9
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)


Scale Wellckfill' QA TesMP Casing
Meter Casingsing OK Description
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
8
7
6
5
4
3
2
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0205 - MP38 Measurment Port
sn: 6168
020110 - MP38 Casing 1 (10F/3M)
0224 - MP38 Pumping Port
0238 - MP38 Packer 74mm (5F/1.5M
0205 - MP38 Measurment Port
@ sn 6146
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0224 - MP38 Pumping Port
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
Packer ① inflated
note: at 480psi the uncas. part of MP38 could collapse
sn: 205
s/n: 17201
Vopen = 165psi
Vunseat = 145psi
sn: 188

Scale Meter	Wellckfill' Casingsing	QA Tes OK	MP Casing Description
560			
561			
562	1		020110 - MP38 Casing 1 (10F/3M)
563			
564			
565			
566			
567			
568			
569			
570			
571			
572			
573			
574			
575			
576			
577			
578			
579			
580			

0202 - MP38 Regular Coupling

0203 - MP38 End Cap

Scale Meter	Wellckfill' Casingsing	QA Tes OK	MP Casing Description
580			
581			
582			
583			
584			
585			
586			
587			
588			
589			
590			
591			
592			
593			
594			
595			
596			
597			
598			
599			
600			

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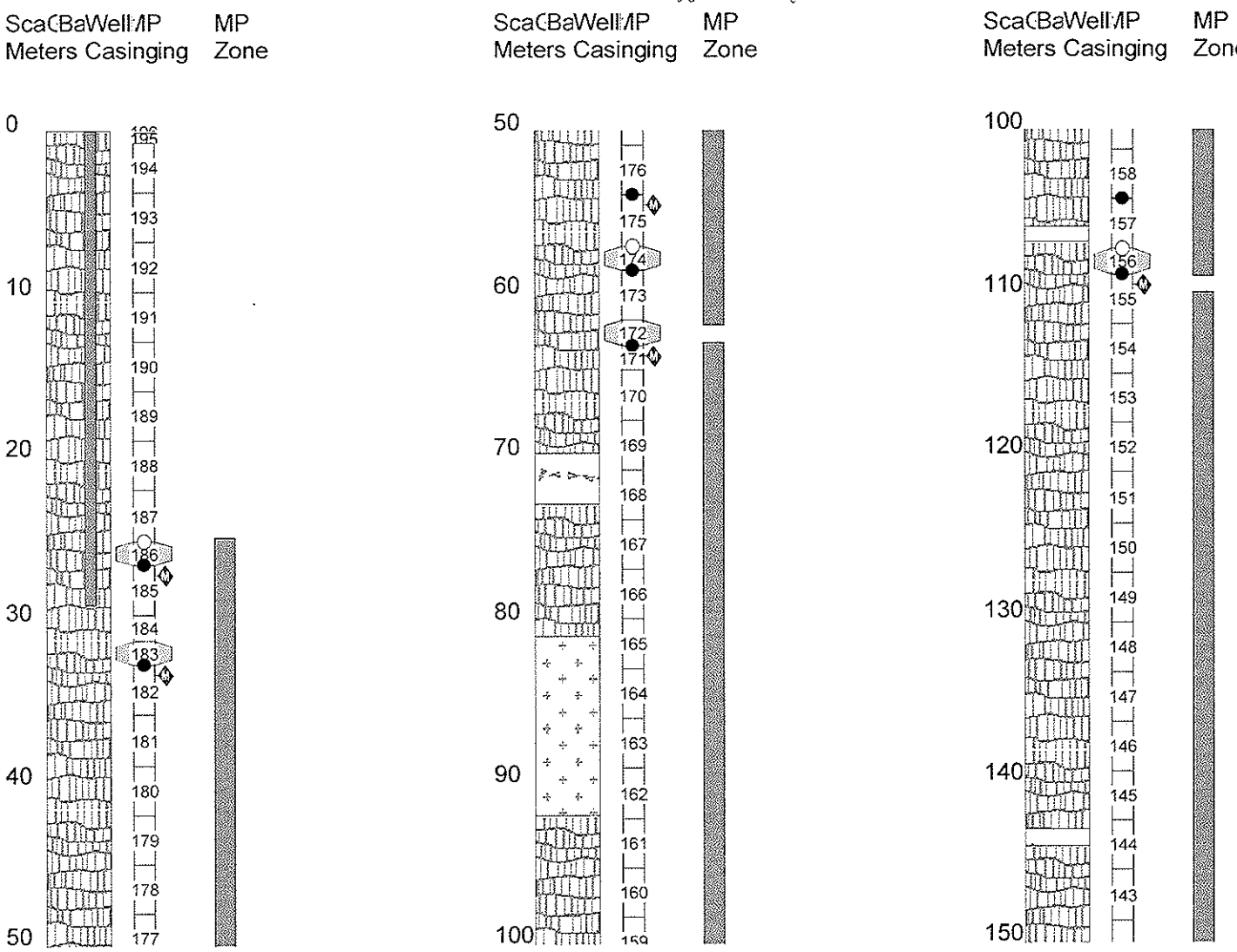
198 pieces
14 x 1.5m packer
3 x 1.5m
2 x 0.45m
179 x 3.0m
563.4m
end cap ~1m off bottom (564)
~0.4m stickup above datum

10WBW001 Rev1
SRK

Job No: 1CH008.013
Well: 10WBW001



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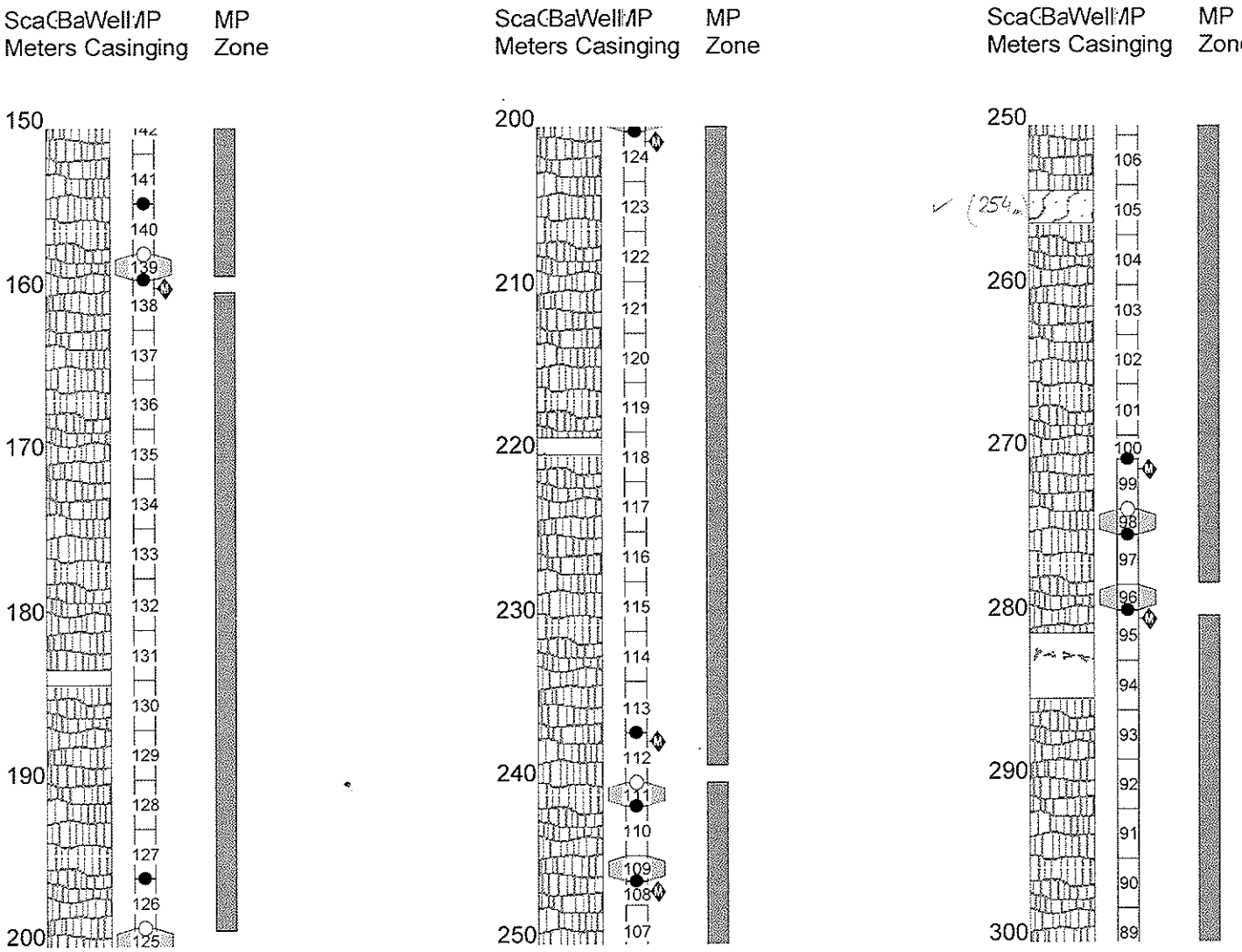
Thu Apr 29 03:08:22 2010



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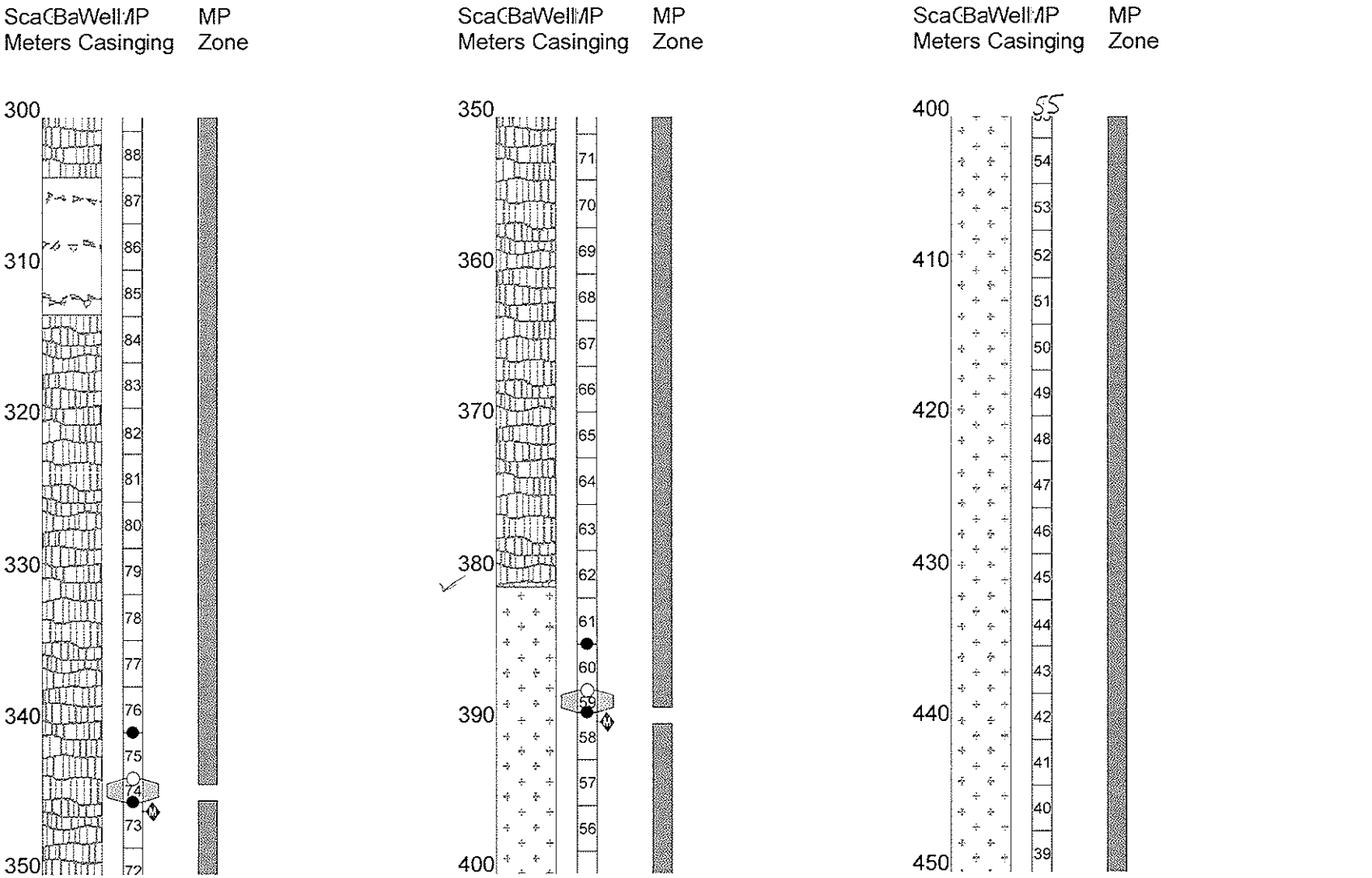
10WBW001 Rev1
SRK

Job No: 1CH008.013
Well: 10WBW001



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Thu Apr 29 03:08:22 2010

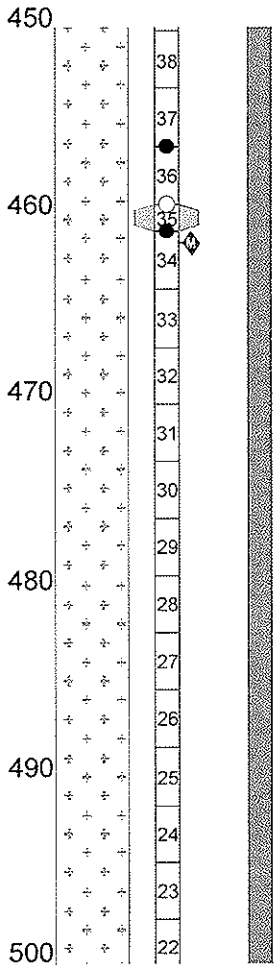
o pump port
● meas port

10WBW001 Rev1
SRK

Job No: 1CH008.013
Well: 10WBW001

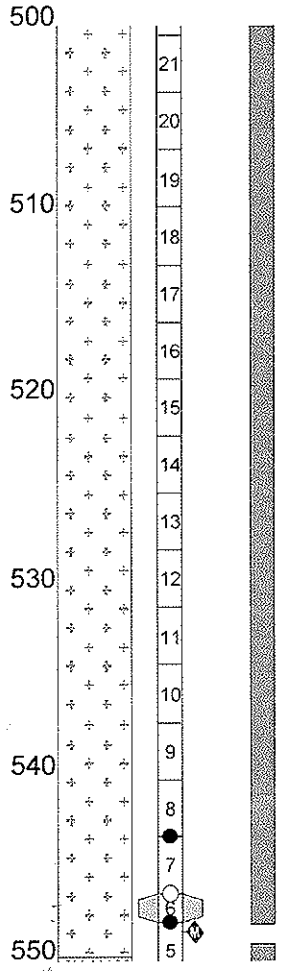
ScaCBaWellMP
Meters Casinging

MP
Zone



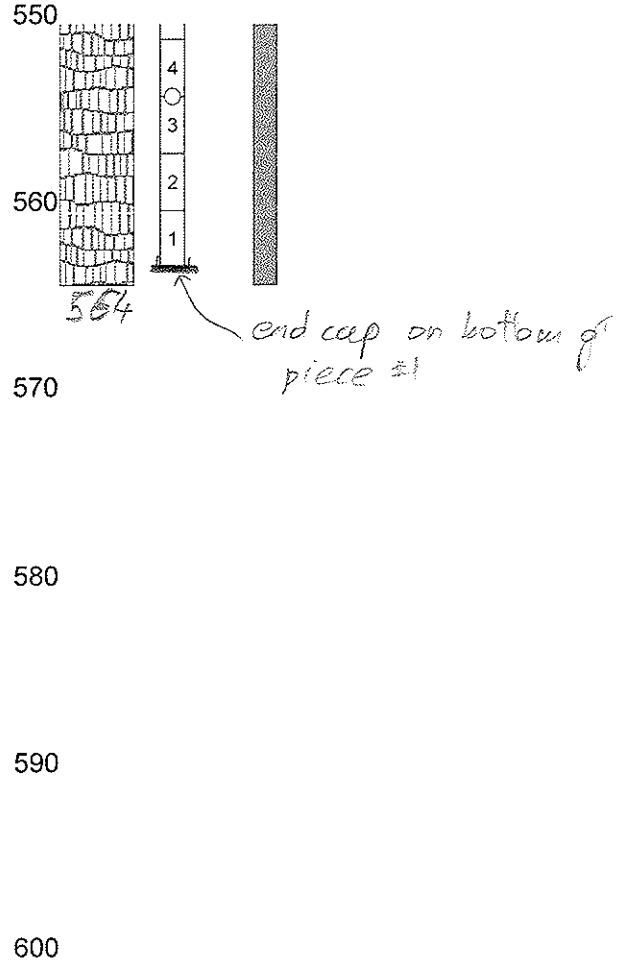
ScaCBaWellMP
Meters Casinging

MP
Zone



ScaCBaWellMP
Meters Casinging

MP
Zone

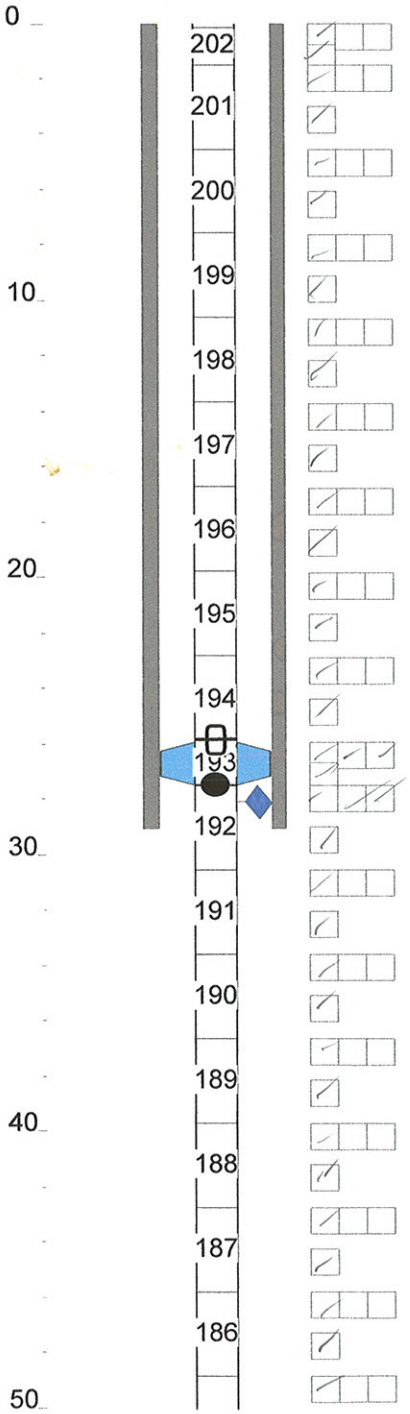


(c) Westbay Instruments Inc. 2000

Thu Apr 29 03:08:22 2010

Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North



(c) Westbay Instruments Inc. 2000

Thu Jun 24 10:07:34 2010

Casing Installation Log
SRK

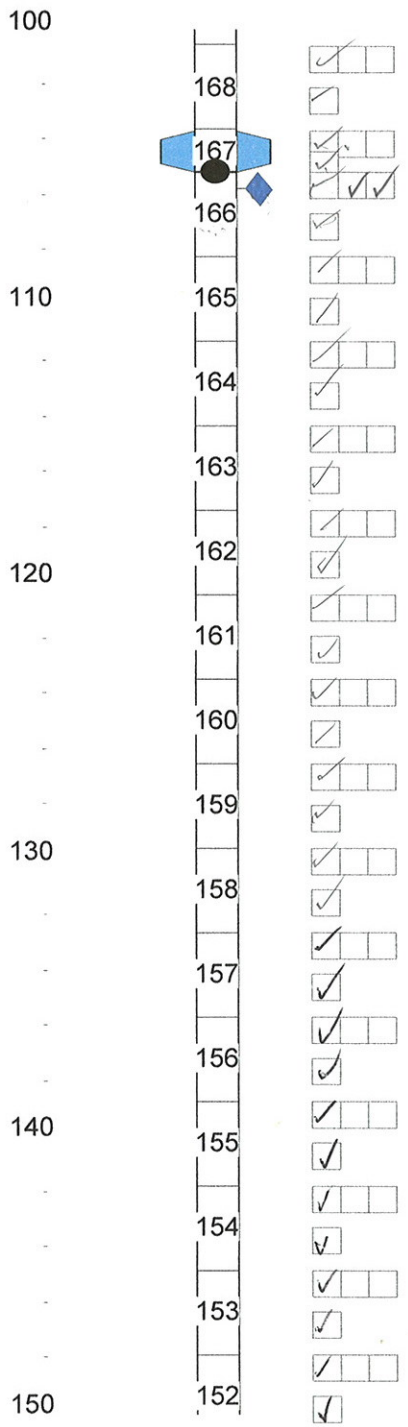
Job No: 1CH008.013
Well: Doris North

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
50	185	☐	020110 - MP38 Casing 1 (10F/3M)	
	184	☑	020110 - MP38 Casing 1 (10F/3M)	
	183	☑	020110 - MP38 Casing 1 (10F/3M)	+ add H2O
60	182	☑	020110 - MP38 Casing 1 (10F/3M)	
	181	☑	020110 - MP38 Casing 1 (10F/3M)	
	180	☑	020110 - MP38 Casing 1 (10F/3M)	
	179	☑	020110 - MP38 Casing 1 (10F/3M)	+ add H2O
70	178	☑	020110 - MP38 Casing 1 (10F/3M)	
	177	☑	020110 - MP38 Casing 1 (10F/3M)	
	176	☑	020110 - MP38 Casing 1 (10F/3M)	
80	175	☑	020110 - MP38 Casing 1 (10F/3M)	
	174	☑	020110 - MP38 Casing 1 (10F/3M)	+ add H2O
	173	☐	020110 - MP38 Casing 1 (10F/3M)	
90	172	☑	020110 - MP38 Casing 1 (10F/3M)	
	171	☑	020110 - MP38 Casing 1 (10F/3M)	
	170	☑	020110 - MP38 Casing 1 (10F/3M)	
100	169	☑	020110 - MP38 Casing 1 (10F/3M)	

(c) Westbay Instruments Inc. 2000

Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North



Add h2o

17177 - 140 psi
6148

~ added water

7:40 am

added water to casing

Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
150				
	151		020110 - MP38 Casing 1 (10F/3M)	
	150		020110 - MP38 Casing 1 (10F/3M)	
	149		020110 - MP38 Casing 1 (10F/3M)	added water to casing
160	148		020110 - MP38 Casing 1 (10F/3M)	
	147		020110 - MP38 Casing 1 (10F/3M)	
	146		020110 - MP38 Casing 1 (10F/3M)	
170	145		020110 - MP38 Casing 1 (10F/3M)	
	144		020110 - MP38 Casing 1 (10F/3M)	
	143		020110 - MP38 Casing 1 (10F/3M)	
180	142		020110 - MP38 Casing 1 (10F/3M)	
	141		020110 - MP38 Casing 1 (10F/3M)	
	140		020110 - MP38 Casing 1 (10F/3M)	
190	139		020110 - MP38 Casing 1 (10F/3M)	
	138		020110 - MP38 Casing 1 (10F/3M)	
	137		020110 - MP38 Casing 1 (10F/3M)	
	136		020110 - MP38 Casing 1 (10F/3M)	
200				

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Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
	135		0238 - MP38 Packer 74mm (5F/1.5M) 0205 - MP38 Measurment Port	17178-140psi 6154
	134		020110 - MP38 Casing 1 (10F/3M)	
	133		020110 - MP38 Casing 1 (10F/3M)	
	132		020110 - MP38 Casing 1 (10F/3M)	
210	131		020110 - MP38 Casing 1 (10F/3M)	
	130		020110 - MP38 Casing 1 (10F/3M)	
	129		020110 - MP38 Casing 1 (10F/3M)	
220	128		020110 - MP38 Casing 1 (10F/3M)	
	127		020110 - MP38 Casing 1 (10F/3M)	
	126		020110 - MP38 Casing 1 (10F/3M)	
230	125		020110 - MP38 Casing 1 (10F/3M)	
	124		020110 - MP38 Casing 1 (10F/3M)	
	123		020110 - MP38 Casing 1 (10F/3M)	
240	122		020110 - MP38 Casing 1 (10F/3M)	
	121		020110 - MP38 Casing 1 (10F/3M)	
	120		020110 - MP38 Casing 1 (10F/3M)	
	119		020110 - MP38 Casing 1 (10F/3M)	
250				

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Thu Jun 24 10:07:34 2010

Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
250				
	118		020110 - MP38 Casing 1 (10F/3M)	
	117		020110 - MP38 Casing 1 (10F/3M)	
	116		020110 - MP38 Casing 1 (10F/3M)	
260	115		020110 - MP38 Casing 1 (10F/3M)	
	114		020110 - MP38 Casing 1 (10F/3M)	
	113		020110 - MP38 Casing 1 (10F/3M)	
270	112		020110 - MP38 Casing 1 (10F/3M)	
	111		020110 - MP38 Casing 1 (10F/3M)	
	110		020110 - MP38 Casing 1 (10F/3M)	
	109		020110 - MP38 Casing 1 (10F/3M)	
280	108		020110 - MP38 Casing 1 (10F/3M)	
	107		020110 - MP38 Casing 1 (10F/3M)	
	106		020110 - MP38 Casing 1 (10F/3M)	
290	105		020110 - MP38 Casing 1 (10F/3M)	
	104		020110 - MP38 Casing 1 (10F/3M)	
	103		0238 - MP38 Packer 74mm (5F/1.5M) 0205 - MP38 Measurment Port	
	102		020110 - MP38 Casing 1 (10F/3M)	
300				

17170-145psi
6153

Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
300				
	101		020110 - MP38 Casing 1 (10F/3M)	
	100		020110 - MP38 Casing 1 (10F/3M)	
	99		020110 - MP38 Casing 1 (10F/3M)	
310	98		020110 - MP38 Casing 1 (10F/3M)	
	97		020110 - MP38 Casing 1 (10F/3M)	
	96		020110 - MP38 Casing 1 (10F/3M)	
320	95		020110 - MP38 Casing 1 (10F/3M)	
	94		020110 - MP38 Casing 1 (10F/3M)	
	93		020110 - MP38 Casing 1 (10F/3M)	
330	92		020110 - MP38 Casing 1 (10F/3M)	
	91		020110 - MP38 Casing 1 (10F/3M)	
	90		020110 - MP38 Casing 1 (10F/3M)	
	89		020110 - MP38 Casing 1 (10F/3M)	
340	88		020110 - MP38 Casing 1 (10F/3M)	
	87		020110 - MP38 Casing 1 (10F/3M)	
	86		020110 - MP38 Casing 1 (10F/3M)	
350				

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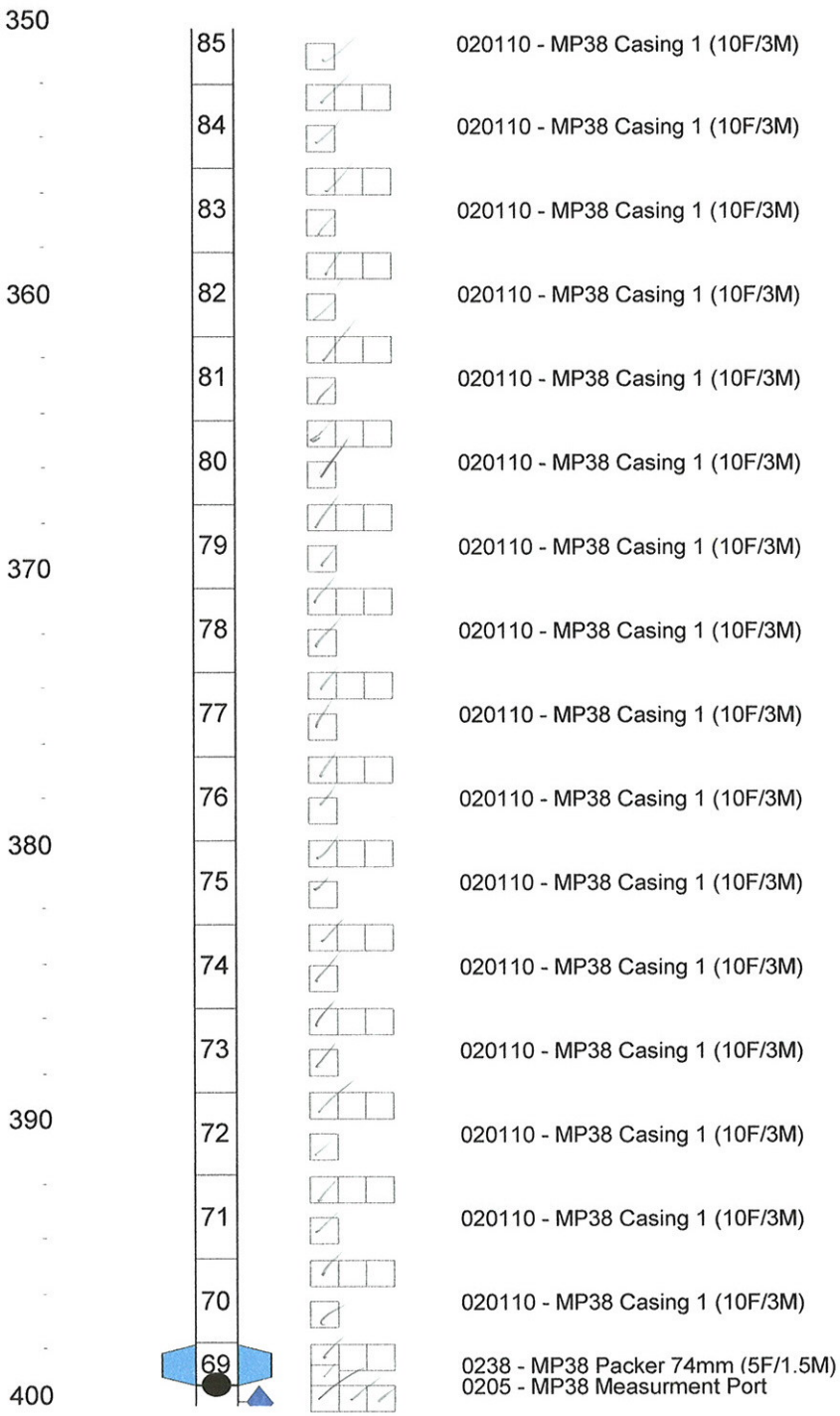
Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North



17172 - 150ps:
6183

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Thu Jun 24 10:09:59 2010

Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
400	68		020110 - MP38 Casing 1 (10F/3M)	
	67		020110 - MP38 Casing 1 (10F/3M)	
	66		020110 - MP38 Casing 1 (10F/3M)	
410	65		020110 - MP38 Casing 1 (10F/3M)	
	64		020110 - MP38 Casing 1 (10F/3M)	
	63		020110 - MP38 Casing 1 (10F/3M)	
420	62		020110 - MP38 Casing 1 (10F/3M)	
	61		020110 - MP38 Casing 1 (10F/3M)	
	60		020110 - MP38 Casing 1 (10F/3M)	
	59		020110 - MP38 Casing 1 (10F/3M)	
430	58		020110 - MP38 Casing 1 (10F/3M)	
	57		020110 - MP38 Casing 1 (10F/3M)	
	56		020110 - MP38 Casing 1 (10F/3M)	
440	55		020110 - MP38 Casing 1 (10F/3M)	
	54		020110 - MP38 Casing 1 (10F/3M)	
	53		020110 - MP38 Casing 1 (10F/3M)	
450	52		020110 - MP38 Casing 1 (10F/3M)	

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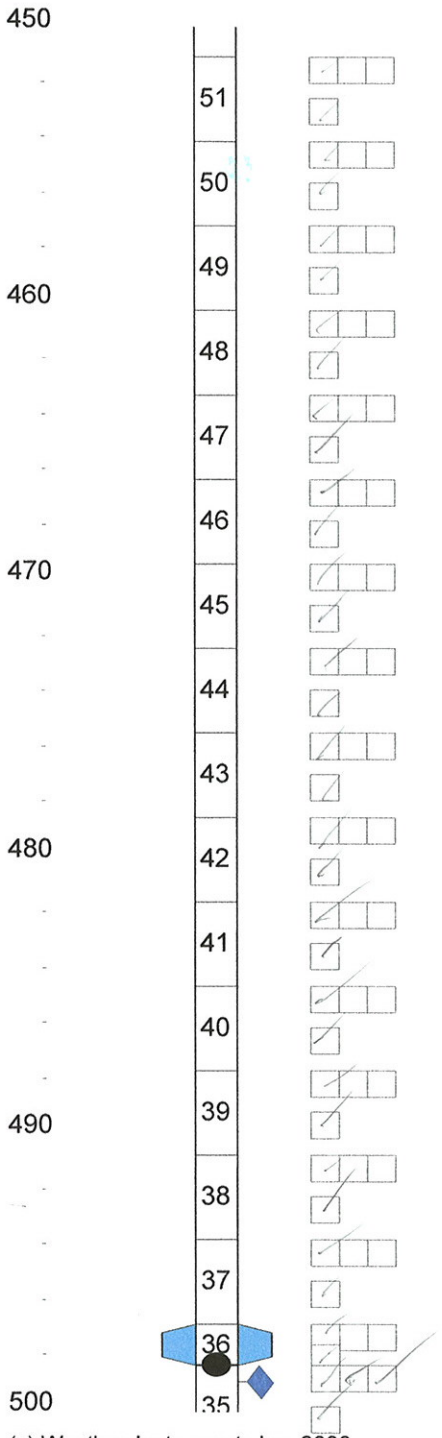
Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North



17171-145 ps: 6189

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Thu Jun 24 10:09:59 2010

Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
500				
	34		020110 - MP38 Casing 1 (10F/3M)	175
	33		0706 - MP38 Hydraulic Pumping Port 0238 - MP38 Packer 74mm (5F/1.5M) 0205 - MP38 Measurment Port	17174 - 145 psi 6153
	32		020110 - MP38 Casing 1 (10F/3M)	
510	31		020110 - MP38 Casing 1 (10F/3M)	
	30		020110 - MP38 Casing 1 (10F/3M)	
	29		020110 - MP38 Casing 1 (10F/3M)	
520	28		020110 - MP38 Casing 1 (10F/3M)	
	27		020110 - MP38 Casing 1 (10F/3M)	
	26		020110 - MP38 Casing 1 (10F/3M)	
	25		020110 - MP38 Casing 1 (10F/3M)	
530	24		020110 - MP38 Casing 1 (10F/3M)	
	23		020110 - MP38 Casing 1 (10F/3M)	
	22		020110 - MP38 Casing 1 (10F/3M)	
540	21		020110 - MP38 Casing 1 (10F/3M)	
	20		020110 - MP38 Casing 1 (10F/3M)	
	19		020110 - MP38 Casing 1 (10F/3M)	
550				

(c) Westbay Instruments Inc. 2000

Thu Jun 24 10:11:52 2010

Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
550	18	✓	020110 - MP38 Casing 1 (10F/3M)	
	17	✓	020110 - MP38 Casing 1 (10F/3M)	
	16	✓	020110 - MP38 Casing 1 (10F/3M)	
	15	✓	020110 - MP38 Casing 1 (10F/3M)	
560	14	✓	020110 - MP38 Casing 1 (10F/3M)	
	13	✓	020110 - MP38 Casing 1 (10F/3M)	
	12	✓	020110 - MP38 Casing 1 (10F/3M)	
570	11	✓	020110 - MP38 Casing 1 (10F/3M)	
	10	✓	020110 - MP38 Casing 1 (10F/3M)	
	9	✓	020110 - MP38 Casing 1 (10F/3M)	
580	8	✓	020110 - MP38 Casing 1 (10F/3M)	
	7	✓	020110 - MP38 Casing 1 (10F/3M)	
	6	✓	020110 - MP38 Casing 1 (10F/3M)	
590	5	✓	020110 - MP38 Casing 1 (10F/3M)	
	4	✓	020105 - MP38 Casing 2 (5F/1.5M)	
	3	✓	0238 - MP38 Packer 74mm (5F/1.5M) 0205 - MP38 Measurment Port	
	2	✓	020110 - MP38 Casing 1 (10F/3M)	
		✓	0706 - MP38 Hydraulic Pumping Port	
600	1	✓	020110 - MP38 Casing 1 (10F/3M)	

17173-150 ps:
6195
173

(c) Westbay Instruments Inc. 2000

Thu Jun 24 10:11:52 2010

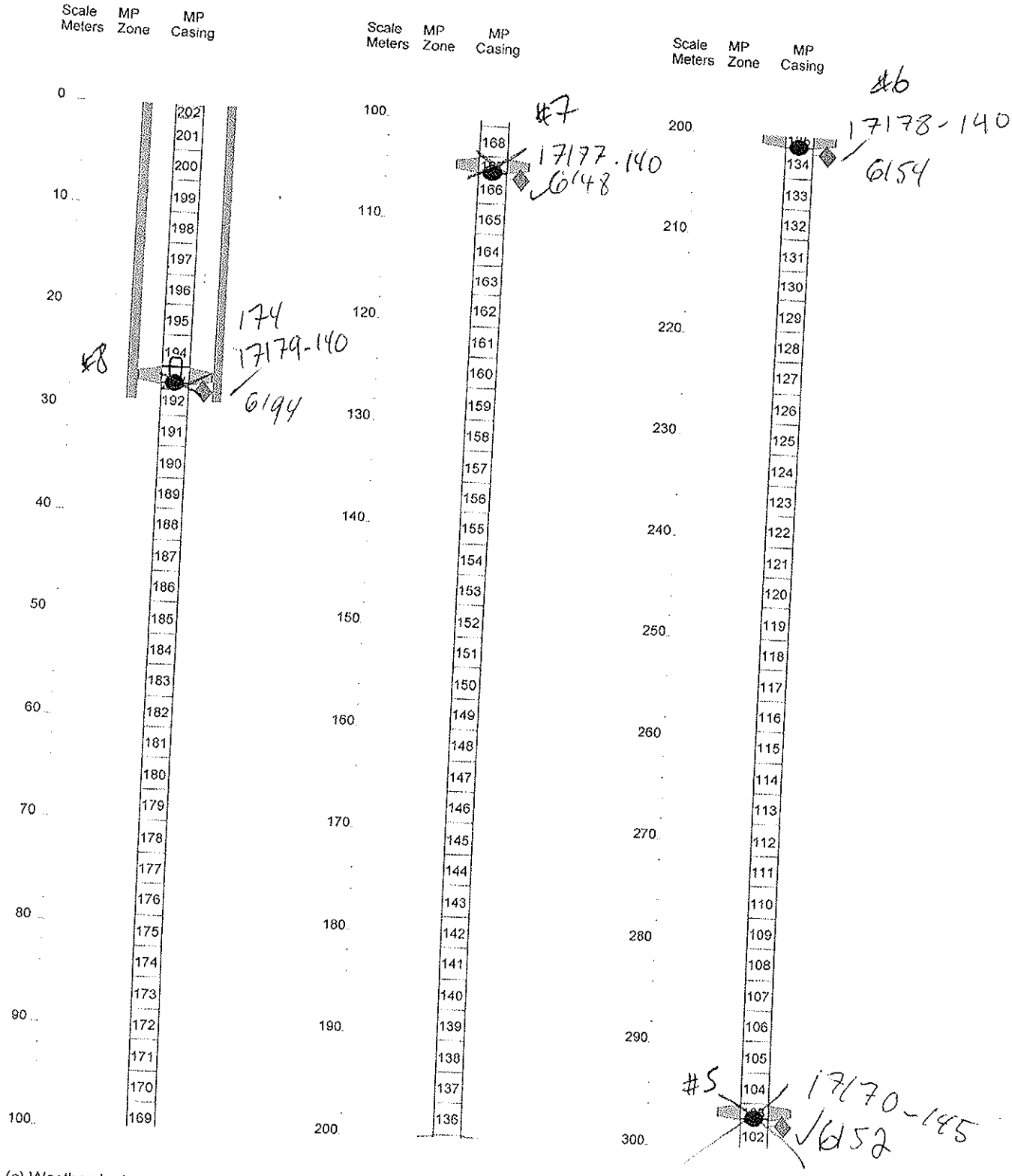
Casing Installation Log
SRK

Job No: 1CH008.013
Well: Doris North

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
600			0203 - MP38 End Cap	
610				
620				
630				
640				
650				

Summary Casing Log
SRK

Job No: 1CH008.013
Well: Doris North



(c) Westbay Instruments Inc. 2000

Thu Jun 24 10:04:40 2010

Summary Casing Log

Company: SRK
Well: Boston
Site: Hope Bay
Project: Hope Bay

Job No: 1CH008.013
Author: J.Scibek

Well Information

Reference Datum: top of steel casing
Elevation of Datum: 0.00 m.
MP Casing Top: 0.00 m.
MP Casing Length: 468.27 m.

Borehole Depth: 500.00 m.
Borehole Inclination: 68
Borehole Diameter: 96.00 mm

Well Description:
Boston sub-PF
Other References:
Draft - zone 446 - 500m pending testing
(add piece 170 as needed until rig moved

File Information

File Name: WBW04.WWD
Report Date: Sat Jul 31 15:39:21 2010

File Date: Jul 31 12:45:16 2010

Sketch of Wellhead Completion

Casing Installation Log

Company: SRK
Well: Boston
Site: Hope Bay
Project: Hope Bay

Job No: 1CH008.013
Author: J.Scibek

Well Information

Reference Datum: top of steel casing
Elevation of Datum: 0.00 m.
MP Casing Top: 0.00 m.
MP Casing Length: 468.27 m.

Borehole Depth: 500.00 m.
Borehole Inclination: 68
Borehole Diameter: 96.00 mm

Well Description:
Boston sub-PF
Other References:
Draft - zone 446 - 500m pending testing
(add piece 170 as needed until rig moved

File Information

File Name: WBW04.WWD
Report Date: Sat Jul 31 15:40:31 2010

File Date: Jul 31 12:45:16 2010

Comments

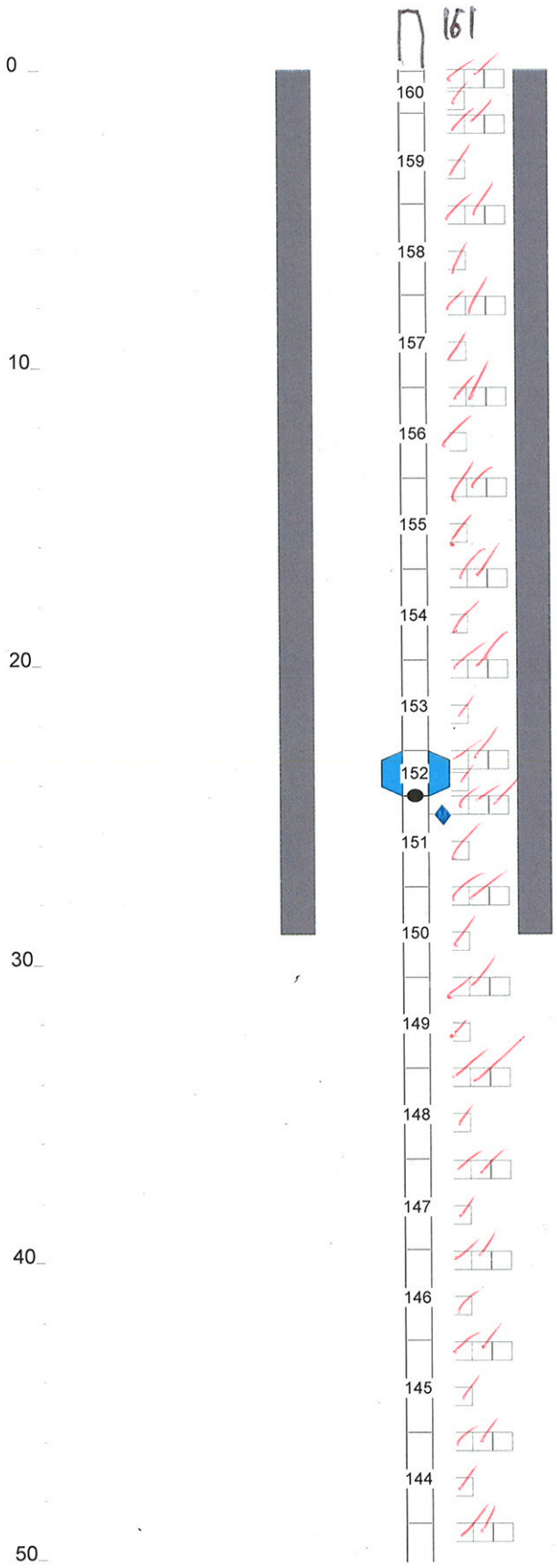
Hole terminated at 470m (planned 500m) because of drilling problems. Bottom zone 446–470m no packer test (core is solid rock).

Log Information

Borehole condition confirmed.	(method)_____	Date: Jul 30 2010
MP well design & preparation.	By: J. Scibek	Date: Jul 30 2010
MP well design checked.	By: M. Royle	Date: Jul 30 2010
MP well and borehole approved to install.	By: M. Royle/D. Mackie	Date: Jul 30 2010

Well Designer Report
Scale
Meters

Job No: 1CH008.013
Well: Boston



MP Casing Description

020105 - MP38 Casing 2 (5F/1.5M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

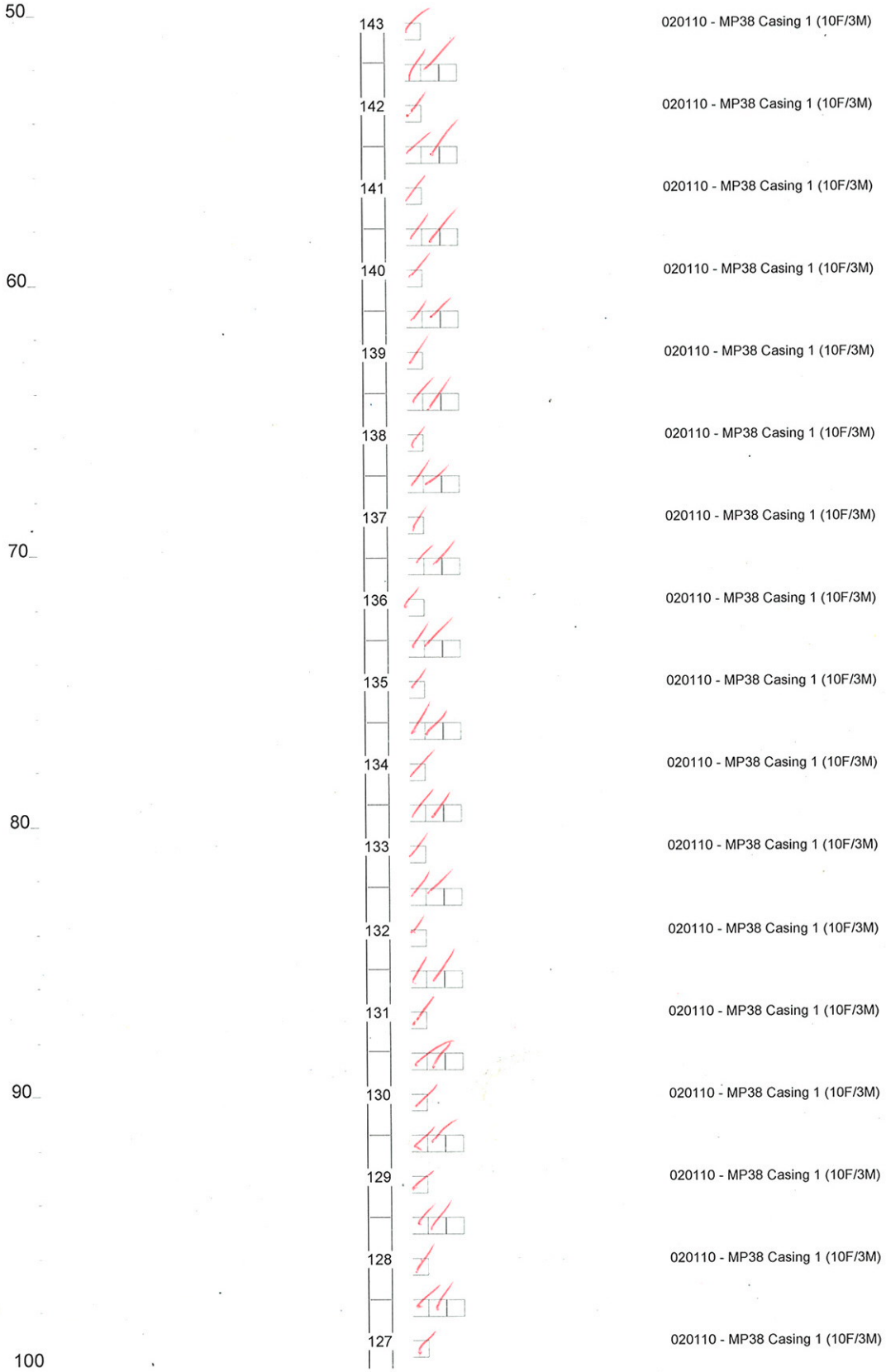
020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

(c) Westbay Instruments Inc. 2000

Sat Jul 31 15:41:34 2010


50
60
70
80
90
100
143
142
141
140
139
138
137
136
135
134
133
132
131
130
129
128
127
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)

Well Designer Report
Scale
Meters

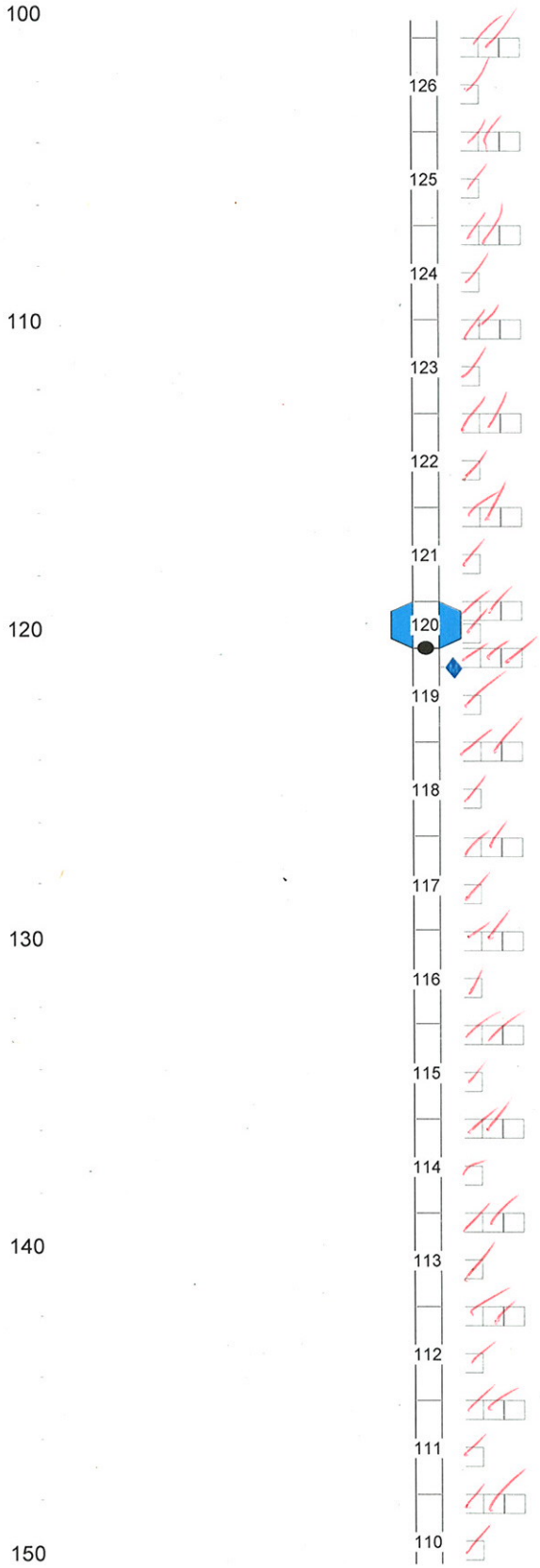
Well
Casing

MP
Casing

QA Tested
OK

MP Casing
Description

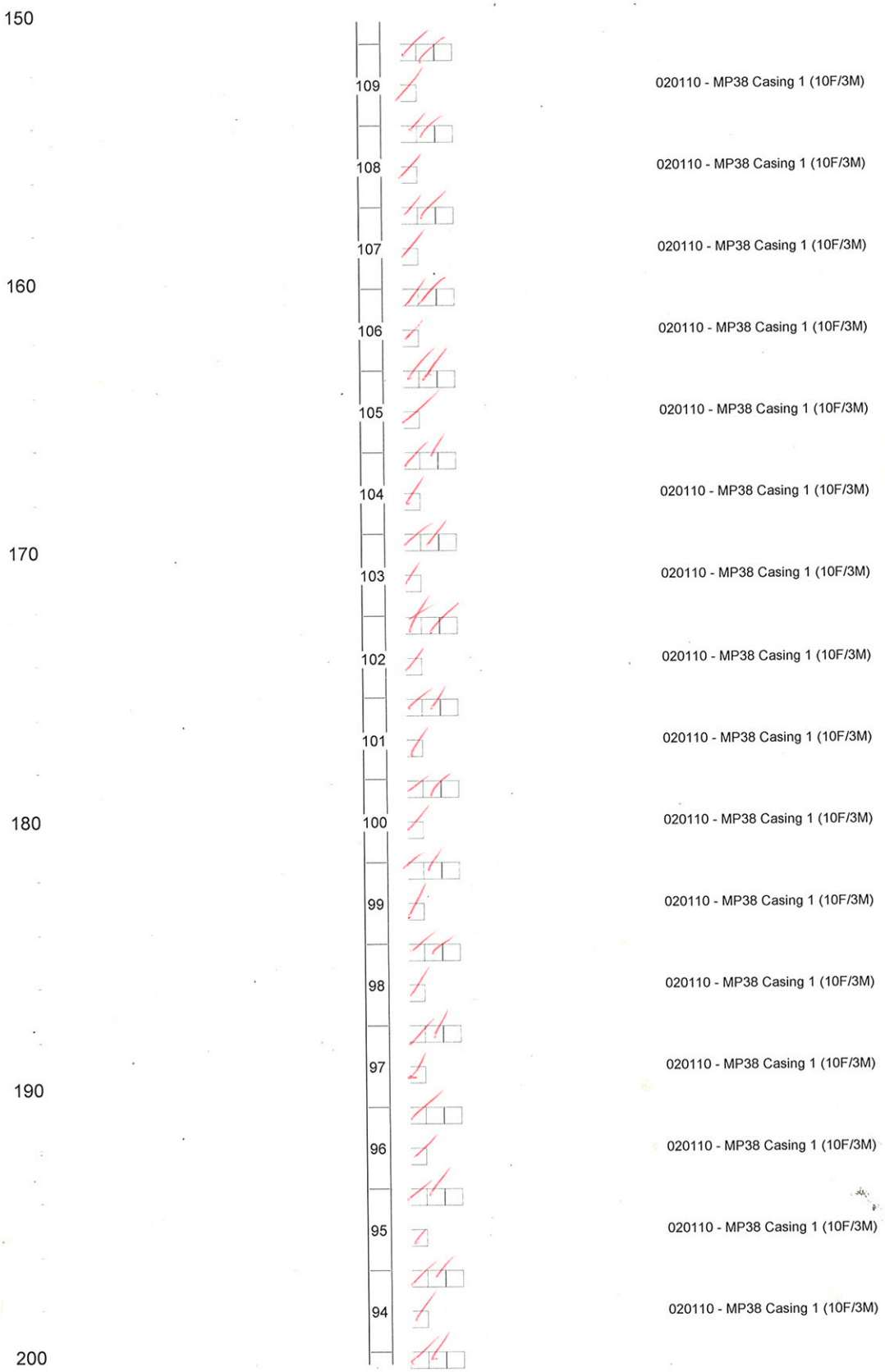
Job No: 1CH008.013
Well: Boston



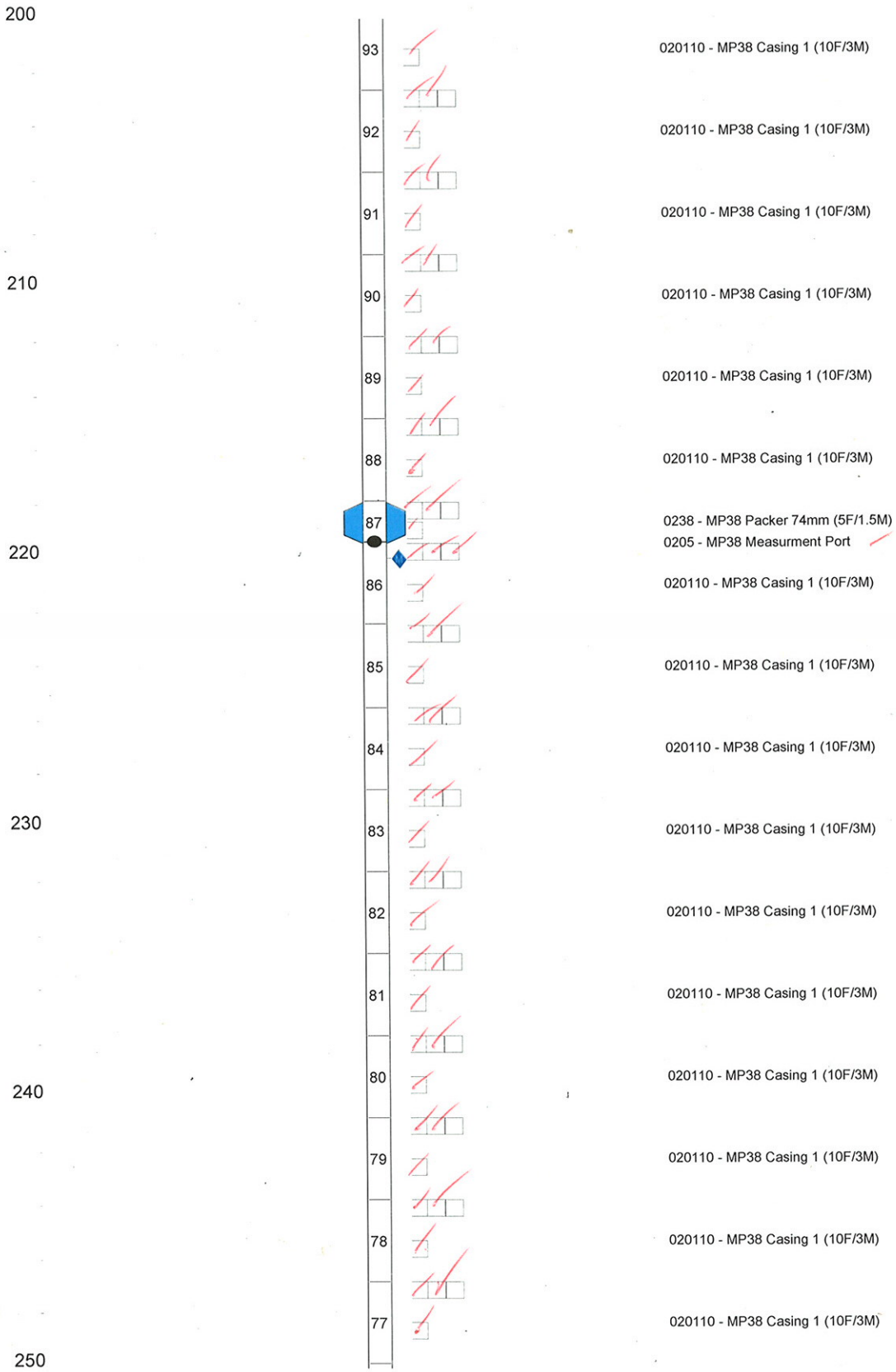
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)
020110 - MP38 Casing 1 (10F/3M)

(c) Westbay Instruments Inc. 2000

Sat Jul 31 15:41:34 2010



(c) Westbay Instruments Inc. 2000



(c) Westbay Instruments Inc. 2000

250

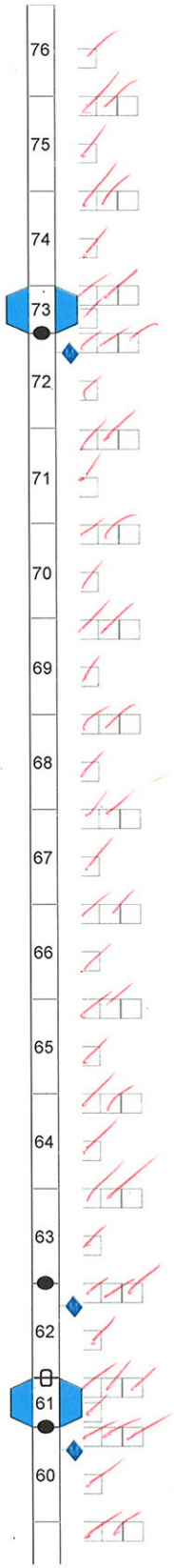
260

270

280

290

300



020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

0706 - MP38 Hydraulic Pumping Port
0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

300

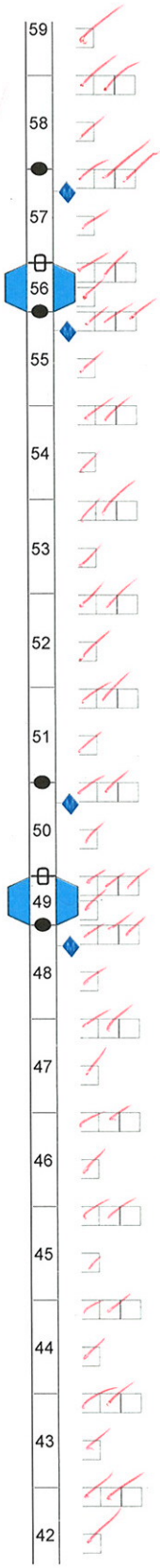
310

320

330

340

350



020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

0706 - MP38 Hydraulic Pumping Port
0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

0706 - MP38 Hydraulic Pumping Port
0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

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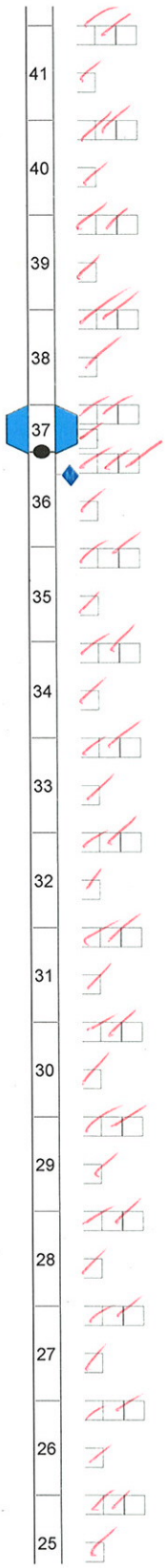
020110 - MP38 Casing 1 (10F/3M)



020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

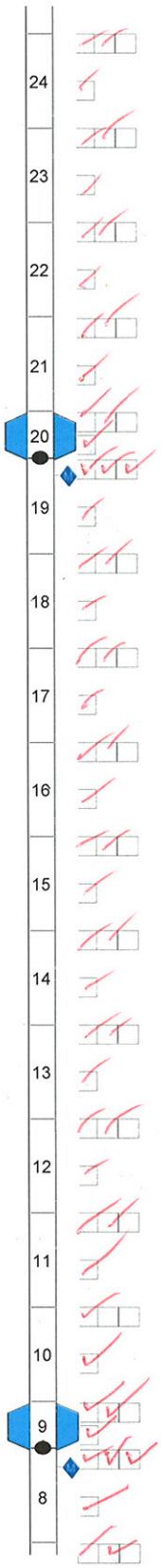
020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

400



410

420

430

440

450

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port

020110 - MP38 Casing 1 (10F/3M)

Well Designer Report
Scale
Meters

Well
Casing

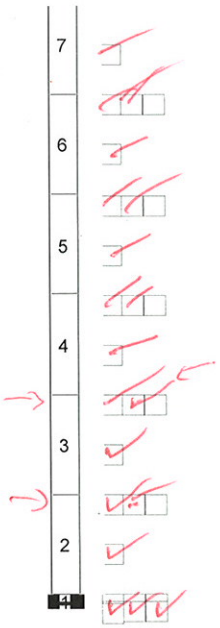
MP
Casing

QA Tested
OK

MP Casing
Description

Job No: 1CH008.013
Well: Boston

450



020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

460

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

020110 - MP38 Casing 1 (10F/3M)

0203 - MP38 End Cap

470

water level = 30.8 FT
(b. top of rod)
(top of rod ~ 1.5 m above casing)

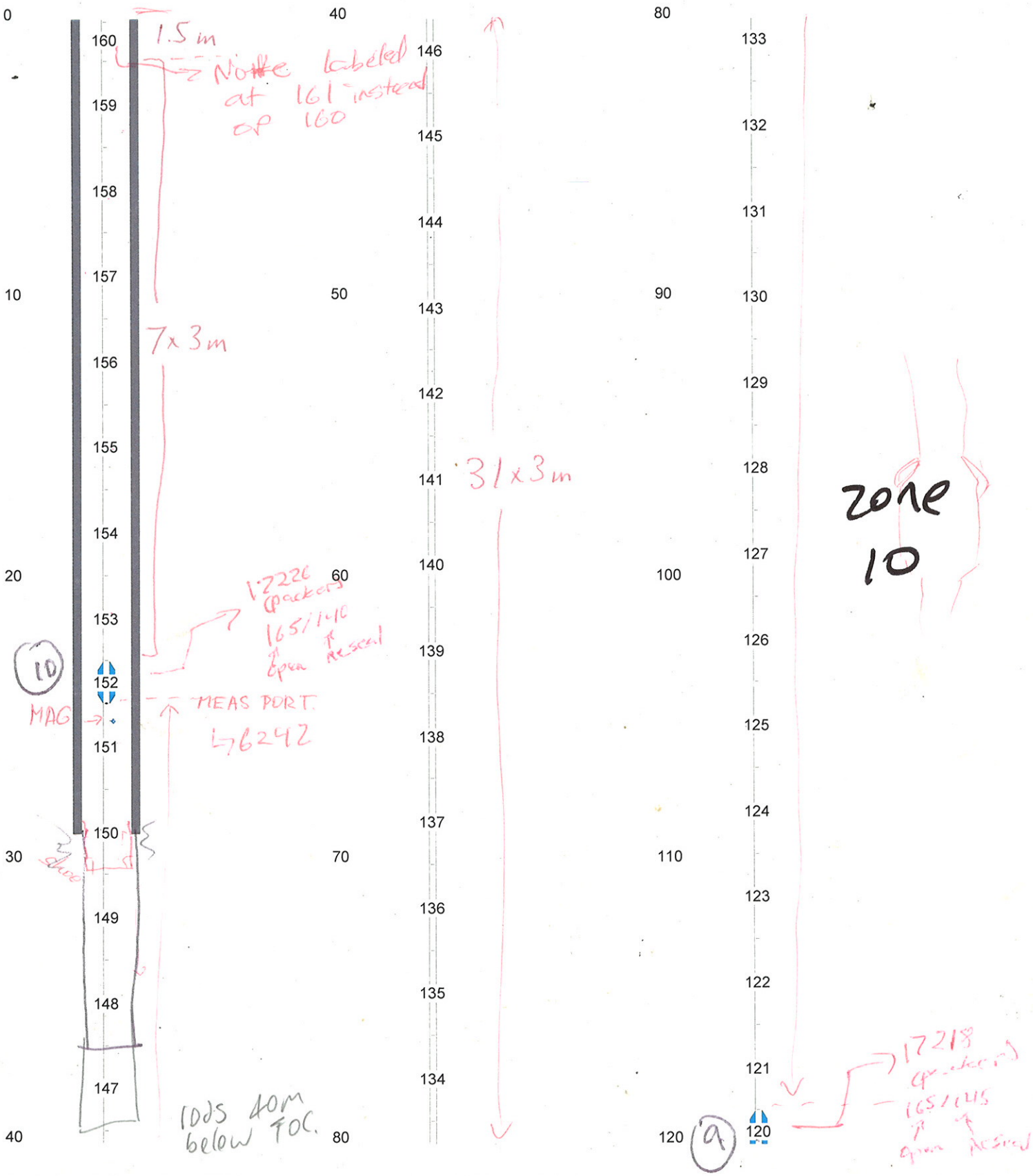
480

490

500

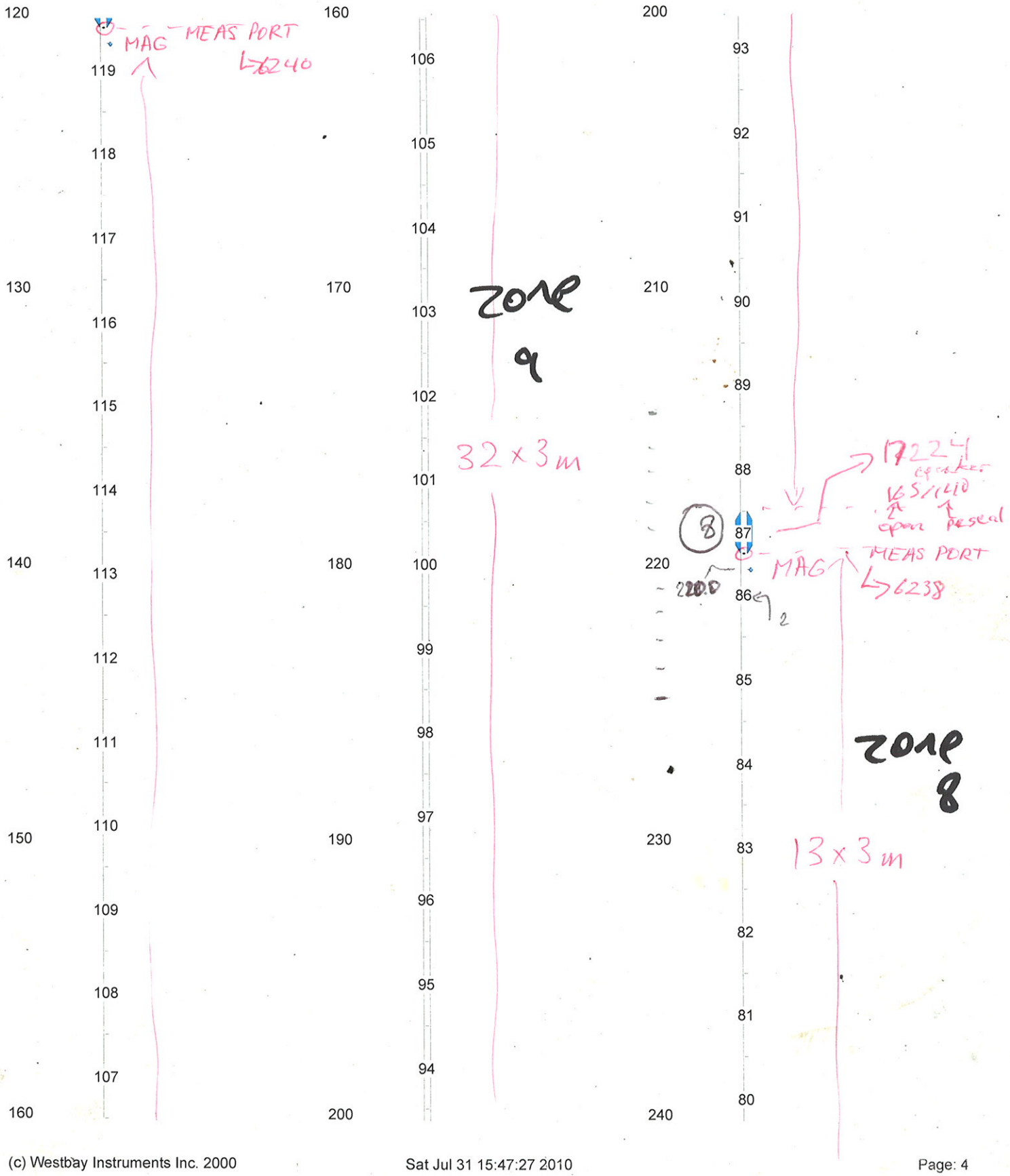
Well Designer Report

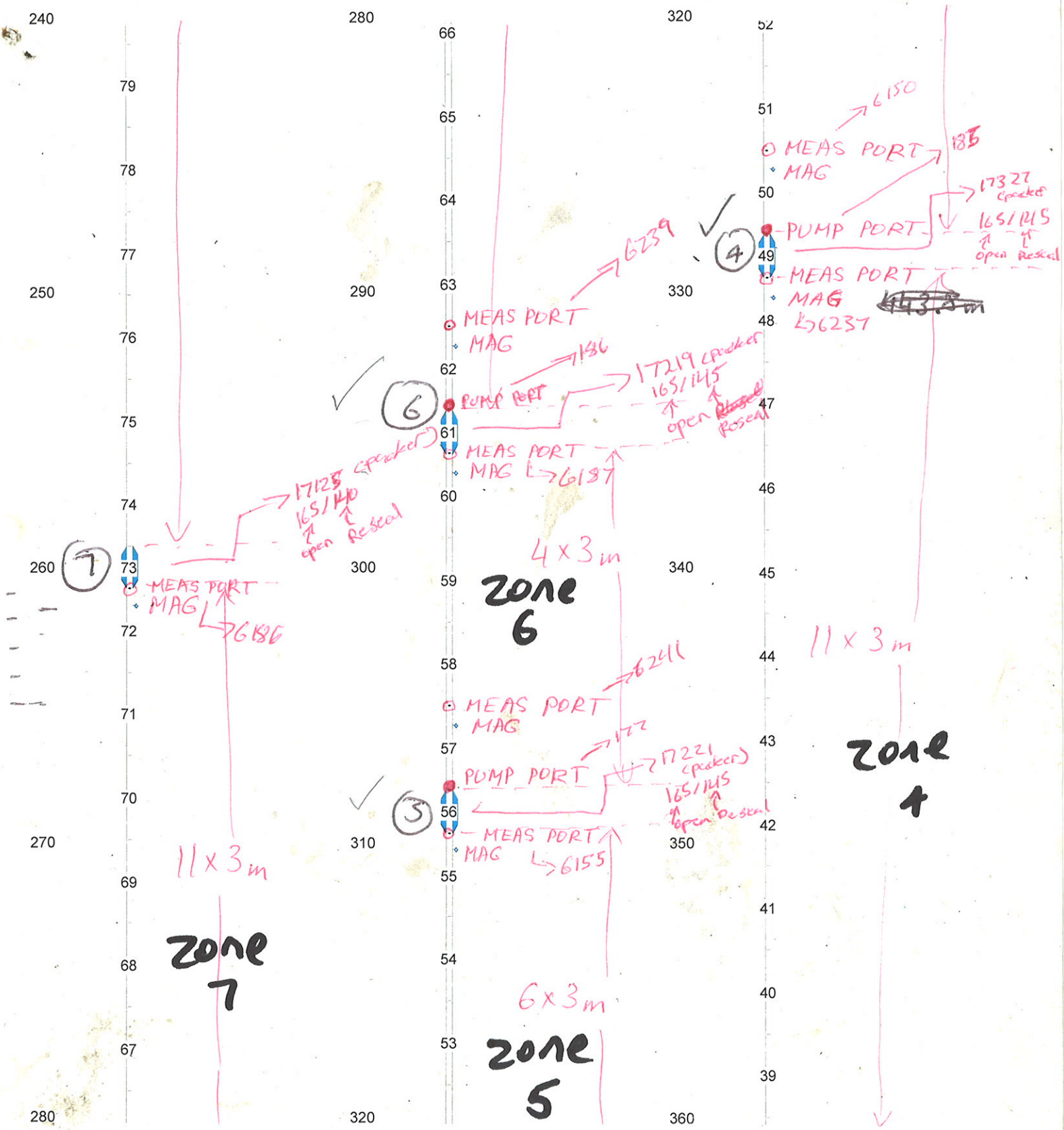
Job No: 1CH008.013
Well: Boston



Well Designer Report

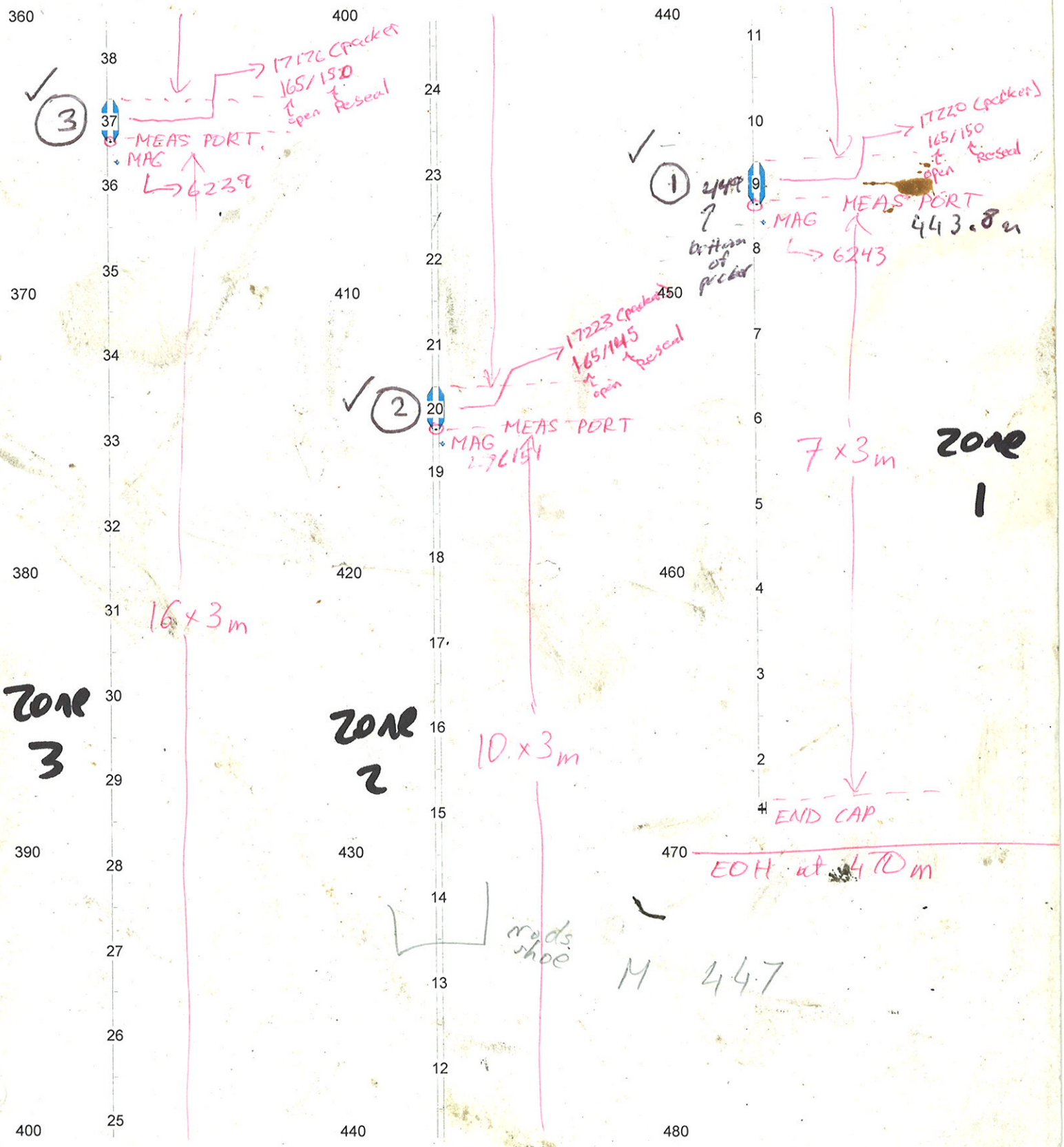
Job No: 1CH008.013
Well: Boston




240
79
78
77
250
76
75
74
260
73
72
71
70
270
69
68
67
280
MEAS PORT
MAG
6186
17125 cracker
165/145
open
Reseal
7
11 x 3m
zone 7
280
66
65
64
290
63
62
61
60
300
59
58
57
56
310
55
54
53
320
MEAS PORT
MAG
6239
PUMP PORT
186
17219 cracker
165/145
open
Reseal
6
MEAS PORT
MAG
6187
4 x 3m
zone 6
MEAS PORT
MAG
6241
PUMP PORT
177
17221 cracker
165/145
open
Reseal
5
MEAS PORT
MAG
6155
6 x 3m
zone 5
320
52
51
50
49
48
47
46
45
44
43
42
41
40
39
360
MEAS PORT
MAG
6150
185
PUMP PORT
17327 cracker
165/145
open
Reseal
4
MEAS PORT
MAG
6237
11 x 3m
zone 4

Well Designer Report

Job No: 1CH008.013
Well: Boston



Appendix G
Westbay Packer Inflation Records

Schlumberger WATER SERVICES

Sheet 1 of ___

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBW 001

Location: Doris Central | Completed by: JS | Date Inflated: MAY 1, 2010

Packer No. 1 (sn 17201) | Depth (ft / m): 546.5 | Inflation Tool No.: 3198

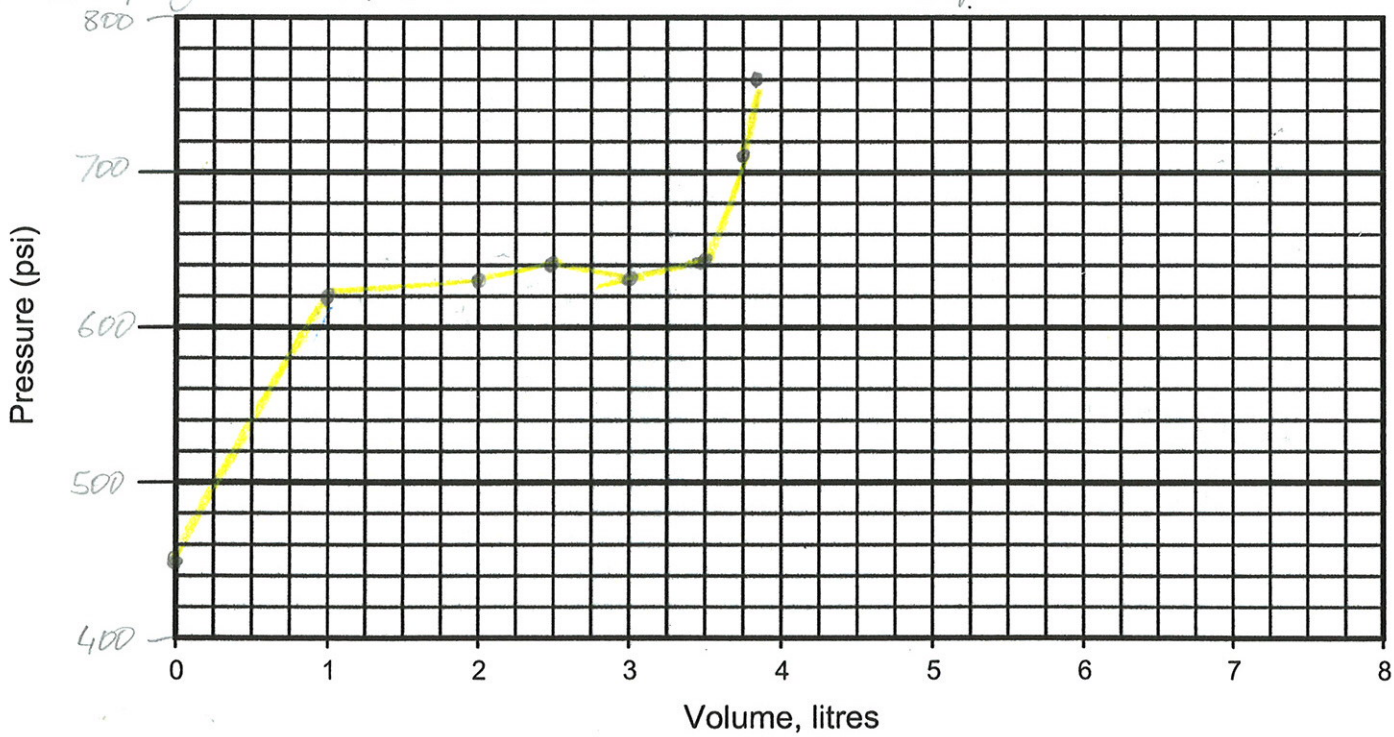
Packer Valve Pressure, P_V: 165 psi | Final Line Pressure, P_L: 760 psi | Tool Pressure, P_T: 440 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 155 psi
− 50psi Pbackup in hose reel

Volume, litres	0	1.0	2.0	2.5	3.0	3.5	3.75	3.85		
Pressure, psi	450	620	630	640	630	642	710	760		
Volume, litres										
Pressure, psi										

Each P read ≈ 5 min after pump stop as there was delay in P equilibrating.
Reverse page has P measurements vs time at each step.



Comments: Packer # | Time - 8:44 am to 10:05 am

Mag Collars:	549.2	462.4	390.7	346.5	281.0	271.9	247.5	238.3	201.2	160.6
	~548	461.5	390.0	340	280.5	271.4	241	238	201.5	160.5

109.1	63.4	54.3	34.1	28.0
110.0	64.7	55.3	34.6	28.5

Schlumberger WATER SERVICES

Sheet 2 of ____

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBW 001

Location: Doris Central | Completed by: JS | Date Inflated: May 1 2010

Packer No. 2 (sn 17200) | Depth (ft / m): 461 | Inflation Tool No.: 3198

Packer Valve Pressure, P_V: 165 psi | Final Line Pressure, P_L: 745 psi | Tool Pressure, P_T: 430 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

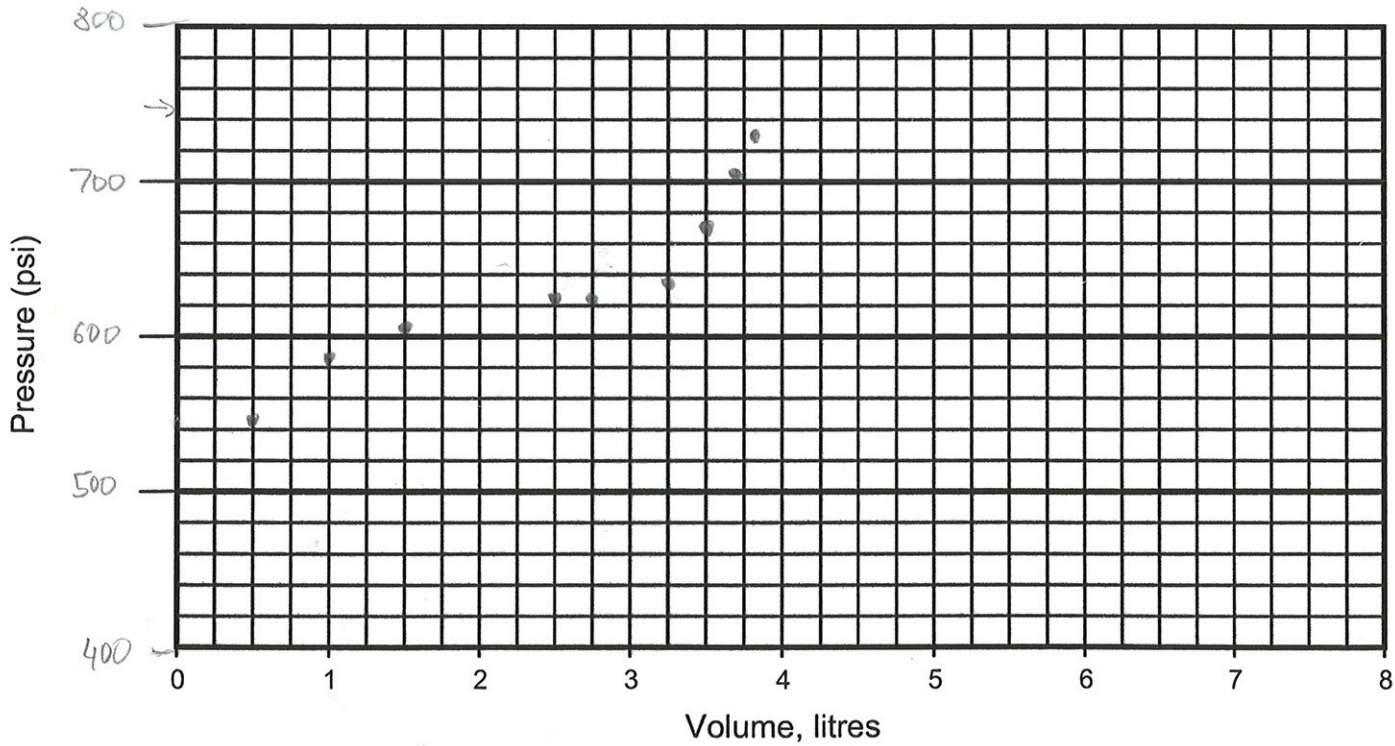
(full to top of pvc)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 135 psi

$P_L = P_E - P_W + P_V + P_T = 150 - 0 + 165 + 430 = 745$

Volume, litres	0.5	1.0	1.5	2.5	2.75	3.25	3.50	3.70	3.85	
Pressure, psi	545	585	605	625	625	635	670	705	730	

Volume, litres										
Pressure, psi										



Comments: Packer # 2 normal inflation | Time - 21:00

Schlumberger WATER SERVICES

Sheet 3 of ___

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10WBW001

Location: Doris Central | Completed by: JS. | Date Inflated: May 1 2010

Packer No. 3 (sn: 17202) | Depth (ft / (m)): 389 | Inflation Tool No.: 3198

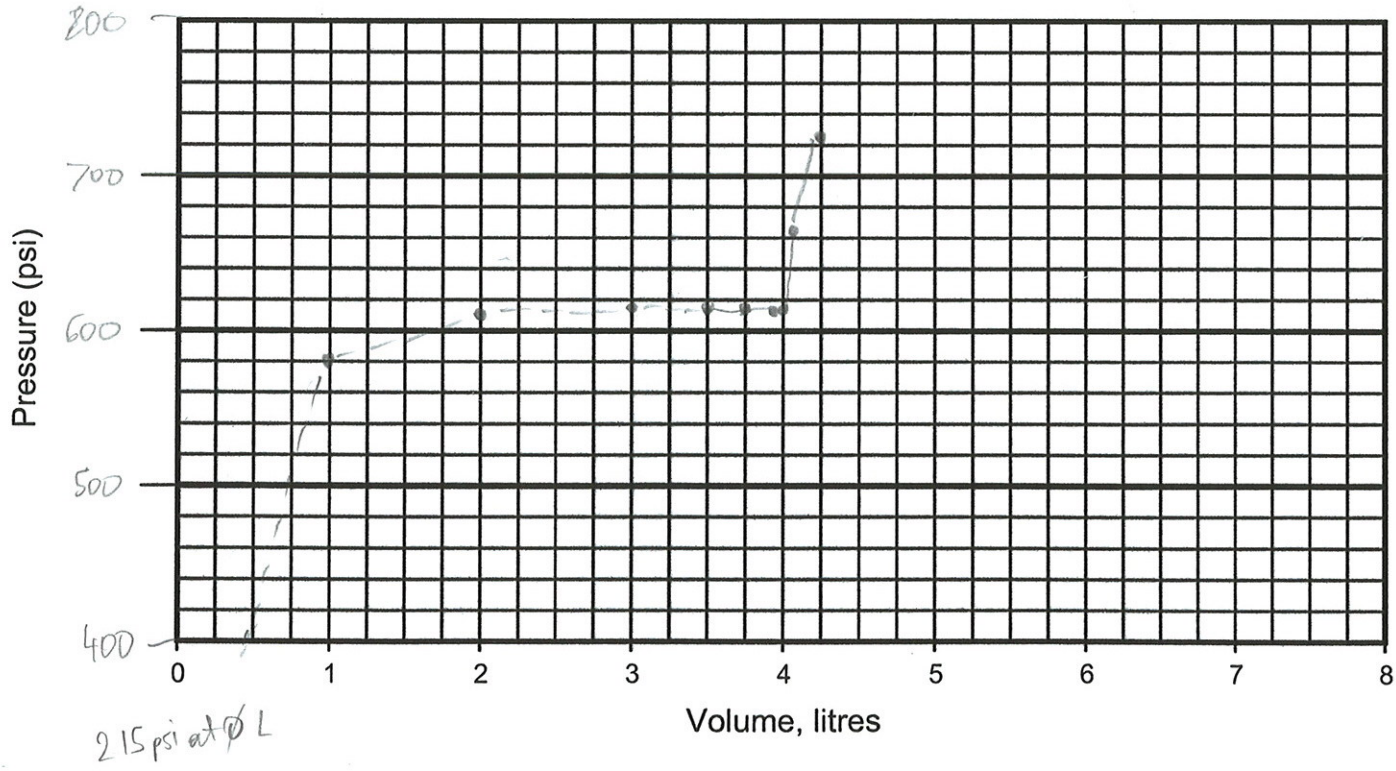
Packer Valve Pressure, P_V: 170 psi | Final Line Pressure, P_L: 725 psi | Tool Pressure, P_T: 430 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 125 psi

725 + 0 - 170 - 430 = 125

Volume, litres	1.0	2.0	3.0	3.5	3.75	3.9	4.0	4.1	4.25	
Pressure, psi	580	610	615	615	615	615	615	665	725	
Volume, litres										
Pressure, psi										



Comments: Packer # 3 normal inflation | Time - 22:20

Schlumberger WATER SERVICES

Sheet 4 of ___

Westbay Packer Inflation Record

Project: HOPE BAY | Project No.: 1CH08.13 | Well No.: 10-WBW-001

Location: DORIS C | Completed by: DM | Date Inflated: MAY 2

Packer No. 4 SN 17206 | Depth (ft / (m)): ~346.7 ~343.4 ON CORE | Inflation Tool No.: 3198

Packer Valve Pressure, P_V: 165 psi | Final Line Pressure, P_L: 710 psi | Tool Pressure, P_T: 430 psi

Borehole Water Level: 10 ((ft) / m) = 0 psi (P_W)

40m

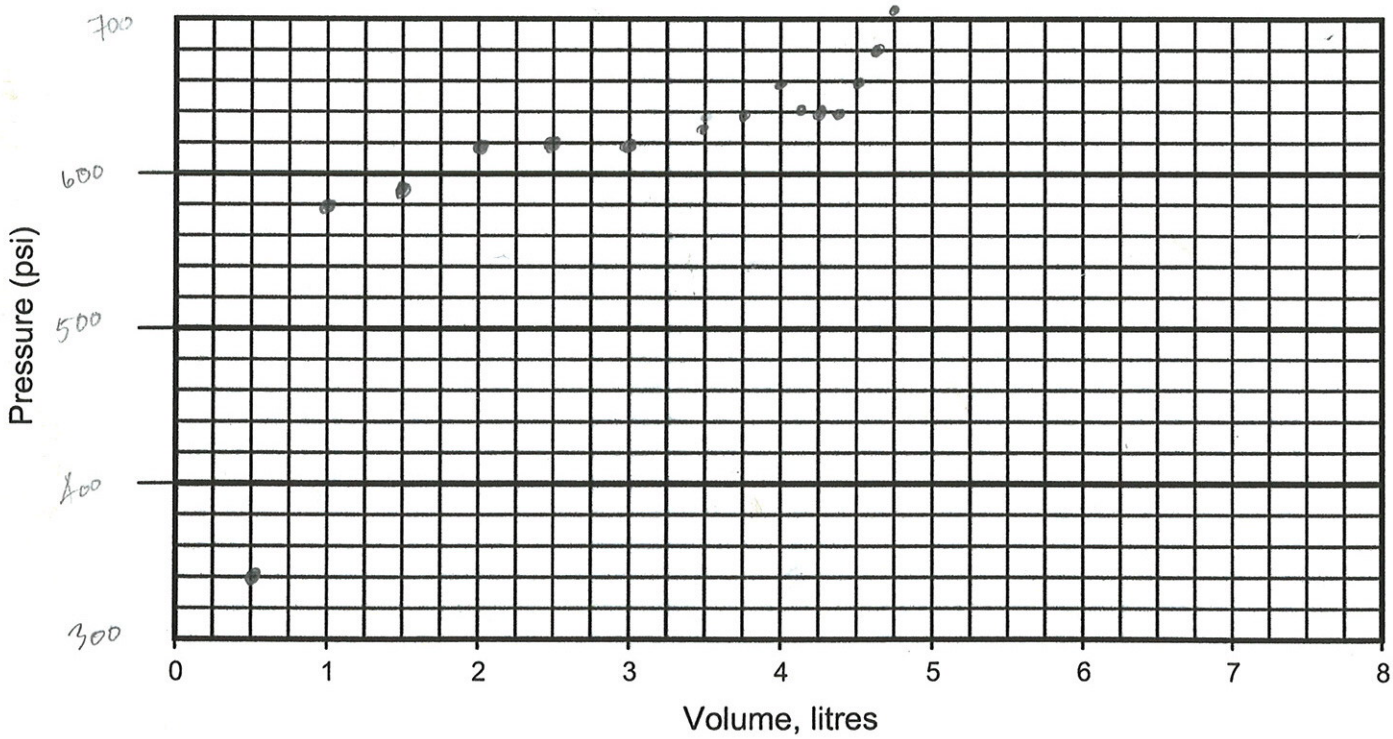
Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 120 psi

EST FINAL LP ~ $P_E - P_W + P_V + P_T$ = 150 − 58 + 165 + 430 = 687

Volume, litres	0.5	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.0	4.12
Pressure, psi	340	580	590	620	620	620	630	640	660	640

Volume, litres	4.25	4.37	4.5	4.67	4.75					
Pressure, psi	640	640	660	680	710					

FINAL VOLUME AFTER LINE OPEN = ~3.85



Comments: Packer # | Time -

MAGS COLLARS 30.1 36.1 57.6 61.6 66.6 107.1 112.6 157.6 162.6 178.6 203.6 240.1 249.6 273.6 285.1 348.6

29.2 35.2 56.3 65.8 111 161 202 238.4 247.6 271.8 280.0 346.0

Schlumberger WATER SERVICES

Sheet 5 of ____

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBW 001

Location: Doris Central | Completed by: JS | Date Inflated: May 2 2010

Packer No. 5 (sn 17211) | Depth (ft / m): 279 | Inflation Tool No.: 3198

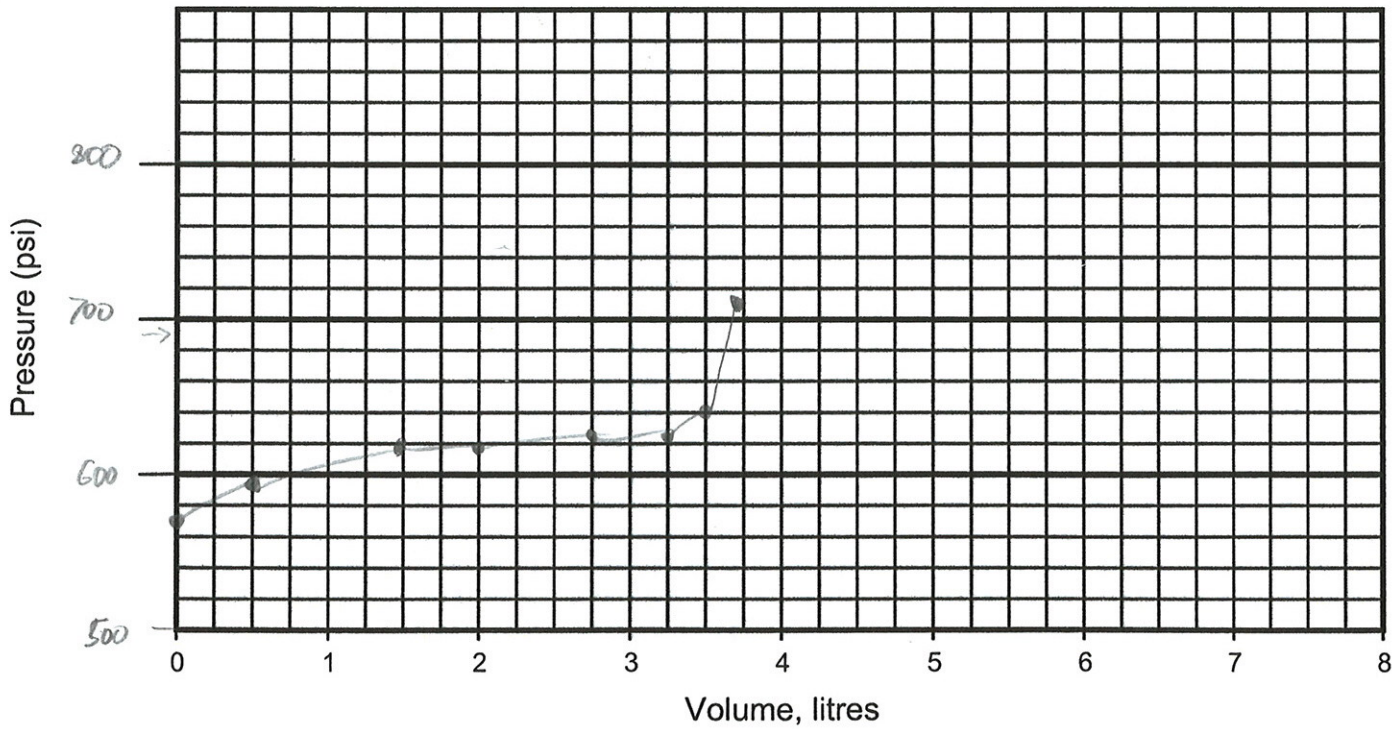
Packer Valve Pressure, P_V: 165 psi | Final Line Pressure, P_L: 710 psi | Tool Pressure, P_T: 430 psi

~687 ↳ tool tested 1 hr before packer inflation

Borehole Water Level: 10 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 115 psi

Volume, litres	0	0.5	1.5	2.0	2.75	3.25	3.50	3.70		
Pressure, psi	570	595	620	620	625	625	640	710		
Volume, litres										
Pressure, psi										



Comments: Packer # 5 normal inflation | Time - 12:00 noon

- infl. tool taken out and surface tested prior to Packer 5 inflation

(emerg defl. valve was open and cables twisted)

new shear pins put in (3)

Schlumberger WATER SERVICES

Sheet 6 of ____

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBLW001

Location: Doris Central | Completed by: JS | Date Inflated: May 2 2010

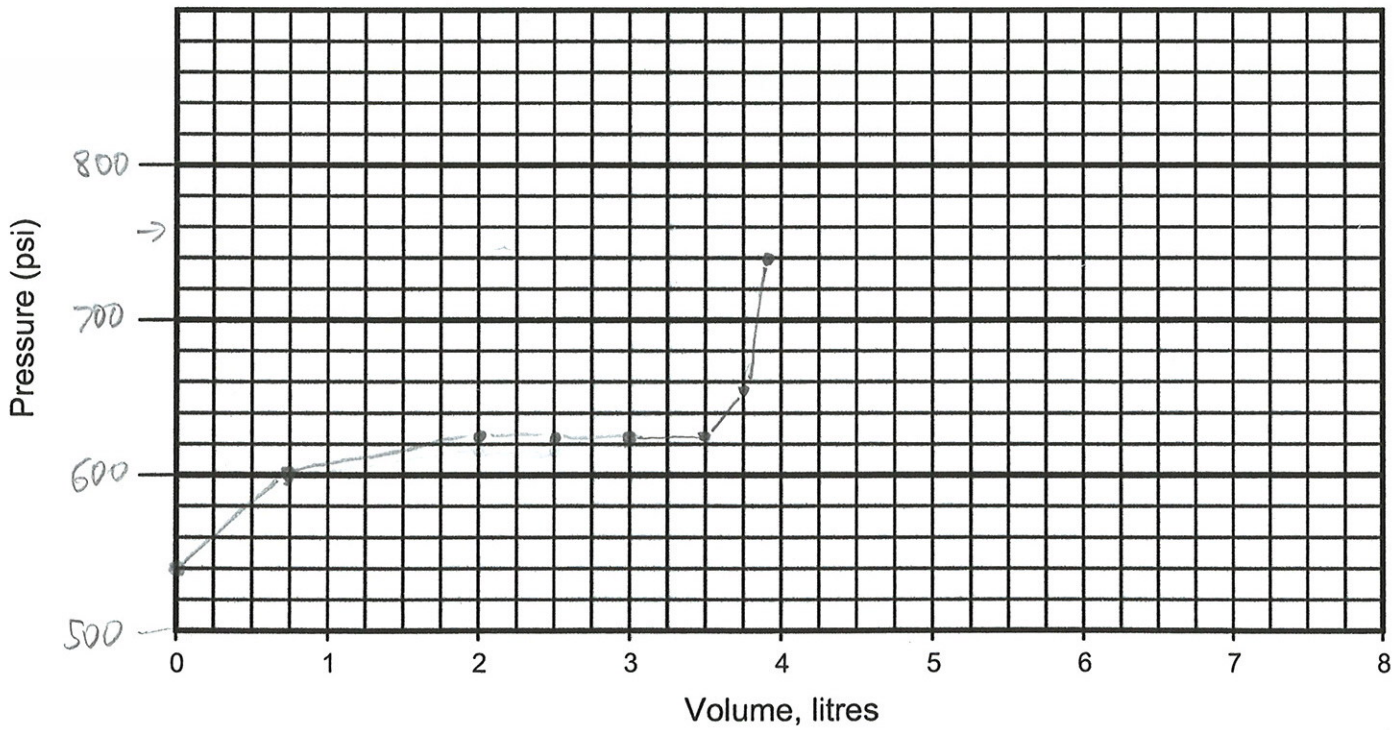
Packer No. 6 (sn: 17207) | Depth (ft / m): 275. | Inflation Tool No.: 3198

Packer Valve Pressure, P_V: 190 psi | Final Line Pressure, P_L: 740 psi | Tool Pressure, P_T: 430 psi

Borehole Water Level: 10' (ft / m) = 50 psi (P_W) ~ 150 − 58 + 190 + 430 = 762 (P_{target})

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 120 psi

Volume, litres	0	0.75	2.0	2.5	3.0	3.5	3.75	3.90		
Pressure, psi	540	600	625	625	625	625	655	740		
Volume, litres										
Pressure, psi										



Comments: Packer # 6 normal inflation Time - 13:30

Schlumberger WATER SERVICES

Sheet 7 of ____

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBM001

Location: Doris Central | Completed by: DM | Date Inflated: MAY 2, 2010

Packer No. 7 (sn: 17083) | Depth (ft / m): 246 | Inflation Tool No.: 3198

Packer Valve Pressure, P_V: 170 psi | Final Line Pressure, P_L: 650 psi | Tool Pressure, P_T: 360 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

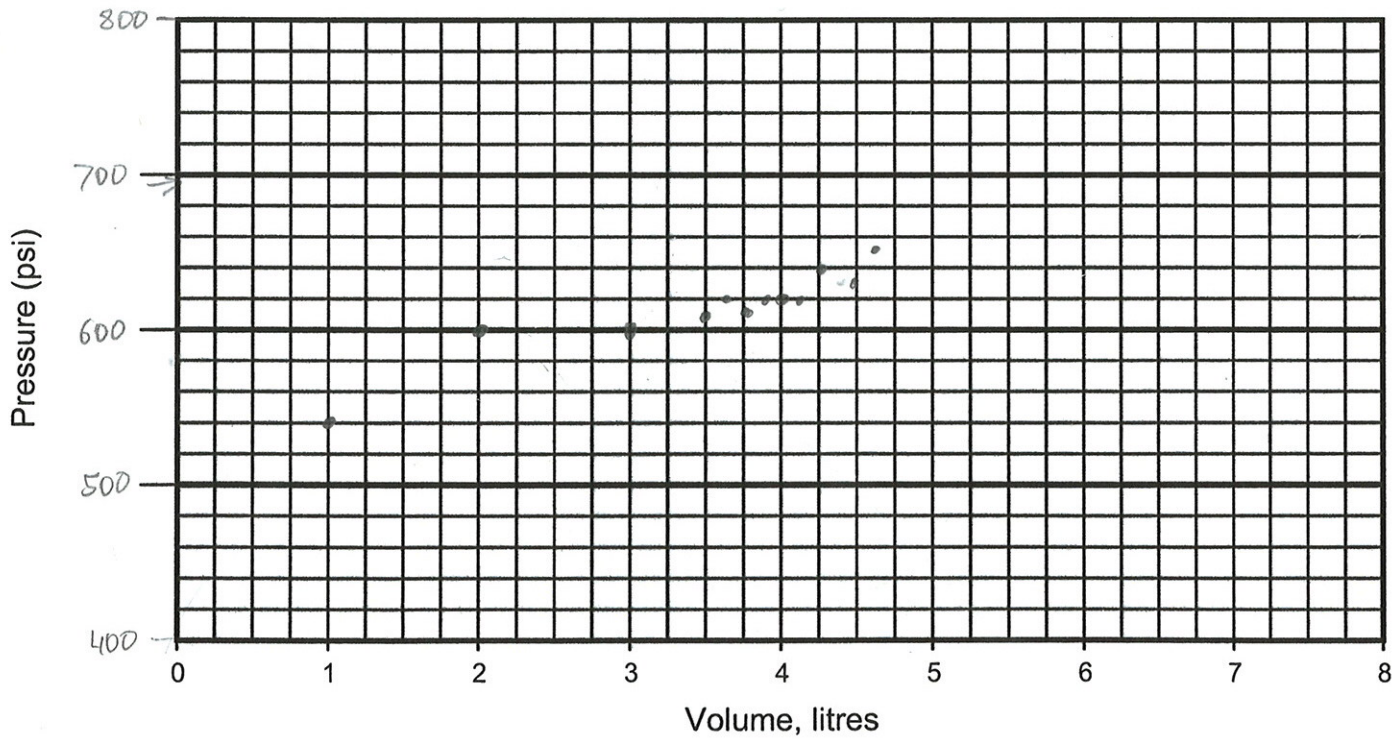
Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 120 psi

TARGET P = $P_E - P_W + P_V + P_T$ = 150 − 0 + 170 + 360 = 637 psi

Volume, litres	1.0	2.0	3.0	3.5	3.62	3.75	3.87	4.0	4.15	4.25
Pressure, psi	540	600	600	615	620	615 54	620 59	620 02	620 06	620 10

Volume, litres	4.37	4.5	4.67							
Pressure, psi	6210 13	630 17	650 20							

FINAL TANK READING AFTER LINE OPEN = 3.75



Comments: Packer # 7 ↓ Time - 19:30

27.6 34 55 64 110 160 201 238 247 — IN PC 107 – INFLATE LAUNCH ARM

29.1 35.1 56.2 65.4 110.8 160.7 201.7 236.1 247.2 — HOLDING @ 600PSI @ 1L

↓0.75 BACK ON LINE OPEN

Schlumberger WATER SERVICES

Sheet 8 of ____

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBW 001

Location: Doris Central | Completed by: DM | Date Inflated: May 2, 2010

Packer No. 8 (sn: 17205) | Depth (ft / (m)): 241 | Inflation Tool No.: 3198

Packer Valve Pressure, P_V: 165 psi | Final Line Pressure, P_L: 690 psi | Tool Pressure, P_T: 360 psi

MAY BE HIGHER

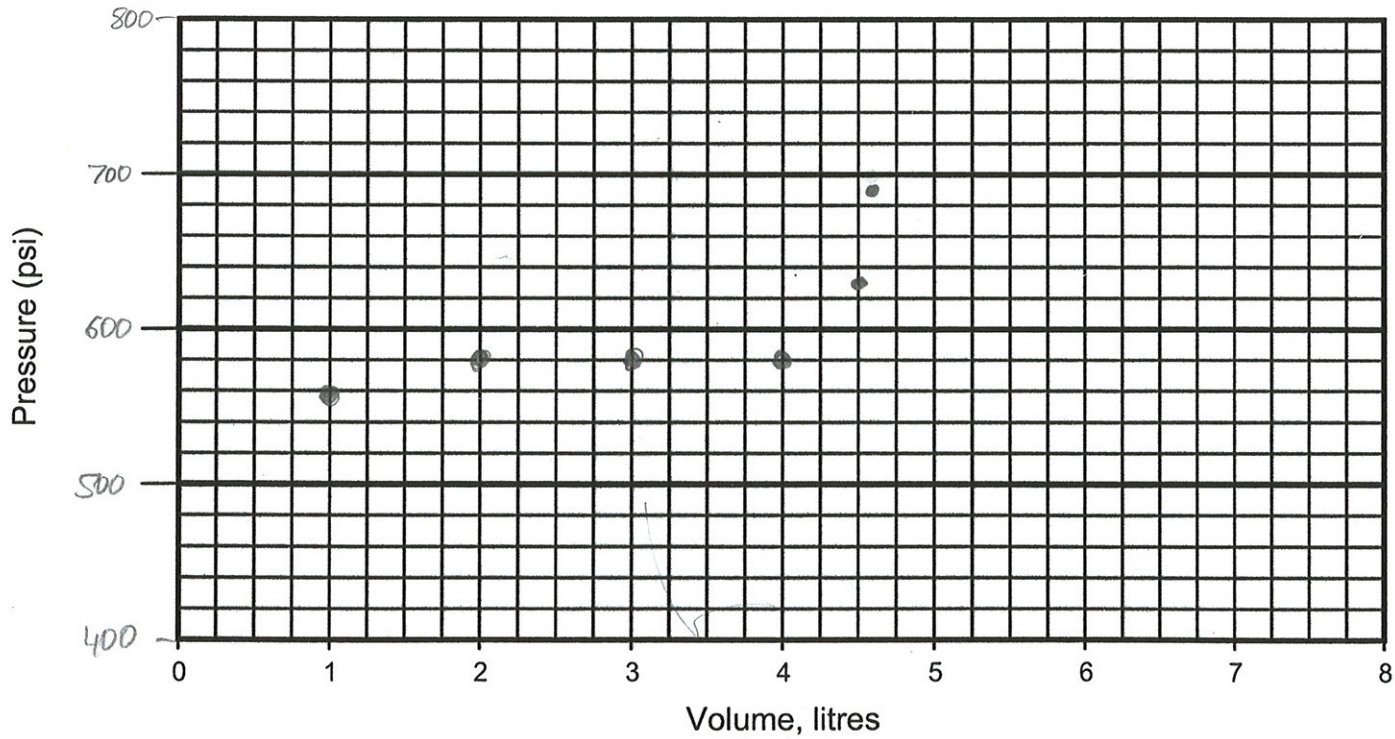
Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 165 psi

TARGET ELEMENT P = 150 - 42 + 165 + 360 = ~635

(0) VOLUME IN PACKER										
Volume, litres	1 (0)	2 (1)	3 (2)	4 (3)	4.5 (3.5)	4.6 (3.6)				
Pressure, psi	560 BASE	580 65	580 14	580 23	630 30	690 36	BIT 700 MOUTH			
START MIN										
Volume, litres										
Pressure, psi										

TANK LEVEL AFTER VALVE OPEN = ~3.75 = TOTAL PACKER VOLUME



Comments: Packer # | Time - 2045

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBW 001

Location: Doris Central | Completed by: DM | Date Inflated: MAY 2, 2010

Packer No. 9 (sn: 17204) | Depth (ft / (m)): 200 | Inflation Tool No.: 3198

info missing → assume 170

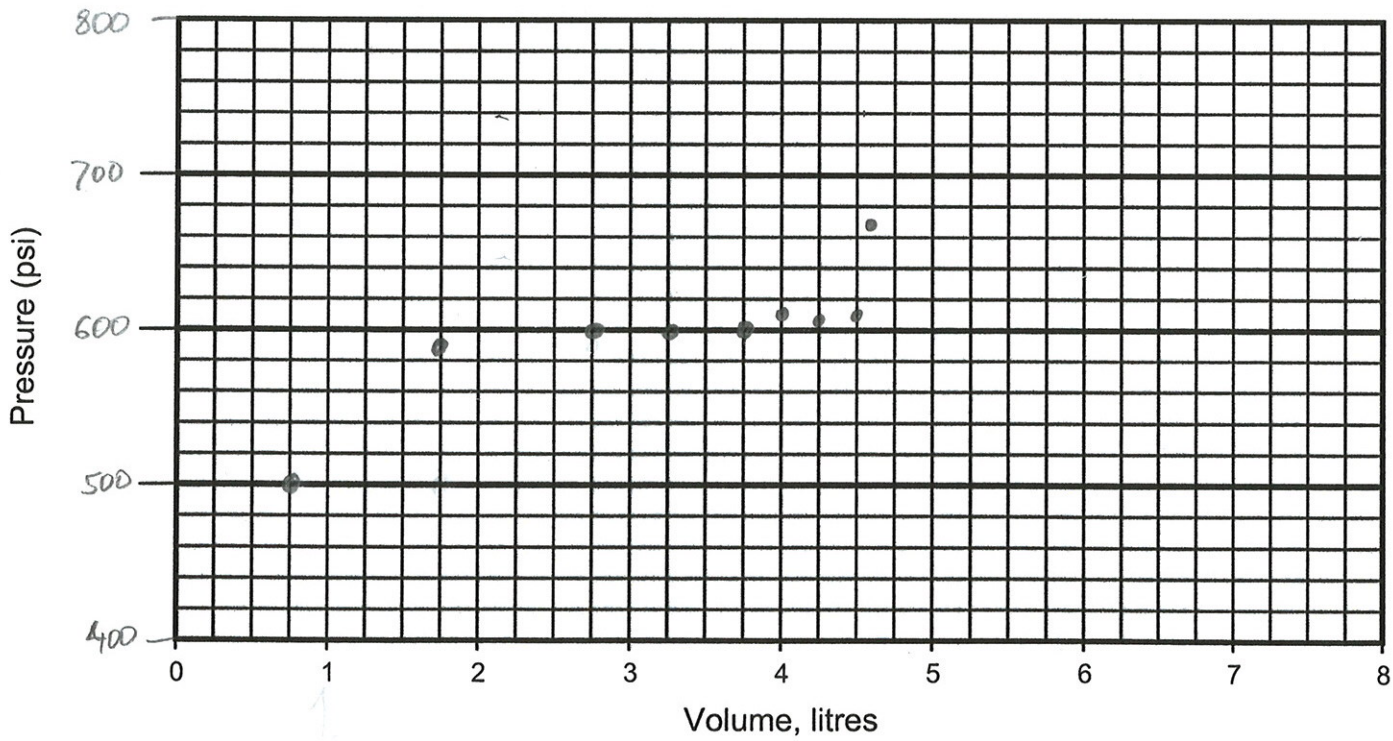
Packer Valve Pressure, P_V: 170 psi | Final Line Pressure, P_L: 670 psi | Tool Pressure, P_T: 360 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 140 psi

TARGET = 150 − 0 + 170 + 360 = 680

Volume, litres	0.75 PACKER + LINE	1.75 ①	2.75	3.25	3.75	4.0	4.25	4.5	4.62	
Pressure, psi TIME START MIN	500	590 24	600 24	600 41:30	600 49	610 56	605 02	610 07	670	
Volume, litres										
Pressure, psi										



Comments: Packer # MAGS 238 201 — TANK VOLUME AFTER VALVE OPEN = 3.75 = PACKER VOLUME

Time - 22:22

Schlumberger WATER SERVICES

Sheet 10 of ____

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBW 001

Location: Doris Central | Completed by: DM | Date Inflated: MAY 2, 2010

Packer No. 10 (sn: 17208) | Depth (ft / (m)): 159 | Inflation Tool No.: 3198

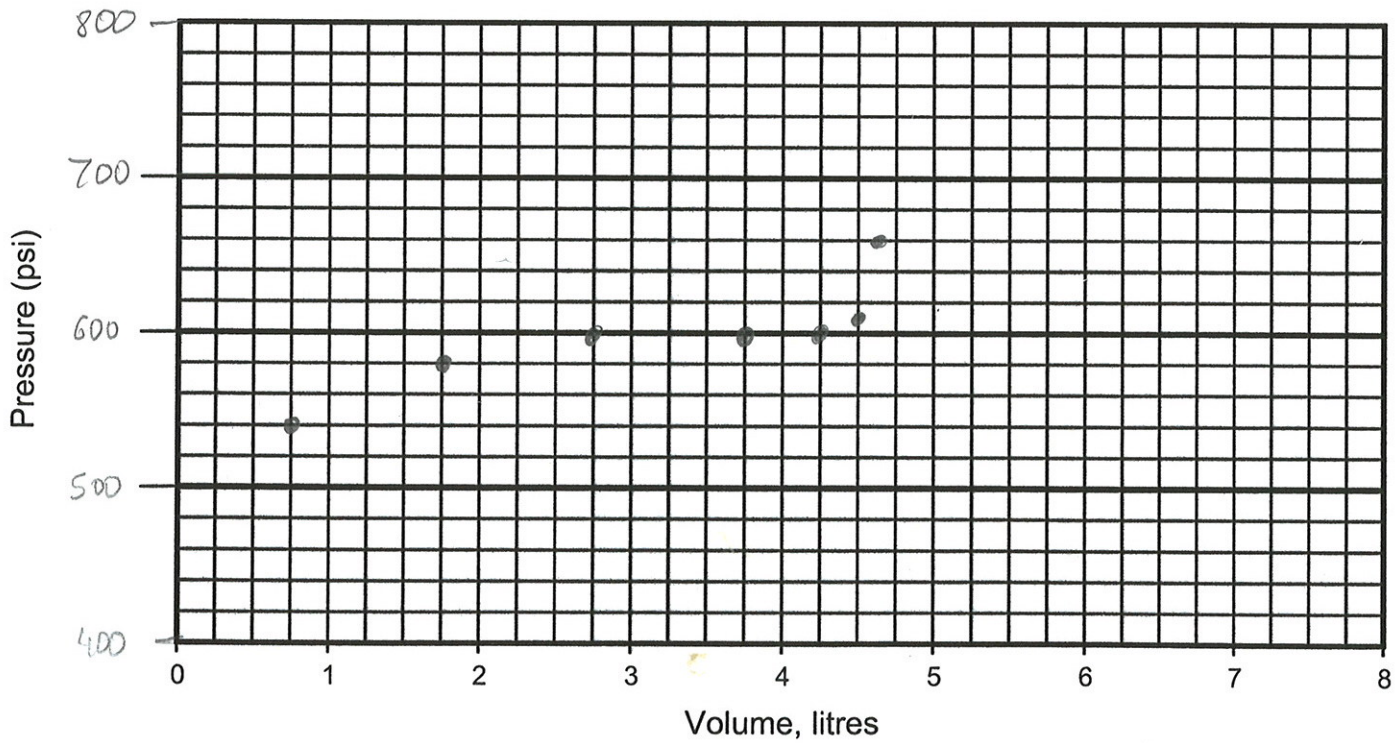
Packer Valve Pressure, P_V: 170 psi | Final Line Pressure, P_L: 660 psi | Tool Pressure, P_T: 360 psi

Borehole Water Level: 0 (ft / m) = 10 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 130 psi

TARGET P = 150 - 10 + 170 - 360 = 680

Volume, litres	0.75 PACKER+LINE	1.75	2.75	3.75	4.25	4.5	4.6			
Pressure, psi	540	580	600	600	600	610	660			
Volume, litres										
Pressure, psi										



Comments: Packer # | Time -

160 MAG | TANK VOLUME w/ LINE OPEN = 3.75 = PACKER VOLUME

LANDED 158.2

Schlumberger WATER SERVICES

Sheet 11 of ____

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBW 001

Location: Doris Central | Completed by: DM | Date Inflated: MAY 3 2010

Packer No. 11 (SN: 17209) | Depth (ft / (m)): 109 | Inflation Tool No.: 3198

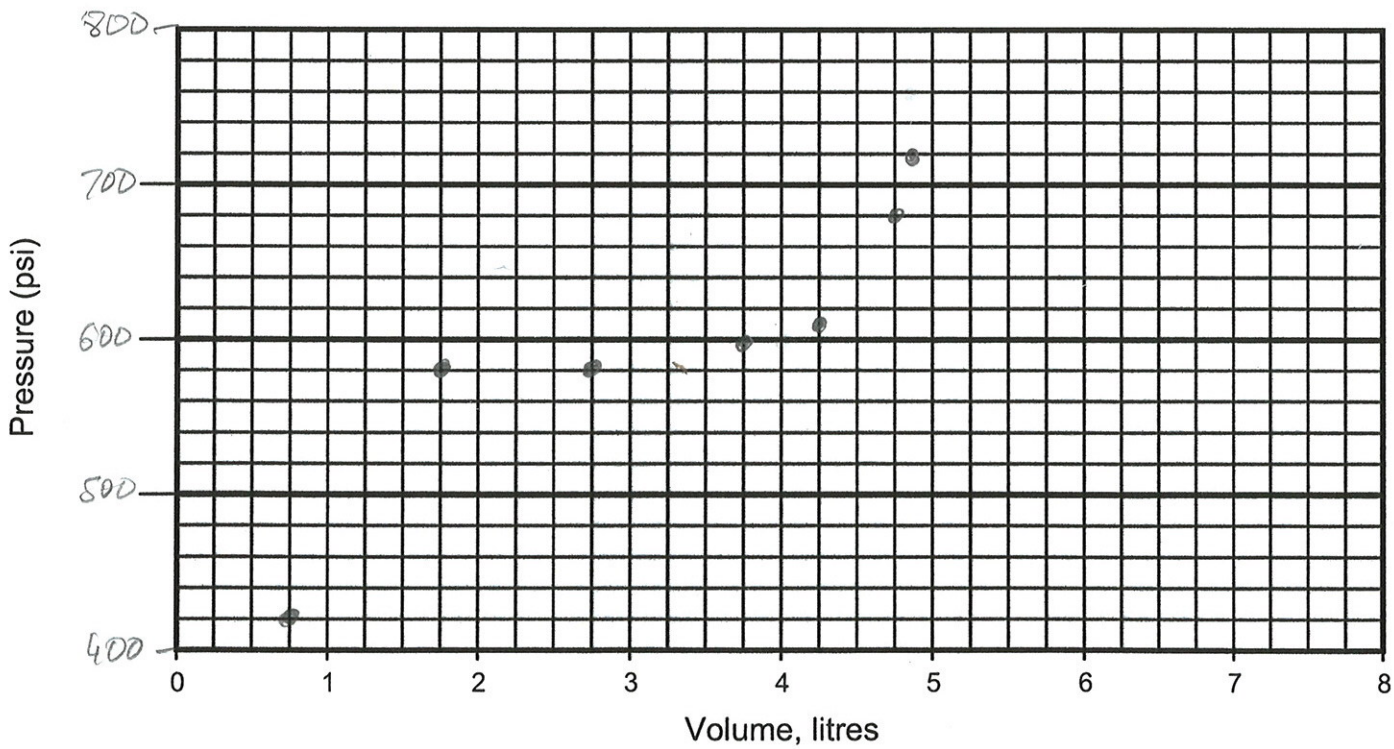
Packer Valve Pressure, P_V: 165 psi | Final Line Pressure, P_L: 720 psi | Tool Pressure, P_T: 360 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 195 psi

TARGET = 360 + 165 + 200 − 0 = 725

Volume, litres	0.75 P+L	1.75	2.75	3.75	4.25	4.75	4.87			
Pressure, psi	420	580	580	600	610	680	720			
Volume, litres										
Pressure, psi										



Comments: Packer # Time - 01:45

TANK VOLUME W/ LINE OPEN = 3.87 = PACKER VOLUME

Schlumberger WATER SERVICES

Sheet 12 of ___

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CHD08.013 | Well No.: 10 WBW 001

Location: Doris Central | Completed by: DM | Date Inflated: MAY 3 2010

Packer No. 12 (sn: 17203) | Depth (ft / m): 63 | Inflation Tool No.: 3198

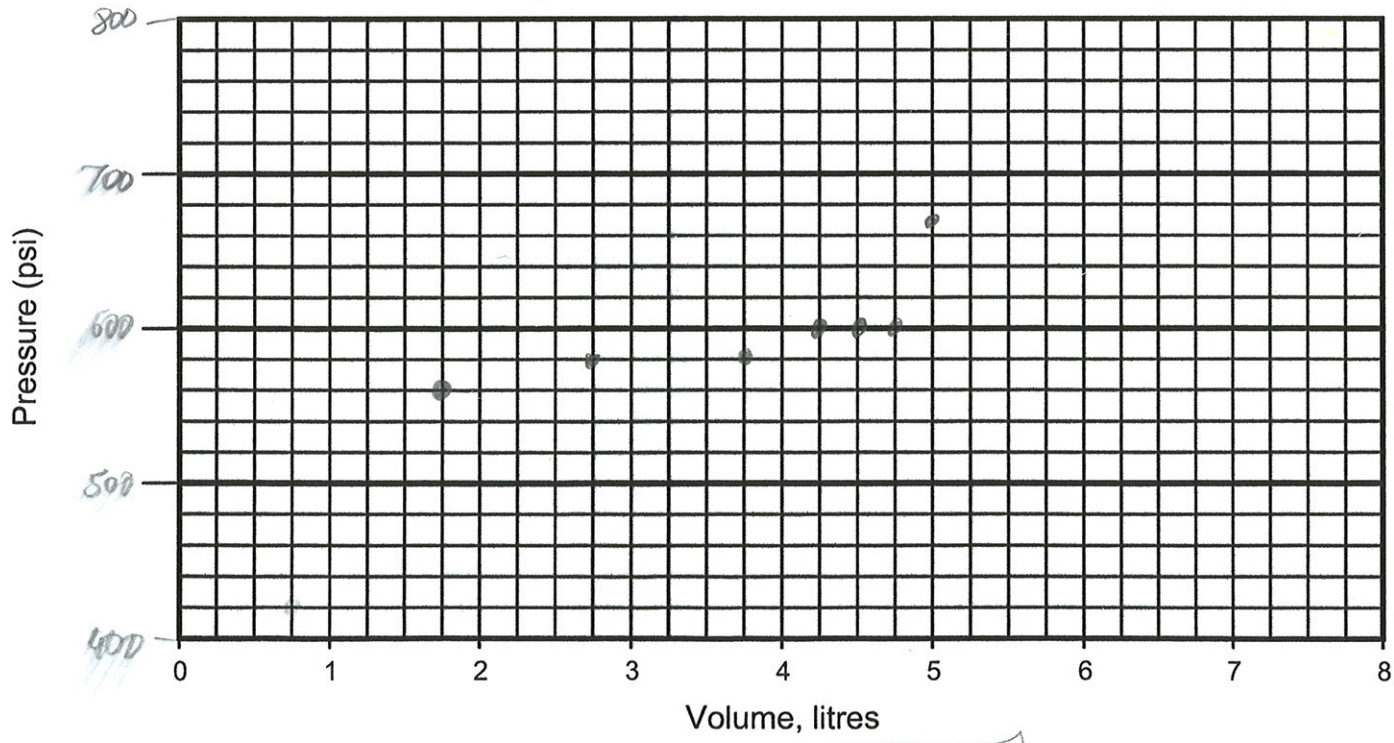
Packer Valve Pressure, P_V: 165 psi | Final Line Pressure, P_L: 670 psi | Tool Pressure, P_T: 360 psi

Borehole Water Level: 10 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 145 psi

TARGET = 360 + 165 − 0 + 200 = 725

Volume, litres	0.75	1.75	2.75	3.75	4.25	4.50	4.75	5.0		
Pressure, psi	X	560	580	580	600	600	600	670		
Volume, litres										
Pressure, psi										



Comments: Packer # FINAL TANK VOLUME = 4.25 FINAL PACK VOL = 4.0 Time -

MAG @ ~ 64 0.25 START

BAD CAND = RE-TIMED AND WORKING OK

Schlumberger WATER SERVICES

Sheet 13 of ___

Westbay Packer Inflation Record

Project: Hope Bay Project No.: 1CH008.013 Well No.: 10 WBW 001

Location: Doris Central Completed by: DM Date Inflated: MAY 3, 2010

Packer No. 13 (sn: 17084) Depth (ft / (m)): 58 Inflation Tool No.: 3198

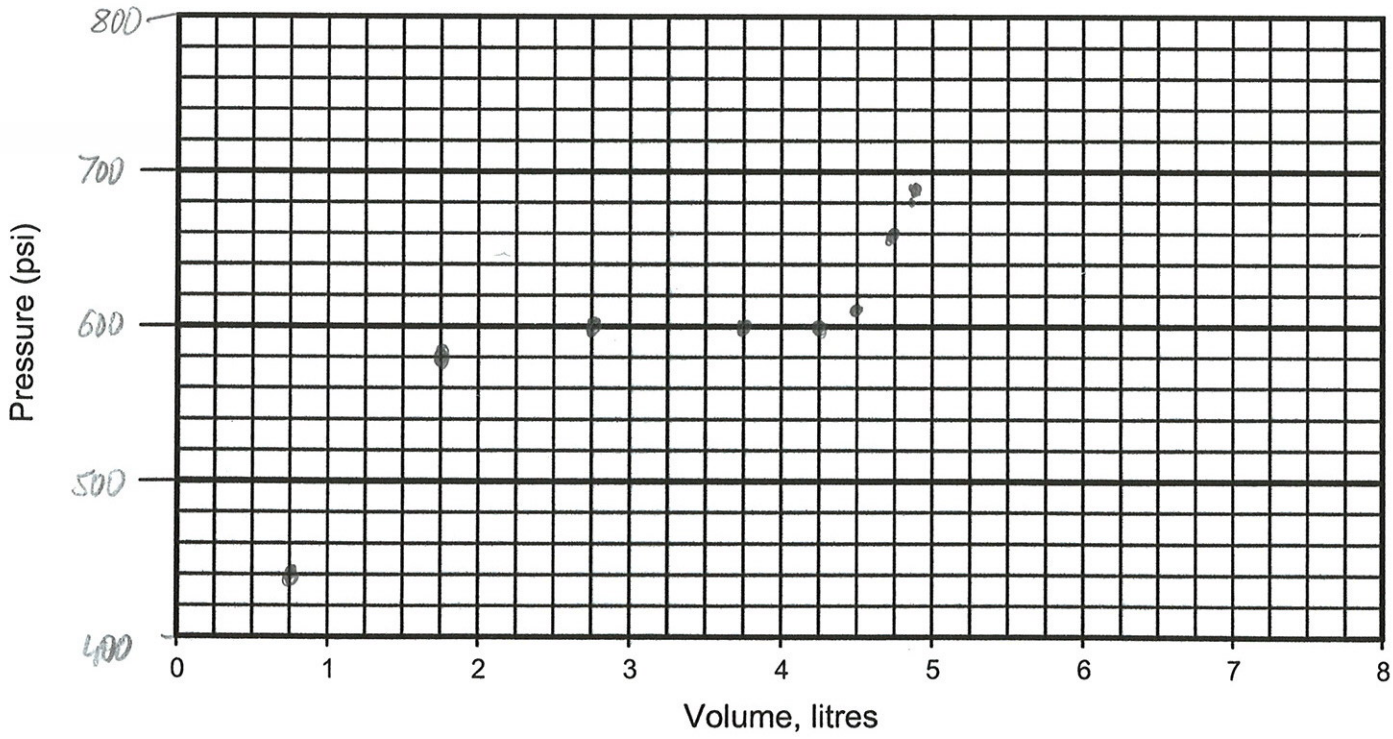
Packer Valve Pressure, P_V: 175 psi Final Line Pressure, P_L: 690 psi Tool Pressure, P_T: 360 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 155 psi

TARGET P = 360 + 200 + 175 = 735

Volume, litres	0.75 P+V	1.75	2.75	3.75	4.25	4.50	4.75	4.87		
Pressure, psi	440	580	600	600	600	610	660	690		
Volume, litres										
Pressure, psi										



Comments: Packer # TANK VOLUME AFTER LINE OPEN = 4.0 = FINAL PACKER VOL. Time - 04:31

Schlumberger WATER SERVICES

Sheet 14 of ___

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBW 001

Location: Doris Central | Completed by: | Date Inflated:

Packer No. 14 (sn: 17210) | Depth (ft / m): 33 | Inflation Tool No.: 3198

Packer Valve Pressure, P_V: 165 psi | Final Line Pressure, P_L: 640 psi | Tool Pressure, P_T: 360 psi

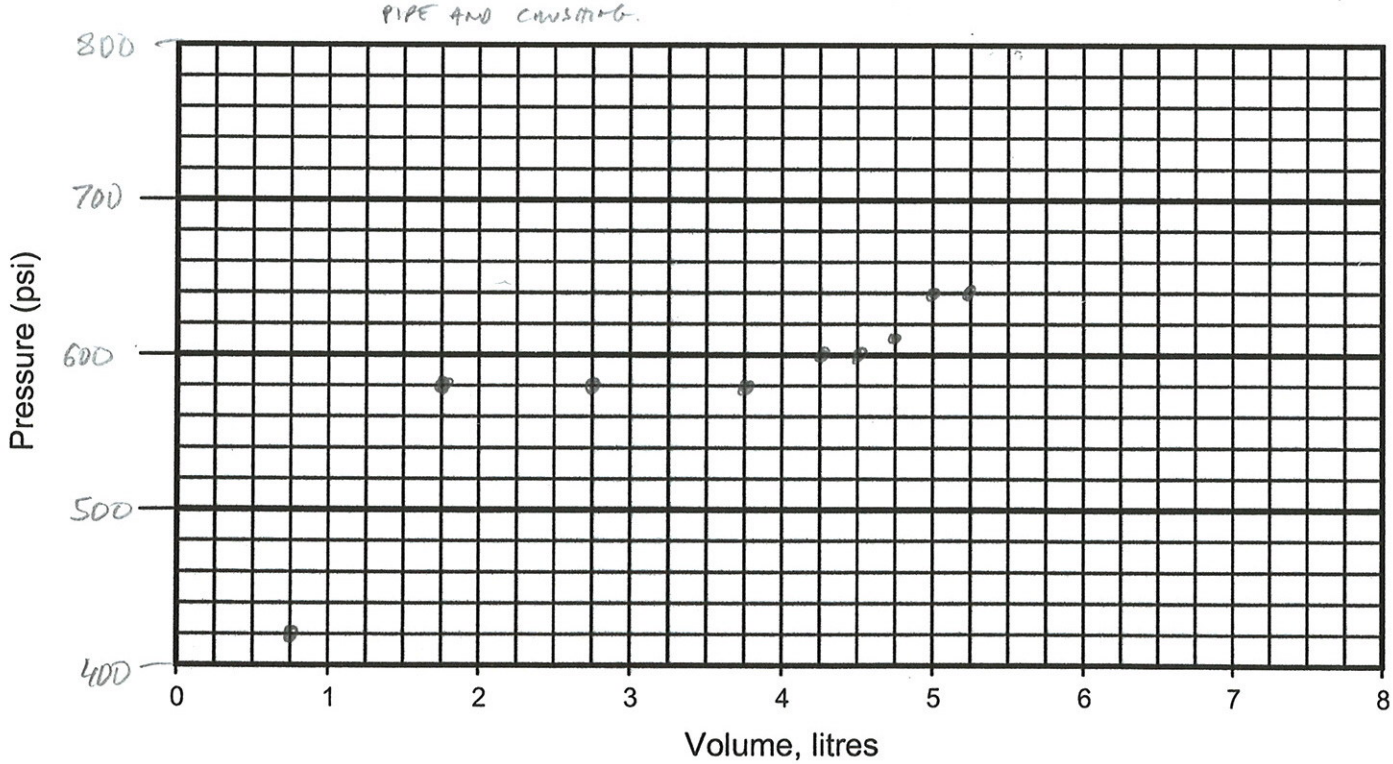
Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 115 psi

TARGET = 360 + 165 + 200 = 725

Volume, litres	0.75 P+L	1.75	2.75	3.75	4.25	4.5	4.75	5.0		STOP - FILL PVC TO TOP
Pressure, psi	420	580	580	580	600	600	610	640		0.75 flow BACK
Volume, litres	5.25									
Pressure, psi	640									

NOTE: NOT INFLATING FURTHER B/C CONCERN ABOUT SHALLOW DEPTH, DRY INSIDE PIPE AND CUSHING.



Comments: Packer # | Time -

MAG 34.55 UP TO 34.55

- 3.05

31.50

STARTED @ 2 ON TANK

Schlumberger WATER SERVICES

Sheet 15 of ____

Westbay Packer Inflation Record

Project: Hope Bay | Project No.: 1CH008.013 | Well No.: 10 WBW 001

Location: Doris Central | Completed by: DM | Date Inflated: MAY 3 2010

Packer No. 15 (sn: 17082) | Depth (ft / m): 27 | Inflation Tool No.: 3198

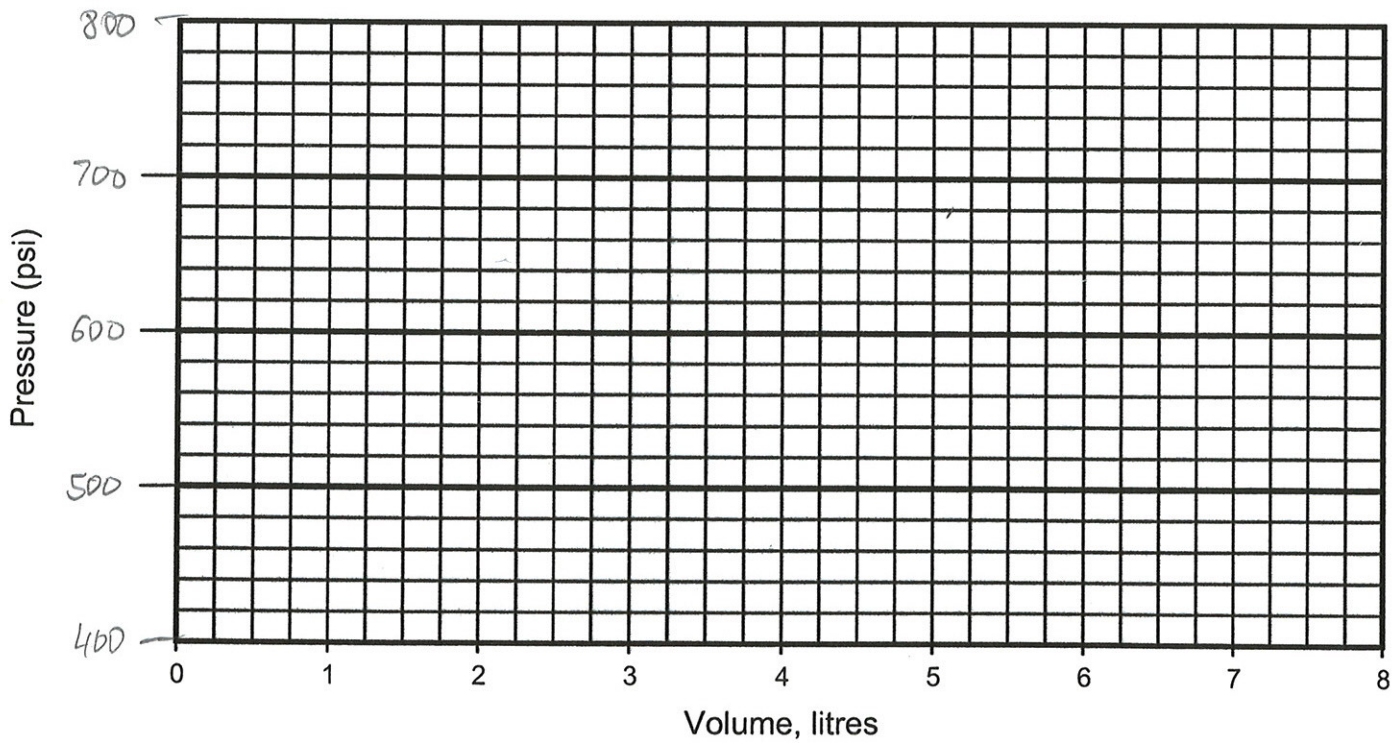
Packer Valve Pressure, P_V: 170 psi | Final Line Pressure, P_L: 800 psi | Tool Pressure, P_T: 360 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 270 psi

DANGER

Volume, litres	0.75	1.25	1.50	1.75	2.0	2.25	2.5			
Pressure, psi	420	580	580	620	620	640	800 !			
Volume, litres										
Pressure, psi										



Comments: Packer # Time -

Schlumberger WATER SERVICES

Sheet 1 of ____

Westbay Packer Inflation Record

Project: Hope Bay - Westbay Install Project No.: _____ Well No.: 10 WBLW002

Location: Doris North Completed by: ML Date Inflated: Jun 25, 2010

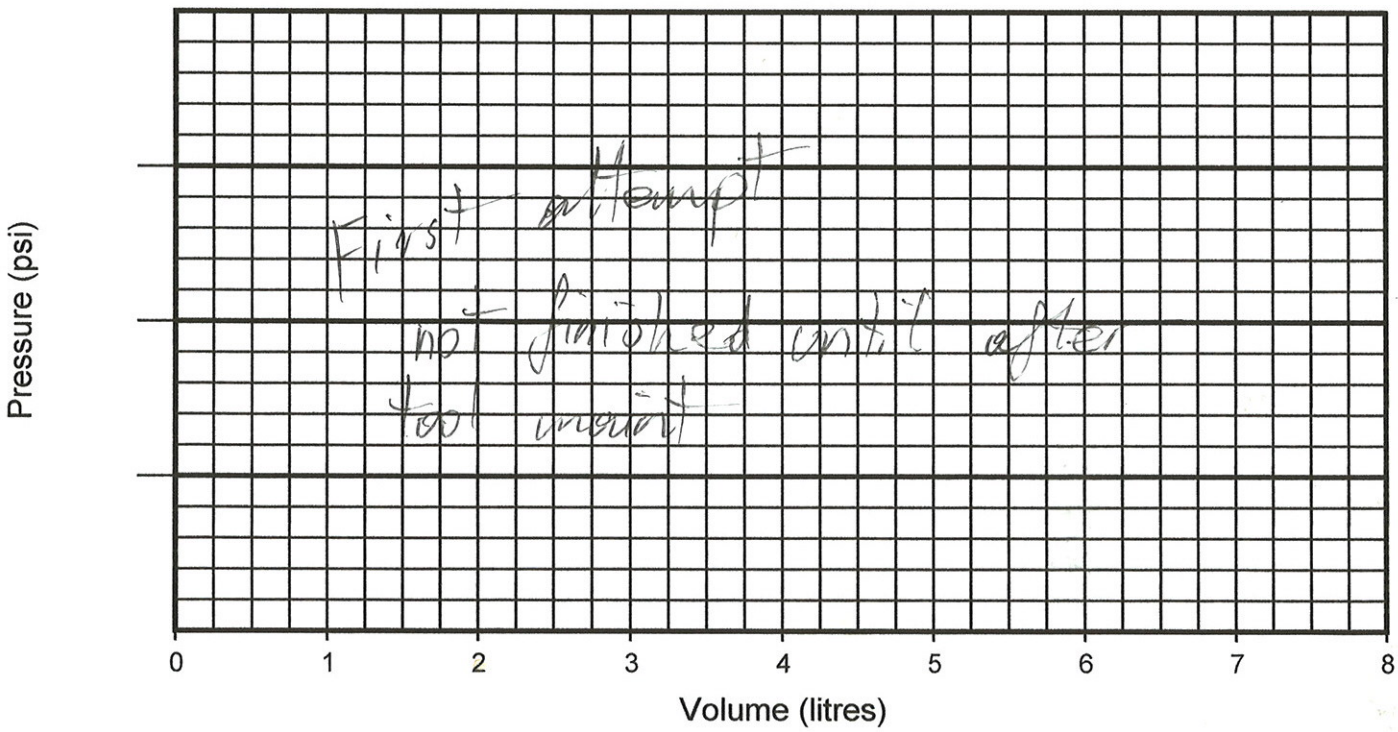
Packer No. 1, comp 3 SN# 17173 Depth (ft / m): _____ Inflation Tool No.: _____

Packer Valve Pressure, P_V: 150 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: 380 psi

Borehole Water Level: _____ (ft / m) = _____ psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

Volume, litres	1.0	1.25		1.0	1.25					
Pressure, psi	620	800	ϕ	700	800	ϕ				
Volume, litres										
Pressure, psi										



Comments: Packer # 1 TIME -

Target 650 psi

Schlumberger WATER SERVICES

Sheet 1 of ___

Westbay Packer Inflation Record

Project: Hope Bay - Westbay Install Project No.: _____ Well No.: ~~DH008~~ ~~Doris North~~ 10MW801002

Location: Doris North Completed by: M. Lessard Date Inflated: June 25/10

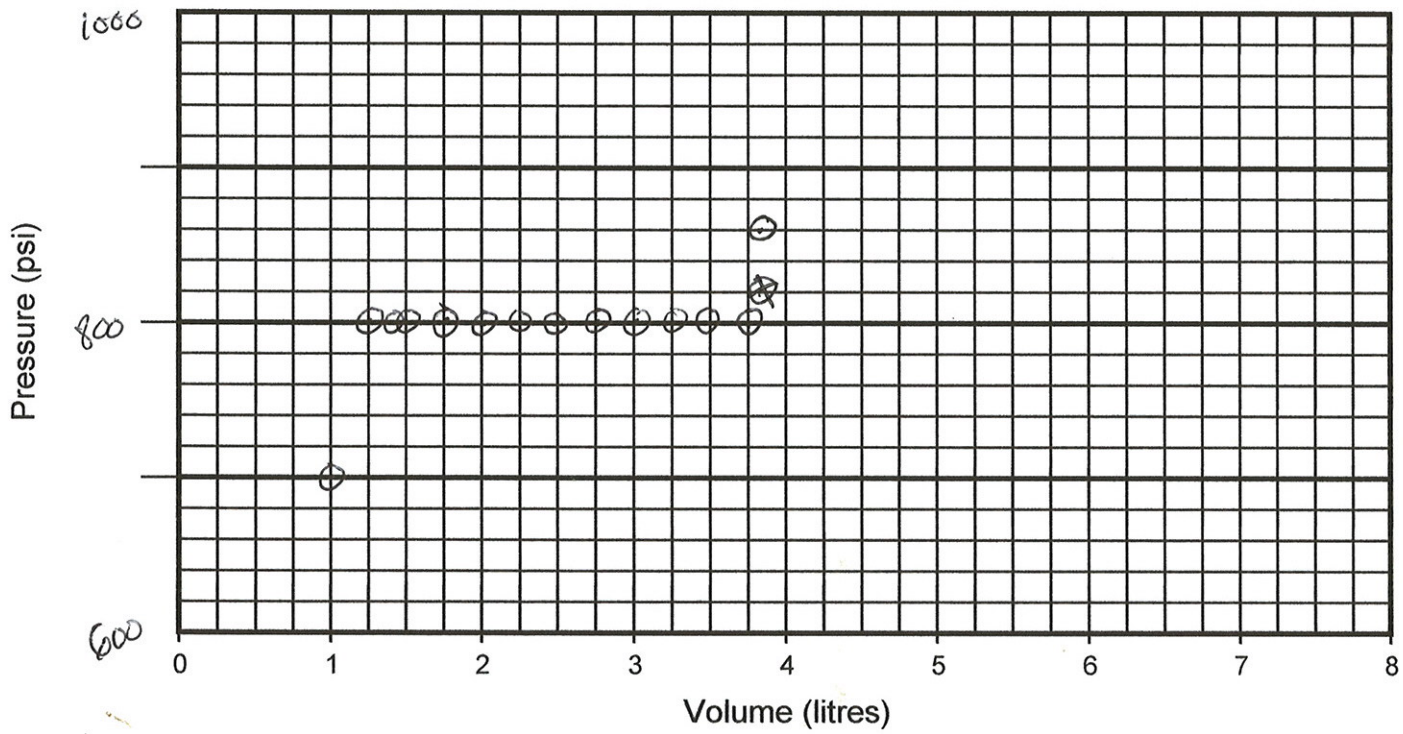
Packer No. 1, comp 3 SN#17173 Depth (ft/m): 594 Inflation Tool No.: TFW 3198

Packer Valve Pressure, P_V: 150 psi Final Line Pressure, P_L: 860 psi Tool Pressure, P_T: 350 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 360 psi

Volume, litres	1.0	1.25	1.4	1.5	1.75	2.0	2.25	2.5	2.75	3.0
Pressure, psi	700	800	800	800	800	800	800	800	800	800
Volume, litres	3.25	3.5	3.75	3.85	2.75					
Pressure, psi	800	800	800	860	ϕ					



Comments: Packer # 1 TIME - 7:25 pm

40% propylene glycol mixture used. Guage may be affeted by mixture.
Up to 2-L may have been inflated in packer on first try to inflate.

Schlumberger WATER SERVICES

Sheet 2 of ___

Westbay Packer Inflation Record

Project: Hope Bay - Westbay Install Project No.: _____ Well No.: 10 WBW 002

Location: Doris North Completed by: ML/JS Date Inflated: June 25/10

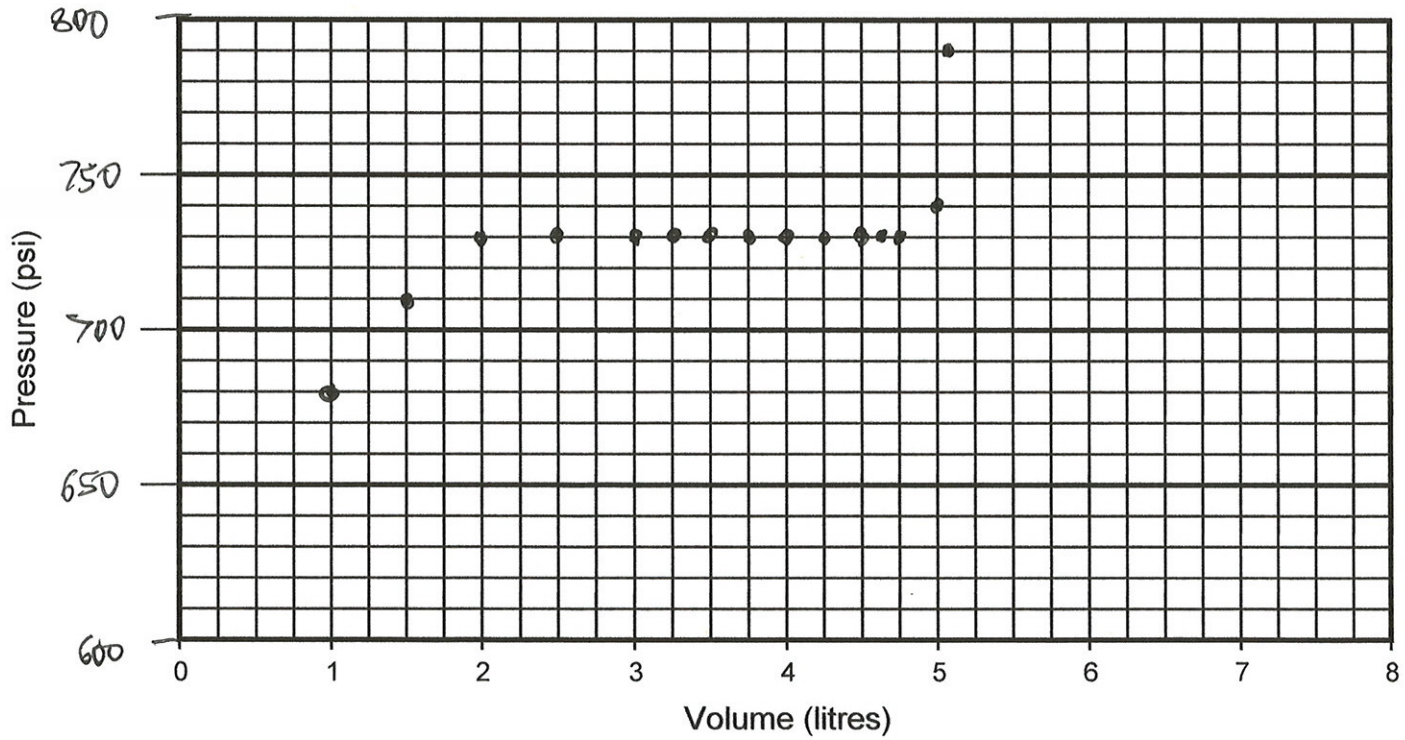
Packer No. 2, comp 33 sn 17174 Depth (ft (m)): 505 Inflation Tool No.: TFW 3198

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: 350 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 350 psi

	2 min			2½ min						
Volume, litres	1.0	1.5	2.0	2.5	3.0	3.25	3.5	3.75	4.0	4.25
Pressure, psi	680	710	730	730	730	730	730	730	730	730
Volume, litres	4.5	4.55	4.75	5.0	5.1	4.25				
Pressure, psi	730	730	730	740	790	Ø				



Comments: Packer # 2 TIME - 9:03 pm

Schlumberger WATER SERVICES

Sheet 3 of ___

Westbay Packer Inflation Record

Project: Hope Bay - Westbay Install Project No.: _____ Well No.: 10 WBLW002

Location: Doris North Completed by: JS Date Inflated: Jan 25/10

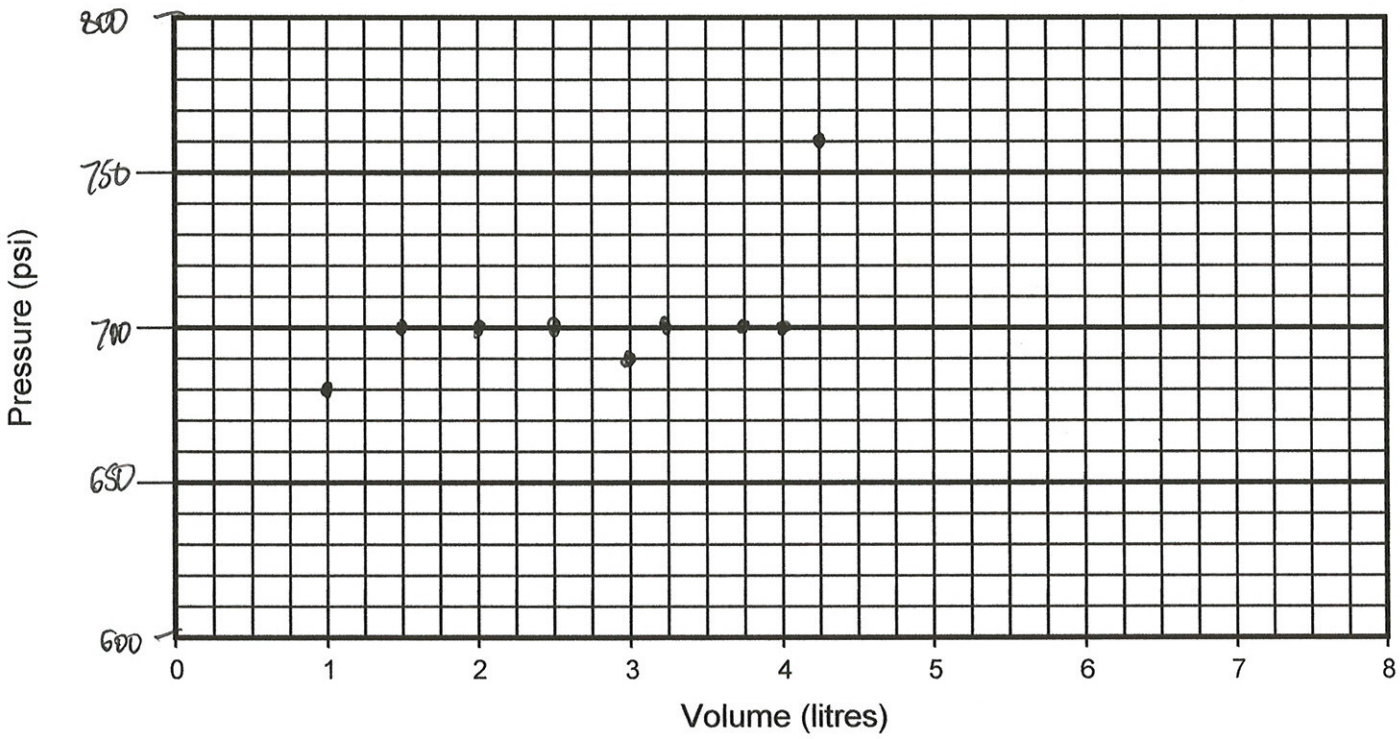
Packer No. 3, part #36 Depth (ft / (m)): 498 Inflation Tool No.: TFW 3198

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: 350 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

	2 min						2:20			
Volume, litres +0.5 L	1.0	1.5	2.0	2.5	3.0	3.25	3.75	4.0	4.25	
Pressure, psi	680	700	700	700	690	700	700	700	760	
Volume, litres										
Pressure, psi										



Comments: Packer # 3 TIME - 22:05

Volume +0.5 L which was added before inflation to pressurize hose reel

Schlumberger WATER SERVICES

Sheet 4 of ___

Westbay Packer Inflation Record

Project: Hope Bay - Westbay Install Project No.: _____ Well No.: 10 WBLW 002

Location: Doris North Completed by: JS Date Inflated: Jun 25 2010

Packer No. 4, sn 17172, comp 69 Depth (ft / (m)): 399 Inflation Tool No.: TFW 3198

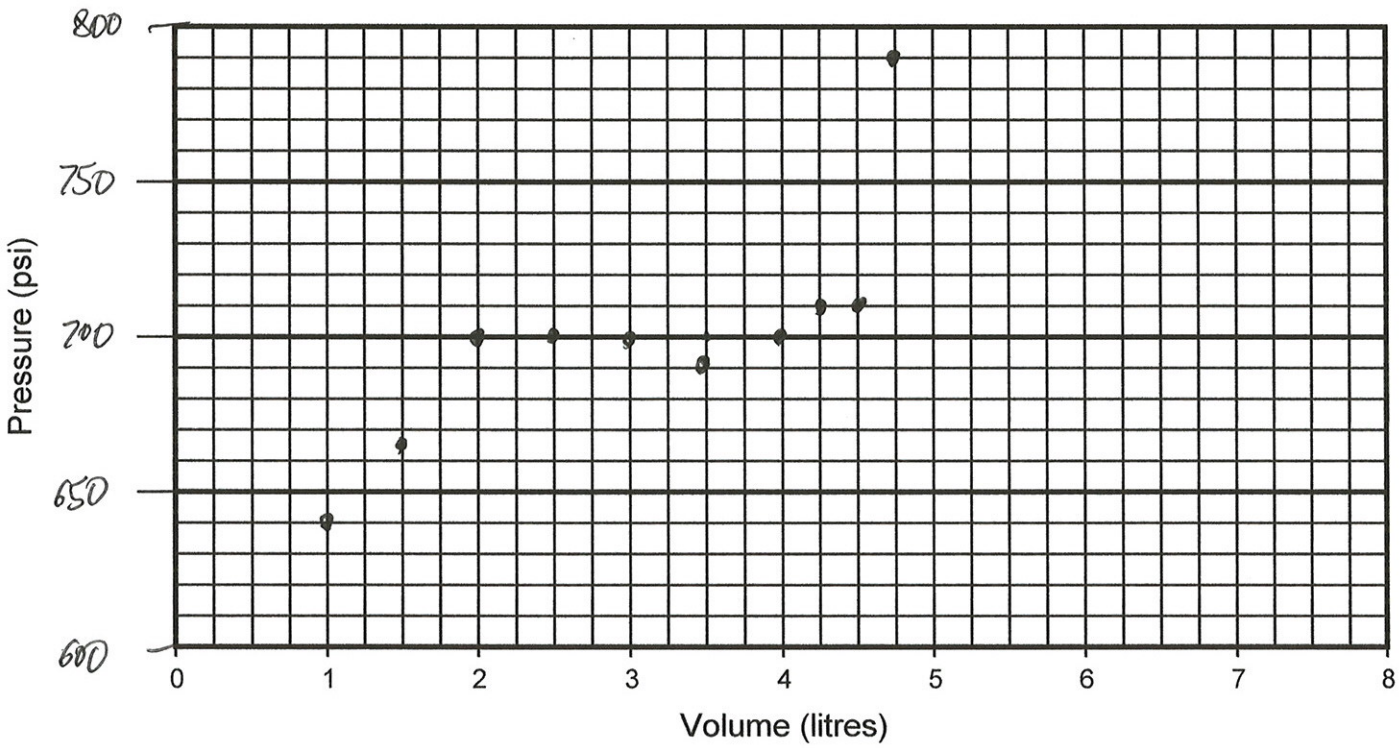
Packer Valve Pressure, P_V: 150 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: 350 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

2.0 min 2:10 min

Volume, litres	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.25	4.50	4.75
Pressure, psi	640	665	700	700	700	690	700	710	710	790
Volume, litres										
Pressure, psi										



Comments: Packer # 4 TIME - 23:10

Mag collar at 398.5

Schlumberger WATER SERVICES

Sheet 5 of ___

Westbay Packer Inflation Record

Project: Hope Bay-Westbay Install Project No.: ____ Well No.: 10 WBW 002

Location: Doris North Completed by: JS Date Inflated: Jun 26 2010

Packer No. 5, sn 17120, comp 103 Depth (ft / m): 297 Inflation Tool No.: TFW 3198

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: ____ psi Tool Pressure, P_T: 350 psi

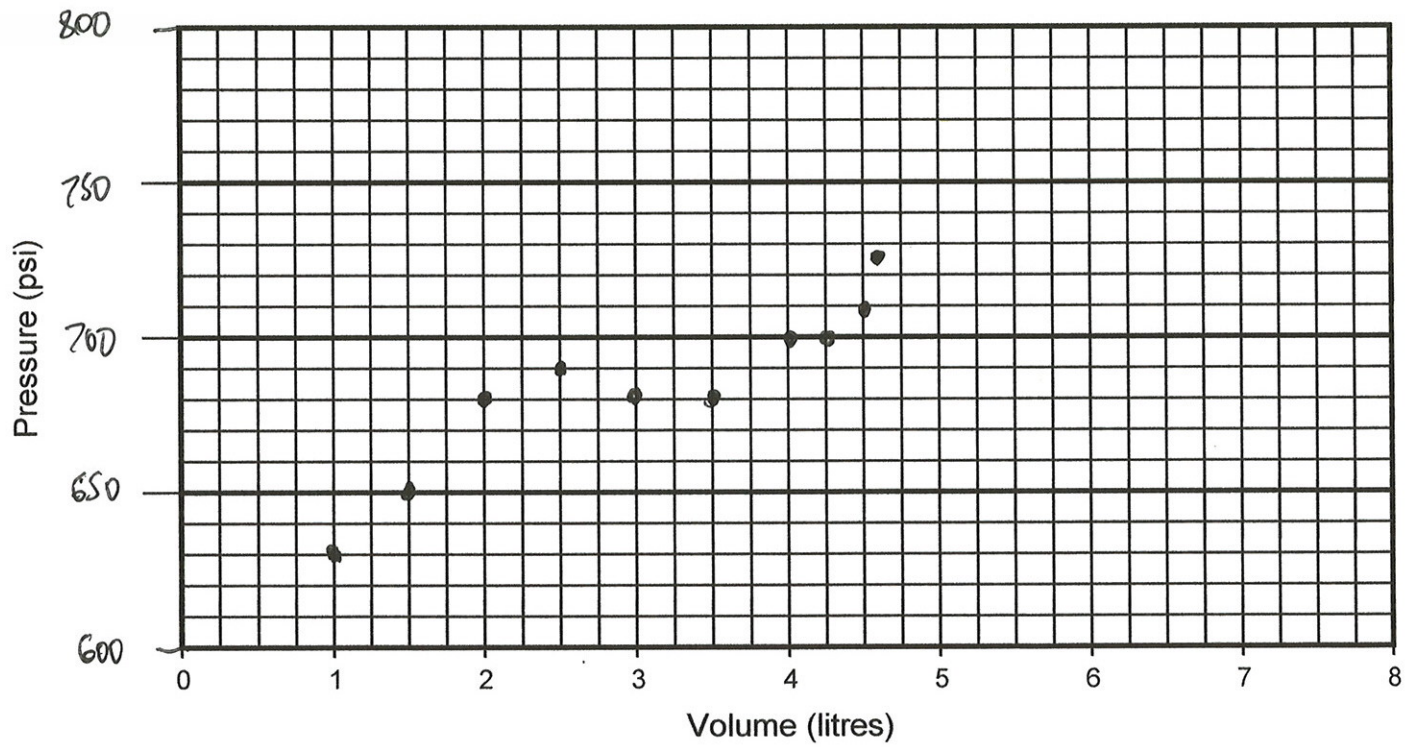
Borehole Water Level: ____ (ft / m) = ____ psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = ____ psi

2.0 min

Volume, litres	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.25	4.5	4.6
Pressure, psi	630	650	680	690	680	680	700	700	710	725

Volume, litres	4									
Pressure, psi	0									



Comments: Packer # 5 TIME 03:30 (am)

Mag collar 297.0

Previous attempt no good because during tool deflection at Packer 4, energ. defl. pins sheared. Tripped tool and replace pins.

Schlumberger WATER SERVICES

Sheet 6 of ____

Westbay Packer Inflation Record

Project: Hope Bay-Westbay Install Project No.: _____ Well No.: 10WBW002

Location: Doris North Completed by: JS Date Inflated: Jun 26 2010

Packer No. 6, sn 17178, comp 133 Depth (ft / (m)): 200 Inflation Tool No.: TFW 3198

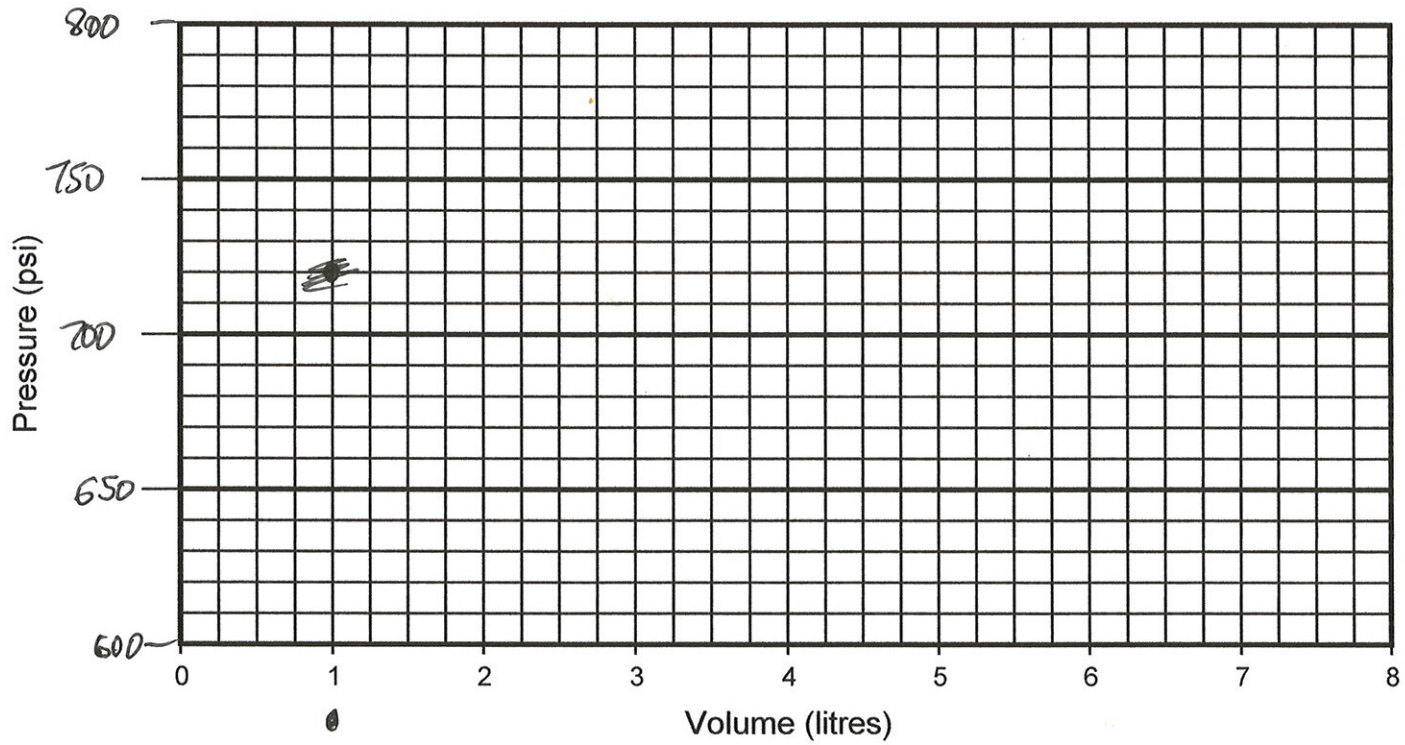
Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: 350 psi

Borehole Water Level: _____ (ft / m) = _____ psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

20 min Restart

Volume, litres	~~1.0~~	~~1.5~~	1.0	/	1.0	1.5	/	1.0	1.25	1.5
Pressure, psi	~~720~~		570	/	720	1020	/	660	840	1020
Volume, litres										
Pressure, psi										



Comments: Packer # 6 TIME -

Schlumberger WATER SERVICES

Sheet ____ of ____

Westbay Packer Inflation Record

Project: Hope Bay - Westbay Project No.: _____ Well No.: 10WBW002

Location: Doris North Completed by: ML Date Inflated: June 26/18

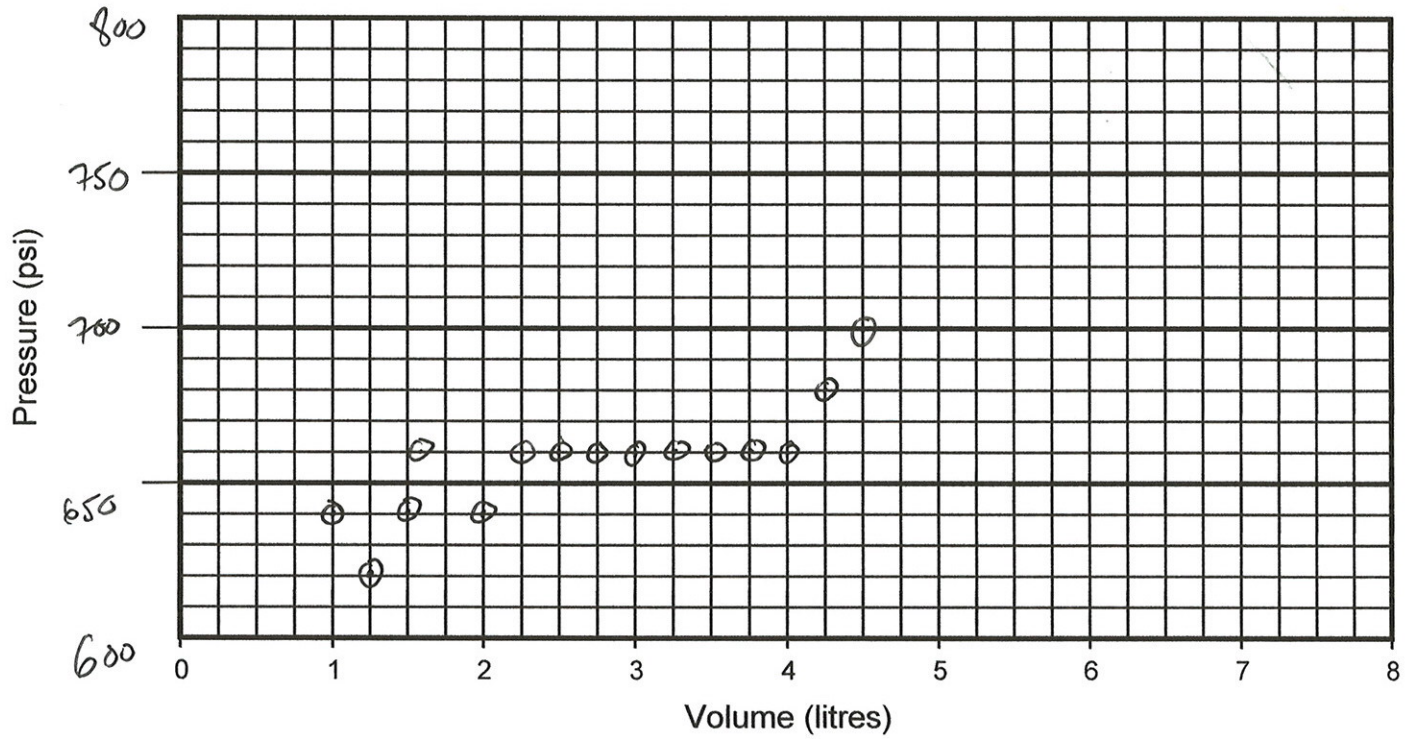
Packer No. 7, Comp 167 S#: 17177 Depth (ft / m): _____ Inflation Tool No.: TIW3198

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: 340 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

Volume, litres	1.0	1.25	1.5	1.85	2.0	2.25	2.5	2.75	3.0	3.25
Pressure, psi	640	620	640	660	640	660	660	660	660	660
Volume, litres	3.5	3.75	4.0	4.25	4.5	3.7				
Pressure, psi	660	660	660	680	700	0				



Comments: Packer # 7 TIME - 2:04pm

Schlumberger WATER SERVICES

Sheet ____ of ____

Westbay Packer Inflation Record

Project: Hope Bay - Westbay Project No.: _____ Well No.: 10WBW002

Location: _____ Completed by: ML Date Inflated: June 26/10

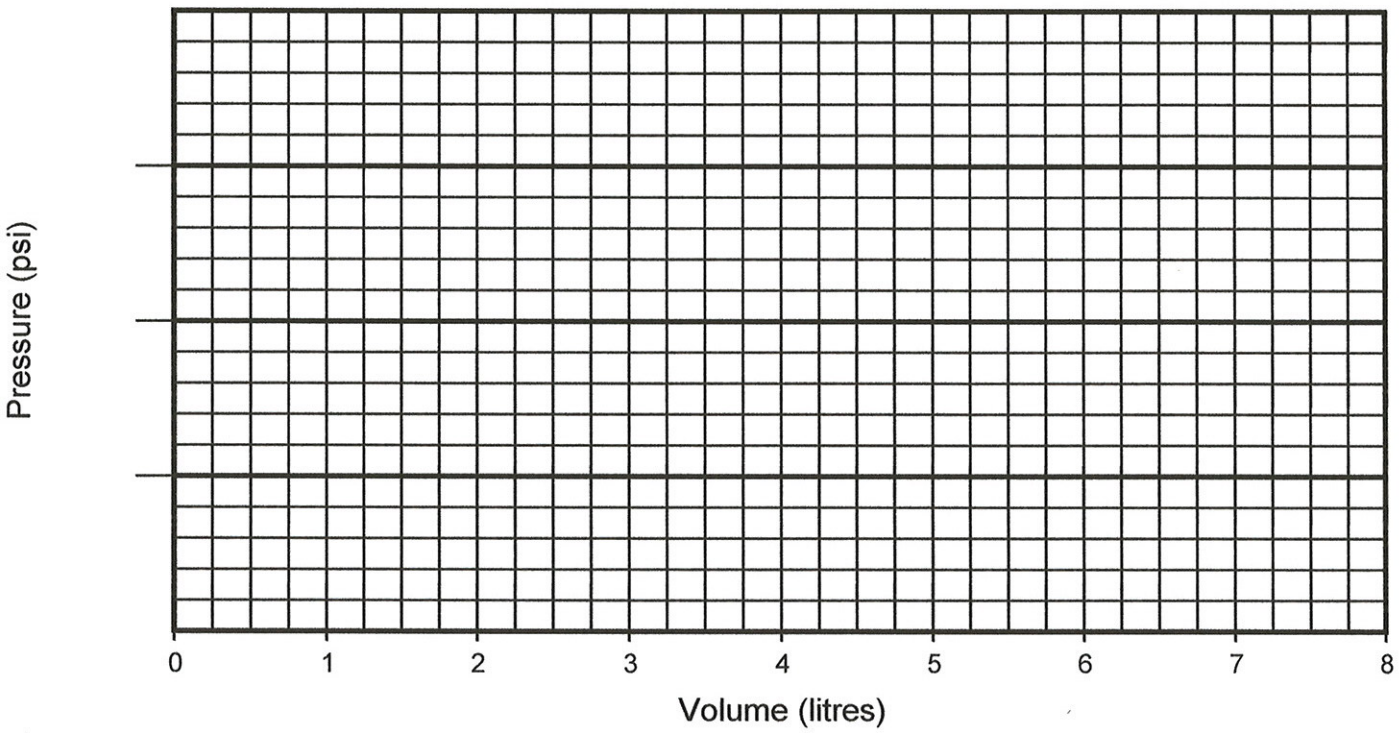
Packer No. 8 1/2 comp 193 SN: 17179 Depth (ft / m): _____ Inflation Tool No.: TFW 3198

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: 340 psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

Volume, litres	1.0	1.5	2.0	2.25	1.5					
Pressure, psi	590	610	620	730	∅					
Volume, litres										
Pressure, psi										



Comments: Packer # 7 TIME - 2:40pm

In 3-in id guide tube.

Schlumberger WATER SERVICES

Sheet 1 of 1

Westbay Packer Inflation Record

Project: Hope Bay Project No.: VC1008.13 Well No.: 10WSW004

Location: Boston Completed by: JH/JM Date Inflated: 7 Aug 10

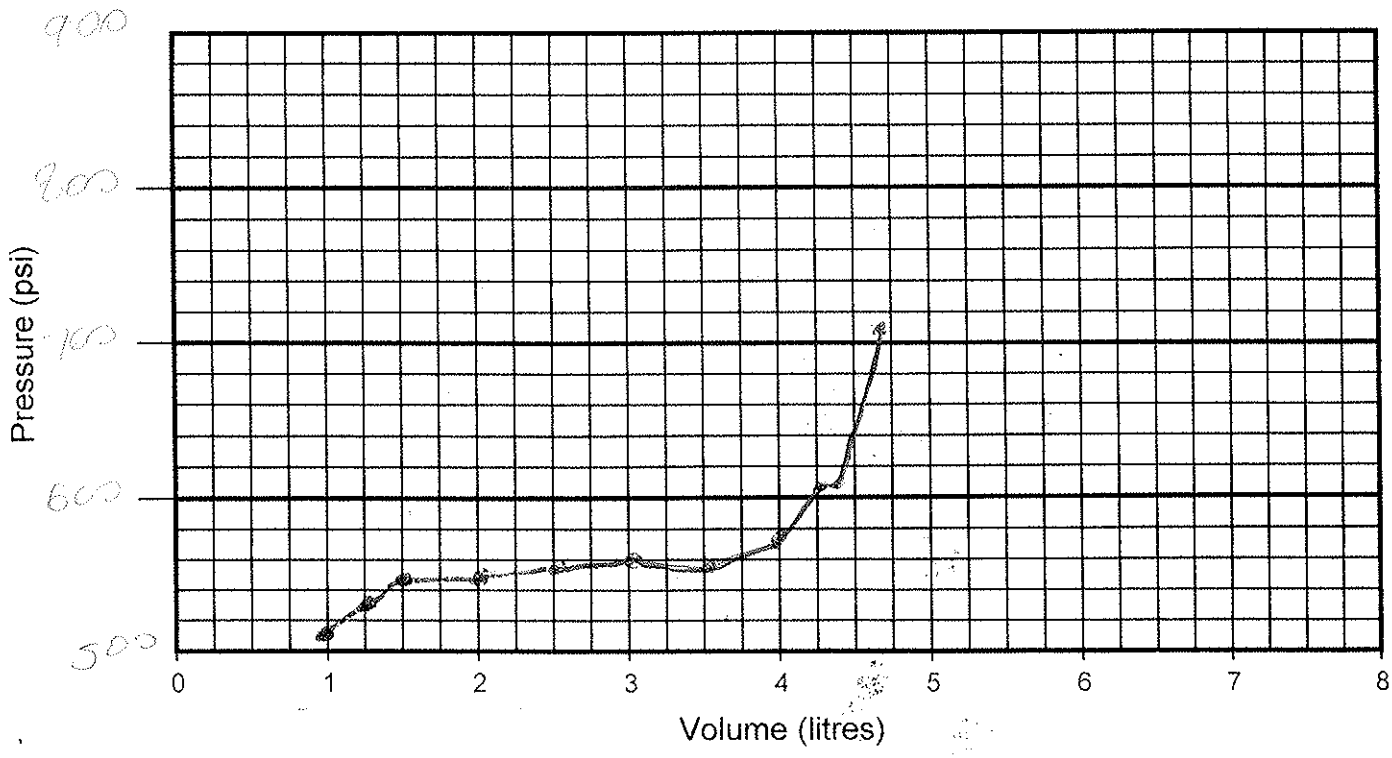
Packer No. 1 # 17220 Depth (ft / m): 449m Inflation Tool No.: SI 98

Packer Valve Pressure, P_V: 165 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: _____ psi

Borehole Water Level: 10 (ft / m) = 14 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

	2	3	3.25	3.5	4	4.5	5	5.5	6	6.25	6.45
Volume, litres	1	1.25	1.5	2	2.5	3	3.5	4	4.25	4.45	
Pressure, psi	510	530	545	530	555	560	555	575	605	610	
Volume, litres	4.7 (6.7)										
Pressure, psi	710										



Comments: Packer # over inflated a little. TIME - 5:35pm

Schlumberger WATER SERVICES

Sheet 1 of 1

Westbay Packer Inflation Record

Project: Hope Bay Project No.: 1400815 Well No.: 10MBH24

Location: Roslyn Completed by: JH/JM Date Inflated: 2 August

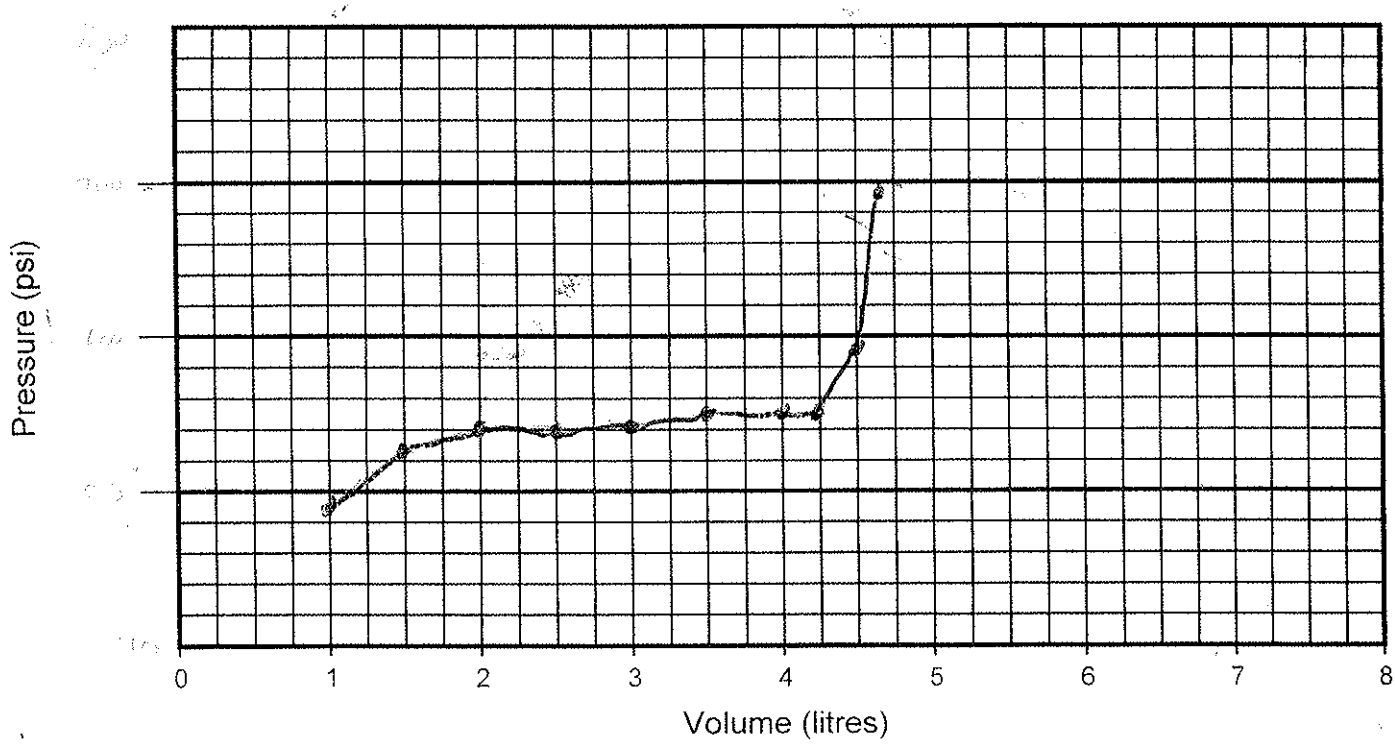
Packer No. 2 H 17223 Depth (ft / m): 45m Inflation Tool No.: 319

Packer Valve Pressure, P_V: 165 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: _____ psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

Volume, litres	1	1.5	2.0	2.5	3.0	3.5	4	4.25		
Pressure, psi	495	515	540	540	540	550	550	550	550	550
Volume, litres										
Pressure, psi										



Comments: Packer # Over-inflated quickly. Will add only 100 ml next time. 145 PSI above flat line. TIME - 9:17 am

Schlumberger WATER SERVICES

Sheet 1 of 1

Westbay Packer Inflation Record

Project: Hope Bay Project No.: 1CIRCB.13 Well No.: MW19-U004

Location: Boston Completed by: JH Date Inflated: 2 Aug 19

Packer No. 3 #17176 Depth (ft / m): 364m Inflation Tool No.: 3198

Packer Valve Pressure, P_V: 165 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: _____ psi

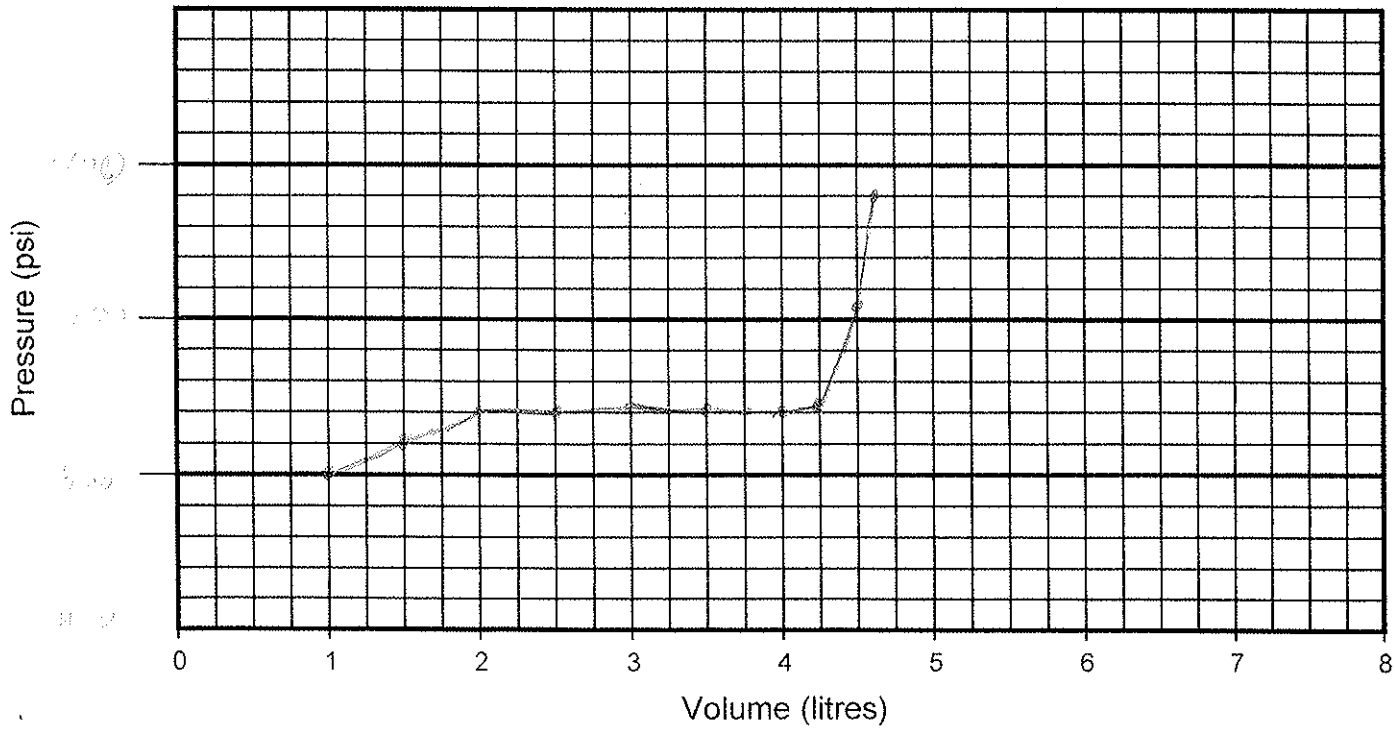
Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

0 1 1.5 2.0 2.5 3.0 3.5 3.75 4 4.25 4.5

Volume, litres	1	1.5	2.0	2.5	3.0	3.5	3.75	4	4.25	4.5
Pressure, psi	500	520	540	540	545	540	540	540	545	610
Volume, litres	4.625									
Pressure, psi	620									

4.625



Comments: Packer # TIME - 9.57am

Schlumberger WATER SERVICES

Sheet 1 of 1

Westbay Packer Inflation Record

Project: Hope Bay Project No.: 1CH008.15 Well No.: 10WBW004

Location: Boston Completed by: JH/JM Date Inflated: 2 August

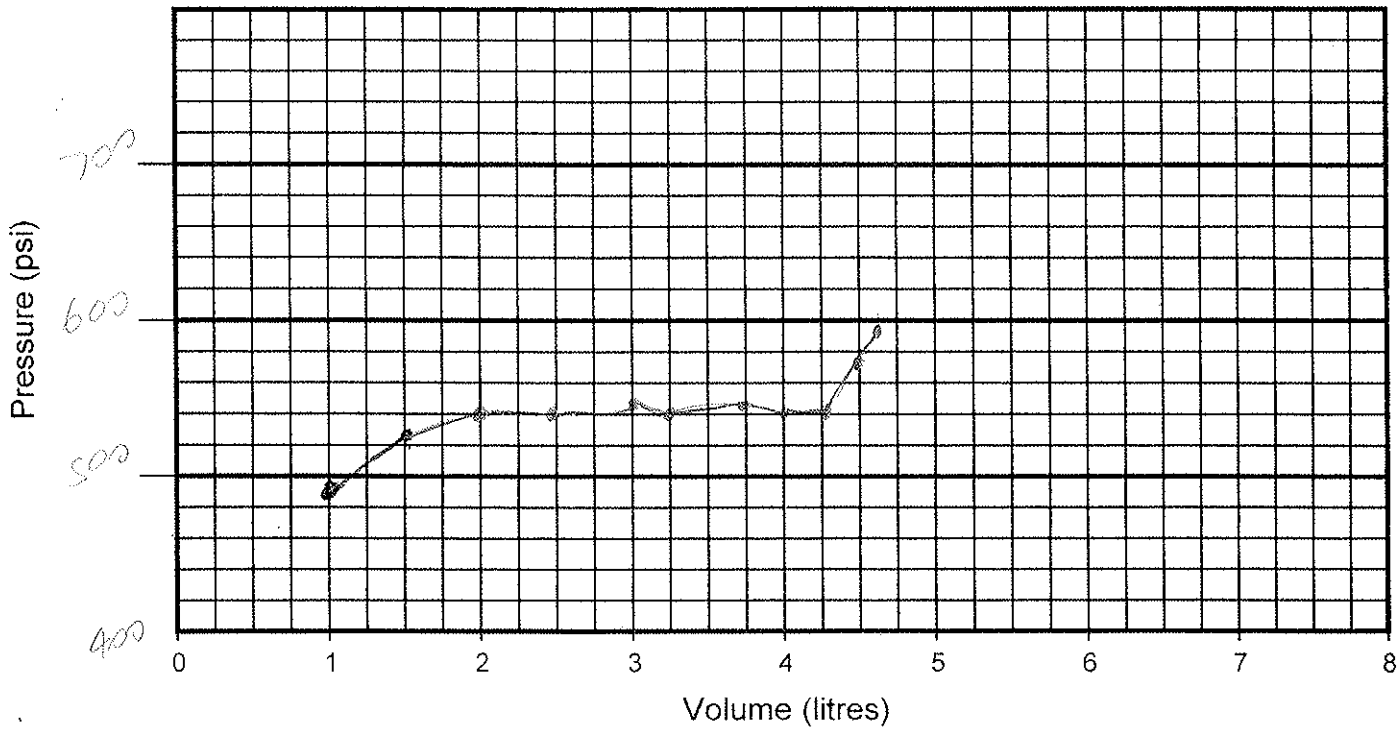
Packer No. 4 #17327 Depth (ft / m): 328m Inflation Tool No.: 3198

Packer Valve Pressure, P_V: 165 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: _____ psi

Borehole Water Level: 0 (ft / m) = 0 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

	1	1	1.5	2	2.5	3	3.5	4	4.25	4.75	5	5.25	5.5
Volume, litres	1		1.5	2	2.5	3	3.25	3.75	4	4.25	4.5		
Pressure, psi	490		525	540	540	545	540	545	540	540	575		
Volume, litres	4.625	5.125											
Pressure, psi	595												



Comments: Packer # TIME - 12.35

mag @ 330m

Schlumberger WATER SERVICES

Sheet 1 of 1

Westbay Packer Inflation Record

Project: Hope Bay Project No.: 1CH008.13 Well No.: 10MW0004

Location: Boston Completed by: JH/JM Date Inflated: 1 Aug 10

Packer No. S # 17221 Depth (ft / m): ~308m Inflation Tool No.: 3198

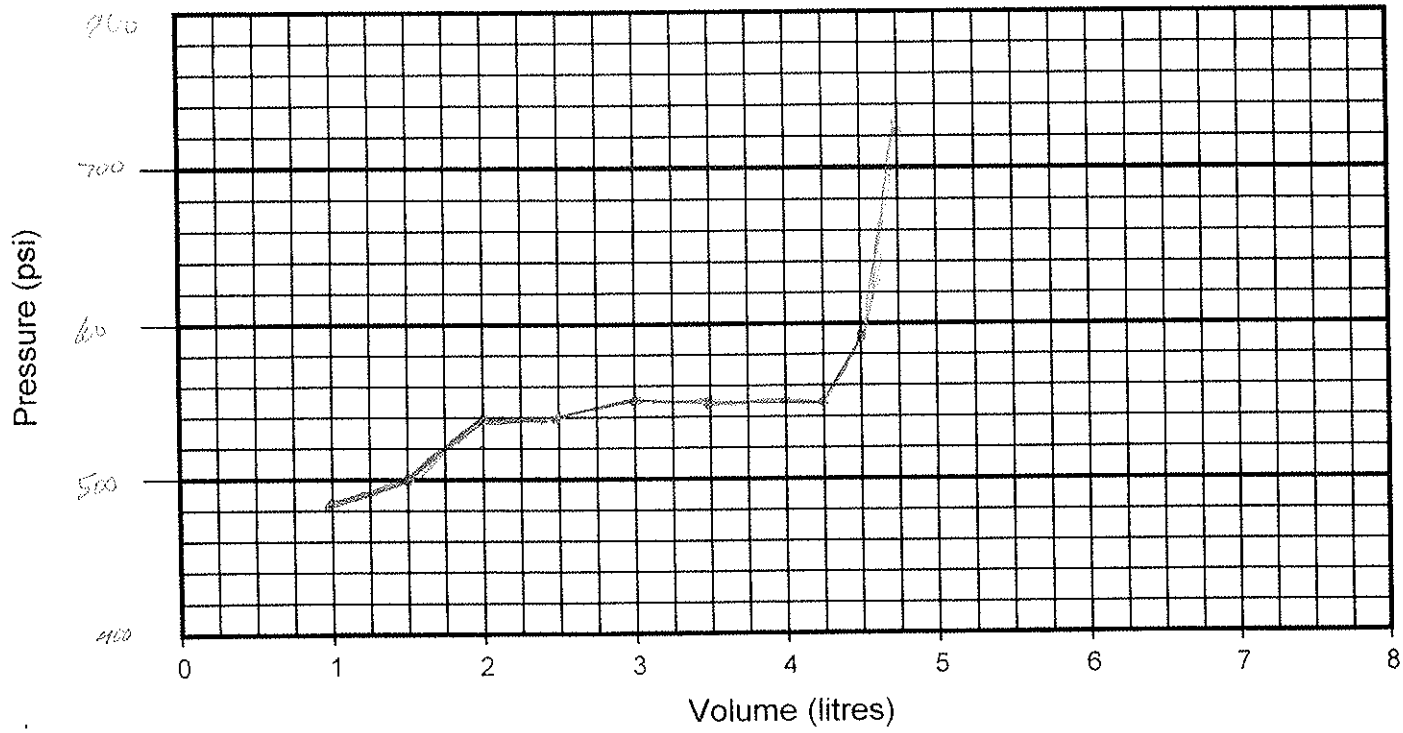
Packer Valve Pressure, P_V: 165 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: _____ psi

Borehole Water Level: _____ (ft / m) = _____ psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

0.25 1.25 1.75 2.25 2.75 3.25 3.75 4.25 4.50 4.75 5.00

Volume, litres	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.25	4.5	4.75
Pressure, psi	485	500	540	540	550	550	55	550	590	710
Volume, litres										
Pressure, psi										



Comments: Packer # Mag ~ 310m TIME -

Schlumberger WATER SERVICES

Sheet 1 of 1

Westbay Packer Inflation Record

Project: Hope Bay Project No.: 1CH008.13 Well No.: 10WBMW004

Location: Boston Completed by: JH/JM Date Inflated: 2 Aug 10

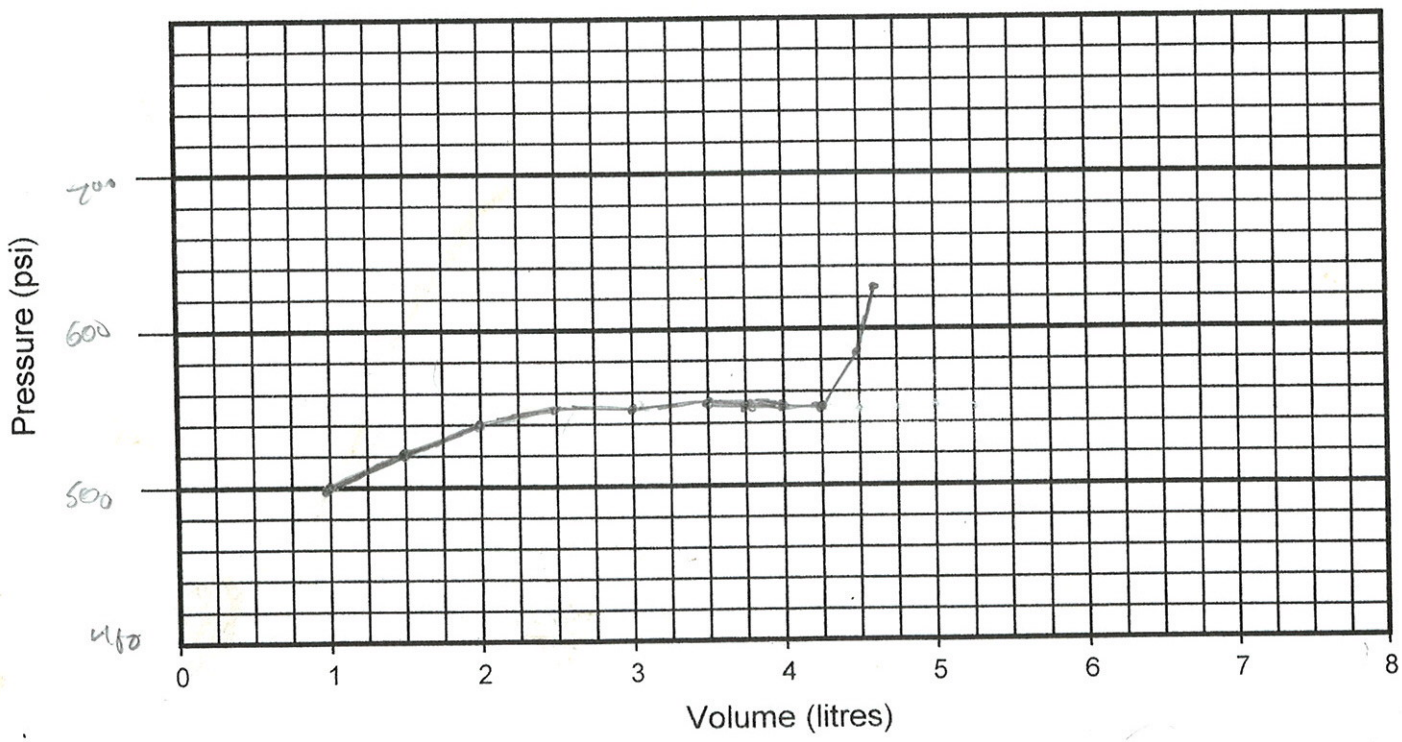
Packer No. 6 # 17219 Depth (ft / m): 296m Inflation Tool No.: 3148

Packer Valve Pressure, P_V: 165 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: _____ psi

Borehole Water Level: _____ (ft / m) = _____ psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

	0	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.0	4.25	4.5
Volume, litres	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.0	4.25	4.5	
Pressure, psi	500	520	540	550	550	555	550	550	550	585	
Volume, litres	4.6										
Pressure, psi	625										



Comments: Packer # Mag 297 TIME - 3:40pm

Schlumberger WATER SERVICES

Sheet____of____

Westbay Packer Inflation Record

Project: Nova Bay Project No.: 1CH008.13 Well No.: RIVER WELL

Location: Boston Completed by: JH/JM Date Inflated: 7-14-10

Packer No. 7 # 17125 Depth (ft / m): 261m Inflation Tool No.: 3148

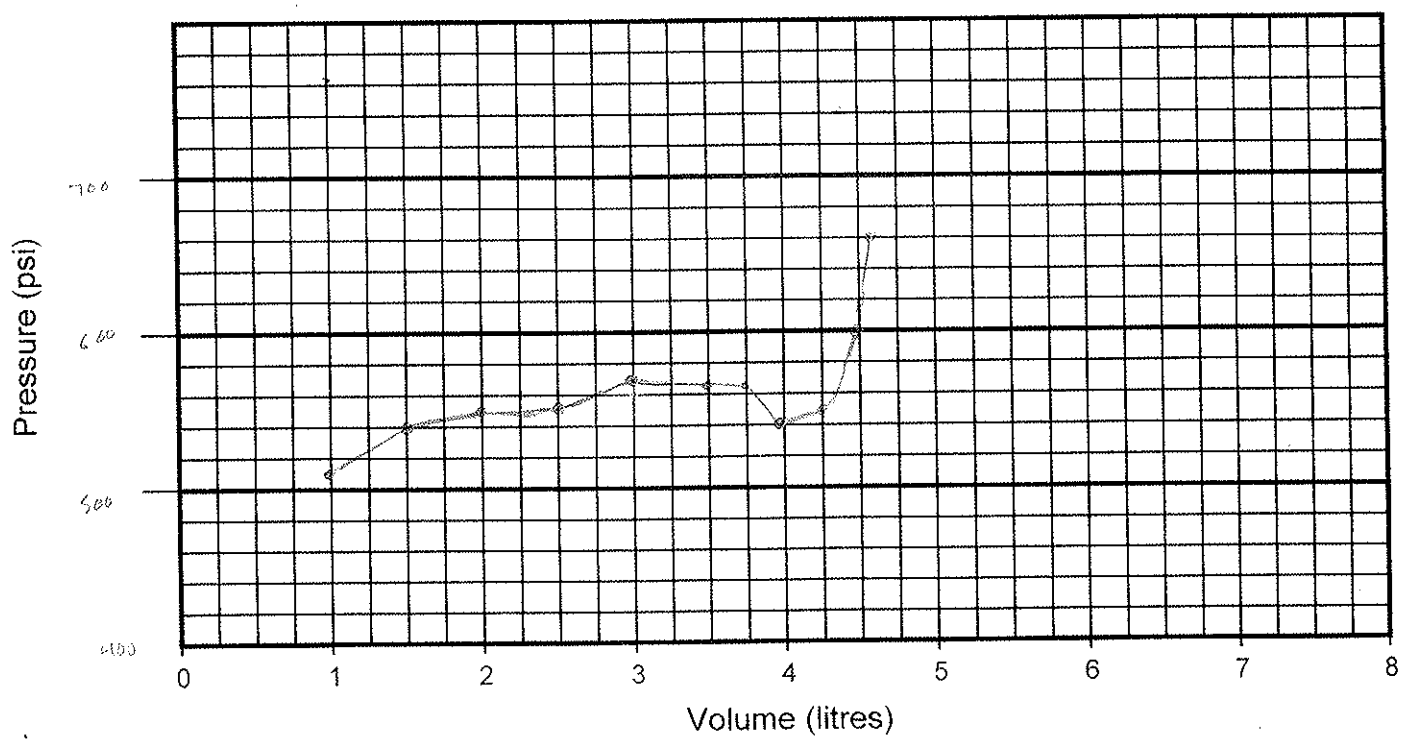
Packer Valve Pressure, P_V: 165 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: _____ psi

Borehole Water Level: _____ (ft / m) = _____ psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

2 3 3.5 4.0 4.5 5.0 5.5 5.75 6 6.75 6.8

Volume, litres	1	1.5	2.0	2.5	3.0	3.5	3.75	4.0	4.25	4.5
Pressure, psi	545	540	550	555	570	565	515	540	550	600
Volume, litres	4.6									
Pressure, psi	660									



Comments: Packer # TIME - 5:10pm

mag @ 2.60

Schlumberger WATER SERVICES

Sheet 1 of 1

Westbay Packer Inflation Record

Project: Hope Bay Project No.: 1CH00B.13 Well No.: 10WBW004

Location: Boston Completed by: JS Date Inflated: 2 Aug 10

Packer No. 8 # 17224 Depth (ft / m): 219m Inflation Tool No.: _____

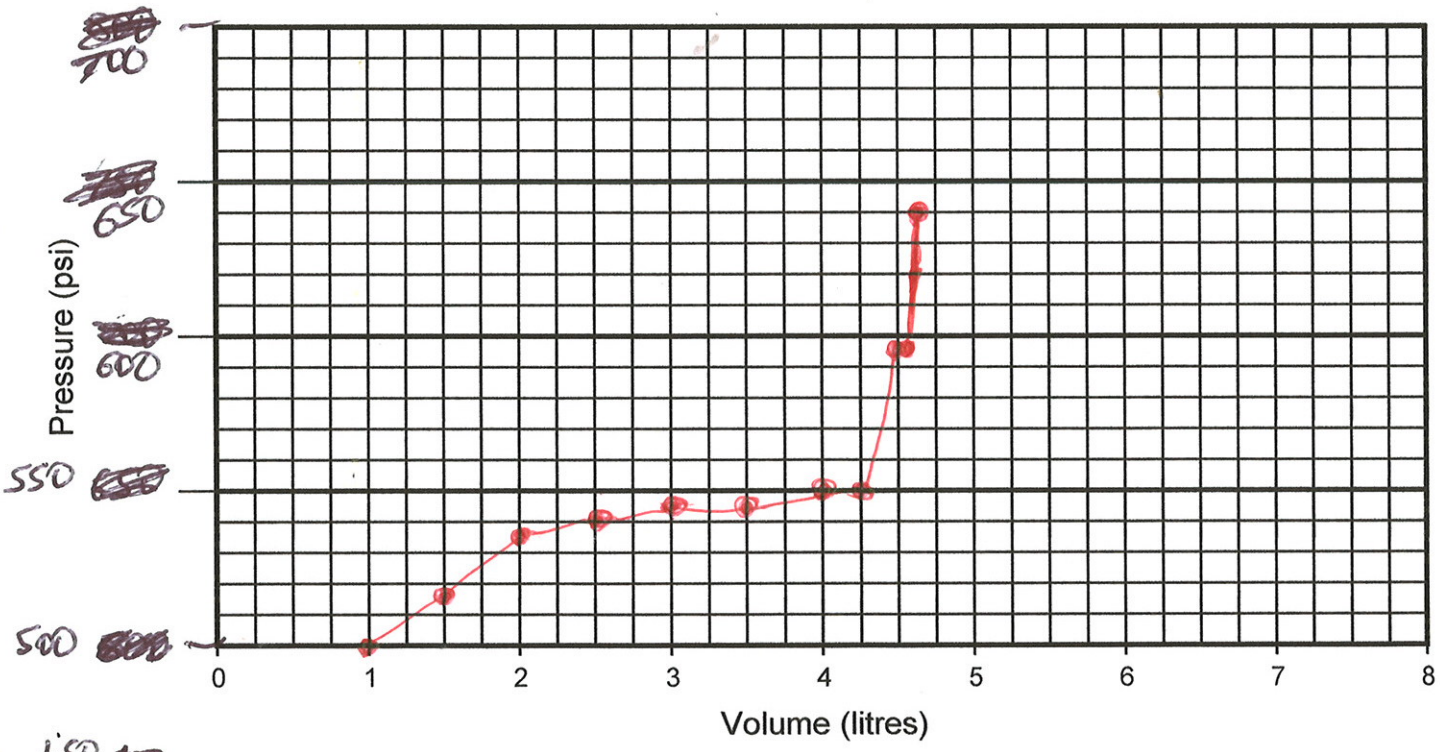
Packer Valve Pressure, P_V: 165 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: _____ psi

Borehole Water Level: _____ (ft / m) = _____ psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

5 min wait each step

Volume, litres	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.25	4.50	[illegible]
Pressure, psi	500	515	535	540	545	545	550	550	595	
Volume, litres	4.55	4.60								
Pressure, psi	595	640								



Comments: Packer # Mag ~ 220m TIME - 10:30 pm

(last mag @ 260.3 on reel
on design it is 261.8)

219.4m Mag detected
up up 2.8m
land at 216.5m

Sheet 1 of ___

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Hope Bay Westbay Install Project No.: 1CH008.93 Well No.: 10WBW004

Location: Boston Completed by: JS Date Inflated: Aug 3 2010

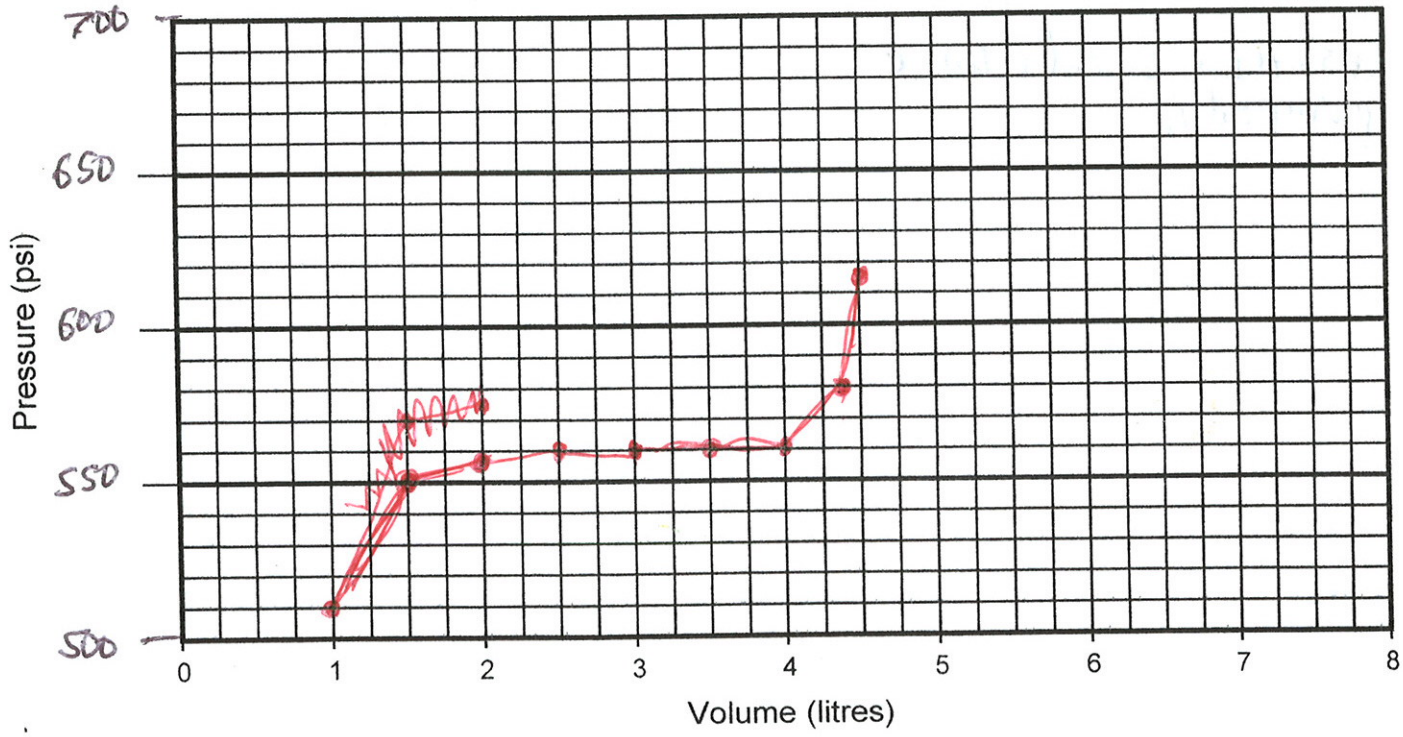
Packer No. 9 SN: 17218 Depth (ft / (m)): 120 m Inflation Tool No.: _____

Packer Valve Pressure, P_V: 165 psi Final Line Pressure, P_L: _____ psi Tool Pressure, P_T: _____ psi

Borehole Water Level: _____ (ft / m) = _____ psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = _____ psi

Volume, litres	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.25	4.50	
Pressure, psi	510	530	535	560	560	560	560	580	630	
Volume, litres										
Pressure, psi										



Comments: Packer # 9 TIME - 12:20 am

Mag collar detector ~~beeper~~ speaker box broken. Soldered voltmeter leads to input cables. When mag collar detected V = 0, when not near collar V = 24.8 V. Mag out 120.95m, lift to 118.1 m then land.

Appendix H
Westbay Final As-built Designs and Monitoring Zone Depths

Table 1: Westbay zone depths

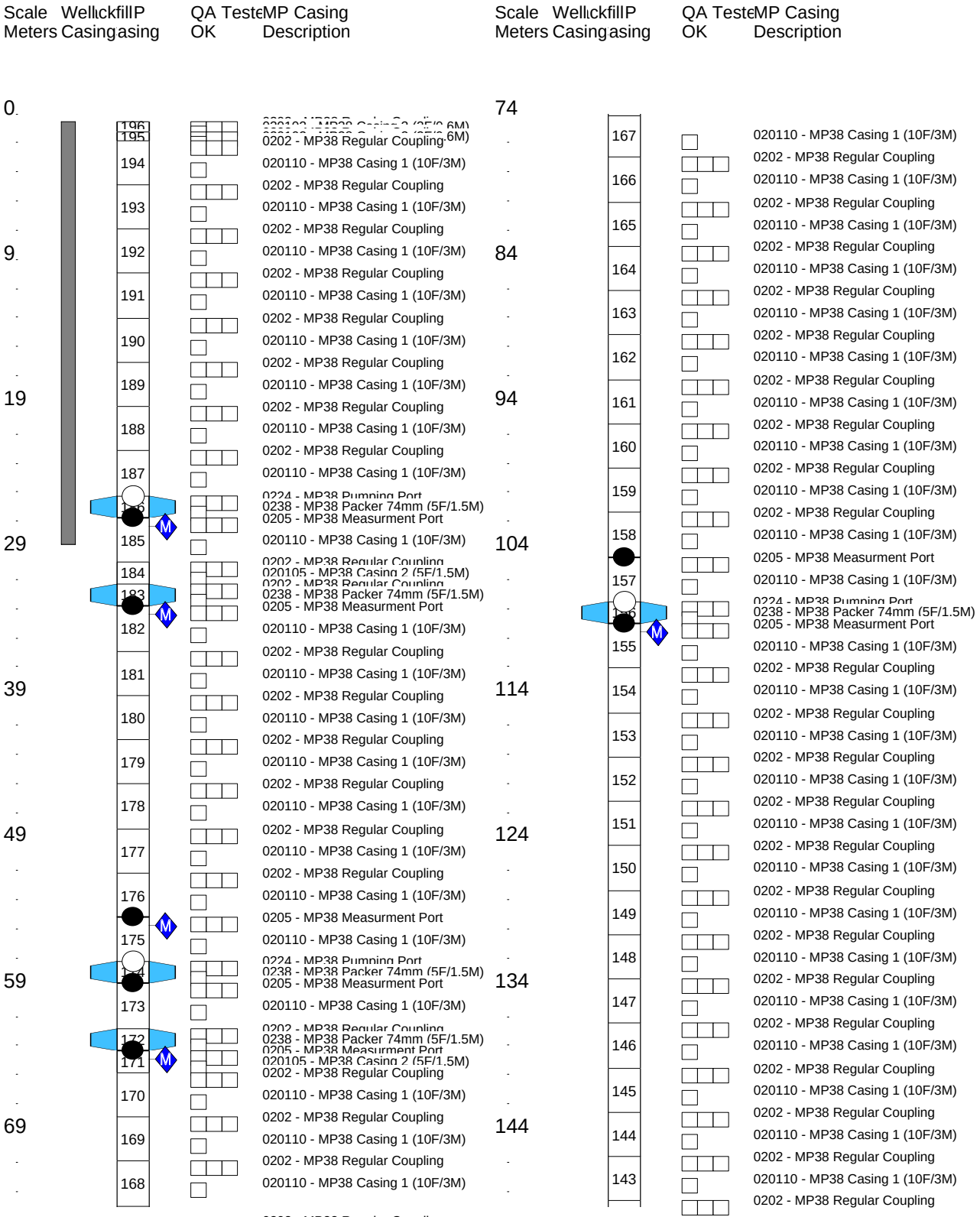
Hole ID	Zone	From	To	From	To	Sampled zones only	
		Downhole distance (m)	Downhole distance (m)	Vertical distance (m)	Vertical distance (m)	Length of zone (m)	Volume of zone annulus between Westbay and borehole (L)
10WBW001	12	27.0	31.5	24.5	28.6		
10WBW001	11	33.0	57.5	29.9	52.0		
10WBW001	10	63.5	107.5	57.4	97.1	44.0	264
10WBW001	9	109.0	158.0	98.4	142.6		
10WBW001	8	159.0	199.0	143.5	179.3		
10WBW001	7	200.5	240.0	180.6	215.7		
10WBW001	6	246.0	274.0	221.1	245.8	28.0	168
10WBW001	5	280.0	343.5	251.1	306.7		
10WBW001	4	345.0	388.0	308.0	345.5		
10WBW001	3	389.5	459.5	346.8	407.8		
10WBW001	2	461.0	546.5	409.2	483.5		
10WBW001	1	548.0	564.0	484.8	495.2	16.0	96
10WBW002	8	27.5	103.7	26.5	100.0		
10WBW002	7	105.2	199.7	101.5	192.7		
10WBW002	6	201.2	295.7	194.1	285.4		
10WBW002	5	297.2	397.8	286.8	384.1		
10WBW002	4	399.3	496.9	385.6	480.3		
10WBW002	3	498.4	504.5	481.8	487.7		
10WBW002	2	506.0	592.9	489.2	573.6		
10WBW002	1	594.4	600.6	575.1	577.6	6.2	37
10WBW004	10	24.4	118.9	22.8	110.9		
10WBW004	9	120.4	217.9	112.3	201.8		
10WBW004	8	219.4	259.1	203.2	239.0		
10WBW004	7	260.6	294.2	240.3	270.2		
10WBW004	6	295.7	307.9	271.5	282.3	12.2	73
10WBW004	5	309.4	327.7	283.7	299.9		
10WBW004	4	329.3	362.8	301.3	330.7		
10WBW004	3	364.3	413.1	332.0	373.8		
10WBW004	2	414.6	445.1	375.0	400.5		
10WBW004	1	446.7	470.0	401.8	421.0		

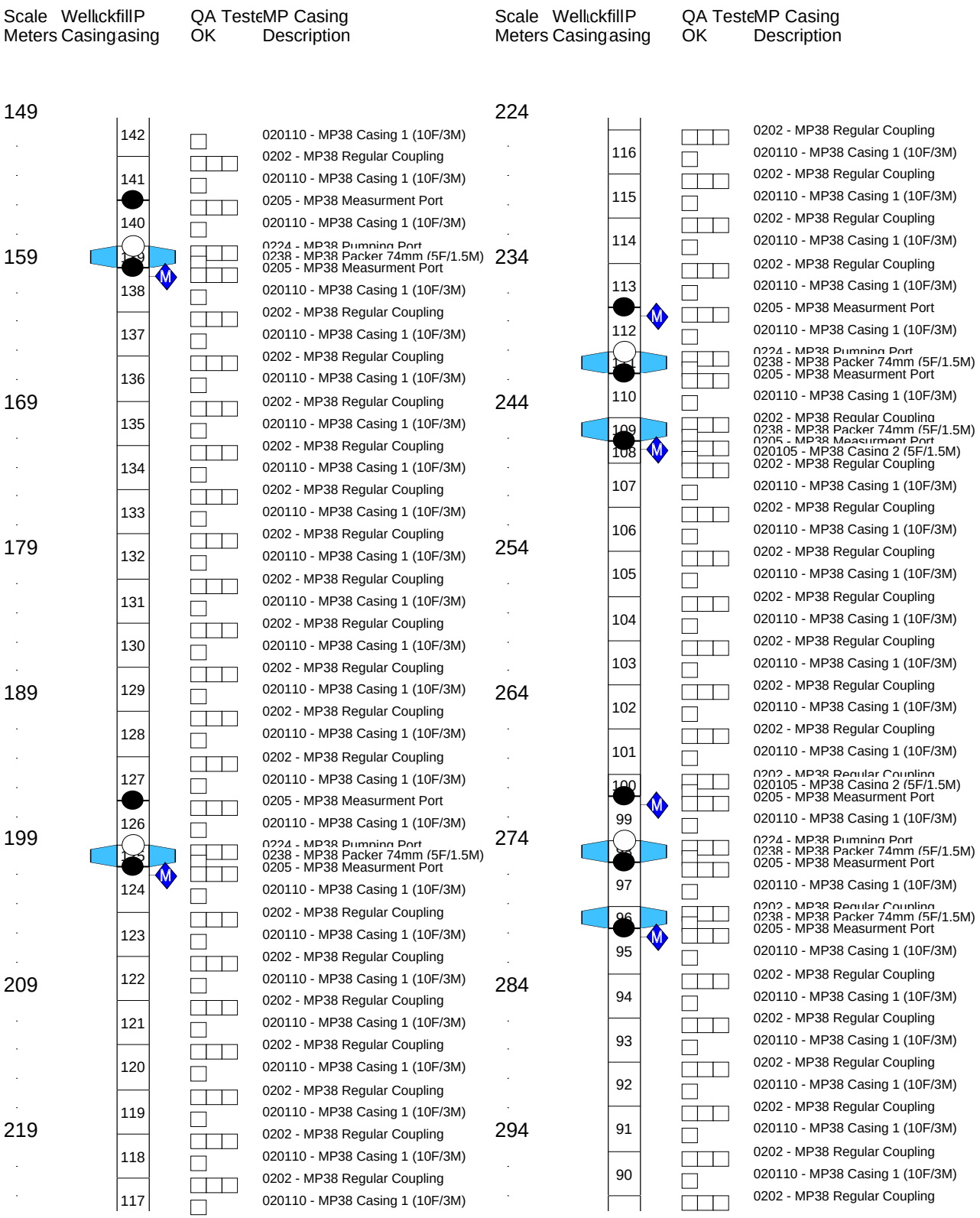
Table 2: Depths of Westbay Measurement Ports

Hole ID	ZONE #	Depth - downhole distance (m)	Depth - vertical (m)	Top of zone?	Used for port sampling?	LOCATIONX	LOCATIONY	LOCATIONZ
10WBW001	12	27.00	24.49	Yes		33787.24	557530.64	5001.70
10WBW001	11	33.00	29.92	Yes		33789.42	557529.32	4996.27
10WBW001	11	54.50	49.32	No		33797.38	557524.56	4976.87
10WBW001		59.00	53.37	Pressure relief only		33799.05	557523.56	4972.82
10WBW001	10	63.50	57.43	Yes	Y	33800.73	557522.57	4968.76
10WBW001	10	105.00	94.84	No		33816.22	557513.48	4931.34
10WBW001	9	109.00	98.45	Yes		33817.72	557512.62	4927.74
10WBW001	9	155.00	139.88	No		33835.13	557502.80	4886.31
10WBW001	8	159.50	143.92	Yes		33836.86	557501.85	4882.27
10WBW001	8	196.00	176.63	No		33851.13	557494.16	4849.56
10WBW001	7	200.50	180.64	Yes		33852.92	557493.21	4845.54
10WBW001	7	237.00	213.09	No		33867.71	557485.42	4813.10
10WBW001		241.50	217.08	Pressure relief only		33869.56	557484.45	4809.11
10WBW001	6	246.00	221.06	Yes	Y	33871.41	557483.48	4805.12
10WBW001	6	271.00	243.15	No		33881.81	557478.09	4783.04
10WBW001		275.50	247.11	Pressure relief only		33883.69	557477.11	4779.07
10WBW001	5	280.00	251.08	Yes		33885.59	557476.13	4775.11
10WBW001	5	340.50	304.10	No		33911.54	557462.89	4722.09
10WBW001	4	345.00	308.03	Yes		33913.50	557461.90	4718.16
10WBW001	4	385.00	342.91	No		33930.95	557453.06	4683.27
10WBW001	3	389.50	346.84	Yes		33932.92	557452.06	4679.35
10WBW001	3	456.50	405.24	No		33962.24	557437.27	4620.95
10WBW001	2	461.00	409.15	Yes		33964.23	557436.28	4617.03
10WBW001	2	543.50	480.91	No		34000.73	557418.28	4545.28
10WBW001	1	548.00	484.82	Yes	Y	34002.74	557417.30	4541.37
10WBW002	8	27.50	26.51	Yes		33905.72	559375.59	5003.86
10WBW002	7	105.20	101.46	Yes		33885.26	559376.27	4928.91
10WBW002	6	201.20	194.15	Yes		33860.30	559377.73	4836.22
10WBW002	5	297.20	286.85	Yes		33835.43	559379.73	4743.52
10WBW002	4	399.30	385.60	Yes		33809.68	559382.57	4644.77
10WBW002	3	498.40	481.78	Yes		33785.84	559384.08	4548.59
10WBW002	2	506.00	489.16	Yes		33784.03	559384.26	4541.21
10WBW002	1	594.40	575.06	Yes	Y	33763.32	559386.86	4455.31
10WBW004	10	24.40	22.84	Yes		41012.62	505658.33	5044.88
10WBW004	9	120.40	112.33	Yes		40987.93	505633.89	4955.39
10WBW004	8	219.40	203.19	Yes		40957.50	505609.20	4864.53
10WBW004	7	260.60	240.34	Yes		40942.80	505599.14	4827.38
10WBW004	7	291.10	267.46	No		40930.84	505591.97	4800.26
10WBW004	6	295.70	271.54	Yes	Y	40928.99	505590.91	4796.18
10WBW004	6	304.80	279.60	No	Y	40925.32	505588.81	4788.12
10WBW004	5	309.40	283.67	Yes		40923.46	505587.76	4784.05
10WBW004	5	324.70	297.22	No		40917.24	505584.32	4770.50
10WBW004	4	329.30	301.29	Yes		40915.36	505583.29	4766.43
10WBW004	3	364.30	332.03	Yes		40900.56	505575.50	4735.69
10WBW004	2	414.60	375.02	Yes		40876.89	505564.50	4692.70
10WBW004	1	446.70	401.83	Yes		40860.53	505557.91	4665.89

Doris North rev1
SRK

Job No: 1CH008.013
Well: 10WBW001




Scale Meters
Well Casing
Backfill Casing
P
QA Tested OK
MP Casing Description
149
159
169
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141
140
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020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3M)
0224 - MP38 Pumping Port
0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3M)
0224 - MP38 Pumping Port
0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
224
234
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284
294
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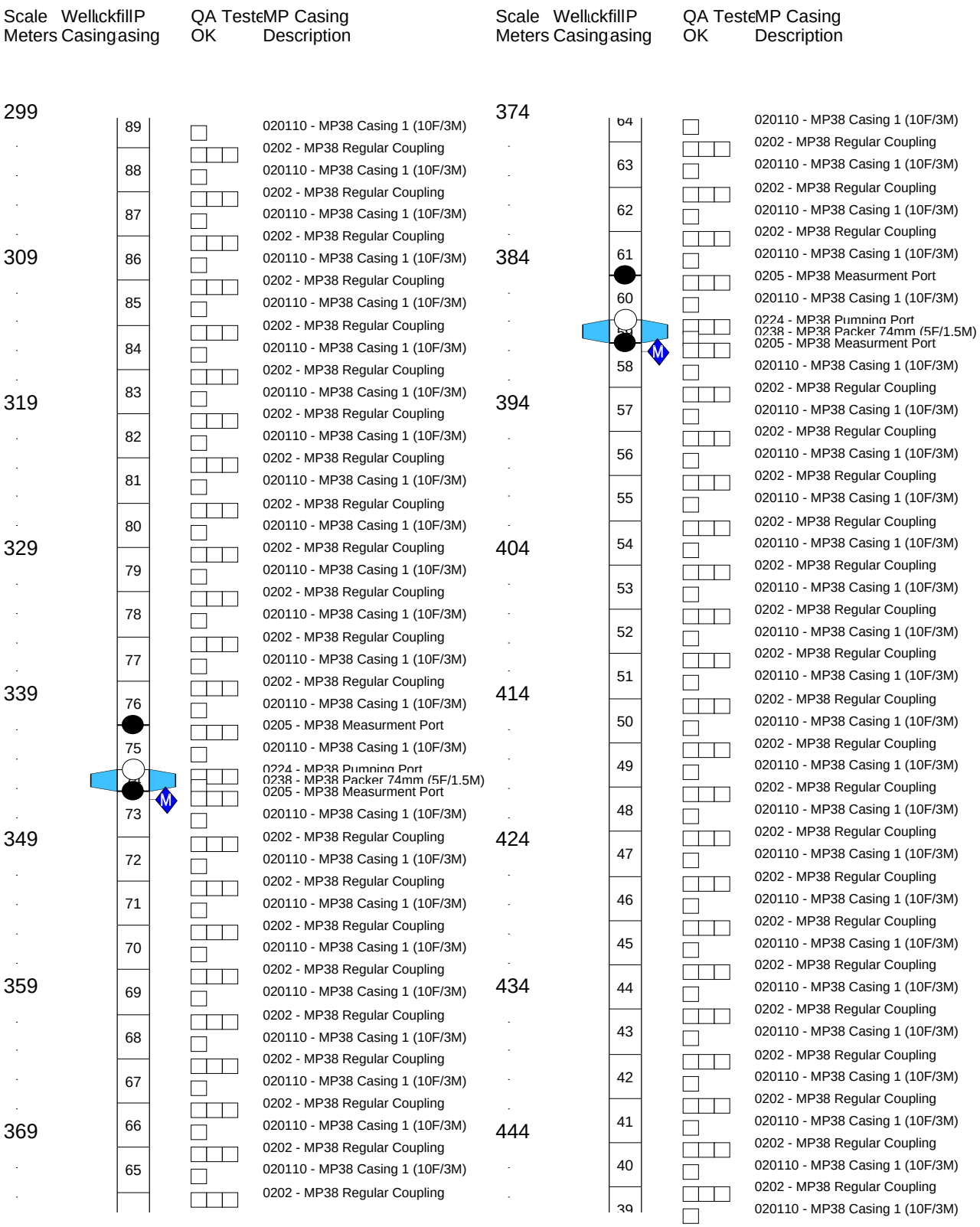
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3M)
0224 - MP38 Pumping Port
0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port
020105 - MP38 Casing 2 (5F/1.5M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020105 - MP38 Casing 2 (5F/1.5M)
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3M)
0224 - MP38 Pumping Port
0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
0238 - MP38 Packer 74mm (5F/1.5M)
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling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ckfill
P asing
QA Teste OK
MP Casing Description
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319
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020110 - MP38 Casing 1 (10F/3M)
0202 - MP38 Regular Coupling
0205 - MP38 Measurment Port
0224 - MP38 Pumping Port
0238 - MP38 Packer 74mm (5F/1.5M)
374
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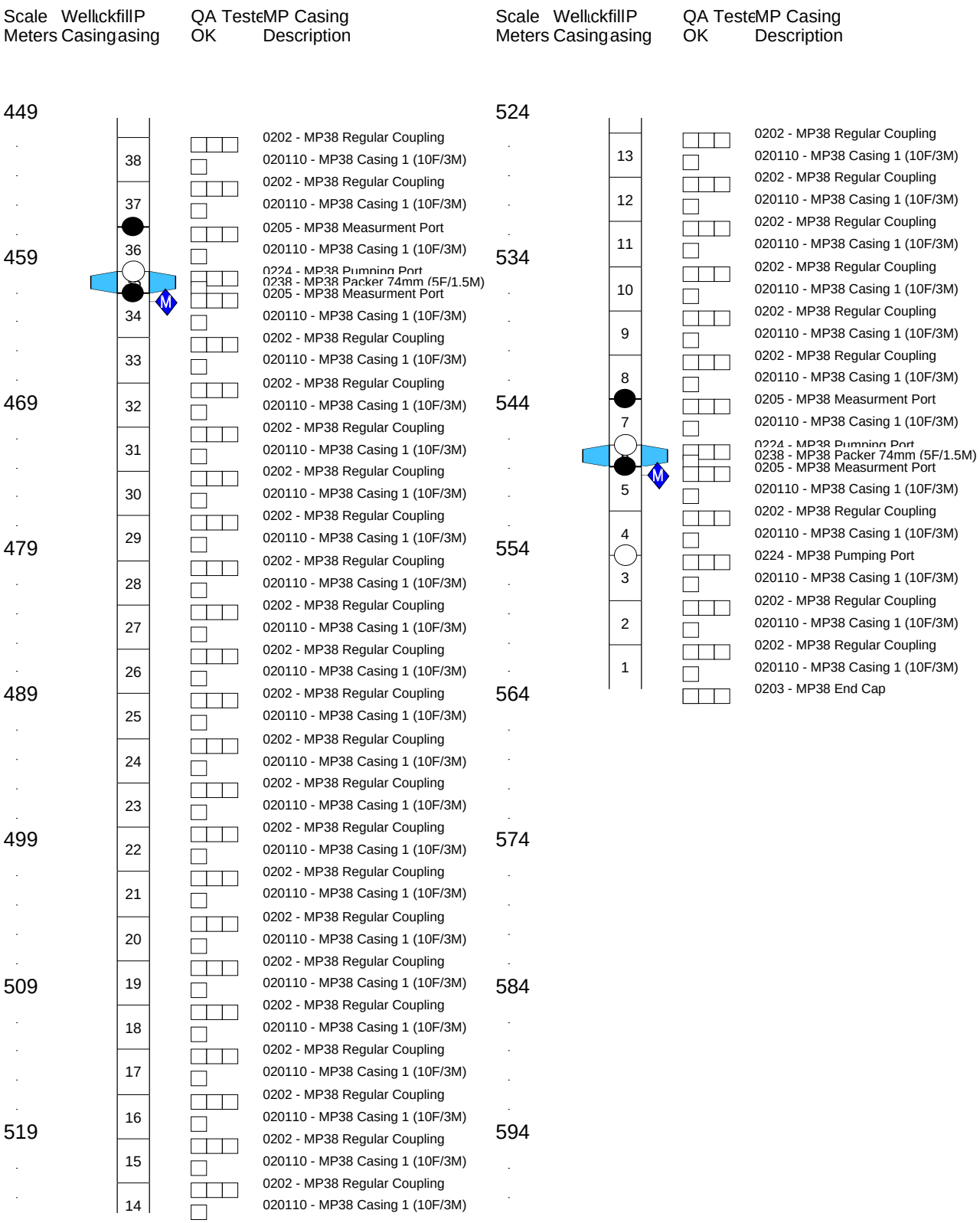
Scale Meters
Well Casing
ckfill Casing
P
QA Teste OK
MP Casing Description
449
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0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3M)
0205 - MP38 Measurment Port
0224 - MP38 Pumping Port
0238 - MP38 Packer 74mm (5F/1.5M)
0203 - MP38 End Cap

Scale Meters	Ba	Well Casing	MP ng	QA Tes OK	MP Casing Description
0			202	▫	020105 - MP38 Casing 2 (5F/1.5M)
			201	▫	020110 - MP38 Casing 1 (10F/3M)
			200	▫	020110 - MP38 Casing 1 (10F/3M)
10			199	▫	020110 - MP38 Casing 1 (10F/3M)
			198	▫	020110 - MP38 Casing 1 (10F/3M)
			197	▫	020110 - MP38 Casing 1 (10F/3M)
			196	▫	020110 - MP38 Casing 1 (10F/3M)
20			195	▫	020110 - MP38 Casing 1 (10F/3M)
			194	▫	020110 - MP38 Casing 1 (10F/3M)
					0706 - MP38 Hydraulic Pumping Port
			193	▫	0238 - MP38 Packer 74mm (5F/1.5M)
					0205 - MP38 Measurment Port
30			192	▫	020110 - MP38 Casing 1 (10F/3M)
			191	▫	020110 - MP38 Casing 1 (10F/3M)
			190	▫	020110 - MP38 Casing 1 (10F/3M)
			189	▫	020110 - MP38 Casing 1 (10F/3M)
40			188	▫	020110 - MP38 Casing 1 (10F/3M)
			187	▫	020110 - MP38 Casing 1 (10F/3M)
			186	▫	020110 - MP38 Casing 1 (10F/3M)
50			185	▫	020110 - MP38 Casing 1 (10F/3M)
			184	▫	020110 - MP38 Casing 1 (10F/3M)
			183	▫	020110 - MP38 Casing 1 (10F/3M)
60			182	▫	020110 - MP38 Casing 1 (10F/3M)
			181	▫	020110 - MP38 Casing 1 (10F/3M)
			180	▫	020110 - MP38 Casing 1 (10F/3M)
70			179	▫	020110 - MP38 Casing 1 (10F/3M)
			178	▫	020110 - MP38 Casing 1 (10F/3M)
			177	▫	020110 - MP38 Casing 1 (10F/3M)
75			176	▫	020110 - MP38 Casing 1 (10F/3M)
			175	▫	020110 - MP38 Casing 1 (10F/3M)
85			174	▫	020110 - MP38 Casing 1 (10F/3M)
			173	▫	020110 - MP38 Casing 1 (10F/3M)
			172	▫	020110 - MP38 Casing 1 (10F/3M)
			171	▫	020110 - MP38 Casing 1 (10F/3M)
95			170	▫	020110 - MP38 Casing 1 (10F/3M)
			169	▫	020110 - MP38 Casing 1 (10F/3M)
			168	▫	020110 - MP38 Casing 1 (10F/3M)
105			167	▫	0238 - MP38 Packer 74mm (5F/1.5M)
					0205 - MP38 Measurment Port
			166	▫	020110 - MP38 Casing 1 (10F/3M)
			165	▫	020110 - MP38 Casing 1 (10F/3M)
			164	▫	020110 - MP38 Casing 1 (10F/3M)
115			163	▫	020110 - MP38 Casing 1 (10F/3M)
			162	▫	020110 - MP38 Casing 1 (10F/3M)
			161	▫	020110 - MP38 Casing 1 (10F/3M)
125			160	▫	020110 - MP38 Casing 1 (10F/3M)
			159	▫	020110 - MP38 Casing 1 (10F/3M)
			158	▫	020110 - MP38 Casing 1 (10F/3M)
135			157	▫	020110 - MP38 Casing 1 (10F/3M)
			156	▫	020110 - MP38 Casing 1 (10F/3M)
			155	▫	020110 - MP38 Casing 1 (10F/3M)
145			154	▫	020110 - MP38 Casing 1 (10F/3M)
			153	▫	020110 - MP38 Casing 1 (10F/3M)
			152	▫	020110 - MP38 Casing 1 (10F/3M)

Scale Meters	Bad Casing	Well Casing	MP	QA Test OK	MP Casing Description
150					
			151	▫	020110 - MP38 Casing 1 (10F/3M)
			150	▫	020110 - MP38 Casing 1 (10F/3M)
			149	▫	020110 - MP38 Casing 1 (10F/3M)
160					
			148	▫	020110 - MP38 Casing 1 (10F/3M)
			147	▫	020110 - MP38 Casing 1 (10F/3M)
			146	▫	020110 - MP38 Casing 1 (10F/3M)
170					
			145	▫	020110 - MP38 Casing 1 (10F/3M)
			144	▫	020110 - MP38 Casing 1 (10F/3M)
			143	▫	020110 - MP38 Casing 1 (10F/3M)
180					
			142	▫	020110 - MP38 Casing 1 (10F/3M)
			141	▫	020110 - MP38 Casing 1 (10F/3M)
			140	▫	020110 - MP38 Casing 1 (10F/3M)
			139	▫	020110 - MP38 Casing 1 (10F/3M)
190					
			138	▫	020110 - MP38 Casing 1 (10F/3M)
			137	▫	020110 - MP38 Casing 1 (10F/3M)
			136	▫	020110 - MP38 Casing 1 (10F/3M)
200					
			135	▫	0238 - MP38 Packer 74mm (5F/1.5M) 0205 - MP38 Measurment Port
			134	▫	020110 - MP38 Casing 1 (10F/3M)
			133	▫	020110 - MP38 Casing 1 (10F/3M)
			132	▫	020110 - MP38 Casing 1 (10F/3M)
210					
			131	▫	020110 - MP38 Casing 1 (10F/3M)
			130	▫	020110 - MP38 Casing 1 (10F/3M)
			129	▫	020110 - MP38 Casing 1 (10F/3M)
220					
			128	▫	020110 - MP38 Casing 1 (10F/3M)
			127	▫	020110 - MP38 Casing 1 (10F/3M)

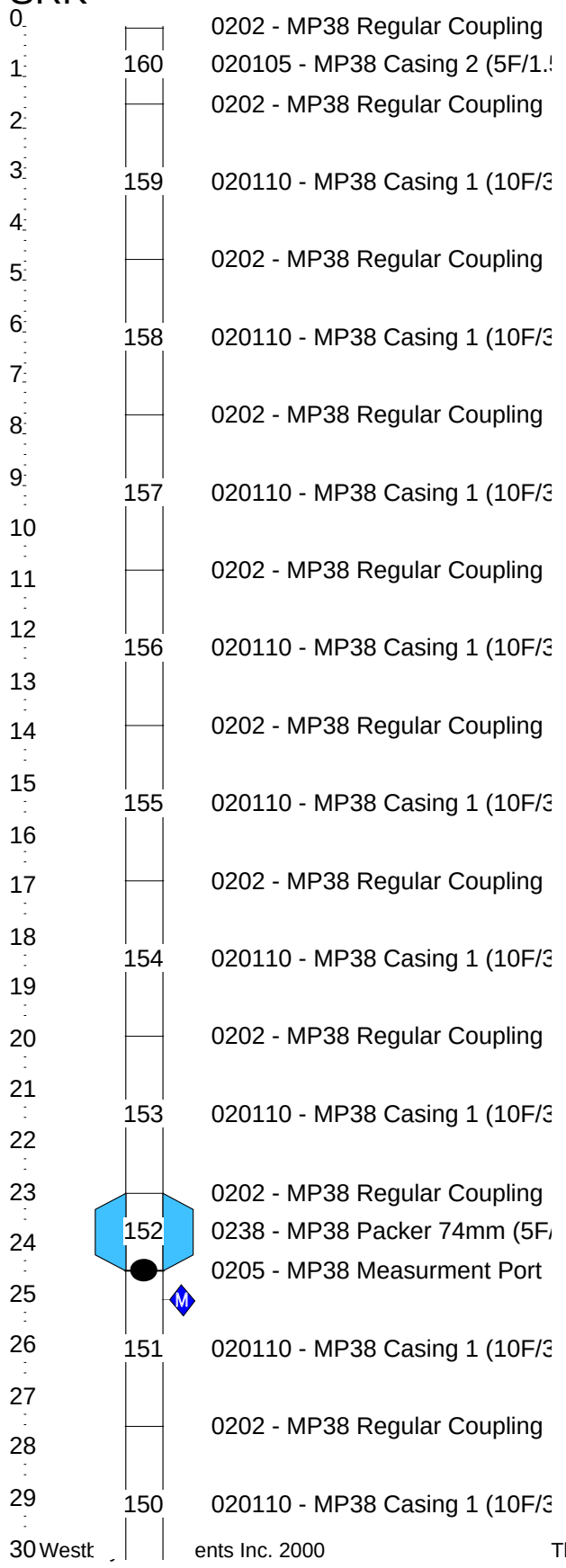
Scale Meters	Bad Casing	Well Casing	MP	QA Test OK	MP Casing Description
225					
			126	▫	020110 - MP38 Casing 1 (10F/3M)
			125	▫	020110 - MP38 Casing 1 (10F/3M)
			124	▫	020110 - MP38 Casing 1 (10F/3M)
235					
			123	▫	020110 - MP38 Casing 1 (10F/3M)
			122	▫	020110 - MP38 Casing 1 (10F/3M)
			121	▫	020110 - MP38 Casing 1 (10F/3M)
245					
			120	▫	020110 - MP38 Casing 1 (10F/3M)
			119	▫	020110 - MP38 Casing 1 (10F/3M)
			118	▫	020110 - MP38 Casing 1 (10F/3M)
255					
			117	▫	020110 - MP38 Casing 1 (10F/3M)
			116	▫	020110 - MP38 Casing 1 (10F/3M)
			115	▫	020110 - MP38 Casing 1 (10F/3M)
			114	▫	020110 - MP38 Casing 1 (10F/3M)
265					
			113	▫	020110 - MP38 Casing 1 (10F/3M)
			112	▫	020110 - MP38 Casing 1 (10F/3M)
			111	▫	020110 - MP38 Casing 1 (10F/3M)
275					
			110	▫	020110 - MP38 Casing 1 (10F/3M)
			109	▫	020110 - MP38 Casing 1 (10F/3M)
			108	▫	020110 - MP38 Casing 1 (10F/3M)
285					
			107	▫	020110 - MP38 Casing 1 (10F/3M)
			106	▫	020110 - MP38 Casing 1 (10F/3M)
			105	▫	020110 - MP38 Casing 1 (10F/3M)
			104	▫	020110 - MP38 Casing 1 (10F/3M)
295					
			103	▫	0238 - MP38 Packer 74mm (5F/1.5M) 0205 - MP38 Measurment Port
			102	▫	020110 - MP38 Casing 1 (10F/3M)

Scale Meters	Ba Casing	Well ng	MP	QA Tes OK	MP Casing Description
300					
		101			020110 - MP38 Casing 1 (10F/3M)
		100			020110 - MP38 Casing 1 (10F/3M)
		99			020110 - MP38 Casing 1 (10F/3M)
310					
		98			020110 - MP38 Casing 1 (10F/3M)
		97			020110 - MP38 Casing 1 (10F/3M)
		96			020110 - MP38 Casing 1 (10F/3M)
320					
		95			020110 - MP38 Casing 1 (10F/3M)
		94			020110 - MP38 Casing 1 (10F/3M)
		93			020110 - MP38 Casing 1 (10F/3M)
330					
		92			020110 - MP38 Casing 1 (10F/3M)
		91			020110 - MP38 Casing 1 (10F/3M)
		90			020110 - MP38 Casing 1 (10F/3M)
		89			020110 - MP38 Casing 1 (10F/3M)
340					
		88			020110 - MP38 Casing 1 (10F/3M)
		87			020110 - MP38 Casing 1 (10F/3M)
		86			020110 - MP38 Casing 1 (10F/3M)
350					
		85			020110 - MP38 Casing 1 (10F/3M)
		84			020110 - MP38 Casing 1 (10F/3M)
		83			020110 - MP38 Casing 1 (10F/3M)
360					
		82			020110 - MP38 Casing 1 (10F/3M)
		81			020110 - MP38 Casing 1 (10F/3M)
		80			020110 - MP38 Casing 1 (10F/3M)
		79			020110 - MP38 Casing 1 (10F/3M)
370					
		78			020110 - MP38 Casing 1 (10F/3M)
		77			020110 - MP38 Casing 1 (10F/3M)
375					
		76			020110 - MP38 Casing 1 (10F/3M)
		75			020110 - MP38 Casing 1 (10F/3M)
		74			020110 - MP38 Casing 1 (10F/3M)
385					
		73			020110 - MP38 Casing 1 (10F/3M)
		72			020110 - MP38 Casing 1 (10F/3M)
		71			020110 - MP38 Casing 1 (10F/3M)
395					
		70			020110 - MP38 Casing 1 (10F/3M)
		69			0238 - MP38 Packer 74mm (5F/1.5M) 0205 - MP38 Measurment Port
		68			020110 - MP38 Casing 1 (10F/3M)
405					
		67			020110 - MP38 Casing 1 (10F/3M)
		66			020110 - MP38 Casing 1 (10F/3M)
		65			020110 - MP38 Casing 1 (10F/3M)
		64			020110 - MP38 Casing 1 (10F/3M)
415					
		63			020110 - MP38 Casing 1 (10F/3M)
		62			020110 - MP38 Casing 1 (10F/3M)
		61			020110 - MP38 Casing 1 (10F/3M)
425					
		60			020110 - MP38 Casing 1 (10F/3M)
		59			020110 - MP38 Casing 1 (10F/3M)
		58			020110 - MP38 Casing 1 (10F/3M)
435					
		57			020110 - MP38 Casing 1 (10F/3M)
		56			020110 - MP38 Casing 1 (10F/3M)
		55			020110 - MP38 Casing 1 (10F/3M)
		54			020110 - MP38 Casing 1 (10F/3M)
445					
		53			020110 - MP38 Casing 1 (10F/3M)
		52			020110 - MP38 Casing 1 (10F/3M)

Scale Meters	Bar Casing	Well Mng	MP OK	QA Test	MP Casing Description
450					
		51	▫		020110 - MP38 Casing 1 (10F/3M)
		50	▫		020110 - MP38 Casing 1 (10F/3M)
		49	▫		020110 - MP38 Casing 1 (10F/3M)
460					
		48	▫		020110 - MP38 Casing 1 (10F/3M)
		47	▫		020110 - MP38 Casing 1 (10F/3M)
		46	▫		020110 - MP38 Casing 1 (10F/3M)
470					
		45	▫		020110 - MP38 Casing 1 (10F/3M)
		44	▫		020110 - MP38 Casing 1 (10F/3M)
		43	▫		020110 - MP38 Casing 1 (10F/3M)
480					
		42	▫		020110 - MP38 Casing 1 (10F/3M)
		41	▫		020110 - MP38 Casing 1 (10F/3M)
		40	▫		020110 - MP38 Casing 1 (10F/3M)
490					
		39	▫		020110 - MP38 Casing 1 (10F/3M)
		38	▫		020110 - MP38 Casing 1 (10F/3M)
		37	▫		020110 - MP38 Casing 1 (10F/3M)
		36	▫		0238 - MP38 Packer 74mm (5F/1.5M)
					0205 - MP38 Measurment Port
500					
		35	▫		020110 - MP38 Casing 1 (10F/3M)
		34	▫		020110 - MP38 Casing 1 (10F/3M)
					0706 - MP38 Hydraulic Pumping Port
		33	▫		0238 - MP38 Packer 74mm (5F/1.5M)
					0205 - MP38 Measurment Port
		32	▫		020110 - MP38 Casing 1 (10F/3M)
510					
		31	▫		020110 - MP38 Casing 1 (10F/3M)
		30	▫		020110 - MP38 Casing 1 (10F/3M)
		29	▫		020110 - MP38 Casing 1 (10F/3M)
520					
		28	▫		020110 - MP38 Casing 1 (10F/3M)
		27	▫		020110 - MP38 Casing 1 (10F/3M)
525					
		26	▫		020110 - MP38 Casing 1 (10F/3M)
		25	▫		020110 - MP38 Casing 1 (10F/3M)
		24	▫		020110 - MP38 Casing 1 (10F/3M)
535					
		23	▫		020110 - MP38 Casing 1 (10F/3M)
		22	▫		020110 - MP38 Casing 1 (10F/3M)
		21	▫		020110 - MP38 Casing 1 (10F/3M)
545					
		20	▫		020110 - MP38 Casing 1 (10F/3M)
		19	▫		020110 - MP38 Casing 1 (10F/3M)
		18	▫		020110 - MP38 Casing 1 (10F/3M)
555					
		17	▫		020110 - MP38 Casing 1 (10F/3M)
		16	▫		020110 - MP38 Casing 1 (10F/3M)
		15	▫		020110 - MP38 Casing 1 (10F/3M)
565					
		14	▫		020110 - MP38 Casing 1 (10F/3M)
		13	▫		020110 - MP38 Casing 1 (10F/3M)
		12	▫		020110 - MP38 Casing 1 (10F/3M)
575					
		11	▫		020110 - MP38 Casing 1 (10F/3M)
		10	▫		020110 - MP38 Casing 1 (10F/3M)
		9	▫		020110 - MP38 Casing 1 (10F/3M)
585					
		8	▫		020110 - MP38 Casing 1 (10F/3M)
		7	▫		020110 - MP38 Casing 1 (10F/3M)
		6	▫		020110 - MP38 Casing 1 (10F/3M)
595					
		5	▫		020110 - MP38 Casing 1 (10F/3M)
		4	▫		020105 - MP38 Casing 2 (5F/1.5M)
		3	▫		0238 - MP38 Packer 74mm (5F/1.5M)
					0205 - MP38 Measurment Port
		2	▫		020110 - MP38 Casing 1 (10F/3M)
					0706 - MP38 Hydraulic Pumping Port
		1	▫		020110 - MP38 Casing 1 (10F/3M)

Well Designer Report

SRK



0202 - MP38 Regular Coupling
020105 - MP38 Casing 2 (5F/1.
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3
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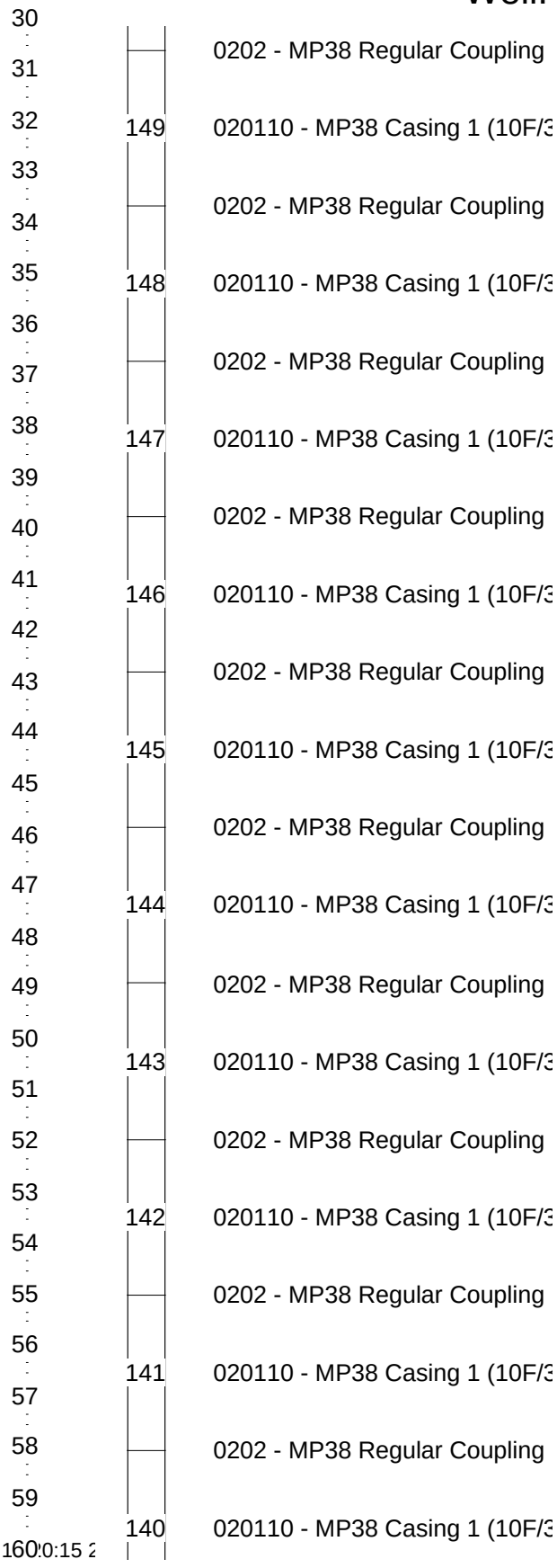
020110 - MP38 Casing 1 (10F/3
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3
0202 - MP38 Regular Coupling
0238 - MP38 Packer 74mm (5F/
0205 - MP38 Measurment Port
020110 - MP38 Casing 1 (10F/3
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3



0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3
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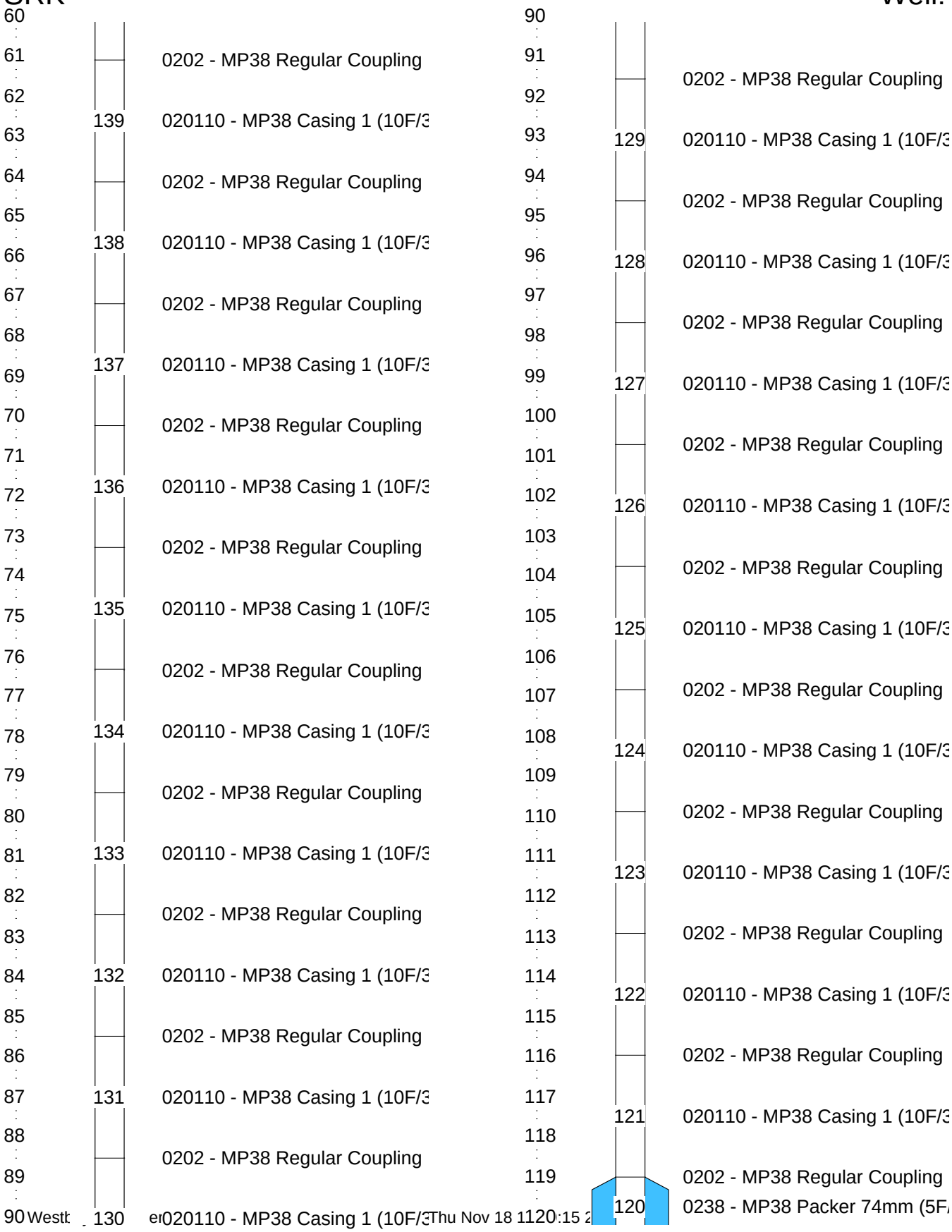
0202 - MP38 Regular Coupling
020110 - MP38 Casing 1 (10F/3

Well Designer Report

SRK

Job No: 1CH008.013

Well: Boston



Well Designer Report

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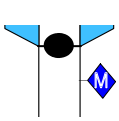
Job No: 1CH008.013

Well: Boston



Scale Meters	MP Casing	MP Casing Description
120		
		0205 - MP38 Measurment Port
121		
122	119	020110 - MP38 Casing 1 (10F/3
123		
		0202 - MP38 Regular Coupling
124		
125	118	020110 - MP38 Casing 1 (10F/3
126		
		0202 - MP38 Regular Coupling
127		
128	117	020110 - MP38 Casing 1 (10F/3
129		
		0202 - MP38 Regular Coupling
130		
131	116	020110 - MP38 Casing 1 (10F/3
132		
		0202 - MP38 Regular Coupling
133		
134	115	020110 - MP38 Casing 1 (10F/3
135		
		0202 - MP38 Regular Coupling
136		
137	114	020110 - MP38 Casing 1 (10F/3
138		
		0202 - MP38 Regular Coupling
139		
140	113	020110 - MP38 Casing 1 (10F/3
141		
		0202 - MP38 Regular Coupling
142		
143	112	020110 - MP38 Casing 1 (10F/3
144		
		0202 - MP38 Regular Coupling
145		
146	111	020110 - MP38 Casing 1 (10F/3
147		
		0202 - MP38 Regular Coupling
148		
149	110	020110 - MP38 Casing 1 (10F/3
150		
		0202 - MP38 Regular Coupling
151		
152	109	020110 - MP38 Casing 1 (10F/3
153		
		0202 - MP38 Regular Coupling
154		
155	108	020110 - MP38 Casing 1 (10F/3
156		
		0202 - MP38 Regular Coupling
157		
158	107	020110 - MP38 Casing 1 (10F/3
159		
		0202 - MP38 Regular Coupling
160		
161	106	020110 - MP38 Casing 1 (10F/3
162		
		0202 - MP38 Regular Coupling
163		
164	105	020110 - MP38 Casing 1 (10F/3
165		
		0202 - MP38 Regular Coupling
166		
167	104	020110 - MP38 Casing 1 (10F/3
168		
		0202 - MP38 Regular Coupling
169		
170	103	020110 - MP38 Casing 1 (10F/3
171		
		0202 - MP38 Regular Coupling
172		
173	102	020110 - MP38 Casing 1 (10F/3
174		
		0202 - MP38 Regular Coupling
175		
176	101	020110 - MP38 Casing 1 (10F/3
177		
		0202 - MP38 Regular Coupling
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179	100	020110 - MP38 Casing 1 (10F/3
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Well Designer Report

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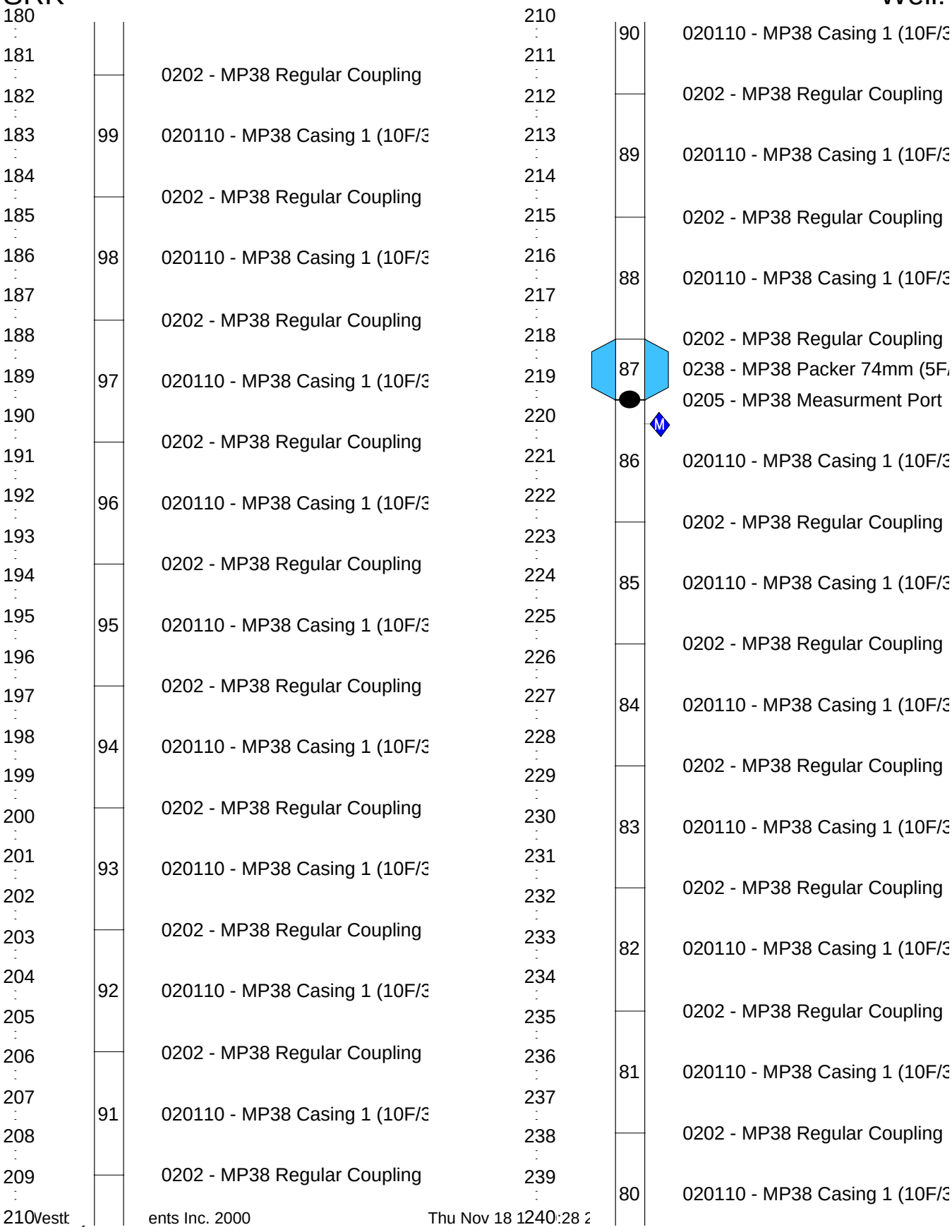
Job No: 1CH008.013

Well: Boston



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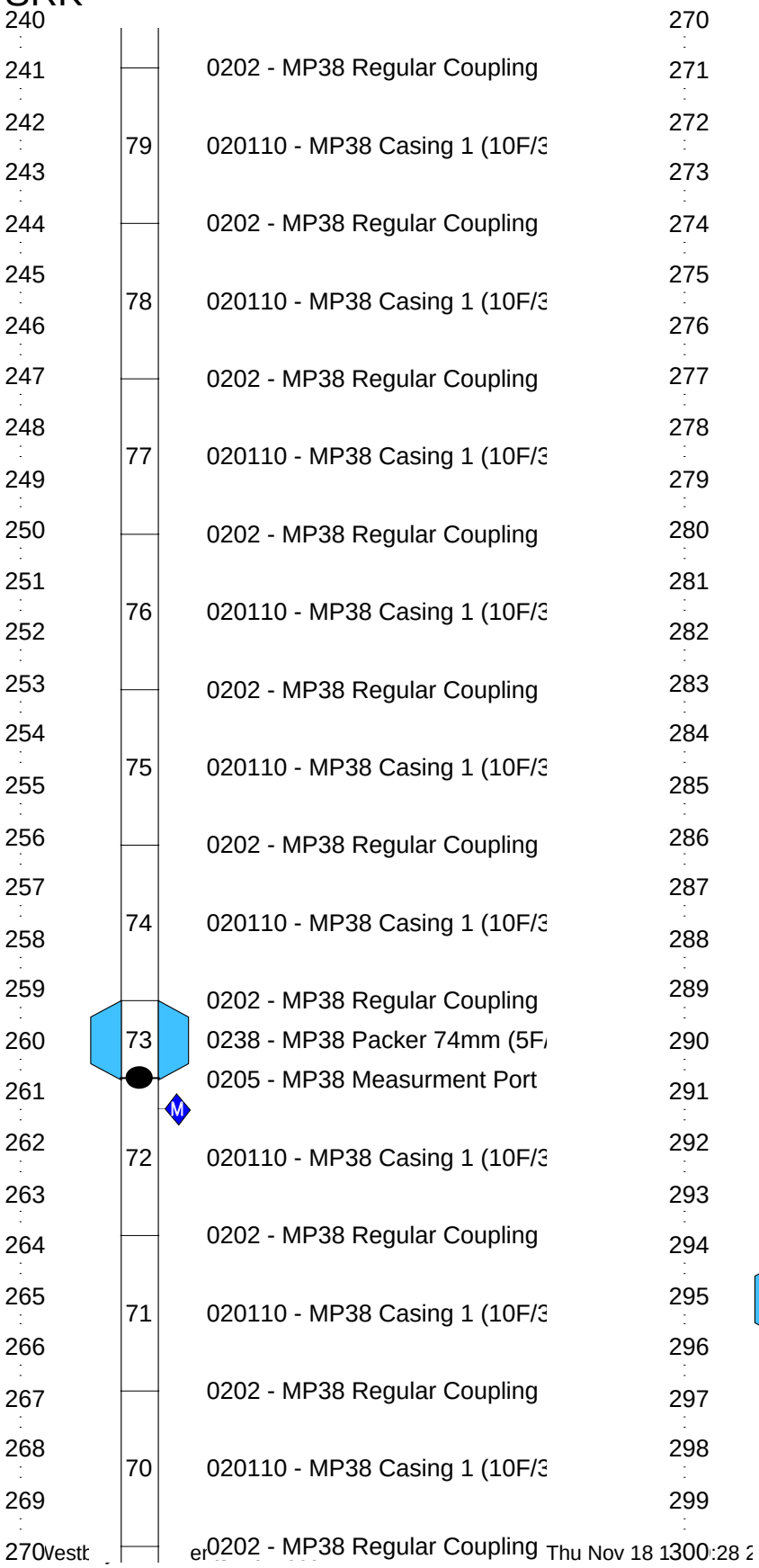
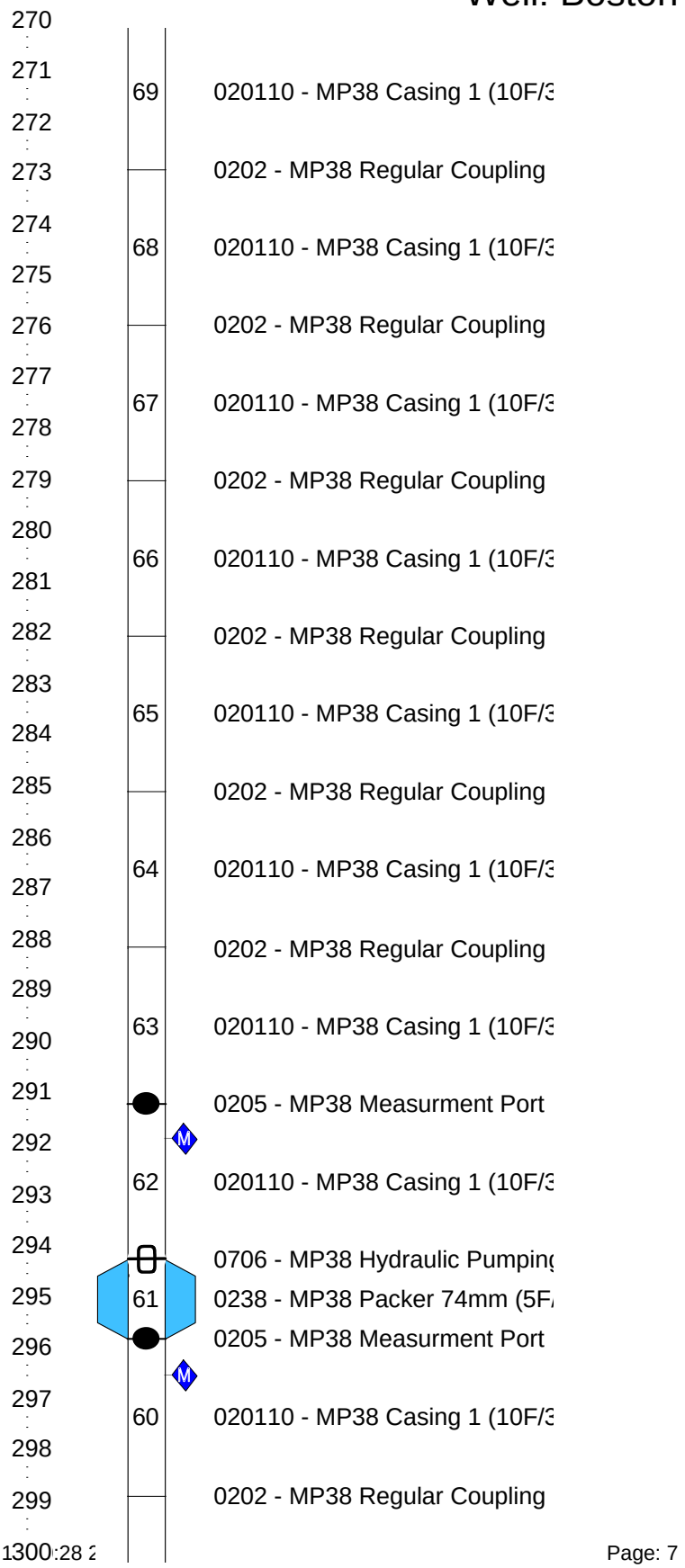
Job No: 1CH008.013

Well: Boston





Well Designer Report

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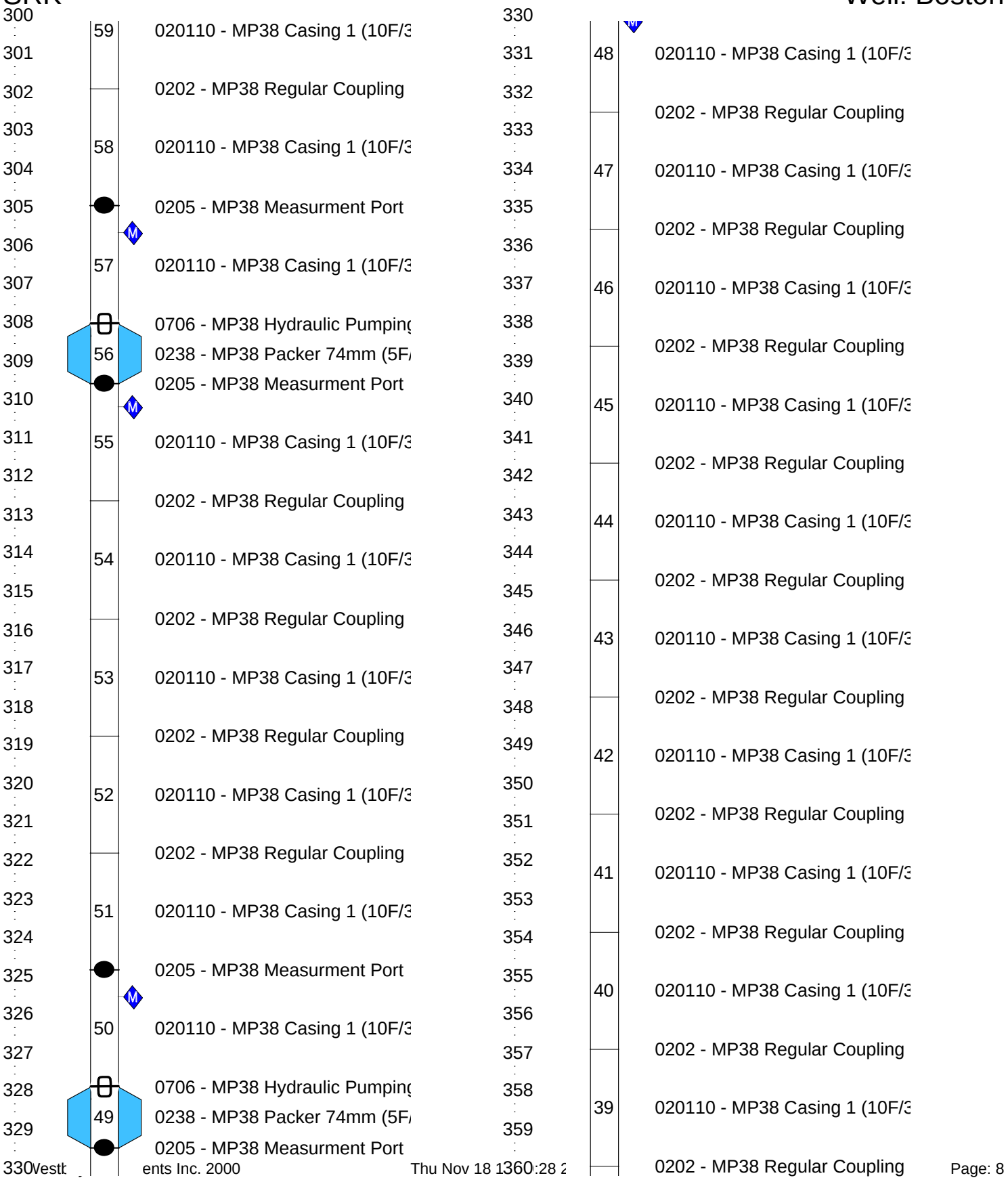
Job No: 1CH008.013

Well: Boston



Well Designer Report

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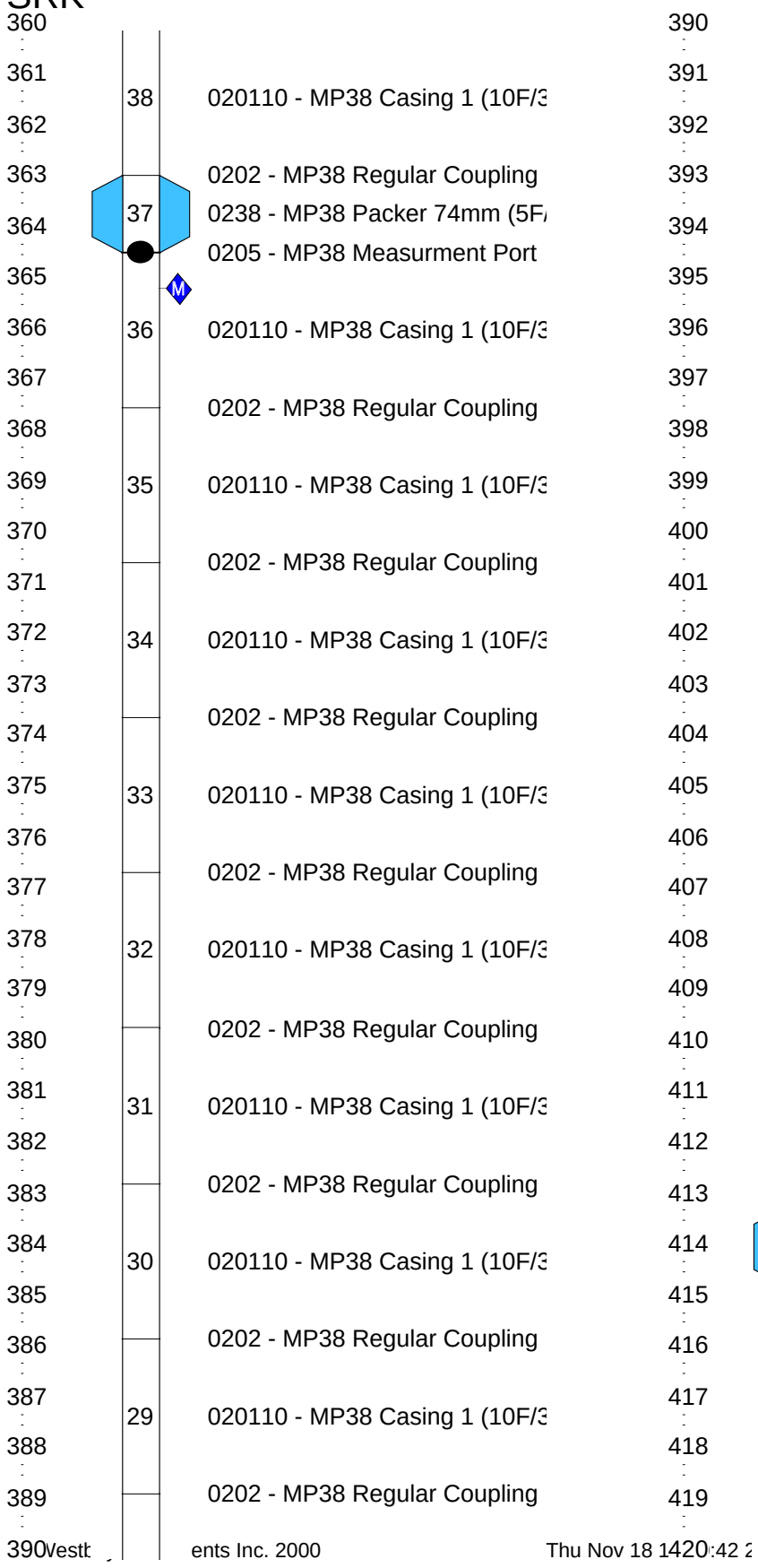
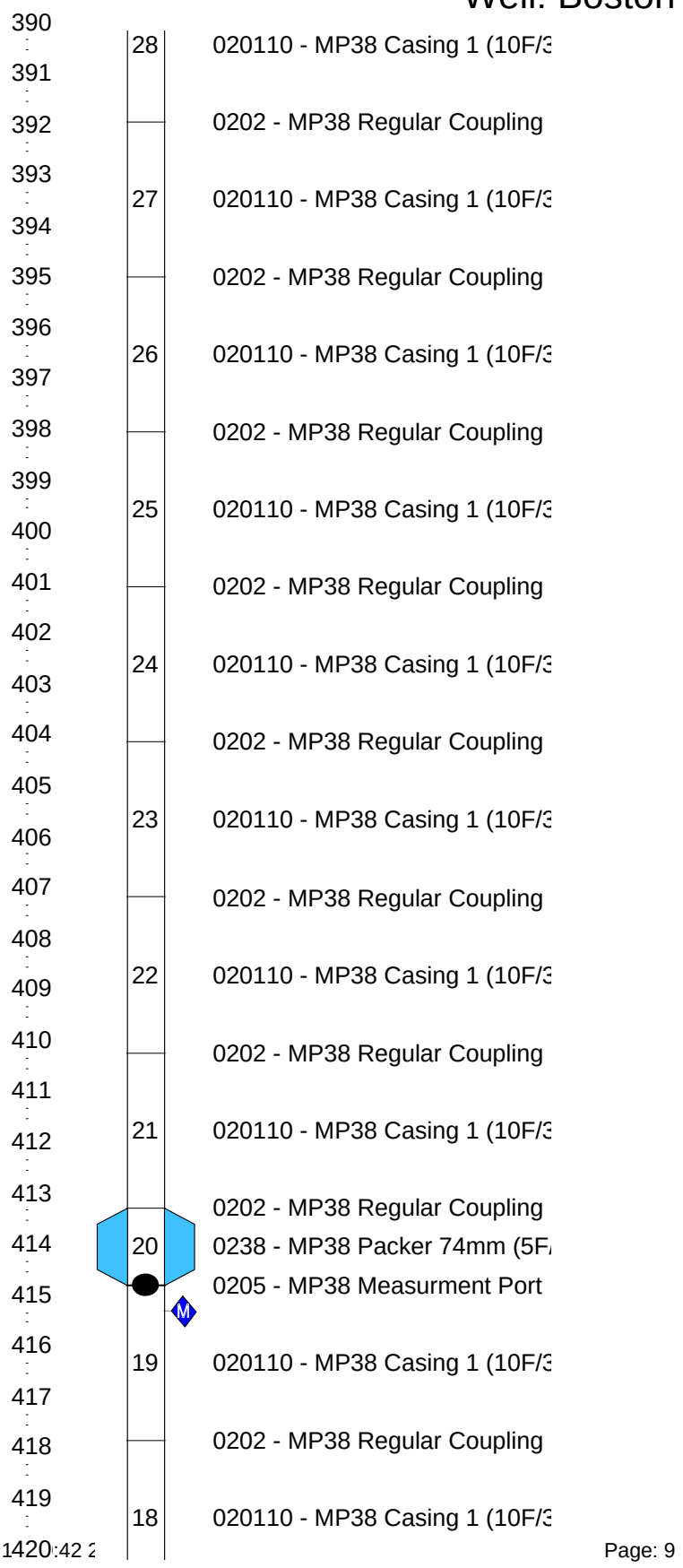
Job No: 1CH008.013

Well: Boston





Well Designer Report

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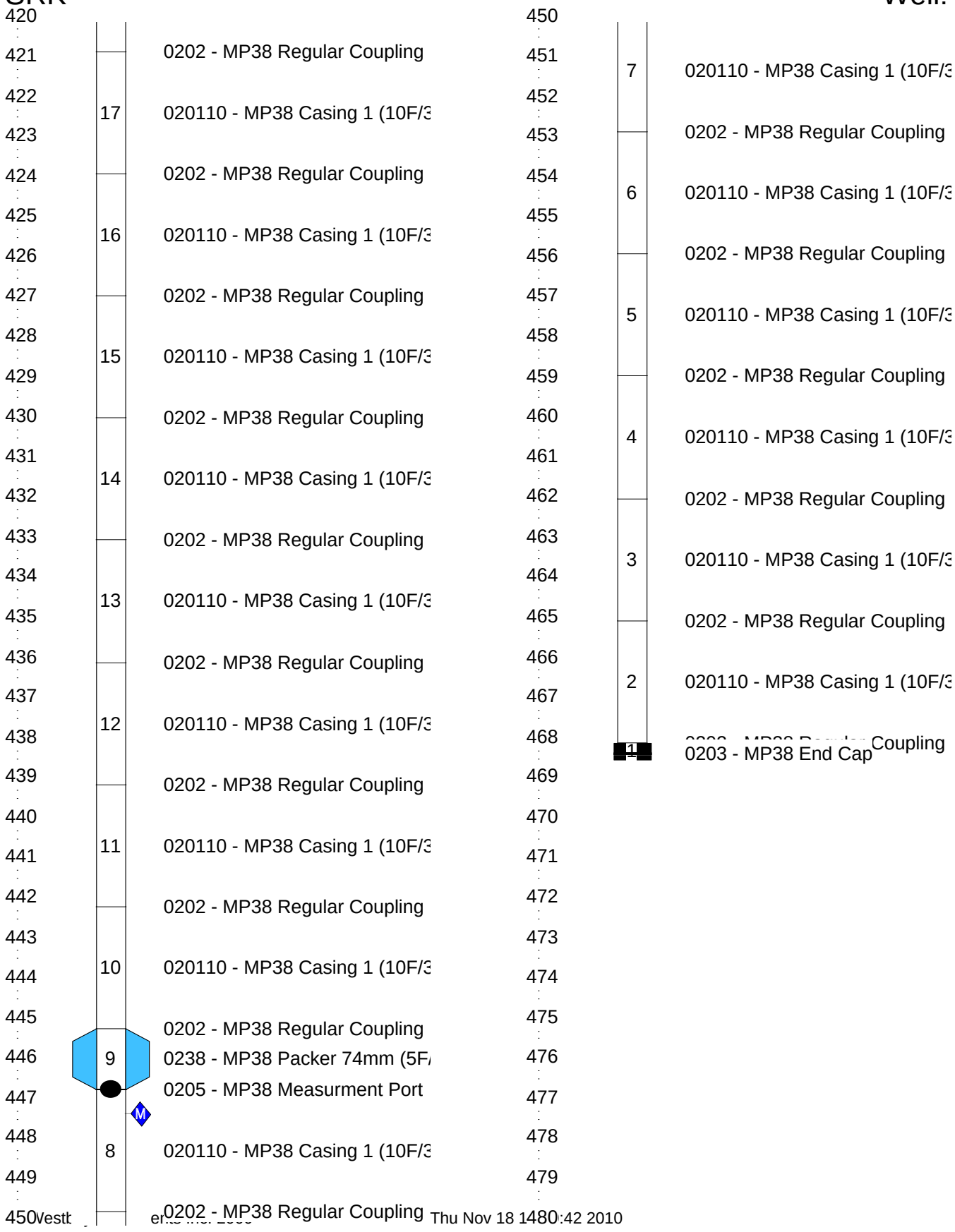
Job No: 1CH008.013

Well: Boston



Well Designer Report

Job No: 1CH008.013

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Well: Boston

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Appendix I
Data Sheets from Pressure and Temperature Profiles

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Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW001
Date: 30 April 10 Pre Inflation

Datum: UTM
Elev. G.S.: -
Height of MP above G.S.: 0.27m
Elev. top of MP Casing: -
Reference Elevation: Top of joint at end of install
Drillhole angle: 62.3

Probe Type: Mosdax
Serial No.:
Probe Range:
MP Casing Type:
Depth to water in MP: (at start)
Depth to water in MP: (at finish)

Client: Newmont
Job No.: 1CH008.013
Location: Doris Central
Weather: 15 degrees
Operator(s): DM

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: 14.5PSi, 15C, 20.47pm Finish: 14.6
P_{atm} 14.55 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth From GEMS (m)	Fluid Pressure Readings			Probe Temp (°C)	Density Outside Casing "ρ" (kg/m³)	Time H.M.S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)				H = [(P2-Patm)*σ]/(ρg)	Dz = Dp - H	
1	548	547.76	484.82	539.40	720.70	539.45	3.00	1020.00	21:48:00	485.52	-1.70	
2	543.5	542.10	480.91	533.40	714.80	533.40	3.10	1020.00	21:53:00	482.45	-1.54	
2	461	460.00	409.15	426.80	610.30	426.80	3.20	1020.00	22:01:00	410.46	-1.30	
3	456.5	456.30	405.24	420.80	604.40	420.80	3.20	1020.00	22:05:00	406.39	-1.16	
3	389.5	388.70	346.84	333.70	519.10	333.70	2.98	1020.00	22:11:00	347.62	-0.79	
4	385	384.70	342.91	327.70	513.20	327.70	2.85	1020.00	22:14:00	343.56	-0.64	
4	345	345.20	308.03	276.20	462.80	276.20	2.70	1020.00	22:19:00	308.83	-0.81	
5	340.5	340.00	304.10	270.20	456.90	270.20	2.60	1020.00	22:27:00	304.77	-0.67	
5	280	279.30	251.08	190.40	378.90	190.40	2.40	1020.00	22:33:00	251.03	0.05	
na	275.5	274.80	247.11	184.40	373.00	184.40	2.20	1020.00	22:41:00	246.96	0.15	
6	271	270.10	243.15	178.30	367.00	178.30	2.20	1020.00	22:44:00	242.83	0.32	
6	246	245.70	221.06	146.10	335.60	146.10	2.40	1020.00	22:49:00	221.19	-0.13	
na	241.5	241.10	217.08	140.00	329.60	140.00	2.50	1020.00	22:56:00	217.06	0.02	
7	237	236.70	213.09	133.90	323.60	133.90	2.50	1020.00	22:58:00	212.93	0.16	
7	200.5	200.00	180.64	85.20	276.20	85.30	2.40	1020.00	23:03:00	180.27	0.37	
8	196	195.50	176.63	79.10	270.20	79.10	2.40	1020.00	23:06:00	176.14	0.49	
8	159.5	159.00	143.92	30.20	222.60	30.20	2.40	1020.00	23:13:00	143.34	0.58	
9	155	154.30	139.88	24.00	216.50	24.00	2.40	1020.00	23:17:00	139.14	0.74	
9	109	108.90	98.45	94.20	157.20	94.20	2.25	1020.00	23:39:00	98.28	0.17	Glycol added
10	105	104.30	94.84	87.50	151.10	87.40	2.23	1020.00	23:47:00	94.08	0.76	
10	63.5	63.40	57.43	32.00	97.60	32.00	2.25	1020.00	23:50:00	57.22	0.21	
na	59	58.80	53.37	25.80	91.70	25.80	2.27	1020.00	23:59:00	53.15	0.22	
11	54.5	54.10	49.32	19.50	85.70	19.40	2.30	1020.00	23:55:00	49.02	0.30	
11	33	33.00	29.92	14.60	58.00	14.60	2.40	1020.00	23:58:00	29.94	-0.02	
12	27	26.80	24.49	14.60	50.00	14.60	2.45	1020.00	0:00:00	24.42	0.06	

Notes: g = gravity (9.81 m/s²)
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure
ρ = density outside casing
σ = psi to Pa Conversion (1 psi = 6.984 x 10³ Pa)

SRK Consulting
Engineers and Scientists

Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW001
Date: 3 May 10 Post Inflation

Datum: UTM
Elev. G.S.: -
Height of MP above G.S.: 0.27m
Elev. top of MP Casing: -
Reference Elevation: Top of joint at end of install
Drillhole angle: 62.3

Probe Type: Mosdax
Serial No.: 2652
Probe Range:
MP Casing Type: MP38
Depth to water in MP: (at start)
Depth to water in MP: (at finish)

Client: Newmont
Job No.: 1CH008.013
Location: Doris Central
Weather: 13.7 deg, cloudy, cool.
Operator(s): DM

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: 14.5PSI, 13.2C, 1136ar Finish: ?
P_{atm} 14.50 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Density Outside Casing "ρ" (kg/m^3)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)				H = [(P2-Patm)*σ]/(ρg)	Dz = Dp - H	
1	548	547.00	484.82	731.44	721.39	731.90	2.80	1020.00	14:00:00	487.03	-2.21	
2	543.5	543.00	480.91	725.90	734.90	725.90	2.80	1020.00	14:10:00	496.34	-15.43	
3	456.5	456.00	405.24	613.20	606.40	613.20	2.70	1020.00	14:17:00	407.80	-2.57	
4	385	385.00	342.91	520.20	515.50	520.20	2.40	1020.00	14:23:00	345.18	-2.26	
5	340.5	340.70	304.10	462.60	458.20	462.60	2.10	1020.00	14:31:00	305.70	-1.60	
6	271	271.10	243.15	370.80	367.70	370.80	1.90	1020.00	14:39:00	243.35	-0.20	
7	237	237.50	213.09	326.40	324.10	326.40	1.90	1020.00	14:45:00	213.31	-0.22	
8	196	196.70	176.63	271.70	270.40	271.70	1.90	1020.00	14:50:00	176.31	0.32	
9	155	155.40	139.88	216.60	216.00	26.60	1.90	1020.00	15:01:00	138.83	1.05	
10	105	105.40	94.84	149.00	149.60	149.00	2.00	1020.00	15:02:00	93.08	1.76	
11	54.5	54.70	49.32	81.40	83.50	81.40	2.30	1020.00	15:13:00	47.54	1.78	
12	27	28.00	24.49	44.60	47.70	44.60	2.30	1020.00	15:17:00	22.87	1.61	

Notes:
g = gravity (9.81 m/s^2)
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure
ρ = density outside casing
σ = psi to Pa Conversion (1psi = 6.984 x 10^3 Pa)

SRK Consulting
Engineers and Scientists

Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW001
Date: 7-Jul-10

Datum: UTM
Elev. G.S.: -
Height of MP above G.S.: 0.27
Elev. top of MP Casing: -
Reference Elevation: Top of Casing
Drillhole angle: 62.3

Probe Type: Mosdax
Serial No.: 4344
Probe Range: 2000m
MP Casing Type: MP38
Depth to water in MP: - (at start, m)
Depth to water in MP: - (at finish, m)

Client: Newmont
Job No.: 1CH008.013
Location: Hopebay
Weather: Sunny
Operator(s): MP, JA

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: Finish:
P_{atm} 14.33 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Density Outside Casing "ρ" (kg/m³)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)				H = [(P2-Patm)*σ]/(ρg)	Dz = Dp - H	
1	548.0	545.2	484.82	730.86	721.39	730.82	2.63	1020.00	11:17	487.15	-2.33	All temperatures read after stabalizing (8 to 10 mins on average)
2	461.0	459.6	409.15	618.12	613.53	618.15	1.94	1020.00	11:49	412.83	-3.68	
3	389.5	388.0	346.84	525.08	523.38	525.01	1.49	1020.00	12:07	350.72	-3.89	
4	345.0	344.2	308.03	467.48	464.92	467.50	1.28	1020.00	12:27	310.44	-2.42	
5	280.0	278.6	251.08	381.56	380.04	381.59	1.07	1020.00	12:42	251.96	-0.89	
6	271.0	269.4	243.15	369.57	368.10	369.51	1.04	1020.00	12:55	243.74	-0.59	
6	246.0	244.5	221.06	337.31	336.52	337.30	1.13	1020.00	13:06	221.98	-0.92	
7	237.0	235.4	213.09	325.14	324.29	325.21	1.06	1020.00	13:15	213.55	-0.46	
7	200.5	199.1	180.64	276.54	277.14	276.49	1.00	1020.00	13:22	181.07	-0.43	
8	159.5	158.1	143.92	221.48	223.20	221.54	0.98	1020.00	13:36	143.91	0.01	
9	109.0	108.1	98.45	153.91	156.49	153.96	1.11	1020.00	13:44	97.94	0.50	
10	63.5	63.2	57.43	92.42	96.05	92.41	1.30	1020.00	14:02	56.30	1.13	
11	54.5	53.3	49.32	80.04	83.76	80.04	1.42	1020.00	14:15	47.84	1.48	
11	33.0	32.2	29.92	51.48	55.86	51.43	1.04	1020.00	14:28	28.61	1.30	
12	27.0	26.0	24.49	43.24	47.86	43.25	0.74	1020.00	14:36	23.10	1.38	

Notes: g = gravity (9.81 m/s²)
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure
ρ = density outside casing
σ = psi to Pa Conversion (1psi = 6.984 x 10³ Pa)

SRK Consulting
Engineers and Scientists

Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW001
Date: 5-6 Aug 10

Datum: UTM
Elev. G.S.: -
Height of MP above G.S.: 0.27m
Elev. top of MP Casing: -
Reference Elevation: Top of casing
Drillhole angle: 62.3

Probe Type: Mosdax
Serial No.: 4344
Probe Range: 2km
MP Casing Type: MP38
Depth to water in MP: n/a (at start)
Depth to water in MP: n/a (at finish)

Client: Newmont
Job No.: 10CH008.013
Location: Hope Bay - Doris Central
Weather: Windy, Partial Clouds
Operator(s): JM

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: _____ Finish: _____
P_{atm} 14.35 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Density Outside Casing "ρ" (kg/m³)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)				H = [(P2-Patm)*σ]/(ρg)	Dz = Dp - H	
1	548.0	544.70	484.82	667.81	721.21	667.79	2.57	1020.00		487.01	-2.19	
2	461.0	458.70	409.15	556.89	612.49	556.88	1.87	1020.00		412.10	-2.95	
3	389.5	387.50	346.84	465.01	521.64	465.02	1.40	1020.00		349.51	-2.67	
4	345.0	343.70	308.03	408.32	464.73	408.32	1.21	1020.00		310.30	-2.27	Probe was left for over an hour but temperature was still not perfectly stable
5	280.0	278.60	251.08	323.64	380.00	323.64	1.04	1020.00		251.92	-0.85	
6	246.0	245.40	221.06	280.07	336.33	280.07	1.10	1020.00		221.84	-0.77	
7	200.5	199.80	180.64	220.26	276.85	220.26	0.95	1020.00		180.86	-0.21	
8	159.5	158.90	143.92	166.02	223.89	166.08	0.96	1020.00		144.37	-0.45	
9	109.0	108.90	98.45	99.49	156.16	99.55	1.23	1020.00		97.70	0.75	
10	105.0	103.50	94.84	93.41	149.97	93.41	1.12	1020.00		93.44	1.40	
10	63.5	63.50	57.43	39.16	95.74	39.10	1.25	1020.00		56.08	1.35	
11	54.5	54.30	49.32	26.72	83.55	26.71	1.32	1020.00		47.68	1.64	
11	33.0	33.00	29.92	14.50	55.68	14.58	1.06	1020.00		28.48	1.44	
12	27.0	27.00	24.49	14.58	47.75	14.46	0.77	1020.00		23.01	1.47	

Notes:
g = gravity (9.81 m/s²)
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure
ρ = density outside casing
σ = psi to Pa Conversion (1psi = 6.984 x 10³ Pa)

SRK Consulting
Engineers and Scientists

Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW001
Date: 18-Oct-10

Datum: UTM
Elev. G.S.:
Height of MP above G.S.:
Elev. top of MP Casing:
Reference Elevation: Top of casing
Drillhole angle: 62.3

Probe Type: EMS
Serial No.: 4344
Probe Range: 2000PSI
MP Casing Type: MP38
Depth to water in MP: 41.220 (at start)
Depth to water in MP: (at finish)

Client: Newmont
Job No.: 1CH008.013
Location: Doris Central
Weather: -5Deg Overcast
Operator(s): JH and JJ

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: .57PSI, 17.36C, 11.20 Finish:
P_{atm} 14.57 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Density Outside Casing "ρ" (kg/m³)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)				H = [(P2-Patm)*σ]/(ρg)	Dz = Dp - H	
1	548.0	544.50	484.82	682.04	721.17	682.09	2.63	1020.00	11:52:00	486.83	-2.01	
2	461.0	458.20	409.15	569.57	612.72	569.61	1.90	1020.00	12:26:00	412.11	-2.96	
3	389.0	387.20	346.84	476.77	522.91	476.76	1.44	1020.00	12:49:00	350.23	-3.40	
4	345.0	343.3	308.03	419.25	464.77	419.28	1.26	1020.00	1:10:00	310.18	-2.15	
5	280.0	278.26	251.08	333.72	379.83	333.66	1.02	1020.00	1:47:00	251.65	-0.58	
6	271.0	269.12	243.15	321.56	367.93	321.51	1.01	1020.00	1:54:00	243.46	-0.31	
6	246.0	244.96	221.06	-	336.23	289.45	1.07	1020.00	2:19:00	221.62	-0.55	
7	237.0	235.82	213.09	277.34	324.08	277.28	0.98	1020.00	-	213.24	-0.15	
7	200.0	199.56	180.64	228.85	276.81	228.85	0.93	1020.00	3:01:00	180.68	-0.03	
8	159.0	158.60	143.92	173.94	222.96	173.94	0.96	1020.00	-	143.58	0.35	
9	109.0	108.70	98.45	106.51	156.17	106.51	1.03	1020.00	-	97.56	0.89	re-read, first reading was weird.
10	63.0	63.36	57.43	45.92	95.37	46.09	1.22	1020.00	-	55.67	1.76	re-read on Oct 19 during sampling, first reading was weird.
11	54.0	54.20	49.32	32.70	83.50	32.70	1.26	1020.00	3:48:00	47.49	1.83	
11	33.0	33.65	29.92	14.57	55.79	14.57		1020.00	-	28.40	1.52	
12	27.0	27.00	24.49	14.58	47.61	14.58	1.04	1020.00	-	22.76	1.72	

Notes:
g = gravity (9.81 m/s²)
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure
ρ = density outside casing
σ = psi to Pa Conversion (1psi = 6.984 x 10³ Pa)

279.6
6.1
273.7

PRE-INFLATION PROFILE

Westbay Instruments Inc.
A Schlumberger Company

Piezometric Pressures/Levels
Field Data and Calculation Sheet

PAGE 1/2

Datum: Top of JT — Ø - AT END OF INSTALL Probe Type: _____ Client: _____ Date: 4/30/00

Elev. G.S.: _____ Serial No.: _____ Job No.: _____ Well No.: 10-WBN-001

Height of MP above G.S.: _____ Probe Range: 0 to _____ Location: HOPE BAY DOR 15 C

Elev. top of MP Casing: _____ Weather: CLOUDY MP Casing Type: _____

Reference Elevation: _____ Atm. Pressure: _____ Operator: DM

Ambient Reading (Patm) (Pressure, Temperature, time) Start: 14.5 15C 2047 Finish: _____

Port No.	Port Depth From Log (m)	Port Depth From Cable (m)	Port Elev. ( )	Fluid Pressure Readings			Temp. (C)	Time H:M:S	Pressure Head Outside Port ( ) H = (P2-Patm)/w	Piez. Level Outside Port ( ) Dz = Dp - H	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)					
1	548.6	547.76		539.4	720.7	539.45	3.0	21:48			MAG 0.6 BELOW
2	544.0	542.1		533.4	714.8	533.4	3.1	21:53			MAG 5.1 BELOW
3	461.8	460		426.8	610.3	426.8	3.2	22:01			MAG 0.6 BELOW 3.2°C OUT
4	457.2	456 3		420.8	604.4	420.8	3.2	22:05			MAG 5.1 BELOW
5	390.1	388.7		333.7	519.1	333.7	2.98	22:11			MAG 0.6 BELOW 2.99°C OUT
6	385.6	384.7		327.7	513.2	327.7	2.85	22:14			MAG 5.1 BELOW
7	345.9	345.2		276.2	462.8	276.2	2.7	22:19			MAG 0.6 BELOW
8	341.4	340.0		270.2	456.9	270.2	2.6	22:27			MAG 5.1 BELOW
9	280.4	279.3		190.4	378.9	190.4	2.4	22:33			MAG 0.6 BELOW
10	275.8	274.8		184.4	373.0	184.4	2.2	22:41			MAG 5.1 BELOW
11	271.3	270.1		178.3	367.0	178.3	2.2	22:44			MAG 0.6 BELOW
12	246.9	245 7		146.1	335.6	146.1	2.4	22:49			MAG 0.6 BELOW
13	242 3	241.1		140.0	329.6	140.10	2.5	22:56			MAG 5.1 BELOW 2.5 OUT
14	237.7	236.7		133.9	323.6	133.9	2.5	22:58			MAG 0.6 BELOW
15	201.2	200.0		85.2	276.2	85.3	2.4	23:03			MAG 0.6 BELOW
16	196.6	195.5		79.1	270.2	79.1	2.4	23:06			MAG 5.1 BELOW
17	160.0	159.0		30.2	222.6	30.2	2.4	23:13			MAG 0.6 BELOW
18	155.4	154.3		24 0	216.5	24.0	2.4	23:17			MAG 5.1 BELOW
19	109.7	108.9		94.2	159.2	94.2	2.25	23:39			MAG 0.6 BELOW
20	105.2	104.3		87.5	151.1	87.4	2.23	23:47			MAG 5.1 BELOW

25/05/00 WHB

★ ADDED PG TO INSIDE OF PIPE

PRE-INFLATION PROFILE

Westbay Instruments Inc.
A Schlumberger Company

Piezometric Pressures/Levels
Field Data and Calculation Sheet

Datum: _____ Probe Type: _____ Client: _____ Date: APR 20/10

Elev. G.S.: _____ Serial No.: _____ Job No.: _____ Well No.: 10-08BG004

Height of MP above G.S.: _____ Probe Range: 0 to _____ Location: D. CEMENT

Elev. top of MP Casing: _____ Weather: _____ MP Casing Type: _____

Reference Elevation: _____ Atm. Pressure: _____ Operator: _____

Ambient Reading (Patm) (Pressure, Temperature, time) Start: _____ Finish: _____

Port No.	Port Depth From Log ( )	Port Depth From Cable ( )	Port Elev. ( )	Fluid Pressure Readings			Temp. ( )	Time H:M:S	Pressure Head Outside Port ( ) H = (P2-Patm)/w	Piez. Level Outside Port ( ) Dz = Dp - H	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)					
21	69.0	63.4		32.0	97.6	32.0	2.25	23:50			MG 0.6 BE
22	59.4	58.8		25.8	91.7	25.8	2.24	23:53			MG 5.1 BE
23	54.9	54.1		19.5	85.7	19.4	2.3	23:55			MG 0.6 BE
24	33.5	33.0		14.6	58.0	14.6	2.4	23:58			MG 0.6 BE
25	27.4	26.8		14.6	50.0	14.6	2.45	00:00			MG 0.6 BE
	TOUCHED BOTTOM @ ~ 565.5m ±					P= 558.7 ±	0.05				

25/05/00 WHB

Westbay Instruments Inc.
A Schlumberger Company

Piezometric Pressures/Levels
Field Data and Calculation Sheet

POST - INSTALLATION PROFILE

Datum: TOP OF JOINT / AT END OF INSTALL Probe Type: _____ Client: NEWMONT Date: MAY 3, 2010

Elev. G.S.: _____ Serial No.: 2652 Job No.: 10H008.013 Well No.: 10-WBW-001

Height of MP above G.S.: _____ Probe Range: 0 to _____ Location: DAMS CENTRAL

Elev. top of MP Casing: _____ Weather: CLOUDY + COOL MP Casing Type: MP38

Reference Elevation: _____ Atm. Pressure: 14.5 13.7°C Operator: DM

Ambient Reading (Patm) (Pressure, Temperature, time) Start: 14.5/13.2 1136 Finish: _____

Port No.	Port Depth From Log ( )	Port Depth From Cable (m)	Port Elev. ( )	Fluid Pressure Readings			Temp. ( )	Time H:M:S	Pressure Head Outside Port ( ) H = (P2-Patm)/w	Piez. Level Outside Port ( ) Dz = Dp - H	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)					
1	548	547		731.44	721.39	731.9	2.8	14:00			
2	544	543		725.9	734.9	725.9	2.8	14:10			
3	461.8	/							REDUNDANT		
4	457.2	456		613.2	606.4	613.2	2.7	14:17			
5	390.1	/							REDUNDANT		
6	385.6	385		520.2	515.5	520.2	2.4	14:23			
7	345.9	/							REDUNDANT		
8	341.4	340.8		462.6	458.2	462.6	2.1	14:31			
9	280.4	/							REDUNDANT		
10	275.8	/		QC / PRESSURE RELIEF							
11	271.3	271.8		370.8	367.7	370.8	1.9	14:39			
12	246.9	/							REDUNDANT		
13	242.3	/		QC / PRESSURE RELIEF							
14	237.7	237.5		326.4	324.1	326.4	1.9	14:45			
15	201.2	/							REDUNDANT		
16	196.6	196.7		271.7	270.4	271.7	1.9	14:50			
17	160.0	/							REDUNDANT		
18	155.4	155.9		216.6	216.0	216.6	1.9	15:01			
19	109.7	/							REDUNDANT		
20	105.2	105.4		149.0	149.6	149.0	2.0	15:07			

25/05/00 WHB

SURFACE TBS (6000) FOR REAM + SLOPE

Westbay Instruments Inc.
A Schlumberger Company

Piezometric Pressures/Levels
Field Data and Calculation Sheet

Post 2/2

Datum: _____ Probe Type: _____ Client: _____ Date: _____

Elev. G.S.: _____ Serial No.: _____ Job No.: _____ Well No.: _____

Height of MP above G.S.: _____ Probe Range: 0 to _____ Location: _____

Elev. top of MP Casing: _____ Weather: _____ MP Casing Type: _____

Reference Elevation: _____ Atm. Pressure: _____ Operator: _____

Ambient Reading (Patm) (Pressure, Temperature, time) Start: _____ Finish: 15:20

Port No.	Port Depth From Log ( )	Port Depth From Cable ( )	Port Elev. ( )	Fluid Pressure Readings			Temp. ( )	Time H:M:S	Pressure Head Outside Port ( ) H = (P2-Patm)/w	Piez. Level Outside Port ( ) Dz = Dp - H	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)					
21	64.0	/							Redundant		
22	59.4	/		Qc /	pressure	reset					
23	54.9	54.7		91.4	83.5	91.4	2.3	15:13			
24	33.5	/							Redundant		
25	27.4	28.0		44.6	47.7	44.6	2.3	15:17			

25/05/00 WHB

SRK Consulting
Engineers and Scientists

Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW001
Date: 7 July 2010

Datum: UTM
Elev. G.S.:
Height of MP above G.S.: 27cm
Elev. top of MP Casing:
Reference Elevation:
Drillhole angle: 70 (-)

Probe Type: MP Mini Explorer
Serial No.: 42444
Probe Range:
MP Casing Type: MP 38
Depth to water in MP: (at start)
Depth to water in MP: (at finish)

Client: Newmont
Job No.: 1CA008.013
Location: Hope Bay
Weather: Sunny
Operator(s): MP, JA

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: 10:45 Finish: 14:50
14.37 psi
16.07 °C
P_{atm} 14.46 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)			H = (P2-Patm)/w	Dz = Dp - H	
1	548	545.2		730.86	721.39	730.82	2.63	11:17			
2	461	459.6		618.12	613.53	618.15	1.94	11:49			
3	389	388.0		525.08	523.38	525.01	1.49	12:07			
4	345	344.2		467.48	464.92	467.50	1.28	12:27			
5	280	278.6		381.56	380.04	381.59	1.07	12:42			
6	270	269.4		369.51	368.10	369.51	1.04	12:55			
7	247	244.5		337.31	336.52	337.30	1.13	13:06			
8	238	235.4		325.14	324.39	325.21	1.06	13:15			
9	201	199.1		276.54	277.14	276.49	1.00	13:22			
10	160	158.1		222.48	223.26	221.54	0.98	13:36			
11	110	108.1		153.91	156.49	153.96	1.11	13:44			
12	64	63.2		92.42	94.05	92.41	1.30	14:02			
13	54	53.3		80.04	83.67	80.04	1.42	14:15			
14	37	35.2		51.48	55.86	51.43	1.04	14:28			
15	27	26.2		43.24	47.86	43.25	0.74	14:36			

Notes:
w = 1.422psi/m of H_2O
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure

* All temps read after 10 min (approx)

SRK Consulting
Engineers and Scientists

Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW001
Date: 19 July 2010

Datum: UTM
Elev. G.S.:
Height of MP above G.S.: 0.27m
Elev. top of MP Casing:
Reference Elevation:
Drillhole angle: 70 (check)

Probe Type: Sampler
Serial No.: 4364
Probe Range: 2Km
MP Casing Type: MP36
Depth to water in MP: 53.9 feet (at start)
Depth to water in MP: (at finish)

Client: Newmont
Job No.: 1CH008.013
Location: Hope Bay
Weather: Cloudy
Operator(s): JH

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: Finish: 14:38, 11.1°C
P_{atm} 14.38 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P4)	Outside Casing (P2)	Inside Casing (P1)			H = (P2-Patm)/w	Dz = Dp - H	
10	105	104.6		78.58	149.72	131.39	1.33	12:51			Took ~15 mins to stabilise temp
						didn't give it					
							Mind to		stabilise?		

Notes: w = 1.422psi/m of H_2O Dz = piezometric level in zone Patm = atmospheric pressure
H = pressure head of water in zone Dp = true depth of measurement port

SRK Consulting
Engineers and Scientists

Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 16MB5001
Date: Aug 5-6 /10

Datum: UTM
Elev. G.S.:
Height of MP above G.S.: 0.27m
Elev. top of MP Casing:
Reference Elevation:
Drillhole angle: 70

Probe Type: Sampler
Serial No.: 4344
Probe Range: 2km
MP Casing Type: MP38
Depth to water in MP: N/A (at start)
Depth to water in MP: N/A (at finish)

Client: Nacomont
Job No.: 10CH008.013
Location: Hopebay
Weather: windy ✓ / partly sunny ✓
Operator(s): JM, JH ✓

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: Finish:
P_{atm} 14.35 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)			H = (P2-Patm)/w	Dz = Dp - H	
11	33.0	33.0		14.50	55.68	14.58	1.06				Aug 5
12	27.0	27.0		14.58	47.75	14.46	0.77				
11	54	54.3		26.72	83.55	26.71	1.32				
10	64	63.5		39.16	95.74	39.10	1.25				
~~10~~	104.5	103.5		93.41	149.97	93.41	1.12				
9	~~109~~ 110	109.9		99.49	156.16	99.55	1.23				Aug 6 * Might not ~~stable~~ be fully stable but worked on hour
8	160	158.9		166.02	223.89	166.08	0.96				
7	201	199.8		220.26	27~~6.85~~	220.26	0.95				
~~4~~	~~238~~			~~[illegible]~~	~~[illegible]~~		~~[illegible]~~				
6	247	245.4		280.07	336.33	290.07	1.10				
~~6~~	~~290~~										
5	280	278.6		323.64	390.00	323.64	1.04				
4	345	343.1		408.32	464.73	408.32	1.21				
3	389	387.5		465.01	521.64	465.02	1.40				
2	461	459.1		~~536.89~~	612.49	556.88	1.87				
1	548	546.7		667.81	~~[illegible]~~ 721.21	667.79	2.57				

Notes: w = 1.422psi/m of H_2O
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure

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Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10wBW001
Date: 18 Oct 10

Datum: UTM
Elev. G.S.: _____
Height of MP above G.S.: _____
Elev. top of MP Casing: _____
Reference Elevation: _____
Drillhole angle: _____

Probe Type: EMS
Serial No.: ~~4~~ 4344
Probe Range: 2000 PSI
MP Casing Type: MP58
Depth to water in MP: 42.22 (at start)
Depth to water in MP: _____ (at finish)

Client: Newmont
Job No.: 1CH008.013
Location: Ooris Central
Weather: -5 Overcast
Operator(s): JH + JJ

11:20 am
Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: 14.57 Finish: _____
17.36°C
P_{atm} _____ psi

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings: Inside Casing (P1)	Fluid Pressure Readings: Outside Casing (P2)	Fluid Pressure Readings: Inside Casing (P1)	Probe Temp. (°C)	Time H:M:S	Pressure Head Outside Port (m) H = (P2-Patm)/w	Piez. Level Outside Port (m) Dz = Dp - H	Comments
1	548	544.5	~~484.87~~	682.04	721.17	682.09	2.63	11:52			
2	543										
2	461	458.2	409.15	569.57	612.72	569.61	1.90	12:26			
3	456										
3	389	387.2	346.84	476.7	~~522.91~~ 522.91	476.76	1.44	12:49			
4	385										
4	345	343.3	308.03	419.23	~~460.62~~	419.28	1.26	1:10			464.77: Problem landing!! Took 4 attempts landed on coupling above at first (got ~~kink~~ cable in a tangle)
5	340										
5	280	278.26	(333.72)	~~324.59~~	379.83	333.66	1.02	1:47			
6	271	269.12		321.56	367.93	321.51	~~1.01~~	1:54			
6	246	244.96		~~289.51~~	336.23	289.~~15~~	1.07	2:19			
7	237	235.82		277.34	324.08	277.28	~~0.98~~	2:37			
7	200	~~199.56~~	(228.85)	~~228.76~~	276.81	228.85	0.93	3:01			Trouble landing
~~8~~	~~196~~										
8	159	158.6		173.94	222.96	173.94	0.96				
~~9~~	155										
9	109	~~108.7~~		106.46	180.144	106.58	1.03	3:23			

Notes: w = 1.422psi/m of H_2O
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure

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Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBH001
Date: 18 Oct 10

Datum: _____
Elev. G.S.: _____
Height of MP above G.S.: _____
Elev. top of MP Casing: _____
Reference Elevation: _____
Drillhole angle: _____

Probe Type: _____
Serial No.: _____
Probe Range: _____
MP Casing Type: _____
Depth to water in MP: _____ (at start)
Depth to water in MP: _____ (at finish)

Client: _____
Job No.: _____
Location: _____
Weather: _____
Operator(s): _____

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: _____ Finish: _____
P_{atm} _____ psi

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)			H = (P2-Patm)/w	Dz = Dp - H	
~~10~~	~~105~~										
10	63	63.36		45.08	56.97	45.04	1.18	3:31			
11	54	54.2		32.70	83.50	32.70	~~1.26~~	3:48			
11	33	33.65		14.57	55.79	14.57	—				
12	27	27		14.58	47~~.83~~	14.58	1.0~~4~~				
re-read											
9	109	107.7		106.51	156.17	106.51					
10	63	63.36		45.02	57.21	45.~~14~~	1.22				

Notes: w = 1.422psi/m of H_2O
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure

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Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: **10WBW002**
Date: **25-Jun-10 Pre Inflation**

Datum: Ground Surface
Elev. G.S.: 30m
Height of MP above G.S.: 2.43m
Elev. top of MP Casing: 32.43m
Reference Elevation: N/A
Drillhole angle: 74

Probe Type: Mosdax
Serial No.: 4344
Probe Range: 2km
MP Casing Type: MP38
Depth to water in MP: N/A (close to surface) (at start, m)
Depth to water in MP: N/A (close to surface) (at finish, m)

Client: Newmont
Job No.: 1CH008.013
Location: Hope Bay
Weather: Sun with clouds
Operator(s): JA, ML

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: 11:20 Finish: 12:45
P_{atm} **14.38** psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)			H = (P2-Patm)/w	Dz = Dp - H	
1	594.4	590.07	575.06	832.23	969.3	832.21	1.36	12:00	671.53	-96.48	This profile was done after pvc install but prior to packer inflation component of installation
2	506	501.9	489.16	704.9	827.22	704.93	1.25	12:08	571.62	-82.46	
3	498.4	494.36	481.78	693.91	814.83	693.82	1.11	12:11	562.90	-81.13	
4	399.3	395.5	385.60	551.28	655.35	551.23	0.35	12:17	450.75	-65.15	
5	297.2	294.46	286.85	404.63	491.49	404.62	-0.6	12:23	335.52	-48.67	
6	201.2	199.3	194.15	266.87	336.47	266.91	-1.83	12:30	226.50	-32.36	
7	105.2	103.88	101.46	129.34	182.51	129.35	-2.46	12:36	118.23	-16.77	
8	27.5	26.48	26.51	18.14	58.42	18.14	-1.99	12:40	30.97	-4.46	

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Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW002
Date: 26-Jun-10 Post Inflatio

Datum:	Ground Surface	Probe Type:	Sampler	Client:	Newmont
Elev. G.S.:	30m	Serial No.:	4344	Job No.:	1CH008.013
Height of MP above G.S.:	2.43m	Probe Range:	2km	Location:	Hope Bay
Elev. top of MP Casing:	32.43m	MP Casing Type:	MP38	Weather:	Overcast
Reference Elevation:	N/A	Depth to water in MP:	N/A (close to surface)	Operator(s):	JA, ML
Drillhole angle:	74	Depth to water in MP:	N/A (close to surface)		

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: 15:00; 17 C; 14.46 psi Finish: 16:40
P_{atm} **14.49** psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)			H = (P2-Patm)/w	Dz = Dp - H	
1	594.4	589.9	575.06	883.06	955.91	883.05	0.83	15:32	662.04	-86.98	
2	506	502.2	489.16	751.38	790.54	751.41	0.83	15:39	545.75	-56.59	
3	498.4	494.24	481.78	739.92	723.07	739.94	0.7	15:42	498.30	-16.52	
4	399.3	395.9	385.60	591.2	593.43	591.22	-0.1	15:54	407.13	-21.53	
5	297.2	294.29	286.85	440.8	501.56	440.81	-1.16	16:00	342.52	-55.68	
6	201.2	199.3	194.15	299.8	332.64	299.93	-3.2	16:14	223.73	-29.59	Packer didn't inflate; temperature after 10 mins -3.2 C
7	105.2	103.31	101.46	159.81	181.84	159.84	-4.28	16:28	117.69	-16.22	
8	27.5	26.05	26.51	47.57	54.31	47.56	-3.84	16:33	28.00	-1.50	

Notes: w = 1.422psi/m of H_2O
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure

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Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW002
Date: 8-Nov-10

Datum:	Ground Surface	Probe Type:	Sampler	Client:	Newmont
Elev. G.S.:	30m	Serial No.:	4344	Job No.:	1CH008.013
Height of MP above G.S.:	2.43m	Probe Range:	2km	Location:	Hope Bay
Elev. top of MP Casing:	32.43m	MP Casing Type:	MP38	Weather:	Overcast
Reference Elevation:	N/A	Depth to water in MP:	36.380 (at start)	Operator(s):	JA; JJ
Drillhole angle:	74	Depth to water in MP:	(at finish)		

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: 14.4 (psi), 14:40 Finish:
P_{atm} 14.40 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)			H = [(P2-Patm)*σ]/(ρg)	Dz = Dp - H	
1	594.4	592.70	575.06	832.70	774.05	832.67		14:44:00	534.21	40.85	After 4L had been removed from zone 1. No temps recorded in this profile in the interests of time (just verifying pressure changes)
2	506	504.40	489.16	699.76	633.22	699.73		14:52:00	435.18	53.98	
3	498.4	496.40	481.78	688.15	706.81	688.24		14:56:00	486.93	-5.15	
4	399.3	398.40	385.60	541.41	570.55	541.40		15:01:00	391.10	-5.50	
5	297.2	296.60	286.85	391.33	612.49	391.37		15:07:00	420.60	-133.75	
6	201.2	200.90	194.15	250.79	429.13	250.79		15:13:00	291.65	-97.50	
7	105.2	105.10	101.46	110.34	282.65	110.36		15:19:00	188.64	-87.18	
8	27.5	27.80	26.51	14.60	51.32	14.66		15:25:00	25.96	0.54	

Notes: w = 1.422psi/m of H_2O
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure

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Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW002
Date: 10-Nov-10

Datum:	Ground Surface	Probe Type:	Sampler	Client:	Newmont
Elev. G.S.:	30m	Serial No.:	4344	Job No.:	1CH008.013
Height of MP above G.S.:	2.43m	Probe Range:	2km	Location:	Hope Bay
Elev. top of MP Casing:	32.43m	MP Casing Type:	MP38	Weather:	Overcast
Reference Elevation:	N/A	Depth to water in MP:	(at start)	Operator(s):	JA; JJ
Drillhole angle:	74	Depth to water in MP:	(at finish)		

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: Finish:
P_{atm} 14.40 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)			H = [(P2-Patm)*σ]/(ρg)	Dz = Dp - H	
1	594.4		575.06	822.33	813.37	822.21			561.86	13.19	After recovering overnight, pressure checked after purging 8.7L yesterday
2	506		489.16	689.31	671.42	689.35			462.04	27.12	
3	498.4		481.78	677.87	724.96	677.70			499.69	-17.91	
5	297.2		286.85	381.33	612.55	381.37			420.64	-133.79	Prior to pressure release from zone 5
1	594.4		575.06	814.97	716.50	813.56			493.74	81.32	Pressure checked in the afternoon after purging 6.2L on the same day
2	506		489.16	680.77	583.37	680.75			400.12	89.04	
3	498.4		481.78	669.23	695.43	669.33			478.92	2.85	
5	297.2		286.85		562.30				385.30	-98.45	After pressure release from zone 5

Notes: w = 1.422psi/m of H_2O Dz = piezometric level in zone Patm = atmospheric pressure
H = pressure head of water in zone Dp = true depth of measurement port

Schlumberger
WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: [illegible]
Datum: [illegible]
Elev. G.S.: [illegible]
Height of Westbay above G.S.: [illegible]
Elev. top of Westbay Casing: N/A
Reference Elevation: N/A
Borehole angle: 24

Probe Type: [illegible]
Serial No.: [illegible]
Probe Range: [illegible]
Westbay Casing Type: [illegible]
Sampler Valve Position: [illegible]

Date: [illegible]
Client: [illegible]
Job No.: [illegible]
Location: [illegible]
Weather: [illegible]
Operator: [illegible]

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)

Start: Pressure [illegible] Finish:
Temp [illegible]
Time [illegible]

P_{atm} [illegible] psi

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (m) H = (P2-Patm)/w	Piez. Level Outside Port (m) Dz = Dp - H	[illegible] (m)	Comments
[illegible]	[illegible]	590.07		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	671.53	-79.1	590.2	
[illegible]	586.0	501.9		704.90	827.22	12:08	[illegible]	[illegible]	571.62	-69.2	[illegible]	
[illegible]	[illegible]	494.36		[illegible]	814.83	12:11	[illegible]	[illegible]	562.90	-64.5	[illegible]	
[illegible]	[illegible]	395.9		[illegible]	[illegible]	12:17	[illegible]	[illegible]	470.75	-51.45	[illegible]	
[illegible]	[illegible]	284.46		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	335.52	-32.32	[illegible]	
[illegible]	[illegible]	99.3		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	226.50	-20.3	[illegible]	
[illegible]	[illegible]	109.66		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	26.42		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30.97	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

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Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW004
Date: 3-Aug-10

Datum: UTM
Elev. G.S.: -
Height of MP above G.S.: -
Elev. top of MP Casing: -
Reference Elevation: Top of Casing
Drillhole angle: 63.5

Note average bendy hole dip

Probe Type: Mosdax
Serial No.: 4344
Probe Range: 2000m
MP Casing Type: MP38
Depth to water in MP: 7.900 (at start, m)
Depth to water in MP: - (at finish, m)

Client: Newmont
Job No.: 1CH008.013
Location: Boston
Weather: Rain/Wind
Operator(s): Jacek

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: _____ Finish: _____
P_{atm} 14.33 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)	Density Outside Casing "ρ" (kg/m³)	Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)				H = [(P2-Patm)*σ]/(ρg)	Dz = Dp - H	
1	447.0	443.00	401.83	607.18	609.90	607.14	1.45	1020.00		410.33	-8.50	adjusted pos from cable = 445
2	414.5	411.20	375.02	566.90	561.23	566.91	1.40	1020.00		376.80	-1.78	adjusted pos from cable = 413.2
3	364.0	361.30	332.03	502.23	499.50	502.22	1.06	1020.00		334.27	-2.24	adjusted pos from cable = 363.3
4	329.5	326.40	301.29	456.11	458.00	456.13	0.77	1020.00		305.68	-4.39	adjusted pos from cable = 328.4
5	325.0	321.90	297.22	449.90	451.80	449.98	0.61	1020.00		301.40	-4.18	adjusted pos from cable = 323.9
5	309.8	306.80	283.67	429.90	431.70	425.72	0.54	1020.00		287.56	-3.89	adjusted pos from cable = 308.8
6	305.0	302.20	279.60	423.52	426.03	423.52	0.44	1020.00		283.65	-4.05	adjusted pos from cable = 304.2
6	296.0	293.00	271.54	411.34	414.03	411.35	0.35	1020.00		275.38	-3.84	adjusted pos from cable = 295
7	291.0	288.40	267.46	405.22	407.85	405.23	0.25	1020.00		271.12	-3.66	adjusted pos from cable = 290.4
7	260.5	258.90	240.34	362.51	368.00	364.53	-0.14	1020.00		243.67	-3.33	adjusted pos from cable = 260.9
8	219.8	217.30	203.19	308.66	312.22	308.68	-0.52	1020.00		205.24	-2.05	adjusted pos from cable = 219.3
9	120.5	118.80	112.33	171.93	175.08	171.96	-1.52	1020.00		110.75	1.58	adjusted pos from cable = 120.8
	48.8	50.00	43.67				-2.30	1020.00		-9.87		additional Temp measurement, 'design depth' calced from cable/design diff on port above
10	24.7	23.60	22.84	37.55	42.74	37.53	-2.10	1020.00		19.57	3.27	adjusted pos from cable = 25.6

Notes:
g = gravity (9.81 m/s^2)
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure
ρ = density outside casing
σ = psi to Pa Conversion (1psi = 6.984 x 10^3 Pa)

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Piezometric Pressures/Levels
Field Data and Calculation Sheet

Well No.: 10WBW004
Date: 15-Nov-10

Datum: UTM
Elev. G.S.: -
Height of MP above G.S.: -
Elev. top of MP Casing: -
Reference Elevation: Top of Casing
Drillhole angle: 63.5

Probe Type: Mosdax
Serial No.: 4344
Probe Range: 2000m
MP Casing Type: MP38
Depth to water in MP: 8.800 (at start)
Depth to water in MP: - (at finish)

Client: Newmont
Job No.: 1CH008.013
Location: Boston
Weather: Cold and clear
Operator(s): JA

Note: "Port position" in angled drillholes refer to position along drillhole. True depth (Dp) needs to be calculated using drillhole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: 14.6; 2.73 C; 12:05 Finish: 17:20
P_{atm} 14.70 psi

Zone No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings			Probe Temp. (°C)		Time H:M:S	Pressure Head Outside Port (m)	Piez. Level Outside Port (m)	Comments
				Inside Casing (P1)	Outside Casing (P2)	Inside Casing (P1)				H = [(P2-Patm)*σ]/(ρg)	Dz = Dp - H	
1	447.0	444.10	401.83	607.06	602.62	606.98	1.03	1020.00	12:43:00	405.06	-3.23	
2	414.5	412.30	375.02	566.73	563.71	566.75	0.75	1020.00	13:06:00	378.25	-3.23	
3	364.0	362.50	332.03	502.30	498.63	502.17	0.11	1020.00	13:33:00	333.41	-1.38	
4	329.5	327.40	301.29	455.90	452.92	455.90	-0.39	1020.00	13:57:00	301.92	-0.63	
5	325.0	323.00	297.22	449.72	446.67	449.73	-0.51	1020.00	14:20:00	297.62	-0.40	
5	309.8	307.90	283.67	429.49	426.63	429.53	-0.69	1020.00	14:38:00	283.81	-0.14	
6	305.0	303.40	279.60	423.31	420.87	423.33	-0.76	1020.00	14:56:00	279.84	-0.24	
6	296.0	294.00	271.54	411.19	409.06	411.23	-0.90	1020.00	15:13:00	271.70	-0.16	
7	291.0	289.70	267.46	405.01	402.94	405.04	-1.02	1020.00	15:36:00	267.49	-0.03	
7	260.5	259.40	240.34	364.24	363.03	364.23	-1.48	1020.00	16:06:00	239.99	0.35	
8	219.8	218.20	203.19	308.50	308.09	308.50	-2.15	1020.00	16:26:00	202.14	1.05	
9	120.5	119.90	112.33	171.74	172.31	171.79	-4.21	1020.00	16:53:00	108.59	3.74	
10	24.7	24.60	22.84	37.08	40.18	37.10	-6.10	1020.00	17:14:00	17.56	5.28	

Notes:
g = gravity (9.81 m/s^2)
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure
ρ = density outside casing
σ = psi to Pa Conversion (1psi = 6.984 x 10^3 Pa)

SRK Consulting

Post inflation profile. profile

Schlumberger WATER SERVICES

Groundwater ~~Sampling~~

Field Data Sheet

at start WL = 7.9 m (inside MP casing)

Project: ICH008.013

Monitoring Well No.: 10WBW004

Sampling Zone No(s).: 1 to 10

Date: Aug 3 2010

Start Time: 05:00 Atm. Reading: 14.25

End Time: 06:30 Atm. Reading: 14.4

Operators: J. Sadek

Port No.	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler				Sample Collection Checks (probe located at sampling zone in Westbay casing)								Comments (volume recovered)
		Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Bottles (3-5 psi)	Close Valve	Shoe In- Arm In	Locate Port	Arm Out	Land Probe	Pressure in Westbay ( )	Shoe Out	Zone Pressure ( )	Open Valve	Zone Pressure ( )	Close Valve	Shoe In	Pressure in Westbay ( )	Temp. °C
1	1	Mag	443.8 m			Port	443.0	–	✓	✓	607.18	✓	609.9		[redacted]		✓	607.14	1.45
2	1	Mag	411.9 m			Port	311.2	–	✓	✓	566.9	✓	561.23				✓	566.91	1.40
3	1	Mag	362.0 m			Port	361.3 m	–	✓	✓	502.23	✓	499.5				✓	502.22	[redacted] 1.06
4	1	Mag	327.2 m			Port	326.4 m	–	✓	✓	456.11	✓	458.00				✓	456.13	0.77
5	1	Mag	322.6 m			Port	321.9	–	✓	✓	449.9	✓	451.8				✓	449.98	0.61
6	1	Mag	307.5 m			Port	306.8 m	–	✓	✓	429.71	✓	431.7				✓	429.72	0.54
7	1		302.9				302.2	–	✓	✓	423.52	✓	426.03				✓	423.52	0.44
8	1		293.7 m				293.0	–	✓	✓	411.34	✓	414.03				✓	411.35	0.35
9	1		288.1				288.4	–	✓	✓	405.22	✓	407.85				✓	405.23	0.25
10	1		258.9				258.2	–	✓	✓	364.51	✓	368.00				✓	364.53	[redacted]
11	1		218.0				217.3	–	✓	✓	308.66	✓	312.22				✓	308.68	-0.52 -0.14
12	1		119.5				118.8	✓	✓	✓	171.93	✓	175.08				✓	171.96	-1.52
[redacted]																				
[redacted] 13	1		24.3				23.6	✓	✓	✓	37.55	✓	42.74				✓	37.53	at 50m T = -2.3
[redacted]																				at 24m T = -2.1

Additional Comments: (pH, turbidity, S.C., etc.)

Bottom depth inside MP = 464.7 m on counter, P = 432.6 psi, T = 1.07 °C

counter on return -2.0 m (0 at steel casing top counter -1 m)

Appendix J
Data Sheets from Sampling

SRK Consulting
Engineers and Scientists

Groundwater Sampling
Field Data Sheet

Well No.: 10WBW001
Date: 08-Jul-10

Zones sampled: 1, 6, 10
Drillhole angle: 70 degrees
Start Time: 15:00
End Time: 16:40

Client: Newmont
Job No.: 1CH008.013
Location: Hope Bay
Weather: Sunny
Operator(s): MP, JA

Zone No.	Sample Bottle Label	Port Position From Log (m)	Port Position From Cable (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)									Volume Retrieved		Comments
					Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate Port ( ) Arm Out ( ) Land Probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Time to Fill (min)	Close Valve	Shoe in	Pressure in MP (psi)	Filtered & Preserved (mL)	Not Filtered / Not Preserved (mL)	
1	10WBW001-01	548	545.1	1	x	x	x	x	x	x	xxx	732.23	x	721.36	x	492.37	2	x	x	732.13	250	375	EC > 20mS; pH = 7.93
1	10WBW001-01	548	545.2	2	x	x	x	x	x	x	xxx	731.76	x	721.41	x	528.41	1	x	x	731.76	-	1000	EC > 20mS; pH = 8.13
6	no sample	271	268.9	1	x	x	x	x	x	x	xxx	370.1	x	367.91	x	4.21	-	-	-	-	-	-	Did not collect sample; filling didr
6	10WBW001-02	271	269.2	2	x	x	x	x	x	x	xxx	369.92	x	367.93	x	260.31	1.5	x	x	369.87	250	375	EC > 20mS; pH = 6.89
6	10WBW001-02	271	269.2	3	x	x	x	x	x	x	xxx	369.53	x	367.84	x	242.10	1	x	x	369.71	-	1000	EC > 20mS; pH = 7.06
10	10WBW001-03	63	63.2	1	x	x	x	x	x	x	xxx	92.26	x	95.71	x	61.40	2.5	x	x	92.31	250	375	EC > 20mS; pH = 7.77
10	10WBW001-03	63	63.2	2	x	x	x	x	x	x	xxx	92.29	x	95.74	x	64.54	2	x	x	92.38	-	1000	EC > 20mS; pH = 7.76
10	10WBW001-04	63	63.2	1	x	x	x	x	x	x	xxx	92.2	x	95.71	x	63.11	2.5	x	x	92.25	250	375	Duplicate; EC > 20mS; pH = 7.83
10	10WBW001-04	63	63.2	2	x	x	x	x	x	x	xxx	92.19	x	95.70	x	63.47	3	x	x	92.49	-	500	Duplicate; EC > 20mS; pH = 7.75
10	10WBW001-04	63	63.2	3	x	x	x	x	x	x	xxx	92.06	x	95.76	x	65.19	2.5	x	x	92.18	-	500	Duplicate; EC > 20mS; pH = 7.82

Additional Comments: (pH, Turbidity, S.C., etc.)

Fluid level inside casing was 20ft 2in

Only zone 1 was sampled July 8, zone 6 and 10 was sampled July 9: Start 9:30; Sunny; 13.80 psi; Finish: 14:00

SRK Consulting
Engineers and Scientists

Groundwater Sampling
Field Data Sheet

Well No.: 10WBW001
Date: 8 July 2010

Client: Newmont
Job No.: CHUDX.013
Location: Hope Bay
Weather: Sunny
Operator(s): MP, JA

Zones sampled: 1, 6, 10
Drillhole angle: 70 degrees
Start Time: 15:00
End Time: 16:40

Zone No.	Sample Bottle Label	Port Position From Log (m)	Port Position From Cable (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)									Volume Retrieved		Comments
					Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate Port ( ) Arm Out ( ) Land Probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Time to Fill (min)	Close Valve	Shoe In	Pressure in MP (psi)	Filtered & Preserved (mL)	Not Filtered / Not Preserved (mL)	
1	10WBW001-01	548	545.1	1	✓	✓	✓	✓	✓	✓	✓✓✓	732.23	✓	721.36	✓	92.37	2	✓	✓	732.13	250	375	EC > 20mS; T=14.7°C; pH=7.93
1	10WBW001-01	548	545.2	2	✓	✓	✓	✓	✓	✓	✓✓✓	731.76	✓	721.41	✓	528.41	1	✓	✓	77.76	–	1000	EC>20mS T=15.8°C pH=8.13
6	no sample	271	268.9	1	✓	✓	✓	✓	✓	✓	✓✓✓	370.10	✓	367.97	✓	4.21	–	✓	✓	–	–	–	did not fill - probe would not fit
6	10WBW001-02	271	269.2	2	✓	✓	✓	✓	✓	✓	✓✓✓	369.22	✓	367.93	✓	26.31	1.5	✓	✓	369.87	250	375	EC>20mS; T=13.3°C pH=6.89
6	6WBW001-02	271	269.2	3	✓	✓	✓	✓	✓	✓	✓✓✓	369.53	✓	367.84	✓	242.1	1	✓	✓	369.71	–	1000	EC>20mS; T=17.0°C pH=7.06
10	10WBW001-03	63	63.2	1	✓	✓	✓	✓	✓	✓	✓✓✓	92.26	✓	95.71	✓	61.40	2.5	✓	✓	92.31	250	375	EC>20mS; pH=7.77
10	10WBW001-03	63	63.2	2	✓	✓	–	✓	✓	✓	✓✓✓	92.29	✓	95.74	✓	64.54	2	✓	✓	92.38	–	1000	EC>20mS; pH=7.76
10	10WBW001-04	63	63.2	1	–	✓	✓	✓	–	✓	✓✓✓	92.20	✓	95.71	✓	63.11	2.5	✓	✓	92.25	250	375	EC>20mS; pH=7.93
10	10WBW001-04	63	63.2	2	✓	✓	✓	✓	✓	✓	✓✓✓	92.19	✓	95.70	✓	63.47	3	✓	✓	92.49	–	500	split sample; EC>20; pH=7.75
10	10WBW001-04	63	63.2	3	✓	✓	–	✓	✓	–	✓✓✓	92.06	✓	95.76	✓	65.19	2.5	✓	✓	92.18	–	500	EC>20mS; pH=7.82

Additional Comments: (pH, Turbidity, S.C., etc.)

* Fluid level inside casing (water bag) @ 20 ft 2 in
* only Zone 1 on 8 July 2010 – Zone 6 & 10 9 July 2010 Time Start 9:30 ; Sunny ; rain @ 13:30 . Finish 14:00

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Groundwater Sampling
Field Data Sheet

Well No.: 10WBW001
Date: 18 July 2010

Zones sampled: 10
Drillhole angle: 70 degrees
Start Time: ~12.30
End Time: ~1.00pm

Client: Newmont
Job No.: 1CH008.012
Location: Hope Bay
Weather: Cloudy
Operator(s): JH

Zone No.	Sample Bottle Label	Port Position From Log (m)	Port Position From Cable (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)									Volume Retrieved		Comments
					Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate Port ( ) Arm Out ( ) Land Probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Time to Fill (min)	Close Valve	Shoe In	Pressure in MP (psi)	Filtered & Preserved (mL)	Not Filtered / Not Preserved (mL)	
10	10WBW001															1	13						pH 7.49
																							@ 8.4°C
																							EC > 20mS

Additional Comments: (pH, Turbidity, S.C., etc.)

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Groundwater Sampling
Field Data Sheet

Well No.: 10WBW001
Date: 25 July 2010

Client: Newmont
Job No.: 1CH008.13
Location: Hope Bay
Weather: Very windy, Sunny, 15°C
Operator(s): JH + JM

Zones sampled: Zone 1
Drillhole angle: 66 degrees
Start Time: 10.56am
End Time: ~1.30pm

Atmos 14.25
temp 18.06
time 10.56

Zone No.	Sample Bottle Label	Port Position From Log (m)	Port Position From Cable (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)									Volume Retrieved		Comments
					Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate Port ( ) Arm Out ( ) Land Probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Time to Fill (min)	Close Valve	Shoe In	Pressure in MP (psi)	Filtered & Preserved (mL)	Not Filtered / Not Preserved (mL)	
1	10WBW001-17	54.8	545.6	1	X	X	X	X	X	X	X X X	696.29	X	721.37	X	721.34	1	X	X	696.36			Port 1 only 6m
1	10WBW001-17	54.8	545.72	2	X	X	X	X	X	X	X X X	695.33	X	721.35	X	721.35	1	X	X	695.06			below was open
1	"	"		3	X	X	X	X	X	X	X X	695.34	X	721.36		721.39				695.34			overnight.
																							Chances are
				1	EC	>20mS,						pH	7.91	, temp	17.4 (readable)							high that the
				2	EC	>20mS,						pH	7.98	, temp	14.4							glycol inside
				3	EC	>20mS,						pH	2.12	temp	11.4							Westbay has
																							migrated out.
																							— no colour
																							pink indicator
																							though

Additional Comments: (pH, Turbidity, S.C., etc.)

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Groundwater Sampling
Field Data Sheet

Well No.: 10WBW001
Date: 4 Aug 2010

Client: Newmont
Job No.: 1CH006.013
Location: Lon's Island
Weather: Sunny, windy, 10°C
Operator(s): JH + JM

Zones sampled: 1, 6, 10
Drillhole angle: -70 degrees
Start Time: 1.25pm 4 Aug 10
End Time:

Zone No.	Sample Bottle Label	Port Position From Log (m)	Port Position From Cable (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)									Volume Retrieved		Comments
					Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate Port ( ) Arm Out ( ) Land Probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Time to Fill (min)	Close Valve	Shoe In	Pressure in MP (psi)	Filtered & Preserved (mL)	Not Filtered / Not Preserved (mL)	
1	10WBW001-35	548	544.85	1	X	X	X	X	X	X	X X X	670.08	X	721.30	X	721.28	1	X	X	—	2x 250mL		2.57°C 1.42pm
1	10WBW001-35	548	544.79	2	X	X	X	X	✓	✓	✓ ✓ ✓	670.12	X	721.33	X	721.33	1	X	X	670.08	≈2.2L		2.56°C 2.48pm
1	10WBW001-35	548	544.82	3	X	X	X	X	X	X	✓ ✓ ✓	670.00	X	721.39	X	721.3	1	X	X	670.00	1x	250mL	pH = 8.44
																							EC = >20mS
												pH	8.51	EC > 20 mS									T = 7.2°C
														T = 8.6 °C									
6	10WBW001-36	246	245.4	1	X	X	X	X	X	X	X X X	298.05	X										Shoe sealed to
																							deploy

Additional Comments: (pH, Turbidity, S.C., etc.)

Surface pressure 14.37, temp 11.66°C time @ start 1.24

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Groundwater Sampling
Field Data Sheet

Well No.: 10WBW001
Date: Aug 5

Zones sampled: 1, 6, 10
Drillhole angle: 70 degrees
Start Time:
End Time:

Client: Newmont
Job No.: 1CH008.013
Location: Hap Bay
Weather: Overcast / Partly Sunny
Operator(s): John, Ian

Zone No.	Sample Bottle Label	Port Position From Log (m)	Port Position From Cable (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)								Volume Retrieved		Comments
					Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate Port ( ) Arm Out ( ) Land Probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Time to Fill (min)	Close Valve	Shoe In	Pressure in MP (psi)	Filtered & Preserved (mL)	Not Filtered / Not Preserved (mL)	
6	10WBW001-36	246	245.4	2	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	281.76	✓	336.28	✓	336.29	1	✓	✓	281.99			
6	" "	"	245.9	3	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	281.98	✓	336.50	✓	336.31	1	✓	✓	281.85			
6	" "	"	245.6	4	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	281.85	✓	336.38	✓	336.33	1	✓	✓	281.92			
10	10WBW001-37	63.5	63.5	1	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	40.36	✓	95.59	✓	95.68	2	✓	✓	40.41			
10	" "	" "	63.4	2	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	40.22	✓	95.46	✓	95.47	2	✓	✓	40.47			
10	" "	" "	63.6	3	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	40.36	✓	95.71	✓	95.55	2	✓	✓	40.33			

Additional Comments: (pH, Turbidity, S.C., etc.)

Schlumberger
WATER SERVICES

Groundwater Sampling
Field Data Sheet

Project: ICH008.013
Monitoring Well No.: 10WBW001
Sampling Zone No(s).: 1, 6, 10

Date: 19 Oct 2010
Start Time: 10 am Atm. Reading: 14.31
End Time: _____ Atm. Reading: _____
Operators: JH + JJ

Port No.	Run No.	Surface Function Tests (probe in flushing collar): Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Bottles (3-5 psi)	Close Valve	Position Sampler: Shoe In-Arm In	Locate Port	Arm Out	Land Probe	Sample Collection Checks (probe located at sampling zone in Westbay casing): Pressure in Westbay (PSI)	Shoe Out	Zone Pressure ( )	Open Valve	Zone Pressure ( )	Close Valve	Shoe In	Pressure in Westbay ( )	Comments (volume recovered)
10am 1	1	X	X	X	X	X	X	X	X	X	X	683.64	X	721.20	X	721.15	X	X	683.65	10.35
11.40 1	2	X	X	X	X	X	X	X	X	X	X	683.55	X	721.22	X	721.21	X	X	683.55	12.07
1244 1	3	X	X	X	X	X	X	X	X	X	X	683.43	X	721.20	X	721.20	X	X	683.46	1.07
2.10 6	1	X	X	X	X	X	X	X	X	X	X	290.75	X	336.43	X	290.77	→		→	
6	2	X	X	X	X	X	X	X	X	X	X	290.68	X	336.15	X	290.68	→		→	
6	3	X	X	X	X	X	X	X	X	X	X	290.76	X	336.22	X	336.18			290.64	4.04
10	1	X	X	X	X	X	X	X	X	X	X	45.92	X	95.37	X	95.54	X	X	46.09	10.03
10.37 10	2	X	X	X	X	X	X	X	X	X	X	46.02	X	95.49	X	95.52	X	X	46.11	10:45
10	3	X	X	X	X	X	X	X	X	X	X	46.01	X	95.45	X	95.49	X	X	46.10	11:27
10	4	X	X	X	X	X	X	X	X	X	X	45.92	X	95.48	X	95.43	X	X	46.10	12:12

Additional Comments: (pH, turbidity, S.C., etc.)

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Page____of____

Groundwater Sampling
Field Data Sheet

Project: Hope Bay
Monitoring Well No: 10mBW001
Sampling Zone No(s): 10
Angled Drillhole (Y/N): Y
Drillhole Angle: 65

Date: 29/10/2015
Start Time: 14:00 - 16:00 / 10:30 -
End Time:
Technicians: JM & JA

Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)							Comments (vol. retrieved)
				Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Close Valve	Shoe In	Pressure in MP (psi)	
10	63.6	63.5	1	✓	✓	✓	✓	✓	✓	✓✓✓	69.85	✓	95.78	✓	95.40	✓	✓	69.92	no advance
10	63.4	63.5	2	✓	✓	✓	✓	✓	✓	✓✓✓	69.98	✓	95.41	✓	95.47	✓	✓	69.96	LOSS
10	63.5	63.5	3	✓	✓	✓	✓	✓	✓	✓✓✓	69.82	✓	95.39	✓	95.47	✓	✓	—	
10	63.5	63.5	4	✓	✓	✓	✓	✓	✓	✓✓✓	69.87	✓	95.39	✓	95.47	✓	✓	69.96	
10	63.2	63.5	5	✓	✓	✓	✓	✓	✓	✓✓✓	69.44	✓	95.05	✓	95.28	✓	✓	69.73	[illegible] sample [illegible]
1	545.2	548	1	✓	✓	✓	✓	✓	✓	✓✓✓	703.9	✓	721.09	✓	720.8	✓	✓	703.96	
1	545.0	548	2	✓	✓	✓	✓	✓	✓	✓✓✓	704.09	✓	721.12	✓	720.85	✓	✓	703.90	sample discarded
1	545.5	548	3	✓	✓	✓	✓	✓	✓	✓✓✓	704.11	✓	721.04	✓	720.90	✓	✓	703.91	
1	545.5	548	4	✓	✓	✓	✓	✓	✓	✓✓✓	704.17	✓	721.10	✓	720.81	✓	✓	704.12	
1	545.5	548	5	✓	✓	✓	✓	✓	✓	✓✓✓	704.28	✓	721.09	✓	721.08	✓	✓	703.81	
6	246	246	1	✓	✓	✓	✓	✓	✓	✓✓✓	314.44	✓	335.65	✓	335.79	✓	✓	36.56	
6	243	246	2	✓	✓	✓	✓	✓	✓	✓✓✓	314.79	✓	336.12	✓	336.0	✓	✓	314.79	
6	246	246	3	✓	✓	✓	✓	✓	✓	✓✓✓	314.57	✓	336.03	✓	336.08	✓	✓	314.82	
6	246	246	4	✓	✓	✓	✓	✓	✓	✓✓✓	[illegible]	✓	336.06	✓	336.03	✓	✓	314.78	

Additional Comments: (pH, Turbidity, S.C., etc.)

6 5.09
6 3.54
mag 6 4.0 ↑

mag 5 ↓

Sampling

Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: 10WBN002
Datum:
Elev. G.S.: 30 m
Height of Westbay above G.S.:
Elev. top of Westbay Casing:
Reference Elevation:
Borehole angle: 74

Probe Type: MP 32
Serial No.: 43414
Probe Range:
Westbay Casing Type: MP 32
Sampler Valve Position:

Date:
Client:
Job No.:
Location:
Weather:
Operator:

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)

Start: Pressure
Temp
Time 10:20

Finish:

P_{atm} _____ psi

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (m) H = (P2-Patm)/w	Piez. Level Outside Port (m) Dz = Dp - H	Comments
1	594.4	592.2		885.33	916.05	10:37	0.87	884.20			$T_0 \rightarrow T_{\infty}$ (to vs final)
											T_0 > 0.65 · 0.71, 0.75, 0.79, 0.80, 0.82, 0.83, 0.85
											0.85, 0.86, 0.87, 0.87, 0.87, 0.87
2	506.0	504.1		751.58	652.02	11:22	0.19	751.64			→ hit 1 corner pulse + temp at 60 s, redo to 20 min
3	498.4	496.6		740.07	688.90	11:47	0.03	739.59			Temp read after 10min
											Temp read after 10min
2	594.4	592.3		823.53	819.19	13:35	0.85	822.18			~ 495m temp goes negative
3	594.4	592.2		881.76	776.96	14:55	0.86	880.21			
4	594.4	592.2		879.72	771.60	16:05	0.73	878.38			
5	594.4	592.3		879.74	772.61	17:15	0.77	876.35			

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

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Groundwater Sampling
Field Data Sheet

Project: HBML - Westbay
Monitoring Well No: 10 WBW - 004
Sampling Zone No(s): 6
Angled Drillhole (Y/N): Y
Drillhole Angle: 70 to 54°

Date: Nov 18, 2010
Start Time: 0940
End Time: 1830
Technicians: Jen Andrews, Jan Jarolin, Robert Bowden

Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)								Comments (vol. retrieved)
				Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Close Valve	Shoe In	Pressure in MP (psi)	
6	293.8	295.7	1	✓	✓	✓	✓	✓	✓		412.60	✓	408.82	✓	406.91	✓	✓	412.60	1.1 L frozen
5u	303.9	304.20	1	✓	✓	✓	✓	✓	✓		430.60	✓	426.40	✓	406.70	✓	✓	430.20	1.0 slush
6	[illegible]	296.7	2	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	[illegible]	✓	409.12	✓	405.43	✓	✓	[illegible]	1.1 slushy
6	296.3	295.7	3	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	411.46	✓	418.69	✓	406.61	✓	✓	411.53	[illegible] 1.1 slushy
6	295.4	295.7	4	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	411.23	✓	412.59	✓	406.77	✓	✓	411.93	1.1 L slush

Sample 1 2 3 (parallel - ard)

Additional Comments: (pH, Turbidity, S.C., etc.)

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Groundwater Sampling
Field Data Sheet

Project: HBML - Westbay
Monitoring Well No: 10-WBH-004
Sampling Zone No(s): 6
Angled Drillhole (Y/N):
Drillhole Angle: 70 to 54°

Date: Nov 19/2010
Start Time: 0840
End Time: 1730
Technicians: Jan Jarolim, Rob Bowden

Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)								Comments (vol. retrieved)
				Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Close Valve	Shoe In	Pressure in MP (psi)	
6	295.60	295.7	5	✓	✓	✓	✓	✓	✓		411.2	✓	408.75	0856	407.23	0907	✓	411.15	1.1 l slushy
6	295.15	"	6	✓	✓	✓	✓	✓	✓		410.89	✓	408.56	✓	407.45	✓	✓	410.83	9:59 1.1 l slushy
6	295.7	"	7	✓	✓	✓	✓	✓	✓		410.65	✓	408.63	1114	407.10	1125		410.63	12:00 1.1 l slushy
6	295.7	"	8	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	410.43	✓	409.89	✓	407.42	✓	✓	410.41	1:36 1.1 l "
6		"	9	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	410.22	✓	408.85	1553	407.36	1607	✓	410.17	1.1 l

Additional Comments: (pH, Turbidity, S.C., etc.)

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Groundwater Sampling
Field Data Sheet

Project: HBML – Westbay
Monitoring Well No: 10WBW004
Sampling Zone No(s): 6
Angled Drillhole (Y/N):
Drillhole Angle: 50 to 52°

Date: Nov 20, 2010
Start Time: 1000
End Time: 1830
Technicians: Jan Jaworski

Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)								Comments (vol. retrieved)
				Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Close Valve	Shoe In	Pressure in MP (psi)	
6	305.0	304.8	10	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	422.06	✓	420.82	1005	419.23	1015	✓	422.07	1.1ℓ cloudy, light brown
6	305.0	"	11	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	421.64	✓	420.42	1107	418.91	1117	✓	421.69	1.1ℓ sl. cloudy T=0.69°C
6	305.0	"	12	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	421.40	✓	420.37	1201	418.95	1212	✓	421.49	1.1ℓ " T=0.70°C
6	"	"	13	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	421.06	✓	420.50	1416	418.82	1426	✓	421.15	1.1ℓ colourless
11	304.0	"	14	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	420.97	✓	420.40	1508	418.94	1518	✓	421.01	1.1ℓ "
6	304.58	-11-	15	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	420.69	✓	420.29	✓	418.51	✓	✓	420.66	0.5ℓ " 15:56
6	303.76	"	16	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	420.42	✓	420.45	1654	419.39	✓	✓	420.39	0.6ℓ "
6	303.6	"	17	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	420.05	✓	420.35	17:41	418.92	1752	✓	420.10	

Additional Comments: (pH, Turbidity, S.C., etc.)

295.10

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Groundwater Sampling
Field Data Sheet

Project: HBML - Westfarm
Monitoring Well No: 10WBW004
Sampling Zone No: 6
Angled Drillhole (Y/N):
Drillhole Angle: 70° to 54

Date: Nov 23, 2010
Start Time: 1100
End Time: 1825
Technicians: R Bowden, J Jarolim

Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	(probe located at sampling zone in MP casing)		Sample Collection Checks						Comments (vol. retrieved)
				Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Close Valve	Shoe In	Pressure in MP (psi)	
6	294.2	295.7	18	✓	✓	✓	✓	✓	✓	1110 - 1210	406.70	✓	408.72	1124	407.68	1135	✓	406.70	0.8 l clear colourless
6	294.4	"	19	✓	✓	✓	✓	✓	✓	1225 - 1310	406.74	✓	408.60	1242	407.00	1252	✓	406.91	1.1 l "
6	294.4	"	20	✓	✓	✓	✓	✓	✓	1325 - 1430	406.80	✓	408.84	1340	407.19	1352	✓	406.61	1.1 l " , gas
6	303.5	304.8	21	✓	✓	✓	✓	✓	✓	1455 - 1530	418.44	✓	420.52	1452	418.96	1502	✓	418.50	1.1 l " , gas
6	303.6	304.8	22	✓	✓	✓	✓	✓	✓	1540 - 1620	418.18	✓	420.03	1552	418.47	1602	✓	417.29	1.1 l " , gas
6	306.6	304.8	23	✓	✓	✓	✓	✓	✓	1652 - 1710	417.89	✓	419.91	1630	418.29	1640	✓	417.93	1.1 l "
6	294.5	295.7	24	✓	✓	✓	✓	✓	✓	1720 - 1820	405.80	✓	409.30	1742	406.64	1752	✓	405.65	1.1 l "

3 bottles. T = -.86°
T = 0.74
T = -0.79
T = -0.74
T = -0.67
T = -0.68

Additional Comments: (pH, Turbidity, S.C., etc.)

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Groundwater Sampling
Field Data Sheet

Project: Misery - Westbay
Monitoring Well No: 10MBW004
Sampling Zone No(s): 6
Angled Drillhole (Y/N):
Drillhole Angle: 70° to 54°

Date: Nov 24/2010
Start Time: 0900
End Time: 1845
Technicians: R Bowden, J Jarolin

Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Pressure (probe located at sampling zone in MP casing)		Sample Collection Checks						Comments (vol. retrieved)
				Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve time	Zone Pressure (psi)	Close Valve time	Shoe In	Pressure in MP (psi)	
6	303.3	304.8	25	✓	✓	✓	✓	✓	✓	0920 - 1040	417.33	✓	420.38	0943	419.10	0957	✓	417.40	1.0 l clear colourless, gas smell
6	303.1	304.8	26	✓	✓	✓	✓	✓	✓	1050 - 1140	417.03	✓	420.23	1105	418.68	1115	✓	417.15	1.06 l " " T=-0.54°
6	303.6	304.8	27	✓	✓	✓	✓	✓	✓	1145 - 1230	416.73	✓	420.05	1157	418.51	1207	✓	416.81	1.06 l " -0.58
6	294.6	295.7	28	✓	✓	✓	✓	✓	✓	1240 - 1310	404.41	✓	408.25	1245	406.62	1254	✓	404.47	1.1 l "
6	294.4	295.7	29	✓	✓	✓	✓	✓	✓	1330 - 1423	404.06	✓	408.13	1341	406.40	1351	✓	404.22	1.1 l ice T=-0.5°C
6	294.4	295.7	30	✓	✓	✓	✓	✓	✓	1424 - 1523	403.94	✓	408.31	1435	407.11	1445	✓	403.90	1.1 l " " T=-0.5°C
6	294.5	295.7	31	✓	✓	✓	✓	✓	✓	1534 - 1600	403.59	✓	408.36	1536	406.96	1546	✓	403.70	1.1 l " " T=-0.2°C
6	303.5	304.8	32	-	-	-	-	No	✓	1610 - 1700	415.43	✓	419.83	1622	418.42	1632	✓	415.50	1.06 l
6	303.5	304.8	33	-	-	-	-	No	✓	1700 - 1735	415.22	✓	419.80	1704	418.25	1714	✓	415.44	1.0 l " "
6	~~294.6~~ ~~303.6~~	~~295.7~~ ~~304.8~~	34	-	-	-	-	No	✓	1740 - 1830	~~402.85~~ ~~415.85~~	✓	408.34	1804	406.77	1814	✓	402.86	1.06 l " "

Additional Comments: (pH, Turbidity, S.C., etc.)

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Groundwater Sampling
Field Data Sheet

Project: HBML – Westbay
Monitoring Well No: 10WBW004
Sampling Zone No: 6
Angled Drillhole (Y/N): Y
Drillhole Angle: 70° to 54°

Date: Nov 25/2010
Start Time: 1540
End Time: 1930
Technicians: R. Bowden J. Jarolin

Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	(probe located at sampling zone in MP casing)		Sample Collection Checks						Comments (vol. retrieved)
				Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Close Valve	Shoe In	Pressure in MP (psi)	
6	294.5	295.7	35	✓	✓	✓	✓	No	✓	✓ ✓ ✓	365.09	✓	408.60	1602	406.93	~~1612~~ ✓	~~1560~~ 1560	365.09	1.04 l, clear colourless
6	294.4	295.7	36	✓	✓	✓	✓	7 psi	✓	✓ ✓ ✓	364.98	✓	408.73	1744	406.94	~~1754~~ ✓	1754	365.00	1.1 l "
6	294.4	295.7	37	✓	✓	✓	✓	No	✓	✓ ✓ ✓	364.97	✓	408.38	1830	406.63	~~1840~~ ✓	1840	364.97	1.1 l
	Lowered glycol in westbay from ~16m to ~43m																		

Additional Comments: (pH, Turbidity, S.C., etc.)
*removed 27m glycol before Run 35

0700 – 1500 hrs

Start of sample pair 124 & 125

T = 0.86

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Groundwater Sampling
Field Data Sheet

Project: Hope Bay
Monitoring Well No: 10WBW004
Sampling Zone No(s): 6
Angled Drillhole (Y/N): Y
Drillhole Angle: 70 to 54°

Date: Sept 10
Start Time: 8:00
End Time: 1900
Technicians: BS

Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	(probe located at sampling zone in MP casing)		Sample Collection Checks						Comments (vol. retrieved)
				Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Close Valve	Shoe In	Pressure in MP (psi)	
6	294.6	295.7	38	—	—	—	—	No	✓	✓ ✓ ✓	364.79	✓	408.76	0829	407.24	✓	0834	364.79	1.1l clear, colourless T=-0.90
6	294.6	295.7	39	—	—	—	—	No	✓	✓ ✓ ✓	364.59	✓	408.47	9:28	407.02	✓	9:38	364.24	1.1l "
6	294.6	295.7	40	—	—	—	—	No	✓	✓ ✓ ✓	364.65	✓	408.59	10:44	407.19	✓	10:45	364.66	1.1l "
6	294.6	295.7	41					No	✓	✓ ✓ ✓	364.52	✓	408.45	1139	406.85	✓	1149	364.51	1.1l " T=-0.77
6	303.5	304.8	42	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	376.55	✓	420.29	12:50	419.44	✓	12:59	376.51	0.8l " T=-0.80
6	303.6	304.8	43	—	—	—	—	No	✓	✓	376.35	✓	420.25	1404	418.70	✓	1414	376.32	1.1l "
6	294.6	295.7	44	—	—	—	—	No	✓	✓	364.15	✓	408.70	1534	407.06	✓	1544	364.10	1l
6	303.6	304.8	45	✓	✓	—	—	No	✓	✓ ✓ ✓	376.00	✓	420.19	1643	418.84	✓	1658	376.10	1.1 "
6	303.5	304.8	46	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	375.86	✓	420.20	1806	418.62	✓	1816	376.96	1.1 " T=-0.68
~~6~~			~~47~~								~~376.96~~ 374.30	✓							

Additional Comments: (pH, Turbidity, S.C., etc.)

5.10
30/8/05 30/8/05

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Groundwater Sampling
Field Data Sheet

Project: HOPE BAY
Monitoring Well No: 10W3W004
Sampling Zone No(s): 6
Angled Drillhole (Y/N): Y
Drillhole Angle: 72.54

Date: 27/11/2010
Start Time: 0800
End Time: 1900
Technicians: JD. BBowden

Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	Sample Collection Checks (probe located at sampling zone in MP casing)							Comments (vol. retrieved)
				Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Close Valve	Shoe In	Pressure in MP (psi)	
6	294.6	295.7	47	—	—	—	—	No	✓	✓ ✓ ✓	363.62	✓	408.42	9:03	407.39	✓	✓	363.69	clear, colourless, gassy T=-0.41°C 1.1L
6	294.6	295.7	48	—	—	—	—	No	✓	✓ ✓ ✓	362.34	✓	408.64	10:29	407.17	✓	✓	363.20	T=0.22°C 1.0L
6	294.6	295.7	49	—	—	—	—	No	✓	✓ ✓ ✓	363.10	✓	408.42	11:34	406.80	✓	✓	362.98	T=1.12°C 1.1L
6	294.5	11	50	—	—	—	—	No	✓	✓ ✓	363.02	✓	408.21	12:14	406.61	12:24	✓	363.11	1.1L
6	294.5	11	51	—	—	—	—	No	✓	✓ ✓ ✓	362.91	✓	408.25	12:57	406.60	13:04	✓	363.15	1.1L ↓ sample start
6	294.7	1	52	✓	✓	✓	✓	✓	✓	✓ ✓ ✓	362.64	✓	408.39	14:06	406.97	✓	✓	363.85	T=0.76°C 1.1L
6	294.6	6	53	—	—	—	—	No	✓	✓ ✓ ✓	362.53	✓	408.06	14:52	406.64	15:02	✓	362.65	1.1L
6	294.6	11	54	—	—	—	—	No	✓	✓ ✓ ✓	362.39	✓	408.26	15:38	406.64	15:48	✓	362.64	1.1L Sample 12.8 pH
6	294.6	11	55	—	—	—	—	No	✓	✓	362.24	✓	408.06	16:21	406.64	16:31	✓	362.58	1.1L
6	11	11	56	—	—	—	—	No	✓	✓	362.10	✓	407.95	17:02	406.64	17:12	✓	362.28	1.1L
~~6~~	~~294.6~~	11	57	—	—	—	—	No	✓	✓	362.01	✓							
6	303.5	304.8	57	—	—	—	—	No	✓	✓	374.36	✓	420.11	18:18	419.37	19:29	✓	374.39	

Additional Comments: (pH, Turbidity, S.C., etc.)

SRK Consulting
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Groundwater Sampling
Field Data Sheet

Project: HBML - Westbay
Monitoring Well No: 10WBW004
Sampling Zone No(s): 6
Angled Drillhole (Y/N):
Drillhole Angle: 70 to 54°

Date: 28/11/10
Start Time: 0830
End Time: 1800
Technicians: J Jarolin, R Bowden

Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar)						Position Sampler	(probe located at sampling zone in MP casing)		Sample Collection Checks						Comments (vol. retrieved)
				Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Zone Pressure (psi)	Open Valve	Zone Pressure (psi)	Close Valve	Shoe In	Pressure in MP (psi)	
6	303.4	304.8	58	–	–	–	–	No	✓	✓	374.10	✓	420.41	0900	418.78	0910	✓	374.13	clear colourless gas, 1.1l
6	303.5	304.8	59	✓	✓	✓	✓	7psi	✓	✓	373.74	✓	420.03	1004	418.59	1014	✓	374.02	Sample #129, silent, 1.1l
6	303.5	304.8	60	–	–	–	–	No	✓	✓	373.52	✓	419.92	1048	418.34	1058	✓	373.88	" #129 1.1l
6	"	304.90	61	–	–	–	–	No	✓	✓	373.30	✓	419.78	1245	419.97	1255	✓	373.42	T=-0.75, #129 end
6	303.6	304.8	62	–	–	–	–	No	✓	✓	373.21	✓	420.21	1349	418.79	1359	✓	373.27	T=-0.67 1.0l
6	"	304.8	63	–	–	–	–	No	✓	✓	373.08	✓	419.99	1439	418.66	1449	✓	373.22	clear, colourless 1.1l
6	303.5	304.8	64	–	–	–	–	No	✓	✓	372.95	✓	419.92	1525	418.41	1533	✓	373.03	" 1.1
6	303.6	304.8	65	–	–	–	–	No	✓	✓	372.78	✓	419.75	1607	418.23	1617	✓	373.85	" 1.1l
6	294.4	~~295.8~~ 295.8	66	–	–	–	–	No	✓	✓	360.50	✓	408.04	1651	406.35	1701	✓	360.70	" 0.9L
6	294.4	295.7	67	–	–	–	–	No	✓	✓	360.48	✓	408.02	1733	406.64	1743	✓	360.50	" 1.1l

Additional Comments: (pH, Turbidity, S.C., etc.)

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Groundwater Sampling
Field Data Sheet

Project: HBML - Westbay
Monitoring Well No: 10WBW004
Sampling Zone No(s): 6
Angled Drillhole (Y/N):
Drillhole Angle: 70° to 54°

Date: 29/11/10 & 30/11/10
Start Time: 0800 & 0800
End Time: 1900 & 1140
Technicians: R Bowden, J Jarolin

	Zone No.	Cable Depth (m)	Log Depth of Mport (m)	Run No.	Surface Function Tests (probe in flushing collar): Shoe Out	Close Valve	Check Vacuum	Open Valve	Evacuate Container	Close Valve	Position Sampler: Locate port ( ) Arm out ( ) Land probe ( )	Pressure in MP (psi)	Shoe Out	Sample Collection Checks (probe located at sampling zone in MP casing): Zone Pressure (psi)	Open Valve time	Zone Pressure (psi)	Close Valve time	Shoe In	Pressure in MP (psi)	Comments (vol. retrieved)
0810	6	294.5 ~~298~~	295.7	68	–	–	–	–	No	–	3✓	360.21	✓	408.69	0826	467.19	0836	✓	360.38	clean, colourless, gas smell 1.1L
0905	6	303.7	304.8	69	–	–	–	–	No	–	✓✓✓	372.25	✓	419.89	0907	418.48	0917	✓	372.37	" 1.04L
0950	6	303.45	304.8	70	✓	✓	✓	✓	✓	✓	✓✓✓	372.16	✓	420.10	1009	418.46	1019	✓	372.23	" 1.1L
1035	6	303.7	304.8	71	–	–	–	–	No	✓	✓✓✓	372.00	✓	419.75	1050	418.45	1100	✓	372.10	1.1L
1117	6	303.7	304.8	72	–	–	–	–	No	✓	✓✓✓	372.94	✓	419.75	1132	418.98	1142	✓	372.06	empty bottles 0L
1210	6	303.6	304.8	73	–	–	–	–	10psi	✓	✓✓✓	371.83	✓	420.15	1222	418.91	1237	✓	372.00	1.1L
1304	6	303.6	304.8	74	–	–	–	–	✓	✓	✓✓✓	372.85	✓	420.16	1328	418.67	1338	✓	371.76	1.1L
1416	6	294.5	295.7	75	–	–	–	–	–	✓	✓✓✓	359.57	✓	408.34	1422	406.92	14:32	✓	359.57	1.1L
1515	6	294.5	295.7	76	–	–	–	–	–	✓	✓✓✓	359.26	✓	408.04	1508	406.82	1518	✓	359.41	
1540	6	294.5	295.7	77	–	–	–	–	–	✓	✓✓✓	359.29	✓	408.14	1558	407.06	1607	✓	359.40	1.06 T-0.86
1635	6	294.5	295.7	78	–	–	–	–	–	✓	✓✓✓	359.09	✓	408.16	1644	406.63	1654	✓	359.22	T-0.66 1.1
1717	6	303.6	304.8	79	–	–	–	–	–	✓	✓✓✓	371.15	✓	419.72	1732	419.87	1742	✓	371.38	T-0.49 1.04
0810	6	294.3	295.7	80	–	–	–	–	10psi	✓	✓✓✓	358.94	✓	408.68	0819	407.19	0828	✓	358.96	T-0.64 Nov 30
0905	6	11	295.7	81	✓	✓	✓	✓	8psi	✓	✓✓✓	358.65	✓	408.64	0920	407.16	0930	✓	358.77	Sample 131
0950	6	11	11	82	–	–	–	–	No	✓	✓✓✓	358.60	✓	408.22	1002	406.94	1014	✓	358.65	
	6		11	83	–	–	–	–	No	✓	✓✓✓	358.51	✓	408.38	1057	406.81	1107	✓	358.48	T-0.85 1.1L
	6		11	84																

Nov 29 Sample 130

Additional Comments: (pH, Turbidity, S.C., etc.)

Appendix K
Field Parameters from Development and Sampling

Table K1: Summary of EC and pH at Doris Centre 10WBW001 Zone 1 Airlift Purge

	Cumulative Volume L	EC ms	pH	Comments
Lake Sample	0	0.294	8.01	Doris Lake
Sampling Port Water	563	>20	7.93	Initial samples from sampling port - nothing purged, but samples from inside first zone vol
	563	>20	8.13	
	1188	>20	7.91	From sampling port - note pumping port 6m below had been open overnight
	1189	>20	7.98	
	1190	>20	8.12	
Airlift Purge Water	30	2.82	7.09	Pink, turbid, mixed glycol and water from inside casing
	54	2	7.19	Pink, turbid, mixed glycol and water from inside casing
	60	2.08	7.2	Pink, turbid, mixed glycol and water from inside casing
	70	2.04	7.22	Pink, turbid, mixed glycol and water from inside casing
	100	1.97	7.2	Pink, turbid, mixed glycol and water from inside casing
	168	1.66	7.16	Pink, turbid, mixed glycol and water from inside casing
	200	1.67	7.16	Pink, turbid, mixed glycol and water from inside casing
	275	1.81	7.11	Pink, turbid, mixed glycol and water from inside casing
	325	1.95	7.13	Pink, turbid, mixed glycol and water from inside casing
	405	7.06	6.94	Pink, turbid, mixed glycol and water from inside casing
	450	7.04	6.97	Pink, turbid, mixed glycol and water from inside casing
	500	6.59	6.98	Pink, turbid, mixed glycol and water from inside casing
	550	6.78	6.94	Pink, turbid, mixed glycol and water from inside casing
	625	7.26	6.95	Pink, turbid, mixed glycol and water from inside casing
	695	>20	7.73	Greyish pink
	750	>20	7.81	Clearing up, now just light grey
	775	>20	7.97	
	795	>20	8.02	Sample 18
	853	>20	8.13	
	883	>20	8.15	
	903	>20	8.18	
	923	>20	8.2	
	956	>20	8.21	
	986	>20	8.22	
	1001	>20	8.22	
Airlift Purge Water	1021	>20	8.17	
	1054	>20	8.16	Sample 19
	1084	>20	8.17	
	1119	>20	8.19	
	1134	>20	8.2	
	1162	>20	8.21	
	1187	>20	8.23	
	1212	>20	8.22	
	1237	>20	8.23	
	1265	>20	8.21	
	1290	>20	8.21	
	1320	>20	8.25	
	1345	>20	8.23	
	1368	>20	8.19	Sample 20
	1393	>20	8.2	
	1471	>20	8.22	
	1456	>20	7.72	
	1501	>20	7.94	
	1531	>20	7.93	
	1561	>20	8.01	
	1586	>20	8.05	Sample 21
	1611	>20	7.97	
	1649	>20	8.05	
	1684	>20	8.09	
	1802	>20	8.01	8.18 likely contam from previous RO blank
	1937	>20	8.18	
	1962	>20	8.2	
	1992	>20	8.23	
	2018	>20	8.25	Sample 23
	2043	>20	8.25	
	2068	>20	8.27	
	2098	>20	8.27	
Airlift Purge Water	2121	>20	8.26	
	2176	>20	8.25	
	2196	>20	8.27	
	2224	>20	8.28	
	2274	>20	8.26	
	2327	>20	8.26	
	2377	>20	8.28	
	2430	>20	8.26	
	2533	>20	8.26	
	2558	>20	8.25	
	2636	>20	8.26	Sample 24
	2686	>20	8.27	
	2739	>20	8.27	
	2789	>20	8.27	
	2842	>20	8.24	
	2962	>20	8.26	
	3065	>20	8.24	Samples 25/26
	3168	>20	8.25	

Table K2: Summary of EC and pH at Doris Centre 10WBW001 Zone 6 Airlift Purge

	Cumulative Volume L	EC ms	pH	Comments
Lake Sample	0	0.294	8.01	Doris Lake
Initial Data Zone 1	0	>20	8.25	Water left in pipe at beginning of purge
Sampling Port	273	>20	6.89	Initial samples from sampling port - nothing purged, but samples from inside first zone vol
	273	>20	7.06	Initial samples from sampling port - nothing purged, but samples from inside first zone vol
Airlift Purging and Sampling	95	>20	8.34	
	185	>20	8.48	
	258	>20	7.64	
	338	>20	7.69	Sample 27
	363	>20	7.94	
	388	>20	8.07	
	413	>20	8.08	
	441	>20	8.06	
	466	>20	8.07	
	491	>20	8.04	
	516	>20	8.04	Sample 28
	544	>20	8.03	
	569	>20	8.03	
	594	>20	8.01	
	619	>20	8.01	
	647	>20	7.98	
	672	>20	7.58	Start new day remove glycol again
	822	>20	7.64	Sample 29
	847	>20	7.67	
	872	>20	7.66	
	897	>20	7.66	
	925	>20	7.73	
	950	>20	7.78	
	975	>20	7.79	
	1000	>20	7.8	
Airlift Purging and Sampling	1028	>20	7.8	
	1053	>20	7.9	
	1078	>20	7.94	
	1103	>20	7.94	
	1131	>20	7.92	Sample 30
	1156	>20	7.91	
	1181	>20	7.89	
	1234	>20	7.85	
	1259	>20	7.85	
	1284	>20	7.83	
	1309	>20	7.84	
	1359	>20	7.82	
	1440	>20	7.78	
	1515	>20	7.78	Sample 31
	1543	>20	7.76	
	1593	>20	7.78	
	1646	>20	7.75	
	1696	>20	7.74	
	1749	>20	7.74	
	1799	>20	7.74	
	1852	>20	7.73	
	1902	>20	7.74	
	1952	>20	7.63	Could be affected by reading glycol in drum in between purge volumes
	1977	>20	7.69	Could be affected by reading glycol in drum in between purge volumes
	2058	>20	7.7	Sample 32
	2161	>20	7.7	
	2264	>20	7.71	
	2389	>20	7.7	
	2513	>20	7.72	
	2638	>20	7.71	
Airlift Purging and Sampling	2741	>20	7.68	
	2844	>20	7.66	
	2954	>20	7.66	
	3057	>20	7.66	
	3167	>20	7.65	
	3270	>20	7.64	
	3373			
	3601	>20	7.59	
	3704	>20	7.61	
	3807	>20	7.63	
	3910	>20	7.62	
	4035	>20	7.61	
	4138	>20	7.6	
	4241	>20	7.59	
	4344	>20	7.6	
	4447	>20	7.59	
	4550	>20	7.57	
	4675	>20	7.57	
	5006	>20	7.51	
	5212	>20	7.56	
	5521	>20	7.54	
	5727	>20	7.54	
	5977	>20	7.53	
	6183	>20	7.54	
	6433	>20	7.52	Sample 33
	6718	>20	7.47	
	7003	>20	7.48	
	7209	>20	7.46	
	7422	>20	7.46	
	7650	>20	7.48	
	7883	>20	7.46	
	8096	>20	7.46	

Table K3: Summary of EC and pH at Doris Centre 10WBW001 Zone 10 Airlift Purge

	Cumulative Volume L	EC ms	pH	Comments
Lake Sample	0	0.294	8.01	Doris Lake
Sampling Port Water	105	>20	7.77	Initial samples from sampling port - nothing purged, but samples from inside first zone vol
	105	>20	7.76	Initial samples from sampling port
	105	>20	7.83	Initial samples from sampling port
	105	>20	7.75	Initial samples from sampling port
	105	>20	7.82	Initial samples from sampling port
	105	>20	7.49	Sample from port for density
Airlift Purge Water	205	>20	7.67	
	255	>20	7.62	
	330	>20	7.58	Sample 10
	392	>20	7.49	
	452	>20	7.45	
	497	>20	7.47	Sample 11
	534	>20	7.44	
	581	>20	7.46	
	656	>20	7.57	
	814	>20		error in measurement, not left to stablise (6.71)
	849	>20	7.5	Sample 12
	916	>20	7.65	
	942	>20	7.68	
	968	>20	7.67	
	994	>20	7.67	
	1019	>20	7.66	
	1045	>20	7.65	
	1071	>20	7.66	
	1097	>20	7.66	
	1122	>20	7.66	
	1148	>20	7.67	
	1174	>20	7.67	
	1209	>20	7.66	
Airlift Purge Water	1225	>20	7.67	
	1277	>20	7.66	
	1328	>20	7.65	
	1380	>20	7.63	Sample 13
	1433	>20	7.61	
	1485	>20	7.61	
	1536	>20	7.61	
	1588	>20	7.63	
	1639	>20	7.61	
	1691	>20	7.59	
	1742	>20	7.57	
	1794	>20	7.54	
	1845	>20	7.54	
	1897	>20	7.54	
	1949	>20	7.54	
	2051	>20	7.56	Sample 14
	2111	>20		7.27 - error
	2267	>20	7.44	
	2319	>20	7.43	
	2380	>20	7.44	
	2432	>20	7.46	
	2483	>20	7.47	
	2535	>20	7.46	
	2586	>20	7.47	
	2638	>20	7.42	
	2699	>20	7.45	
	2802	>20	7.43	
	2854	>20	7.42	
	2905	>20	7.41	
	2961	>20	7.42	
	3008	>20	7.39	Sample 15/16 (dup)

Table K4: Summary of Field Parameters at Doris Centre 10WBW001 Zone 6 Airlift Purge

	Cumulative Volume L	pH	EC S/cm	Turbidity NTU	Dissolved Oxygen g/L	Salinity %	TDS g/L	ORP mV	Comments
Airlift Purge Water	40	6.96	7.09		11.42	0.4	4.6		glycol being removed
	80	7.19	6.41	522	11.06	0.3	4.1		glycol being removed
	120		11.8	488	10.61	0.6	7	-111	glycol being removed
	200	5.51	16.1	203	10.37	0.9	10	-120	glycol being removed
	270	5.48	56	236	11.2	3.4	34	-145	
	320	5.51	69.5	209	11.3	4	42	-138	
	370	7.24	60.8	464	13.03	3.8	36	-144	start of second day, some glycol below may have mixed overnight
	420	7.37	62.7	213	12.48	3.9	38	-128	
	470	7.42	64	199	12.24	3.8	37	-125	
	520	7.5	61.5	219	11.94	3.9	38	-105	
	620	5.59	61.3	277	11.74	3.8	37	-149	
	720	5.56	61.8	173	11.82	3.8	37	-158	
	920	5.52	60.3	52.1	11.95	3.8	37	-144	
	1120	5.55	61.7	36.5	11.78	3.8	37	-138	
	1320	5.46	61.8	17.1	11.4	3.8	37	-129	
	1520	5.45	60.1	12.5	11.62	3.7	36	-127	
	1720	5.44	61.8	8.8	11.64	3.8	37	-123	
	1820	5.44	60.4	8.4	11.49	3.7	36	-125	Slowed pump rate for sampling
	1960	5.46	60.3	7.8	11.12	3.7	36	-125	
	2090	5.46	60.2	8.6	11.59	3.7	36	-121	
	2340		59.9	8	11.7	3.7	36	-117	
	2440	5.48	60.3	7.7	11.34	3.8	36	-116	
	2540	5.70	60.2	6.2	11.51	3.8	36	-112	

Table K5: Summary of Field Parameters Collected from Doris North 10WBW002 Zone 1 During Purging and Sampling

	Cumulative Volume *L*	pH	EC *mS/cm*	Turbidity *NTU*	Dissolved Oxygen *mg/L*	Temperature *°C*	Salinity *%*	TDS *g/L*	ORP *mV*	Comments
Sampling Port Purge Water	29.3	6.02	99.9	409	12.35	0.69	4.0	99.0	146	
	36.9	6.02	99.9	459.0	14.74	-1.46	4.0	99.0	109	
	40.2	6.07	99.9	334.0	12.95	2.72	4.0	99.0	113	
	41.3	6.10	99.9	363.0	13.32	1.42	4.0	99.0	58	
	42.4	6.16	99.9	224.0	14.18	0.87	4.0	99.0	55	
	43.5	6.11	99.9	278.0	13.46	0.36	4.0	99.0	50	
	44.3	6.16	99.9	247.0	15.29	2.01	4.0	99.0	46	Screw cap loose when system brough to surface, so some sample was lost
	45.4	6.16	99.9	216.0	14.92	1.36	4.0	99.0	45	
	46.4	7.36	99.9	167.0	12.33	9.36	4.0	99.0	67	The field parameters for this run were delayed compared to other runs; this run was completed with cleaned actuator, new shoe, new face plate seal and new plunger
	48.8	6.15	48.4	319	15.73	2.47	0.9	29.0	74	
	52.1	6.13	99.9	-5.0	14.15	4.33	4.0	99.0	106	

Table K6: Summary of Field Parameters of Lower Port at Boston 10WBW004 During Purging and Sampling

	Cumulative Volume *L*	pH	EC *mS/cm*	Turbidity *NTU*	Dissolved Oxygen *mg/L*	Temperature *°C*	Salinity *%*	TDS *g/L*	ORP *mV*	Comments
Sampling Port Purge Water	11.0	5.34	89.0	141.0	9.79	10.10	*4.0*	53	298	
	12.1	5.16	95.3	24.2	16.35	7.72	*4.0*	57	237	
	13.2	5.80	96.7	11.0	12.60	4.00	*4.0*	57	230	
	14.3	6.10	95.3	0.0	8.68	8.49	*4.0*	57	169	
	15.4	5.86	95.3	9.0	11.79	4.62	*4.0*	58	200	
	15.9	5.71	97.3	0.0	13.30	8.72	6.5	58	200	Salinity of 6.5 determined by diluting sample with RO water, 4:1, and then multiplying value recorded by 5
	16.5	5.74	93.0	5.0	8.44	3.34	*4.0*	56	169	
	17.6	5.83	94.7	14.8	14.98	6.31	6.8	57	210	Salinity of 6.8 determined by diluting sample with RO water, 1:1 , and then multiplying value recorded by 2
	21.7	6.30	93.2	0.0	*20.00*	10.02	6.8	57	216	zone temp @ this port, -0.68 to -0.74 C, 3 measurements. Salinity of 6.8 determined by diluting sample with RO water, 1:1 , and then multiplying value recorded by 2
	22.8	6.41	94.3	0.0	*20.00*	8.16	7.0	57	205	Salinity of 7.0 determined by diluting sample with RO water, 1:1 , and then multiplying value recorded by 2
	23.9	6.54	94.3	5.3	*20.00*	4.62	7.0	57	210	
	26.00	5.13	87.6	0.0	*20.00*	15.26	6.6	52	308	
	27.06	5.22	89.5	0.1	*20.00*	11.23	6.6	54	245	
	28.12	5.09	87.9	0.0	*20.00*	5.54	5.8	53	226	
	33.58	5.60	6.5	0.0	*20.00*	5.68	4.4	40	203	
	34.58	5.61	49.9	0.0	*20.00*	2.97	3.0	30	169	
	44.12									Sample 10WBW004-126, start
Sampling Port Purge Water	45.22									Sample 10WBW004-126, continued. Routine and Total Metals samples obtained
	47.42	6.83	40.4	40.0	19.08	10.52	2.5	25.0	161	Sample 10WBW004-126, end
	48.52									Sample 10WBW004-127 - rinsate, approx 300ml. - taken before the run. Sample 10WBW004-126, continued. Nutrients, Isotopes and Dis. Metals samples obtained
	70.68	7.02	42.0	0.0	*20.00*	3.84	2.5	26	183	
	72.82	6.80	40.0	0.0	19.37	9.23	2.5	24	164	
	73.92									Sample 10WBW004-130, start
	75.02									
	75.02									
	76.12	7.12	38.7	0.0	18.37	14.86	2.4	24	164	Sample 10WBW004-130, end.
	77.22	7.14	39.1	0.0	18.11	11.70	2.5	24	159	
	82.62	7.10	40.9	4.3	*20.00*	5.76	2.6	26	171	

Table K7: Summary of Field Parameters of Upper Port at Boston 10WBW004 During Purging and Sampling

	Cumulative Volume *L* 1.1	pH 6.29	EC *mS/cm* 37.1	Turbidity *NTU* 82.5	Dissolved Oxygen *mg/L* 13.94	Temperature *°C* 2.03	Salinity *%* 2.2	TDS *g/L* 23.0	ORP *mV* 253	Comments
Sampling Port Purge Water	2.2									Sample 10WBW004-123, start. No parameters measured, entire sample use for sample
	3.3									No parameters measured, entire sample use for sample
	4.4	6.26	37.2	6.9	13.52	5.50	2.30	23.00	169	
	5.5									Sample 10WBW004-123, end No parameters measured, entire sample use for sample
	6.6	6.34	34.2	12.3	10.30	19.56	2.2	21	206	
	7.7	6.27	33.8	17.5	8.98	20.22	2.1	21	170	
	8.8	6.17	35.1	27.0	10.76	11.68	2.2	21	181	
	9.9	6.12	38.3	39.9	13.42	2.87	2.3	23	178	
	18.4	5.50	36.6	72.4	13.87	8.54	2.2	22	253	zone temp @ this port, -0.79 to -0.86 C, 3 measurements
	19.5	5.78	40.6	0.0	19.82	5.78	2.5	25	301	
	20.6	6.13	39.2	0.1	20.00	6.50	2.4	24	245	
	25.0	6.50	39.1	10.7	20.00	7.87	2.4	24	189	
	29.22	6.03	38.3	0.8	20.00	10.33	2.4	23	233	
	30.32	5.38	41.9	0.0	20.00	1.25	2.5	26	200	
	31.42	5.56	38.9	0.0	20.00	6.88	2.4	24	195	
	32.52	5.70	40.7	0.0	20.00	4.63	2.5	25	185	
	35.68	5.55	38.6	0.0	20.00	6.85	2.4	24	179	
	36.72	5.11	40.0	0.1	20.00	5.79	2.5	24	283	zone temp @ this port, -0.86 at end fo sampling port.
Sampling Port Purge Water	37.82									Samples 10WBW004-124 and 10WBW004-125, start.
	38.92									Samples 10WBW004-124 and 10WBW004-125, continued.
	40.02									Samples 10WBW004-124 and 10WBW004-125, continued.
	41.12									Samples 10WBW004-124 and 10WBW004-125, continued.
	42.22									Samples 10WBW004-124 and 10WBW004-125, continued.
	43.32	5.75	38.00	0.0	19.97	6.95	2.3	23	243	Samples 10WBW004-124 and 10WBW004-125, end. 0.5 L used to measure parameters
	46.32	6.20	36.9	10.6	16.72	13.19	2.3	23	169	Could not land on lower port (elev 304.8m)
	49.62	5.84	39.8	0	20.00	5.96	2.4	24.0	261	zone temp -0.91C
	50.68	5.86	41.5	0.0	20.00	6.67	2.6	25	212	zone temp -0.82C
	51.78	6.21	42.8	0.0	20.00	5.23	2.6	26	209	
	52.88	6.40	42.3	38.2	20.00	5.74	2.6	26	192	
	53.98	6.38	44.0	0.0	20.00	3.68	2.7	27	199	
	55.08									Sample 10WBW004-128, start.
	56.18									
	57.28	6.83	41.2	0.0	20.00	10.45	2.6	25	169	Sample 10WBW004-128, end.
	58.38	7.01	41.3	0.0	19.00	11.32	2.6	29	158	
	59.48	7.11	43.6	0.0	18.06	12.75	2.8	27	175	
	69.58	7.13	42.1	0.0	20.00	4.93	2.5	25	170	
	71.78	6.31	37.9	2.3	20.00	4.80	2.3	23	196	
	78.32	7.28	39.9	0.1	17.51	9.59	2.4	23	147	
	79.42	7.13	39.5	0.1	19.36	8..46	2.5	24	163	
Sampling Port Purge Water	80.48	7.08	38.2	0.1	18.27	8.97	2.4	23	167	
	81.58	7.19	36.9	0.0	17.76	11.76	2.3	23	155	zone temp = -0.66
	83.68	6.45	38.1	0.1	12.12	10.98	2.4	23	203	
	84.78								208	Sample 10WBW004-131, start. Zone temp = -0.64C
	85.82	6.30	39.1	0.2	14.71	6.88	2.4	24	195	
	86.92								208	Sample 10WBW004-131, end. Zone temp = -0.85C

Appendix L
Water Quality Results Tables

Table L1: Summary of Final, Purged Water Quality Results from Doris Central 10WBW001 Zones 1, 6 and 10

Parameter	Units	Doris Central - Zone 10 Final port samples	Doris Central - Zone 6 Final port samples	Doris Central - Zone 1 Final port samples
		(n=3)	(n=3)	(n=3)
pH	pH units	7.44 to 7.47	7.59 to 7.83	7.38 to 7.69
TDS	mg/L	23100 to 34500	19600 to 28900	42300 to 47800
Alkalinity, Total	mg/L	77.3 to 106	43.7 to 44.2	<2
Conductivity	uS/cm	30300 to 43300	24600 to 37000	46600 to 46900
Calcium	mg/L	1010 to 1560	749 to 1160	4960 to 4730
Magnesium	mg/L	849 to 1250	702 to 1080	70 to 64
Potassium	mg/L	160 to 249	117 to 172	39 to 40
Sodium	mg/L	5400 to 8700	4130 to 6810	6910 to 7290
Alkalinity, Bicarbonate	mg/L	77.3 to 106	44.2 to 43.7	<2
Chloride	mg/L	11500 to 16500	9130 to 14200	18400 to 19000
Sulphate	mg/L	1160 to 1580	940 to 1500	935 to 981
Bromide	mg/L	27.6 to 41	21.2 to 41.3	100 to 101
Barium	mg/L	0.122 to 0.169	0.120 to 0.169	0.0526 to 0.053
Aluminum	mg/L	<0.005	<0.005	<0.005 to 0.005
Arsenic	mg/L	<0.002	<0.002	<0.002
Cadmium	mg/L	<0.00005	<0.00005	<0.00012 to 0.000097
Chromium	mg/L	<0.0001	<0.001 to <0.0001	<0.001 to <0.0001
Cobalt	mg/L	0.000102 to 0.000187	0.000087 to 0.000091	<0.0005 to <0.00005
Copper	mg/L	<0.0005 to 0.00296	<0.0005	<0.001 to 0.00067
Iron	mg/L	2.68 to 8.94	0.06 to 0.503	<0.5 to <0.075
Lead	mg/L	<0.0003	<0.0003	<0.001 to <0.0003
Manganese	mg/L	1.04 to 1.69	0.53 to 0.94	0.69 to 0.725
Molybdenum	mg/L	0.0044 to 0.0259	0.0345 to 0.037	0.009 to 0.0128
Nickel	mg/L	<0.0005 to 0.0006	<0.0005 to 0.00158	<0.0005 to 0.00237
Selenium	mg/L	<0.002	<0.002	<0.002
Zinc	mg/L	0.0504 to 0.0851	0.02 to 0.0705	0.0897 to 0.137

All reported metal concentrations are dissolved.

Table L2: Summary of Water Quality Results from Purging Doris North 10WBW002 Zone 1, Compared with Doris Central 10WBW001 Final Results from all Zones, Boston Drill Water and Other Reference Samples

Parameter	Units	Doris North - Zone 1 all purge samples	Doris North Inside Westbay Casing at 600m	Boston Drill Water (no Doris drill water sample available)	Prepared Glycol-Water Mix	Doris Lake	Doris Central - Zone 10 Final port samples	Doris Central - Zone 6 Final port samples	Doris Central - Zone 1 Final port samples
		(n=4)	(n=1)	(n=2)	(n=1)	(n=2)	(n=3)	(n=3)	(n=3)
pH	pH units	8.51	6.63	6.31 to 7.03	7.58	7.10 to 8.52	7.44 to 7.47	7.59 to 7.83	7.38 to 7.69
TDS	mg/L	223000 to 250000	116000	12400 to 26000	187	192 to 188	23100 to 34500	19600 to 28900	42300 to 47800
Alkalinity, Total	mg/L	59	42	13 to 41.9	46	31.8 to 34.4	77.3 to 106	44.2 to 43.7	<2
Conductivity	uS/cm	160000 to 182000	19200	19800 to 39600	152	304 to 324	30300 to 43300	24600 to 37000	46600 to 46900
Calcium	mg/L	72100 to 79800	29400	4330 to 8320	8.55	9.30 to 9.70	1010 to 1560	749 to 1160	4920 to 4730
Magnesium	mg/L	110 to 124	65	18.7 to 84.7	5.9	5.96 to 7.37	849 to 1250	702 to 1080	70 to 64
Potassium	mg/L	39 to 52	-200	12.6 to 83	31	2.11 to 2.31	160 to 249	117 to 172	39 to 40
Sodium	mg/L	300 to 1680	-200	62.7 to 439	30	29.6 to 38.0	5400 to 8700	4130 to 6810	6910 to 7290
Alkalinity, Bicarbonate	mg/L	57.4		15.9 to 51.1		27.2 to 41.9	77.3 to 106	44.2 to 43.7	<2
Chloride	mg/L	114000 to 123000	46800	7530 to 16400	53	60.3 to 76.6	11500 to 16500	9130 to 14200	18400 to 19000
Sulphate	mg/L	na	<500	5.28 to 50	<50		1160 to 1580	940 to 1500	935 to 981
Bromide	mg/L						27.6 to 41	21.2 to 41.3	100 to 101
Aluminum	mg/L	<0.05	<0.025	<0.1	<0.005	<0.01	<0.005	<0.005	<0.005 to 0.005
Arsenic	mg/L	<0.02	0.027	<0.08 to 0.0537	0.0103	0.00057 to 0.00068	<0.002	<0.002	<0.002
Barium	mg/L	0.683 to 0.833	0.308	0.188 to 0.700	0.0034	0.0036 to 0.0037	0.122 to 0.169	0.120 to 0.169	0.0526 to 0.053
Cadmium	mg/L	<0.0005	<0.0012	<0.01 to <0.001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00012 to 0.000097
Chromium	mg/L	<0.001	<0.0025	0.0139 to 0.519	<0.0005	<0.005	<0.0001	<0.001 to <0.0001	<0.001 to <0.0001
Cobalt	mg/L	<0.0005	0.00052	0.0053 to 0.033	<0.00005	<0.002	0.000102 & 0.000187	0.000087 to 0.000091	<0.0005 to <0.00005
Copper	mg/L	.0129 to 0.0158	0.0101	<0.012 to <0.12	0.00180	0.0016 to 0.0022	<0.0005 one @ 0.00296	<0.0005	<0.001 to 0.00067
Iron	mg/L	0.12 to <0.1	<0.05	0.091 to 12.7	<0.01	<0.03 to 0.035	2.68 to 8.94	0.06 to 0.503	<0.5 to <0.075
Lead	mg/L	0.003 to <0.003	<0.015	<0.002 to <0.02	<0.003	<0.0001 to 0.00069	<0.0003	<0.0003	<0.001 to <0.0003
Manganese	mg/L	0.0141 to 0.0196	0.741	0.615 to 2.09	0.00109	<0.005 to 0.006	1.04 to 1.69	0.53 to 0.94	0.69 to 0.725
Molybdenum	mg/L	.163 to 0.175	0.063	0.0310 to 0.074	<0.002		0.0044 to 0.0259	0.0345 to 0.037	0.009 to 0.0128
Nickel	mg/L	<0.005 to 0.0072	0.0096	0.0764 to 0.190	<0.0005		<0.0005 one @ 0.0006	<0.0005 to 0.00158	<0.0005 to 0.00237
Selenium	mg/L	<0.02	<0.07	<0.04 to <0.4	<0.02		<0.002	<0.002	<0.002
Zinc	mg/L	<0.03 to 0.044	1.99	<0.02 to <0.2	0.0069		0.0504 to 0.0851	0.02 to 0.0705	0.0897 to 0.137

Table L3: Summary of EWater Quality Results from Purging Boston 10WBW004 Zone 6, Compared with Doris Central 10WBW001 Final Results From All Zones, Boston Drill Water and Spyder Lake

Parameter	Units	Boston - Zone 6 Top port all purge samples	Boston - Zone 6 Middle Port all purge samples	Boston Drill Water	Spyder Lake Water	Doris Central - Zone 10 Final port samples	Doris Central - Zone 6 Final port samples	Doris Central - Zone 1 Final port samples
		(n=5)	(n=3)	(n=2)	(n=1)	(n=3)	(n=3)	(n=3)
pH	pH units	6.66 to 7.05	6.81 to 7.09	6.31 to 7.03	6.99	7.44 to 7.47	7.59 to 7.83	7.38 to 7.69
TDS	mg/L	28500 to 32300	33300 to 33900	12400 to 26000	32	23100 to 34500	19600 to 28900	42300 to 47800
Alkalinity, Total	mg/L	35.3 to 53.5	40.0 to 53.0	13 to 41.9	7.9	77.3 to 106	44.2 to 43.7	<2
Conductivity	uS/cm	30200 to 31800	33300 to 33800	19800 to 39600	44	30300 to 43300	24600 to 37000	46600 to 46900
Calcium	mg/L	4080 to 5050	4180 to 4620	4330 to 8320	3	1010 to 1560	749 to 1160	4920 to 4730
Magnesium	mg/L	309 to 387	404 to 432	18.7 to 84.7	1.42	849 to 1250	702 to 1080	70 to 64
Potassium	mg/L	47 to 49	48 to 53	12.6 to 83	0.72	160 to 249	117 to 172	39 to 40
Sodium	mg/L	1790 to 2330	2410 to 2600	62.7 to 439	3.8	5400 to 8700	4130 to 6810	6910 to 7290
Alkalinity, Bicarbonate	mg/L	35.3 to 53.5	40.0 to 53.0	15.9 to 51.1	9.6	77.3 to 106	44.2 to 43.7	<2
Chloride	mg/L	12100 to 12800	13400 to 13700	7530 to 16400	7.58	11500 to 16500	9130 to 14200	18400 to 19000
Sulphate	mg/L	244 to 330	336 to 349	5.28 to 50	1.63	1160 to 1580	940 to 1500	935 to 981
Bromide	mg/L	6.3 to 9.0	9.2 to 9.9			27.6 to 41	21.2 to 41.3	100 to 101
Aluminum	mg/L	<0.005	<0.005	<0.1	0.014	<0.005	<0.005	<0.005 to 0.005
Arsenic	mg/L	<0.002	<0.002	<0.08 to 0.0537	<0.0004	<0.002	<0.002	<0.002
Barium	mg/L	0.555 to 0.594	0.533 to 0.582	0.188 to 0.700	<0.003	0.122 to 0.169	0.120 to 0.169	0.0526 to 0.053
Cadmium	mg/L	<0.0001	<0.0001	<0.01 to <0.001	<0.00005	<0.00005	<0.00005	<0.00012 to 0.000097
Chromium	mg/L	<0.0001 to <0.0005	<0.0005	0.0139 to 0.519	<0.005	<0.0001	<0.001 to <0.0001	<0.001 to <0.0001
Cobalt	mg/L	0.00529 to 0.00779	0.00526 to 0.00566	0.0053 to 0.033	<0.002	0.000102 & 0.000187	0.000087 to 0.000091	<0.0005 to <0.00005
Copper	mg/L	<0.0005	<0.0005	<0.012 to <0.12	0.0015	<0.0005 one @ 0.00296	<0.0005	<0.001 to 0.00067
Iron	mg/L	4.45 to 8.05	4.34 to 6.43	0.091 to 12.7	0.068	2.68 to 8.94	0.06 to 0.503	<0.5 to <0.075
Lead	mg/L	<0.0003 to <0.0005	<0.0005	<0.002 to <0.02	<0.0001	<0.0003	<0.0003	<0.001 to <0.0003
Manganese	mg/L	0.870 to 1.01	0.888 to 0.911	0.615 to 2.09	0.0064	1.04 to 1.69	0.53 to 0.94	0.69 to 0.725
Molybdenum	mg/L	0.0860 to 0.0967	0.0990 to 0.101	0.0310 to 0.074	<0.005	0.0044 to 0.0259	0.0345 to 0.037	0.009 to 0.0128
Nickel	mg/L	0.0208 to 0.0320	0.0199 to 0.0203	0.0764 to 0.190	<0.002	<0.0005 one @ 0.0006	<0.0005 to 0.00158	<0.0005 to 0.00237
Selenium	mg/L	<0.002	<0.0021 to <0.0045	<0.04 to <0.4	<0.0004	<0.002	<0.002	<0.002
Zinc	mg/L	<0.0005	<0.0005	<0.02 to <0.2	0.0032	0.0504 to 0.0851	0.02 to 0.0705	0.0897 to 0.137

Table L4: All 10WBW001 Zone 1 Water Quality Results

Field Sample ID / Unique ID	Units	10WBW001-01b	10WBW001-17	10WBW001-20	10WBW001-25	10WBW001-26	10WBW001-35	10WBW001-100	10WBW001-106
Sample From		**Westbay Port**	**Westbay Port**	**Westbay airlift**	**Westbay airlift**	**Westbay airlift**	**Westbay Port**	**Westbay Port**	**Westbay Port**
Sample Purging Status		**Initial sample**	**Purging sample**	**Purging sample**	**Final' Sample**	**Final' Sample**	**Final' Sample**	**Final' Sample**	**Final' Sample**
Sample label		10WBW001-Zone 1-Port Initial-S01b	10WBW001-Zone 1-Port Purge-S17	10WBW001-Zone 1-Airlift Purge - S20	10WBW001-Zone 1-Airlift Final-S25	10WBW001-Zone 1-Airlift Final-S26D	10WBW001-Zone 1-Port Final-S35	10WBW001-Zone 1-Port after 2mths-S100	10WBW001-Zone 1-Port after bulk-S106
Location of port in zone		Top	Top	Middle	Middle	Middle	Top	Top	Top
Deposit		Doris Lower	Doris Lower	Doris Lower	Doris Lower	Doris Lower	Doris Lower	Doris Lower	Doris Lower
Sample Location		10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001
Sample Zone		1	1	1	1	1	1	1	1
Zone port drillhole depth		548.0	548.0	554.00	554.00	554.00	548.0	548.0	548.0
Zone port vertical depth	m	484.8	484.8	?	?	?	484.8	484.8	484.8
Sample Comments		n/a	Pumping port had been open all night, potential for glycol contam.	n/a	n/a	n/a	n/a	After leaving zone sitting for 2 months	After airlifting water from zone 6 (diff zone). Should be same as S100
QA/QC Sample?		N	N	N	Y	Y	N	N	N
QA/QC Comments		n/a	n/a	n/a	Duplicate of 10WBW001-26	Duplicate of 10WBW001-25	n/a	n/a	n/a
Total Litres purged from zone before sample was taken		0	1189	1368	3065	3065	3186	3189	3192
Zone volumes purged before sample was taken		0.0	6.6	8.5	26.2	26.2	27.4	27.4	27.5
Field Data									
Field pH		8.03	8	8.19	8.24	8.24	8.44	7.73	6.00
Field Electrical Conductivity	mS/cm	>20	>20	>20	>20	>20	>20	52	52.65
Field Turbidity	NTU	n/a	n/a	n/a	n/a	n/a	n/a	72.85	211.00
Field DO	mg/L	n/a	n/a	n/a	n/a	n/a	n/a	11.2	11.43
Field Temperature	°C	n/a	14.4	3.9	n/a	n/a	n/a	11.79	4.51
Field Dep	m	n/a	n/a	n/a	n/a	n/a	n/a	-0.5	-1.00
Field Salinity	%	n/a	n/a	n/a	n/a	n/a	n/a	3.5	3.50
Field TDS		n/a	n/a	n/a	n/a	n/a	n/a	32.5	32.00
Field oT		n/a	n/a	n/a	n/a	n/a	n/a	26.5	26.50
Field ORP		n/a	n/a	n/a	n/a	n/a	n/a	39.5	15.00
Sample colour/turbidity comments		n/a	Clear	V. Light grey. Slightly turbid, more	n/a	n/a	Clear	n/a	n/a
ALS DATA									
ALS File No.		L909782	L915201	L915201	L915201	L915201	L917645	L946743	L949713
Date Lab Received		17-Jul-10 13:05	01-Aug-10 11:24	01-Aug-10 11:24	01-Aug-10 11:24	01-Aug-10 11:24	09-Aug-10 09:10	25-Oct-10 11:21	02-Nov-10 10:21
ALS Report Date		28-Jul-10	13-Aug-10	13-Aug-10	13-Aug-10	13-Aug-10	20-Aug-10	10-Dec-10	01-Dec-10
RESULTS OF ANALYSIS									
ALS SRK Sample ID		10WBW001-01	10WBW001-17	10WBW001-20	10WBW001-25	10WBW001-26	10WBW001-35	10WBW001-100	10WBW001-106
ALS Date Sampled		08-JUL-10	25-JUL-10	25-JUL-10	25-JUL-10	25-JUL-10	04-AUG-10	19-OCT-10	30-OCT-10
ALS Time Sampled		15:00	11:25	17:11	12:37	12:37	13:42	12:00	13:00
ALS Sample ID		L909782-1	L915201-3	L915201-6	L915201-13	L915201-14	L917645-1	L946743-1	L949713-3
Matrix		Water	Water	Water	Water	Water	Seawater	Seawater	Seawater
Physical Tests									
Conductivity (EC)	uS/cm	47600	47400	47500	47600	47600	46600	46700	46900
Density		1.02						1.01	1.03
Hardness (as CaCO3)	mg/L	11700	11500	10900	11500	11100	12700	12600	12100
pH	pH	7.67	7.91	7.83	7.65	7.72	7.43	7.38	7.69
Salinity (EC)	g/L							30.50	31.2
Total Dissolved Solids	mg/L	33100	32400	33200	33300	32400	47800	42300	47500
Leachable Anions & Nutrients									
Anion Sum	meq/L							00019	539
Cation Sum	meq/L							00565	543
Cation - Anion Balance	%							00094	0.4
Anions and Nutrients									
Alkalinity, Bicarbonate (as CaCO3)	mg/L	8.4	9.7	9.3	8.2	7.9	<2	<2	<2
Alkalinity, Carbonate (as CaCO3)	mg/L							<2	<2
Alkalinity, Hydroxide (as CaCO3)	mg/L							<2	<2
Alkalinity, Total (as CaCO3)	mg/L							<2	<2
Ammonia as N	mg/L								0.0631
Bromide (Br)	mg/L						100	101	101
Chloride (Cl)	mg/L	18200	19100	19000	18700	18800	19000	19000	18400
Fluoride (F)	mg/L	<5	<1	<1	<1	<1	<0.75	<0.75	<0.75
Nitrate (as N)	mg/L	<5	<1	<1	<1	<1	<0.5	0.96	<0.5
Nitrite (as N)	mg/L	<5	<1	<1	<1	<1	<0.1	<0.1	<0.1
Ortho Phosphate as P	mg/L							0.0264	0.0086
Total Phosphate as P	mg/L								0.0163
Silicate (as SIO2)	mg/L							7.8	<10
Sulfate (SO4)	mg/L	1020	1010	0997	0960	0964	0981	980	935
Additional Anions and Nutrients									
Bicarbonate (HCO3)	mg/L	10.2	11.9	011	010	010			
Carbonate (CO3)	mg/L	<5	<5	<5	<5	<5			
Hydroxide (OH)	mg/L	<5	<5	<5	<5	<5			
Ion Balance	%	100	094	89.9	95.5	89.8	001		
Nitrate and Nitrite as N	mg/L	<7.1	<1.4	<1.4	<1.4	<1.4			
TDS (Calculated)	mg/L	30700	31500	30800	31000	30500			
Total Metals									
Aluminum (Al)-Total	mg/L	0.42	<2	<2	<2	<2	0.0992	0.0136	0.0086
Antimony (Sb)-Total	mg/L	<0.008	<0.08	<0.08	<0.08	<0.08	<0.0005	<0.0005	<0.0005
Arsenic (As)-Total	mg/L	<0.08	0.113	0.114	0.296	0.101	<0.002	<0.002	<0.002
Barium (Ba)-Total	mg/L	0.059	0.046	0.054	0.054	0.059	0.051	0.053	0.0521
Beryllium (Be)-Total	mg/L	<0.02	<0.2	<0.2	<0.2	<0.2	<0.0005	<0.0005	<0.0005
Bismuth (Bi)-Total	mg/L						<0.0005	<0.0005	<0.0005
Boron (B)-Total	mg/L	3.11	2.38	2.59	2.56	2.50	2.93	2.89	3.25
Cadmium (Cd)-Total	mg/L	<0.001	<0.01	<0.01	<0.01	<0.01	<0.00012	0.000066	0.000085
Calcium (Ca)-Total	mg/L	4650	4100	4430	4430	4380	5070	4960	4700
Cesium (Cs)-Total	mg/L						0000	0.00102	0.0011
Chromium (Cr)-Total	mg/L	0.036	0.960	0.95	0.62	0.74	0.01	0.0006	0.0002
Cobalt (Co)-Total	mg/L	0.0046	<0.04	<0.04	<0.04	<0.04	<0.0005	0.000073	0.000051
Copper (Cu)-Total	mg/L	<0.02	<0.2	<0.2	<0.2	<0.2	0.0018	0.00059	0.00102
Gallium (Ga)-Total	mg/L						<0.0005	<0.0005	<0.0005
Iron (Fe)-Total	mg/L	2.27	0.51	0.68	0.15	0.16	0.46	0.24	0.197
Lead (Pb)-Total	mg/L	0.0021	<0.02	<0.02	<0.02	<0.02	0.0013	<0.0003	<0.0003
Lithium (Li)-Total	mg/L	0.37	<1.2	<1.2	<1.2	<1.2	0.37	0.346	0.381
Magnesium (Mg)-Total	mg/L	181	076	066	0051	0053	0071	064	67.8
Manganese (Mn)-Total	mg/L	1.44	0.77	0.71	0.62	0.64	0.72	0.72	0.712
Mercury (Hg)-Total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.00001	<0.00001
Molybdenum (Mo)-Total	mg/L	0.0411	0.0200	<0.02	<0.02	<0.02	0.0136	0.0089	0.0088
Nickel (Ni)-Total	mg/L	0.0774	0.0740	0.071	0.068	0.074	0.00437	0.00075	0.00265
Phosphorus (P)-Total	mg/L						<1	<1	<1
Potassium (K)-Total	mg/L	057	036	035	044	045	040	040	39
Rhenium (Re)-Total	mg/L						<0.0005	<0.0005	<0.0005
Rubidium (Rb)-Total	mg/L						000	0.0526	0.0531
Selenium (Se)-Total	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.002	<0.002	<0.002
Silicon (Si)-Total	mg/L						2.61	2.79	2.47
Silver (Ag)-Total	mg/L	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0001	<0.0001
Sodium (Na)-Total	mg/L	7390	6290	6580	7420	7870	7470	7200	6850
Strontium (Sr)-Total	mg/L						0060	57.2	54.6
Tellurium (Te)-Total	mg/L						<0.0005	<0.0005	<0.0005
Thallium (Tl)-Total	mg/L	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0005	<0.00005	<0.00005
Thorium (Th)-Total	mg/L						<0.0005	<0.0005	<0.0005
Tin (Sn)-Total	mg/L	<0.05	<0.08	<0.08	<0.08	<0.08	<0.001	<0.001	<0.001
Titanium (Ti)-Total	mg/L	0.052	<0.12	<0.12	<0.12	<0.12	0.0082	<0.005	<0.005
Tungsten (W)-Total	mg/L						<0.001	0.0014	0.0016
Uranium (U)-Total	mg/L	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0005	<0.00005	<0.00005
Vanadium (V)-Total	mg/L	<0.1	0.31	0.33	0.21	0.23	0.00	<0.0005	<0.0005
Yttrium (Y)-Total	mg/L						<0.0005	0.00052	0.00057
Zinc (Zn)-Total	mg/L	<0.08	<0.8	<0.8	<0.8	<0.8	0.503	0.279	0.285
Zirconium (Zr)-Total	mg/L						<0.0005	<0.0005	<0.0005

Sample label		10WBW001-Zone 1-Port Initial-S01b	10WBW001-Zone 1-Port Purge-S17	10WBW001-Zone 1-Airlift Purge - S20	10WBW001-Zone 1-Airlift Final-S25	10WBW001-Zone 1-Airlift Final-S26D	10WBW001-Zone 1-Port Final-S35	10WBW001-Zone 1-Port after 2mths-S100	10WBW001-Zone 1-Port after bulk-S106
Location of port in zone		Top	Top	Middle	Middle	Middle	Top	Top	Top
Dissolved Metals									
Aluminum (Al)-Dissolved	mg/L	0.12	<1	<1	<1	<1	<0.005	<0.005	0.005
Antimony (Sb)-Dissolved	mg/L	<0.008	<0.08	<0.08	<0.08	<0.08	<0.0005	<0.0005	<0.0005
Arsenic (As)-Dissolved	mg/L	<0.08	0.103	0.103	<0.08	0.090	<0.002	<0.002	<0.002
Barium (Ba)-Dissolved	mg/L	0.057	0.052	0.048	0.051	0.052	0.052	0.053	0.0526
Beryllium (Be)-Dissolved	mg/L	<0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005
Bismuth (Bi)-Dissolved	mg/L						<0.0005	<0.0005	<0.0005
Boron (B)-Dissolved	mg/L	3.19	2.64	2.62	2.87	2.74	2.99	2.92	3.3
Cadmium (Cd)-Dissolved	mg/L	<0.001	<0.01	<0.01	<0.01	<0.01	<0.00012	0.000083	0.000097
Calcium (Ca)-Dissolved	mg/L	4390	4480	4260	4520	4360	4960	4920	4730
Cesium (Cs)-Dissolved	mg/L						0000	0.00102	0.0011
Chromium (Cr)-Dissolved	mg/L	0.0444	0.8840	0.899	0.351	0.532	<0.001	<0.0001	<0.0001
Cobalt (Co)-Dissolved	mg/L	0.0043	<0.02	<0.02	<0.02	<0.02	<0.0005	<0.00005	<0.00005
Copper (Cu)-Dissolved	mg/L	0.014	<0.12	<0.12	<0.12	<0.12	<0.001	<0.0005	0.00067
Gallium (Ga)-Dissolved	mg/L						<0.0005	<0.0005	<0.0005
Iron (Fe)-Dissolved	mg/L	0.22	<0.15	<0.15	<0.15	<0.15	<0.05	0.06	0.075
Lead (Pb)-Dissolved	mg/L	<0.002	<0.02	<0.02	<0.02	<0.02	<0.001	<0.0003	<0.0003
Lithium (Li)-Dissolved	mg/L	0.370	<0.6	<0.6	<0.6	<0.6	0.37	0.350	0.39
Magnesium (Mg)-Dissolved	mg/L	172	080	066	0046	0045	0070	064	68.1
Manganese (Mn)-Dissolved	mg/L	1.34	0.81	0.694	0.544	0.53	0.69	0.71	0.725
Mercury (Hg)-Dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<	<0.00001	<0.00001
Molybdenum (Mo)-Dissolved	mg/L	0.0411	0.0200	<0.02	<0.02	<0.02	0.0128	0.0092	0.009
Nickel (Ni)-Dissolved	mg/L	0.0817	0.0640	0.055	0.061	0.066	<0.0005	<0.0005	0.00237
Phosphorus (P)-Dissolved	mg/L						<1	<1	<1
Potassium (K)-Dissolved	mg/L	054	043	039	039	037	039	039	40
Rhenium (Re)-Dissolved	mg/L						<0.0005	<0.0005	<0.0005
Rubidium (Rb)-Dissolved	mg/L						000	0.0528	0.0532
Selenium (Se)-Dissolved	mg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.002	<0.002	<0.002
Silicon (Si)-Dissolved	mg/L						2.3	2.42	2.43
Silver (Ag)-Dissolved	mg/L	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0001	<0.0001
Sodium (Na)-Dissolved	mg/L	6840	6810	6480	6730	6260	7290	7200	6910
Strontium (Sr)-Dissolved	mg/L						0059	56.7	55.1
Tellurium (Te)-Dissolved	mg/L						<0.0005	<0.0005	<0.0005
Thallium (Tl)-Dissolved	mg/L	<0.001	0.01	0.013	<0.01	<0.01	<0.0005	<0.00005	<0.00005
Thorium (Th)-Dissolved	mg/L						<0.0005	<0.0005	<0.0005
Tin (Sn)-Dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.001	<0.001	<0.001
Titanium (Ti)-Dissolved	mg/L	0.0124	<0.06	<0.06	<0.06	<0.06	<0.005	<0.005	<0.005
Tungsten (W)-Dissolved	mg/L						<0.001	0.0014	0.0015
Uranium (U)-Dissolved	mg/L	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0005	<0.00005	<0.00005
Vanadium (V)-Dissolved	mg/L	0.129	0.291	0.302	0.122	0.174	<0.0005	<0.0005	<0.0005
Yttrium (Y)-Dissolved	mg/L						<0.0005	0.00051	0.00054
Zinc (Zn)-Dissolved	mg/L	0.044	<0.2	0.31	<0.2	<0.2	0.0897	0.1130	0.137
Zirconium (Zr)-Dissolved	mg/L						<0.0005	<0.0005	<0.0005
Isotope Chemistry									
Our Lab ID		1	12	13	15	16	35		
Delta 2H x 1000		-130.59	-134.14	-135.5	-138.13	-138.57	-138		
Delta 18O x 1000		-17.82	-18.09	-18.43	-19.06	-19.07	-18.83		

Table L5: All Doris Central 10WBW001 Zone 6 water quality data

Field Sample ID / Unique ID	Units	10WBW001-02b	10WBW001-28	10WBW001-31	10WBW001-33	10WBW001-36	10WBW001-101	10WBW001-103	10WBW001-107	10WBW001-108
Sample From		**Westbay Port**	**Westbay airlift**	**Westbay airlift**	**Westbay airlift**	**Westbay Port**	**Westbay Port**	**Westbay airlift**	**Westbay airlift**	**Westbay Port**
Sample Purging Status		**Initial sample**	**Purging sample**	**Purging sample**	**Final' Sample**	**Final' Sample**	**Final' Sample**	**Final' Sample**	**Final' Sample**	**Final' Sample**
Sample label		10WBW001-Zone 6-Port Initial-S02b	10WBW001-Zone 6-Airlift Purge -S28	10WBW001-Zone 6-Airlift Purge-S31	10WBW001-Zone 6-Airlift Final-S33	10WBW001-Zone 6-Port Final-S36	10WBW001-Zone 6-Port after 2mths-S101	10WBW001-Zone 6-Airlift 160L sample-S103	10WBW001-Zone 6-Airlift 80L sample-S107	10WBW001-Zone 6-Port after bulk-S108
Location of port in zone		Top	Bottom	Bottom	Bottom	Top	Top	Bottom	Bottom	Top
Deposit		Doris Central	Doris Central	Doris Central	Doris Central	Doris Central	Doris Central	Doris Central	Doris Central	Doris Central
Sample Location		10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001
Sample Zone		6	6	6	6	6	6	6	6	6
Zone port drillhole depth		246.0	274.00	274.00	274.00	246.0	246.0	274.00	274.00	246.0
Zone port vertical depth	m	221.1	246	246	246	221.1	221.1	246	246	221.1
Sample Comments		n/a	n/a	n/a	n/a	n/a	After leaving zone sitting for 2 months	Part of 160L toxicity sample. Diss Metals not filtered!	Part of airlifting water from zone 6 for 80L bulk sample	After airlifting water from zone 6. Should be same as S108
QA/QC Sample?		N	N	N	N	N	N	N	N	N
QA/QC Comments		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Litres purged from zone before sample was taken		0	516	1515	6433	8096	8099	10639	13589	13592
Zone volumes purged before sample was taken		0.0	1.4	7.4	36.7	46.6	46.6	61.7	79.3	79.3
Field Data										
Field pH		6.975	8.04	7.78	7.52	8.27	7.91	5.59	6.35	7.29
Field Electrical Conductivity	mS/cm	>20	>20	>20	>20	>20	40.3	60.13	62.75	44.10
Field Turbidity	NTU	n/a	n/a	n/a	n/a	n/a	118	7.30	6.20	38.90
Field DO	mg/L	n/a	n/a	n/a	n/a	n/a	12.23	11.52	12.33	8.26
Field Temperature	°C	n/a	2.8	2.6	3.1	9.6	7.44	2.66	1.73	6.47
Field Dep	m	n/a	n/a	n/a	n/a	n/a	-1	-1.00	0.00	0.00
Field Salinity	%	n/a	n/a	n/a	n/a	n/a	2.5	3.77	3.90	2.75
Field TDS		n/a	n/a	n/a	n/a	n/a	25	36.00	37.50	27.00
Field oT		n/a	n/a	n/a	n/a	n/a	20	30.00	31.50	21.50
Field ORP		n/a	n/a	n/a	n/a	n/a	10	-115.00	-110.00	-55.00
Sample colour/turbidity comments		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Sample label		10WBW001-Zone 6-Port Initial-S02b	10WBW001-Zone 6-Airlift Purge -S28	10WBW001-Zone 6-Airlift Purge-S31	10WBW001-Zone 6-Airlift Final-S33	10WBW001-Zone 6-Port Final-S36	10WBW001-Zone 6-Port after 2mths-S101	10WBW001-Zone 6-Airlift 160L sample-S103	10WBW001-Zone 6-Airlift 80L sample-S107	10WBW001-Zone 6-Port after bulk-S108
Location of port in zone		Top	Bottom	Bottom	Bottom	Top	Top	Bottom	Bottom	Top
ALS DATA										
ALS File No.		L909782	L915201	L915201	L915201	L917645	L946743	L948685	L949713	L951724
Date Lab Received		17-Jul-10 13:05	01-Aug-10 11:24	01-Aug-10 11:24	01-Aug-10 11:24	09-Aug-10 09:10	25-Oct-10 11:21	29-Oct-10 10:28	02-Nov-10 10:21	08-Nov-10 09:23
ALS Report Date		28-Jul-10	13-Aug-10	13-Aug-10	13-Aug-10	20-Aug-10	10-Dec-10	22-Nov-10	01-Dec-10	16-Dec-10
RESULTS OF ANALYSIS										
ALS SRK Sample ID		10WBW001-02	10WBW001-28	10WBW001-31	10WBW001-33	10WBW001-36	10WBW001-101	10WBW001-103	10WBW001-107	10WBW001-108
ALS Date Sampled		09-JUL-10	26-JUL-10	27-JUL-10	27-JUL-10	05-AUG-10	19-OCT-10	25-OCT-10	30-OCT-10	01-NOV-10
ALS Time Sampled		14:00	16:23	10:35	15:21	09:00	15:00	00:00	14:00	15:00
ALS Sample ID		L909782-2	L915201-16	L915201-19	L915201-21	L917645-2	L946743-2	L948685-2	L949713-4	L951724-2
Matrix		Water	Water	Water	Water	Seawater	Seawater	Water	Seawater	BOTH
Physical Tests										
Conductivity (EC)	uS/cm	52800	41600	42900	44400	24600	34900	48500	48800	37000
Density		1.02					1.01		1.03	1.03
Hardness (as CaCO3)	mg/L	9980	7280	8550	8870	4760	6720	10000	9760	7340
pH	pH	6.90	7.58	7.51	7.43	7.83	7.79	7.04	7.46	7.59
Salinity (EC)	g/L						22.10	32.4	32.6	23.5
Total Dissolved Solids	mg/L	36900	29000	30000	30400	19600	28900	35400	39000	25500
Leachable Anions & Nutrients										
Anion Sum	meq/L						00029	00580	581	432
Cation Sum	meq/L						00400	00603	592	447
Cation - Anion Balance	%						00086	00002	0.9	1.7
Anions and Nutrients										
Alkalinity, Bicarbonate (as CaCO3)	mg/L						44.2		76.5	43.7
Alkalinity, Carbonate (as CaCO3)	mg/L						<2		<1	<2
Alkalinity, Hydroxide (as CaCO3)	mg/L						<2		<1	<2
Alkalinity, Total (as CaCO3)	mg/L	87.3	63.4	67.7	70.8	44.2	44.2	72.4	76.5	43.7
Ammonia as N	mg/L							3.14	3.37	2.32
Bromide (Br)	mg/L					21.2	38.1	49.1	52	41.3
Chloride (Cl)	mg/L	20100	15900	16500	17100	09130	13400	19000	19100	14200
Fluoride (F)	mg/L	<5	<1	<1	<1	<0.75	<0.75	0.091	<0.75	<0.75
Nitrate (as N)	mg/L	<5	<1	<1	<1	<0.5	<0.5	<0.5	<1	<0.5
Nitrite (as N)	mg/L	<5	<1	<1	<1	<0.1	<0.1	<0.1	<0.2	<0.1
Ortho Phosphate as P	mg/L						0.0017		<0.001	<0.001
Total Phosphate as P	mg/L							0.0262	0.0124	0.0162
Silicate (as SIO2)	mg/L						5.0	6.1	9.7	5.8
Sulfate (SO4)	mg/L	2090	1690	1760	1820	0940	1390	2020	2000	1500
Additional Anions and Nutrients										
Bicarbonate (HCO3)	mg/L	106.0	77.3	083	086					
Carbonate (CO3)	mg/L	<5	<5	<5	<5					
Hydroxide (OH)	mg/L	<5	<5	<5	<5					
Ion Balance	%	098	089	103.0	103.0					
Nitrate and Nitrite as N	mg/L	<7.1	<1.4	<1.4	<1.4					
TDS (Calculated)	mg/L	34600	26500	29000	30000					

Sample label		10WBW001-Zone 6-Port Initial-S02b	10WBW001-Zone 6-Airlift Purge -S28	10WBW001-Zone 6-Airlift Purge-S31	10WBW001-Zone 6-Airlift Final-S33	10WBW001-Zone 6-Port Final-S36	10WBW001-Zone 6-Port after 2mths-S101	10WBW001-Zone 6-Airlift 160L sample-S103	10WBW001-Zone 6-Airlift 80L sample-S107	10WBW001-Zone 6-Port after bulk-S108
Location of port in zone		Top	Bottom	Bottom	Bottom	Top	Top	Bottom	Bottom	Top
Total Metals										
Aluminum (Al)-Total	mg/L	<0.2	<2	<2	<2	0.0281	0.0052	0.0318	0.0053	0.0059
Antimony (Sb)-Total	mg/L	<0.008	<0.08	<0.08	<0.08	0.00745	0.005	0.00127	0.00115	0.00461
Arsenic (As)-Total	mg/L	<0.08	0.085	0.095	0.121	0.003	<0.002	0.007	0.0068	<0.002
Barium (Ba)-Total	mg/L	0.072	0.139	0.125	0.107	0.130	0.175	0.117	0.112	0.169
Beryllium (Be)-Total	mg/L	<0.02	<0.2	<0.2	<0.2	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bismuth (Bi)-Total	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B)-Total	mg/L	2.88	1.54	1.64	1.91	1.04	1.38	2.65	2.66	1.50
Cadmium (Cd)-Total	mg/L	<0.001	<0.01	<0.01	<0.01	<0.00012	<0.00005	<0.00005	<0.00005	<0.00005
Calcium (Ca)-Total	mg/L	1750	1190	1370	1280	0805	1140	1600	1570	1170
Cesium (Cs)-Total	mg/L					0000	0000	0.00155	0.00155	0.00095
Chromium (Cr)-Total	mg/L	0.033	0.660	0.72	0.86	0.00	0.00	<0.0005	<0.0001	<0.0005
Cobalt (Co)-Total	mg/L	<0.004	<0.04	<0.04	<0.04	<0.0005	0.000092	0.000381	0.000356	0.000103
Copper (Cu)-Total	mg/L	<0.02	<0.2	<0.2	<0.2	<0.001	<0.0005	<0.0005	<0.0005	0.00061
Gallium (Ga)-Total	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Iron (Fe)-Total	mg/L	12.00	4.74	3.33	3.54	1.60	2.94	4.53	4.56	2.28
Lead (Pb)-Total	mg/L	0.002	<0.02	<0.02	<0.02	<0.001	0.00035	<0.0003	<0.0003	<0.0003
Lithium (Li)-Total	mg/L	0.37	<1.2	<1.2	<1.2	0.093	0.117	0.228	0.217	0.131
Magnesium (Mg)-Total	mg/L	1540	1120	1290	1210	0739	1010	1510	1480	1080
Manganese (Mn)-Total	mg/L	2.62	1.27	1.73	1.81	0.56	0.95	2.08	2.13	0.892
Mercury (Hg)-Total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001		<0.00001	<0.00005	<0.00001	
Molybdenum (Mo)-Total	mg/L	0.0059	0.0250	0.02	<0.02	0.0403	0.037	0.0140	0.012	0.0361
Nickel (Ni)-Total	mg/L	0.0335	<0.04	<0.04	<0.04	0.00159	0.00059	0.00095	0.00098	0.00120
Phosphorus (P)-Total	mg/L					<1	<1	<1	<1	<1
Potassium (K)-Total	mg/L	268	185	227	203	125	171	240	233	172
Rhenium (Re)-Total	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Rubidium (Rb)-Total	mg/L					000	000	0.1420	0.141	0.102
Selenium (Se)-Total	mg/L	<0.4	<0.4	<0.4	<0.4	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon (Si)-Total	mg/L					2.88	3.5	3.68	3.48	3.82
Silver (Ag)-Total	mg/L	<0.002	<0.02	<0.02	<0.02	<0.0002	<0.0001	<0.0001	<0.0001	0.00018
Sodium (Na)-Total	mg/L	9750	6830	8290	7450	4460	6410	9350	9170	6790
Strontium (Sr)-Total	mg/L					0010	0014	21.2	19.9	14.6
Tellurium (Te)-Total	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Thallium (Tl)-Total	mg/L	<0.002	<0.02	<0.02	<0.02	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005
Thorium (Th)-Total	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Tin (Sn)-Total	mg/L	<0.05	<0.08	<0.08	<0.08	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti)-Total	mg/L	<0.012	<0.12	<0.12	<0.12	<0.005	<0.005	<0.005	<0.005	<0.005
Tungsten (W)-Total	mg/L					0.0334	0.0247	0.0056	0.0049	0.0227
Uranium (U)-Total	mg/L	<0.002	<0.02	<0.02	<0.02	<0.0005	<0.00005	0.00023	0.000228	0.000059
Vanadium (V)-Total	mg/L	0.17	0.22	0.25	0.27	<0.0005	<0.0005	0.00054	<0.0005	<0.0005
Yttrium (Y)-Total	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc (Zn)-Total	mg/L	0.088	<0.8	<0.8	<0.8	0.195	0.236	0.046	0.0241	0.115
Zirconium (Zr)-Total	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Sample label		10WBW001-Zone 6-Port Initial-S02b	10WBW001-Zone 6-Airlift Purge -S28	10WBW001-Zone 6-Airlift Purge-S31	10WBW001-Zone 6-Airlift Final-S33	10WBW001-Zone 6-Port Final-S36	10WBW001-Zone 6-Port after 2mths-S101	10WBW001-Zone 6-Airlift 160L sample-S103	10WBW001-Zone 6-Airlift 80L sample-S107	10WBW001-Zone 6-Port after bulk-S108
Location of port in zone		Top	Bottom	Bottom	Bottom	Top	Top	Bottom	Bottom	Top
Dissolved Metals										
Aluminum (Al)-Dissolved	mg/L	<0.1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	<0.005
Antimony (Sb)-Dissolved	mg/L	<0.008	<0.08	<0.08	<0.08	0.00703	0.0048	0.00121	0.00116	0.00393
Arsenic (As)-Dissolved	mg/L	<0.08	<0.08	<0.08	0.102	<0.002	<0.002	0.0066	0.0069	<0.002
Barium (Ba)-Dissolved	mg/L	0.062	0.143	0.115	0.120	0.120	0.178	0.113	0.115	0.169
Beryllium (Be)-Dissolved	mg/L	<0.01	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bismuth (Bi)-Dissolved	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B)-Dissolved	mg/L	2.44	1.64	2.03	1.97	0.94	1.38	2.64	2.61	1.48
Cadmium (Cd)-Dissolved	mg/L	<0.001	<0.01	<0.01	<0.01	<0.00012	<0.00005	<0.00005	<0.00005	<0.00005
Calcium (Ca)-Dissolved	mg/L	1640	1150	1330	1390	0749	1100	1550	1520	1160
Cesium (Cs)-Dissolved	mg/L					0000	0000	0.00154	0.00159	0.00097
Chromium (Cr)-Dissolved	mg/L	0.0385	0.3130	0.451	0.682	<0.001	<0.0001	<0.0005	<0.0001	<0.0005
Cobalt (Co)-Dissolved	mg/L	<0.002	<0.02	<0.02	<0.02	<0.0005	0.000087	0.000315	0.000312	0.000091
Copper (Cu)-Dissolved	mg/L	<0.012	<0.12	<0.12	<0.12	<0.001	<0.0005	<0.0005	<0.0005	<0.0005
Gallium (Ga)-Dissolved	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Iron (Fe)-Dissolved	mg/L	9.26	1.54	2.87	3.32	0.06	0.13	4.31	4.55	0.503
Lead (Pb)-Dissolved	mg/L	<0.002	<0.02	<0.02	<0.02	<0.001	<0.0003	<0.003	<0.0003	<0.0003
Lithium (Li)-Dissolved	mg/L	0.297	<0.6	<0.6	<0.6	0.087	0.12	0.223	0.223	0.127
Magnesium (Mg)-Dissolved	mg/L	1430	1070	1270	1310	0702	0964	1490	1450	1080
Manganese (Mn)-Dissolved	mg/L	2.48	1.17	1.7	1.96	0.53	0.94	2.03	2.11	0.888
Mercury (Hg)-Dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<	<0.00001	<0.00005	<0.00001	
Molybdenum (Mo)-Dissolved	mg/L	<0.005	0.0280	0.023	<0.02	0.0379	0.037	0.0138	0.0122	0.0345
Nickel (Ni)-Dissolved	mg/L	0.0289	<0.02	<0.02	<0.02	0.00076	<0.0005	0.00101	0.00094	0.00158
Phosphorus (P)-Dissolved	mg/L					<1	<1	<1	<1	<1
Potassium (K)-Dissolved	mg/L	251	170	186	194	117	160	233	229	172
Rhenium (Re)-Dissolved	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Rubidium (Rb)-Dissolved	mg/L					000	000	0.1400	0.139	0.106
Selenium (Se)-Dissolved	mg/L	<0.4	<0.4	<0.4	<0.4	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon (Si)-Dissolved	mg/L					2.48	2.88	3.49	3.38	3.33
Silver (Ag)-Dissolved	mg/L	<0.002	<0.02	<0.02	<0.02	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Sodium (Na)-Dissolved	mg/L	9080	6450	7910	8160	4130	6010	9130	8980	6810
Strontium (Sr)-Dissolved	mg/L					0009	0013	21.1	19.4	14.6
Tellurium (Te)-Dissolved	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Thallium (Tl)-Dissolved	mg/L	<0.001	<0.01	<0.01	<0.01	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005
Thorium (Th)-Dissolved	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Tin (Sn)-Dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (Ti)-Dissolved	mg/L	<0.006	<0.06	<0.06	<0.06	<0.005	<0.005	<0.005	<0.005	<0.005
Tungsten (W)-Dissolved	mg/L					0.0316	0.0246	0.0053	0.0048	0.0231
Uranium (U)-Dissolved	mg/L	<0.002	<0.02	<0.02	<0.02	<0.0005	<0.00005	0.000231	0.000234	0.000058
Vanadium (V)-Dissolved	mg/L	0.152	0.128	0.176	0.229	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Yttrium (Y)-Dissolved	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc (Zn)-Dissolved	mg/L	0.041	<0.2	<0.2	<0.2	0.02	0.0705	0.0384	0.0243	0.0295
Zirconium (Zr)-Dissolved	mg/L					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Isotope Chemistry										
Our Lab ID		2	17	18	19	24				
Delta 2H x 1000		-69.03	-89.73	-88.14	-85.71	-117.72				
Delta 18O x 1000		-8.98	-11.49	-11.09	-10.9	-15				

Table L6: All Doris Central 10WBW001 Zone 10 Water Quality Results

Field Sample ID / Unique ID	Units	10WBW001-03b	10WBW001-04b	10WBW001-12	10WBW001-14	10WBW001-15	10WBW001-16	10WBW001-37	10WBW001-102	10WBW001-105
Sample From		**Westbay Port**	**Westbay Port**	**Westbay airlift**	**Westbay airlift**	**Westbay airlift**	**Westbay airlift**	**Westbay Port**	**Westbay Port**	**Westbay Port**
Sample Purging Status		**Initial sample**	**Initial sample**	**Purging sample**	**Purging sample**	**Purging sample**	**Final' Sample**	**Final' Sample**	**Final' Sample**	**Final' Sample**
Sample label		10WBW001-Zone 10-Port Initial-S03b	10WBW001-Zone 10-Port InitialD-S04b	10WBW001-Zone 10-Airlift Purge-S12	10WBW001-Zone 10-Airlift Purge-S14	10WBW001-Zone 10-Airlift Purge-S15	10WBW001-Zone 10-Airlift Final-S16D	10WBW001-Zone 10-Port Final-S37	10WBW001-Zone 10-Port after 2mths-S102	10WBW001-Zone 10-Port after bulk-S105
Location of port in zone		Top	Top	Bottom	Bottom	Bottom	Bottom	Top	Top	Top
Deposit		Doris Central	Doris Central	Doris Central	Doris Central	Doris Central	Doris Central	Doris Central	Doris Central	Doris Central
Sample Location		10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001	10WBW001
Sample Zone		10	10	10	10	10	10	10	10	10
Zone port drillhole depth		63.5	63.5	107.50	107.50	107.50	107.50	63.5	63.5	63.5
Zone port vertical depth	m	57.4	57.4	97	97	97	97	57.4	57.4	57.4
Sample Comments		n/a	n/a	Isotope sample stopped	n/a	n/a	n/a	n/a	After leaving zone sitting for 2 months	After airlifting water from zone 6 (diff zone). Should be same as S102
QA/QC Sample?		Y	Y	N	N	Y	Y	N	N	N
QA/QC Comments		Duplicate of 10WBW001-04b	Duplicate of 10WBW001-03b	n/a	n/a	Duplicate of 10WBW001-16	Duplicate of 10WBW001-15	n/a	n/a	n/a
Total Litres purged from zone before sample was taken		0	2	849	2051	3008	3008	3008	3011	3014
Zone volumes purged before sample was taken		0.0	0.3	2.8	7.4	11.0	11.0	11.0	11.0	11.0
Field Data										
Field pH		7.765	7.8	7.5	7.56	7.39	7.39	7.86	7.55	7.50
Field Electrical Conductivity	mS/cm	>20	>20	>20	>20	>20	>20	>20	40.60	50.20
Field Turbidity	NTU	n/a	n/a	n/a	n/a	n/a	n/a	n/a	39.35	36.85
Field DO	mg/L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.44	10.44
Field Temperature	°C	n/a	n/a	4.5	4.6	8	8	8.3	5.09	6.19
Field Dep	m	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-1.00	-0.50
Field Salinity	%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2.45	3.20
Field TDS		n/a	n/a	n/a	n/a	n/a	n/a	n/a	24.50	30.00
Field oT		n/a	n/a	n/a	n/a	n/a	n/a	n/a	19.50	25.00
Field ORP		n/a	n/a	n/a	n/a	n/a	n/a	n/a	-151.50	-117.00
Sample colour/turbidity comments		n/a	n/a	Light brown, slightly turbid	Slightly turbid, more clear than prev.	Clear	Clear	Clear	n/a	n/a
ALS DATA										
ALS File No.		L909782	L909782	L911681	L911681	L915201	L915201	L917645	L946743	L949713
Date Lab Received		17-Jul-10 13:05	17-Jul-10 13:05	22-Jul-10 12:59	22-Jul-10 12:59	01-Aug-10 11:24	01-Aug-10 11:24	09-Aug-10 09:10	25-Oct-10 11:21	02-Nov-10 10:21
ALS Report Date		28-Jul-10	28-Jul-10	17-Aug-10	17-Aug-10	13-Aug-10	13-Aug-10	20-Aug-10	10-Dec-10	01-Dec-10
RESULTS OF ANALYSIS										
ALS SRK Sample ID		10WBW001-03	10WBW001-04	10WBW001-12	10WBW001-14	10WBW001-15	10WBW001-16	10WBW001-37	10WBW001-102	10WBW001-105
ALS Date Sampled		09-JUL-10	09-JUL-10	20-JUL-01	20-JUL-01	21-JUL-10	21-JUL-10	05-AUG-10	20-OCT-10	29-OCT-10
ALS Time Sampled		14:00	14:00	09:49	16:30	16:28	17:28	11:40	11:00	15:00
ALS Sample ID		L909782-3	L909782-4	L911681-3	L911681-5	L915201-1	L915201-2	L917645-3	L946743-3	L949713-1
Matrix		Water	Water	Water	Water	Water	Water	Seawater	Seawater	Seawater
Physical Tests										
Conductivity (EC)	uS/cm	27600	27500	41400	45700	46500	46600	30300	33800	43300
Density		1.00	1.01	1.01	1.02				1.01	1.01
Hardness (as CaCO3)	mg/L	4960	5060	7150	7750	8360	9250	6030	6360	8900
pH	pH	7.37	7.42	7.38	7.34	7.35	7.39	7.47	7.46	7.44
Salinity (EC)	g/L									28.5
Total Dissolved Solids	mg/L	18700	18500	27700	31000	32200	32700	23100	28300	34500
Leachable Anions & Nutrients										
Anion Sum	meq/L								27.2	501
Cation Sum	meq/L								383	576
Cation - Anion Balance	%								86.7	7
Anions and Nutrients										
Alkalinity, Bicarbonate (as CaCO3)	mg/L								77.3	106
Alkalinity, Carbonate (as CaCO3)	mg/L								<1	<2
Alkalinity, Hydroxide (as CaCO3)	mg/L								<1	<2
Alkalinity, Total (as CaCO3)	mg/L	66.3	64.8	90.6	83.3	82.3	81.7	49.7	77.3	106
Ammonia as N	mg/L									3.46
Bromide (Br)	mg/L							27.6	36.4	41
Chloride (Cl)	mg/L	9650	9610	15200	17100	17700	18200	11500	13100	16500
Fluoride (F)	mg/L	<5	<5	<2.5	<2.5	<1	<1	<0.75	<0.75	<0.75
Nitrate (as N)	mg/L	<5	<5	<2.5	<2.5	<1	<1	<0.5	<0.5	<1
Nitrite (as N)	mg/L	<5	<5	<2.5	<2.5	<1	<1	<0.1	<0.1	<0.2
Ortho Phosphate as P	mg/L								<0.001	<0.001
Total Phosphate as P	mg/L									0.0389
Silicate (as SIO2)	mg/L								3.8	7.5
Sulfate (SO4)	mg/L	995	991	1490	1700	1750	1790	1160	1230	1580
Additional Anions and Nutrients										
Bicarbonate (HCO3)	mg/L	80.9	79.0	111	102	100	99.6			
Carbonate (CO3)	mg/L	<5	<5	<5	<5	<5	<5			
Hydroxide (OH)	mg/L	<5	<5	<5	<5	<5	<5			
Ion Balance	%	101	103	99.4	96.7	96.6	109	1.4		
Nitrate and Nitrite as N	mg/L	<7.1	<7.1	<3.5	<3.5	<1.4	<1.4			
TDS (Calculated)	mg/L	16800	16900	26300	29300	30300	32600			
Total Metals										
Aluminum (Al)-Total	mg/L	<0.2	<0.2	<2	<2	<2	<2	0.0146	<0.005	<0.005
Antimony (Sb)-Total	mg/L	<0.008	<0.008	<0.08	<0.08	<0.08	<0.08	0.00349	0.00099	0.00054
Arsenic (As)-Total	mg/L	<0.08	<0.08	<0.08	0.098	0.083	0.090	<0.002	<0.002	<0.002
Barium (Ba)-Total	mg/L	0.187	0.185	0.125	0.136	0.102	0.113	0.179	0.177	0.129
Beryllium (Be)-Total	mg/L	<0.02	<0.02	<0.2	<0.2	<0.2	<0.2	<0.0005	<0.0005	<0.0005
Bismuth (Bi)-Total	mg/L							<0.0005	<0.0005	<0.0005
Boron (B)-Total	mg/L	1.34	1.37	1.91	2.22	2.32	2.31	1.51	1.53	2.8
Cadmium (Cd)-Total	mg/L	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.00012	<0.00005	<0.00005
Calcium (Ca)-Total	mg/L	851	867	1120	1290	1590	1580	1020	1080	1540
Cesium (Cs)-Total	mg/L							0.00097	0.001	0.00151
Chromium (Cr)-Total	mg/L	<0.016	0.024	<0.16	0.55	0.61	0.66	0.0030	0.00011	0.00016
Cobalt (Co)-Total	mg/L	<0.004	<0.004	<0.04	<0.04	<0.04	<0.04	<0.0005	0.000084	0.000132
Copper (Cu)-Total	mg/L	<0.02	<0.02	<0.2	<0.2	<0.2	<0.2	<0.001	<0.0005	<0.0005
Gallium (Ga)-Total	mg/L							<0.0005	<0.0005	<0.0005
Iron (Fe)-Total	mg/L	3.53	3.65	7.51	5.08	7.15	7.14	3.95	4.31	11
Lead (Pb)-Total	mg/L	<0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.001	<0.0003	<0.0003
Lithium (Li)-Total	mg/L	0.13	0.14	<1.2	<1.2	<1.2	<1.2	0.128	0.128	0.2
Magnesium (Mg)-Total	mg/L	726	736	914	1020	1290	1290	867	797	1230
Manganese (Mn)-Total	mg/L	1.04	1.06	1.23	1.40	1.73	1.76	1.09	1.15	1.73
Mercury (Hg)-Total	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.00001	<0.00001
Molybdenum (Mo)-Total	mg/L	0.0244	0.0237	<0.02	<0.02	<0.02	<0.02	0.0225	0.0244	0.0072
Nickel (Ni)-Total	mg/L	0.0138	0.0144	<0.04	<0.04	<0.04	<0.04	0.00237	<0.0005	<0.0005
Phosphorus (P)-Total	mg/L							<1	<1	<1
Potassium (K)-Total	mg/L	114	116	211	223	294	292	166	166	262
Rhenium (Re)-Total	mg/L							<0.0005	<0.0005	<0.0005
Rubidium (Rb)-Total	mg/L							0.0816	0.0842	0.104
Selenium (Se)-Total	mg/L	<0.4	<0.4	0.106	0.147	<0.4	<0.4	<0.002	<0.002	<0.002
Silicon (Si)-Total	mg/L							2.12	2.42	3.51
Silver (Ag)-Total	mg/L	<0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0001	<0.0001
Sodium (Na)-Total	mg/L	4860	4930	6640	7150	9260	9580	5590	5530	8990
Strontium (Sr)-Total	mg/L							11.7	11.1	16.4
Tellurium (Te)-Total	mg/L							<0.0005	<0.0005	<0.0005
Thallium (Tl)-Total	mg/L	<0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0005	<0.00005	<0.00005
Thorium (Th)-Total	mg/L							<0.0005	<0.0005	<0.0005
Tin (Sn)-Total	mg/L	<0.05	<0.05	<0.08	<0.08	<0.08	<0.08	<0.001	<0.001	<0.001

Sample label		10WBW001-Zone 10-Port Initial-S03b	10WBW001-Zone 10-Port InitialD-S04b	10WBW001-Zone 10-Airlift Purge-S12	10WBW001-Zone 10-Airlift Purge-S14	10WBW001-Zone 10-Airlift Purge-S15	10WBW001-Zone 10-Airlift Final-S16D	10WBW001-Zone 10-Port Final-S37	10WBW001-Zone 10-Port after 2mths-S102	10WBW001-Zone 10-Port after bulk-S105
Location of port in zone		Top	Top	Bottom	Bottom	Bottom	Bottom	Top	Top	Top
Titanium (Ti)-Total	mg/L	<0.012	<0.012	<0.12	<0.12	<0.12	<0.12	<0.005	<0.005	<0.005
Tungsten (W)-Total	mg/L							0.0067	0.0051	0.0059
Uranium (U)-Total	mg/L	<0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0005	0.000057	<0.00005
Vanadium (V)-Total	mg/L	<0.1	<0.1	<0.1	0.18	0.20	0.22	<0.0005	<0.0005	<0.0005
Yttrium (Y)-Total	mg/L							<0.0005	<0.0005	<0.0005
Zinc (Zn)-Total	mg/L	<0.08	<0.08	<0.8	<0.8	<0.8	<0.8	0.261	0.173	0.107
Zirconium (Zr)-Total	mg/L							<0.0005	<0.0005	<0.0005
Dissolved Metals										
Aluminum (Al)-Dissolved	mg/L	0.13	<0.1	<1	<1	<1	<1	<0.005	<0.005	<0.005
Antimony (Sb)-Dissolved	mg/L	<0.008	<0.008	<0.08	<0.08	<0.08	<0.08	0.00306	0.00097	0.00053
Arsenic (As)-Dissolved	mg/L	<0.08	<0.08	0.100	0.116	0.091	0.097	<0.002	<0.002	<0.002
Barium (Ba)-Dissolved	mg/L	0.186	0.188	0.135	0.105	0.100	0.097	0.169	0.178	0.122
Beryllium (Be)-Dissolved	mg/L	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005
Bismuth (Bi)-Dissolved	mg/L							<0.0005	<0.0005	<0.0005
Boron (B)-Dissolved	mg/L	1.31	1.38	2.06	2.43	2.23	2.32	1.42	1.54	2.86
Cadmium (Cd)-Dissolved	mg/L	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.00012	<0.00005	<0.00005
Calcium (Ca)-Dissolved	mg/L	822	837	1230	1340	1420	1560	1010	1110	1560
Cesium (Cs)-Dissolved	mg/L							0.00092	0.00104	0.00148
Chromium (Cr)-Dissolved	mg/L	0.0178	0.0264	<0.8	0.739	0.747	0.874	<0.001	<0.0001	<0.0001
Cobalt (Co)-Dissolved	mg/L	<0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0005	0.000102	0.000187
Copper (Cu)-Dissolved	mg/L	<0.012	<0.012	0.13	<0.12	0.19	<0.12	<0.001	<0.0005	0.00296
Gallium (Ga)-Dissolved	mg/L							<0.0005	<0.0005	<0.0005
Iron (Fe)-Dissolved	mg/L	1.88	1.63			5.77	6.25	2.68	3.15	8.94
Lead (Pb)-Dissolved	mg/L	<0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.001	<0.0003	<0.0003
Lithium (Li)-Dissolved	mg/L	0.128	0.136	<0.6	<0.6	<0.6	<0.6	0.121	0.13	0.201
Magnesium (Mg)-Dissolved	mg/L	707	721	990	1070	1170	1300	849	869	1250
Manganese (Mn)-Dissolved	mg/L	1.01	1.01			1.56	1.72	1.04	1.17	1.69
Mercury (Hg)-Dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<	<0.00001	<0.00001
Molybdenum (Mo)-Dissolved	mg/L	0.0240	0.0239	<0.02	<0.02	<0.02	<0.02	0.0211	0.0259	0.0044
Nickel (Ni)-Dissolved	mg/L	0.0146	0.0159	0.032	0.043	<0.02	<0.02	<0.0005	<0.0005	0.0006
Phosphorus (P)-Dissolved	mg/L							<1	<1	<1
Potassium (K)-Dissolved	mg/L	129	131	225	245	206	294	160	173	249
Rhenium (Re)-Dissolved	mg/L							<0.0005	<0.0005	<0.0005
Rubidium (Rb)-Dissolved	mg/L							0.0766	0.085	0.107
Selenium (Se)-Dissolved	mg/L	<0.4	<0.4	0.107	0.139	<0.4	<0.4	<0.002	<0.002	<0.002
Silicon (Si)-Dissolved	mg/L							1.99	2.38	3.3
Silver (Ag)-Dissolved	mg/L	<0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0001	<0.0001
Sodium (Na)-Dissolved	mg/L	4470	4540	7130	7840	7970	9450	5400	5780	8700
Strontium (Sr)-Dissolved	mg/L							11.3	11.7	16.8
Tellurium (Te)-Dissolved	mg/L							<0.0005	<0.0005	<0.0005
Thallium (Tl)-Dissolved	mg/L	<0.001	<0.001	<0.01	<0.01	<0.01	0.010	<0.0005	<0.00005	<0.00005
Thorium (Th)-Dissolved	mg/L							<0.0005	<0.0005	<0.0005
Tin (Sn)-Dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.001	<0.001	<0.001
Titanium (Ti)-Dissolved	mg/L	0.0135	0.0081	<0.06	<0.06	<0.06	<0.06	<0.005	<0.005	<0.005
Tungsten (W)-Dissolved	mg/L							0.0059	0.005	0.006
Uranium (U)-Dissolved	mg/L	<0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.0005	0.000059	<0.00005
Vanadium (V)-Dissolved	mg/L	0.077	0.099	0.221	0.214	0.259	0.292	<0.0005	<0.0005	<0.0005
Yttrium (Y)-Dissolved	mg/L							<0.0005	<0.0005	<0.0005
Zinc (Zn)-Dissolved	mg/L	0.026	0.022	<0.2	<0.2	0.22	<0.2	0.0504	0.061	0.0851
Zirconium (Zr)-Dissolved	mg/L							<0.0005	<0.0005	<0.0005
Isotope Chemistry										
Our Lab ID		3	4		9	10	11	25		
Delta 2H x 1000		-110.12	-109.57		-79.08	-77.72	-77.67	-106.52		
Delta 18O x 1000		-14	-13.96		-10.16	-10	-10.18	-13.49		

Table L7: All Doris Central 10WBW001 Lake and Drilling Water Tank Water Quality Results

Field Sample ID / Unique ID	Units	10WBW001-01a	10WBW001-02a	10WBW001-04a	10WBW001-07
Sample From		**Lake**	**Drill Water**	**Drill Water**	**Lake**
Sample Purging Status		**Other**	**Other**	**Other**	**Other**
Sample label for graph		Doris Lake Winter	10WBW001 Drill Tank	10WBW001 Drill Tank Dup	Doris Lake Summer
Location of port in zone		n/a	n/a	n/a	n/a
Deposit		Doris Central	Doris Central	Doris Central	Doris Central
Sample Location		Doris Lake	10WBW001	10WBW001	Doris Lake
Sample Zone		n/a	n/a	n/a	n/a
Zone port drillhole depth		n/a	n/a	n/a	n/a
Zone port vertical depth	m	n/a	n/a	n/a	n/a
Sample Comments		Lake water from hole in ice near intake.	Drilling water in drill tank - no brine	Drilling water in drill tank - no brine	Grab of lake water
QA/QC Sample?		N	Y	N	N
QA/QC Comments		n/a	Duplicate of 10WBW001-04a	Duplicate of 10WBW001-02a	n/a
Total Litres purged from zone (ever) before sample was taken		n/a	n/a	n/a	n/a
Zone volumes purged before sample was taken		n/a	n/a	n/a	n/a
Field Data					
Field pH		n/a	n/a	n/a	n/a
Field Electrical Conductivity	mS/cm	n/a	n/a	n/a	n/a
Field Turbidity	NTU	n/a	n/a	n/a	n/a
Field DO	mg/L	n/a	n/a	n/a	n/a
Field Temperature	°C	n/a	n/a	n/a	n/a
Field Dep	m	n/a	n/a	n/a	n/a
Field Salinity	%	n/a	n/a	n/a	n/a
Field TDS		n/a	n/a	n/a	n/a
Field oT		n/a	n/a	n/a	n/a
Field ORP		n/a	n/a	n/a	n/a
Sample colour/turbidity comments		n/a	n/a	n/a	n/a
ALS DATA					
ALS File No.		L880950	L880950	L880950	L909782
Date Lab Received		27-Apr-10 15:23	27-Apr-10 15:23	27-Apr-10 15:23	17-Jul-10 13:05
ALS Report Date		06-May-10	06-May-10	06-May-10	28-Jul-10
RESULTS OF ANALYSIS					
ALS SRK Sample ID		10WBW001-01	10WBW001-02	10WBW001-04	10WBW001-07
ALS Date Sampled		26-APR-10	25-APR-10	25-APR-10	15-JUL-10
ALS Time Sampled		12:30	16:00	16:00	14:00
ALS Sample ID		L880950-1	L880950-2	L880950-4	L909782-7
Matrix		Water	Water	Water	Water
Physical Tests					
Conductivity (EC)	uS/cm	324	335	339	304
Density					0.998
Hardness (as CaCO3)	mg/L	53.6	57.8	59.8	48.8
pH	pH	7.10	7.20	7.26	8.52
Salinity (EC)	g/L				
Total Dissolved Solids	mg/L	192	197	202	188
Leachable Anions & Nutrients					
Anion Sum	meq/L				
Cation Sum	meq/L				
Cation - Anion Balance	%				
Anions and Nutrients					
Alkalinity, Bicarbonate (as CaCO3)	mg/L				
Alkalinity, Carbonate (as CaCO3)	mg/L				
Alkalinity, Hydroxide (as CaCO3)	mg/L				
Alkalinity, Total (as CaCO3)	mg/L	34.4	35.6	35.2	31.8
Ammonia as N	mg/L				
Bromide (Br)	mg/L				
Chloride (Cl)	mg/L	76.6	83.4	82.5	60.3
Fluoride (F)	mg/L	0.069	0.069	0.069	<0.05
Nitrate (as N)	mg/L	0.053	0.053	<0.050	<0.05
Nitrite (as N)	mg/L	<0.050	<0.050	<0.050	<0.05
Ortho Phosphate as P	mg/L				
Total Phosphate as P	mg/L				
Silicate (as SIO2)	mg/L				
Sulfate (SO4)	mg/L	3.44	4.05	3.70	2.42
Additional Anions and Nutrients					
Bicarbonate (HCO3)	mg/L	41.9	43.4	43.0	27.2
Carbonate (CO3)	mg/L	<5.0	<5.0	<5.0	5.7
Hydroxide (OH)	mg/L	<5.0	<5.0	<5.0	<5
Ion Balance	%	95.1	93.7	99.3	97.0
Nitrate and Nitrite as N	mg/L	<0.071	<0.071	<0.071	<0.071
TDS (Calculated)	mg/L	158	170	171	129
Total Metals					
Aluminum (Al)-Total	mg/L	<0.010	0.014	0.021	0.048
Antimony (Sb)-Total	mg/L	<0.00040	<0.00040	<0.00040	<0.0004
Arsenic (As)-Total	mg/L	0.00074	0.00076	0.00067	0.00055
Barium (Ba)-Total	mg/L	0.0036	0.0050	0.0057	0.0034
Beryllium (Be)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.001
Bismuth (Bi)-Total	mg/L				
Boron (B)-Total	mg/L	<0.050	<0.050	<0.050	<0.05
Cadmium (Cd)-Total	mg/L	<0.000050	<0.000050	<0.000050	<0.00005
Calcium (Ca)-Total	mg/L	8.47	10.5	10.8	9.47
Cesium (Cs)-Total	mg/L				
Chromium (Cr)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.005
Cobalt (Co)-Total	mg/L	<0.0020	<0.0020	<0.0020	<0.002
Copper (Cu)-Total	mg/L	0.0023	0.0040	0.0054	0.0019
Gallium (Ga)-Total	mg/L				
Iron (Fe)-Total	mg/L	0.017	0.118	0.149	0.108
Lead (Pb)-Total	mg/L	0.00089	0.00063	0.00018	<0.0001
Lithium (Li)-Total	mg/L	<0.010	<0.010	<0.010	<0.01
Magnesium (Mg)-Total	mg/L	6.73	8.59	8.73	5.87
Manganese (Mn)-Total	mg/L	0.0035	0.0066	0.0072	0.0154

Sample label for graph		Doris Lake Winter	10WBW001 Drill Tank	10WBW001 Drill Tank Dup	Doris Lake Summer
Location of port in zone		n/a	n/a	n/a	n/a
Mercury (Hg)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.0001
Molybdenum (Mo)-Total	mg/L	<0.0050	<0.0050	<0.0050	<0.005
Nickel (Ni)-Total	mg/L	<0.0020	<0.0020	<0.0020	<0.002
Phosphorus (P)-Total	mg/L				
Potassium (K)-Total	mg/L	2.30	3.13	3.14	2.13
Rhenium (Re)-Total	mg/L				
Rubidium (Rb)-Total	mg/L				
Selenium (Se)-Total	mg/L	0.00056	0.00058	0.00057	<0.002
Silicon (Si)-Total	mg/L				
Silver (Ag)-Total	mg/L	<0.00050	<0.00050	<0.00050	<0.0001
Sodium (Na)-Total	mg/L	34.2	43.0	43.9	29.2
Strontium (Sr)-Total	mg/L				
Tellurium (Te)-Total	mg/L				
Thallium (Tl)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.0001
Thorium (Th)-Total	mg/L				
Tin (Sn)-Total	mg/L	<0.050	<0.050	<0.050	<0.05
Titanium (Ti)-Total	mg/L	<0.0010	<0.0010	<0.0010	0.0013
Tungsten (W)-Total	mg/L				
Uranium (U)-Total	mg/L	<0.00010	<0.00010	<0.00010	<0.0001
Vanadium (V)-Total	mg/L	<0.0010	<0.0010	<0.0010	<0.001
Yttrium (Y)-Total	mg/L				
Zinc (Zn)-Total	mg/L	0.0090	0.0131	0.0252	<0.004
Zirconium (Zr)-Total	mg/L				
Dissolved Metals					
Aluminum (Al)-Dissolved	mg/L	<0.010	<0.010	<0.010	<0.01
Antimony (Sb)-Dissolved	mg/L	<0.00040	<0.00040	<0.00040	<0.0004
Arsenic (As)-Dissolved	mg/L	0.00057	0.00066	0.00068	0.00068
Barium (Ba)-Dissolved	mg/L	0.0037	0.0040	0.0042	0.0036
Beryllium (Be)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.001
Bismuth (Bi)-Dissolved	mg/L				
Boron (B)-Dissolved	mg/L	<0.050	<0.050	<0.050	<0.05
Cadmium (Cd)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.00005
Calcium (Ca)-Dissolved	mg/L	9.30	10.1	10.3	9.70
Cesium (Cs)-Dissolved	mg/L				
Chromium (Cr)-Dissolved	mg/L	<0.0050	<0.0050	<0.0050	<0.005
Cobalt (Co)-Dissolved	mg/L	<0.0020	<0.0020	<0.0020	<0.002
Copper (Cu)-Dissolved	mg/L	0.0022	0.0028	0.0028	0.0016
Gallium (Ga)-Dissolved	mg/L				
Iron (Fe)-Dissolved	mg/L	<0.030	0.072	0.075	0.035
Lead (Pb)-Dissolved	mg/L	0.00069	0.00015	0.00012	<0.0001
Lithium (Li)-Dissolved	mg/L	0.0032	0.0034	<0.0030	0.0040
Magnesium (Mg)-Dissolved	mg/L	7.37	7.90	8.28	5.96
Manganese (Mn)-Dissolved	mg/L	<0.0050	0.0054	0.0056	0.0060
Mercury (Hg)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.0001
Molybdenum (Mo)-Dissolved	mg/L	<0.0050	<0.0050	<0.0050	<0.005
Nickel (Ni)-Dissolved	mg/L	<0.0020	<0.0020	<0.0020	<0.002
Phosphorus (P)-Dissolved	mg/L				
Potassium (K)-Dissolved	mg/L	2.31	2.47	2.67	2.11
Rhenium (Re)-Dissolved	mg/L				
Rubidium (Rb)-Dissolved	mg/L				
Selenium (Se)-Dissolved	mg/L	0.00058	0.00044	0.00060	<0.002
Silicon (Si)-Dissolved	mg/L				
Silver (Ag)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.0001
Sodium (Na)-Dissolved	mg/L	38.0	40.0	42.0	29.6
Strontium (Sr)-Dissolved	mg/L				
Tellurium (Te)-Dissolved	mg/L				
Thallium (Tl)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.0001
Thorium (Th)-Dissolved	mg/L				
Tin (Sn)-Dissolved	mg/L	<0.050	<0.050	<0.050	<0.05
Titanium (Ti)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.001
Tungsten (W)-Dissolved	mg/L				
Uranium (U)-Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.0001
Vanadium (V)-Dissolved	mg/L	<0.0010	<0.0010	<0.0010	0.0011
Yttrium (Y)-Dissolved	mg/L				
Zinc (Zn)-Dissolved	mg/L	0.0061	0.0032	0.0038	<0.002
Zirconium (Zr)-Dissolved	mg/L				
Isotope Chemistry					
Our Lab ID		W-14312	?	?	5
Delta 2H x 1000		-156.3	-157.78	-159.7	-146.79
Delta 18O x 1000		-19.44	-19.16	-19.25	-18.5

Table L8: All Doris North water quality results

Field Sample ID / Unique ID	Units	10WBW001-01a	10WBW001-07	10WBW002-01	10WBW002-02	10WBW002-109a	10WBW002-109b	10WBW002-121	10WBW002-122	10WBW002-120	10WBW004-02	10WBW004-03
Sample From		**Lake**	**Lake**	**Westbay Port**	**Westbay Port**	**Westbay Port**	**Westbay Port**	**Westbay Port**	**Other**	**Other**	**Drill Water**	**Drill Water**
Sample Purging Status		**Other**	**Other**	**Initial sample**	**Purging sample**	**Purging sample**	**Purging sample**	**Purging sample**	**Other**	**Other**	**Other**	**Other**
Sample label		Doris Lake Winter	Doris Lake Summer	10WBW002-Zone 1-Port Initial-S01	10WBW002-Zone 1-Port Purge-S02	10WBW002-Zone 1-Port Purge-S109a	10WBW002-Zone 1-Port Purge-S109b	10WBW002-Zone 1-Port Purge-S121	Glycol & water mix prepared at camp	Glycol & water mix from inside Westbay 10WBW002	10WBW004 - Drill Tank Beginning	10WBW004 - Drill Tank End
Location of port in zone		n/a	n/a	Top	Top	Top	Top	Top	n/a	n/a	n/a	n/a
Deposit		Doris Central	Doris Central	Doris North	Doris North	Doris North	Doris North	Doris North	Other	Other	Boston	Boston
Sample Location		Doris Lake	Doris Lake	10WBW002	10WBW002	10WBW002	10WBW002	10WBW002	Glycol	10WBW002	10WBW004	10WBW004
Sample Zone		n/a	n/a	1	1	1	1	1	n/a	n/a	Drill Water	Drill Water
Zone port drillhole depth		n/a	n/a	594.4	594.4	594.4	594.4	594.4	n/a	594.4	n/a	n/a
Zone port vertical depth	m	n/a	n/a	575.06	575.06	575.06	575.06	575.06	n/a	575.06	n/a	n/a
Sample Comments		Lake water from hole in ice near intake.	Grab of lake water	n/a	n/a	Total metals sampled twice - one was clear, one was rusty with sediment (unsure which is which)	Total metals sampled twice - one was clear, one was rusty with sediment (unsure which is which)	At end of Nov purging process	A mix from glycol & lake water from site ST-7, created to compare with what is inside the westbay (S122)	Sample of water INSIDE westbay using regular WB sampler probe near zone 1 depth	Drill tank at beginning of hole (brine)	Drill tank at end of hole (brine). They were starting to add salt when this taken, a few bags added.
QA/QC Sample?		N	N	N	N	Y	Y	N	Y	Y	N	N
QA/QC Comments		n/a	n/a	n/a	n/a	see other S109b result	see other S109a result	n/a	Compare with S122	For comparison with what we are getting outside	n/a	n/a
Total Litres purged from zone before sample was taken		n/a	n/a	0	26	27.1	27.1	52.1	n/a	n/a	n/a	n/a
Zone volumes purged before sample was taken		n/a	n/a	0	0.7	0.7	0.7	1.4	n/a	n/a	n/a	n/a
Field Data												
Field pH		n/a	n/a	n/a	n/a	6.02	6.02	6.13	n/a	6.15	7.7	7.56
Field Electrical Conductivity	mS/cm	n/a	n/a	n/a	n/a	> 99.9	> 99.9	99.9	n/a	48.4	>20	>20
Field Turbidity	NTU	n/a	n/a	n/a	n/a	409	409	-5.0	n/a	319		
Field DO	mg/L	n/a	n/a	n/a	n/a	12.35	12.35	14.15	n/a	15.73		
Field Temperature	°C	n/a	n/a	n/a	n/a	0.69	0.69	4.33	n/a	2.47	22.2	17.5
Field Dep	m	n/a	n/a	n/a	n/a	-1	-1	-1	n/a	0		
Field Salinity	%	n/a	n/a	n/a	n/a	> 4.0	> 4.0	4.0	n/a	0.9		
Field TDS		n/a	n/a	n/a	n/a	> 99	> 99	99.0	n/a	29.0		
Field oT		n/a	n/a	n/a	n/a	> 50	> 50	50	n/a	23		
Field ORP		n/a	n/a	n/a	n/a	146	146	106	n/a	74		
Sample colour/turbidity comments		n/a	n/a	n/a	n/a	Turbid, orange/red	Turbid, orange/red	n/a	n/a	Pink	Opaque	Opaque
ALS DATA												
ALS File No.		L880950	L909782	L909782	L909782	L956881	L956881	L956881	L956881	L956881	L915201	L917645
Date Lab Received		27-Apr-10 15:23	17-Jul-10 13:05	17-Jul-10 13:05	17-Jul-10 13:05	24-Nov-10 10:53	24-Nov-10 10:53	24-Nov-10 10:53	24-Nov-10 10:53	24-Nov-10 10:53	01-Aug-10 11:24	09-Aug-10 09:10
ALS Report Date		06-May-10	28-Jul-10	28-Jul-10	28-Jul-10	08-Dec-10	08-Dec-10	08-Dec-10	08-Dec-10	08-Dec-10	13-Aug-10	20-Aug-10
RESULTS OF ANALYSIS												
ALS SRK Sample ID		10WBW001-01	10WBW001-07	10WBW002-01	10WBW002-02	10WBW002-109	10WBW002-109	10WBW002-121	10WBW002-122	10WBW002-120	10WBW004-1	10WBW004-03
ALS Date Sampled		26-APR-10	15-JUL-10	03-JUL-10	04-JUL-10	07-NOV-10	08-NOV-10	13-NOV-10	14-NOV-10	12-NOV-10	24-JUL-10	31-JUL-10
ALS Time Sampled		12:30	14:00	14:00	14:00	17:00	11:00	11:00	18:00	17:00	15:00	15:00
ALS Sample ID		L880950-1	L909782-7	L909782-5	L909782-6	L956881-1	L956881-2	L956881-4	L956881-5	L956881-3	L915201-11	L917645-4
Matrix		Water	Water	Water	Water	Seawater	Seawater	Seawater	Water	Water	Water	Water
Physical Tests												
Conductivity (EC)	uS/cm	324	304	160000	182000			182000	152	19200	39600	19800
Density			0.998	1.13	1.14			1.17	1.02	1.08		1
Hardness (as CaCO3)	mg/L	53.6	48.8	180000	200000	187000	189000	183000	45.7	73600	21100	10900
pH	pH	7.10	8.52					8.51	7.56	6.63	6.31	7.03
Salinity (EC)	g/L											
Total Dissolved Solids	mg/L	192	188	250000	225000			223000	187	116000	26000	12400
Leachable Anions & Nutrients												
Anion Sum	meq/L											
Cation Sum	meq/L											
Cation - Anion Balance	%											
Anions and Nutrients												
Alkalinity, Bicarbonate (as CaCO3)	mg/L							57.4	46.1	42.8		
Alkalinity, Carbonate (as CaCO3)	mg/L							1.6	<1	<1		
Alkalinity, Hydroxide (as CaCO3)	mg/L							<1	<1	<1		
Alkalinity, Total (as CaCO3)	mg/L	34.4	31.8	56.0	59.5			59.0	46.1	42.8	41.9	13.0
Ammonia as N	mg/L					4.55		4.58	0.040	1.91		
Bromide (Br)	mg/L							<250	<5	<50		
Chloride (Cl)	mg/L	76.6	60.3	114000	123000			133000	53	46800	16400	7530
Fluoride (F)	mg/L	0.069	<0.05	16	20			<100	<2	<20	<1	1.4
Nitrate (as N)	mg/L	0.053	<0.05	<10	<10			<25	<0.5	<5	<1	<0.05
Nitrite (as N)	mg/L	<0.050	<0.05	<10	<10			<5	<0.1	<1	<1	<0.05
Ortho Phosphate as P	mg/L							<0.1	12.1	0.45		
Total Phosphate as P	mg/L							1.01	10.3	10.3		
Silicate (as SIO2)	mg/L							<100	<20	<100		
Sulfate (SO4)	mg/L	3.44	2.42	<100	<100			<2500	<50	<500	50	5.28
Additional Anions and Nutrients												
Bicarbonate (HCO3)	mg/L	41.9	27.2	68.3	11.9						51.1	15.9
Carbonate (CO3)	mg/L	<5.0	5.7	<5	29.9						<5	<5
Hydroxide (OH)	mg/L	<5.0	<5	<5	<5						<5	<5
Ion Balance	%	95.1	97.0								95.4	104
Nitrate and Nitrite as N	mg/L	<0.071	<0.071	<14	<14						<1.4	<0.071
TDS (Calculated)	mg/L	158	129	187000	203000						25400	12000
Total Metals												
Aluminum (Al)-Total	mg/L	<0.010	0.048	30.5	9.7	0.161	9.40	9.94	0.0795	1.40	4.6	13.7
Antimony (Sb)-Total	mg/L	<0.00040	<0.0004	<0.08	<0.08	0.0104	0.0107	0.0117	<0.0005	0.0081	<0.08	<0.08
Arsenic (As)-Total	mg/L	0.00074	0.00055	0.218	0.507	<0.02	<0.02	<0.02	0.0111	0.027	<0.08	<0.08
Barium (Ba)-Total	mg/L	0.0036	0.0034	0.719	0.736	0.860	0.827	0.832	0.0026	0.280	0.681	0.262
Beryllium (Be)-Total	mg/L	<0.0010	<0.001	<0.2	<0.2	<0.005	<0.005	<0.005	<0.0005	<0.0025	<0.2	<0.2
Bismuth (Bi)-Total	mg/L					<0.005	<0.005	<0.005	<0.0005	<0.0025		
Boron (B)-Total	mg/L	<0.050	<0.05	0.95	0.99	<1	<1	<1	<0.1	<0.5	1.25	<0.8
Cadmium (Cd)-Total	mg/L	<0.000050	<0.00005	<0.01	<0.01	<0.0005	<0.0005	<0.0005	<0.00005	<0.001	<0.01	<0.01
Calcium (Ca)-Total	mg/L	8.47	9.47	78500	96200	77400	75500	78800	8.53	25200	7820	4750
Cesium (Cs)-Total	mg/L					0.0057	0.0061	0.0063	<0.0005	<0.0025		
Chromium (Cr)-Total	mg/L	<0.0050	<0.005	0.63	0.48	0.0062	0.107	0.120	0.00160	0.0243	0.46	0.35
Cobalt (Co)-Total	mg/L	<0.0020	<0.002	0.094	0.088	<0.0005	0.00841	0.00949	<0.00005	0.00200	<0.04	<0.04
Copper (Cu)-Total	mg/L	0.0023	0.0019	<0.2	<0.2	0.0242	0.0467	0.0585	0.00234	0.0217	<0.2	<0.2
Gallium (Ga)-Total	mg/L					<0.005	<0.005	<0.005	<0.0005	<0.0025		
Iron (Fe)-Total	mg/L	0.017	0.108	133	34.4	0.51	38.6	54.6	0.078	5.50	23.1	58.6
Lead (Pb)-Total	mg/L	0.00089	<0.0001	0.113	0.030	0.0039	0.0438	0.0663	<0.0003	0.0116	<0.02	0.086
Lithium (Li)-Total	mg/L	<0.010	<0.01	<1.2	<1.2	<0.2	0.44	<0.2	<0.02	<0.1	<1.2	<1.2
Magnesium (Mg)-Total	mg/L	6.73	5.87	132	114	113	129	135	5.3	56	82.0	24.1
Manganese (Mn)-Total	mg/L	0.0035	0.0154	2.68	0.47	0.0233	1.05	1.15	0.00476	0.786	2.09	1.03
Mercury (Hg)-Total	mg/L	<0.00010	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	0.000014	<0.00005	<0.00005	<0.0001	<0.0001
Molybdenum (Mo)-Total	mg/L	<0.0050	<0.005	0.222	0.223	0.178	0.178	0.193	<0.002	0.058	0.075	0.073
Nickel (Ni)-Total	mg/L	<0.0020	<0.002	1.40	1.82	0.0076	0.0359	0.0402	0.00064	0.0174	0.191	0.151
Phosphorus (P)-Total	mg/L					<10	<10	<10	9.8	6.5		
Potassium (K)-Total	mg/L	2.30	2.13	36	35	<200	<200	<200	28	<200	70.4	16.1
Rhenium (Re)-Total	mg/L					<0.005	<0.005	<0.005	<0.0005	<0.0025		
Rubidium (Rb)-Total	mg/L					0.051	0.053	<0.05	<0.005	<0.025		
Selenium (Se)-Total	mg/L	0.00056	<0.002	<0.4	<0.4	<0.02	<0.02	<0.02	<0.02	<0.07	<0.4	<0.08
Silicon (Si)-Total	mg/L					<5	25.4	27.8	1.23	<5		
Silver (Ag)-Total	mg/L	<0.00050	<0.0001	<0.02	<0.02	<0.001	0.0018	0.0022	<0.0001	<0.0005	<0.02	<0.02
Sodium (Na)-Total	mg/L	34.2	29.2	580	240	280	1770	450	26	<200	378	61.5
Strontium (Sr)-Total	mg/L					33.1	59.0	37.3	0.036	9.71		
Tellurium (Te)-Total	mg/L					<0.005	<0.005	<0.005	<0.0005	<0.0025		
Thallium (Tl)-Total	mg/L	<0.00010	<0.0001	<0.02	<0.02	0.00054	0.00052	<0.0005	<0.00005	<0.00025	<0.02	<0.02
Thorium (Th)-Total	mg/L					<0.005	<0.005	<0.005	<0.0005	<0.0025		
Tin (Sn)-Total	mg/L	<0.050	<0.05	<0.08	<0.08	<0.01	<0.01	<0.01	<0.001	<0.005	<0.08	<0.08
Titanium (Ti)-Total	mg/L	<0.0010	0.0013	2.97	0.81	<0.05	0.366	0.378	0.0051	0.083	<0.12	<0.12
Tungsten (W)-Total	mg/L					0.028	0.028	0.030	<0.001	<0.005		
Uranium (U)-Total	mg/L	<0.00010	<0.0001	<0.02	<0.02	<0.0005	<0.0005	<0.0005	0.000151	<0.00025	<0.02	<0.02
Vanadium (V)-Total	mg/L	<0.0010	<0.001	0.98	1.34	<0.005	0.0279	0.0282	0.00166	0.0049	0.15	<0.1
Yttrium (Y)-Total	mg/L					<0.005	<0.005	<0.005	<0.0005	<0.0025		
Zinc (Zn)-Total	mg/L	0.0090	<0.004	<0.8	<0.8	0.595	0.373	0.557	0.0150	3.12	<0.8	<0.8
Zirconium (Zr)-Total	mg/L					<0.005	<0.005	<0.005	<0.0005	<0.0025		

Sample label		Doris Lake Winter	Doris Lake Summer	10WBW002-Zone 1-Port Initial-S01	10WBW002-Zone 1-Port Purge-S02	10WBW002-Zone 1-Port Purge-S109a	10WBW002-Zone 1-Port Purge-S109b	10WBW002-Zone 1-Port Purge-S121	Glycol & water mix prepared at camp	Glycol & water mix from inside Westbay 10WBW002	10WBW004 - Drill Tank Beginning	10WBW004 - Drill Tank End
Location of port in zone		n/a	n/a	Top	Top	Top	Top	Top	n/a	n/a	n/a	n/a
Dissolved Metals												
Aluminum (Al)-Dissolved	mg/L	<0.010	<0.01	<1	<1	<0.05		<0.05	<0.005	<0.025	<1	<0.1
Antimony (Sb)-Dissolved	mg/L	<0.00040	<0.0004	<0.08	<0.08	0.0093		0.0094	<0.0005	0.0076	<0.08	<0.008
Arsenic (As)-Dissolved	mg/L	0.00057	0.00068	0.266	0.421	<0.02		<0.02	0.0103	0.027	<0.08	0.0537
Barium (Ba)-Dissolved	mg/L	0.0037	0.0036	0.683	0.770	0.833		0.817	0.0034	0.308	0.700	0.188
Beryllium (Be)-Dissolved	mg/L	<0.0010	<0.001	<0.1	<0.1	<0.005		<0.005	<0.0005	<0.0025	<0.1	<0.01
Bismuth (Bi)-Dissolved	mg/L					<0.005		<0.005	<0.0005	<0.0025		
Boron (B)-Dissolved	mg/L	<0.050	<0.05	0.86	0.99	<1		<1	<0.1	<0.5	1.31	0.102
Cadmium (Cd)-Dissolved	mg/L	<0.000050	<0.00005	<0.01	<0.01	<0.0005		<0.0005	<0.00005	<0.0012	<0.01	<0.001
Calcium (Ca)-Dissolved	mg/L	9.30	9.70	72100	79800	74700		73100	8.55	29400	8320	4330
Cesium (Cs)-Dissolved	mg/L					0.0063		0.0062	<0.0005	<0.0025		
Chromium (Cr)-Dissolved	mg/L	<0.0050	<0.005	0.371	0.328	0.0079		<0.001	<0.0005	<0.0025	0.519	0.0139
Cobalt (Co)-Dissolved	mg/L	<0.0020	<0.002	0.061	0.074	<0.0005		<0.0005	<0.00005	0.00052	0.033	0.0053
Copper (Cu)-Dissolved	mg/L	0.0022	0.0016	<0.12	<0.12	0.0129		0.0158	0.00180	0.0101	<0.12	<0.012
Gallium (Ga)-Dissolved	mg/L					<0.005		<0.005	<0.0005	<0.0025		
Iron (Fe)-Dissolved	mg/L	<0.030	0.035	<1.5	<1.5	0.12		<0.1	<0.01	<0.05	12.7	0.091
Lead (Pb)-Dissolved	mg/L	0.00069	<0.0001	<0.02	<0.02	0.0030		<0.003	<0.003	<0.015	<0.02	<0.002
Lithium (Li)-Dissolved	mg/L	0.0032	0.0040	<0.6	<0.6	0.44		<0.2	<0.02	<0.1	<0.6	<0.06
Magnesium (Mg)-Dissolved	mg/L	7.37	5.96	113	124	110		113	5.9	65	84.7	18.7
Manganese (Mn)-Dissolved	mg/L	<0.0050	0.0060	<0.25	<0.25	0.0196		0.0141	0.00109	0.741	2.09	0.615
Mercury (Hg)-Dissolved	mg/L	<0.00010	<0.0001	<0.0001	<0.0001	<0.00001		<0.00001	<0.00005	<0.00005	<0.0001	<0.0001
Molybdenum (Mo)-Dissolved	mg/L	<0.0050	<0.005	0.222	0.180	0.163		0.175	<0.002	0.063	0.074	0.0310
Nickel (Ni)-Dissolved	mg/L	<0.0020	<0.002	1.43	1.68	<0.005		0.0072	<0.0005	0.0096	0.190	0.0764
Phosphorus (P)-Dissolved	mg/L					<10		<10	11.4	<5		
Potassium (K)-Dissolved	mg/L	2.31	2.11	39	52	<200		<200	31	<200	83.0	12.6
Rhenium (Re)-Dissolved	mg/L					<0.005		<0.005	<0.0005	<0.0025		
Rubidium (Rb)-Dissolved	mg/L					0.053		<0.05	<0.005	<0.025		
Selenium (Se)-Dissolved	mg/L	0.00058	<0.002	<0.4	<0.4	<0.02		<0.02	<0.02	<0.07	<0.4	<0.04
Silicon (Si)-Dissolved	mg/L					<5		<5	1.32	<5		
Silver (Ag)-Dissolved	mg/L	<0.00010	<0.0001	<0.02	<0.02	<0.001		<0.001	<0.0001	<0.0005	<0.02	<0.002
Sodium (Na)-Dissolved	mg/L	38.0	29.6	655	300	1680		490	30	<200	439	62.7
Strontium (Sr)-Dissolved	mg/L					57.6		35.8	0.038	11.0		
Tellurium (Te)-Dissolved	mg/L					<0.005		<0.005	<0.0005	<0.0025		
Thallium (Tl)-Dissolved	mg/L	<0.00010	<0.0001	<0.01	<0.01	0.00053		<0.0005	<0.00005	<0.00025	<0.01	<0.001
Thorium (Th)-Dissolved	mg/L					<0.005		<0.005	<0.0005	<0.0025		
Tin (Sn)-Dissolved	mg/L	<0.050	<0.05	<0.05	<0.05	<0.01		<0.01	<0.001	<0.005	<0.05	<0.05
Titanium (Ti)-Dissolved	mg/L	<0.0010	<0.001	<0.06	<0.06	<0.05		<0.05	<0.005	<0.025	<0.06	<0.006
Tungsten (W)-Dissolved	mg/L					0.026		0.024	<0.001	<0.005		
Uranium (U)-Dissolved	mg/L	<0.00010	<0.0001	<0.02	<0.02	<0.0005		<0.0005	0.000155	<0.00025	<0.02	<0.002
Vanadium (V)-Dissolved	mg/L	<0.0010	0.0011	0.863	1.08	<0.005		<0.005	0.00166	<0.0025	0.205	0.0555
Yttrium (Y)-Dissolved	mg/L					<0.005		<0.005	<0.0005	<0.0025		
Zinc (Zn)-Dissolved	mg/L	0.0061	<0.002	<0.2	<0.2	<0.03		0.044	0.0069	1.99	<0.2	<0.02
Zirconium (Zr)-Dissolved	mg/L					<0.005		<0.005	<0.0005	<0.0025		
Cation Balance		2.78	2.32								443.35	220.65
Anion Balance		2.92	2.38								463.85	212.48
Ion Balance		17.55	21.28								0.11	0.00
Isotope Chemistry												
Our Lab ID		W-14312	5	6	7						21	26
Delta 2H x 1000		-156.3	-146.79	-147.68	-149.12						-151.63	-154.5
Delta 18O x 1000		-19.44	-18.5	-20.52	-20.83						-19.03	-19.46

Table L9: All Boston Water Quality Results

Field Sample ID / Unique ID	Units	10WBW004-01	10WBW004-02	10WBW004-03	10WBW004-123	10WBW004-124	10WBW004-125	10WBW004-126	10WBW004-128	10WBW004-129	10WBW004-130	10WBW004-131
Sample From		**Lake**	**Drill Water**	**Drill Water**	**Westbay Port**	**Westbay Port**	**Westbay Port**	**Westbay Port**	**Westbay Port**	**Westbay Port**	**Westbay Port**	**Westbay Port**
Sample Purging Status		**Other**	**Other**	**Other**	**Initial sample**	**Purging sample**	**Purging sample**	**Purging sample**	**Purging sample**	**Purging sample**	**Purging sample**	**Purging sample**
Sample label		Spyder Lake	10WBW004 -Drill Tank Beginning	10WBW004 - Drill Tank End	10WBW004 - Zone 6-Port Initial-S123	10WBW004 - Zone 6-Port Purge-S124	10WBW004 - Zone 6-Port Purge-S125	10WBW004 - Zone 6-Port Purge-S126	10WBW004 - Zone 6-Port Purge-S128	10WBW004 - Zone 6-Port Purge-S129	10WBW004 - Zone 6-Port Purge-S130	10WBW004 - Zone 6-Port Purge Final Dec-S131
Location of port in zone		n/a	n/a	n/a	Top	Top	Top	Middle	Top	Middle	Middle	Top
Deposit		Boston	Boston	Boston	Boston	Boston	Boston	Boston	Boston	Boston	Boston	Boston
Sample Location		Spyder Lake	10WBW004	10WBW004	10WBW004	10WBW004	10WBW004	10WBW004	10WBW004	10WBW004	10WBW004	10WBW004
Sample Zone		n/a	Drill Water	Drill Water	6	6	6	6	6	6	6	6
Zone port drillhole depth		n/a	n/a	n/a	295.7	295.7	295.7	304.8	295.7	304.8	304.8	295.7
Zone port vertical depth	m	n/a	n/a	n/a	271.54	271.54	271.54	379.6	271.54	379.6	379.6	271.54
Sample Comments		Spyder Lake near drill water intake	Drill tank at beginning of hole (brine)	Drill tank at end of hole (brine). They were starting to add salt when this taken, a few bags added.	Partially frozen, all samples warmed to prevent freeze.	Slushy, all samples warmed to prevent freeze.	Slushy, all samples warmed to prevent freeze.	Slushy, all samples warmed to prevent freeze.	Slushy, all samples warmed to prevent freeze.	Slushy, all samples warmed to prevent freeze.	Slushy, all samples warmed to prevent freeze.	Slushy, all samples warmed to prevent freeze.
QA/QC Sample?		N	N	N	N	N	N	N	N	N	N	N
QA/QC Comments		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total litres purged from zone before sample was taken		n/a	n/a	n/a	1.1	38	38	44	52	59	72	84
Zone volumes purged before sample was taken		n/a	n/a	n/a	0	0.52	0.52	0.60	0.71	0.81	0.98	1.15
Field Data												
Field pH		6.93	7.7	7.56	6.26	5.43	5.43	6.83	6.38	6.64	6.80	6.30
Field Electrical Conductivity	mS/cm	0.0425	>20	>20	37.2	39	39	40.4	44.0	40.3	40.0	39.1
Field Turbidity	NTU				6.9	0.05	0.05	40.0	0.0	0.0	0.0	0.2
Field DO	mg/L				13.54	19.97	19.97	19.08	>20	15.85	19.37	14.71
Field Temperature	°C	20.4	22.2	17.5	5.5	6.37	6.37	10.52	3.68	15.13	9.23	6.88
Field Dep	m				0	0	0	0	0.0	0.0	0.0	0.0
Field Salinity	%				2.3	2.4	2.4	2.5	2.7	2.6	2.5	2.4
Field TDS					23	23.5	23.5	25.0	27	25	24	24
Field oT					18	18.5	18.5	19	21	19	19	19
Field ORP					163	263	263	161	199	251	164	195
Sample colour/turbidity comments		Clear	Opaque	Opaque	clear, colourless, gas smell, all samples warmed to prevent freezing	clear, colourless, gas smell, all samples warmed to prevent freezing	clear, colourless, gas smell, all samples warmed to prevent freezing	clear, colourless, gas smell, all samples warmed to prevent freezing	clear, colourless, gas smell, all samples warmed to prevent freezing	clear, colourless, gas smell, all samples warmed to prevent freezing	clear, colourless, gas smell, all samples warmed to prevent freezing	clear, colourless, gas smell, all samples warmed to prevent freezing
ALS DATA												
ALS File No.		L915201	L915201	L917645	L957001	L960194	L960194	L960194	L960194	L960194	L960194	L960194
Date Lab Received		01-Aug-10 11:24	01-Aug-10 11:24	09-Aug-10 09:10	24-Nov-10 14:00	03-Dec-10 17:00	03-Dec-10 17:00	03-Dec-10 17:00	03-Dec-10 17:00	03-Dec-10 17:00	03-Dec-10 17:00	03-Dec-10 17:00
ALS Report Date		13-Aug-10	13-Aug-10	20-Aug-10	13-Dec-10	22-Dec-10	22-Dec-10	22-Dec-10	22-Dec-10	22-Dec-10	22-Dec-10	22-Dec-10
RESULTS OF ANALYSIS												
ALS SRK Sample ID		10WBW004-2	10WBW004-1	10WBW004-03	10WBW004-123	10WBW004-124	10WBW004-125	10WBW004-126	10WBW004-128	10WBW004-129	10WBW004-130	10WBW004-131
ALS Date Sampled		24-JUL-10	24-JUL-10	31-JUL-10	18-NOV-10	25-NOV-10	25-NOV-10	26-NOV-10	27-NOV-10	28-NOV-10	29-NOV-10	30-NOV-10
ALS Time Sampled		14:30	15:00	15:00	18:00	18:00	18:00	19:00	16:00	10:30	11:00	09:00
ALS Sample ID		L915201-12	L915201-11	L917645-4	L957001-1	L960194-1	L960194-2	L960194-3	L960194-4	L960194-5	L960194-6	L960194-7
Matrix		Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
Physical Tests												
Conductivity (EC)	uS/cm	44.0	39600	19800	30200	30900	30700	33800	31400	33000	33000	31800
Density		0.996		1	1.02	1.00	1.02	1.02	1.02	1.02	1.02	1.01
Hardness (as CaCO3)	mg/L	13.3	21100	10900	13900	12900	12700	12100	12100	12600	13300	11800
pH	pH	6.99	6.31	7.03	7.05	6.66	6.68	6.81	6.96	7.02	7.09	7.03
Salinity (EC)	g/L										21.0	20.2
Total Dissolved Solids	mg/L	32.0	26000	12400	28500	32000	30800	33500	31700	33900	33300	32300
Leachable Anions & Nutrients												
Anion Sum	meq/L					355	357	394	362	385	386	368
Cation Sum	meq/L					337	334	348	338	363	381	338
Cation - Anion Balance	%					<2.6	<3.4	<6.1	<3.5	<3	<0.7	<4.2
Anions and Nutrients												
Alkalinity, Bicarbonate (as CaCO3)	mg/L				35.8	35.5	35.3	40.0	48.7	50.5	53.0	53.5
Alkalinity, Carbonate (as CaCO3)	mg/L				<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L				<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	7.9	41.9	13.0	35.8	35.5	35.3	40.0	48.7	50.5	53.0	53.5
Ammonia as N	mg/L				2.33	<	<	<			1.96	1.95
Bromide (Br)	mg/L				6.3	6.4	6.5	9.2	8.2	9.9	9.3	9.0
Chloride (Cl)	mg/L	7.58	16400	7530	12100	12400	12400	13700	12600	13400	13400	12800
Fluoride (F)	mg/L	<0.05	<1	1.4	0.78	0.669	0.677	0.983	0.645	0.716	0.689	0.642
Nitrate (as N)	mg/L	<0.05	<1	<0.05	<0.5	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	<0.50
Nitrite (as N)	mg/L	<0.05	<1	<0.05	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Ortho Phosphate as P	mg/L				<0.005						<0.0010	<0.0010
Total Phosphate as P	mg/L				0.123						0.148	0.155
Silicate (as SIO2)	mg/L				<10						8.2	6.5
Sulfate (SO4)	mg/L	1.63	50	5.28	244	264	260	336	322	349	347	330
Additional Anions and Nutrients												
Bicarbonate (HCO3)	mg/L	9.6	51.1	15.9								
Carbonate (CO3)	mg/L	<5	<5	<5								
Hydroxide (OH)	mg/L	<5	<5	<5								
Ion Balance	%	Low EC	95.4	104								
Nitrate and Nitrite as N	mg/L	<0.071	<1.4	<0.071								
TDS (Calculated)	mg/L	22.9	25400	12000								
Total Metals												
Aluminum (Al)-Total	mg/L	0.061	4.6	13.7	0.0469	0.0114	0.0133	0.0152	0.0189	0.0110	0.0167	0.0087
Antimony (Sb)-Total	mg/L	<0.0004	<0.08	<0.08	0.0184	0.0180	0.0180	0.0176	0.0199	0.0199	0.0214	0.0203
Arsenic (As)-Total	mg/L	<0.0004	<0.08	<0.08	<0.002	<0.0020	<0.0020	<0.0030	<0.0020	<0.0030	<0.0030	<0.0030
Barium (Ba)-Total	mg/L	<0.003	0.681	0.262	0.530	0.567	0.557	0.554	0.570	0.562	0.596	0.564
Beryllium (Be)-Total	mg/L	<0.001	<0.2	<0.2	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)-Total	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L	<0.05	1.25	<0.8	0.79	0.87	0.87	1.00	0.92	0.96	0.99	0.96
Cadmium (Cd)-Total	mg/L	<0.00005	<0.01	<0.01	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Calcium (Ca)-Total	mg/L	<10	7820	4750	4700	4460	4510	4730	4180	4330	4380	4110
Cesium (Cs)-Total	mg/L				0.00485	0.00531	0.00519	0.00665	0.00600	0.00659	0.00671	0.00644
Chromium (Cr)-Total	mg/L	<0.005	0.46	0.35	0.00776	<0.0020	<0.0030	<0.0040	<0.0020	<0.0030	<0.0030	<0.0030
Cobalt (Co)-Total	mg/L	<0.002	<0.04	<0.04	0.00717	0.00712	0.00699	0.00562	0.00585	0.00537	0.00612	0.00556
Copper (Cu)-Total	mg/L	0.0013	<0.2	<0.2	0.00083	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Gallium (Ga)-Total	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total	mg/L	0.22	23.1	58.6	8.23	7.74	7.62	8.25	5.83	5.68	5.21	4.89
Lead (Pb)-Total	mg/L	<0.0001	<0.02	0.086	0.00602	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lithium (Li)-Total	mg/L	<0.01	<1.2	<1.2	0.049	0.052	0.051	0.059	0.054	0.055	0.057	0.053
Magnesium (Mg)-Total	mg/L	<2	82.0	24.1	287	305	306	413	370	414	411	394
Manganese (Mn)-Total	mg/L	<0.04	2.09	1.03	0.965	0.936	0.926	0.909	0.903	0.888	0.953	0.887
Mercury (Hg)-Total	mg/L	<0.0001	<0.0001	<0.0001	<0.00001						<0.000050	<0.000050
Molybdenum (Mo)-Total	mg/L	<0.005	0.075	0.073	0.0837	0.0879	0.0853	0.118	0.0937	0.101	0.108	0.0942
Nickel (Ni)-Total	mg/L	<0.002	0.191	0.151	0.0343	0.0309	0.0305	0.0220	0.0239	0.0216	0.0228	0.0223
Phosphorus (P)-Total	mg/L				<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Potassium (K)-Total	mg/L	<2	70.4	16.1	44	46	47	50	48	50	50	49
Rhenium (Re)-Total	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)-Total	mg/L				0.0533	0.0568	0.0555	0.0556	0.0544	0.0536	0.0554	0.0544
Selenium (Se)-Total	mg/L	<0.0004	<0.4	<0.08	<0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)-Total	mg/L				1.61	1.62	1.68	1.67	1.76	1.77	1.80	1.81
Silver (Ag)-Total	mg/L	<0.0001	<0.02	<0.02	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)-Total	mg/L	<20	378	61.5	1680	1760	1780	2500	2190	2480	2460	2360
Strontium (Sr)-Total	mg/L				17.2	19.9	19.8	26.1	23.0	26.0	26.5	24.8
Tellurium (Te)-Total	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)-Total	mg/L	<0.0001	<0.02	<0.02	<0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium (Th)-Total	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)-Total	mg/L	<0.05	<0.08	<0.08	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)-Total	mg/L	0.0017	<0.12	<0.12	<0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)-Total	mg/L				<0.001	<0.0010	<0.0010	0.0014	0.0015	0.0029	0.0053	0.0015
Uranium (U)-Total	mg/L	<0.0001	<0.02	<0.02	0.00503	0.00517	0.00501	0.00636	0.00733	0.00840	0.0101	0.00864
Vanadium (V)-Total	mg/L	<0.001	0.15	<0.1	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Yttrium (Y)-Total	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	mg/L	<0.004	<0.8	<0.8	0.392	0.188	0.206	0.204	0.148	0.196	0.217	0.193
Zirconium (Zr)-Total	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Sample label		Spyder Lake	10WBW004 -Drill Tank Beginning	10WBW004 - Drill Tank End	10WBW004 - Zone 6-Port Initial-S123	10WBW004 - Zone 6-Port Purge-S124	10WBW004 - Zone 6-Port Purge-S125	10WBW004 - Zone 6-Port Purge-S126	10WBW004 - Zone 6-Port Purge-S128	10WBW004 - Zone 6-Port Purge-S129	10WBW004 - Zone 6-Port Purge-S130	10WBW004 - Zone 6-Port Purge Final Dec-S131
Location of port in zone		n/a	n/a	n/a	Top	Top	Top	Middle	Top	Middle	Middle	Top
Dissolved Metals												
Aluminum (Al)-Dissolved	mg/L	0.014	<1	<0.1	<0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Antimony (Sb)-Dissolved	mg/L	<0.0004	<0.08	<0.008	0.0182	0.0178	0.0182	0.0178	0.0194	0.0211	0.0207	0.0192
Arsenic (As)-Dissolved	mg/L	<0.0004	<0.08	0.0537	<0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)-Dissolved	mg/L	<0.003	0.700	0.188	0.594	0.586	0.570	0.533	0.563	0.582	0.575	0.555
Beryllium (Be)-Dissolved	mg/L	<0.001	<0.1	<0.01	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)-Dissolved	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L	<0.05	1.31	0.102	0.84	0.93	0.90	0.97	0.92	1.01	0.96	0.95
Cadmium (Cd)-Dissolved	mg/L	<0.00005	<0.01	<0.001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Calcium (Ca)-Dissolved	mg/L	3.00	8320	4330	5050	4630	4580	4180	4230	4350	4620	4080
Cesium (Cs)-Dissolved	mg/L				0.00540	0.00553	0.00537	0.00648	0.00595	0.00683	0.00651	0.00621
Chromium (Cr)-Dissolved	mg/L	<0.005	0.519	0.0139	<0.0001	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L	<0.002	0.033	0.0053	0.00779	0.00736	0.00708	0.00526	0.00575	0.00529	0.00566	0.00529
Copper (Cu)-Dissolved	mg/L	0.0015	<0.12	<0.012	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Gallium (Ga)-Dissolved	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Dissolved	mg/L	0.068	12.7	0.091	8.05	7.38	7.06	6.43	5.06	4.34	4.45	4.45
Lead (Pb)-Dissolved	mg/L	<0.0001	<0.02	<0.002	<0.0003	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lithium (Li)-Dissolved	mg/L	<0.003	<0.6	<0.06	0.054	0.055	0.055	0.055	0.055	0.057	0.055	0.054
Magnesium (Mg)-Dissolved	mg/L	1.42	84.7	18.7	311	312	309	404	365	425	432	387
Manganese (Mn)-Dissolved	mg/L	0.0064	2.09	0.615	1.01	0.989	0.950	0.888	0.899	0.911	0.904	0.870
Mercury (Hg)-Dissolved	mg/L	<0.0001	<0.0001	<0.0001	<0.00001						<0.000050	<0.000050
Molybdenum (Mo)-Dissolved	mg/L	<0.005	0.074	0.0310	0.0902	0.0866	0.0860	0.0990	0.0931	0.100	0.101	0.0967
Nickel (Ni)-Dissolved	mg/L	<0.002	0.190	0.0764	0.0320	0.0313	0.0301	0.0199	0.0229	0.0203	0.0201	0.0208
Phosphorus (P)-Dissolved	mg/L				<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Potassium (K)-Dissolved	mg/L	0.72	83.0	12.6	47	47	47	48	48	50	53	49
Rhenium (Re)-Dissolved	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)-Dissolved	mg/L				0.0601	0.0587	0.0576	0.0530	0.0551	0.0564	0.0541	0.0539
Selenium (Se)-Dissolved	mg/L	<0.0004	<0.4	<0.04	<0.002	<0.0020	<0.0020	<0.0030	<0.0020	<0.0021	<0.0045	<0.0020
Silicon (Si)-Dissolved	mg/L				1.57	1.65	1.63	1.65	1.72	1.71	1.89	1.78
Silver (Ag)-Dissolved	mg/L	<0.0001	<0.02	<0.002	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)-Dissolved	mg/L	3.8	439	62.7	1820	1820	1790	2410	2200	2510	2600	2330
Strontium (Sr)-Dissolved	mg/L				18.8	21.3	20.1	25.3	23.1	27.0	26.3	24.4
Tellurium (Te)-Dissolved	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)-Dissolved	mg/L	<0.0001	<0.01	<0.001	<0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium (Th)-Dissolved	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)-Dissolved	mg/L	<0.05	<0.05	<0.05	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)-Dissolved	mg/L	<0.001	<0.06	<0.006	<0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)-Dissolved	mg/L				<0.001	<0.0010	<0.0010	0.0020	0.0013	0.0029	0.0050	0.0014
Uranium (U)-Dissolved	mg/L	<0.0001	<0.02	<0.002	0.00512	0.00523	0.00521	0.00730	0.00730	0.00909	0.0100	0.00863
Vanadium (V)-Dissolved	mg/L	<0.001	0.205	0.0555	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Yttrium (Y)-Dissolved	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L	0.0032	<0.2	<0.02	0.156	0.0944	0.0933	0.136	0.114	0.0941	0.137	0.131
Zirconium (Zr)-Dissolved	mg/L				<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cation Balance		0.45	443.35	220.65	357.91	337.04	332.99	347.83	337.99	362.44	380.48	337.99
Anion Balance		0.41	463.85	212.48	346.64	355.50	355.41	393.71	362.61	385.74	385.75	368.50
Ion Balance		0.00	0.11	0.00	0.00	0.14	0.15	0.13	0.14	0.13	0.13	0.14
Isotope Chemistry												
Our Lab ID		20	21	26								
Delta 2H x 1000		-149.48	-151.63	-154.5								
Delta 18O x 1000		-18.93	-19.03	-19.46								

Table L10: All Final Samples (Airlift and Port Samples) from Doris Central Westbay Well 10WBW001

Sample Descriptor	Sample From	Analysis method	Date Taken	Physical Tests															Ha	
				pH Field	pH Lab	Temp Field - At time of field parameters reading	Temp Field - Zone at depth	Conductivity Lab (EC)	Conductivity Field (EC)	Salinity Lab (EC)	Salinity Field	Total Dissolved Solids Lab	Total Dissolved Solids Field	Turbidity Field	DO Field	oT Field	ORP Field	Density Lab	Hardness (as CaCO3)	Alkalinity, Bicarbonate (as CaCO3)
				pH	pH	°C	°C	uS/cm	uS/cm	g/L	%	mg/L	mg/L	NTU	mg/L		mV		mg/L	mg/L
Doris Central Talik Zone 10 (57 - 97m vertical depth below lake surface)																				
10WBW001-Zone 10 - port (37)	Measurement port at end of purge process	Seawater	5-Aug-10	7.86	7.47		1.25	**30300**	>20000			**23100**							**6030**	
10WBW001-Zone 10 - port (102)	Measurement port after 2 months of no activity in zone	Seawater	20-Oct-10	7.55	7.46	5.09	1.22	**33800**	40600		2.45	**28300**	24500	39	6.4	20	**-152**	1.01	**6360**	**77.3**
10WBW001-Zone 10 - port (105)	Measurement port after airlifting toxicity sample from zone 6	Seawater	29-Oct-10	7.90	7.44	7.10	1.22	**43300**	50200	28.5	3.2	**34500**	30000	37	7.6	25	**-121**	1.01	**8900**	**106**
Min				7.55	7.44	5.09	1.22	**30300**	>20000	28.5	2.45	**23100**	24500	37	6.4	20	**-152**	1.01	**6030**	**77.3**
Average				7.77	7.46	6.09	1.23	**35800**	45400	28.5	2.825	**28633**	27250	38	7.0	22	**-136**	1.01	**7097**	**91.7**
Max				7.90	7.47	7.10	1.25	**43300**	50200	28.5	3.2	**34500**	30000	39	7.6	25	**-121**	1.01	**8900**	**106**
% difference	*in to max (note different sampling methods)*			4.4%	0.4%	28.4%	2.4%	**30.0%**	n/a	0.0%	23.4%	**33.0%**	18.3%	5.0%	14.9%	22.0%	**-25.2%**	0.0%	**32.2%**	**27.1%**
Doris Central Talik Zone 6 (221 - 245m vertical depth below lake surface)																				
10WBW001-Zone 6 - port (36)	Measurement port at end of purge process	Seawater	5-Aug-10	8.27	7.83		1.10	**24600**	>20000			**19600**							**4760**	
10WBW001-Zone 6 - port (101)	Measurement port after 2 months of no activity in zone	Seawater	19-Oct-10	7.91	7.79	7.44	1.07	**34900**	40300	22.1	2.5	**28900**	25000	118	12.2	20		1.01	**6720**	**44.2**
10WBW001-Zone 6 - airlift (103)	Airlifting for bulk water sample	Seawater	24-Oct-10	5.48	7.04	2.83	1.07	**48500**	60300	32.4	3.8	**35400**	36000	8	11.3	30	**-116**		**10000**	
10WBW001-Zone 6 - airlift (107)	Airlifting for toxicity sample	Seawater	31-Oct-10	6.35	7.46	1.72	1.07	**48800**	63400	32.6	3.9	**39000**	38000	6	12.3	32	**-110**	1.03	**9760**	**76.5**
10WBW001-Zone 6 - port (108)	Measurement port after airlifting toxicity sample from zone 6	Seawater	1-Nov-10	7.36	7.59	5.51	1.07	**37000**	46100		2.9	**25500**	28000	18	9.4	23	**-96**	1.03	**7340**	**43.7**
Min				5.48	7.04	1.72	1.07	**37000**	>20000	32.4	2.90	**25500**	28000	6	9.4	23	**-116**	1.03	**7340**	**43.7**
Average				6.40	7.36	3.35	1.07	**44767**	56600	32.5	3.53	**33300**	34000	11	11.0	28	**-107**	1.03	**9033**	**60.1**
Max				7.36	7.59	5.51	1.07	**48800**	63400	32.6	3.90	**39000**	38000	18	12.3	32	**-96**	1.03	**10000**	**76.5**
% difference	*in to max (note different sampling methods)*			25.5%	7.2%	68.8%	0.0%	**24.2%**	n/a	0.6%	25.6%	**34.6%**	26.3%	65.7%	23.5%	28.1%	**-20.8%**	0.0%	**26.6%**	**42.9%**
Doris Central Talik Zone 1 (484 - 495m vertical depth below lake surface)																				
10WBW001-Zone 1 - port (35)	Measurement port at end of purge process	Seawater	4-Aug-10	8.44	7.43		2.57	**46600**	>20000			**47800**							**12700**	**<2**
10WBW001-Zone 1 - port (100)	Measurement port after 2 months of no activity in zone	Seawater	19-Oct-10	7.73	7.38	11.79	2.63	**46700**	52000	30.5	3.5	**42300**	32500	73	11.2	27	**40**	1.01	**12600**	**<2**
10WBW001-Zone 1 - port (106)	Measurement port after airlifting toxicity sample from zone 6	Seawater	30-Oct-10	6.00	7.69	4.51	2.63	**46900**	52650	31.2	3.5	**47500**	32000	211	11.4	27	**15**	1.03	**12100**	**<2**
Min				6.00	7.38	4.51	2.57	**46600**	>20000	30.5	3.5	**42300**	32000	73	11.2	27	**15**	1.01	**12100**	**<2**
Average				7.39	7.50	8.15	2.61	**46733**	52325	30.9	3.5	**45867**	32250	142	11.3	27	**27.25**	1.02	**12467**	**<2**
Max				8.44	7.69	11.79	2.63	**46900**	52650	31.2	3.5	**47800**	32500	211	11.4	27	**39.5**	1.03	**12700**	**<2**
% difference	*in to max (note different sampling methods)*			29.0%	4.0%	61.7%	2.3%	**0.6%**	n/a	2.2%	0.0%	**11.5%**	1.5%	65.5%	2.0%	0.0%	**62.0%**	1.9%	**4.7%**	**n/a**

Notes:
Nitrogen species (excluding ammonia) exceeded recommended hold time of 48hrs.
The airlift sampling method and measurement port methods produce different results for some parameters due to different levels of aeration. The airlifted samples have been reported in blue to differentiate.

Sample Descriptor	Hardness and Alkalinity			Nutrients						Other Anions				Aluminum, total and dissolved									
	Alkalinity, Carbonate (as CaCO3)	Alkalinity, Hydroxide (as CaCO3)	Alkalinity, Total (as CaCO3)	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Sulfate (SO4)	Ortho Phosphate as P	Total Phosphate as P	Bromide (Br)	Chloride (Cl)	Fluoride (F)	Silicate (as SIO2)	Aluminum (Al)-Dissolved	Aluminum (Al)-Total	Antimony (Sb)-Dissolved	Antimony (Sb)-Total	Arsenic (As)-Dissolved	Arsenic (As)-Total	Barium (Ba)-Dissolved	Barium (Ba)-Total	Beryllium (Be)-Dissolved	Beryllium (Be)-Total	Bismuth (Bi)-Dissolved
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Doris Central Talik																								
10WBW001-Zone 10 - port (37)			49.7		<0.5	<0.1	1160			**27.6**	**11500**	<0.75		**<0.005**	**0.0146**	0.00306	0.00349	<0.002	<0.002	0.169	0.179	<0.0005	<0.0005	<0.0005
10WBW001-Zone 10 - port (102)	<1	<1	77.3		<0.5	<0.1	1230	<0.001		**36.4**	**13100**	<0.75	3.8	**<0.005**	**<0.005**	0.00097	0.00099	<0.002	<0.002	0.178	0.177	<0.0005	<0.0005	<0.0005
10WBW001-Zone 10 - port (105)	<2	<2	106.0	3.46	<1	<0.2	1580	<0.001	0.0389	**41.0**	**16500**	<0.75	7.5	**<0.005**	**<0.005**	0.00053	0.00054	<0.002	<0.002	0.122	0.129	<0.0005	<0.0005	<0.0005
Min	<1	<1	49.7	3.46	<0.5	<0.1	1160	<0.001	0.0389	**27.6**	**11500**	<0.75	3.8	**<0.005**	**0.0146**	0.00053	0.00054	<0.002	<0.002	0.122	0.129	<0.0005	<0.0005	<0.0005
Average	n/a	n/a	77.7	3.46	n/a	n/a	1323	<0.001	0.0389	**35.0**	**13700**	<0.75	5.7	**<0.005**	**n/a**	0.00152	0.001673333	<0.002	<0.002	0.156	0.162	<0.0005	<0.0005	<0.0005
Max	<2	<2	106.0	3.46	<1	<0.2	1580	<0.001	0.0389	**41.0**	**16500**	<0.75	7.5	**<0.005**	**<0.005**	0.00306	0.00349	<0.002	<0.002	0.178	0.179	<0.0005	<0.0005	<0.0005
% difference	n/a	n/a	53.1%	0.0%	n/a	n/a	26.6%	n/a	0.0%	**0.3**	**30.3%**	n/a	49.3%	**n/a**	**n/a**	82.7%	84.5%	n/a	n/a	31.5%	27.9%	n/a	n/a	n/a
Doris Central Talik																								
10WBW001-Zone 6 - port (36)			44.2		<0.5	<0.1	940			**21.2**	**9130**	<0.75		**<0.005**	**0.0281**	0.00703	0.00745	<0.002	0.0026	0.120	0.13	<0.0005	<0.0005	<0.0005
10WBW001-Zone 6 - port (101)	<2	<2	44.2	0.0017			1390	0.0017		**38.1**	**13400**		5.0	**<0.005**	**0.0052**	0.0048	0.005	<0.002	<0.002	0.178	0.175	<0.0005	<0.0005	<0.0005
10WBW001-Zone 6 - airlift (103)			72.4	3.14	<0.5	<0.1	2020		0.0262	**49.1**	**19000**	0.091	6.1	**<0.005**	**0.0318**	0.00121	0.00127	0.0066	0.0070	0.113	0.117	<0.0005	<0.0005	<0.0005
10WBW001-Zone 6 - airlift (107)	<1	<1	76.5	3.37	<1	<0.2	2000	<0.001	0.0124	**52.0**	**19100**	<0.75	9.7	**<0.005**	**0.0053**	0.00116	0.00115	0.0069	0.0068	0.115	0.112	<0.0005	<0.0005	<0.0005
10WBW001-Zone 6 - port (108)	<2	<2	43.7	2.32	<0.5	<0.1	1500	<0.001	0.0162	**41.3**	**14200**	<0.75	5.8	**<0.005**	**0.0059**	0.00393	0.00461	<0.002	<0.002	0.169	0.169	<0.0005	<0.0005	<0.0005
Min	<1	<1	43.7	2.32	<0.5	<0.1	1500	<0.001	0.01	**41.3**	**14200**	0.091	5.8	**<0.005**	**0.0053**	0.00116	0.00115	0.0066	0.0026	0.11	0.112	<0.0005	<0.0005	<0.0005
Average	n/a	n/a	64.2	2.94	n/a	n/a	1840	n/a	0.02	**47.5**	**17433**	n/a	7.2	**<0.005**	**0.0143**	0.00210	0.00234	n/a	n/a	0.13	0.133	<0.0005	<0.0005	<0.0005
Max	<2	<2	76.5	3.37	<1	<0.2	2020	0.0017	0.03	**52.0**	**19100**	<0.75	9.70	**<0.005**	**0.0318**	0.00393	0.00461	<0.002	<0.002	0.17	0.169	<0.0005	<0.0005	<0.0005
% difference	n/a	n/a	42.9%	31.2%	n/a	n/a	25.7%	n/a	52.7%	**0.2**	**25.7%**	n/a	40.2%	**n/a**	**83.3%**	70.5%	75.1%	n/a	n/a	33.1%	33.7%	n/a	n/a	n/a
Doris Central Talik																								
10WBW001-Zone 1 - port (35)					<0.5	<0.1	981			**100.0**	**19000**	<0.75		**<0.005**	**0.0992**	<0.0005	<0.0005	<0.002	<0.002	0.0520	0.0511	<0.0005	<0.0005	<0.0005
10WBW001-Zone 1 - port (100)	<2	<2	<2		0.96	<0.1	980	0.0264		**101.0**	**19000**	<0.75	7.8	**<0.005**	**0.0136**	<0.0005	<0.0005	<0.002	<0.002	0.0530	0.0525	<0.0005	<0.0005	<0.0005
10WBW001-Zone 1 - port (106)	<2	<2	<2	0.0631	<0.5	<0.1	935	0.0086	0.0163	**101.0**	**18400**	<0.75	<10	**0.005**	**0.0086**	<0.0005	<0.0005	<0.002	<0.002	0.0526	0.0521	<0.0005	<0.0005	<0.0005
Min	<2	<2	<2	0.0631	<0.5	<0.1	935	0.0086	0.0163	**100.0**	**18400**	<0.75	7.8	**<0.005**	**0.0086**	<0.0005	<0.0005	<0.002	<0.002	0.052	0.051	<0.0005	<0.0005	<0.0005
Average	<2	<2	<2	0.0631	n/a	<0.1	965	0.0175	0.0163	**100.7**	**18800**	<0.75	n/a	**n/a**	**0.0405**	<0.0005	<0.0005	<0.002	<0.002	0.053	0.052	<0.0005	<0.0005	<0.0005
Max	<2	<2	<2	0.0631	0.96	<0.1	981	0.0264	0.0163	**101.0**	**19000**	<0.75	<10	**0.005**	**0.0992**	<0.0005	<0.0005	<0.002	<0.002	0.053	0.053	<0.0005	<0.0005	<0.0005
% difference	n/a	n/a	n/a	0.0%	n/a	n/a	4.7%	67.4%	0.0%	**0.0**	**3.2%**	n/a	n/a	**n/a**	**91.3%**	n/a	n/a	n/a	n/a	1.9%	2.7%	n/a	n/a	n/a

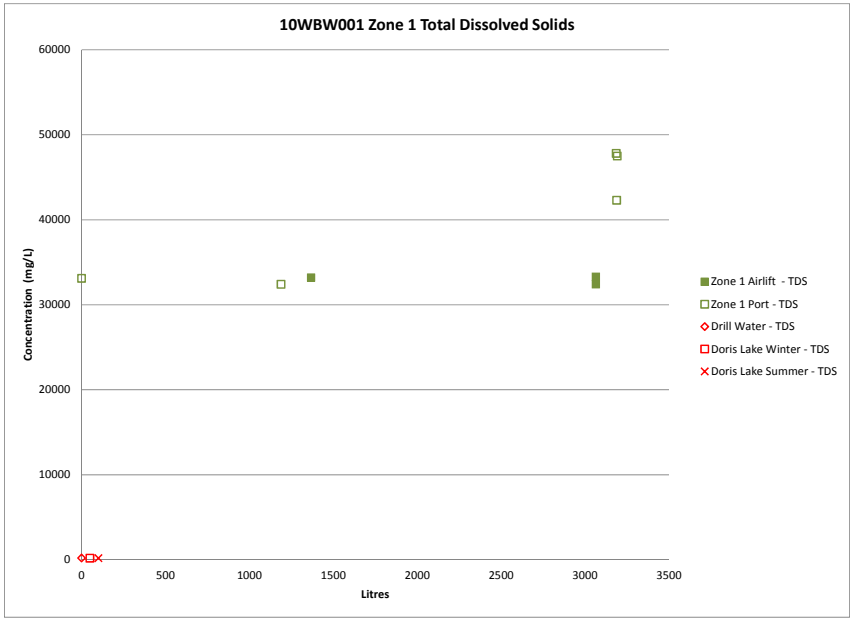
Sample Descriptor	Bismuth (Bi)-Total	Boron (B)-Dissolved	Boron (B)-Total	Cadmium (Cd)-Dissolved	Cadmium (Cd)-Total	Calcium (Ca)-Dissolved	Calcium (Ca)-Total	Cesium (Cs)-Dissolved	Cesium (Cs)-Total	Chromium (Cr)-Dissolved	Chromium (Cr)-Total	Cobalt (Co)-Dissolved	Cobalt (Co)-Total	Copper (Cu)-Dissolved	Copper (Cu)-Total	Gallium (Ga)-Dissolved	Gallium (Ga)-Total	Iron (Fe)-Dissolved	Iron (Fe)-Total	Lead (Pb)-Dissolved	Lead (Pb)-Total	Lithium (Li)-Dissolved	Lithium (Li)-Total	Magnesium (Mg)-Dissolved	Magnesium (Mg)-Total	Manganese (Mn)-Dissolved	Manganese (Mn)-Total
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Doris Central Tali																											
10WBW001-Zone 10 - port (37)	<0.0005	1.42	1.51	<0.00012	<0.00012	**1010**	**1020**	0.00092	0.00097	<0.001	0.003	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	**2.68**	**3.95**	<0.001	<0.001	0.121	0.128	**849**	**867**	1.04	1.09
10WBW001-Zone 10 - port (102)	<0.0005	1.54	1.53	<0.00005	<0.00005	**1110**	**1080**	0.00104	0.001	<0.0001	0.00011	0.000102	0.000084	<0.0005	<0.0005	<0.0005	<0.0005	**3.15**	**4.31**	<0.0003	<0.0003	0.130	0.128	**869**	**797**	1.17	1.15
10WBW001-Zone 10 - port (105)	<0.0005	2.86	2.8	<0.00005	<0.00005	**1560**	**1540**	0.00148	0.00151	<0.0001	0.00016	0.000187	0.000132	0.00296	<0.0005	<0.0005	<0.0005	**8.94**	**11**	<0.0003	<0.0003	0.201	0.200	**1250**	**1230**	1.69	1.73
Min	<0.0005	1.42	1.51	<0.00005	<0.00005	**1010**	**1020**	0.00092	0.00097	<0.0001	0.00011	0.000102	0.000084	<0.0005	<0.0005	<0.0005	<0.0005	**2.68**	**3.95**	<0.0003	<0.0003	0.121	0.128	**849**	**797**	1.04	1.09
Average	<0.0005	1.94	1.95	n/a	n/a	**1227**	**1213**	0.00115	0.00116	n/a	0.00109	n/a	n/a	n/a	n/a	<0.0005	<0.0005	**4.92**	**6.42**	n/a	n/a	0.151	0.152	**989**	**965**	1.30	1.32
Max	<0.0005	2.86	2.8	<0.00012	<0.00012	**1560**	**1540**	0.00148	0.00151	<0.001	0.003	<0.0005	<0.0005	0.00296	<0.001	<0.0005	<0.0005	**8.94**	**11.00**	<0.001	<0.001	0.201	0.200	**1250**	**1230**	1.69	1.73
% difference	n/a	50.3%	46.1%	n/a	n/a	**35.3%**	**33.8%**	37.8%	35.8%	n/a	96.3%	n/a	n/a	n/a	n/a	n/a	n/a	**70.0%**	**64.1%**	n/a	n/a	39.8%	36.0%	**32.1%**	**35.2%**	38.5%	37.0%
Doris Central Talik																											
10WBW001-Zone 6 - port (36)	<0.0005	0.94	1.04	<0.00012	<0.00012	**749**	**805**	0.00069	0.00072	<0.001	0.0016	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	**0.059**	**1.60**	<0.001	<0.001	0.087	0.093	**702**	**739**	0.526	0.555
10WBW001-Zone 6 - port (101)	<0.0005	1.38	1.38	<0.00005	<0.00005	**1100**	**1140**	0.00094	0.00091	<0.0001	0.00029	0.000087	0.000092	<0.0005	<0.0005	<0.0005	<0.0005	**0.127**	**2.94**	<0.0003	0.00035	0.120	0.117	**964**	**1010**	0.941	0.948
10WBW001-Zone 6 - airlift (103)	<0.0005	2.64	2.65	<0.00005	<0.00005	**1550**	**1600**	0.00154	0.00155	<0.0005	<0.0005	0.000315	0.000381	<0.0005	<0.0005	<0.0005	<0.0005	**4.31**	**4.53**	<0.003	<0.0003	0.223	0.228	**1490**	**1510**	2.030	2.08
10WBW001-Zone 6 - airlift (107)	<0.0005	2.61	2.66	<0.00005	<0.00005	**1520**	**1570**	0.00159	0.00155	<0.0001	<0.0001	0.000312	0.000356	<0.0005	<0.0005	<0.0005	<0.0005	**4.55**	**4.56**	<0.0003	<0.0003	0.223	0.217	**1450**	**1480**	2.110	2.13
10WBW001-Zone 6 - port (108)	<0.0005	1.48	1.5	<0.00005	<0.00005	**1160**	**1170**	0.00097	0.00095	<0.0005	<0.0005	0.000091	0.000103	<0.0005	0.00061	<0.0005	<0.0005	**0.503**	**2.28**	<0.0003	<0.0003	0.127	0.131	**1080**	**1080**	0.888	0.892
Min	<0.0005	1.48	1.50	<0.00005	<0.00005	**1160**	**1170**	0.00097	0.00095	<0.0001	<0.0001	0.000087	0.000092	<0.0005	<0.0005	<0.0005	<0.0005	**0.50**	**2.28**	<0.0003	<0.0003	0.127	0.131	**1080**	**1080**	0.888	0.892
Average	<0.0005	2.24	2.27	n/a	n/a	**1410**	**1447**	0.00137	0.00135	n/a	n/a	n/a	n/a	n/a	n/a	<0.0005	<0.0005	**3.12**	**3.79**	n/a	n/a	0.191	0.192	**1340**	**1357**	1.676	1.701
Max	<0.0005	2.64	2.66	<0.00012	<0.00012	**1550**	**1600**	0.00159	0.00155	<0.001	0.0016	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	**4.55**	**4.56**	<0.001	<0.001	0.223	0.228	**1490**	**1510**	2.110	2.130
% difference	n/a	43.9%	43.6%	n/a	n/a	**25.2%**	**26.9%**	39.0%	38.7%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**88.9%**	**50.0%**	n/a	n/a	43.0%	42.5%	**27.5%**	**28.5%**	57.9%	58.1%
Doris Central Talik																											
10WBW001-Zone 1 - port (35)	<0.0005	2.99	2.93	<0.00012	<0.00012	**4960**	**5070**	0.00105	0.00105	<0.001	0.00570	<0.0005	<0.0005	<0.001	0.00180	<0.0005	<0.0005	**<0.05**	**0.456**	<0.001	0.0013	0.370	0.370	**69.5**	**71.0**	0.691	0.717
10WBW001-Zone 1 - port (100)	<0.0005	2.92	2.89	0.000083	0.000066	**4920**	**4960**	0.00102	0.00102	<0.0001	0.00063	<0.00005	0.000073	<0.0005	0.00059	<0.0005	<0.0005	**0.056**	**0.240**	<0.0003	<0.0003	0.350	0.346	**64.1**	**64.4**	0.708	0.722
10WBW001-Zone 1 - port (106)	<0.0005	3.30	3.25	0.000097	0.000085	**4730**	**4700**	0.00110	0.00110	<0.0001	0.00020	<0.00005	0.000051	0.00067	0.00102	<0.0005	<0.0005	**0.075**	**0.197**	<0.0003	<0.0003	0.390	0.381	**68.1**	**67.8**	0.725	0.712
Min	<0.0005	2.92	2.89	0.000083	0.000066	**4730**	**4700**	0.00102	0.00102	<0.0001	0.0002	<0.0005	0.000051	<0.0005	0.00059	<0.0005	<0.0005	**<0.05**	**0.197**	<0.0003	<0.0003	0.350	0.346	**64**	**64**	0.691	0.712
Average	<0.0005	3.07	3.02	n/a	n/a	**4870**	**4910**	0.00106	0.00106	n/a	0.0022	<0.0005	n/a	n/a	0.001136667	<0.0005	<0.0005	**n/a**	**0.298**	n/a	n/a	0.370	0.366	**67**	**68**	0.708	0.717
Max	<0.0005	3.3	3.25	<0.00012	<0.00012	**4960**	**5070**	0.00110	0.00110	<0.001	0.0057	<0.0005	<0.0005	<0.001	0.0018	<0.0005	<0.0005	**0.075**	**0.456**	<0.001	0.0013	0.390	0.381	**70**	**71**	0.725	0.722
% difference	n/a	11.5%	11.1%	n/a	n/a	**4.6%**	**7.3%**	7.3%	7.3%	n/a	96.5%	n/a	n/a	n/a	67.2%	n/a	n/a	**n/a**	**56.8%**	n/a	n/a	10.3%	9.2%	**7.8%**	**9.3%**	4.7%	1.4%

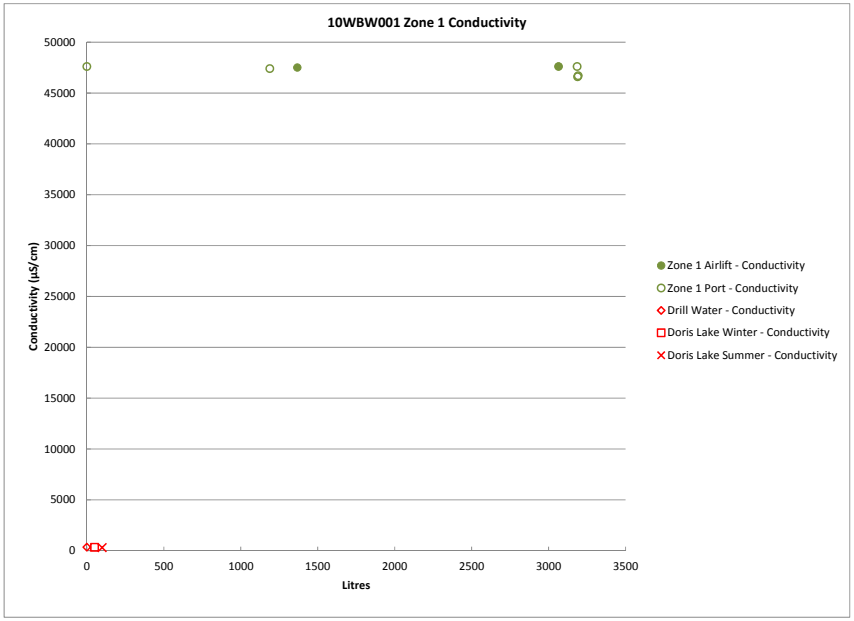
Sample Descriptor	Mercury (Hg)-Dissolved	Mercury (Hg)-Total	Molybdenum (Mo)-Dissolved	Molybdenum (Mo)-Total	Nickel (Ni)-Dissolved	Nickel (Ni)-Total	Phosphorus (P)-Dissolved	Phosphorus (P)-Total	Potassium (K)-Dissolved	Potassium (K)-Total	Rhenium (Re)-Dissolved	Rhenium (Re)-Total	Rubidium (Rb)-Dissolved	Rubidium (Rb)-Total	Selenium (Se)-Dissolved	Selenium (Se)-Total	Silicon (Si)-Dissolved	Silicon (Si)-Total	Silver (Ag)-Dissolved	Silver (Ag)-Total	Sodium (Na)-Dissolved	Sodium (Na)-Total	Strontium (Sr)-Dissolved	Strontium (Sr)-Total	Tellurium (Te)-Dissolved	Tellurium (Te)-Total	Thallium (Tl)-Dissolved
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Doris Central Talik																											
10WBW001-Zone 10 - port (37)			0.0211	0.0225	<0.0005	0.00237	<1	<1	**160**	**166**	<0.0005	<0.0005	0.0766	0.0816	<0.002	<0.002	1.99	2.12	<0.0002	<0.0002	**5400**	**5590**	**11.3**	**11.7**	<0.0005	<0.0005	<0.0005
10WBW001-Zone 10 - port (102)	<0.00001	<0.00001	0.0259	0.0244	<0.0005	<0.0005	<1	<1	**173**	**166**	<0.0005	<0.0005	0.0850	0.0842	<0.002	<0.002	2.38	2.42	<0.0001	<0.0001	**5780**	**5530**	**11.7**	**11.1**	<0.0005	<0.0005	<0.00005
10WBW001-Zone 10 - port (105)	<0.00001	<0.00001	0.0044	0.0072	0.0006	<0.0005	<1	<1	**249**	**262**	<0.0005	<0.0005	0.1070	0.1040	<0.002	<0.002	3.3	3.51	<0.0001	<0.0001	**8700**	**8990**	**16.8**	**16.4**	<0.0005	<0.0005	<0.00005
Min	<0.00001	<0.00001	0.0044	0.0072	<0.0005	<0.0005	<1	<1	**160**	**166**	<0.0005	<0.0005	0.0766	0.0816	<0.002	<0.002	1.99	2.12	<0.0001	<0.0001	**5400**	**5530**	**11.3**	**11.1**	<0.0005	<0.0005	<0.0005
Average	<0.00001	<0.00001	0.0171	0.0180	n/a	n/a	<1	<1	**194**	**198**	<0.0005	<0.0005	0.0895	0.0899	<0.002	<0.002	2.56	2.68	n/a	n/a	**6627**	**6703**	**13.3**	**13.1**	<0.0005	<0.0005	<0.0005
Max	<0.00001	<0.00001	0.0259	0.0244	0.0006	0.00237	<1	<1	**249**	**262**	<0.0005	<0.0005	0.1070	0.1040	<0.002	<0.002	3.30	3.51	<0.0002	<0.0002	**8700**	**8990**	**16.8**	**16.4**	<0.0005	<0.0005	<0.0005
% difference	n/a	n/a	83.0%	70.5%	n/a	n/a	n/a	n/a	**35.7%**	**36.6%**	n/a	n/a	28.4%	21.5%	n/a	n/a	39.7%	39.6%	n/a	n/a	**37.9%**	**38.5%**	**32.7%**	**32.3%**	n/a	n/a	n/a
Doris Central Talik																											
10WBW001-Zone 6 - port (36)			0.0379	0.0403	0.00076	0.001590	<1	<1	**117**	**125**	<0.0005	<0.0005	0.0725	0.0765	<0.002	<0.002	2.48	2.88	<0.0002	<0.0002	**4130**	**4460**	**9.0**	**9.7**	<0.0005	<0.0005	<0.0005
10WBW001-Zone 6 - port (101)	<0.00001	<0.00001	0.0370	0.0370	<0.0005	0.00059	<1	<1	**160**	**171**	<0.0005	<0.0005	0.1090	0.1040	<0.002	<0.002	2.88	3.50	<0.0001	<0.0001	**6010**	**6410**	**13.1**	**13.9**	<0.0005	<0.0005	<0.00005
10WBW001-Zone 6 - airlift (103)	<0.00005	<0.00005	0.0138	0.0140	0.00101	0.00095	<1	<1	**233**	**240**	<0.0005	<0.0005	0.1400	0.1420	<0.002	<0.002	3.49	3.68	<0.0001	<0.0001	**9130**	**9350**	**21.1**	**21.2**	<0.0005	<0.0005	<0.00005
10WBW001-Zone 6 - airlift (107)	<0.00001	<0.00001	0.0122	0.0120	0.00094	0.00098	<1	<1	**229**	**233**	<0.0005	<0.0005	0.1390	0.1410	<0.002	<0.002	3.38	3.48	<0.0001	<0.0001	**8980**	**9170**	**19.4**	**19.9**	<0.0005	<0.0005	<0.00005
10WBW001-Zone 6 - port (108)			0.0345	0.0361	0.00158	0.00120	<1	<1	**172**	**172**	<0.0005	<0.0005	0.1060	0.1020	<0.002	<0.002	3.33	3.82	<0.0001	0.00018	**6810**	**6790**	**14.6**	**14.6**	<0.0005	<0.0005	<0.00005
Min	<0.00001	<0.00001	0.0122	0.0120	<0.0005	<0.0005	<1	<1	**172**	**172**	<0.0005	<0.0005	0.1060	0.1020	<0.002	<0.002	3.33	3.48	<0.0001	<0.0001	**6810**	**6790**	**14.6**	**14.6**	<0.0005	<0.0005	<0.0005
Average	<0.00001	<0.00001	0.0202	0.0207	n/a	n/a	<1	<1	**211**	**215**	<0.0005	<0.0005	0.1283	0.1283	<0.002	<0.002	3.40	3.66	n/a	n/a	**8307**	**8437**	**18.4**	**18.6**	<0.0005	<0.0005	<0.0005
Max	<0.00005	<0.00005	0.0345	0.0361	0.00158	0.001590	<1	<1	**233**	**240**	<0.0005	<0.0005	0.1400	0.1420	<0.002	<0.002	3.49	3.82	<0.0002	<0.0002	**9130**	**9350**	**21.1**	**21.2**	<0.0005	<0.0005	<0.0005
% difference	n/a	n/a	64.6%	66.8%	n/a	n/a	n/a	n/a	**26.2%**	**28.3%**	n/a	n/a	24.3%	28.2%	n/a	n/a	4.6%	8.9%	n/a	n/a	**25.4%**	**27.4%**	**30.8%**	**31.1%**	n/a	n/a	n/a
Doris Central Talik																											
10WBW001-Zone 1 - port (35)			0.0128	0.0136	<0.0005	0.00437	<1	<1	**39**	**40**	<0.0005	<0.0005	0.0504	0.0500	<0.002	<0.002	2.30	2.61	<0.0002	<0.0002	**7290**	**7470**	**58.9**	**60.4**	<0.0005	<0.0005	<0.0005
10WBW001-Zone 1 - port (100)	<0.00001	<0.00001	0.0092	0.0089	<0.0005	0.00075	<1	<1	**39**	**40**	<0.0005	<0.0005	0.0528	0.0526	<0.002	<0.002	2.42	2.79	<0.0001	<0.0001	**7200**	**7200**	**56.7**	**57.2**	<0.0005	<0.0005	<0.00005
10WBW001-Zone 1 - port (106)	<0.00001	<0.00001	0.0090	0.0088	0.00237	0.00265	<1	<1	**40**	**39**	<0.0005	<0.0005	0.0532	0.0531	<0.002	<0.002	2.43	2.47	<0.0001	<0.0001	**6910**	**6850**	**55.1**	**54.6**	<0.0005	<0.0005	<0.00005
Min	<0.00001	<0.00001	0.0090	0.0088	<0.0005	0.00075	<1	<1	**39**	**39**	<0.0005	<0.0005	0.0504	0.0500	<0.002	<0.002	2.30	2.47	<0.0001	<0.0001	**6910**	**6850**	**55.1**	**54.6**	<0.0005	<0.0005	<0.0005
Average	<0.00001	<0.00001	0.0103	0.0104	n/a	0.00259	<1	<1	**39**	**40**	<0.0005	<0.0005	0.0521	0.0519	<0.002	<0.002	2.38	2.62	n/a	n/a	**7133**	**7173**	**56.9**	**57.4**	<0.0005	<0.0005	<0.0005
Max	<0.00001	<0.00001	0.0128	0.0136	0.00237	0.00437	<1	<1	**40**	**40**	<0.0005	<0.0005	0.0532	0.0531	<0.002	<0.002	2.43	2.79	<0.0002	<0.0002	**7290**	**7470**	**58.9**	**60.4**	<0.0005	<0.0005	<0.0005
% difference	n/a	n/a	29.7%	35.3%	n/a	82.8%	n/a	n/a	**2.5%**	**2.5%**	n/a	n/a	5.3%	5.8%	n/a	n/a	5.3%	11.5%	n/a	n/a	**5.2%**	**8.3%**	**6.5%**	**9.6%**	n/a	n/a	n/a

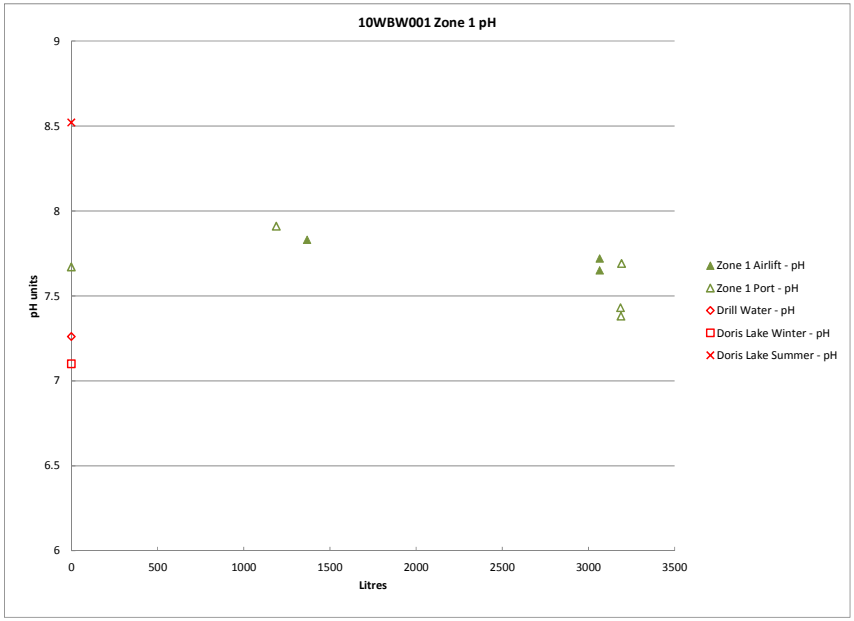
Sample Descriptor	Thallium (Tl)-Total	Thorium (Th)-Dissolved	Thorium (Th)-Total	Tin (Sn)-Dissolved	Tin (Sn)-Total	Titanium (Ti)-Dissolved	Titanium (Ti)-Total	Tungsten (W)-Dissolved	Tungsten (W)-Total	Uranium (U)-Dissolved	Uranium (U)-Total	Vanadium (V)-Dissolved	Vanadium (V)-Total	Yttrium (Y)-Dissolved	Yttrium (Y)-Total	Zinc (Zn)-Dissolved	Zinc (Zn)-Total	Zirconium (Zr)-Dissolved	Zirconium (Zr)-Total	Isotope Chemistry	
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	Delta 2H x 1000	Delta 18O x 1000
Doris Central Talik																					
10WBW001-Zone 10 - port (37)	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0059	0.0067	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0504	0.2610	<0.0005	<0.0005	-106.52	-13.49
10WBW001-Zone 10 - port (102)	<0.00005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.005	0.0051	0.000059	0.000057	<0.0005	<0.0005	<0.0005	<0.0005	0.0610	0.1730	<0.0005	<0.0005		
10WBW001-Zone 10 - port (105)	<0.00005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.006	0.0059	<0.00005	<0.00005	<0.0005	<0.0005	<0.0005	<0.0005	0.0851	0.1070	<0.0005	<0.0005		
Min	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0050	0.0051	0.000059	0.000057	<0.0005	<0.0005	<0.0005	<0.0005	0.0504	0.1070	<0.0005	<0.0005	-106.52	-13.49
Average	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0056	0.0059	n/a	n/a	<0.0005	<0.0005	<0.0005	<0.0005	0.0655	0.1803	<0.0005	<0.0005	-106.52	-13.49
Max	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0060	0.0067	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0851	0.2610	<0.0005	<0.0005	-106.52	-13.49
% difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	16.7%	23.9%	n/a	n/a	n/a	n/a	n/a	n/a	40.8%	59.0%	n/a	n/a	0.0%	0.0%
Doris Central Talik																					
10WBW001-Zone 6 - port (36)	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0316	0.0334	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0186	0.1950	<0.0005	<0.0005	-117.72	-15
10WBW001-Zone 6 - port (101)	<0.00005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0246	0.0247	<0.00005	<0.00005	<0.0005	<0.0005	<0.0005	<0.0005	0.0705	0.2360	<0.0005	<0.0005		
10WBW001-Zone 6 - airlift (103)	<0.00005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0053	0.0056	0.000231	0.000230	<0.0005	0.00054	<0.0005	<0.0005	0.0384	0.0456	<0.0005	<0.0005		
10WBW001-Zone 6 - airlift (107)	<0.00005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0048	0.0049	0.000234	0.000228	<0.0005	<0.0005	<0.0005	<0.0005	0.0243	0.0241	<0.0005	<0.0005		
10WBW001-Zone 6 - port (108)	<0.00005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0231	0.0227	0.000058	0.000059	<0.0005	<0.0005	<0.0005	<0.0005	0.0295	0.1150	<0.0005	<0.0005		
Min	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0048	0.0049	0.000231	0.000230	<0.0005	<0.0005	<0.0005	<0.0005	0.0243	0.0241	<0.0005	<0.0005	-117.72	-15
Average	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0111	0.0111	n/a	n/a	<0.0005	<0.0005	<0.0005	<0.0005	0.0307	0.0616	<0.0005	<0.0005	-117.72	-15
Max	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0231	0.0227	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0384	0.1150	<0.0005	<0.0005	-117.72	-15
% difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	79.2%	78.4%	n/a	n/a	n/a	n/a	n/a	n/a	36.7%	79.0%	n/a	n/a	0.0%	0.0%
Doris Central Talik																					
10WBW001-Zone 1 - port (35)	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	0.0082	<0.001	<0.001	<0.0005	<0.0005	<0.0005	0.00059	<0.0005	<0.0005	0.0897	0.5030	<0.0005	<0.0005	-138	-18.83
10WBW001-Zone 1 - port (100)	<0.00005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0014	0.0014	<0.00005	<0.00005	<0.0005	<0.0005	0.00051	0.00052	0.1130	0.2790	<0.0005	<0.0005		
10WBW001-Zone 1 - port (106)	<0.00005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0015	0.0016	<0.00005	<0.00005	<0.0005	<0.0005	0.00054	0.00057	0.1370	0.2850	<0.0005	<0.0005		
Min	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.00005	<0.00005	<0.0005	<0.0005	<0.0005	<0.0005	0.0897	0.2790	<0.0005	<0.0005	-138	-18.83
Average	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	n/a	n/a	n/a	n/a	<0.0005	<0.0005	n/a	n/a	0.1132	0.3557	<0.0005	<0.0005	-138	-18.83
Max	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.005	<0.005	0.0015	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	0.00054	0.00057	0.1370	0.5030	<0.0005	<0.0005	-138	-18.83
% difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	34.5%	44.5%	n/a	n/a	0.0%	0.0%

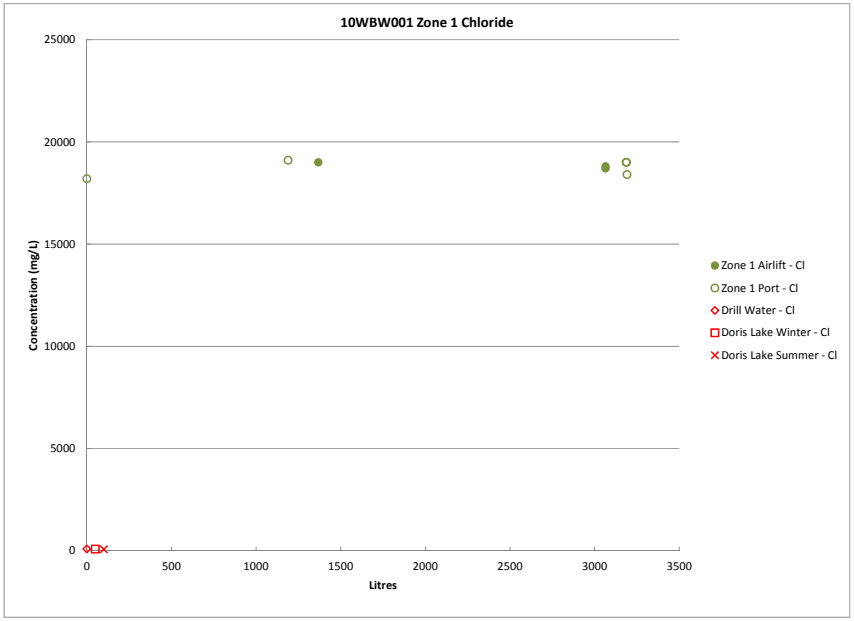
Appendix M
Water Quality Graphs

J:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Appendices\Appendix M Water quality interpretive graphs



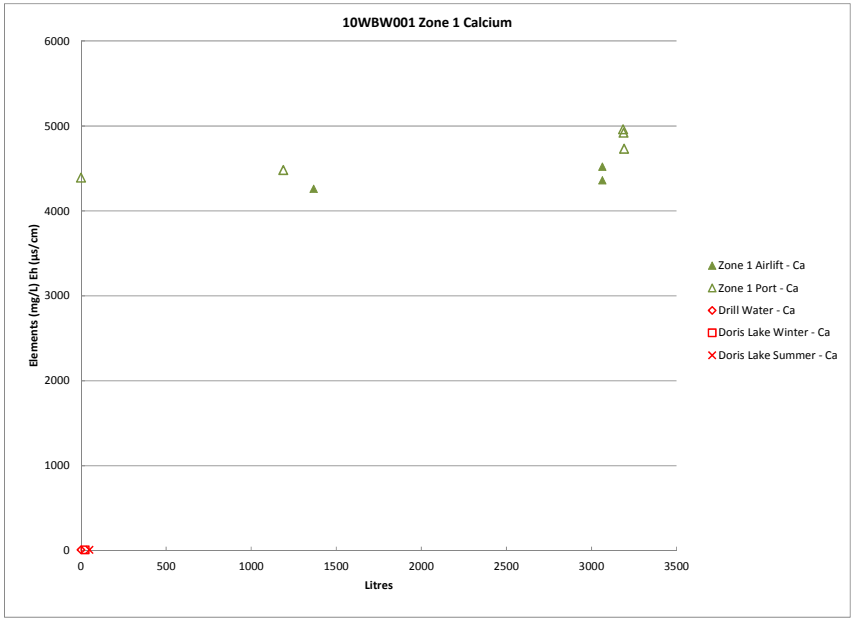


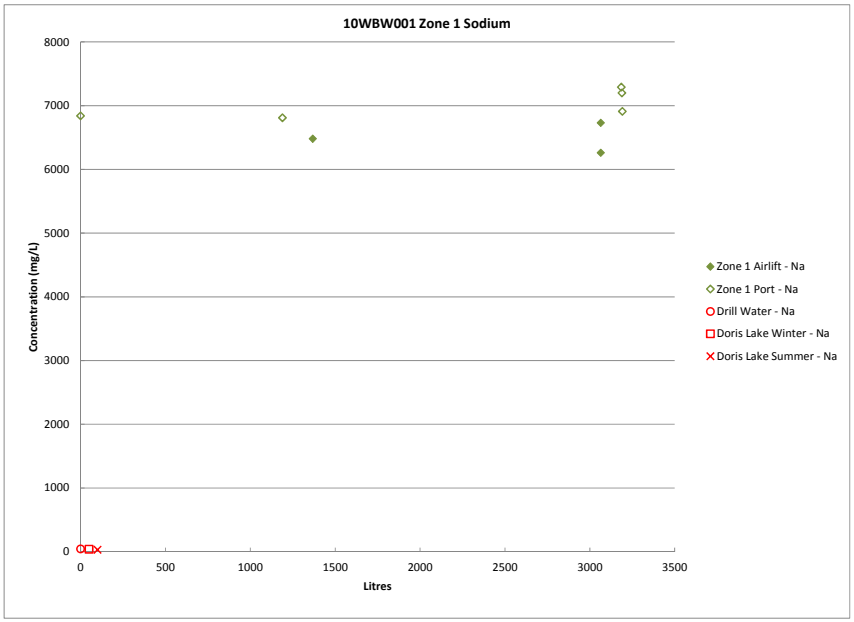


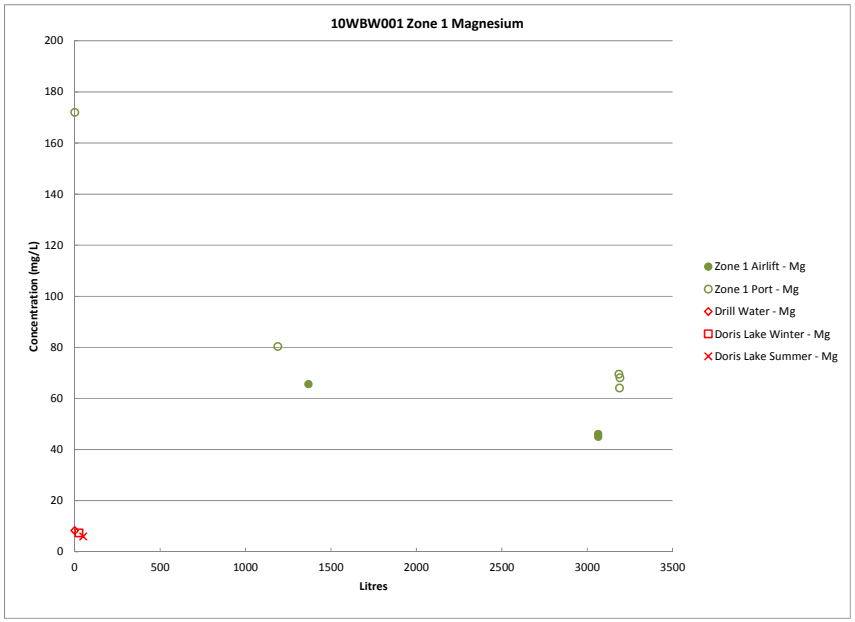


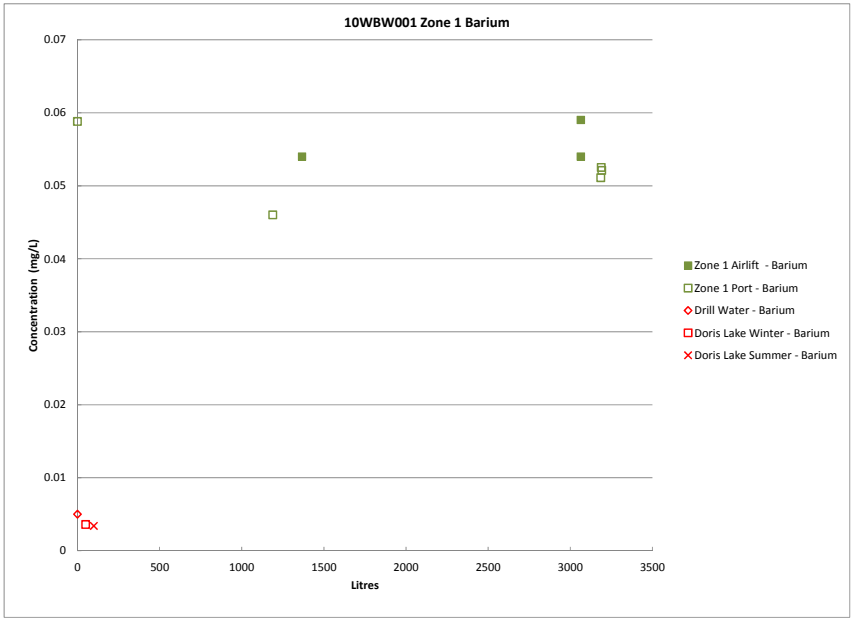
srk consulting	NEWMONT NORTH AMERICA	2010 West Bay Data Report - Appendix M
Job No: 1CH008.013 Filename: Figures M1-9_DorisCentral_20110202.pptx	**HOPE BAY MINING LTD.**	Doris Central 10WBW001 Zone 1
		Date: February 2011 / Approved: JH / Figure: **M.1**

J:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\080_Reporting\20110125 Westbay Data Report\Appendices\Appendix M Water quality interpretive graphs









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2010 West Bay Data Report - Appendix M

Doris Central 10WBW001 Zone 1

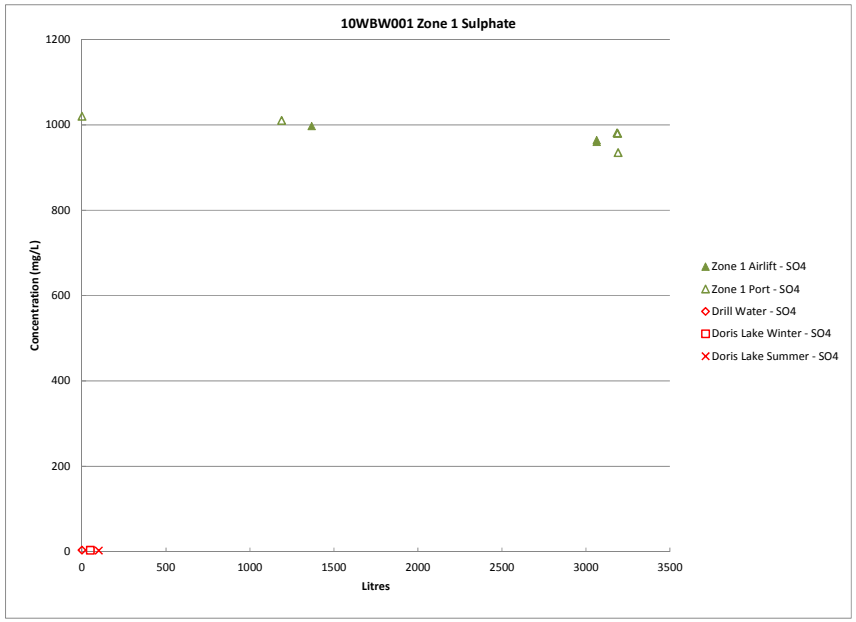
Job No: 1CH008.013

Filename: Figures M1-9_DorisCentral_20110202.pptx

Date: February 2011

Approved: JH

Figure: **M.2**



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Job No: 1CH008.013

Filename: Figures M1-9_DorisCentral_20110202.pptx

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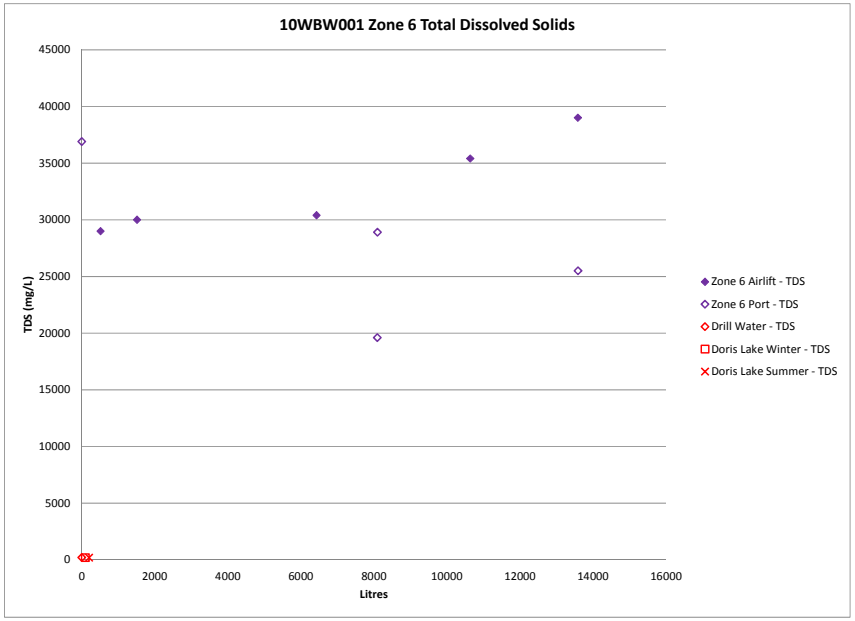
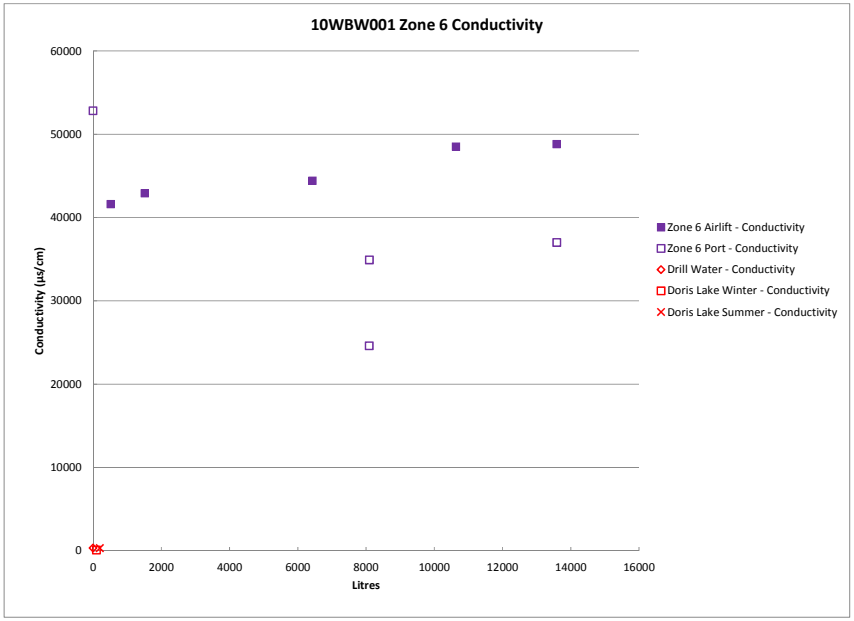
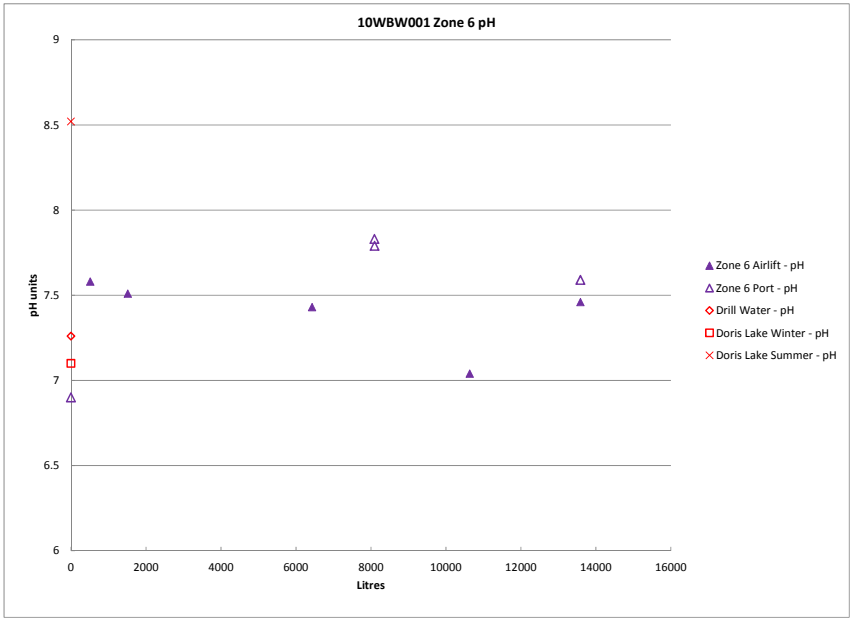
2010 West Bay Data Report - Appendix M

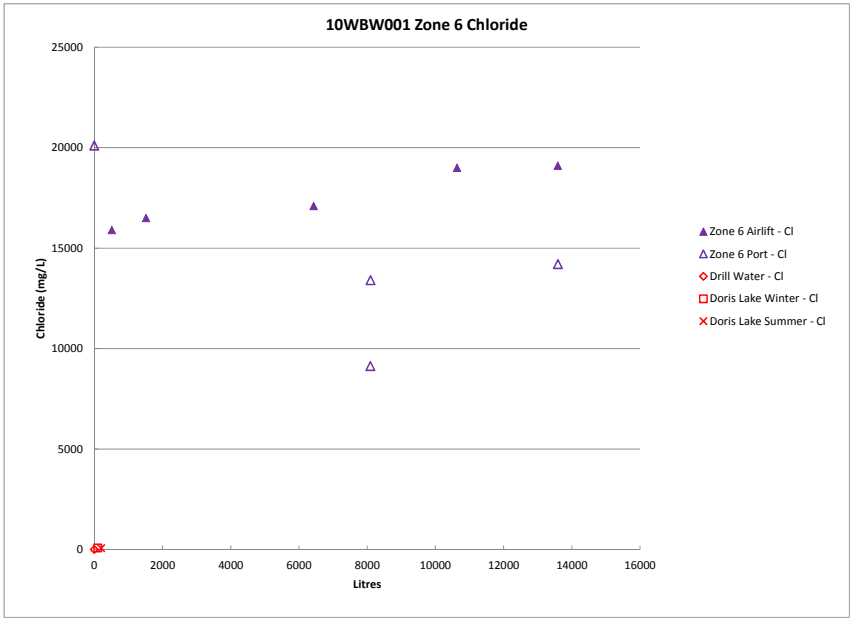
Doris Central 10WBW001 Zone 1

Date:	Approved:	Figure:
February 2011	JH	**M.3**









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Job No: 1CH008.013

Filename: Figures M1-9_DorisCentral_20110202.pptx

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2010 West Bay Data Report - Appendix M

Doris Central 10WBW001
Zone 6

Date:	Approved:	Figure:
February 2011	JH	**M.4**

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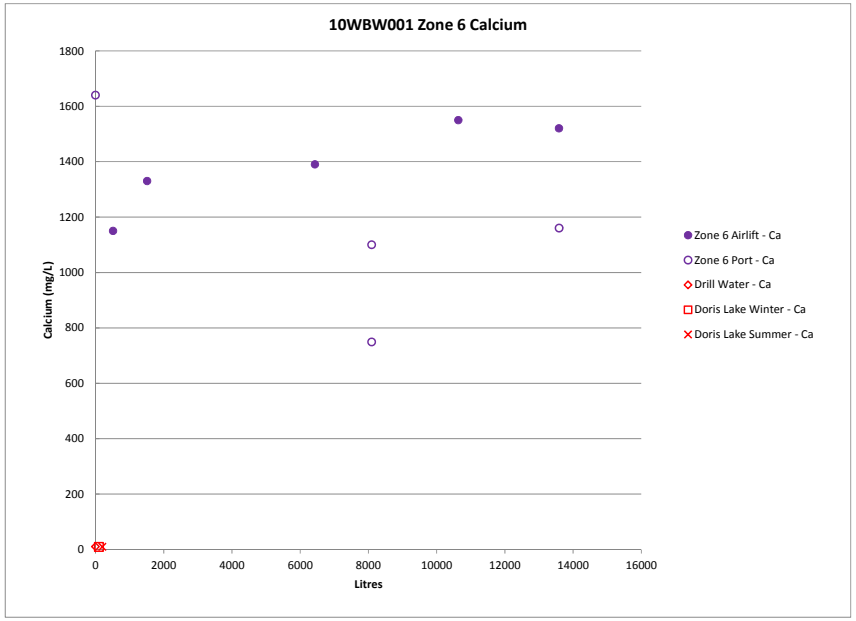

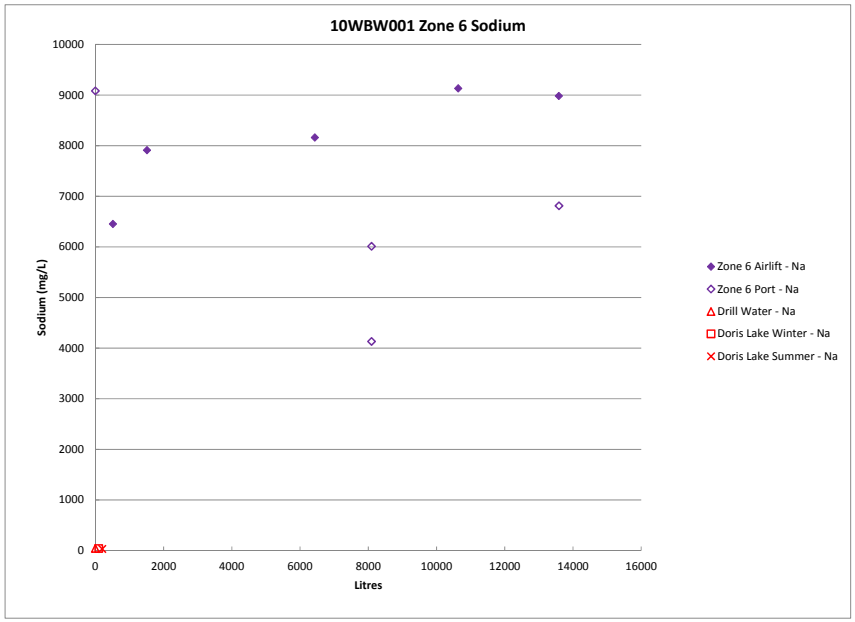

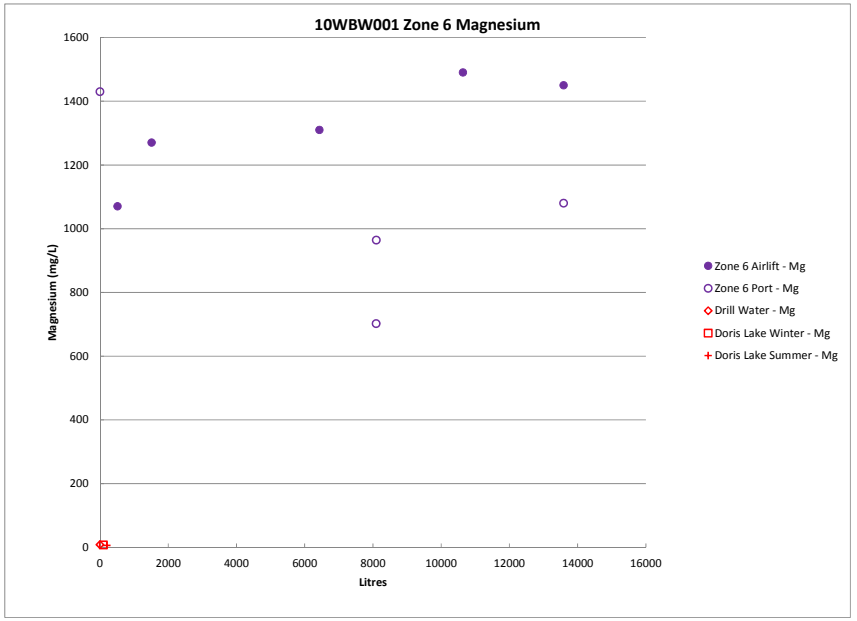

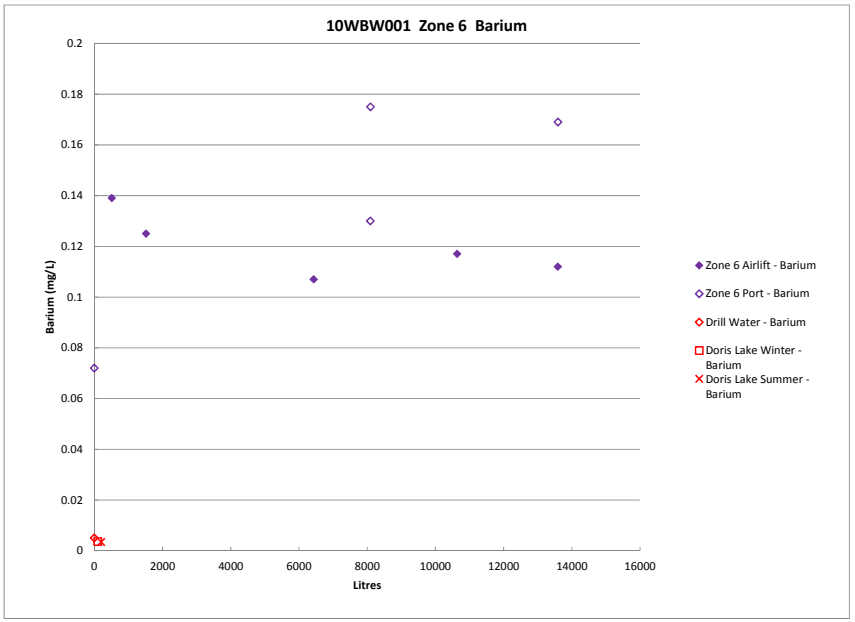

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Job No: 1CH008.013

Filename: Figures M1-9_DorisCentral_20110202.pptx

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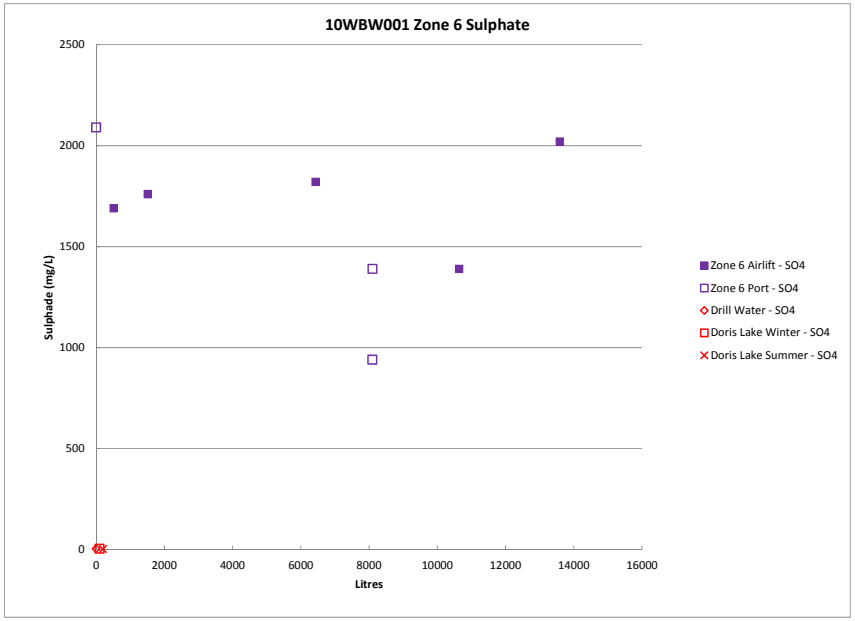
2010 West Bay Data Report - Appendix M

Doris Central 10WBW001 Zone 6

Date:	Approved:	Figure:
February 2011	JH	**M.5**



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Job No: 1CH008.013

Filename: Figures M1-9_DorisCentral_20110202.pptx

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2010 West Bay Data Report - Appendix M

Doris Central 10WBW001
Zone 6

Date:	Approved:	Figure:
February 2011	JH	**M.6**

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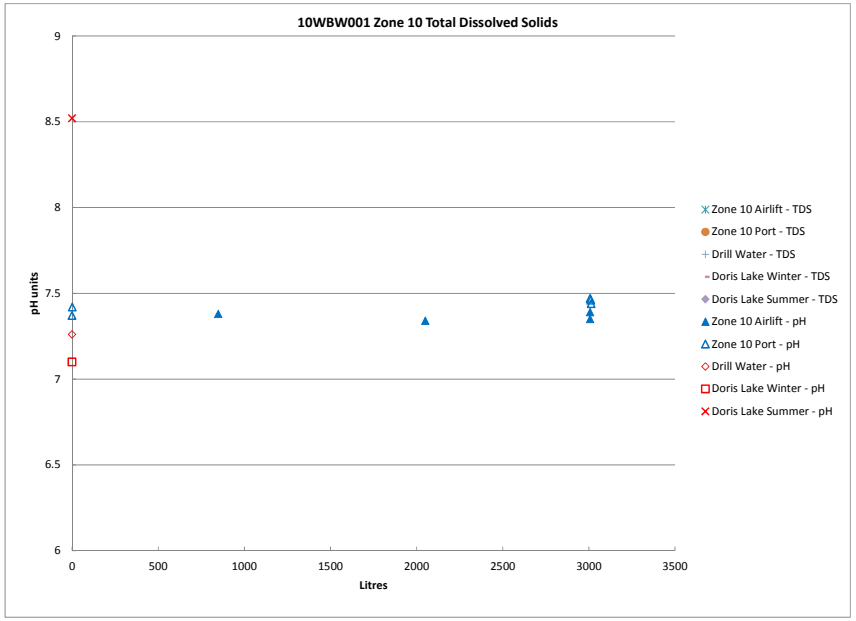

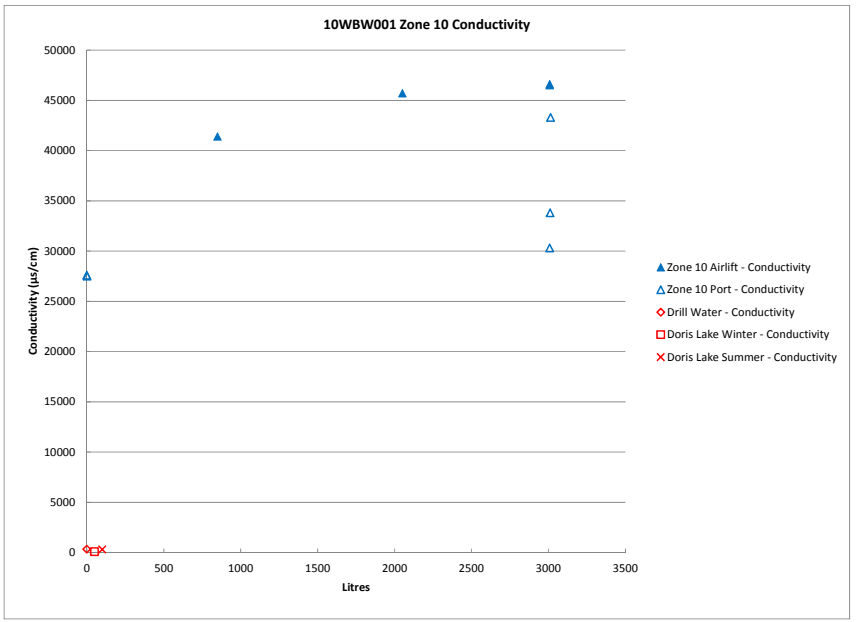

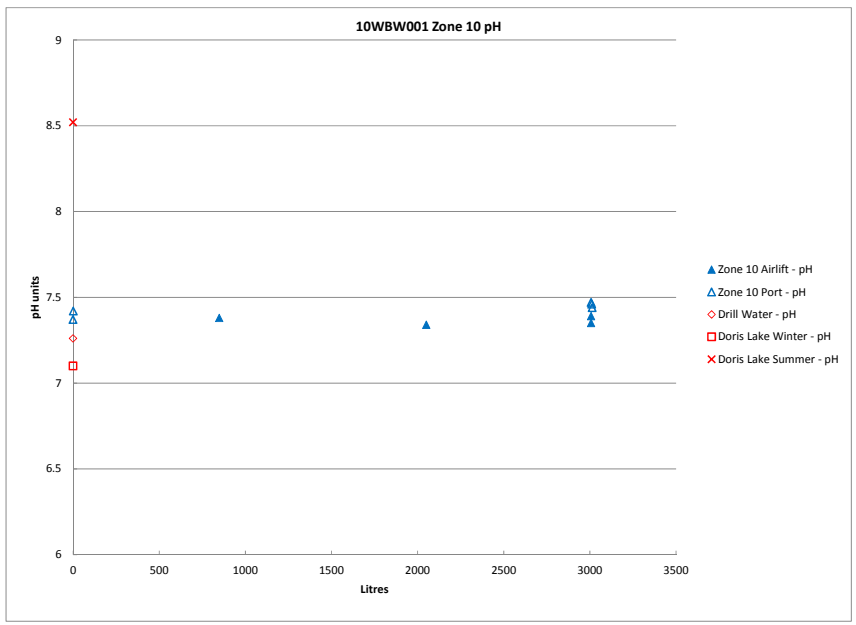

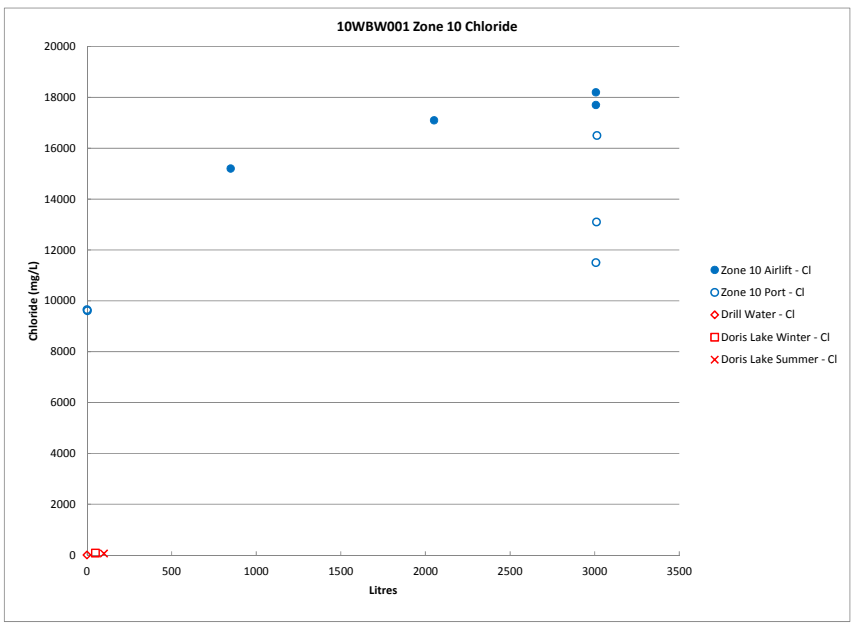

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2010 West Bay Data Report - Appendix M

Doris Central 10WBW001 Zone 10

Job No: 1CH008.013

Filename: Figures M1-9_DorisCentral_20110202.pptx

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Date: February 2011

Approved: JH

Figure: **M.7**

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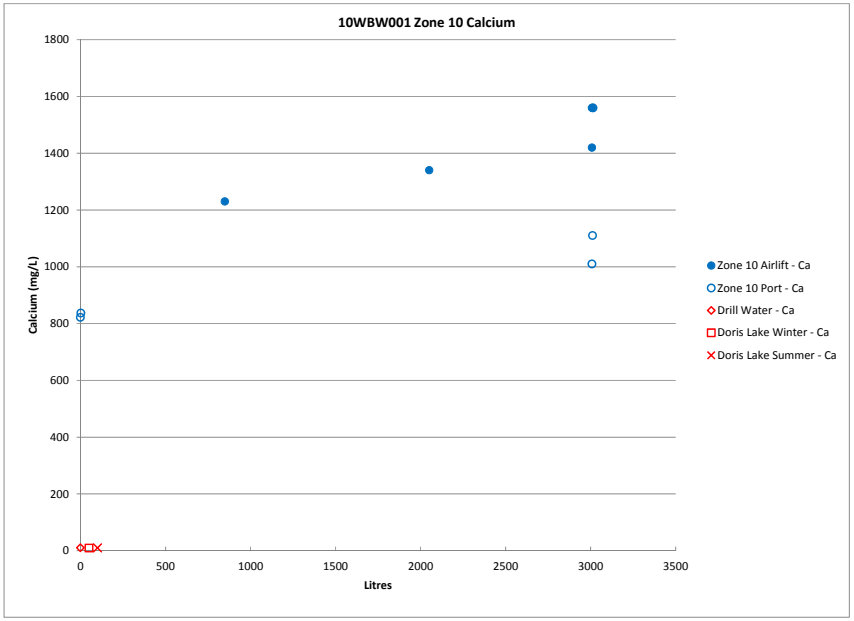

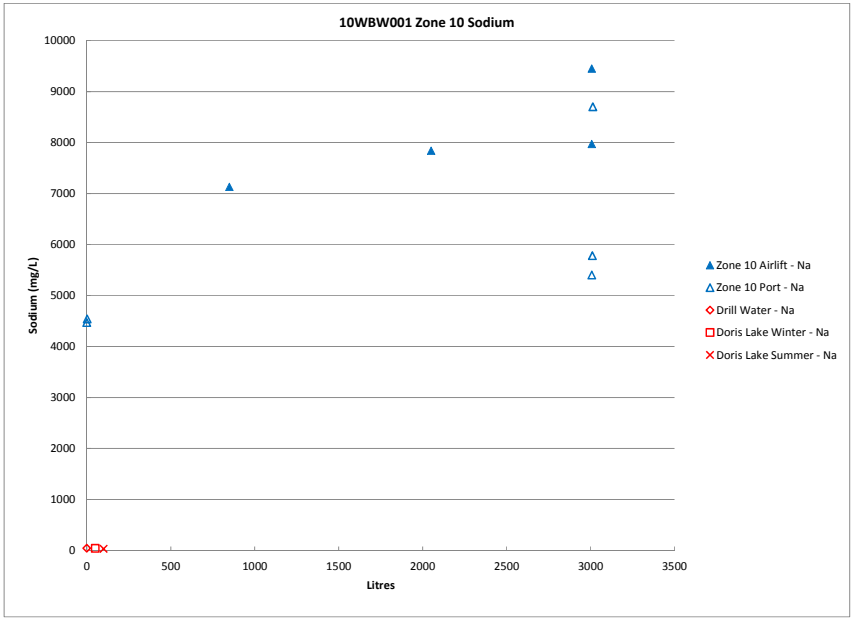

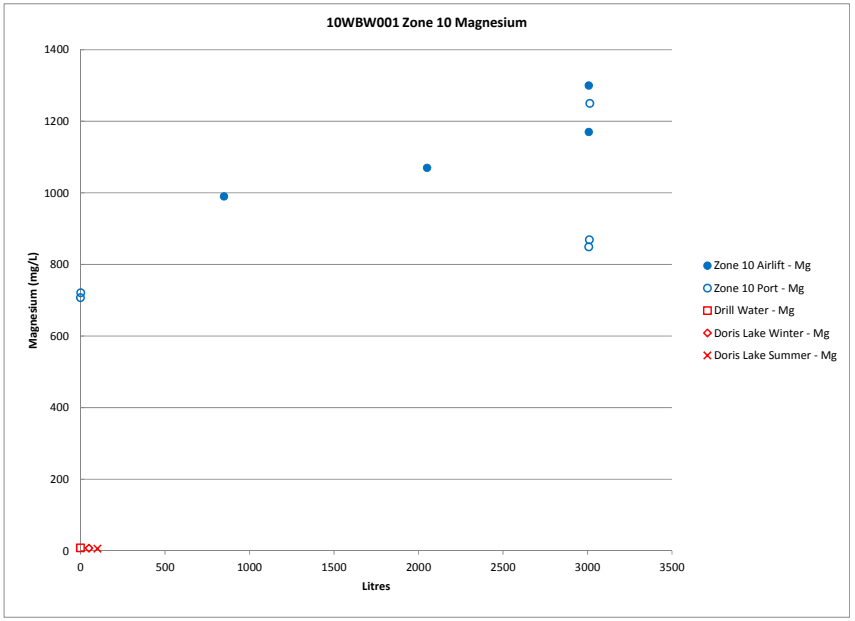

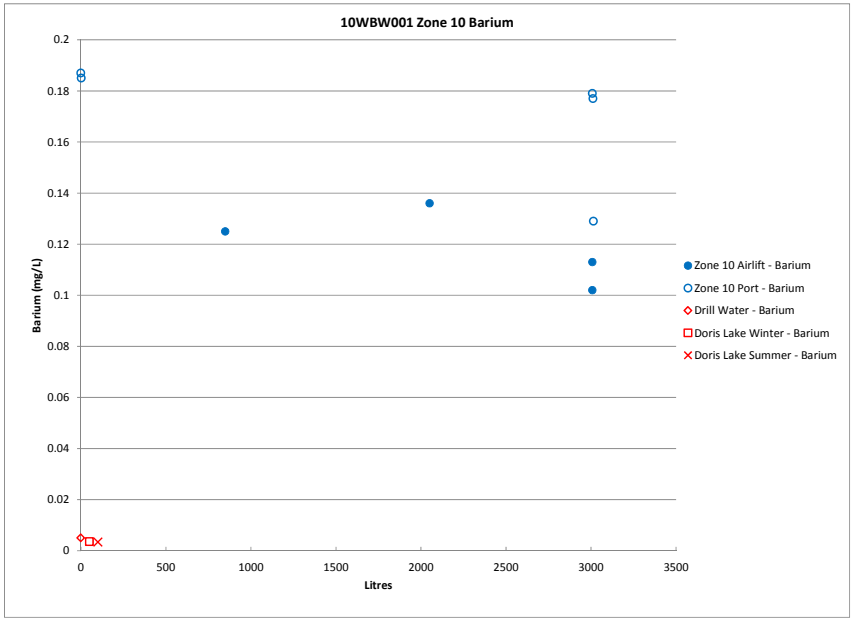

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Job No: 1CH008.013

Filename: Figures M1-9_DorisCentral_20110202.pptx

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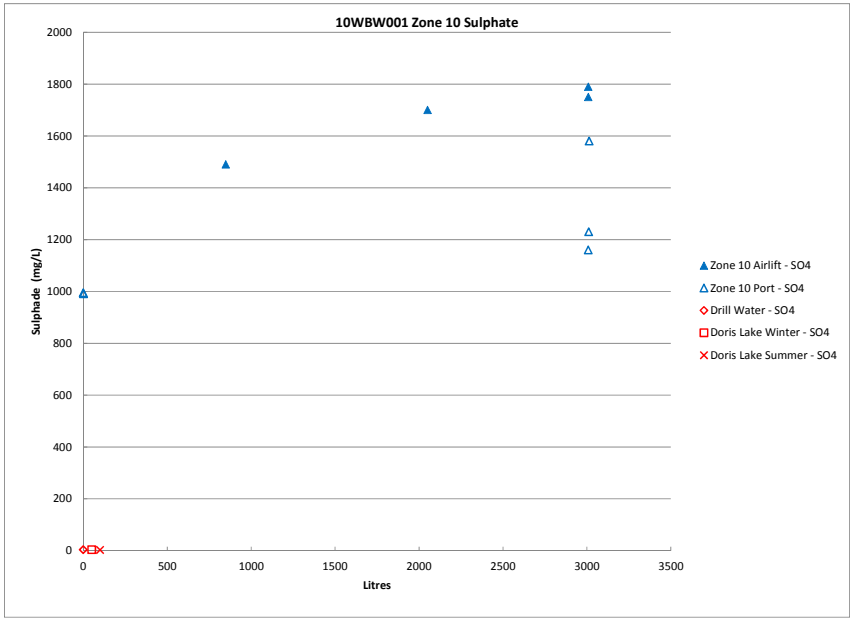
2010 West Bay Data Report - Appendix M

Doris Central 10WBW001
Zone 10

Date:	Approved:	Figure:
February 2011	JH	**M.8**



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Job No: 1CH008.013

Filename: Figures M1-9_DorisCentral_20110202.pptx

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2010 West Bay Data Report - Appendix M

Doris Central 10WBW001
Zone 10

Date:	Approved:	Figure:
February 2011	JH	**M.9**

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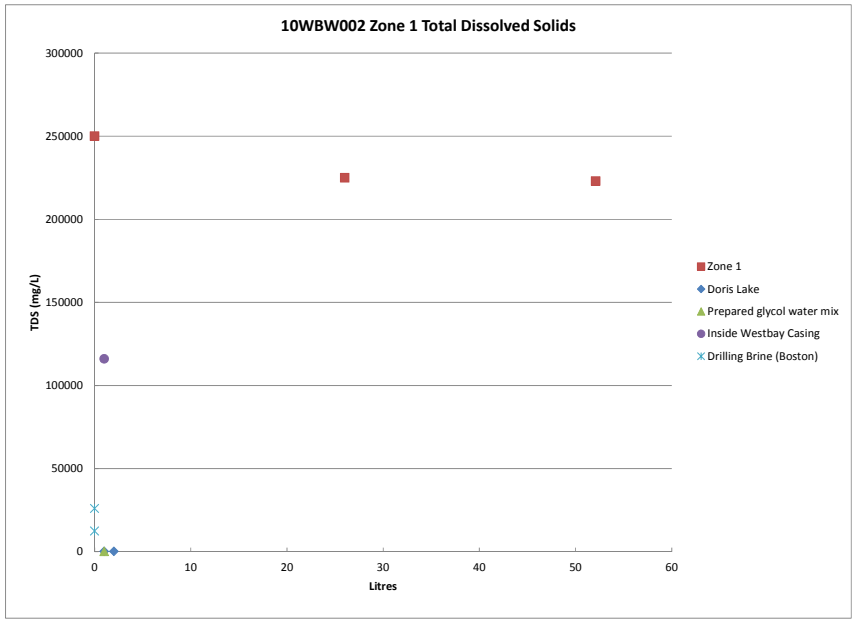

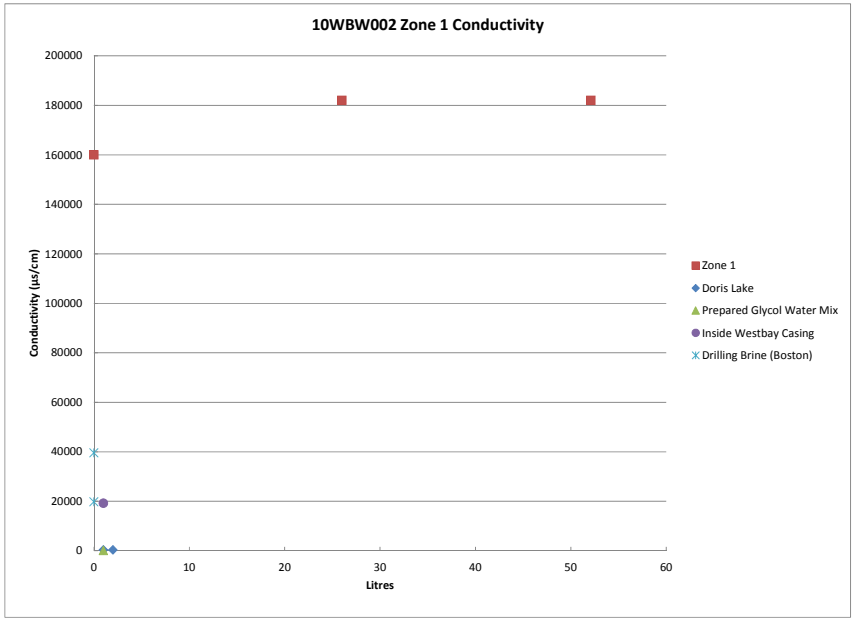

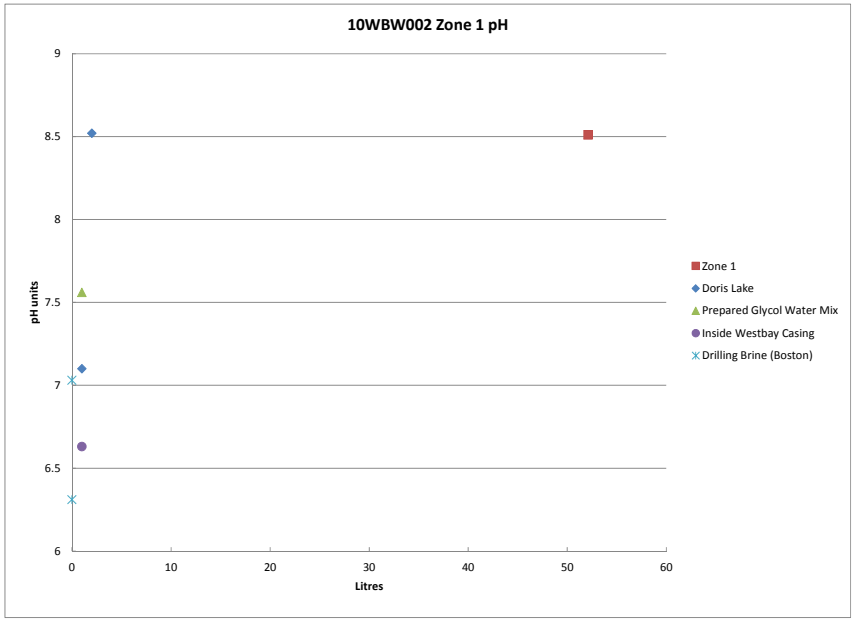

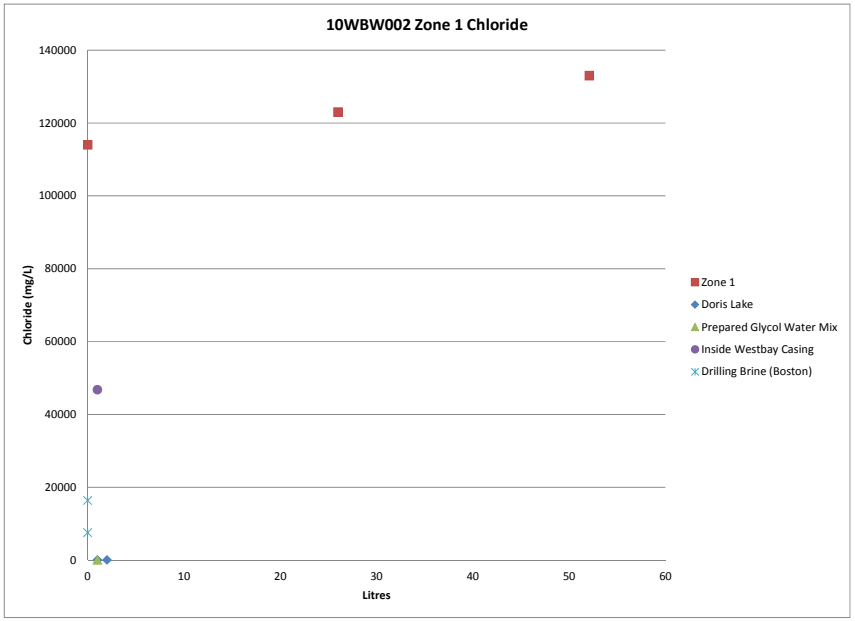

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2010 West Bay Data Report - Appendix M

Doris North 10WBW004
Zone 1

Job No: 1CH008.013

Filename: Figures M10-11_DorisNorth_20110202.pptx

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Date: February 2011

Approved: JH

Figure: **M.10**

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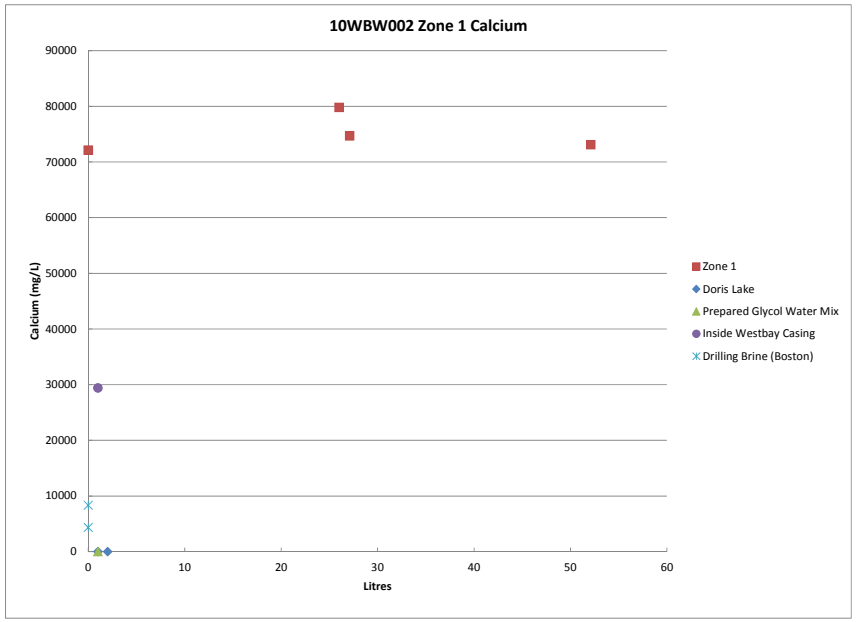

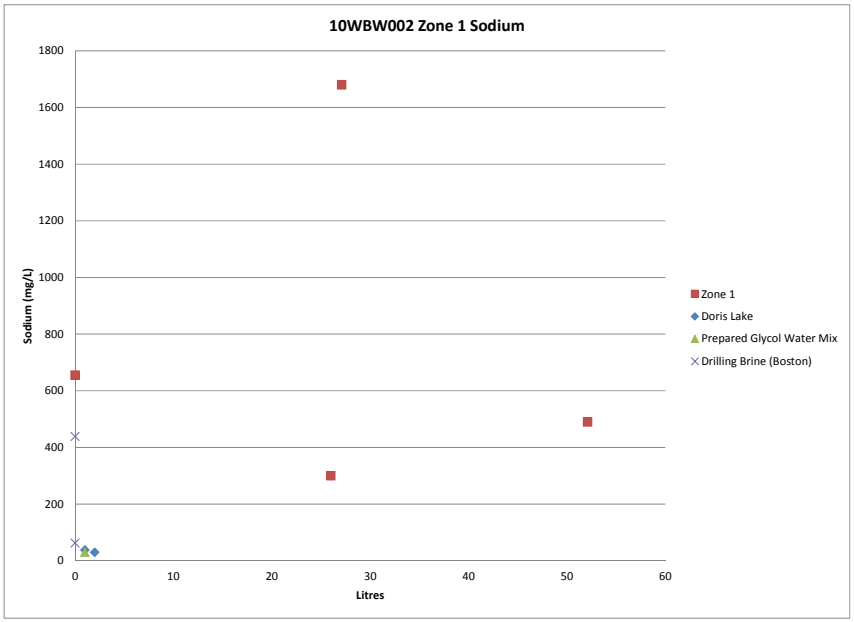

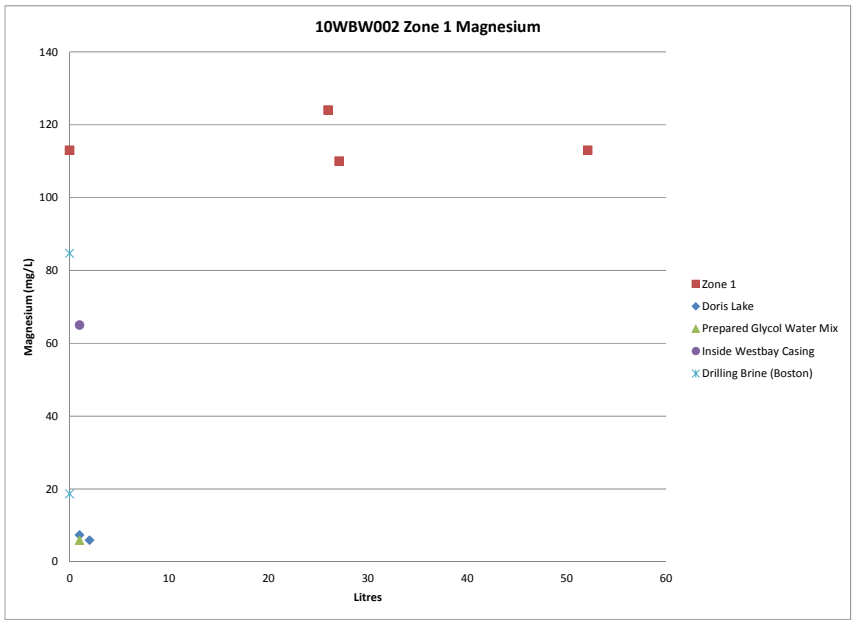

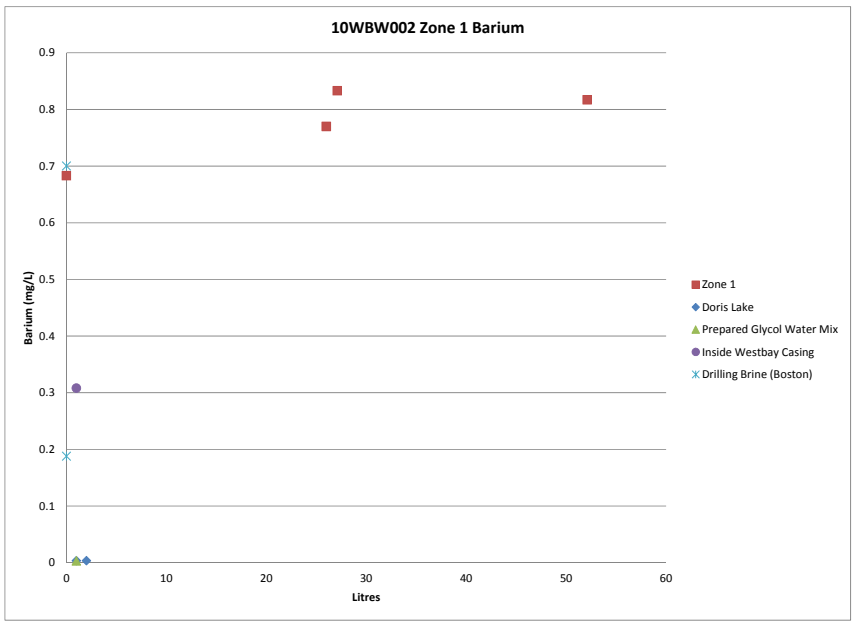

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2010 West Bay Data Report - Appendix M

Doris North 10WBW004
Zone 1

Job No: 1CH008.013

Filename: Figures M10-11_DorisNorth_20110202.pptx

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Date: February 2011

Approved: JH

Figure: **M.11**

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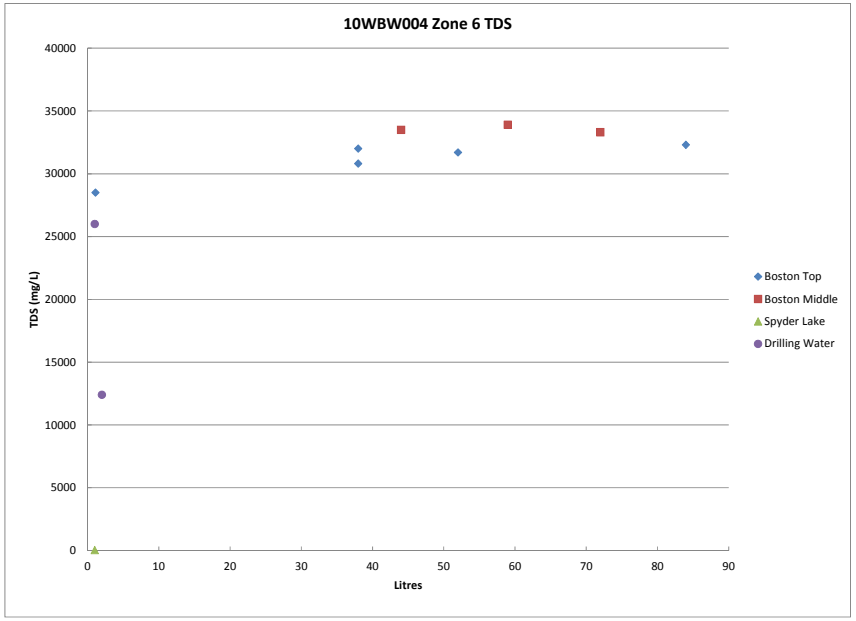

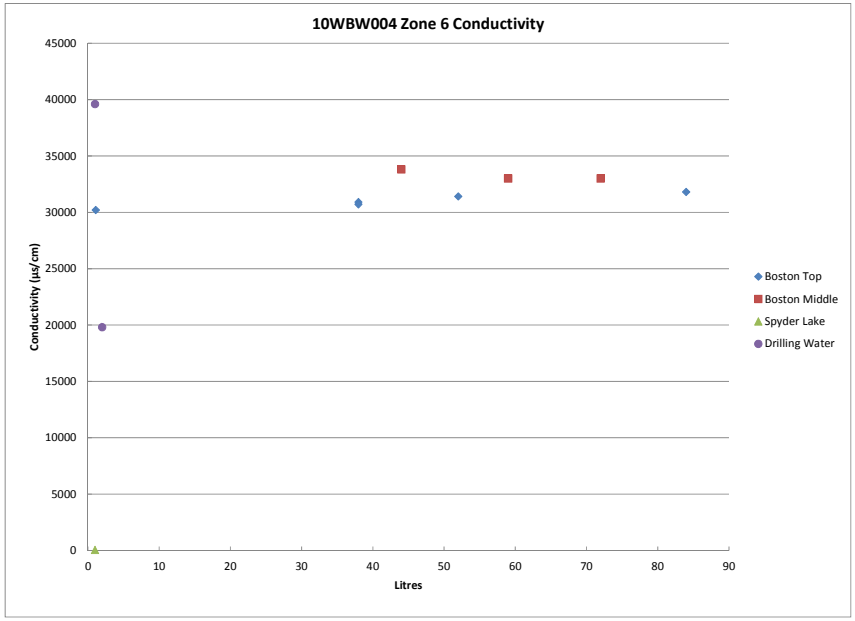

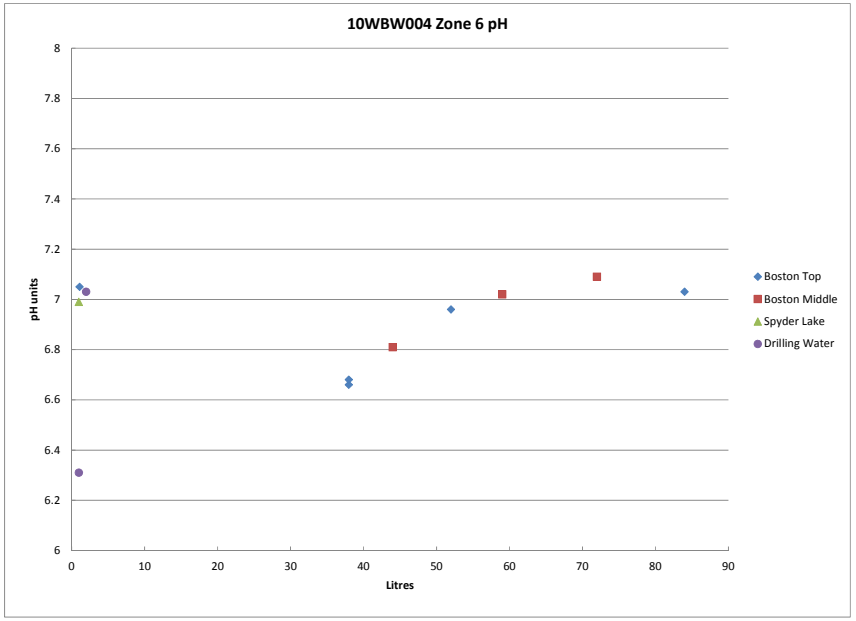

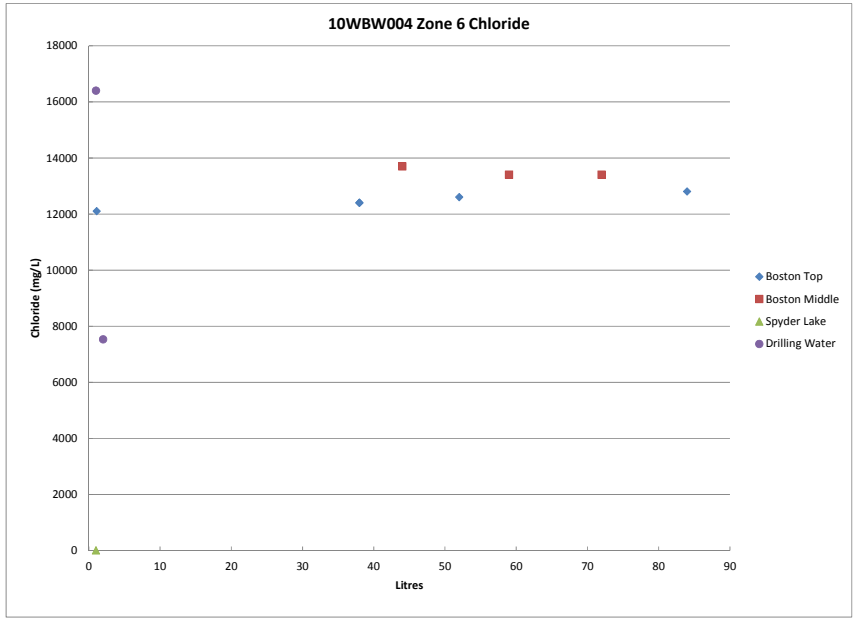

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Job No: 1CH008.013

Filename: Figures M12-14_20110202.pptx

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2010 West Bay Data Report - Appendix M

Boston 10WBW004
Zone 6

Date:	Approved:	Figure:
February 2011	JH	**M.12**

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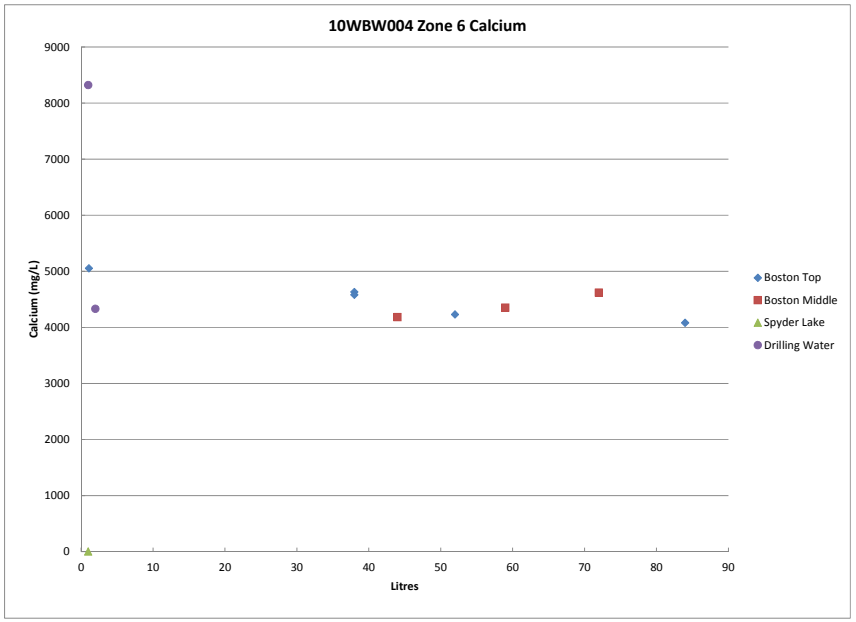

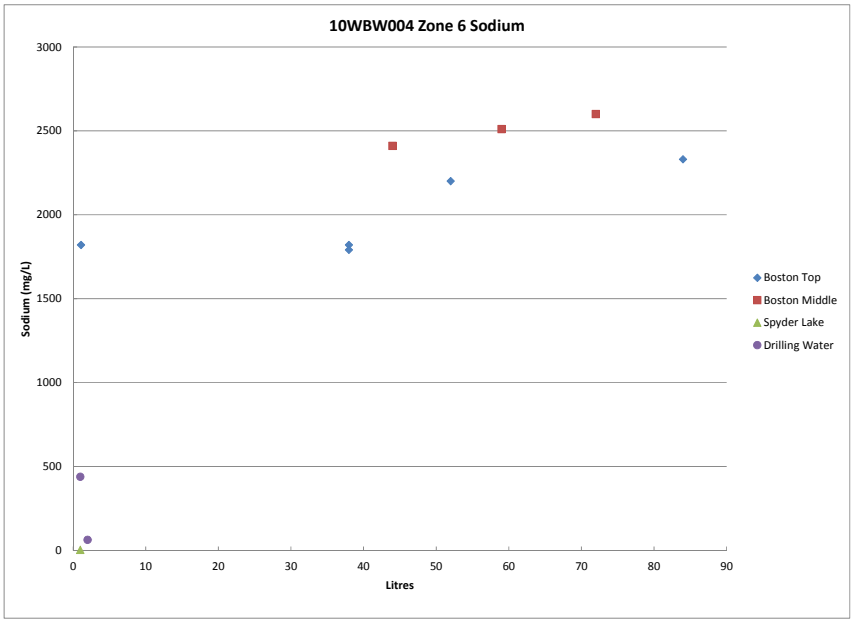

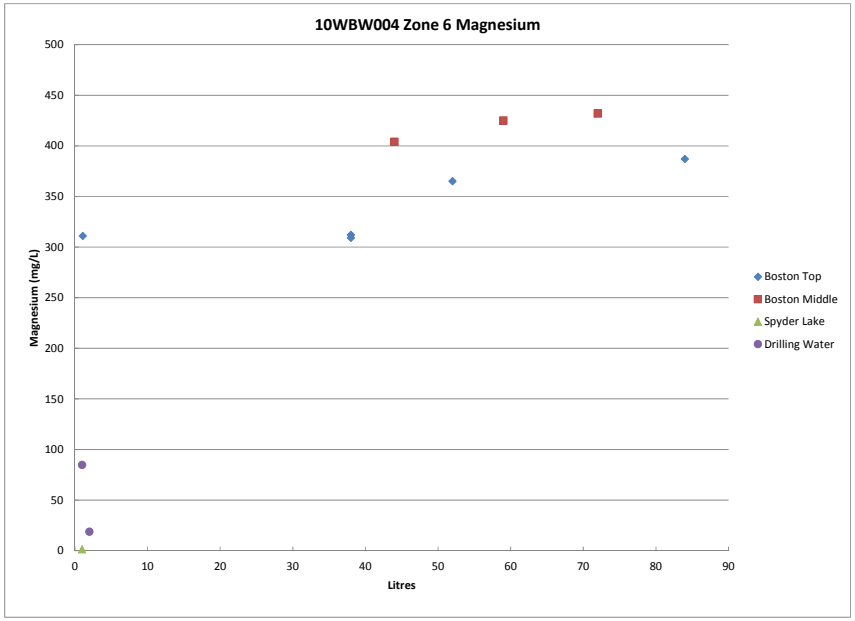

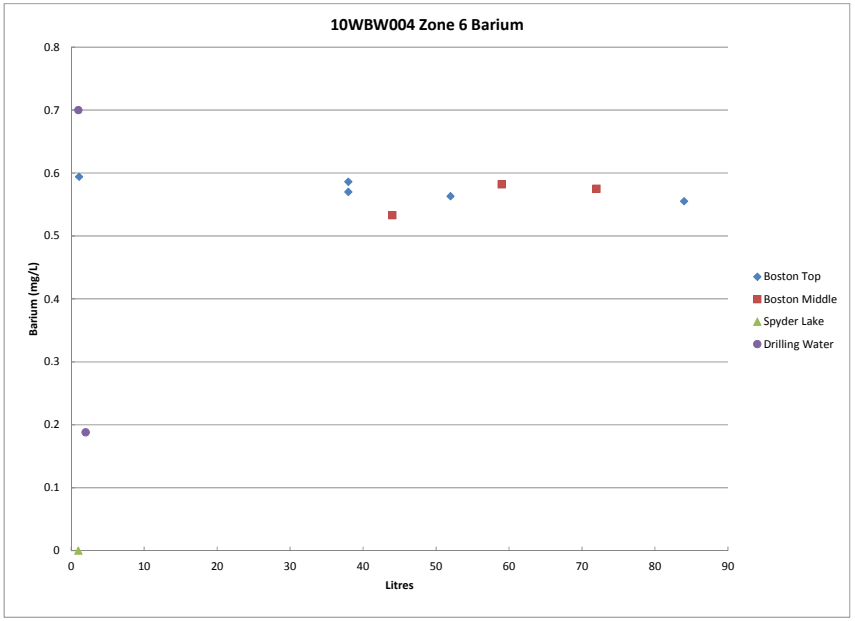

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Job No: 1CH008.013

Filename: Figures M12-14_20110202.pptx

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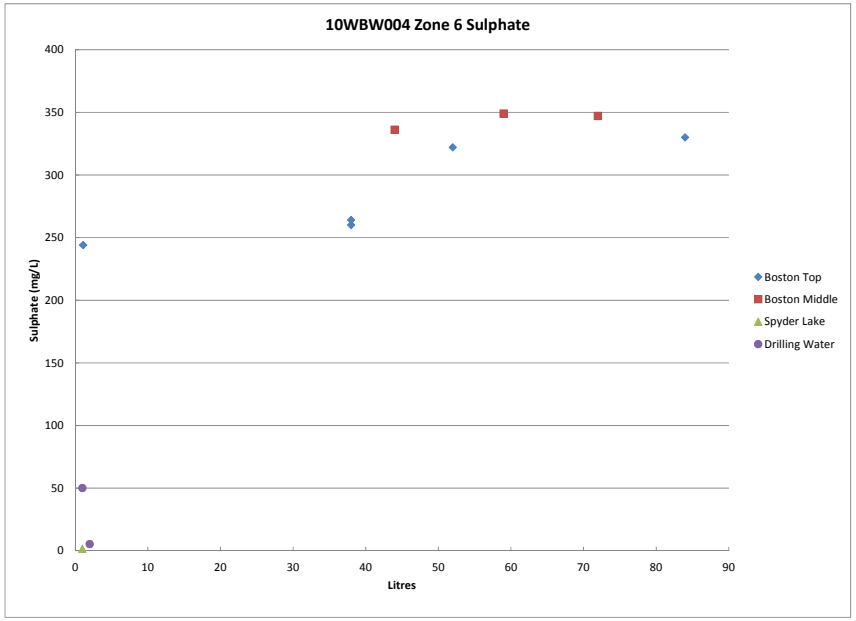
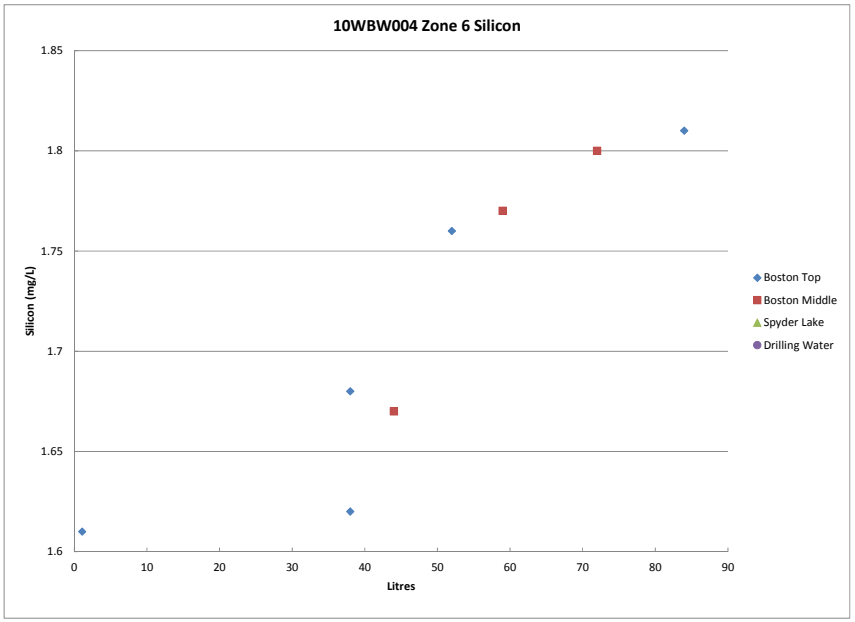
2010 West Bay Data Report - Appendix M

Boston 10WBW004
Zone 6

Date:	Approved:	Figure:
February 2011	JH	**M.13**





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Job No: 1CH008.013

Filename: Figures M12-14_Boston_20110202.pptx

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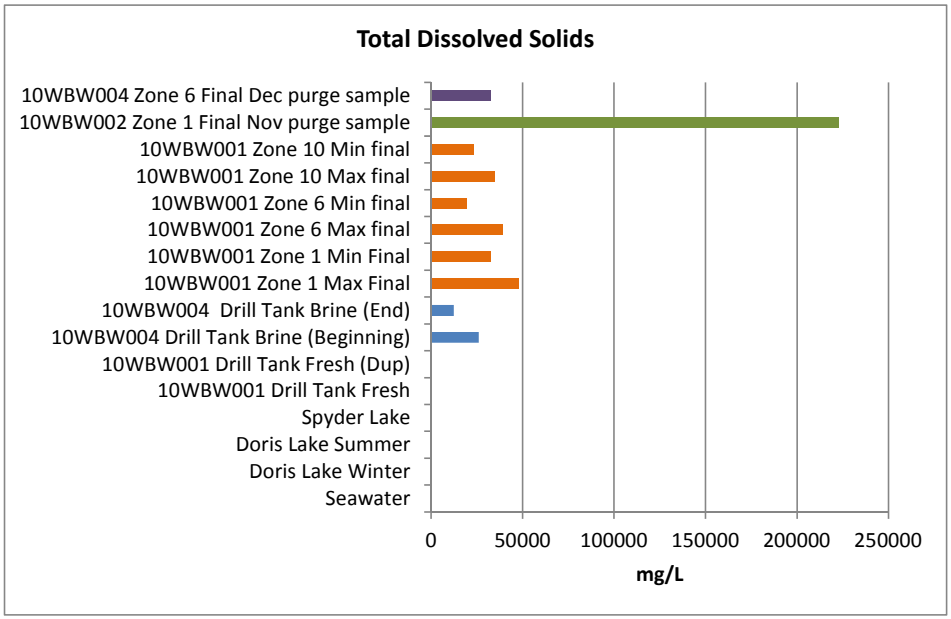
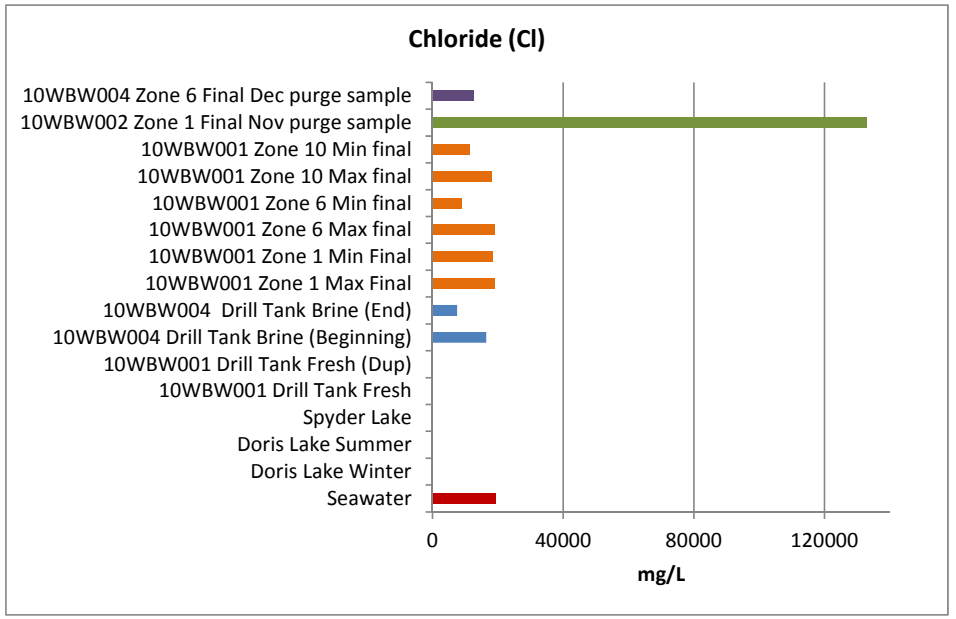
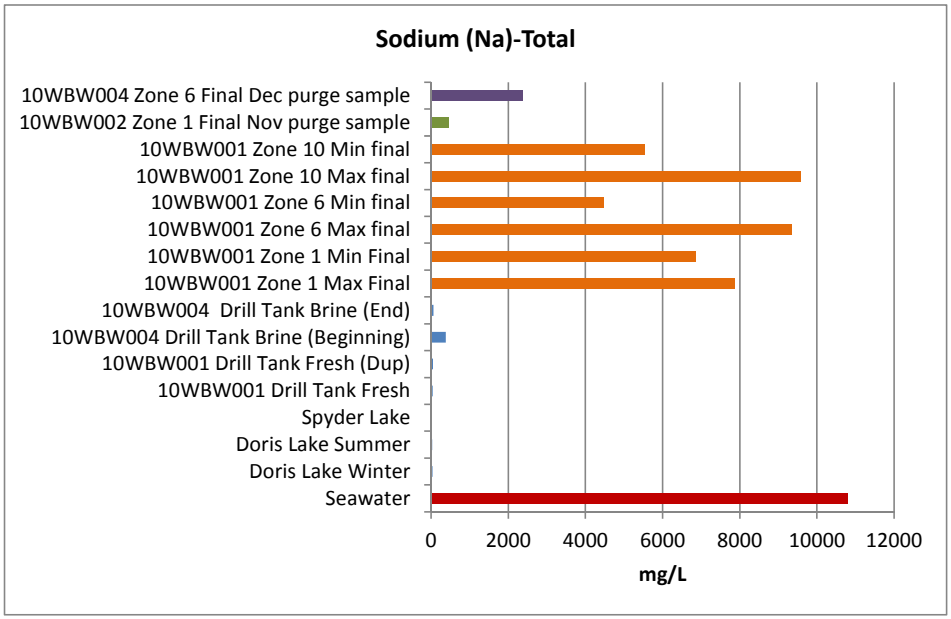
2010 West Bay Data Report - Appendix M

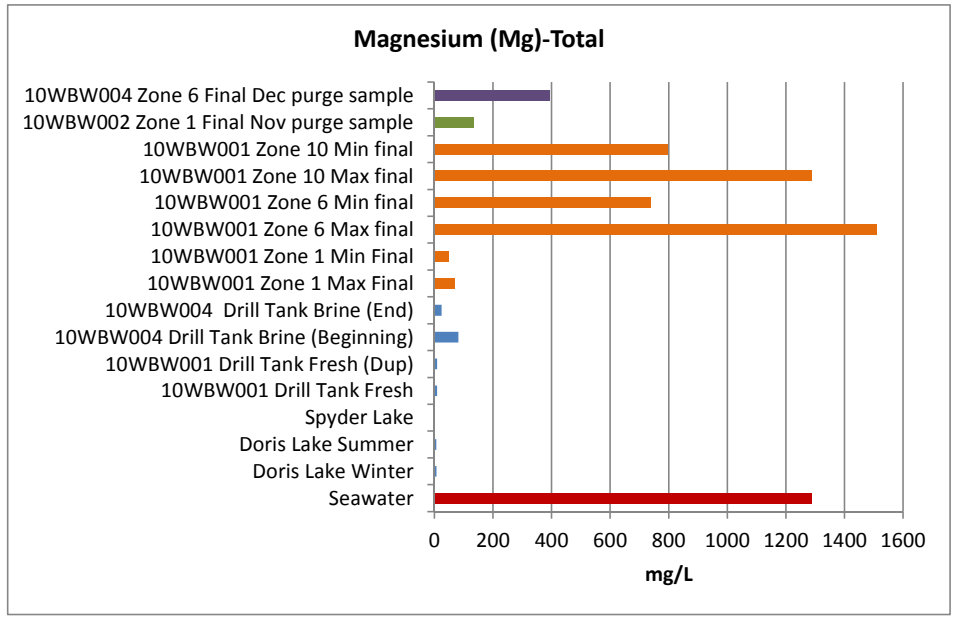
Boston 10WBW004
Zone 6

Date:	Approved:	Figure:
February 2011	JH	**M.14**









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2010 West Bay Data Report - Appendix M

Comparison Graphs

Job No: 1CH008.013

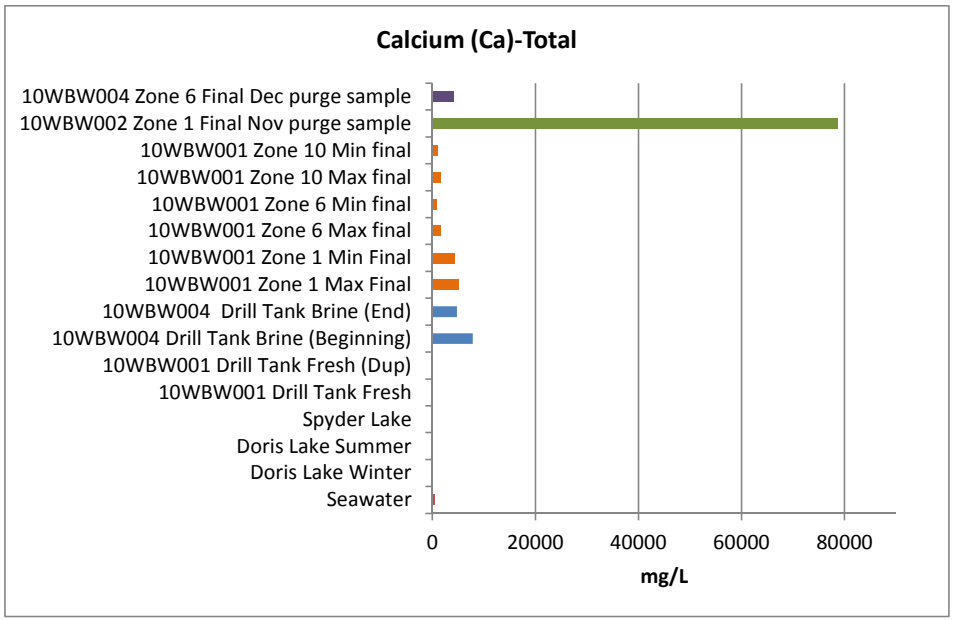
Filename: Figures M15-17_DorisCentral_20110202.pptx

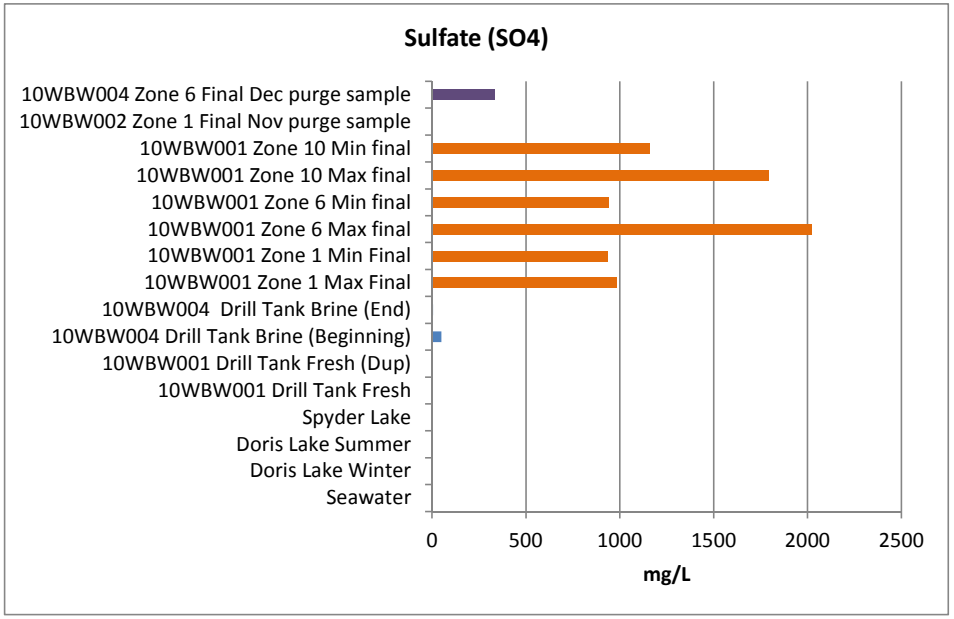
HOPE BAY MINING LTD.

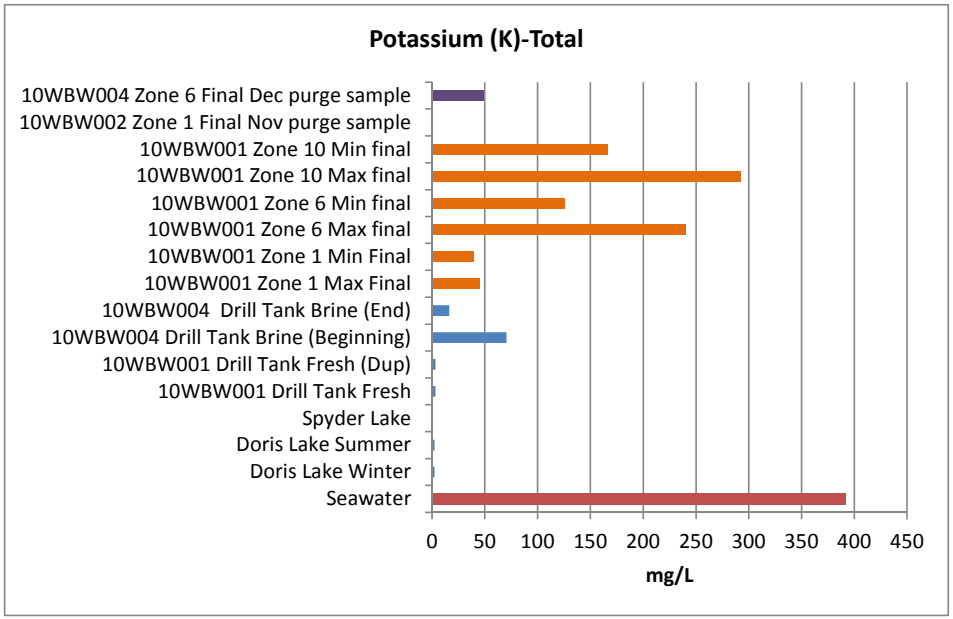
Date: February 2011

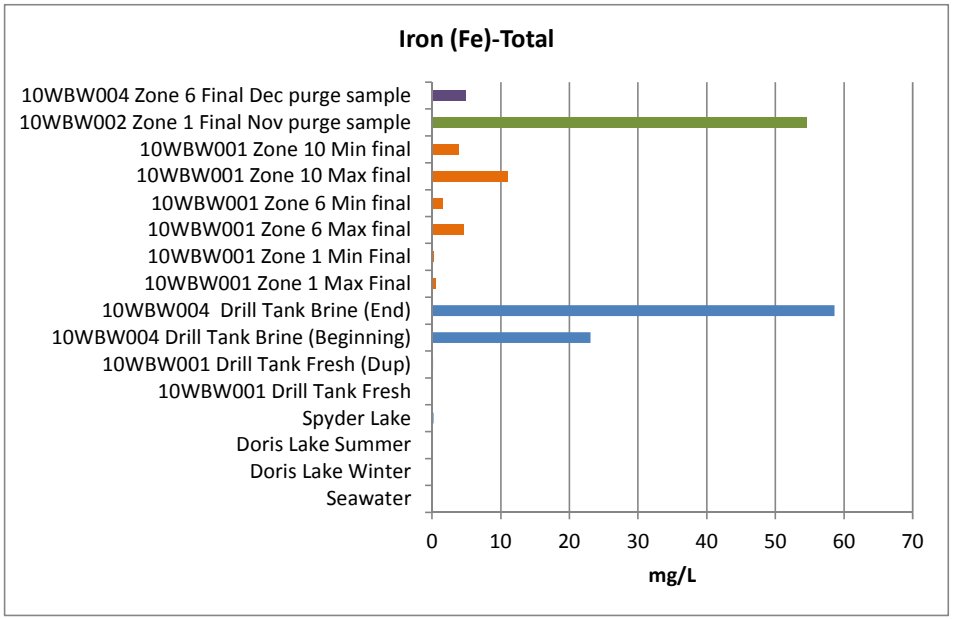
Approved: JH

Figure: **M.15**









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Comparison Graphs

Job No: 1CH008.013

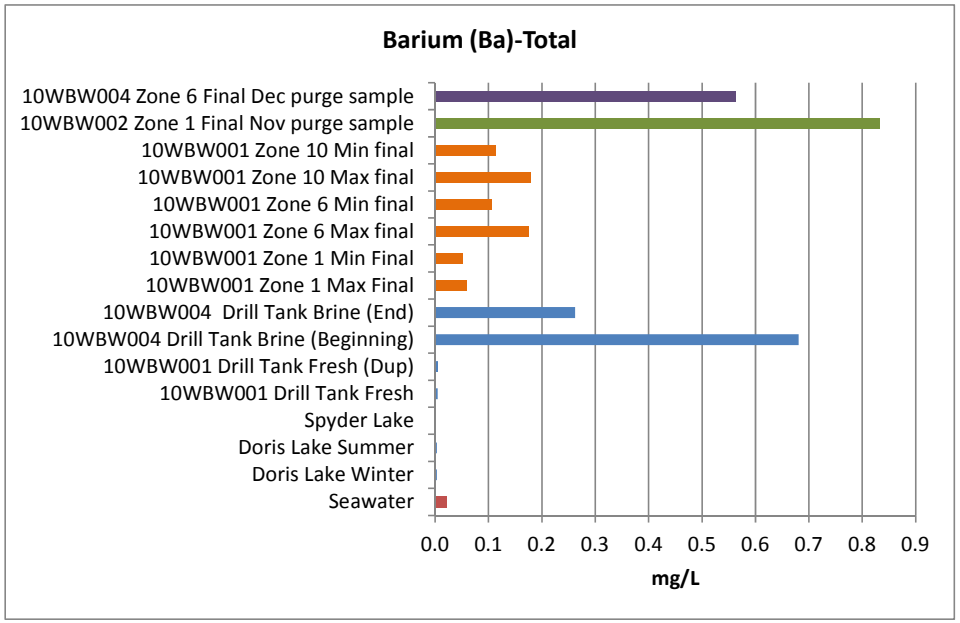
Filename: Figures M15-17_DorisCentral_20110202.pptx

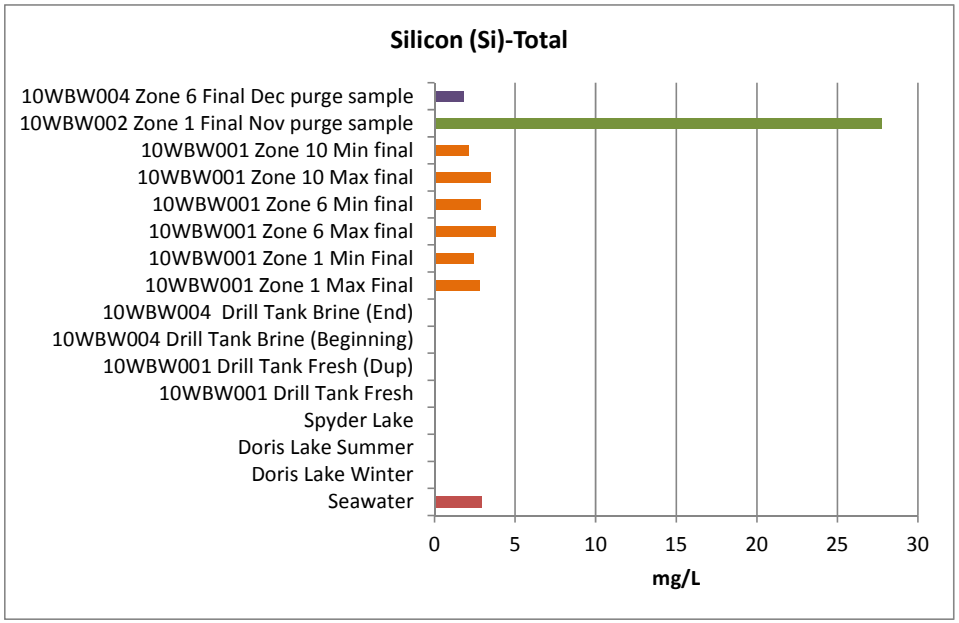
HOPE BAY MINING LTD.

Date: February 2011

Approved: JH

Figure: **M.16**





Data file reference:
J:\01_SITES\Hope.Bay\1CH008.013_2010_Westbay_Installation\020_Project_Data\SRK\07_Water Chemisty Results\Working Files\20110201ComparisonGraphs.xlsx

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Job No: 1CH008.013

Filename: Figures M15-17_Comparison_20110202.pptx

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2010 West Bay Data Report - Appendix M

Comparison Graphs

Date:	Approved:	Figure:
February 2011	JH	**M.17**

Appendix N
QA/QC Tables

Table N1: Comparison of Repeated Samples from the Same Port, Over Time

		Repeated port samples over time		RPD	Repeated port samples over time		RPD	Repeated port samples over time		RPD	Repeated port samples over time		RPD	Repeated port samples over time		RPD	Repeated port samples over time		RPD
Field Sample ID / Unique ID	**Units**	**10WBW001-35**	**10WBW001-100**		**10WBW001-100**	**10WBW001-106**		**10WBW001-36**	**10WBW001-101**		**10WBW001-101**	**10WBW001-108**		**10WBW001-37**	**10WBW001-102**		**10WBW001-102**	**10WBW001-105**	
Sample From		**Westbay Port**	**Westbay Port**		**Westbay Port**	**Westbay Port**		**Westbay Port**	**Westbay Port**		**Westbay Port**	**Westbay Port**		**Westbay Port**	**Westbay Port**		**Westbay Port**	**Westbay Port**	
Sample label for graph		10WBW001-Zone 1-Port Final-S35	10WBW001-Zone 1-Port after 2mths-S100		10WBW001-Zone 1-Port after 2mths-S100	10WBW001-Zone 1-Port after bulk-S106		10WBW001-Zone 6-Port Final-S36	10WBW001-Zone 6-Port after 2mths-S101		10WBW001-Zone 6-Port after 2mths-S101	10WBW001-Zone 6-Port after bulk-S108		10WBW001-Zone 10-Port Final-S37	10WBW001-Zone 10-Port after 2mths-S102		10WBW001-Zone 10-Port after 2mths-S102	10WBW001-Zone 10-Port after bulk-S105	
Sample Zone		1	1		1	1		6	6		6	6		10	10		10	10	
Location of port in zone		Top	Top		Top	Top		Top	Top		Top	Top		Top	Top		Top	Top	
Zone port drillhole depth		548.0	548.0		548.0	548.0		246.0	246.0		246.0	246.0		63.5	63.5		63.5	63.5	
Total Litres purged from zone before sample was taken		3186	3189		3189	3192		8096	8099		8099	13592		3008	3011		3011	3014	
Zone volumes purged before sample was taken		27.4	27.4		27.4	27.5		46.6	46.6		46.6	79.3		11.0	11.0		11.0	11.0	
ALS DATA																			
ALS Date Sampled		04-AUG-10	19-OCT-10		19-OCT-10	30-OCT-10		05-AUG-10	19-OCT-10		19-OCT-10	01-NOV-10		05-AUG-10	20-OCT-10		20-OCT-10	29-OCT-10	
ALS Time Sampled		13:42	12:00		12:00	13:00		09:00	15:00		15:00	15:00		11:40	11:00		11:00	15:00	
Matrix		Seawater	Seawater		Seawater	Seawater		Seawater	Seawater		Seawater	BOTH		Seawater	Seawater		Seawater	Seawater	
Physical Tests																			
Conductivity (EC)	uS/cm	46600	46700	0%	46700	46900	0%	24600	34900	-35%	34900	37000	-6%	30300	33800	-11%	33800	43300	-25%
Density			1.01		1.01	1.03	-2%		1.01		1.01	1.03	-2%		1.01		1.01	1.01	0%
Hardness (as CaCO3)	mg/L	12700	12600	1%	12600	12100	4%	4760	6720	-34%	6720	7340	-9%	6030	6360	-5%	6360	8900	-33%
pH	pH	7.43	7.38	1%	7.38	7.69	-4%	7.83	7.79	1%	7.79	7.59	3%	7.47	7.46	0%	7.46	7.44	0%
Salinity (EC)	g/L		30.50		30.50	31.2	-2%		22.10		22.10	23.5	-6%					28.5	
Total Dissolved Solids	mg/L	47800	42300	12%	42300	47500	-12%	19600	28900	-38%	28900	25500	13%	23100	28300	-20%	28300	34500	-20%
Anions and Nutrients																			
Alkalinity, Bicarbonate (as CaCO3)	mg/L	<2	<2		<2	<2			44.2		44.2	43.7	1%		77.3		77.3	106	-31%
Alkalinity, Carbonate (as CaCO3)	mg/L		<2		<2	<2			<2		<2	<2			<1		<1	<2	
Alkalinity, Hydroxide (as CaCO3)	mg/L		<2		<2	<2			<2		<2	<2			<1		<1	<2	
Alkalinity, Total (as CaCO3)	mg/L		<2		<2	<2		44.2	44.2	0%	44.2	43.7	1%	49.7	77.3	-43%	77.3	106	-31%
Ammonia as N	mg/L					0.0631						2.32						3.46	
Bromide (Br)	mg/L	100	101	-1%	101	101	0%	21.2	38.1	-57%	38.1	41.3	-8%	27.6	36.4	-28%	36.4	41	-12%
Chloride (Cl)	mg/L	19000	19000	0%	19000	18400	3%	09130	13400	-38%	13400	14200	-6%	11500	13100	-13%	13100	16500	-23%
Fluoride (F)	mg/L	<0.75	<0.75		<0.75	<0.75		<0.75	<0.75		<0.75	<0.75		<0.75	<0.75		<0.75	<0.75	
Nitrate (as N)	mg/L	<0.5	0.96		0.96	<0.5		<0.5	<0.5		<0.5	<0.5		<0.5	<0.5		<0.5	<1	
Nitrite (as N)	mg/L	<0.1	<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.2	
Ortho Phosphate as P	mg/L		0.0264		0.0264	0.0086	102%		0.0017		0.0017	<0.001			<0.001		<0.001	<0.001	
Total Phosphate as P	mg/L					0.0163						0.0162						0.0389	
Silicate (as SiO2)	mg/L		7.8		7.8	<10			5.0		5.0	5.8	-15%		3.8		3.8	7.5	-65%
Sulfate (SO4)	mg/L	0981	980	0%	980	935	5%	0940	1390	-39%	1390	1500	-8%	1160	1230	-6%	1230	1580	-25%
Total Metals																			
Aluminum (Al)-Total	mg/L	0.0992	0.0136	152%	0.0136	0.0086	45%	0.0281	0.0052	138%	0.0052	0.0059	-13%	0.0146	<0.005		<0.005	<0.005	
Antimony (Sb)-Total	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		0.00745	0.005	39%	0.005	0.00461	8%	0.00349	0.00099	112%	0.00099	0.00054	59%
Arsenic (As)-Total	mg/L	<0.002	<0.002		<0.002	<0.002		0.003	<0.002		<0.002	<0.002		<0.002	<0.002		<0.002	<0.002	
Barium (Ba)-Total	mg/L	0.051	0.053	-3%	0.053	0.0521	1%	0.130	0.175	-30%	0.175	0.169	3%	0.179	0.177	1%	0.177	0.129	31%
Beryllium (Be)-Total	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Bismuth (Bi)-Total	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Boron (B)-Total	mg/L	2.93	2.89	1%	2.89	3.25	-12%	1.04	1.38	-28%	1.38	1.50	-8%	1.51	1.53	-1%	1.53	2.8	-59%
Cadmium (Cd)-Total	mg/L	<0.00012	0.000066		0.000066	0.000085	-25%	<0.00012	<0.00005		<0.00005	<0.00005		<0.00012	<0.00005		<0.00005	<0.00005	
Calcium (Ca)-Total	mg/L	5070	4960	2%	4960	4700	5%	0805	1140	-34%	1140	1170	-3%	1020	1080	-6%	1080	1540	-35%
Cesium (Cs)-Total	mg/L	0000	0.00102	3%	0.00102	0.0011	-8%	0000	0000	-23%	0000	0.00095	-4%	0.00097	0.001	-3%	0.001	0.00151	-41%
Chromium (Cr)-Total	mg/L	0.01	0.0006	160%	0.0006	0.0002	104%	0.00	0.00	139%	0.00	<0.0005		0.0030	0.00011	186%	0.00011	0.00016	-37%
Cobalt (Co)-Total	mg/L	<0.0005	0.000073		0.000073	0.000051	35%	<0.0005	0.000092		0.000092	0.000103	-11%	<0.0005	0.000084		0.000084	0.000132	-44%
Copper (Cu)-Total	mg/L	0.0018	0.00059	101%	0.00059	0.00102	-53%	<0.001	<0.0005		<0.0005	0.00061		<0.001	<0.0005		<0.0005	<0.0005	
Gallium (Ga)-Total	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Iron (Fe)-Total	mg/L	0.46	0.24	62%	0.24	0.197	20%	1.60	2.94	-59%	2.94	2.28	25%	3.95	4.31	-9%	4.31	11	-87%
Lead (Pb)-Total	mg/L	0.0013	<0.0003		<0.0003	<0.0003		<0.001	0.00035		0.00035	<0.0003		<0.001	<0.0003		<0.0003	<0.0003	
Lithium (Li)-Total	mg/L	0.37	0.346	7%	0.346	0.381	-10%	0.093	0.117	-23%	0.117	0.131	-11%	0.128	0.128	0%	0.128	0.2	-44%
Magnesium (Mg)-Total	mg/L	0071	064	10%	064	67.8	-5%	0739	1010	-31%	1010	1080	-7%	867	797	8%	797	1230	-43%
Manganese (Mn)-Total	mg/L	0.72	0.72	-1%	0.72	0.712	1%	0.56	0.95	-52%	0.95	0.892	6%	1.09	1.15	-5%	1.15	1.73	-40%
Mercury (Hg)-Total	mg/L		<0.00001		<0.00001	<0.00001			<0.00001		<0.00001				<0.00001		<0.00001	<0.00001	
Molybdenum (Mo)-Total	mg/L	0.0136	0.0089	42%	0.0089	0.0088	1%	0.0403	0.037	9%	0.037	0.0361	2%	0.0225	0.0244	-8%	0.0244	0.0072	109%
Nickel (Ni)-Total	mg/L	0.00437	0.00075	141%	0.00075	0.00265	-112%	0.00159	0.00059	92%	0.00059	0.00120	-68%	0.00237	<0.0005		<0.0005	<0.0005	
Phosphorus (P)-Total	mg/L	<1	<1		<1	<1		<1	<1		<1	<1		<1	<1		<1	<1	
Potassium (K)-Total	mg/L	040	040	0%	040	39	3%	125	171	-31%	171	172	-1%	166	166	0%	166	262	-45%
Rhenium (Re)-Total	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Rubidium (Rb)-Total	mg/L	000	0.0526	-5%	0.0526	0.0531	-1%	000	000	-30%	000	0.102	2%	0.0816	0.0842	-3%	0.0842	0.104	-21%
Selenium (Se)-Total	mg/L	<0.002	<0.002		<0.002	<0.002		<0.002	<0.002		<0.002	<0.002		<0.002	<0.002		<0.002	<0.002	
Silicon (Si)-Total	mg/L	2.61	2.79	-7%	2.79	2.47	12%	2.88	3.5	-19%	3.5	3.82	-9%	2.12	2.42	-13%	2.42	3.51	-37%
Silver (Ag)-Total	mg/L	<0.0002	<0.0001		<0.0001	<0.0001		<0.0002	<0.0001		<0.0001	0.00018		<0.0002	<0.0001		<0.0001	<0.0001	
Sodium (Na)-Total	mg/L	7470	7200	4%	7200	6850	5%	4460	6410	-36%	6410	6790	-6%	5590	5530	1%	5530	8990	-48%
Strontium (Sr)-Total	mg/L	0060	57.2	5%	57.2	54.6	5%	0010	0014	-35%	0014	14.6	-5%	11.7	11.1	5%	11.1	16.4	-39%
Tellurium (Te)-Total	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Thallium (Tl)-Total	mg/L	<0.0005	<0.00005		<0.00005	<0.00005		<0.0005	<0.00005		<0.00005	<0.00005		<0.0005	<0.00005		<0.00005	<0.00005	
Thorium (Th)-Total	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Tin (Sn)-Total	mg/L	<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001	
Titanium (Ti)-Total	mg/L	0.0062	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005	
Tungsten (W)-Total	mg/L	<0.001	0.0014		0.0014	0.0016	-13%	0.0334	0.0247	30%	0.0247	0.0227	8%	0.0067	0.0051	27%	0.0051	0.0059	-15%
Uranium (U)-Total	mg/L	<0.0005	<0.00005		<0.00005	<0.00005		<0.0005	<0.00005		<0.00005	0.000059		<0.0005	0.000057		0.000057	<0.00005	
Vanadium (V)-Total	mg/L	0.00	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Yttrium (Y)-Total	mg/L	<0.0005	0.00052		0.00052	0.00057	-9%	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Zinc (Zn)-Total	mg/L	0.503	0.279	57%	0.279	0.285	-2%	0.195	0.236	-19%	0.236	0.115	69%	0.261	0.173	41%	0.173	0.107	47%
Zirconium (Zr)-Total	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Dissolved Metals																			
Aluminum (Al)-Dissolved	mg/L	<0.005	<0.005		<0.005	0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005	
Antimony (Sb)-Dissolved	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		0.00703	0.0048	38%	0.0048	0.00393	20%	0.00306	0.00097	104%	0.00097	0.00053	59%
Arsenic (As)-Dissolved	mg/L	<0.002	<0.002		<0.002	<0.002		<0.002	<0.002		<0.002	<0.002		<0.002	<0.002		<0.002	<0.002	
Barium (Ba)-Dissolved	mg/L	0.052	0.053	-2%	0.053	0.0526	1%	0.120	0.178	-39%	0.178	0.169	5%	0.169	0.178	-5%	0.178	0.122	37%
Beryllium (Be)-Dissolved	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Bismuth (Bi)-Dissolved	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Boron (B)-Dissolved	mg/L	2.99	2.92	2%	2.92	3.3	-12%	0.94	1.38	-38%	1.38	1.48	-7%	1.42	1.54	-8%	1.54	2.86	-60%
Cadmium (Cd)-Dissolved	mg/L	<0.00012	0.000083		0.000083	0.000097	-16%	<0.00012	<0.00005		<0.00005	<0.00005		<0.00012	<0.00005		<0.00005	<0.00005	
Calcium (Ca)-Dissolved	mg/L	4960	4920	1%	4920	4730	4%	0749	1100	-38%	1100	1160	-5%	1010	1110	-9%	1110	1560	-34%
Cesium (Cs)-Dissolved	mg/L	0000	0.00102	3%	0.00102	0.0011	-8%	0000	0000	-31%	0000	0.00097	-3%	0.00092	0.00104	-12%	0.00104	0.00148	-35%
Chromium (Cr)-Dissolved	mg/L	<0.001	<0.0001		<0.0001	<0.0001		<0.001	<0.0001		<0.0001	<0.0005		<0.001	<0.0001		<0.0001	<0.0001	
Cobalt (Co)-Dissolved	mg/L	<0.0005	<0.00005		<0.00005	<0.00005		<0.0005	0.000087		0.000087	0.000091	-4%	<0.0005	0.000102		0.000102	0.000187	-59%
Copper (Cu)-Dissolved	mg/L	<0.001	<0.0005		<0.0005	0.00067		<0.001	<0.0005		<0.0005	<0.0005		<0.001	<0.0005		<0.0005	0.00296	
Gallium (Ga)-Dissolved	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Iron (Fe)-Dissolved	mg/L	<0.05	0.06		0.06	0.075	-29%	0.06	0.22	-73%	0.22	0.503	-119%	2.66	3.15	-16%	3.15	8.94	-96%
Lead (Pb)-Dissolved	mg/L	<0.001	<0.0003		<0.0003	<0.0003		<0.001	<0.0003		<0.0003	<0.0003		<0.001	<0.0003		<0.0003	<0.0003	
Lithium (Li)-Dissolved	mg/L	0.37	0.350	6%	0.350	0.39	-11%	0.087	0.12	-32%	0.12	0.127	-6%	0.121	0.13	-7%	0.13	0.201	-43%
Magnesium (Mg)-Dissolved	mg/L	0070	064	8%	064	68.1	-6%	0702	0964	-31%	0964	1080	-11%	849	869	-2%	869	1250	-36%
Manganese (Mn)-Dissolved	mg/L	0.69	0.71	-2%	0.71	0.725	-2%	0.53	0.94	-57%	0.94	0.888	6%	1.04	1.17	-12%	1.17	1.69	-36%
Mercury (Hg)-Dissolved	mg/L	<	<0.00001		<0.00001	<0.00001		<	<0.00001		<0.00001			<	<0.00001		<0.00001	<0.00001	
Molybdenum (Mo)-Dissolved	mg/L	0.0128	0.0092	33%	0.0092	0.009	2%	0.0379	0.037	2%	0.037	0.0345	7%	0.0211	0.0259	-20%	0.0259	0.0044	142%
Nickel (Ni)-Dissolved	mg/L	<0.0005	<0.0005		<0.0005	0.00237		0.00076	<0.0005		<0.0005	0.00158		<0.0005	<0.0005		<0.0005	0.0006	
Phosphorus (P)-Dissolved	mg/L	<1	<1		<1	<1		<1	<1		<1	<1		<1	<1		<1	<1	
Potassium (K)-Dissolved	mg/L	039	039	0%	039	40	-3%	117	160	-31%	160	172	-7%	160	173	-8%	173	249	-36%
Rhenium (Re)-Dissolved	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Rubidium (Rb)-Dissolved	mg/L	000	0.0528	-5%	0.0528	0.0532	-1%	000	000	-40%	000	0.106	3%	0.0766	0.085	-10%	0.085	0.107	-23%
Selenium (Se)-Dissolved	mg/L	<0.002	<0.002		<0.002	<0.002		<0.002	<0.002		<0.002	<0.002		<0.002	<0.002		<0.002	<0.002	
Silicon (Si)-Dissolved	mg/L	2.3	2.42	-5%	2.42	2.43	0%	2.48	2.88	-15%	2.88	3.33	-14%	1.99	2.38	-18%	2.38	3.3	-32%
Silver (Ag)-Dissolved	mg/L	<0.0002	<0.0001		<0.0001	<0.0001		<0.0002	<0.0001		<0.0001	<0.0001		<0.0002	<0.0001		<0.0001	<0.0001	
Sodium (Na)-Dissolved	mg/L	7290	7200	1%	7200	6910	4%	4130	6010	-37%	6010	6810	-12%	5400	5780	-7%	5780	8700	-40%
Strontium (Sr)-Dissolved	mg/L	0059	56.7	4%	56.7	55.1	3%	0009	0013	-37%	0013	14.6	-11%	11.3	11.7	-3%	11.7	16.8	-36%
Tellurium (Te)-Dissolved	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Thallium (Tl)-Dissolved	mg/L	<0.0005	<0.00005		<0.00005	<0.00005		<0.0005	<0.00005		<0.00005	<0.00005		<0.0005	<0.00005		<0.00005	<0.00005	
Thorium (Th)-Dissolved	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Tin (Sn)-Dissolved	mg/L	<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001	
Titanium (Ti)-Dissolved	mg/L	<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005	
Tungsten (W)-Dissolved	mg/L	<0.001	0.0014		0.0014	0.0015	-7%	0.0316	0.0246	25%	0.0246	0.0231	6%	0.0059	0.005	17%	0.005	0.006	-18%
Uranium (U)-Dissolved	mg/L	<0.0005	<0.00005		<0.00005	<0.00005		<0.0005	<0.00005		<0.00005	0.000058		<0.0005	0.000059		0.000059	<0.00005	
Vanadium (V)-Dissolved	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Yttrium (Y)-Dissolved	mg/L	<0.0005	0.00051		0.00051	0.00054	-6%	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	
Zinc (Zn)-Dissolved	mg/L	0.0897	0.1130	-23%	0.1130	0.137	-19%	0.02	0.0705	-116%	0.0705	0.0295	82%	0.0504	0.061	-19%	0.061	0.0851	-33%
Zirconium (Zr)-Dissolved	mg/L	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	

RPDs greater than 20% are highlighted, to show parameters with the greatest variation between samples.

Table N2: Comparison of Duplicate Samples

		Duplicate		RPD	Duplicate		RPD	Duplicate		RPD	Duplicate		RPD
Field Sample ID / Unique ID	**Units**	**10WBW001-03b**	**10WBW001-04b**		**10WBW001-15**	**10WBW001-16**		**10WBW001-25**	**10WBW001-26**		**10WBW001-02a**	**10WBW001-04a**	
Sample From		**Westbay Port**	**Westbay Port**		**Westbay airlift**	**Westbay airlift**		**Westbay airlift**	**Westbay airlift**		**Other**	**Other**	
Sample Label		10WBW001-Zone 10-Port Initial-S03b	10WBW001-Zone 10-Port InitialD-S04b		10WBW001-Zone 10-Airlift Purge-S15	10WBW001-Zone 10-Airlift Final-S16D		10WBW001-Zone 1-Airlift Final-S25	10WBW001-Zone 1-Airlift Final-S26D		10WBW001 Drill Tank	10WBW001 Drill Tank Dup	
Sample Zone		10	10		10	10		1	1		n/a	n/a	
Location of port in zone		Top	Top		Bottom	Bottom		Middle	Middle		n/a	n/a	
Zone port drillhole depth		63.5	63.5		107.50	107.50		554.00	554.00		n/a	n/a	
Total Litres purged from zone before sample was taken		0	2		3008	3008		3065	3065		n/a	n/a	
Zone volumes purged before sample was taken		0.0	0.3		11.0	11.0		26.2	26.2		n/a	n/a	
ALS DATA													
ALS Date Sampled		09-JUL-10	09-JUL-10		21-JUL-10	21-JUL-10		25-JUL-10	25-JUL-10		25-APR-10	25-APR-10	
ALS Time Sampled		14:00	14:00		16:28	17:28		12:37	12:37		16:00	16:00	
Matrix		Water	Water		Water	Water		Water	Water		Water	Water	
Physical Tests													
Conductivity (EC)	uS/cm	27600	27500	0%	46500	46600	0%	47600	47600	0%	335	339	-1%
Density		1.00	1.01	-1%									
Hardness (as CaCO3)	mg/L	4960	5060	-2%	8360	9250	-10%	11500	11100	4%	57.8	59.8	-3%
pH	pH	7.37	7.42	-1%	7.35	7.39	-1%	7.65	7.72	-1%	7.20	7.26	-1%
Total Dissolved Solids	mg/L	18700	18500	1%	32200	32700	-2%	33300	32400	3%	197	202	-3%
Anions and Nutrients													
Alkalinity, Total (as CaCO3)	mg/L	66.3	64.8	2%	82.3	81.7	1%				35.6	35.2	1%
Chloride (Cl)	mg/L	9650	9610	0%	17700	18200	-3%	18700	18800	-1%	83.4	82.5	1%
Fluoride (F)	mg/L	<5	<5		<1	<1		<1	<1		0.069	0.069	0%
Nitrate (as N)	mg/L	<5	<5		<1	<1		<1	<1		0.053	<0.050	
Nitrite (as N)	mg/L	<5	<5		<1	<1		<1	<1		<0.050	<0.050	
Sulfate (SO4)	mg/L	995	991	0%	1750	1790	-2%	0960	0964	0%	4.05	3.70	9%
Additional Anions and Nutrients													
Bicarbonate (HCO3)	mg/L	80.9	79.0	2%	100	99.6	0%	010	010	5%	43.4	43.0	1%
Carbonate (CO3)	mg/L	<5	<5		<5	<5		<5	<5		<5.0	<5.0	
Hydroxide (OH)	mg/L	<5	<5		<5	<5		<5	<5		<5.0	<5.0	
Ion Balance	%	101	103	-2%	96.6	109	-12%	95.5	89.8	6%	93.7	99.3	-6%
Nitrate and Nitrite as N	mg/L	<7.1	<7.1		<1.4	<1.4		<1.4	<1.4		<0.071	<0.071	
TDS (Calculated)	mg/L	16800	16900	-1%	30300	32600	-7%	31000	30500	2%	170	171	-1%
Total Metals													
Aluminum (Al)-Total	mg/L	<0.2	<0.2		<2	<2		<2	<2		0.014	0.021	-40%
Antimony (Sb)-Total	mg/L	<0.008	<0.008		<0.08	<0.08		<0.08	<0.08		<0.00040	<0.00040	
Arsenic (As)-Total	mg/L	<0.08	<0.08		0.083	0.090	-8%	0.296	0.101	98%	0.00076	0.00067	13%
Barium (Ba)-Total	mg/L	0.187	0.185	1%	0.102	0.113	-10%	0.054	0.059	-9%	0.0050	0.0057	-13%
Beryllium (Be)-Total	mg/L	<0.02	<0.02		<0.2	<0.2		<0.2	<0.2		<0.0010	<0.0010	
Boron (B)-Total	mg/L	1.34	1.37	-2%	2.32	2.31	0%	2.56	2.50	2%	<0.050	<0.050	
Cadmium (Cd)-Total	mg/L	<0.001	<0.001		<0.01	<0.01		<0.01	<0.01		<0.000050	<0.000050	
Calcium (Ca)-Total	mg/L	851	867	-2%	1590	1580	1%	4430	4380	1%	10.5	10.8	-3%
Chromium (Cr)-Total	mg/L	<0.016	0.024		0.61	0.66	-8%	0.62	0.74	-18%	<0.0050	<0.0050	
Cobalt (Co)-Total	mg/L	<0.004	<0.004		<0.04	<0.04		<0.04	<0.04		<0.0020	<0.0020	
Copper (Cu)-Total	mg/L	<0.02	<0.02		<0.2	<0.2		<0.2	<0.2		0.0040	0.0054	-30%
Iron (Fe)-Total	mg/L	3.53	3.65	-3%	7.15	7.14	0%	0.15	0.16	-6%	0.118	0.149	-23%
Lead (Pb)-Total	mg/L	<0.002	<0.002		<0.02	<0.02		<0.02	<0.02		0.00063	0.00018	111%
Lithium (Li)-Total	mg/L	0.13	0.14	-7%	<1.2	<1.2		<1.2	<1.2		<0.010	<0.010	
Magnesium (Mg)-Total	mg/L	726	736	-1%	1290	1290	0%	0051	0053	-4%	8.59	8.73	-2%
Manganese (Mn)-Total	mg/L	1.04	1.06	-2%	1.73	1.76	-2%	0.62	0.64	-4%	0.0066	0.0072	-9%
Mercury (Hg)-Total	mg/L	<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.00010	<0.00010	
Molybdenum (Mo)-Total	mg/L	0.0244	0.0237	3%	<0.02	<0.02		<0.02	<0.02		<0.0050	<0.0050	
Nickel (Ni)-Total	mg/L	0.0138	0.0144	-4%	<0.04	<0.04		0.068	0.074	-8%	<0.0020	<0.0020	
Potassium (K)-Total	mg/L	114	116	-2%	294	292	1%	044	045	-3%	3.13	3.14	0%
Selenium (Se)-Total	mg/L	<0.4	<0.4		<0.4	<0.4		<0.4	<0.4		0.00058	0.00057	2%
Silver (Ag)-Total	mg/L	<0.002	<0.002		<0.02	<0.02		<0.02	<0.02		<0.00050	<0.00050	
Sodium (Na)-Total	mg/L	4860	4930	-1%	9260	9580	-3%	7420	7870	-6%	43.0	43.9	-2%
Thallium (Tl)-Total	mg/L	<0.002	<0.002		<0.02	<0.02		<0.02	<0.02		<0.00010	<0.00010	
Tin (Sn)-Total	mg/L	<0.05	<0.05		<0.08	<0.08		<0.08	<0.08		<0.050	<0.050	
Titanium (Ti)-Total	mg/L	<0.012	<0.012		<0.12	<0.12		<0.12	<0.12		<0.0010	<0.0010	
Uranium (U)-Total	mg/L	<0.002	<0.002		<0.02	<0.02		<0.02	<0.02		<0.00010	<0.00010	
Vanadium (V)-Total	mg/L	<0.1	<0.1		0.20	0.22	-10%	0.21	0.23	-9%	<0.0010	<0.0010	
Zinc (Zn)-Total	mg/L	<0.08	<0.08		<0.8	<0.8		<0.8	<0.8		0.0131	0.0252	-63%
Dissolved Metals													
Aluminum (Al)-Dissolved	mg/L	0.13	<0.1		<1	<1		<1	<1		<0.010	<0.010	
Antimony (Sb)-Dissolved	mg/L	<0.008	<0.008		<0.08	<0.08		<0.08	<0.08		<0.00040	<0.00040	
Arsenic (As)-Dissolved	mg/L	<0.08	<0.08		0.091	0.097	-6%	<0.08	0.090		0.00066	0.00068	-3%
Barium (Ba)-Dissolved	mg/L	0.186	0.188	-1%	0.100	0.097	3%	0.051	0.052	-2%	0.0040	0.0042	-5%
Beryllium (Be)-Dissolved	mg/L	<0.01	<0.01		<0.1	<0.1		<0.1	<0.1		<0.0010	<0.0010	
Boron (B)-Dissolved	mg/L	1.31	1.38	-5%	2.23	2.32	-4%	2.87	2.74	5%	<0.050	<0.050	
Cadmium (Cd)-Dissolved	mg/L	<0.001	<0.001		<0.01	<0.01		<0.01	<0.01		<0.000050	<0.000050	
Calcium (Ca)-Dissolved	mg/L	822	837	-2%	1420	1560	-9%	4520	4360	4%	10.1	10.3	-2%
Chromium (Cr)-Dissolved	mg/L	0.0178	0.0264	-39%	0.747	0.874	-16%	0.351	0.532	-41%	<0.0050	<0.0050	
Cobalt (Co)-Dissolved	mg/L	<0.002	<0.002		<0.02	<0.02		<0.02	<0.02		<0.0020	<0.0020	
Copper (Cu)-Dissolved	mg/L	<0.012	<0.012		0.19	<0.12		<0.12	<0.12		0.0028	0.0028	0%
Iron (Fe)-Dissolved	mg/L	1.88	1.63	14%	5.77	6.25	-8%	<0.15	<0.15		0.072	0.075	-4%
Lead (Pb)-Dissolved	mg/L	<0.002	<0.002		<0.02	<0.02		<0.02	<0.02		0.00015	0.00012	22%
Lithium (Li)-Dissolved	mg/L	0.128	0.136	-6%	<0.6	<0.6		<0.6	<0.6		0.0034	<0.0030	
Magnesium (Mg)-Dissolved	mg/L	707	721	-2%	1170	1300	-11%	0046	0045	2%	7.90	8.28	-5%
Manganese (Mn)-Dissolved	mg/L	1.01	1.01	0%	1.56	1.72	-10%	0.544	0.53	2%	0.0054	0.0056	-4%
Mercury (Hg)-Dissolved	mg/L	<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.00010	<0.00010	
Molybdenum (Mo)-Dissolved	mg/L	0.0240	0.0239	0%	<0.02	<0.02		<0.02	<0.02		<0.0050	<0.0050	
Nickel (Ni)-Dissolved	mg/L	0.0146	0.0159	-9%	<0.02	<0.02		0.061	0.066	-8%	<0.0020	<0.0020	
Potassium (K)-Dissolved	mg/L	129	131	-2%	206	294	-35%	039	037	4%	2.47	2.67	-8%
Selenium (Se)-Dissolved	mg/L	<0.4	<0.4		<0.4	<0.4		<0.4	<0.4		0.00044	0.00060	-31%
Silver (Ag)-Dissolved	mg/L	<0.002	<0.002		<0.02	<0.02		<0.02	<0.02		<0.00010	<0.00010	
Sodium (Na)-Dissolved	mg/L	4470	4540	-2%	7970	9450	-17%	6730	6260	7%	40.0	42.0	-5%
Thallium (Tl)-Dissolved	mg/L	<0.001	<0.001		<0.01	0.010		<0.01	<0.01		<0.00010	<0.00010	
Tin (Sn)-Dissolved	mg/L	<0.05	<0.05		<0.05	<0.05		<0.05	<0.05		<0.050	<0.050	
Titanium (Ti)-Dissolved	mg/L	0.0135	0.0081	50%	<0.06	<0.06		<0.06	<0.06		<0.0010	<0.0010	
Uranium (U)-Dissolved	mg/L	<0.002	<0.002		<0.02	<0.02		<0.02	<0.02		<0.00010	<0.00010	
Vanadium (V)-Dissolved	mg/L	0.077	0.099	-25%	0.259	0.292	-12%	0.122	0.174	-35%	<0.0010	<0.0010	
Zinc (Zn)-Dissolved	mg/L	0.026	0.022	17%	0.22	<0.2		<0.2	<0.2		0.0032	0.0038	-17%
Isotope Chemistry											?	?	
Delta 2H x 1000		-110.12	-109.57	1%	-77.72	-77.67	0%	-138.13	-138.57	0%	-19.16	-19.25	0%
Delta 18O x 1000		-14	-13.96	0%	-10	-10.18	-2%	-19.06	-19.07	0%			

RPDs greater than 20% are highlighted, to show parameters above the recommended duplicate limits.

Table N3: Ion Balance Assessment

Sample label	Alkalinity, Total (as CaCO3)	Chloride (Cl)	Sulfate (SO4)	Calcium (Ca)-Dissolved	Magnesium (Mg)-Dissolved	Potassium (K)-Dissolved	Sodium (Na)-Dissolved	Cation Balance	Anion Balance	Ion Balance
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	% diff
Doris Lake Winter	34.4	76.6	3.44	9.3	7.37	2.31	38	2.78	2.92	**2.38**
10WBW001 Drill Tank	35.6	83.4	4.05	10.1	7.9	2.47	40	2.96	3.15	**3.10**
10WBW001 Casing Flow	52.9	1960	195	111	140	34.2	1110	66.19	60.33	**4.63**
10WBW001 Drill Tank Dup	35.2	82.5	3.7	10.3	8.28	2.67	42	3.09	3.10	**0.25**
equipment blank DI										
10WBW001-Zone 1-Port Initial-S01b		18200	1020	4390	172	54	6840	531.98	533.91	**0.18**
10WBW001-Zone 6-Port Initial-S02b	87.3	20100	2090	1640	1430	251	9080	600.69	611.46	**0.89**
10WBW001-Zone 10-Port Initial-S03b	66.3	9650	995	822	707	129	4470	296.83	293.87	**0.50**
10WBW001-Zone 10-Port InitialD-S04b	64.8	9610	991	837	721	131	4540	301.83	292.63	**1.55**
Doris Lake Summer	31.8	60.3	2.42	9.7	5.96	2.11	29.6	2.32	2.38	**1.48**
10WBW001-Zone 10-Airlift Purge-S12	90.6	15200	1490	1230	990	225	7130	458.58	461.00	**0.26**
10WBW001-Zone 10-Airlift Purge-S14	83.3	17100	1700	1340	1070	245	7840	502.03	518.75	**1.64**
10WBW001-Zone 10-Airlift Purge-S15	82.3	17700	1750	1420	1170	206	7970	518.91	536.67	**1.68**
10WBW001-Zone 10-Airlift Final-S16D	81.7	18200	1790	1560	1300	294	9450	603.18	551.58	**4.47**
10WBW001-Zone 1-Port Purge-S17		19100	1010	4480	80.3	42.5	6810	527.33	559.06	**2.92**
10WBW001-Zone 1-Airlift Purge - S20		19000	997	4260	65.6	39.1	6480	500.71	555.97	**5.23**
RO Water	<5	0.65	<0.5	0.75	0.12	<0.5	1.4			
10WBW001-Zone 1-Airlift Final-S25		18700	960	4520	46.1	38.5	6730	522.93	546.75	**2.23**
10WBW001-Zone 1-Airlift Final-S26D		18800	964	4360	45	37	6260	494.39	549.65	**5.29**
10WBW001-Zone 6-Airlift Purge -S28	63.4	15900	1690	1150	1070	170	6450	430.20	484.34	**5.92**
10WBW001-Zone 6-Airlift Purge-S31	67.7	16500	1760	1330	1270	186	7910	519.52	502.79	**1.64**
10WBW001-Zone 6-Airlift Final-S33	70.8	17100	1820	1390	1310	194	8160	536.88	521.00	**1.50**
Westbay Sampler Bottles Equipment blank	<5	7.03	<0.5	<0.5	0.24	<0.5	1.4			
10WBW001-Zone 1-Port Final-S35		19000	981	4960	69.5	39	7290	571.18	555.64	**1.38**
10WBW001-Zone 6-Port Final-S36	44.2	9130	940	749	702	117	4130	277.69	277.64	**0.01**
10WBW001-Zone 10-Port Final-S37	49.7	11500	1160	1010	849	160	5400	359.12	349.09	**1.42**
10WBW001-Zone 1-Port after 2mths-S100	<2	19000	980	4920	64.1	39	7200			
10WBW001-Zone 6-Port after 2mths-S101	44.2	13400	1390	1100	964	160	6010	399.60	407.29	**0.95**
10WBW001-Zone 10-Port after 2mths-S102	77.3	13100	1230	1110	869	173	5780	382.61	396.17	**1.74**
10WBW001-Zone 6-Airlift 160L sample-S103	72.4	19000	2020	1550	1490	233	9130	602.84	578.72	**2.04**
Gas Can Rinsate blank	<2	<0.5	<0.5	0.224	<0.1	<2	<2			
10WBW001-Zone 10-Port after bulk-S105	106	16500	1580	1560	1250	249	8700	565.31	499.80	**6.15**
10WBW001-Zone 1-Port after bulk-S106	<2	18400	935	4730	68.1	40	6910			
10WBW001-Zone 6-Airlift 80L sample-S107	76.5	19100	2000	1520	1450	229	8980	591.43	581.20	**0.87**
10WBW001-Zone 6-Port after bulk-S108	43.7	14200	1500	1160	1080	172	6810	447.22	432.10	**1.72**
10WBW002-Zone 1-Port Initial-S01	56	114000	<100	72100	113	39	655			
10WBW002-Zone 1-Port Purge-S02	59.5	123000	<100	79800	124	52	300			
10WBW002-Zone 1-Port Purge-S109a				74700	110	<200	1680			
10WBW002-Zone 1-Port Purge-S109b										
Glycol & water mix from inside Westbay 10WBW001	42.8	46800	<500	29400	65	<200	<200			
10WBW002-Zone 1-Port Purge-S121	59	133000	<2500	73100	113	<200	490			
Glycol & water mix prepared at camp	46.1	53	<50	8.55	5.9	31	30			
Spyder Lake	7.9	7.58	1.63	3	1.42	0.72	3.8	0.45	0.41	**5.23**
10WBW004 -Drill Tank Beginning	41.9	16400	50	8320	84.7	83	439	443.35	463.85	**2.26**
10WBW004 - Drill Tank End	13	7530	5.28	4330	18.7	12.6	62.7	220.65	212.48	**1.89**
10WBW004 - Zone 6-Port Initial-S123	35.8	12100	244	5050	311	47	1820	357.91	346.64	**1.60**
10WBW004 - Zone 6-Port Purge-S124	35.5	12400	264	4630	312	47	1820	337.04	355.50	**2.67**
10WBW004 - Zone 6-Port Purge-S125	35.3	12400	260	4580	309	47	1790	332.99	355.41	**3.26**
10WBW004 - Zone 6-Port Purge-S126	40	13700	336	4180	404	48	2410	347.83	393.71	**6.19**
10WBW004 - Zone 6-Port Purge-S128	48.7	12600	322	4230	365	48	2200	337.99	362.61	**3.51**
10WBW004 - Zone 6-Port Purge-S129	50.5	13400	349	4350	425	50	2510	362.44	385.74	**3.11**
10WBW004 - Zone 6-Port Purge-S130	53	13400	347	4620	432	53	2600	380.48	385.75	**0.69**
10WBW004 - Zone 6-Port Purge Final Dec-S131	53.5	12800	330	4080	387	49	2330	337.99	368.50	**4.32**

Table N4: Evaluation of Blank Samples

Sample label	Units	10WBW001-Zone 6-Port Final-S36	equipment blank DI	% of ground water sample	RO Water	% of ground water sample	Westbay Sampler Bottles Equipment blank	% of ground water sample	Gas Can Rinsate blank	% of ground water sample	10WBW004 Rinsate blank	% of ground water sample
Field Sample ID		**10WBW001-36**	**10WBW001-05**		**10WBW001-22**		**10WBW001-34**		**10WBW001-104**		**10WBW004-127**	
Sample Comments		Groundwater sample for comparison with blank samples	Equipment blank DI water		RO blank		Rinse blank of Westbay sampler probe bottles		DI water rinsate of gas cans used in bulk samples.		Rinsate blank of Westbay sample probe	
ALS DATA												
ALS File No.		L917645	L880950		L915201		L915201		L948685		L960194	
Date Lab Received		09-Aug-10 09:10	27-Apr-10 15:23		01-Aug-10 11:24		01-Aug-10 11:24		29-Oct-10 10:28		03-Dec-10 17:00	
ALS Report Date		20-Aug-10	06-May-10		13-Aug-10		13-Aug-10		22-Nov-10		22-Dec-10	
RESULTS OF ANALYSIS												
ALS SRK Sample ID		10WBW001-36	10WBW001-05		10WBW001-22		10WBW001-34		10WBW001-104		10WBW004-127	
ALS Date Sampled		05-AUG-10	25-APR-10		26-JUL-10		28-JUL-10		25-OCT-10		26-NOV-10	
ALS Time Sampled		09:00	00:00		09:10		11:00		00:00		18:00	
ALS Sample ID		L917645-2	L880950-5		L915201-8		L915201-22		L948685-1		L960194-8	
Matrix		Seawater	Water		Water		Water		Water		Water	
Physical Tests												
Conductivity (EC)	uS/cm	24600			5.97	0.0%	24.7	0.1%	<2		28.3	0.1%
Density									1.00		1.01	
Hardness (as CaCO3)	mg/L	4760			2.4	0.1%	<1		0.56	0.0%		
pH	pH	7.83			6.38		6.11		7.29		6.34	
Salinity (EC)	g/L											
Total Dissolved Solids	mg/L	19600			10.0	0.1%	18.0	0.1%	<10		12	0.1%
Anions and Nutrients												
Alkalinity, Bicarbonate (as CaCO3)	mg/L								<2		<1.0	
Alkalinity, Carbonate (as CaCO3)	mg/L								<2		<1.0	
Alkalinity, Hydroxide (as CaCO3)	mg/L								<2		<1.0	
Alkalinity, Total (as CaCO3)	mg/L	44.2			<5		<5		<2		<1.0	
Ammonia as N	mg/L								<0.005			
Bromide (Br)	mg/L	21.2							<0.05		<0.050	
Chloride (Cl)	mg/L	9130			0.65	0.0%	7.03	0.1%	<0.5		6.33	0.1%
Fluoride (F)	mg/L	<0.75			<0.05		<0.05		<0.02		<0.020	
Nitrate (as N)	mg/L	<0.5			<0.05		<0.05		<0.005		<0.0050	
Nitrite (as N)	mg/L	<0.1			<0.05		<0.05		<0.001		<0.0010	
Ortho Phosphate as P	mg/L											
Total Phosphate as P	mg/L								0.0052			
Silicate (as SIO2)	mg/L								<1			
Sulfate (SO4)	mg/L	940			<0.5		<0.5		<0.5		<0.50	
Additional Anions and Nutrients												
Bicarbonate (HCO3)	mg/L				<5		<5					
Carbonate (CO3)	mg/L				<5		<5					
Hydroxide (OH)	mg/L				<5		<5					
Ion Balance	%				Low EC		Low EC					
Nitrate and Nitrite as N	mg/L				<0.071		<0.071					
TDS (Calculated)	mg/L				2.9		8.7					
Total Metals												
Aluminum (Al)-Total	mg/L	0.0281	<0.010		<0.01		<0.01		0.0086	30.6%		
Antimony (Sb)-Total	mg/L	0.00745	<0.00040		<0.0004		<0.0004		<0.00001			
Arsenic (As)-Total	mg/L	0.003	<0.00040		<0.0004		<0.0004		<0.00005			
Barium (Ba)-Total	mg/L	0.130	<0.0030		<0.003		<0.003		0.00017	0.1%		
Beryllium (Be)-Total	mg/L	<0.0005	<0.0010		<0.001		<0.001		<0.000005			
Bismuth (Bi)-Total	mg/L	<0.0005							<0.00005			
Boron (B)-Total	mg/L	1.04	<0.050		<0.05		<0.05		0.0097	0.9%		
Cadmium (Cd)-Total	mg/L	<0.00012	<0.000050		<0.00005		0.000190		<0.000005			
Calcium (Ca)-Total	mg/L	0805	<0.50		<0.5		<0.5		<0.05			
Cesium (Cs)-Total	mg/L	0000							<0.000005			
Chromium (Cr)-Total	mg/L	0.00	<0.0050		<0.005		<0.005		<0.0005			
Cobalt (Co)-Total	mg/L	<0.0005	<0.0020		<0.002		<0.002		<0.00005			
Copper (Cu)-Total	mg/L	<0.001	<0.0010		0.0807		<0.001		0.0161			
Gallium (Ga)-Total	mg/L	<0.0005							<0.00005			
Iron (Fe)-Total	mg/L	1.60	<0.010		<0.01		0.037	2.3%	<0.03			
Lead (Pb)-Total	mg/L	<0.001	<0.00010		0.00244		0.00067		0.00114			
Lithium (Li)-Total	mg/L	0.093	<0.010		<0.01		<0.01		<0.0002			
Magnesium (Mg)-Total	mg/L	0739	<0.10		<0.1		<0.1		<0.1			
Manganese (Mn)-Total	mg/L	0.56	<0.0020		<0.002		0.0023	0.4%	<0.0002			
Mercury (Hg)-Total	mg/L		<0.00010		<0.0001		<0.0001		<0.00005			
Molybdenum (Mo)-Total	mg/L	0.0403	<0.0050		<0.005		<0.005		<0.00005			
Nickel (Ni)-Total	mg/L	0.00159	<0.0020		<0.002		<0.002		<0.0002			
Phosphorus (P)-Total	mg/L	<1							<0.3			
Potassium (K)-Total	mg/L	125	<0.10		<0.1		<0.1		<2			
Rhenium (Re)-Total	mg/L	<0.0005							<0.000005			
Rubidium (Rb)-Total	mg/L	000							<0.00002			
Selenium (Se)-Total	mg/L	<0.002	<0.00040		<0.0004		<0.0004		<0.0002			
Silicon (Si)-Total	mg/L	2.88							<0.05			
Silver (Ag)-Total	mg/L	<0.0002	<0.00050		<0.0001		<0.0001		0.0000058			
Sodium (Na)-Total	mg/L	4460	<1.0		<1		<1		<2			
Strontium (Sr)-Total	mg/L	0010							<0.005			
Tellurium (Te)-Total	mg/L	<0.0005							<0.00001			
Thallium (Tl)-Total	mg/L	<0.0005	<0.00010		<0.0001		<0.0001		<0.000002			
Thorium (Th)-Total	mg/L	<0.0005							<0.000005			
Tin (Sn)-Total	mg/L	<0.001	<0.050		<0.05		<0.05		<0.0002			
Titanium (Ti)-Total	mg/L	<0.005	<0.0010		<0.001		<0.001		<0.0002			
Tungsten (W)-Total	mg/L	0.0334							<0.00001			
Uranium (U)-Total	mg/L	<0.0005	<0.00010		<0.0001		<0.0001		0.0000020			
Vanadium (V)-Total	mg/L	<0.0005	<0.0010		<0.001		<0.001		<0.00005			
Yttrium (Y)-Total	mg/L	<0.0005							<0.000005			
Zinc (Zn)-Total	mg/L	0.195	<0.0040		0.0408	20.9%	0.0300	15.4%	0.0056	2.9%		
Zirconium (Zr)-Total	mg/L	<0.0005							<0.00005			

Sample label	Units	10WBW001-Zone 6-Port Final-S36	equipment blank DI	% of ground water sample	RO Water	% of ground water sample	Westbay Sampler Bottles Equipment blank	% of ground water sample	Gas Can Rinsate blank	% of ground water sample	10WBW004 Rinsate blank	% of ground water sample
Field Sample ID		**10WBW001-36**	**10WBW001-05**		**10WBW001-22**		**10WBW001-34**		**10WBW001-104**		**10WBW004-127**	
Sample Comments		Groundwater sample for comparison with blank samples	Equipment blank DI water		RO blank		Rinse blank of Westbay sampler probe bottles		DI water rinsate of gas cans used in bulk samples.		Rinsate blank of Westbay sample probe	
Dissolved Metals												
Aluminum (Al)-Dissolved	mg/L	<0.005	<0.010		<0.01		<0.01		<0.003			
Antimony (Sb)-Dissolved	mg/L	0.00703	<0.00040		<0.0004		<0.0004		0.000021	0.3%		
Arsenic (As)-Dissolved	mg/L	<0.002	<0.00040		<0.0004		<0.0004		<0.00005			
Barium (Ba)-Dissolved	mg/L	0.120	<0.0030		<0.003		<0.003		0.00044	0.4%		
Beryllium (Be)-Dissolved	mg/L	<0.0005	<0.0010		<0.001		<0.001		<0.000005			
Bismuth (Bi)-Dissolved	mg/L	<0.0005							<0.00005			
Boron (B)-Dissolved	mg/L	0.94	<0.050		<0.05		<0.05		<0.005			
Cadmium (Cd)-Dissolved	mg/L	<0.00012	<0.000050		<0.00005		<0.00005		0.0000102			
Calcium (Ca)-Dissolved	mg/L	749			0.75	0.1%	<0.5		0.224	0.0%		
Cesium (Cs)-Dissolved	mg/L	0.00069							<0.000005			
Chromium (Cr)-Dissolved	mg/L	<0.001	<0.0050		<0.005		<0.005		<0.0005			
Cobalt (Co)-Dissolved	mg/L	<0.0005	<0.0020		<0.002		<0.002		<0.00005			
Copper (Cu)-Dissolved	mg/L	<0.001	<0.0010		0.0031		<0.001		0.0123			
Gallium (Ga)-Dissolved	mg/L	<0.0005							<0.00005			
Iron (Fe)-Dissolved	mg/L	0.06			<0.03		<0.03		<0.03			
Lead (Pb)-Dissolved	mg/L	<0.001	<0.00010		<0.0001		<0.0001		0.00114			
Lithium (Li)-Dissolved	mg/L	0.087	<0.0030		<0.003		<0.003		<0.0002			
Magnesium (Mg)-Dissolved	mg/L	702			0.12	0.0%	0.24	0.0%	<0.1			
Manganese (Mn)-Dissolved	mg/L	0.53			<0.005		<0.005		<0.0002			
Mercury (Hg)-Dissolved	mg/L	<	<0.00010		<0.0001		<0.0001		<0.00005			
Molybdenum (Mo)-Dissolved	mg/L	0.0379	<0.0050		<0.005		<0.005		<0.00005			
Nickel (Ni)-Dissolved	mg/L	0.00076	<0.0020		<0.002		<0.002		<0.0002			
Phosphorus (P)-Dissolved	mg/L	<1							<0.3			
Potassium (K)-Dissolved	mg/L	117			<0.5		<0.5		<2			
Rhenium (Re)-Dissolved	mg/L	<0.0005							<0.000005			
Rubidium (Rb)-Dissolved	mg/L	000							<0.00002			
Selenium (Se)-Dissolved	mg/L	<0.002	<0.00040		<0.0004		<0.0004		<0.0002			
Silicon (Si)-Dissolved	mg/L	2.48							<0.05			
Silver (Ag)-Dissolved	mg/L	<0.0002	<0.00010		<0.0001		<0.0001		<0.000005			
Sodium (Na)-Dissolved	mg/L	4130			1.4	0.0%	1.4	0.0%	<2			
Strontium (Sr)-Dissolved	mg/L	0009							<0.005			
Tellurium (Te)-Dissolved	mg/L	<0.0005							<0.00001			
Thallium (Tl)-Dissolved	mg/L	<0.0005	<0.00010		<0.0001		<0.0001		<0.000002			
Thorium (Th)-Dissolved	mg/L	<0.0005							<0.000005			
Tin (Sn)-Dissolved	mg/L	<0.001	<0.050		<0.05		<0.05		<0.0002			
Titanium (Ti)-Dissolved	mg/L	<0.005	<0.0010		<0.001		<0.001		<0.0002			
Tungsten (W)-Dissolved	mg/L	0.0316							<0.00001			
Uranium (U)-Dissolved	mg/L	<0.0005	<0.00010		<0.0001		<0.0001		<0.000002			
Vanadium (V)-Dissolved	mg/L	<0.0005	<0.0010		<0.001		<0.001		<0.00005			
Yttrium (Y)-Dissolved	mg/L	<0.0005							<0.000005			
Zinc (Zn)-Dissolved	mg/L	0.02	<0.0020		0.0030	16.1%	0.0031	16.7%	0.0109	58.6%		
Zirconium (Zr)-Dissolved	mg/L	<0.0005							<0.00005			
Delta 2H x 1000		-117.72	-144.31		-149.55							
Delta 18O x 1000		-15.00	-15.60		-18.97							
Parameters with detectable concentrations in blanks are higlighted.												

Table N5: Comparison of Airlift and Port Samples

		Airlift vs Port		RPD	Airlift vs Port		RPD	Airlift vs Port		RPD	Airlift vs Port		RPD
Field Sample ID / Unique ID	**Units**	**10WBW001-33**	**10WBW001-36**		**10WBW001-26**	**10WBW001-35**		**10WBW001-16**	**10WBW001-37**		**10WBW001-103**	**10WBW001-108**	
Sample From		**Westbay airlift**	**Westbay Port**		**Westbay airlift**	**Westbay Port**		**Westbay airlift**	**Westbay Port**		**Westbay airlift**	**Westbay Port**	
Sample label for graph		10WBW001-Zone 6-Airlift Final-S33	10WBW001-Zone 6-Port Final-S36		10WBW001-Zone 1-Airlift Final-S26D	10WBW001-Zone 1-Port Final-S35		10WBW001-Zone 10-Airlift Final-S16D	10WBW001-Zone 10-Port Final-S37		10WBW001-Zone 6-Airlift 160L sample-S103	10WBW001-Zone 6-Port after bulk-S108	
Sample Zone		6	6		1	1		10	10		6	6	
Location of port in zone		Bottom	Top		Middle	Top		Bottom	Top		Bottom	Top	
Zone port drillhole depth		274.00	246.0		554.00	548.0		107.50	63.5		274.00	246.0	
Total Litres purged from zone before sample was taken		6433	8096		3065	3186		3008	3008		10639	13592	
Zone volumes purged before sample was taken		36.7	46.6		26.2	27.4		11.0	11.0		61.7	79.3	
ALS DATA													
ALS Date Sampled		27-JUL-10	05-AUG-10		25-JUL-10	04-AUG-10		21-JUL-10	05-AUG-10		25-OCT-10	01-NOV-10	
ALS Time Sampled		15:21	09:00		12:37	13:42		17:28	11:40		00:00	15:00	
Matrix		Water	Seawater		Water	Seawater		Water	Seawater		Water	BOTH	
Physical Tests													
Conductivity (EC)	uS/cm	44400	24600	57%	47600	46600	2%	46600	30300	42%	48500	37000	27%
Density												1.03	
Hardness (as CaCO3)	mg/L	8870	4760	60%	11100	12700	-13%	9250	6030	42%	10000	7340	31%
pH	pH	7.43	7.83	-5%	7.72	7.43	4%	7.39	7.47	-1%	7.04	7.59	-8%
Salinity (EC)	g/L										32.4	23.5	32%
Total Dissolved Solids	mg/L	30400	19600	43%	32400	47800	-38%	32700	23100	34%	35400	25500	33%
Anions and Nutrients													
Alkalinity, Total (as CaCO3)	mg/L	70.8	44.2	46%				81.7	49.7	49%	72.4	43.7	49%
Ammonia as N	mg/L										3.14	2.32	30%
Bromide (Br)	mg/L		21.2			100			27.6		49.1	41.3	17%
Chloride (Cl)	mg/L	17100	09130	61%	18800	19000	-1%	18200	11500	45%	19000	14200	29%
Fluoride (F)	mg/L	<1	<0.75		<1	<0.75		<1	<0.75		0.091	<0.75	
Nitrate (as N)	mg/L	<1	<0.5		<1	<0.5		<1	<0.5		<0.5	<0.5	
Nitrite (as N)	mg/L	<1	<0.1		<1	<0.1		<1	<0.1		<0.1	<0.1	
Total Phosphate as P	mg/L										0.0262	0.0162	47%
Silicate (as SIO2)	mg/L										6.1	5.8	5%
Sulfate (SO4)	mg/L	1820	0940	64%	0964	0981	-2%	1790	1160	43%	2020	1500	30%
Total Metals													
Aluminum (Al)-Total	mg/L	<2	0.0281		<2	0.0992		<2	0.0146		0.0318	0.0059	137%
Antimony (Sb)-Total	mg/L	<0.08	0.00745		<0.08	<0.0005		<0.08	0.00349		0.00127	0.00461	-114%
Arsenic (As)-Total	mg/L	0.121	0.003	192%	0.101	<0.002		0.090	<0.002		0.007	<0.002	
Barium (Ba)-Total	mg/L	0.107	0.130	-19%	0.059	0.051	14%	0.113	0.179	-45%	0.117	0.169	-36%
Beryllium (Be)-Total	mg/L	<0.2	<0.0005		<0.2	<0.0005		<0.2	<0.0005		<0.0005	<0.0005	
Bismuth (Bi)-Total	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Boron (B)-Total	mg/L	1.91	1.04	59%	2.50	2.93	-16%	2.31	1.51	42%	2.65	1.50	55%
Cadmium (Cd)-Total	mg/L	<0.01	<0.00012		<0.01	<0.00012		<0.01	<0.00012		<0.00005	<0.00005	
Calcium (Ca)-Total	mg/L	1280	805	46%	4380	5070	-15%	1580	1020	43%	1600	1170	31%
Cesium (Cs)-Total	mg/L		0.00072			0.00105			0.00097		0.00155	0.00095	48%
Chromium (Cr)-Total	mg/L	0.86	0.00	199%	0.74	0.01	197%	0.66	0.0030	198%	<0.0005	<0.0005	
Cobalt (Co)-Total	mg/L	<0.04	<0.0005		<0.04	<0.0005		<0.04	<0.0005		0.000381	0.000103	115%
Copper (Cu)-Total	mg/L	<0.2	<0.001		<0.2	0.0018		<0.2	<0.001		<0.0005	0.00061	
Gallium (Ga)-Total	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Iron (Fe)-Total	mg/L	3.54	1.60	75%	0.16	0.46	-96%	7.14	3.95	58%	4.53	2.28	66%
Lead (Pb)-Total	mg/L	<0.02	<0.001		<0.02	0.0013		<0.02	<0.001		<0.0003	<0.0003	
Lithium (Li)-Total	mg/L	<1.2	0.093		<1.2	0.37		<1.2	0.128		0.228	0.131	54%
Magnesium (Mg)-Total	mg/L	1210	739	48%	53	71	-29%	1290	867	39%	1510	1080	33%
Manganese (Mn)-Total	mg/L	1.81	0.56	106%	0.64	0.72	-11%	1.76	1.09	47%	2.08	0.892	80%
Mercury (Hg)-Total	mg/L	<0.0001			<0.0001			<0.0001			<0.00005		
Molybdenum (Mo)-Total	mg/L	<0.02	0.0403		<0.02	0.0136		<0.02	0.0225		0.0140	0.0361	-88%
Nickel (Ni)-Total	mg/L	<0.04	0.00159		0.074	0.00437	178%	<0.04	0.00237		0.00095	0.00120	-23%
Phosphorus (P)-Total	mg/L		<1			<1			<1		<1	<1	
Potassium (K)-Total	mg/L	203	125	48%	045	040	12%	292	166	55%	240	172	33%
Rhenium (Re)-Total	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Rubidium (Rb)-Total	mg/L		0.0765			0.0500			0.0816		0.1420	0.102	33%
Selenium (Se)-Total	mg/L	<0.4	<0.002		<0.4	<0.002		<0.4	<0.002		<0.002	<0.002	
Silicon (Si)-Total	mg/L		2.88			2.61			2.12		3.68	3.82	-4%
Silver (Ag)-Total	mg/L	<0.02	<0.0002		<0.02	<0.0002		<0.02	<0.0002		<0.0001	0.00018	
Sodium (Na)-Total	mg/L	7450	4460	50%	7870	7470	5%	9580	5590	53%	9350	6790	32%
Strontium (Sr)-Total	mg/L		10			60			11.7		21.2	14.6	37%
Tellurium (Te)-Total	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Thallium (Tl)-Total	mg/L	<0.02	<0.0005		<0.02	<0.0005		<0.02	<0.0005		<0.00005	<0.00005	
Thorium (Th)-Total	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Tin (Sn)-Total	mg/L	<0.08	<0.001		<0.08	<0.001		<0.08	<0.001		<0.001	<0.001	
Titanium (Ti)-Total	mg/L	<0.12	<0.005		<0.12	0.0082		<0.12	<0.005		<0.005	<0.005	
Tungsten (W)-Total	mg/L		0.0334			<0.001			0.0067		0.0056	0.0227	-121%
Uranium (U)-Total	mg/L	<0.02	<0.0005		<0.02	<0.0005		<0.02	<0.0005		0.00023	0.000059	118%
Vanadium (V)-Total	mg/L	0.27	<0.0005		0.23	0.001	199%	0.22	<0.0005		0.00054	<0.0005	
Yttrium (Y)-Total	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Zinc (Zn)-Total	mg/L	<0.8	0.195		<0.8	0.503		<0.8	0.261		0.046	0.115	-86%
Zirconium (Zr)-Total	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Dissolved Metals													
Aluminum (Al)-Dissolved	mg/L	<1	<0.005		<1	<0.005		<1	<0.005		<0.005	<0.005	
Antimony (Sb)-Dissolved	mg/L	<0.08	0.00703		<0.08	<0.0005		<0.08	0.00306		0.00121	0.00393	-106%
Arsenic (As)-Dissolved	mg/L	0.102	<0.002		0.090	<0.002		0.097	<0.002		0.0066	<0.002	
Barium (Ba)-Dissolved	mg/L	0.120	0.120	0%	0.052	0.052	0%	0.097	0.169	-54%	0.113	0.169	-40%
Beryllium (Be)-Dissolved	mg/L	<0.1	<0.0005		<0.1	<0.0005		<0.1	<0.0005		<0.0005	<0.0005	
Bismuth (Bi)-Dissolved	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	

		Airlift vs Port		RPD	Airlift vs Port		RPD	Airlift vs Port		RPD	Airlift vs Port		RPD
Field Sample ID / Unique ID	**Units**	**10WBW001-33**	**10WBW001-36**		**10WBW001-26**	**10WBW001-35**		**10WBW001-16**	**10WBW001-37**		**10WBW001-103**	**10WBW001-108**	
Boron (B)-Dissolved	mg/L	1.97	0.94	71%	2.74	2.99	-9%	2.32	1.42	48%	2.64	1.48	56%
Cadmium (Cd)-Dissolved	mg/L	<0.01	<0.00012		<0.01	<0.00012		<0.01	<0.00012		<0.00005	<0.00005	
Calcium (Ca)-Dissolved	mg/L	1390	749	60%	4360	4960	-13%	1560	1010	43%	1550	1160	29%
Cesium (Cs)-Dissolved	mg/L		0.00069			0.00105			0.00092		0.00154	0.00097	45%
Chromium (Cr)-Dissolved	mg/L	0.682	<0.001		0.532	<0.001		0.874	<0.001		<0.0005	<0.0005	
Cobalt (Co)-Dissolved	mg/L	<0.02	<0.0005		<0.02	<0.0005		<0.02	<0.0005		0.000315	0.000091	110%
Copper (Cu)-Dissolved	mg/L	<0.12	<0.001		<0.12	<0.001		<0.12	<0.001		<0.0005	<0.0005	
Gallium (Ga)-Dissolved	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Iron (Fe)-Dissolved	mg/L	3.32	0.06	193%	<0.15	<0.05		6.25	2.68	80%	4.31	0.503	158%
Lead (Pb)-Dissolved	mg/L	<0.02	<0.001		<0.02	<0.001		<0.02	<0.001		<0.003	<0.0003	
Lithium (Li)-Dissolved	mg/L	<0.6	0.087		<0.6	0.37		<0.6	0.121		0.223	0.127	55%
Magnesium (Mg)-Dissolved	mg/L	1310	0702	60%	0045	0070	-43%	1300	849	42%	1490	1080	32%
Manganese (Mn)-Dissolved	mg/L	1.96	0.53	115%	0.53	0.69	-26%	1.72	1.04	49%	2.03	0.888	78%
Mercury (Hg)-Dissolved	mg/L	<0.0001			<0.0001			<0.0001			<0.00005		
Molybdenum (Mo)-Dissolved	mg/L	<0.02	0.0379		<0.02	0.0128		<0.02	0.0211		0.0138	0.0345	-86%
Nickel (Ni)-Dissolved	mg/L	<0.02	0.00076		0.066	<0.0005		<0.02	<0.0005		0.00101	0.00158	-44%
Phosphorus (P)-Dissolved	mg/L		<1			<1			<1		<1	<1	
Potassium (K)-Dissolved	mg/L	194	117	50%	037	039	-5%	294	160	59%	233	172	30%
Rhenium (Re)-Dissolved	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Rubidium (Rb)-Dissolved	mg/L		0.0725			0.0504			0.0766		0.1400	0.106	28%
Selenium (Se)-Dissolved	mg/L	<0.4	<0.002		<0.4	<0.002		<0.4	<0.002		<0.002	<0.002	
Silicon (Si)-Dissolved	mg/L		2.48			2.3			1.99		3.49	3.33	5%
Silver (Ag)-Dissolved	mg/L	<0.02	<0.0002		<0.02	<0.0002		<0.02	<0.0002		<0.0001	<0.0001	
Sodium (Na)-Dissolved	mg/L	8160	4130	66%	6260	7290	-15%	9450	5400	55%	9130	6810	29%
Strontium (Sr)-Dissolved	mg/L		9.0			58.9			11.3		21.1	14.6	36%
Tellurium (Te)-Dissolved	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Thallium (Tl)-Dissolved	mg/L	<0.01	<0.0005		<0.01	<0.0005		0.010	<0.0005		<0.00005	<0.00005	
Thorium (Th)-Dissolved	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Tin (Sn)-Dissolved	mg/L	<0.05	<0.001		<0.05	<0.001		<0.05	<0.001		<0.001	<0.001	
Titanium (Ti)-Dissolved	mg/L	<0.06	<0.005		<0.06	<0.005		<0.06	<0.005		<0.005	<0.005	
Tungsten (W)-Dissolved	mg/L		0.0316			<0.001			0.0059		0.0053	0.0231	-125%
Uranium (U)-Dissolved	mg/L	<0.02	<0.0005		<0.02	<0.0005		<0.02	<0.0005		0.000231	0.000058	120%
Vanadium (V)-Dissolved	mg/L	0.229	<0.0005		0.174	<0.0005		0.292	<0.0005		<0.0005	<0.0005	
Yttrium (Y)-Dissolved	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Zinc (Zn)-Dissolved	mg/L	<0.2	0.02		<0.2	0.0897		<0.2	0.0504		0.0384	0.0295	26%
Zirconium (Zr)-Dissolved	mg/L		<0.0005			<0.0005			<0.0005		<0.0005	<0.0005	
Isotope Chemistry													
Delta 2H x 1000		-85.71	-117.72	-31%	-138.57	-138	0%	-77.67	-106.52	-31%			
Delta 18O x 1000		-10.9	-15	-32%	-19.07	-18.83	1%	-10.18	-13.49	-28%			

RPDs greater than 20% are highlighted, to show parameters with the greatest variation between samples.

Table N6: Comparison of Boston Upper and Middle Ports

		At beginning of Dec purge		RPD	At end of Dec purge		RPD
Field Sample ID / Unique ID	**Units**	**10WBW004-125**	**10WBW004-126**		**10WBW004-130**	**10WBW004-131**	
Sample From		**Westbay Port**	**Westbay Port**		**Westbay Port**	**Westbay Port**	
Sample Purging Status		**Purging sample**	**Purging sample**		**Purging sample**	**Purging sample**	
Sample label for graph		**10WBW004 - Zone 6-Port Purge-S125**	**10WBW004 - Zone 6-Port Purge-S126**		**10WBW004 - Zone 6-Port Purge-S130**	**10WBW004 - Zone 6-Port Purge Final Dec-S131**	
Deposit		Boston	Boston		Boston	Boston	
Sample Location		10WBW004	10WBW004		10WBW004	10WBW004	
Sample Zone		6	6		6	6	
Location of port in zone		Top	Middle		Middle	Top	
Zone port drillhole depth		295.7	304.8		304.8	295.7	
Zone port vertical depth	m	271.54	379.6		379.6	271.54	
Sample Comments		Slushy, all samples warmed to prevent freeze.	Slushy, all samples warmed to prevent freeze.		Slushy, all samples warmed to prevent freeze.	Slushy, all samples warmed to prevent freeze.	
QA/QC Sample?		N	N		N	N	
QA/QC Comments		n/a	n/a		n/a	n/a	
Total Litres purged from zone before sample was taken		38	44		72	84	
Zone volumes purged before sample was taken		0.52	0.60		0.98	1.15	
Field Data							
Field pH		5.43	6.83	-23%	6.80	6.30	8%
Field Electrical Conductivity	mS/cm	39	40.4	-4%	40.0	39.1	2%
Field Turbidity	NTU	0.05	40.0	-200%	0.0	0.2	-200%
Field DO	mg/L	19.97	19.08	5%	19.37	14.71	27%
Field Temperature	°C	6.37	10.52	-49%	9.23	6.88	29%
Field Dep	m	0	0		0.0	0.0	
Field Salinity	%	2.4	2.5	-4%	2.5	2.4	4%
Field TDS		23.5	25.0	-6%	24	24	0%
Field oT		18.5	19	-3%	19	19	0%
Field ORP		263	161	48%	164	195	-17%
ALS DATA							
ALS Date Sampled		25-NOV-10	26-NOV-10	0%	29-NOV-10	30-NOV-10	0%
ALS Time Sampled		18:00	19:00	-5%	11:00	09:00	20%
ALS Sample ID		L960194-2	L960194-3		L960194-6	L960194-7	
Matrix		Water	Water		Water	Water	
Physical Tests							
Conductivity (EC)	uS/cm	30700	33800	-10%	33000	31800	4%
Density		1.02	1.02	0%	1.02	1.01	1%
Hardness (as CaCO3)	mg/L	12700	12100	5%	13300	11800	12%
pH	pH	6.68	6.81	-2%	7.09	7.03	1%
Salinity (EC)	g/L				21.0	20.2	4%
Total Dissolved Solids	mg/L	30800	33500	-8%	33300	32300	3%
Leachable Anions & Nutrients							
Anion Sum	meq/L	357	394	-10%	386	368	5%
Cation Sum	meq/L	334	348	-4%	381	338	12%
Cation - Anion Balance	%	<3.4	<6.1		<0.7	<4.2	
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	mg/L	35.3	40.0	-12%	53.0	53.5	-1%
Alkalinity, Carbonate (as CaCO3)	mg/L	<1.0	<1.0		<1.0	<1.0	
Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	<1.0		<1.0	<1.0	
Alkalinity, Total (as CaCO3)	mg/L	35.3	40.0	-12%	53.0	53.5	-1%
Ammonia as N	mg/L	<	<		1.96	1.95	1%
Bromide (Br)	mg/L	6.5	9.2	-34%	9.3	9.0	3%
Chloride (Cl)	mg/L	12400	13700	-10%	13400	12800	5%
Fluoride (F)	mg/L	0.677	0.983	-37%	0.689	0.642	7%
Nitrate (as N)	mg/L	<0.50	<0.50		<0.50	<0.50	
Nitrite (as N)	mg/L	<0.10	<0.10		<0.10	<0.10	
Ortho Phosphate as P	mg/L				<0.0010	<0.0010	
Total Phosphate as P	mg/L				0.148	0.155	-5%
Silicate (as SIO2)	mg/L				8.2	6.5	23%
Sulfate (SO4)	mg/L	260	336	-26%	347	330	5%
Total Metals							
Aluminum (Al)-Total	mg/L	0.0133	0.0152	-13%	0.0167	0.0087	63%
Antimony (Sb)-Total	mg/L	0.0180	0.0176	2%	0.0214	0.0203	5%
Arsenic (As)-Total	mg/L	<0.0020	<0.0030		<0.0030	<0.0030	
Barium (Ba)-Total	mg/L	0.557	0.554	1%	0.596	0.564	6%
Beryllium (Be)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Bismuth (Bi)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Boron (B)-Total	mg/L	0.87	1.00	-14%	0.99	0.96	3%
Cadmium (Cd)-Total	mg/L	<0.00010	<0.00010		<0.00010	<0.00010	
Calcium (Ca)-Total	mg/L	4510	4730	-5%	4380	4110	6%
Cesium (Cs)-Total	mg/L	0.00519	0.00665	-25%	0.00671	0.00644	4%
Chromium (Cr)-Total	mg/L	<0.0030	<0.0040		<0.0030	<0.0030	
Cobalt (Co)-Total	mg/L	0.00699	0.00562	22%	0.00612	0.00556	10%
Copper (Cu)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Gallium (Ga)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Iron (Fe)-Total	mg/L	7.62	8.25	-8%	5.21	4.89	6%
Lead (Pb)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	

		At beginning of Dec purge		RPD	At end of Dec purge		RPD
Field Sample ID / Unique ID	**Units**	**10WBW004-125**	**10WBW004-126**		**10WBW004-130**	**10WBW004-131**	
Lithium (Li)-Total	mg/L	0.051	0.059	-15%	0.057	0.053	7%
Magnesium (Mg)-Total	mg/L	306	413	-30%	411	394	4%
Manganese (Mn)-Total	mg/L	0.926	0.909	2%	0.953	0.887	7%
Mercury (Hg)-Total	mg/L				<0.000050	<0.000050	
Molybdenum (Mo)-Total	mg/L	0.0853	0.118	-32%	0.108	0.0942	14%
Nickel (Ni)-Total	mg/L	0.0305	0.0220	32%	0.0228	0.0223	2%
Phosphorus (P)-Total	mg/L	<1.0	<1.0		<1.0	<1.0	
Potassium (K)-Total	mg/L	47	50	-6%	50	49	2%
Rhenium (Re)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Rubidium (Rb)-Total	mg/L	0.0555	0.0556	0%	0.0554	0.0544	2%
Selenium (Se)-Total	mg/L	<0.0020	<0.0020		<0.0020	<0.0020	
Silicon (Si)-Total	mg/L	1.68	1.67	1%	1.80	1.81	-1%
Silver (Ag)-Total	mg/L	<0.00010	<0.00010		<0.00010	<0.00010	
Sodium (Na)-Total	mg/L	1780	2500	-34%	2460	2360	4%
Strontium (Sr)-Total	mg/L	19.8	26.1	-27%	26.5	24.8	7%
Tellurium (Te)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Thallium (Tl)-Total	mg/L	<0.000050	<0.000050		<0.000050	<0.000050	
Thorium (Th)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Tin (Sn)-Total	mg/L	<0.0010	<0.0010		<0.0010	<0.0010	
Titanium (Ti)-Total	mg/L	<0.0050	<0.0050		<0.0050	<0.0050	
Tungsten (W)-Total	mg/L	<0.0010	0.0014		0.0053	0.0015	112%
Uranium (U)-Total	mg/L	0.00501	0.00636	-24%	0.0101	0.00864	16%
Vanadium (V)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Yttrium (Y)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Zinc (Zn)-Total	mg/L	0.206	0.204	1%	0.217	0.193	12%
Zirconium (Zr)-Total	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L	<0.0050	<0.0050		<0.0050	<0.0050	
Antimony (Sb)-Dissolved	mg/L	0.0182	0.0178	2%	0.0207	0.0192	8%
Arsenic (As)-Dissolved	mg/L	<0.0020	<0.0020		<0.0020	<0.0020	
Barium (Ba)-Dissolved	mg/L	0.570	0.533	7%	0.575	0.555	4%
Beryllium (Be)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Bismuth (Bi)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Boron (B)-Dissolved	mg/L	0.90	0.97	-7%	0.96	0.95	1%
Cadmium (Cd)-Dissolved	mg/L	<0.00010	<0.00010		<0.00010	<0.00010	
Calcium (Ca)-Dissolved	mg/L	4580	4180	9%	4620	4080	12%
Cesium (Cs)-Dissolved	mg/L	0.00537	0.00648	-19%	0.00651	0.00621	5%
Chromium (Cr)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Cobalt (Co)-Dissolved	mg/L	0.00708	0.00526	29%	0.00566	0.00529	7%
Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Gallium (Ga)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Iron (Fe)-Dissolved	mg/L	7.06	6.43	9%	4.45	4.45	0%
Lead (Pb)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Lithium (Li)-Dissolved	mg/L	0.055	0.055	0%	0.055	0.054	2%
Magnesium (Mg)-Dissolved	mg/L	309	404	-27%	432	387	11%
Manganese (Mn)-Dissolved	mg/L	0.950	0.888	7%	0.904	0.870	4%
Mercury (Hg)-Dissolved	mg/L				<0.000050	<0.000050	
Molybdenum (Mo)-Dissolved	mg/L	0.0860	0.0990	-14%	0.101	0.0967	4%
Nickel (Ni)-Dissolved	mg/L	0.0301	0.0199	41%	0.0201	0.0208	-3%
Phosphorus (P)-Dissolved	mg/L	<1.0	<1.0		<1.0	<1.0	
Potassium (K)-Dissolved	mg/L	47	48	-2%	53	49	8%
Rhenium (Re)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Rubidium (Rb)-Dissolved	mg/L	0.0576	0.0530	8%	0.0541	0.0539	0%
Selenium (Se)-Dissolved	mg/L	<0.0020	<0.0030		<0.0045	<0.0020	
Silicon (Si)-Dissolved	mg/L	1.63	1.65	-1%	1.89	1.78	6%
Silver (Ag)-Dissolved	mg/L	<0.00010	<0.00010		<0.00010	<0.00010	
Sodium (Na)-Dissolved	mg/L	1790	2410	-30%	2600	2330	11%
Strontium (Sr)-Dissolved	mg/L	20.1	25.3	-23%	26.3	24.4	7%
Tellurium (Te)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Thallium (Tl)-Dissolved	mg/L	<0.000050	<0.000050		<0.000050	<0.000050	
Thorium (Th)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Tin (Sn)-Dissolved	mg/L	<0.0010	<0.0010		<0.0010	<0.0010	
Titanium (Ti)-Dissolved	mg/L	<0.0050	<0.0050		<0.0050	<0.0050	
Tungsten (W)-Dissolved	mg/L	<0.0010	0.0020		0.0050	0.0014	113%
Uranium (U)-Dissolved	mg/L	0.00521	0.00730	-33%	0.0100	0.00863	15%
Vanadium (V)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Yttrium (Y)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	
Zinc (Zn)-Dissolved	mg/L	0.0933	0.136	-37%	0.137	0.131	4%
Zirconium (Zr)-Dissolved	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	

RPDs greater than 20% are highlighted, to show parameters with the greatest variation between samples.

Appendix O
Lab Results Reports

Certificate of Analysis

SRK CONSULTING (CANADA) INC.
ATTN: MELISSA PITZ

SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6

Report Date: 20-AUG-10 09:05 (MT)
Version: FINAL

Lab Work Order #: **L917645** **Date Received:** **09-AUG-10**

Project P.O. #: NOT SUBMITTED
Job Reference: 1CH008.013
Legal Site Desc:
CofC Numbers:

Other Information:

Comments:

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.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L917645-1	L917645-2	L917645-3		
	Description	WATER	WATER	WATER		
	Sampled Date	04-AUG-10	05-AUG-10	05-AUG-10		
	Sampled Time	13:42	09:00	11:40		
	Client ID	10WBW001-35	10WBW001-36	10WBW001-37		
Grouping	**Analyte**					
SEAWATER						
Physical Tests	Conductivity (uS/cm)	46600	24600	30300		
	Hardness (as CaCO3) (mg/L)	12700	4760	6030		
	pH (pH)	7.43	7.83	7.47		
	Total Dissolved Solids (mg/L)	47800	19600	23100		
Leachable Anions & Nutrients	Anion Sum (meq/L)	557	278	349		
	Cation Sum (meq/L)	571	278	359		
	Cation - Anion Balance (%)	1.3	0.0	1.4		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<2.0	44.2	49.7		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0	<2.0	<2.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0	<2.0	<2.0		
	Alkalinity, Total (as CaCO3) (mg/L)	<2.0	44.2	49.7		
	Bromide (Br) (mg/L)	100	21.2	27.6		
	Chloride (Cl) (mg/L)	19000	9130	11500		
	Fluoride (F) (mg/L)	<0.75	<0.75	<0.75		
	Nitrate (as N) (mg/L)	<0.50	<0.50	<0.50		
	Nitrite (as N) (mg/L)	<0.10	<0.10	<0.10		
	Sulfate (SO4) (mg/L)	981	940	1160		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0992	0.0281	0.0146		
	Antimony (Sb)-Total (mg/L)	<0.00050	0.00745	0.00349		
	Arsenic (As)-Total (mg/L)	<0.0020	0.0026	<0.0020		
	Barium (Ba)-Total (mg/L)	0.0511	0.130	0.179		
	Beryllium (Be)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Boron (B)-Total (mg/L)	2.93	1.04	1.51		
	Cadmium (Cd)-Total (mg/L)	<0.00012	<0.00012	<0.00012		
	Calcium (Ca)-Total (mg/L)	5070	805	1020		
	Cesium (Cs)-Total (mg/L)	0.00105	0.00072	0.00097		
	Chromium (Cr)-Total (mg/L)	0.0057	0.0016	0.0030		
	Cobalt (Co)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Copper (Cu)-Total (mg/L)	0.0018	<0.0010	<0.0010		
	Gallium (Ga)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Iron (Fe)-Total (mg/L)	0.456	1.60	3.95		
	Lead (Pb)-Total (mg/L)	0.0013	<0.0010	<0.0010		
	Lithium (Li)-Total (mg/L)	0.370	0.093	0.128		
	Magnesium (Mg)-Total (mg/L)	71.0	739	867		
	Manganese (Mn)-Total (mg/L)	0.717	0.555	1.09		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L917645-1	L917645-2	L917645-3		
Description	WATER	WATER	WATER		
Sampled Date	04-AUG-10	05-AUG-10	05-AUG-10		
Sampled Time	13:42	09:00	11:40		
Client ID	10WBW001-35	10WBW001-36	10WBW001-37		
Grouping / **Analyte**					
SEAWATER					
Total Metals Molybdenum (Mo)-Total (mg/L)	0.0136	0.0403	0.0225		
Nickel (Ni)-Total (mg/L)	0.00437	0.00159	0.00237		
Phosphorus (P)-Total (mg/L)	<1.0	<1.0	<1.0		
Potassium (K)-Total (mg/L)	40	125	166		
Rhenium (Re)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
Rubidium (Rb)-Total (mg/L)	0.0500	0.0765	0.0816		
Selenium (Se)-Total (mg/L)	<0.0020	<0.0020	<0.0020		
Silicon (Si)-Total (mg/L)	2.61	2.88	2.12		
Silver (Ag)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
Sodium (Na)-Total (mg/L)	7470	4460	5590		
Strontium (Sr)-Total (mg/L)	60.4	9.72	11.7		
Tellurium (Te)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
Thallium (Tl)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
Thorium (Th)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
Tin (Sn)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
Titanium (Ti)-Total (mg/L)	0.0082	<0.0050	<0.0050		
Tungsten (W)-Total (mg/L)	<0.0010	0.0334	0.0067		
Uranium (U)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
Vanadium (V)-Total (mg/L)	0.00059	<0.00050	<0.00050		
Yttrium (Y)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
Zinc (Zn)-Total (mg/L)	0.503	0.195	0.261		
Zirconium (Zr)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
Dissolved Metals Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		
Antimony (Sb)-Dissolved (mg/L)	<0.00050	0.00703	0.00306		
Arsenic (As)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020		
Barium (Ba)-Dissolved (mg/L)	0.0520	0.120	0.169		
Beryllium (Be)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
Bismuth (Bi)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
Boron (B)-Dissolved (mg/L)	2.99	0.94	1.42		
Cadmium (Cd)-Dissolved (mg/L)	<0.00012	<0.00012	<0.00012		
Calcium (Ca)-Dissolved (mg/L)	4960	749	1010		
Cesium (Cs)-Dissolved (mg/L)	0.00105	0.00069	0.00092		
Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
Cobalt (Co)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
Gallium (Ga)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
Iron (Fe)-Dissolved (mg/L)	<0.050	0.059	2.68		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L917645-1 WATER 04-AUG-10 13:42 10WBW001-35	L917645-2 WATER 05-AUG-10 09:00 10WBW001-36	L917645-3 WATER 05-AUG-10 11:40 10WBW001-37		
	Sample ID					
	Description					
	Sampled Date					
	Sampled Time					
	Client ID					
SEAWATER						
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Lithium (Li)-Dissolved (mg/L)	0.370	0.087	0.121		
	Magnesium (Mg)-Dissolved (mg/L)	69.5	702	849		
	Manganese (Mn)-Dissolved (mg/L)	0.691	0.526	1.04		
	Molybdenum (Mo)-Dissolved (mg/L)	0.0128	0.0379	0.0211		
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00076	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)	<1.0	<1.0	<1.0		
	Potassium (K)-Dissolved (mg/L)	39	117	160		
	Rhenium (Re)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Rubidium (Rb)-Dissolved (mg/L)	0.0504	0.0725	0.0766		
	Selenium (Se)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020		
	Silicon (Si)-Dissolved (mg/L)	2.30	2.48	1.99		
	Silver (Ag)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Sodium (Na)-Dissolved (mg/L)	7290	4130	5400		
	Strontium (Sr)-Dissolved (mg/L)	58.9	8.99	11.3		
	Tellurium (Te)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Thallium (Tl)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Thorium (Th)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Tin (Sn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Titanium (Ti)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		
	Tungsten (W)-Dissolved (mg/L)	<0.0010	0.0316	0.0059		
	Uranium (U)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Yttrium (Y)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	0.0897	0.0186	0.0504		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L917645-4				
	Description	WATER				
	Sampled Date	31-JUL-10				
	Sampled Time	15:00				
	Client ID	10WBW004-03				
Grouping	**Analyte**					
WATER						
Physical Tests	Density (kg/L)	1.00				
	Total Dissolved Solids (mg/L)	12400				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	13.0				
	Bicarbonate (HCO3) (mg/L)	15.9				
	Carbonate (CO3) (mg/L)	<5.0				
	Chloride (Cl) (mg/L)	7530 DLM				
	Conductivity (EC) (uS/cm)	19800				
	Fluoride (F) (mg/L)	1.4 DLM				
	Hardness (as CaCO3) (mg/L)	10900				
	Hydroxide (OH) (mg/L)	<5.0				
	Ion Balance (%)	104				
	Nitrate and Nitrite as N (mg/L)	<0.071				
	Nitrate (as N) (mg/L)	<0.050				
	Nitrite (as N) (mg/L)	<0.050				
	pH (pH)	7.03				
	TDS (Calculated) (mg/L)	12000				
	Sulfate (SO4) (mg/L)	5.28				
Total Metals	Aluminum (Al)-Total (mg/L)	13.7 DLM				
	Antimony (Sb)-Total (mg/L)	<0.080 DLM				
	Arsenic (As)-Total (mg/L)	<0.080 DLM				
	Barium (Ba)-Total (mg/L)	0.262 DLM				
	Beryllium (Be)-Total (mg/L)	<0.20 DLM				
	Boron (B)-Total (mg/L)	<0.80 DLM				
	Cadmium (Cd)-Total (mg/L)	<0.010 DLM				
	Calcium (Ca)-Total (mg/L)	4750				
	Chromium (Cr)-Total (mg/L)	0.35 DLM				
	Cobalt (Co)-Total (mg/L)	<0.040 DLM				
	Copper (Cu)-Total (mg/L)	<0.20 DLM				
	Iron (Fe)-Total (mg/L)	58.6				
	Lead (Pb)-Total (mg/L)	0.086 DLM				
	Lithium (Li)-Total (mg/L)	<1.2 DLM				
	Magnesium (Mg)-Total (mg/L)	24.1				
	Manganese (Mn)-Total (mg/L)	1.03				
	Mercury (Hg)-Total (mg/L)	<0.00010				
	Molybdenum (Mo)-Total (mg/L)	0.073 DLM				
	Nickel (Ni)-Total (mg/L)	0.151 DLM				
	Potassium (K)-Total (mg/L)	16.1				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID	L917645-4				
		Description	WATER				
		Sampled Date	31-JUL-10				
		Sampled Time	15:00				
		Client ID	10WBW004-03				
Grouping	**Analyte**						
WATER							
Total Metals	Selenium (Se)-Total (mg/L)		<0.080 DLM				
	Silver (Ag)-Total (mg/L)		<0.020 DLM				
	Sodium (Na)-Total (mg/L)		61.5				
	Thallium (Tl)-Total (mg/L)		<0.020 DLM				
	Tin (Sn)-Total (mg/L)		<0.080 DLM				
	Titanium (Ti)-Total (mg/L)		<0.12 DLM				
	Uranium (U)-Total (mg/L)		<0.020 DLM				
	Vanadium (V)-Total (mg/L)		<0.10 DLM				
	Zinc (Zn)-Total (mg/L)		<0.80 DLM				
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)		<0.10 DLM				
	Antimony (Sb)-Dissolved (mg/L)		<0.0080 DLM				
	Arsenic (As)-Dissolved (mg/L)		0.0537 DLM				
	Barium (Ba)-Dissolved (mg/L)		0.188 DLM				
	Beryllium (Be)-Dissolved (mg/L)		<0.010 DLM				
	Boron (B)-Dissolved (mg/L)		0.102 DLM				
	Cadmium (Cd)-Dissolved (mg/L)		<0.0010 DLM				
	Calcium (Ca)-Dissolved (mg/L)		4330 DLM				
	Chromium (Cr)-Dissolved (mg/L)		0.0139 DLM				
	Cobalt (Co)-Dissolved (mg/L)		0.0053 DLM				
	Copper (Cu)-Dissolved (mg/L)		<0.012 DLM				
	Iron (Fe)-Dissolved (mg/L)		0.091 DLM				
	Lead (Pb)-Dissolved (mg/L)		<0.0020 DLM				
	Lithium (Li)-Dissolved (mg/L)		<0.060 DLM				
	Magnesium (Mg)-Dissolved (mg/L)		18.7 DLM				
	Manganese (Mn)-Dissolved (mg/L)		0.615 DLM				
	Mercury (Hg)-Dissolved (mg/L)		<0.00010				
	Molybdenum (Mo)-Dissolved (mg/L)		0.0310 DLM				
	Nickel (Ni)-Dissolved (mg/L)		0.0764 DLM				
	Potassium (K)-Dissolved (mg/L)		12.6 DLM				
	Selenium (Se)-Dissolved (mg/L)		<0.040 DLM				
	Silver (Ag)-Dissolved (mg/L)		<0.0020 DLM				
	Sodium (Na)-Dissolved (mg/L)		62.7 DLM				
	Thallium (Tl)-Dissolved (mg/L)		<0.0010 DLM				
	Tin (Sn)-Dissolved (mg/L)		<0.050 DLM				
	Titanium (Ti)-Dissolved (mg/L)		<0.0060 DLM				
	Uranium (U)-Dissolved (mg/L)		<0.0020 DLM				
	Vanadium (V)-Dissolved (mg/L)		0.0555 DLM				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L917645-4				
Description	WATER				
Sampled Date	31-JUL-10				
Sampled Time	15:00				
Client ID	10WBW004-03				
Grouping **Analyte**					
WATER					
Dissolved Metals Zinc (Zn)-Dissolved (mg/L)	<0.020 DLM				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-C-SCR-VA	Seawater	Alk. by colour or titration (seawater)	EPA 310.2 OR APHA 2320
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method. OR This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-NO2-IC-VA	Seawater	Nitrite by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the detection of nitrite is by UV absorbance and not conductivity.			
ANIONS-C-NO3-IC-VA	Seawater	Nitrate by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, nitrate detection is by UV absorbance and not conductivity.			
ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
CL-IC-ED	Water	Chloride by IC	APHA 4110 B-ION CHROMATOGRAPHY
DENSITY-ED	Water	Density	CSSS-Gravimetric
EC-C-PCT-VA	Seawater	Conductivity (Automated) (seawater)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
F-IC-ED	Water	Fluoride by IC	APHA 4110 B-ION CHROMATOGRAPHY
F-ISE-VA	Seawater	Fluoride by SIE	BASED ON APHA 4500-F FLUORIDE
This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.			
HARDNESS-CALC-VA	Seawater	Hardness	APHA 2340B
Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.			
HG-D-CVAA-ED	Water	Mercury (Hg) - Dissolved	EPA 245.7 / EPA 245.1
HG-T-CVAA-ED	Water	Mercury (Hg) - Total	EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
IONBALANCE-VA	Seawater	Ion Balance Calculation (seawater)	APHA 1030E
MET-D-ICP-ED	Water	Dissolved Metals in Water by ICPOES	APHA 3120 B-ICP-OES
MET-D-L-HRMS-VA	Seawater	Diss. Metals in Seawater by HR-ICPMS	EPA 200.8
Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.			
MET-D-L-MS-ED	Water	Diss. Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
MET-DIS-C-ICP-VA	Seawater	Diss. Metals in Seawater by ICPOES	PUGET SOUND PROTOCOLS, EPA 6010B
This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-T-L-HRMS-VA	Seawater	Tot. Metals in Seawater by HR-ICPMS	EPA 200.8
Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.			

Reference Information

MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-L-MS-ED	Water	Total Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
MET-TOT-C-ICP-VA	Seawater	Total Metals in Seawater by ICPOES	PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

NO2+NO3-CALC-ED	Water	Nitrate+Nitrite	CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
NO3-IC-ED	Water	Nitrate as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
PH-C-PCT-VA	Seawater	pH by Meter (Automated) (seawater)	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.

It is recommended that this analysis be conducted in the field.

PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
SO4-IC-ED	Water	Sulfate by IC	APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C
TDS-VA	Seawater	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.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of 1

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	SRK Consulting	☑ Standard ☐ Other		◉ Regular (Default)
Contact:	Melissa Pitz	☑ PDF ☑ Excel ☑ Digital ☐ Fax		○ Priority (Specify Date Required → →) Surcharges apply
Address:	Suite 205, 2100 Airport Drive	Email 1:	mpitz@srk.com	○ Emergency (1 Business Day) - 100% Surcharge
	Saskatoon, SK, Canada, S7L 6M6	Email 2:	dmackie@srk.com	○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	(306) 955-4732 Fax: 306) 955-4750			
Invoice To	Same as Report ? ☐ Yes ☐ No	Client / Project Information		
Company:		Job #:	1CH008.013	
Contact:		PO / AFE:		
Address:		LSD:		
Phone:	Fax:	Quote #:		
Lab Work Order # (lab use only)	L917645	ALS Contact:	Sean Whitaker	Sampler:

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	met-tot-ccme-ed	met-dis-ccme-ed	Rou +F (TDS)	density - ed	Number of Containers
	10WBW001-35	04-Aug-10	13:42	Water	X	X	X	X	4
	10WBW001-36	05-Aug-10	9:00	Water	X	X	X	X	4
	10WBW001-37	05-Aug-10	11:40	Water	X	X	X	X	4
	10WBW004-03	31-Jul-10	15:00	Water	X	X	X	X	4

Analysis Request — Please indicate below Filtered, Preserved or both (F, P, F/P)

P F/P

Special Instructions / Regulations / Hazardous Details

* HOLD FOR INSTRUCTIONS FROM MELISSA PITZ*

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
J Henshaw	21-Jul-10	8.30am				°C				

GENF 18.02 Front

SRK CONSULTING (CANADA) INC.
ATTN: MELISSA PITZ
SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6
Phone: 306-955-4732

Date Received: 29-OCT-10
Report Date: 22-NOV-10 09:12 (MT)
Version: FINAL

Certificate of Analysis

Lab Work Order #: L948685
Project P.O. #: NOT SUBMITTED
Job Reference:
Legal Site Desc:
C of C Numbers:

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L948685-1	L948685-2			
	Description	WATER	WATER			
	Sampled Date	25-OCT-10	25-OCT-10			
	Sampled Time					
	Client ID	10WBW001-104	10WBW001-103			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0	48500			
	Hardness (as CaCO3) (mg/L)	0.56	10000			
	pH (pH)	7.29	7.04			
	Total Dissolved Solids (mg/L)	<10	35400			
Leachable Anions & Nutrients	Anion Sum (meq/L)	<0.10	580			
	Cation Sum (meq/L)	<0.10	603			
	Cation - Anion Balance (%)	0.0	2.0			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<2.0				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0				
	Alkalinity, Total (as CaCO3) (mg/L)	<2.0	72.4			
	Ammonia as N (mg/L)	<0.0050	3.14			
	Bromide (Br) (mg/L)	<0.050	49.1			
	Chloride (Cl) (mg/L)	<0.50	19000			
	Fluoride (F) (mg/L)	<0.020	0.091			
	Nitrate (as N) (mg/L)	<0.0050	<0.50			
	Nitrite (as N) (mg/L)	<0.0010	<0.10			
	Total Phosphate as P (mg/L)	0.0052	0.0262			
	Silicate (as SIO2) (mg/L)	<1.0	6.1			
	Sulfate (SO4) (mg/L)	<0.50	2020			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0086	0.0318			
	Antimony (Sb)-Total (mg/L)	<0.000010	0.00127			
	Arsenic (As)-Total (mg/L)	<0.000050	0.0070			
	Barium (Ba)-Total (mg/L)	0.00017	0.117			
	Beryllium (Be)-Total (mg/L)	<0.0000050	<0.00050			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.00050			
	Boron (B)-Total (mg/L)	0.0097	2.65			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.000050			
	Calcium (Ca)-Total (mg/L)	<0.050	1600			
	Cesium (Cs)-Total (mg/L)	<0.0000050	0.00155			
	Chromium (Cr)-Total (mg/L)	<0.00050	<0.00050			
	Cobalt (Co)-Total (mg/L)	<0.000050	0.000381			
	Copper (Cu)-Total (mg/L)	0.0161	<0.00050			
	Gallium (Ga)-Total (mg/L)	<0.000050	<0.00050			
	Iron (Fe)-Total (mg/L)	<0.030	4.53			
	Lead (Pb)-Total (mg/L)	0.00114	<0.00030			

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L948685-1	L948685-2			
	Description	WATER	WATER			
	Sampled Date	25-OCT-10	25-OCT-10			
	Sampled Time					
	Client ID	10WBW001-104	10WBW001-103			
Grouping	**Analyte**					
WATER						
Total Metals	Lithium (Li)-Total (mg/L)	<0.00020	0.228			
	Magnesium (Mg)-Total (mg/L)	<0.10	1510			
	Manganese (Mn)-Total (mg/L)	<0.00020	2.08			
	Mercury (Hg)-Total (mg/L)	<0.000050	<0.000050			
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.0140			
	Nickel (Ni)-Total (mg/L)	<0.00020	0.00095			
	Phosphorus (P)-Total (mg/L)	<0.30	<1.0			
	Potassium (K)-Total (mg/L)	<2.0	240			
	Rhenium (Re)-Total (mg/L)	<0.0000050	<0.00050			
	Rubidium (Rb)-Total (mg/L)	<0.000020	0.142			
	Selenium (Se)-Total (mg/L)	<0.00020	<0.0020			
	Silicon (Si)-Total (mg/L)	<0.050	3.68			
	Silver (Ag)-Total (mg/L)	0.0000058	<0.00010			
	Sodium (Na)-Total (mg/L)	<2.0	9350			
	Strontium (Sr)-Total (mg/L)	<0.0050	21.2			
	Tellurium (Te)-Total (mg/L)	<0.000010	<0.00050			
	Thallium (Tl)-Total (mg/L)	<0.0000020	<0.000050			
	Thorium (Th)-Total (mg/L)	<0.0000050	<0.00050			
	Tin (Sn)-Total (mg/L)	<0.00020	<0.0010			
	Titanium (Ti)-Total (mg/L)	<0.00020	<0.0050			
	Tungsten (W)-Total (mg/L)	<0.000010	0.0056			
	Uranium (U)-Total (mg/L)	0.0000020	0.000230			
	Vanadium (V)-Total (mg/L)	<0.000050	0.00054			
	Yttrium (Y)-Total (mg/L)	<0.0000050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.0056	0.0456			
	Zirconium (Zr)-Total (mg/L)	<0.000050	<0.00050			
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<0.0030	<0.0050			
	Antimony (Sb)-Dissolved (mg/L)	0.000021	0.00121			
	Arsenic (As)-Dissolved (mg/L)	<0.000050	0.0066			
	Barium (Ba)-Dissolved (mg/L)	0.00044	0.113			
	Beryllium (Be)-Dissolved (mg/L)	<0.0000050	<0.00050			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.00050			
	Boron (B)-Dissolved (mg/L)	<0.0050	2.64			
	Cadmium (Cd)-Dissolved (mg/L)	0.0000102	<0.000050			
	Calcium (Ca)-Dissolved (mg/L)	0.224	1550			
	Cesium (Cs)-Dissolved (mg/L)	<0.0000050	0.00154			
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050			

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L948685-1	L948685-2			
	Description	WATER	WATER			
	Sampled Date	25-OCT-10	25-OCT-10			
	Sampled Time					
	Client ID	10WBW001-104	10WBW001-103			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.000050	0.000315			
	Copper (Cu)-Dissolved (mg/L)	0.0123	<0.00050			
	Gallium (Ga)-Dissolved (mg/L)	<0.000050	<0.00050			
	Iron (Fe)-Dissolved (mg/L)	<0.030	4.31			
	Lead (Pb)-Dissolved (mg/L)	0.00114	<0.0030			
	Lithium (Li)-Dissolved (mg/L)	<0.00020	0.223			
	Lithium (Li)-Dissolved (mg/L)	<0.00020	0.223			
	Magnesium (Mg)-Dissolved (mg/L)	<0.10	1490			
	Manganese (Mn)-Dissolved (mg/L)	<0.00020	2.03			
	Mercury (Hg)-Dissolved (mg/L)	<0.000050	<0.000050			
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	0.0138			
	Nickel (Ni)-Dissolved (mg/L)	<0.00020	0.00101			
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<1.0			
	Potassium (K)-Dissolved (mg/L)	<2.0	233			
	Rhenium (Re)-Dissolved (mg/L)	<0.0000050	<0.00050			
	Rubidium (Rb)-Dissolved (mg/L)	<0.000020	0.140			
	Selenium (Se)-Dissolved (mg/L)	<0.00020	<0.0020			
	Silicon (Si)-Dissolved (mg/L)	<0.050	3.49			
	Silicon (Si)-Dissolved (mg/L)	<0.050	3.49			
	Silver (Ag)-Dissolved (mg/L)	<0.0000050	<0.00010			
	Sodium (Na)-Dissolved (mg/L)	<2.0	9130			
	Strontium (Sr)-Dissolved (mg/L)	<0.0050	21.1			
	Tellurium (Te)-Dissolved (mg/L)	<0.000010	<0.00050			
	Thallium (Tl)-Dissolved (mg/L)	<0.0000020	<0.000050			
	Thorium (Th)-Dissolved (mg/L)	<0.0000050	<0.00050			
	Thorium (Th)-Dissolved (mg/L)	<0.0000050	<0.00050			
	Tin (Sn)-Dissolved (mg/L)	<0.00020	<0.0010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00020	<0.0050			
	Tungsten (W)-Dissolved (mg/L)	<0.000010	0.0053			
	Uranium (U)-Dissolved (mg/L)	<0.0000020	0.000231			
	Vanadium (V)-Dissolved (mg/L)	<0.000050	<0.00050			
	Yttrium (Y)-Dissolved (mg/L)	<0.0000050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0109	0.0384			
	Zirconium (Zr)-Dissolved (mg/L)	<0.000050	<0.00050			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-PCT-VA	Water	Alkalinity by Auto. Titration	APHA 2320 "Alkalinity"

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALK-PCT-VA	Water	Alkalinity by Auto. Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALK-SCR-VA	Water	Alkalinity by colour or titration	EPA 310.2 OR APHA 2320

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.
OR
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the nitrite detection is by UV absorbance and not conductivity.

ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the nitrate detection is by UV absorance and not conductivity.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

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.

F-SIE-VA	Water	Fluoride by SIE	APHA 4500-F "Fluoride"

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using a selective ion electrode. This method has a significant negative interference (i.e. results could be biased low) when Al3+ is present in the sample at a concentration greater than 2.5 mg/L.

F-SIE-VA	Water	Fluoride by SIE	APHA 4500-F Fluoride

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using a selective ion electrode. This method has a significant negative interference (i.e. results could be biased low) when Al3+ is present in the sample at a concentration greater than 2.5 mg/L.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-DIS-CVAFS-VA	Water	Dissolved Mercury in Water by CVAFS	EPA SW-846 3005A & 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 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-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).

IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-L-HRMS-VA	Water	Diss. Metals in Water by HR-ICPMS	EPA 200.8

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration modified from APHA Method 3030B.

MET-DIS-ICP-VA	Water	Dissolved Metals in Water by ICPOES	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-T-L-HRMS-VA	Water	Total Metals in Water by HR-ICPMS	EPA 200.8

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion modified from APHA Method 3030E.

MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	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 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 - optical emission spectrophotometry (EPA Method 6010B).

NH3-F-VA	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulphuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

PH-MAN-VA	Water	pH by Manual Meter	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.

It is recommended that this analysis be conducted in the field.

PH-MAN-VA	Water	pH by Manual Meter	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.

It is recommended that this analysis be conducted in the field.

PO4-T-COL-VA	Water	Total Phosphate P by Color	APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-T-COL-VA	Water	Total Phosphate P by Color	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - 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.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location

Reference Information

VA ALS LABORATORY GROUP - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

SRK CONSULTING (CANADA) INC.
ATTN: MELISSA PITZ
SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6
Phone: 306-955-4732

Date Received: 25-OCT-10
Report Date: 10-DEC-10 09:26 (MT)
Version: FINAL REV. 3

Certificate of Analysis

Lab Work Order #: L946743
Project P.O. #: NOT SUBMITTED
Job Reference: 1CH008.013
Legal Site Desc:
C of C Numbers:

Comments: ADDITIONAL 07-DEC-10 11:56
ADDITIONAL 07-DEC-10 11:55
ADDITIONAL 29-NOV-10 11:16
ADDITIONAL 29-NOV-10 11:16

01-DEC-10: salinity added as per client request. SMW
10-DEC-10: Anions were added to file as they were missed in original login. SMW

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L946743-1	L946743-2	L946743-3		
	Description	WATER	WATER	WATER		
	Sampled Date	19-OCT-10	19-OCT-10	20-OCT-10		
	Sampled Time	12:00	15:00	11:00		
	Client ID	10WBW001-100	10WBW001-101	10WBW001-102		
Grouping	**Analyte**					
SEAWATER						
Physical Tests	Conductivity (uS/cm)	46700	34900	33800		
	Hardness (as CaCO3) (mg/L)	12600	6720	6360		
	pH (pH)	7.38	7.79	7.55		
	Salinity (EC) (g/L)	30.5	22.1	21.3		
	Total Dissolved Solids (mg/L)	42300	28900	28300		
Leachable Anions & Nutrients	Anion Sum (meq/L)	18.8	29.3	27.2		
	Cation Sum (meq/L)	565	400	383		
	Cation - Anion Balance (%)	93.5	86.4	86.7		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<2.0	44.2	77.3		
				88.3		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0	<2.0	<1.0		
				<2.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0	<2.0	<2.0		
				<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	<2.0	44.2	88.3		
				77.3		
	Bromide (Br) (mg/L)	101	38.1	36.4		
	Chloride (Cl) (mg/L)	19000	13400	13100		
	Fluoride (F) (mg/L)	<0.75	<0.75	<0.75		
	Nitrate (as N) (mg/L)	0.96	<0.50	<0.50		
	Nitrite (as N) (mg/L)	<0.10	<0.10	<0.10		
	Sulfate (SO4) (mg/L)	980	1390	1230		
		905	1360	1280		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0136	0.0052	<0.0050		
	Antimony (Sb)-Total (mg/L)	<0.00050	0.00500	0.00099		
	Arsenic (As)-Total (mg/L)	<0.0020	<0.0020	<0.0020		
	Barium (Ba)-Total (mg/L)	0.0525	0.175	0.177		
	Beryllium (Be)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Boron (B)-Total (mg/L)	2.89	1.38	1.53		
	Cadmium (Cd)-Total (mg/L)	0.000066	<0.000050	<0.000050		
	Calcium (Ca)-Total (mg/L)	4960	1140	1080		
	Cesium (Cs)-Total (mg/L)	0.00102	0.00091	0.00100		
	Chromium (Cr)-Total (mg/L)	0.00063	0.00029	0.00011		
	Cobalt (Co)-Total (mg/L)	0.000073	0.000092	0.000084		
	Copper (Cu)-Total (mg/L)	0.00059	<0.00050	<0.00050		
	Gallium (Ga)-Total (mg/L)	<0.00050	<0.00050	<0.00050		

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID	L946743-1	L946743-2	L946743-3		
		Description	WATER	WATER	WATER		
		Sampled Date	19-OCT-10	19-OCT-10	20-OCT-10		
		Sampled Time	12:00	15:00	11:00		
		Client ID	10WBW001-100	10WBW001-101	10WBW001-102		
Grouping	**Analyte**						
SEAWATER							
Total Metals	Iron (Fe)-Total (mg/L)		0.240	2.94	4.31		
	Lead (Pb)-Total (mg/L)		<0.00030	0.00035	<0.00030		
	Lithium (Li)-Total (mg/L)		0.346	0.117	0.128		
	Magnesium (Mg)-Total (mg/L)		64.4	1010	797		
	Manganese (Mn)-Total (mg/L)		0.722	0.948	1.15		
	Mercury (Hg)-Total (mg/L)		<0.000010	<0.000010	<0.000010		
	Molybdenum (Mo)-Total (mg/L)		0.0089	0.0370	0.0244		
	Nickel (Ni)-Total (mg/L)		0.00075	0.00059	<0.00050		
	Phosphorus (P)-Total (mg/L)		<1.0	<1.0	<1.0		
	Potassium (K)-Total (mg/L)		40	171	166		
	Rhenium (Re)-Total (mg/L)		<0.00050	<0.00050	<0.00050		
	Rubidium (Rb)-Total (mg/L)		0.0526	0.104	0.0842		
	Selenium (Se)-Total (mg/L)		<0.0020	<0.0020	<0.0020		
	Silicon (Si)-Total (mg/L)		2.79	3.50	2.42		
	Silver (Ag)-Total (mg/L)		<0.00010	<0.00010	<0.00010		
	Sodium (Na)-Total (mg/L)		7200	6410	5530		
	Strontium (Sr)-Total (mg/L)		57.2	13.9	11.1		
	Tellurium (Te)-Total (mg/L)		<0.00050	<0.00050	<0.00050		
	Thallium (Tl)-Total (mg/L)		<0.000050	<0.000050	<0.000050		
	Thorium (Th)-Total (mg/L)		<0.00050	<0.00050	<0.00050		
	Tin (Sn)-Total (mg/L)		<0.0010	<0.0010	<0.0010		
	Titanium (Ti)-Total (mg/L)		<0.0050	<0.0050	<0.0050		
	Tungsten (W)-Total (mg/L)		0.0014	0.0247	0.0051		
	Uranium (U)-Total (mg/L)		<0.000050	<0.000050	0.000057		
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050		
	Yttrium (Y)-Total (mg/L)		0.00052	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)		0.279	0.236	0.173		
	Zirconium (Zr)-Total (mg/L)		<0.00050	<0.00050	<0.00050		
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)		<0.0050	<0.0050	<0.0050		
	Antimony (Sb)-Dissolved (mg/L)		<0.00050	0.00480	0.00097		
	Arsenic (As)-Dissolved (mg/L)		<0.0020	<0.0020	<0.0020		
	Barium (Ba)-Dissolved (mg/L)		0.0530	0.178	0.178		
	Beryllium (Be)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050		
	Bismuth (Bi)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050		
	Boron (B)-Dissolved (mg/L)		2.92	1.38	1.54		
	Cadmium (Cd)-Dissolved (mg/L)		0.000083	<0.000050	<0.000050		
	Calcium (Ca)-Dissolved (mg/L)		4920	1100	1110		

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L946743-1	L946743-2	L946743-3		
	Description	WATER	WATER	WATER		
	Sampled Date	19-OCT-10	19-OCT-10	20-OCT-10		
	Sampled Time	12:00	15:00	11:00		
	Client ID	10WBW001-100	10WBW001-101	10WBW001-102		
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Cesium (Cs)-Dissolved (mg/L)	0.00102	0.00094	0.00104		
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)	<0.000050	0.000087	0.000102		
	Copper (Cu)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Gallium (Ga)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Iron (Fe)-Dissolved (mg/L)	0.056	0.127	3.15		
	Lead (Pb)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Lithium (Li)-Dissolved (mg/L)	0.350	0.120	0.130		
	Magnesium (Mg)-Dissolved (mg/L)	64.1	964	869		
	Manganese (Mn)-Dissolved (mg/L)	0.708	0.941	1.17		
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Molybdenum (Mo)-Dissolved (mg/L)	0.0092	0.0370	0.0259		
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)	<1.0	<1.0	<1.0		
	Potassium (K)-Dissolved (mg/L)	39	160	173		
	Rhenium (Re)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Rubidium (Rb)-Dissolved (mg/L)	0.0528	0.109	0.0850		
	Selenium (Se)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020		
	Silicon (Si)-Dissolved (mg/L)	2.42	2.88	2.38		
	Silver (Ag)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Sodium (Na)-Dissolved (mg/L)	7200	6010	5780		
	Strontium (Sr)-Dissolved (mg/L)	56.7	13.1	11.7		
	Tellurium (Te)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Thallium (Tl)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Thorium (Th)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Tin (Sn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Titanium (Ti)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		
	Tungsten (W)-Dissolved (mg/L)	0.0014	0.0246	0.0050		
	Uranium (U)-Dissolved (mg/L)	<0.000050	<0.000050	0.000059		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Yttrium (Y)-Dissolved (mg/L)	0.00051	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	0.113	0.0705	0.0610		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L946743-1	L946743-2	L946743-3		
	Description	WATER	WATER	WATER		
	Sampled Date	19-OCT-10	19-OCT-10	20-OCT-10		
	Sampled Time	12:00	15:00	11:00		
	Client ID	10WBW001-100	10WBW001-101	10WBW001-102		
Grouping	**Analyte**					
WATER						
Physical Tests	Density (kg/L)	1.01	1.01	1.01		
	pH (pH)			7.46		
Anions and Nutrients	Ortho Phosphate as P (mg/L)	0.0264	0.0017	<0.0010		
	Silicate (as SIO2) (mg/L)	7.8	5.0	3.8		

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-C-PCT-VA	Seawater	Alkalinity by Titration (seawataer)	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ALK-C-SCR-VA	Seawater	Alk. by colour or titration (seawater)	EPA 310.2 OR APHA 2320
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method. OR This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-NO2-IC-VA	Seawater	Nitrite by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the detection of nitrite is by UV absorbance and not conductivity.			
ANIONS-C-NO3-IC-VA	Seawater	Nitrate by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, nitrate detection is by UV absorbance and not conductivity.			
ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
DENSITY-ED	Water	Density	CSSS-Gravimetric
EC-C-PCT-VA	Seawater	Conductivity (Automated) (seawater)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
F-ISE-VA	Seawater	Fluoride by SIE	BASED ON APHA 4500-F FLUORIDE
This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.			
HARDNESS-CALC-VA	Seawater	Hardness	APHA 2340B
Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.			
HG-DIS-C-CVAFS-VA	Seawater	Diss. Mercury in Seawater by CVAFS	PUGET SOUND PROTOCOLS, EPA 245.7
This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater 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-C-CVAFS-VA	Seawater	Total Mercury in Seawater by CVAFS	PUGET SOUND PROTOCOLS, EPA 245.7
This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater 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).			
IONBALANCE-VA	Seawater	Ion Balance Calculation (seawater)	APHA 1030E
MET-D-L-HRMS-VA	Seawater	Diss. Metals in Seawater by HR-ICPMS	EPA 200.8
Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.			
MET-DIS-C-ICP-VA	Seawater	Diss. Metals in Seawater by ICPOES	PUGET SOUND PROTOCOLS, EPA 6010B
This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-T-L-HRMS-VA	Seawater	Tot. Metals in Seawater by HR-ICPMS	EPA 200.8

Reference Information

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.

MET-TOT-C-ICP-VA Seawater Total Metals in Seawater by ICPOES PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

PH-C-PCT-VA Seawater pH by Meter (Automated) (seawater) 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.

It is recommended that this analysis be conducted in the field.

PH-MAN-VA Water pH by Manual Meter 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.

It is recommended that this analysis be conducted in the field.

PH-MAN-VA Water pH by Manual Meter 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.

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Dissolved ortho Phosphate by Colour APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-DO-COL-VA Water Dissolved ortho Phosphate by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

SALINITY-C-EC-VA Seawater Salinity by calc. using EC (seawater) APHA 2520 B

This analysis is carried out using procedures adapted from APHA Method 2520 "Salinity". Salinity is determined using a samples conductivity and the Practical Salinity Scale.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-C-TUR-VA Seawater Sulphate(SO4) by Turbidity (seawater) APHA 4500-SO4 Sulphate

This analysis is carried out using procedures adapted from APHA Method 4500-SO4 "Sulphate". Sulphate is determined using the turbidimetric method.

TDS-VA Seawater 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.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES
Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # _____

Page 1 of 1

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	SRK Consulting	☑ Standard ☐ Other		◉ Regular (Default)
Contact:	Melissa Pitz	☑ PDF ☑ Excel ☑ Digital ☐ Fax		○ Priority (Specify Date Required → →) Surcharges apply
Address:	Suite 205, 2100 Airport Drive	Email 1: mpitz@srk.com		○ Emergency (1 Business Day) - 100% Surcharge
	Saskatoon, SK, Canada, S7L 6M6	Email 2: dmackie@srk.com		○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	(306) 955-4732 Fax: 306) 955-4750			
Invoice To	Same as Report ? ☐ Yes ☐ No	Client / Project Information		Analysis Request
Company:		Job #: 1CH008.013		Please indicate below Filtered, Preserved or both (F, P, F/P)
Contact:		PO / AFE:		
Address:		LSD:		
Phone:	Fax:	Quote #: Q25959		
Lab Work Order # (lab use only)	L946743.	ALS Contact: Sean Whitaker	Sampler:	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	total HRMS metals +hg	Dis HRMS metals +hg	anions/alk/ph/ec/tds	density - ed	isotopes	Dissolved PO4	Silicates						Number of Containers
					P	F/P			F								
	10WBW001-100	19-Oct-10	12:00	Water	x	x	x			x	x						5
	10WBW001-101	19-Oct-10	15:00	Water	x	x	x			x	x						5
	10WBW001-102	20-Oct-10	11:00	Water	x	x	x			x	x						5

Special Instructions / Regulations / Hazardous Details

* HOLD FOR INSTRUCTIONS FROM MELISSA PITZ*

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
J Henshaw	22-Oct-10	8.30am	SH	23-Oct-10	9AM	N/A °C				

GENF 18.02 Front

Certificate of Analysis

SRK CONSULTING (CANADA) INC.

ATTN: MELISSA PITZ

SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6

Report Date: 13-AUG-10 15:49 (MT)
Version: FINAL

Lab Work Order #: **L915201** **Date Received:** **01-AUG-10**

Project P.O. #: NOT SUBMITTED
Job Reference: 1CH008.013
Legal Site Desc:
CofC Numbers:

Other Information:

Comments:

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.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L915201-1 WATER 21-JUL-10 16:28 10WBW001-15	L915201-2 WATER 21-JUL-10 17:28 10WBW001-16	L915201-3 WATER 25-JUL-10 11:25 10WBW001-17	L915201-6 WATER 25-JUL-10 17:11 10WBW001-20	L915201-8 WATER 26-JUL-10 09:10 10WBW001-22
WATER						
Physical Tests	Density (kg/L)	32200	32700	32400	33200	10.0
	Total Dissolved Solids (mg/L)	82.3	81.7	9.7	9.3	<5.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	100	99.6	11.9	11.4	<5.0
	Bicarbonate (HCO3) (mg/L)	<5.0 DLM	<5.0 DLM	<5.0 DLM	<5.0 DLM	<5.0
	Carbonate (CO3) (mg/L)	17700	18200	19100	19000	0.65
	Chloride (Cl) (mg/L)	46500	46600	47400	47500	5.97
	Conductivity (EC) (uS/cm)	<1.0 DLM	<1.0 DLM	<1.0 DLM	<1.0 DLM	<0.050
	Fluoride (F) (mg/L)	8360	9250	11500	10900	2.4
	Hardness (as CaCO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Hydroxide (OH) (mg/L)	96.6	109	94.2	89.9	Low EC
	Ion Balance (%)	<1.4 DLM	<1.4 DLM	<1.4 DLM	<1.4 DLM	<0.071
	Nitrate and Nitrite as N (mg/L)	<1.0 DLM	<1.0 DLM	<1.0 DLM	<1.0 DLM	<0.050
	Nitrate (as N) (mg/L)	<1.0 DLM	<1.0 DLM	<1.0 DLM	<1.0 DLM	<0.050
	Nitrite (as N) (mg/L)	7.35	7.39	7.91	7.83	6.38
	pH (pH)	30300 DLM	32600 DLM	31500 DLM	30800 DLM	2.9
	TDS (Calculated) (mg/L)	1750 DLM	1790 DLM	1010 DLM	997 DLM	<0.50
	Sulfate (SO4) (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)	<2.0 DLM	<2.0 DLM	<2.0 DLM	<2.0 DLM	<0.010
	Antimony (Sb)-Total (mg/L)	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.00040
	Arsenic (As)-Total (mg/L)	0.083 DLM	0.090 DLM	0.113 DLM	0.114 DLM	<0.00040
	Barium (Ba)-Total (mg/L)	0.102 DLM	0.113 DLM	0.046 DLM	0.054 DLM	<0.0030
	Beryllium (Be)-Total (mg/L)	<0.20 DLM	<0.20 DLM	<0.20 DLM	<0.20 DLM	<0.0010
	Boron (B)-Total (mg/L)	2.32 DLM	2.31 DLM	2.38 DLM	2.59 DLM	<0.050
	Cadmium (Cd)-Total (mg/L)	<0.010 DLM	<0.010 DLM	<0.010 DLM	<0.010 DLM	<0.000050
	Calcium (Ca)-Total (mg/L)	1590 DLM	1580 DLM	4100 DLM	4430 DLM	<0.50
	Chromium (Cr)-Total (mg/L)	0.61 DLM	0.66 DLM	0.96 DLM	0.95 DLM	<0.0050
	Cobalt (Co)-Total (mg/L)	<0.040 DLM	<0.040 DLM	<0.040 DLM	<0.040 DLM	<0.0020
	Copper (Cu)-Total (mg/L)	<0.20 DLM	<0.20 DLM	<0.20 DLM	<0.20 DLM	0.0807
	Iron (Fe)-Total (mg/L)	7.15 DLM	7.14 DLM	0.51 DLM	0.68 DLM	<0.010
	Lead (Pb)-Total (mg/L)	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.020 DLM	0.00244
	Lithium (Li)-Total (mg/L)	<1.2 DLM	<1.2 DLM	<1.2 DLM	<1.2 DLM	<0.010
	Magnesium (Mg)-Total (mg/L)	1290 DLM	1290 DLM	75.8 DLM	65.9 DLM	<0.10
	Manganese (Mn)-Total (mg/L)	1.73	1.76	0.771	0.714	<0.0020
	Mercury (Hg)-Total (mg/L)	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM	<0.00010
	Molybdenum (Mo)-Total (mg/L)	<0.020 DLM	<0.020 DLM	0.020 DLM	<0.020 DLM	<0.0050
	Nickel (Ni)-Total (mg/L)	<0.040 DLM	<0.040 DLM	0.074 DLM	0.071 DLM	<0.0020
	Potassium (K)-Total (mg/L)	294	292	35.5	35.4	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L915201-11 WATER 24-JUL-10 15:00 10WBW004-1	L915201-12 WATER 24-JUL-10 14:30 10WBW004-2	L915201-13 WATER 25-JUL-10 12:37 10WBW001-25	L915201-14 WATER 25-JUL-10 12:37 10WBW001-26	L915201-16 WATER 26-JUL-10 16:23 10WBW001-28
WATER						
Physical Tests	Density (kg/L)		0.996			
	Total Dissolved Solids (mg/L)	26000	32.0	33300	32400	29000
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	41.9	7.9	8.2	7.9	63.4
	Bicarbonate (HCO3) (mg/L)	51.1	9.6	10.1	9.6	77.3
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Chloride (Cl) (mg/L)	16400 DLM	7.58	18700 DLM	18800 DLM	15900 RRV
	Conductivity (EC) (uS/cm)	39600	44.0	47600	47600	41600
	Fluoride (F) (mg/L)	<1.0 DLM	<0.050	<1.0 DLM	<1.0 DLM	<1.0 DLM
	Hardness (as CaCO3) (mg/L)	21100	13.3	11500	11100	7280
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Ion Balance (%)	95.4	Low EC	95.5	89.8	88.7 BL:INT
	Nitrate and Nitrite as N (mg/L)	<1.4	<0.071	<1.4	<1.4	<1.4
	Nitrate (as N) (mg/L)	<1.0 DLM	<0.050	<1.0 DLM	<1.0 DLM	<1.0 DLM
	Nitrite (as N) (mg/L)	<1.0 DLM	<0.050	<1.0 DLM	<1.0 DLM	<1.0 DLM
	pH (pH)	6.31	6.99	7.65	7.72	7.58
	TDS (Calculated) (mg/L)	25400	22.9	31000	30500	26500
	Sulfate (SO4) (mg/L)	50 DLM	1.63	960 DLM	964 DLM	1690 RRV
Total Metals	Aluminum (Al)-Total (mg/L)	4.6 DLM	0.061	<2.0 DLM	<2.0 DLM	<2.0 DLM
	Antimony (Sb)-Total (mg/L)	<0.080 DLM	<0.00040	<0.080 DLM	<0.080 DLM	<0.080 DLM
	Arsenic (As)-Total (mg/L)	<0.080 DLM	<0.00040	0.296 DLM	0.101 DLM	0.085 DLM
	Barium (Ba)-Total (mg/L)	0.681 DLM	<0.0030	0.054 DLM	0.059 DLM	0.139 DLM
	Beryllium (Be)-Total (mg/L)	<0.20 DLM	<0.0010	<0.20 DLM	<0.20 DLM	<0.20 DLM
	Boron (B)-Total (mg/L)	1.25 DLM	<0.050	2.56 DLM	2.50 DLM	1.54 DLM
	Cadmium (Cd)-Total (mg/L)	<0.010 DLM	<0.000050 DLM	<0.010 DLM	<0.010 DLM	<0.010 DLM
	Calcium (Ca)-Total (mg/L)	7820 DLM	<10	4430 DLM	4380 DLM	1190 DLM
	Chromium (Cr)-Total (mg/L)	0.46 DLM	<0.0050	0.62 DLM	0.74 DLM	0.66 DLM
	Cobalt (Co)-Total (mg/L)	<0.040 DLM	<0.0020	<0.040 DLM	<0.040 DLM	<0.040 DLM
	Copper (Cu)-Total (mg/L)	<0.20 DLM	0.0013 DLM	<0.20 DLM	<0.20 DLM	<0.20 DLM
	Iron (Fe)-Total (mg/L)	23.1 DLM	0.22	0.15 DLM	0.16 DLM	4.74 DLM
	Lead (Pb)-Total (mg/L)	<0.020 DLM	<0.00010	<0.020 DLM	<0.020 DLM	<0.020 DLM
	Lithium (Li)-Total (mg/L)	<1.2 DLM	<0.010 DLM	<1.2 DLM	<1.2 DLM	<1.2 DLM
	Magnesium (Mg)-Total (mg/L)	82.0 DLM	<2.0 DLM	51.1 DLM	53.0 DLM	1120 DLM
	Manganese (Mn)-Total (mg/L)	2.09	<0.040	0.618	0.641	1.27
	Mercury (Hg)-Total (mg/L)	<0.00010 DLM	<0.00010	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM
	Molybdenum (Mo)-Total (mg/L)	0.075 DLM	<0.0050	<0.020 DLM	<0.020 DLM	0.025 DLM
	Nickel (Ni)-Total (mg/L)	0.191 DLM	<0.0020 DLM	0.068 DLM	0.074 DLM	<0.040 DLM
	Potassium (K)-Total (mg/L)	70.4	<2.0	43.5	44.9	185

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L915201-19	L915201-21	L915201-22		
Description	WATER	WATER	WATER		
Sampled Date	27-JUL-10	27-JUL-10	28-JUL-10		
Sampled Time	10:35	15:21	11:00		
Client ID	10WBW001-31	10WBW001-33	10WBW001-34		
Grouping / **Analyte**					
WATER					
Physical Tests					
Density (kg/L)	30000	30400	18.0		
Total Dissolved Solids (mg/L)	67.7	70.8	<5.0		
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	82.7	86.4	<5.0		
Bicarbonate (HCO3) (mg/L)	<5.0	<5.0	<5.0		
Carbonate (CO3) (mg/L)	16500 DLM	17100 DLM	7.03 RRV		
Chloride (Cl) (mg/L)	42900	44400	24.7		
Conductivity (EC) (uS/cm)	<1.0 DLM	<1.0 DLM	<0.050		
Fluoride (F) (mg/L)	8550	8870	<1.0		
Hardness (as CaCO3) (mg/L)	<5.0	<5.0	<5.0		
Hydroxide (OH) (mg/L)	103	103	Low EC		
Ion Balance (%)	<1.4 DLM	<1.4 DLM	<0.071		
Nitrate and Nitrite as N (mg/L)	<1.0 DLM	<1.0 DLM	<0.050		
Nitrate (as N) (mg/L)	<1.0 DLM	<1.0 DLM	<0.050		
Nitrite (as N) (mg/L)	7.51	7.43	6.11		
pH (pH)	29000 DLM	30000 DLM	8.7 RRV		
TDS (Calculated) (mg/L)	1760 DLM	1820 DLM	<0.50		
Sulfate (SO4) (mg/L)	<2.0 DLM	<2.0 DLM	<0.010		
Total Metals					
Aluminum (Al)-Total (mg/L)	<0.080 DLM	<0.080 DLM	<0.00040		
Antimony (Sb)-Total (mg/L)	0.095 DLM	0.121 DLM	<0.00040		
Arsenic (As)-Total (mg/L)	0.125 DLM	0.107 DLM	<0.0030		
Barium (Ba)-Total (mg/L)	<0.20 DLM	<0.20 DLM	<0.0010		
Beryllium (Be)-Total (mg/L)	1.64 DLM	1.91 DLM	<0.050		
Boron (B)-Total (mg/L)	<0.010 DLM	<0.010 DLM	0.000190		
Cadmium (Cd)-Total (mg/L)	1370 DLM	1280 DLM	<0.50		
Calcium (Ca)-Total (mg/L)	0.72 DLM	0.86 DLM	<0.0050		
Chromium (Cr)-Total (mg/L)	<0.040 DLM	<0.040 DLM	<0.0020		
Cobalt (Co)-Total (mg/L)	<0.20 DLM	<0.20 DLM	<0.0010		
Copper (Cu)-Total (mg/L)	3.33 DLM	3.54 DLM	0.037		
Iron (Fe)-Total (mg/L)	<0.020 DLM	<0.020 DLM	0.00067		
Lead (Pb)-Total (mg/L)	<1.2 DLM	<1.2 DLM	<0.010		
Lithium (Li)-Total (mg/L)	1290 DLM	1210 DLM	<0.10		
Magnesium (Mg)-Total (mg/L)	1.73 DLM	1.81 DLM	0.0023		
Manganese (Mn)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
Mercury (Hg)-Total (mg/L)	0.020 DLM	<0.020 DLM	<0.0050		
Molybdenum (Mo)-Total (mg/L)	<0.040 DLM	<0.040 DLM	<0.0020		
Nickel (Ni)-Total (mg/L)	227 DLM	203 DLM	<0.10		
Potassium (K)-Total (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L915201-1 WATER 21-JUL-10 16:28 10WBW001-15	L915201-2 WATER 21-JUL-10 17:28 10WBW001-16	L915201-3 WATER 25-JUL-10 11:25 10WBW001-17	L915201-6 WATER 25-JUL-10 17:11 10WBW001-20	L915201-8 WATER 26-JUL-10 09:10 10WBW001-22
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	<0.40 DLM	<0.40 DLM	<0.40 DLM	<0.40 DLM	<0.00040
	Silver (Ag)-Total (mg/L)	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.00010
	Sodium (Na)-Total (mg/L)	9260 DLM	9580 DLM	6290 DLM	6580 DLM	<1.0
	Thallium (Tl)-Total (mg/L)	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.00010
	Tin (Sn)-Total (mg/L)	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.050
	Titanium (Ti)-Total (mg/L)	<0.12 DLM	<0.12 DLM	<0.12 DLM	<0.12 DLM	<0.0010
	Uranium (U)-Total (mg/L)	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.00010
	Vanadium (V)-Total (mg/L)	0.20 DLM	0.22 DLM	0.31 DLM	0.33 DLM	<0.0010
	Zinc (Zn)-Total (mg/L)	<0.80 DLM	<0.80 DLM	<0.80 DLM	<0.80 DLM	0.0408
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<1.0 DLM	<1.0 DLM	<1.0 DLM	<1.0 DLM	<0.010
	Antimony (Sb)-Dissolved (mg/L)	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.00040
	Arsenic (As)-Dissolved (mg/L)	0.091 DLM	0.097 DLM	0.103 DLM	0.103 DLM	<0.00040
	Barium (Ba)-Dissolved (mg/L)	0.100 DLM	0.097 DLM	0.052 DLM	0.048 DLM	<0.0030
	Beryllium (Be)-Dissolved (mg/L)	<0.10 DLM	<0.10 DLM	<0.10 DLM	<0.10 DLM	<0.0010
	Boron (B)-Dissolved (mg/L)	2.23 DLM	2.32 DLM	2.64 DLM	2.62 DLM	<0.050
	Cadmium (Cd)-Dissolved (mg/L)	<0.010 DLM	<0.010 DLM	<0.010 DLM	<0.010 DLM	<0.000050
	Calcium (Ca)-Dissolved (mg/L)	1420 DLM	1560 DLM	4480 DLM	4260 DLM	0.75
	Chromium (Cr)-Dissolved (mg/L)	0.747 DLM	0.874 DLM	0.884 DLM	0.899 DLM	<0.0050
	Cobalt (Co)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.0020
	Copper (Cu)-Dissolved (mg/L)	0.19 DLM	<0.12 DLM	<0.12 DLM	<0.12 DLM	0.0031
	Iron (Fe)-Dissolved (mg/L)	5.77 DLM	6.25 DLM	<0.15 DLM	<0.15 DLM	<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.00010
	Lithium (Li)-Dissolved (mg/L)	<0.60 DLM	<0.60 DLM	<0.60 DLM	<0.60 DLM	<0.0030
	Magnesium (Mg)-Dissolved (mg/L)	1170 DLM	1300 DLM	80.3 DLM	65.6 DLM	0.12
	Manganese (Mn)-Dissolved (mg/L)	1.56 DLM	1.72 DLM	0.806 DLM	0.694 DLM	<0.0050
	Mercury (Hg)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Molybdenum (Mo)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	0.020 DLM	<0.020 DLM	<0.0050
	Nickel (Ni)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	0.064 DLM	0.055 DLM	<0.0020
	Potassium (K)-Dissolved (mg/L)	206 DLM	294 DLM	42.5 DLM	39.1 DLM	<0.50
	Selenium (Se)-Dissolved (mg/L)	<0.40 DLM	<0.40 DLM	<0.40 DLM	<0.40 DLM	<0.00040
	Silver (Ag)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.00010
	Sodium (Na)-Dissolved (mg/L)	7970 DLM	9450 DLM	6810 DLM	6480 DLM	1.4
	Thallium (Tl)-Dissolved (mg/L)	<0.010 DLM	0.010 DLM	0.010 DLM	0.013 DLM	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.050 DLM	<0.050 DLM	<0.050 DLM	<0.050 DLM	<0.050
	Titanium (Ti)-Dissolved (mg/L)	<0.060 DLM	<0.060 DLM	<0.060 DLM	<0.060 DLM	<0.0010
	Uranium (U)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.00010
	Vanadium (V)-Dissolved (mg/L)	0.259 DLM	0.292 DLM	0.291 DLM	0.302 DLM	<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	Sample ID / Description / Sampled Date / Sampled Time / Client ID				
		L915201-11 WATER 24-JUL-10 15:00 10WBW004-1	L915201-12 WATER 24-JUL-10 14:30 10WBW004-2	L915201-13 WATER 25-JUL-10 12:37 10WBW001-25	L915201-14 WATER 25-JUL-10 12:37 10WBW001-26	L915201-16 WATER 26-JUL-10 16:23 10WBW001-28
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	DLM <0.40	<0.00040	DLM <0.40	DLM <0.40	DLM <0.40
	Silver (Ag)-Total (mg/L)	DLM <0.020	<0.00010	DLM <0.020	DLM <0.020	DLM <0.020
	Sodium (Na)-Total (mg/L)	DLM 378	DLM <20	DLM 7420	DLM 7870	DLM 6830
	Thallium (Tl)-Total (mg/L)	DLM <0.020	<0.00010	DLM <0.020	DLM <0.020	DLM <0.020
	Tin (Sn)-Total (mg/L)	DLM <0.080	<0.050	DLM <0.080	DLM <0.080	DLM <0.080
	Titanium (Ti)-Total (mg/L)	DLM <0.12	0.0017	DLM <0.12	DLM <0.12	DLM <0.12
	Uranium (U)-Total (mg/L)	DLM <0.020	<0.00010	DLM <0.020	DLM <0.020	DLM <0.020
	Vanadium (V)-Total (mg/L)	DLM 0.15	<0.0010	DLM 0.21	DLM 0.23	DLM 0.22
	Zinc (Zn)-Total (mg/L)	DLM <0.80	<0.0040	DLM <0.80	DLM <0.80	DLM <0.80
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	DLM <1.0	0.014	DLM <1.0	DLM <1.0	DLM <1.0
	Antimony (Sb)-Dissolved (mg/L)	DLM <0.080	<0.00040	DLM <0.080	DLM <0.080	DLM <0.080
	Arsenic (As)-Dissolved (mg/L)	DLM <0.080	<0.00040	DLM <0.080	DLM 0.090	DLM <0.080
	Barium (Ba)-Dissolved (mg/L)	DLM 0.700	<0.0030	DLM 0.051	DLM 0.052	DLM 0.143
	Beryllium (Be)-Dissolved (mg/L)	DLM <0.10	<0.0010	DLM <0.10	DLM <0.10	DLM <0.10
	Boron (B)-Dissolved (mg/L)	DLM 1.31	<0.050	DLM 2.87	DLM 2.74	DLM 1.64
	Cadmium (Cd)-Dissolved (mg/L)	DLM <0.010	<0.000050	DLM <0.010	DLM <0.010	DLM <0.010
	Calcium (Ca)-Dissolved (mg/L)	DLM 8320	3.00	DLM 4520	DLM 4360	RRV 1150
	Chromium (Cr)-Dissolved (mg/L)	DLM 0.519	<0.0050	DLM 0.351	DLM 0.532	DLM 0.313
	Cobalt (Co)-Dissolved (mg/L)	DLM 0.033	<0.0020	DLM <0.020	DLM <0.020	DLM <0.020
	Copper (Cu)-Dissolved (mg/L)	DLM <0.12	0.0015	DLM <0.12	DLM <0.12	DLM <0.12
	Iron (Fe)-Dissolved (mg/L)	DLM 12.7	0.068	DLM <0.15	DLM <0.15	DLM 1.54
	Lead (Pb)-Dissolved (mg/L)	DLM <0.020	<0.00010	DLM <0.020	DLM <0.020	DLM <0.020
	Lithium (Li)-Dissolved (mg/L)	DLM <0.60	<0.0030	DLM <0.60	DLM <0.60	DLM <0.60
	Magnesium (Mg)-Dissolved (mg/L)	DLM 84.7	1.42	DLM 46.1	DLM 45.0	RRV 1070
	Manganese (Mn)-Dissolved (mg/L)	DLM 2.09	0.0064	DLM 0.544	DLM 0.532	DLM 1.17
	Mercury (Hg)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Molybdenum (Mo)-Dissolved (mg/L)	DLM 0.074	<0.0050	DLM <0.020	DLM <0.020	DLM 0.028
	Nickel (Ni)-Dissolved (mg/L)	DLM 0.190	<0.0020	DLM 0.061	DLM 0.066	DLM <0.020
	Potassium (K)-Dissolved (mg/L)	DLM 83.0	0.72	DLM 38.5	DLM 37.0	RRV 170
	Selenium (Se)-Dissolved (mg/L)	DLM <0.40	<0.00040	DLM <0.40	DLM <0.40	DLM <0.40
	Silver (Ag)-Dissolved (mg/L)	DLM <0.020	<0.00010	DLM <0.020	DLM <0.020	DLM <0.020
	Sodium (Na)-Dissolved (mg/L)	DLM 439	3.8	DLM 6730	DLM 6260	RRV 6450
	Thallium (Tl)-Dissolved (mg/L)	DLM <0.010	<0.00010	DLM <0.010	DLM <0.010	DLM <0.010
	Tin (Sn)-Dissolved (mg/L)	DLM <0.050	<0.050	DLM <0.050	DLM <0.050	DLM <0.050
	Titanium (Ti)-Dissolved (mg/L)	DLM <0.060	<0.0010	DLM <0.060	DLM <0.060	DLM <0.060
	Uranium (U)-Dissolved (mg/L)	DLM <0.020	<0.00010	DLM <0.020	DLM <0.020	DLM <0.020
	Vanadium (V)-Dissolved (mg/L)	DLM 0.205	<0.0010	DLM 0.122	DLM 0.174	DLM 0.128

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L915201-19	L915201-21	L915201-22		
	Description	WATER	WATER	WATER		
	Sampled Date	27-JUL-10	27-JUL-10	28-JUL-10		
	Sampled Time	10:35	15:21	11:00		
	Client ID	10WBW001-31	10WBW001-33	10WBW001-34		
Grouping	**Analyte**					
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	<0.40 DLM	<0.40 DLM	<0.00040		
	Silver (Ag)-Total (mg/L)	<0.020 DLM	<0.020 DLM	<0.00010		
	Sodium (Na)-Total (mg/L)	8290 DLM	7450 DLM	<1.0		
	Thallium (Tl)-Total (mg/L)	<0.020 DLM	<0.020 DLM	<0.00010		
	Tin (Sn)-Total (mg/L)	<0.080 DLM	<0.080 DLM	<0.050		
	Titanium (Ti)-Total (mg/L)	<0.12 DLM	<0.12 DLM	<0.0010		
	Uranium (U)-Total (mg/L)	<0.020 DLM	<0.020 DLM	<0.00010		
	Vanadium (V)-Total (mg/L)	0.25 DLM	0.27 DLM	<0.0010		
	Zinc (Zn)-Total (mg/L)	<0.80 DLM	<0.80 DLM	0.0300		
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<1.0 DLM	<1.0 DLM	<0.010		
	Antimony (Sb)-Dissolved (mg/L)	<0.080 DLM	<0.080 DLM	<0.00040		
	Arsenic (As)-Dissolved (mg/L)	<0.080 DLM	0.102 DLM	<0.00040		
	Barium (Ba)-Dissolved (mg/L)	0.115 DLM	0.120 DLM	<0.0030		
	Beryllium (Be)-Dissolved (mg/L)	<0.10 DLM	<0.10 DLM	<0.0010		
	Boron (B)-Dissolved (mg/L)	2.03 DLM	1.97 DLM	<0.050		
	Cadmium (Cd)-Dissolved (mg/L)	<0.010 DLM	<0.010 DLM	<0.000050		
	Calcium (Ca)-Dissolved (mg/L)	1330 DLM	1390 DLM	<0.50		
	Chromium (Cr)-Dissolved (mg/L)	0.451 DLM	0.682 DLM	<0.0050		
	Cobalt (Co)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	<0.0020		
	Copper (Cu)-Dissolved (mg/L)	<0.12 DLM	<0.12 DLM	<0.0010		
	Iron (Fe)-Dissolved (mg/L)	2.87 DLM	3.32 DLM	<0.030		
	Lead (Pb)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	<0.00010		
	Lithium (Li)-Dissolved (mg/L)	<0.60 DLM	<0.60 DLM	<0.0030		
	Magnesium (Mg)-Dissolved (mg/L)	1270 DLM	1310 DLM	0.24		
	Manganese (Mn)-Dissolved (mg/L)	1.70 DLM	1.96 DLM	<0.0050		
	Mercury (Hg)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Molybdenum (Mo)-Dissolved (mg/L)	0.023 DLM	<0.020 DLM	<0.0050		
	Nickel (Ni)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	<0.0020		
	Potassium (K)-Dissolved (mg/L)	186 DLM	194 DLM	<0.50		
	Selenium (Se)-Dissolved (mg/L)	<0.40 DLM	<0.40 DLM	<0.00040		
	Silver (Ag)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	<0.00010		
	Sodium (Na)-Dissolved (mg/L)	7910 DLM	8160 DLM	1.4		
	Thallium (Tl)-Dissolved (mg/L)	<0.010 DLM	<0.010 DLM	<0.00010		
	Tin (Sn)-Dissolved (mg/L)	<0.050 DLM	<0.050 DLM	<0.050		
	Titanium (Ti)-Dissolved (mg/L)	<0.060 DLM	<0.060 DLM	<0.0010		
	Uranium (U)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM	<0.00010		
	Vanadium (V)-Dissolved (mg/L)	0.176 DLM	0.229 DLM	<0.0010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L915201-1 WATER 21-JUL-10 16:28 10WBW001-15	L915201-2 WATER 21-JUL-10 17:28 10WBW001-16	L915201-3 WATER 25-JUL-10 11:25 10WBW001-17	L915201-6 WATER 25-JUL-10 17:11 10WBW001-20	L915201-8 WATER 26-JUL-10 09:10 10WBW001-22
Sample ID **Description** **Sampled Date** **Sampled Time** **Client ID**						
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)	0.22 DLM	<0.20 DLM	<0.20 DLM	0.31 DLM	0.0030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	Sample ID Description Sampled Date Sampled Time Client ID	L915201-11 WATER 24-JUL-10 15:00 10WBW004-1	L915201-12 WATER 24-JUL-10 14:30 10WBW004-2	L915201-13 WATER 25-JUL-10 12:37 10WBW001-25	L915201-14 WATER 25-JUL-10 12:37 10WBW001-26	L915201-16 WATER 26-JUL-10 16:23 10WBW001-28
WATER							
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)		<0.20 DLM	0.0032	<0.20 DLM	<0.20 DLM	<0.20 DLM

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L915201-19	L915201-21	L915201-22		
Description	WATER	WATER	WATER		
Sampled Date	27-JUL-10	27-JUL-10	28-JUL-10		
Sampled Time	10:35	15:21	11:00		
Client ID	10WBW001-31	10WBW001-33	10WBW001-34		
Grouping **Analyte**					
WATER					
Dissolved Metals Zinc (Zn)-Dissolved (mg/L)	<0.20 DLM	<0.20 DLM	0.0031		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
RRV	Reported Result Verified By Repeat Analysis
BL:INT	Balance Reviewed: Interference Or Non-Measured Component
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-ED	Water	Chloride by IC	APHA 4110 B-ION CHROMATOGRAPHY
DENSITY-ED	Water	Density	CSSS-Gravimetric
F-IC-ED	Water	Fluoride by IC	APHA 4110 B-ION CHROMATOGRAPHY
HG-D-CVAA-ED	Water	Mercury (Hg) - Dissolved	EPA 245.7 / EPA 245.1
HG-T-CVAA-ED	Water	Mercury (Hg) - Total	EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-ICP-ED	Water	Dissolved Metals in Water by ICPOES	APHA 3120 B-ICP-OES
MET-D-L-MS-ED	Water	Diss. Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-L-MS-ED	Water	Total Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite	CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
NO3-IC-ED	Water	Nitrate as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
SO4-IC-ED	Water	Sulfate by IC	APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # _____

Report To		Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	SRK Consulting	☑ Standard ☐ Other	◉ Regular (Default)
Contact:	Melissa Pitz	☑ PDF ☑ Excel ☑ Digital ☐ Fax	○ Priority (Specify Date Required → →) Surcharges apply
Address:	Suite 205, 2100 Airport Drive	Email 1: mpitz@srk.com	○ Emergency (1 Business Day) - 100% Surcharge
	Saskatoon, SK, Canada, S7L 6M6	Email 2: dmackie@srk.com	○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	(306) 955-4732 Fax: 306) 955-4750		
Invoice To	Same as Report ? ☐ Yes ☐ No	**Client / Project Information**	**Analysis Request**
Company:		Job #: 1CH008.013	Please indicate below Filtered, Preserved or both (F, P, F/P)
Contact:		PO / AFE:	
Address:		LSD:	
Phone:	Fax:	Quote #:	
Lab Work Order # (lab use only)		**ALS Contact:** Sean Whitaker	**Sampler:**

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P	F/P										Number of Containers
					met-tot-ccme-ed	met-dis-ccme-ed	Rou +F (TDS)	density - ed								
	10WBW001-15	21-Jul-10	16:28	Water	X	X	X									3
	10WBW001-16	21-Jul-10	17:28	Water	X	X	X									3
	10WBW001-17	25-Jul-10	11:25	Water	X	X	X									3
	10WBW001-18	25-Jul-10	15:35	Water												3
	10WBW001-19	25-Jul-10	16:16	Water												3
	10WBW001-20	25-Jul-10	17:11	Water	X	X	X									3
	10WBW001-21	26-Jul-10	8:47	Water												3
	10WBW001-22	26-Jul-10	9:10	Water	X	X	X									3
	10WBW001-23	26-Jul-10	9:53	Water												3
	10WBW001-24	26-Jul-10	11:32	Water												3
	10WBW004-1	24-Jul-10	15:00	Water	X	X	X									3
	10WBW004-2	24-Jul-10	14:30	Water	X	X	X	X								3

Special Instructions / Regulations / Hazardous Details

* HOLD FOR INSTRUCTIONS FROM MELISSA PITZ*

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
J Henshaw	21-Jul-10	8.30am				°C				

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES
Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # _____

Page 1 of 1

Report To		Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	SRK Consulting	☑ Standard ☐ Other	◉ Regular (Default)
Contact:	Melissa Pitz	☑ PDF ☑ Excel ☑ Digital ☐ Fax	○ Priority (Specify Date Required → →) Surcharges apply
Address:	Suite 205, 2100 Airport Drive	Email 1: mpitz@srk.com	○ Emergency (1 Business Day) - 100% Surcharge
	Saskatoon, SK, Canada, S7L 6M6	Email 2: dmackie@srk.com	○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	(306) 955-4732 Fax: 306) 955-4750		

Invoice To	Same as Report ? ☐ Yes ☐ No	Client / Project Information	
Company:		Job #:	1CH008.013
Contact:		PO / AFE:	
Address:		LSD:	
Phone:	Fax:	Quote #:	

Lab Work Order # (lab use only)		ALS Contact:	Sean Whitaker	Sampler:	

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P	F/P											Number of Containers
					met-tot-ccme-ed	met-dis-ccme-ed	Rou +F (TDS)	density - ed									
	10WBW001-25	25-Jul-10	12:37	Water	X	X	X										3
	10WBW001-26	25-Jul-10	12:37	Water	X	X	X										3
	10WBW001-27	26-Jul-10	16:01	Water													4
	10WBW001-28	26-Jul-10	16:23	Water	X	X	X										4
	10WBW001-29	27-Jul-10	9:28	Water													4
	10WBW001-30	27-Jul-10	9:56	Water													4
	10WBW001-31	27-Jul-10	10:35	Water	X	X	X										4
	10WBW001-32	27-Jul-10	11:46	Water													4
	10WBW001-33	27-Jul-10	15:21	Water	X	X	X										4
	10WBW004-34	28-Jul-10	11:00	Water	X	X	X										4
	10WBW001-14	20-Jul-10	16:30	Water	X	X											

Special Instructions / Regulations / Hazardous Details

* HOLD FOR INSTRUCTIONS FROM MELISSA PITZ*

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
J Henshaw	21-Jul-10	8.30am				°C				

Certificate of Analysis

SRK CONSULTING (CANADA) INC.
ATTN: MELISSA PITZ

SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6

Report Date: 13-AUG-10 15:54 (MT)
Version: FINAL REV. 2

Lab Work Order #: **L911681** **Date Received:** **22-JUL-10**

Project P.O. #: NOT SUBMITTED
Job Reference: 1CH008.013
Legal Site Desc:
CofC Numbers: 08-011632

Other Information:

Comments: ADDITIONAL 06-AUG-10 08:47
ADDITIONAL 06-AUG-10 08:47
rest of analysis is on hold as per email correspondence

Sean Whitaker
13-AUG-10: metals analysis requested by client.

SMW

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.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L911681-3	L911681-5			
	Description	WATER	WATER			
	Sampled Date	20-JUL-01	20-JUL-01			
	Sampled Time	09:49	16:30			
	Client ID	10WBW001-12	10WBW001-14			
Grouping	**Analyte**					
WATER						
Physical Tests	Density (kg/L)	1.01	1.02			
	Total Dissolved Solids (mg/L)	27700	31000			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	90.6	83.3			
	Bicarbonate (HCO3) (mg/L)	111	102			
	Carbonate (CO3) (mg/L)	<5.0	<5.0			
	Chloride (Cl) (mg/L)	15200 DLA	17100 DLA			
	Conductivity (EC) (uS/cm)	41400	45700			
	Fluoride (F) (mg/L)	<2.5 DLM	<2.5 DLM			
	Hardness (as CaCO3) (mg/L)	7150	7750			
	Hydroxide (OH) (mg/L)	<5.0	<5.0			
	Ion Balance (%)	99.4	96.7			
	Nitrate and Nitrite as N (mg/L)	<3.5 DLM	<3.5 DLM			
	Nitrate (as N) (mg/L)	<2.5 DLM	<2.5 DLM			
	Nitrite (as N) (mg/L)	<2.5 DLM	<2.5 DLM			
	pH (pH)	7.38	7.34			
	TDS (Calculated) (mg/L)	26300	29300			
	Sulfate (SO4) (mg/L)	1490 DLA	1700 DLA			
Total Metals	Aluminum (Al)-Total (mg/L)	<2.0 DLM	<2.0 DLM			
	Antimony (Sb)-Total (mg/L)	<0.080 DLM	<0.080 DLM			
	Arsenic (As)-Total (mg/L)	<0.080 DLM	0.098 DLM			
	Barium (Ba)-Total (mg/L)	0.125 DLM	0.136 DLM			
	Beryllium (Be)-Total (mg/L)	<0.20 DLM	<0.20 DLM			
	Boron (B)-Total (mg/L)	1.91 DLM	2.22 DLM			
	Cadmium (Cd)-Total (mg/L)	<0.010 DLM	<0.010 DLM			
	Calcium (Ca)-Total (mg/L)	1120	1290			
	Chromium (Cr)-Total (mg/L)	<0.16 DLM	0.55 DLM			
	Cobalt (Co)-Total (mg/L)	<0.040 DLM	<0.040 DLM			
	Copper (Cu)-Total (mg/L)	<0.20 DLM	<0.20 DLM			
	Iron (Fe)-Total (mg/L)	7.51	5.08			
	Lead (Pb)-Total (mg/L)	<0.020 DLM	<0.020 DLM			
	Lithium (Li)-Total (mg/L)	<1.2 DLM	<1.2 DLM			
	Magnesium (Mg)-Total (mg/L)	914	1020			
	Manganese (Mn)-Total (mg/L)	1.23	1.40			
	Mercury (Hg)-Total (mg/L)	<0.00010	<0.00010			
	Molybdenum (Mo)-Total (mg/L)	<0.020 DLM	<0.020 DLM			
	Nickel (Ni)-Total (mg/L)	<0.040 DLM	<0.040 DLM			
	Potassium (K)-Total (mg/L)	211	223			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L911681-3	L911681-5			
	Description	WATER	WATER			
	Sampled Date	20-JUL-01	20-JUL-01			
	Sampled Time	09:49	16:30			
	Client ID	10WBW001-12	10WBW001-14			
Grouping	**Analyte**					
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	0.106 DLM	0.147 DLM			
	Silver (Ag)-Total (mg/L)	<0.020 DLM	<0.020 DLM			
	Sodium (Na)-Total (mg/L)	6640	7150			
	Thallium (Tl)-Total (mg/L)	<0.020 DLM	<0.020 DLM			
	Tin (Sn)-Total (mg/L)	<0.080 DLM	<0.080 DLM			
	Titanium (Ti)-Total (mg/L)	<0.12 DLM	<0.12 DLM			
	Uranium (U)-Total (mg/L)	<0.020 DLM	<0.020 DLM			
	Vanadium (V)-Total (mg/L)	<0.10 DLM	0.18 DLM			
	Zinc (Zn)-Total (mg/L)	<0.80 DLM	<0.80 DLM			
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<1.0 DLM	<1.0 DLM			
	Antimony (Sb)-Dissolved (mg/L)	<0.080 DLM	<0.080 DLM			
	Arsenic (As)-Dissolved (mg/L)	0.100 DLM	0.116 DLM			
	Barium (Ba)-Dissolved (mg/L)	0.135 DLM	0.105 DLM			
	Beryllium (Be)-Dissolved (mg/L)	<0.10 DLM	<0.10 DLM			
	Boron (B)-Dissolved (mg/L)	2.06 DLM	2.43 DLM			
	Cadmium (Cd)-Dissolved (mg/L)	<0.010 DLM	<0.010 DLM			
	Calcium (Ca)-Dissolved (mg/L)	1230 DLM	1340 DLM			
	Chromium (Cr)-Dissolved (mg/L)	<0.8 DLM	0.739 DLM			
	Cobalt (Co)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM			
	Copper (Cu)-Dissolved (mg/L)	0.13 DLM	<0.12 DLM			
	Lead (Pb)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM			
	Lithium (Li)-Dissolved (mg/L)	<0.60 DLM	<0.60 DLM			
	Magnesium (Mg)-Dissolved (mg/L)	990 DLM	1070 DLM			
	Mercury (Hg)-Dissolved (mg/L)	<0.00010	<0.00010			
	Molybdenum (Mo)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM			
	Nickel (Ni)-Dissolved (mg/L)	0.032 DLM	0.043 DLM			
	Potassium (K)-Dissolved (mg/L)	225 DLM	245 DLM			
	Selenium (Se)-Dissolved (mg/L)	0.107 DLM	0.139 DLM			
	Silver (Ag)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM			
	Sodium (Na)-Dissolved (mg/L)	7130 DLM	7840 DLM			
	Thallium (Tl)-Dissolved (mg/L)	<0.010 DLM	<0.010 DLM			
	Tin (Sn)-Dissolved (mg/L)	<0.050 DLM	<0.050 DLM			
	Titanium (Ti)-Dissolved (mg/L)	<0.060 DLM	<0.060 DLM			
	Uranium (U)-Dissolved (mg/L)	<0.020 DLM	<0.020 DLM			
	Vanadium (V)-Dissolved (mg/L)	0.221 DLM	0.214 DLM			
	Zinc (Zn)-Dissolved (mg/L)	<0.20 DLM	<0.20 DLM			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit Adjusted For required dilution
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-ED	Water	Chloride by IC	APHA 4110 B-ION CHROMATOGRAPHY
DENSITY-ED	Water	Density	CSSS-Gravimetric
F-IC-ED	Water	Fluoride by IC	APHA 4110 B-ION CHROMATOGRAPHY
HG-D-CVAA-ED	Water	Mercury (Hg) - Dissolved	EPA 245.7 / EPA 245.1
HG-T-CVAA-ED	Water	Mercury (Hg) - Total	EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-ICP-ED	Water	Dissolved Metals in Water by ICPOES	APHA 3120 B-ICP-OES
MET-D-L-MS-ED	Water	Diss. Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-L-MS-ED	Water	Total Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite	CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
NO3-IC-ED	Water	Nitrate as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
SO4-IC-ED	Water	Sulfate by IC	APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

08-011632

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # 08-011632

Page ___ of ___

Report to:		Report Format / Distribution		Service Requested: (rush - subject to availability)	
Company:	SRK Consulting	Standard: X	Other:	X	Regular (Default)
Contact:	Melissa Pitz	Select: PDF X	Excel X Digital X		Priority (2-3 Business Days) - 50% Surcharge
Address:	Suite 205, 2100 Airport Drive, Saskatoon	Email 1:	mpitz@srk.com		Emergency (1 Business Day) - 100% Surcharge
		Email 2:	dmackie@srk.com		For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	306 9554732 Fax: 306 9554750				

Invoice To:	Same as Report ? Yes / No ?	Client / Project Information:	
Company:		Job #:	1CH008.013
Contact:		PO / AFE:	
Address:		Legal Site Description:	
Phone:	Fax:	Quote #:	
Lab Work Order # (lab use only)	L911681	ALS Contact:	Sampler:

Analysis Request (Indicate Filtered or Preserved, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	met-tot-ame-ed (F/P)	met-dis-ame-ed (F/P)	Rou+F (TDS) *	density-ed *									Number of Containers
	10WBW001-10	19 Jul	3.15pm	Water	X	X	X	X									
	10WBW001-11	19 Jul	4.15pm		X	X	X	X									
	10WBW001-12	20 Jul	9.49am		X	X	X	X									
	10WBW001-13	20 Jul	12.24pm		X	X	X	X									
	10WBW001-14	20 Jul	4.30pm		X	X	X	X									

Special Instructions / Regulations / Hazardous Details

★ HOLD FOR INSTRUCTIONS FROM MELISSA PITZ ★ Rerun Samples

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF
Jenny Henshaw	21 July 8am							

Certificate of Analysis

SRK CONSULTING (CANADA) INC.
ATTN: MELLISSA PITZ
SUITE 205 2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6

Report Date: 28-JUL-10 17:53 (MT)
Version: FINAL

Lab Work Order #: L909782 **Date Received:** 17-JUL-10

Project P.O. #: NOT SUBMITTED
Job Reference: 1CH008.013
Legal Site Desc:
CofC Numbers:

Other Information:

Comments:

Andre Langlais
Account Manager

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.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L909782-1 WATER 08-JUL-10 15:00 10WBW001-01	L909782-2 WATER 09-JUL-10 14:00 10WBW001-02	L909782-3 WATER 09-JUL-10 14:00 10WBW001-03	L909782-4 WATER 09-JUL-10 14:00 10WBW001-04	L909782-5 WATER 03-JUL-10 14:00 10WBW002-01
WATER						
Physical Tests	Density (kg/L)	1.02	1.02	1.00	1.01	1.13
	Total Dissolved Solids (mg/L)	33100	36900	18700	18500	250000
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	8.4	87.3	66.3	64.8	56.0
	Bicarbonate (HCO3) (mg/L)	10.2	106	80.9	79.0	68.3
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Chloride (Cl) (mg/L)	18200 DLA	20100 DLA	9650 DLA	9610 DLA	114000 RRV
	Conductivity (EC) (uS/cm)	47600	52800	27600	27500	160000
	Fluoride (F) (mg/L)	<5.0 DLM	<5.0 DLM	<5.0 DLM	<5.0 DLM	16 DLM
	Hardness (as CaCO3) (mg/L)	11700	9980	4960	5060	180000
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Ion Balance (%)	99.5	98.1	101	103	113 BL:INT
	Nitrate and Nitrite as N (mg/L)	<7.1 DLM	<7.1 DLM	<7.1 DLM	<7.1 DLM	<14 DLM
	Nitrate (as N) (mg/L)	<5.0 DLM	<5.0 DLM	<5.0 DLM	<5.0 DLM	<10 DLM
	Nitrite (as N) (mg/L)	<5.0	<5.0	<5.0	<5.0	<10
	pH (pH)	7.67	6.90	7.37	7.42	7.75
	TDS (Calculated) (mg/L)	30700	34600	16800	16900	187000
	Sulfate (SO4) (mg/L)	1020 DLA	2090 DLA	995 DLA	991 DLA	<100 RRV
Total Metals	Aluminum (Al)-Total (mg/L)	0.42 DLM	<0.20 DLM	<0.20 DLM	<0.20 DLM	30.5 DLM
	Antimony (Sb)-Total (mg/L)	<0.0080 DLM	<0.0080 DLM	<0.0080 DLM	<0.0080 DLM	<0.080 DLM
	Arsenic (As)-Total (mg/L)	<0.080 DLM	<0.080 DLM	<0.080 DLM	<0.080 DLM	0.218 DLM
	Barium (Ba)-Total (mg/L)	0.0588 DLM	0.0720 DLM	0.187 DLM	0.185 DLM	0.719 DLM
	Beryllium (Be)-Total (mg/L)	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.20 DLM
	Boron (B)-Total (mg/L)	3.11 DLM	2.88 DLM	1.34 DLM	1.37 DLM	0.95 DLM
	Cadmium (Cd)-Total (mg/L)	<0.0010 DLM	<0.0010 DLM	<0.0010 DLM	<0.0010 DLM	<0.010 DLM
	Calcium (Ca)-Total (mg/L)	4650 DLM	1750 DLM	851 DLM	867 DLM	78500 DLM
	Chromium (Cr)-Total (mg/L)	0.036 DLM	0.033 DLM	<0.016 DLM	0.024 DLM	0.63 DLM
	Cobalt (Co)-Total (mg/L)	0.0046 DLM	<0.0040 DLM	<0.0040 DLM	<0.0040 DLM	0.094 DLM
	Copper (Cu)-Total (mg/L)	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.020 DLM	<0.20 DLM
	Iron (Fe)-Total (mg/L)	2.27 DLM	12.0 DLM	3.53 DLM	3.65 DLM	133 DLM
	Lead (Pb)-Total (mg/L)	0.0021 DLM	0.0020 DLM	<0.0020 DLM	<0.0020 DLM	0.113 DLM
	Lithium (Li)-Total (mg/L)	0.37 DLM	0.37 DLM	0.13 DLM	0.14 DLM	<1.2 DLM
	Magnesium (Mg)-Total (mg/L)	181 DLM	1540 DLM	726 DLM	736 DLM	132 DLM
	Manganese (Mn)-Total (mg/L)	1.44	2.62	1.04	1.06	2.68
	Mercury (Hg)-Total (mg/L)	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM
	Molybdenum (Mo)-Total (mg/L)	0.0411 DLM	0.0059 DLM	0.0244 DLM	0.0237 DLM	0.222 DLM
	Nickel (Ni)-Total (mg/L)	0.0774 DLM	0.0335 DLM	0.0138 DLM	0.0144 DLM	1.40 DLM
	Potassium (K)-Total (mg/L)	56.6	268	114	116	36

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L909782-6	L909782-7			
	Description	WATER	WATER			
	Sampled Date	04-JUL-10	15-JUL-10			
	Sampled Time	14:00	14:00			
	Client ID	10WBW002-02	10WBW001-07			
Grouping	**Analyte**					
WATER						
Physical Tests	Density (kg/L)	1.14	0.998			
	Total Dissolved Solids (mg/L)	225000	188			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	59.5	31.8			
	Bicarbonate (HCO3) (mg/L)	11.9	27.2			
	Carbonate (CO3) (mg/L)	29.9	5.7			
	Chloride (Cl) (mg/L)	123000 RRV	60.3			
	Conductivity (EC) (uS/cm)	182000	304			
	Fluoride (F) (mg/L)	20 DLM	<0.050			
	Hardness (as CaCO3) (mg/L)	200000	48.8			
	Hydroxide (OH) (mg/L)	<5.0	<5.0			
	Ion Balance (%)	115 BL:INT	97.0			
	Nitrate and Nitrite as N (mg/L)	<14	<0.071			
	Nitrate (as N) (mg/L)	<10 DLM	<0.050			
	Nitrite (as N) (mg/L)	<10 DLM	<0.050			
	pH (pH)	8.53	8.52			
	TDS (Calculated) (mg/L)	203000	129			
	Sulfate (SO4) (mg/L)	<100 RRV	2.42			
Total Metals	Aluminum (Al)-Total (mg/L)	9.7 DLM	0.048			
	Antimony (Sb)-Total (mg/L)	<0.080 DLM	<0.00040			
	Arsenic (As)-Total (mg/L)	0.507 DLM	0.00055			
	Barium (Ba)-Total (mg/L)	0.736 DLM	0.0034			
	Beryllium (Be)-Total (mg/L)	<0.20 DLM	<0.0010			
	Boron (B)-Total (mg/L)	0.99 DLM	<0.050			
	Cadmium (Cd)-Total (mg/L)	<0.010 DLM	<0.000050			
	Calcium (Ca)-Total (mg/L)	96200	9.47			
	Chromium (Cr)-Total (mg/L)	0.48 DLM	<0.0050			
	Cobalt (Co)-Total (mg/L)	0.088 DLM	<0.0020			
	Copper (Cu)-Total (mg/L)	<0.20 DLM	0.0019			
	Iron (Fe)-Total (mg/L)	34.4 DLM	0.108			
	Lead (Pb)-Total (mg/L)	0.030 DLM	<0.00010			
	Lithium (Li)-Total (mg/L)	<1.2 DLM	<0.010			
	Magnesium (Mg)-Total (mg/L)	114 DLM	5.87			
	Manganese (Mn)-Total (mg/L)	0.47 DLM	0.0154			
	Mercury (Hg)-Total (mg/L)	<0.00010	<0.00010			
	Molybdenum (Mo)-Total (mg/L)	0.223 DLM	<0.0050			
	Nickel (Ni)-Total (mg/L)	1.82 DLM	<0.0020			
	Potassium (K)-Total (mg/L)	35 DLM	2.13			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L909782-1 WATER 08-JUL-10 15:00 10WBW001-01	L909782-2 WATER 09-JUL-10 14:00 10WBW001-02	L909782-3 WATER 09-JUL-10 14:00 10WBW001-03	L909782-4 WATER 09-JUL-10 14:00 10WBW001-04	L909782-5 WATER 03-JUL-10 14:00 10WBW002-01
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	DLM <0.40	DLM <0.40	DLM <0.40	DLM <0.40	DLM <0.40
	Silver (Ag)-Total (mg/L)	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.020
	Sodium (Na)-Total (mg/L)	DLM 7390	DLM 9750	DLM 4860	DLM 4930	DLM 580
	Thallium (Tl)-Total (mg/L)	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.020
	Tin (Sn)-Total (mg/L)	DLM <0.050	DLM <0.050	DLM <0.050	DLM <0.050	DLM <0.080
	Titanium (Ti)-Total (mg/L)	DLM 0.052	DLM <0.012	DLM <0.012	DLM <0.012	DLM 2.97
	Uranium (U)-Total (mg/L)	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.020
	Vanadium (V)-Total (mg/L)	DLM <0.10	DLM 0.17	DLM <0.10	DLM <0.10	DLM 0.98
	Zinc (Zn)-Total (mg/L)	DLM <0.080	DLM 0.088	DLM <0.080	DLM <0.080	DLM <0.80
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	DLM 0.12	DLM <0.10	DLM 0.13	DLM <0.10	DLM <1.0
	Antimony (Sb)-Dissolved (mg/L)	DLM <0.0080	DLM <0.0080	DLM <0.0080	DLM <0.0080	DLM <0.080
	Arsenic (As)-Dissolved (mg/L)	DLM <0.080	DLM <0.080	DLM <0.080	DLM <0.080	DLM 0.266
	Barium (Ba)-Dissolved (mg/L)	DLM 0.0573	DLM 0.0619	DLM 0.186	DLM 0.188	DLM 0.683
	Beryllium (Be)-Dissolved (mg/L)	DLM <0.010	DLM <0.010	DLM <0.010	DLM <0.010	DLM <0.10
	Boron (B)-Dissolved (mg/L)	DLM 3.19	DLM 2.44	DLM 1.31	DLM 1.38	DLM 0.86
	Cadmium (Cd)-Dissolved (mg/L)	DLM <0.0010	DLM <0.0010	DLM <0.0010	DLM <0.0010	DLM <0.010
	Calcium (Ca)-Dissolved (mg/L)	DLM 4390	DLM 1640	DLM 822	DLM 837	RRV 72100
	Chromium (Cr)-Dissolved (mg/L)	DLM 0.0444	DLM 0.0385	DLM 0.0178	DLM 0.0264	DLM 0.371
	Cobalt (Co)-Dissolved (mg/L)	DLM 0.0043	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM 0.061
	Copper (Cu)-Dissolved (mg/L)	DLM 0.014	DLM <0.012	DLM <0.012	DLM <0.012	DLM <0.12
	Iron (Fe)-Dissolved (mg/L)	DLM 0.22	DLM 9.26	DLM 1.88	DLM 1.63	DLM <1.5
	Lead (Pb)-Dissolved (mg/L)	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.020
	Lithium (Li)-Dissolved (mg/L)	DLM 0.370	DLM 0.297	DLM 0.128	DLM 0.136	DLM <0.60
	Magnesium (Mg)-Dissolved (mg/L)	DLM 172	DLM 1430	DLM 707	DLM 721	RRV 113
	Manganese (Mn)-Dissolved (mg/L)	DLM 1.34	DLM 2.48	DLM 1.01	DLM 1.01	DLM <0.25
	Mercury (Hg)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Molybdenum (Mo)-Dissolved (mg/L)	DLM 0.0411	DLM <0.0050	DLM 0.0240	DLM 0.0239	DLM 0.222
	Nickel (Ni)-Dissolved (mg/L)	DLM 0.0817	DLM 0.0289	DLM 0.0146	DLM 0.0159	DLM 1.43
	Potassium (K)-Dissolved (mg/L)	DLM 54.0	DLM 251	DLM 129	DLM 131	RRV 39
	Selenium (Se)-Dissolved (mg/L)	DLM <0.40	DLM <0.40	DLM <0.40	DLM <0.40	DLM <0.40
	Silver (Ag)-Dissolved (mg/L)	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.020
	Sodium (Na)-Dissolved (mg/L)	DLM 6840	DLM 9080	DLM 4470	DLM 4540	RRV 655
	Thallium (Tl)-Dissolved (mg/L)	DLM <0.0010	DLM <0.0010	DLM <0.0010	DLM <0.0010	DLM <0.010
	Tin (Sn)-Dissolved (mg/L)	DLM <0.050	DLM <0.050	DLM <0.050	DLM <0.050	DLM <0.050
	Titanium (Ti)-Dissolved (mg/L)	DLM 0.0124	DLM <0.0060	DLM 0.0135	DLM 0.0081	DLM <0.060
	Uranium (U)-Dissolved (mg/L)	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.0020	DLM <0.020
	Vanadium (V)-Dissolved (mg/L)	DLM 0.129	DLM 0.152	DLM 0.077	DLM 0.099	DLM 0.863

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L909782-6	L909782-7			
	Description	WATER	WATER			
	Sampled Date	04-JUL-10	15-JUL-10			
	Sampled Time	14:00	14:00			
	Client ID	10WBW002-02	10WBW001-07			
Grouping	**Analyte**					
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	<0.40 DLM	<0.0020 DLM			
	Silver (Ag)-Total (mg/L)	<0.020 DLM	<0.00010			
	Sodium (Na)-Total (mg/L)	240 DLM	29.2			
	Thallium (Tl)-Total (mg/L)	<0.020 DLM	<0.00010			
	Tin (Sn)-Total (mg/L)	<0.080 DLM	<0.050			
	Titanium (Ti)-Total (mg/L)	0.81 DLM	0.0013			
	Uranium (U)-Total (mg/L)	<0.020 DLM	<0.00010			
	Vanadium (V)-Total (mg/L)	1.34 DLM	<0.0010			
	Zinc (Zn)-Total (mg/L)	<0.80 DLM	<0.0040			
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<1.0 DLM	<0.010			
	Antimony (Sb)-Dissolved (mg/L)	<0.080 DLM	<0.00040			
	Arsenic (As)-Dissolved (mg/L)	0.421 DLM	0.00068			
	Barium (Ba)-Dissolved (mg/L)	0.770 DLM	0.0036			
	Beryllium (Be)-Dissolved (mg/L)	<0.10 DLM	<0.0010			
	Boron (B)-Dissolved (mg/L)	0.99 DLM	<0.050			
	Cadmium (Cd)-Dissolved (mg/L)	<0.010 DLM	<0.000050			
	Calcium (Ca)-Dissolved (mg/L)	79800 RRV	9.70			
	Chromium (Cr)-Dissolved (mg/L)	0.328 DLM	<0.0050			
	Cobalt (Co)-Dissolved (mg/L)	0.074 DLM	<0.0020			
	Copper (Cu)-Dissolved (mg/L)	<0.12 DLM	0.0016			
	Iron (Fe)-Dissolved (mg/L)	<1.5 DLM	0.035			
	Lead (Pb)-Dissolved (mg/L)	<0.020 DLM	<0.00010			
	Lithium (Li)-Dissolved (mg/L)	<0.60 DLM	0.0040			
	Magnesium (Mg)-Dissolved (mg/L)	124 RRV	5.96			
	Manganese (Mn)-Dissolved (mg/L)	<0.25 DLM	0.0060			
	Mercury (Hg)-Dissolved (mg/L)	<0.00010	<0.00010			
	Molybdenum (Mo)-Dissolved (mg/L)	0.180 DLM	<0.0050			
	Nickel (Ni)-Dissolved (mg/L)	1.68 DLM	<0.0020			
	Potassium (K)-Dissolved (mg/L)	52 RRV	2.11			
	Selenium (Se)-Dissolved (mg/L)	<0.40 DLM	<0.0020 DLM			
	Silver (Ag)-Dissolved (mg/L)	<0.020 DLM	<0.00010			
	Sodium (Na)-Dissolved (mg/L)	300 RRV	29.6			
	Thallium (Tl)-Dissolved (mg/L)	<0.010 DLM	<0.00010			
	Tin (Sn)-Dissolved (mg/L)	<0.050 DLM	<0.050			
	Titanium (Ti)-Dissolved (mg/L)	<0.060 DLM	<0.0010			
	Uranium (U)-Dissolved (mg/L)	<0.020 DLM	<0.00010			
	Vanadium (V)-Dissolved (mg/L)	1.08 DLM	0.0011			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	Sample ID Description Sampled Date Sampled Time Client ID	L909782-1 WATER 08-JUL-10 15:00 10WBW001-01	L909782-2 WATER 09-JUL-10 14:00 10WBW001-02	L909782-3 WATER 09-JUL-10 14:00 10WBW001-03	L909782-4 WATER 09-JUL-10 14:00 10WBW001-04	L909782-5 WATER 03-JUL-10 14:00 10WBW002-01
WATER							
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)		0.044 DLM	0.041 DLM	0.026 DLM	0.022 DLM	<0.20 DLM

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L909782-6	L909782-7			
	Description	WATER	WATER			
	Sampled Date	04-JUL-10	15-JUL-10			
	Sampled Time	14:00	14:00			
	Client ID	10WBW002-02	10WBW001-07			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)	<0.20 DLM	<0.0020			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
RRV	Reported Result Verified By Repeat Analysis
BL:INT	Balance Reviewed: Interference Or Non-Measured Component
DLA	Detection Limit Adjusted For required dilution
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-ED	Water	Chloride by IC	APHA 4110 B-ION CHROMATOGRAPHY
DENSITY-ED	Water	Density	CSSS-Gravimetric
F-IC-ED	Water	Fluoride by IC	APHA 4110 B-ION CHROMATOGRAPHY
HG-D-CVAA-ED	Water	Mercury (Hg) - Dissolved	EPA 245.7 / EPA 245.1
HG-T-CVAA-ED	Water	Mercury (Hg) - Total	EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-ICP-ED	Water	Dissolved Metals in Water by ICPOES	APHA 3120 B-ICP-OES
MET-D-L-MS-ED	Water	Diss. Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-L-MS-ED	Water	Total Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite	CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
NO3-IC-ED	Water	Nitrate as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
SO4-IC-ED	Water	Sulfate by IC	APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of 1

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	SRK Consulting	☑ Standard ☐ Other		◉ Regular (Default)
Contact:	Melissa Pitz	☑ PDF ☑ Excel ☑ Digital ☐ Fax		○ Priority (Specify Date Required → →) Surcharges apply
Address:	Suite 205, 2100 Airport Drive	Email 1:	mpitz@srk.com	○ Emergency (1 Business Day) - 100% Surcharge
	Saskatoon, SK, Canada, S7L 6M6	Email 2:	dmackie@srk.com	○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	(306) 955-4732 Fax: 306) 955-4750			
Invoice To	Same as Report ? ☐ Yes ☐ No	**Client / Project Information**		**Analysis Request**
Company:		Job #:	1CH008.013	Please indicate below Filtered, Preserved or both (F, P, F/P)
Contact:		PO / AFE:		
Address:		LSD:		
Phone:	Fax:	Quote #:		
Lab Work Order # (lab use only)	L909782	**ALS Contact:**	Sean Whitaker	**Sampler:**

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P	F/P	met-tot-ccme-ed	met-dis-ccme-ed	Rou +F (TDS)	density - ed	Number of Containers
✓	10WBW001-01	08-Jul-10	15:00	Water			x	x	x	x	
✓	10WBW001-02	09-Jul-10	14:00	Water			x	x	x	x	
✓	10WBW001-03	09-Jul-10	14:00	Water			x	x	x	x	
✓	10WBW001-04	09-Jul-10	14:00	Water			x	x	x	x	
✓	10WBW002-01	03-Jul-10	14:00	Water			x	x	x	x	
✓	10WBW002-02	04-Jul-10	14:00	Water			x	x	x	x	
✓	10WBW001-07	15-Jul-10	14:00	Water			x	x	x	x	

Special Instructions / Regulations / Hazardous Details

these samples have a very high EC>20 mS - except for the last sample

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
				17-July-10	8AM	10 °C				

GENF 18.02 Front

Certificate of Analysis

SRK CONSULTING (CANADA) INC.
ATTN: DAN MACKIE
SUITE 2200
1066 WEST HASTINGS ST.
VANCOUVER BC V6E 3X2

Report Date: 06-MAY-10 10:48 (MT)
Version: FINAL

Lab Work Order #: L880950 **Date Received:** 27-APR-10

Project P.O. #: 1CH008.013
Job Reference:
Legal Site Desc: HOPE BAY - DORIS C
CofC Numbers: 08-011846, 08-011847

Other Information:

Comments: Detection limits adjusted due to dilutions and matrix effects.

Sean Whitaker

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.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L880950-1	L880950-2	L880950-3	L880950-4	L880950-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	26-APR-10	25-APR-10	25-APR-10	25-APR-10	25-APR-10
	Sampled Time	12:30	16:00	16:45	16:00	
	Client ID	10WBW001-01	10WBW001-02	10WBW001-03	10WBW001-04	10WBW001-05
Grouping	**Analyte**					
WATER						
Physical Tests	Total Dissolved Solids (mg/L)	192	197	3790	202	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	34.4	35.6	52.9	35.2	
	Bicarbonate (HCO3) (mg/L)	41.9	43.4	64.5	43.0	
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	
	Chloride (Cl) (mg/L)	76.6	83.4	1960 DLA	82.5	
	Conductivity (EC) (uS/cm)	324	335	6430	339	
	Fluoride (F) (mg/L)	0.069	0.069	<0.50 DLM	0.069	
	Hardness (as CaCO3) (mg/L)	53.6	57.8	854	59.8	
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	
	Ion Balance (%)	95.1	93.7	110	99.3	
	Nitrate and Nitrite as N (mg/L)	<0.071	<0.071	<0.71 DLM	<0.071	
	Nitrate (as N) (mg/L)	0.053	0.053	<0.50 DLM	<0.050	
	Nitrite (as N) (mg/L)	<0.050	<0.050	<0.50 DLM	<0.050	
	pH (pH)	7.10	7.20	8.16	7.26	
	TDS (Calculated) (mg/L)	158	170	3580	171	
	Sulfate (SO4) (mg/L)	3.44	4.05	195 DLA	3.70	
Total Metals	Aluminum (Al)-Total (mg/L)	<0.010	0.014	2.10 DLM	0.021	<0.010
	Antimony (Sb)-Total (mg/L)	<0.00040	<0.00040	<0.0080 DLM	<0.00040	<0.00040
	Arsenic (As)-Total (mg/L)	0.00074	0.00076	0.0134 DLM	0.00067	<0.00040
	Barium (Ba)-Total (mg/L)	0.0036	0.0050	0.0232 DLM	0.0057	<0.0030
	Beryllium (Be)-Total (mg/L)	<0.0010	<0.0010	<0.020 DLM	<0.0010	<0.0010
	Boron (B)-Total (mg/L)	<0.050	<0.050	0.387 DLM	<0.050	<0.050
	Cadmium (Cd)-Total (mg/L)	<0.000050	<0.000050	<0.0010 DLM	<0.000050	<0.000050
	Calcium (Ca)-Total (mg/L)	8.47	10.5	105	10.8	<0.50
	Chromium (Cr)-Total (mg/L)	<0.0050	<0.0050	0.051 DLM	<0.0050	<0.0050
	Cobalt (Co)-Total (mg/L)	<0.0020	<0.0020	<0.0040 DLM	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)	0.0023	0.0040	<0.020 DLM	0.0054	<0.0010
	Iron (Fe)-Total (mg/L)	0.017	0.118	4.04	0.149	<0.010
	Lead (Pb)-Total (mg/L)	0.00089	0.00063	<0.0020 DLM	0.00018	<0.00010
	Lithium (Li)-Total (mg/L)	<0.010	<0.010	<0.12 DLM	<0.010	<0.010
	Magnesium (Mg)-Total (mg/L)	6.73	8.59	131	8.73	<0.10
	Manganese (Mn)-Total (mg/L)	0.0035	0.0066	0.238	0.0072	<0.0020
	Mercury (Hg)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Molybdenum (Mo)-Total (mg/L)	<0.0050	<0.0050	0.0364 DLM	<0.0050	<0.0050
	Nickel (Ni)-Total (mg/L)	<0.0020	<0.0020	0.0043 DLM	<0.0020	<0.0020
	Potassium (K)-Total (mg/L)	2.30	3.13	35.7	3.14	<0.10
	Selenium (Se)-Total (mg/L)	0.00056	0.00058	0.0153 DLM	0.00057	<0.00040

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L880950-1 WATER 26-APR-10 12:30 10WBW001-01	L880950-2 WATER 25-APR-10 16:00 10WBW001-02	L880950-3 WATER 25-APR-10 16:45 10WBW001-03	L880950-4 WATER 25-APR-10 16:00 10WBW001-04	L880950-5 WATER 25-APR-10 10WBW001-05
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.00050 DLM	<0.00050 DLM	<0.0020 DLM	<0.00050 DLM	<0.00050 DLM
	Sodium (Na)-Total (mg/L)	34.2	43.0	1060	43.9	<1.0
	Thallium (Tl)-Total (mg/L)	<0.00010	<0.00010	<0.0020 DLM	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.050	<0.050	<0.050 DLM	<0.050	<0.050
	Titanium (Ti)-Total (mg/L)	<0.0010	<0.0010	0.029 DLM	<0.0010	<0.0010
	Uranium (U)-Total (mg/L)	<0.00010	<0.00010	<0.0020 DLM	<0.00010	<0.00010
	Vanadium (V)-Total (mg/L)	<0.0010	<0.0010	0.014 DLM	<0.0010	<0.0010
	Zinc (Zn)-Total (mg/L)	0.0090 RRV	0.0131 RRV	<0.080 DLM	0.0252 RRV	<0.0040
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<0.010	<0.010	2.07 DLM	<0.010	<0.010
	Antimony (Sb)-Dissolved (mg/L)	<0.00040	<0.00040	<0.0080 DLM	<0.00040	<0.00040
	Arsenic (As)-Dissolved (mg/L)	0.00057	0.00066	0.0131 DLM	0.00068	<0.00040
	Barium (Ba)-Dissolved (mg/L)	0.0037	0.0040	0.0232 DLM	0.0042	<0.0030
	Beryllium (Be)-Dissolved (mg/L)	<0.0010	<0.0010	<0.010 DLM	<0.0010	<0.0010
	Boron (B)-Dissolved (mg/L)	<0.050	<0.050	0.377 DLM	<0.050	<0.050
	Cadmium (Cd)-Dissolved (mg/L)	<0.000050	<0.000050	<0.0010 DLM	<0.000050	<0.000050
	Calcium (Ca)-Dissolved (mg/L)	9.30	10.1	111	10.3	
	Chromium (Cr)-Dissolved (mg/L)	<0.0050	<0.0050	0.0122 DLM	<0.0050	<0.0050
	Cobalt (Co)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020 DLM	<0.0020	<0.0020
	Copper (Cu)-Dissolved (mg/L)	0.0022	0.0028	<0.012 DLM	0.0028	<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030	0.072	3.91 DLM	0.075	
	Lead (Pb)-Dissolved (mg/L)	0.00069	0.00015	<0.0020 DLM	0.00012	<0.00010
	Lithium (Li)-Dissolved (mg/L)	0.0032	0.0034	<0.060 DLM	<0.0030	<0.0030
	Magnesium (Mg)-Dissolved (mg/L)	7.37	7.90	140	8.28	
	Manganese (Mn)-Dissolved (mg/L)	<0.0050	0.0054	0.245	0.0056	
	Mercury (Hg)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0050	<0.0050	0.0345 DLM	<0.0050	<0.0050
	Nickel (Ni)-Dissolved (mg/L)	<0.0020	<0.0020	0.0046 DLM	<0.0020	<0.0020
	Potassium (K)-Dissolved (mg/L)	2.31	2.47	34.2	2.67	
	Selenium (Se)-Dissolved (mg/L)	0.00058	0.00044	0.0167 DLM	0.00060	<0.00040
	Silver (Ag)-Dissolved (mg/L)	<0.00010	<0.00010	<0.0020 DLM	<0.00010	<0.00010
	Sodium (Na)-Dissolved (mg/L)	38.0	40.0	1110	42.0	
	Thallium (Tl)-Dissolved (mg/L)	<0.00010	<0.00010	<0.0010 DLM	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.050	<0.050	<0.050 DLM	<0.050	<0.050
	Titanium (Ti)-Dissolved (mg/L)	<0.0010	<0.0010	0.0359 DLM	<0.0010	<0.0010
	Uranium (U)-Dissolved (mg/L)	<0.00010	<0.00010	<0.0020 DLM	<0.00010	<0.00010
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010	0.0140 DLM	<0.0010	<0.0010
	Zinc (Zn)-Dissolved (mg/L)	0.0061	0.0032	0.029 DLM	0.0038	<0.0020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
EHT	Exceeded Recommended Holding Time Prior To Analysis - NO2, NO3, PH

Qualifiers for Individual Samples Listed:

Sample Numbe	Client Sample ID	Qualifier	Description
L880950-1	10WBW001-01	EHT	Exceeded Recommended Holding Time Prior To Analysis - NO2, NO3, PH

Qualifiers for Individual Parameters Listed:

Qualifier	Description
RRV	Reported Result Verified By Repeat Analysis
DLA	Detection Limit Adjusted For required dilution
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-ED	Water	Chloride by IC	APHA 4110 B-ION CHROMATOGRAPHY
F-IC-ED	Water	Fluoride by IC	APHA 4110 B-ION CHROMATOGRAPHY
HG-D-CVAA-ED	Water	Mercury (Hg) - Dissolved	EPA 245.7 / EPA 245.1
HG-T-CVAA-ED	Water	Mercury (Hg) - Total	EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-ICP-ED	Water	Dissolved Metals in Water by ICPOES	APHA 3120 B-ICP-OES
MET-D-L-MS-ED	Water	Diss. Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-L-MS-ED	Water	Total Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
NO2+NO3-CALC-ED	Water	Nitrate+Nitrite	CALCULATION
NO2-IC-ED	Water	Nitrite as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
NO3-IC-ED	Water	Nitrate as N by IC	APHA 4110 B-ION CHROMATOGRAPHY
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
SO4-IC-ED	Water	Sulfate by IC	APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

08-011846 08-011847

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

L880950

COC # 08-011846

Page 1 of 2

Report to:		Report Format / Distribution		Service Requested: (rush - subject to availability)	
Company:	SRK Consulting	Standard: X	Other:	X	Regular (Default)
Contact:	DAN MACKIE	Select: PDF X	Excel X Digital		Priority (2-3 Business Days) - 50% Surcharge
Address:	2200-1066 W. HASTINGS ST	Email 1:	dmackie@srk.com		Emergency (1 Business Day) - 100% Surcharge
	VANCOUVER BC	Email 2:	mpitz@srk.com		For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	604 681 4196 Fax:			P-5 ml HNO_3	Analysis Request
Invoice To:	Same as Report ? (Yes) No ?	Client / Project Information:		(Indicate Filtered or Preserved, F/P)	
Company:		Job #:			
Contact:		PO / AFE:	1CH008.013		
Address:		Legal Site Description:	HOPE BAY - DORIS C		
Phone:	Fax:	Quote #:			
Lab Work Order # (lab use only)		ALS Contact:	Sampler: JACEK SCIBEK		

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	Routine TDS	Total Metals	Dissolved Metals	~~Isotopes~~	Dissolved Metals	~~Isotopes~~							Number of Containers
	10WBW001-01	APR 26 2010	12:30	WATER	X											(1 liter)	1
	10WBW001-01	APR 26 2010	12:30	WATER		X										(0.5 liter)	1
	10WBW001-01	APR 26 2010	12:30	WATER			X									(0.5 liter)	1
	~~10WBW001-01~~ J.S.	~~APR 26 2010~~	~~12:30~~	~~WATER~~				X								(125 ml)	1
	10WBW001-02	APR 25 2010	16:00	WATER	X											(1 liter)	1
	10WBW001-02	APR 25 2010	16:00	WATER		X										(250 ml)	1
	10WBW001-02	APR 25 2010	15:30	WATER			X									(250 ml)	1
	~~10WBW001-02~~ J.S.	~~APR 25 2010~~	~~15:30~~	~~WATER~~				X								(125 ml)	1
	10WBW001-03	APR 25 2010	16:45	WATER	X											(1 liter)	1
	10WBW001-03	APR 25 2010	16:45	WATER		X										(250 ml)	1
	10WBW001-03	APR 25 2010	16:30	WATER					X							(250 ml)	1
	~~10WBW001-03~~ J.S.	~~APR 25 2010~~	~~16:45~~	~~WATER~~						X						(125 ml)	1

Special Instructions / Regulations / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by: Jacek Scibek	Date & Time: APR 26 2010	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

L880950 COC # 08-011847

Report to:	Report Format / Distribution	Service Requested: (rush - subject to availability)
Company: SRK Consulting	Standard: X Other:	X Regular (Default)
Contact: Dan Mackie	Select: PDF X Excel X Digital	Priority (2-3 Business Days) - 50% Surcharge
Address: 2200-1066 W. Hastings St. VANCOUVER BC	Email 1: dmackie@srk.com	Emergency (1 Business Day) - 100% Surcharge
	Email 2: mpitz@srk.com	For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone: 604-681-4196 Fax:		P=5 ml HNO_3 Analysis Request
Invoice To: Same as Report ? (Yes) No ?	Client / Project Information:	(Indicate Filtered or Preserved, F/P)
Company:	Job #:	
Contact:	PO / AFE: 1CH008.013	
Address:	Legal Site Description: MORE BAY - DORIS C	
Phone: Fax:	Quote #:	
Lab Work Order # (lab use only)	ALS Contact:	Sampler: JACEK SCIBEK

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	Routine: TDS	P Total Metals	F/P Dissolved Metals									Number of Containers
	10 WBW 001-04	APR 25 2010	16:00	WATER	X									(1 liter)		1
	10 WBW 001-04	APR 25 2010	16:00	WATER		X								(250 ml)		1
	10 W BW 001-04	APR 25 2010	16:00	WATER			X							(250 ml)		1
	10 W BW 001-05	APR 25 2010		WATER	X									(1 liter)		1
	10 W BW 001-05	APR 25 2010		WATER		X								(0.5 liter)		1
	10 W BW 001-05	APR 25 2010		WATER			X							(0.5 liter)		1

Special Instructions / Regulations / Hazardous Details

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by: Jacek Scibek	Date & Time: APR 26 2010	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF

SRK CONSULTING (CANADA) INC.
ATTN: MELISSA PITZ
SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6
Phone: 306-955-4732

Date Received: 03-DEC-10
Report Date: 22-DEC-10 14:11 (MT)
Version: FINAL

Certificate of Analysis

Lab Work Order #: L960194
Project P.O. #: NOT SUBMITTED
Job Reference: 1CH008.013
Legal Site Desc:
C of C Numbers:

Comments: Please let me know if any parameters were missed and I will have them added to the file.
Note 132 sample is on hold as no analytical was requested.

SMW

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ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L960194-1	L960194-2	L960194-3	L960194-4	L960194-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	25-NOV-10	25-NOV-10	26-NOV-10	27-NOV-10	28-NOV-10
	Sampled Time	18:00	18:00	19:00	16:00	10:30
	Client ID	10WBW004-124	10WBW004-125	10WBW004-126	10WBW004-128	10WBW004-129
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	30900	30700	33800	31400	33000
	Density (kg/L)	1.00	1.02	1.02	1.02	1.02
	Hardness (as CaCO3) (mg/L)	12900	12700	12100	12100	12600
	pH (pH)	6.66	6.68	6.81	6.96	7.02
	Salinity (EC) (g/L)					
	Total Dissolved Solids (mg/L)	32000	30800	33500	31700	33900
Leachable Anions & Nutrients	Anion Sum (meq/L)	355	357	394	362	385
	Cation Sum (meq/L)	337	334	348	338	363
	Cation - Anion Balance (%)	-2.6	-3.4	-6.1	-3.5	-3.0
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	35.5	35.3	40.0	48.7	50.5
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	35.5	35.3	40.0	48.7	50.5
	Ammonia as N (mg/L)					
	Bromide (Br) (mg/L)	6.4	6.5	9.2	8.2	9.9
	Chloride (Cl) (mg/L)	12400	12400	13700	12600	13400
	Fluoride (F) (mg/L)	0.669	0.677	0.983	0.645	0.716
	Nitrate (as N) (mg/L)	<0.50	<0.50	<0.50	0.53	<0.50
	Nitrite (as N) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Ortho Phosphate as P (mg/L)					
	Total Phosphate as P (mg/L)					
	Silicate (as SIO2) (mg/L)					
	Sulfate (SO4) (mg/L)	264	260	336	322	349
Total Metals	Aluminum (Al)-Total (mg/L)	0.0114	0.0133	0.0152	0.0189	0.0110
	Antimony (Sb)-Total (mg/L)	0.0180	0.0180	0.0176	0.0199	0.0199
	Arsenic (As)-Total (mg/L)	<0.0020	<0.0020	<0.0030 DLM	<0.0020	<0.0030 DLM
	Barium (Ba)-Total (mg/L)	0.567	0.557	0.554	0.570	0.562
	Beryllium (Be)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Total (mg/L)	0.87	0.87	1.00	0.92	0.96
	Cadmium (Cd)-Total (mg/L)	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM
	Calcium (Ca)-Total (mg/L)	4460	4510	4730	4180	4330
	Cesium (Cs)-Total (mg/L)	0.00531	0.00519	0.00665	0.00600	0.00659
	Chromium (Cr)-Total (mg/L)	<0.0020 DLM	<0.0030 DLM	<0.0040 DLM	<0.0020 DLM	<0.0030 DLM
	Cobalt (Co)-Total (mg/L)	0.00712	0.00699	0.00562	0.00585	0.00537
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L960194-6	L960194-7	L960194-8		
	Description	WATER	WATER	WATER		
	Sampled Date	29-NOV-10	30-NOV-10	26-NOV-10		
	Sampled Time	11:00	09:00	18:00		
	Client ID	10WBW004-130	10WBW004-131	10WBW004-127		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	33000	31800	28.3		
	Density (kg/L)	1.02	1.01	1.01		
	Hardness (as CaCO3) (mg/L)	13300	11800			
	pH (pH)	7.09	7.03	6.34		
	Salinity (EC) (g/L)	21.0	20.2			
	Total Dissolved Solids (mg/L)	33300	32300	12		
Leachable Anions & Nutrients	Anion Sum (meq/L)	386	368			
	Cation Sum (meq/L)	381	338			
	Cation - Anion Balance (%)	-0.7	-4.2			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	53.0	53.5	<1.0		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	53.0	53.5	<1.0		
	Ammonia as N (mg/L)	1.96	1.95			
	Bromide (Br) (mg/L)	9.3	9.0	<0.050		
	Chloride (Cl) (mg/L)	13400	12800	6.33		
	Fluoride (F) (mg/L)	0.689	0.642	<0.020		
	Nitrate (as N) (mg/L)	<0.50	<0.50	<0.0050		
	Nitrite (as N) (mg/L)	<0.10	<0.10	<0.0010		
	Ortho Phosphate as P (mg/L)	<0.0010	<0.0010			
	Total Phosphate as P (mg/L)	0.148	0.155			
	Silicate (as SIO2) (mg/L)	8.2	6.5			
	Sulfate (SO4) (mg/L)	347	330	<0.50		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0167	0.0087			
	Antimony (Sb)-Total (mg/L)	0.0214	0.0203			
	Arsenic (As)-Total (mg/L)	<0.0030 DLM	<0.0030 DLM			
	Barium (Ba)-Total (mg/L)	0.596	0.564			
	Beryllium (Be)-Total (mg/L)	<0.00050	<0.00050			
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050			
	Boron (B)-Total (mg/L)	0.99	0.96			
	Cadmium (Cd)-Total (mg/L)	<0.00010 DLM	<0.00010 DLM			
	Calcium (Ca)-Total (mg/L)	4380	4110			
	Cesium (Cs)-Total (mg/L)	0.00671	0.00644			
	Chromium (Cr)-Total (mg/L)	<0.0030 DLM	<0.0030 DLM			
	Cobalt (Co)-Total (mg/L)	0.00612	0.00556			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L960194-1	L960194-2	L960194-3	L960194-4	L960194-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	25-NOV-10	25-NOV-10	26-NOV-10	27-NOV-10	28-NOV-10
	Sampled Time	18:00	18:00	19:00	16:00	10:30
	Client ID	10WBW004-124	10WBW004-125	10WBW004-126	10WBW004-128	10WBW004-129
Grouping	**Analyte**					
WATER						
Total Metals	Gallium (Ga)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	7.74 DLM	7.62 DLM	8.25 DLM	5.83 DLM	5.68 DLM
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)	0.052	0.051	0.059	0.054	0.055
	Magnesium (Mg)-Total (mg/L)	305	306	413	370	414
	Manganese (Mn)-Total (mg/L)	0.936	0.926	0.909	0.903	0.888
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)	0.0879	0.0853	0.118	0.0937	0.101
	Nickel (Ni)-Total (mg/L)	0.0309	0.0305	0.0220	0.0239	0.0216
	Phosphorus (P)-Total (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Potassium (K)-Total (mg/L)	46	47	50	48	50
	Rhenium (Re)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Rubidium (Rb)-Total (mg/L)	0.0568	0.0555	0.0556	0.0544	0.0536
	Selenium (Se)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Silicon (Si)-Total (mg/L)	1.62	1.68	1.67	1.76	1.77
	Silver (Ag)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Sodium (Na)-Total (mg/L)	1760	1780	2500	2190	2480
	Strontium (Sr)-Total (mg/L)	19.9	19.8	26.1	23.0	26.0
	Tellurium (Te)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Thallium (Tl)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Thorium (Th)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Tin (Sn)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Titanium (Ti)-Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Tungsten (W)-Total (mg/L)	<0.0010	<0.0010	0.0014	0.0015	0.0029
	Uranium (U)-Total (mg/L)	0.00517	0.00501	0.00636	0.00733	0.00840
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Yttrium (Y)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.188	0.206	0.204	0.148	0.196
	Zirconium (Zr)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	0.0178	0.0182	0.0178	0.0194	0.0211
	Arsenic (As)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Barium (Ba)-Dissolved (mg/L)	0.586	0.570	0.533	0.563	0.582
	Beryllium (Be)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Dissolved (mg/L)	0.93	0.90	0.97	0.92	1.01
	Cadmium (Cd)-Dissolved (mg/L)	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM	<0.00010 DLM

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L960194-6	L960194-7	L960194-8		
	Description	WATER	WATER	WATER		
	Sampled Date	29-NOV-10	30-NOV-10	26-NOV-10		
	Sampled Time	11:00	09:00	18:00		
	Client ID	10WBW004-130	10WBW004-131	10WBW004-127		
Grouping	**Analyte**					
WATER						
Total Metals	Gallium (Ga)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	5.21	4.89			
	Lead (Pb)-Total (mg/L)	<0.00050 DLM	<0.00050 DLM			
	Lithium (Li)-Total (mg/L)	0.057	0.053			
	Magnesium (Mg)-Total (mg/L)	411	394			
	Manganese (Mn)-Total (mg/L)	0.953	0.887			
	Mercury (Hg)-Total (mg/L)	<0.000050	<0.000050			
	Molybdenum (Mo)-Total (mg/L)	0.108	0.0942			
	Nickel (Ni)-Total (mg/L)	0.0228	0.0223			
	Phosphorus (P)-Total (mg/L)	<1.0	<1.0			
	Potassium (K)-Total (mg/L)	50	49			
	Rhenium (Re)-Total (mg/L)	<0.00050	<0.00050			
	Rubidium (Rb)-Total (mg/L)	0.0554	0.0544			
	Selenium (Se)-Total (mg/L)	<0.0020	<0.0020			
	Silicon (Si)-Total (mg/L)	1.80	1.81			
	Silver (Ag)-Total (mg/L)	<0.00010	<0.00010			
	Sodium (Na)-Total (mg/L)	2460	2360			
	Strontium (Sr)-Total (mg/L)	26.5	24.8			
	Tellurium (Te)-Total (mg/L)	<0.00050	<0.00050			
	Thallium (Tl)-Total (mg/L)	<0.000050	<0.000050			
	Thorium (Th)-Total (mg/L)	<0.00050	<0.00050			
	Tin (Sn)-Total (mg/L)	<0.0010	<0.0010			
	Titanium (Ti)-Total (mg/L)	<0.0050	<0.0050			
	Tungsten (W)-Total (mg/L)	0.0053	0.0015			
	Uranium (U)-Total (mg/L)	0.0101	0.00864			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Yttrium (Y)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.217	0.193			
	Zirconium (Zr)-Total (mg/L)	<0.00050	<0.00050			
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050			
	Antimony (Sb)-Dissolved (mg/L)	0.0207	0.0192			
	Arsenic (As)-Dissolved (mg/L)	<0.0020	<0.0020			
	Barium (Ba)-Dissolved (mg/L)	0.575	0.555			
	Beryllium (Be)-Dissolved (mg/L)	<0.00050	<0.00050			
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050	<0.00050			
	Boron (B)-Dissolved (mg/L)	0.96	0.95			
	Cadmium (Cd)-Dissolved (mg/L)	<0.00010 DLM	<0.00010 DLM			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L960194-1	L960194-2	L960194-3	L960194-4	L960194-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	25-NOV-10	25-NOV-10	26-NOV-10	27-NOV-10	28-NOV-10
	Sampled Time	18:00	18:00	19:00	16:00	10:30
	Client ID	10WBW004-124	10WBW004-125	10WBW004-126	10WBW004-128	10WBW004-129
Grouping	**Analyte**					
WATER						
Dissolved Metals	Calcium (Ca)-Dissolved (mg/L)	4630	4580	4180	4230	4350
	Cesium (Cs)-Dissolved (mg/L)	0.00553	0.00537	0.00648	0.00595	0.00683
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	0.00736	0.00708	0.00526	0.00575	0.00529
	Copper (Cu)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Gallium (Ga)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Dissolved (mg/L)	7.38	7.06	6.43	5.06	4.34
	Lead (Pb)-Dissolved (mg/L)	<0.00050 DLM	<0.00050 DLM	<0.00050 DLM	<0.00050 DLM	<0.00050 DLM
	Lithium (Li)-Dissolved (mg/L)	0.055	0.055	0.055	0.055	0.057
	Magnesium (Mg)-Dissolved (mg/L)	312	309	404	365	425
	Manganese (Mn)-Dissolved (mg/L)	0.989	0.950	0.888	0.899	0.911
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)	0.0866	0.0860	0.0990	0.0931	0.100
	Nickel (Ni)-Dissolved (mg/L)	0.0313	0.0301	0.0199	0.0229	0.0203
	Phosphorus (P)-Dissolved (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Potassium (K)-Dissolved (mg/L)	47	47	48	48	50
	Rhenium (Re)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Rubidium (Rb)-Dissolved (mg/L)	0.0587	0.0576	0.0530	0.0551	0.0564
	Selenium (Se)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0030 DLM	<0.0020	<0.0021 DLM
	Silicon (Si)-Dissolved (mg/L)	1.65	1.63	1.65	1.72	1.71
	Silver (Ag)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Sodium (Na)-Dissolved (mg/L)	1820	1790	2410	2200	2510
	Strontium (Sr)-Dissolved (mg/L)	21.3	20.1	25.3	23.1	27.0
	Tellurium (Te)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Thallium (Tl)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Thorium (Th)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Tin (Sn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Titanium (Ti)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Tungsten (W)-Dissolved (mg/L)	<0.0010	<0.0010	0.0020	0.0013	0.0029
	Uranium (U)-Dissolved (mg/L)	0.00523	0.00521	0.00730	0.00730	0.00909
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Yttrium (Y)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0944	0.0933	0.136	0.114	0.0941
	Zirconium (Zr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L960194-6	L960194-7	L960194-8		
	Description	WATER	WATER	WATER		
	Sampled Date	29-NOV-10	30-NOV-10	26-NOV-10		
	Sampled Time	11:00	09:00	18:00		
	Client ID	10WBW004-130	10WBW004-131	10WBW004-127		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Calcium (Ca)-Dissolved (mg/L)	4620	4080			
	Cesium (Cs)-Dissolved (mg/L)	0.00651	0.00621			
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050			
	Cobalt (Co)-Dissolved (mg/L)	0.00566	0.00529			
	Copper (Cu)-Dissolved (mg/L)	<0.00050	<0.00050			
	Gallium (Ga)-Dissolved (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Dissolved (mg/L)	4.45	4.45			
	Lead (Pb)-Dissolved (mg/L)	<0.00050 DLM	<0.00050 DLM			
	Lithium (Li)-Dissolved (mg/L)	0.055	0.054			
	Magnesium (Mg)-Dissolved (mg/L)	432	387			
	Manganese (Mn)-Dissolved (mg/L)	0.904	0.870			
	Mercury (Hg)-Dissolved (mg/L)	<0.000050	<0.000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.101	0.0967			
	Nickel (Ni)-Dissolved (mg/L)	0.0201	0.0208			
	Phosphorus (P)-Dissolved (mg/L)	<1.0	<1.0			
	Potassium (K)-Dissolved (mg/L)	53	49			
	Rhenium (Re)-Dissolved (mg/L)	<0.00050	<0.00050			
	Rubidium (Rb)-Dissolved (mg/L)	0.0541	0.0539			
	Selenium (Se)-Dissolved (mg/L)	<0.0045 DLM	<0.0020			
	Silicon (Si)-Dissolved (mg/L)	1.89	1.78			
	Silver (Ag)-Dissolved (mg/L)	<0.00010	<0.00010			
	Sodium (Na)-Dissolved (mg/L)	2600	2330			
	Strontium (Sr)-Dissolved (mg/L)	26.3	24.4			
	Tellurium (Te)-Dissolved (mg/L)	<0.00050	<0.00050			
	Thallium (Tl)-Dissolved (mg/L)	<0.000050	<0.000050			
	Thorium (Th)-Dissolved (mg/L)	<0.00050	<0.00050			
	Tin (Sn)-Dissolved (mg/L)	<0.0010	<0.0010			
	Titanium (Ti)-Dissolved (mg/L)	<0.0050	<0.0050			
	Tungsten (W)-Dissolved (mg/L)	0.0050	0.0014			
	Uranium (U)-Dissolved (mg/L)	0.0100	0.00863			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Yttrium (Y)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.137	0.131			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00050	<0.00050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-PCT-VA	Water	Alkalinity by Auto. Titration	APHA 2320 "Alkalinity"
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ALK-PCT-VA	Water	Alkalinity by Auto. Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the nitrite detection is by UV absorbance and not conductivity.			
ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the nitrate detection is by UV absorance and not conductivity.			
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
DENSITY-ED	Water	Density	CSSS-Gravimetric
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.			
F-SIE-VA	Water	Fluoride by SIE	APHA 4500-F "Fluoride"
This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using a selective ion electrode. This method has a significant negative interference (i.e. results could be biased low) when Al3+ is present in the sample at a concentration greater than 2.5 mg/L.			
F-SIE-VA	Water	Fluoride by SIE	APHA 4500-F Fluoride
This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using a selective ion electrode. This method has a significant negative interference (i.e. results could be biased low) when Al3+ is present in the sample at a concentration greater than 2.5 mg/L.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.			
HG-DIS-CVAFS-VA	Water	Dissolved Mercury in Water by CVAFS	EPA SW-846 3005A & 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 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-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).			
IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-L-HRMS-VA Water Diss. Metals in Water by HR-ICPMS EPA 200.8

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration modified from APHA Method 3030B.

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICPOES 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-T-L-HRMS-VA Water Total Metals in Water by HR-ICPMS EPA 200.8

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion modified from APHA Method 3030E.

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES 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 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 - optical emission spectrophotometry (EPA Method 6010B).

NH3-F-VA Water Ammonia by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulphuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

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

It is recommended that this analysis be conducted in the field.

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

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Dissolved ortho Phosphate by Colour APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-DO-COL-VA Water Dissolved ortho Phosphate by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-T-COL-VA Water Total Phosphate P by Color APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-T-COL-VA Water Total Phosphate P by Color APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

SALINITY-EC-VA Water Salinity by calculation using EC APHA 2520 B

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2520 "Salinity". Salinity is determined using a samples conductivity and the Practical Salinity Scale.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - 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.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of 1

Report To		Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	SRK Consulting		
Contact:	Melissa Pitz		Surcharges apply
Address:	Suite 205, 2100 Airport Drive	Email 1: mpitz@srk.com	
	Saskatoon, SK, Canada, S7L 6M6	Email 2: jhenshaw@.com	
Phone:	(306) 955-4732 Fax: 306) 955-4750		
Invoice To	Same as Report ?	**Client / Project Information**	
Company:		Job #: 1CH008.013	
Contact:		PO / AFE:	
Address:		LSD:	
Phone:	Fax:	Quote #: Q25959	

Lab Work Order # (lab use only): L960194

ALS Contact: Sean Whitaker

Sampler: J Jarolim

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Routine	Dis metals (F/P)	Total metals (P)	Ammonia (P)	silicates	Tds	density	salinity	PO4	Mercury			Number of Containers
	10WBW004-124	25-Nov-10	18:00	Water	x	x	x			x	x						
	10WBW004-125	25-Nov-10	18:00	Water	x	x	x			x	x						
	10WBW004-126	26-Nov-10	19:00	Water	x	x	x			x	x						
	10WBW004-128	27-Nov-10	16:00	Water	x	x	x			x	x						
	10WBW004-129	28.11.2010	10:30	Water	x	x	x			x	x						
	10WBW004-130	29.11.2010	11:00	Water	x	x	x	x	x	x	x	x	x	x			
	10WBW004-131	30.11.2010	9:00	Water	x	x	x	x	X	x	x	X	X	x			
	10WBW004-127				x	x	x			x	x			x			

Special Instructions / Regulations / Hazardous Details

SAMPLES ARE BRINE WATER WITH THE EXCEPTION OF 127

Failure to complete all portions of this form may delay analysis. Please fill in this form

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
J Jarolim	1-Dec-10			30-Nov / 3-Dec	5pm	NA °C				

GENF 18.02 Front

SRK CONSULTING (CANADA) INC.
ATTN: MELISSA PITZ
SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6
Phone: 306-955-4732

Date Received: 24-NOV-10
Report Date: 13-DEC-10 08:45 (MT)
Version: FINAL

Certificate of Analysis

Lab Work Order #: L957001
Project P.O. #: NOT SUBMITTED
Job Reference: 1CH008.013
Legal Site Desc:
C of C Numbers:

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L957001-1	L957001-2	L957001-3		
	Description	SEA WATER	SEA WATER	SEA WATER		
	Sampled Date	18-NOV-10	19-NOV-10	18-NOV-10		
	Sampled Time	18:00	10:00	16:00		
	Client ID	10WBW004-123-1	10WBW004-123-2	10WBW004-123-3		
Grouping	**Analyte**					
SEAWATER						
Physical Tests	Conductivity (uS/cm)	30200				
	Hardness (as CaCO3) (mg/L)		13900	12900		
	pH (pH)	7.05				
	Total Dissolved Solids (mg/L)	28500				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	35.8				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	35.8				
	Bromide (Br) (mg/L)	6.3				
	Chloride (Cl) (mg/L)	12100				
	Fluoride (F) (mg/L)	0.78				
	Nitrate (as N) (mg/L)	<0.50				
	Nitrite (as N) (mg/L)	<0.10				
	Ortho Phosphate as P (mg/L)	<0.0050				
	Total Phosphate as P (mg/L)	0.123				
	Silicate (as SIO2) (mg/L)	<10				
	Sulfate (SO4) (mg/L)	244				
Total Metals	Aluminum (Al)-Total (mg/L)			0.0469		
	Antimony (Sb)-Total (mg/L)			0.0184		
	Arsenic (As)-Total (mg/L)			<0.0020		
	Barium (Ba)-Total (mg/L)			0.530		
	Beryllium (Be)-Total (mg/L)			<0.00050		
	Bismuth (Bi)-Total (mg/L)			<0.00050		
	Boron (B)-Total (mg/L)			0.79		
	Cadmium (Cd)-Total (mg/L)			<0.00010 DLM		
	Calcium (Ca)-Total (mg/L)			4700		
	Cesium (Cs)-Total (mg/L)			0.00485		
	Chromium (Cr)-Total (mg/L)			0.00776		
	Cobalt (Co)-Total (mg/L)			0.00717		
	Copper (Cu)-Total (mg/L)			0.00083		
	Gallium (Ga)-Total (mg/L)			<0.00050		
	Iron (Fe)-Total (mg/L)			8.23		
	Lead (Pb)-Total (mg/L)			0.00602		
	Lithium (Li)-Total (mg/L)			0.049		
	Magnesium (Mg)-Total (mg/L)			287		
	Manganese (Mn)-Total (mg/L)			0.965		
	Mercury (Hg)-Total (mg/L)			<0.000010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L957001-1	L957001-2	L957001-3		
	Description	SEA WATER	SEA WATER	SEA WATER		
	Sampled Date	18-NOV-10	19-NOV-10	18-NOV-10		
	Sampled Time	18:00	10:00	16:00		
	Client ID	10WBW004-123-1	10WBW004-123-2	10WBW004-123-3		
Grouping	**Analyte**					
SEAWATER						
Total Metals	Molybdenum (Mo)-Total (mg/L)			0.0837		
	Nickel (Ni)-Total (mg/L)			0.0343		
	Phosphorus (P)-Total (mg/L)			<1.0		
	Potassium (K)-Total (mg/L)			44		
	Rhenium (Re)-Total (mg/L)			<0.00050		
	Rubidium (Rb)-Total (mg/L)			0.0533		
	Selenium (Se)-Total (mg/L)			<0.0020		
	Silicon (Si)-Total (mg/L)			1.61		
	Silver (Ag)-Total (mg/L)			<0.00010		
	Sodium (Na)-Total (mg/L)			1680		
	Strontium (Sr)-Total (mg/L)			17.2		
	Tellurium (Te)-Total (mg/L)			<0.00050		
	Thallium (Tl)-Total (mg/L)			<0.000050		
	Thorium (Th)-Total (mg/L)			<0.00050		
	Tin (Sn)-Total (mg/L)			<0.0010		
	Titanium (Ti)-Total (mg/L)			<0.0050		
	Tungsten (W)-Total (mg/L)			<0.0010		
	Uranium (U)-Total (mg/L)			0.00503		
	Vanadium (V)-Total (mg/L)			<0.00050		
	Yttrium (Y)-Total (mg/L)			<0.00050		
	Zinc (Zn)-Total (mg/L)			0.392		
	Zirconium (Zr)-Total (mg/L)			<0.00050		
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)		<0.0050			
	Antimony (Sb)-Dissolved (mg/L)		0.0182			
	Arsenic (As)-Dissolved (mg/L)		<0.0020			
	Barium (Ba)-Dissolved (mg/L)		0.594			
	Beryllium (Be)-Dissolved (mg/L)		<0.00050			
	Bismuth (Bi)-Dissolved (mg/L)		<0.00050			
	Boron (B)-Dissolved (mg/L)		0.84			
	Cadmium (Cd)-Dissolved (mg/L)		<0.00010 DLM			
	Calcium (Ca)-Dissolved (mg/L)		5050			
	Cesium (Cs)-Dissolved (mg/L)		0.00540			
	Chromium (Cr)-Dissolved (mg/L)		<0.00010			
	Cobalt (Co)-Dissolved (mg/L)		0.00779			
	Copper (Cu)-Dissolved (mg/L)		<0.00050			
	Gallium (Ga)-Dissolved (mg/L)		<0.00050			
	Iron (Fe)-Dissolved (mg/L)		8.05			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L957001-1	L957001-2	L957001-3		
	Description	SEA WATER	SEA WATER	SEA WATER		
	Sampled Date	18-NOV-10	19-NOV-10	18-NOV-10		
	Sampled Time	18:00	10:00	16:00		
	Client ID	10WBW004-123-1	10WBW004-123-2	10WBW004-123-3		
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)		<0.00030			
	Lithium (Li)-Dissolved (mg/L)		0.054			
	Magnesium (Mg)-Dissolved (mg/L)		311			
	Manganese (Mn)-Dissolved (mg/L)		1.01			
	Mercury (Hg)-Dissolved (mg/L)		<0.000010			
	Molybdenum (Mo)-Dissolved (mg/L)		0.0902			
	Nickel (Ni)-Dissolved (mg/L)		0.0320			
	Phosphorus (P)-Dissolved (mg/L)		<1.0			
	Potassium (K)-Dissolved (mg/L)		47			
	Rhenium (Re)-Dissolved (mg/L)		<0.00050			
	Rubidium (Rb)-Dissolved (mg/L)		0.0601			
	Selenium (Se)-Dissolved (mg/L)		<0.0020			
	Silicon (Si)-Dissolved (mg/L)		1.57			
	Silver (Ag)-Dissolved (mg/L)		<0.00010			
	Sodium (Na)-Dissolved (mg/L)		1820			
	Strontium (Sr)-Dissolved (mg/L)		18.8			
	Tellurium (Te)-Dissolved (mg/L)		<0.00050			
	Thallium (Tl)-Dissolved (mg/L)		<0.000050			
	Thorium (Th)-Dissolved (mg/L)		<0.00050			
	Tin (Sn)-Dissolved (mg/L)		<0.0010			
	Titanium (Ti)-Dissolved (mg/L)		<0.0050			
	Tungsten (W)-Dissolved (mg/L)		<0.0010			
	Uranium (U)-Dissolved (mg/L)		0.00512			
	Vanadium (V)-Dissolved (mg/L)		<0.00050			
	Yttrium (Y)-Dissolved (mg/L)		<0.00050			
	Zinc (Zn)-Dissolved (mg/L)		0.156			
	Zirconium (Zr)-Dissolved (mg/L)		<0.00050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L957001-1	L957001-4			
	Description	SEA WATER	SEAWATER			
	Sampled Date	18-NOV-10	19-NOV-10			
	Sampled Time	18:00	10:00			
	Client ID	10WBW004-123-1	10WBW004-123-4			
Grouping	**Analyte**					
WATER						
Physical Tests	Density (kg/L)	1.02				
Anions and Nutrients	Ammonia as N (mg/L)		2.33			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-C-PCT-VA	Seawater	Alkalinity by Titration (seawataer)	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-C-NO2-IC-VA	Seawater	Nitrite by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the detection of nitrite is by UV absorbance and not conductivity.

ANIONS-C-NO3-IC-VA	Seawater	Nitrate by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, nitrate detection is by UV absorbance and not conductivity.

ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

DENSITY-ED	Water	Density	CSSS-Gravimetric
EC-C-PCT-VA	Seawater	Conductivity (Automated) (seawater)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

F-ISE-VA	Seawater	Fluoride by SIE	BASED ON APHA 4500-F FLUORIDE

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.

HARDNESS-CALC-VA	Seawater	Hardness	APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-DIS-C-CVAFS-VA	Seawater	Diss. Mercury in Seawater by CVAFS	PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater 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-C-CVAFS-VA	Seawater	Total Mercury in Seawater by CVAFS	PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater 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-D-L-HRMS-VA	Seawater	Diss. Metals in Seawater by HR-ICPMS	EPA 200.8

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.

MET-DIS-C-ICP-VA	Seawater	Diss. Metals in Seawater by ICPOES	PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-L-HRMS-VA	Seawater	Tot. Metals in Seawater by HR-ICPMS	EPA 200.8

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.

MET-TOT-C-ICP-VA	Seawater	Total Metals in Seawater by ICPOES	PUGET SOUND PROTOCOLS, EPA 6010B

Reference Information

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

NH3-SIE-VA Water Ammonia by SIE APHA 4500 D. - NH3 NITROGEN (AMMONIA)

This analysis is carried out, on sulphuric acid preserved samples, using procedures adapted from APHA Method 4500-NH3 "Nitrogen (Ammonia)". Ammonia is determined using an ammonia selective electrode.

PH-C-PCT-VA Seawater pH by Meter (Automated) (seawater) 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.

It is recommended that this analysis be conducted in the field.

PO4-C-DO-COL-VA Seawater Dis. ortho Phosphate by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-C-T-COL-VA Seawater Total Phosphate P by Colour (seawater) APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

SILICATE-C-COL-VA Seawater Silicate by Colourimetric (seawater) APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

TDS-VA Seawater 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.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of 1

Report To				**Report Format / Distribution**				**Service Requested** (Rush for routine analysis subject to availability)	
Company:	SRK Consulting			☑ Standard	☐ Other			◉ Regular (Default)	
Contact:	Melissa Pitz			☑ PDF	☑ Excel	☑ Digital	☐ Fax	○ Priority (Specify Date Required → →)	Surcharges apply
Address:	Suite 205, 2100 Airport Drive			Email 1:	mpitz@srk.com			○ Emergency (1 Business Day) - 100% Surcharge	
Saskatoon, SK, Canada, S7L 6M6				Email 2:	dmackie@srk.com			○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS	
Phone:	(306) 955-4732	Fax:	306) 955-4750					**Analysis Request**	
Invoice To	Same as Report ?	☑ Yes	☐ No	**Client / Project Information**				Please indicate below Filtered, Preserved or both (F, P, F/P)	
Company:				Job #:	1CH008.013				
Contact:				PO / AFE:					
Address:				LSD:					
Phone:		Fax:		Quote #:	Q25959				
Lab Work Order # (lab use only)	L950 61			**ALS Contact:**	Sean Whitaker	**Sampler:**	Robert Bowden		

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Routine	F/P Dis metals	P Total metals	P Nutrients	Isotopes	Number of Containers
	10WBW004-123-1	18-Nov-10	18:00	Water	✓					2
	10WBW004-123-2	19-Nov-10	10:00	Water		✓				1
	10WBW004-123-3	18-Nov-10	16:00	Water			✓			1
	10WBW004-123-4	19-Nov-10	10:00	Water				✓		1
	Melissa Pitz, SRK, will provide testing details									

Special Instructions / Regulations / Hazardous Details

* HOLD FOR INSTRUCTIONS FROM MELISSA PITZ*

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
R Bowden	24-Nov-10	8:00				°C				

SRK CONSULTING (CANADA) INC.
ATTN: MELISSA PITZ
SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6
Phone: 306-955-4732

Date Received: 24-NOV-10
Report Date: 08-DEC-10 12:17 (MT)
Version: FINAL

Certificate of Analysis

Lab Work Order #: L956881
Project P.O. #: NOT SUBMITTED
Job Reference: 1CH008.013
Legal Site Desc:
C of C Numbers:

Comments: To Note: Please review the metals data focusing on Na and Sr in samples 1 and 2 total and dissolved. ALS believes that a bottle labelling error occurred. After extensive data review sample 1 dissolved is believed to correspond with sample 2 total metals. The COC states a total and dissolved from sample 1.

L956881-1 total metals bottle was labelled on the 7-nov-10
L956881-1 dissolved metals bottle was labelled on the 8-nov-10
L956881-2 total metals bottle was labelled 8-nov-10

Please let ALS know if you require further information.

Also to Note samples were diluted due to high concentrations of Ca. Detection limits were adjusted accordingly.

Regards
Sean Whitaker

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L956881-1 SEAWATER 07-NOV-10 17:00 10WBW002-109	L956881-2 SEAWATER 08-NOV-10 11:00 10WBW002-109	L956881-4 SEAWATER 13-NOV-10 11:00 10WBW002-121		
SEAWATER						
Physical Tests	Conductivity (uS/cm)			182000		
	Hardness (as CaCO3) (mg/L)	187000	189000	183000		
	pH (pH)			8.51		
	Total Dissolved Solids (mg/L)			223000		
Anions and Nutrients	Bromide (Br) (mg/L)			<250		
	Chloride (Cl) (mg/L)			133000		
	Fluoride (F) (mg/L)			<100		
	Nitrate (as N) (mg/L)			<25		
	Nitrite (as N) (mg/L)			<5.0		
	Ortho Phosphate as P (mg/L)			<0.10		
	Total Phosphate as P (mg/L)			1.01		
	Silicate (as SIO2) (mg/L)			<100 DLM		
	Sulfate (SO4) (mg/L)			<2500		
Total Metals	Aluminum (Al)-Total (mg/L)	0.161	9.40	9.94		
	Antimony (Sb)-Total (mg/L)	0.0104	0.0107	0.0117		
	Arsenic (As)-Total (mg/L)	<0.020	<0.020	<0.020		
	Barium (Ba)-Total (mg/L)	0.860	0.827	0.832		
	Beryllium (Be)-Total (mg/L)	<0.0050 DLA	<0.0050	<0.0050		
	Bismuth (Bi)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
	Boron (B)-Total (mg/L)	<1.0	<1.0	<1.0		
	Cadmium (Cd)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Calcium (Ca)-Total (mg/L)	77400	75500	78800		
	Cesium (Cs)-Total (mg/L)	0.0057	0.0061	0.0063		
	Chromium (Cr)-Total (mg/L)	0.0062	0.107	0.120		
	Cobalt (Co)-Total (mg/L)	<0.00050	0.00841	0.00949		
	Copper (Cu)-Total (mg/L)	0.0242	0.0467	0.0585		
	Gallium (Ga)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
	Iron (Fe)-Total (mg/L)	0.51	38.6	54.6		
	Lead (Pb)-Total (mg/L)	0.0039	0.0438	0.0663		
	Lithium (Li)-Total (mg/L)	<0.20	0.44	<0.20		
	Magnesium (Mg)-Total (mg/L)	113	129	135		
	Manganese (Mn)-Total (mg/L)	0.0233	1.05	1.15		
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010	0.000014		
	Molybdenum (Mo)-Total (mg/L)	0.178	0.178	0.193		
	Nickel (Ni)-Total (mg/L)	0.0076	0.0359	0.0402		
	Phosphorus (P)-Total (mg/L)	<10	<10	<10		
	Potassium (K)-Total (mg/L)	<200	<200	<200		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	Sample ID: L956881-1 Description: SEAWATER Sampled Date: 07-NOV-10 Sampled Time: 17:00 Client ID: 10WBW002-109	Sample ID: L956881-2 Description: SEAWATER Sampled Date: 08-NOV-10 Sampled Time: 11:00 Client ID: 10WBW002-109	Sample ID: L956881-4 Description: SEAWATER Sampled Date: 13-NOV-10 Sampled Time: 11:00 Client ID: 10WBW002-121		
SEAWATER						
Total Metals	Rhenium (Re)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
	Rubidium (Rb)-Total (mg/L)	0.051	0.053	<0.050		
	Selenium (Se)-Total (mg/L)	<0.020	<0.020	<0.020		
	Silicon (Si)-Total (mg/L)	<5.0	25.4	27.8		
	Silver (Ag)-Total (mg/L)	<0.0010	0.0018	0.0022		
	Sodium (Na)-Total (mg/L)	280	1770	450		
	Strontium (Sr)-Total (mg/L)	33.1	59.0	37.3		
	Tellurium (Te)-Total (mg/L)	<0.0050	<0.0050 DLA	<0.0050 DLA		
	Thallium (Tl)-Total (mg/L)	0.00054	0.00052	<0.00050		
	Thorium (Th)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
	Tin (Sn)-Total (mg/L)	<0.010	<0.010	<0.010		
	Titanium (Ti)-Total (mg/L)	<0.050	0.366	0.378		
	Tungsten (W)-Total (mg/L)	0.028	0.028	0.030		
	Uranium (U)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Vanadium (V)-Total (mg/L)	<0.0050	0.0279	0.0282		
	Yttrium (Y)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
	Zinc (Zn)-Total (mg/L)	0.595	0.373	0.557		
	Zirconium (Zr)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<0.050		<0.050		
	Antimony (Sb)-Dissolved (mg/L)	0.0093		0.0094		
	Arsenic (As)-Dissolved (mg/L)	<0.020		<0.020		
	Barium (Ba)-Dissolved (mg/L)	0.833		0.817		
	Beryllium (Be)-Dissolved (mg/L)	<0.0050 DLA		<0.0050		
	Bismuth (Bi)-Dissolved (mg/L)	<0.0050		<0.0050		
	Boron (B)-Dissolved (mg/L)	<1.0		<1.0		
	Cadmium (Cd)-Dissolved (mg/L)	<0.00050		<0.00050		
	Calcium (Ca)-Dissolved (mg/L)	74700		73100		
	Cesium (Cs)-Dissolved (mg/L)	0.0063		0.0062		
	Chromium (Cr)-Dissolved (mg/L)	0.0079		<0.0010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00050		<0.00050 DLA		
	Copper (Cu)-Dissolved (mg/L)	0.0129		0.0158		
	Gallium (Ga)-Dissolved (mg/L)	<0.0050		<0.0050		
	Iron (Fe)-Dissolved (mg/L)	0.12		<0.10		
	Lead (Pb)-Dissolved (mg/L)	0.0030		<0.0030		
	Lithium (Li)-Dissolved (mg/L)	0.44		<0.20		
	Magnesium (Mg)-Dissolved (mg/L)	110		113		
	Manganese (Mn)-Dissolved (mg/L)	0.0196		0.0141		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L956881-1	L956881-2	L956881-4		
	Description	SEAWATER	SEAWATER	SEAWATER		
	Sampled Date	07-NOV-10	08-NOV-10	13-NOV-10		
	Sampled Time	17:00	11:00	11:00		
	Client ID	10WBW002-109	10WBW002-109	10WBW002-121		
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Mercury (Hg)-Dissolved (mg/L)	<0.000010		<0.000010		
	Molybdenum (Mo)-Dissolved (mg/L)	0.163		0.175		
	Nickel (Ni)-Dissolved (mg/L)	<0.0050		0.0072		
	Phosphorus (P)-Dissolved (mg/L)	<10		<10		
	Potassium (K)-Dissolved (mg/L)	<200		<200		
	Rhenium (Re)-Dissolved (mg/L)	<0.0050		<0.0050		
	Rubidium (Rb)-Dissolved (mg/L)	0.053		<0.050		
	Selenium (Se)-Dissolved (mg/L)	<0.020		<0.020		
	Silicon (Si)-Dissolved (mg/L)	<5.0		<5.0		
	Silver (Ag)-Dissolved (mg/L)	<0.0010		<0.0010		
	Sodium (Na)-Dissolved (mg/L)	1680		490		
	Strontium (Sr)-Dissolved (mg/L)	57.6		35.8		
	Tellurium (Te)-Dissolved (mg/L)	<0.0050		<0.0050 DLA		
	Thallium (Tl)-Dissolved (mg/L)	0.00053		<0.00050		
	Thorium (Th)-Dissolved (mg/L)	<0.0050 DLA		<0.0050 DLA		
	Tin (Sn)-Dissolved (mg/L)	<0.010		<0.010		
	Titanium (Ti)-Dissolved (mg/L)	<0.050		<0.050		
	Tungsten (W)-Dissolved (mg/L)	0.026		0.024		
	Uranium (U)-Dissolved (mg/L)	<0.00050		<0.00050		
	Vanadium (V)-Dissolved (mg/L)	<0.0050		<0.0050		
	Yttrium (Y)-Dissolved (mg/L)	<0.0050		<0.0050		
	Zinc (Zn)-Dissolved (mg/L)	<0.030		0.044		
	Zirconium (Zr)-Dissolved (mg/L)	<0.0050		<0.0050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L956881-1	L956881-3	L956881-4	L956881-5	
Description	SEAWATER	PRODUCT	SEAWATER	PRODUCT	
Sampled Date	07-NOV-10	12-NOV-10	13-NOV-10	14-NOV-10	
Sampled Time	17:00	17:00	11:00	18:00	
Client ID	10WBW002-109	10WBW002-120	10WBW002-121	10WBW002-122	
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)		19200		152	
Density (kg/L)		1.08	1.17	1.02	
Hardness (as CaCO3) (mg/L)		73600		45.7	
pH (pH)		6.63		7.56	
Total Dissolved Solids (mg/L)		116000		187	
Anions and Nutrients Alkalinity, Bicarbonate (as CaCO3) (mg/L)		42.8	57.4	46.1	
Alkalinity, Carbonate (as CaCO3) (mg/L)		<1.0	1.6	<1.0	
Alkalinity, Hydroxide (as CaCO3) (mg/L)		<1.0	<1.0	<1.0	
Alkalinity, Total (as CaCO3) (mg/L)		42.8	59.0	46.1	
Ammonia as N (mg/L)	4.55	1.91	4.58	0.040	
Bromide (Br) (mg/L)		<50		<5.0	
Chloride (Cl) (mg/L)		46800		53	
Fluoride (F) (mg/L)		<20		<2.0	
Nitrate (as N) (mg/L)		<5.0		<0.50	
Nitrite (as N) (mg/L)		<1.0		<0.10	
Ortho Phosphate as P (mg/L)		0.45		12.1	
Total Phosphate as P (mg/L)		10.3		10.3	
Silicate (as SIO2) (mg/L)		<100 DLM		<20 DLM	
Sulfate (SO4) (mg/L)		<500		<50	
Total Metals Aluminum (Al)-Total (mg/L)		1.40		0.0795	
Antimony (Sb)-Total (mg/L)		0.0081		<0.00050	
Arsenic (As)-Total (mg/L)		0.027		0.0111	
Barium (Ba)-Total (mg/L)		0.280		0.0026	
Beryllium (Be)-Total (mg/L)		<0.0025		<0.00050	
Bismuth (Bi)-Total (mg/L)		<0.0025		<0.00050	
Boron (B)-Total (mg/L)		<0.50		<0.10	
Cadmium (Cd)-Total (mg/L)		<0.0010		<0.000050	
Calcium (Ca)-Total (mg/L)		25200		8.53	
Cesium (Cs)-Total (mg/L)		<0.0025		<0.00050	
Chromium (Cr)-Total (mg/L)		0.0243		0.00160	
Cobalt (Co)-Total (mg/L)		0.00200		<0.000050	
Copper (Cu)-Total (mg/L)		0.0217		0.00234	
Gallium (Ga)-Total (mg/L)		<0.0025		<0.00050	
Iron (Fe)-Total (mg/L)		5.50		0.078	
Lead (Pb)-Total (mg/L)		0.0116		<0.00030	
Lithium (Li)-Total (mg/L)		<0.10		<0.020	
Magnesium (Mg)-Total (mg/L)		56		5.3	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L956881-1	L956881-3	L956881-4	L956881-5	
Description	SEAWATER	PRODUCT	SEAWATER	PRODUCT	
Sampled Date	07-NOV-10	12-NOV-10	13-NOV-10	14-NOV-10	
Sampled Time	17:00	17:00	11:00	18:00	
Client ID	10WBW002-109	10WBW002-120	10WBW002-121	10WBW002-122	
Grouping / **Analyte**					
WATER					
Total Metals Manganese (Mn)-Total (mg/L)		0.786		0.00476	
Mercury (Hg)-Total (mg/L)		<0.000050		<0.000050	
Molybdenum (Mo)-Total (mg/L)		0.058		<0.0020	
Nickel (Ni)-Total (mg/L)		0.0174		0.00064	
Phosphorus (P)-Total (mg/L)		6.5		9.8	
Potassium (K)-Total (mg/L)		<200		28	
Rhenium (Re)-Total (mg/L)		<0.0025		<0.00050	
Rubidium (Rb)-Total (mg/L)		<0.025		<0.0050	
Selenium (Se)-Total (mg/L)		<0.070		<0.020	
Silicon (Si)-Total (mg/L)		<5.0		1.23	
Silver (Ag)-Total (mg/L)		<0.00050		<0.00010	
Sodium (Na)-Total (mg/L)		<200		26	
Strontium (Sr)-Total (mg/L)		9.71		0.036	
Tellurium (Te)-Total (mg/L)		<0.0025		<0.00050	
Thallium (Tl)-Total (mg/L)		<0.00025		<0.000050	
Thorium (Th)-Total (mg/L)		<0.0025		<0.00050	
Tin (Sn)-Total (mg/L)		<0.0050		<0.0010	
Titanium (Ti)-Total (mg/L)		0.083		0.0051	
Tungsten (W)-Total (mg/L)		<0.0050		<0.0010	
Uranium (U)-Total (mg/L)		<0.00025		0.000151	
Vanadium (V)-Total (mg/L)		0.0049		0.00166	
Yttrium (Y)-Total (mg/L)		<0.0025		<0.00050	
Zinc (Zn)-Total (mg/L)		3.12		0.0150	
Zirconium (Zr)-Total (mg/L)		<0.0025		<0.00050	
Dissolved Metals Aluminum (Al)-Dissolved (mg/L)		<0.025		<0.0050	
Antimony (Sb)-Dissolved (mg/L)		0.0076		<0.00050	
Arsenic (As)-Dissolved (mg/L)		0.027		0.0103	
Barium (Ba)-Dissolved (mg/L)		0.308		0.0034	
Beryllium (Be)-Dissolved (mg/L)		<0.0025 DLA		<0.00050	
Bismuth (Bi)-Dissolved (mg/L)		<0.0025		<0.00050	
Boron (B)-Dissolved (mg/L)		<0.50		<0.10	
Cadmium (Cd)-Dissolved (mg/L)		<0.0012		<0.000050	
Calcium (Ca)-Dissolved (mg/L)		29400		8.55	
Cesium (Cs)-Dissolved (mg/L)		<0.0025		<0.00050	
Chromium (Cr)-Dissolved (mg/L)		<0.0025		<0.00050	
Cobalt (Co)-Dissolved (mg/L)		0.00052		<0.000050	
Copper (Cu)-Dissolved (mg/L)		0.0101		0.00180	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L956881-1	L956881-3	L956881-4	L956881-5	
Description	SEAWATER	PRODUCT	SEAWATER	PRODUCT	
Sampled Date	07-NOV-10	12-NOV-10	13-NOV-10	14-NOV-10	
Sampled Time	17:00	17:00	11:00	18:00	
Client ID	10WBW002-109	10WBW002-120	10WBW002-121	10WBW002-122	
Grouping / **Analyte**					
WATER					
Dissolved Metals Gallium (Ga)-Dissolved (mg/L)		<0.0025		<0.00050	
Iron (Fe)-Dissolved (mg/L)		<0.050		<0.010	
Lead (Pb)-Dissolved (mg/L)		<0.015		<0.0030	
Lithium (Li)-Dissolved (mg/L)		<0.10		<0.020	
Magnesium (Mg)-Dissolved (mg/L)		65		5.9	
Manganese (Mn)-Dissolved (mg/L)		0.741		0.00109	
Mercury (Hg)-Dissolved (mg/L)		<0.000050		<0.000050	
Molybdenum (Mo)-Dissolved (mg/L)		0.063		<0.0020	
Nickel (Ni)-Dissolved (mg/L)		0.0096		<0.00050	
Phosphorus (P)-Dissolved (mg/L)		<5.0		11.4	
Potassium (K)-Dissolved (mg/L)		<200		31	
Rhenium (Re)-Dissolved (mg/L)		<0.0025		<0.00050	
Rubidium (Rb)-Dissolved (mg/L)		<0.025		<0.0050	
Selenium (Se)-Dissolved (mg/L)		<0.070		<0.020	
Silicon (Si)-Dissolved (mg/L)		<5.0		1.32	
Silver (Ag)-Dissolved (mg/L)		<0.00050 DLA		<0.00010	
Sodium (Na)-Dissolved (mg/L)		<200		30	
Strontium (Sr)-Dissolved (mg/L)		11.0		0.038	
Tellurium (Te)-Dissolved (mg/L)		<0.0025		<0.00050	
Thallium (Tl)-Dissolved (mg/L)		<0.00025		<0.000050	
Thorium (Th)-Dissolved (mg/L)		<0.0025 DLA		<0.00050	
Tin (Sn)-Dissolved (mg/L)		<0.0050		<0.0010	
Titanium (Ti)-Dissolved (mg/L)		<0.025		<0.0050	
Tungsten (W)-Dissolved (mg/L)		<0.0050		<0.0010	
Uranium (U)-Dissolved (mg/L)		<0.00025		0.000155	
Vanadium (V)-Dissolved (mg/L)		<0.0025		0.00166	
Yttrium (Y)-Dissolved (mg/L)		<0.0025		<0.00050	
Zinc (Zn)-Dissolved (mg/L)		1.99		0.0069	
Zirconium (Zr)-Dissolved (mg/L)		<0.0025		<0.00050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit Adjusted For required dilution
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-MAN-VA	Water	Alkalinity (Species) by Manual Titration	APHA 2320 "Alkalinity"
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ALK-MAN-VA	Water	Alkalinity (Species) by Manual Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-F-IC-VA	Seawater	Fluoride by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-NO2-IC-VA	Seawater	Nitrite by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the detection of nitrite is by UV absorbance and not conductivity.			
ANIONS-C-NO3-IC-VA	Seawater	Nitrate by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, nitrate detection is by UV absorbance and not conductivity.			
ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the nitrite detection is by UV absorbance and not conductivity.			
ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the nitrate detection is by UV absorance and not conductivity.			
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
DENSITY-ED	Water	Density	CSSS-Gravimetric
EC-C-MAN-VA	Seawater	Conductivity (Manual) (seawater)	APHA 2510 Conductivity
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			

Reference Information

EC-MAN-VA Water Conductivity (Manual) APHA 2510 "Conductivity"

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-MAN-VA Water Conductivity (Manual) APHA 2510 Conductivity

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HARDNESS-CALC-VA Seawater Hardness APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-DIS-C-CVAFS-VA Seawater Diss. Mercury in Seawater by CVAFS PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater 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-DIS-CVAFS-VA Water Dissolved Mercury in Water by CVAFS EPA SW-846 3005A & 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 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-C-CVAFS-VA Seawater Total Mercury in Seawater by CVAFS PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater 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-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-D-L-HRMS-VA Water Diss. Metals in Water by HR-ICPMS EPA 200.8

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration modified from APHA Method 3030B.

MET-D-L-HRMS-VA Seawater Diss. Metals in Seawater by HR-ICPMS EPA 200.8

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.

MET-DIS-C-ICP-VA Seawater Diss. Metals in Seawater by ICPOES PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICPOES 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-T-L-HRMS-VA Water Total Metals in Water by HR-ICPMS EPA 200.8

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion modified from APHA Method 3030E.

MET-T-L-HRMS-VA Seawater Tot. Metals in Seawater by HR-ICPMS EPA 200.8

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.

MET-TOT-C-ICP-VA Seawater Total Metals in Seawater by ICPOES PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The

Reference Information

procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES 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 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 - optical emission spectrophotometry (EPA Method 6010B).

NH3-SIE-VA Water Ammonia by SIE APHA 4500 D. - NH3 NITROGEN (AMMONIA)

This analysis is carried out, on sulphuric acid preserved samples, using procedures adapted from APHA Method 4500-NH3 "Nitrogen (Ammonia)". Ammonia is determined using an ammonia selective electrode.

PH-C-MAN-VA Seawater pH by Manual Meter (seawater) 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.

It is recommended that this analysis be conducted in the field.

PH-MAN-VA Water pH by Manual Meter 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.

It is recommended that this analysis be conducted in the field.

PH-MAN-VA Water pH by Manual Meter 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.

It is recommended that this analysis be conducted in the field.

PO4-C-DO-COL-VA Seawater Dis. ortho Phosphate by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-C-T-COL-VA Seawater Total Phosphate P by Colour (seawater) APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-DO-COL-VA Water Dissolved ortho Phosphate by Colour APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-DO-COL-VA Water Dissolved ortho Phosphate by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-T-COL-VA Water Total Phosphate P by Color APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-T-COL-VA Water Total Phosphate P by Color APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

SILICATE-C-COL-VA Seawater Silicate by Colourimetric (seawater) APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SIO2 D.

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - 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.

TDS-VA Seawater 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.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

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Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	SRK Consulting	☑ Standard ☐ Other		◉ Regular (Default)
Contact:	Melissa Pitz	☑ PDF ☑ Excel ☑ Digital ☐ Fax		○ Priority (Specify Date Required → →) Surcharges apply
Address:	Suite 205, 2100 Airport Drive	Email 1: mpitz@srk.com		○ Emergency (1 Business Day) - 100% Surcharge
	Saskatoon, SK, Canada, S7L 6M6	Email 2: dmackie@srk.com		○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	(306) 955-4732 Fax: 306) 955-4750			
Invoice To	Same as Report ? ☐ Yes ☐ No	Client / Project Information		Analysis Request
Company:		Job #: 1CH008.013		Please indicate below Filtered, Preserved or both (F, P, F/P)
Contact:		PO / AFE:		
Address:		LSD:		
Phone:	Fax:	Quote #: Q25959		
Lab Work Order # (lab use only)	L956881	ALS Contact: Sean Whitaker	Sampler:	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P total HRMS metals +hg	F/P Dis HRMS metals +hg	anions/alk/ph/ec/tds	density	F isotopes	total PO4/disolved p04	Silicates	NH3	Salinity				Number of Containers
	10wbw002-109	07-Nov-10	17:00	Seawater	x	x						x					3
	10wbw002-109	08-Nov-10	11:00	Seawater	x												1
	10wbw002-120	12-Nov-10	17:00	Product	x	x	x	x		x	x	x					4
	10wbw002-121	13-Nov-10	11:00	Seawater	x	x	x	x		x	x	x					4
	10wbw002-122	14-Nov-10	18:00	Product	x	x	x	x		x	x	x					4

Special Instructions / Regulations / Hazardous Details

Product is Glycol

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature: °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 18.02 Front

SRK CONSULTING (CANADA) INC.
ATTN: MELISSA PITZ
SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6
Phone: 306-955-4732

Date Received: 08-NOV-10
Report Date: 16-DEC-10 15:28 (MT)
Version: FINAL REV. 3

Certificate of Analysis

Lab Work Order #: L951724
Project P.O. #: NOT SUBMITTED
Job Reference: 1CH008.013
Legal Site Desc:
C of C Numbers:

Comments: ADDITIONAL 08-DEC-10 10:20

07-DEC-10:
16-DEC-10: additional parameters added as per client request. SMW

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ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L951724-1	L951724-2			
	Description	WATER	WATER			
	Sampled Date	31-OCT-10	01-NOV-10			
	Sampled Time	15:30	15:00			
	Client ID	10WBW001-108	10WBW001-108			
Grouping	**Analyte**					
SEAWATER						
Physical Tests	Conductivity (uS/cm)		37000			
	Hardness (as CaCO3) (mg/L)	7360	7340			
	pH (pH)		7.59			
	Salinity (EC) (g/L)		23.5			
	Total Dissolved Solids (mg/L)		25500			
Leachable Anions & Nutrients	Anion Sum (meq/L)		432			
	Cation Sum (meq/L)		447			
	Cation - Anion Balance (%)		1.7			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)		43.7			
	Alkalinity, Carbonate (as CaCO3) (mg/L)		<2.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)		<2.0			
	Alkalinity, Total (as CaCO3) (mg/L)		43.7			
	Bromide (Br) (mg/L)		41.3			
	Chloride (Cl) (mg/L)		14200			
	Fluoride (F) (mg/L)		<0.75			
	Nitrate (as N) (mg/L)		<0.50			
	Nitrite (as N) (mg/L)		<0.10			
	Ortho Phosphate as P (mg/L)		<0.0010			
	Total Phosphate as P (mg/L)	0.0162				
	Silicate (as SIO2) (mg/L)		5.8			
	Sulfate (SO4) (mg/L)		1500			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0059				
	Antimony (Sb)-Total (mg/L)	0.00461				
	Arsenic (As)-Total (mg/L)	<0.0020				
	Barium (Ba)-Total (mg/L)	0.169				
	Beryllium (Be)-Total (mg/L)	<0.00050				
	Bismuth (Bi)-Total (mg/L)	<0.00050				
	Boron (B)-Total (mg/L)	1.50				
	Cadmium (Cd)-Total (mg/L)	<0.000050				
	Calcium (Ca)-Total (mg/L)	1170				
	Cesium (Cs)-Total (mg/L)	0.00095				
	Chromium (Cr)-Total (mg/L)	<0.00050				
	Cobalt (Co)-Total (mg/L)	0.000103				
	Copper (Cu)-Total (mg/L)	0.00061				
	Gallium (Ga)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	2.28				

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L951724-1	L951724-2			
	Description	WATER	WATER			
	Sampled Date	31-OCT-10	01-NOV-10			
	Sampled Time	15:30	15:00			
	Client ID	10WBW001-108	10WBW001-108			
Grouping	**Analyte**					
SEAWATER						
Total Metals	Lead (Pb)-Total (mg/L)	<0.00030				
	Lithium (Li)-Total (mg/L)	0.131				
	Magnesium (Mg)-Total (mg/L)	1080				
	Manganese (Mn)-Total (mg/L)	0.892				
	Molybdenum (Mo)-Total (mg/L)	0.0361				
	Nickel (Ni)-Total (mg/L)	0.00120				
	Phosphorus (P)-Total (mg/L)	<1.0				
	Potassium (K)-Total (mg/L)	172				
	Rhenium (Re)-Total (mg/L)	<0.00050				
	Rubidium (Rb)-Total (mg/L)	0.102				
	Selenium (Se)-Total (mg/L)	<0.0020				
	Silicon (Si)-Total (mg/L)	3.82				
	Silver (Ag)-Total (mg/L)	0.00018				
	Sodium (Na)-Total (mg/L)	6790				
	Strontium (Sr)-Total (mg/L)	14.6				
	Tellurium (Te)-Total (mg/L)	<0.00050				
	Thallium (Tl)-Total (mg/L)	<0.000050				
	Thorium (Th)-Total (mg/L)	<0.00050				
	Tin (Sn)-Total (mg/L)	<0.0010				
	Titanium (Ti)-Total (mg/L)	<0.0050				
	Tungsten (W)-Total (mg/L)	0.0227				
	Uranium (U)-Total (mg/L)	0.000059				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Yttrium (Y)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	0.115				
	Zirconium (Zr)-Total (mg/L)	<0.00050				
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)		<0.0050			
	Antimony (Sb)-Dissolved (mg/L)		0.00393			
	Arsenic (As)-Dissolved (mg/L)		<0.0020			
	Barium (Ba)-Dissolved (mg/L)		0.169			
	Beryllium (Be)-Dissolved (mg/L)		<0.00050			
	Bismuth (Bi)-Dissolved (mg/L)		<0.00050			
	Boron (B)-Dissolved (mg/L)		1.48			
	Cadmium (Cd)-Dissolved (mg/L)		<0.000050			
	Calcium (Ca)-Dissolved (mg/L)		1160			
	Cesium (Cs)-Dissolved (mg/L)		0.00097			
	Chromium (Cr)-Dissolved (mg/L)		<0.00050			

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L951724-1	L951724-2			
	Description	WATER	WATER			
	Sampled Date	31-OCT-10	01-NOV-10			
	Sampled Time	15:30	15:00			
	Client ID	10WBW001-108	10WBW001-108			
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)		0.000091			
	Copper (Cu)-Dissolved (mg/L)		<0.00050			
	Gallium (Ga)-Dissolved (mg/L)		<0.00050			
	Iron (Fe)-Dissolved (mg/L)		0.503			
	Lead (Pb)-Dissolved (mg/L)		<0.00030			
	Lithium (Li)-Dissolved (mg/L)		0.127			
	Magnesium (Mg)-Dissolved (mg/L)		1080			
	Manganese (Mn)-Dissolved (mg/L)		0.888			
	Molybdenum (Mo)-Dissolved (mg/L)		0.0345			
	Nickel (Ni)-Dissolved (mg/L)		0.00158			
	Phosphorus (P)-Dissolved (mg/L)		<1.0			
	Potassium (K)-Dissolved (mg/L)		172			
	Rhenium (Re)-Dissolved (mg/L)		<0.00050			
	Rubidium (Rb)-Dissolved (mg/L)		0.106			
	Selenium (Se)-Dissolved (mg/L)		<0.0020			
	Silicon (Si)-Dissolved (mg/L)		3.33			
	Silver (Ag)-Dissolved (mg/L)		<0.00010			
	Sodium (Na)-Dissolved (mg/L)		6810			
	Strontium (Sr)-Dissolved (mg/L)		14.6			
	Tellurium (Te)-Dissolved (mg/L)		<0.00050			
	Thallium (Tl)-Dissolved (mg/L)		<0.000050			
	Thorium (Th)-Dissolved (mg/L)		<0.00050			
	Tin (Sn)-Dissolved (mg/L)		<0.0010			
	Titanium (Ti)-Dissolved (mg/L)		<0.0050			
	Tungsten (W)-Dissolved (mg/L)		0.0231			
	Uranium (U)-Dissolved (mg/L)		0.000058			
	Vanadium (V)-Dissolved (mg/L)		<0.00050			
	Yttrium (Y)-Dissolved (mg/L)		<0.00050			
	Zinc (Zn)-Dissolved (mg/L)		0.0295			
	Zirconium (Zr)-Dissolved (mg/L)		<0.00050			

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L951724-1	L951724-2			
	Description	WATER	WATER			
	Sampled Date	31-OCT-10	01-NOV-10			
	Sampled Time	15:30	15:00			
	Client ID	10WBW001-108	10WBW001-108			
Grouping	**Analyte**					
WATER						
Physical Tests	Density (kg/L)		1.03			
Anions and Nutrients	Ammonia as N (mg/L)	2.32				

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-C-SCR-VA	Seawater	Alk. by colour or titration (seawater)	EPA 310.2 OR APHA 2320

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.
OR
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-C-NO2-IC-VA	Seawater	Nitrite by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the detection of nitrite is by UV absorbance and not conductivity.

ANIONS-C-NO3-IC-VA	Seawater	Nitrate by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, nitrate detection is by UV absorbance and not conductivity.

ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

DENSITY-ED	Water	Density	CSSS-Gravimetric
EC-C-PCT-VA	Seawater	Conductivity (Automated) (seawater)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

F-ISE-VA	Seawater	Fluoride by SIE	BASED ON APHA 4500-F FLUORIDE

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.

HARDNESS-CALC-VA	Seawater	Hardness	APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

IONBALANCE-VA	Seawater	Ion Balance Calculation (seawater)	APHA 1030E
MET-D-L-HRMS-VA	Seawater	Diss. Metals in Seawater by HR-ICPMS	EPA 200.8

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.

MET-DIS-C-ICP-VA	Seawater	Diss. Metals in Seawater by ICPOES	PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-L-HRMS-VA	Seawater	Tot. Metals in Seawater by HR-ICPMS	EPA 200.8

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.

MET-TOT-C-ICP-VA	Seawater	Total Metals in Seawater by ICPOES	PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

NH3-SIE-VA	Water	Ammonia by SIE	APHA 4500 D. - NH3 NITROGEN (AMMONIA)

This analysis is carried out, on sulphuric acid preserved samples, using procedures adapted from APHA Method 4500-NH3 "Nitrogen (Ammonia)". Ammonia is determined using an ammonia selective electrode.

PH-C-PCT-VA	Seawater	pH by Meter (Automated) (seawater)	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.

It is recommended that this analysis be conducted in the field.

Reference Information

PO4-C-DO-COL-VA	Seawater	Dis. ortho Phosphate by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-C-T-COL-VA	Seawater	Total Phosphate P by Colour (seawater)	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

SALINITY-C-EC-VA	Seawater	Salinity by calc. using EC (seawater)	APHA 2520 B

This analysis is carried out using procedures adapted from APHA Method 2520 "Salinity". Salinity is determined using a samples conductivity and the Practical Salinity Scale.

SILICATE-C-COL-VA	Seawater	Silicate by Colourimetric (seawater)	APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

TDS-VA	Seawater	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.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # _____

Page 1 of 1

Report To		Report Format / Distribution				Service Requested (Rush for routine analysis subject to availability)	
Company:	SRK Consulting	☑ Standard	☐ Other			◉ Regular (Default)	
Contact:	Melissa Pitz	☑ PDF	☑ Excel	☑ Digital	☐ Fax	○ Priority (Specify Date Required → →)	Surcharges apply
Address:	Suite 205, 2100 Airport Drive	Email 1:	mpitz@srk.com			○ Emergency (1 Business Day) - 100% Surcharge	
	Saskatoon, SK, Canada, S7L 6M6	Email 2:	dmackie@srk.com			○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS	
Phone:	(306) 955-4732 Fax: 306) 955-4750						
Invoice To	Same as Report ? ☐ Yes ☐ No	**Client / Project Information**				**Analysis Request**	
Company:		Job #:	1CH008.013			Please indicate below Filtered, Preserved or both (F, P, F/P)	
Contact:		PO / AFE:					
Address:		LSD:					
Phone:	Fax:	Quote #:	Q25959				
Lab Work Order # (lab use only)	L951724	**ALS Contact:**	Sean Whitaker	**Sampler:**			

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P total HRMS metals +hg	F/P Dis HRMS metals +hg	anions/alk/ph/ec/tds	density	F isotopes	Dissolved PO4	Silicates	Number of Containers
	10WBW001-108	31-Oct-10	15:30	Water	X					X	X	2
	10WBW001-108	01-Nov-10	15:00	Water		X	X					2

Special Instructions / Regulations / Hazardous Details

* HOLD FOR INSTRUCTIONS FROM MELISSA PITZ*

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
J Henshaw	1-Nov-10	8:00				°C				

SRK CONSULTING (CANADA) INC.
ATTN: MELISSA PITZ
SUITE 205
2100 AIRPORT DRIVE
SASKATOON SK S7L 6M6
Phone: 306-955-4732

Date Received: 02-NOV-10
Report Date: 01-DEC-10 11:35 (MT)
Version: FINAL REV. 2

Certificate of Analysis

Lab Work Order #: L949713
Project P.O. #: NOT SUBMITTED
Job Reference: 1CH008.013
Legal Site Desc:
C of C Numbers:

Comments: ADDITIONAL 29-NOV-10 11:10
ADDITIONAL 29-NOV-10 11:10

01-DEC-10:

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ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L949713-1	L949713-2	L949713-3	L949713-4	
	Description	WATER	WATER	WATER	WATER	
	Sampled Date	29-OCT-10	30-OCT-10	30-OCT-10	30-OCT-10	
	Sampled Time	15:00	11:00	13:00	14:00	
	Client ID	10WBW001-105	10WBW001-105	10WBW001-106	10WBW001-107	
Grouping	**Analyte**					
SEAWATER						
Physical Tests	Conductivity (uS/cm)	43300		46900	48800	
	Hardness (as CaCO3) (mg/L)	8900	9040	12100	9760	
	pH (pH)	7.44		7.69	7.46	
	Salinity (EC) (g/L)	28.5		31.2	32.6	
	Total Dissolved Solids (mg/L)	34500		47500	39000	
Leachable Anions & Nutrients	Anion Sum (meq/L)	501		539	581	
	Cation Sum (meq/L)	576		543	592	
	Cation - Anion Balance (%)	7.0		0.4	0.9	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	106		<2.0	76.5	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0		<2.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0		<2.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	106		<2.0	76.5	
	Ammonia as N (mg/L)	3.46		0.0631	3.37	
	Bromide (Br) (mg/L)	41		101	52	
	Chloride (Cl) (mg/L)	16500		18400	19100	
	Fluoride (F) (mg/L)	<0.75		<0.75	<0.75	
	Nitrate (as N) (mg/L)	<1.0		<0.50	<1.0	
	Nitrite (as N) (mg/L)	<0.20		<0.10	<0.20	
	Ortho Phosphate as P (mg/L)	<0.0010		0.0086	<0.0010	
	Total Phosphate as P (mg/L)	0.0389		0.0163	0.0124	
	Silicate (as SIO2) (mg/L)	7.5		<10 DLM	9.7	
	Sulfate (SO4) (mg/L)	1580		935	2000	
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0050		0.0086	0.0053	
	Antimony (Sb)-Total (mg/L)	0.00054		<0.00050	0.00115	
	Arsenic (As)-Total (mg/L)	<0.0020		<0.0020	0.0068	
	Barium (Ba)-Total (mg/L)	0.129		0.0521	0.112	
	Beryllium (Be)-Total (mg/L)	<0.00050		<0.00050	<0.00050	
	Bismuth (Bi)-Total (mg/L)	<0.00050		<0.00050	<0.00050	
	Boron (B)-Total (mg/L)	2.80		3.25	2.66	
	Cadmium (Cd)-Total (mg/L)	<0.000050		0.000085	<0.000050	
	Calcium (Ca)-Total (mg/L)	1540		4700	1570	
	Cesium (Cs)-Total (mg/L)	0.00151		0.00110	0.00155	
	Chromium (Cr)-Total (mg/L)	0.00016		0.00020	<0.00010	
	Cobalt (Co)-Total (mg/L)	0.000132		0.000051	0.000356	
	Copper (Cu)-Total (mg/L)	<0.00050		0.00102	<0.00050	
	Gallium (Ga)-Total (mg/L)	<0.00050		<0.00050	<0.00050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L949713-1	L949713-2	L949713-3	L949713-4	
	Description	WATER	WATER	WATER	WATER	
	Sampled Date	29-OCT-10	30-OCT-10	30-OCT-10	30-OCT-10	
	Sampled Time	15:00	11:00	13:00	14:00	
	Client ID	10WBW001-105	10WBW001-105	10WBW001-106	10WBW001-107	
Grouping	**Analyte**					
SEAWATER						
Total Metals	Iron (Fe)-Total (mg/L)	11.0		0.197	4.56	
	Lead (Pb)-Total (mg/L)	<0.00030		<0.00030	<0.00030	
	Lithium (Li)-Total (mg/L)	0.200		0.381	0.217	
	Magnesium (Mg)-Total (mg/L)	1230		67.8	1480	
	Manganese (Mn)-Total (mg/L)	1.73		0.712	2.13	
	Mercury (Hg)-Total (mg/L)	<0.000010		<0.000010	<0.000010	
	Molybdenum (Mo)-Total (mg/L)	0.0072		0.0088	0.0120	
	Nickel (Ni)-Total (mg/L)	<0.00050		0.00265	0.00098	
	Phosphorus (P)-Total (mg/L)	<1.0		<1.0	<1.0	
	Potassium (K)-Total (mg/L)	262		39	233	
	Rhenium (Re)-Total (mg/L)	<0.00050		<0.00050	<0.00050	
	Rubidium (Rb)-Total (mg/L)	0.104		0.0531	0.141	
	Selenium (Se)-Total (mg/L)	<0.0020		<0.0020	<0.0020	
	Silicon (Si)-Total (mg/L)	3.51		2.47	3.48	
	Silver (Ag)-Total (mg/L)	<0.00010		<0.00010	<0.00010	
	Sodium (Na)-Total (mg/L)	8990		6850	9170	
	Strontium (Sr)-Total (mg/L)	16.4		54.6	19.9	
	Tellurium (Te)-Total (mg/L)	<0.00050		<0.00050	<0.00050	
	Thallium (Tl)-Total (mg/L)	<0.000050		<0.000050	<0.000050	
	Thorium (Th)-Total (mg/L)	<0.00050		<0.00050	<0.00050	
	Tin (Sn)-Total (mg/L)	<0.0010		<0.0010	<0.0010	
	Titanium (Ti)-Total (mg/L)	<0.0050		<0.0050	<0.0050	
	Tungsten (W)-Total (mg/L)	0.0059		0.0016	0.0049	
	Uranium (U)-Total (mg/L)	<0.000050		<0.000050	0.000228	
	Vanadium (V)-Total (mg/L)	<0.00050		<0.00050	<0.00050	
	Yttrium (Y)-Total (mg/L)	<0.00050		0.00057	<0.00050	
	Zinc (Zn)-Total (mg/L)	0.107		0.285	0.0241	
	Zirconium (Zr)-Total (mg/L)	<0.00050		<0.00050	<0.00050	
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)		<0.0050	0.0050	<0.0050	
	Antimony (Sb)-Dissolved (mg/L)		0.00053	<0.00050	0.00116	
	Arsenic (As)-Dissolved (mg/L)		<0.0020	<0.0020	0.0069	
	Barium (Ba)-Dissolved (mg/L)		0.122	0.0526	0.115	
	Beryllium (Be)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	
	Bismuth (Bi)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	
	Boron (B)-Dissolved (mg/L)		2.86	3.30	2.61	
	Cadmium (Cd)-Dissolved (mg/L)		<0.000050	0.000097	<0.000050	
	Calcium (Ca)-Dissolved (mg/L)		1560	4730	1520	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L949713-1	L949713-2	L949713-3	L949713-4	
Description	WATER	WATER	WATER	WATER	
Sampled Date	29-OCT-10	30-OCT-10	30-OCT-10	30-OCT-10	
Sampled Time	15:00	11:00	13:00	14:00	
Client ID	10WBW001-105	10WBW001-105	10WBW001-106	10WBW001-107	
Grouping / **Analyte**					
SEAWATER					
Dissolved Metals Cesium (Cs)-Dissolved (mg/L)		0.00148	0.00110	0.00159	
Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	
Cobalt (Co)-Dissolved (mg/L)		0.000187	<0.000050	0.000312	
Copper (Cu)-Dissolved (mg/L)		0.00296	0.00067	<0.00050	
Gallium (Ga)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	
Iron (Fe)-Dissolved (mg/L)		8.94	0.075	4.55	
Lead (Pb)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	
Lithium (Li)-Dissolved (mg/L)		0.201	0.390	0.223	
Magnesium (Mg)-Dissolved (mg/L)		1250	68.1	1450	
Manganese (Mn)-Dissolved (mg/L)		1.69	0.725	2.11	
Mercury (Hg)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	
Molybdenum (Mo)-Dissolved (mg/L)		0.0044	0.0090	0.0122	
Nickel (Ni)-Dissolved (mg/L)		0.00060	0.00237	0.00094	
Phosphorus (P)-Dissolved (mg/L)		<1.0	<1.0	<1.0	
Potassium (K)-Dissolved (mg/L)		249	40	229	
Rhenium (Re)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	
Rubidium (Rb)-Dissolved (mg/L)		0.107	0.0532	0.139	
Selenium (Se)-Dissolved (mg/L)		<0.0020	<0.0020	<0.0020	
Silicon (Si)-Dissolved (mg/L)		3.30	2.43	3.38	
Silver (Ag)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	
Sodium (Na)-Dissolved (mg/L)		8700	6910	8980	
Strontium (Sr)-Dissolved (mg/L)		16.8	55.1	19.4	
Tellurium (Te)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	
Thallium (Tl)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	
Thorium (Th)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	
Tin (Sn)-Dissolved (mg/L)		<0.0010	<0.0010	<0.0010	
Titanium (Ti)-Dissolved (mg/L)		<0.0050	<0.0050	<0.0050	
Tungsten (W)-Dissolved (mg/L)		0.0060	0.0015	0.0048	
Uranium (U)-Dissolved (mg/L)		<0.000050	<0.000050	0.000234	
Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	
Yttrium (Y)-Dissolved (mg/L)		<0.00050	0.00054	<0.00050	
Zinc (Zn)-Dissolved (mg/L)		0.0851	0.137	0.0243	
Zirconium (Zr)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L949713-1	L949713-3	L949713-4		
	Description	WATER	WATER	WATER		
	Sampled Date	29-OCT-10	30-OCT-10	30-OCT-10		
	Sampled Time	15:00	13:00	14:00		
	Client ID	10WBW001-105	10WBW001-106	10WBW001-107		
Grouping	**Analyte**					
WATER						
Physical Tests	Density (kg/L)	1.01	1.03	1.03		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-C-PCT-VA	Seawater	Alkalinity by Titration (seawataer)	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ALK-C-SCR-VA	Seawater	Alk. by colour or titration (seawater)	EPA 310.2 OR APHA 2320
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method. OR This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-NO2-IC-VA	Seawater	Nitrite by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, the detection of nitrite is by UV absorbance and not conductivity.			
ANIONS-C-NO3-IC-VA	Seawater	Nitrate by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Specifically, nitrate detection is by UV absorbance and not conductivity.			
ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
DENSITY-ED	Water	Density	CSSS-Gravimetric
EC-C-PCT-VA	Seawater	Conductivity (Automated) (seawater)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
F-ISE-VA	Seawater	Fluoride by SIE	BASED ON APHA 4500-F FLUORIDE
This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.			
HARDNESS-CALC-VA	Seawater	Hardness	APHA 2340B
Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.			
HG-DIS-C-CVAFS-VA	Seawater	Diss. Mercury in Seawater by CVAFS	PUGET SOUND PROTOCOLS, EPA 245.7
This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater 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-C-CVAFS-VA	Seawater	Total Mercury in Seawater by CVAFS	PUGET SOUND PROTOCOLS, EPA 245.7
This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater 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).			
IONBALANCE-VA	Seawater	Ion Balance Calculation (seawater)	APHA 1030E
MET-D-L-HRMS-VA	Seawater	Diss. Metals in Seawater by HR-ICPMS	EPA 200.8
Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.			
MET-DIS-C-ICP-VA	Seawater	Diss. Metals in Seawater by ICPOES	PUGET SOUND PROTOCOLS, EPA 6010B

Reference Information

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-L-HRMS-VA Seawater Tot. Metals in Seawater by HR-ICPMS EPA 200.8

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.

MET-TOT-C-ICP-VA Seawater Total Metals in Seawater by ICPOES PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

NH3-C-COL-VA Seawater Ammonia by Colour (seawater) APHA 4500-NH3 Nitrogen (Ammonia)

This analysis is carried out, on unpreserved samples, using procedures adapted from APHA Method 4500-NH3 "Nitrogen (Ammonia)". Ammonia is determined using the phenate colourimetric method.

PH-C-PCT-VA Seawater pH by Meter (Automated) (seawater) 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.

It is recommended that this analysis be conducted in the field.

PO4-C-DO-COL-VA Seawater Dis. ortho Phosphate by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-C-T-COL-VA Seawater Total Phosphate P by Colour (seawater) APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

SALINITY-C-EC-VA Seawater Salinity by calc. using EC (seawater) APHA 2520 B

This analysis is carried out using procedures adapted from APHA Method 2520 "Salinity". Salinity is determined using a samples conductivity and the Practical Salinity Scale.

SILICATE-C-COL-VA Seawater Silicate by Colourimetric (seawater) APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

TDS-VA Seawater 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.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg milligrams per kilogram based on dry weight of sample.
mg/kg wwt milligrams per kilogram based on wet weight of sample.
mg/kg lwt milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L milligrams per litre.
< - Less than.
D.L. The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as receieved by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of 1

Report To		Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	SRK Consulting	☑ Standard ☐ Other	◉ Regular (Default)
Contact:	Melissa Pitz	☑ PDF ☑ Excel ☑ Digital ☐ Fax	○ Priority (Specify Date Required → →) Surcharges apply
Address:	Suite 205, 2100 Airport Drive	Email 1: mpitz@srk.com	○ Emergency (1 Business Day) - 100% Surcharge
	Saskatoon, SK, Canada, S7L 6M6	Email 2: dmackie@srk.com	○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	(306) 955-4732 Fax: 306) 955-4750		
Invoice To	Same as Report ? ☐ Yes ☐ No	**Client / Project Information**	**Analysis Request**
Company:		Job #: 1CH008.013	Please indicate below Filtered, Preserved or both (F, P, F/P)
Contact:		PO / AFE:	
Address:		LSD:	
Phone:	Fax:	Quote #: Q25959	
Lab Work Order # (lab use only)	L9499713	ALS Contact: Sean Whitaker	Sampler:

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P total HRMS metals +hg	F/P Dis HRMS metals +hg	anions/alk/ph/ec/tds	density	F isotopes	Dissolved PO4	Silicates						Number of Containers
	10WBW001-105	29-Oct-10	15:00	Water	x		x	x		x	x						3
	10WBW001-105	30-Oct-10	11:00	Water		X											1
	10WBW001-106	30-Oct-10	13:00	Water	X	X	X	x		X	X						4
	10WBW001-107	31-Oct-10	14:00	Water	x	x	x			x	x						4

Special Instructions / Regulations / Hazardous Details

* HOLD FOR INSTRUCTIONS FROM MELISSA PITZ*

Failure to complete all portions of this form may analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd mmm yy)	Time (hh:mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
J Henshaw	1-Nov-10	8:00		1-Nov-10	1830	NA °C				

GENF 18.02 Front