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Date: March 31, 2008
Refer To: EP2008-0149

James P. Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
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Subject: Submittal of Well R-14 Rehabilitation and Conversion Summary Report

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the Well R-14 Rehabilitation and Conversion Summary Report.

If you have questions, please contact Ardyth Simmons at (505) 665-3935 (asimmons@lanl.gov) or Mat Johansen at (505) 665-5046 (mjohansen@doeal.gov).

Sincerely,

for

Susan G. Stiger, Associate Director
Environmental Programs
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Sincerely,

David R. Gregory, Project Director
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SS/DG/PH/AS:sm

Enclosures: Two hard copies with electronic files - Well R-14 Rehabilitation and Conversion Summary Report (EP2008-0149)

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LA-UR-08-1539
March 2008
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Well R-14 Rehabilitation and Conversion Summary Report

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Prepared by the Environmental Programs Directorate

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LA-UR-08-1539
EP2008-0149

Well R-14 Rehabilitation and Conversion Summary Report

January 2008

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CONTENTS

1.0 INTRODUCTION 1

2.0 REHABILITATION ACTIVITIES 1

2.1 Westbay Removal 1
2.2 Video Logging 1
2.3 Verification of Hydraulic Parameters—Preabandonment Hydraulic Testing 2
2.4 Screen 2 Abandonment 2
2.5 Redevelopment of Screen 1 3
2.6 Hydraulic Testing—Postdevelopment 4
2.7 Water Quality 4
2.7.1 Sample Collection, Field Preparation, and Analytical Techniques 4
2.7.2 Field Parameters 5
2.7.3 Analytical Results 6
2.7.4 Well Screen Analysis 7
2.7.5 Geochemical Comparison of Westbay and Pumping Test Samples 8

3.0 SUMMARY AND CONCLUSIONS 8

4.0 REFERENCES 9

Figures

Figure 2.7-1 Field parameters measured at R-14 screen 1 from 2004 to 2007 using the Westbay sampling system and the February 29, 2008, pumping test 11

Figure 2.7-2 Sample sequence versus dissolved concentrations of total carbonate alkalinity ($mgCaCO^3/L$), sodium (Na), calcium (Ca), sulfate (SO_4), and nitrate(N) (NO_3-N) at R-14 screen 1 from 2004 to 2007 using the Westbay sampling system and the February 29, 2008, pumping test 12

Figure 2.7-3 Sample sequence versus dissolved and total concentrations of iron (Fe) and manganese (Mn) during characterization sampling from 2004 to 2007 using the Westbay sampling system and the February 29, 2008, pumping test 13

Tables

Table 2.7-1 Sample Collection Objectives and Measured Constituents for the R-14 Well Rehabilitation and Conversion Project 15

Table 2.7-2 Field Parameters Measured at R-14 Screen 1 17

Table 2.2-1 Video Log Observations 19

Table 2.3-1 R-14 Screen 1 and 2 Pumping Results 19

Appendixes

Appendix A Analytical Data Results

Appendix B Evaluation of Water Quality Using Well Screen Analysis Methodolgy

Appendix C Westbay Retrieval Report

Appendix D Video Logging (on DVD included with this document)

1.0 INTRODUCTION

This report provides a summary of the work performed and the results of rehabilitating and converting well R-14 from a dual-screen to a single-screen well. Plans for R-14 conversion were presented in the "Work Plan for R-Well Rehabilitation and Replacement, Revision 2" (LANL 2007, 098119) that was approved by the New Mexico Environment Department (NMED) on August 20, 2007 (NMED 2007, 098182). The R-14 borehole was drilled to a total depth (TD) of 1327 ft using fluid-assisted air-rotary and conventional mud-rotary techniques and was completed with two screened intervals in the regional aquifer: screen 1 from 1200.6 to 1233.2 ft and screen 2 from 1286.5 to 1293.1 ft. A dedicated Westbay sampling system was installed in the well after completion.

The results of the well screen analysis for R-14 (LANL 2007, 096330) indicated that the uppermost screen (screen 1) was very good, passing >90% of the assessment tests, and screen 2 passed 71% of the assessment tests. Based on these results, screen 2 was abandoned, screen 1 was subjected to rehabilitation activities, and a single submersible pump will be installed for long-term sampling of screen 1.

2.0 REHABILITATION ACTIVITIES

Well rehabilitation and conversion activities at R-14 included removal of the Westbay multiport sampling system, video logging of the well, initial hydraulic testing of screens 1 and 2, abandonment of screen 2, final hydraulic testing to measure the specific capacity of screen 1, and collection of water samples for laboratory analysis in accordance with the work plan approved by NMED. The permanent sampling pump will be installed after the Threatened and Endangered Species Act exclusion is lifted from the area where R-14 is located.

2.1 Westbay Removal

Retrieval of the Westbay MP55 sampling system was conducted between February 5 and February 10, 2008. A Westbay technical representative was on-site to lead the retrieval operations. All Westbay components were successfully removed from the well. The Westbay retrieval report is presented in Appendix C. The retrieval report describes field operations in detail and documents field measurements recorded in association with the retrieval process.

2.2 Video Logging

After removal of the Westbay system, a downhole video camera was run in the R-14 well on February 11, 2008, to document current screen and casing conditions and verify screen locations, total working depth of the well, and composite static water level (SWL) before testing and backfilling activities began. Los Alamos National Laboratory's (the Laboratory's) geophysical trailer and camera were used to complete video logging from the surface to the TD of the well. Ground surface was used as the datum for all video depth measurements. SWL in the well at the time of logging was recorded at 1181.4 ft below ground surface (bgs). Observed screen depths, SWL, and total well depth are noted in Table 2.2-1. Overall, water clarity was good to very good and provided good visibility of the screened intervals. A well log DVD is included with this report as Appendix D.

2.3 Verification of Hydraulic Parameters—Preabandonment Hydraulic Testing

Specific capacity testing was performed before screen abandonment and after well development. The purpose of performing hydraulic testing at both screens before abandonment of screen 2 was to ensure that screen 1 could provide a sustained rate of pumping during sampling and to determine design parameters for pump selection. Testing consisted of pumping screens 1 and 2 simultaneously and testing each screen individually. After well rehabilitation and conversion efforts, screen 1 was tested again (section 2.6) to evaluate the effectiveness of the development procedures.

Testing was performed by installing a submersible pump. An inflatable packer was located above the pump to eliminate casing storage effects in the drawdown and recovery data. A pressure transducer was installed between the pump and packer to collect water-level data for specific capacity determination. Initial testing was done with a 3 hp submersible pump that was limited in capacity to less than 4 gal./min. Postdevelopment testing was performed with the larger pump used for jet development. One of the postdevelopment tests was conducted by valving back the discharge rate of the large pump to between 3 and 4 gal./min to provide a valid comparison of the pre- and postdevelopment performance.

A corollary benefit of the data collection effort was to obtain a data set that could support hydraulic analysis of the screen 1 and 2 zones. A detailed hydraulic analysis of the data was beyond the scope of services for the well rehabilitation project. The current discussion is limited to presenting the specific capacity results. However, the data will be archived for the future and will be available for examination if the Laboratory chooses to pursue a rigorous analysis of site hydraulics.

Preabandonment specific capacity testing was performed on February 12 and 13. Testing was performed on combined screens 1 and 2 and screen 1 individually on February 12. Screen 2 was tested separately on February 13. Table 2.3-1 summarizes the results of the tests.

The data showed that before development, screen 1 produced 3.36 gal./min with 3.08 ft of drawdown for a specific capacity of 1.09 gal./min/ft of drawdown. Screen 2 produced 3.58 gal./min with 20.7 ft of drawdown for a specific capacity of 0.17 gal./min/ft. The sum of the individual specific capacities was 1.09 + 0.17 = 1.26 gal./min/ft.

The combined zones produced a discharge rate of 3.45 gal./min with a drawdown of 2.62 and a specific capacity of 1.32 gal./min/ft. Curiously, the combined zone specific capacity was greater than the sum of the specific capacities of the individual zones. This was likely caused by greater turbulent flow in the individual tests in which each zone produced more water than during the combined test. For example, testing of screen 2 individually was performed at a rate perhaps fivefold greater than what screen 2 would have contributed during the combined test.

The key statistic from the predevelopment testing was the specific capacity of screen 1 of 1.09 gal./min/ft.

2.4 Screen 2 Abandonment

Abandonment of screen 2 at R-14 was conducted between February 13 and 20, 2008. Details of abandonment materials and placement are presented in Figure 2.4-1. Filter-grade 10/20 silica sand was used as the primary backfill material through the lower screen interval. The 10/20 sand was installed from the TD of the well at 1315.6 to 1283.3 ft bgs. Finer 20/40 filter-grade silica sand was installed above the 10/20 sand from 1283.3 to 1278.8-ft bgs. The finer 20/40 sand serves as a transition interval to keep the cement from flowing into the coarser 10/20 sand. All of the backfill sand was installed with a tremie pipe while running a small volume of potable water to carry the sand into place. A Portland-cement seal was installed above the fine transition sand from 1278.8 to 1270.1 ft bgs. Cement was emplaced using a

wireline dump bailer. The dump bailer allowed discrete placement of a calculated volume of cement while minimizing impacts to the well screen by fugitive cement. The cement was allowed to cure overnight before bailing of cement-impacted water proceeded.

Before the final interval of sand was placed above the cement seal, purging with a bailer was conducted to remove any cement-impacted waters produced from seal placement. The bailer was run inside a 3-in.-diameter conductor pipe. The conductor pipe was installed in the well to isolate screen 1 from the bailing process and to prevent any fugitive cement-impacted water from contacting the screen. Approximately 100 gal. was removed with the bailer. A final interval of 10/20 sand was installed above the cement from 1270.1 to 1246.3 ft bgs above the cement seal to help isolate the cement plug. The final sand interval was placed on February 20 and 21, 2008. A stainless steel and viton k-packer was installed above the abandonment materials during final hydraulic testing activities on February 28, 2008. The packer isolates the abandonment materials below from the sampled water column above.

2.5 Redevelopment of Screen 1

Well development of screen 1 consisted of three activities: (1) swabbing, (2), high-velocity jetting with simultaneous pumping, and (3) final purge pumping. All development activities were performed after plugging and abandoning screen 2.

Screen 1 was swabbed using a surge block built by sandwiching a 4-in.-outer diameter nylon disc between two metal plates. The surge block was connected to a heavy weight so that effective swabbing could be accomplished in the downward direction. Swabbing was performed primarily in the downward direction by dropping the tool rapidly through the entire well screen length and then raising it slowly above the screen again to prepare for the next downward swabbing motion. Swabbing was performed continuously in this manner for 40 min. After swabbing, the well was bailed for several hours to remove loosened material from the well.

High-velocity jetting was accomplished by operating a nominal 20 gal./min submersible pump with a jetting tool attached above the pump discharge within the well screen. Because of the deep water level in R-14, it was estimated that the actual production rate of the pump would be approximately 14 gal./min. The pump and jetting tool were raised and lowered continuously throughout the well screen length while being rotated back and forth periodically to cover the entire screen surface. The jetting tool nozzles were designed to direct a portion of the pump output through the nozzles and the balance to the surface. In this way, the jetting effectiveness was enhanced by ensuring net removal of water from the screen zone throughout the development process, i.e., simultaneous jetting and pumping.

During the jetting procedures, numerous pump problems were encountered. On the first two jetting attempts, operation of the pump did not bring water to the surface. The pump was pulled and tested at the surface and found to underperform. The pump bowls were replaced; the new bowls were also underperforming significantly. A different electrical controller was substituted, resulting in improved pump performance. During subsequent well testing, however, pump operation produced only 11 gal./min compared with the estimated14 gal./min, indicating slight persistent underperformance of the replacement equipment. The cause of the continued substandard pump operation, even with new bowls and controller, was not determined.

Screen 1 was developed using a jetting tool having four nozzles, each 1/16 in. in diameter. Based on the water level in the well, the jetting pressure was estimated to be about 550 psi. At this pressure, the flux rate through the four nozzles was estimated to be about 9 gal./min. A total pumping rate of 14 gal./min would have implied a net discharge to the surface of 14 – 9 = 5 gal./min. During operation, however, flow to the surface averaged between 8 and 9 gal./min. This difference implied a jetting rate of just

5 to 6 gal./min, suggesting that perhaps two of the four jetting nozzles had become plugged or mostly plugged with sediment and that only two were operating. Jetting of the screen surface was performed continuously for more than 3 h. During jetting and simultaneous pumping, the discharge water brought to the surface was discolored and contained sediment, demonstrating effectiveness of the procedures.

After well development, purging was performed to achieve final cleanup of the well. The pump was set and operated at multiple elevations in the well to ensure cleaning the well screen as well as removing the stagnant water above screen 1. Initially, the pump was operated with the intake at 1198 ft (a couple of feet above the well screen). Then the pump was raised to about 1187 ft (within 6 ft of the SWL) and operated briefly to evacuate the stagnant water above the screen. Operating the pump at this elevation ensured "starving" the pump and pulling the pumping water level down to the pump intake so that the entire water column above the screen was pumped out of the well. Finally, the pump intake was returned to 1198 ft for further purging and testing.

The pumping events served multiple purposes. In addition to cleaning the well, each pumping episode was used to quantify the specific capacity of the well for comparison to that measured before well development. Also, the final purging/testing event was extended for several hours to obtain an extensive suite of water samples from the well.

2.6 Hydraulic Testing—Postdevelopment

After development of screen 1, specific capacity tests were performed on February 28 and 29. The pumping results are summarized in Table 2.3-1. On February 28, the discharge rate was adjusted to between 3 and 4 gal./min to obtain data that could be compared with the predevelopment screen 1 test (which was conducted at 3.36 gal./min). The adjusted discharge rate was 3.23 gal./min, resulting in a drawdown of 2.02 ft and a specific capacity of 1.60 gal./min/ft. This represented a 47% increase over the specific capacity measured before well development. This confirmed that the well development procedures were reasonably effective.

On February 29, extensive pumping of screen 1 was performed at a discharge rate of 11.0 gal./min. The resulting drawdown was 7.7 ft, yielding a specific capacity of 1.43 gal./min. The reduction in specific capacity at the greater discharge rate, from 1.60 to 1.43 gal./min/ft, was attributable to increased turbulent flow associated with increased flow velocities at the greater discharge rate.

2.7 Water Quality

Table 2.7-1 shows the sample collection objectives for R-14 screen 1 during the hydraulic testing and the constituents that were measured in the field and laboratory.

2.7.1 Sample Collection, Field Preparation, and Analytical Techniques

A total of 17 primary groundwater samples were collected during the aquifer performance test conducted at R-14 screen 1 on February 29, 2008. Field parameters consisting of pH, turbidity, dissolved oxygen (DO), temperature (T), specific conductance (SC), and oxidation-reduction potential (ORP) were measured using a flow-through cell (Geotech) during pumping and sample collection. Measurements for the different field parameters recorded during the pumping test are provided in Table 2.7-2. Field pH and temperature were measured using a Beckman (Model 255) meter and DO was measured using a WTW (Model OXI-330I) DO meter. SC and ORP were measured using a HACH Sension-5 meter and a Thermoelectron Corp. (Russell RL 060P Model) instrument, respectively. Two equipment rinseate blanks and one field blank were collected during the pumping test. On February 29, 2008, groundwater samples

were generally collected every 5 min during the initial 25 min of the pumping test (Table 2.7-1). The frequency of sample collection decreased to every 10 min from 25 to 75 min during the test and every 30 min from 75 to 285 min (4.75 h). Groundwater pumping continued from 315 to 381 min (6.35 h), and no groundwater samples were collected for laboratory analyses during this time period. Field parameters, however, were measured during this interval. Groundwater samples were collected using a submersible pump consisting of a mild-steel discharge pipe equipped with a standard retrofitted submersible pump. The discharge rate varied from 10.40 to 10.97 gal./min during the aquifer performance test.

Twenty-one water samples (including 17 primary groundwater samples, 2 duplicates, and 2 equipment rinseate blanks) were filtered before analyses for metals, trace elements, and major cations and anions. Aliquots of samples collected from R-14 screen 1 were filtered through 0.45-µmeter (µm) Geotech disposable filters. Twenty-two nonfiltered samples (17 primary groundwater samples, 2 duplicates, 1 field blank, and 2 equipment rinseate blanks) were also analyzed for the same suite in addition to sulfide. Thirteen of the 22 nonfiltered samples were analyzed for total organic carbon (TOC) because of a component failure (broken heating element in the reaction chamber) associated with the TOC analytical instrument. Samples were acidified with analytical-grade nitric acid to a pH of 2.0 or less for metal and major cation analyses. Nonfiltered samples were collected for measurement of anions and total sulfide. Samples collected for total sulfide analyses were preserved with a buffer consisting of sodium hydroxide, ethylenediaminetetraacetic acid (EDTA), and ascorbic acid. Samples collected for TOC analysis were not filtered or acidified.

Chemical analyses of screening-groundwater samples were performed at the Laboratory's Earth and Environmental Sciences Group 6 (EES-6) laboratory. Groundwater samples were analyzed by EES-6 using techniques specified in the U.S. Environmental Protection Agency SW-846 Manual. Total carbonate alkalinity was measured using standard titration techniques. Ion chromatography was the analytical method for bromide, chloride, fluoride, nitrate, nitrite, oxalate, chlorate, phosphate, and sulfate. Total sulfide was determined by ion selective electrode, with a detection limit of 0.010 mg/L. Inductively coupled (argon) plasma optical emission spectroscopy (ICPOES) was used for analyses of calcium, magnesium, potassium, silica, and sodium. Aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, cesium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, rubidium, selenium, silver, thallium, thorium, tin, vanadium, uranium, and zinc were analyzed by inductively coupled (argon) plasma mass spectrometry (ICPMS). The precision limits (analytical error) for major ions and trace elements were generally less than ±10% using ICPOES and ICPMS. TOC was measured using a total carbon-organic carbon analyzer.

2.7.2 Field Parameters

Field parameters measured during the February 29, 2008, test and previous values measured from February 9, 2004, to February 29, 2008, are provided in Table 2.7-2 and are shown in Figure 2.7-1. Field pH varied from 7.53 to 7.71; T varied from 23.6°C to 24.3°C during the 2008 aquifer performance test conducted at R-14 screen 1; prior T values are not reliable because of long residence times in Westbay sampling bottles. SC generally decreased from 131 to 127 microSiemens per centimeter (µS/cm) and DO varied from 3.73 to 6.30 mg/L. All turbidity measurements were less than 2 nephelometric turbidity units (NTUs) (Table 2.7-2, Figure 2.7-1). ORP measurements varied from –26 to +118 millivolts during the pumping test. The variability in ORP throughout the pumping test suggests that groundwater is weakly poised with respect to reactive reductants and oxidants, inferring ORP values to be qualitative. A new platinum-reference electrode was used during part of the pumping test, starting with samples collected at 3:06 p.m. on February 29, 2008, in response to instrument drift resulting in anomalous negative readings. Field ORP is used along with analytical results (DO, nitrate, manganese, iron, sulfide, and sulfate) to evaluate the redox state of groundwater. Concentrations of DO ranged between 3.73 and 4.25 mg/L

during this part of the test, which are considered to be more reliable than the questionable negative ORP readings recorded between 10:40 a.m. and 2:50 p.m. on February 29, 2008.

2.7.3 Analytical Results

Analytical results for groundwater samples collected during performance testing at R-14 screen 1 are provided in Appendix A, Table A-1. Charge balance errors for dissolved cations and anions were generally less than ±10%. Figure 2.7-2 shows concentration trends of several ions during pumping of the regional aquifer (screen 1) at R-14. Calcium and sodium are the dominant cations present in the regional aquifer at R-14 screen 1 (Table A-1). Dissolved concentrations of calcium and sodium do not exceed maximum background concentrations of 41.70 and 32.90 mg/L, respectively, for regional aquifer groundwater (LANL 2007, 095817). Dissolved concentrations of calcium decreased from 12.0 to 9.88 mg/L or mg/L, and dissolved concentrations of sodium varied from 9.97 to 11.1 mg/L during pumping. Dissolved concentrations of chloride slightly varied from 2.92 to 3.09 mg/L, not exceeding the maximum background of 5.95 mg/L (LANL 2007, 095817). Concentrations of total carbonate alkalinity slightly varied from 75.7 to 76.9 mg $CaCO_3$/L and are less than the maximum background of 152 mg $CaCO_3$/L (LANL 2007, 095817). Dissolved concentrations of sulfate varied from 4.24 to 5.40 mg/L during pumping (Figure 2.7-2, Table A-1). Sulfate concentrations at R-14 screen 1 are less than the maximum background concentration of 8.63 mg/L for this anion (LANL 2007, 095817).

Concentrations of total sulfide were less than detection (0.010 mg/L), suggesting that sulfate reduction was not significant during pumping. ORP and DO measurements and stable sulfate concentrations also indicate that the groundwater is not sufficiently reduced to enhance stability of dissolved sulfide species at R-14 screen 1. Concentrations of TOC generally decreased from 1.13 to 0.42 mgC/L during pumping. Dissolved concentrations of nitrate(N) slightly varied from 0.35 to 0.39 mg/L during pumping (Figure 2.7-2, Table A-1).

Dissolved concentrations of barium ranging from 0.051 to 0.057 mg/L at R-14 screen 1 are within background distributions for regional aquifer groundwater (0.0049 to 0.115 mg/L) (LANL 2007, 095817). Dissolved concentrations of uranium range from 0.0010 to 0.0012 mg/L (Table A-1) and are less than the maximum background of 0.0025 mg/L for this actinide (LANL 2007, 095817). Uranium(VI) for the most part is the stable oxidation state of this actinide at R-14 screen 1, based on similar concentrations of uranium in sample pairs for filtered and nonfiltered aliquots. Uranium(VI) complexes, including $UO_2(CO_3)_2^{2-}$ and $UO_2(CO_3)_3^{4-}$, are mobile in oxidizing groundwater under basic pH conditions (Langmuir 1997, 056037) characteristic of R-14 screen 1.

Figure 2.7-3 shows concentrations of iron and manganese in filtered and nonfiltered samples collected at R-14 screen 1 since February 2004. During the February 2008 test, dissolved concentrations of iron and manganese ranged from 0.17 to 0.22 mg/L and from 0.081 to 0.113 mg/L (Table A-1), respectively. Concentrations of iron and manganese in filtered and nonfiltered samples decreased during characterization sampling conducted from 2004 to 2006. Higher concentrations of iron in both filtered and nonfiltered samples, however, were measured during the 2008 pumping test than during characterization sampling using the Westbay sampling system (Figure 2.7-3). During the 2008 pumping, concentrations of manganese increased; however, they were within the range of previous measurements (Figure 2.7-3). During this test, dissolved concentrations of iron exceeded the maximum background value of 0.147 mg/L, whereas dissolved concentrations of manganese did not exceed the maximum background value of 0.124 mg/L (LANL 2007, 095817).

During the 2008 test, iron concentrations in nonfiltered samples were greater than those in filtered samples (Table A-1) (Figure 2.7-3), suggesting the presence of iron-bearing particulates. Elevated, above-background concentrations of iron at R-14 screen 1 are hypothesized to result mainly from the presence of particulate hydrous ferric oxide (HFO) smaller than 0.45 μm (filter size) derived from the regional aquifer. Secondary effects of elevated iron may result from discharge pipe corrosion (see below) used to collect samples throughout the test. Concentrations of iron in filtered groundwater samples exceed those measured in the two filtered rinseate blanks, providing evidence for colloidal HFO derived from pumping of R-14 screen 1. Concentrations of DO consistently above 2 mg/L, TOC concentrations consistently less than 1 mgC/L, and detectable nitrate (as N) also support the stability of colloidal HFO in oxidizing groundwater at R-14 screen 1. Reductive dissolution of natural manganese dioxide possibly has taken place within the regional aquifer, based on very similar concentrations of manganese in filtered and nonfiltered samples (Figure 2.7-3, Table A-1).

Two equipment rinseate blanks (nonfiltered) collected from the pump (hardened steel) and discharge pipe (mild steel) have concentrations of total manganese and iron of 0.004 and 0.042 mg/L and 0.2 and 11.4 mg/L, respectively (Table A-1). Other metals and trace elements detected in the nonfiltered rinseate blanks include aluminum (0.023 and 0.103 mg/L) and zinc (0.024 and 0.052 mg/L) (Table A-2). Total concentrations of lead in the nonfiltered rinseate samples were 0.0031 and 0.0026 mg/L.

2.7.4 Well Screen Analysis

Previous Results

Analytical results obtained from sampling of well R-14 screen 1 were evaluated for representativeness and reliability of the water quality data obtained from this well, following geochemical protocols established by the Laboratory (2007, 096330) and approved by NMED (2007, 098182). Groundwater samples were collected from this Westbay-equipped well from 2004 to 2007 during 10 sampling events (LANL 2007, 096330). Groundwater samples collected from R-14 screen 1 during that interval have well screen analysis scores that range from 86% to 92%, with an average score of 90% (LANL 2007, 096330). The test scores for the 2004–2007 samples varied over time; two to four analytes or general indicators per sampling event failed the geochemical criteria, consisting of 31 to 36 individual tests. Analytes that did not meet the well screen criteria during one or more of the previous sampling rounds included ORP, manganese, iron, perchlorate, barium, chromium, and/or nitrate (LANL 2007, 096330).

Updated Well Screen Analysis

Table B-1 provides results of the Laboratory's well screen analysis using analytical results obtained during this 2008 pumping test. A total of eight primary groundwater samples were selected for this analysis, including nonfiltered samples GW14-08-10725, GW14-08-10731, GW14-08-10737, and GW14-08-10743 and filtered samples GW14-08-10727, GW14-08-10787, GW14-08-10793, and GW14-08-10799. These four filtered/nonfiltered pairs of samples were collected at evenly spaced intervals throughout the pumping test. These groundwater samples analyzed from well R-14 screen 1 during the 2008 test have scores of 97%, consisting of 33 and 34 criteria (Table B-1). Two negative ORP measurements were not included as part of the geochemical screening criteria for the selected samples due to electrode malfunction. The average well screen test score for the 2008 test is 97%, which is an improvement over the previous average score of 90% for the 2004 to 2007 samples. Elevated above-background concentrations of dissolved iron (17 samples) contributed to samples failing one criterion of the well screen analysis (Table B-1).

Well screen tests for four criteria were not applicable in the updated analysis because groundwater samples were not analyzed for perchlorate, acetone, total Kjeldahl nitrogen, and ammonia.

2.7.5 Geochemical Comparison of Westbay and Pumping Test Samples

A geochemical comparison of selected analytes and pH was performed on the R-14 screen 1 samples to compare groundwaters collected by the 2004 to 2007 passive Westbay sampling system with those collected in 2008 using a submersible pump that allowed active purging. This comparison included analytical results for 10 previous sampling events, conducted from February 9, 2004, to August 14, 2007, using the Westbay system. Concentrations of total carbonate alkalinity, TOC, and dissolved chloride, iron, manganese, nitrate(N), sulfate, strontium, uranium, and zinc were generally lower in samples using Westbay equipment in comparison to those collected using a submersible pump during the 2008 pumping test (Table A-1). Higher total and dissolved concentrations of iron were measured during the 2008 pumping test than concentrations measured during previous characterization sampling. Well rehabilitation involving energetic purging or pumping of screen 1 allowed groundwater outside of the filter pack to be evacuated and sampled, providing more representative groundwater samples.

3.0 SUMMARY AND CONCLUSIONS

There were no deviations from the NMED-approved work plan. All activities were completed successfully with the exception of installation of the permanent sampling pump. R-14 will be outfitted with a single environmentally retrofitted 4-in. submersible pump with a 1-in. stainless-pump column. A dedicated, 1-in.-diameter polyvinyl chloride transducer tube will be installed with and banded to the pump column.

Screen 2 was successfully isolated and abandoned using guidance in the Compliance Order on Consent.

The specific capacity test performed on February 28, 2008, after redevelopment of screen 1 yielded a specific capacity of 1.60 gal./min/ft. This represented a 47% increase over the specific capacity measured before well development of 1.09 gal./min/ft. This confirmed that the well development procedures were reasonably effective, despite poor operation of the submersible jetting pump.

On February 29, 2008, extensive pumping of screen 1 yielded a specific capacity of 1.43 gal./min. The reduction in specific capacity at the greater discharge rate, from 1.60 to 1.43 gal./min/ft, was attributable to increased turbulent flow associated with increased flow velocities at the greater discharge rate.

The water quality of screen 1 was very good even before redevelopment of screen 1 but improved as a result of redevelopment activities. This conclusion is based on the following observations and data.

- Screen 1 turbidity values were less than 2 NTUs throughout the 2008 pumping test.
- Major cations and anions at screen 1, such as Ca, Cl, Na, NO^3(N), and SO_4 and TOC, are within background values established for regional aquifer groundwater.
- The elevated, above-background concentration of iron probably results mainly from the presence of particulate HFO, smaller than 0.45 μm (filter size), within the regional aquifer. Secondary effects of elevated iron may be produced from discharge pipe corrosion during sampling.
- Groundwater samples analyzed from well R-14 screen 1 during the 2008 test have an average well screen analysis score of 97%, with each test having a score of 97%. The average well screen score for the 2004–2007 characterization sampling, during which the nonpurging Westbay sampling system was in use, was 90%. Excessive concentrations of dissolved iron (17 samples) exceeding Laboratory background levels contributed to samples failing only one criterion of the 2008 well screen analysis.

- Concentrations of total carbonate alkalinity, TOC, and dissolved chloride, iron, manganese, nitrate(N), sulfate, strontium, uranium, and zinc were generally lower in samples using Westbay equipment in comparison to those collected during the 2008 test (Table A-1). Well rehabilitation involving energetic purging or pumping of screen 1 allowed groundwater outside of the filter pack to be sampled, providing more representative groundwater samples.

4.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

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LANL (Los Alamos National Laboratory), May 2007. "Groundwater Background Investigation Report, Revision 3," Los Alamos National Laboratory document LA-UR-07-2853, Los Alamos, New Mexico. (LANL 2007, 095817)

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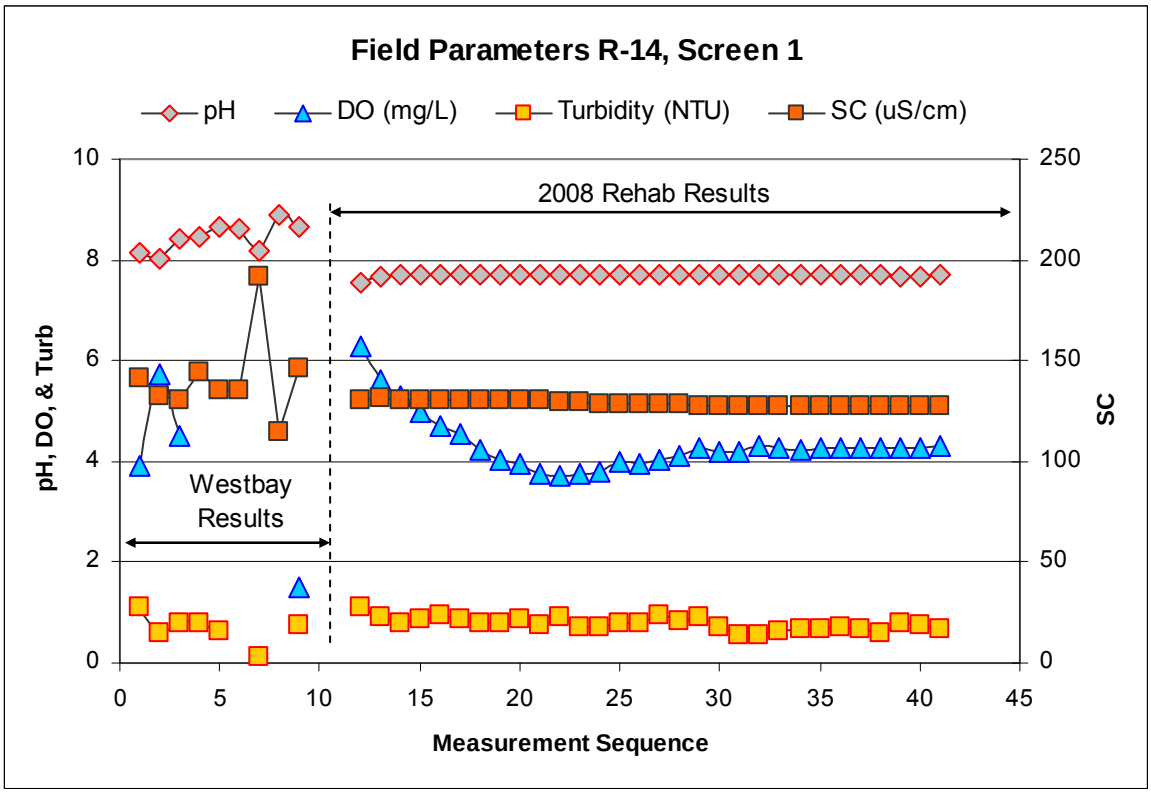

Figure 2.7-1 **Field parameters measured at R-14 screen 1 from 2004 to 2007 using the Westbay sampling system and the February 29, 2008, pumping test**

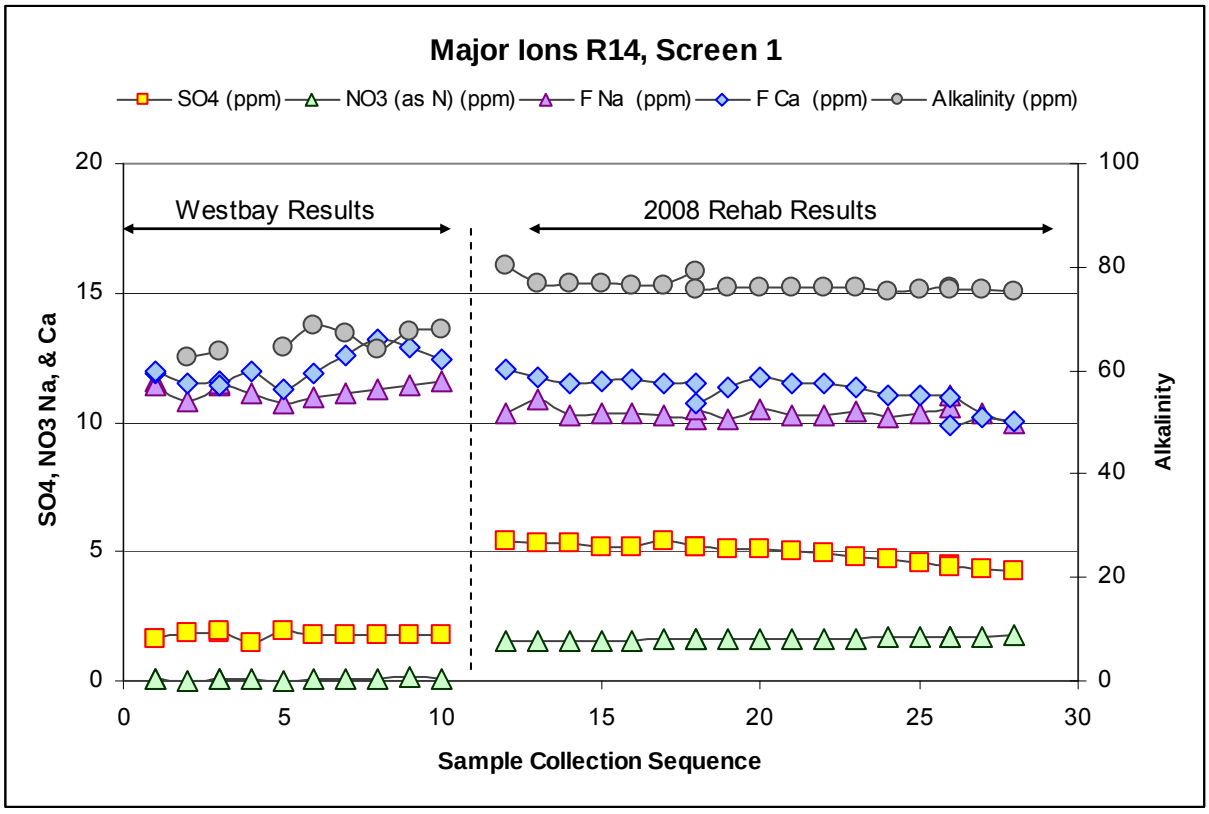

Figure 2.7-2 **Sample sequence versus dissolved concentrations of total carbonate alkalinity ($mgCaCO^3/L$), sodium (Na), calcium (Ca), sulfate (SO_4), and nitrate(N) (NO_3-N) at R-14 screen 1 from 2004 to 2007 using the Westbay sampling system and the February 29, 2008, pumping test**

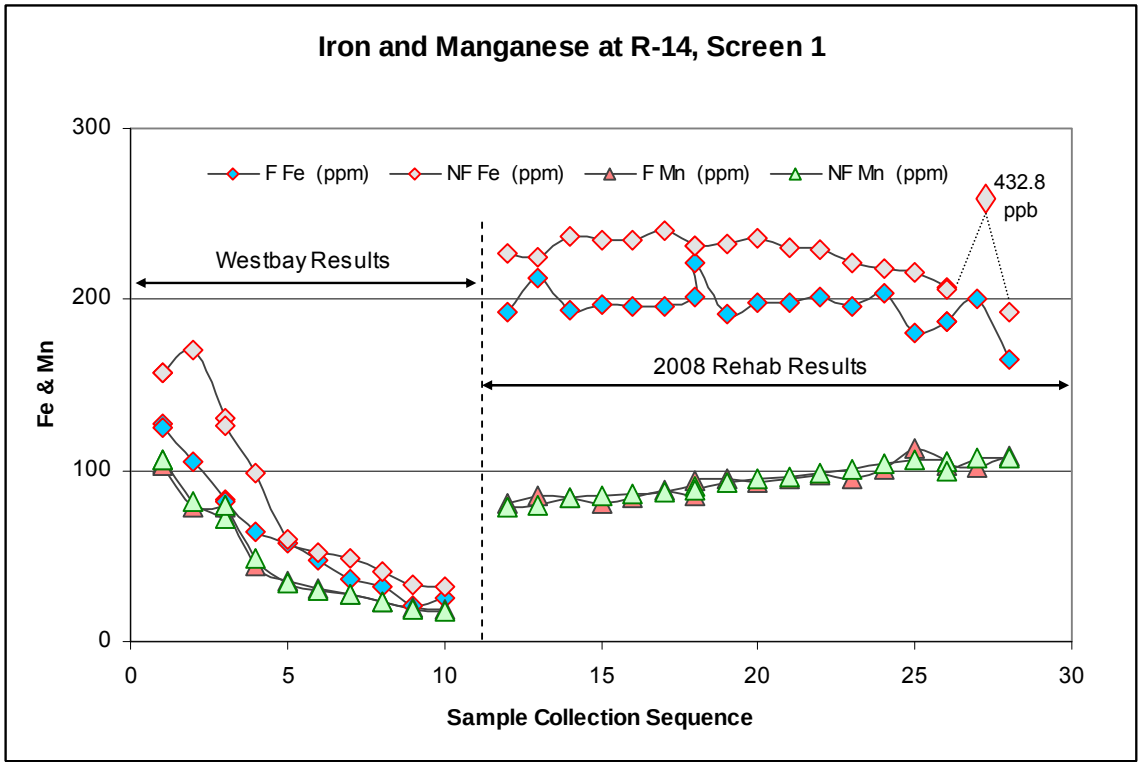

Figure 2.7-3 **Sample sequence versus dissolved and total concentrations of iron (Fe) and manganese (Mn) during characterization sampling from 2004 to 2007 using the Westbay sampling system and the February 29, 2008, pumping test**

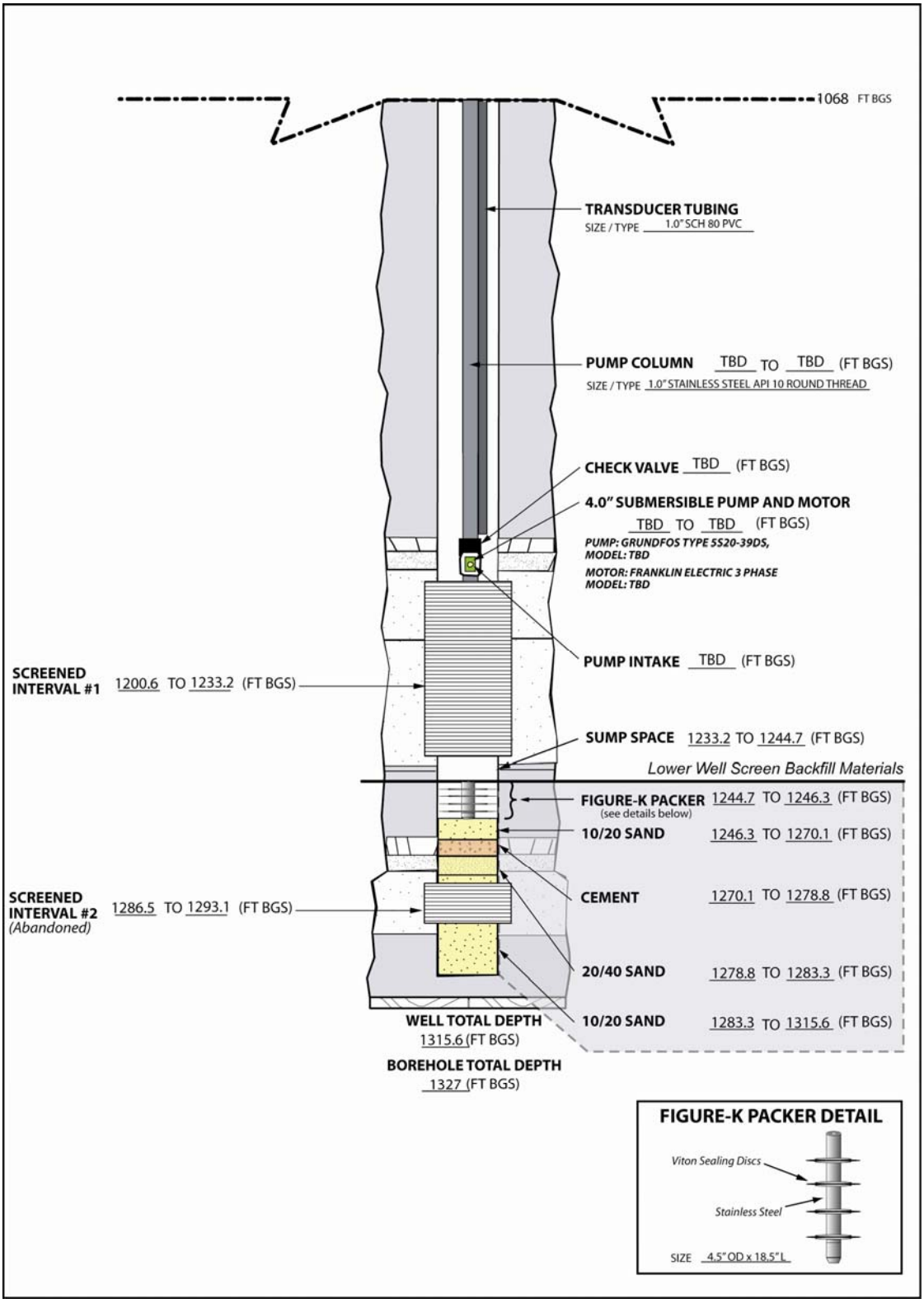

Figure 2.4-1 Well R-14 final rehabilitation and conversion configuration

Table 2.7-1
Sample Collection Objectives and Measured Constituents for the R-14 Well Rehabilitation and Conversion Project

Process/Step	Purpose	Sample Collection	Field Parameters	Frequency/Number of Samples
Remove Westbay System	Prepare well for rehabilitation	None	None	None
Video well	Assess screen condition, determine composite SWL before redevelopment	DVD and VHS recording	None	None
Pump Screen #1 and Screen #2 from Isolated Screens to Evaluate Screen Performance	Measure specific capacity and assess flow rate and drawdown during sustained pumping of each zone.	None	Measure flow rate and drawdown	None
Jet and Simultaneously Pump Screen #1	Redevelop screen #1	None	None	None
Swab Screen #1	Redevelop screen #1	None	None	None
Abandon Screen #2	Isolate screen #2 from screen #1	None	None	None
Pump Screen #1 to Evaluate Groundwater Chemistry and Screen Performance	Measure specific capacity and assess water quality from screen #1 during sustained pumping	Collect performance suite (see notes below)	Flow rate and drawdown, pH, ORP, T, SC, DO, and turbidity	Every 5 min for first 30 min; 10 min for next 30 min; 30 min for a minimum of 3 h; each hour until end of specific capacity test (25 performance suite samples per screen). Paperwork for additional samples will be ordered if rehabilitation activities are extended.
Install K-Packer and Submersible Pump Sample System	Long-term sampling	None	None	None

Table 2.7-1 (continued)

Process/Step	Purpose	Sample Collection	Field Parameters	Frequency/Number of Samples
Performance Measurement, *after* Submersible Pump Installment	Test effects of rehabilitation	Sample 1 mo after installation; full suite analysis, followed by semiannual monitoring, per "2007 Interim Facility-Wide Groundwater Monitoring Plan" requirements and schedule	pH, ORP, T, SC, DO, turbidity	Refer to the "2007 Interim Facility-Wide Groundwater Monitoring Plan" for analytes and sampling schedule

Notes: Performance suite: Sulfide (not filtered), total organic carbon (not filtered), metals and cations (filtered and nonfiltered), alkalinity (nonfiltered), and anions (including perchlorate, filtered), from the Earth and Environmental Sciences-6 laboratory.

Full analytical suite: Refer to the "2007 Interim Groundwater Monitoring Plan" watershed analytical suites (volatile organic compounds, semivolatile organic compounds, general inorganics [including alkalinity], metals, radionuclides, tritium, stable isotopes of hydrogen, oxygen, and nitrogen). Full analytical suite samples to be collected after installation of the dedicated sampling system.

Table 2.7-2
Field Parameters Measured at R-14 Screen 1

Sample Collection System	Sample Collection Date	Sample Collection Time	pH (SU)[a]	Temp (deg C)	SC (uS/cm)	DO (mg/L)	Turbidity (NTU)	ORP[b] (mV)	Cumulative Volume Purged[c] (gal.)	Pumping Rate (gal/min)
Westbay Sampling System	2/9/04	14:00	8.13	18.1	141.4	3.9	1.1	411.5	≈ 5	< 0.1
	5/11/05	8:43	8.03	16.5	132.0	5.7	0.6	na[d]	≈ 5	< 0.1
	1/24/06	9:39	8.40	18.9	130.1	4.5	0.8	na	≈ 5	< 0.1
	6/26/06	11:17	8.44	21.7	144.0	na	0.8	na	≈ 5	< 0.1
	10/23/06	10:30	8.67	20.5	135.0	na	0.6	na	≈ 5	< 0.1
	10/23/06	10:23	8.61	na	135.0	na	na	na	≈ 5	< 0.1
	3/1/07	14:33	8.18	15.3	191.3	na	0.1	na	≈ 5	< 0.1
	6/5/07	8:58	8.9	na	114.8	na	na	na	≈ 5	< 0.1
	8/14/07	11:06	8.66	24.8	146.0	1.5	0.75	na	≈ 5	< 0.1
Packer-Pump Sampling System (well rehabilitation effort)	2/29/2008	9:35	7.53	23.8	130.3	6.3	1.1	83[a]	729.0	10.7
	2/29/2008	9:40	7.66	23.6	131.1	5.6	0.9	28[a]	919.3	10.7
	2/29/2008	9:45	7.69	23.6	130.9	5.3	0.8	20[a]	972.8	10.7
	2/29/2008	9:50	7.70	23.6	130.9	5.0	0.9	12[a]	1031.0	10.8
	2/29/2008	9:55	7.71	23.6	130.7	4.7	0.9	13[a]	1089.8	10.8
	2/29/2008	10:00	7.71	23.6	130.5	4.5	0.9	12a	1149.0	10.9
	2/29/2008	10:10	7.71	23.6	130.4	4.2	0.8	8[a]	1260.9	10.9
	2/29/2008	10:20	7.71	23.6	130.4	4.1	0.8	5[a]	1372.1	10.9
	2/29/2008	10:30	7.71	23.4	130.2	3.9	0.9	3[a]	1482.4	10.9
	2/29/2008	10:40	7.71	23.6	130.1	3.8	0.8	-11[a]	1585.6	10.8
	2/29/2008	10:50	7.71	23.6	129.9	3.7	0.9	-19[a]	1686.4	10.7
	2/29/2008	11:20	7.72	24.0	129.9	3.8	0.7	24[a]	1997.6	10.7
	2/29/2008	11:50	7.70	24.3	128.6	3.8	0.7	-13[a]	2306.9	10.7
	2/29/2008	12:20	7.70	24.1	128.6	4.0	0.8	-11[a]	2632.2	10.9
	2/29/2008	12:50	7.70	23.7	128.5	4.0	0.8	-27[a]	3008.4	10.9

Table 2.7-2 (continued)

Sample Collection System	Sample Collection Date	Sample Collection Time	pH (SU)[a]	Temp (deg C)	SC (uS/cm)	DO (mg/L)	Turbidity (NTU)	ORP[b] (mV)	Cumulative Volume Purged[c] (gal.)	Pumping Rate (gal/min)
Packer-Pump Sampling System (well rehabilitation effort)	2/29/2008	13:20	7.70	23.6	128.5	4.0	1.0	-26[a]	3341.5	10.9
	2/29/2008	13:50	7.69	23.7	128.5	4.1	0.8	-25[a]	3675.8	11.0
	2/29/2008	14:20	7.69	23.7	127.5	4.3	0.9	-19[a]	4015.0	11.0
	2/29/2008	14:50	7.69	23.7	127.5	4.2	0.7	-18[a]	4336.2	10.9
	2/29/2008	15:06	7.69	23.7	127.5	4.2	0.6	109	4503.2	10.9
	2/29/2008	15:11	7.69	23.6	127.3	4.3	0.6	118	4553.6	10.9
	2/29/2008	15:16	7.69	23.7	127.4	4.3	0.6	110	4608.2	10.9
	2/29/2008	15:21	7.69	23.6	127.2	4.2	0.7	96	4662.8	10.8
	2/29/2008	15:26	7.69	23.6	127.3	4.3	0.7	103	4674.2	10.7
	2/29/2008	15:31	7.70	23.7	127.0	4.3	0.7	121	4684.6	10.6
	2/29/2008	15:36	7.70	23.7	127.1	4.3	0.7	116	4694.0	10.5
	2/29/2008	15:41	7.69	23.7	127.1	4.3	0.6	107	4698.0	10.4
	2/29/2008	15:46	7.68	23.6	127.4	4.3	0.8	111	4700.8	10.8
	2/29/2008	15:51	7.66	23.8	127.6	4.3	0.8	109	4935.6	10.8
	2/29/2008	15:56	7.69	23.7	127.0	4.3	0.7	112	4989.6	10.8

[a] SU = Standard unit.

[b] = ORP measurements were not reliable during initial sample collection on 02/29/2008 due to faulty probe.

[c] = Cumulative volume purged during each sampling event; Westbay values are approximate.

[d] na = Not available.

Table 2.2-1
Video Log Observations

	Depth to		Remarks
	Top	Bottom	
SWL	1181 ft 5 in.	n/a*	Composite
Screen #1	1200 ft 1 in.	1231 ft 10 in.	Pipe-based; visibility very good; screen interval clean
Screen #2	1285 ft 4 in.	1291 ft 6 in.	Pipe-based; visibility very good; screen interval clean
TD	1311 ft 11 in.	n/a	Sediment in bottom of sump

*n/a = not applicable.

Table 2.3-1
R-14 Screen 1 and 2 Pumping Results

Date	Zone	Pumping Rate (gal./min)	Drawdown (ft)	Specific Capacity (gal./min/ft)
Predevelopment Data				
2/12/2008	Screens 1 & 2	3.45	2.62	1.32
2/12/2008	Screen 1	3.36	3.08	1.09
2/13/2008	Screen 2	3.58	20.7	0.17
Postdevelopment Data				
2/28/2008	Screen 1	3.23	2.02	1.60
2/29/2008	Screen 1	11.0	7.7	1.43

Appendix A

Analytical Data Results

Table A1
Laboratory Analytical Results for R-14 Screen 1

SAMPLE ID	Date Collected	Time Collected	DATE RECEIVED 0.!	ER/RRES-WQH	Field Prep	QA/QC Type	Comment	Ag rslt (ppm)	stdev (Ag)	Al rslt (ppm)	stdev (Al)	As rslt (ppm)	stdev (As)	B rslt (ppm)	stdev (B)	Ba rslt (ppm)	stdev (Ba)	Be rslt (ppm)	stdev (Be)	Br(-) ppm	Br(-) (U)	TOC rslt (ppm)
GW14-08-10725	02/29/08	9:35	2/29/2008	08-730	NF	CS	---[a]	0.001	---	0.022	0.001	0.0010	0.0000	0.013	0.000	0.056	0.001	0.001	---	---	---	1.13
GW14-08-10726	02/29/08	9:40	2/29/2008	08-730	NF	CS	---	0.001	---	0.020	0.002	0.0010	0.0000	0.013	0.000	0.056	0.002	0.001	---	---	---	0.99
GW14-08-10729	02/29/08	9:45	2/29/2008	08-730	NF	CS	---	0.001	---	0.016	0.001	0.0010	0.0001	0.028	0.000	0.051	0.002	0.001	---	---	---	1.03
GW14-08-10730	02/29/08	9:50	2/29/2008	08-730	NF	CS	---	0.001	---	0.017	0.003	0.0011	0.0000	0.023	0.000	0.055	0.001	0.001	---	---	---	0.99
GW14-08-10731	02/29/08	9:55	2/29/2008	08-730	NF	CS	---	0.001	---	0.020	0.002	0.0011	0.0001	0.020	0.000	0.059	0.001	0.001	---	---	---	0.93
GW14-08-10732	02/29/08	10:00	2/29/2008	08-730	NF	CS	---	0.001	---	0.015	0.001	0.0010	0.0000	0.019	0.000	0.055	0.000	0.001	---	---	---	0.89
GW14-08-10733	02/29/08	10:10	2/29/2008	08-730	NF	CS	---	0.001	---	0.016	0.001	0.0010	0.0000	0.016	0.000	0.056	0.002	0.001	---	---	---	0.91
GW14-08-10734	02/29/08	10:20	2/29/2008	08-730	NF	CS	---	0.001	---	0.027	0.003	0.0011	0.0001	0.016	0.000	0.056	0.000	0.001	---	---	---	0.93
GW14-08-10735	02/29/08	10:30	2/29/2008	08-730	NF	CS	---	0.001	---	0.021	0.001	0.0010	0.0000	0.015	0.000	0.054	0.000	0.001	---	---	---	0.85
GW14-08-10736	02/29/08	10:40	2/29/2008	08-730	NF	CS	---	0.001	---	0.015	0.000	0.0011	0.0000	0.014	0.000	0.058	0.002	0.001	---	---	---	0.82
GW14-08-10737	02/29/08	10:50	2/29/2008	08-730	NF	CS	---	0.001	---	0.015	0.001	0.0011	0.0001	0.054	0.001	0.053	0.001	0.001	---	---	---	0.83
GW14-08-10738	02/29/08	11:20	2/29/2008	08-730	NF	CS	---	0.001	---	0.013	0.001	0.0010	0.0000	0.030	0.001	0.058	0.001	0.001	---	---	---	---
GW14-08-10739	02/29/08	11:50	2/29/2008	08-730	NF	CS	---	0.001	---	0.014	0.001	0.0010	0.0000	0.022	0.001	0.056	0.000	0.001	---	---	---	---
GW14-08-10740	02/29/08	12:20	2/29/2008	08-730	NF	CS	---	0.001	---	0.016	0.001	0.0009	0.0000	0.018	0.000	0.051	0.000	0.001	---	---	---	---
GW14-08-10741	02/29/08	12:50	2/29/2008	08-730	NF	CS	---	0.001	---	0.011	0.002	0.0011	0.0002	0.016	0.000	0.058	0.007	0.001	---	---	---	---
GW14-08-10742	02/29/08	13:50	2/29/2008	08-730	NF	CS	---	0.001	---	0.014	0.002	0.0010	0.0000	0.015	0.001	0.052	0.004	0.001	---	---	---	---
GW14-08-10743	02/29/08	14:50	2/29/2008	08-730	NF	CS	---	0.001	---	0.013	0.000	0.0010	0.0000	0.013	0.001	0.054	0.004	0.001	---	---	---	---
GW14-08-10777	02/28/08	NA[b]	2/28/2008	08-712	NF	EQB	---	0.001	---	0.023	0.001	0.0002	---	0.017	0.001	0.003	0.000	0.001	---	---	---	0.42
GW14-08-10778	02/28/08	NA	2/28/2008	08-712	NF	EQB	---	0.001	---	0.103	0.005	0.0005	0.0000	0.011	0.000	0.017	0.000	0.001	---	---	---	0.57
GW14-08-10779	02/29/08	10:20	2/29/2008	08-730	NF	FB	---	0.001	---	0.002	0.000	0.0002	---	0.017	0.000	0.001	---	0.001	---	---	---	---
GW14-08-10780	02/29/08	10:10	2/29/2008	08-730	NF	FD#1	---	0.001	---	0.019	0.001	0.0010	0.0000	0.024	0.000	0.054	0.003	0.001	---	---	---	---
GW14-08-10781	02/29/08	12:50	2/29/2008	08-730	NF	FD#2	---	0.001	---	0.014	0.000	0.0010	0.0000	0.019	0.000	0.054	0.001	0.001	---	---	---	---
GW14-08-10727	02/29/08	9:35	2/29/2008	08-731	F	CS	---	0.001	---	0.009	0.000	0.0010	0.0000	0.012	0.000	0.055	0.000	0.001	---	0.01	---	---
GW14-08-10728	02/29/08	9:40	2/29/2008	08-731	F	CS	---	0.001	---	0.009	0.000	0.0010	0.0000	0.039	0.000	0.054	0.001	0.001	---	0.01	---	---
GW14-08-10785	02/29/08	9:45	2/29/2008	08-731	F	CS	---	0.001	---	0.011	0.001	0.0010	0.0000	0.017	0.000	0.055	0.001	0.001	---	0.01	---	---
GW14-08-10786	02/29/08	9:50	2/29/2008	08-731	F	CS	---	0.001	---	0.010	0.001	0.0009	0.0000	0.016	0.000	0.054	0.001	0.001	---	0.01	---	---
GW14-08-10787	02/29/08	9:55	2/29/2008	08-731	F	CS	---	0.001	---	0.007	0.000	0.0010	0.0000	0.015	0.000	0.055	0.001	0.001	---	0.01	---	---
GW14-08-10788	02/29/08	10:00	2/29/2008	08-731	F	CS	---	0.001	---	0.012	0.000	0.0010	0.0001	0.013	0.000	0.055	0.002	0.001	---	0.01	---	---
GW14-08-10789	02/29/08	10:10	2/29/2008	08-731	F	CS	---	0.001	---	0.010	0.000	0.0010	0.0000	0.013	0.000	0.052	0.003	0.001	---	0.01	---	---
GW14-08-10790	02/29/08	10:20	2/29/2008	08-731	F	CS	---	0.001	---	0.008	0.000	0.0010	0.0000	0.012	0.000	0.056	0.001	0.001	---	0.01	---	---
GW14-08-10791	02/29/08	10:30	2/29/2008	08-731	F	CS	---	0.001	---	0.007	0.000	0.0010	0.0000	0.050	0.001	0.055	0.002	0.001	---	0.01	---	---
GW14-08-10792	02/29/08	10:40	2/29/2008	08-731	F	CS	---	0.001	---	0.007	0.000	0.0010	0.0000	0.028	0.000	0.056	0.000	0.001	---	0.01	---	---
GW14-08-10793	02/29/08	10:50	2/29/2008	08-731	F	CS	---	0.001	---	0.008	0.000	0.0010	0.0000	0.020	0.000	0.054	0.001	0.001	---	0.01	---	---
GW14-08-10794	02/29/08	11:20	2/29/2008	08-731	F	CS	---	0.001	---	0.006	0.000	0.0009	0.0001	0.016	0.000	0.051	0.003	0.001	---	0.01	U	---
GW14-08-10795	02/29/08	11:50	2/29/2008	08-731	F	CS	---	0.001	---	0.008	0.000	0.0010	0.0001	0.015	0.000	0.056	0.003	0.001	---	0.01	---	---
GW14-08-10796	02/29/08	12:20	2/29/2008	08-731	F	CS	---	0.001	---	0.009	0.000	0.0010	0.0000	0.014	0.000	0.056	0.002	0.001	---	0.01	---	---
GW14-08-10797	02/29/08	12:50	2/29/2008	08-731	F	CS	---	0.001	---	0.012	0.000	0.0010	0.0000	0.014	0.000	0.056	0.001	0.001	---	0.01	---	---
GW14-08-10798	02/29/08	13:50	2/29/2008	08-731	F	CS	---	0.001	---	0.008	0.000	0.0010	0.0000	0.013	0.000	0.055	0.000	0.001	---	0.01	---	---
GW14-08-10799	02/29/08	14:50	2/29/2008	08-731	F	CS	---	0.001	---	0.008	0.000	0.0010	0.0001	0.013	0.000	0.055	0.000	0.001	---	0.01	---	---
GW14-08-10833	02/28/08	NA	2/28/2008	08-711	F	EQB	---	0.001	---	0.004	0.000	0.0002	---	0.005	0.000	0.001	---	0.001	---	0.01	U	---
GW14-08-10834	02/28/08	NA	2/28/2008	08-711	F	EQB	---	0.001	---	0.011	0.000	0.0002	---	0.005	0.000	0.001	---	0.001	---	0.01	U	---
GW14-08-10836	02/29/08	10:10	2/29/2008	08-731	F	FD#1	---	0.001	---	0.010	0.001	0.0010	0.0000	0.012	0.000	0.057	0.003	0.001	---	0.01	---	---
GW14-08-10837	02/29/08	12:50	2/29/2008	08-731	F	FD#2	---	0.001	---	0.006	0.000	0.0010	0.0000	0.051	0.001	0.055	0.001	0.001	---	0.01	---	---

Table A1
Laboratory Analytical Results for R-14 Screen 1

TOC (U)	Ca rslt (ppm)	stdev (Ca)	Cd rslt (ppm)	stdev (Cd)	Cl(-) ppm	Cl(-) (U)	ClO4(-) ppm	ClO4(-) (U)	Co rslt (ppm)	stdev (Co)	Alk-CO_3 rslt (ppm)	ALK-CO_3 (U)	Cr rslt (ppm)	stdev (Cr)	Cs rslt (ppm)	stdev (Cs)	Cu rslt (ppm)	stdev (Cu)	F(-) ppm	F(-) (U)	Fe rslt (ppm)	stdev (Fe)
---	12.0	0.0	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.002	0.000	---	---	0.23	0.00
---	12.0	0.0	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.002	0.000	---	---	0.22	0.00
---	12.0	0.0	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.008	0.000	---	---	0.24	0.01
---	11.9	0.1	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.002	0.000	---	---	0.23	0.00
---	11.9	0.1	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.003	0.000	---	---	0.24	0.00
---	11.8	0.1	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.002	0.000	---	---	0.24	0.00
---	11.5	0.1	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.001		---	---	0.23	0.00
---	11.5	0.0	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.002	0.000	---	---	0.23	0.00
---	11.4	0.1	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.001	0.000	---	---	0.24	0.00
---	11.1	0.1	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.002	0.000	---	---	0.23	0.00
---	11.2	0.1	0.001	---	---	---	---	---	0.001	---	0.8	U	0.003	0.000	0.001	---	0.002	0.000	---	---	0.23	0.00
---	11.0	0.1	0.001	---	---	---	---	---	0.001	---	0.8	U	0.003	0.000	0.001	---	0.001	---	---	---	0.22	0.00
---	10.9	0.0	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.001	---	---	---	0.22	0.00
---	10.7	0.1	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.001	0.000	---	---	0.22	0.00
---	10.5	0.0	0.001	---	---	---	---	---	0.001	---	0.8	U	0.005	0.001	0.001	---	0.001		---	---	0.21	0.00
---	10.5	0.0	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.002	0.000	---	---	0.43	0.00
---	10.3	0.1	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.002	0.000	---	---	0.19	0.00
---	0.47	0.01	0.001	---	---	---	---	---	0.001	---	0.8	U	0.001	0.000	0.001	---	0.002	0.000	---	---	0.2	0.0
---	1.00	0.01	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.003	0.000	---	---	11.4	0.0
---	0.01		0.001	---	---	---	---	---	0.001	---	0.8	U	0.001		0.001	---	0.001		---	---	0.01	
---	11.2	0.0	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.004	0.000	---	---	0.23	0.00
---	10.8	0.0	0.001	---	---	---	---	---	0.001	---	0.8	U	0.002	0.000	0.001	---	0.011	0.000	---	---	0.21	0.00
---	12.1	0.0	0.001	---	3.04	---	---	---	0.002	0.000	0.8	U	0.002	0.000	0.001	---	0.003	0.000	0.32	---	0.19	0.00
---	11.7	0.1	0.001	---	3.07	---	---	---	0.002	0.000	0.8	U	0.002	0.000	0.001	---	0.001	0.000	0.31	---	0.21	0.00
---	11.5	0.0	0.001	---	3.09	---	---	---	0.003	0.000	0.8	U	0.002	0.000	0.001	---	0.002	0.000	0.38	---	0.19	0.00
---	11.6	0.0	0.001	---	2.96	---	---	---	0.002	0.000	0.8	U	0.002	0.000	0.001	---	0.001	0.000	0.31	---	0.20	0.00
---	11.6	0.0	0.001	---	3.00	---	---	---	0.002	0.000	0.8	U	0.002	0.000	0.001	---	0.001	---	0.32	---	0.20	0.00
---	11.5	0.1	0.001	---	3.23	---	---	---	0.002	0.000	0.8	U	0.002	0.000	0.001	---	0.003	0.000	0.39	---	0.20	0.00
---	11.5	0.1	0.001	---	3.03	---	---	---	0.001	0.000	0.8	U	0.002	0.000	0.001	---	0.002	0.000	0.37	---	0.20	0.00
---	11.3	0.0	0.001	---	3.01	---	---	---	0.004	0.000	0.8	U	0.002	0.000	0.001	---	0.001	0.000	0.37	---	0.19	0.00
---	11.7	0.0	0.001	---	2.99	---	---	---	0.002	0.000	0.8	U	0.002	0.000	0.001	---	0.001	---	0.32	---	0.20	0.00
---	11.5	0.0	0.001	---	3.01	---	---	---	0.002	0.000	0.8	U	0.002	0.000	0.001	---	0.001	---	0.37	---	0.20	0.00
---	11.5	0.0	0.001	---	2.94	---	---	---	0.003	0.000	0.8	U	0.002	0.000	0.001	---	0.008	0.000	0.37	---	0.20	0.00
---	11.3	0.0	0.001	---	2.95	---	---	---	0.003	0.000	0.8	U	0.002	0.000	0.001	---	0.001	0.000	0.34	---	0.20	0.00
---	11.0	0.0	0.001	---	3.00	---	---	---	0.003	0.000	0.8	U	0.002	0.000	0.001	---	0.011	0.000	0.38	---	0.20	0.00
---	11.0	0.1	0.001	---	2.92	---	---	---	0.006	0.000	0.8	U	0.002	0.000	0.001	---	0.002	0.000	0.29	---	0.18	0.00
---	11.0	0.0	0.001	---	2.93	---	---	---	0.001	0.000	0.8	U	0.002	0.000	0.001	---	0.001	0.000	0.32	---	0.19	0.00
---	10.2	0.1	0.001	---	2.94	---	---	---	0.002	0.000	0.8	U	0.003	0.000	0.001	---	0.001	0.000	0.29	---	0.20	0.00
---	10.0	0.0	0.001	---	3.01	---	---	---	0.002	0.000	0.8	U	0.002	0.000	0.001	---	0.001	---	0.29	---	0.17	0.00
---	0.42	0.01	0.001	---	0.24	---	---	---	0.001	0.000	0.8	U	0.001		0.001	---	0.001	---	0.01	---	0.01	
---	0.26	0.00	0.001	---	0.07	---	---	---	0.001		0.8	U	0.001		0.001	---	0.002	0.000	0.01	U	0.05	0.00
---	10.8	0.0	0.001	---	3.03	---	---	---	0.004	0.000	0.8	U	0.0020	0.0001	0.001	---	0.002	0.000	0.32	---	0.22	0.00
---	9.88	0.00	0.001	---	2.92	---	---	---	0.003	0.000	0.8	U	0.0020	0.0001	0.001	---	0.001	---	0.30	---	0.19	0.00

Table A1
Laboratory Analytical Results for R-14 Screen 1

Alk-CO_3+HCO_3 rslt (ppm)	ALK-CO_3+HCO_3 (U)	Hg rslt (ppm)	stdev (Hg)	K rslt (ppm)	stdev (K)	Li rslt (ppm)	stdev (Li)	Mg rslt (ppm)	stdev (Mg)	Mn rslt (ppm)	stdev (Mn)	Mo rslt (ppm)	stdev (Mo)	Na rslt (ppm)	stdev (Na)	Ni rslt (ppm)	stdev (Ni)	NO2(ppm)	NO2-N rslt	NO2-N (U)	NO3 ppm
80.3	---	0.00005	---	2.13	0.03	0.020	0.000	2.69	0.02	0.078	0.004	0.001	---	10.3	0.0	0.001	0.000	---	---	---	---
76.7	---	0.00005	---	2.13	0.02	0.021	0.000	2.73	0.03	0.079	0.003	0.001	---	10.3	0.1	0.003	0.000	---	---	---	---
76.8	---	0.00005	---	2.15	0.01	0.020	0.001	2.83	0.01	0.084	0.000	0.001	---	10.9	0.0	0.001	0.000	---	---	---	---
76.8	---	0.00005	---	2.11	0.01	0.021	0.002	2.82	0.01	0.085	0.001	0.001	---	10.9	0.1	0.001	0.000	---	---	---	---
76.3	---	0.00005	---	2.07	0.00	0.021	0.000	2.84	0.01	0.087	0.000	0.001	---	10.8	0.1	0.001	0.000	---	---	---	---
76.4	---	0.00005	---	2.06	0.02	0.020	0.000	2.81	0.02	0.088	0.000	0.001	---	10.7	0.1	0.001	0.000	---	---	---	---
79.1	---	0.00005	---	2.08	0.00	0.020	0.000	2.87	0.01	0.090	0.000	0.001	---	10.8	0.1	0.001	0.000	---	---	---	---
76.2	---	0.00005	---	2.06	0.01	0.021	0.001	2.87	0.01	0.093	0.000	0.001	---	10.8	0.0	0.001	0.000	---	---	---	---
76.2	---	0.00005	---	2.04	0.00	0.020	0.000	2.88	0.01	0.095	0.001	0.001	---	10.8	0.1	0.001	0.000	---	---	---	---
76.1	---	0.00005	---	1.98	0.02	0.021	0.000	2.86	0.01	0.096	0.000	0.001	---	10.6	0.0	0.001	0.000	---	---	---	---
76.1	---	0.00005	---	2.21	0.01	0.020	0.001	2.90	0.02	0.098	0.001	0.001	---	10.9	0.1	0.001	0.000	---	---	---	---
76.0	---	0.00005	---	2.11	0.01	0.020	0.001	2.94	0.01	0.101	0.001	0.001	---	10.7	0.1	0.001	0.000	---	---	---	---
75.4	---	0.00005	---	2.00	0.01	0.021	0.001	2.97	0.01	0.104	0.001	0.001	---	10.7	0.0	0.001	0.000	---	---	---	---
75.8	---	0.00005	---	1.97	0.01	0.019	0.000	2.95	0.01	0.107	0.001	0.001	---	10.6	0.0	0.001	0.000	---	---	---	---
76.1	---	0.00005	---	1.89	0.02	0.021	0.002	2.88	0.01	0.105	0.001	0.001	---	10.2	0.0	0.001	0.000	---	---	---	---
75.6	---	0.00005	---	1.91	0.02	0.020	0.000	2.96	0.02	0.108	0.001	0.001	---	10.3	0.1	0.001	0.000	---	---	---	---
75.3	---	0.00005	---	1.89	0.00	0.020	0.001	2.97	0.02	0.108	0.001	0.001	---	10.2	0.0	0.001	0.000	---	---	---	---
0	U	0.00005	---	0.03	0.00	0.001	---	0.05	0.02	0.004	0.000	0.001	---	0.23	0.00	0.001	0.000	---	---	---	---
0	U	0.00005	---	0.01	---	0.001	---	0.12	0.00	0.042	0.001	0.001	---	0.28	0.00	0.008	0.000	---	---	---	---
0	U	0.00005	---	0.01	---	0.001	---	0.01	---	0.001	---	0.001	---	0.01		0.001		---	---	---	---
75.7	---	0.00005	---	1.99	0.02	0.020	0.000	2.64	0.01	0.089	0.001	0.001	---	10.1	0.1	0.001	0.000	---	---	---	---
75.8	---	0.00005	---	1.93	0.01	0.020	0.000	2.81	0.01	0.100	0.001	0.001	---	10.1	0.0	0.001	0.000	---	---	---	---
76.9	---	0.00005	---	2.13	0.01	0.021	0.000	2.72	0.00	0.081	0.000	0.001	---	10.4	0.0	0.001	0.000	0.01	0.003	U	1.53
76.7	---	0.00005	---	2.14	0.03	0.021	0.000	2.79	0.01	0.085	0.000	0.001	---	10.9	0.0	0.002	0.000	0.01	0.003	U	1.54
76.9	---	0.00005	---	2.06	0.01	0.020	0.000	2.62	0.01	0.084	0.000	0.001	---	10.3	0.0	0.001	0.000	0.01	0.003	U	1.55
76.7	---	0.00005	---	2.05	0.02	0.020	0.000	2.67	0.01	0.081	0.001	0.001	---	10.4	0.0	0.001	0.000	0.01	0.003	U	1.54
76.6	---	0.00005	---	2.03	0.01	0.020	0.000	2.67	0.02	0.085	0.001	0.001	---	10.3	0.1	0.001	0.000	0.01	0.003	U	1.55
76.7	---	0.00005	---	2.01	0.01	0.020	0.000	2.68	0.01	0.088	0.002	0.001	---	10.2	0.1	0.001	0.000	0.01	0.003	U	1.62
76.4	---	0.00005	---	1.99	0.01	0.020	0.000	2.68	0.01	0.085	0.001	0.001	---	10.1	0.0	0.001	0.000	0.01	0.003	U	1.60
76.3	---	0.00005	---	1.98	0.02	0.020	0.000	2.68	0.03	0.095	0.003	0.001	---	10.1	0.1	0.001	0.000	0.01	0.003	U	1.61
76.2	---	0.00005	---	2.19	0.02	0.021	0.000	2.75	0.02	0.092	0.001	0.001	---	10.5	0.0	0.001	0.000	0.01	0.003	U	1.62
76.0	---	0.00005	---	2.09	0.00	0.020	0.000	2.75	0.00	0.096	0.002	0.001	---	10.2	0.0	0.001	0.000	0.01	0.003	U	1.65
76.2	---	0.00005	---	2.10	0.01	0.021	0.000	2.77	0.01	0.098	0.005	0.001	---	10.3	0.0	0.001	0.000	0.01	0.003	U	1.62
76.1	---	0.00005	---	2.11	0.01	0.021	0.000	2.85	0.01	0.095	0.001	0.001	---	10.4	0.1	0.001	0.000	0.01	0.003	U	1.66
75.7	---	0.00005	---	2.03	0.01	0.021	0.000	2.81	0.01	0.101	0.003	0.001	---	10.2	0.1	0.001	0.000	0.01	0.003	U	1.70
75.9	---	0.00005	---	2.05	0.01	0.021	0.000	2.88	0.00	0.113	0.003	0.001	---	10.3	0.1	0.001	0.000	0.01	0.003	U	1.69
75.6	---	0.00005	---	2.10	0.01	0.022	0.000	3.00	0.01	0.105	0.005	0.001	---	10.5	0.0	0.001	0.000	0.01	0.003	U	1.70
75.7	---	0.00005	---	1.91	0.01	0.021	0.000	2.94	0.01	0.102	0.000	0.001	---	10.3	0.0	0.001	0.000	0.01	0.003	U	1.71
75.9	---	0.00005	---	1.83	0.02	0.020	0.000	2.85	0.03	0.108	0.004	0.001	---	9.97	0.11	0.001	0.000	0.01	0.003	U	1.75
0	U	0.00005	---	0.01	---	0.001	---	0.03	0.00	0.002	0.000	0.001	---	0.13	0.00	0.001	---	0.01	0.003	U	0.12
0	U	0.00005	---	0.01	---	0.001	---	0.02	0.00	0.002	0.000	0.001	---	0.27	0.00	0.005	0.000	0.01	0.003	U	0.01
76.4	---	0.00005	---	1.97	0.02	0.022	0.000	2.78	0.03	0.094	0.001	0.001	---	10.5	0.1	0.001	0.000	0.01	0.003	U	1.60
75.9	---	0.00005	---	2.20	0.03	0.020	0.000	2.95	0.00	0.103	0.002	0.001	---	11.1	0.1	0.001	0.000	0.01	0.003	U	1.69

Table A1
Laboratory Analytical Results for R-14 Screen 1

NO3-N rslt	NO3-N (U)	C2O4 rslt (ppm)	C2O4 (U)	Pb rslt (ppm)	stdev (Pb)	pH	PO4(-3) rslt (ppm)	PO4(-3) (U)	Rb rslt (ppm)	stdev (Rb)	S2- rslt (ppm)	S2- (U)	Sb rslt (ppm)	stdev (Sb)	Se rslt (ppm)	stdev (Se)	Si rslt (ppm)	stdev (Si)	SiO2 rslt (ppm)	stdev (SiO2)	Sn rslt (ppm)	stdev (Sn)
---	---	---	---	0.0004	0.0000	7.76	---	---	0.007	0.000	0.01	---	0.001	---	0.001	---	35.7	0.3	76.4	0.6	0.001	---
---	---	---	---	0.0008	0.0000	7.69	---	---	0.007	0.000	0.01	---	0.001	---	0.001	---	36.3	0.2	77.6	0.4	0.001	---
---	---	---	---	0.0005	0.0000	7.68	---	---	0.006	0.000	0.01	U	0.001	---	0.001	---	36.9	0.2	79.0	0.5	0.001	---
---	---	---	---	0.0003	0.0000	7.74	---	---	0.007	0.000	0.01	U	0.001	---	0.001	---	37.2	0.3	79.6	0.5	0.001	---
---	---	---	---	0.0005	0.0000	7.70	---	---	0.007	0.000	0.01	U	0.001	---	0.001	---	37.4	0.1	80.0	0.2	0.001	---
---	---	---	---	0.0004	0.0000	7.74	---	---	0.007	0.000	0.01	U	0.001	---	0.001	---	36.8	0.0	78.8	0.0	0.001	---
---	---	---	---	0.0003	0.0000	7.75	---	---	0.007	0.000	0.01	U	0.001	---	0.001	---	37.2	0.3	79.7	0.7	0.001	---
---	---	---	---	0.0005	0.0000	7.76	---	---	0.007	0.000	0.01	U	0.001	---	0.001	---	37.1	0.3	79.4	0.6	0.001	---
---	---	---	---	0.0004	0.0000	7.77	---	---	0.006	0.000	0.01	U	0.001	---	0.001	---	37.1	0.2	79.4	0.5	0.001	---
---	---	---	---	0.0005	0.0000	7.75	---	---	0.006	0.000	0.01	U	0.001	---	0.001	---	36.7	0.2	78.6	0.5	0.001	---
---	---	---	---	0.0003	0.0000	7.66	---	---	0.006	0.000	0.01	U	0.001	---	0.001	---	36.8	0.3	78.8	0.6	0.001	---
---	---	---	---	0.0003	0.0000	7.69	---	---	0.006	0.000	0.01	U	0.001	---	0.001	---	36.6	0.2	78.4	0.5	0.001	---
---	---	---	---	0.0003	0.0000	7.66	---	---	0.006	0.000	0.01	U	0.001	---	0.001	---	36.7	0.3	78.6	0.6	0.001	---
---	---	---	---	0.0003	0.0000	7.73	---	---	0.006	0.000	0.01	U	0.001	---	0.001	---	36.6	0.2	78.2	0.5	0.001	---
---	---	---	---	0.0002	0.0000	7.73	---	---	0.006	0.000	0.01	U	0.001	---	0.001	---	35.4	0.1	75.8	0.3	0.001	---
---	---	---	---	0.0003	0.0000	7.72	---	---	0.006	0.000	0.01	U	0.001	---	0.001	---	35.9	0.2	76.8	0.3	0.001	---
---	---	---	---	0.0003	0.0000	7.73	---	---	0.005	0.000	0.01	U	0.001	---	0.001	---	35.9	0.3	76.7	0.7	0.001	---
---	---	---	---	0.0031	0.0000	6.29	---	---	0.001	---	0.01	U	0.001	---	0.001	---	0.08	0.00	0.2	0.0	0.001	---
---	---	---	---	0.0026	0.0001	6.59	---	---	0.001	---	0.01	U	0.001	---	0.001	---	2.51	0.02	5.4	0.0	0.001	---
---	---	---	---	0.0002	---	5.06	---	---	0.001	---	0.01	U	0.001	---	0.001	---	0.01	---	0.02	---	0.001	---
---	---	---	---	0.0006	0.0000	7.76	---	---	0.007	0.000	0.01	U	0.001	---	0.001	---	34.8	0.2	74.4	0.5	0.001	---
---	---	---	---	0.0004	0.0000	7.80	---	---	0.006	0.000	0.01	U	0.001	---	0.001	---	35.6	0.3	76.2	0.7	0.001	---
0.346	---	0.01	U	0.0004	0.0000	7.71	0.26	---	0.007	0.000	---	---	0.001	---	0.001	---	35.9	0.4	76.8	0.8	0.001	---
0.348	---	0.01	U	0.0006	0.0000	7.70	0.27	---	0.007	0.000	---	---	0.001	---	0.001	---	36.8	0.4	78.8	0.8	0.001	---
0.349	---	0.01	U	0.0005	0.0000	7.73	0.26	---	0.007	0.000	---	---	0.001	---	0.001	---	34.9	0.3	74.8	0.6	0.001	---
0.347	---	0.01	U	0.0003	0.0000	7.71	0.26	---	0.006	0.000	---	---	0.001	---	0.001	---	35.6	0.2	76.2	0.4	0.001	---
0.349	---	0.01	U	0.0003	0.0000	7.72	0.25	---	0.006	0.000	---	---	0.001	---	0.001	---	35.7	0.2	76.4	0.4	0.001	---
0.367	---	0.01	U	0.0004	0.0000	7.77	0.25	---	0.007	0.000	---	---	0.001	---	0.001	---	35.3	0.3	75.6	0.7	0.001	---
0.360	---	0.01	U	0.0004	0.0000	7.77	0.25	---	0.006	0.000	---	---	0.001	---	0.001	---	35.4	0.3	75.7	0.6	0.001	---
0.363	---	0.01	U	0.0002	0.0000	7.79	0.25	---	0.007	0.000	---	---	0.001	---	0.001	---	35.0	0.2	74.9	0.5	0.001	---
0.365	---	0.01	U	0.0002	0.0000	7.79	0.25	---	0.006	0.000	---	---	0.001	---	0.001	---	35.7	0.3	76.5	0.6	0.001	---
0.372	---	0.01	U	0.0002	0.0000	7.80	0.24	---	0.007	0.000	---	---	0.001	---	0.001	---	35.4	0.3	75.7	0.5	0.001	---
0.366	---	0.01	U	0.0004	0.0000	7.65	0.23	---	0.007	0.000	---	---	0.001	---	0.001	---	35.5	0.2	76.0	0.5	0.001	---
0.375	---	0.01	U	0.0003	0.0000	7.71	0.23	---	0.006	0.000	---	---	0.001	---	0.001	---	36.3	0.3	77.7	0.7	0.001	---
0.383	---	0.01	U	0.0004	0.0000	7.64	0.23	---	0.006	0.000	---	---	0.001	---	0.001	---	35.5	0.1	76.0	0.2	0.001	---
0.381	---	0.01	U	0.0002	0.0000	7.71	0.22	---	0.006	0.000	---	---	0.001	---	0.001	---	35.8	0.3	76.5	0.7	0.001	---
0.385	---	0.01	U	0.0002	0.0000	7.73	0.22	---	0.006	0.000	---	---	0.001	---	0.001	---	36.9	0.3	78.9	0.5	0.001	---
0.386	---	0.01	U	0.0003	0.0000	7.72	0.21	---	0.006	0.000	---	---	0.001	---	0.001	---	35.7	0.0	76.5	0.1	0.001	---
0.395	---	0.01	U	0.0002	0.0000	7.76	0.21	---	0.006	0.000	---	---	0.001	---	0.001	---	34.3	0.4	73.4	0.9	0.001	---
0.028	---	0.01	U	0.0002	---	6.96	0.01	U	0.001	---	---	---	0.001	---	0.001	---	0.1	0.0	0.2	0.0	0.001	---
0.003	---	0.01	U	0.0014	0.0000	6.20	0.01	U	0.001	---	---	---	0.001	---	0.001	---	0.4	0.0	0.9	0.0	0.001	---
0.361	---	0.01	U	0.0004	0.0000	7.90	0.23	---	0.007	0.000	---	---	0.001	---	0.001	---	35.9	0.3	76.9	0.6	0.001	---
0.381	---	0.01	U	0.0002	0.0000	7.79	0.20	---	0.006	0.000	---	---	0.001	---	0.001	---	35.9	0.5	76.7	1.0	0.001	---

Table A1
Laboratory Analytical Results for R-14 Screen 1

SO4(-2) rslt (ppm)	SO4(-2) (U)	Sr rslt (ppm)	stdev (Sr)	Th rslt (ppm)	stdev (Th)	Ti rslt (ppm)	stdev (Ti)	Tl rslt (ppm)	stdev (Tl)	U rslt (ppm)	stdev (U)	V rslt (ppm)	stdev (V)	Zn rslt (ppm)	stdev (Zn)	TDS (ppm)	Cations	Anions	Balance	Status
---	---	0.075	0.001	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.006	0.000	0.007	0.000	185	1.33	1.34	-0.01	
---	---	0.076	0.001	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.006	0.000	0.013	0.000	183	1.34	1.29	0.02	
---	---	0.071	0.001	0.001	---	0.002	---	0.001	---	0.0009	0.0000	0.007	0.000	0.006	0.000	185	1.37	1.29	0.03	
---	---	0.078	0.007	0.001	---	0.002	---	0.001	---	0.0009	0.0001	0.007	0.001	0.005	0.000	185	1.36	1.29	0.03	
---	---	0.076	0.002	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.007	0.000	0.006	0.000	185	1.36	1.28	0.03	
---	---	0.071	0.003	0.001	---	0.002	---	0.001	---	0.0009	0.0000	0.006	0.000	0.006	0.000	184	1.35	1.28	0.03	
---	---	0.077	0.001	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.007	0.000	0.004	0.000	188	1.35	1.33	0.01	
---	---	0.074	0.002	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.007	0.000	0.005	0.000	184	1.34	1.28	0.02	
---	---	0.073	0.000	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.007	0.000	0.005	0.000	184	1.34	1.28	0.02	
---	---	0.075	0.004	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.005	0.000	183	1.31	1.28	0.01	
---	---	0.071	0.001	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.007	0.000	0.005	0.000	183	1.34	1.28	0.02	
---	---	0.074	0.004	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.005	0.000	183	1.32	1.27	0.02	
---	---	0.071	0.001	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.005	0.000	182	1.31	1.26	0.02	
---	---	0.065	0.001	0.001	---	0.002	---	0.001	---	0.0010	0.0001	0.007	0.000	0.004	0.000	182	1.30	1.27	0.01	
---	---	0.073	0.007	0.001	---	0.002	---	0.001	---	0.0011	0.0001	0.008	0.001	0.004	0.000	179	1.26	1.28	0.00	
---	---	0.065	0.000	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.005	0.000	180	1.27	1.27	0.00	
---	---	0.064	0.001	0.001	---	0.002	---	0.001	---	0.0011	0.0001	0.007	0.001	0.004	0.000	179	1.26	1.26	0.00	
---	---	0.002	0.000	0.001	---	0.002	0.001	0.001	---	0.0002	---	0.001		0.024	0.001	2	0.04	0.03	0.17	
---	---	0.005	0.000	0.001	---	0.005	0.000	0.001	---	0.0003	0.0000	0.003	0.000	0.052	0.001	19	0.08	0.03	0.45	
---	---	0.001		0.001	---	0.002	0.002	0.001	---	0.0002	---	0.001	---	0.001	---	1	0.00	0.03	-0.85	
---	---	0.070	0.001	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.010	0.000	177	1.28	1.27	0.00	
---	---	0.068	0.000	0.001	---	0.002	---	0.001	---	0.0012	0.0000	0.007	0.000	0.006	0.000	179	1.26	1.27	0.00	
5.40	---	0.076	0.001	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.006	0.000	0.005	0.000	193	1.34	1.53	-0.07	
5.33	---	0.075	0.001	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.006	0.000	0.011	0.000	195	1.35	1.53	-0.06	
5.30	---	0.071	0.001	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.006	0.000	0.006	0.000	190	1.30	1.54	-0.08	
5.20	---	0.073	0.000	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.006	0.000	0.004	0.000	191	1.31	1.52	-0.08	
5.16	---	0.073	0.001	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.005	0.000	191	1.31	1.52	-0.07	
5.44	---	0.072	0.001	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.006	0.000	191	1.30	1.54	-0.08	
5.16	---	0.072	0.001	0.001	---	0.002	---	0.001	---	0.0010	0.0000	0.007	0.000	0.005	0.000	190	1.29	1.52	-0.08	
5.09	---	0.071	0.001	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.005	0.000	189	1.28	1.52	-0.08	
5.09	---	0.073	0.001	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.005	0.000	191	1.33	1.52	-0.06	
5.03	---	0.072	0.001	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.005	0.000	190	1.31	1.51	-0.07	
4.91	---	0.072	0.001	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.006	0.000	190	1.31	1.51	-0.07	
4.82	---	0.074	0.000	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.005	0.000	192	1.32	1.51	-0.07	
4.72	---	0.070	0.001	0.001	---	0.002	---	0.001	---	0.0012	0.0001	0.007	0.001	0.008	0.000	189	1.29	1.50	-0.08	
4.55	---	0.070	0.000	0.001	---	0.002	---	0.001	---	0.0012	0.0000	0.007	0.000	0.005	0.000	190	1.30	1.50	-0.07	
4.46	---	0.072	0.000	0.001	---	0.002	---	0.001	---	0.0012	0.0000	0.007	0.000	0.005	0.000	192	1.32	1.49	-0.06	
4.31	---	0.067	0.000	0.001	---	0.002	---	0.001	---	0.0012	0.0000	0.007	0.000	0.007	0.000	188	1.26	1.49	-0.08	
4.24	---	0.063	0.001	0.001	---	0.002	---	0.001	---	0.0012	0.0000	0.007	0.000	0.005	0.000	185	1.23	1.49	-0.10	
0.37	---	0.001	0.000	0.001	---	0.002	0.000	0.001	---	0.0002	---	0.001	---	0.003	0.000	2	0.03	0.04	-0.20	
0.17	---	0.001	0.000	0.001	---	0.002	---	0.001	---	0.0002	---	0.001	---	0.021	0.000	3	0.03	0.03	-0.10	
5.17	---	0.075	0.003	0.001	---	0.002	---	0.001	---	0.0010	0.0001	0.007	0.000	0.005	0.000	191	1.28	1.52	-0.09	
4.43	---	0.068	0.001	0.001	---	0.002	---	0.001	---	0.0011	0.0000	0.007	0.000	0.004	0.000	190	1.28	1.50	-0.08	

Appendix B

Evaluation of Water Quality Using
Well Screen Analysis Methodology

Table B-1
Results of Well Screen Analysis for R-14 (Screen 1) During the Pumping Test Conducted on February 29, 2008

Well	Port depth (ft)	Scr #	Sample collection date	Event	Tritium (pCi/L)	Modern water?	3H plume?	Field pH	Low pH?	High pH?	Test Gen-1	Alkalinity (mg/L CaCO3)	Test Gen-2	Turbidity (NTU)		Test Gen-3	Acetone (ug/L)	Lab Qual Code	Test B1	NH3-N (mg/L)	Lab Qual Code	Test B2	TKN (mg/L)	Lab Qual Code	Test B3	TOC (mg/L)	Lab Qual Code	Test B4	Ba ug/L	Test D3	Test E1	Ca mg/L	Test E2a	Test E2b	Test E2
						pCi/L	**pCi/L**		**SU**	**SU**			**mg/L**			**NTU**			**ug/L**			**mg/L**			**mg/L**			**mg/L**		**ug/L**	**ug/L**		**mg/L**	**mg/L**	**Within**
						>UL	**>UL**		**>LL**	**<UL**			**<UL**			**<UL**			**<UL**			**<UL**			**<UL**			**<UL**		**>LL**	**<UL**		**>LL**	**<UL**	**range**
						1	**17**		**6.4**	**9.0**			**157**			**5**			**5**			**0.05**			**0.46**			**1.37**		**1.4**	**57**		**4.3**	**42**	
R-20	1205	2	29-Feb-08	1	NA*	NA	NA	7.53 Fld	Yes	Yes	P	77 F	P	1.12	P		ND		ND	ND		ND	ND		ND	1.1	UF	P	55	P	P	12.1	Yes	Yes	P
	1205		29-Feb-08	5	NA	NA	NA	7.71 Fld	Yes	Yes	P	77 F	P	0.94	P		ND		ND	ND		ND	ND		ND	0.9	UF	P	55	P	P	11.6	Yes	Yes	P
R-20	1205	2	29-Feb-08	11	NA	NA	NA	7.71 Fld	Yes	Yes	P	76 F	P	0.89	P		ND		ND	ND		ND	ND		ND	0.8	UF	P	54	P	P	11.5	Yes	Yes	P
R-20	1205	2	29-Feb-08	17	NA	NA	NA	7.70 Fld	Yes	Yes	P	76 F	P	0.82	P		ND		ND	ND		ND	ND		ND	NA			55	P	P	10.0	Yes	Yes	P

* NA = not applicable.

Table B-1
Results of Well Screen Analysis for R-14 (Screen 1) During the Pumping Test Conducted on February 29, 2008

Well	Port depth (ft)	Scr #	Sample collection date	Event	Cl mg/L	Test A1	F mg/L	Lab Qual Code	Test A2	Mg mg/L	Test E3	NO3-N mg/L	Lab Qual Code	Test Gen-5	Test C10	ORP	Comment	Test C3	DO	Test C11	ClO4 ug/L	Lab Qual Code	Test Gen-4	Test C7	PO4-P	Lab Qual Code	UOM	Test A6	Na mg/L	Molar Ratio Na/Cl	Test A4	SO4 mg/L	Lab Qual Code	Test C1	Test A5
						mg/L			**mg/**		**mg/L**				**mg/L**			**mV**		**mg/L**				**ug/L**	**Threshold**			**mg/L P**			**mg/L**			**mg/L**	**mg/L**
						<UL			**<UL**		**<UL**			**<UL**	**>LL**			**>LL**		**>LL**			**<UL**	**>LL**	**as P**			**<UL**			**<UL**			**>LL**	**<UL**
						3.6			**0.6**		**4.2**			**0. 89**	**0.01**			**0**		**2**			**0.5**	**0.22**	**0.34**			**0.08**			**25**			**1.7**	**7.2**
R-20	1205	2	29-Feb-08	1	3.0	P	0.32		P	2.72	P	0.346		P	P	83		P	6.3	P	< 5	U	DL	DL	0.26		mg/L as PO4	P	10.4	5.3	P	5.4		P	P
	1205		29-Feb-08	5	3.0	P	0.32		P	2.67	P	0.349		P	P	13		P	4.5	P	< 5	U	DL	DL	0.25		mg/L as PO4	P	10.3	5.3	P	5.2		P	P
R-20	1205	2	29-Feb-08	11	2.9	P	0.37		P	2.77	P	0.366		P	P	NA			3.7	P	< 5	U	DL	DL	0.23		mg/L as PO4	P	10.3	5.5	P	4.9		P	P
R-20	1205	2	29-Feb-08	17	3.0	P	0.29		P	2.85	P	0.395		P	P	NA			4.1	P	< 5	U	DL	DL	0.21		mg/L as PO4	P	10.0	5.1	P	4.2		P	P

* NA = not applicable.

Table B-1
Results of Well Screen Analysis for R-14 (Screen 1) During the Pumping Test Conducted on February 29, 2008

Well	Port depth (ft)	Scr #	Sample collection date	Event	Sulfide		Test C2	B ug/L	Lab Qual Code	Test A1	Cr (F) ug/L	Lab Qual Code	Test Gen 6	Test C9	Cr (NF) ug/L	Lab Qual Code	Test F3	Ratio Cr (NF/F)	Test F4	Fe (F) ug/L	Lab Qual Code	Test C5	Fe (NF) ug/L	Lab Qual Code	Test F1	Ratio Fe(NF/F)	Test F2	Mn (F) ug/L	Lab Qual Code	Test C6	Ni (F) ug/L	Lab Qual Code	Test F5	Sr ug/L	Test D2	Test E3
							mg/L <UL 0.01			**<UL 38.77**			**<UL 5.75**	**ug/L >LL 0.39**			**ug/L <UL 10**		**Ratio <UL 5**			**ug/L <UL 147**			**ug/L <UL 1270**		**Ratio <UL 10**			**ug/L <UL 124**			**ug/L <UL 50**		**ug/L >LL 44**	**ug/L <UL 540**
R-20	1205	2	29-Feb-08	1	0.01	U	P	12		P	2.0		P	P	2.0		P	1.0	P	190		Fail	230		Yes	1.2	P	81		P	1		P	76	P	P
	1205		29-Feb-08	5	0.01	U	P	15		P	2.0		P	P	2.0		P	1.0	P	200		Fail	240		Yes	1.2	P	85		P	1		P	73	P	P
R-20	1205	2	29-Feb-08	11	0.01	U	P	16		P	2.0		P	P	3.0		P	1.5	P	200		Fail	230		Yes	1.2	P	98		P	1		P	72	P	P
R-20	1205	2	29-Feb-08	17	0.01	U	P	13		P	2.0		P	P	2.0		P	1.0	P	170		Fail	190		Yes	1.1	P	108		P	1		P	63	P	P

* NA = not applicable.

Table B-1
Results of Well Screen Analysis for R-14 (Screen 1) During the Pumping Test Conducted on February 29, 2008

Well	Port depth (ft)	Scr #	Sample collection date	Event	U ug/L	Lab Qual Code	Test C8	Test D1	Test E5	V ug/L	Lab qual code	Test C4	Zn ug/L	Lab Qual Code	Test D4	Tests Passed	Tests Failed	Total Tests with P/Fail Outcome	% Pass	Is 3H detected?	General Indicators	Category A	Category B		Category C						
							ug/L >LL 0.06	**ug/L >LL 0.06**	**ug/L <UL 1.9**			**>LL 2.27**			**ug/L >LL 0.4**							**Residual Inorganics**	**Residual Organics**	**SO4**	**Redox Indicators**						
																									Fe/Mn					
																									V	**Fe**	**Mn**	**ClO4**	**U**	**Cr**
R-20	1205	2	29-Feb-08	1	1.0		P	P	P	6		P	5		P	33	1	34	97	NA						Fe					
	1205		29-Feb-08	5	1.1		P	P	P	7		P	5		P	33	1	34	97	NA						Fe					
R-20	1205	2	29-Feb-08	11	1.1		P	P	P	7		P	6		P	32	1	33	97	NA						Fe					
R-20	1205	2	29-Feb-08	17	1.2		P	P	P	7		P	5		P	32	1	33	97	NA						Fe					

* NA = not applicable.

Table B-1
Results of Well Screen Analysis for R-14 (Screen 1) During the Pumping Test Conducted on February 29, 2008

Well	Port depth (ft)	Scr #	Sample collection date	Event		Category D					Category E				Category F	General Indicators							Category A Inorganic Indicators						Category B Organic Indicators				Category C1 Redox (SO4)		
						Sorption					Carbonate Minerals				Metal Corrosion	Mod water	Gen-1	Gen-2	Gen-3	Gen-4	Gen-5	Gen-6	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	C1	C2	C3
					NO3											3H	ln pH	Alk	Turb	ClO4	NO3-N	Cr	B	Cl	Na	SO4	F	PO4	Ace	NH3	TKN	TOC	SO4	S	ORP
						U	Sr	Ba	Zn	Ba	Ca	Mg	Sr	U		UL=1	range	UL=52	UL=5	UL=0.5	UL=0.89	UL=5.75	UL=39	UL=3.6	UL=24.	UL=7.2	UL=0.	UL=3.4	5	0.05	0.35	1.37	LL=1.65	UL=0.0	LL=0
R-20	1205	2	29-Feb-08	1												ND	P	P	P	DL	P	P	P	P	P	P	P	P	ND	ND	ND	P	P	P	P
	1205		29-Feb-08	5												ND	P	P	P	DL	P	P	P	P	P	P	P	P	ND	ND	ND	P	P	P	P
R-20	1205	2	29-Feb-08	11												ND	P	P	P	DL	P	P	P	P	P	P	P	P	ND	ND	ND	P	P	P	Fail
R-20	1205	2	29-Feb-08	17												ND	P	P	P	DL	P	P	P	P	P	P	P	P	ND	ND	ND	P	P	P	Fail

* NA = not applicable.

Table B-1
Results of Well Screen Analysis for R-14 (Screen 1) During the Pumping Test Conducted on February 29, 2008

Well	Port depth (ft)	Scr #	Sample collection date	Event	Category C2 Redox (Fe/Mn)						Category C3 Redox (NO3)			Category D Adsorption				Category E Carbonate Mineralogy						Category F Metal Corrosion					Categories under which Drilling Flags are to be Assigned					
					C4	C5	C6	C7	C8	C9	C10	C11	D1	D2	D3	D4	E1	E2a	E2b	E2	E3	E4	E5	F1	F2	F3	F4	F5						
					V	Fe	Mn	ClO4	U	Cr	NO3-N	DO	U	Sr	Ba	Zn	Ba	Ca	Ca	Ca	Mg	Sr	U	FeT	FeR	CrT	CrR	Ni	A	B	C	D	E	F
					LL=2.27	UL=14	UL=124	LL=0.2	LL=0.06	LL=0.3	LL=0.0	LL=2	LL=0.0	LL=44	LL=4.	LL=0.	UL=57	LL=4.3	UL=42	In	UL=4.2	UL=540	UL=1.90	UL=500	UL=10	UL=10	UL=5	UL=5						
R-20	1205	2	29-Feb-08	1	P	P	P	DL	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	–	–	Fe	–	–	–
	1205		29-Feb-08	5	P	P	P	DL	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	–	–	Fe	–	–	–
R-20	1205	2	29-Feb-08	11	P	P	P	DL	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	–	–	Fe	–	–	–
R-20	1205	2	29-Feb-08	17	P	P	P	DL	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	–	–	Fe	–	–	–

* NA = not applicable.

Appendix C

Westbay Retrieval Report

Westbay Instruments Inc.
3480 Gilmore Way, Suite 110
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Canada
Tel. (604) 430-4272
Fax (604) 430-3538

Schlumberger
WATER SERVICES

RETRIEVAL REPORT

Westbay System Monitoring Well: R-14

Los Alamos, NM

Prepared for:

Terranear PMC
1911 Central Ave, 2nd Floor
Los Alamos, NM
87544-2385
USA

Prepared by:

Westbay Instruments Inc.
WB777

February 20, 2008

CONTENTS:

		Page
1.	INTRODUCTION	1
2.	WESTBAY CASING RETRIEVAL	1
	2.1 Pre-Deflation Profile	1
	2.2 Deflation of Westbay Packers	1
	2.3 Retrieval of Westbay Casing Components	2

APPENDIX

APPENDIX: R-14 Retrieval

1. Introduction

This report and the attached Appendix document the technical services carried out by Westbay Instruments Inc. under Terranear PMC, LLC (TPMC) Task Order No. 003 dated January 30, 2008, under Subcontract Agreement No. 0001. The Westbay MP55 System completion previously installed in LANL well R-14 was retrieved.

Westbay technical services representative Mr. Dave Larssen was on site for the retrieval tasks from February 5 to 10, 2008. The work was supervised by Mr. S. White of TPMC. This report documents the retrieval tasks and related QA checks.

2. Westbay Casing Retrieval

The monitoring well had previously been installed as indicated below. The well installation was described in a Westbay Installation Report dated February 20, 2003.

(Note: all depths are with respect to ground surface. The monitoring well depth reference point was ground level as defined by a brass survey marker set in a concrete pad at the well.

Table 1, Summary of MP Well Installation

Monitoring Well No.	Installation Date	Westbay Casing Length (ft)	No. Screens	No. Packers	Open Hole Depth to Water (ft)
R-14	2003	1311	2	8	Approx. 1190 ft

The Westbay casing was retrieved according to the procedure described in the following sections.

2.1 Pre-Deflation Profile

A pre-deflation pressure profile was carried out at the well prior to deflating the packers to confirm the proper operation and position of measurement ports and to confirm the present water levels inside and outside the well. The data confirmed that the ports operated properly. The data for the pre-deflation profile are shown on Figure 1 in the Appendix and on the pre-deflation Field Data and Calculation Sheet.

Based on the information from this profile it was determined that the water level inside the Westbay System casing (about 1114 ft) was near the water level in the two (2) screened intervals (about 1178 ft). Therefore, the water level did not require adjustment before the procedure for deflation of the packers could begin.

2.2 Deflation of the Westbay Packers

The Westbay Model 0625 Packer Tool was deployed in the well on February 8 and 9, 2008. Drinking water purchased locally was used for operation of the packer deflation equipment. All of the packers

in the well were successfully deflated. After deflation the packer valves were left in the Open position. The field data for deflation of each packer are shown on the MP55 Packer Deflation Field Records and Packer Deflation graphs in the Appendix.

2.3 Retrieval of Westbay Casing Components

Prior to retrieval of the Westbay System a post-deflation profile of fluid levels was measured. The head differences observed across each packer in the pre-deflation profile (Figure 1 in the Appendix) were no longer present. The fluid pressure distribution was hydrostatic at an approximate depth of 1177 ft below ground level, thus indicating that none of the packers were sealed inside the well.

The bottom Westbay Pumping Port at 1293.8 ft depth was opened to allow the water levels inside and outside the Westbay casing to equilibrate.

The Westbay System casing was lifted from the well. The tensile load applied to the Westbay casing was measured by means of a load gauge provided by Westbay. The retrieved Westbay System items and the load during lifting were recorded on a Casing Retrieval Log. The maximum applied lifting load was 2400 lb, comparable to the maximum load during original installation of 2250 lb. A copy of the log is included in the Appendix.

All of the installed Westbay System casing components were successfully retrieved from the well. A list of the retrieved items is shown on the second page of the Casing Retrieval Log.

Each retrieved casing component was set aside on a rack. Plastic protective caps supplied by Westbay were put on each end for protection against damage during handling. Decontamination, cleaning, inspection, packaging and transport to LANL storage were to be done by others after de-mobilization of the Westbay representative from the site.

During retrieval, the following items were observed to be damaged:

1. Bottom end of component No. 54 had a broken shear wire in the coupling. The casing end was cut off with a saw.
2. Bottom end of component No. 2 had a broken shear wire in the coupling. The casing end was cut off with a saw.
3. The bottom packer (MP5, Packer No. 8) had a displaced element clamp on the bottom. The packer likely cannot be re-used without rebuilding.

APPENDIX 1

Monitoring Well R-14 Retrieval

Casing Retrieval Log	- 16 pages
Figure 1, Pre-Deflation Pressure Profile (February 7, 2008)	- 1 page
Pre-deflation Piezometric Pressure/Levels Field Data and Calculation Sheet (February 7, 2008)	- 2 pages
Figure 2, Post Deflation Pressure Profile (February 9, 2008)	- 1 page
Post Deflation Piezometric Pressure/Levels Field Data and Calculation Sheet (February 9, 2008)	- 2 pages
Packer Deflation Records	- 21 pages

Casing Retrieval Log

Company: Los Alamos National Lab
Well: R14
Site: LANL
Project: Hydrogeology Study

Job No: WB777
Author: DL/GG

Well Information

Reference Datum: Ground Level
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 1310.97 ft.

Borehole Depth: 1327.00 ft.
Borehole Inclination: vertical
Borehole Diameter: 4.50 in.

Well Description:
PlasticMP55
Other References:
Pipe-based wire-wrapped screens.
BF and screens: LANL As-Built 10-18-02

File Information

File Name: 777_R14.WWD
Report Date: Sun Feb 03 11:49:01 2008

File Date: Jan 20 10:06:08 2003

Comments

RETRIEVAL DATE = FEB 10, 2008.
* PIPES CUT WHERE NOTED BECAUSE SHEAR WIRES BROKE
* BOTTOM PACKER - element clamps damaged, likely during deflation. Packer not re-usable as-is.

Dave L.
FEB 10, 2008.

Log Information

Borehole condition confirmed.	(method)_____	Date: _____
MP well design & preparation.	By: _____	Date: _____
MP well design checked.	By: _____	Date: _____
MP well and borehole approved to install.	By: _____	Date: _____

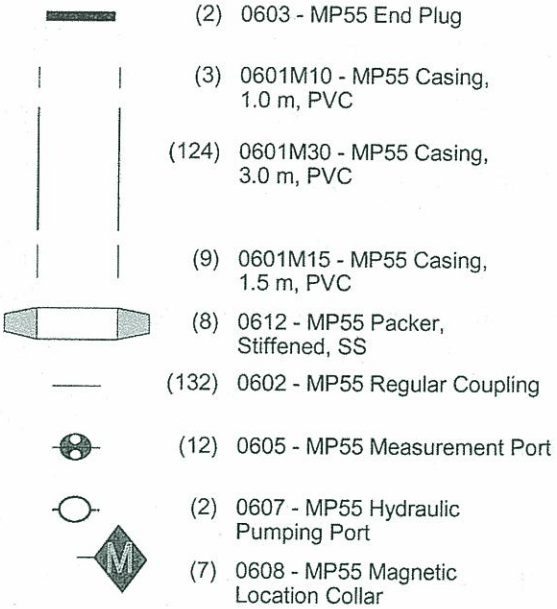
Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14

Legend

(Qty) MP Components

(Library - WD Library 7/27/00)



(2) 0603 - MP55 End Plug

(3) 0601M10 - MP55 Casing, 1.0 m, PVC

(124) 0601M30 - MP55 Casing, 3.0 m, PVC

(9) 0601M15 - MP55 Casing, 1.5 m, PVC

(8) 0612 - MP55 Packer, Stiffened, SS

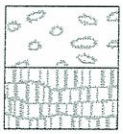
(132) 0602 - MP55 Regular Coupling

(12) 0605 - MP55 Measurement Port

(2) 0607 - MP55 Hydraulic Pumping Port

(7) 0608 - MP55 Magnetic Location Collar

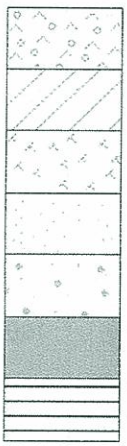
Geology



Conglomerate

Lava, Basaltic

Backfill/Casing



Concrete

Bentonite

Native / Cave

Sand Fine

Sand Coarse

Stainless Steel

Well Screen

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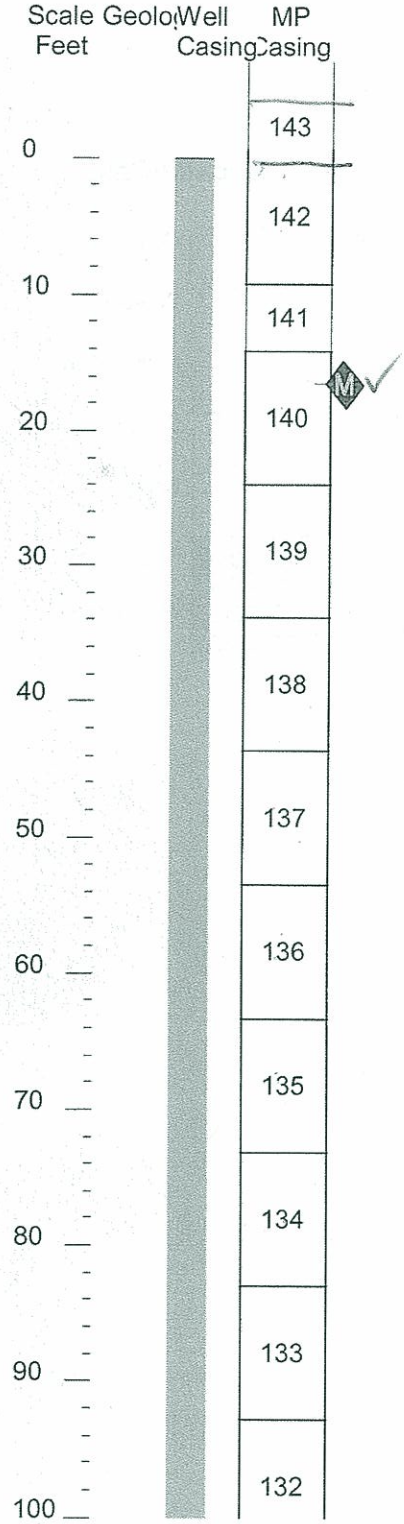
In Feb 03 11:48:49 2008

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14

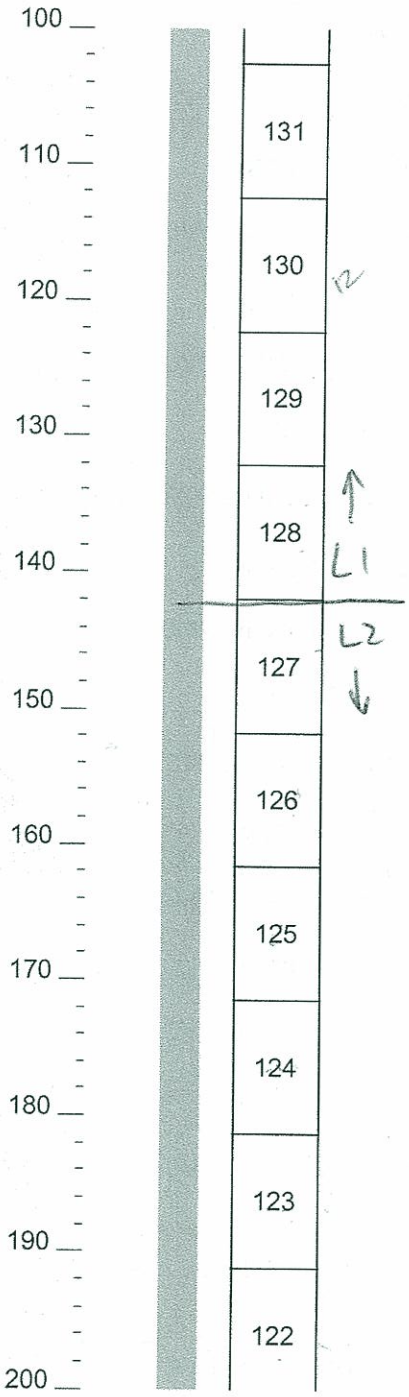
STARTING NOTE
- TOP SHEAR WIRE NOT COMPLETELY IN
- ACCESS RESTRICTED BY SURFACE CASING
- LIFT UP, SHEAR WIRE SLIPPED.
- CUT SURFACE CASING, IMPROVE SHEAR WIRE GROOVE AND RE-INSTALL OK.
1025 hr
START LIFTING.



LOAD = 2400
thumb to 2300 lb
~100 lb friction
LOAD = 2200
2200 lb.
LOAD = 2200
2200 lb
2150 lb
2300 lift
2150 hang

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



QA Tested OK	MP Casing Description	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	LIFT = 2250 HANG = 2100 lb
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	Hang = 2100
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	LIFT 2250 HANG 2050
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	spike to 2800 Hang 2050
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	LIFT 2200 HANG 2000
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	

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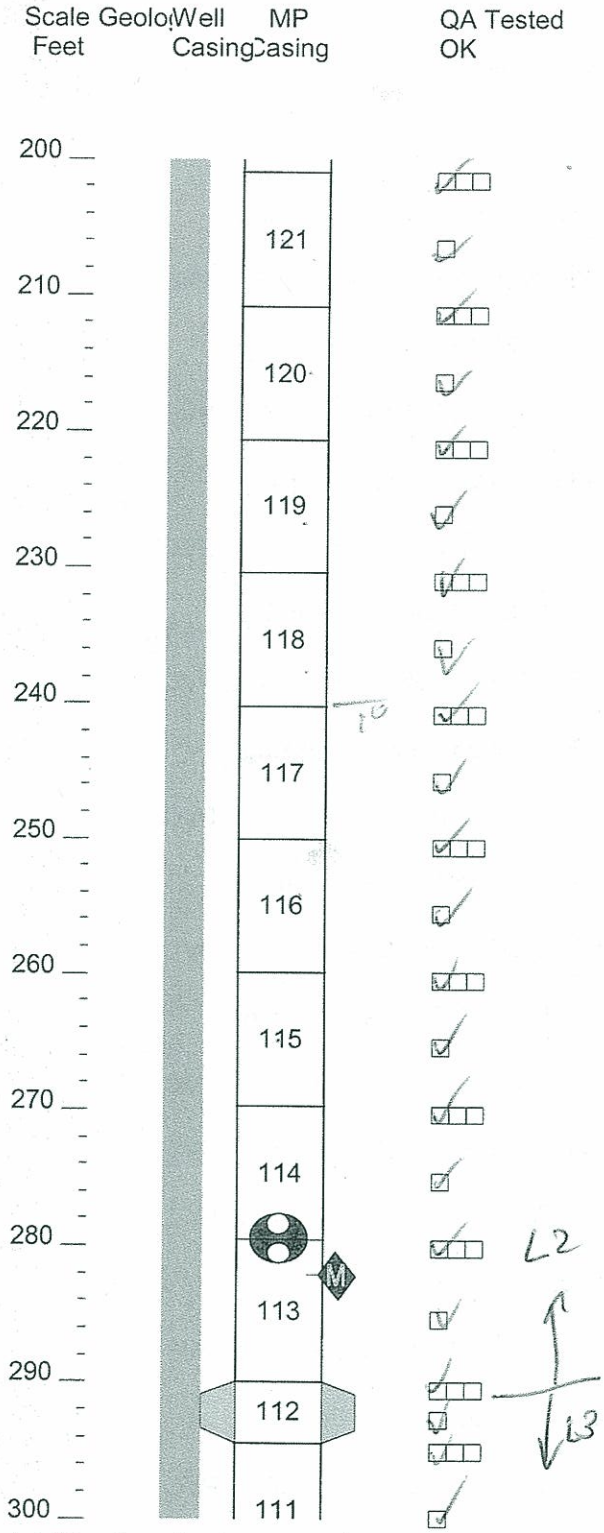
Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



LIFT 2150
HANG 1950

LIFT 2100
HANG 1950

LIFT 2100
Hang 1900

LIFT 2050
HANG 1850

LIFT 2000
HANG 1800

LIFT 1900
HANG 1800

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EXTERIOR CLEAN, NO SIGN OF WATER.

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14

Geolo Well Casing	MP Casing	QA Tested OK	MP Casing Description	
		☑	0602 - MP55 Regular Coupling	LIFT 1800 HANG 1750
	110 3	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
	109	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
	108	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
	107	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
	106	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	LIFT 1850 HANG 1700
	105	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
	104	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	LIFT 1800 HANG 1700
	103 10	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
	102	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	LIFT 1700 HANG 1650
	101	☑	0601M30 - MP55 Casing, 3.0 m, PVC	

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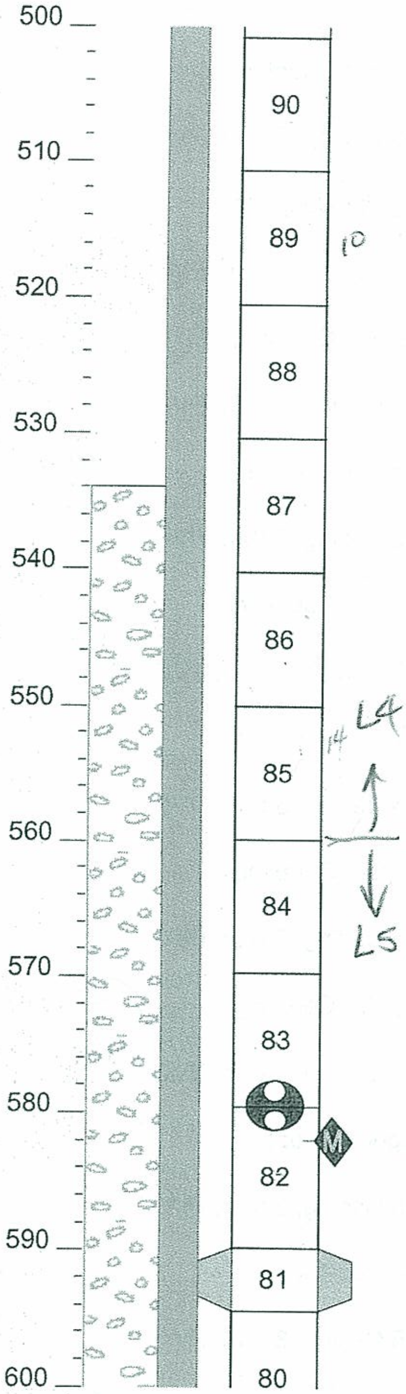
Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14

Scale Feet: 400 – 410 – 420 – 430 – 440 – 450 – 460 – 470 – 480 – 490 – 500

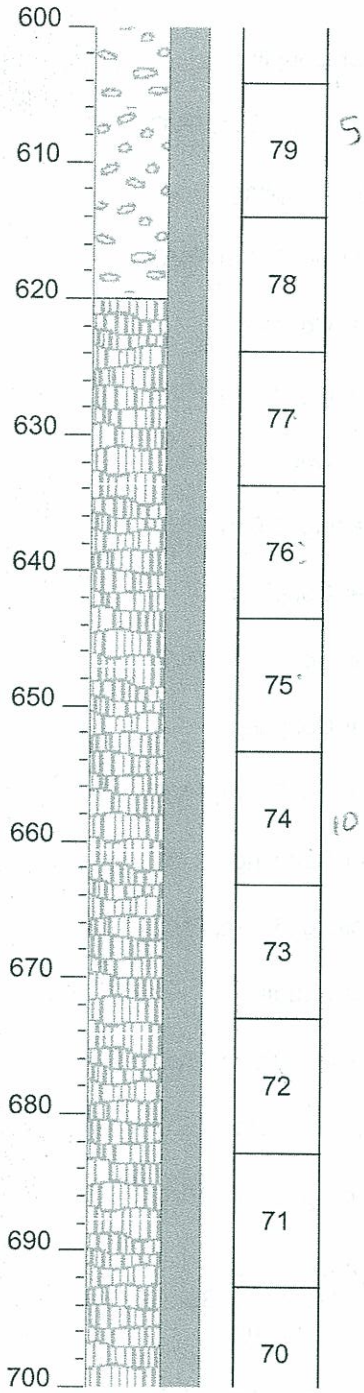
Scale Feet	Geolo	Well Casing	MP Casing	QA Tested OK	MP Casing Description	Notes
400				✓	0602 - MP55 Regular Coupling	LIFT 1700
			100	✓	0601M30 - MP55 Casing, 3.0 m, PVC	13 HANG 1650
410				✓	0602 - MP55 Regular Coupling	
			99	✓	0601M30 - MP55 Casing, 3.0 m, PVC	L3
420				✓	0602 - MP55 Regular Coupling	
			98	✓	0601M30 - MP55 Casing, 3.0 m, PVC	L4
430				✓	0602 - MP55 Regular Coupling	LIFT 1750
			97	✓	0601M30 - MP55 Casing, 3.0 m, PVC	HANG 1650
440				✓	0602 - MP55 Regular Coupling	
			96	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
450				✓	0602 - MP55 Regular Coupling	
			95	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
460				✓	0602 - MP55 Regular Coupling	
			94	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
470				✓	0602 - MP55 Regular Coupling	LIFT 1700
			93	✓	0601M30 - MP55 Casing, 3.0 m, PVC	HANG 1600
480				✓	0602 - MP55 Regular Coupling	
			92	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
490				✓	0602 - MP55 Regular Coupling	
			91	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
500						



MP Casing	QA Tested OK	MP Casing Description	
	✓	0602 - MP55 Regular Coupling	LIFT 1650
90	✓	0601M30 - MP55 Casing, 3.0 m, PVC	HANG 1550
		0602 - MP55 Regular Coupling	← LIFT 1600
89	✓	0601M30 - MP55 Casing, 3.0 m, PVC	10; HANG 1500
	✓	0602 - MP55 Regular Coupling	
88	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	
87	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	
86	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	14 L4; LIFT 1550
85	✓	0601M30 - MP55 Casing, 3.0 m, PVC	↑; HANG 1450
	✓	0602 - MP55 Regular Coupling	
84	✓	0601M30 - MP55 Casing, 3.0 m, PVC	↓ L5
	✓	0602 - MP55 Regular Coupling	
83	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0605 - MP55 Measurement Port	LIFT 1500
82	✓	0601M30 - MP55 Casing, 3.0 m, PVC	HANG 1400
	✓	0602 - MP55 Regular Coupling	
81	✓	0612 - MP55 Packer, Stiffened, SS	
	✓	0602 - MP55 Regular Coupling	
80	✓	0601M30 - MP55 Casing, 3.0 m, PVC	

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



Scale Feet	Geolo	Well Casing	MP Casing	QA Tested OK	MP Casing Description
				☑	0602 - MP55 Regular Coupling
				☑	0601M30 - MP55 Casing, 3.0 m, PVC
				☑	0602 - MP55 Regular Coupling — LIFT 1400 HANG 1300
				☑	0601M30 - MP55 Casing, 3.0 m, PVC
				☑	0602 - MP55 Regular Coupling
				☑	0601M30 - MP55 Casing, 3.0 m, PVC
				☑	0602 - MP55 Regular Coupling — LIFT 1350 — HANG 1300
				☑	0601M30 - MP55 Casing, 3.0 m, PVC
				☑	0602 - MP55 Regular Coupling
				☑	0601M30 - MP55 Casing, 3.0 m, PVC
				☑	0602 - MP55 Regular Coupling
				☑	0601M30 - MP55 Casing, 3.0 m, PVC
				☑	0602 - MP55 Regular Coupling
				☑	0601M30 - MP55 Casing, 3.0 m, PVC
				☑	0602 - MP55 Regular Coupling — LIFT 1300 HANG 1250
				☑	0601M30 - MP55 Casing, 3.0 m, PVC
				☑	0602 - MP55 Regular Coupling
				☑	0601M30 - MP55 Casing, 3.0 m, PVC
				☑	0602 - MP55 Regular Coupling
				☑	0601M30 - MP55 Casing, 3.0 m, PVC

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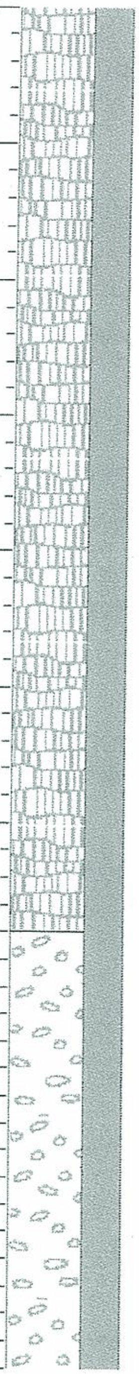
Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



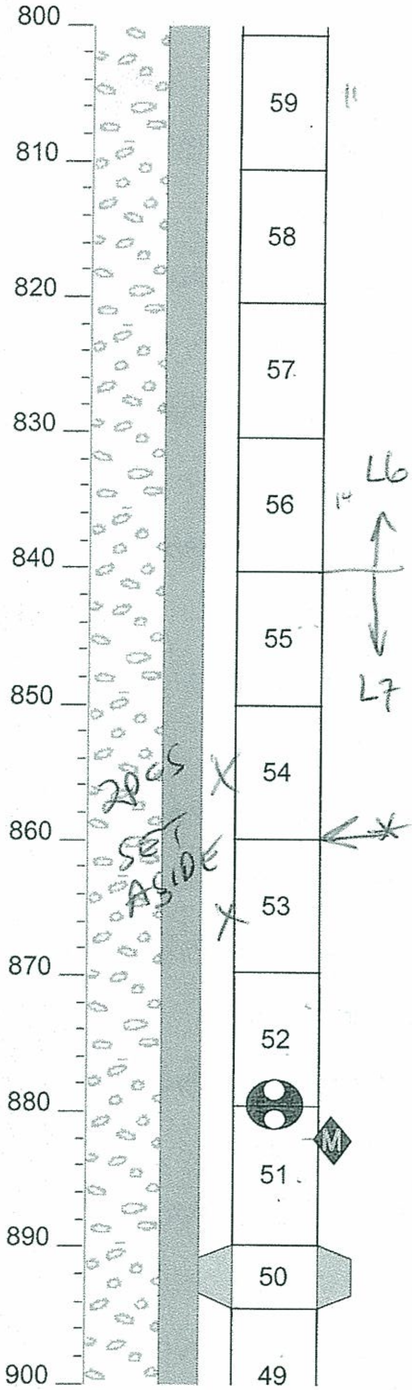
Scale Feet	MP Casing	QA Tested OK	MP Casing Description	Notes
700		☑	0602 - MP55 Regular Coupling	LS ↑ / ↓ L6
710	69	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	LIFT 1300
720	68	☑	0601M30 - MP55 Casing, 3.0 m, PVC	HANG 1200
		☑	0602 - MP55 Regular Coupling	
730	67	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	LIFT 1200
740	66	☑	0601M30 - MP55 Casing, 3.0 m, PVC	HANG 1150
		☑	0602 - MP55 Regular Coupling	
750	65	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
760	64	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
770	63	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
780	62	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
790	61	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
800	60	☑	0601M30 - MP55 Casing, 3.0 m, PVC	10

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14

Scale Feet	Geology	Well Casing	MP Casing	QA Tested OK	MP Casing Description

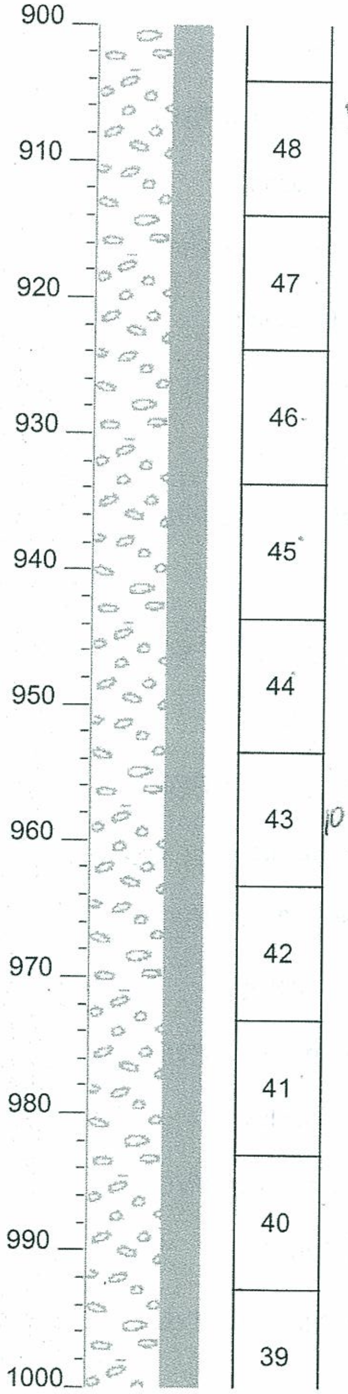
WESTBAY CASING REMAINS CLEAN, NO SCALE/RUST/STAIN.



- 0602 - MP55 Regular Coupling — LIFT 1100 HANG 1050
- 0601M30 - MP55 Casing, 3.0 m, PVC
- 0602 - MP55 Regular Coupling
- 0601M30 - MP55 Casing, 3.0 m, PVC
- 0602 - MP55 Regular Coupling
- 0601M30 - MP55 Casing, 3.0 m, PVC
- 0602 - MP55 Regular Coupling — LIFT 1050 HANG 1000
- 0601M30 - MP55 Casing, 3.0 m, PVC
- 0602 - MP55 Regular Coupling
- 0601M30 - MP55 Casing, 3.0 m, PVC
- 0602 - MP55 Regular Coupling
- 0601M30 - MP55 Casing, 3.0 m, PVC
- 0602 - MP55 Regular Coupling — * TOP SHEAR WIRE BROKE - CUT OFF END OF MP #54.
- 0601M30 - MP55 Casing, 3.0 m, PVC
- 0602 - MP55 Regular Coupling
- 0601M30 - MP55 Casing, 3.0 m, PVC
- 0605 - MP55 Measurement Port — LIFT 950 HANG 900
- 0601M30 - MP55 Casing, 3.0 m, PVC
- 0602 - MP55 Regular Coupling — PKR TOP END - slight indents.
- 0612 - MP55 Packer, Stiffened, SS
- 0602 - MP55 Regular Coupling
- 0601M30 - MP55 Casing, 3.0 m, PVC

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



Scale Feet: 900 – 1000

MP Casing	QA Tested OK	MP Casing Description	Notes
	✓	0602 - MP55 Regular Coupling	LIFT 900 HANG 850
48 (5)	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	
47	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	
46	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	LIFT 850 HANG 800
45	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	
44	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	
43 (10)	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	LIFT 800 HANG 750
42	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	
41	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	
40	✓	0601M30 - MP55 Casing, 3.0 m, PVC	
	✓	0602 - MP55 Regular Coupling	
39	✓	0601M30 - MP55 Casing, 3.0 m, PVC	

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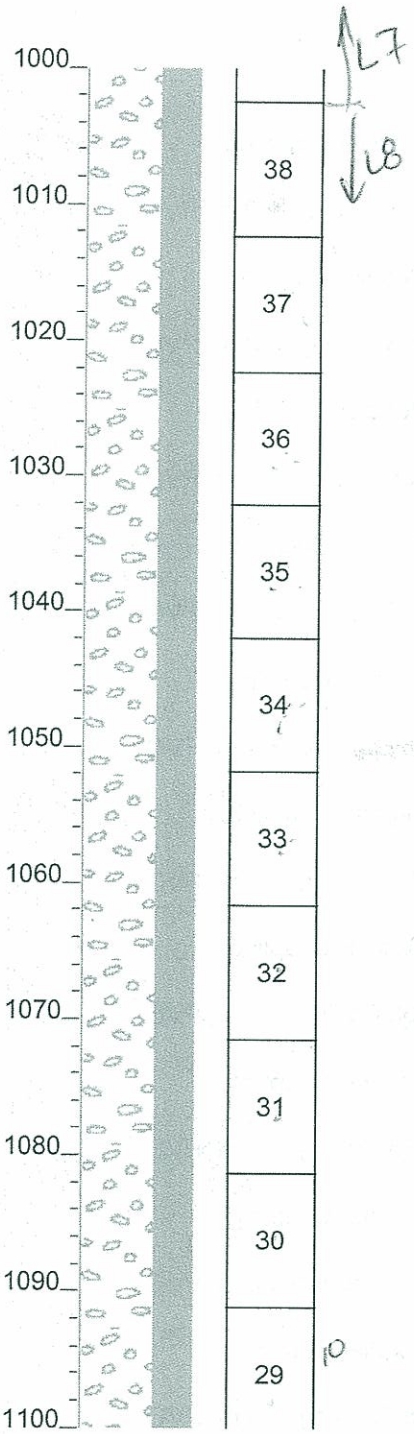
Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



QA Tested OK	MP Casing Description	
☑	0602 - MP55 Regular Coupling	LIFT 750 HANG 700
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	LIFT 700 HANG 650
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	LIFT
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	LIFT 650 HANG 600
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	

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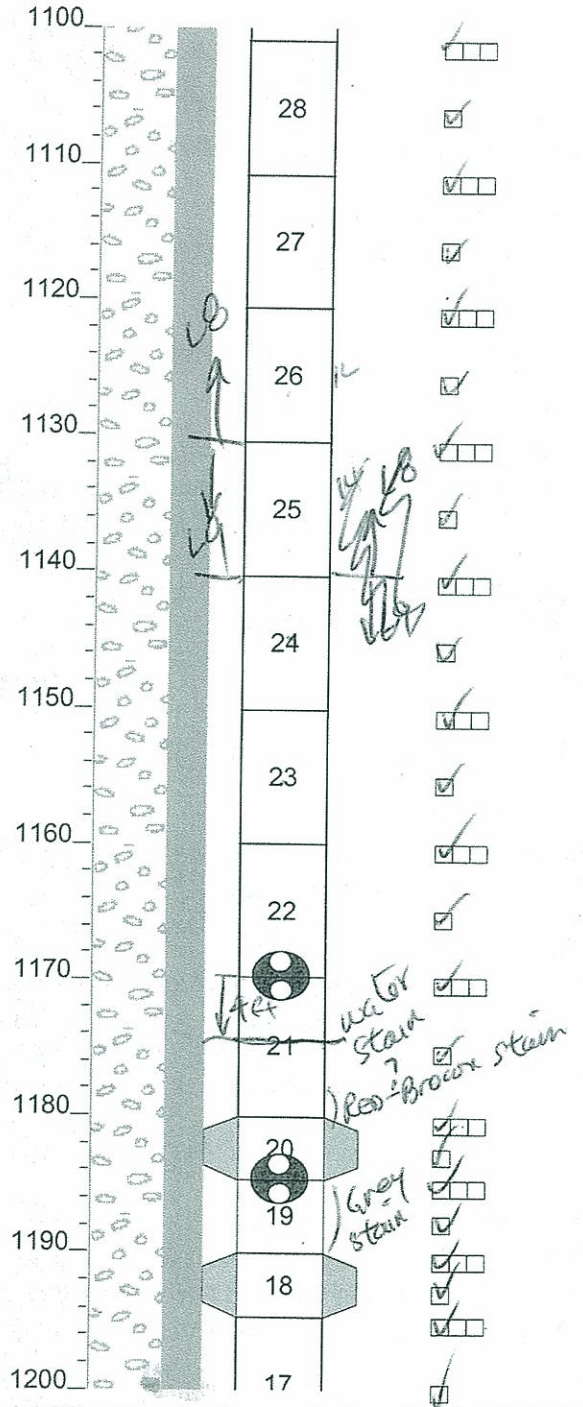
Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



(c) Westbay Instruments Inc. 2000
Mon Feb 03 11:47:06 2008

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14

Scale Feet	Geolo	Well Casing	MP Casing	QA Tested OK	MP Casing Description
1200					
				☑	0605 - MP55 Measurement Port LIFT 300 HANG 290
1210		16	M	☑	0601M30 - MP55 Casing, 3.0 m, PVC
				☑	0602 - MP55 Regular Coupling
		15		☑	0601M15 - MP55 Casing, 1.5 m, PVC
1220				☑	0602 - MP55 Regular Coupling
		14		☑	0601M30 - MP55 Casing, 3.0 m, PVC
1230				☑	0605 - MP55 Measurement Port
		13	M	☑	0601M15 - MP55 Casing, 1.5 m, PVC
				☑	0607 - MP55 Hydraulic Pumping Port
		12		☑	0601M15 - MP55 Casing, 1.5 m, PVC
1240				☑	0605 - MP55 Measurement Port
		11		☑	0601M10 - MP55 Casing, 1.0 m, PVC
				☑	0602 - MP55 Regular Coupling LIFT 210
		10		☑	0612 - MP55 Packer, Stiffened, SS HANG 200
1250				☑	0605 - MP55 Measurement Port
		9		☑	0601M30 - MP55 Casing, 3.0 m, PVC
1260				☑	0602 - MP55 Regular Coupling
		8		☑	0601M15 - MP55 Casing, 1.5 m, PVC
				☑	0602 - MP55 Regular Coupling
		7		☑	0612 - MP55 Packer, Stiffened, SS
1270				☑	0605 - MP55 Measurement Port
		6		☑	0601M15 - MP55 Casing, 1.5 m, PVC
				☑	0602 - MP55 Regular Coupling
		5		☑	0612 - MP55 Packer, Stiffened, SS
1280				☑	0602 - MP55 Regular Coupling
		4		☑	0601M30 - MP55 Casing, 3.0 m, PVC
1290				☑	0605 - MP55 Measurement Port
		3	M	☑	0601M15 - MP55 Casing, 1.5 m, PVC
				☑	0607 - MP55 Hydraulic Pumping Port
		2		☑	0601M15 - MP55 Casing, 1.5 m, PVC
1300					

ORANGE STAIN

BLK STAIN

BLK STAIN 3'

FLUFFICE BLK

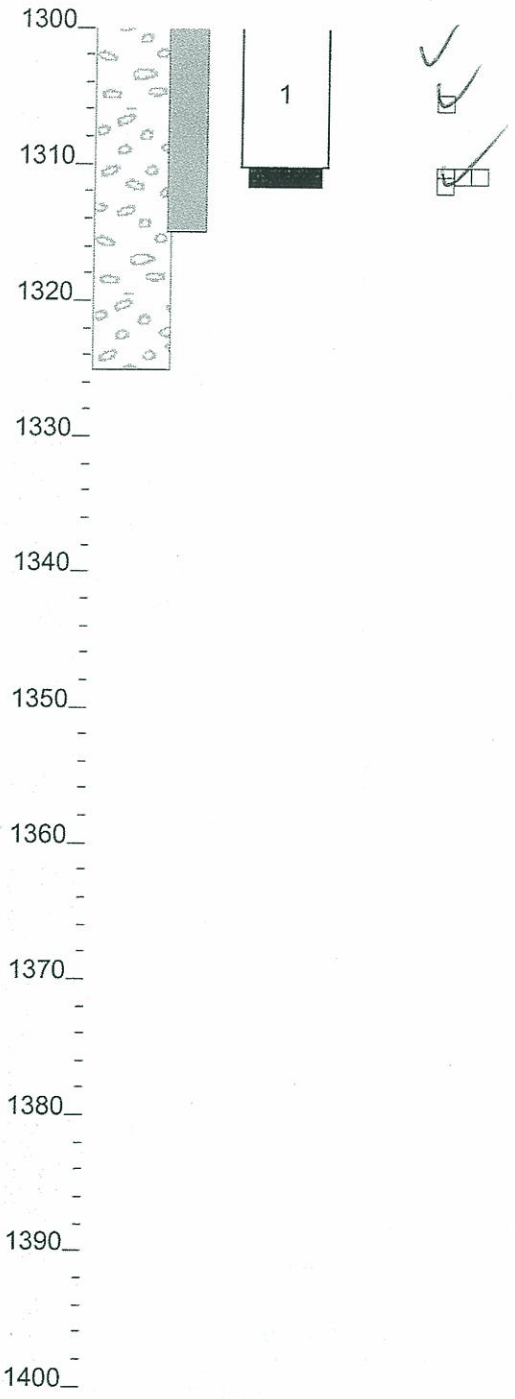
Bottom element clamp slipped off; no seal on bottom of clamp

X shear wires broke. Cut w/ saw

(c) Westbay Instruments Inc. 2000 Mon Feb 03 11:47:06 2008

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



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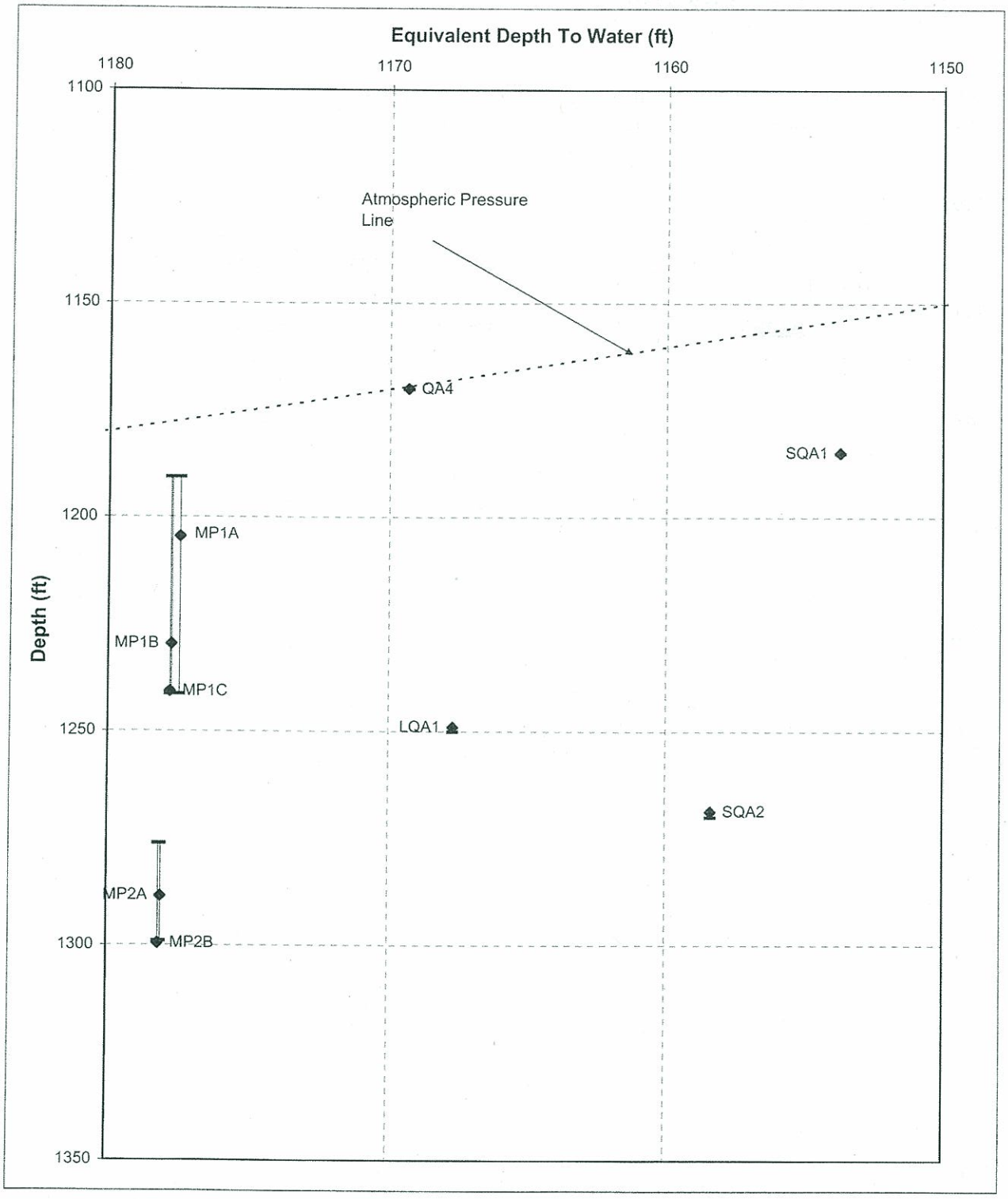
In Feb 03 11:47:06 2008

Pre-Deflation Profile
Monitoring Well: R14

Figure: 1
Profile Date: Feb 7, 2008
Comments: All Zones



Client: TPMC/LANL
Site: Los Alamos
Datum: ground surface

Plot By: DC Date: 20Feb08
Checked By:_____ Date:_____
Westbay Project : WB777
File: R14 Profile plots - Retrieval.xls

Schlumberger
WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: R12 R14
Datum: GL
Elev. G.S.:
Height of Westbay above G.S.:
Elev. top of Westbay Casing:
Reference Elevation:
Borehole angle: VERT.

Probe Type: EM
Serial No.: 3057
Probe Range: 100psi
Westbay Casing Type: MP55

Date: 07 FEB 2008
Client: TPMC
Job No.: WB 277
Location: Los Alamos NM.
Weather: SUNNY, cool
Operator: DL/Deb S.

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: 11.46/13.76/1125 Finish: 11.41/19.33/1240
P_{atm} 11.46 psi

Port No.	Port Position From Log (ft)	Port Position From Cable (ft)	True Port Depth "Dp" ( )	Fluid Pressure Readings			Probe 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)					
MP2B	1299.5	1299.7		91.98	64.06		21.84	1146			
					64.05	91.97	22.07	1147		1178.19	
MP2A	1288.5	1288.7		87.20	59.32		22.54	1150			
					59.32	87.21	22.61	1151		1178.1	
SQA2	1268.7	1268.9		78.67	59.29		22.83	1154			
					59.23	78.66	22.84	1155		1158.6	
LQA1	1248.9	1249.1		70.13	46.76		22.82	1157			
					46.67	70.13	22.81	1158		1167.7	
MP1C	1240.6	1240.9		66.53	38.68		22.76	1200		1177.8	
					38.68	66.54	22.73	1201			

Notes: w = 0.433 psi/ ft (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

P2

Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: R14
Datum:
Elev. G.S.:
Height of Westbay above G.S.:
Elev. top of Westbay Casing:
Reference Elevation:
Borehole angle:

Probe Type: EM
Serial No.: 3057
Probe Range: 100psi
Westbay Casing Type: MPSS

Date: 07FEB2008
Client: TPMC
Job No.: WB777
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).

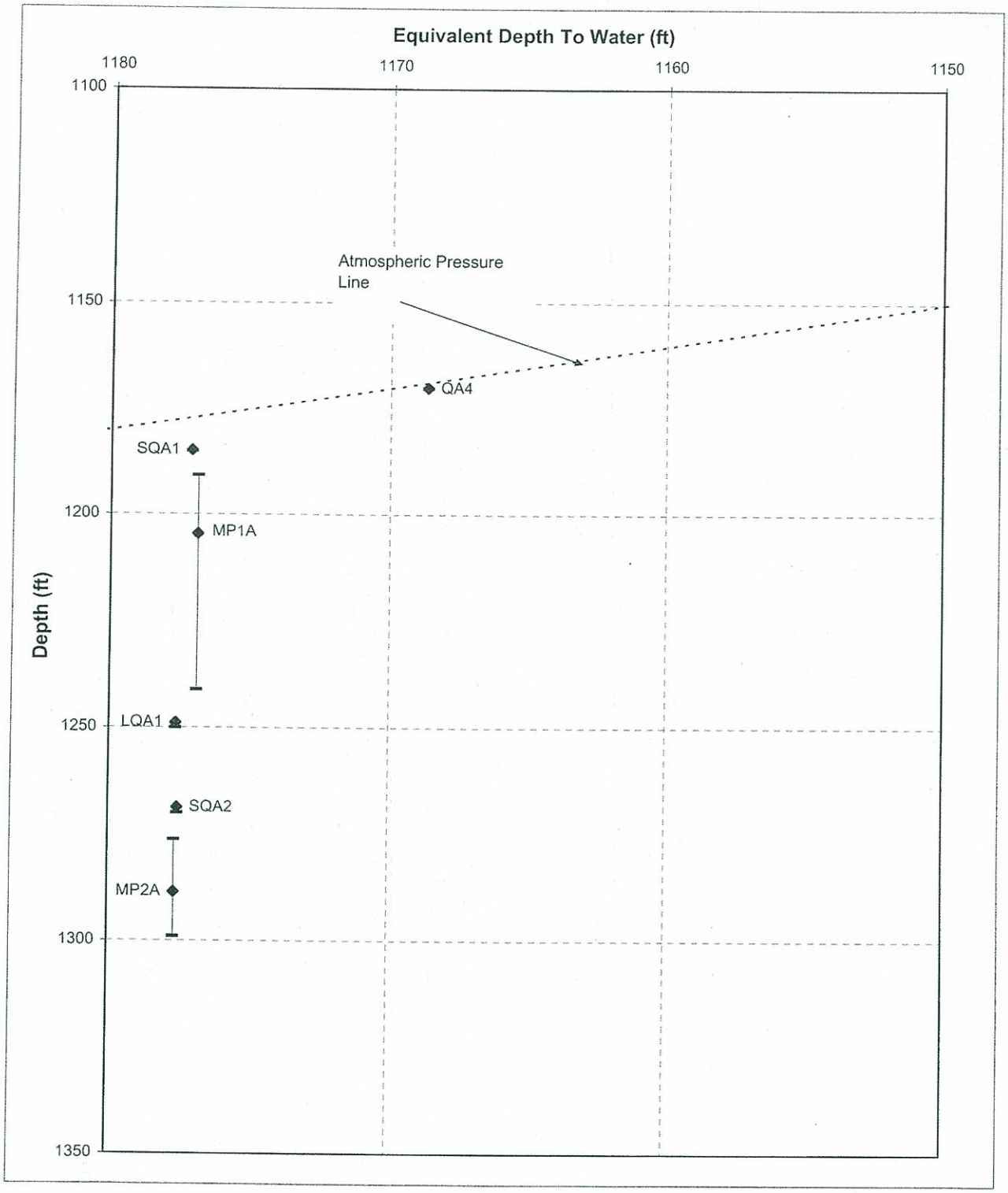
Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: Finish:
P_{atm} psi

Port No.	Port Position From Log (ft)	Port Position From Cable (ft)	True Port Depth "Dp" ( )	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 ( ) H = (P2-Patm)/w	Piez. Level Outside Port ( ) Dz = Dp - H	Comments
MP1B	1229.6	1229.9		61.79	33.94		22.69	1203			
					33.93	61.78	22.67	1204		1177.8	
MP1A	1204.5	1204.9		50.95	23.17		22.59	1206			
					23.17	50.95	22.50	1207		1177.6	
SQA1	1184.8	1185.0		42.41	24.98		22.4	1209			
					24.93	42.41	22.38	1214		1153.7	
QA4	1169.9	1170.4		36.00	11.72		22.23	1217			
					11.71	36.00	22.21	1218		DRY	
QA3	879.8	879.9		11.82	11.60		22.81	1224			
					11.60	11.79	22.81	1225		DRY	
QA2	580.2	580.1		11.66	11.66		21.27	1231			
					11.65	11.66	21.20	1232		DRY	
QA1	280.8	279.9		11.54	~~20.4~~		20.48	1236			
					11.68			1237		DRY	
					11.66	11.52	20.29	1238			END

Notes: w = 0.433 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

Post Deflation Profile
Monitoring Well: R14

Figure: 2
Profile Date: Feb 9, 2008
Comments: All Zones



Client: TPMC/LANL
Site: Los Alamos
Datum: ground surface

Plot By: DL Date: 20feb08
Checked By:_____ Date:_____
Westbay Project : WB777
File: R14 Profile plots - Retrieval.xls

Schlumberger
WATER SERVICES

POST DEFLATION

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: R14
Datum: GL
Elev. G.S.:
Height of Westbay above G.S.:
Elev. top of Westbay Casing:
Reference Elevation:
Borehole angle:

Probe Type: GMS
Serial No.: 2653
Probe Range: 2000
Westbay Casing Type: MP55

Date: 09 FEB 2008
Client: TPMC
Job No.: WB777
Location: Los Alamos
Weather: SUNNY, COOL
Operator: DC

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: 11.66/13.86/1445 Finish: 11.72/02.1/1550
P_{atm} 11.66 psi

Port No.	Port Position From Log ( )	Port Position From Cable ( )	True Port Depth "Dp" ( )	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 ( ) H = (P2-Patm)/w	Piez. Level Outside Port ( ) Dz = Dp - H	Comments
MP2A	~~1291.0~~	~~1291.0~~		~~62.56~~							
	1288.5	1288.5		62.03	59.71		20.85	1505			
					59.71	61.99	21.16	1506	110.8	1177.7	
	~~SQA~~		8.6								
SQA2	1268.7	1268.7		53.31	51.17		21.98	1509		1177.6	
					51.17	53.32	22.20	1510			
LQA1	1248.9	1249.0		44.75	42.55		22.36	1512		1177.6	
					42.55	44.75	22.31	1513			
MP1A	1204.5	1204.8		25.59	23.56		22.36	1516		1177.0	
					23.62	25.58	22.25	1518			
SQA1	1184.8	1185.0		17.06	~~14.98~~ 14.99		22.17	1520		1177.1	
					14.98	17.06	22.11	1521			
QAA	1169.9	1170.1		12.15	12.21		22.02	1523		DRY	
					12.21	12.15	21.98	1524			

Notes: w = 0.433 psi/ ft (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

Schlumberger
WATER SERVICES

02/2

POST DEFLATION

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: R14
Datum:
Elev. G.S.:
Height of Westbay above G.S.:
Elev. top of Westbay Casing:
Reference Elevation:
Borehole angle:

Probe Type:
Serial No.:
Probe Range:
Westbay Casing Type:

Date: 09 FEB 2008
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: Finish:
P_{atm} psi

Port No.	Port Position From Log ( )	Port Position From Cable ( )	True Port Depth "Dp" ( )	Fluid Pressure Readings			Probe 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)					
QA3	879.8	880.2		12.07	12.07		21.81	1528		DRY	
					12.07	12.07	21.70	1529			
QA2	580.2	579.9		11.97	12.02		21.27	1533			
					12.00	11.94	21.06	1534			
QA1	280.8	281.2		11.86	11.92		19.97	1539			
					11.90	11.84	19.77	1540			

Notes: w = 0.433 psi/ ft (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

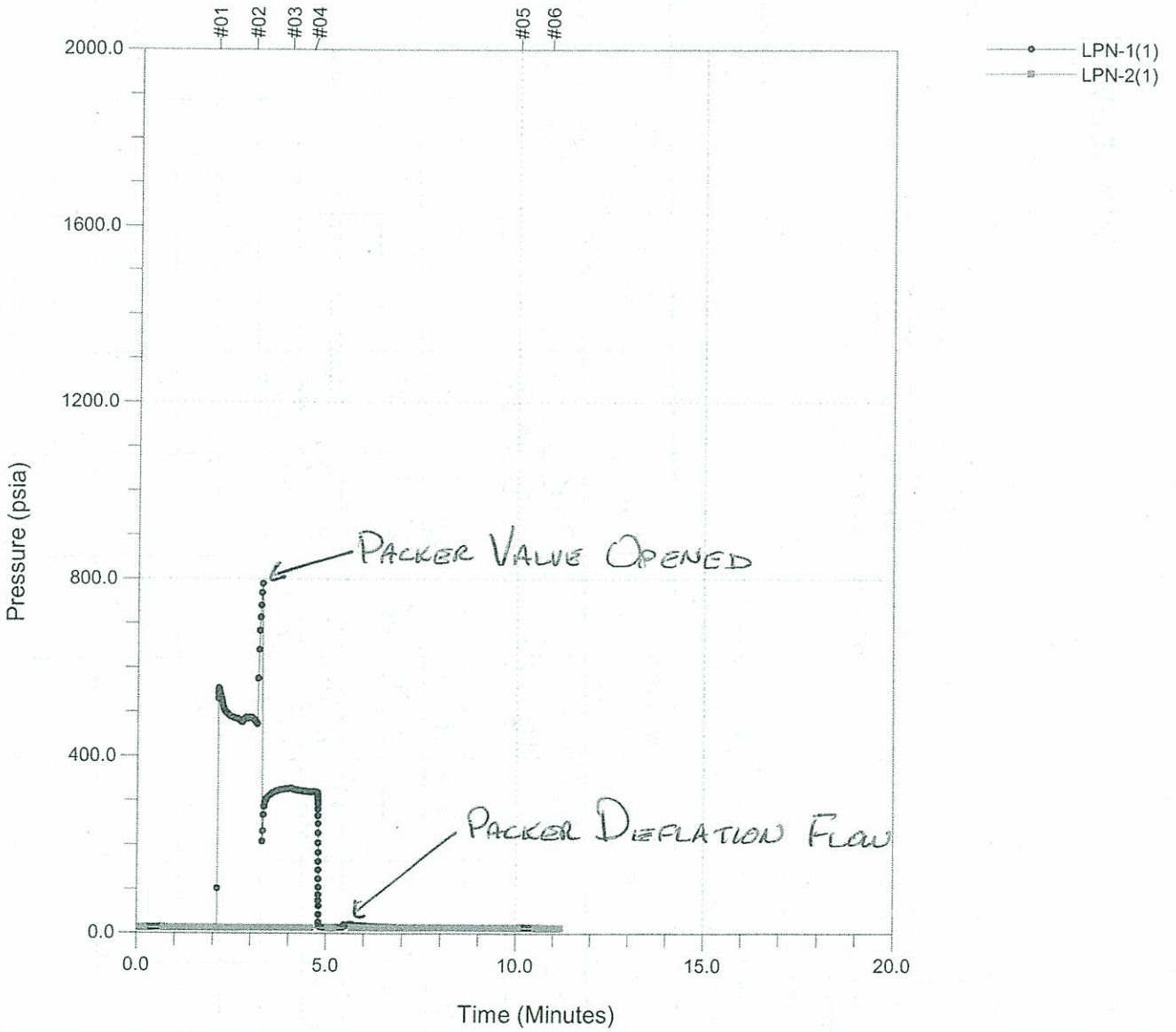
Packer Deflation

Company: Terranear PMC
Site: Los Alamos
Project: LANL Well Retrieval
Description: Plastic MP55
Well: R-14
WB project: WB777
Comment:

Packer: P1
Packer Depth:

Plot By: DL Date: 20 FEB 08

Checked By:_____ Date:_____



TZero: Sat Feb 09 22:00:00 2008

Report Date: Tue Feb 19 17:31:49 2008

R14_P1D.WDF

Page _____ of _____

Schlumberger WATER SERVICES

MP55 Packer Inflation Field Record

Project: 717	Client: TPMC	By: DL	Date: 09 FEB 2008
Location: Los Alamos	Well No. R14	Borehole Diameter:	
Packer No. P1	Depth: 291.1	Computer Data File: R14_P1D .WDF	
Inf-Tool No. 2325	Vent Tool No. 2653	Volume Pumped:	Vol Returned
H-B Valve: (P_H)	Offset (P_V).	Confirm Venting (Vent Tool Data) (Y/N)	
Vent Tool Pressure (Shoe Out, P_O)		Final Inf'n Vol:	Final Press: (P_F)
Comments:		Calc'd Element Pressure ($P_F + P_V - P_O$)	
		Confirm Pkr Valve Closed (Yes/No):	

500 ft hose length

Pumping Information

Software Reminder
I = Inflate, O = Off, C = Close

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	TIE=OFF Text
0	0	11.5	11.9	1400		Start logging / shoe out
0	0	11.9	11.9	1401		Pump to 1000
0.25	1000	11.9	11.9	1402	1	TIE = INF
						P↑ to 550 then slow ↓
0.25	950	480	11.9	1403	2	P↑ to 790 then
						sharply ↓ to 200
0.3	700	320	11.9	1403:40	3	TIE = OFF / VENT
0.1	0	320	11.9	1404:30	4	TIE SHOE IN / CLOSE / SHOE OUT.
		17.8	11.9	1405:45		observe TIE-P ↓
		16.17		1406		as Packer vents
		15.13		1406:15		thru tool.
		14.11		1406:30		
		12.9		1407		
		12.4		1408		
		12.3		1409		
0.1	0	12.2	11.9	1410	5	SHOE IN
0.1	0	11.5	11.9	1411	6	END
						CONCLUSION
						- PKR Valve open
						- Pkr deflated.

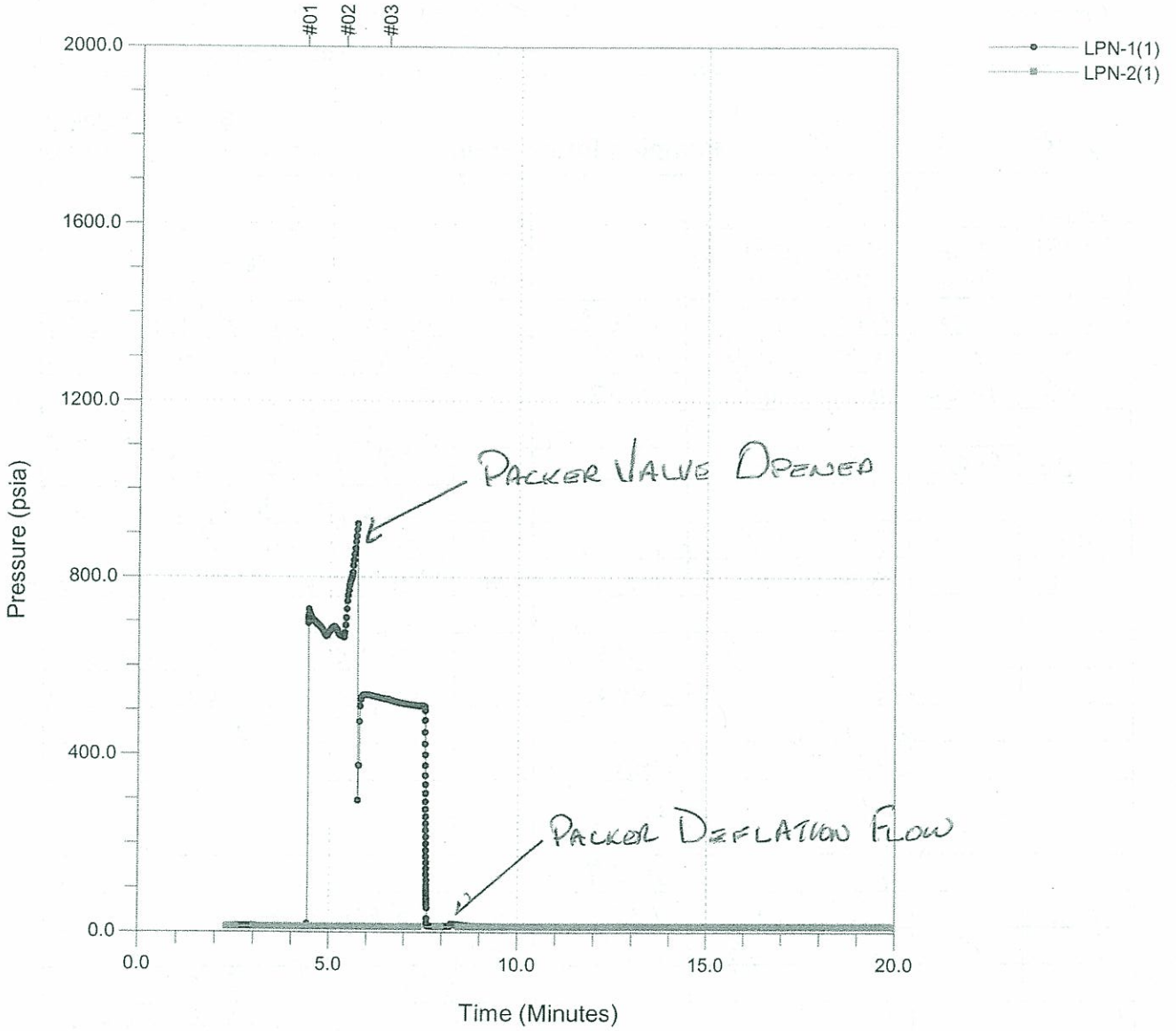
Packer Deflation

Company: Terranear PMC
Site: Los Alamos NM
Project: LANL Well Retrieval
Description: Plastic MP55
Well: R-14
WB project: WB777
Comment:

Packer: P2
Packer Depth:

Plot By: DL Date: 20 Feb 2008

Checked By:_____ Date:_____



TZero: Sat Feb 09 21:06:40 2008

Report Date: Tue Feb 19 17:34:32 2008

R14_P2D.WDF

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

Project: 777 Client: TPMC	By: DL Date: 09 FEB 2008
Location: Los Alamos Well No. R14	Borehole Diameter:
Packer No. P2 Depth: 590.5	Computer Data File: R14_P2D.WDF
Inf-Tool No. 2325 Vent Tool No. 2653	Volume Pumped: _____ Vol Returned _____
H-B Valve: (P_H) _____ Offset (P_V). _____	Confirm Venting (Vent Tool Data) (Y/N) _____
Vent Tool Pressure (Shoe Out, P_O) _____	Final Inf'n Vol: _____ Final Press: _____ (P_F)
Comments:	Calc'd Element Pressure ($P_F + P_V - P_O$) _____
	Confirm Pkr Valve Closed (Yes/No): _____

Software Reminder

Pumping Information

I = Inflate, O = Off, C = Close

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
0	0	11.7	11.9	1309		START LOG / TIE SHOE OUT
0	0	12.0	11.9	1310		Pump to 1000
0.4	1000	12.0	11.9	1311	1	TIE → INF.
						P↑ 700, stable.
0.4	970	1069	12.0	1312	2	Pump slowly
						up to 890 then drop
						to 250, rise to 530
						→ PKR VALVE OPEN
0.5	1200 V	532	12.0	1313	3	TIE-OFF / VENT
	to 840					
0.1	0	514	12.0	1314		SHOE IN / CLOSE / SHOE OUT
		14.9	12.0	1315		
		13.5	12.0	1315:30		See TIE P V ∞
		12.4	12.0	1316:30		Pkr vents thru tool
						LUNCH
0.1	0	12.2	12.0	1330	4	SHOE IN / TIE-OFF
0.1	0	11.7	12.1	1331	5	END
						CONCLUSION:
						> Pkr Valve is open
						> Pkr is deflated

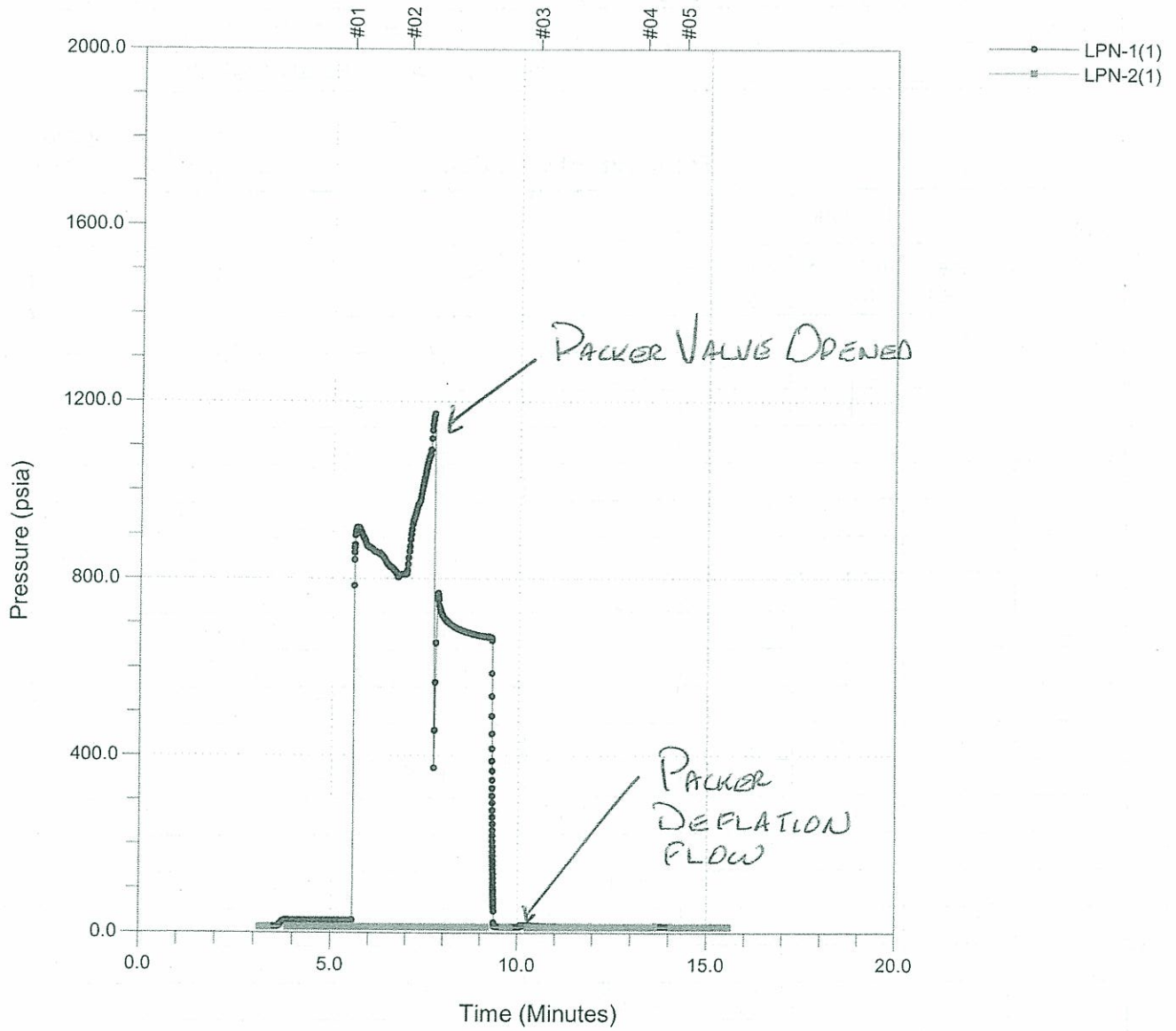
Packer Deflation

Company: Terranear PMC
Site: Los Alamos NM
Project: LANL Well Retrieval
Description: Plastic MP55
Well: R-14
WB project: WB777
Comment:

Packer: P3
Packer Depth:

Plot By: DL Date: 20 Feb 2008

Checked By:_____ Date:_____



TZero: Sat Feb 09 20:26:40 2008

Report Date: Tue Feb 19 17:35:40 2008

R14_P3D.WDF

Page _____ of _____

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

Project: WB 277 Client: TPMC	By: DL Date: 09 FEB 2008
Location: Los Alamos Well No. R14	Borehole Diameter:
Packer No. P3 Depth: 890.1 ft	Computer Data File: R14_P3D .WDF
Inf-Tool No. 2325 Vent Tool No. 2653	Volume Pumped: _____ Vol Returned _____
H-B Valve: (P_H) _____ Offset (P_V). _____	Confirm Venting (Vent Tool Data) (Y/N) _____
Vent Tool Pressure (Shoe Out, P_O) _____	Final Inf'n Vol: _____ Final Press: _____ (P_F)
Comments:	Calc'd Element Pressure ($P_F + P_V - P_O$) _____
	Confirm Pkr Valve Closed (Yes/No): _____

Software Reminder
I = Inflate, O = Off, C = Close

Pumping Information

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
0	0	11.7	12.1	1230	—	START LOGGING / SHOE OUT
0	0	26.3	12.1	1231	~~3~~	PUMP TO 1000
0.6	1000	26.2	12.1	1232	1	TIE = INF. P↑ to 950
0.6	950	840	12.1	1233		NOT OPEN.
0.6	950	808	12.1	1233:30	2	Pump Slowly @ 1250 see sharp drop then rise ' TIE=OFF
0.9	1400	690	12.1	1234:40	~~3~~	VENT, SHOE IN TIE=C, ~~SHOE OUT~~
0.1	0	11.7	12.1	1236:20		SHOE OUT
0.1	0	15.5	12.1	1237	3	See xducer P↓
0.1	0	14.9	12.1	1237:15		as pkr deflates thru tool.
0.1	0	13.6	12.1	1237:30		
0.1	0	13.1	12.1	1238		
0.1	0	12.6	12.1	1238:30		CONCLUSION: PKR is deflating PKR valve is open.
0.1	0	12.5	12.1	1240	4	~~CLOSE~~ SHOE IN
0.1	0	11.8	12.1	1241	5	END See bounce No Pressure as PKR vents

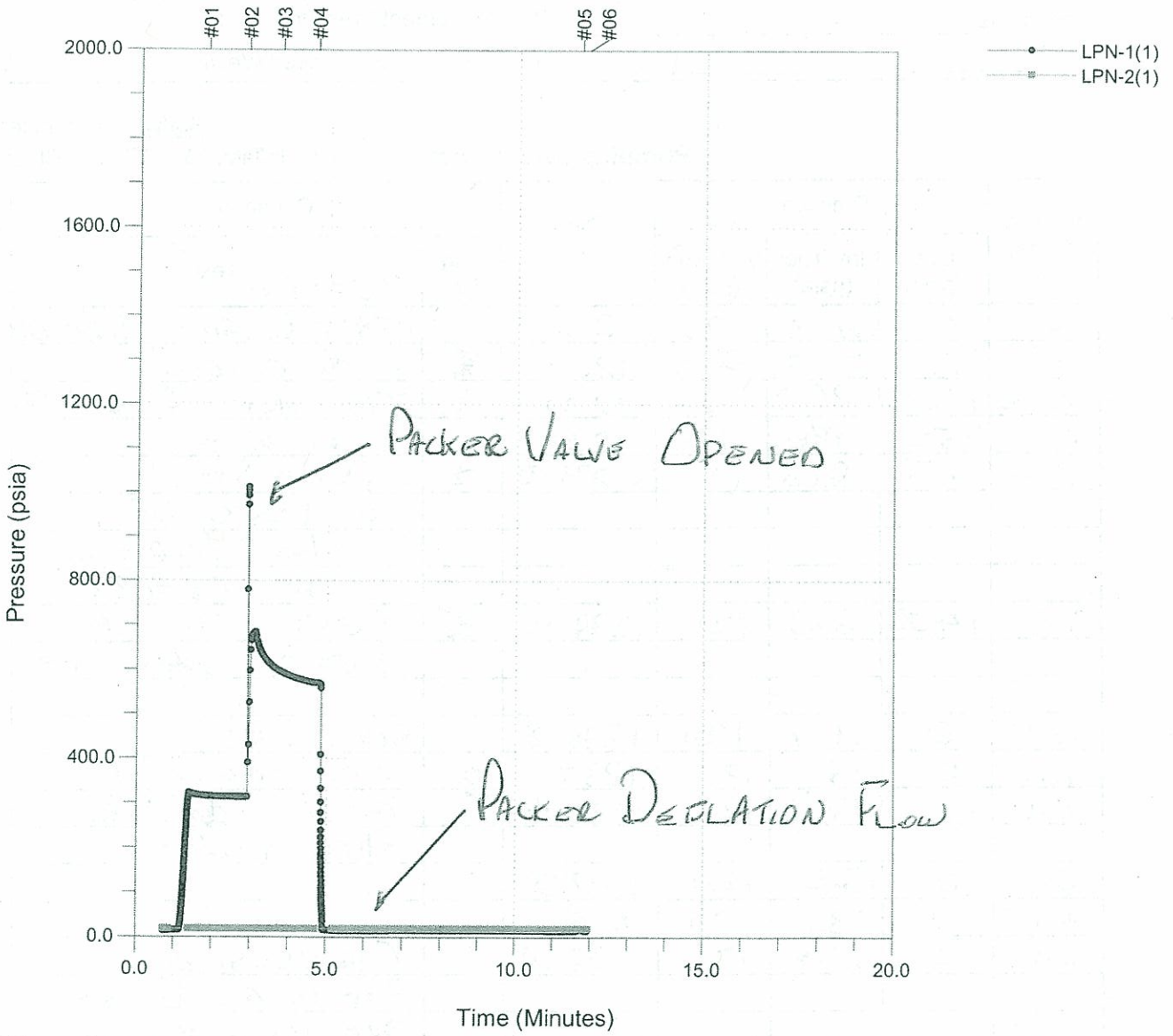
Packer Deflation

Company: Terranear PMC
Site: Los Alamos NM
Project: LANL Well Retrieval
Description: Plastic MP55
Well: R-14
WB project: WB777
Comment:

Packer: P4
Packer Depth:

Plot By: DL Date: 20 Feb 2008

Checked By:_____ Date:_____



TZero: Sat Feb 09 20:03:20 2008

Report Date: Tue Feb 19 17:37:19 2008

R14_P4D.WDF

Page _____ of _____

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

Project: WB377 Client: TPMC	By: DL Date: 09 FEB 2008
Location: Los Alamos Well No. R14	Borehole Diameter: _____
Packer No. P4 Depth: 1180.2	Computer Data File: R14-P4D .WDF
Inf-Tool No. 2325 Vent Tool No. 2653	Volume Pumped: _____ Vol Returned _____
H-B Valve: (P_H) _____ Offset (P_V). _____	Confirm Venting (Vent Tool Data) (Y/N) _____
Vent Tool Pressure (Shoe Out, P_O) _____	Final Inf'n Vol: _____ Final Press: _____ (P_F)
Comments: _____	Calc'd Element Pressure ($P_F + P_V - P_O$) _____
_____	Confirm Pkr Valve Closed (Yes/No): _____

Software Reminder
I = Inflate, O = Off, C = Close

Pumping Information

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
0	0	13.6	18.4	1204		TIE = OFF Start logging / SHOE out. - see squeeze P
0	0	318	18.4	1205	1	Pump to 1000
0.6	1000	313	18.4	1206	2	TIE = SNF P4 to 1000, down to 500 Then climb
	PKR VALVE		OPEN			TIE = OFF
0.6	700	609	18.4	1207	3	VENT LINE
0.2	0	574	18.4	1208	4	SHOE IN
0.2	0	14.0	18.7	1208:30		
0.1 ~~0.2~~	0	14.1	18.8	1209		
0.1	0	14.2	18.9	1210		ΔP = 19.0 - 18.4 = 0.6 psi = 1.0 ft water
0.1	0	14.2	19.0	1211		
0.1	0	14.2	19.0	1212		
						CONCLUSION: PKR valve is open and Pkr is deflated.
0.1	0	14.2	19.0	1215	5	END

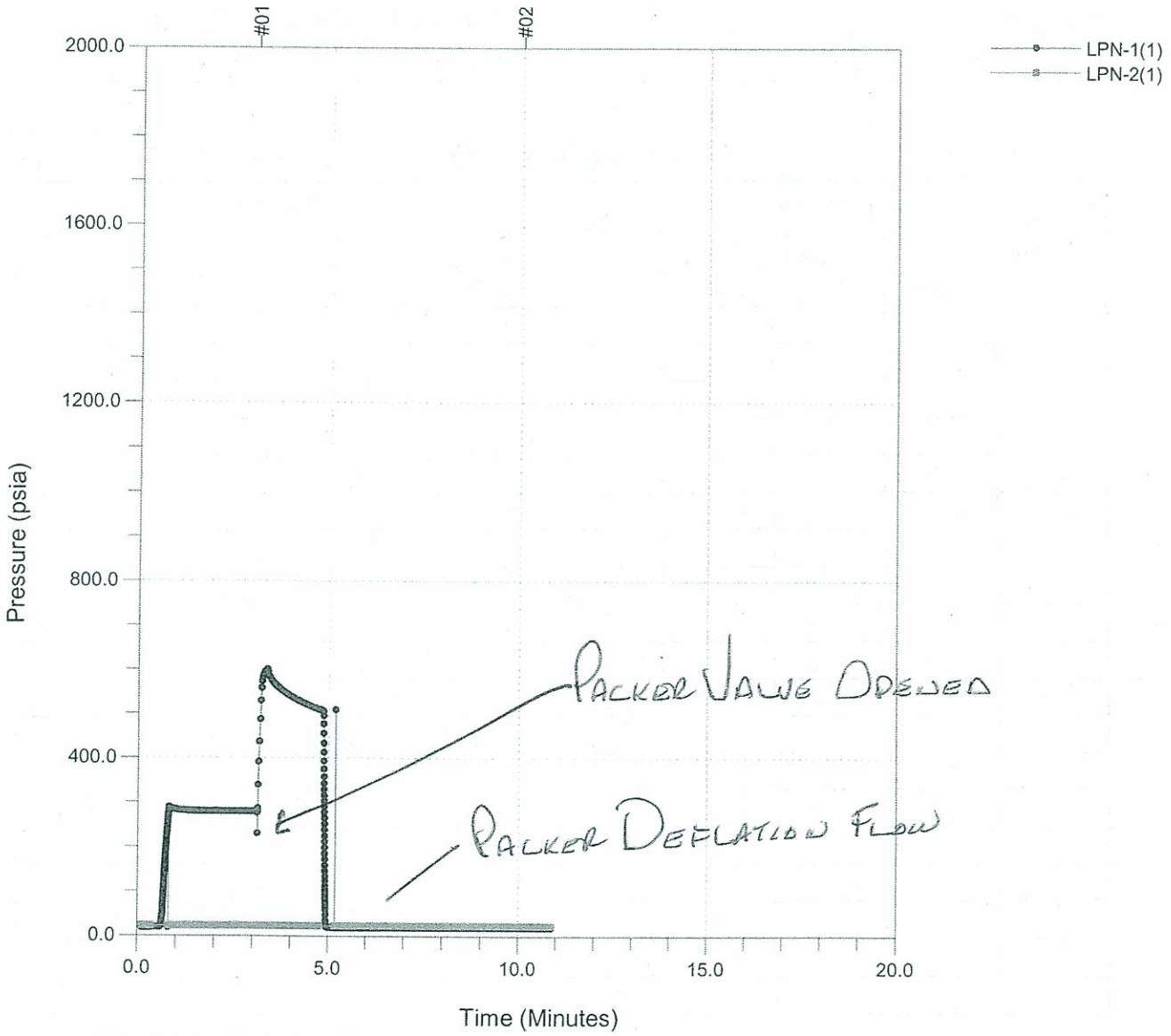
Packer Deflation

Company: Terranear PMC
Site: Los Alamos NM
Project: LANL Well Retrieval
Description: Plastic MP55
Well: R-14
WB project: WB777
Comment:

Packer: P5
Packer Depth:

Plot By: DL Date: 20 Feb 2008

Checked By:_____ Date:_____



TZero: Sat Feb 09 19:50:00 2008

Report Date: Tue Feb 19 17:38:23 2008

R14_P5D.WDF

Page _____ of _____

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

Project: WB 777	Client: TPMC	By: DL	Date: 09 FEB 2008
Location: Los Alamos	Well No. R14	Borehole Diameter:	
Packer No. P5	Depth: 1190.2 ft	Computer Data File: R14-P5D	.WDF
Inf-Tool No. 2325	Vent Tool No. 2653	Volume Pumped:	Vol Returned
H-B Valve: (P_H)	Offset (P_V).	Confirm Venting (Vent Tool Data) (Y/N)	
Vent Tool Pressure (Shoe Out, P_O)		Final Inf'n Vol:	Final Press: (P_F)
Comments:		Calc'd Element Pressure ($P_F + P_V - P_O$)	
		Confirm Pkr Valve Closed (Yes/No):	

Software Reminder

Pumping Information

I = Inflate, O = Off, C = Close

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
0	0	17.6	22.3	1150		TIE SHOE OUT/START LOGGING
						-small squeeze to 284
0	0	283	22.3	1151		Pump to 1000
0.6	1000	279	22.3	1153	1	TIE = INF
						See P drop slightly
						then rise
0.6	600	547	22.3	1153:30		TIE = OFF / VENT
0.2	0	515	22.3	1154:30	2	TIE SHOE IN
0.2	0	17.8	22.5	1155		
0.2	0	17.9	22.7	1155:30		See P-rise on EMS
0.2	0	18.0	22.8	1156		as Pkr deflates.
						∴ Pkr valve is open.
0.2	0	18.1	22.9	1157		
						ΔP = 22.9 - 22.3 = 0.6psi
						= 1.0 L.
0.2	0	18.1	22.9	1200	32	END
						CONCLUSION
						→ Pkr valve open
						and pkr deflated.

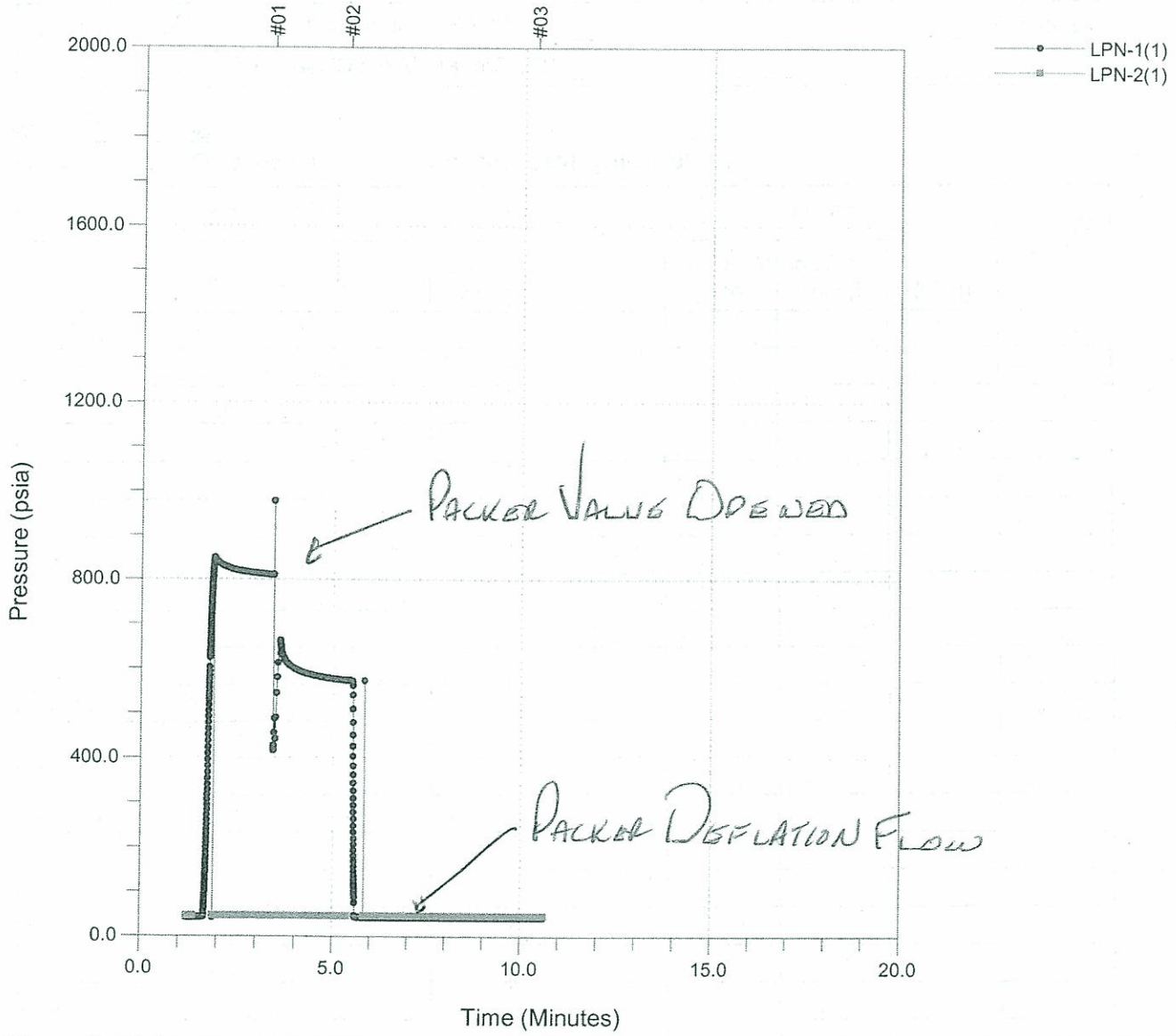
Packer Deflation

Company: Terranear PMC
Site: Los Alamos NM
Project: LANL Well Retrieval
Description: Plastic MP55
Well: R-14
WB project: WB777
Comment:

Packer: P6
Packer Depth:

Plot By: DC Date: 20 Feb 2008

Checked By:_____ Date:_____



TZero: Sat Feb 09 19:31:40 2008

Report Date: Tue Feb 19 17:40:02 2008

R14_P6D.WDF

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

Project: WB777 Client: TPMC	By: DC Date: 09 FEB 2005
Location: Los Alamos Well No. R14	Borehole Diameter:
Packer No. P6 Depth: 1244.3	Computer Data File: R14-P6D .WDF
Inf-Tool No. 2325 Vent Tool No. 2653	Volume Pumped: _____ Vol Returned _____
H-B Valve: (P_H) _____ Offset (P_V). _____	Confirm Venting (Vent Tool Data) (Y/N) _____
Vent Tool Pressure (Shoe Out, P_O) _____	Final Inf'n Vol: _____ Final Press: _____ (P_F)
Comments:	Calc'd Element Pressure ($P_F + P_V - P_O$) _____
	Confirm Pkr Valve Closed (Yes/No): _____

Software Reminder
I = Inflate, O = Off, C = Close

Pumping Information

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	TIE=OFF Text
0	0	41.3	45.9	1133		TIE SHOE OUT. / START LOGGING.
						- See Squeeze P
0	0	834	45.9	1134		- Pump to 1000
0.6	1000	812	45.9	1135	1	TIE=INF.
						P↑ to 100, drop to 450
						then climb.
0.6	1050	594	46.0	1135:20		TIE=OFF. / VENT
0.1	0	576	46.9	1137	2	SHOE IN
0.1	0	41.4	46.2	1137:30		See EMS P↑ as
0.1	0	41.6	46.4	1138:20		PKR deflates.
0.1	0	41.7	46.5	1139		
						NP=46.5-45.9=0.6psi
						=1.0l
						∴ PKR VALVE IS OPEN
0.1	0	41.7	46.5	1142	3	END

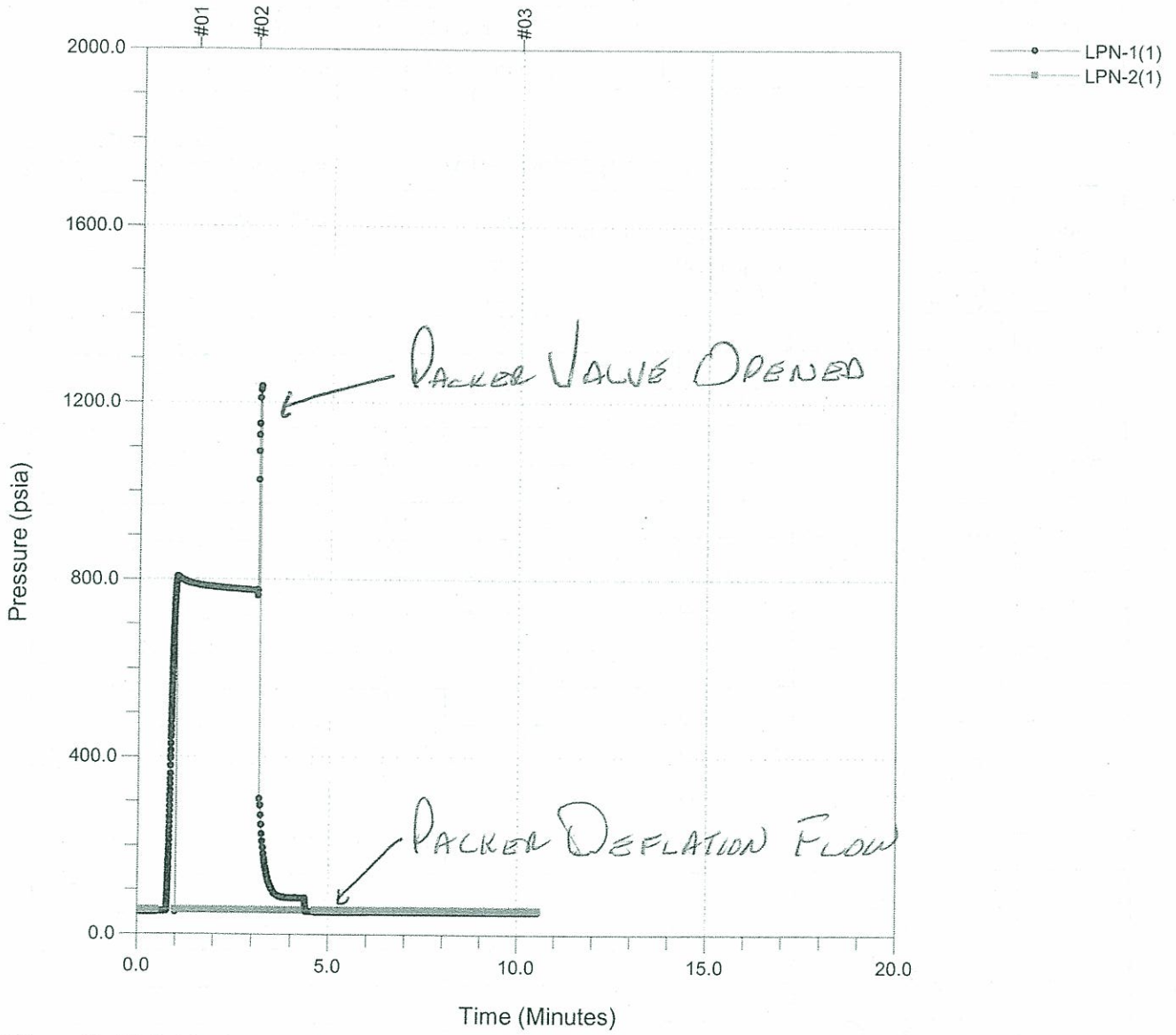
Packer Deflation

Company: Terranear PMC
Site: Los Alamos NM
Project: LANL Well Retrieval
Description: Plastic MP55
Well: R-14
WB project: WB777
Comment: Second Deflation

Packer: P7
Packer Depth:

Plot By: DL Date: 20 Feb 2008

Checked By:_____ Date:_____



TZero: Sat Feb 09 19:15:00 2008

Report Date: Tue Feb 19 17:42:46 2008

R14_P7D2.WDF

Page _____ of _____

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

SECOND DEFLATION

Project: WB777 Client: TPMC	By: DL Date: Feb 9/08
Location: Los Alamos Well No. R14	Borehole Diameter:
Packer No. P7 Depth: 1264.1	Computer Data File: R14-P7D2 .WDF
Inf-Tool No. 2325 Vent Tool No. 2653	Volume Pumped: _____ Vol Returned _____
H-B Valve: (P_H) _____ Offset (P_V). _____	Confirm Venting (Vent Tool Data) (Y/N) _____
Vent Tool Pressure (Shoe Out, P_O) _____	Final Inf'n Vol: _____ Final Press: _____ (P_F)
Comments:	Calc'd Element Pressure ($P_F + P_V - P_O$) _____
	Confirm Pkr Valve Closed (Yes/No): _____

Software Reminder

Pumping Information

I = Inflate, O = Off, C = Close

Volume (litres)	Pressure			Clock	TIE= OFF Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
0	0	49.82	54.50	1115		TIE Shoe out Start recording - See squeeze P.
0	0	797↓	54.5	1116	1	Pump to 1000
0.5	1000	779	54.5	1118	2	TIE = INF
						See P to 1280 then down sharply to 1200
0.5	100	82.4	54.5	1119		TIE = OFF / SHOE IN/VENT.
0.4	0	50.1	54.8	1121		* 0.4l lost from hose.
0.4	0	50.2	54.9	1122		* Rise in MP = 54.9 - 54.5 = 0.4psi = 0.7l.
						∴ net from PKR = 0.3l
0.4	0	50.2	54.9	1125	3	See no more rise in MP VOL.
					←	END
						CONCLUSION: PKR VALVE IS OPEN.

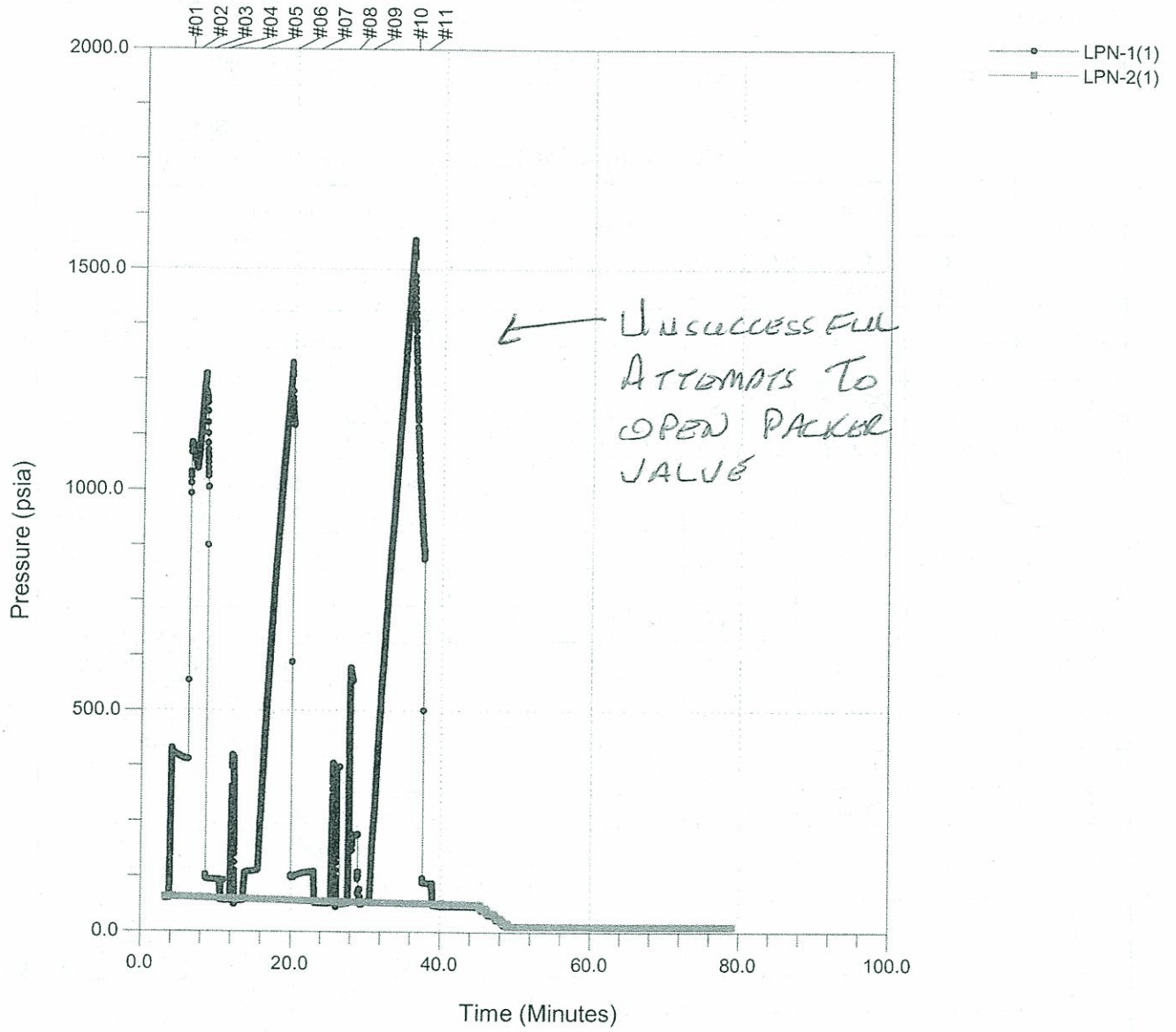
Packer Deflation

Company: Terranear PMC
Site: Los Alamos NM
Project: LANL Well Retrieval
Description: Plastic MP55
Well: R-14
WB project: WB777
Comment: First Deflation

Packer: P7
Packer Depth:

Plot By: DL Date: 20 Feb 2008

Checked By:_____ Date:_____



TZero: Fri Feb 08 22:00:00 2008

Report Date: Tue Feb 19 17:41:09 2008

R14_P7D.WDF

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

Project: WB777 Client: TPMC	By: DL Date: 08Feb
Location: Los Alamos Well No. R14	Borehole Diameter: 4.5
Packer No. P7 Depth: 1264.1	Computer Data File: R14-P7D .WDF
Inf-Tool No._____ Vent Tool No._____	Volume Pumped:_____ Vol Returned_____
H-B Valve: (P_H) _____ Offset (P_V). _____	Confirm Venting (Vent Tool Data) (Y/N) _____
Vent Tool Pressure (Shoe Out, P_O) _____	Final Inf'n Vol:_____ Final Press:_____ (P_F)
Comments:_____	Calc'd Element Pressure ($P_F + P_V - P_O$)_____
_____	Confirm Pkr Valve Closed (Yes/No): _____

Software Reminder
I = Inflate, O = Off, C = Close

Pumping Information

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
0	0	73.7	78.4	1403	-	TIE=OFF Shoe out.
0	0	407	77.8	1404		pump to 1000
1.0	1000	388	76.9	1406	1	TIE → INF.
						No p-drop. Pkr valve
						not open.
1.0	950	1067	76.3	1407	2	
1.5	1400	1200	75.4	1408:45	3	See p. drop. stop Pump
						TIE=OFF.
1.5	1400	117	74.9	1410	-	Vent Line.
0.2	0	116	74.6	1410:30	4	TIE SHOE IN
		69.3	74.0	1411:30		SHOE OUT.
		391	73.6	1412		See squeeze?
		68.6	73.2	1413		Shoe IN TIE-INF
						Shoe out
		132	72.79	1414	4	
0	0	135	72.5	1415	5	Start pump; Slowly
						P rise sharply: Valve not open
0.5	550	490	71.5	1416:30		
1.0	900	825	70.9	1417:50		
1.5	1300	1190	70.3	1419:30		
1.9	1500	1300	70.0	1420	6	See p-drop. → Valve open?
						TIE=OFF. PV to 127

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record Part 2

Project:_____ Well No._____ Packer No. P7 Date:_____

Software Reminder

Pumping Information

I = Inflate, O = Off, C = Close

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
1.9	1300	130	69.5	1421:30		Vent Line.
0	0	135	68.8	1423	7	TIE SHOE N
0	0	63.7	68.4	1424		
0	0	63.13	67.9	1425		see wt decline in MP.
						SHOE OUT.
		379	67.7	1425:30		See squeeze!
						Shoe in Reland.
						Shoe out.
		596	66.8	1428	8	TIE=INF
		218	66.5	1429		CYCLE TIE I-O-C-O-I
0	0	65.2	66.0	1430	9	Pump Slowly
0.5	500	447	65.4	1431:40		P Rise sharply.
1.0	800	710	65.0	1432:40		
1.5	1150	1107	64.6	1434:15		
2.0	1500	1400	64.1	1435-25		
2.1	1600	1480		1436	10	see P drop to 1430 Pdecl.
						stop Pump; observe - leak
2.1	1100	934	63.7	1437:30	11	TIE=OFF
2.1	1000	110	63.5	1438		Vent Line.
0.84	0	108	63.4	1439		SHOE IN
0.7	0	58.2	63.0	1439:40		

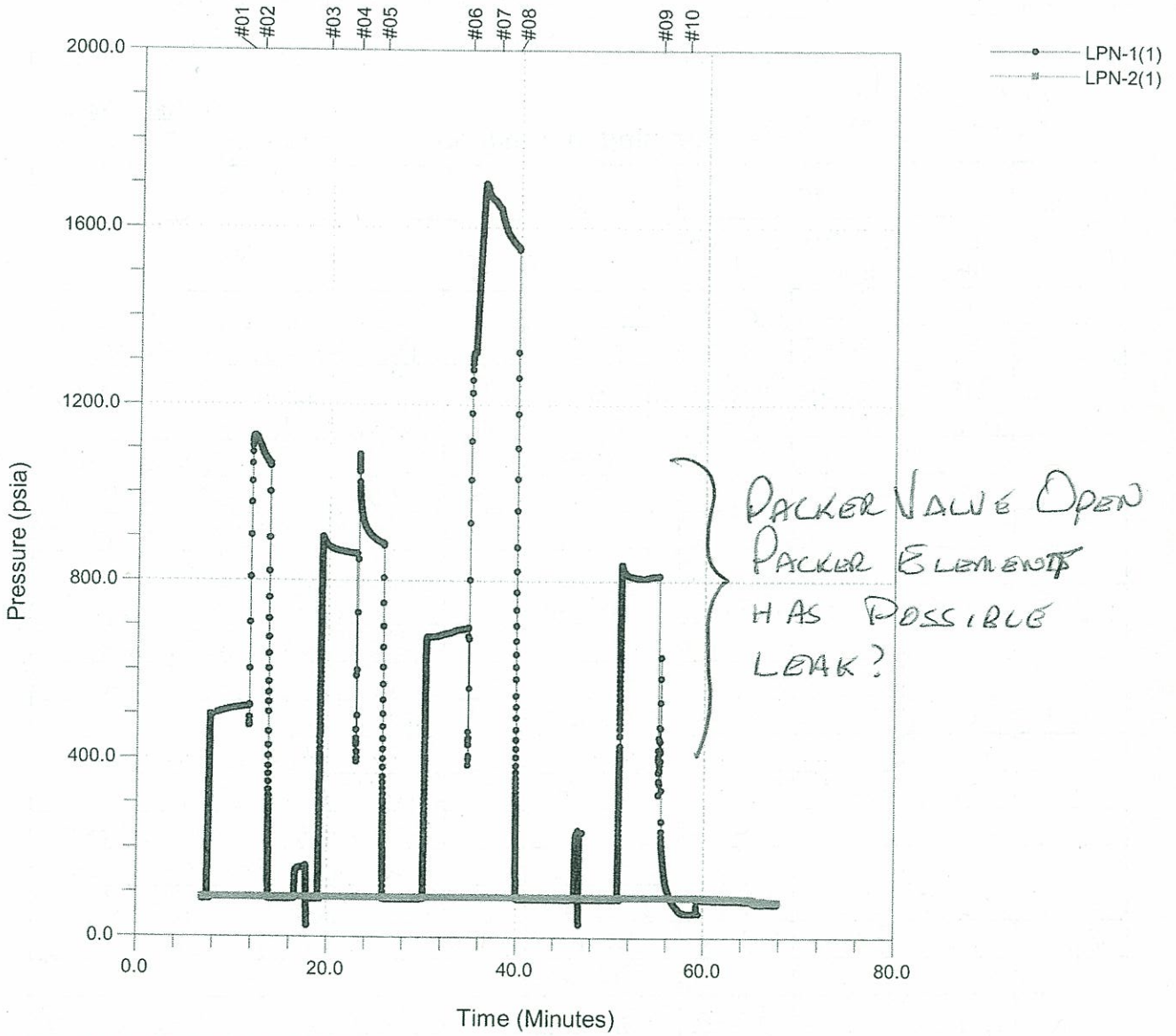
Packer Deflation

Company: Terranear PMC
Site: Los Alamos NM
Project: LANL Well Retrieval
Description: Plastic MP55
Well: R-14
WB project: WB777
Comment:

Packer: P8
Packer Depth:

Plot By: DL Date: 20 Feb 2008

Checked By:_____ Date:_____



TZero: Fri Feb 08 20:53:20 2008

Report Date: Tue Feb 19 17:44:40 2008

R14_P8D.WDF

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

Project: WB 77 Client: TPMC	By: DL Date: 08 Feb 2008
Location: Los Alamos Well No. R14	Borehole Diameter: 4 ½
Packer No. P8 Depth: 1274.1	Computer Data File: R14 - P8 D .WDF
Inf-Tool No. 12 2325 Vent Tool No. _____	Volume Pumped: _____ Vol Returned _____
H-B Valve: (P_H) _____ Offset (P_V). _____	Confirm Venting (Vent Tool Data) (Y/N) _____
Vent Tool Pressure (Shoe Out, P_O) _____	Final Inf'n Vol: _____ Final Press: _____ (P_F)
Comments: _____	Calc'd Element Pressure ($P_F + P_V - P_O$) _____
_____	Confirm Pkr Valve Closed (Yes/No): _____

CLOCK IS ON PACIFIC STD TIME

Pumping Information

Software Reminder
I = Inflate, O = Off, C = Close

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
0	0	84.0	88.9	1300	–	Start logging Shoe out
0	6	495	88.9	1301		Pump to 1500psi.
2.2	1500	515	88.9	1305	1	Tie → INF. - maybe Valve opened
2.2	1150	1114	88.9	1306	2	Vent Line.
				1307		Tie = 0 SHOE IN
0.4	0	84.2	89.06	1309	3	- not see much water rise in MP? Tie = SHOE OUT
0.4	0	153	89.06	1310:30		- very low squeeze? Shoe in, See "suction"
						Suspect Pkr valve not open.
0.4	0	84.37	89.06	1312		Shoe out.
0.4	0	894	89.06	1313	4	Pump to ~~1500~~ 2000
2.8	1700	861	89.06	1316	5	See sharp drop to approx 350, then climb.
						Suspect Pkr valve open.
2.8	1500	920	89.12	1317:30		Tie → OFF, Vent.
0.8	0	890	89.12	1319	6	Tie SHOE IN
			89.18	1319:40		
			89.25	1320		- See W.L. rise in MP.
			89.31	1321		Tie SHOE OUT
0.7	0	84.6	89.31	1322		- NO SQUEEZE, Pkr valve is OP.
						Tie SHOE OUT
0.7	0	673.4	89.25	1325		See squeeze, Pkr valve not open.

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record Part 2

Project:_____ Well No._____ Packer No._____ Date:_____

Software Reminder
I = Inflate, O = Off, C = Close

Pumping Information

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
0.7	0	673.4	89.25	1325		Pump to 1700
3.25	1800	1300	89.25	1328	6	TIE → INF. See drop to 400 then rise.
3.9	1750	1680	89.25	1330		pump to 1680
3.9	1700	1650	89.25	1331	7	VENT LINE, TIE=OFF
1.5	0	1560	89.25	1333	8	TIE SHOE IN
1.5	0	84.65	89.43	1333:40		
1.5	0	84.68	89.49	1335:30		Δ = 89.49 - 89.25 = 0.24 psi = 0.17 m = 0.5 L - this vol seems small.
				1339		TIE SHOE OUT AFTER RE-LAND
						Squeeze = 233 psi
						Shoe-in - See reduction ∴ believe PKR valve not open
				1344		TIE SHOE OUT
1.4	0	818	89.49	1345		Pump
4.1	1750	811	89.55	1348	9	See variable P, drop.
						No P-rise on OMS, ∴ water going into PKR.
						See P drop way below P inside. - maybe PKR burst?
4.1	50	56.4	89.55	1351	10	TIE=OFF
4.1	50	53.4	89.49	1352		SHOE IN
		83.49	88.33	1355		See P inside drop. ∴ WL inside MP dropping PKR likely burst.
4.1	0	83.04	87.59	1356		END

Page _____ of _____

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

Project: WB777 Client: TPMC	By: DL Date: Feb 9/08
Location: Los Alamos Well No. R14	Borehole Diameter:
Packer No. P8 Depth: 1274.1 ft.	Computer Data File: R14P8CL .WDF
Inf-Tool No. 2325 Vent Tool No.	Volume Pumped: Vol Returned
H-B Valve: (P_H) Offset (P_V).	Confirm Venting (Vent Tool Data) (Y/N)
Vent Tool Pressure (Shoe Out, P_O)	Final Inf'n Vol: Final Press: (P_F)
Comments:	Calc'd Element Pressure ($P_F + P_V - P_O$)
	Confirm Pkr Valve Closed (Yes/No):

CLOCK IS ON MTN STD TIME

Pumping Information

Software Reminder
I = Inflate, O = Off, C = Close

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
						TIE=OFF
0	0	53.67	58.60	1056	–	Shoe out, start logging
0	0	53.1	58.5	1057	1	Pump to 800
0.6	800	53.1	58.5	1100	2	TIE=C
0.6	760	53.7	58.5	1100:15	—	
0.6	760	53.7	58.5	1101	3	Vent line.
0.	0	53.7	58.5	1102	4	SHOE IN, TIE=I
0	0	53.7	58.5	1103	5	start pump to add
1.0	0	54.2	58.96	1104:25		water to MP - test PC
1.0	0	54.2	58.96	1106		stable.
1.0	0	54.2	59.0	1107		ΔP = 58.96-58.5 = 0.4psi
1.0	0	54.2	59.0	1108		= 0.9l water ✓
						= Vol pumped.
						-P stable for 5 min.
						∴ Pkr valve (leak) is
						closed.
1.0	0	54.2	59.0	1109	6	END

Appendix D

Video Logging
(on DVD included with this document)

TO VIEW THE VIDEO THAT ACCOMPANIES THIS DOCUMENT, PLEASE CALL THE HAZARDOUS WASTE BUREAU AT 505-476-6000 TO MAKE AN APPOINTMENT