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Well R-14 Rehabilitation and Conversion Summary Report, Revision 1

Los Alamos
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Responsible project leader:

Printed Name	Signature	Title	Organization	Date
Ardyth Simmons		Program Manager	Environmental Programs	6/23/08

Responsible LANS representative:

Printed Name	Signature	Title	Organization	Date
Susan G. Stiger		Associate Director	Environmental Programs	6/26/08

Responsible DOE representative:

Printed Name	Signature	Title	Organization	Date
David R. Gregory		Project Director	DOE-LASO	6/26/08

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1.0 INTRODUCTION

This revision of the "Well R-14 Rehabilitation and Conversion Summary Report" (LANL 2008, 101462) 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. This revision includes a final as-built diagram showing placement of the submersible pump (Figure 1.0-1) and results of additional sampling requested by the New Mexico Environment Department (NMED) (2008, 101309).

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 on August 20, 2007, by NMED (2007, 098182). The R-14 borehole was drilled as a characterization well potentially suitable for monitoring downgradient of Technical Area 50 (TA-50) and TA-35 in Ten Site Canyon. The 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 was 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 Threatened and Endangered Species Act area exclusion caused a hiatus in activities from February 29 to April 28, 2008. The permanent submersible pump was installed between May 12 and May 14 after the Threatened and Endangered Species Act exclusion ended.

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 to 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 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, 2008. On February 12, testing was performed on combined screens 1 and 2 and on screen 1 individually. 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. 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 roughly 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 1.09 gal./min/ft at screen 1.

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 1.0-1. 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 a small volume of potable water was run that carried 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 disk 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, namely, 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 estimated 14 gal./min, which indicated slight persistent underperformance of the replacement equipment. The cause of the continued substandard pump operation was not determined, even with new bowls and controller.

Screen 1 was developed using a jetting tool with 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 that the well screen was cleaned and the stagnant water was removed 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, 2008. 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, representing a 47% increase over the specific capacity measured before well development. This increase confirmed that the well development procedures were 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 Dedicated Sampling System Installation

A single submersible pump sampling system was installed between May 12 and May 14, 2008. The pump system consists of a Grundfos Model 10S50-1125CBM with a 3-phase 5-hp Franklin motor. The Grundfos pump intake was set at 1197.4 ft bgs, approximately 3.2 ft above the top of the screen interval. The discharge pipe for the Grundfos pump consists of custom-fabricated, high-strength 1-in. threaded/coupled Type 304, nonannealed material, which meets the requirements of American Society for Testing and Materials Standard A 554, and has a wall thickness about 15% to 20% greater than Schedule 40 pipe. The threaded ends and couplings conform to 1-in. American Petroleum Institute thread design with 10 threads per inch. A dedicated 1-in. flush-threaded polyvinyl chloride (PVC) transducer tube was installed with the sampling system. The transducer tube terminates with a 6-in. machine-slotted screen with 0.010-in. slots. The transducer tube and pump-motor electrical cable are banded to the 1-in. stainless-pump column at 10-ft intervals with stainless-steel bands.

2.8 Water-Quality Conditions in February 2008

Table 2.8-1 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 in February 2008.

2.8.1 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 2.8-2. 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 2.8-1). 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. Only 13 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. EES-6 analyzed groundwater samples by using techniques specified in the U.S. Environmental Protection Agency (EPA) 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 to analyze calcium, magnesium, potassium, silica, and sodium. Inductively coupled (argon) plasma mass spectrometry (ICPMS) was used to analyze 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. 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.

2.8.2 Field Parameters

Table 2.8-2 and Figure 2.8-1 provide the field parameters measured during the February 29, 2008, test and previous values measured from February 9, 2004, to February 29, 2008. 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 2.8-2, Figure 2.8-1). ORP measurements varied from –26 to +118 millivolts (mV) 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, implying that ORP values are 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.

2.8.3 Analytical Results

Analytical results for groundwater samples collected during performance testing at R-14 screen 1 during February 2008 are provided in Appendix A, Table A-1. Charge balance errors for dissolved cations and anions were generally less than ±10%. Figure 2.8-2 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, and dissolved concentrations of sodium varied from 9.97 to 11.1 mg/L during pumping. Dissolved concentrations of chloride varied slightly 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 varied slightly 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 2.8-2, 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) varied slightly from 0.35 to 0.39 mg/L during pumping (Figure 2.8-2, 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 2.8-3 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 2007. 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 2.8-3). During the 2008 pumping, concentrations of manganese increased; however, they were within the range of previous measurements (Figure 2.8-3). 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 February 2008 test, iron concentrations in nonfiltered samples were greater than those in filtered samples (Figure 2.8-3, Table A-1), 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 have resulted from corrosion of the discharge pipe (see below) used to collect samples throughout the test. Concentrations of iron in filtered groundwater samples exceeded 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 may have taken place within the regional aquifer, based on very similar concentrations of manganese in filtered and nonfiltered samples (Figure 2.8-2, Table A-1).

Two equipment rinseate blanks (nonfiltered) collected from the pump (hardened steel) and discharge pipe (mild steel) had 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 included aluminum (0.023 and 0.103 mg/L) and zinc (0.024 and 0.052 mg/L) (Table A-1). Total concentrations of lead in the nonfiltered rinseate samples were 0.0031 and 0.0026 mg/L.

2.8.4 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 ranged 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, which consisted 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—February 2008

Table B-1 of the Laboratory's February 2008 well screen analysis provides analytical results obtained during the 2008 pumping test. A total of eight primary groundwater samples were selected for this analysis: nonfiltered samples included GW14-08-10725, GW14-08-10731, GW14-08-10737, and GW14-08-10743; filtered samples included GW14-08-10727, GW14-08-10787, GW14-08-10793, and GW14-08-10799. These four nonfiltered/filtered pairs of samples were collected at evenly spaced intervals throughout the pumping test. During the 2008 test, these groundwater samples analyzed from well R-14 screen 1 have scores of 97%, based on 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 2004–2007 samples. Dissolved iron (17 samples) above the background concentrations 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 (TKN), and ammonia.

2.8.5 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 2004–2007 passive Westbay sampling system with those collected in February 2008 using a submersible pump that allowed active purging. This comparison included analytical results for 10 previous sampling events using the Westbay system. Samples that were collected with Westbay equipment generally had lower concentrations of total carbonate alkalinity, TOC, and dissolved chloride, iron, manganese, nitrate(N), sulfate, strontium, uranium, and zinc compared with those samples that were collected with 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.

2.9 Water-Quality Conditions in May 2008

An additional water sample was collected in May 2008 with new sampling equipment to test whether the R-14 screen 1 water quality would improve when new stainless steel was used in place of the previously used mild-steel discharge pipe. Table 2.9-1 shows the sample collection data quality objectives for R-14 screen 1 during postrehabilitation sampling and the constituents that were measured in the field and the laboratory.

2.9.1 Sample Collection, Field Preparation, and Analytical Techniques

Two primary groundwater samples were collected at 9:45 and 10:15 a.m. on May 14, 2008, during postrehabilitation sampling conducted at screen 1. Six duplicate groundwater samples, including one field blank, were collected during this sampling event (Table 2.9-1). Field parameters consisting of pH, turbidity, DO, T, SC, and ORP were measured using a flow-through cell (Geotech) during pumping and sample collection. Measurements of the different field parameters recorded during this postrehabilitation sampling are provided in Table 2.9-2. Field pH and T were measured with a Beckman (Model 255) meter, and DO was measured with a WTW (Model OXI-330I) DO meter. Specific conductance and ORP were measured with a HACH Sension-5 meter and a Thermoelectron Corp. (Russell RL 060P Model) instrument, respectively. The dedicated Grundfos pump was used to collect groundwater samples. The discharge rate varied from 7.0 to 7.3 gal./min during sampling.

Five aliquots of the groundwater samples collected from R-14 screen 1 were filtered through 0.45-µm Geotech disposable filters before metals, trace elements, and major cations and anions were analyzed. Four nonfiltered samples (two primary groundwater samples, one duplicate, and one field blank) were also analyzed for the same suite, in addition to sulfide. 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 anions and total sulfide. Samples collected for total sulfide analyses were preserved with a buffer consisting of sodium hydroxide, EDTA, and ascorbic acid. Samples collected for TOC analysis were not filtered or acidified.

Chemical analyses of the groundwater samples were performed at the Laboratory's EES-6 laboratory. EES-6 analyzed groundwater samples using techniques specified in the EPA SW-846 Manual. Total carbonate alkalinity was measured through 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 ppm. ICPOES was used to analyze calcium, magnesium, potassium, silica, and sodium. ICPMS was used to analyze 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. The precision limits (analytical error) for major ions and trace elements were generally less than ±10% using ICPOES and ICPMS. Total organic carbon was measured using a total carbon–organic carbon analyzer.

2.9.2 Field Parameters

Field parameters were measured 13 times from 9:00 to 10:15 a.m. on May 14, 2008, during pumping of R-14 screen (Table 2.9-2). Field parameters were recorded at 5-min intervals from 9:00 to 9:45 a.m. and at 10-min intervals from 9:45 to 10:15 a.m. Field pH varied from 7.75 to 8.12; T varied from 19.7°C to 24.2°C during this sampling event. SC generally decreased from 124 to 120 µS/cm, and DO varied from 2.4 to 3.3 mg/L. Turbidity measurements varied from 50.9 to 1.13 NTUs, with three measurements exceeding 5 NTUs during the initial 10 min of pumping (Table 2.9-2). Noncorrected ORP measurements generally decreased from +370 to +101 mV during pumping. Field ORP was used along with analytical results (DO, nitrate, manganese, iron, sulfide, and sulfate) to evaluate the redox state of groundwater.

2.9.3 Analytical Results

Analytical results of groundwater samples collected during postrehabilitation testing at R-14 screen 1 are provided in Appendix A, Table A-2 Several samples were not collected for anion analyses and are denoted by "—" in Table A-2. Calcium and sodium are the dominant cations present in the regional aquifer at R-14 screen 1 (Table A-2). 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 varied slightly from 10.6 to 10.7 mg/L, and dissolved concentrations of sodium varied from 10.0 to 10.5 mg/L during pumping. Dissolved concentrations of chloride varied from 1.99 to 2.31 mg/L, not exceeding the maximum background of 5.95 mg/L (LANL 2007, 095817). Concentrations of total carbonate alkalinity varied slightly from 78.0 to 79.0 mg $CaCO_3$/L in nonfiltered samples and are less than the maximum background of 152 mg $CaCO_3$/L (LANL 2007, 095817). Dissolved concentrations of sulfate varied from 3.05 to 3.60 mg/L during sampling (Table A-2). Dissolved 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 analytical detection (0.010 ppm), suggesting that sulfate reduction was not significant at R-14 screen 1. Noncorrected positive ORP and DO measurements (Table 2.9-2) and stable sulfate concentrations (Table A-2) also suggest that the groundwater is not sufficiently reduced to enhance stability of dissolved sulfide species at R-14 screen 1. Concentrations of TOC varied from 0.71 to 0.90 mgC/L during the pumping test, also suggesting that groundwater is relatively oxidizing at R-14 screen 1. Dissolved concentrations of nitrate(N) varied from 0.25 to 0.29 ppm during pumping (Table A-2).

Dissolved concentrations of barium, ranging from 0.048 to 0.053 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 0.0007 to 0.0008 ppm (Table A-2) and are less than the maximum background of 0.0025 mg/L for this element (LANL 2007, 095817). Uranium(VI) for the most

part is the stable oxidation state of this element 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. During sampling, dissolved concentrations of manganese range from 0.006 to 0.015 mg/L and dissolved iron concentrations are less than analytical detection (0.010 mg/L) (Table A-2). Dissolved concentrations of manganese do not exceed the maximum background value of 0.124 mg/L (LANL 2007, 095817).

2.9.4 Updated Well Screen Analysis, Postrehabilitation

Analytical results obtained from sampling of well R-14 screen 1 were evaluated for representativeness and reliability, following geochemical protocols established by the Laboratory (2007, 096330) and approved by NMED (2007, 098182). Groundwater samples collected and analyzed from well R-14 screen 1 during the February 2008 pumping test had an average score of 97%, based on 33 and 34 criteria (LANL 2008, 101462). Dissolved iron (17 samples) above-background concentrations caused the samples to fail one redox criterion of the well screen analysis for the February 2008 pumping test samples (LANL 2008, 101462). Corrosion of a mild-steel discharge pipe contributed to concentrations above background of dissolved and total iron.

Results of the well screen analysis using analytical results obtained during the May 2008 postrehabilitation sampling are provided in Table B-2. Four primary groundwater samples were selected for the analysis: nonfiltered samples included GW14-08-12941 and GW14-08-12942; filtered samples included GW14-08-12948 and GW14-08-12949. The first set of samples was collected at 9:45 a.m., and the second set was collected at the conclusion of pumping at 10:15 a.m. on May 14, 2008. Groundwater samples analyzed from well R-14 screen 1 during this sampling event had scores of 100%, based on 34 criteria (Table B-2), which is an additional improvement over the previous average scores before and during well rehabilitation.

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

3.0 SUMMARY AND CONCLUSIONS

There were no deviations from the NMED-approved work plan, although a delay in installation of the permanent submersible pump resulted from the Threatened and Endangered Species Act exclusion from the area around R-14. R-14 was outfitted with a single environmentally retrofitted 4-in. submersible pump with a 1-in. stainless-pump column. A dedicated, 1-in.-diameter PVC transducer tube was installed with and banded to the pump column.

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

The specific capacity test performed on February 28, 2008, yielded a specific capacity of 1.60 gal./min/ft after redevelopment at screen 1. This represented a 47% increase over the specific capacity of 1.09 gal./min/ft measured before well development and confirmed that the well redevelopment procedures were 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 it 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 February 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 in February 2008 probably resulted from the presence of particulate HFO, smaller than 0.45 µm (filter size), within the regional aquifer. Secondary effects of elevated iron may have been produced from discharge pipe corrosion during sampling.
- Groundwater samples analyzed from well R-14 screen 1 during the February 2008 test have an average well screen analysis score of 97%; each test had a score of 97%. The average well screen score for the 2004–2007 characterization sampling was 90% when the nonpurging Westbay sampling system was in use. Concentrations of dissolved iron in 17 samples that exceeded Laboratory background levels caused samples to fail one criterion of the 2008 well screen analysis.
- Samples in which Westbay equipment was used generally had lower concentrations of total carbonate alkalinity, TOC, and dissolved chloride, iron, manganese, nitrate(N), sulfate, strontium, uranium, and zinc compared with concentrations collected during the February 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.

The dedicated pump installed at R-14 screen 1 in May 2008 provides reliable and consistent groundwater samples that are most likely representative of oxidizing, predrilling conditions (LANL 2008, 101462). Residual drilling fluid effects are not present in the groundwater samples collected in 2008 from R-14 screen 1, based on reliable and representative concentrations of major ions, trace metals, and TOC (Table A-2). Concentrations of these analytes are within background values established for regional aquifer groundwater. Higher total and dissolved concentrations of iron measured during the February 2008 pumping test resulted from a corroded mild-steel discharge pipe, but when the dedicated stainless-steel sampling system was used in May, the iron concentrations were in the background range.

Groundwater samples analyzed from screen 1 during the February 2008 pumping test had an average well screen analysis score of 97%. Groundwater samples analyzed from well R-14 screen 1 during May 2008 postrehabilitation sampling had an average well screen analysis score of 100%.

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; EPA, 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.

Langmuir, D., 1997. *Aqueous Environmental Geochemistry*, Prentice Hall, Inc., Upper Saddle River, New Jersey. (Langmuir 1997, 056037)

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)

LANL (Los Alamos National Laboratory), May 2007. "Well Screen Analysis Report, Revision 2," Los Alamos National Laboratory document LA-UR-07-2852, Los Alamos, New Mexico. (LANL 2007, 096330)

LANL (Los Alamos National Laboratory), May 2007. "2007 Interim Facility-Wide Groundwater Monitoring Plan," Los Alamos National Laboratory document LA-UR-07-3271, Los Alamos, New Mexico. (LANL 2007, 096665)

LANL (Los Alamos National Laboratory), July 2007. "Work Plan for R-Well Rehabilitation and Replacement, Revision 2," Los Alamos National Laboratory document LA-UR-07-5087, Los Alamos, New Mexico. (LANL 2007, 098119)

LANL (Los Alamos National Laboratory), March 2008. "Well R-14 Rehabilitation and Conversion Summary Report," Los Alamos National Laboratory document LA-UR-08-1539, Los Alamos, New Mexico. (LANL 2008, 101462)

NMED (New Mexico Environment Department), August 20, 2007. "Approval of the Workplan for R-Well Rehabilitation and Replacement, Revision 2," New Mexico Environment Department letter to D. Gregory (DOE LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED HWB), Santa Fe, New Mexico. (NMED 2007, 098182)

NMED (New Mexico Environment Department), April 22, 2008. "Approval with Direction, Well R-14 Rehabilitation and Conversion Summary Report," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2008, 101309)

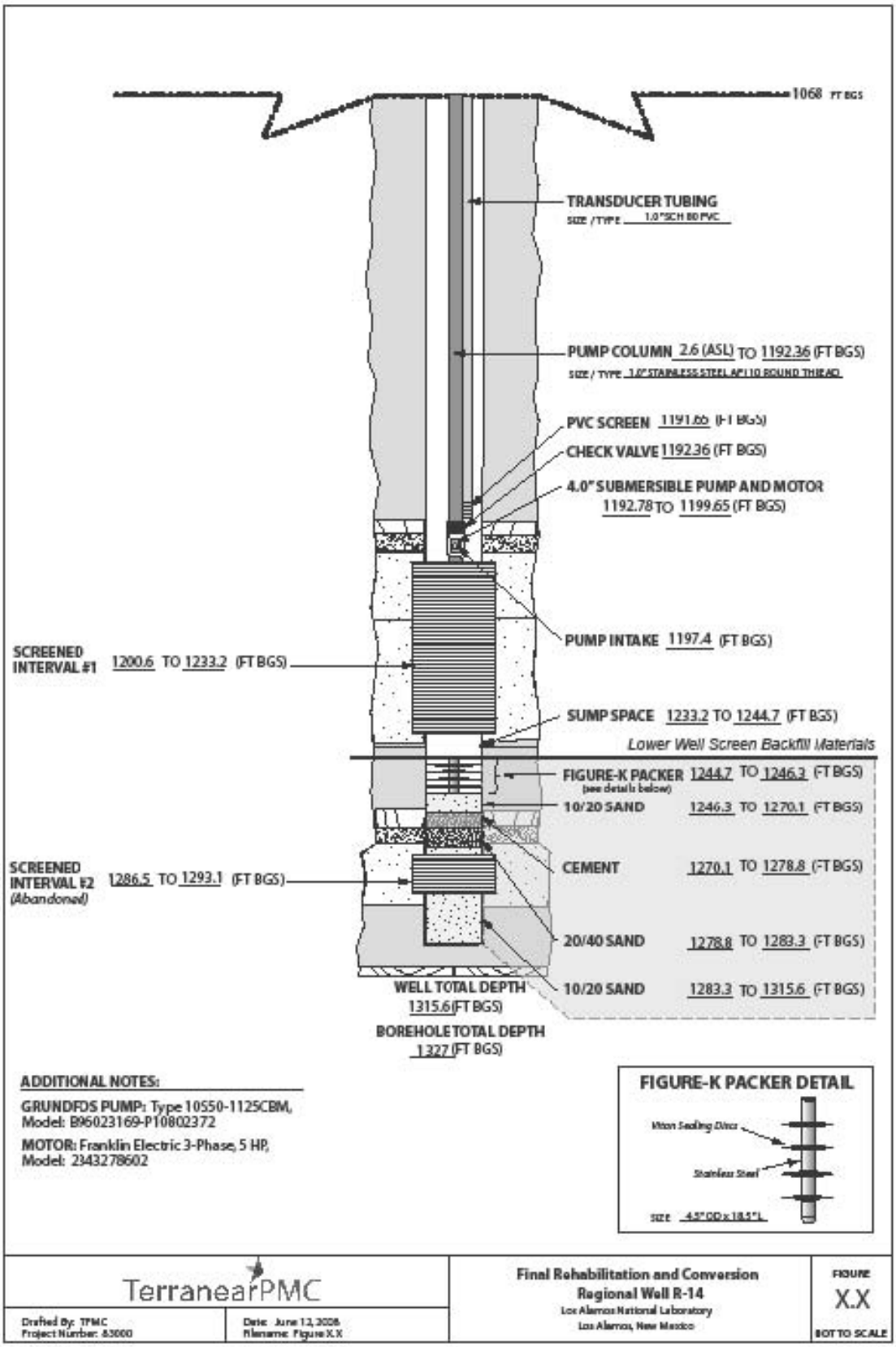


Figure 1.0-1 Well R-14 final rehabilitation and conversion configuration

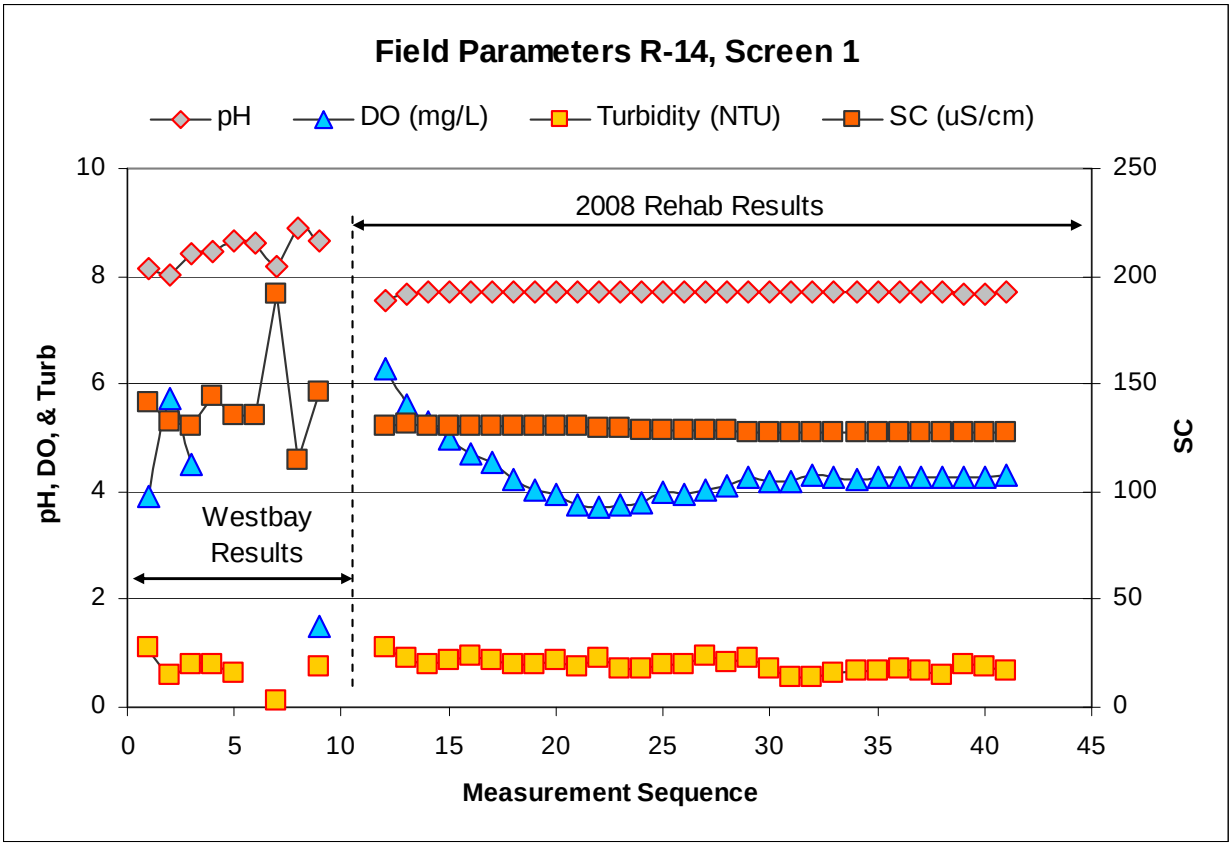


Figure 2.8-1 **Field parameters measured at R-14 screen 1 from 2004 to 2007 using the Westbay sampling system and measured during the February 29, 2008, pumping test**

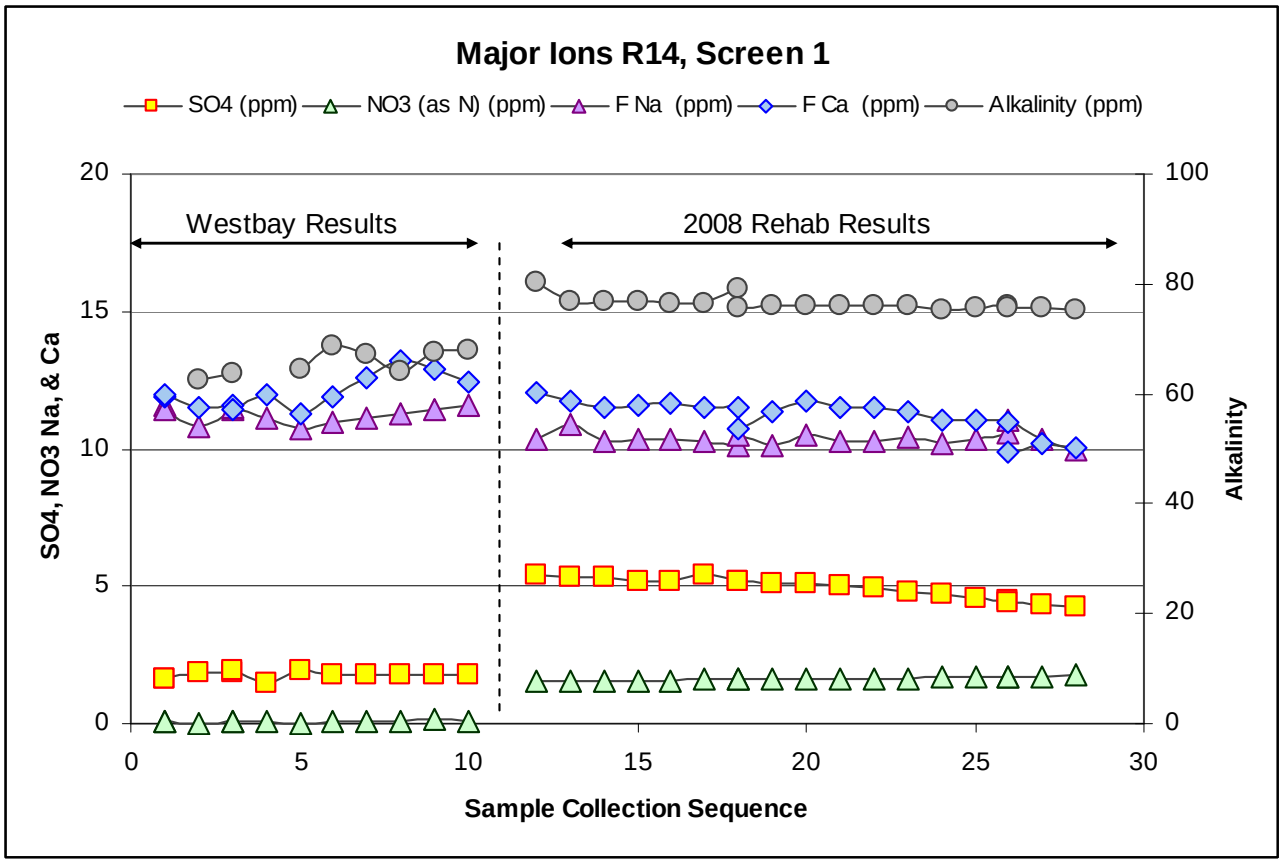


Figure 2.8-2 **Sample sequence versus dissolved concentrations of total carbonate alkalinity ($mgCaCO_3/L$), sodium (Na), calcium (Ca), sulfate (SO_4), and nitrate(N) (NO_3–N) at R-14 screen 1 from 2004 to 2007 using the Westbay sampling system and from the February 29, 2008, pumping test**

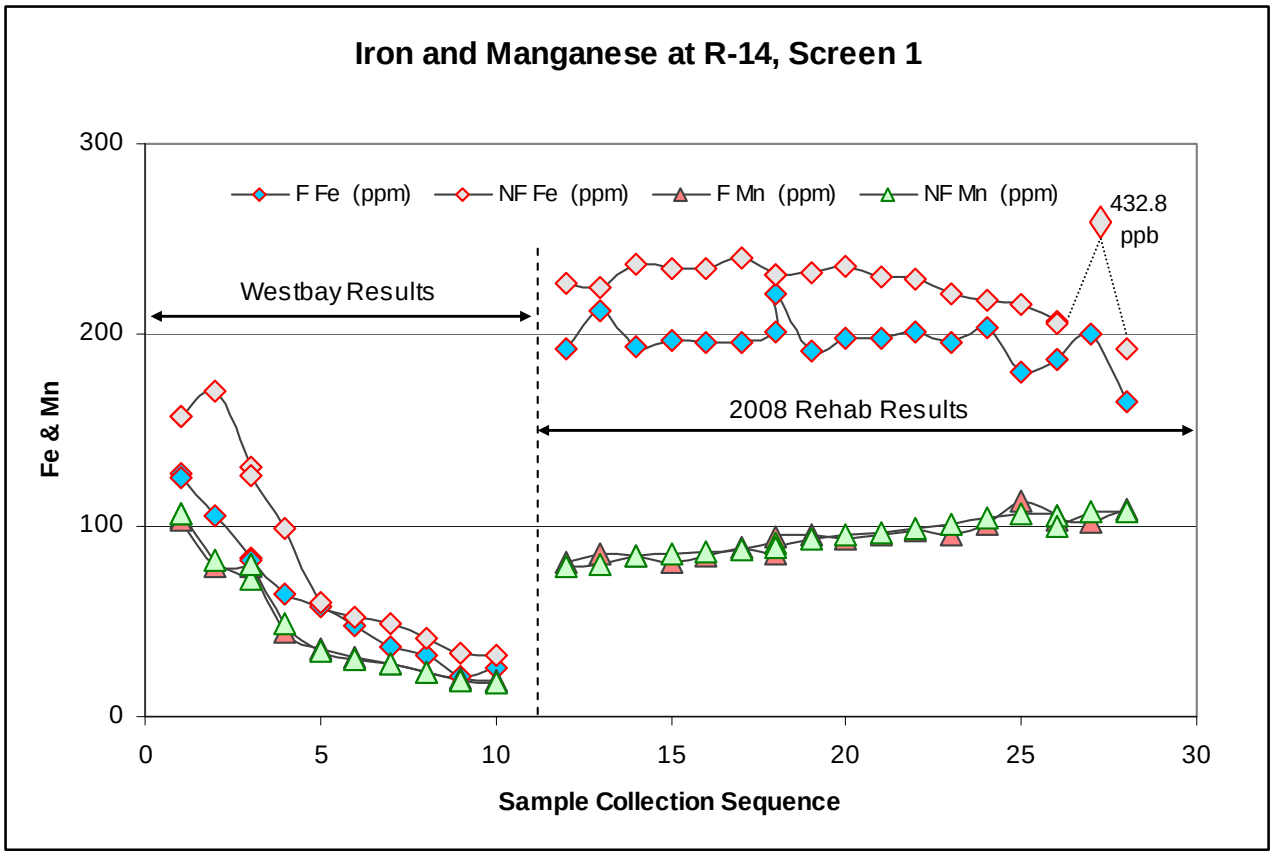


Figure 2.8-3 **Sample sequence versus dissolved and total concentrations of iron (Fe) and manganese (Mn) during characterization sampling from 2004 to 2007 using the Westbay sampling system and during the February 29, 2008, pumping test**

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, February 2008

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

Table 2.8-1
Sample Collection Objectives and Measured Constituents for the R-14 Well Rehabilitation and Conversion Project, February 2008

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; assess flow rate and drawdown during sustained pumping of each zone	None	Measure flow rate and drawdown	None

Table 2.8-1 (continued)

Process/Step	Purpose	Sample Collection	Field Parameters	Frequency/Number of Samples
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
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" (LANL 2007, 096665) requirements and schedule	pH, ORP, T, SC, DO, turbidity	Refer to the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665) 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 EES-6 laboratory. Full analytical suite: Refer to the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665) 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 2.8-2
Field Parameters Measured at R-14
Screen 1 from February 2004 to February 2008

Sample Collection System	Sample Collection Date	Sample Collection Time	pH (SU)[a]	Temp (° C)	SC (µS/cm)	DO (mg/L)	Turbidity (NTU)	ORP[b] (mV)	Cumulative Volume Purged[c] (gal.)	Pumping Rate (gal./min)
Westbay Sampling System	2/9/2004	14:00	8.13	18.1	141.4	3.9	1.1	411.5	≈5	<0.1
	5/11/2005	8:43	8.03	16.5	132.0	5.7	0.6	na[d]	≈5	<0.1
	1/24/2006	9:39	8.40	18.9	130.1	4.5	0.8	na	≈5	<0.1
	6/26/2006	11:17	8.44	21.7	144.0	na	0.8	na	≈5	<0.1
	10/23/2006	10:30	8.67	20.5	135.0	na	0.6	na	≈5	<0.1
	10/23/2006	10:23	8.61	na	135.0	na	na	na	≈5	<0.1
	3/1/2007	14:33	8.18	15.3	191.3	na	0.1	na	≈5	<0.1
	6/5/2007	8:58	8.9	na	114.8	na	na	na	≈5	<0.1
	8/14/2007	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	1[2a]	1149.0	10.9
	2/29/2008	10:10	7.71	23.6	130.4	4.2	0.8	8[b]	1260.9	10.9
	2/29/2008	10:20	7.71	23.6	130.4	4.1	0.8	5[b]	1372.1	10.9
	2/29/2008	10:30	7.71	23.4	130.2	3.9	0.9	3[b]	1482.4	10.9
	2/29/2008	10:40	7.71	23.6	130.1	3.8	0.8	–11[b]	1585.6	10.8
	2/29/2008	10:50	7.71	23.6	129.9	3.7	0.9	–19[b]	1686.4	10.7
	2/29/2008	11:20	7.72	24.0	129.9	3.8	0.7	24[b]	1997.6	10.7
	2/29/2008	11:50	7.70	24.3	128.6	3.8	0.7	–13[b]	2306.9	10.7
	2/29/2008	12:20	7.70	24.1	128.6	4.0	0.8	–11[b]	2632.2	10.9
	2/29/2008	12:50	7.70	23.7	128.5	4.0	0.8	–27[b]	3008.4	10.9

Table 2.8-2 (continued)

Sample Collection System	Sample Collection Date	Sample Collection Time	pH (SU)[a]	Temp (° C)	SC (µS/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[b]	3341.5	10.9
	2/29/2008	13:50	7.69	23.7	128.5	4.1	0.8	–25[b]	3675.8	11.0
	2/29/2008	14:20	7.69	23.7	127.5	4.3	0.9	–19[b]	4015.0	11.0
	2/29/2008	14:50	7.69	23.7	127.5	4.2	0.7	–18[b]	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 2/29/2008 because of faulty probe.

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

[d] na = Not available.

Table 2.9-1
Data Quality Objectives: Process and Sampling for the R-14 Well Rehabilitation Performance Measures May 2008

Process/Step	Purpose	Sample Collection	Field Parameters	Frequency/Number of Samples
Pump R-14 screen 1 (postrehabilitation)	To evaluate screen performance with new sampling system in place	Sequential sampling through time (t = 0, 30, 60, 120, 180, 240, 300 min) and filtration through different membranes (0.45, 0.22, 0.02 µm) throughout pumping	pH, ORP, T, SC, DO, turbidity, and ferrous iron	Every 30 min for the first hour then every hour until pumping is terminated

Note: Performance suite: Sulfide (not filtered), total organic carbon (not filtered), metals and cations (filtered and nonfiltered), alkalinity (nonfiltered), and anions.

Table 2.9-2
Field Parameters Measured at R-14 Screen 1 on May 14, 2008

Time (yr-mo-d-h)	pH (SU)[a]	Temperature (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)
0805140900	7.79	19.7	124	—[b]	50.9	+370
0805140905	8.12	22.9	124	3.3	13.4	+265
0805140910	8.08	23.4	124	2.6	5.64	+217
0805140915	7.99	23.8	123	2.4	4.24	+164
0805140920	7.93	23.9	122	2.4	2.69	+136
0805140925	7.90	24.0	122	2.4	2.24	+134
0805140930	7.87	23.9	121	2.4	2.04	+111
0805140935	7.84	24.0	121	2.5	1.18	+103
0805140940	7.83	24.0	121	2.5	1.37	+102
0805140945	7.81	24.0	121	2.8	1.13	+101
0805140955	7.78	24.1	120	2.6	1.97	+103
0805141005	7.75	24.2	120	2.7	1.55	+107
0805141015	7.75	24.1	120	2.7	1.62	+109

[a] SU = Standard unit.

[b] — = Not measured.

Appendix A

Analytical Data Results

Table A-1
Laboratory Analytical Results for R-14 Screen 1
in February 2008

Sample ID	Date Collected	Time Collected	Date Received	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)
GW14-08-10725	02/29/08	9:35	2/29/2008	08-730	NF	CS	NA[a]	0.001	NA	0.022	0.001	0.0010	0.0000	0.013	0.000	0.056	0.001
GW14-08-10726	02/29/08	9:40	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.020	0.002	0.0010	0.0000	0.013	0.000	0.056	0.002
GW14-08-10729	02/29/08	9:45	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.016	0.001	0.0010	0.0001	0.028	0.000	0.051	0.002
GW14-08-10730	02/29/08	9:50	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.017	0.003	0.0011	0.0000	0.023	0.000	0.055	0.001
GW14-08-10731	02/29/08	9:55	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.020	0.002	0.0011	0.0001	0.020	0.000	0.059	0.001
GW14-08-10732	02/29/08	10:00	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.015	0.001	0.0010	0.0000	0.019	0.000	0.055	0.000
GW14-08-10733	02/29/08	10:10	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.016	0.001	0.0010	0.0000	0.016	0.000	0.056	0.002
GW14-08-10734	02/29/08	10:20	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.027	0.003	0.0011	0.0001	0.016	0.000	0.056	0.000
GW14-08-10735	02/29/08	10:30	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.021	0.001	0.0010	0.0000	0.015	0.000	0.054	0.000
GW14-08-10736	02/29/08	10:40	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.015	0.000	0.0011	0.0000	0.014	0.000	0.058	0.002
GW14-08-10737	02/29/08	10:50	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.015	0.001	0.0011	0.0001	0.054	0.001	0.053	0.001
GW14-08-10738	02/29/08	11:20	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.013	0.001	0.0010	0.0000	0.030	0.001	0.058	0.001
GW14-08-10739	02/29/08	11:50	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.014	0.001	0.0010	0.0000	0.022	0.001	0.056	0.000
GW14-08-10740	02/29/08	12:20	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.016	0.001	0.0009	0.0000	0.018	0.000	0.051	0.000
GW14-08-10741	02/29/08	12:50	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.011	0.002	0.0011	0.0002	0.016	0.000	0.058	0.007
GW14-08-10742	02/29/08	13:50	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.014	0.002	0.0010	0.0000	0.015	0.001	0.052	0.004
GW14-08-10743	02/29/08	14:50	2/29/2008	08-730	NF	CS	NA	0.001	NA	0.013	0.000	0.0010	0.0000	0.013	0.001	0.054	0.004
GW14-08-10777	02/28/08	n/a[c]	2/28/2008	08-712	NF	EQB	NA	0.001	NA	0.023	0.001	0.0002	NA	0.017	0.001	0.003	0.000
GW14-08-10778	02/28/08	n/a	2/28/2008	08-712	NF	EQB	NA	0.001	NA	0.103	0.005	0.0005	0.0000	0.011	0.000	0.017	0.000
GW14-08-10779	02/29/08	10:20	2/29/2008	08-730	NF	FB	NA	0.001	NA	0.002	0.000	0.0002	NA	0.017	0.000	0.001	NA
GW14-08-10780	02/29/08	10:10	2/29/2008	08-730	NF	FD#1	NA	0.001	NA	0.019	0.001	0.0010	0.0000	0.024	0.000	0.054	0.003
GW14-08-10781	02/29/08	12:50	2/29/2008	08-730	NF	FD#2	NA	0.001	NA	0.014	0.000	0.0010	0.0000	0.019	0.000	0.054	0.001
GW14-08-10727	02/29/08	9:35	2/29/2008	08-731	F	CS	NA	0.001	NA	0.009	0.000	0.0010	0.0000	0.012	0.000	0.055	0.000
GW14-08-10728	02/29/08	9:40	2/29/2008	08-731	F	CS	NA	0.001	NA	0.009	0.000	0.0010	0.0000	0.039	0.000	0.054	0.001
GW14-08-10785	02/29/08	9:45	2/29/2008	08-731	F	CS	NA	0.001	NA	0.011	0.001	0.0010	0.0000	0.017	0.000	0.055	0.001
GW14-08-10786	02/29/08	9:50	2/29/2008	08-731	F	CS	NA	0.001	NA	0.010	0.001	0.0009	0.0000	0.016	0.000	0.054	0.001
GW14-08-10787	02/29/08	9:55	2/29/2008	08-731	F	CS	NA	0.001	NA	0.007	0.000	0.0010	0.0000	0.015	0.000	0.055	0.001
GW14-08-10788	02/29/08	10:00	2/29/2008	08-731	F	CS	NA	0.001	NA	0.012	0.000	0.0010	0.0001	0.013	0.000	0.055	0.002
GW14-08-10789	02/29/08	10:10	2/29/2008	08-731	F	CS	NA	0.001	NA	0.010	0.000	0.0010	0.0000	0.013	0.000	0.052	0.003
GW14-08-10790	02/29/08	10:20	2/29/2008	08-731	F	CS	NA	0.001	NA	0.008	0.000	0.0010	0.0000	0.012	0.000	0.056	0.001
GW14-08-10791	02/29/08	10:30	2/29/2008	08-731	F	CS	NA	0.001	NA	0.007	0.000	0.0010	0.0000	0.050	0.001	0.055	0.002
GW14-08-10792	02/29/08	10:40	2/29/2008	08-731	F	CS	NA	0.001	NA	0.007	0.000	0.0010	0.0000	0.028	0.000	0.056	0.000
GW14-08-10793	02/29/08	10:50	2/29/2008	08-731	F	CS	NA	0.001	NA	0.008	0.000	0.0010	0.0000	0.020	0.000	0.054	0.001
GW14-08-10794	02/29/08	11:20	2/29/2008	08-731	F	CS	NA	0.001	NA	0.006	0.000	0.0009	0.0001	0.016	0.000	0.051	0.003
GW14-08-10795	02/29/08	11:50	2/29/2008	08-731	F	CS	NA	0.001	NA	0.008	0.000	0.0010	0.0001	0.015	0.000	0.056	0.003
GW14-08-10796	02/29/08	12:20	2/29/2008	08-731	F	CS	NA	0.001	NA	0.009	0.000	0.0010	0.0000	0.014	0.000	0.056	0.002
GW14-08-10797	02/29/08	12:50	2/29/2008	08-731	F	CS	NA	0.001	NA	0.012	0.000	0.0010	0.0000	0.014	0.000	0.056	0.001
GW14-08-10798	02/29/08	13:50	2/29/2008	08-731	F	CS	NA	0.001	NA	0.008	0.000	0.0010	0.0000	0.013	0.000	0.055	0.000
GW14-08-10799	02/29/08	14:50	2/29/2008	08-731	F	CS	NA	0.001	NA	0.008	0.000	0.0010	0.0001	0.013	0.000	0.055	0.000
GW14-08-10833	02/28/08	n/a	2/28/2008	08-711	F	EQB	NA	0.001	NA	0.004	0.000	0.0002	NA	0.005	0.000	0.001	NA
GW14-08-10834	02/28/08	n/a	2/28/2008	08-711	F	EQB	NA	0.001	NA	0.011	0.000	0.0002	NA	0.005	0.000	0.001	NA
GW14-08-10836	02/29/08	10:10	2/29/2008	08-731	F	FD#1	NA	0.001	NA	0.010	0.001	0.0010	0.0000	0.012	0.000	0.057	0.003
GW14-08-10837	02/29/08	12:50	2/29/2008	08-731	F	FD#2	NA	0.001	NA	0.006	0.000	0.0010	0.0000	0.051	0.001	0.055	0.001

[a]NA = Not analyzed.
[b]U = Undetected.
[c]n/a = Not applicable.

Table A-1
Laboratory Analytical Results for R-14 Screen 1
in February 2008

Sample ID	Date Collected	Time Collected	Date Received	Be rslt (ppm)	stdev (Be)	Br(-) ppm	Br(-) (U)	TOC rslt (ppm)	TOC (U)	Ca rslt (ppm)	stdev (Ca)	Cd rslt (ppm)	stdev (Cd)	Cl(-) ppm	Cl(-) (U)	ClO4(-) ppm	ClO4(-) (U)
GW14-08-10725	02/29/08	9:35	2/29/2008	0.001	NA	NA	NA	1.13	NA	12.0	0.0	0.001	NA	NA	NA	NA	NA
GW14-08-10726	02/29/08	9:40	2/29/2008	0.001	NA	NA	NA	0.99	NA	12.0	0.0	0.001	NA	NA	NA	NA	NA
GW14-08-10729	02/29/08	9:45	2/29/2008	0.001	NA	NA	NA	1.03	NA	12.0	0.0	0.001	NA	NA	NA	NA	NA
GW14-08-10730	02/29/08	9:50	2/29/2008	0.001	NA	NA	NA	0.99	NA	11.9	0.1	0.001	NA	NA	NA	NA	NA
GW14-08-10731	02/29/08	9:55	2/29/2008	0.001	NA	NA	NA	0.93	NA	11.9	0.1	0.001	NA	NA	NA	NA	NA
GW14-08-10732	02/29/08	10:00	2/29/2008	0.001	NA	NA	NA	0.89	NA	11.8	0.1	0.001	NA	NA	NA	NA	NA
GW14-08-10733	02/29/08	10:10	2/29/2008	0.001	NA	NA	NA	0.91	NA	11.5	0.1	0.001	NA	NA	NA	NA	NA
GW14-08-10734	02/29/08	10:20	2/29/2008	0.001	NA	NA	NA	0.93	NA	11.5	0.0	0.001	NA	NA	NA	NA	NA
GW14-08-10735	02/29/08	10:30	2/29/2008	0.001	NA	NA	NA	0.85	NA	11.4	0.1	0.001	NA	NA	NA	NA	NA
GW14-08-10736	02/29/08	10:40	2/29/2008	0.001	NA	NA	NA	0.82	NA	11.1	0.1	0.001	NA	NA	NA	NA	NA
GW14-08-10737	02/29/08	10:50	2/29/2008	0.001	NA	NA	NA	0.83	NA	11.2	0.1	0.001	NA	NA	NA	NA	NA
GW14-08-10738	02/29/08	11:20	2/29/2008	0.001	NA	NA	NA	NA	NA	11.0	0.1	0.001	NA	NA	NA	NA	NA
GW14-08-10739	02/29/08	11:50	2/29/2008	0.001	NA	NA	NA	NA	NA	10.9	0.0	0.001	NA	NA	NA	NA	NA
GW14-08-10740	02/29/08	12:20	2/29/2008	0.001	NA	NA	NA	NA	NA	10.7	0.1	0.001	NA	NA	NA	NA	NA
GW14-08-10741	02/29/08	12:50	2/29/2008	0.001	NA	NA	NA	NA	NA	10.5	0.0	0.001	NA	NA	NA	NA	NA
GW14-08-10742	02/29/08	13:50	2/29/2008	0.001	NA	NA	NA	NA	NA	10.5	0.0	0.001	NA	NA	NA	NA	NA
GW14-08-10743	02/29/08	14:50	2/29/2008	0.001	NA	NA	NA	NA	NA	10.3	0.1	0.001	NA	NA	NA	NA	NA
GW14-08-10777	02/28/08	n/a[c]	2/28/2008	0.001	NA	NA	NA	0.42	NA	0.47	0.01	0.001	NA	NA	NA	NA	NA
GW14-08-10778	02/28/08	n/a	2/28/2008	0.001	NA	NA	NA	0.57	NA	1.00	0.01	0.001	NA	NA	NA	NA	NA
GW14-08-10779	02/29/08	10:20	2/29/2008	0.001	NA	NA	NA	NA	NA	0.01	NA	0.001	NA	NA	NA	NA	NA
GW14-08-10780	02/29/08	10:10	2/29/2008	0.001	NA	NA	NA	NA	NA	11.2	0.0	0.001	NA	NA	NA	NA	NA
GW14-08-10781	02/29/08	12:50	2/29/2008	0.001	NA	NA	NA	NA	NA	10.8	0.0	0.001	NA	NA	NA	NA	NA
GW14-08-10727	02/29/08	9:35	2/29/2008	0.001	NA	0.01	NA	NA	NA	12.1	0.0	0.001	NA	3.04	NA	NA	NA
GW14-08-10728	02/29/08	9:40	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.7	0.1	0.001	NA	3.07	NA	NA	NA
GW14-08-10785	02/29/08	9:45	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.5	0.0	0.001	NA	3.09	NA	NA	NA
GW14-08-10786	02/29/08	9:50	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.6	0.0	0.001	NA	2.96	NA	NA	NA
GW14-08-10787	02/29/08	9:55	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.6	0.0	0.001	NA	3.00	NA	NA	NA
GW14-08-10788	02/29/08	10:00	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.5	0.1	0.001	NA	3.23	NA	NA	NA
GW14-08-10789	02/29/08	10:10	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.5	0.1	0.001	NA	3.03	NA	NA	NA
GW14-08-10790	02/29/08	10:20	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.3	0.0	0.001	NA	3.01	NA	NA	NA
GW14-08-10791	02/29/08	10:30	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.7	0.0	0.001	NA	2.99	NA	NA	NA
GW14-08-10792	02/29/08	10:40	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.5	0.0	0.001	NA	3.01	NA	NA	NA
GW14-08-10793	02/29/08	10:50	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.5	0.0	0.001	NA	2.94	NA	NA	NA
GW14-08-10794	02/29/08	11:20	2/29/2008	0.001	NA	0.01	U	NA	NA	11.3	0.0	0.001	NA	2.95	NA	NA	NA
GW14-08-10795	02/29/08	11:50	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.0	0.0	0.001	NA	3.00	NA	NA	NA
GW14-08-10796	02/29/08	12:20	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.0	0.1	0.001	NA	2.92	NA	NA	NA
GW14-08-10797	02/29/08	12:50	2/29/2008	0.001	NA	0.01	NA	NA	NA	11.0	0.0	0.001	NA	2.93	NA	NA	NA
GW14-08-10798	02/29/08	13:50	2/29/2008	0.001	NA	0.01	NA	NA	NA	10.2	0.1	0.001	NA	2.94	NA	NA	NA
GW14-08-10799	02/29/08	14:50	2/29/2008	0.001	NA	0.01	NA	NA	NA	10.0	0.0	0.001	NA	3.01	NA	NA	NA
GW14-08-10833	02/28/08	n/a	2/28/2008	0.001	NA	0.01	U	NA	NA	0.42	0.01	0.001	NA	0.24	NA	NA	NA
GW14-08-10834	02/28/08	n/a	2/28/2008	0.001	NA	0.01	U	NA	NA	0.26	0.00	0.001	NA	0.07	NA	NA	NA
GW14-08-10836	02/29/08	10:10	2/29/2008	0.001	NA	0.01	NA	NA	NA	10.8	0.0	0.001	NA	3.03	NA	NA	NA
GW14-08-10837	02/29/08	12:50	2/29/2008	0.001	NA	0.01	NA	NA	NA	9.88	0.00	0.001	NA	2.92	NA	NA	NA

[a]NA = Not analyzed.
[b]U = Undetected.
[c]n/a = Not applicable.

Table A-1
Laboratory Analytical Results for R-14 Screen 1
in February 2008

Sample ID	Date Collected	Time Collected	Date Received	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)
GW14-08-10725	02/29/08	9:35	2/29/2008	0.001	NA	0.8	U[b]	0.002	0.000	0.001	NA	0.002	0.000	NA	NA	0.23	0.00
GW14-08-10726	02/29/08	9:40	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.002	0.000	NA	NA	0.22	0.00
GW14-08-10729	02/29/08	9:45	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.008	0.000	NA	NA	0.24	0.01
GW14-08-10730	02/29/08	9:50	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.002	0.000	NA	NA	0.23	0.00
GW14-08-10731	02/29/08	9:55	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.003	0.000	NA	NA	0.24	0.00
GW14-08-10732	02/29/08	10:00	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.002	0.000	NA	NA	0.24	0.00
GW14-08-10733	02/29/08	10:10	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.001	NA	NA	NA	0.23	0.00
GW14-08-10734	02/29/08	10:20	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.002	0.000	NA	NA	0.23	0.00
GW14-08-10735	02/29/08	10:30	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.001	0.000	NA	NA	0.24	0.00
GW14-08-10736	02/29/08	10:40	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.002	0.000	NA	NA	0.23	0.00
GW14-08-10737	02/29/08	10:50	2/29/2008	0.001	NA	0.8	U	0.003	0.000	0.001	NA	0.002	0.000	NA	NA	0.23	0.00
GW14-08-10738	02/29/08	11:20	2/29/2008	0.001	NA	0.8	U	0.003	0.000	0.001	NA	0.001	NA	NA	NA	0.22	0.00
GW14-08-10739	02/29/08	11:50	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.001	NA	NA	NA	0.22	0.00
GW14-08-10740	02/29/08	12:20	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.001	0.000	NA	NA	0.22	0.00
GW14-08-10741	02/29/08	12:50	2/29/2008	0.001	NA	0.8	U	0.005	0.001	0.001	NA	0.001	NA	NA	NA	0.21	0.00
GW14-08-10742	02/29/08	13:50	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.002	0.000	NA	NA	0.43	0.00
GW14-08-10743	02/29/08	14:50	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.002	0.000	NA	NA	0.19	0.00
GW14-08-10777	02/28/08	n/a[c]	2/28/2008	0.001	NA	0.8	U	0.001	0.000	0.001	NA	0.002	0.000	NA	NA	0.2	0.0
GW14-08-10778	02/28/08	n/a	2/28/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.003	0.000	NA	NA	11.4	0.0
GW14-08-10779	02/29/08	10:20	2/29/2008	0.001	NA	0.8	U	0.001	NA	0.001	NA	0.001	NA	NA	NA	0.01	NA
GW14-08-10780	02/29/08	10:10	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.004	0.000	NA	NA	0.23	0.00
GW14-08-10781	02/29/08	12:50	2/29/2008	0.001	NA	0.8	U	0.002	0.000	0.001	NA	0.011	0.000	NA	NA	0.21	0.00
GW14-08-10727	02/29/08	9:35	2/29/2008	0.002	0.000	0.8	U	0.002	0.000	0.001	NA	0.003	0.000	0.32	NA	0.19	0.00
GW14-08-10728	02/29/08	9:40	2/29/2008	0.002	0.000	0.8	U	0.002	0.000	0.001	NA	0.001	0.000	0.31	NA	0.21	0.00
GW14-08-10785	02/29/08	9:45	2/29/2008	0.003	0.000	0.8	U	0.002	0.000	0.001	NA	0.002	0.000	0.38	NA	0.19	0.00
GW14-08-10786	02/29/08	9:50	2/29/2008	0.002	0.000	0.8	U	0.002	0.000	0.001	NA	0.001	0.000	0.31	NA	0.20	0.00
GW14-08-10787	02/29/08	9:55	2/29/2008	0.002	0.000	0.8	U	0.002	0.000	0.001	NA	0.001	NA	0.32	NA	0.20	0.00
GW14-08-10788	02/29/08	10:00	2/29/2008	0.002	0.000	0.8	U	0.002	0.000	0.001	NA	0.003	0.000	0.39	NA	0.20	0.00
GW14-08-10789	02/29/08	10:10	2/29/2008	0.001	0.000	0.8	U	0.002	0.000	0.001	NA	0.002	0.000	0.37	NA	0.20	0.00
GW14-08-10790	02/29/08	10:20	2/29/2008	0.004	0.000	0.8	U	0.002	0.000	0.001	NA	0.001	0.000	0.37	NA	0.19	0.00
GW14-08-10791	02/29/08	10:30	2/29/2008	0.002	0.000	0.8	U	0.002	0.000	0.001	NA	0.001	NA	0.32	NA	0.20	0.00
GW14-08-10792	02/29/08	10:40	2/29/2008	0.002	0.000	0.8	U	0.002	0.000	0.001	NA	0.001	NA	0.37	NA	0.20	0.00
GW14-08-10793	02/29/08	10:50	2/29/2008	0.003	0.000	0.8	U	0.002	0.000	0.001	NA	0.008	0.000	0.37	NA	0.20	0.00
GW14-08-10794	02/29/08	11:20	2/29/2008	0.003	0.000	0.8	U	0.002	0.000	0.001	NA	0.001	0.000	0.34	NA	0.20	0.00
GW14-08-10795	02/29/08	11:50	2/29/2008	0.003	0.000	0.8	U	0.002	0.000	0.001	NA	0.011	0.000	0.38	NA	0.20	0.00
GW14-08-10796	02/29/08	12:20	2/29/2008	0.006	0.000	0.8	U	0.002	0.000	0.001	NA	0.002	0.000	0.29	NA	0.18	0.00
GW14-08-10797	02/29/08	12:50	2/29/2008	0.001	0.000	0.8	U	0.002	0.000	0.001	NA	0.001	0.000	0.32	NA	0.19	0.00
GW14-08-10798	02/29/08	13:50	2/29/2008	0.002	0.000	0.8	U	0.003	0.000	0.001	NA	0.001	0.000	0.29	NA	0.20	0.00
GW14-08-10799	02/29/08	14:50	2/29/2008	0.002	0.000	0.8	U	0.002	0.000	0.001	NA	0.001	NA	0.29	NA	0.17	0.00
GW14-08-10833	02/28/08	n/a	2/28/2008	0.001	0.000	0.8	U	0.001	NA	0.001	NA	0.001	NA	0.01	NA	0.01	NA
GW14-08-10834	02/28/08	n/a	2/28/2008	0.001	NA	0.8	U	0.001	NA	0.001	NA	0.002	0.000	0.01	U	0.05	0.00
GW14-08-10836	02/29/08	10:10	2/29/2008	0.004	0.000	0.8	U	0.0020	0.0001	0.001	NA	0.002	0.000	0.32	NA	0.22	0.00
GW14-08-10837	02/29/08	12:50	2/29/2008	0.003	0.000	0.8	U	0.0020	0.0001	0.001	NA	0.001	NA	0.30	NA	0.19	0.00

[a]NA = Not analyzed.
[b]U = Undetected.
[c]n/a = Not applicable.

Table A-1
Laboratory Analytical Results for R-14 Screen 1
in February 2008

Sample ID	Date Collected	Time Collected	Date Received	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)
GW14-08-10725	02/29/08	9:35	2/29/2008	80.3	NA	0.00005	NA	2.13	0.03	0.020	0.000	2.69	0.02	0.078	0.004	0.001	NA
GW14-08-10726	02/29/08	9:40	2/29/2008	76.7	NA	0.00005	NA	2.13	0.02	0.021	0.000	2.73	0.03	0.079	0.003	0.001	NA
GW14-08-10729	02/29/08	9:45	2/29/2008	76.8	NA	0.00005	NA	2.15	0.01	0.020	0.001	2.83	0.01	0.084	0.000	0.001	NA
GW14-08-10730	02/29/08	9:50	2/29/2008	76.8	NA	0.00005	NA	2.11	0.01	0.021	0.002	2.82	0.01	0.085	0.001	0.001	NA
GW14-08-10731	02/29/08	9:55	2/29/2008	76.3	NA	0.00005	NA	2.07	0.00	0.021	0.000	2.84	0.01	0.087	0.000	0.001	NA
GW14-08-10732	02/29/08	10:00	2/29/2008	76.4	NA	0.00005	NA	2.06	0.02	0.020	0.000	2.81	0.02	0.088	0.000	0.001	NA
GW14-08-10733	02/29/08	10:10	2/29/2008	79.1	NA	0.00005	NA	2.08	0.00	0.020	0.000	2.87	0.01	0.090	0.000	0.001	NA
GW14-08-10734	02/29/08	10:20	2/29/2008	76.2	NA	0.00005	NA	2.06	0.01	0.021	0.001	2.87	0.01	0.093	0.000	0.001	NA
GW14-08-10735	02/29/08	10:30	2/29/2008	76.2	NA	0.00005	NA	2.04	0.00	0.020	0.000	2.88	0.01	0.095	0.001	0.001	NA
GW14-08-10736	02/29/08	10:40	2/29/2008	76.1	NA	0.00005	NA	1.98	0.02	0.021	0.000	2.86	0.01	0.096	0.000	0.001	NA
GW14-08-10737	02/29/08	10:50	2/29/2008	76.1	NA	0.00005	NA	2.21	0.01	0.020	0.001	2.90	0.02	0.098	0.001	0.001	NA
GW14-08-10738	02/29/08	11:20	2/29/2008	76.0	NA	0.00005	NA	2.11	0.01	0.020	0.001	2.94	0.01	0.101	0.001	0.001	NA
GW14-08-10739	02/29/08	11:50	2/29/2008	75.4	NA	0.00005	NA	2.00	0.01	0.021	0.001	2.97	0.01	0.104	0.001	0.001	NA
GW14-08-10740	02/29/08	12:20	2/29/2008	75.8	NA	0.00005	NA	1.97	0.01	0.019	0.000	2.95	0.01	0.107	0.001	0.001	NA
GW14-08-10741	02/29/08	12:50	2/29/2008	76.1	NA	0.00005	NA	1.89	0.02	0.021	0.002	2.88	0.01	0.105	0.001	0.001	NA
GW14-08-10742	02/29/08	13:50	2/29/2008	75.6	NA	0.00005	NA	1.91	0.02	0.020	0.000	2.96	0.02	0.108	0.001	0.001	NA
GW14-08-10743	02/29/08	14:50	2/29/2008	75.3	NA	0.00005	NA	1.89	0.00	0.020	0.001	2.97	0.02	0.108	0.001	0.001	NA
GW14-08-10777	02/28/08	n/a[c]	2/28/2008	0	U	0.00005	NA	0.03	0.00	0.001	NA	0.05	0.02	0.004	0.000	0.001	NA
GW14-08-10778	02/28/08	n/a	2/28/2008	0	U	0.00005	NA	0.01	NA	0.001	NA	0.12	0.00	0.042	0.001	0.001	NA
GW14-08-10779	02/29/08	10:20	2/29/2008	0	U	0.00005	NA	0.01	NA	0.001	NA	0.01	NA	0.001	NA	0.001	NA
GW14-08-10780	02/29/08	10:10	2/29/2008	75.7	NA	0.00005	NA	1.99	0.02	0.020	0.000	2.64	0.01	0.089	0.001	0.001	NA
GW14-08-10781	02/29/08	12:50	2/29/2008	75.8	NA	0.00005	NA	1.93	0.01	0.020	0.000	2.81	0.01	0.100	0.001	0.001	NA
GW14-08-10727	02/29/08	9:35	2/29/2008	76.9	NA	0.00005	NA	2.13	0.01	0.021	0.000	2.72	0.00	0.081	0.000	0.001	NA
GW14-08-10728	02/29/08	9:40	2/29/2008	76.7	NA	0.00005	NA	2.14	0.03	0.021	0.000	2.79	0.01	0.085	0.000	0.001	NA
GW14-08-10785	02/29/08	9:45	2/29/2008	76.9	NA	0.00005	NA	2.06	0.01	0.020	0.000	2.62	0.01	0.084	0.000	0.001	NA
GW14-08-10786	02/29/08	9:50	2/29/2008	76.7	NA	0.00005	NA	2.05	0.02	0.020	0.000	2.67	0.01	0.081	0.001	0.001	NA
GW14-08-10787	02/29/08	9:55	2/29/2008	76.6	NA	0.00005	NA	2.03	0.01	0.020	0.000	2.67	0.02	0.085	0.001	0.001	NA
GW14-08-10788	02/29/08	10:00	2/29/2008	76.7	NA	0.00005	NA	2.01	0.01	0.020	0.000	2.68	0.01	0.088	0.002	0.001	NA
GW14-08-10789	02/29/08	10:10	2/29/2008	76.4	NA	0.00005	NA	1.99	0.01	0.020	0.000	2.68	0.01	0.085	0.001	0.001	NA
GW14-08-10790	02/29/08	10:20	2/29/2008	76.3	NA	0.00005	NA	1.98	0.02	0.020	0.000	2.68	0.03	0.095	0.003	0.001	NA
GW14-08-10791	02/29/08	10:30	2/29/2008	76.2	NA	0.00005	NA	2.19	0.02	0.021	0.000	2.75	0.02	0.092	0.001	0.001	NA
GW14-08-10792	02/29/08	10:40	2/29/2008	76.0	NA	0.00005	NA	2.09	0.00	0.020	0.000	2.75	0.00	0.096	0.002	0.001	NA
GW14-08-10793	02/29/08	10:50	2/29/2008	76.2	NA	0.00005	NA	2.10	0.01	0.021	0.000	2.77	0.01	0.098	0.005	0.001	NA
GW14-08-10794	02/29/08	11:20	2/29/2008	76.1	NA	0.00005	NA	2.11	0.01	0.021	0.000	2.85	0.01	0.095	0.001	0.001	NA
GW14-08-10795	02/29/08	11:50	2/29/2008	75.7	NA	0.00005	NA	2.03	0.01	0.021	0.000	2.81	0.01	0.101	0.003	0.001	NA
GW14-08-10796	02/29/08	12:20	2/29/2008	75.9	NA	0.00005	NA	2.05	0.01	0.021	0.000	2.88	0.00	0.113	0.003	0.001	NA
GW14-08-10797	02/29/08	12:50	2/29/2008	75.6	NA	0.00005	NA	2.10	0.01	0.022	0.000	3.00	0.01	0.105	0.005	0.001	NA
GW14-08-10798	02/29/08	13:50	2/29/2008	75.7	NA	0.00005	NA	1.91	0.01	0.021	0.000	2.94	0.01	0.102	0.000	0.001	NA
GW14-08-10799	02/29/08	14:50	2/29/2008	75.9	NA	0.00005	NA	1.83	0.02	0.020	0.000	2.85	0.03	0.108	0.004	0.001	NA
GW14-08-10833	02/28/08	n/a	2/28/2008	0	U	0.00005	NA	0.01	NA	0.001	NA	0.03	0.00	0.002	0.000	0.001	NA
GW14-08-10834	02/28/08	n/a	2/28/2008	NA	U	0.00005	NA	0.01	NA	0.001	NA	0.02	0.00	0.002	0.000	0.001	NA
GW14-08-10836	02/29/08	10:10	2/29/2008	76.4	NA	0.00005	NA	1.97	0.02	0.022	0.000	2.78	0.03	0.094	0.001	0.001	NA
GW14-08-10837	02/29/08	12:50	2/29/2008	75.9	NA	0.00005	NA	2.20	0.03	0.020	0.000	2.95	0.00	0.103	0.002	0.001	NA

[a]NA = Not analyzed.
[b]U = Undetected.
[c]n/a = Not applicable.

Table A-1
Laboratory Analytical Results for R-14 Screen 1
in February 2008

Sample ID	Date Collected	Time Collected	Date Received	Na rslt (ppm)	stdev (Na)	Ni rslt (ppm)	stdev (Ni)	NO2(ppm)	NO2-N rslt	NO2-N (U)	NO3 ppm	NO3-N rslt	NO3-N (U)	C2O4 rslt (ppm)	C2O4 (U)	Pb rslt (ppm)
GW14-08-10725	02/29/08	9:35	2/29/2008	10.3	0.0	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0004
GW14-08-10726	02/29/08	9:40	2/29/2008	10.3	0.1	0.003	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0008
GW14-08-10729	02/29/08	9:45	2/29/2008	10.9	0.0	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0005
GW14-08-10730	02/29/08	9:50	2/29/2008	10.9	0.1	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0003
GW14-08-10731	02/29/08	9:55	2/29/2008	10.8	0.1	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0005
GW14-08-10732	02/29/08	10:00	2/29/2008	10.7	0.1	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0004
GW14-08-10733	02/29/08	10:10	2/29/2008	10.8	0.1	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0003
GW14-08-10734	02/29/08	10:20	2/29/2008	10.8	0.0	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0005
GW14-08-10735	02/29/08	10:30	2/29/2008	10.8	0.1	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0004
GW14-08-10736	02/29/08	10:40	2/29/2008	10.6	0.0	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0005
GW14-08-10737	02/29/08	10:50	2/29/2008	10.9	0.1	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0003
GW14-08-10738	02/29/08	11:20	2/29/2008	10.7	0.1	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0003
GW14-08-10739	02/29/08	11:50	2/29/2008	10.7	0.0	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0003
GW14-08-10740	02/29/08	12:20	2/29/2008	10.6	0.0	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0003
GW14-08-10741	02/29/08	12:50	2/29/2008	10.2	0.0	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0002
GW14-08-10742	02/29/08	13:50	2/29/2008	10.3	0.1	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0003
GW14-08-10743	02/29/08	14:50	2/29/2008	10.2	0.0	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0003
GW14-08-10777	02/28/08	n/a[c]	2/28/2008	0.23	0.00	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0031
GW14-08-10778	02/28/08	n/a	2/28/2008	0.28	0.00	0.008	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0026
GW14-08-10779	02/29/08	10:20	2/29/2008	0.01	NA	0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0002
GW14-08-10780	02/29/08	10:10	2/29/2008	10.1	0.1	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0006
GW14-08-10781	02/29/08	12:50	2/29/2008	10.1	0.0	0.001	0.000	NA	NA	NA	NA	NA	NA	NA	NA	0.0004
GW14-08-10727	02/29/08	9:35	2/29/2008	10.4	0.0	0.001	0.000	0.01	0.003	U	1.53	0.346	NA	0.01	U	0.0004
GW14-08-10728	02/29/08	9:40	2/29/2008	10.9	0.0	0.002	0.000	0.01	0.003	U	1.54	0.348	NA	0.01	U	0.0006
GW14-08-10785	02/29/08	9:45	2/29/2008	10.3	0.0	0.001	0.000	0.01	0.003	U	1.55	0.349	NA	0.01	U	0.0005
GW14-08-10786	02/29/08	9:50	2/29/2008	10.4	0.0	0.001	0.000	0.01	0.003	U	1.54	0.347	NA	0.01	U	0.0003
GW14-08-10787	02/29/08	9:55	2/29/2008	10.3	0.1	0.001	0.000	0.01	0.003	U	1.55	0.349	NA	0.01	U	0.0003
GW14-08-10788	02/29/08	10:00	2/29/2008	10.2	0.1	0.001	0.000	0.01	0.003	U	1.62	0.367	NA	0.01	U	0.0004
GW14-08-10789	02/29/08	10:10	2/29/2008	10.1	0.0	0.001	0.000	0.01	0.003	U	1.60	0.360	NA	0.01	U	0.0004
GW14-08-10790	02/29/08	10:20	2/29/2008	10.1	0.1	0.001	0.000	0.01	0.003	U	1.61	0.363	NA	0.01	U	0.0002
GW14-08-10791	02/29/08	10:30	2/29/2008	10.5	0.0	0.001	0.000	0.01	0.003	U	1.62	0.365	NA	0.01	U	0.0002
GW14-08-10792	02/29/08	10:40	2/29/2008	10.2	0.0	0.001	0.000	0.01	0.003	U	1.65	0.372	NA	0.01	U	0.0002
GW14-08-10793	02/29/08	10:50	2/29/2008	10.3	0.0	0.001	0.000	0.01	0.003	U	1.62	0.366	NA	0.01	U	0.0004
GW14-08-10794	02/29/08	11:20	2/29/2008	10.4	0.1	0.001	0.000	0.01	0.003	U	1.66	0.375	NA	0.01	U	0.0003
GW14-08-10795	02/29/08	11:50	2/29/2008	10.2	0.1	0.001	0.000	0.01	0.003	U	1.70	0.383	NA	0.01	U	0.0004
GW14-08-10796	02/29/08	12:20	2/29/2008	10.3	0.1	0.001	0.000	0.01	0.003	U	1.69	0.381	NA	0.01	U	0.0002
GW14-08-10797	02/29/08	12:50	2/29/2008	10.5	0.0	0.001	0.000	0.01	0.003	U	1.70	0.385	NA	0.01	U	0.0002
GW14-08-10798	02/29/08	13:50	2/29/2008	10.3	0.0	0.001	0.000	0.01	0.003	U	1.71	0.386	NA	0.01	U	0.0003
GW14-08-10799	02/29/08	14:50	2/29/2008	9.97	0.11	0.001	0.000	0.01	0.003	U	1.75	0.395	NA	0.01	U	0.0002
GW14-08-10833	02/28/08	n/a	2/28/2008	0.13	0.00	0.001	NA	0.01	0.003	U	0.12	0.028	NA	0.01	U	0.0002
GW14-08-10834	02/28/08	n/a	2/28/2008	0.27	0.00	0.005	0.000	0.01	0.003	U	0.01	0.003	NA	0.01	U	0.0014
GW14-08-10836	02/29/08	10:10	2/29/2008	10.5	0.1	0.001	0.000	0.01	0.003	U	1.60	0.361	NA	0.01	U	0.0004
GW14-08-10837	02/29/08	12:50	2/29/2008	11.1	0.1	0.001	0.000	0.01	0.003	U	1.69	0.381	NA	0.01	U	0.0002

[a]NA = Not analyzed.
[b]U = Undetected.
[c]n/a = Not applicable.

Table A-1
Laboratory Analytical Results for R-14 Screen 1
in February 2008

Sample ID	Date Collected	Time Collected	Date Received	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)
GW14-08-10725	02/29/08	9:35	2/29/2008	0.0000	7.76	NA	NA	0.007	0.000	0.01	NA	0.001	NA	0.001	NA	35.7	0.3
GW14-08-10726	02/29/08	9:40	2/29/2008	0.0000	7.69	NA	NA	0.007	0.000	0.01	NA	0.001	NA	0.001	NA	36.3	0.2
GW14-08-10729	02/29/08	9:45	2/29/2008	0.0000	7.68	NA	NA	0.006	0.000	0.01	U	0.001	NA	0.001	NA	36.9	0.2
GW14-08-10730	02/29/08	9:50	2/29/2008	0.0000	7.74	NA	NA	0.007	0.000	0.01	U	0.001	NA	0.001	NA	37.2	0.3
GW14-08-10731	02/29/08	9:55	2/29/2008	0.0000	7.70	NA	NA	0.007	0.000	0.01	U	0.001	NA	0.001	NA	37.4	0.1
GW14-08-10732	02/29/08	10:00	2/29/2008	0.0000	7.74	NA	NA	0.007	0.000	0.01	U	0.001	NA	0.001	NA	36.8	0.0
GW14-08-10733	02/29/08	10:10	2/29/2008	0.0000	7.75	NA	NA	0.007	0.000	0.01	U	0.001	NA	0.001	NA	37.2	0.3
GW14-08-10734	02/29/08	10:20	2/29/2008	0.0000	7.76	NA	NA	0.007	0.000	0.01	U	0.001	NA	0.001	NA	37.1	0.3
GW14-08-10735	02/29/08	10:30	2/29/2008	0.0000	7.77	NA	NA	0.006	0.000	0.01	U	0.001	NA	0.001	NA	37.1	0.2
GW14-08-10736	02/29/08	10:40	2/29/2008	0.0000	7.75	NA	NA	0.006	0.000	0.01	U	0.001	NA	0.001	NA	36.7	0.2
GW14-08-10737	02/29/08	10:50	2/29/2008	0.0000	7.66	NA	NA	0.006	0.000	0.01	U	0.001	NA	0.001	NA	36.8	0.3
GW14-08-10738	02/29/08	11:20	2/29/2008	0.0000	7.69	NA	NA	0.006	0.000	0.01	U	0.001	NA	0.001	NA	36.6	0.2
GW14-08-10739	02/29/08	11:50	2/29/2008	0.0000	7.66	NA	NA	0.006	0.000	0.01	U	0.001	NA	0.001	NA	36.7	0.3
GW14-08-10740	02/29/08	12:20	2/29/2008	0.0000	7.73	NA	NA	0.006	0.000	0.01	U	0.001	NA	0.001	NA	36.6	0.2
GW14-08-10741	02/29/08	12:50	2/29/2008	0.0000	7.73	NA	NA	0.006	0.000	0.01	U	0.001	NA	0.001	NA	35.4	0.1
GW14-08-10742	02/29/08	13:50	2/29/2008	0.0000	7.72	NA	NA	0.006	0.000	0.01	U	0.001	NA	0.001	NA	35.9	0.2
GW14-08-10743	02/29/08	14:50	2/29/2008	0.0000	7.73	NA	NA	0.005	0.000	0.01	U	0.001	NA	0.001	NA	35.9	0.3
GW14-08-10777	02/28/08	n/a[c]	2/28/2008	0.0000	6.29	NA	NA	0.001	NA	0.01	U	0.001	NA	0.001	NA	0.08	0.00
GW14-08-10778	02/28/08	n/a	2/28/2008	0.0001	6.59	NA	NA	0.001	NA	0.01	U	0.001	NA	0.001	NA	2.51	0.02
GW14-08-10779	02/29/08	10:20	2/29/2008	NA	5.06	NA	NA	0.001	NA	0.01	U	0.001	NA	0.001	NA	0.01	NA
GW14-08-10780	02/29/08	10:10	2/29/2008	0.0000	7.76	NA	NA	0.007	0.000	0.01	U	0.001	NA	0.001	NA	34.8	0.2
GW14-08-10781	02/29/08	12:50	2/29/2008	0.0000	7.80	NA	NA	0.006	0.000	0.01	U	0.001	NA	0.001	NA	35.6	0.3
GW14-08-10727	02/29/08	9:35	2/29/2008	0.0000	7.71	0.26	NA	0.007	0.000	NA	NA	0.001	NA	0.001	NA	35.9	0.4
GW14-08-10728	02/29/08	9:40	2/29/2008	0.0000	7.70	0.27	NA	0.007	0.000	NA	NA	0.001	NA	0.001	NA	36.8	0.4
GW14-08-10785	02/29/08	9:45	2/29/2008	0.0000	7.73	0.26	NA	0.007	0.000	NA	NA	0.001	NA	0.001	NA	34.9	0.3
GW14-08-10786	02/29/08	9:50	2/29/2008	0.0000	7.71	0.26	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	35.6	0.2
GW14-08-10787	02/29/08	9:55	2/29/2008	0.0000	7.72	0.25	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	35.7	0.2
GW14-08-10788	02/29/08	10:00	2/29/2008	0.0000	7.77	0.25	NA	0.007	0.000	NA	NA	0.001	NA	0.001	NA	35.3	0.3
GW14-08-10789	02/29/08	10:10	2/29/2008	0.0000	7.77	0.25	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	35.4	0.3
GW14-08-10790	02/29/08	10:20	2/29/2008	0.0000	7.79	0.25	NA	0.007	0.000	NA	NA	0.001	NA	0.001	NA	35.0	0.2
GW14-08-10791	02/29/08	10:30	2/29/2008	0.0000	7.79	0.25	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	35.7	0.3
GW14-08-10792	02/29/08	10:40	2/29/2008	0.0000	7.80	0.24	NA	0.007	0.000	NA	NA	0.001	NA	0.001	NA	35.4	0.3
GW14-08-10793	02/29/08	10:50	2/29/2008	0.0000	7.65	0.23	NA	0.007	0.000	NA	NA	0.001	NA	0.001	NA	35.5	0.2
GW14-08-10794	02/29/08	11:20	2/29/2008	0.0000	7.71	0.23	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	36.3	0.3
GW14-08-10795	02/29/08	11:50	2/29/2008	0.0000	7.64	0.23	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	35.5	0.1
GW14-08-10796	02/29/08	12:20	2/29/2008	0.0000	7.71	0.22	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	35.8	0.3
GW14-08-10797	02/29/08	12:50	2/29/2008	0.0000	7.73	0.22	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	36.9	0.3
GW14-08-10798	02/29/08	13:50	2/29/2008	0.0000	7.72	0.21	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	35.7	0.0
GW14-08-10799	02/29/08	14:50	2/29/2008	0.0000	7.76	0.21	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	34.3	0.4
GW14-08-10833	02/28/08	n/a	2/28/2008	NA	6.96	0.01	U	0.001	NA	NA	NA	0.001	NA	0.001	NA	0.1	0.0
GW14-08-10834	02/28/08	n/a	2/28/2008	0.0000	6.20	0.01	U	0.001	NA	NA	NA	0.001	NA	0.001	NA	0.4	0.0
GW14-08-10836	02/29/08	10:10	2/29/2008	0.0000	7.90	0.23	NA	0.007	0.000	NA	NA	0.001	NA	0.001	NA	35.9	0.3
GW14-08-10837	02/29/08	12:50	2/29/2008	0.0000	7.79	0.20	NA	0.006	0.000	NA	NA	0.001	NA	0.001	NA	35.9	0.5

[a]NA = Not analyzed.
[b]U = Undetected.
[c]n/a = Not applicable.

Table A-1
Laboratory Analytical Results for R-14 Screen 1
in February 2008

Sample ID	Date Collected	Time Collected	Date Received	SiO2 rslt (ppm)	stdev (SiO2)	Sn rslt (ppm)	stdev (Sn)	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)
GW14-08-10725	02/29/08	9:35	2/29/2008	76.4	0.6	0.001	NA	NA	NA	0.075	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10726	02/29/08	9:40	2/29/2008	77.6	0.4	0.001	NA	NA	NA	0.076	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10729	02/29/08	9:45	2/29/2008	79.0	0.5	0.001	NA	NA	NA	0.071	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10730	02/29/08	9:50	2/29/2008	79.6	0.5	0.001	NA	NA	NA	0.078	0.007	0.001	NA	0.002	NA	0.001	NA
GW14-08-10731	02/29/08	9:55	2/29/2008	80.0	0.2	0.001	NA	NA	NA	0.076	0.002	0.001	NA	0.002	NA	0.001	NA
GW14-08-10732	02/29/08	10:00	2/29/2008	78.8	0.0	0.001	NA	NA	NA	0.071	0.003	0.001	NA	0.002	NA	0.001	NA
GW14-08-10733	02/29/08	10:10	2/29/2008	79.7	0.7	0.001	NA	NA	NA	0.077	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10734	02/29/08	10:20	2/29/2008	79.4	0.6	0.001	NA	NA	NA	0.074	0.002	0.001	NA	0.002	NA	0.001	NA
GW14-08-10735	02/29/08	10:30	2/29/2008	79.4	0.5	0.001	NA	NA	NA	0.073	0.000	0.001	NA	0.002	NA	0.001	NA
GW14-08-10736	02/29/08	10:40	2/29/2008	78.6	0.5	0.001	NA	NA	NA	0.075	0.004	0.001	NA	0.002	NA	0.001	NA
GW14-08-10737	02/29/08	10:50	2/29/2008	78.8	0.6	0.001	NA	NA	NA	0.071	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10738	02/29/08	11:20	2/29/2008	78.4	0.5	0.001	NA	NA	NA	0.074	0.004	0.001	NA	0.002	NA	0.001	NA
GW14-08-10739	02/29/08	11:50	2/29/2008	78.6	0.6	0.001	NA	NA	NA	0.071	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10740	02/29/08	12:20	2/29/2008	78.2	0.5	0.001	NA	NA	NA	0.065	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10741	02/29/08	12:50	2/29/2008	75.8	0.3	0.001	NA	NA	NA	0.073	0.007	0.001	NA	0.002	NA	0.001	NA
GW14-08-10742	02/29/08	13:50	2/29/2008	76.8	0.3	0.001	NA	NA	NA	0.065	0.000	0.001	NA	0.002	NA	0.001	NA
GW14-08-10743	02/29/08	14:50	2/29/2008	76.7	0.7	0.001	NA	NA	NA	0.064	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10777	02/28/08	n/a[c]	2/28/2008	0.2	0.0	0.001	NA	NA	NA	0.002	0.000	0.001	NA	0.002	0.001	0.001	NA
GW14-08-10778	02/28/08	n/a	2/28/2008	5.4	0.0	0.001	NA	NA	NA	0.005	0.000	0.001	NA	0.005	0.000	0.001	NA
GW14-08-10779	02/29/08	10:20	2/29/2008	0.02	NA	0.001	NA	NA	NA	0.001		0.001	NA	0.002	0.002	0.001	NA
GW14-08-10780	02/29/08	10:10	2/29/2008	74.4	0.5	0.001	NA	NA	NA	0.070	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10781	02/29/08	12:50	2/29/2008	76.2	0.7	0.001	NA	NA	NA	0.068	0.000	0.001	NA	0.002	NA	0.001	NA
GW14-08-10727	02/29/08	9:35	2/29/2008	76.8	0.8	0.001	NA	5.40	NA	0.076	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10728	02/29/08	9:40	2/29/2008	78.8	0.8	0.001	NA	5.33	NA	0.075	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10785	02/29/08	9:45	2/29/2008	74.8	0.6	0.001	NA	5.30	NA	0.071	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10786	02/29/08	9:50	2/29/2008	76.2	0.4	0.001	NA	5.20	NA	0.073	0.000	0.001	NA	0.002	NA	0.001	NA
GW14-08-10787	02/29/08	9:55	2/29/2008	76.4	0.4	0.001	NA	5.16	NA	0.073	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10788	02/29/08	10:00	2/29/2008	75.6	0.7	0.001	NA	5.44	NA	0.072	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10789	02/29/08	10:10	2/29/2008	75.7	0.6	0.001	NA	5.16	NA	0.072	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10790	02/29/08	10:20	2/29/2008	74.9	0.5	0.001	NA	5.09	NA	0.071	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10791	02/29/08	10:30	2/29/2008	76.5	0.6	0.001	NA	5.09	NA	0.073	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10792	02/29/08	10:40	2/29/2008	75.7	0.5	0.001	NA	5.03	NA	0.072	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10793	02/29/08	10:50	2/29/2008	76.0	0.5	0.001	NA	4.91	NA	0.072	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10794	02/29/08	11:20	2/29/2008	77.7	0.7	0.001	NA	4.82	NA	0.074	0.000	0.001	NA	0.002	NA	0.001	NA
GW14-08-10795	02/29/08	11:50	2/29/2008	76.0	0.2	0.001	NA	4.72	NA	0.070	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10796	02/29/08	12:20	2/29/2008	76.5	0.7	0.001	NA	4.55	NA	0.070	0.000	0.001	NA	0.002	NA	0.001	NA
GW14-08-10797	02/29/08	12:50	2/29/2008	78.9	0.5	0.001	NA	4.46	NA	0.072	0.000	0.001	NA	0.002	NA	0.001	NA
GW14-08-10798	02/29/08	13:50	2/29/2008	76.5	0.1	0.001	NA	4.31	NA	0.067	0.000	0.001	NA	0.002	NA	0.001	NA
GW14-08-10799	02/29/08	14:50	2/29/2008	73.4	0.9	0.001	NA	4.24	NA	0.063	0.001	0.001	NA	0.002	NA	0.001	NA
GW14-08-10833	02/28/08	n/a	2/28/2008	0.2	0.0	0.001	NA	0.37	NA	0.001	0.000	0.001	NA	0.002	0.000	0.001	NA
GW14-08-10834	02/28/08	n/a	2/28/2008	0.9	0.0	0.001	NA	0.17	NA	0.001	0.000	0.001	NA	0.002	NA	0.001	NA
GW14-08-10836	02/29/08	10:10	2/29/2008	76.9	0.6	0.001	NA	5.17	NA	0.075	0.003	0.001	NA	0.002	NA	0.001	NA
GW14-08-10837	02/29/08	12:50	2/29/2008	76.7	1.0	0.001	NA	4.43	NA	0.068	0.001	0.001	NA	0.002	NA	0.001	NA

[a]NA = Not analyzed.
[b]U = Undetected.
[c]n/a = Not applicable.

Table A-1
Laboratory Analytical Results for R-14 Screen 1
in February 2008

Sample ID	Date Collected	Time Collected	Date Received	U rslt (ppm)	stdev (U)	V rslt (ppm)	stdev (V)	Zn rslt (ppm)	stdev (Zn)	TDS (ppm)	Cations	Anions	Balance
GW14-08-10725	02/29/08	9:35	2/29/2008	0.0010	0.0000	0.006	0.000	0.007	0.000	185	1.33	1.34	-0.01
GW14-08-10726	02/29/08	9:40	2/29/2008	0.0010	0.0000	0.006	0.000	0.013	0.000	183	1.34	1.29	0.02
GW14-08-10729	02/29/08	9:45	2/29/2008	0.0009	0.0000	0.007	0.000	0.006	0.000	185	1.37	1.29	0.03
GW14-08-10730	02/29/08	9:50	2/29/2008	0.0009	0.0001	0.007	0.001	0.005	0.000	185	1.36	1.29	0.03
GW14-08-10731	02/29/08	9:55	2/29/2008	0.0010	0.0000	0.007	0.000	0.006	0.000	185	1.36	1.28	0.03
GW14-08-10732	02/29/08	10:00	2/29/2008	0.0009	0.0000	0.006	0.000	0.006	0.000	184	1.35	1.28	0.03
GW14-08-10733	02/29/08	10:10	2/29/2008	0.0010	0.0000	0.007	0.000	0.004	0.000	188	1.35	1.33	0.01
GW14-08-10734	02/29/08	10:20	2/29/2008	0.0010	0.0000	0.007	0.000	0.005	0.000	184	1.34	1.28	0.02
GW14-08-10735	02/29/08	10:30	2/29/2008	0.0010	0.0000	0.007	0.000	0.005	0.000	184	1.34	1.28	0.02
GW14-08-10736	02/29/08	10:40	2/29/2008	0.0011	0.0000	0.007	0.000	0.005	0.000	183	1.31	1.28	0.01
GW14-08-10737	02/29/08	10:50	2/29/2008	0.0010	0.0000	0.007	0.000	0.005	0.000	183	1.34	1.28	0.02
GW14-08-10738	02/29/08	11:20	2/29/2008	0.0011	0.0000	0.007	0.000	0.005	0.000	183	1.32	1.27	0.02
GW14-08-10739	02/29/08	11:50	2/29/2008	0.0011	0.0000	0.007	0.000	0.005	0.000	182	1.31	1.26	0.02
GW14-08-10740	02/29/08	12:20	2/29/2008	0.0010	0.0001	0.007	0.000	0.004	0.000	182	1.30	1.27	0.01
GW14-08-10741	02/29/08	12:50	2/29/2008	0.0011	0.0001	0.008	0.001	0.004	0.000	179	1.26	1.28	0.00
GW14-08-10742	02/29/08	13:50	2/29/2008	0.0011	0.0000	0.007	0.000	0.005	0.000	180	1.27	1.27	0.00
GW14-08-10743	02/29/08	14:50	2/29/2008	0.0011	0.0001	0.007	0.001	0.004	0.000	179	1.26	1.26	0.00
GW14-08-10777	02/28/08	n/a[c]	2/28/2008	0.0002	NA	0.001		0.024	0.001	2	0.04	0.03	0.17
GW14-08-10778	02/28/08	n/a	2/28/2008	0.0003	0.0000	0.003	0.000	0.052	0.001	19	0.08	0.03	0.45
GW14-08-10779	02/29/08	10:20	2/29/2008	0.0002	NA	0.001	NA	0.001	NA	1	0.00	0.03	-0.85
GW14-08-10780	02/29/08	10:10	2/29/2008	0.0011	0.0000	0.007	0.000	0.010	0.000	177	1.28	1.27	0.00
GW14-08-10781	02/29/08	12:50	2/29/2008	0.0012	0.0000	0.007	0.000	0.006	0.000	179	1.26	1.27	0.00
GW14-08-10727	02/29/08	9:35	2/29/2008	0.0010	0.0000	0.006	0.000	0.005	0.000	193	1.34	1.53	-0.07
GW14-08-10728	02/29/08	9:40	2/29/2008	0.0010	0.0000	0.006	0.000	0.011	0.000	195	1.35	1.53	-0.06
GW14-08-10785	02/29/08	9:45	2/29/2008	0.0010	0.0000	0.006	0.000	0.006	0.000	190	1.30	1.54	-0.08
GW14-08-10786	02/29/08	9:50	2/29/2008	0.0010	0.0000	0.006	0.000	0.004	0.000	191	1.31	1.52	-0.08
GW14-08-10787	02/29/08	9:55	2/29/2008	0.0011	0.0000	0.007	0.000	0.005	0.000	191	1.31	1.52	-0.07
GW14-08-10788	02/29/08	10:00	2/29/2008	0.0011	0.0000	0.007	0.000	0.006	0.000	191	1.30	1.54	-0.08
GW14-08-10789	02/29/08	10:10	2/29/2008	0.0010	0.0000	0.007	0.000	0.005	0.000	190	1.29	1.52	-0.08
GW14-08-10790	02/29/08	10:20	2/29/2008	0.0011	0.0000	0.007	0.000	0.005	0.000	189	1.28	1.52	-0.08
GW14-08-10791	02/29/08	10:30	2/29/2008	0.0011	0.0000	0.007	0.000	0.005	0.000	191	1.33	1.52	-0.06
GW14-08-10792	02/29/08	10:40	2/29/2008	0.0011	0.0000	0.007	0.000	0.005	0.000	190	1.31	1.51	-0.07
GW14-08-10793	02/29/08	10:50	2/29/2008	0.0011	0.0000	0.007	0.000	0.006	0.000	190	1.31	1.51	-0.07
GW14-08-10794	02/29/08	11:20	2/29/2008	0.0011	0.0000	0.007	0.000	0.005	0.000	192	1.32	1.51	-0.07
GW14-08-10795	02/29/08	11:50	2/29/2008	0.0012	0.0001	0.007	0.001	0.008	0.000	189	1.29	1.50	-0.08
GW14-08-10796	02/29/08	12:20	2/29/2008	0.0012	0.0000	0.007	0.000	0.005	0.000	190	1.30	1.50	-0.07
GW14-08-10797	02/29/08	12:50	2/29/2008	0.0012	0.0000	0.007	0.000	0.005	0.000	192	1.32	1.49	-0.06
GW14-08-10798	02/29/08	13:50	2/29/2008	0.0012	0.0000	0.007	0.000	0.007	0.000	188	1.26	1.49	-0.08
GW14-08-10799	02/29/08	14:50	2/29/2008	0.0012	0.0000	0.007	0.000	0.005	0.000	185	1.23	1.49	-0.10
GW14-08-10833	02/28/08	n/a	2/28/2008	0.0002	NA	0.001	NA	0.003	0.000	2	0.03	0.04	-0.20
GW14-08-10834	02/28/08	n/a	2/28/2008	0.0002	NA	0.001	NA	0.021	0.000	3	0.03	0.03	-0.10
GW14-08-10836	02/29/08	10:10	2/29/2008	0.0010	0.0001	0.007	0.000	0.005	0.000	191	1.28	1.52	-0.09
GW14-08-10837	02/29/08	12:50	2/29/2008	0.0011	0.0000	0.007	0.000	0.004	0.000	190	1.28	1.50	-0.08

[a]NA = Not analyzed.
[b]U = Undetected.
[c]n/a = Not applicable.

Table A-2
Laboratory Analytical Results for R-14 Screen 1
in May 2008

Sample ID	Date Collected	Date Received	ER/RRES-WQH	TEMP C	pH	Specific Conductance (uS/cm)	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Ag rslt (ppm)	stdev (Ag)	Al rslt (ppm)
GW14-08-12948 F	200805140945	5/14/2008	08-1153	24	7.81	120.7	101	2.5	1.13	0.001	U[a]	0.001
GW14-08-12955 F	200805140945	5/14/2008	08-1151	—	—	—	—	—	—	0.001	U	0.001
GW14-08-12962 F	200805140945	5/14/2008	08-1150	—	—	—	—	—	—	0.001	U	0.003
GW14-08-12949 F	200805141015	5/14/2008	08-1153	24.1	7.75	120	109	2.7	1.62	0.001	U	0.001
GW14-08-12956 F	200805141015	5/14/2008	08-1151	—	—	—	—	—	—	0.001	U	0.001
GW14-08-12963 F	200805141015	5/14/2008	08-1150	—	—	—	—	—	—	0.001	U	0.003
GW14-08-12971 F	200805141015	5/14/2008	08-1153	—	—	—	—	—	—	0.001	U	0.001
GW14-08-12941 NF	200805140945	5/14/2008	08-1152	—	—	—	—	—	—	0.001	U	0.004
GW14-08-12942 NF	200805141015	5/14/2008	08-1152	—	—	—	—	—	—	0.001	U	0.003
GW14-08-12969 NF	200805141015	5/14/2008	08-1152	—	—	—	—	—	—	0.001	U	0.003
GW14-08-12970 NF, B	200805141015	5/14/2008	08-1152	—	—	—	—	—	—	0.001	U	0.001

[a]U = Undetected.

[b]— = Sample request not taken; sample not collected for analysis.

Table A-2
Laboratory Analytical Results for R-14 Screen 1
in May 2008

Sample ID	Date Collected	Date Received	ER/RRES-WQH	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)
GW14-08-12948 F	200805140945	5/14/2008	08-1153	0.000	0.0013	0.0000	0.0140	0.0004	0.052	0.000	0.001	—[b]	0.04	—
GW14-08-12955 F	200805140945	5/14/2008	08-1151	U	0.0014	0.0001	0.0137	0.0001	0.052	0.001	0.001	—	—	—
GW14-08-12962 F	200805140945	5/14/2008	08-1150	0.000	0.0013	0.0000	0.0218	0.0003	0.047	0.000	0.001	—	—	—
GW14-08-12949 F	200805141015	5/14/2008	08-1153	U	0.0012	0.0001	0.0139	0.0008	0.053	0.001	0.001	—	0.06	—
GW14-08-12956 F	200805141015	5/14/2008	08-1151	U	0.0013	0.0000	0.0413	0.0007	0.053	0.000	0.001	—	—	—
GW14-08-12963 F	200805141015	5/14/2008	08-1150	0.000	0.0013	0.0000	0.0165	0.0005	0.048	0.000	0.001	—	—	—
GW14-08-12971 F	200805141015	5/14/2008	08-1153	U	0.0013	0.0000	0.0147	0.0002	0.053	0.001	0.001	—	0.07	—
GW14-08-12941 NF	200805140945	5/14/2008	08-1152	0.000	0.0013	0.0000	0.0154	0.0004	0.052	0.000	0.001	—	—	—
GW14-08-12942 NF	200805141015	5/14/2008	08-1152	0.000	0.0014	0.0000	0.0147	0.0002	0.052	0.000	0.001	—	—	—
GW14-08-12969 NF	200805141015	5/14/2008	08-1152	0.000	0.0012	0.0000	0.0144	0.0002	0.050	0.001	0.001	—	—	—
GW14-08-12970 NF, B	200805141015	5/14/2008	08-1152	U	0.0002	U	0.0037	0.0003	0.001	U	0.001	—	0.01	—

[a]U = Undetected.

[b]— = Sample request not taken; sample not collected for analysis.

Table A-2
Laboratory Analytical Results for R-14 Screen 1
in May 2008

Sample ID	Date Collected	Date Received	ER/RRES-WQH	TOC rslt (ppm)	Ca rslt (ppm)	stdev (Ca)	Cd rslt (ppm)	Cl(-) ppm	ClO4(-) ppm	Co rslt (ppm)	stdev (Co)	Alk-CO3 rslt (ppm)
GW14-08-12948 F	200805140945	5/14/2008	08-1153	—	10.6	0.0	0.001	1.99	Not Analyzed	0.001	U	—
GW14-08-12955 F	200805140945	5/14/2008	08-1151	—	10.6	0.0	0.001	—	Not Analyzed	0.001	U	—
GW14-08-12962 F	200805140945	5/14/2008	08-1150	—	10.6	0.0	0.001	—	Not Analyzed	0.001	U	—
GW14-08-12949 F	200805141015	5/14/2008	08-1153	—	10.6	0.0	0.001	2.31	Not Analyzed	0.001	U	—
GW14-08-12956 F	200805141015	5/14/2008	08-1151	—	10.6	0.0	0.001	—	Not Analyzed	0.004	0.000	—
GW14-08-12963 F	200805141015	5/14/2008	08-1150	—	10.7	0.0	0.001	—	Not Analyzed	0.001	U	—
GW14-08-12971 F	200805141015	5/14/2008	08-1153	—	10.6	0.0	0.001	2.14	Not Analyzed	0.001	U	—
GW14-08-12941 NF	200805140945	5/14/2008	08-1152	0.90	10.6	0.0	0.001	—	Not Analyzed	0.001	U	0.8
GW14-08-12942 NF	200805141015	5/14/2008	08-1152	0.71	10.5	0.1	0.001	—	Not Analyzed	0.001	U	0.8
GW14-08-12969 NF	200805141015	5/14/2008	08-1152	0.89	10.6	0.0	0.001	—	Not Analyzed	0.001	U	0.8
GW14-08-12970 NF, B	200805141015	5/14/2008	08-1152	0.37	0.05	0.01	0.001	0.03	Not Analyzed	0.001	U	0.8

[a]U = Undetected.

[b]— = Sample request not taken; sample not collected for analysis.

Table A-2
Laboratory Analytical Results for R-14 Screen 1
in May 2008

Sample ID	Date Collected	Date Received	ER/RRES-WQH	ALK-CO3 (U)	Cr rslt (ppm)	stdev (Cr)	Cr 6+ rslt (ppm)	Cs rslt (ppm)	stdev (Cs)	Cu rslt (ppm)	F(-) ppm	Fe rslt (ppm)	stdev (Fe)
GW14-08-12948 F	200805140945	5/14/2008	08-1153	—	0.003	0.000	—	0.001	U	0.001	0.2	0.01	U
GW14-08-12955 F	200805140945	5/14/2008	08-1151	—	0.003	0.000	—	0.001	U	0.001	—	0.01	U
GW14-08-12962 F	200805140945	5/14/2008	08-1150	—	0.003	0.000	—	0.001	U	0.001	—	0.01	U
GW14-08-12949 F	200805141015	5/14/2008	08-1153	—	0.003	0.000	—	0.001	U	0.001	0.2	0.01	U
GW14-08-12956 F	200805141015	5/14/2008	08-1151	—	0.003	0.000	—	0.001	U	0.001	—	0.01	U
GW14-08-12963 F	200805141015	5/14/2008	08-1150	—	0.003	0.000	—	0.001	U	0.001	—	0.01	U
GW14-08-12971 F	200805141015	5/14/2008	08-1153	—	0.003	0.000	—	0.001	U	0.001	0.2	0.01	0.00
GW14-08-12941 NF	200805140945	5/14/2008	08-1152	U	0.003	0.000	—	0.001	U	0.001	—	0.03	0.00
GW14-08-12942 NF	200805141015	5/14/2008	08-1152	U	0.003	0.000	—	0.001	U	0.001	—	0.02	0.00
GW14-08-12969 NF	200805141015	5/14/2008	08-1152	U	0.003	0.000	—	0.001	U	0.001	—	0.02	0.00
GW14-08-12970 NF, B	200805141015	5/14/2008	08-1152	U	0.001	—	—	0.001	U	0.001	0.02	0.01	U

[a]U = Undetected.

[b]— = Sample request not taken; sample not collected for analysis.

Table A-2
Laboratory Analytical Results for R-14 Screen 1
in May 2008

Sample ID	Date Collected	Date Received	ER/RRES-WQH	Alk-CO3+HCO3 rslt (ppm)	ALK-CO3+HCO3 (U)	Hg rslt (ppm)	K rslt (ppm)	stdev (K)	Li rslt (ppm)	stdev (Li)	Mg rslt (ppm)	stdev (Mg)	Mn rslt (ppm)
GW14-08-12948 F	200805140945	5/14/2008	08-1153	—	—	0.00005	1.84	0.00	0.021	0.000	2.99	0.02	0.007
GW14-08-12955 F	200805140945	5/14/2008	08-1151	—	—	0.00005	1.88	0.01	0.022	0.000	3.02	0.01	0.007
GW14-08-12962 F	200805140945	5/14/2008	08-1150	—	—	0.00005	2.03	0.01	0.021	0.000	3.01	0.02	0.006
GW14-08-12949 F	200805141015	5/14/2008	08-1153	—	—	0.00005	1.87	0.01	0.020	0.000	2.98	0.00	0.007
GW14-08-12956 F	200805141015	5/14/2008	08-1151	—	—	0.00005	2.06	0.01	0.022	0.000	2.92	0.01	0.015
GW14-08-12963 F	200805141015	5/14/2008	08-1150	—	—	0.00005	1.96	0.02	0.021	0.000	2.93	0.01	0.008
GW14-08-12971 F	200805141015	5/14/2008	08-1153	—	—	0.00005	1.92	0.01	0.021	0.000	2.94	0.01	0.007
GW14-08-12941 NF	200805140945	5/14/2008	08-1152	79.0	—	0.00005	1.84	0.01	0.020	0.000	3.00	0.01	0.007
GW14-08-12942 NF	200805141015	5/14/2008	08-1152	78.4	—	0.00005	1.83	0.00	0.021	0.000	2.94	0.01	0.008
GW14-08-12969 NF	200805141015	5/14/2008	08-1152	78.0	—	0.00005	1.84	0.00	0.020	0.000	2.80	0.01	0.008
GW14-08-12970 NF, B	200805141015	5/14/2008	08-1152	0	U	0.00005	0.02	0.00	0.001	U	0.01	U	0.001

[a]U = Undetected.

[b]— = Sample request not taken; sample not collected for analysis.

Table A-2
Laboratory Analytical Results for R-14 Screen 1
in May 2008

Sample ID	Date Collected	Date Received	ER/RRES-WQH	stdev (Mn)	Mo rslt (ppm)	stdev (Mo)	Na rslt (ppm)	stdev (Na)	Ni rslt (ppm)	stdev (Ni)	NO2(ppm)	NO2-N rslt
GW14-08-12948 F	200805140945	5/14/2008	08-1153	0.000	0.001	0.000	10.1	0.1	0.001	U	0.01	0.003
GW14-08-12955 F	200805140945	5/14/2008	08-1151	0.000	0.001	0.000	10.2	0.1	0.001	U	—	—
GW14-08-12962 F	200805140945	5/14/2008	08-1150	0.000	0.001	0.000	10.5	0.1	0.001	U	—	—
GW14-08-12949 F	200805141015	5/14/2008	08-1153	0.000	0.001	0.000	10.2	0.0	0.001	U	0.01	0.003
GW14-08-12956 F	200805141015	5/14/2008	08-1151	0.000	0.001	0.000	10.4	0.1	0.001	0.000	—	—
GW14-08-12963 F	200805141015	5/14/2008	08-1150	0.000	0.001	0.000	10.1	0.0	0.001	U	—	—
GW14-08-12971 F	200805141015	5/14/2008	08-1153	0.000	0.001	0.000	10.0	0.0	0.001	U	0.01	0.003
GW14-08-12941 NF	200805140945	5/14/2008	08-1152	0.000	0.001	0.000	10.0	0.1	0.001	U	—	—
GW14-08-12942 NF	200805141015	5/14/2008	08-1152	0.000	0.001	0.000	10.0	0.1	0.001	U	—	—
GW14-08-12969 NF	200805141015	5/14/2008	08-1152	0.000	0.001	0.000	9.64	0.02	0.001	U	—	—
GW14-08-12970 NF, B	200805141015	5/14/2008	08-1152	U	0.001	U	0.24	0.00	0.001	U	0.01	0.003

[a]U = Undetected.

[b]— = Sample request not taken; sample not collected for analysis.

Table A-2
Laboratory Analytical Results for R-14 Screen 1
in May 2008

Sample ID	Date Collected	Date Received	ER/RRES-WQH	NO3 ppm	NO3-N rslt	C2O4 rslt (ppm)	C2O4 (U)	Pb rslt (ppm)	stdev (Pb)	pH	PO4(-3) rslt (ppm)	Rb rslt (ppm)
GW14-08-12948 F	200805140945	5/14/2008	08-1153	1.12	0.25	0.01	—	0.0002	U	—	0.41	0.006
GW14-08-12955 F	200805140945	5/14/2008	08-1151	—	—	—	—	0.0002	U	—	—	0.006
GW14-08-12962 F	200805140945	5/14/2008	08-1150	—	—	—	—	0.0002	U	—	—	0.006
GW14-08-12949 F	200805141015	5/14/2008	08-1153	1.27	0.29	0.01	—	0.0002	U	—	0.33	0.006
GW14-08-12956 F	200805141015	5/14/2008	08-1151	—	—	—	—	0.0002	U	—	—	0.006
GW14-08-12963 F	200805141015	5/14/2008	08-1150	—	—	—	—	0.0002	U	—	—	0.006
GW14-08-12971 F	200805141015	5/14/2008	08-1153	1.24	0.28	0.01	—	0.0002	U	—	0.33	0.006
GW14-08-12941 NF	200805140945	5/14/2008	08-1152	—	—	—	—	0.0002	U	7.57	—	0.006
GW14-08-12942 NF	200805141015	5/14/2008	08-1152	—	—	—	—	0.0002	U	7.38	—	0.006
GW14-08-12969 NF	200805141015	5/14/2008	08-1152	—	—	—	—	0.0002	U	7.63	—	0.006
GW14-08-12970 NF, B	200805141015	5/14/2008	08-1152	0.01	0.00	0.01	—	0.0002	U	5.44	0.03	0.001

[a]U = Undetected.

[b]— = Sample request not taken; sample not collected for analysis.

Table A-2
Laboratory Analytical Results for R-14 Screen 1
in May 2008

Sample ID	Date Collected	Date Received	ER/RRES-WQH	stdev (Rb)	S2- rslt (ppm)	S2- (U)	Sb rslt (ppm)	Se rslt (ppm)	stdev (Se)	Si rslt (ppm)	stdev (Si)	SiO2 rslt (ppm)
GW14-08-12948 F	200805140945	5/14/2008	08-1153	0.000	—	—	0.001	0.001	—	35.6	0.3	76.2
GW14-08-12955 F	200805140945	5/14/2008	08-1151	0.000	—	—	0.001	0.001	—	36.6	0.1	78.3
GW14-08-12962 F	200805140945	5/14/2008	08-1150	0.000	—	—	0.001	0.001	—	36.2	0.6	77.6
GW14-08-12949 F	200805141015	5/14/2008	08-1153	0.000	—	—	0.001	0.001	—	36.4	0.2	77.8
GW14-08-12956 F	200805141015	5/14/2008	08-1151	0.000	—	—	0.001	0.001	—	35.4	0.2	75.8
GW14-08-12963 F	200805141015	5/14/2008	08-1150	0.000	—	—	0.001	0.001	—	35.4	0.3	75.7
GW14-08-12971 F	200805141015	5/14/2008	08-1153	0.000	—	—	0.001	0.001	—	35.5	0.2	76.0
GW14-08-12941 NF	200805140945	5/14/2008	08-1152	0.000	0.01	U	0.001	0.001	—	36.0	0.2	77.0
GW14-08-12942 NF	200805141015	5/14/2008	08-1152	0.000	0.01	U	0.001	0.001	—	35.4	0.1	75.7
GW14-08-12969 NF	200805141015	5/14/2008	08-1152	0.000	0.01	U	0.001	0.001	—	33.7	0.1	72.2
GW14-08-12970 NF, B	200805141015	5/14/2008	08-1152	U	0.01	U	0.001	0.001	—	0.11	0.00	0.24

[a]U = Undetected.

[b]— = Sample request not taken; sample not collected for analysis.

Table A-2
Laboratory Analytical Results for R-14 Screen 1
in May 2008

Sample ID	Date Collected	Date Received	ER/RRES-WQH	stdev (SiO2)	Sn rslt (ppm)	stdev (Sn)	SO4(-2) rslt (ppm)	Sr rslt (ppm)	stdev (Sr)	Th rslt (ppm)	Ti rslt (ppm)	Tl rslt (ppm)	U rslt (ppm)
GW14-08-12948 F	200805140945	5/14/2008	08-1153	0.7	0.001	—	3.6	0.054	0.000	0.001	0.002	0.001	0.0007
GW14-08-12955 F	200805140945	5/14/2008	08-1151	0.1	0.001	—	—	0.055	0.000	0.001	0.002	0.001	0.0007
GW14-08-12962 F	200805140945	5/14/2008	08-1150	1.3	0.001	—	—	0.054	0.000	0.001	0.002	0.001	0.0007
GW14-08-12949 F	200805141015	5/14/2008	08-1153	0.3	0.001	—	3.05	0.055	0.000	0.001	0.002	0.001	0.0008
GW14-08-12956 F	200805141015	5/14/2008	08-1151	0.4	0.001	—	—	0.053	0.000	0.001	0.002	0.001	0.0008
GW14-08-12963 F	200805141015	5/14/2008	08-1150	0.5	0.001	—	—	0.054	0.000	0.001	0.002	0.001	0.0007
GW14-08-12971 F	200805141015	5/14/2008	08-1153	0.4	0.001	—	3.14	0.054	0.000	0.001	0.002	0.001	0.0008
GW14-08-12941 NF	200805140945	5/14/2008	08-1152	0.4	0.001	—	—	0.054	0.001	0.001	0.002	0.001	0.0008
GW14-08-12942 NF	200805141015	5/14/2008	08-1152	0.3	0.001	—	—	0.054	0.000	0.001	0.002	0.001	0.0008
GW14-08-12969 NF	200805141015	5/14/2008	08-1152	0.3	0.001	—	—	0.052	0.000	0.001	0.002	0.001	0.0008
GW14-08-12970 NF, B	200805141015	5/14/2008	08-1152	0.00	0.001	—	0.4	0.001	U	0.001	0.002	0.001	0.0002

[a]U = Undetected.

[b]— = Sample request not taken; sample not collected for analysis.

Table A-2
Laboratory Analytical Results for R-14 Screen 1
in May 2008

Sample ID	Date Collected	Date Received	ER/RRES-WQH	stdev (U)	V rslt (ppm)	stdev (V)	Zn rslt (ppm)	stdev (Zn)	TDS (ppm)	Cations	Anions	Balance
GW14-08-12948 F	200805140945	5/14/2008	08-1153	0.0000	0.007	0.000	0.002	0.000	109	1.27	—	—
GW14-08-12955 F	200805140945	5/14/2008	08-1151	0.0000	0.007	0.000	0.005	0.000	104	1.28	—	—
GW14-08-12962 F	200805140945	5/14/2008	08-1150	0.0000	0.007	0.000	0.001	U	104	1.29	—	—
GW14-08-12949 F	200805141015	5/14/2008	08-1153	0.0000	0.006	0.000	0.002	0.000	111	1.27	—	—
GW14-08-12956 F	200805141015	5/14/2008	08-1151	0.0000	0.007	0.000	0.006	0.000	102	1.28	—	—
GW14-08-12963 F	200805141015	5/14/2008	08-1150	0.0000	0.007	0.000	0.001	U	102	1.27	—	—
GW14-08-12971 F	200805141015	5/14/2008	08-1153	0.0000	0.007	0.000	0.002	0.000	102	1.26	—	—
GW14-08-12941 NF	200805140945	5/14/2008	08-1152	0.0000	0.006	0.000	0.003	0.000	183	1.26	1.32	-0.02
GW14-08-12942 NF	200805141015	5/14/2008	08-1152	0.0000	0.007	0.000	0.002	0.000	180	1.25	1.31	-0.02
GW14-08-12969 NF	200805141015	5/14/2008	08-1152	0.0000	0.007	0.000	0.002	0.000	176	1.23	1.31	-0.03
GW14-08-12970 NF, B	200805141015	5/14/2008	08-1152	U	0.001	U	0.001	U	2	0.01	0.04	-0.45

[a]U = Undetected.

[b]— = Sample request not taken; sample not collected for analysis.

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? **pCi/L >UL 1**	3H plume? **pCi/L >UL 17**	Field pH	Low pH? **SU >LL 6.4**	High pH? **SU <UL 9.0**	Test Gen-1	Alkalinity (mg/L CaCO3)	Test Gen-2 **mg/L <UL 157**	Turbidity (NTU)	Test Gen-3 **NTU <UL 5**	Acetone (ug/L)	Test B1 **ug/L <UL 5**	NH3-N (mg/L)	Test B2 **mg/L <UL 0.05**	TKN (mg/L)	Test B3 **mg/L <UL 0.46**	TOC (mg/L)	Lab Qual Code	Test B4 **mg/L <UL 1.37**	Ba ug/L	Test D3 **ug/L >LL 1.4**	Test E1 **ug/L <UL 57**	Ca mg/L	Test E2a **mg/L >LL 4.3**
R-14	1205	1	29-Feb-08	1	n/a[a]	n/a	n/a	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
R-14	1205	1	29-Feb-08	5	n/a	n/a	n/a	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
R-14	1205	1	29-Feb-08	11	n/a	n/a	n/a	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
R-14	1205	1	29-Feb-08	17	n/a	n/a	n/a	7.70 Fld	Yes	Yes	P	76 F	P	0.82	P	ND	ND	ND	ND	ND	ND	n/a	n/a	n/a	55	P	P	10.0	Yes

[a]n/a = Not applicable.
[b]— = Sample request not taken; sample not collected for analysis.

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	Test E2b	Test E2	Cl mg/L	Test A1	F mg/L	Test A2	Mg mg/L	Test E3	NO3-N mg/L	Test Gen-5	Test C10	ORP	Test C3	DO	Test C11	ClO4 ug/L	Test Gen-4	Test C7	PO4-P	UOM	Test A6	Na mg/L	Molar Ratio Na/Cl	Test A4	SO4 mg/L	Test C1	Test A5
					mg/L <UL 42	**Within range**		**mg/L <UL 3.6**		**mg/L <UL 0.57**		**mg/L <UL 4.2**		**<UL 0. 89**	**mg/L >LL 0.01**		**mV >LL 0**		**mg/L >LL 2**		**<UL 0.5**	**ug/L >LL 0.22**	**Threshold as P 0.34**		**mg/L P <UL 0.08**			**mg/L <UL 25**		**mg/L >LL 1.7**	**mg/L <UL 7.2**
R-14	1205	1	29-Feb-08	1	Yes	P	3.0	P	0.32	P	2.72	P	0.346	P	P	83	P	6.3	P	<5	DL	DL	0.26	mg/L as PO4	P	10.4	5.3	P	5.4	P	P
R-14	1205	1	29-Feb-08	5	Yes	P	3.0	P	0.32	P	2.67	P	0.349	P	P	13	P	4.5	P	<5	DL	DL	0.25	mg/L as PO4	P	10.3	5.3	P	5.2	P	P
R-14	1205	1	29-Feb-08	11	Yes	P	2.9	P	0.37	P	2.77	P	0.366	P	P	n/a	n/a	3.7	P	<5	DL	DL	0.23	mg/L as PO4	P	10.3	5.5	P	4.9	P	P
R-14	1205	1	29-Feb-08	17	Yes	P	3.0	P	0.29	P	2.85	P	0.395	P	P	n/a	n/a	4.1	P	<5	DL	DL	0.21	mg/L as PO4	P	10.0	5.1	P	4.2	P	P

[a]n/a = Not applicable.
[b]— = Sample request not taken; sample not collected for analysis.

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	Test A1	Cr (F) ug/L	Test Gen-6	Test C9	Cr (NF) ug/L	Test F3	Ratio Cr (NF/F)	Test F4	Fe (F) ug/L	Test C5	Fe (NF) ug/L	Test F1	Ratio Fe(NF/F)	Test F2	Mn (F) ug/L	Test C6	Ni (F) ug/L	Test F5	Sr ug/L	Test D2	Test E3	U ug/L	Test C8	Test D1
						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**		**ug/L >LL 0.06**	**ug/L >LL 0.06**
R-14	1205	1	29-Feb-08	1	0.01	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	1.0	P	P
R-14	1205	1	29-Feb-08	5	0.01	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	1.1	P	P
R-14	1205	1	29-Feb-08	11	0.01	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	1.1	P	P
R-14	1205	1	29-Feb-08	17	0.01	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	1.2	P	P

[a] n/a = Not applicable.
[b] — = Sample request not taken; sample not collected for analysis.

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	Test E5	V ug/L	Test C4	Zn ug/L	Test D4	Tests Passed	Tests Failed	Total Tests with P/Fail Outcome	% Pass	Is 3H detected?	Category C	General Indicators						
					ug/L <UL 1.9		**>LL 2.27**		**ug/L >LL 0.4**						**Redox Indicators Fe/Mn Fe**	**Mod water 3H UL=1**	**Gen-1 In pH range**	**Gen-2 Alk UL=52**	**Gen-3 Turb UL=5**	**Gen-4 ClO4 UL=0.5**	**Gen-5 NO3-N UL=0.89**	**Gen-6 Cr UL=5.75**
R-14	1205	1	29-Feb-08	1	P	6	P	5	P	33	1	34	97	n/a[a]	Fe	ND	P	P	P	DL	P	P
R-14	1205	1	29-Feb-08	5	P	7	P	5	P	33	1	34	97	n/a	Fe	ND	P	P	P	DL	P	P
R-14	1205	1	29-Feb-08	11	P	7	P	6	P	32	1	33	97	n/a	Fe	ND	P	P	P	DL	P	P
R-14	1205	1	29-Feb-08	17	P	7	P	5	P	32	1	33	97	n/a	Fe	ND	P	P	P	DL	P	P

[a] n/a = Not applicable.
[b] — = Sample request not taken; sample not collected for analysis.

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 A Inorganic Indicators						Category B Organic Indicators				Category C1 Redox (SO4)			Category C2 Redox (Fe/Mn)						Category C3 Redox (NO3)		
					A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	D1
					B	Cl	Na	SO4	F	PO4	Ace	NH3	TKN	TOC	SO4	S	ORP	V	Fe	Mn	ClO4	U	Cr	NO3-N	DO	U
					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	LL=2.27	UL=14	UL=124	LL=0.2	LL=0.06	LL=0.3	LL=0.0	LL=2	LL=0.0
R-14	1205	1	29-Feb-08	1	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	P	P	DL	P	P	P	P	P
R-14	1205	1	29-Feb-08	5	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	P	P	DL	P	P	P	P	P
R-14	1205	1	29-Feb-08	11	P	P	P	P	P	P	ND	ND	ND	P	P	P	Fail	P	P	P	DL	P	P	P	P	P
R-14	1205	1	29-Feb-08	17	P	P	P	P	P	P	ND	ND	ND	P	P	P	Fail	P	P	P	DL	P	P	P	P	P

[a] n/a = Not applicable.
[b] — = Sample request not taken; sample not collected for analysis.

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 Adsorption				Category E Carbonate Mineralogy						Category F Metal Corrosion					Categories under Which Drilling Flags are to be Assigned					
					D2	D3	D4	E1	E2a	E2b	E2	E3	E4	E5	F1	F2	F3	F4	F5	A	B	C	D	E	F
					Sr	Ba	Zn	Ba	Ca	Ca	Ca	Mg	Sr	U	FeT	FeR	CrT	CrR	Ni						
					LL=44	LL=4.	LL=0.4	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-14	1205	1	29-Feb-08	1	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	—[b]	—	Fe	—	—	—
R-14	1205	1	29-Feb-08	5	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	—	—	Fe	—	—	—
R-14	1205	1	29-Feb-08	11	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	—	—	Fe	—	—	—
R-14	1205	1	29-Feb-08	17	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	—	—	Fe	—	—	—

[a] n/a = Not applicable.
[b] — = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 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
						pCi/L >UL 1	pCi/L >UL 17		SU >LL 6.4	SU <UL 9.0			mg/L <UL 157		NTU <UL 5
R-14	1205	1	5-May-08	1	ND	No	No	7.81	Yes	Yes	P	79	P	1.13	P
R-14	1205	1	5-May-08	2	ND	No	No	7.75	Yes	Yes	P	78	P	1.62	P

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event	Acetone (ug/L)	Test B1	NH3-N (mg/L)	Test B2	TKN (mg/L)	Test B3	TOC (mg/L)	Test B4	Ba ug/L	Test D3	Test E1	Ca mg/L
						ug/L <UL 5		mg/L <UL 0.05		mg/L <UL 0.46		mg/L <UL 1.37		ug/L >LL 1.4	ug/L <UL 57	
R-14	1205	1	5-May-08	1	ND	ND	ND	ND	ND	ND	0.9	P	52	P	P	10.6
R-14	1205	1	5-May-08	2	ND	ND	ND	ND	ND	ND	0.71	P	53	P	P	10.6

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event	Test E2a	Test E2b	Test E2	Cl mg/L	Test A1	F mg/L	Test A2	Mg mg/L	Test E3	NO3-N mg/L	Test Gen-5	Test C10	ORP	Test C3
					mg/L >LL 4.3	mg/L <UL 42	Within range		mg/L <UL 3.6		mg/L <UL 0.57		mg/L <UL 4.2		<UL 0. 89	mg/L >LL 0.01		mV >LL 0
R-14	1205	1	5-May-08	1	No	Yes	P	1.99	P	0.20	P	3.0	P	0.253	P	P	101	P
R-14	1205	1	5-May-08	2	No	Yes	P	2.31	P	0.20	P	3.0	P	0.287	P	P	109	P

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event	DO	Test C11	ClO4 ug/L	Test Gen-4	Test C7	PO4-P	Test A6	Na mg/L	Molar Ratio Na/Cl	Test A4	SO4 mg/L	Test C1
						mg/L >LL 2		<UL 0.5	ug/L >LL 0.22	Threshold as P 0.34	mg/L P <UL 0.08			mg/L <UL 25		mg/L >LL 1.7
R-14	1205	1	5-May-08	1	2.5	P	ND	ND	ND	0.41	P	10.1	7.8	P	3.60	P
R-14	1205	1	5-May-08	2	2.7	P	ND	ND	ND	0.33	P	10.2	6.8	P	3.05	P

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event	Test A5	Sulfide	Test C2	B ug/L	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
					mg/L <UL 7.2		mg/L <UL 0.01		<UL 38.77			<UL 5.75	ug/L >LL 0.39			ug/L <UL 10		Ratio <UL 5
R-14	1205	1	5-May-08	1	P	<0.01	P	14	P	3.00	U[a]	P	P	3	U	P	1	NA
R-14	1205	1	5-May-08	2	P	<0.01	P	13.9	P	3.00	U	P	P	3	U	P	1	NA

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event	Fe (F) ug/L	Test C5	Fe (NF) ug/L	Test F1	Ratio Fe(NF/F)	Test F2	Mn (F) ug/L	Test C6	Ni (F) ug/L	Lab Qual Code	Test F5	Sr ug/L	Test D2
						ug/L <UL 147		ug/L <UL 1270		Ratio <UL 10		ug/L <UL 124			ug/L <UL 50		ug/L >LL 44
R-14	1205	1	5-May-08	1	10	P	30	Yes	3.00	P	7	P	<1	U	P	54	P
R-14	1205	1	5-May-08	2	10	P	20	Yes	2.00	P	7	P	<1	U	P	55	P

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event	Test E3	U ug/L	Test C8	Test D1	Test E5	V ug/L	Test C4	Zn ug/L	Test D4	Tests Passed	Tests Failed	Total tests with P/Fail Outcome	% Pass
					ug/L <UL 540		ug/L >LL 0.06	ug/L >LL 0.06	ug/L <UL 1.9		>LL 2.27		ug/L >LL 0.4				
R-14	1205	1	5-May-08	1	P	0.7	P	P	P	7	P	2	P	34	0	34	100
R-14	1205	1	5-May-08	2	P	0.8	P	P	P	6	P	2	P	34	0	34	100

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event	Is 3H Detected?	General Indicators						
						Mod Water	Gen-1	Gen-	Gen-3	Gen-4	Gen-5	Gen-6
						3H	In pH	Alk	Turb	ClO4	NO3-N	Cr
						UL=1	range	UL=5	UL=5	UL=0.5	UL=0.89	UL=5.75
R-14	1205	1	5-May-08	1	No	No	P	P	P	DL	P	P
R-14	1205	1	5-May-08	2	No	No	P	P	P	DL	P	P

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event	Category A Inorganic Indicators						Category B Organic Indicators				Category C1 Redox (SO4)		
					A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	C1	C2	C3
					B	Cl	Na	SO4	F	PO4	Ace	NH3	TKN	TOC	SO4	S	ORP
					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-14	1205	1	5-May-08	1	P	P	P	P	P	P	ND	ND	ND	P	P	P	P
R-14	1205	1	5-May-08	2	P	P	P	P	P	P	ND	ND	ND	P	P	P	P

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event	Category C2 Redox (Fe/Mn)						Category C3 Redox (NO3)			Category D Adsorption		
					C4	C5	C6	C7	C8	C9	C10	C11	D1	D2	D3	D4
					V	Fe	Mn	ClO4	U	Cr	NO3-N	DO	U	Sr	Ba	Zn
					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=4.9	LL=0.4
R-14	1205	1	5-May-08	1	P	P	P	DL	P	P	P	P	P	P	P	P
R-14	1205	1	5-May-08	2	P	P	P	DL	P	P	P	P	P	P	P	P

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event		Category E Carbonate Mineralogy						Category F Metal Corrosion					Categories a	
					E1	E2a	E2b	E2	E3	E4	E5	F1	F2	F3	F4	F5	A	B
					Ba	Ca	Ca	Ca	Mg	Sr	U	FeT	FeR	CrT	CrR	Ni		
					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-14	1205	1	5-May-08	1	P	P	P	P	P	P	P	Yes	P	P	P	P	—[b]	—
R-14	1205	1	5-May-08	2	P	P	P	P	P	P	P	Yes	P	P	P	P	—	—

[a] U = Undetected.
[b] — = Sample request not taken; sample not collected for analysis.

Table B-2
Results of Well Screen Analysis for R-14 (Screen 1)
During the Pumping Test Conducted in May 2008

Well	Port Depth (ft)	Scr #	Sample Collection Date	Event	Under Which Drilling Flags re to be Assigned			
					C	D	E	F
R-14	1205	1	5-May-08	1	—	—	—	—
R-14	1205	1	5-May-08	2	—	—	—	—

[a]U = Undetected.
[b]— = Sample request not taken; sample not collected for analysis.

Appendix C

Westbay Retrieval Report

Westbay Instruments Inc.
3480 Gilmore Way, Suite 110
Burnaby, BC V5G 4Y1
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:

APPENDIX

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

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: _____

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

Casing Retrieval Log
Los Alamos National Lab

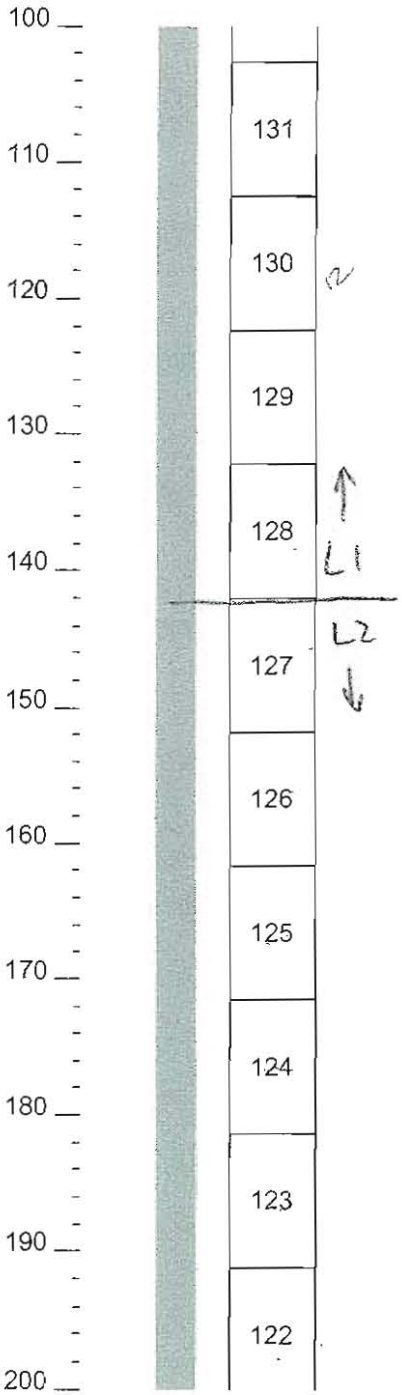
Job No: WB777
Well: R14

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.

Scale Feet	MP Casing	QA Tested OK	MP Casing Description	Notes
	143	5' mp ✓		
0				— LOAD = 2400
	142	☑	0601M30 - MP55 Casing, 3.0 m, PVC	then to 2300 lb
10		☑	0602 - MP55 Regular Coupling	
	141	☑	0601M15 - MP55 Casing, 1.5 m, PVC	~100 lb friction
		☑ ✓	0602 - MP55 Regular Coupling	— LOAD = 2200
20	140	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	2200 lb.
30	139	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	LOAD = 2200
40	138	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	2200 lb
50	137	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
60	136	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	2150 lb
70	135	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	2300 lift
80	134	☑	0601M30 - MP55 Casing, 3.0 m, PVC	2150 hang
		☑	0602 - MP55 Regular Coupling	
90	133	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
100	132	☑	0601M30 - MP55 Casing, 3.0 m, PVC	

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14

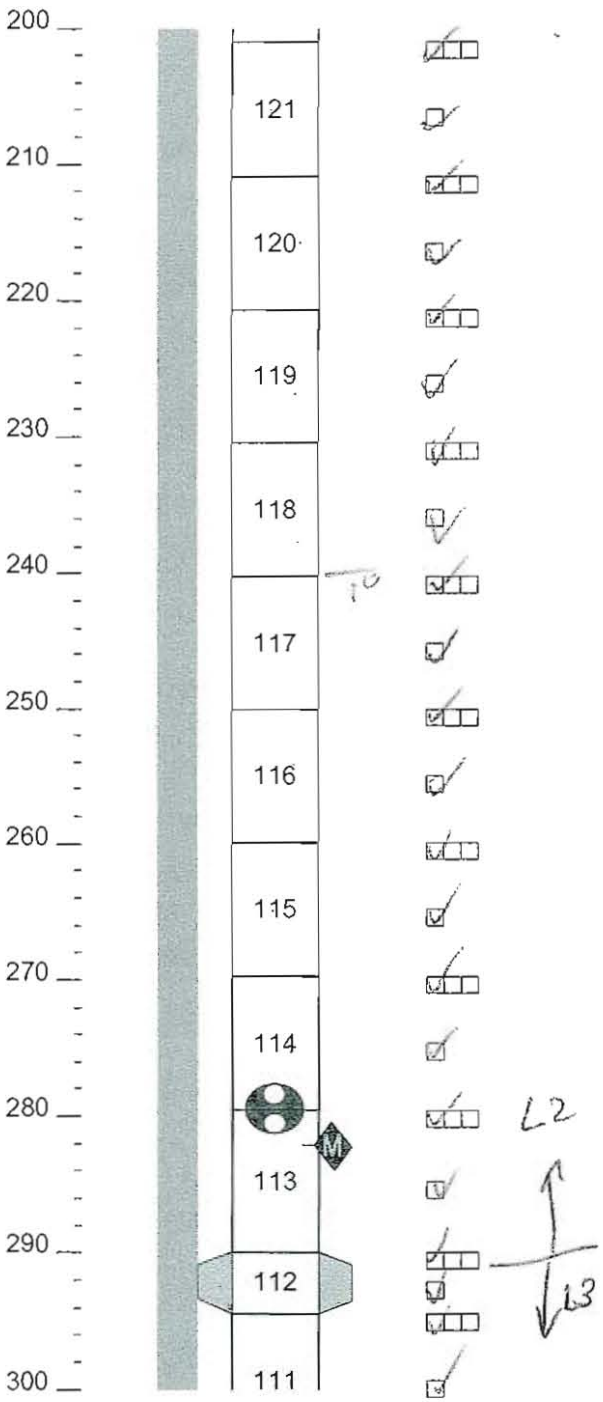


QA Tested OK	MP Casing Description
☑	0602 - MP55 Regular Coupling
☑	0601M30 - MP55 Casing, 3.0 m, PVC
☑	0602 - MP55 Regular Coupling
☑	0601M30 - MP55 Casing, 3.0 m, PVC
☑	0602 - MP55 Regular Coupling LIFT=2250 HANG=2100 lb
☑	0601M30 - MP55 Casing, 3.0 m, PVC
☑	0602 - MP55 Regular Coupling Hang = 2100
☑	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 Spica 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

 Printed Feb 03 11:46:50 2008

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

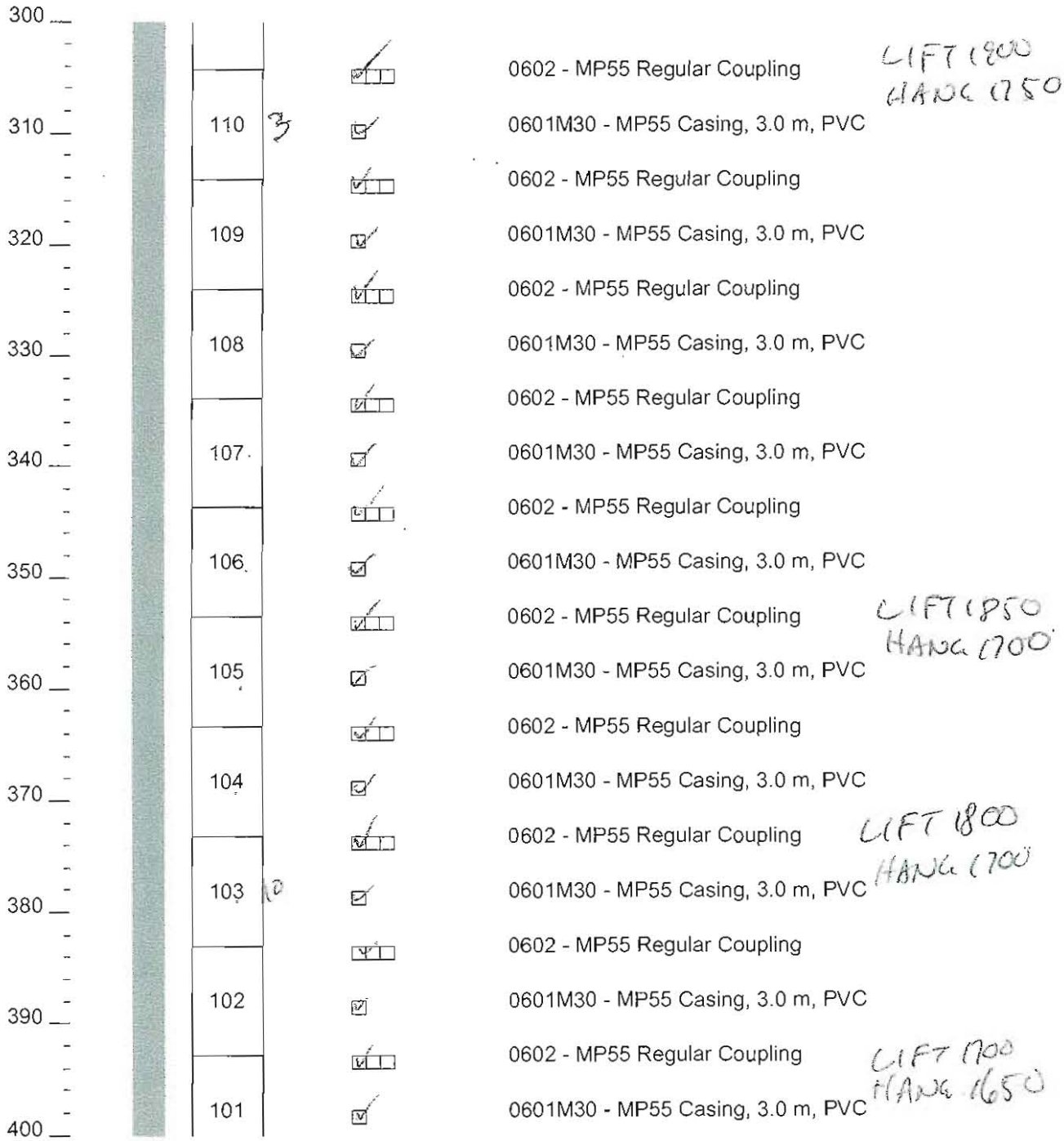
LIFT 2000
HANG 1800

LIFT 1900
HANG 1800

EXTERIOR CLEAN, NO SIGN OF WATER.

Casing Retrieval Log
Los Alamos National Lab

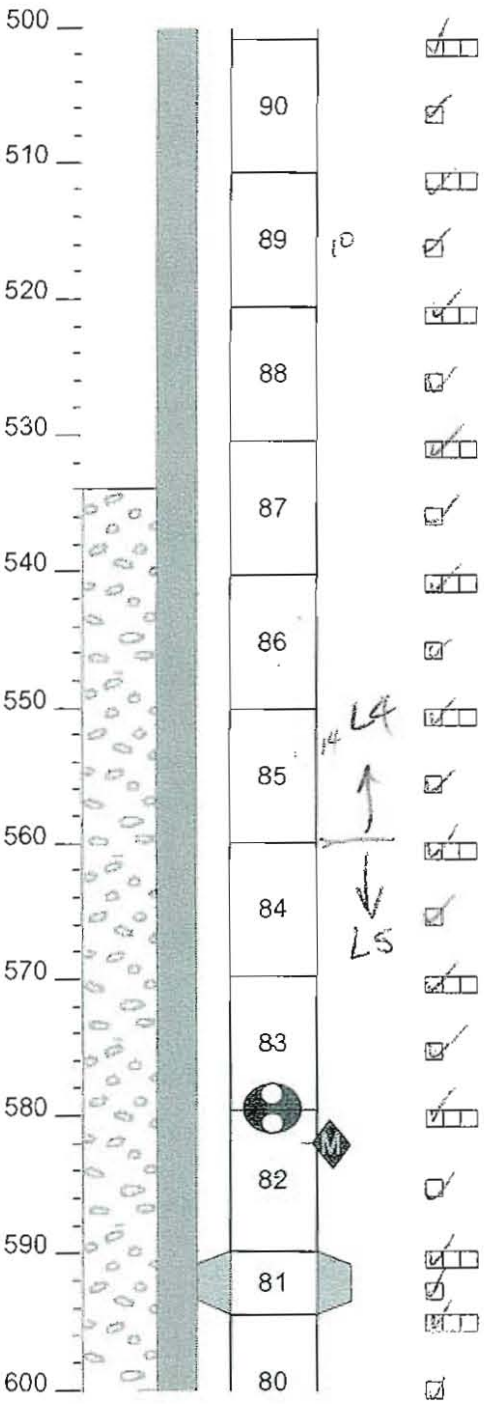
Job No: WB777
Well: R14



Scale Feet	MP Casing	QA Tested OK	MP Casing Description	Notes
400		☑	0602 - MP55 Regular Coupling	— LIFT 000
410	100	☑	0601M30 - MP55 Casing, 3.0 m, PVC	13 HANG 1650
		☑	0602 - MP55 Regular Coupling	L3
420	99	☑	0601M30 - MP55 Casing, 3.0 m, PVC	↑
		☑	0602 - MP55 Regular Coupling	↓ L4
430	98	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	— LIFT 1750
440	97	☑	0601M30 - MP55 Casing, 3.0 m, PVC	HANG 1650
		☑	0602 - MP55 Regular Coupling	
450	96	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
460	95	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
470	94	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	— LIFT 1700
480	93	☑	0601M30 - MP55 Casing, 3.0 m, PVC	HANG 1600
		☑	0602 - MP55 Regular Coupling	
490	92	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
500	91	☑	0601M30 - MP55 Casing, 3.0 m, PVC	

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



LIFT 1650
HANG 1550

LIFT 1600
HANG 1500

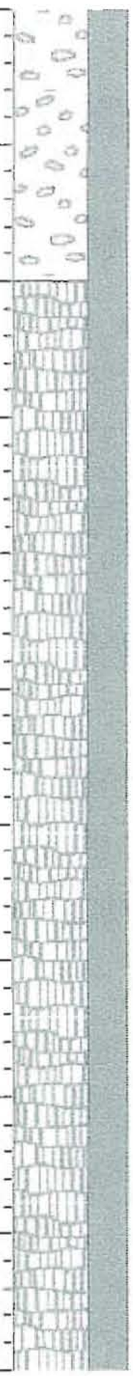
LIFT 1550
HANG 1450

LIFT 1500
HANG 1400

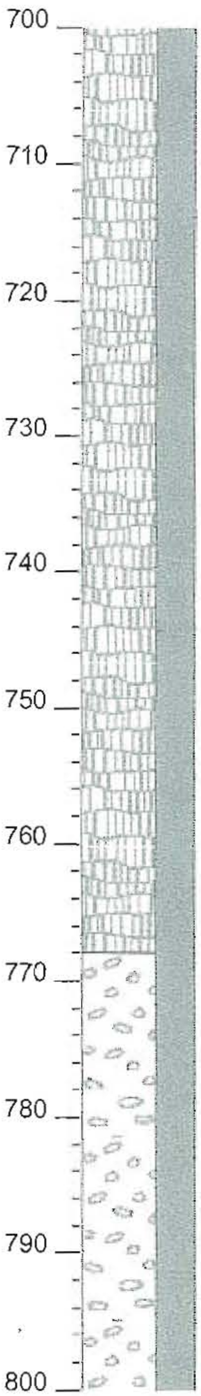
In Feb 03 11:46:58 2008

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



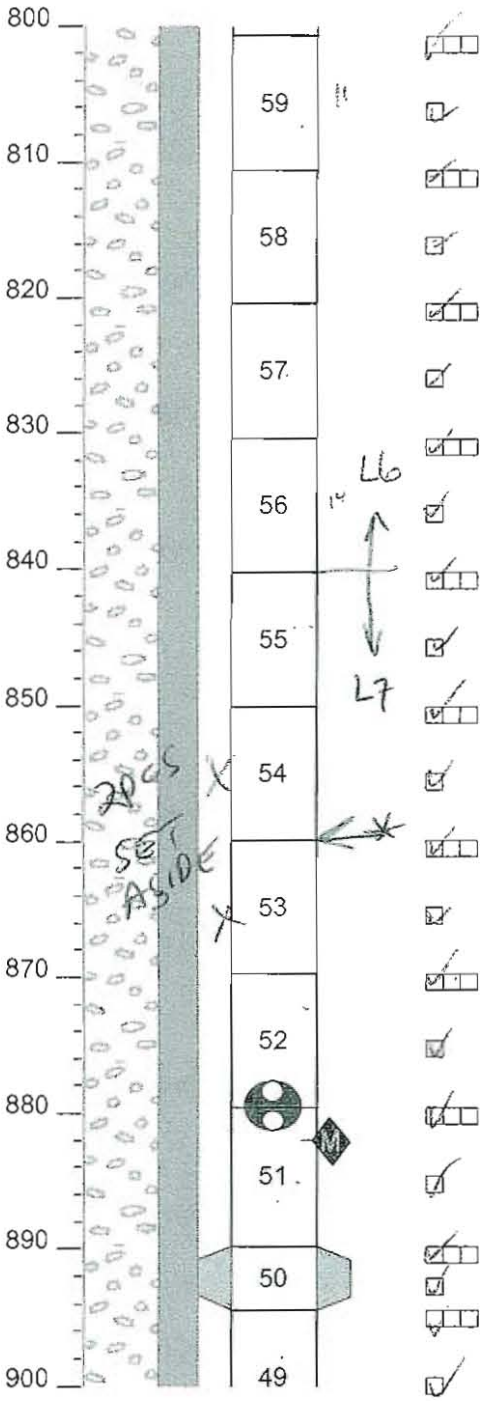
Scale Feet	MP Casing		QA Tested OK	MP Casing Description	
600			☑	0602 - MP55 Regular Coupling	
610	79	5	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
			☑	0602 - MP55 Regular Coupling	LIFT 1400 HANG 1300
620	78		☑	0601M30 - MP55 Casing, 3.0 m, PVC	
			☑	0602 - MP55 Regular Coupling	
630	77		☑	0601M30 - MP55 Casing, 3.0 m, PVC	
			☑	0602 - MP55 Regular Coupling	LIFT 1350 HANG 1300
640	76		☑	0601M30 - MP55 Casing, 3.0 m, PVC	
			☑	0602 - MP55 Regular Coupling	
650	75		☑	0601M30 - MP55 Casing, 3.0 m, PVC	
			☑	0602 - MP55 Regular Coupling	
660	74	10	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
			☑	0602 - MP55 Regular Coupling	
670	73		☑	0601M30 - MP55 Casing, 3.0 m, PVC	
			☑	0602 - MP55 Regular Coupling	LIFT 1300 HANG 1250
680	72		☑	0601M30 - MP55 Casing, 3.0 m, PVC	
			☑	0602 - MP55 Regular Coupling	
690	71		☑	0601M30 - MP55 Casing, 3.0 m, PVC	
			☑	0602 - MP55 Regular Coupling	
700	70		☑	0601M30 - MP55 Casing, 3.0 m, PVC	



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

Casing Retrieval Log
Los Alamos National Lab

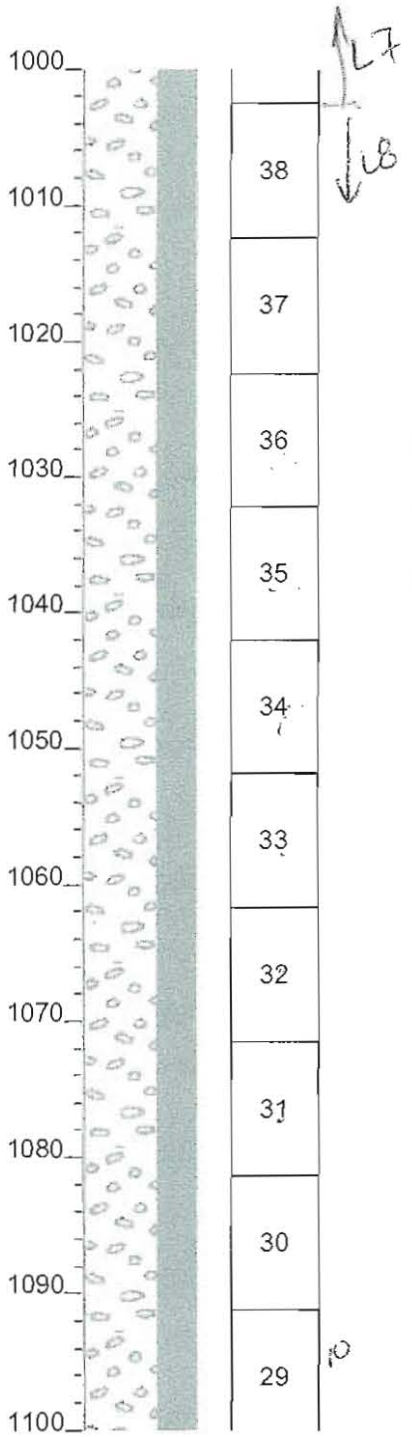
Job No: WB777
Well: R14



Scale Feet	MP Casing	QA Tested OK	MP Casing Description	Notes
900				
		☑	0602 - MP55 Regular Coupling	LIFT 900 HANG 850
910	48 (5)	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
920	47	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
930	46	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	LIFT 850 HANG 800
940	45	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
950	44	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
960	43 (10)	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	LIFT 800 HANG 750
970	42	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
980	41	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
990	40	☑	0601M30 - MP55 Casing, 3.0 m, PVC	
		☑	0602 - MP55 Regular Coupling	
1000	39	☑	0601M30 - MP55 Casing, 3.0 m, PVC	

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14

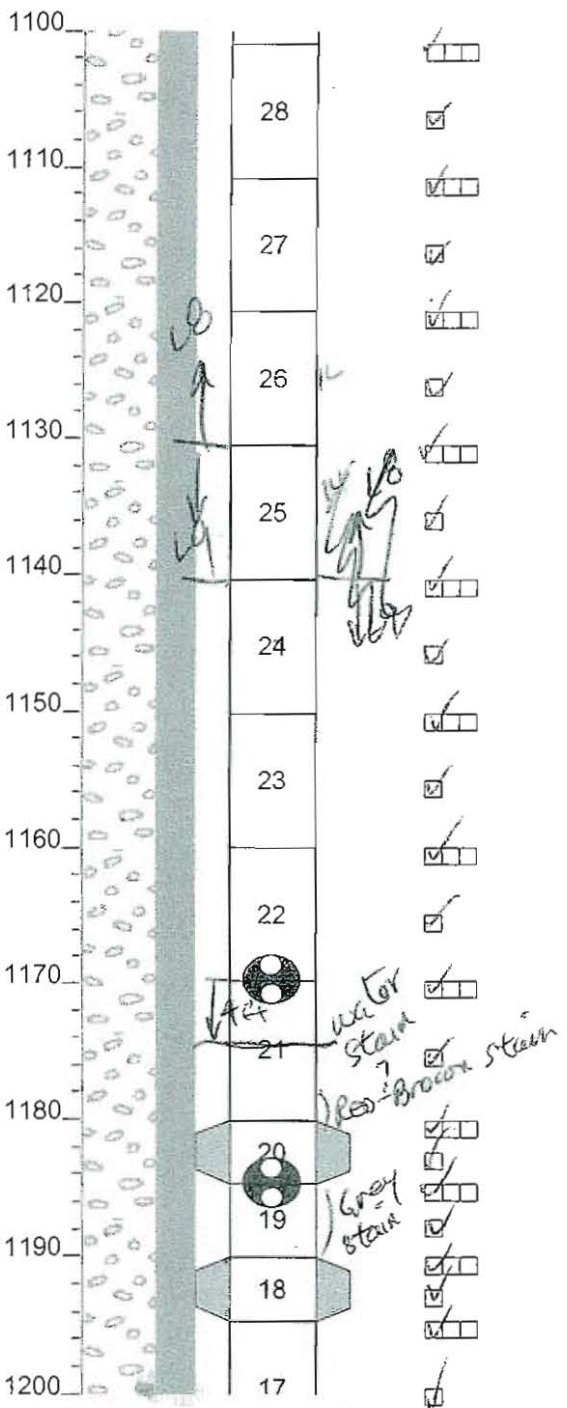


QA Tested OK	MP Casing Description	
☑	0602 - MP55 Regular Coupling	LIFT 750 HANG 700
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	
☑	0601M30 - MP55 Casing, 3.0 m, PVC	
☑	0602 - MP55 Regular Coupling	LIFT 700 HANG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

In Feb 03 11:47:06 2008

Casing Retrieval Log
Los Alamos National Lab

Job No: WB777
Well: R14



 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		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		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		0601M15 - MP55 Casing, 1.5 m, PVC
					0607 - MP55 Hydraulic Pumping Port
			2		0601M15 - MP55 Casing, 1.5 m, PVC
1300					

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

X shear wires broke. Cut w/ saw

Casing Retrieval Log
Los Alamos National Lab

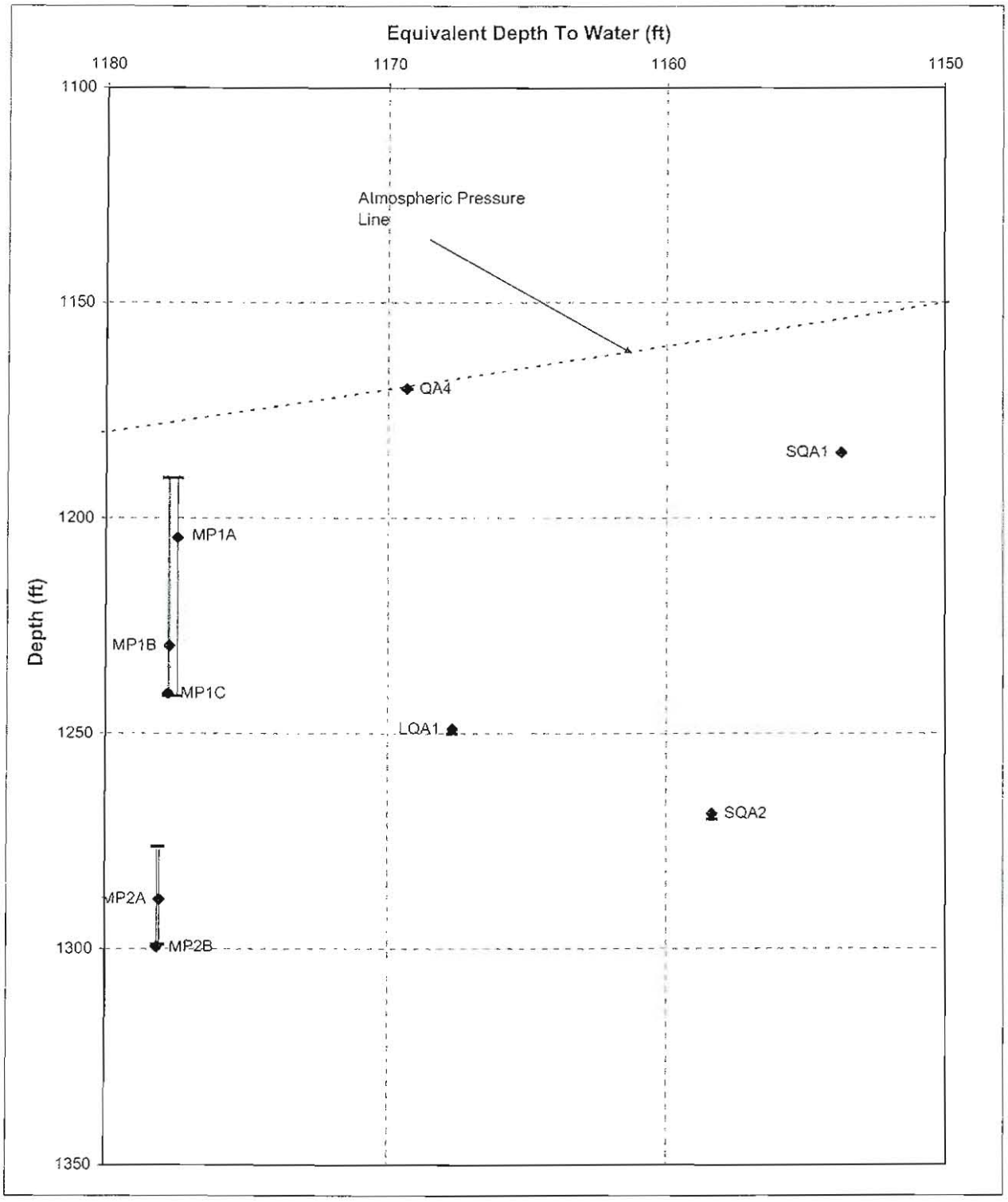
Job No: WB777
Well: R14

Scale Feet	Geolo	Well Casing	MP Casing	QA Tested OK	MP Casing Description
1300					
1310			1	✓	0601M30 - MP55 Casing, 3.0 m, PVC
1320				✓	0603 - MP55 End Plug Coupling
1330					DONE LIFTING 1300hr
1340					
1350					
1360					
1370					
1380					
1390					
1400					

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: DL Date: 20 Feb 08
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 R1A
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 777
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: 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
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		1162.7	
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 Dz = piezometric level in zone Patm = atmospheric pressure
H = pressure head of water in zone Dp = true depth of measurement port

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: MP55

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).

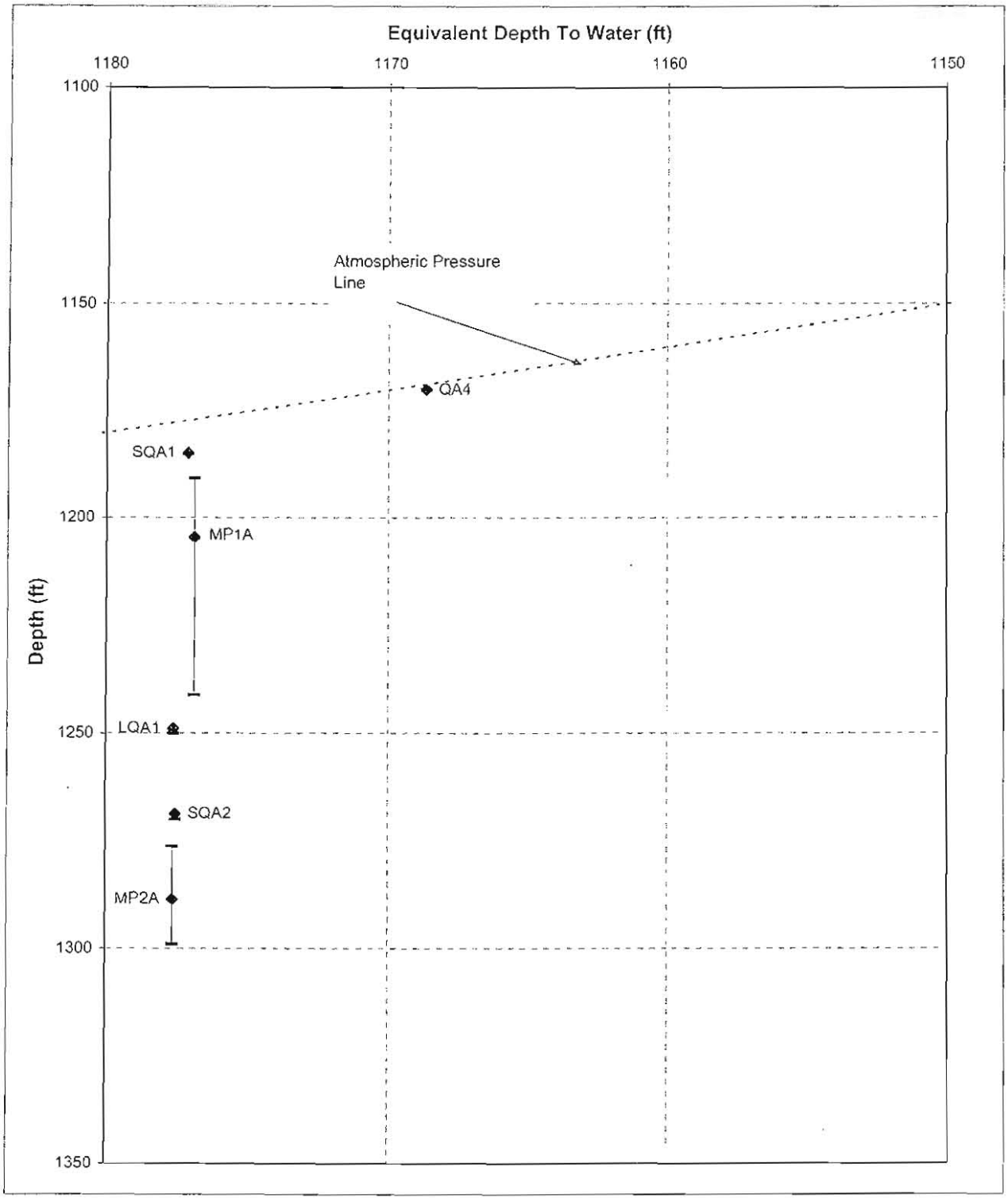
Ambient Reading (P_{atm}) (pressure, temperature, time)
Start: Finish:
P_{atm} psi

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	~~20.47~~		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
H = pressure head of water in zone
Dz = piezometric level in zone
Dp = true depth of measurement port
Patm = atmospheric pressure

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.: WB277
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_{ntm}) (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~~	~~1291.3~~		~~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	22.37	1513			
MP1A	1209.5	1209.8		25.59	23.56		22.36	1516		1177.0	
					23.62	25.58	22.25	1518			
SQA1	1184.8	1185.0		17.06	~~23.62~~ 14.98		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

92/2

POST DEFLATION

Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: RI4

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 (ft)	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 Dz = piezometric level in zone Palm = atmospheric pressure

H = pressure head of water in zone Op = true depth of measurement port

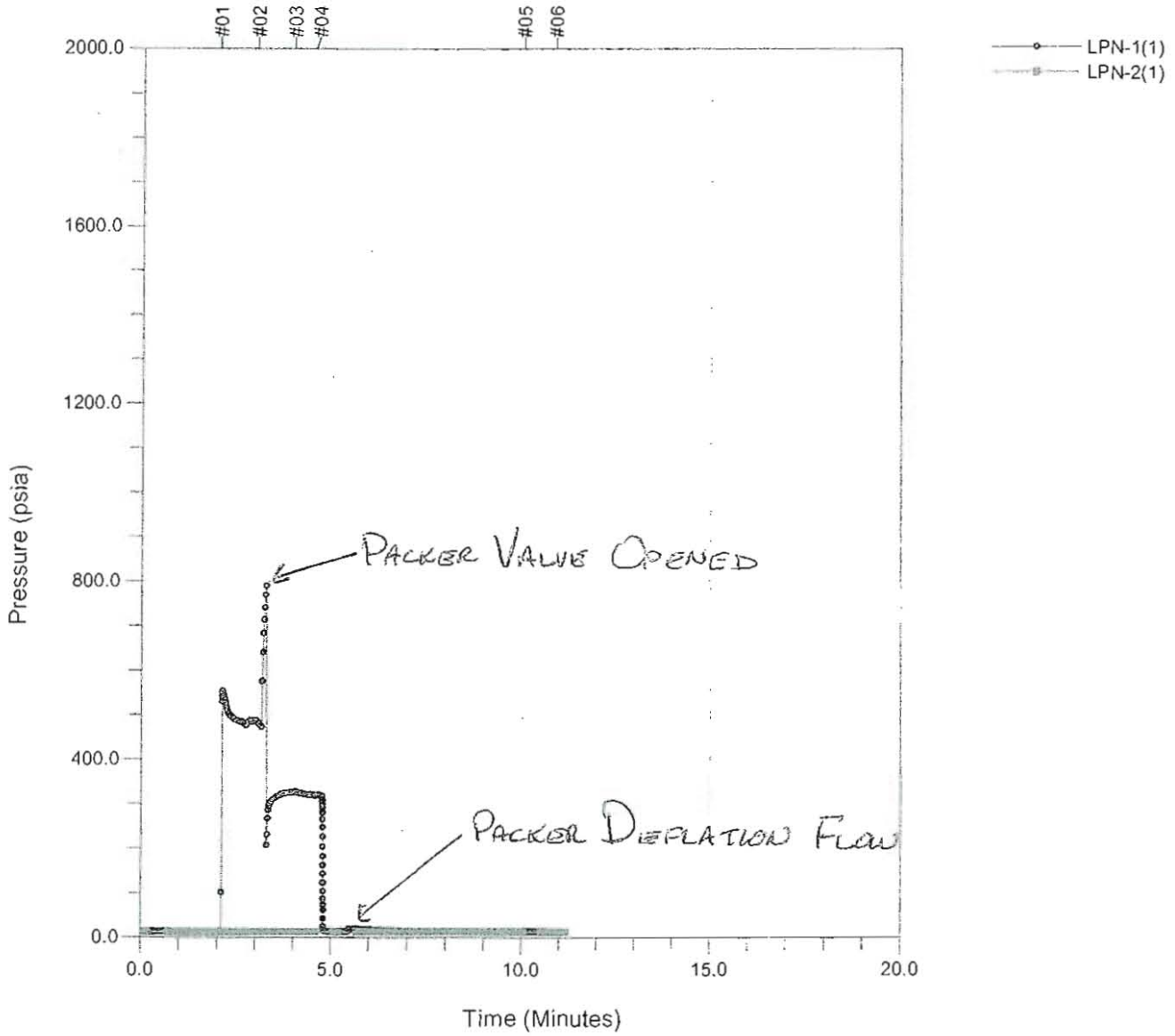
Packer Deflation

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: 20080508

Checked By:_____ Date:_____



TZero: Sat Feb 09 22:00:00 2008

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

R14_P1D.WDF

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Schlumberger WATER SERVICES

MP55 Packer Inflation Field Record

Project: 777	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	520	11.9	1403:10	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.

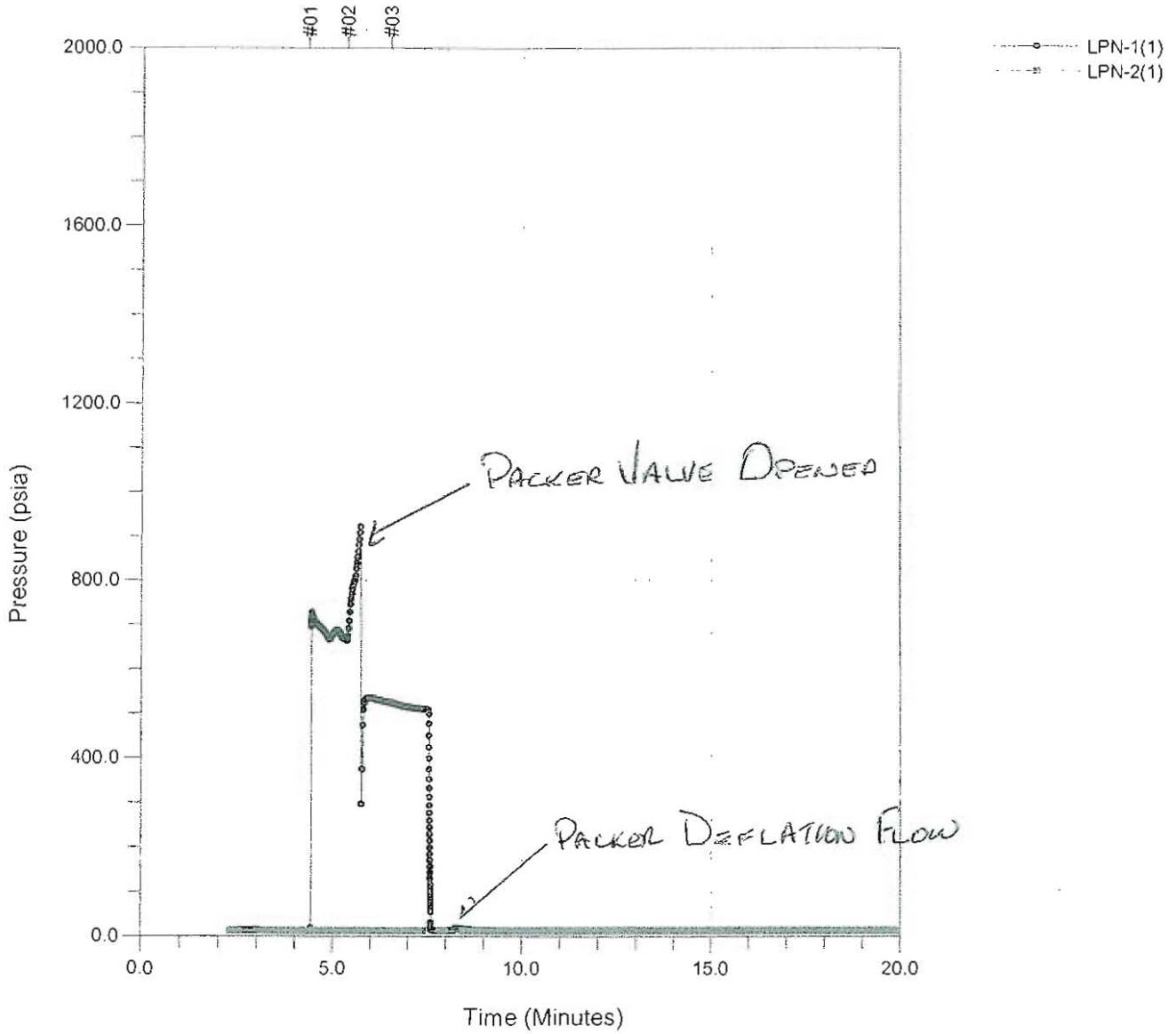
Packer Deflation

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
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	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	669	12.0	1312	2	Pump slowly
						up to 890 the drop
						to 250. rise to 532
						→ PKR VALVE OPEN
0.5	1200↓	532	12.0	1313	3	TIE-OFF / VENT
	to 890					
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↓ as
		12.4	12.0	1316:30		Pkr vents thru tool
						LAUNCH
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

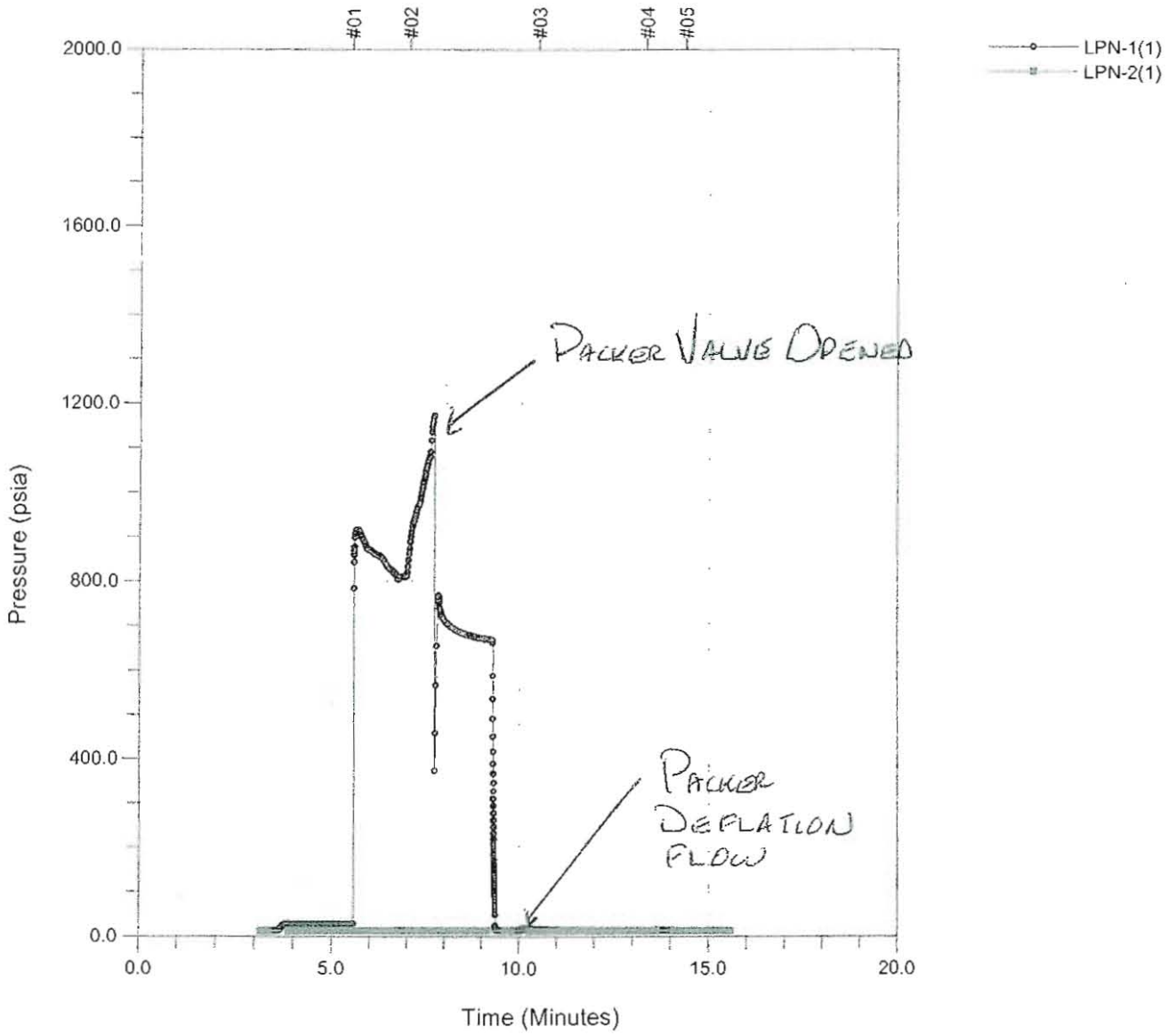
Packer Deflation

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

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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

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	12.1	1230	—	START LOGGING / SHOE OUT
0	0	26.3	12.1	1231		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	~~END~~ SHOE IN
0.1	0	11.8	12.1	1241	5	END See bounce No
						Pressure as pkr vents

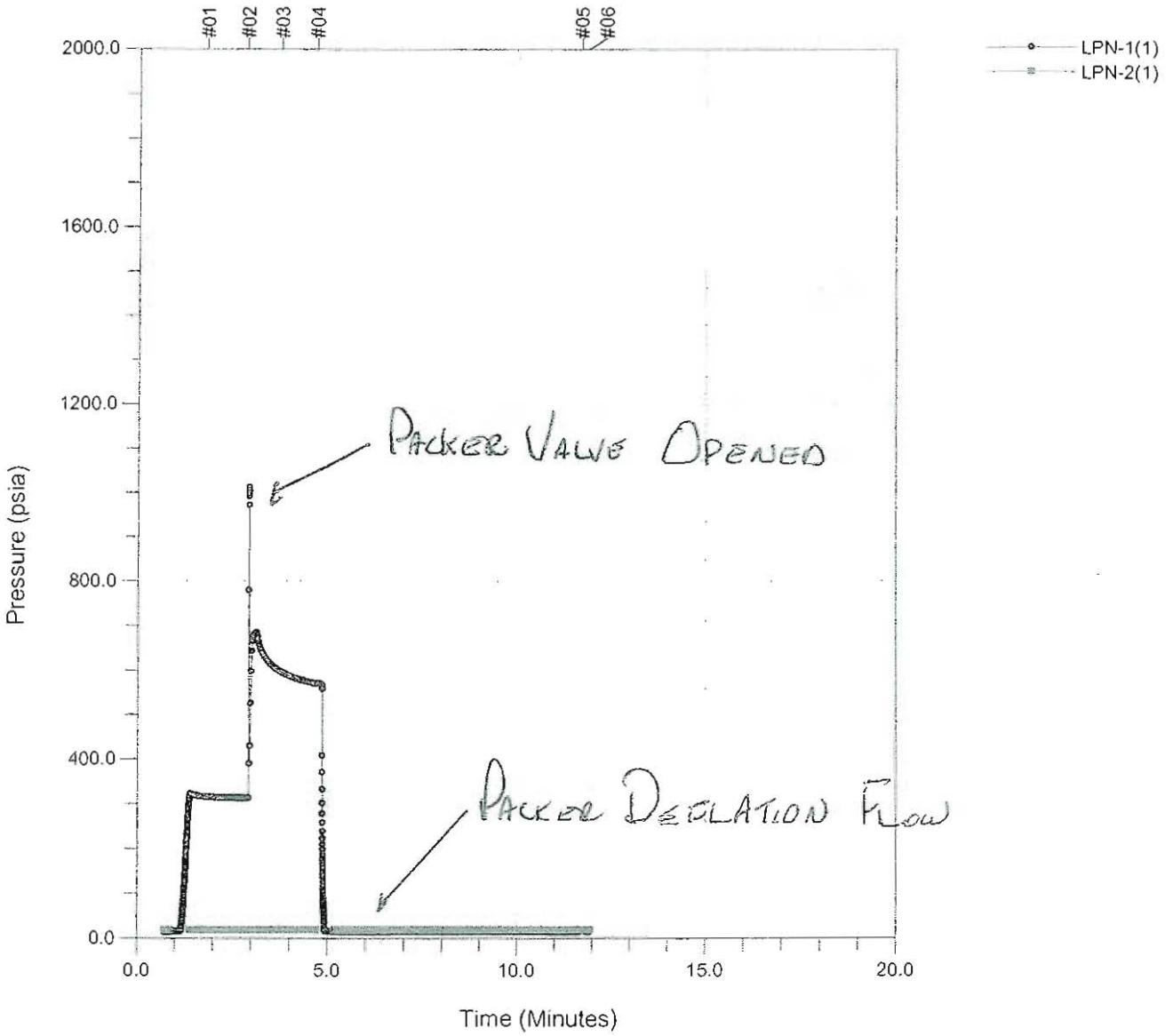
Packer Deflation

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

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Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

Project: WB777 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

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	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 = S.NF
						P 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
0.1	0	14.2	19.0	1211		= 1.0 ft water
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

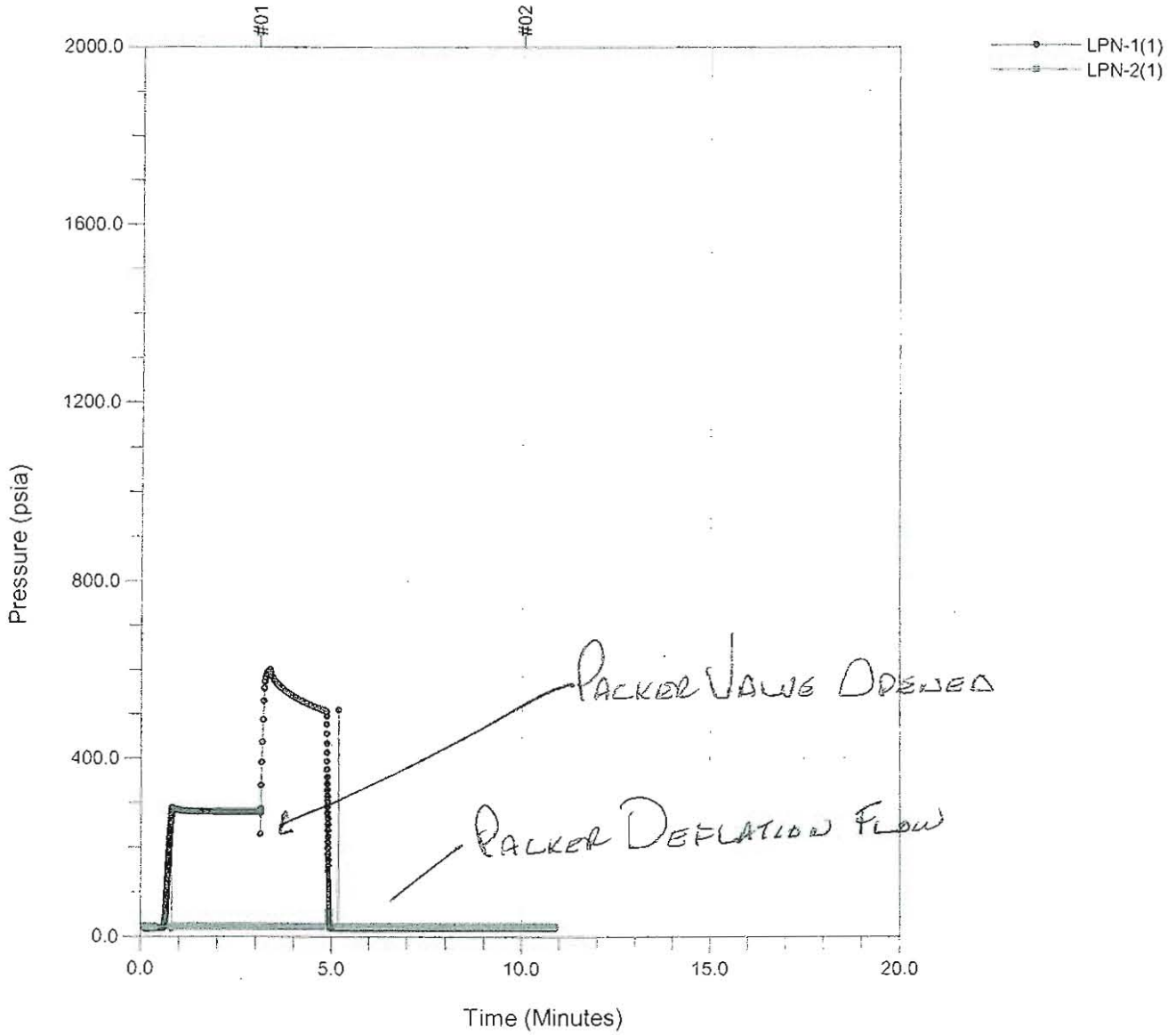
Packer Deflation

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

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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 = 0.6 psi
						= 1.0 ft.
0.2	0	18.1	22.9	1200	3 2	END
						CONCLUSION
						→ Pkr valve open
						and pkr deflated

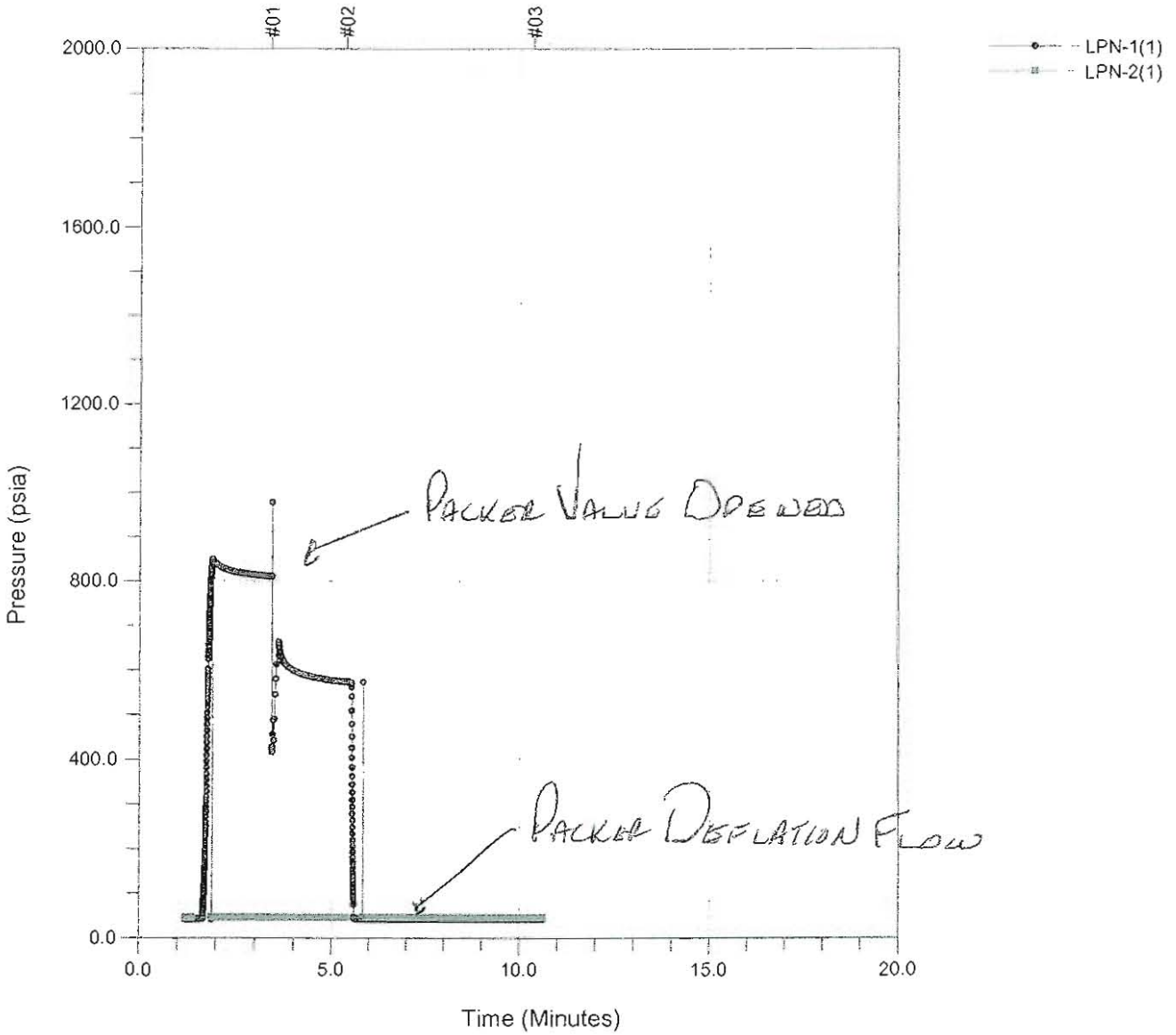
Packer Deflation

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: DL	Date: 09 FEB 2000
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 ENS 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
						= 1.0 l
						∴ PKR VALVE IS OPEN
0.1	0	41.7	46.5	1142	3	END

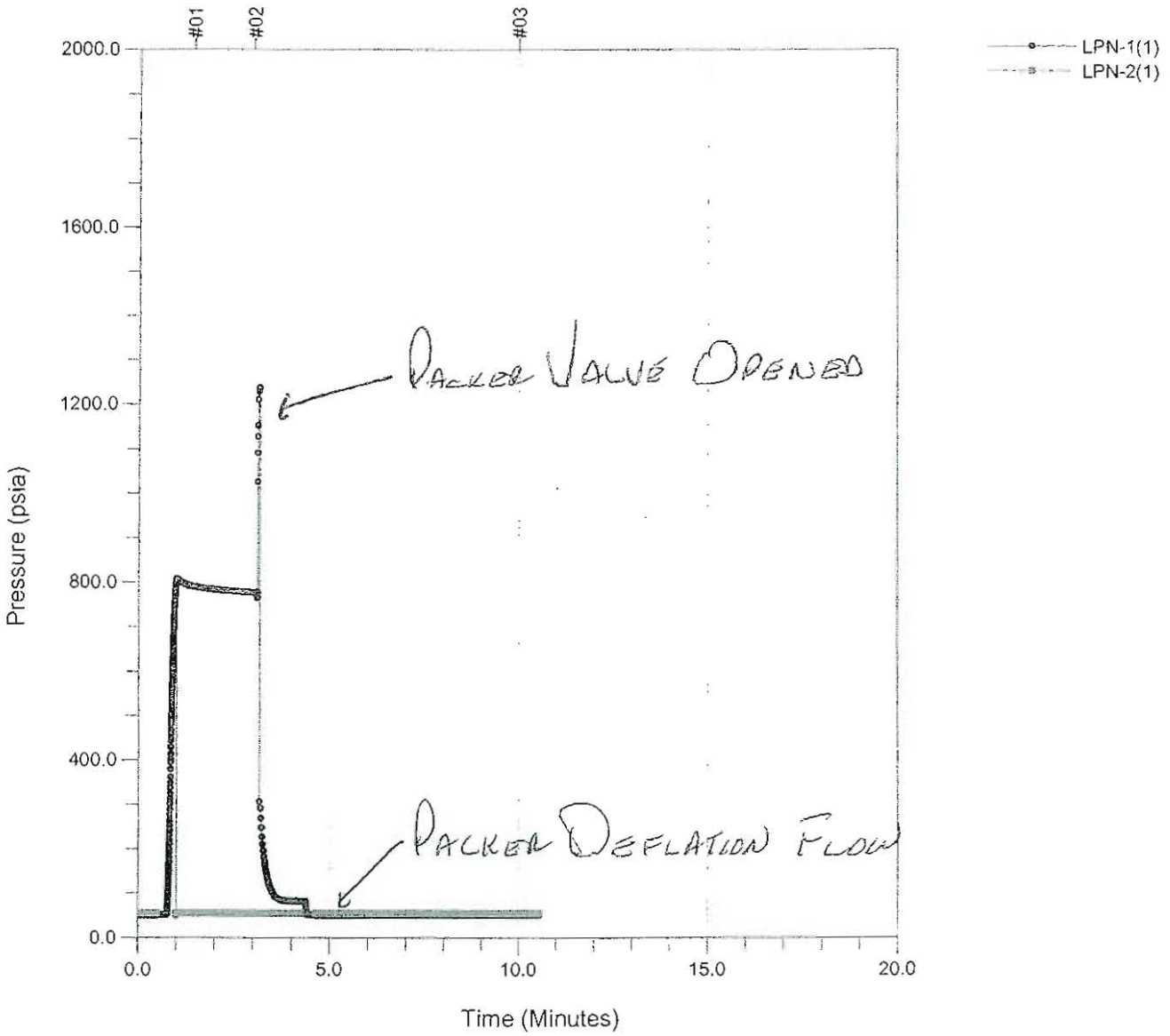
Packer Deflation

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

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

SECOND DEFLATION

Project: WB 777 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-P702 .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 WC.
						END
						CONCLUSION: PKR VALVE IS OPEN

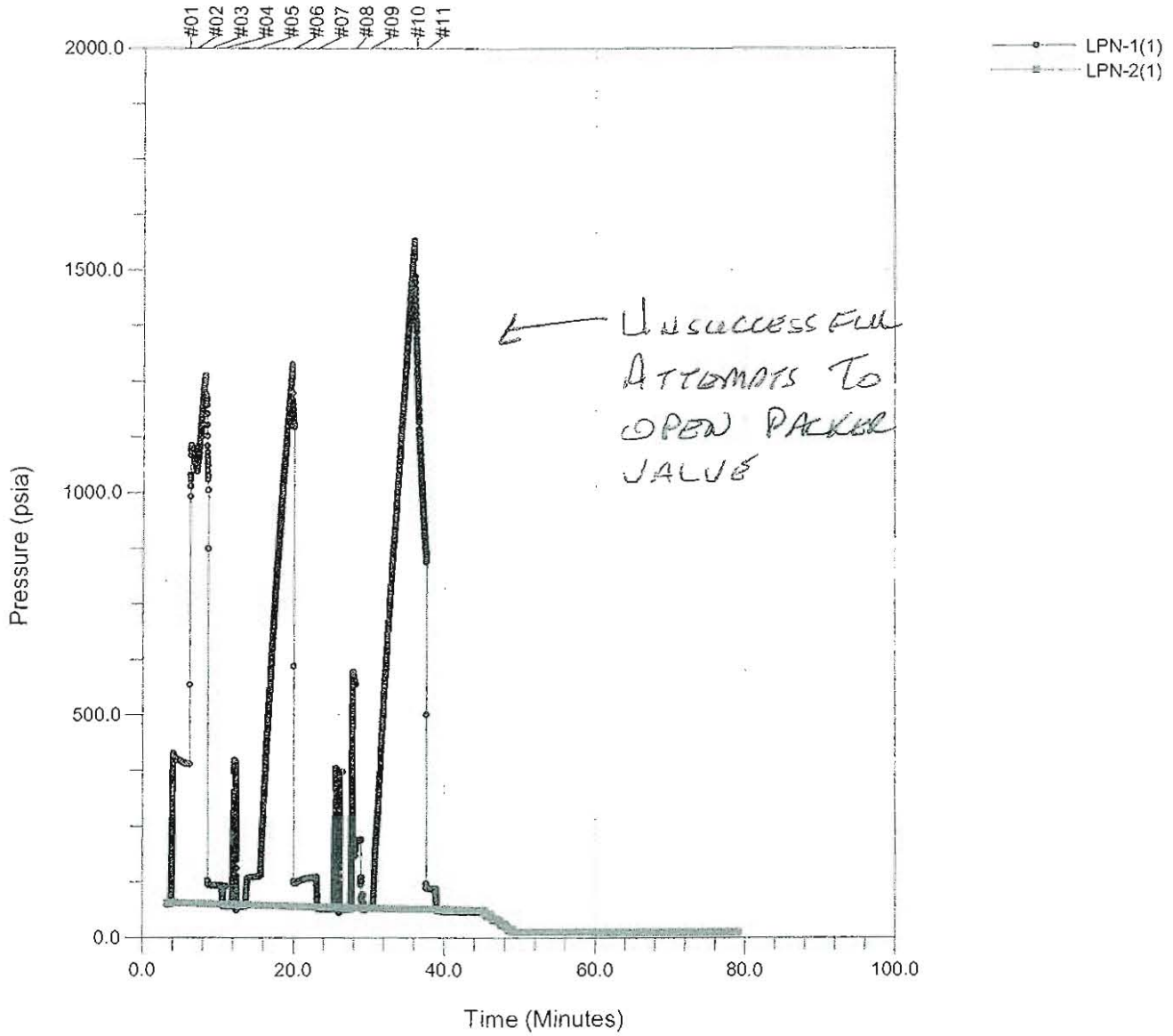
Packer Deflation

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: 08 Feb
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

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	737	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. P9 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
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 pup.
						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		

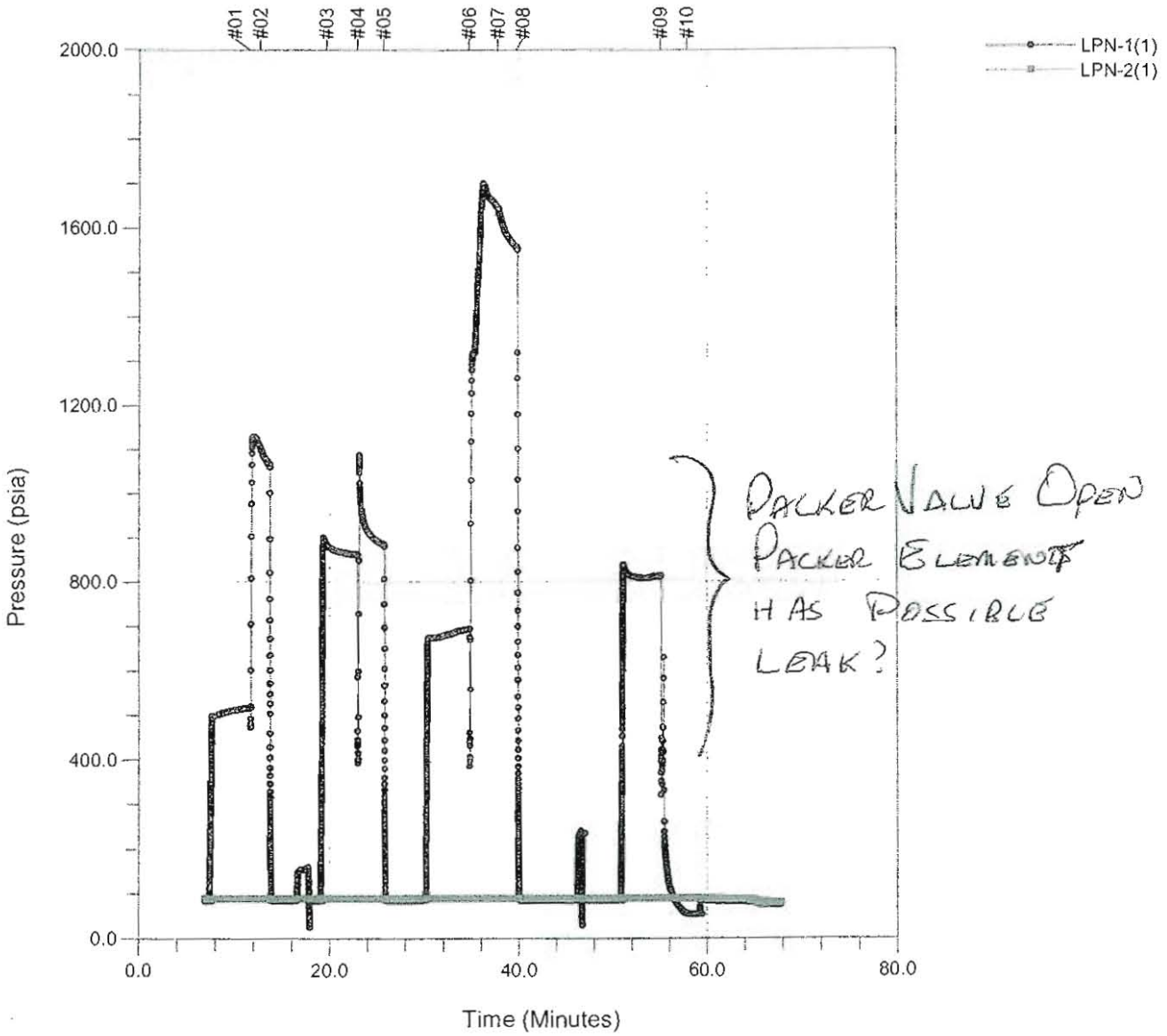
Packer Deflation

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: WB777 Client: TPMC	By: DL Date: 08Feb2008
Location: Los Alamos Well No. R14	Borehole Diameter: 4 ½
Packer No. PB Depth: 1274.1	Computer Data File: R14_PBD .WDF
Inf-Tool No. HE2325 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 pmp? 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 pmp.
			89.31	1321		TIE SHOE OUT
0.7	0	84.6	89.31	1322		- NO SQUEEZE, Pkr valve is open.
						TIE SHOE OUT
0.7	0	6734	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

Pumping Information I = Inflate, O = Off, C = Close

Volume (litres)	Pressure			Clock	Comments	
	Line (psig)	Inf. Tool (psia)	Vent Tool (psia)		Tag No.	Text
0.7	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 = 89.44 - 89.25 = 0.24 psi = 0.17 m = 0.5 l - this vol seems small.
				~~1338~~		
				1339		TIE SHOE OUT AFTER RE-LAND SQUEEZE = 233 psi
						Shoe-in - see reaction & 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 GMS, i.e. 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. i.e. WL inside PKR dropping PKR likely burst.
						END
4.1	0	83.04	87.59	1356		

Schlumberger WATER SERVICES

MP55 Packer Deflation Field Record

Project: WB77	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
0	0	53.67	58.60	1056	-	SHOE OUT, start logging TIE=OFF
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)