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Date: July 31, 2008
Refer To: EP2008-0381

James P. Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the Response to the Direction for Further Action at Well R-20 Rehabilitation and Conversion Summary Report and Revision 1 of the Summary Report

References: 1. Letter, Bearzi to Messrs. Gregory and McInroy, dated February 11, 2008
2. Letter, Messrs. Gregory and McInroy to Bearzi, dated March 1, 2008

Dear Mr. Bearzi:

On February 11, 2008, the New Mexico Environment Department (NMED) provided a direction for further rehabilitation action at well R-20 (reference 1). The letter directed the following actions: (1) analysis of increased iron concentrations using geochemical models, (2) rehabilitation using an oxygen release compound, and (3) installation of the sampling system. It required that the rehabilitation approach (comment 2) be proposed by March 1, 2008, and a revised report on the modeling and rehabilitation results by July 31, 2008.

The Los Alamos National Laboratory (LANL) responded in a letter on March 1 (reference 2) and followed up in a meeting with NMED on April 15, 2008. A verbal agreement was reached between NMED and LANL at the April 15 meeting that use of an oxygen release compound to improve R-20 would be unnecessary, based on analytical results from additional sample collection and geochemical modeling.

The enclosed report, "Well R-20 Conversion and Rehabilitation Summary Report, Revision 1," documents the additional sampling, geochemical modeling, and installation of the permanent sampling system. These actions are also addressed in the enclosed response to direction for further action at well R-20 and the enclosed crosswalk that indicates where NMED's comments on the original report are addressed in the revision.

If you have any questions, please contact Ardyth Simmons at (505) 665-3935 (asimmons@lanl.gov) or David Gregory at (505) 667-5808 (dgregory@doeal.gov).

Sincerely,

Susan G. Stiger, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

David R. Gregory, Project Director
Environmental Operations
Los Alamos Site Office

SS/DG/PH/AS:sm

Enclosures: 1) Two hard copies with electronic files – Response to the Direction for Further Action at Well R-20 Rehabilitation and Conversion Summary Report (EP2008-0381)
2) Two hard copies with electronic files – Well R-20 Rehabilitation and Conversion Summary Report, Revision 1 (EP2008-0301)
3) Cross-reference table of NMED comments

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Response to the "Direction for Further Action at Well R-20 Rehabilitation and Conversion Summary Report, Los Alamos National Laboratory, EPA ID No: NM0890010515, HWB-LANL-GROUNDWATER-MISC," Dated February 11, 2008

INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department's (NMED's) comments are included verbatim. Los Alamos National Laboratory's (LANL's or the Laboratory's) responses follow each NMED comment.

NMED Comment

1. **Analysis of Increased Iron Concentrations Using Geochemical Models**

In the Conclusion Section of the Report, the Permittees attribute the increases in dissolved iron concentrations measured from Screens 1 and 2 of R-20 during the December 2007 sampling events to three potential conditions. They are: (1) reductive dissolution of iron minerals that are naturally present as components of the local geologic materials; (2) oxidation of iron sulfides that have been accumulated in the vicinity of the well screens due to drilling fluid impacts; and (3) presence of reduced groundwater in the regional aquifer outside the zones impacted by drilling fluids. Although all three conditions could potentially cause increases in dissolved iron concentrations in groundwater, the site-specific data help eliminate the possibility that the first and third potential occurrences are major factors in raising dissolved iron concentrations in groundwater.

Both reductive dissolution of iron minerals and development of reduced groundwater in the regional aquifer would most likely be caused by the presence of organics including residual drilling fluids. However, total organic carbon (TOC) concentrations measured during the 2007 sampling events are all close to the groundwater background level and passed the criteria established for well screen analysis, as shown in Tables B-1a and B-1b of the Report. In the absence of organic [carbon] as a driving force, reductive dissolution of iron minerals could not be sustained, and the continuous increases in dissolved iron concentrations in groundwater (as shown in Figure 2.6-6 of the Report) should not be observed.

Furthermore, if the increases in dissolved iron concentrations were due to reductive dissolution of iron minerals or reduced conditions of the formation water, other lines of supporting evidence, such as reduced nitrate concentrations and elevated manganese concentrations, should be observed as a result of the sequence of redox reactions. As documented in the Well Screen Analysis Report, Revision 2, iron reduction occurs as one of a sequence of redox reactions after nitrate reduction and manganese reduction. This case is not supported by the data obtained from screens 1 and 2 of R-20 during the 2007 sampling events because both nitrate and manganese concentrations remained close to their respective background levels and passed the criteria established for the well screen analysis (Table B-1b of the Report).

The possibility that the formation water is directly contaminated by ferrous or dissolved iron is also very low. Ferrous iron, if present in groundwater outside the drilling fluid impact zones, will react with dissolved oxygen (DO) in groundwater since the site-specific conditions (including temperature and pH) favor such a reaction. In terms of dissolved iron and DO concentrations, the formation water should reach an equilibrium condition because of the relatively long residence (reaction) time. As a

result, the formation water should maintain a concentration pattern over time that displays an inverse relationship between ferrous iron concentrations in groundwater and DO levels. As shown in Figure 2.6-1, 2.6-2 and 2.6-6, however, the accelerating increases in dissolved iron concentrations during the 2007 sampling events are coupled with steady increases in DO concentrations rather than decreases. These data indicate nonequilibrium conditions for dissolved iron and DO in groundwater, suggesting that the dissolved iron Is less likely to come from the formation water outside the drilling fluid impacted zones.

In appears that oxidation of iron sulfides may be causing the increases in dissolved iron concentrations in groundwater, if contamination of water samples by introduced iron is not an issue. During the 2007 sampling events, the extended pumping likely drew fresh formation water into the two screens of R-20. Once the fresh water passed through the drilling fluid impact zones, iron sulfides as new minerals, that accumulated in the vicinity of Screens 1 and 2, may react with DO in groundwater resulting in the increases in dissolved iron and the decreases in DO in groundwater. The observation (in Screen 2 of R-20) of elevated concentrations of sulfate, the other potential product of oxidizing iron sulfides, also supports the likelihood of the occurrence of oxidation of iron sulfides.

To better understand the geochemical reactions that have occurred in the vicinity of Screens 1 and 2 of R-20 , the Permittees must conduct a geochemical modeling analysis of the data collected during the Westbay (before 2006), the July 2006 and the December 2007 sampling events. The geochemical modeling analysis of these data must focus on understanding the reasons for the increases in concentrations of dissolved iron and sulfate during the December 2007 sampling event. The geochemical modeling analysis must investigate the possibility that iron sulfides are oxidized by DO and other potential oxidants under natural groundwater conditions, and identify the limiting factors that could restrict natural oxidation of iron sulfides. These modeling efforts will be useful to develop a rehabilitation strategy to minimize the potential influence of the newly-formed reactive minerals on the quality of water samples collected from well R-20.

LANL Response

1. The report attributed the increases in dissolved iron concentrations measured from screens 1 and 2 of R-20 during the December 2007 sampling events to three potential conditions: (1) reductive dissolution of naturally occurring iron minerals in local aquifer materials, (2) oxidation of iron sulfides that have been accumulated near the well screens due to drilling fluid impacts, and (3) presence of reduced groundwater in the regional aquifer outside the zones impacted by drilling fluids. The collection of additional samples in March 2008, accompanied by geochemical modeling, indicates that none of the three hypotheses were correct. The additional samples were collected through a stainless-steel pipe and filtered through three different filter sizes. These results indicated an absence of colloidal iron and iron concentrations that are representative of the regional aquifer. The results were corroborated by geochemical modeling. The analytical results are discussed in section 4.1, and the modeling is discussed in section 4.2 of the revised report. These results indicate that the mild-steel pipe used to collect samples in November and December 2007 was responsible for the high iron concentrations in those samples. Henceforth, well rehabilitation activities will use a stainless-steel discharge pipe in place of a mild-steel pipe whenever possible.

NMED Comment

2. ***Rehabilitation of R-20 by Using an Oxygen Release Compound***

As discussed in Comment 1, iron sulfides are likely present in the vicinity of Screens 1and 2 of R-20. The newly formed minerals are reactive with certain potential contaminants of concern, and therefore may lead to contaminant concentrations measured in water samples that are lower than those present in the formation water. It appears that the mechanical development procedures that have been used for rehabilitating R-20 may not be as effective as necessary to remove these reactive minerals. The geochemical data suggest that natural oxidation may be a promising method for restoring the formation mineralogy or deactivating the newly formed minerals. Natural oxidation, however, may be too slow to rehabilitate R-20 to timely meet the groundwater monitoring requirements at Technical Area (TA) 54.

The addition of oxygen to groundwater is an economical process to enhance clean up [of] groundwater contamination and restore groundwater to aerobic conditions. A variety of oxygen release compounds that are able to steadily release oxygen to groundwater are available commercially. In terms of R-20, the increased dissolved iron concentrations appear to limit the ability of Screens 1 and 2 to provide reliable data for monitoring certain contaminants of concern (such as volatile organic compounds) identified at TA-54. To expedite restoration of the geologic formation or deactivation of the newly formed minerals in the vicinity of the well screens, the Permittees must develop a method for use of oxygen release compounds (such as hydrogen peroxide) as an enhanced rehabilitation technique. An increase in DO concentrations in groundwater surrounding the well screens will enhance the processes for oxidation of not only iron sulfides, but also any residual organic drilling fluids. The Permittees must propose and implement a technique to further rehabilitate both Screens 1 and 2 of R-20 to minimize potential influence of the reactive minerals on the quality of water samples.

LANL Response

2. In a letter to NMED (LANL 2008, 101640), the Laboratory stated that the use of hydrogen peroxide to achieve oxidation in well R-20 would be feasible if the procedure were carefully designed and executed. The Laboratory also proposed collection of additional samples and performance of geochemical modeling before deciding to use chemicals in the well. At a meeting held on April 15, 2008, the Laboratory showed analytical results of samples collected in March 2008 that were collected through a stainless-steel pipe and filtered through three different filter sizes. These results indicated an absence of colloidal iron and showed iron concentrations that are representative of the regional aquifer. The results were corroborated by geochemical modeling. The analytical results are discussed in section 4.1, and the modeling is discussed in section 4.2 of the revised report. Based on these results, NMED, Laboratory, and the U.S. Department of Energy mutually decided that it was unnecessary to apply chemical rehabilitation methods at the well.

NMED Comment

3. ***Installation of Sampling System***

Following completion of rehabilitating Screens 1 and 2 of R-20 using an oxygen release compound, the Permittees must install the proposed sampling system and collect water samples to evaluate performance of the rehabilitation.

LANL Response

3. The permanent Baski-fabricated dual-pump sampling system was installed between May 20 and May 22, 2008. Its installation is described in section 2.6 of the revised report.

REFERENCE

LANL (Los Alamos National Laboratory) March 1, 2008. "Submittal of the Response to the Direction for Further Action at Well R-20 Rehabilitation and Conversion Summary Report," Los Alamos National Laboratory letter (EP2008-0104) to J.P. Bearzi (NMED-HWB) from S.G. Stiger (EP Associate Director) and D. Gregory (DOE-LASO), Los Alamos, New Mexico. (LANL 2008, 101640)

Cross-Reference of NMED Comments and Revisions to the Well R-20 Rehabilitation and Conversion Summary Report, Revision 1

NMED Comment No.	Well R-20 Rehabilitation and Conversion Summary Report	Page(s) in January 2008 Report	Page(s) in Revised July 2008 Report	Nature of Well R-20 Rehabilitation and Conversion Summary Report Revision
1	Conclusion	pp. 14–15	pp. 21–22	Geochemical modeling results agreed with analytical results, that is, with the absence of ferrous iron and the absence of reducing conditions at R-20.
2	Related to Figures 2.6-1, 2.6-2, 2.6-6, and Tables B-1a and B-1b	pp. 18, 19, 21, B-1–B-8	n/a*	No change. Comment relates to use of an oxygen release compound at R-20. A meeting with NMED on April 15, 2008, determined that this procedure was not necessary.
3	Conclusion	p. 15	p. 6	Provided text in section 2.6 describing installation of the permanent sampling system

*n/a = Not applicable.

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July 2008
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Well R-20 Rehabilitation and Conversion Summary Report, Revision 1

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EST. 1943

Prepared by the Environmental Programs Directorate

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Well R-20 Rehabilitation and Conversion Summary Report, Revision 1

July 2008

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1.0 INTRODUCTION

This revision of the "R-20 Well Rehabilitation and Conversion Summary Report" (2008, 100473) provides a summary of the work performed and the results of rehabilitating and converting well R-20 to a dual-screen well. This revision includes a final as-built diagram showing placement of the Baski sampling system and results of additional sampling requested by the New Mexico Environment Department (NMED) (2008, 100461).

Plans for R-20 conversion were presented in the "Work Plan for R-Well Rehabilitation and Replacement, Revision 2" (LANL 2007, 098119) that was approved by NMED on August 20, 2007 (2007, 098182). The R-20 borehole was drilled as a characterization well potentially suitable for monitoring in lower Pajarito Canyon. The borehole was drilled to a total depth (TD) of 1365 ft using fluid-assisted air-rotary and conventional mud-rotary techniques and was completed with three screened intervals in the regional aquifer: screen 1 from 904.6 to 912.2 ft, screen 2 from 1147.1 to 1154.7 ft, and screen 3 from 1328.8 to 1336.5 ft (Figure 1.4-1). A dedicated Westbay sampling system was installed in the well after completion.

The results of the well screen analysis for R-20 (LANL 2007, 096330) indicated that after the rehabilitation pilot study (LANL 2007, 095889), screen 1 passed 81% of the assessment tests, screen 2 passed 89% of the assessment tests, and screen 3 passed 69% of the assessment tests. Based on these results, screen 3 was abandoned as part of the rehabilitation and conversion program. One pneumatically operated Bennett piston pump and one conventional electrical submersible pump were installed for long-term sampling of the uppermost screens (screens 1 and 2) at R-20, respectively (section 2.6).

2.0 REHABILITATION ACTIVITIES

Well rehabilitation and conversion activities at R-20 included removing and subsequently replacing the temporary inflatable isolation packers, compiling a video log of the upper two screens, redeveloping screens 1 and 2 by means of jetting/pumping and swabbing, isolating screen 3, hydraulic testing to measure the specific capacity of screens 1 and 2, cleanup pumping from abandonment activities, and collecting water samples for laboratory analysis. These activities are described in the following sections.

2.1 Isolation Packers

The Westbay sampling system in R-20 was removed during the 2006 pilot study, and the well screens were left in an isolated state with two inflatable packers. The packers were deflated and removed from the well on November 12, 2007. After video logging, redevelopment, abandonment of screen 3, and testing activities were completed, a single inflatable packer was reinstalled on December 5, 2007, between screens 1 and 2 as an interim measure until the permanent sampling system arrived.

2.2 Video Logging

A downhole video camera was run in the R-20 well on November 13, 2007, to document screen conditions, confirm screen depth locations of the upper two screens, and measure the composite static water level before backfilling and development activities. The Los Alamos National Laboratory's (the Laboratory's) geophysical trailer and camera were used to complete video logging. Ground surface was used as the datum for all video depth measurements. The video was run from the surface to a depth of 1160 ft below ground surface (bgs) to just below screen 2. Static water level in the well at the time of logging was recorded at 850 ft 10 in. bgs. Observed screen depths and static water level are noted in Table 2.2-1. Overall water clarity was good to excellent and provided visibility to adequately assess

screen conditions. Approximately 600 gal. of clear potable water was introduced into the well overnight before the video was run to ensure that visibility was enhanced during video logging operations. Both screens were observed to be in very good condition. Although fines were present resting on the lower portion of the circular perforations of the pipe-based portion of the screen, no bentonite was observed protruding through the wire-wrapped portion of either screen. Previous redevelopment operations performed on screen 1 noted bentonite on the tools that passed through the top screen (LANL 2007, 095889). A well video log DVD is included as Appendix C of this document.

2.3 Redevelopment of Screens 1 and 2

Well development of R-20 screens 1 and 2 consisted of three activities: (1) high-velocity jetting with simultaneous pumping, (2) swabbing, and (3) pumping. Jetting and swabbing were performed before screen 3 was isolated, while purging was performed afterwards.

High-velocity jetting was accomplished by operating a 20 gal./min submersible pump with a jetting tool attached above the pump discharge within the well screen. The pump and jetting tool were raised and lowered continuously throughout the well screen length while they were 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 effectiveness of the jetting was enhanced by ensuring the net removal of water from the screen zone throughout the development process (i.e., simultaneous jetting and pumping).

Screen 2 was developed using a jetting tool with four nozzles, each 5/64 in. in diameter. Approximately 13 gal./min was delivered to the jetting tool, with the balance of about 7 gal./min discharged from the well. Based on the estimated pumping water level, the jetting pressures likely exceeded 400 psi. The jetting tool was moved up and down over a length roughly 2.5 times the well screen length to allow much of the sediment stirred up by the jets to be purged from the screen zone while the jetting tool was inside blank casing. This was done to minimize the possible damaging sand-blasting effect on the screen. Jetting continued for about 3 h, so the effective jetting time within the screen was a little over an hour.

Screen 1 was developed using a jetting tool that had four nozzles, each 3/32-in. in diameter. This design change from that of screen 2 increased the flow delivered to the jetting tool to about 15 gal./min and decreased the flow to the surface to around 5 gal./min. This modification was done to avoid completely dewatering screen 1 (just 74 ft below the regional aquifer water level) while jetting. To further reduce the chance of dewatering the screen, jetting was carried out in 20-min intervals, with 10 min of rest in between to allow water levels in the casing above screen 1 to recover between jetting episodes. As with screen 2, active jetting was performed for about 3 h.

Following jetting and simultaneous pumping, both screens were swabbed using a surge block built by sandwiching a 4-in.-outside diameter nylon disk between two metal plates. The surge block was connected to a heavy weight so that effective swabbing was accomplished in both upward and downward directions. Swabbing consisted of running the tool both upward and downward approximately 150 round trips through each screen.

Following isolation of screen 3, the well was purged to remove sediment that was loosened by the development activities as well as residual abandonment materials, such as traces of cement and fines from the sand backfill. Purging was performed at two depths: first with the pump between the screens and next with the pump installed in the sump beneath screen 2 to clean that portion of the well.

Initial purging was performed with the pump depth setting limited to 986 ft, about 156 ft below the static water level. The drawdown was limited to this level to avoid hydraulically stressing screen 2 and damaging the permeability of the sediments around the screen. During the pilot rehabilitation project executed in 2006, it was observed that applying extreme drawdown to screens 2 and 3 during routine pumping degraded the specific capacities of these zones significantly (LANL 2007, 095889). This occasionally seen phenomenon can occur in deep, tight, fine-grained sediments when very large drawdown is applied to the well. The enormous resulting hydraulic gradient in the regional aquifer near the well can cause hydraulic compaction of the sediments and concomitant loss of permeability. With the pump set at 986 ft, the pumping rate from screens 1 and 2 was about 3 gal./min and held fairly steady at that level.

After the well had been purged clean, the pump was lowered into the sump beneath screen 2 to remove the turbid water from the bottom of the well. Upon start-up, the initial drawdown was limited while the pump evacuated the water stored in the annulus between the well casing and drop pipe. This provided time to adjust the discharge rate to 3 gal./min in an attempt to restrict the drawdown to a level similar to that used in the first purging step. During this pumping step, there was only slight degradation in the pumping capacity.

Following well purging, the pump was pulled and fitted with upper and lower packers to perform sampling and zone testing of screens 1 and 2.

2.4 Abandonment and Conversion

Isolation of screen 3 at R-20 was conducted between November 17 and 18, 2007. Details of backfill materials and placement are presented in Figure 1.4-1. Filter-grade 10/20 silica sand was used as the primary backfill material through the screen interval. The 10/20 sand was installed from the TD of the well at 1353.3 to 1317.4 ft bgs. Finer 20/40 filter-grade silica sand was installed above the 10/20 sand from 1313.1 to 1317.4 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 the backfill sand was installed with a tremie pipe while running a small volume of potable water to carry the sand into place. A Portland-cement seal was installed above the fine transition sand from 1300.4 to 1313.1 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 (approximately 24 h) before proceeding with the next sand interval. A second interval of 10/20 sand was installed as a buffer above the cement from 1185 to 1300.4 ft bgs.

2.5 Specific Capacity Testing

Specific capacity testing of R-20 screens 1 and 2 was performed after well development by installing a shrouded 4-in. submersible pump with inflatable packers above and below the pump to isolate the tested zone. A pressure transducer was installed between the pump and bottom packer to collect water-level data for specific capacity determination.

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

Several pumping events were performed on screens 1 and 2 in R-20. Tests included pumping screens 1 and 2 simultaneously, as well as individual testing on each zone. Table 2.5-1 summarizes the results of the pumping rate and water-level observations made during the tests. An explanation of the tests and test results follows.

Table 2.5-1 also shows the final specific capacity results obtained during the pilot rehabilitation project in 2006 (LANL 2007, 095889). During that project, experimental use of the Hydro-Pulse development tool was applied to R-20. This device uses high-pressure, rapidly expanding nitrogen gas to pulse the well water and formation material. Application of the Hydro-Pulse effectively destroyed the yields of screens 1 and 2, cutting the specific capacity of each zone to less than 0.002 gal./min/ft of drawdown.

Subsequently, more gentle development methods were carefully implemented to restore much of the lost yield. Following these procedures, no tests were conducted on screen 2 by itself. However, screen 1 was isolated and tested, and screens 1 and 2 were tested together. Therefore, by subtraction, it was possible to estimate the specific capacity of screen 2. As shown in Table 2.5-1, the measured specific capacity of screen 1 was 0.0105 gal./min/ft. The combined specific capacity of screens 1 and 2 together was 0.0182 gal./ft, making the inferred specific capacity of screen 2 about 0.077 gal./min/ft. The tests on which these data were based were conducted at low pumping rates that prevented the occurrence of extreme drawdown in screens 1 and 2.

After the 2007 redevelopment and well conversion procedures were concluded, additional specific capacity tests were run on screens 1 and 2. These tests were conducted to document well performance and to evaluate the development methods applied during this effort, primarily simultaneous jetting and pumping. These results are summarized in Table 2.5-1.

On November 29, 2007, a test was conducted in which screens 1 and 2 were pumped simultaneously for 77 min after which the packers were inflated, thus isolating screen 1. The two zones together yielded 2.05 gal./min with a pumping water level 64.9 ft below the screen 1 static water level. As soon as the packers were inflated, the yield (of screen 1 alone) declined to 1.47 gal./min and the drawdown increased to 65.8 ft. Thus, the screen 1 specific capacity was 1.47/65.8 = 0.0223 gal./min/ft.

These data were used to estimate the screen 2 specific capacity. When both screens were producing, the drawdown was 64.9 ft below the screen 1 static water level. Applying this to the screen 1 specific capacity of 0.0223 gal./min/ft meant that the screen 1 contribution to the yield was 0.0223 × 64.9 = 1.45 gal./min. Thus, the inferred contribution of screen 2 was 2.05 – 1.45 = 0.6 gal./min. The static water level of screen 2 was estimated to be about 5 ft lower than that of screen 1. This meant that the drawdown in screen 2 was 64.9 – 5.0 = 59.9 ft. Thus, the estimated/inferred specific capacity of screen 2 was 0.6/59.9 = 0.01 gal./min/ft.

On November 30, 2007, screen 1 was pumped for 420 min. As shown in Table 2.5-1, after 30 min the pumping rate was 1.55 gal./min, with a drawdown of 74 ft, making the short-term specific capacity 0.0209 gal./min/ft. At the end of the test, the pumping rate was 1.43 gal./min, with a drawdown of 70.9 ft, making the long-term specific capacity 0.0202 gal./min/ft. This latter specific capacity can be compared with that obtained in 2006 because the pumping times of the two tests were similar (420 vs. 368 min). The recent specific capacity of 0.0202 gal./min/ft represents an increase of 92% over that observed before the 2007 rehabilitation efforts. The documented improvement in yield speaks to the efficacy of the simultaneous pumping and jetting development method used in R-20.

On December 3, 2007, several tests were conducted. In the first test, the pump was set above screen 1, automatically limiting the drawdown that could be applied to the screen zones, particularly screen 2. After 30 min of pumping 1.88 gal./min from both zones, the drawdown from the *composite* static water level was 63.3 ft. It was estimated that the static water level for screen 1 was 1.5 ft above the composite level,

and for screen 2 it was about 3.5 ft below the composite level. Thus, the drawdown applied to screen 1 was 64.8 ft and the drawdown applied to screen 2 was 59.8 ft. Based on the short-term specific capacity of screen 1 of 0.0209 gal./min/ft, the screen 1 contribution during this test was estimated to be 0.0209 × 64.8 = 1.35 gal./min. This meant that screen 2 contributed 1.88 – 1.35 = 0.53 gal./min. Thus, the inferred short-term specific capacity of screen 2 was 0.53/59.8 = 0.0089 gal./min/ft.

A second pumping test was conducted with the pump set deeper. During this test, screens 1 and 2 were pumped at 2.73 gal./min with a drawdown from the composite static water level of 113.0 ft, substantially below screen 1. The maximum effective drawdown applied to screen 1 during this test was the distance from the screen 1 static water level (828.5 ft) to the center of screen 1 (908 ft), or 79.5 ft. Based on the short-term specific capacity of screen 1 of 0.0209 gal./min/ft, the yield contribution from screen 1 was estimated to be 0.0209 × 79.5 = 1.66 gal./min. This meant that screen 2 had contributed 2.73 – 1.66 = 1.07 gal./min. The screen 2 drawdown was 3.5 ft less than the composite drawdown, or 109.5 ft. Thus, the inferred specific capacity of screen 2 was 1.07/109.5 = 0.0098 gal./min/ft.

Thus, the indirect specific capacity values obtained from screen 2 (0.0100, 0.0089, and 0.0098 gal./min/ft), while constraining the magnitude of the drawdown applied to this zone, averaged 0.0096 gal./min/ft. This represented an increase of 25% over the specific capacity of 0.0077 gal./min/ft inferred from testing R-20 in 2006. The actual increase may have been less than indicated because the 2006 specific capacity value was based on long-term pumping results rather than short-term. Nevertheless, even after an adjustment for pumping time, the 2007 specific-capacity values represented a substantial increase over 2006 performance, again reinforcing the use of simultaneous pumping and jetting for well development.

Despite the good pumping performance obtained from screen 2, once the zone was subjected to extreme drawdown, yields declined significantly as shown by pumping results obtained from the third pumping test conducted on December 3, 2007. Once screen 2 was isolated by inflatable packers with the pump set near the depth of the well screen, it was no longer possible to constrain the drawdown as had been done deliberately during the previous tests. Packing off screen 2 and pumping with a deep-set pump simulated the conditions expected to prevail during future sampling using a permanent pump and packer installation.

As shown in Table 2.5-1, the packer test on screen 2 conducted on December 3, 2007, produced 1.50 gal./min with 314.8 ft of drawdown for a specific capacity of 0.0048 gal./min/ft. As indicated, after 180 min of pumping, the specific capacity had declined to 0.0045 gal./min/ft and to 0.0042 gal./min/ft after 341 min. Previous tests had constrained the drawdown by limiting the pump setting depth or by delaying significant drawdown by relying on casing storage volume to satisfy the pump until the discharge rate could be adjusted to a modest level. With the implementation of inflatable packers and a deep-set pump, however, the drawdown could not be constrained readily and no storage volume was available to the pump. Thus, on start-up, the pump rapidly depressurized the screen zone greatly, causing immediate compaction of the near-well sediments. A detailed analysis of the transducer data revealed that the drawdown had reached 275 ft, just 2 s after the onset of pumping during this initial packer test.

Additional pumping was performed on December 4, 2007. As shown in Table 2.5-1, the specific capacity continued to decline. After pumping times of 34, 200, and 454 min, the measured specific capacities were 0.0041, 0.0040, and 0.0039, respectively.

In summary, well development procedures provided good increases in hydraulic performance of the salvaged screen zones in R-20. The postdevelopment yields of screens 1 and 2 were 92% and 25% greater, respectively, than those before development, supporting the use of the chosen development methods, primarily simultaneous pumping and high-velocity jetting. However, the gains obtained for

screen 2 were lost because of hydraulic compaction of the near-well sediments that occurred when a deep-set pump incorporating inflatable packers was operated. The final specific capacity of screen 2 was less than that obtained before redevelopment when the magnitude of the drawdown was carefully constrained.

It is probable that any tight, fine-grained screened interval far beneath the water table is susceptible to yield degradation from sediment compaction when sampled using a deep-set pump and inflatable packers. The exception to this would be instances where the pump capacity is fortuitously low enough to not overstress the regional aquifer (unlikely in most instances because of the limited selection of pumps that can lift water 1000 ft or more). If similar conditions are encountered in the future, it may be beneficial to explore or develop practical methods to automatically constrain the discharge rate and/or drawdown to prevent the deleterious effects of applying extreme drawdown to producing zones. Implementation of inline flow controllers placed in the discharge line, downhole below the water level, is one example of a possible remedy to consider.

2.6 Dedicated Sampling System Installation

On May 20, 2008, a custom-made Baski k-packer was installed at a depth of 1183.45 to 1185 ft bgs above the abandonment backfill materials. This setting achieved a sump space below the screen 2 of approximately 28.8 ft. Following k-packer installation, a Baski-fabricated dual-pump sampling system was installed between May 20 and May 22, 2008. The dual-pump system consists of a (lower) Grundfos electrical submersible pump and an (upper) Bennett dual-action piston fluid pump operated with compressed gas (Figure 1.4-1). Two inflatable Baski custom-bulkhead, double-mandrel packers isolated the pumping and sampling intervals. Two packers were included in the sampling system design at R-20 to reduce the purge volumes of each sampling interval. The packers are constructed of stainless steel and vulcanized Viton. The Grundfos pump intake was set at 1141.45 ft bgs, approximately 5.7 ft above the top of the lower screen interval. The discharge pipe for the Grundfos pump consists of custom-fabricated, high-strength 1-in. threaded/coupled Type 304 stainless-steel, nonannealed material meeting the requirements of American Society for Testing and Material Standard A554 and having a wall thickness about 15% to 20% greater than Schedule 40 pipe. The threaded ends and couplings conform to 1-in.American Petroleum Institute (API) thread design with 10 threads per inch. The Bennett pump intake was set within the upper screen interval at 908.43 ft bgs. The Bennett pump's discharge column and air actuation line are continuous flexible Teflon tubing. Two dedicated 1-in. flush-threaded polyvinyl chloride transducer tubes were installed with the sampling system. Both transducer tubes were installed directly above the Bennett pump. The upper transducer tube terminates with a 6-in. machine-slotted screen with 0.010-in. slots. The lower transducer tube terminates with a bottom cap that holds a 0.25-in. nylon tube, which extends through the packers to monitor water levels in the lower screen interval. The transducer tubes, Bennett pump tubing, and Grundfos pump motor electrical cable were banded to the 1-in. stainless pump column at 10-ft intervals with stainless bands.

2.7 Water-Quality Conditions in November and December 2007

Table 2.7-1 shows the sample collection objectives for R-20 screens 1 and 2 during the 2007 hydraulic testing and the constituents measured in the field and laboratory.

2.7.1 Sample Collection, Field Preparation, and Analytical Techniques

A total of 34 groundwater samples were collected during two pumping tests conducted at R-20 screen 1 on November 30, 2007 (15 samples) and screen 2 on December 3 and 4, 2007 (19 samples). Field parameters consisting of pH, turbidity, dissolved oxygen (DO), temperature, specific conductance (SC),

and oxidation-reduction potential (ORP) were measured using a flow-through cell (Geotech) during sample collection. Measurements of the different field parameters recorded during the pumping tests at screens 1 and 2 are provided in Table 2.7-2. Field pH and temperature were measured using a Beckman (Model 255) meter, and DO was measured using a WTW (Model OXI-330I) instrument. SC and ORP were measured using a HACH Sension-5 meter and a Thermoelectron Corp. (Russell RL 060P model) instrument, respectively. Four equipment rinseate blanks (GW20-08-8880 and GW20-08-8942, filtered and GW20-08-9004 and GW20-08-9072, nonfiltered) and two field blanks (GW20-08-8998 and GW20-08-9066) were collected during the pumping tests. Groundwater samples were collected every 5 min during the initial 30 min of the pumping test conducted at screen 1 (Table 2.7-2). The frequency of sample collection at screen 1 decreased to every 10 min from 30 to 60 min during the test, every 30 min from 60 to 180 min, and a final sample was collected at 290 min. The total duration of the pumping test at screen 1 was 290 mi (4.83 h).

Groundwater samples were collected every 5 min during the initial 25 min of the pumping test conducted at screen 2 (Table 2.7-2). The frequency of sample collection at screen 2 decreased to every 10 min from 25 to 55 min during the test and every 30 min from 55 to 175 min on December 3, 2007. The pumping test at screen 2 continued on December 4, 2007, with groundwater samples collected every 60 min for 4 h (240 min). A final sample was collected from screen 2 at 270 min. The total duration of the pumping test at screen 2 was 445 min (7.42 h).

Groundwater samples were collected using a submersible pump connected to a mild-steel discharge pipe equipped with a standard submersible pump. The discharge rate varied from 1.47 to 1.5 gal./min and from 1.23 to 1.44 gal./min during the pumping tests conducted at screens 1 and 2, respectively.

Thirty-four groundwater samples were filtered before analyses for metals, trace elements, and major cations and anions. Aliquots of samples collected from R-20 screens 1 and 2 were filtered through 0.45-µmeter (µm) Geotech disposable filters. Thirty-four nonfiltered groundwater samples were also analyzed for major cations, trace elements, and metals. Samples were acidified with analytical-grade nitric acid to a pH of 2.0 or less for metal and major cation analyses. Nonfiltered samples collected for total sulfide analysis were preserved with a buffer consisting of sodium hydroxide, ethylenediaminetetraacetic acid (EDTA), and ascorbic acid. Samples collected for TOC analysis were not filtered and were acidified with analytical-grade sulfuric acid.

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 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, perchlorate, phosphate, and sulfate. Total sulfide was determined by ion selective electrode (ISE) with a detection limit of 0.010 mg/L. Inductively coupled (argon) plasma optical emission spectroscopy (ICPOES) was used for analyses of calcium, magnesium, potassium, silica, sodium, and strontium. Aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, cesium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, rubidium, selenium, silver, thallium, thorium, tin, titanium, vanadium, uranium, and zinc were analyzed by inductively coupled (argon) plasma mass spectrometry (ICPMS). The precision limits (analytical error) for major ions and trace elements were generally less than ±10% using ICPOES and ICPMS. Total organic carbon was measured using a total carbon-organic carbon analyzer.

2.7.2 Field Parameters

During the pumping test conducted at R-20 screen 1 on November 30, 2007, field parameters were measured on 15 groundwater samples collected from R-20 screen 1. These results are provided in Tables 2.7-2 and A-1 in Appendix A and are shown in Figure 2.7-1. Field pH varied from 7.96 to 8.49; temperature varied from 17.4°C to 20.9°C. Specific conductance decreased from 132 to 124 microSiemens per centimeter (μS/cm), and DO generally increased from 1.0 to 1.9 mg/L. Turbidity decreased from 132 to 7.06 nephelometric turbidity units (NTUs) (Table 2.7-2, Figure 2.7-1). Noncorrected ORP measurements varied from +128 to +281 millivolts (mV) during the 2007 pumping test at R-20 screen 1.

DO, ORP, SC, turbidity, and temperature varied during Westbay sampling, conducted at R-20 screen 1 from 2004 to 2006 and from the July 2006 to November–December 2007 pumping tests (Figure 2.7-1). The most consistent temperature measurements were recorded during the 2007 pumping tests. Concentrations of DO were higher during the Westbay sampling than during the 2006 and 2007 pumping tests as a result of sample aeration without the use of a flow-through cell at Westbay-equipped wells.

The most stable field parameter is pH, which had slightly lower values during the initial part of the 2006 pumping test. Specific conductance decreased during both Westbay sampling and the 2006 pumping test in response to groundwater with lower solute concentrations entering the well screen (Figure 2.7-1). SC was most stable during the 2007 pumping test conducted at R-20 screen 1. Turbidity, however, was most stable during Westbay sampling from the lack of purging of groundwater before sampling (Figure 2.7-1). Turbidity consistently decreased during the 2007 pumping test in comparison to the 2006 pumping test, which showed an increase at the end of sampling. The highest SC measurements recorded at R-20 screen 1 were during the initial sampling of the 2007 pumping test (Figure 2.7-1). The most negative, noncorrected ORP measurements were recorded during Westbay sampling at R-20 screen 1, followed by less negative values recorded during the 2006 pumping test. The most positive ORP measurements were taken during the 2007 pumping test; however, this parameter became less positive as fresh groundwater entered screen 1. DO and ORP measurements indicative of in situ groundwater at R-20 are difficult to obtain because the samples become aerated using sampling jars with Westbay equipment.

Field parameters were measured on 19 groundwater samples collected from R-20 screen 2. These results are provided in Tables 2.7-2 and A-2 and are shown in Figure 2.7-2. Field pH varied from 7.68 to 8.50; temperature varied from 18.5°C to 20.9°C during the 2007 pumping test. SC decreased from 165 to 141 μS/cm, and DO slightly increased from 0.4 to 0.6 mg/L. Measurements for DO and SC recorded on December 4, 2007, are very inconsistent and are considered not reliable. These two parameters are not included in any interpretation presented in this report. Turbidity decreased from 331 to 4.15 NTUs during pumping (Table 2.7-2, Figure 2.7-2). Noncorrected ORP measurements generally decreased from +293 to +153 mV during the pumping test at R-20 screen 2.

Similar to field parameters measured at R-20 screen 1, DO, ORP, SC, turbidity, and temperature also varied during Westbay sampling and the 2006 and 2007 pumping tests at screen 2 (Figure 2.7-2). The most consistent temperature measurements were recorded on December 3, 2007. Lower and more consistent concentrations of DO were recorded during the 2006 pumping test. No DO measurements were recorded during Westbay sampling conducted at R-20 screen 2. The most stable field parameter is pH, having slightly lower values during both Westbay sampling and the 2006 pumping test. SC decreased the most during Westbay sampling (Figure 2.7-2). Slightly higher SC measurements, however, were recorded during the 2007 pumping test at R-20 screen 2. Turbidity was most stable during Westbay sampling due to the lack of purging before sampling (Figure 2.7-2). The highest turbidity measurements were made during the 2007 pumping test in comparison to Westbay sampling and the 2006 pumping test. The highest SC measurements recorded at R-20 screen 2 were during Westbay sampling (Figure 2.7-2).

The least positive, noncorrected ORP measurements were recorded during both Westbay sampling and the 2006 pumping test. The most positive ORP measurements were taken during the 2007 pumping test; however, this parameter became less positive as fresh groundwater entered screen 2 (Figure 2.7-2).

2.7.3 Analytical Results

Analytical results of groundwater samples collected during aquifer performance testing at R-20 screens 1 and 2 are provided in Appendix A, Tables A-1 and A-2, respectively. Charge balance errors for dissolved cations and anions were generally less than ±6%. Figures 2.7-3 and 2.7-4 show concentration trends of several solutes for screens 1 and 2, respectively, during Westbay sampling and the 2006 and 2007 pumping tests. Calcium and sodium are the dominant cations present in the regional aquifer at R-20 screens 1 and 2. During the 2007 pumping tests, dissolved concentrations of calcium ranged from 11.2 to 12.0 ppm (or mg/L) and from 12.1 to 14.1 mg/L at screens 1 and 2, respectively (Figures 2.7-3 and 2.7-4). Dissolved concentrations of calcium generally show small variations in groundwater samples collected during pumping tests conducted in 2006 and 2007. The highest concentrations of this solute occurred during Westbay sampling at R-20 screen 2, whereas the lowest concentrations of dissolved calcium were measured during the same time period at screen 1 (Figures 2.7-3 and 2.7-4) (LANL 2007, 096330). Dissolved concentrations of sodium ranged from 12.8 to 13.7 mg/L and from 8.6 to 14.3 mg/L at screens 1 and 2, respectively, during the 2007 pumping tests (Figures 2.7-3 and 2.7-4, Tables A-1 and A-2). The highest concentrations of dissolved sodium were measured during Westbay sampling at R-20 screens 1 and 2 (Figures 2.7-3 and 2.7-4) (LANL 2007, 096330). Dissolved chloride showed small variations in concentration during the 2007 pumping tests for both screens, with the highest concentrations of this anion measured in R-20 screen 2. A higher degree of variability in dissolved chloride concentrations is observed during both Westbay sampling and the July 2006 pumping test conducted at R-20 screen 1. Smaller variations in dissolved chloride concentrations occurred in groundwater samples collected from R-20 screen 2 during both Westbay sampling and the July 2006 pumping test (Figures 2.7-3 and 2.7-4).

Concentrations of total carbonate alkalinity did not vary significantly during the 2007 pumping tests conducted at R-20 screens 1 and 2. Higher concentrations of total carbonate alkalinity were measured during the previous Westbay sampling at screen 2 and the initial part of the July 2006 pumping test. Dissolved concentrations of sulfate in samples collected from R-20 screens 1 and 2 decreased during the 2007 pumping tests (Figures 2.7-3 and 2.7-4). Higher dissolved concentrations of sulfate, however, were measured in groundwater samples collected from R-20 screen 2 during the 2007 pumping test (Figure 2.7-4). Dissolved concentrations of sulfate decreased from 10.8 to 7.21 mg/L in samples collected from R-20 screen 2 (Figure 2.7-4, Table A-2). The upper tolerance limit for dissolved sulfate in the regional aquifer is 7.2 mg/L (LANL 2007, 095817). Concentrations of total sulfide generally were less than analytical detection (0.010 mg/L), suggesting that sulfate reduction was not significant during the 2007 pumping tests. Four groundwater samples (GW20-08-9072, GW20-08--9074, GW20-08--9075, and GW20-08--9088) collected from screen 2 contained measurable total sulfide between 0.02 and 0.04 ppm, suggesting that small amounts of residual sulfide associated with drilling effects occur in the regional aquifer at R-20 screen 2 (Table A-2).

Concentrations of TOC varied from 0.89 to 3.29 mgC/L and from 1.46 to 2.28 mgC/L in groundwater samples collected from R-20 screens 1 and 2, respectively, during the 2007 pumping tests (Tables A-1 and A-2). Concentrations of TOC ranged from 8.24 to 17.10 mgC/L and from 35.20 to 49.3 mgC/L in groundwater samples collected from R-20 screens 1 and 2, respectively, during Westbay sampling (LANL 2007, 096330). During the July 2006 pumping tests, average concentrations of TOC were 2.93 and 1.08 mgC/L in groundwater samples collected from R-20 screens 1 and 2, respectively (LANL 2007, 096330). The dominant source of TOC probably includes residual QUIK-FOAM and other organic-based drilling additives consisting of a long-chain hydrocarbon surfactant used during drilling of R-20. Elevated

above-background concentrations of ammonia and total Kjeldahl nitrogen (TKN) measured in groundwater samples collected from R-20 screens 1 and 2 (LANL 2007, 096330) provided evidence for the presence of residual QUIK-FOAM. Higher concentrations of ammonia and TKN were measured in groundwater samples collected from R-20 screen 2 from 2004 to 2006 than from R-20 screen 1 (LANL 2007, 096330). Well rehabilitation efforts conducted in 2006 and 2007 at R-20, however, have enhanced additional removal of residual drilling fluid and associated breakdown products supported by decreasing concentrations of TOC, TKN, and ammonia in the regional aquifer.

Dissolved concentrations of nitrate(N) increased from 0.145 to 0.331 mg/L during the 2007 pumping test conducted at R-20 screen 1 (Figure 2.7-3, Table A-1). Concentrations of this solute were less than detection (<0.017 mg/L, maximum instrument detection limit [IDL]) during the previous Westbay sampling at R-20 screen 1 (LANL 2007, 096330). The average concentration of dissolved nitrate(N) was 0.15 mg/L at R-20 screen 1 during the July 2006 pumping test, showing higher concentrations during the initial part of the test, then decreasing during the middle, and increasing slightly at the end of testing (Figure 2.7-3). Dissolved concentrations of nitrate(N) increased from 0.160 to 0.316 ppm during the 2007 pumping test conducted at R-20 screen 2 (Figure 2.74, Table A-2). Concentrations of this solute were also less than analytical detection (<0.017 mg/L, maximum IDL) during Westbay sampling (LANL 2007, 096330). The average concentration of dissolved nitrate(N) was 0.27 mg/L at R-20 screen 2 during the July 2006 pumping test, mostly showing consistent concentrations during the test (Figure 2.7-4). Background mean, median, and maximum concentrations of dissolved nitrate plus nitrite(N) are 0.33, 0.31, and 1.05 mg/L, respectively, within the regional aquifer (LANL 2007, 095817).

Total dissolved concentrations of iron increased from 0.15 to 1.56 mg/L during the 2007 pumping test conducted at R-20 screen 1 (Figure 2.7-5, Table A-1). The ratio of total iron in nonfiltered samples to total dissolved iron in groundwater samples collected from R-20 screen 1 decreased during pumping, suggesting that more reducing conditions were established as the pumping test progressed. Concentrations of this solute ranged from 0.0756 to 0.123 mg/L during Westbay sampling conducted at R-20 screen 1 (LANL 2007, 096330). The average concentration of total dissolved iron was 0.243 mg/L at R-20 screen 1 during the July 2006 pumping test, showing some variation during the test (Figure 2.7-5). Background mean, median, and maximum concentrations of total dissolved iron are 0.0193, 0.095, and 0.147 mg/L, respectively, within the regional aquifer (LANL 2007, 095817).

Total dissolved concentrations of manganese generally increased from 0.019 to 0.034 mg/L during the 2007 pumping test conducted at R-20 screen 1 (Figure 2.7-5, Table A-1). As with iron, the ratio of total manganese in nonfiltered samples to total dissolved manganese in groundwater samples collected from R-20 screen 1 also decreased, providing additional evidence that more reducing conditions were established as the 2007 pumping test progressed. Concentrations of this solute ranged from 0.0143 to 0.0285 mg/L during Westbay sampling at R-20 screen 1 (LANL 2007, 096330). The average concentration of total dissolved manganese was 0.029 mg/L at R-20 screen 1 during the July 2006 pumping test, showing higher concentrations during the initial part of the test, then decreasing during the middle. and slightly increasing at the end of testing (Figure 2.7-5). Background mean, median, and maximum concentrations of total dissolved manganese are 0.0076, 0.001, and 0.124 mg/L, respectively, within the regional aquifer (LANL 2007, 095817).

Total dissolved concentrations of iron generally increased from 0.16 to 0.80 ppm during the 2007 pumping test conducted at R-20 screen 2 (Figure 2.7-6, Table A-2). The ratio of total iron in nonfiltered samples to dissolved iron in groundwater samples collected from R-20 screen 2 also decreased during pumping, suggesting that more reducing conditions were established as the pumping test progressed. Concentrations of this solute ranged from 0.141 to 0.423 mg/L during Westbay sampling conducted at R-20 screen 2 (LANL 2007, 096330). The average concentration of total dissolved iron was 0.185 mg/L at R-20 screen 2 during the July 2006 pumping test, showing variation during the test (Figure 2.6-6).

Total dissolved concentrations of manganese varied from 0.021 to 0.039 ppm during the 2007 pumping test conducted at R-20 screen 2 (Figure 2.7-6, Table A-2). Similar to manganese concentrations at screen 1, the ratio of total manganese in nonfiltered samples to total dissolved manganese in groundwater samples collected from screen 2 also decreased during the 2007 pumping test. Concentrations of this solute ranged from 0.332 to 0.368 mg/L during previous Westbay sampling at R-20 screen 2 (LANL 2007, 096330). The average concentration of total dissolved manganese was 0.0371 mg/L at R-20 screen 2 during the July 2006 pumping test, generally decreasing during the test (Figure 2.7-6).

Two rinseate blanks had concentrations of total manganese and iron of 0.013 and 0.073 mg/L and 1.64 and 6.75 mg/L, respectively, in nonfiltered samples that were collected from the discharge pipe consisting of mild-steel used during the 2007 pumping tests conducted at R-20 screens 1 and 2 (Tables A-1 and A-2). Concentrations of total dissolved manganese and iron in associated filtered rinseate blanks were 0.003, 0.003, 0.01. and 0.030 mg/L, respectively. Other metals and trace elements detected in the rinseate blanks included aluminum, barium, boron, chromium, copper, lead, nickel, strontium, titanium, vanadium, and zinc (Tables A-1 and A-2). Total concentrations of copper, lead, nickel, and vanadium in the nonfiltered rinseate samples were less than 0.010 mg/L. Total concentrations of several metals/trace elements exceeded 0.010 mg/L: aluminum (0.042 and 0.613 mg/L), barium (0.018 and 0.081 mg/L), boron (0.028 and 0.032 mg/L), copper (0.014 mg/L), strontium (0.063 mg/L), titanium (0.041 mg/L), and zinc (0.062 and 0.524 mg/L) (Tables A-1 and A-2). Higher concentrations of metals in nonfiltered samples occurred in the two initial equipment rinseate blanks collected before pumping of R-20 screen 1.

Figure 2.7-7 shows total and dissolved concentrations of uranium, vanadium, and zinc measured at R-20 screen 1 from 2004 to 2007. Dissolved concentrations of uranium ranged from 0.0007 to 0.0014 mg/L at R-20 screen 1 during the 2007 pumping test (Table A-1). Total concentrations of uranium were the same or slightly higher, ranging from 0.0007 to 0.0026 mg/L during this pumping test. Similar concentrations of total and dissolved uranium were also measured during the July 2006 pumping test conducted at R-20 screen 1 (Figure 2.7-7). Dissolved uranium(VI) complexes from the major phase at R-20 screen 1, based on similar concentrations of uranium in sample pairs for filtered and nonfiltered aliquots, were analyzed during the 2007 pumping test. 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), suggested by positive noncorrected ORP and DO measurements and sulfate and nitrate concentrations, which are characteristic of R-20 screen 1. Lower concentrations of dissolved and total uranium, ranging from 0.000095 to 0.00021 mg/L, were measured during earlier Westbay sampling conducted at R-20 screen 1 (LANL 2007, 096330) (Figure 2.7-7). It is likely that uranium(IV) complexes were stable during Westbay sampling in which reducing conditions were enhanced by residual organic-rich drilling fluid. Precipitation of uranium(IV) solids, including UO_2 and $USiO_4$, was enhanced under reducing conditions in the absence of DO and in the presence of dissolved sulfide.

Dissolved and total concentrations of vanadium were very consistent, ranging only from 0.003 to 0.006 mg/L at R-20 screen 1 during the 2007 pumping test (Figure 2.7-7, Table A-1). Similar concentrations of total and dissolved vanadium were measured during both Westbay sampling and the July 2006 pumping test conducted at R-20 screen 1 (Figure 2.7-7). Dissolved concentrations of zinc varied from 0.005 to 0.027 mg/L during the 2007 pumping test. Dissolved concentrations of zinc at R-20 screen 1 are within background distributions for the regional aquifer (0.0004 to 0.032 mg/L) (LANL 2007, 095817). Following the same pattern for iron, the ratio of total zinc in nonfiltered samples to total dissolved zinc in groundwater samples collected from R-20 screen 1 decreased during pumping, suggesting that zinc is associated with suspended iron either through adsorption and/or coprecipitation processes. Total concentrations of zinc associated with suspended particles decreased as the pumping test progressed, possibly due to reducing conditions characterized by increasing concentrations of

dissolved iron (see Figure 2.7-5). One hypothesis suggests reductive dissolution of hydrous ferric oxide (HFO), supported by increasing concentrations of dissolved iron, resulting in desorption of zinc(II) surface complexes. An alternative hypothesis includes oxidation of iron-zinc sulfide minerals as fresh, less reducing regional aquifer groundwater enters the well screen during continued pumping. Dissolved concentrations of zinc ranged from 0.0021 to 0.160 mg/L during Westbay sampling conducted at R-20 screen 1 from 2004 to 2006 (LANL 2007, 096330). The highest concentrations of total and dissolved zinc were measured during the July 2006 pumping test, with an average dissolved concentration of 0.326 mg/L (LANL 2007, 096330).

Figure 2.7-8 shows total and dissolved concentrations of uranium, vanadium, and zinc measured at R-20 screen 2 from 2004 through 2007. Dissolved concentrations of uranium ranged from 0.0008 to 0.0011 m/L at R-20 screen 2 during the 2007 pumping test (Table A-2). Total concentrations of uranium were the same or slightly higher, decreasing from 0.0021 to 0.0008 mg/L during this pumping test. The average concentration of dissolved uranium was 0.0012 mg/L (LANL 2007, 096330) measured during the July 2006 pumping test conducted at R-20 screen 2 (Figure 2.6-8). Lower concentrations of dissolved uranium, ranging from 0.000058 to 0.00011 mg/L, were measured during the previous Westbay sampling conducted at R-20 screen 2 (LANL 2007, 096330) (Figure 2.7-8). Dissolved concentrations of vanadium increased from 0.002 to 0.005 mg/L, whereas total vanadium decreased from 0.007 to 0.004 mg/L at R-20 screen 2 during the 2007 pumping test (Figure 2.7-8, Table A-2). Similar concentrations of total and dissolved vanadium generally were measured during the July 2006 pumping test conducted at R-20 screen 2 (Figure 2.7-8). Dissolved concentrations of zinc generally decreased from 0.056 to 0.008 mg/L during the 2007 pumping test conducted at R-20 screen 2. Four of the 19 dissolved concentrations of zinc at R-20 screen 2 (four samples) are not within background distributions for the regional aquifer (0.0004 to 0.032 mg/L) (LANL 2007, 095817). Following the same pattern for zinc at screen 1, the ratio of total zinc in nonfiltered samples to total dissolved zinc in groundwater samples collected from screen 2 decreased during the 2007 pumping test. Hypotheses for zinc and iron presented above are also applicable to screen 2 during the 2007 pumping test. Measurable dissolved concentrations of zinc ranged from 0.0054 to 0.0092 mg/L during Westbay sampling conducted at R-20 screen 2 (LANL 2007, 096330). The average dissolved concentration of zinc was 0.313 mg/L measured during the July 2006 pumping test (LANL 2007, 096330).

2.7.4 Well Screen Analysis

Previous Results

Analytical results obtained from sampling of well R-20 screens 1 and 2 were evaluated for representativeness and reliability, 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 2006 during six and five sampling events conducted at screens 1 and 2, respectively, and results of the Laboratory well screen analysis were previously provided (LANL 2007, 096330). Groundwater samples previously collected from R-20 screen 1 have scores increasing from 51% to 72%, with an average score of 60% (LANL 2007, 096330). Groundwater samples collected from R-20 screen 1 during well rehabilitation conducted in July 2006 contributed to a test score of 72% (LANL 2007, 096330). Groundwater samples collected from R-20 screen 1 during October 2006 contributed to a test score of 81% (LANL 2007, 096330). The test scores for the 2004 to 2006 samples collected from R-20 screen 1 improved over time with 4 to 18 analytes or general indicators per sampling event failing the geochemical criteria, consisting of 26 to 36 individual tests. Analytes that did not meet the well screen criteria during one or more sampling rounds conducted at R-20 screen 1 included pH, ORP, turbidity, magnesium, total carbonate alkalinity, acetone, sulfate, phosphate, TKN, iron, chromium,

TOC, ammonia, perchlorate, nitrate(N), strontium, uranium, molybdenum, manganese, calcium, and/or sodium (LANL 2007, 096330).

Groundwater samples previously collected from R-20 screen 2 have scores ranging from 37% to 44%, with an average score of 40% (LANL 2007, 096330). Groundwater samples collected from R-20 screen 2 during well rehabilitation conducted in July 2006 contributed to a test score of 89% (LANL 2007, 096330). The test scores for the 2004 to 2006 samples collected from R-20 screen 2 varied over time with 3 to 23 analytes or general indicators per sampling event failing the geochemical criteria, consisting of 32 to 35 individual tests. Analytes that did not meet the well screen criteria during one or more sampling rounds conducted at R-20 screen 2 included pH, ORP, turbidity, barium, magnesium, total carbonate alkalinity, acetone, sulfate, sulfide, phosphate, TKN, iron, chromium, TOC, ammonia, perchlorate, nitrate(N), strontium, uranium, molybdenum, manganese, calcium, and/or sodium (LANL 2007, 096330).

Updated Well Screen Analysis—December 2007

Results of the Laboratory well screen analysis using analytical results obtained during the 2007 pumping tests are provided in Tables B-1 and B-2. Groundwater samples analyzed from well R-20 screen 1 during the 2007 pumping test have scores ranging from 85% to 91% consisting of 34 criteria (Table B-1) for 16 samples. This screen is near the regional water table and is most important for detecting potential contaminants released to Pajarito Canyon near Technical Area 18. Therefore, all 16 samples were selected for the well screen analysis presented in this section. Test scores generally improved during pumping of R-20 screen 1. The average well screen test score for the 2007 pumping test is 89%, which is an improvement over the previous score achieved during the July 2006 pumping test (72%). The causes of samples failing several criteria of the well screen analysis (Table B-1) were (1) elevated above-background concentrations of dissolved barium (9 samples), boron (2 samples), iron (16 samples) and zinc (1 sample); (2) turbidity values greater than 5 NTUs (16 measurements); and (3) DO concentrations less than 2 mg/L (16 measurements).

Groundwater samples analyzed from well R-20 screen 2 during the 2007 pumping test have scores ranging from 85% to 91%, consisting of 34 criteria (Table B-2) for three samples. The samples selected for this well screen analysis were collected at the beginning (GW20-08-9118 and GW20-08-8959), middle (GW20-08-9081 and GW20-08-8951), and end (GW20-08-9088 and GW20-08-8958) of the 2007 pumping test. Test scores generally improved during pumping of R-20 screen 2. The average well screen test score for the 2007 pumping test is 88%, which is the same as the previous score achieved during the July 2006 pumping test (89%). The cause of samples failing several criteria of the well screen analysis (Table B-2) were (1) elevated above-background concentrations of dissolved barium (19 samples), boron (1 sample), iron (19 samples), sulfate (19 samples), and zinc (4 samples); (2) turbidity values greater than 5 NTUs (18 measurements); and (3) DO concentrations less than 2 mg/L (13 reliable measurements).

Well screen tests for four criteria were not applicable in the December 2007 analysis of R-20 screens 1 and 2 because

- groundwater samples were not analyzed for acetone, TKN, and ammonia; and
- the analytical detection limitation for perchlorate using the ion chromatography method has a method detection limit greater than 0.005 mg/L, which makes it ineligible for the well screen analysis methodology.

2.7.5 Geochemical Comparison of Westbay and 2006 and 2007 Pumping Test Samples

A geochemical comparison of selected analytes and pH was performed on the R-20 screens 1 and 2 samples to evaluate sampling methodologies using Westbay equipment and a submersible pump. This comparison included analytical results for seven and five previous sampling events for R-20 screens 1 and 2, respectively. The sampling events were conducted from September 20, 2004, to October 2, 2006 (R-20 screen 1), and from September 3, 2004, to June 7, 2006 (R-20 screen 2), using Westbay equipment, and four pumping tests were conducted on July 6 and 8, 2006, November 30, 2007, and December 3-4, 2007. Concentrations of dissolved calcium, chloride, sulfate, nitrate(N), iron, manganese, uranium, vanadium, and zinc were generally lower in samples using Westbay equipment in comparison to those collected during the four pumping tests conducted in 2006 and 2007 (Table A-1). Concentrations of total carbonate alkalinity, TOC, and dissolved sodium, however, were generally higher in samples using Westbay equipment in comparison to those collected during the four pumping tests (Table A-1). Energetic purging or pumping of R-20 screens 1 and 2 allowed groundwater outside of the filter pack to be sampled, providing more reducing groundwater samples potentially impacted by residual drilling effects based on elevated concentrations of dissolved iron. Alternatively, dissolved concentrations of iron could result from partial reductive dissolution of HFO present in the regional aquifer at R-20 screens 1 and 2 or colloidal iron from the mild-steel discharge pipe, based on elevated concentrations of dissolved iron measured during the 2006 and 2007 pumping tests. It is clear that excess TOC concentrations measured from 2004 to 2006 are most likely derived from residual QUIK-FOAM and other drilling additives associated with drilling of R-20. Concentrations of TOC measured during the 2007 pumping tests conducted at R-20 screens 1 and 2 are lower than previous values as more residual organic-based drilling fluid breaks down and oxidizes to inorganic carbon in the form of total carbonate alkalinity. Turbidity significantly decreased during the 2007 pumping tests conducted at R-20 screens 1 and 2 (Table 2.7-2).

3.0 MINERALOGY

Solids from a turbid groundwater sample collected immediately after pumping commenced at screen 1 at well R-20 on November 16, 2007, were analyzed by x-ray diffraction (XRD). The bulk of the solids settled out overnight, and the remaining suspended solids were removed by centrifugation. Those solids collected by centrifugation represent the <1.5-µm-size fraction; the collected mass of this fine fraction was <1% of the total but does not account for similar material that may be bound in uncrushed coarser particles.

Figure 3.0-1 shows the XRD pattern for the coarser bulk sample, mixed with corundum as an internal standard. The dominant mineral present is quartz; among the other minerals present are smectite, mica, feldspar, and talc. This same mineralogy was observed in the particulates from screen 1 when R-20 was pumped in July 2006 (LANL 2007, 095889). Talc is used as a coating on PelPlug and is a characteristic tracer for that annular fill material. The high quartz content is also significant because quartz is rare (<1%) in the local host rock (trachyandesite scoria) at screen 1. The high quartz abundance in this sample is of uncertain origin; it may be mobilized fines from the filter pack or transition sands at screen 1, or it may have been introduced from another horizon when the interval from 765 to 933 ft was reamed after cement was set to the 785-ft depth. The steady and abundant occurrence of fine quartz drawn through this screen suggests that a sizeable source may be involved.

Analysis of the fine fraction (Figure 3.0-2) provides some detail for the most mobile constituents (the finest fraction). Smectite predominates, and talc is still prominent; notably, quartz is also present, indicating that some the quartz observed is extremely fine-grained.

4.0 ADDITIONAL SAMPLING AND MODELING REQUESTED BY NMED

In its "Direction for Future Action Well R-20 rehabilitation and Conversion Summary Report, Los Alamos National Laboratory," (2008, 100461), NMED directed that the following actions must be completed: (1) analysis of increased iron concentrations using geochemical models, (2) rehabilitation of R-20 by using an oxygen release compound, and (3) installation of the permanent sampling system. With respect to the second action, the Laboratory investigated the possibility of using an oxygen release compound at R-20 and reported preliminary findings (LANL 2008, 101640). This investigation was followed by a meeting on April 16, 2008, between the Laboratory, U.S. Department of Energy (DOE)-Los Alamos Site Office (LASO), and NMED where the decision was made to collect an additional sample using stainless-steel equipment and to not proceed with more aggressive chemical rehabilitation methods. Results of the additional sample collection and analysis are discussed in section 4.1. With respect to the first action, geochemical modeling is discussed in section 4.2. The permanent sampling system installation was discussed in section 2.6.

4.1 Collection of Additional Samples with Sequential Filtering at Screens 1 and 2

4.1.1 Field Operations

On March 19–March 21, 2008, purging and sampling activities were performed on R-20 screens 1 and 2 to assess water chemistry and aquifer conditions.

As part of the well conversion effort, water sampling was performed on screens 1 and 2 in late November and early December 2007. At that time, the submersible pump used for sampling was run on the drilling contractor's standard 2-in.-diameter steel drop pipe. The resulting groundwater samples obtained from the well exhibited elevated concentrations of iron. It was suspected that extended contact time between the water and the steel drop pipe (approximately 1-h travel time from the downhole pump to the sampling port at ground surface) may have contributed iron to the water.

Because of the possibility of chemical interference of the steel drop pipe in the original groundwater samples, a repeat sampling event was conducted, this time using stainless-steel drop pipe in place of the standard steel pipe. The advantage of the stainless-steel drop pipe is that it is largely inert with respect to groundwater, thereby avoiding interfering chemically with the water samples. A disadvantage of installing and retrieving stainless-steel pipe, however, is that a single use of the stainless-steel threaded end connections on the pipe often can cause galling of the metal, rendering the threads unusable. When this occurs, it is necessary to cut off the damaged threads, rethread the pipe, and replace the couplings. The galling susceptibility of stainless-steel pipe and couplings generally makes it an impractical choice for temporary installations for the purposes of testing, rehabilitation or sampling.

For resampling R-20, the 1-in.-diameter, API-threaded, stainless-steel drop pipe that had been procured for the permanent R-20 sampling system installation was used as the temporary drop pipe. The pumping string consisted of the 1-in. stainless-steel drop pipe, a shrouded submersible pump, and stainless-steel inflatable packers above and below the pump shroud to provide hydraulic isolation of the sampled screen zones.

The quantity of available API-threaded drop pipe from the permanent R-20 sampling system was not sufficient to extend the bottom packer to a depth beneath screen 2. Therefore, 40 ft of available National Pipe Taper threaded 1-in. stainless-steel pipe was included in the pumping string between the pump shroud and lower packer to provide the necessary length. The pump shroud and miscellaneous pipe fittings connected to it were composed of regular steel material. All other components of the pumping system were stainless steel.

On March 19, the pump was installed in R-20 and positioned near screen 2. The pump intake was placed at a depth of 1125.8 ft bgs, 21.3 ft above the top of screen 2. Following pump installation, initial purging was performed on both screen zones simultaneously for 32 min from 6:20 p.m. to 6:52 p.m. Then the packers were inflated, and screen 2 was purged individually for 8 min from 6:52 pm. to 7:00 p.m. before shutdown for the evening. A total water volume of 168 gal. was pumped, with an estimated contribution of 128 gal. from screen 1 and 40 gal. from screen 2. Table 4.1-1 summarizes the purge times, volumes, and sampling activities.

On March 20, screen 2 was purged additionally for 35 min from 8:28 a.m. to 9:03 a.m. The volume of water purged was 57 gal., making the average discharge rate 1.63 gal./min. The well was shut in for 82 min from 9:03 a.m. until 10:25 a.m. At 10:25 a.m., pumping was resumed to collect groundwater samples. Actual sample collection was deferred until water from screen 2 reached the surface. The "bottoms-up" volume of the drop pipe plus the well casing between screen 2 and the pump intake was estimated to be about 65 gal. Therefore, sample collection did not begin until this volume of water had been discharged. Pumping and sampling continued until 3:23 p.m. During the 298 min of pumping, a total water volume of 429 gal. was removed from screen 2, making the average discharge rate 1.44 gal./min.

Following sample collection from screen 2, the packers were deflated, and the pump was raised, placing the intake at 904.1 ft bgs, just above the top of screen 1. The packers were reinflated to isolate screen 1, and purging was performed for 135 min from 4:15 p.m. to 6:30 p.m. The water volume purged from screen 1 during this period was 195 gal, making the average pumping rate 1.44 gal./min.

On March 21, water sampling of screen 1 was conducted. Pumping began at 8:00 a.m. and continued for 277 min until 12:37 p.m. An estimated bottoms-up volume of 39 gal. dictated that the sample collection would not commence until that volume of water had been discharged. During the sampling of screen 1, a water volume of 354 gal. was removed from the well at an average discharge rate of 1.28 gal./min.

Following sampling of screen 1, the packers were deflated, and the pumping string was removed from the well. A temporary packer was installed between screens 1 and 2 to restore hydraulic isolation of the two zones.

4.1.2 Sampling Procedure

Sequential filtering using three different-sized membranes was performed on samples collected in March 2008 to evaluate the occurrence of iron(III) colloids in groundwater at screens 1 and 2. Screens 1 and 2 were pumped for more than 3 h because of the low pumping rates at each screen (see Table 4.1.1). Groundwater samples were collected every 30 min during the initial 60 min of the pumping test and then decreased to every 60 min for the remainder of the test.

Groundwater samples were collected from screens 1 and 2, and measurements were taken of field parameters (pH, turbidity, dissolved oxygen, temperature, ORP, and SC) during sample collection using a flow-through cell. Field parameter measurements are shown in Table 4.1-2. In addition, ferrous iron was measured in the field each time a sample was collected using the Hach 2700 Spectrophotometer. Fe(II) concentrations are also shown in Table 4.1-2.

Metal and major cation samples were individually filtered through 0.45-, 0.2-, and 0.02-μm membranes. A nonfiltered sample was collected for inorganic and metals analysis as well. Metals and inorganics were preserved with nitric acid to a pH $\leq$2. Sulfide and anion samples were filtered through a 0.45-μm membrane and preserved with ascorbic acid-NaOH-EDTA (sulfide) and at 4°C (anions). In addition, TOC samples were collected and preserved at 4°C.

EES-6 performed analyses for major cations (Ca, Mg, Na, and K), anions (total carbonate alkalinity, SO_4, F, PO_4, Br, NO_3, NO_2, and Cl), TOC, total sulfide, and metals (Al, Cr, Fe, Mn, and Zn). The same analytical methods were used as those described in section 2.7.1.

The analytical results of the March 2008 sampling event are presented in Table A-3 and are shown in Figure 4.1-1. Table 4.1-2 shows that the concentration of Fe(II) was negligible and Table A-3 shows that colloid concentrations were negligible as well, as indicated by the very small concentration of Fe passing through three filter membrane sizes. Use of the stainless-steel discharge pipe for sampling significantly reduced the iron concentrations to the point that NMED could be convinced that additional rehabilitation using an oxygen release compound was not necessary.

4.2 Geochemical Modeling of Iron Concentrations during December 2007 Sampling

Geochemical modeling was performed to understand the reasons for increased iron concentrations in screens 1 and 2 of R-20 during December 2007 sampling. This discussion forms part of the response to the "Direction for Future Action Well R-20 rehabilitation and Conversion Summary Report, Los Alamos National Laboratory" (NMED 2008, 100461).

Three hypotheses were proposed in the original "Well R-20 Rehabilitation and Conversion Summary Report" (LANL 2008, 100473) to explain the increase in dissolved iron concentrations measured at screens 1 and 2 of R-20 during the December 2007 sampling. They are

1. reductive dissolution of HFO by residual drilling products,
2. oxidation of iron sulfide, and
3. groundwater from reducing zones in the aquifer being drawn into the well bore.

NMED raised questions about hypotheses 1 and 3 because of an absence of supporting data in the report (2008, 100461). NMED directed the Laboratory to conduct a geochemical modeling analysis to ascertain why dissolved iron and sulfate concentrations increased during sampling in screens 1 and 2. In addition, NMED asked that the geochemical modeling analysis investigate the possibility that iron sulfides may be oxidized by DO and other potential oxidants under natural groundwater conditions and to identify the factors that could restrict natural oxidation of iron sulfides.

The two objectives of the modeling were to determine

1. the speciation of elements of interest with particular emphasis on iron in screens 1 and 2 of R-20, and
2. the amount of oxygen needed to oxidize sulfide minerals, including pyrite, and identify the limitations that affect the oxidation of these sulfide minerals under relevant groundwater conditions,

The results of these modeling calculations aid in properly delineating the provenance of the measured iron concentration and provide a technical basis for assessing the progress of well rehabilitation and conversion.

4.2.1 Geochemical Modeling Approach

Geochemical approach for objective 1—Groundwater is a solution composed of numerous constituents that may be in equilibrium with a large variety of minerals. Geochemical modeling allows the calculation of the distribution of aqueous species in a given solution and the saturation state of this solution relative to a set of minerals. By using this calculation, the distribution of iron species in screens 1 and 2 samples can be determined. The results of the calculation can identify the dominant species in these samples and can also help identify what mineral phases are likely to contribute to or control the solubility of iron in these

solutions. Field parameters such as pH, temperature, and DO, as well as a complete water analysis are required for accurate calculation of speciation and saturation indices. Figure 4.2-1 illustrates the procedure used for calculating speciation and saturation indices for screens 1 and 2 samples.

Geochemical approach for objective 2—To verify whether the observed iron increase in screens 1 and 2 in December 2007 sampling was due to the oxidation of iron sulfide by DO or other potential oxidants, it is necessary to (1) evaluate which iron sulfide, if any, can be a stable mineral phase under the relevant groundwater conditions and (2) determine the amount of O_2 needed to oxidize the identified stable iron sulfide phase in the system, if there is any. PHREEQC has the capability of adding reactions, including irreversible reactions, to a solution which equilibrates with a large variety of minerals. In this particular case, oxidized iron from iron sulfide will equilibrate with goethite, sulfate oxidized from sulfide will equilibrate with gypsum, and calcite should be the major pH buffer mineral phase in the solution. The results of this modeling will answer whether increased iron in screens 1 and 2 was caused by oxidation of iron sulfide and the amount of O_2 needed for this process. Figure 4.2-2 illustrates the procedure used for calculating the amount of O_2 needed to oxidize pyrite and equilibrate with calcite and gypsum.

"PHREEQC v2.15.0, A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and Inverse Geochemical Calculations" (Parkhurst and Appelo 1999, 095402) was used to carry out the modeling calculation. The default PHREEQC_DATABASE file included in the PHREEQC software was used as thermodynamic database for the calculation.

Two sets of input data were used: (1) Field parameters (pH, T, and DO) and chemical analysis results of common constituents from screens 1 and 2 during the December 2007 sampling event were used as input data for speciation analysis and saturation indices calculations. Tables D-1 and D-2 of Appendix D list the input data used for these geochemical speciation calculations for screens 1 and 2, respectively. (2) Field parameters (pH and T) and chemical analysis results from screen 2 during the December 2007 sampling events were used as input for Table D-3, which lists the input data for demonstration of the feasibility of using PHREEQC to calculate the amount of O_2 needed to oxidize sulfide minerals under the relevant groundwater conditions.

4.2.2 Modeling Results and Discussion

Speciation analysis and saturation indices calculation for screens 1 and 2

Tables E-1 and E-2 of Appendix E list iron speciation calculation results for screens 1 and 2. Tables E-3 and E-4 are mineral phases with positive saturation indices in the PHREEQC model calculation for R-20 screens 1 and 2. Phases without saturation indices have negative values, such as calcite and gypsum.

Figures 4.2-3 and 4.2-4 plot measured iron and calculated iron species concentrations for screen 1 and 2 samples. As shown in Figures 4.2-3 and 4.2-4, Fe(III) is the predominant species in samples from both screens, and it follows the same trend as the measured Fe concentrations for all screen 1 and 2 samples. More soluble species Fe(II) concentrations in all the screen 1 and 2 samples are negligible. These results suggest that hypotheses 1 and 3 (section 4.2) are not applicable. The groundwater in screen 1 is not increasingly reducing. In contrast, the well is increasingly oxidizing, as indicated by the field DO measurements listed in Tables D-1 and D-2.

Figure 4.2-5 shows the oxidation-reduction potential (Eh)-pH diagram for calculated iron species reported by Deutsch (1997, 101992) and the field data collected from screens 1and 2 of R-20 in December 2007 sampling events. As shown in Figure 4.2-5, based on the field pH and pe (converted from field ORP values), the theoretically dominant iron species is in the range of $Fe(OH)_3$, which is consistent with the calculation results. Furthermore, this result confirms that Fe(II), which is the dominant iron species under

more reducing and lower pH conditions, should not be expected to be present in the vicinity of screens 1 and 2 of R-20 groundwater environment.

Combination of information from Figure 4.2-5 and Tables E-3 and E-4 indicate that the mineral phase that controls iron solubility in screen 1 and 2 groundwater should be ferrihydrite, that is, $Fe(OH)_3$ (amorphous). It is well known that the formation of ferrihydrite typically limits the dissolved iron concentration in groundwater when dissolved oxygen is present (Deutsch 1997, 101992).

In summary, the dominant iron species in screens 1 and 2 of R-20 from December 2007 sampling events is Fe(III), and its solubility is controlled by ferrihydrite, which is stable under more oxidizing and higher pH conditions. The concentration of Fe(II) species, which is more stable in a reducing environment, is negligible, suggesting that reducing conditions in screens 1 and 2 of R-20 did not exist in December 2007. Therefore, the increased iron concentration measured in screens 1 and 2 from this sampling event is neither caused by reductive dissolution of HFO by drilling products nor to groundwater from reducing zones in the aquifer being drawn into the well bore.

Oxidation of pyrite and equilibration with calcite and gypsum

To demonstrate whether the increased iron in screens 1 and 2 during the December 2007 sampling event is a result of oxidation of iron sulfide (pyrite) by DO, and if so, what amount of O_2 is needed to oxidize pyrite, as described in Table D-3, four cases were considered where various molar amounts of O_2 were introduced in the vicinity assuming pyrite to be present. The following reactions are anticipated as a result of the introduced O_2:

Dissolution of Pyrite:	$FeS_2 + 3O_2 + 2H_2O \rightarrow Fe^{3+} + 2SO_4^{2-} + 4H^+$	**Equation 1**
Dissolution of Calcite:	$CaCO_3 \leftrightarrow Ca^{2+} + CO_3^{2-}$	**Equation 2**
Precipitation of Gypsum:	$Ca^{2+} + SO_4^{2-} + 2H_2O \leftrightarrow CaSO_4{\cdot}2H_2O$	**Equation 3**
pH Neutralization:	$CO_3^{2-} + H^+ \leftrightarrow HCO_3^-$	**Equation 4**
	$HCO_3^- + H^+ \leftrightarrow H_2CO_3$	**Equation 5**
Precipitation of Ferrihydrite:	$Fe^{3+} + 3H_2O \leftrightarrow Fe(OH)_3 + 3H^+$	**Equation 6**

Table E-5 lists the calculation results demonstrating for each step the number of moles of oxygen added to the aqueous phase that will be consumed (negative for pyrite and calcite) and generated (positive for gypsum, ferrihydrite, and CO_2) and the stoichiometric amount (in moles) of minerals and other phases. For each case of the amount of oxygen (mole) added, there are four reaction steps, as indicated in column 1 of Table E-5.

The results of Table E-5 illustrate that if pyrite exists, it can be oxidized and can cause an increase in the amount of Fe in the system when oxygenated groundwater is introduced into the vicinity of screens 1 and 2. However, in such a system, the dominant iron species in solution is Fe(II), not Fe(III), unless Fe(II) oxidizes rapidly in the presence of dissolved oxygen. Furthermore, as indicated in Figure 4.2-6, the measured and calculated Eh values for screens 1 and 2 samples were far off the range of the theoretical HS^-/SO_4^{2-} redox couples in the aquifer environment as reported by Lindberg and Runnells (1984, 101991). Thus, the theoretical HS^-/SO_4^{2-} couple is unlikely to be present in the system at R-20. Hence, increased iron concentrations in screens 1 and 2 are not caused by oxidation of iron sulfide.

Limitations affecting the oxidation of iron sulfide in the relevant groundwater conditions

Three major factors limit the oxidation of iron sulfide in the system:

1. the presence of other redox-sensitive elements
2. the presence of other sulfide minerals
3. the presence of organic matter

Inspection of chemical analysis results of screen 1 and 2 samples in 2007 (LANL 2008, 100473; Tables A-1 and A-2), shows that the concentration of redox-sensitive elements such as Cr and As were below their background values, suggesting that the effect of these elements on oxidation of iron sulfide is negligible. As discussed above, the HS^-/SO_4^{2-} redox couple is unlikely to be present in groundwater at R-20. Therefore, the effect of other sulfide minerals on the oxidation of iron sulfide is also unlikely.

However, as documented in LANL (2008, 100473), excess TOC concentrations were measured from 2004 and 2006 sampling events, most likely caused by residual QUIK-FOAM and other organic drilling fluids associated with drilling R-20. The report also pointed out that the concentrations of TOC measured during the 2007 pumping tests are lower than previous values of 2004 and 2006, suggesting that breakdown and oxidation of organic matter to inorganic carbon may have occurred.

Carbon in organic matter is commonly in the zero or lower valence state [C(0) to C(-IV)], which is not the stable oxidation state for carbon in equilibrium with measurable dissolved molecular oxygen (O_2). The stable oxidation state of carbon in the presence of molecular oxygen is C(IV), as in CO_2. The disequilibrium between O_2 and organic carbon results in oxidation of carbon and reduction of oxygen according to the following general reaction:

$$CH_2O + O_2 \leftrightarrow CO_2 + H_2O \qquad \textbf{Equation 7}$$

Molecular oxygen is consumed in the oxidation of labile organic matter to carbon dioxide and water usually by biologically mediated processes. The reaction continues until equilibrium conditions are established by decreasing either the organic matter or dissolved oxygen to a low concentration in the system. If organic matter and iron sulfide coexist in a system, O_2 induced in the system will partially be used to oxidize the organic matter, causing a lesser amount of O_2 to be available for oxidation of iron sulfide. In the most conservative case, regardless of reaction thermodynamics and kinetics, the oxidation of iron sulfide will not occur until most of the organic matter has been converted to CO_2. Thus, in practice, it is necessary to modify the amount of O_2 (in moles) needed for oxidation of iron sulfide in the calcite and gypsum system as calculated above by adding the amount of O_2 (in moles) needed for oxidation of excess organic matter.

Iron concentrations from the December 2007 and March 2008 sampling events

In March 2008, R-20 was sampled again, but this time the sampling discharge pipe consisted of stainless-steel tubing. A total of 39 filtered groundwater samples were collected during two pumping tests conducted at R-20 screen 1 on March 21, 2008 (21 samples), and screen 2 on March 20, 2008(18 samples). Details on sample collection, field preparation, and analytical techniques are in section 4.1.

Figure 4.2-7 shows iron concentrations in screens 1 and 2 of R-20 from both December 2007 and March 2008. The phenomenon of increasing iron concentration during December 2007 sampling events did not appear in March 2008 sampling events. For both screens, iron concentrations were fairly stable and low in March. These results support the geochemical modeling study results discussed above, that is, that the increased iron concentrations in screen 1 and 2 from December 2007 sampling events resulted

from colloidal ferrihydrite derived from the rusted mild-steel discharge pipe used for sampling in December, which passes through a 0.45-μm filter and remains in the solution.

5.0 CONCLUSIONS

There were no deviations from the NMED-approved work plan, although installation of the permanent submersible pump was delayed. The results of redevelopment and additional sampling at R-20 are summarized below.

- Screen 3 was successfully isolated and abandoned using guidance in the Compliance Order on Consent.
- Well development procedures provided good increases in hydraulic performance of the salvaged screen zones in R-20. The postdevelopment yields of screens 1 and 2 were 92% and 25% greater, respectively, than those before development, which supports the use of the chosen development methods, primarily simultaneous pumping and high-velocity jetting. However, the hydraulic gains obtained for screen 2 were lost because of hydraulic compaction of the near-well sediments that occurred when operating a deep-set pump incorporating inflatable packers. The final specific capacity of screen 2 was less than that obtained before redevelopment when the magnitude of the drawdown was carefully constrained. If similar conditions are encountered in the future, it may be beneficial to explore or develop practical methods to automatically constrain the discharge rate and/or drawdown to prevent the deleterious effects of applying extreme drawdown to producing zones.
- Most turbidity values during 2007 redevelopment were higher than 5 NTUs but decreased steadily during purging. The elevated turbidity likely was attributable to a combination of the corroded steel drop pipe used for pumping; the compromised annular seal of screen 1; the fine-grained formation; and normal, expected cleanup following aggressive well development.
- In the original version of this report (LANL 2008, 100473), increasing concentrations of dissolved iron measured during the 2007 pumping tests conducted at R-20 screens 1 and 2 (Figures 2.7-5 and 2.7-6) suggested that reductive dissolution of HFO and/or oxidation of iron sulfide may have taken place or that groundwater from reducing zones in the aquifer was being drawn into the well bore. Dissolved iron exceeded the upper background value for iron (0.147 mg/L) (LANL 2007, 095817). Iron concentrations in nonfiltered samples were greater than those in filtered samples collected from R-20 screen 1 and 2 (Tables A-1 and A-2), resulting from pipe corrosion and/or possibly the presence of HFO and iron sulfide within the regional aquifer.
- Taken together, the concentrations of TOC, TKN, and ammonia measured from 2004 to 2007, suggest the lingering presence of QUIK-FOAM and other drilling products.
- Groundwater samples analyzed from well R-20 screen 1 during the 2007 pumping test had an average well screen score of 89%, ranging from 85% to 91%. The well screen score for the July 2006 pumping test was 72%. Turbidity values greater than 5 NTUs (15 measurements), DO concentrations less than 2 mg/L (15 measurements), and excessive concentrations of dissolved iron (15 samples), barium (9 samples), boron (2 samples) and zinc (1 sample) exceeding Laboratory background levels contributed to samples failing several criteria of the 2007 well screen analysis.
- Groundwater samples analyzed from well R-20 screen 2 during the 2007 pumping test had an average well screen score of 88%, ranging from 85% to 91%. The well screen score for the July 2006 pumping test was 89%. Laboratory background level exceedances that contributed to

samples failing several criteria of the 2007 well screen analysis were (1) turbidity values greater than 5 NTUs (18 measurements); (2) DO concentrations less than 2 mg/L (13 measurements); and (3) excessive concentrations of TOC (19 samples), boron (1 sample), dissolved iron (19 samples), barium (19 samples), sulfate (19 samples), and zinc (4 samples).

- A geochemical comparison of selected analytes and pH was performed on the R-20 screens 1 and 2 samples to evaluate sampling methodologies that used Westbay equipment and a submersible pump. Concentrations of dissolved calcium, chloride, sulfate, nitrate(N), iron, manganese, uranium, vanadium, and zinc were generally lower in samples using Westbay equipment in comparison to those collected during the four pumping tests conducted in 2006 and 2007. Concentrations of total carbonate alkalinity, TOC, and dissolved sodium, however, were generally higher in samples using Westbay equipment in comparison to those collected during the four pumping tests. Energetic purging or pumping of R 20 screens 1 and 2 allowed groundwater outside of the filter pack to be sampled, providing more reducing groundwater samples potentially impacted by residual drilling effects based on elevated above background concentrations of dissolved iron. Excess TOC concentrations measured from 2004 to 2006 are most likely derived from residual QUIK-FOAM and additional organic drilling fluids associated with drilling R-20. Concentrations of TOC measured during the 2007 pumping tests conducted at R-20 screens 1 and 2 are lower than previous values as more residual organic-based drilling fluid breaks down and oxidizes to inorganic carbon in the form of total carbonate alkalinity.
- The overall conclusion is that redevelopment activities significantly improved the specific capacity at R-20 screen 1 and (temporarily) at screen 2. Water quality also improved somewhat at screen 1 and screen 2 compared with October 2006 results of the well screen analysis (LANL 2007, 095889).
- The samples collected in March 2008 showed iron concentrations below background thresholds and showed no presence of colloidal iron. The well screen analysis was not rerun using the March samples but the below-threshold iron values in these samples would have improved their scores.
- Geochemical modeling calculation was performed for screen 1 and 2 of R-20 samples collected from December 2007 rehabilitation activities to ascertain the increased iron concentrations in both screens. The combination of field data, laboratory and geochemical modeling calculation, and analysis results suggests that increased iron concentrations in screens 1 and 2 during December 2007 sampling events was neither the result of a reducing environment that can trigger ferrous iron increase in groundwater nor the result of iron sulfide oxidation by dissolved oxygen. In all likelihood, the increased iron concentration in the December samples was caused by colloidal ferrihydrite from the corroded steel drop pipe passing through 0.45-µm filter. The modeling results agree well with those reported in the literature and with iron concentrations measured in March 2008 that were collected using a stainless-steel discharge pipe.

6.0 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; DOE-LASO; 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.

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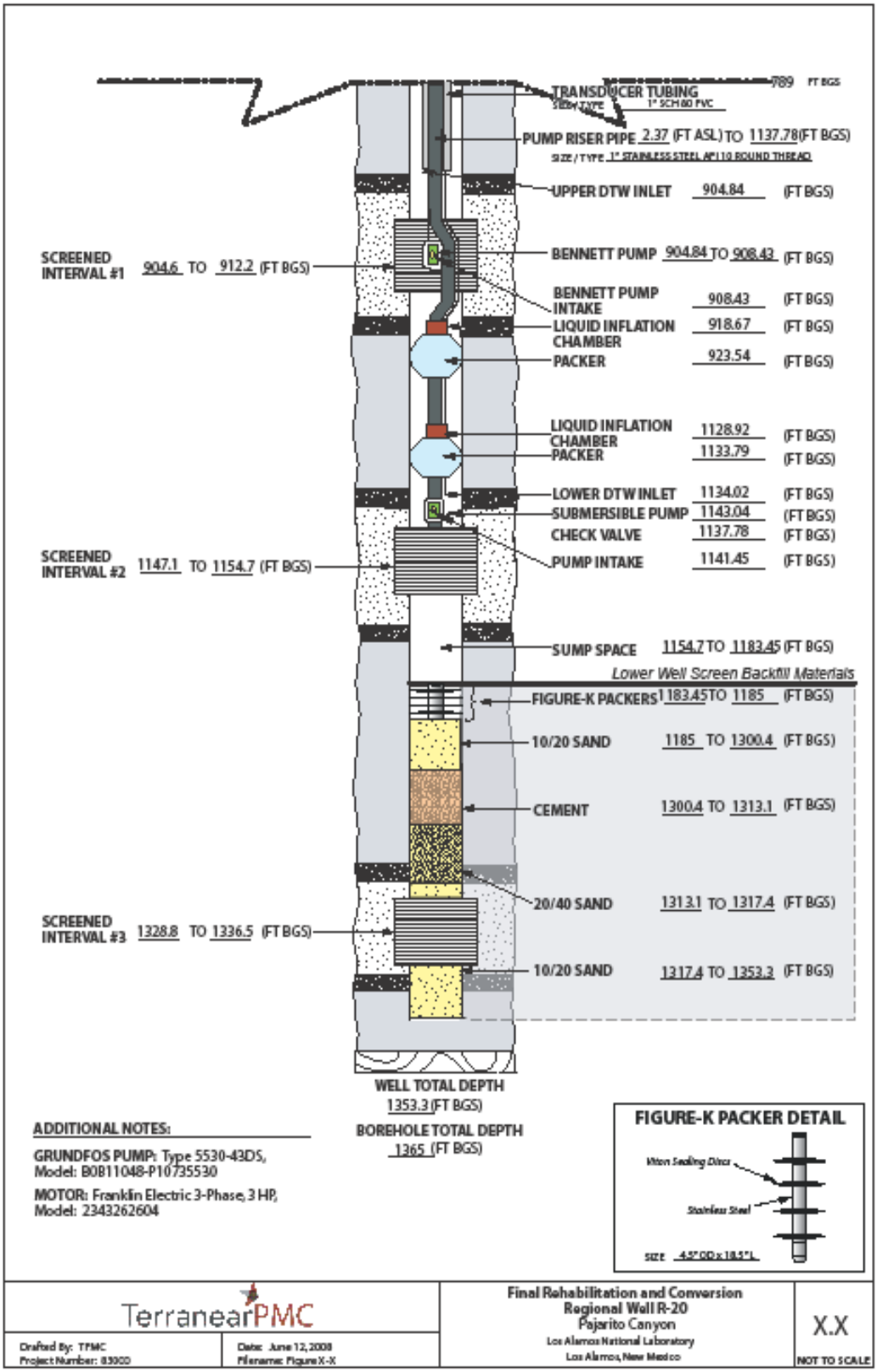
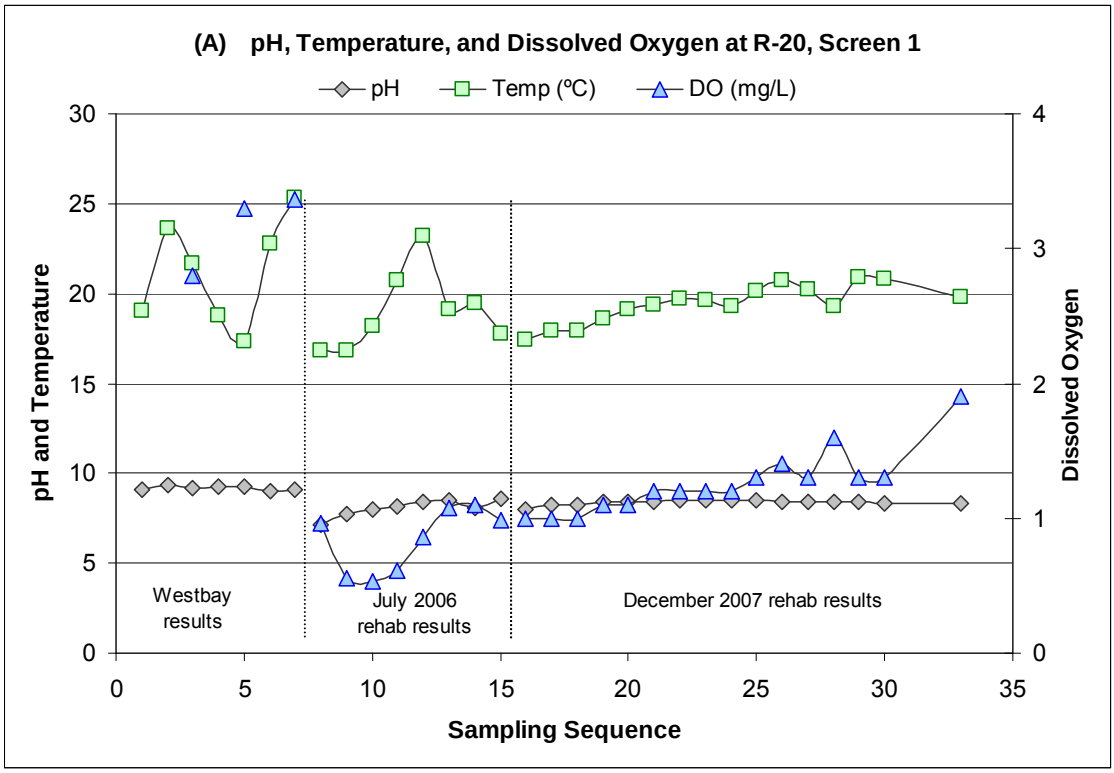


Figure 1.4-1 Well R-20 final rehabilitation and conversion configuration



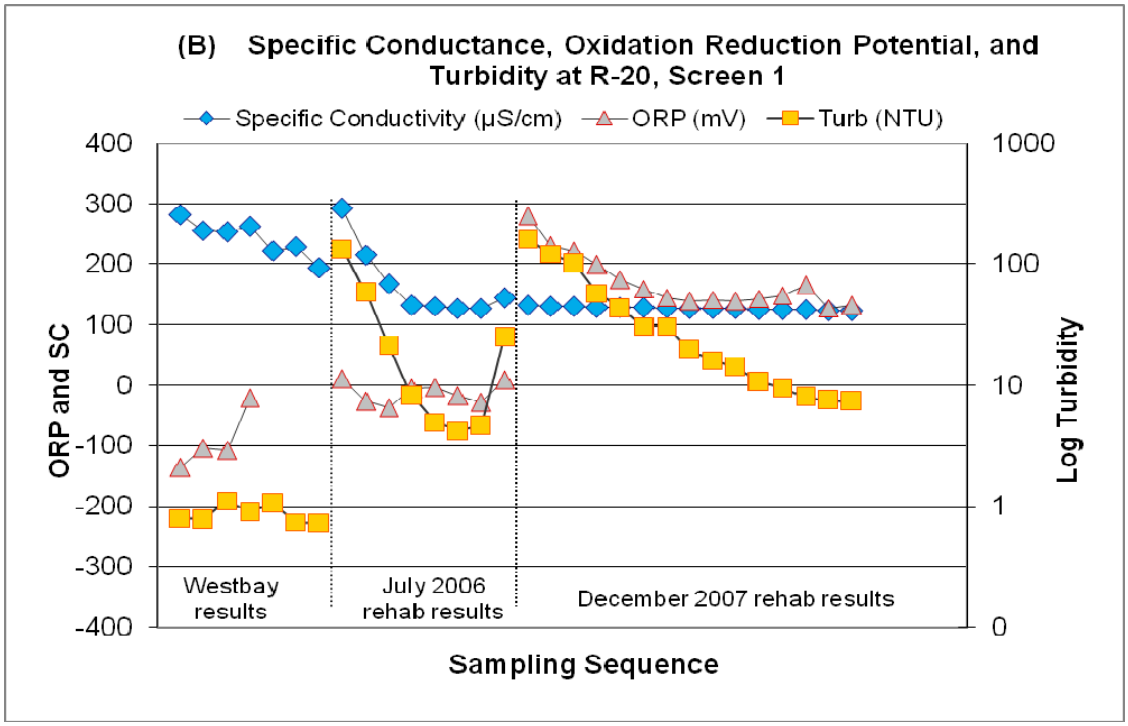
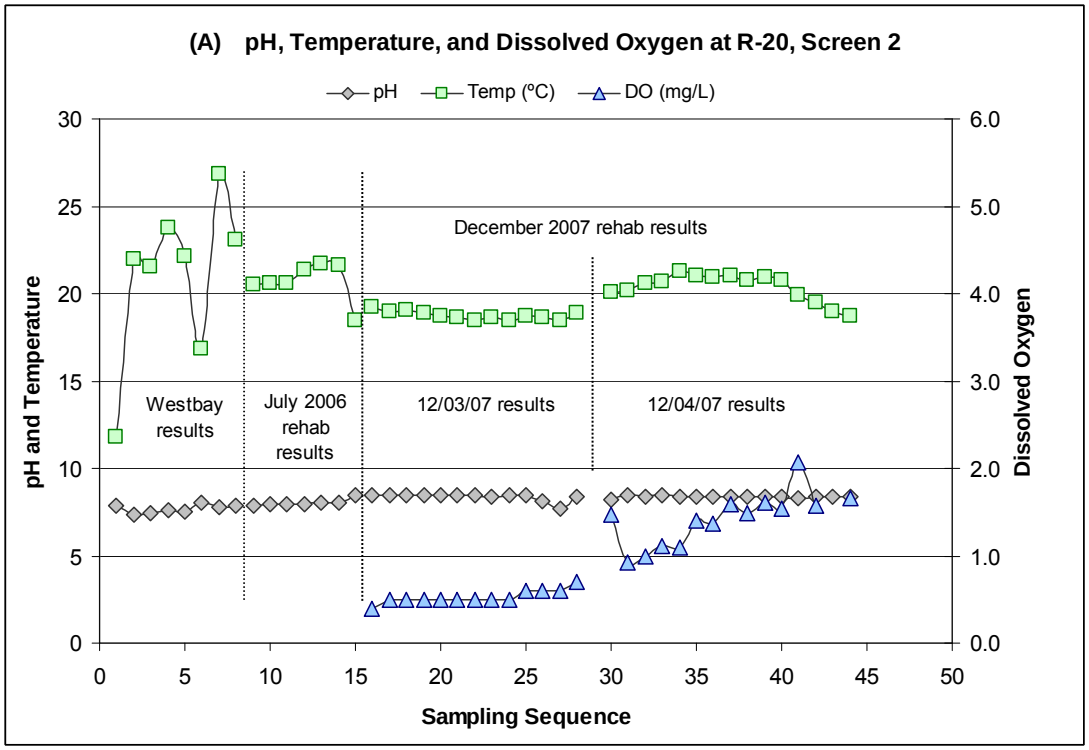


Figure 2.7-1 **Field parameters measured at R-20 screen 1 from 2004 to 2007. (A) pH, temperature, and dissolved oxygen. (B) Specific conductance, oxidation-reduction potential, and turbidity.**



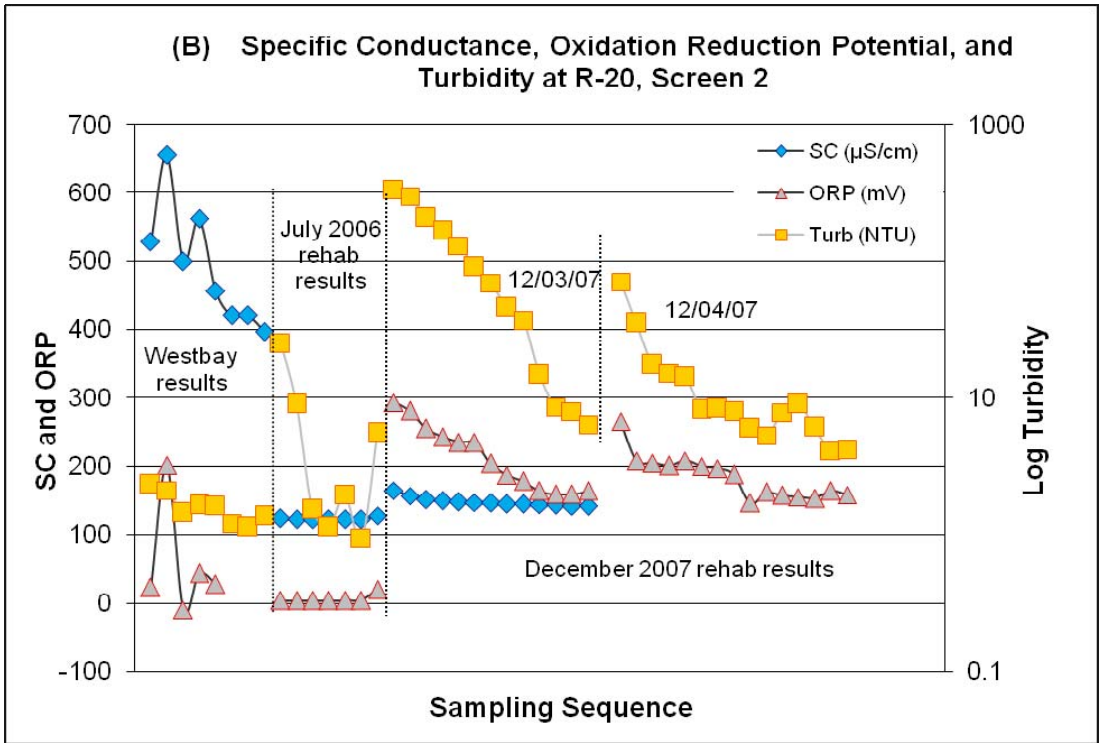


Figure 2.7-2 Field parameters measured at R-20 screen 2 from 2004 to 2007. (A) pH, temperature, and dissolved oxygen. (B) Specific conductance, oxidation-reduction potential, and turbidity.

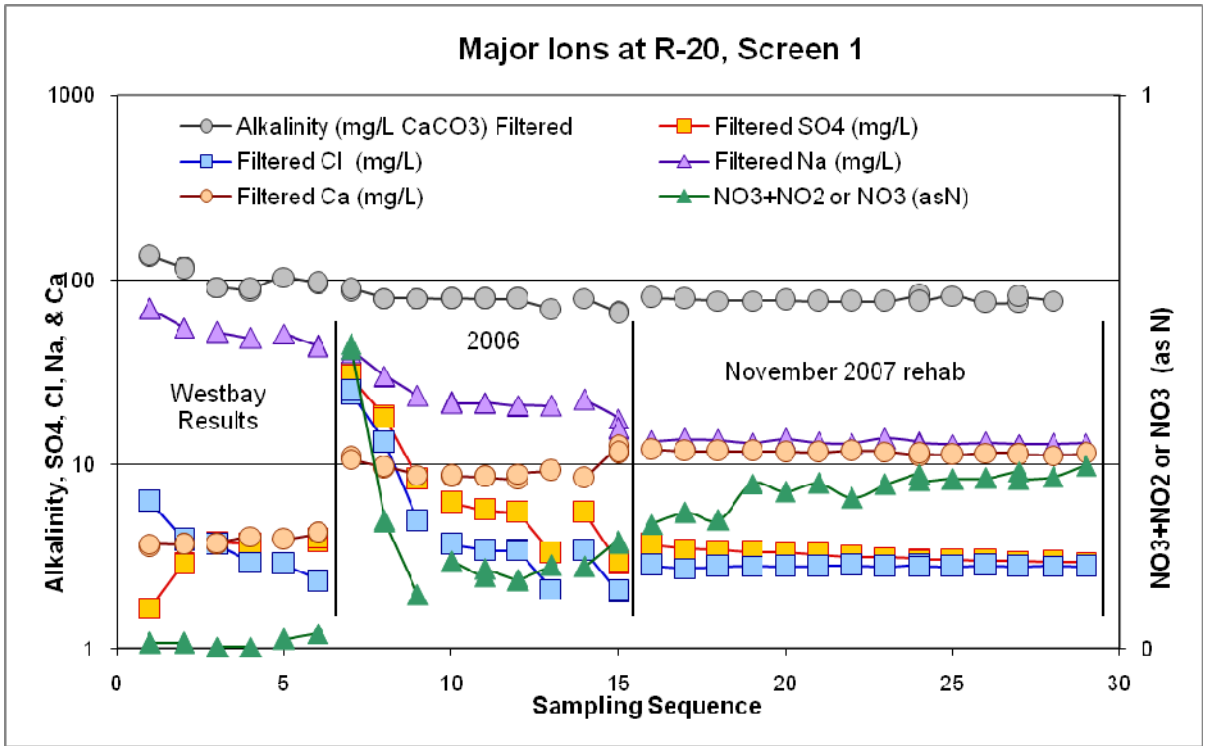


Figure 2.7-3 **Sample sequence versus dissolved concentrations of total carbonate alkalinity, sodium (Na), calcium (Ca), chloride (Cl), sulfate (SO_4), nitrate plus nitrite (NO_3+NO_2), or nitrate (NO_3) (as N) during characterization sampling using Westbay equipment and pumping tests conducted in July 2006 and December 2007 at R-20 screen 1**

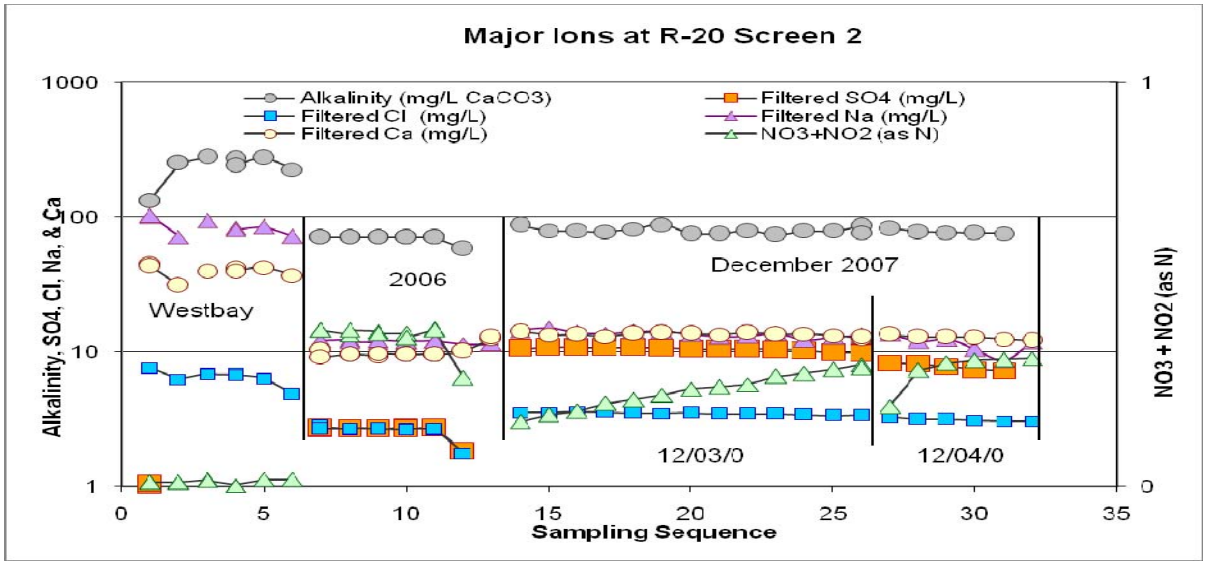


Figure 2.7-4 **Sample sequence versus dissolved concentrations of total carbonate alkalinity, sodium (Na), calcium (Ca), chloride (Cl), sulfate (SO_4), nitrate plus nitrite (NO_3+NO_2) (as N) during characterization sampling using Westbay equipment and pumping tests conducted in July 2006 and December 2007 at R-20 screen 2**

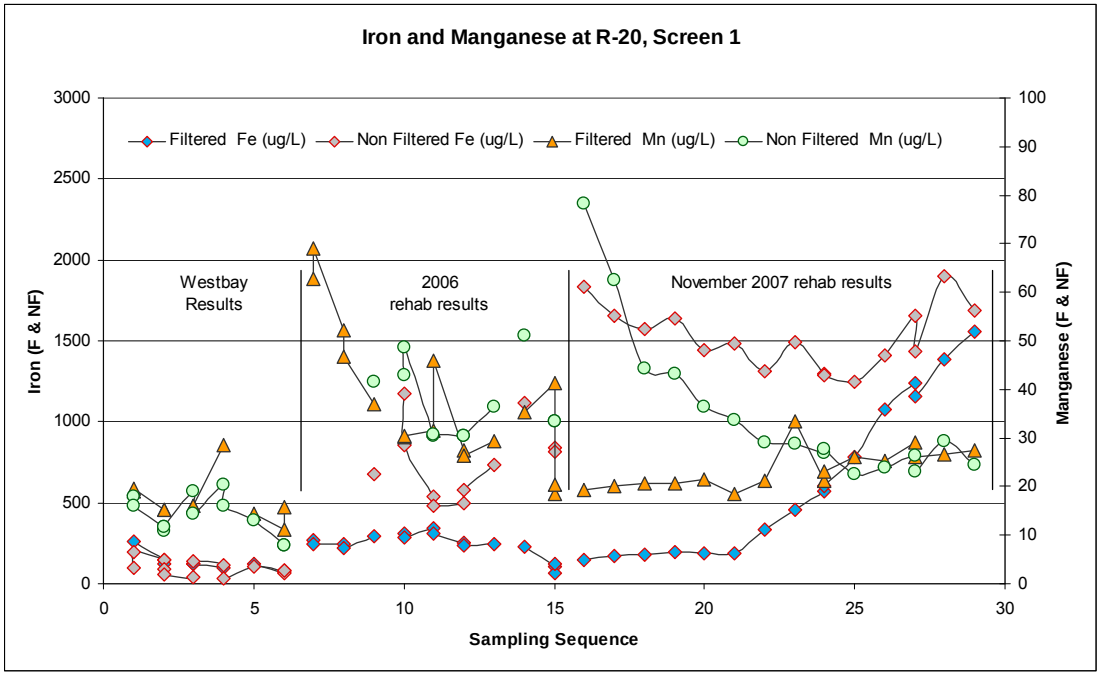


Figure 2.7-5 **Sample sequence versus dissolved and total concentrations of iron (Fe) and manganese (Mn) during characterization sampling using Westbay equipment and pumping tests conducted in July 2006 and November 2007 at R-20 screen 1**

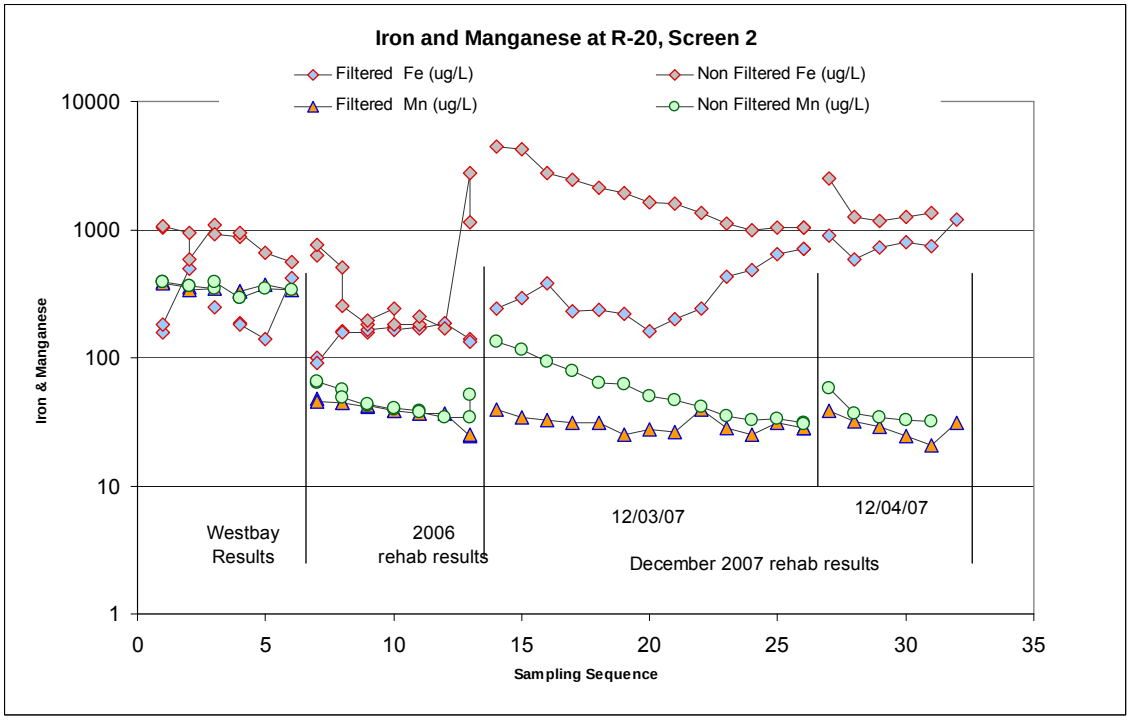


Figure 2.7-6 **Sample sequence versus dissolved and total concentrations of iron (Fe) and manganese (Mn) during characterization sampling using Westbay equipment and pumping tests conducted in July 2006 and December 2007 at R-20 screen 2**

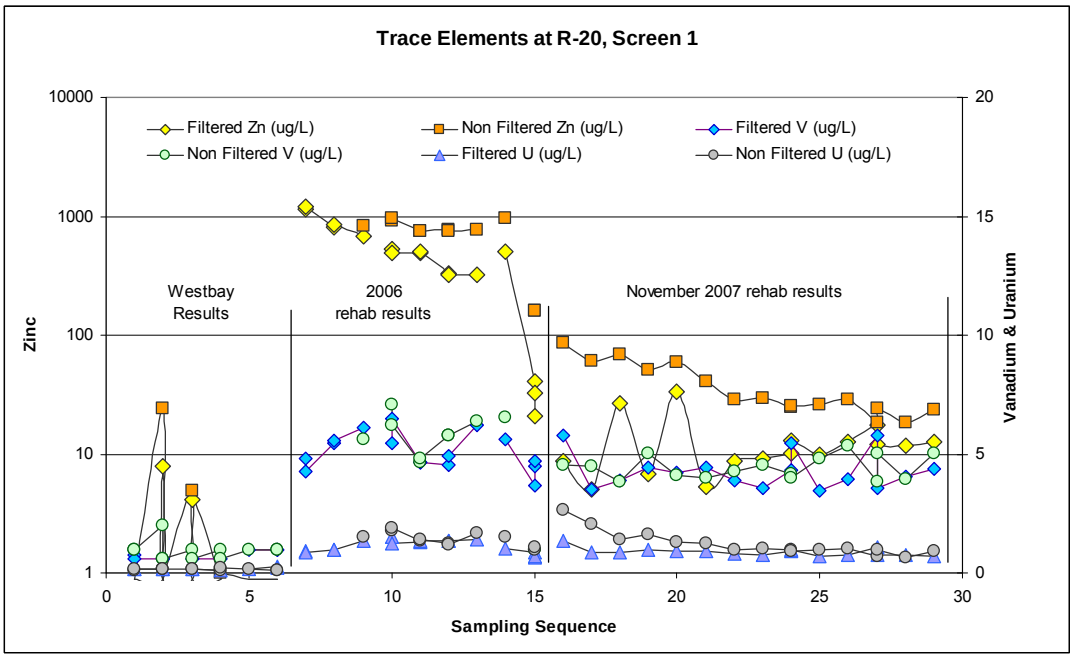


Figure 2.7-7 **Sample sequence versus dissolved and total concentrations of zinc (Zn), vanadium (V), and uranium (U) during characterization sampling using Westbay equipment and pumping tests conducted in July 2006 and November 2007 at R-20 screen 1**

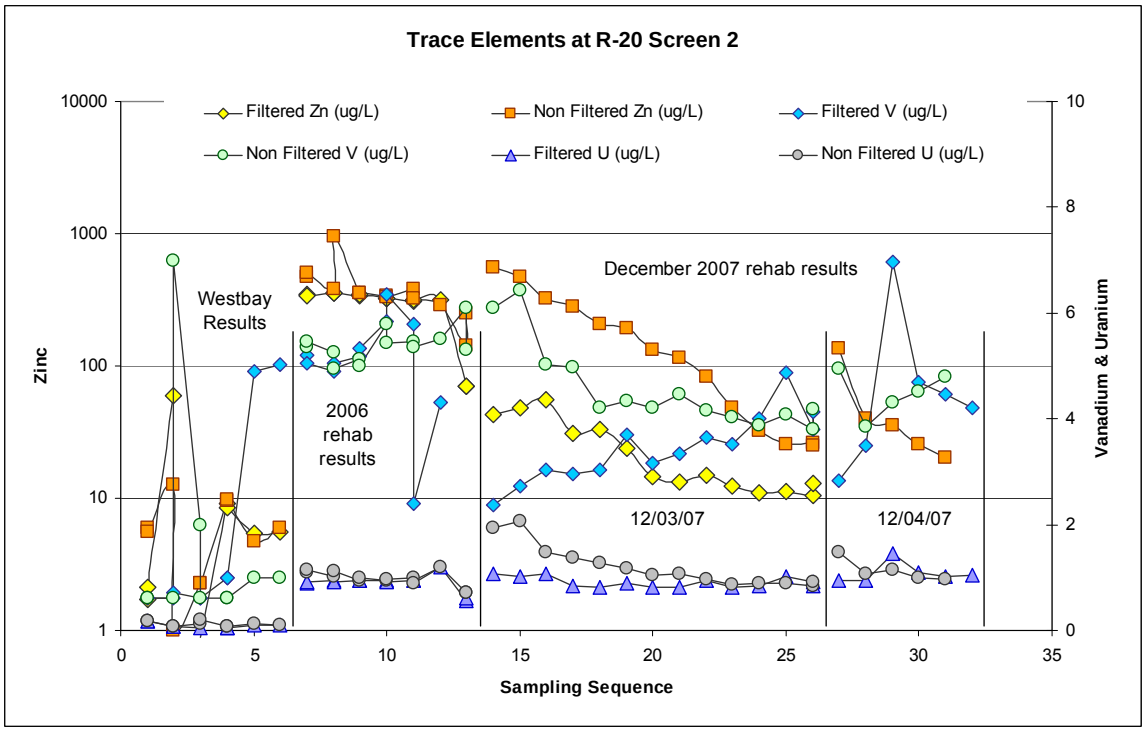


Figure 2.7-8 **Sample sequence versus dissolved and total concentrations of zinc (Zn), vanadium (V), and uranium (U) during characterization sampling using Westbay equipment and pumping tests conducted in July 2006 and December 2007 at R-20 screen 2**

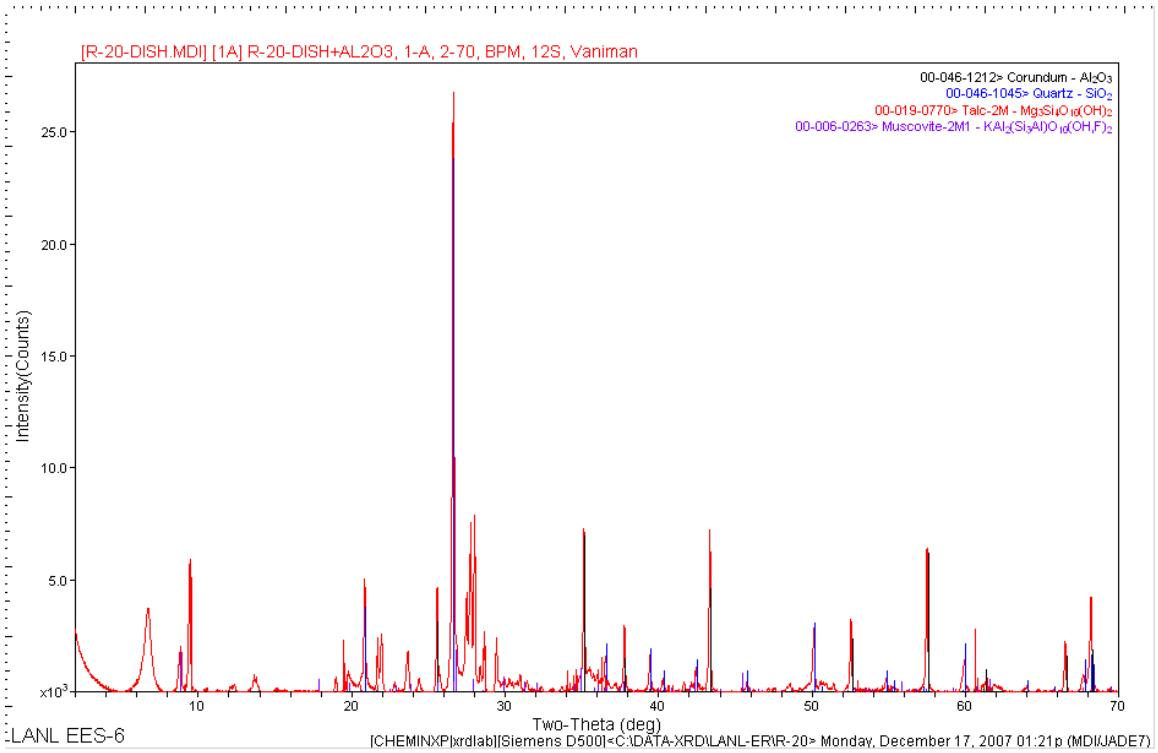


Figure 3.0-1 X-ray diffraction pattern of coarse fraction of solids collected at R-20 screen 1

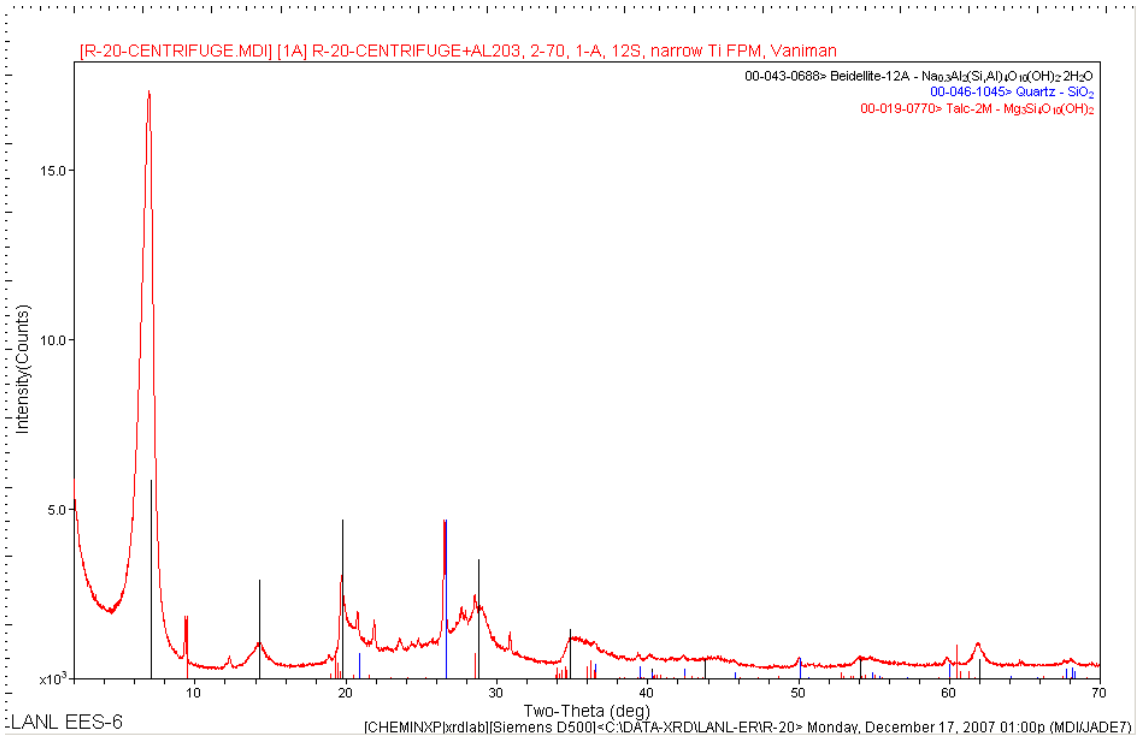


Figure 3.0-2 X-ray diffraction pattern of fine fraction of solids collected at R-20 screen 1

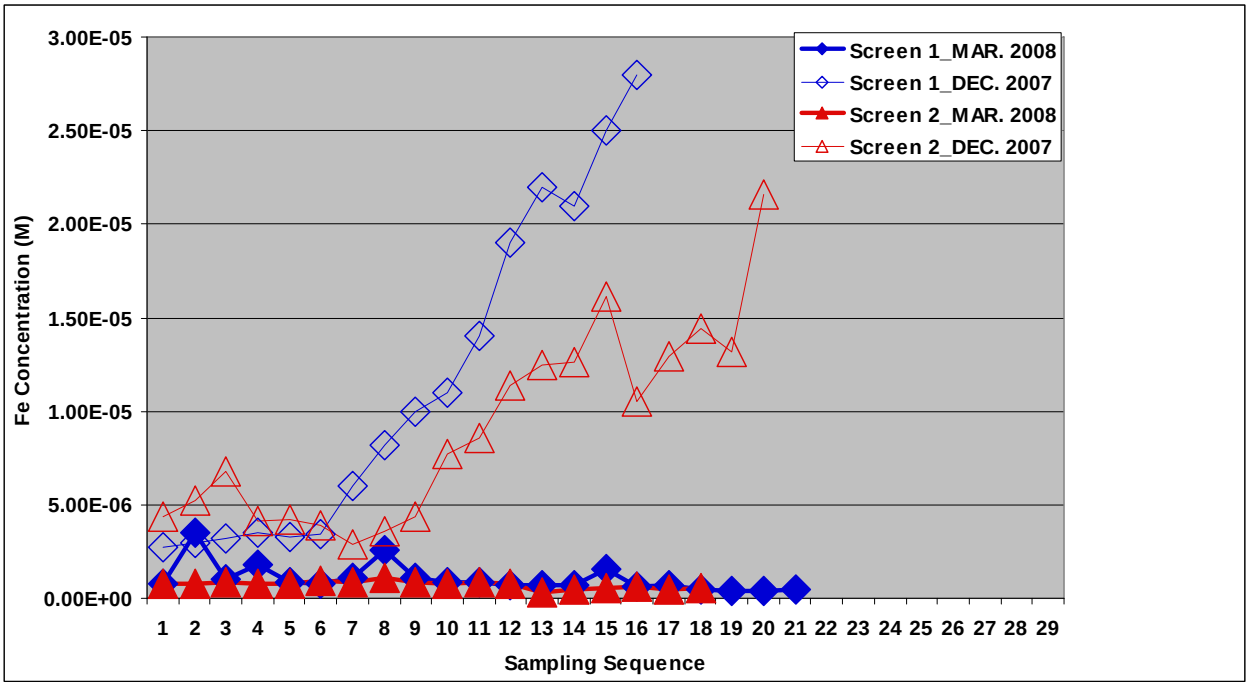
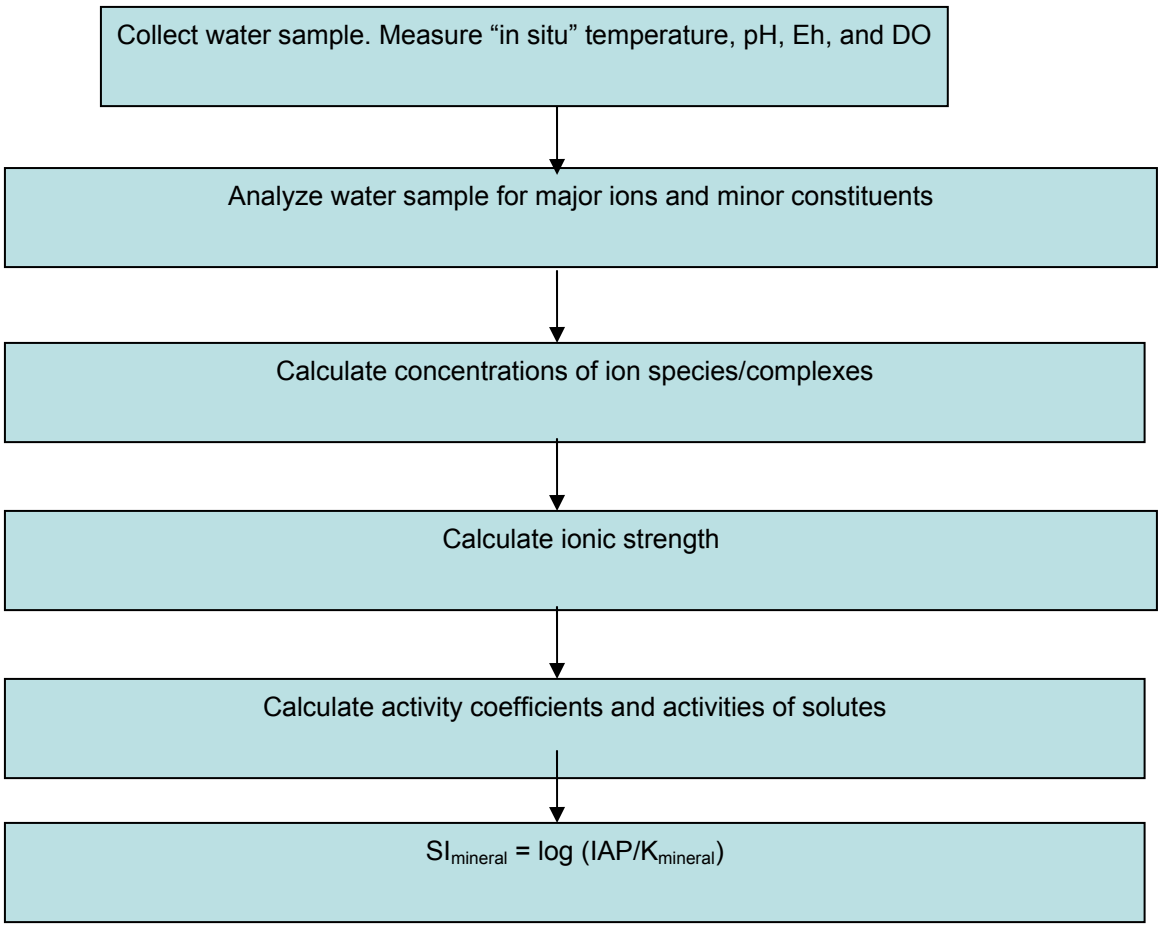
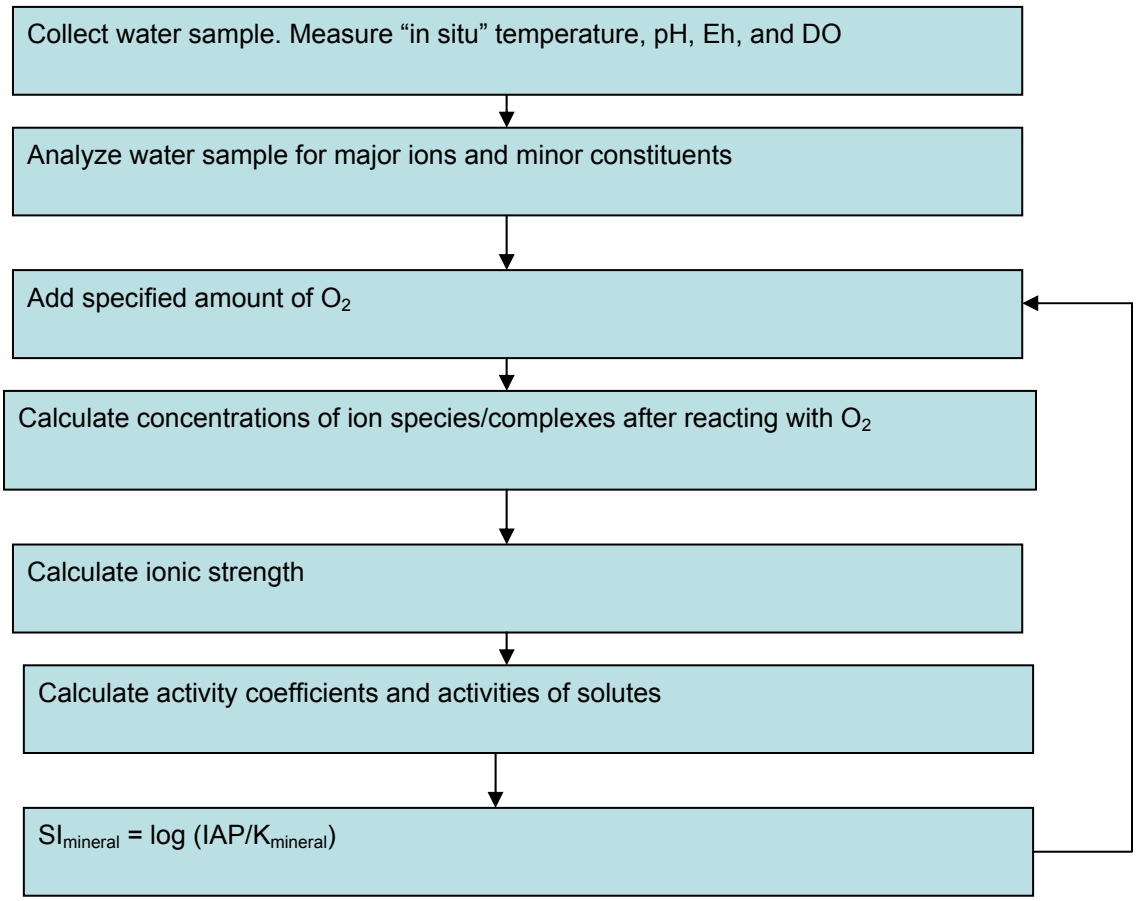


Figure 4.1-1 Comparison of iron concentrations at R-20 from the December 2007 and March 2008 sampling events



Note: Field measurements were used for in situ measurements (SI = Saturation Indices, IAP = Ion Activity Product, K = Equilibrium Constant).

Figure 4.2-1 Speciation and mineral saturation indices calculation process



Note: Field measurements were used for in situ measurements.

Figure 4.2-2 PHREEQC modeling steps showing the addition of oxygen and equilibration with pyrite, calcite, and gypsum

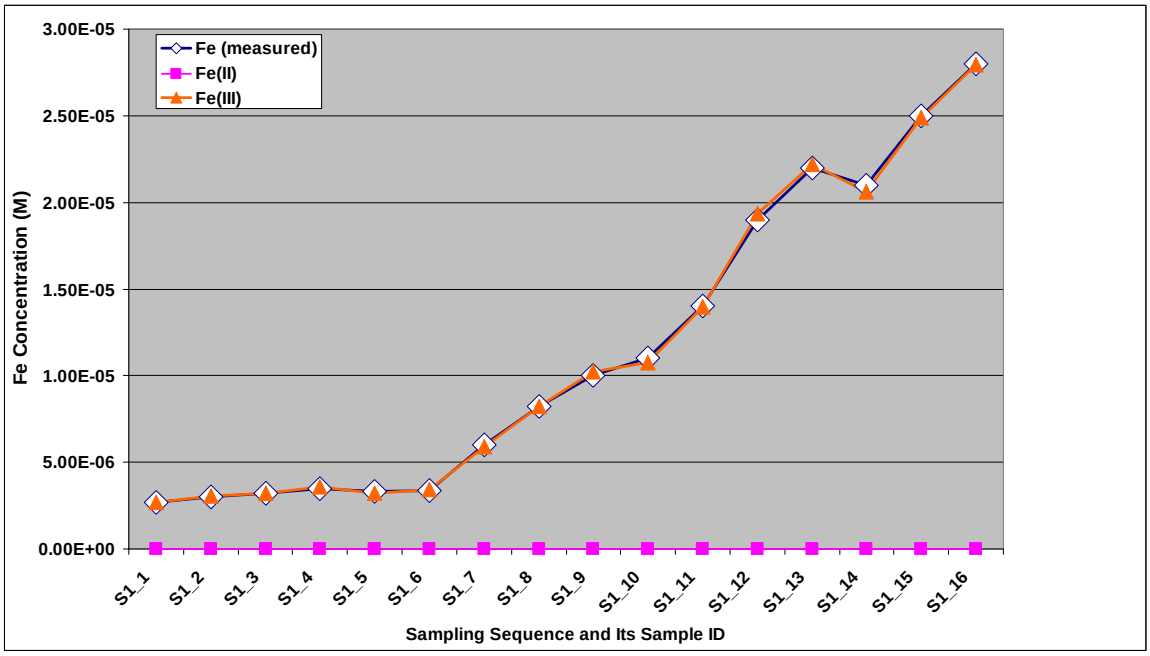


Figure 4.2-3 Measured and calculated iron species concentrations in screen 1 samples from November to December 2007 sampling

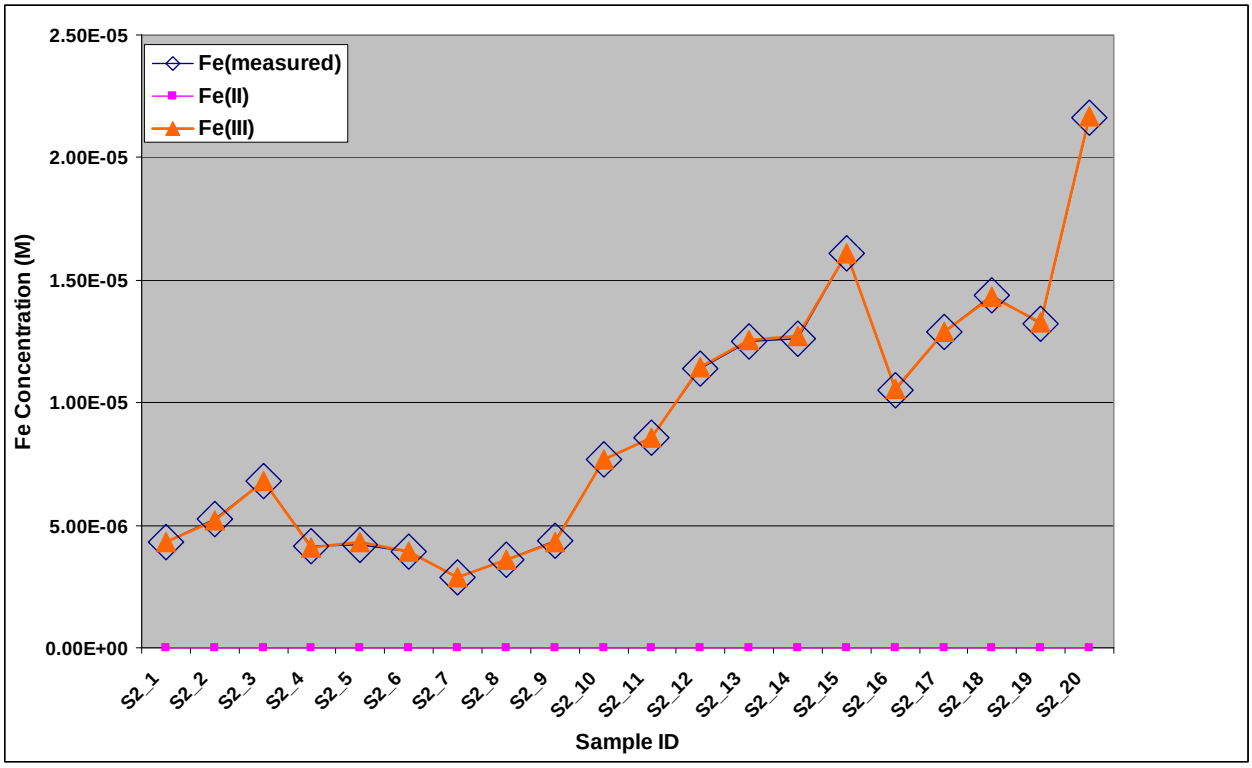
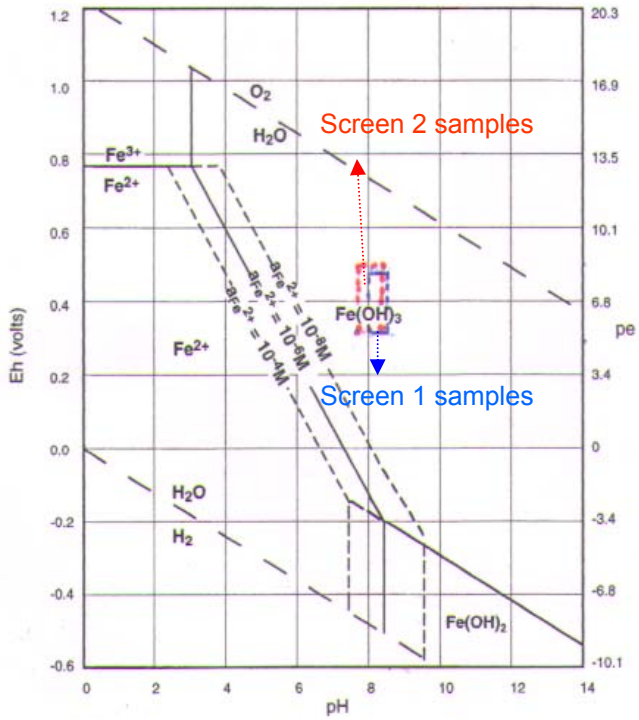
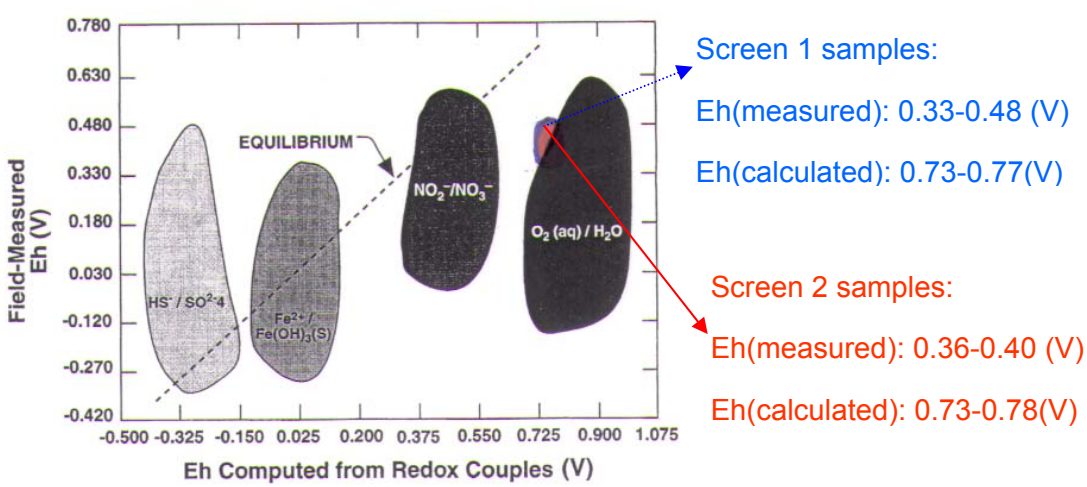


Figure 4.2-4 Measured and calculated iron species concentrations in screen 2 samples from November to December 2007 sampling



From Deutsch (1997, 101992).

Figure 4.2-5 The range of field data from screens 1 and 2 of R-20 in the Eh-pH diagram for selected iron species 5



From Lindberg and Runnells (1984, 101991).

Figure 4.2-6 $Eh_{measured}$ at screens 1 and 2 of R-20 samples collected in December 2007 versus $Eh_{calculated}$

Table 2.2-1
Well R-20 Video Log Information

	Depth to :		Remarks
	Top	Bottom	
Static Water Level	850 ft 10 in.	n/a*	Composite static water level
Screen 1	905 ft 9 in.	912 ft 11in.	Pipe-based; visibility excellent; screen interval appears clean; fines resting on lower lip of hole perforations
Screen 2	1148 ft1 in.	1155 ft 1 in.	Pipe-based; visibility very good to good; screen interval appears clean; fines resting on lower lip of hole perforations

* n/a = Not applicable.

Table 2.5-1
R-20 Screen 1 and 2 Pumping Results

Date	Zone	Pumping Rate (gal./min)	Drawdown (ft)	Pumping Time (min)	Specific Capacity (gal./min/ft)
Baseline Data from 2006					
8/27/2006	Screens 1 and 2	1.35	74.2	531	0.0182
10/17/2006	Screen 1	0.65	62.2	368	0.0105
	Screen 2	n/a[a]	n/a[a]	n/a[a]	0.0077
Postdevelopment Data from 2007					
11/29/2007	Screen 1	1.47	65.8	77	0.0223
	Screen 2	0.60[b]	59.9[c]	77	0.0100
11/30/2007	Screen 1	1.55	74.0	30	0.0209
	Screen 1	1.43	70.9	420	0.0202
12/3/2007	Screen 2	0.53[b]	59.8[c]	30	0.0089
12/3/2007	Screen 2	1.07[b]	109.5[c]	35	0.0098
12/3/2007	Screen 2	1.50	314.8	30	0.0048
	Screen 2	1.43	315.5	180	0.0045
	Screen 2	1.32	311.7	341	0.0042
12/4/2007	Screen 2	1.20	290.8	34	0.0041
	Screen 2	1.23	307.1	200	0.0040
	Screen 2	1.22	315.4	454	0.0039

[a] n/a = Not applicable.
[b] Inferred.
[c] Estimated.

Table 2.7-1
Data Quality Objectives: Process and Sampling for the R-20 Well Rehabilitation and Conversion Project, November and December 2007

Process/Step	Purpose	Sample Collection	Field Parameters	Frequency/Number of Samples
Remove packer isolation string	Prepare well for rehabilitation	None	None	None
Run camera survey	Evaluate screen 1 and 2 conditions	DVD/VHS tape	None	0–1155 ft
Jet screens 1 and 2	Redevelop screens 1 and 2	None	None	None
Swab screens 1 and 2	Redevelopment	None	None	None
Abandon screen 3	To isolate and abandon screen 3	None	None	None
Pump screen 1 and screen 2 to evaluate chemistry	Measure specific capacity and assess water quality during sustained pumping	Performance suite (see definitions below)	pH, ORP temperature (T), SC, DO, turbidity	Every 5 min for first 30 min; 10 min for next 30 min; 30 min for minimum 3 h; each hour until end of specific capacity test [25 samples total per screen]
Install Baski dual 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, per "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665) requirements and schedule	pH, ORP, T, SC, DO, turbidity	One filtered/nonfiltered pair

Notes: Performance suite: S^{2-}, total organic carbon, metals, alkalinity, anions (including perchlorate) and cations, from EES-6 laboratory. Full analytical suite: VOC, SVOC, general inorganics (including alkalinity), metals, stable isotopes of hydrogen, oxygen, and nitrogen (only during initial and final sampling of each screen).

Table 2.7-2
Field Parameters Measured at R-20 Screens 1 and 2
in November and December 2007

Date	Time	pH	Temp (ºC)	Specific Conductivity (µS/cm)	DO (mg/L)	Turb (NTU)	ORP (mV)
A. Field Parameters R-20 Screen 1							
Characterization and Monitoring Results							
03/15/04	10:58	9.09	19.0	282	—[a]	0.8	-135
05/10/04	12:55	9.32	23.6	257	—	0.8	-104
05/11/04	8:35	9.19	21.7	254	2.80	1.1	-108
09/20/04	11:07	9.26	18.8	263	—	0.9	-21
11/04/04	11:56	9.29	17.3	223	3.30	1.1	—
07/20/05	9:00	9.01	22.8	230	—	0.7	—
06/06/06	10:18	9.07	25.3	195	3.37	0.7	—
First Rehabilitation Results							
07/06/06	13:33	7.18	16.8	293	0.96	133.0	10
07/06/06	13:44	7.76	16.8	215	0.56	58.9	-26
07/06/06	13:54	8.02	18.2	168	0.53	21.4	-37
07/06/06	14:42	8.16	20.7	133	0.61	8.2	-5
07/06/06	15:17	8.39	23.2	132	0.86	5.0	-3
07/06/06	15:47	8.49	19.1	127	1.08	4.2	-17
07/06/06	16:05	8.08	19.5	127	1.10	4.7	-28
01/22/07	14:55	8.60	17.8	145	0.99	25.0	9
Second Rehabilitation Results							
11/30/07	9:55	7.96	17.4	132	1	164.0	281
11/30/07	10:00	8.21	17.9	131	1	123.0	231
11/30/07	10:05	8.27	17.9	131	1	101.0	222
11/30/07	10:10	8.40	18.6	129	1.1	58.0	199
11/30/07	10:15	8.41	19.1	129	1.1	43.5	175
11/30/07	10:20	8.44	19.4	129	1.2	31.0	160
11/30/07	10:25	8.46	19.7	128	1.2	31.0	146
11/30/07	10:35	8.48	19.6	128	1.2	19.5	140
11/30/07	10:45	8.49	19.3	127	1.2	16.2	142
11/30/07	10:55	8.47	20.1	127	1.3	14.1	139
11/30/07	11:25	8.45	20.7	126	1.4	10.7	144
11/30/07	11:55	8.43	20.2	125	1.3	9.5	149
11/30/07	12:25	8.42	19.3	126	1.6	8.0	166
11/30/07	12:55	8.39	20.9	124	1.3	7.5	128
11/30/07	13:55	8.37	20.8	124	1.3	7.4	132
11/30/07	14:45	8.35	19.8	124	1.9	7.1	175

Table 2.7-2 (continued)

Date	Time	pH	Temp (ºC)	Specific Conductivity (µS/cm)	DO (mg/L)	Turb (NTU)	ORP (mV)
B. Field Parameters R-20 Screen 2							
Characterization and Monitoring Results							
03/10/04	12:12	7.86	11.8	528	—	2.3	23
05/04/04	11:10	7.31	22.0	655	—	2.1	201
05/05/04	12:25	7.45	21.5	500	—	1.5	-11
09/03/04	10:30	7.64	23.8	562	—	1.6	43
09/07/04	9:30	7.53	22.1	456	—	1.6	27
11/08/04	10:50	8.05	16.8	421	—	1.2	—
07/19/05	10:06	7.77	26.8	421	—	1.1	—
06/07/06	12:54	7.84	23.1	397	—	1.4	—
First Rehabilitation Results							
07/08/06	10:20	7.89	20.5	123	—	24.9	3
07/08/06	10:30	7.94	20.6	122	—	9.0	3
07/08/06	10:40	7.95	20.6	123	—	1.5	3
07/08/06	11:10	7.99	21.4	122	—	1.1	3
07/08/06	11:40	8.02	21.7	122	—	1.9	4
07/08/06	11:50	8.01	21.6	122	—	0.9	4
01/22/07	11:23	8.50	18.5	128	—	5.5	20
Second Rehabilitation Results							
12/03/07	1:30	8.42	19.2	165	0.4	331.0	293
12/03/07	1:35	8.45	19.0	157	0.5	299.0	281
12/03/07	1:40	8.46	19.1	151	0.5	207.0	255
12/03/07	1:45	8.47	18.9	149	0.5	167.4	243
12/03/07	1:50	8.49	18.7	148	0.5	130.0	235
12/03/07	1:55	8.50	18.6	147	0.5	90.6	234
12/03/07	2:05	8.48	18.5	147	0.5	69.2	204
12/03/07	2:15	8.41	18.6	145	0.5	45.5	187
12/03/07	2:25	8.45	18.5	145	0.5	37.0	178
12/03/07	2:55	8.46	18.7	144	0.6	14.8	164
12/03/07	3:25	8.15	18.6	143	0.6	8.6	159
12/03/07	3:55	7.68	18.5	142	0.6	8.0	159
12/03/07	4:25	8.35	18.9	141	0.7	6.4	164
12/04/07	10:10	8.20	20.1	29.7[b]	1.47[b]	70.6	266
12/04/07	10:30	8.42	20.2	30.1[b]	0.93[b]	35.4	208
12/04/07	10:50	8.41	20.6	29.1[b]	1[b]	17.4	205
12/04/07	11:10	8.42	20.7	28.7[b]	1.11[b]	15.2	201
12/04/07	11:30	8.41	21.3	28.6[b]	1.1[b]	14.3	208
12/04/07	11:50	8.37	21.0	28.4[b]	1.4[b]	8.2	200

Table 2.7-2 (continued)

Date	Time	pH	Temp (ºC)	Specific Conductivity (µS/cm)	DO (mg/L)	Turb (NTU)	ORP (mV)
12/04/07	12:10	8.38	20.9	28.4[b]	1.37[b]	8.4	197
12/04/07	12:30	8.36	21.0	28.2[b]	1.59[b]	7.9	188
12/04/07	12:50	8.36	20.8	28.2[b]	1.48[b]	6.0	146
12/04/07	1:10	8.35	20.9	27.9[b]	1.61[b]	5.3	162
12/04/07	1:30	8.35	20.8	27.8[b]	1.54[b]	7.8	157
12/04/07	1:50	8.30	19.9	28[b]	2.06[b]	9.0	155
12/04/07	2:10	8.34	19.5	27.9[b]	1.57[b]	6.1	153
12/04/07	2:30	8.34	19.0	27.8[b]	—	4.1	164
12/04/07	4:40	8.34	18.7	27.8[b]	1.65[b]	4.2	158

[a] — = No data.

[b] Data are suspect.

Table 4.1-1
Purging and Sampling of R-20, March 2008

Date	Time	Activity	Pump Intake Depth (ft)	Volume Pumped (gal.)	Average Discharge Rate (gal./min)
March 19	1820 to 1852	Purge Screen 1	1125.8	128[a]	4.0[b]
	1820 to 1900	Purge Screen 2	1125.8	40[a]	1.0
March 20	823 to 903	Purge Screen 2	1125.8	57	1.63
	1025 to 1523	Sample Screen 2	1125.8	429	1.44
	1415 to 1630	Purge Screen 1	904.1	195	1.44
March 21	800 to 1237	Sample Screen 1	904.1	354	1.28

[a] Estimated volumes.

[b] Contribution from casing storage; subsequently refilled from screen 1.

Table 4.1-2
Field Parameters and Iron(II) Measured in
Nonfiltered Samples at Well R-20 on March 20–March 21, 2008

Screen	Sample	Date (yr-mo-dy-hr-mn)	pH	Temperature (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Ferrous Iron (mg/L)
1	GW20-08-11439	0803210828	8.33	17.0	134.3	4.04	53.5	+163	0.78, 0.77
1	GW20-08-11440	0803210858	8.36	21.4	137.8	3.03	23.1	+147	0.00, -0.01
1	GW20-08-11441	0803210928	8.30	22.7	136.3	3.25	6.90	+161	0.03, 0.03
1	GW20-08-11442	0803211028	8.28	22.7	136.3	3.26	3.23	+170	0.00, 0.00
1	GW20-08-11443	0803211128	8.28	23.5	135.3	3.38	3.69	+155	0.00
1	GW20-08-11444	0803211228	8.24	24.0	134.3	3.23	3.71	+161	-0.01, 0.00
2	GW20-08-11478	0803201110	7.88	20.5	149.5	2.75	117	+179	0.21, 0.24
2	GW20-08-11479	0803201140	7.98	20.9	142.9	2.91	31.8	+96	0.01, -0.00
2	GW20-08-11452	0803201210	8.01	20.9	139.0	3.15	6.90	+105	0.00
2	GW20-08-11481	0803201310	8.04	21.8	135.6	3.41	4.81	+124	-0.03, -0.00

Appendix A

Analytical Data Results

Table A-1
Laboratory-Measured Analytical Results for R-20 Screen 1

Sample ID	Date Collected	Date Received	ER/RRES-WQH	Time	Field pH	Temp C	Cond (µS/cm)	Dissolved O_2 (mg/L)	Turbidity (NTU)	ORP (mV)
R-20 Screen 1										
GW20-08-8880 (F[a])	11/29/2007	11/29/2007	08-276	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Measured
GW20-08-9004 (NF[b])	11/29/2007	11/29/2007	08-275	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Measured
GW20-08-8883 (F)	11/30/2007	12/3/2007	08-301	955	7.96	17.4	132	1	164	281
GW20-08-9007 (NF)	11/30/2007	12/3/2007	08-300	955	7.96	17.4	132	1	164	281
GW20-08-8887 (F)	11/30/2007	12/3/2007	08-301	1000	8.21	17.9	130.9	1	123	231
GW20-08-9011 (NF)	11/30/2007	12/3/2007	08-300	1000	8.21	17.9	130.9	1	123	231
GW20-08-8888 (F)	11/30/2007	12/3/2007	08-301	1005	8.27	17.9	130.7	1	101	222
GW20-08-9012 (NF)	11/30/2007	12/3/2007	08-300	1005	8.27	17.9	130.7	1	101	222
GW20-08-8889 (F)	11/30/2007	12/3/2007	08-301	1010	8.4	18.6	129.3	1.1	58	199
GW20-08-9013 (NF)	11/30/2007	12/3/2007	08-300	1010	8.4	18.6	129.3	1.1	58	199
GW20-08-8890 (F)	11/30/2007	12/3/2007	08-301	1015	8.41	19.1	129	1.1	43.5	175
GW20-08-9014 (NF)	11/30/2007	12/3/2007	08-300	1015	8.41	19.1	129	1.1	43.5	175
GW20-08-8891 (F)	11/30/2007	12/3/2007	08-301	1025	8.46	19.7	128.2	1.2	31	146
GW20-08-9015 (NF)	11/30/2007	12/3/2007	08-300	1025	8.46	19.7	128.2	1.2	31	146
GW20-08-8892 (F)	11/30/2007	12/3/2007	08-301	1035	8.48	19.6	127.6	1.2	19.5	140
GW20-08-9016 (NF)	11/30/2007	12/3/2007	08-300	1035	8.48	19.6	127.6	1.2	19.5	140
GW20-08-8893 (F)	11/30/2007	12/3/2007	08-301	1045	8.49	19.3	127	1.2	16.2	142
GW20-08-9017 (NF)	11/30/2007	12/3/2007	08-300	1045	8.49	19.3	127	1.2	16.2	142
GW20-08-8875 (F)	11/30/2007	12/3/2007	08-301	1055	8.47	20.1	126.9	1.3	14.1	139
GW20-08-8882 (F)	11/30/2007	12/3/2007	08-301	1055	8.47	20.1	126.9	1.3	14.1	139
GW20-08-8998 (NF)	11/30/2007	12/3/2007	08-300	1055	8.47	20.1	126.9	1.3	14.1	139
GW20-08-8999 (NF)	11/30/2007	12/3/2007	08-300	1055	8.47	20.1	126.9	1.3	14.1	139
GW20-08-9006 (NF)	11/30/2007	12/3/2007	08-300	1055	8.47	20.1	126.9	1.3	14.1	139
GW20-08-8894 (F)	11/30/2007	12/3/2007	08-301	1125	8.45	20.7	126	1.4	10.7	144
GW20-08-9018 (NF)	11/30/2007	12/3/2007	08-300	1125	8.45	20.7	126	1.4	10.7	144
GW20-08-8895 (F)	11/30/2007	12/3/2007	08-301	1155	8.43	20.2	125.4	1.3	9.54	149
GW20-08-9019 (NF)	11/30/2007	12/3/2007	08-300	1155	8.43	20.2	125.4	1.3	9.54	149
GW20-08-8885 (F)	11/30/2007	12/3/2007	08-301	1225	8.42	19.3	125.7	1.6	8.01	166
GW20-08-8896 (F)	11/30/2007	12/3/2007	08-301	1225	8.42	19.3	125.7	1.6	8.01	166
GW20-08-9009 (NF)	11/30/2007	12/3/2007	08-300	1225	8.42	19.3	125.7	1.6	8.01	166
GW20-08-9020 (NF)	11/30/2007	12/3/2007	08-300	1225	8.42	19.3	125.7	1.6	8.01	166
GW20-08-8901 (F)	11/30/2007	12/3/2007	08-301	1355	8.37	20.8	123.9	1.3	7.42	132
GW20-08-9025 (NF)	11/30/2007	12/3/2007	08-300	1355	8.37	20.8	123.9	1.3	7.42	132
GW20-08-8899 (F)	11/30/2007	12/3/2007	08-301	1445	8.35	19.8	123.6	1.9	7.06	175
GW20-08-9023 (NF)	11/30/2007	12/3/2007	08-300	1445	8.35	19.8	123.6	1.9	7.06	175

[a]F = Filtered.

[b]NF = Nonfiltered.

[c]IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.

[d]U = Nondetect.

Table A-1
Laboratory-Measured Analytical Results for R-20 Screen 1

Sample ID	Date Collected	Date Received	Discharge Rate (gal./min)	Ag rslt	stdev (Ag)	Al rslt	stdev (Al)	As rslt	stdev (As)	B rslt	stdev (B)	Ba rslt	stdev (Ba)
R-20 Screen 1													
GW20-08-8880 (F[a])	11/29/2007	11/29/2007	Not Measured	0.001	<IDL[c]	0.008	0.001	0.0002	<IDL	0.025	0.000	0.008	0.000
GW20-08-9004 (NF[b])	11/29/2007	11/29/2007	Not Measured	0.001	<IDL	0.613	0.011	0.0002	<IDL	0.028	0.001	0.081	0.002
GW20-08-8883 (F)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.067	0.014	0.0014	0.0002	0.023	0.000	0.092	0.022
GW20-08-9007 (NF)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.465	0.005	0.0012	0.0000	0.035	0.001	0.094	0.001
GW20-08-8887 (F)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.046	0.001	0.0009	0.0000	0.019	0.000	0.057	0.001
GW20-08-9011 (NF)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.686	0.006	0.0011	0.0000	0.019	0.000	0.087	0.001
GW20-08-8888 (F)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.055	0.001	0.0009	0.0001	0.017	0.000	0.062	0.003
GW20-08-9012 (NF)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.371	0.006	0.0010	0.0000	0.050	0.001	0.068	0.001
GW20-08-8889 (F)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.043	0.000	0.0010	0.0002	0.016	0.000	0.067	0.013
GW20-08-9013 (NF)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.416	0.158	0.0012	0.0002	0.032	0.000	0.083	0.011
GW20-08-8890 (F)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.024	0.000	0.0010	0.0001	0.016	0.000	0.060	0.006
GW20-08-9014 (NF)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.462	0.002	0.0010	0.0000	0.018	0.000	0.070	0.001
GW20-08-8891 (F)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.015	0.000	0.0010	0.0000	0.015	0.000	0.068	0.004
GW20-08-9015 (NF)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.605	0.005	0.0009	0.0000	0.017	0.000	0.065	0.000
GW20-08-8892 (F)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.033	0.000	0.0008	0.0000	0.032	0.001	0.054	0.004
GW20-08-9016 (NF)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.256	0.003	0.0009	0.0001	0.016	0.000	0.066	0.002
GW20-08-8893 (F)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.016	0.000	0.0008	0.0000	0.064	0.002	0.050	0.000
GW20-08-9017 (NF)	11/30/2007	12/3/2007	1.5	0.001	<IDL	0.517	0.008	0.0010	0.0001	0.055	0.001	0.064	0.007
GW20-08-8875 (F)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.019	0.001	0.0009	0.0001	0.041	0.000	0.067	0.010
GW20-08-8882 (F)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.035	0.000	0.0011	0.0001	0.028	0.000	0.070	0.011
GW20-08-8998 (NF)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.008	0.000	0.0002	0.0000	0.020	0.000	0.001	<IDL
GW20-08-8999 (NF)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.098	0.002	0.0009	0.0000	0.021	0.000	0.064	0.001
GW20-08-9006 (NF)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.076	0.000	0.0009	0.0000	0.056	0.002	0.063	0.002
GW20-08-8894 (F)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.018	0.000	0.0007	0.0000	0.036	0.001	0.049	0.000
GW20-08-9018 (NF)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.183	0.003	0.0010	0.0001	0.026	0.000	0.066	0.009
GW20-08-8895 (F)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.022	0.000	0.0007	0.0000	0.028	0.000	0.059	0.002
GW20-08-9019 (NF)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.204	0.006	0.0009	0.0001	0.024	0.000	0.079	0.014
GW20-08-8885 (F)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.015	0.000	0.0011	0.0003	0.020	0.000	0.085	0.026
GW20-08-8896 (F)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.018	0.000	0.0007	0.0000	0.022	0.000	0.057	0.002
GW20-08-9009 (NF)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.128	0.003	0.0008	0.0000	0.018	0.000	0.055	0.000
GW20-08-9020 (NF)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.182	0.005	0.0009	0.0002	0.021	0.001	0.069	0.014
GW20-08-8901 (F)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.043	0.000	0.0007	0.0000	0.020	0.000	0.054	0.001
GW20-08-9025 (NF)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.179	0.005	0.0007	0.0000	0.017	0.001	0.055	0.001
GW20-08-8899 (F)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.027	0.000	0.0007	0.0000	0.026	0.000	0.053	0.001
GW20-08-9023 (NF)	11/30/2007	12/3/2007	1.47	0.001	<IDL	0.087	0.003	0.0009	0.0001	0.021	0.001	0.075	0.011

[a]F = Filtered.

[b]NF = Nonfiltered.

[c]IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.

[d]U = Nondetect.

Table A-1
Laboratory-Measured Analytical Results for R-20 Screen 1

Sample ID	Date Collected	Date Received	Be rslt	stdev (Be)	Br(-) ppm	TOC rslt	Ca rslt	stdev (Ca)	Cd rslt	stdev (Cd)	Cl(-) ppm	Co rslt	stdev (Co)	Alk-CO_3 rslt
R-20 Screen 1														
GW20-08-8880 (F[a])	11/29/2007	11/29/2007	0.001	<IDL	0.01(U)[d]	Not Measured	1.8	0.0	0.001	<IDL	0.24	0.002	0.000	0.8
GW20-08-9004 (NF[b])	11/29/2007	11/29/2007	0.001	<IDL	0.01(U)	0.69	17.2	0.1	0.001	<IDL	0.14	0.001	<IDL	0.8
GW20-08-8883 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.03	Not Measured	12.0	0.1	0.001	<IDL	2.82	0.001	<IDL	5.60
GW20-08-9007 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.02	1.06	15.3	0.1	0.001	<IDL	2.72	0.003	0.000	7.21
GW20-08-8887 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.03	Not Measured	11.8	0.1	0.001	<IDL	2.73	0.001	<IDL	6.73
GW20-08-9011 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.03	0.98	14.2	0.0	0.001	<IDL	2.76	0.002	0.000	6.95
GW20-08-8888 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.02	Not Measured	11.8	0.0	0.001	<IDL	2.77	0.001	<IDL	0.8
GW20-08-9012 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.02	0.91	14.6	0.1	0.001	<IDL	2.79	0.001	0.000	7.27
GW20-08-8889 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.02	Not Measured	11.8	0.1	0.001	<IDL	2.81	0.002	0.000	6.71
GW20-08-9013 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.03	0.95	13.6	0.1	0.001	<IDL	2.77	0.001	0.000	7.21
GW20-08-8890 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.02	Not Measured	11.7	0.1	0.001	<IDL	2.79	0.002	0.000	0.8
GW20-08-9014 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.03	0.91	12.5	0.1	0.001	<IDL	2.77	0.001	<IDL	6.59
GW20-08-8891 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.03	Not Measured	11.5	0.0	0.001	<IDL	2.80	0.001	<IDL	6.44
GW20-08-9015 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.02	1.02	12.5	0.1	0.001	<IDL	2.78	0.001	<IDL	6.99
GW20-08-8892 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.02	Not Measured	11.8	0.0	0.001	<IDL	2.82	0.002	0.000	0.8
GW20-08-9016 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.04	0.89	11.9	0.1	0.001	<IDL	2.97	0.001	<IDL	6.55
GW20-08-8893 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.03	Not Measured	11.7	0.0	0.001	<IDL	2.79	0.007	0.000	0.8
GW20-08-9017 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.02	0.96	12.0	0.1	0.001	<IDL	2.80	0.001	<IDL	6.16
GW20-08-8875 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.03	Not Measured	11.2	0.1	0.001	<IDL	2.84	0.001	<IDL	0.8(U)
GW20-08-8882 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.03	Not Measured	11.4	0.0	0.001	<IDL	2.81	0.003	0.000	0.8(U)
GW20-08-8998 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.01(U)	3.29	0.2	0.0	0.001	<IDL	0.01	0.001	<IDL	0.8(U)
GW20-08-8999 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.03	1.01	11.6	0.0	0.001	<IDL	2.75	0.001	<IDL	(U)
GW20-08-9006 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.03	0.99	11.9	0.0	0.001	<IDL	2.84	0.001	<IDL	6.42
GW20-08-8894 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.03	Not Measured	11.3	0.1	0.001	<IDL	2.78	0.003	0.000	0.8(U)
GW20-08-9018 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.03	1.04	12.0	0.1	0.001	<IDL	2.76	0.001	<IDL	0.8(U)
GW20-08-8895 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.03	Not Measured	11.5	0.1	0.001	<IDL	2.83	0.001	0.000	0.8(U)
GW20-08-9019 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.02	1.03	11.7	0.0	0.001	<IDL	2.75	0.001	<IDL	6.14
GW20-08-8885 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.02	Not Measured	11.5	0.0	0.001	<IDL	2.78	0.004	0.001	4.66
GW20-08-8896 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.03	Not Measured	11.3	0.1	0.001	<IDL	2.78	0.002	0.000	0.8(U)
GW20-08-9009 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.03	1.16	11.3	0.1	0.001	<IDL	2.73	0.001	<IDL	5.17
GW20-08-9020 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.03	1.06	11.7	0.1	0.001	<IDL	2.68	0.001	<IDL	0.8(U)
GW20-08-8901 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.02	Not Measured	11.2	0.0	0.001	<IDL	2.81	0.001	<IDL	0.8(U)
GW20-08-9025 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.03	1.15	11.3	0.1	0.001	<IDL	2.72	0.001	<IDL	0.8(U)
GW20-08-8899 (F)	11/30/2007	12/3/2007	0.001	<IDL	0.03	Not Measured	11.4	0.1	0.001	<IDL	2.77	0.001	<IDL	0.8(U)
GW20-08-9023 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.01(U)	1.08	11.4	0.0	0.001	<IDL	2.65	0.001	<IDL	0.8(U)

[a]F = Filtered.

[b]NF = Nonfiltered.

[c]IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.

[d]U = Nondetect.

Table A-1
Laboratory-Measured Analytical Results for R-20 Screen 1

Sample ID	Date Collected	Date Received	Cr rslt	stdev (Cr)	Cs rslt	stdev (Cs)	Cu rslt	stdev (Cu)	F(-) ppm	Fe rslt	stdev (Fe)	Alk-CO3+HCO3 rslt
R-20 Screen 1												
GW20-08-8880 (F[a])	11/29/2007	11/29/2007	0.001	<IDL	0.001	<IDL	0.001	0.000	0.01(U)	0.01	0.00	7.99
GW20-08-9004 (NF[b])	11/29/2007	11/29/2007	0.010	0.001	0.001	<IDL	0.014	0.001	0.02	6.75	0.08	19.9
GW20-08-8883 (F)	11/30/2007	12/3/2007	0.005	0.001	0.001	<IDL	0.002	0.000	0.27	0.15	0.00	79.7
GW20-08-9007 (NF)	11/30/2007	12/3/2007	0.004	0.000	0.001	<IDL	0.004	0.000	0.27	1.84	0.01	80.1
GW20-08-8887 (F)	11/30/2007	12/3/2007	0.003	0.000	0.001	<IDL	0.001	0.000	0.27	0.17	0.00	78.6
GW20-08-9011 (NF)	11/30/2007	12/3/2007	0.005	0.000	0.001	<IDL	0.003	0.000	0.27	1.66	0.02	79.0
GW20-08-8888 (F)	11/30/2007	12/3/2007	0.003	0.000	0.001	<IDL	0.004	0.001	0.27	0.18	0.00	84.7
GW20-08-9012 (NF)	11/30/2007	12/3/2007	0.004	0.000	0.001	<IDL	0.006	0.000	0.27	1.57	0.02	77.1
GW20-08-8889 (F)	11/30/2007	12/3/2007	0.004	0.001	0.001	<IDL	0.005	0.000	0.27	0.20	0.00	77.2
GW20-08-9013 (NF)	11/30/2007	12/3/2007	0.006	0.001	0.001	<IDL	0.004	0.000	0.27	1.64	0.01	77.0
GW20-08-8890 (F)	11/30/2007	12/3/2007	0.004	0.000	0.001	<IDL	0.003	0.000	0.27	0.18	0.00	83.7
GW20-08-9014 (NF)	11/30/2007	12/3/2007	0.004	0.000	0.001	<IDL	0.004	0.000	0.26	1.44	0.01	77.4
GW20-08-8891 (F)	11/30/2007	12/3/2007	0.004	0.000	0.001	<IDL	0.001	0.000	0.27	0.19	0.00	76.8
GW20-08-9015 (NF)	11/30/2007	12/3/2007	0.004	0.000	0.001	<IDL	0.003	0.000	0.26	1.49	0.01	76.6
GW20-08-8892 (F)	11/30/2007	12/3/2007	0.003	0.000	0.001	<IDL	0.004	0.000	0.26	0.33	0.00	83.1
GW20-08-9016 (NF)	11/30/2007	12/3/2007	0.005	0.000	0.001	<IDL	0.002	0.000	0.31	1.31	0.01	76.3
GW20-08-8893 (F)	11/30/2007	12/3/2007	0.003	0.000	0.001	<IDL	0.002	0.000	0.26	0.46	0.00	82.7
GW20-08-9017 (NF)	11/30/2007	12/3/2007	0.006	0.001	0.001	<IDL	0.002	0.000	0.26	1.49	0.01	76.6
GW20-08-8875 (F)	11/30/2007	12/3/2007	0.004	0.001	0.001	<IDL	0.002	0.000	0.26	0.57	0.00	82.2
GW20-08-8882 (F)	11/30/2007	12/3/2007	0.006	0.001	0.001	<IDL	0.007	0.001	0.26	0.60	0.00	82.4
GW20-08-8998 (NF)	11/30/2007	12/3/2007	0.001	<IDL	0.001	<IDL	0.001	0.001	0.01(U)	0.01	0.00	0(U)
GW20-08-8999 (NF)	11/30/2007	12/3/2007	0.005	0.000	0.001	<IDL	0.002	0.000	0.26	1.29	0.02	82.5
GW20-08-9006 (NF)	11/30/2007	12/3/2007	0.004	0.000	0.001	<IDL	0.001	0.000	0.26	1.29	0.01	76.3
GW20-08-8894 (F)	11/30/2007	12/3/2007	0.003	0.000	0.001	<IDL	0.001	0.000	0.26	0.78	0.01	81.9
GW20-08-9018 (NF)	11/30/2007	12/3/2007	0.006	0.001	0.001	<IDL	0.002	0.000	0.26	1.24	0.01	82.0
GW20-08-8895 (F)	11/30/2007	12/3/2007	0.004	0.000	0.001	<IDL	0.001	0.000	0.26	1.08	0.01	81.6
GW20-08-9019 (NF)	11/30/2007	12/3/2007	0.007	0.001	0.001	<IDL	0.002	0.000	0.26	1.41	0.02	75.1
GW20-08-8885 (F)	11/30/2007	12/3/2007	0.006	0.002	0.001	<IDL	0.004	0.001	0.27	1.24	0.01	76.5
GW20-08-8896 (F)	11/30/2007	12/3/2007	0.003	0.000	0.001	<IDL	0.001	0.000	0.26	1.15	0.01	80.8
GW20-08-9009 (NF)	11/30/2007	12/3/2007	0.004	0.000	0.001	<IDL	0.001	0.000	0.27	1.65	0.00	75.9
GW20-08-9020 (NF)	11/30/2007	12/3/2007	0.006	0.001	0.001	<IDL	0.002	0.000	0.31	1.43	0.02	81.3
GW20-08-8901 (F)	11/30/2007	12/3/2007	0.005	0.000	0.001	<IDL	0.001	0.000	0.27	1.39	0.00	80.9
GW20-08-9025 (NF)	11/30/2007	12/3/2007	0.004	0.000	0.001	<IDL	0.002	0.000	0.27	1.90	0.01	77.3
GW20-08-8899 (F)	11/30/2007	12/3/2007	0.006	0.000	0.001	<IDL	0.001	0.000	0.26	1.56	0.02	80.3
GW20-08-9023 (NF)	11/30/2007	12/3/2007	0.006	0.001	0.001	<IDL	0.002	0.000	0.27	1.69	0.01	0(U)

[a]F = Filtered.

[b]NF = Nonfiltered.

[c]IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.

[d]U = Nondetect.

Table A-1
Laboratory-Measured Analytical Results for R-20 Screen 1

Sample ID	Date Collected	Date Received	Hg rslt	stdev (Hg)	K rslt	stdev (K)	Li rslt	stdev (Li)	Mg rslt	stdev (Mg)	Mn rslt	stdev (Mn)	Mo rslt
R-20 Screen 1													
GW20-08-8880 (F[a])	11/29/2007	11/29/2007	0.00005	<IDL	0.26	0.00	0.001	0.000	0.13	0.00	0.003	0.000	0.001
GW20-08-9004 (NF[b])	11/29/2007	11/29/2007	0.00005	<IDL	0.37	0.01	0.001	0.000	0.64	0.01	0.073	0.001	0.001
GW20-08-8883 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.37	0.01	0.022	0.000	2.34	0.01	0.019	0.000	0.001
GW20-08-9007 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.70	0.01	0.025	0.000	3.50	0.03	0.078	0.000	0.001
GW20-08-8887 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.45	0.01	0.023	0.000	2.43	0.02	0.020	0.000	0.001
GW20-08-9011 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.55	0.04	0.024	0.000	3.21	0.01	0.062	0.001	0.001
GW20-08-8888 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.42	0.01	0.023	0.000	2.39	0.02	0.021	0.000	0.001
GW20-08-9012 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.57	0.05	0.022	0.001	3.05	0.17	0.044	0.001	0.001
GW20-08-8889 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.30	0.01	0.021	0.000	2.30	0.01	0.021	0.000	0.001
GW20-08-9013 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.68	0.03	0.024	0.000	2.92	0.09	0.043	0.000	0.001
GW20-08-8890 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.43	0.02	0.023	0.000	2.41	0.02	0.021	0.000	0.001
GW20-08-9014 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.47	0.00	0.024	0.000	2.74	0.01	0.036	0.000	0.001
GW20-08-8891 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.31	0.04	0.022	0.000	2.32	0.03	0.019	0.000	0.001
GW20-08-9015 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.39	0.01	0.023	0.000	2.67	0.01	0.034	0.000	0.001
GW20-08-8892 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.40	0.02	0.022	0.000	2.29	0.02	0.021	0.000	0.001
GW20-08-9016 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.38	0.01	0.023	0.000	2.58	0.01	0.029	0.000	0.001
GW20-08-8893 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.49	0.01	0.023	0.000	2.40	0.02	0.034	0.000	0.001
GW20-08-9017 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.57	0.03	0.024	0.000	2.63	0.02	0.029	0.000	0.001
GW20-08-8875 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.33	0.01	0.023	0.000	2.36	0.03	0.021	0.000	0.001
GW20-08-8882 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.29	0.01	0.022	0.000	2.33	0.00	0.023	0.000	0.001
GW20-08-8998 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	0.01	<IDL	0.001	0.000	0.01	0.00	0.000	0.000	0.001
GW20-08-8999 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.36	0.03	0.023	0.000	2.53	0.01	0.027	0.000	0.001
GW20-08-9006 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.43	0.02	0.024	0.000	2.52	0.02	0.028	0.000	0.001
GW20-08-8894 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.25	0.03	0.022	0.000	2.34	0.04	0.026	0.000	0.001
GW20-08-9018 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.12	0.02	0.020	0.000	2.18	0.01	0.022	0.000	0.001
GW20-08-8895 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.29	0.02	0.023	0.000	2.47	0.03	0.025	0.000	0.001
GW20-08-9019 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.21	0.05	0.021	0.001	2.32	0.05	0.024	0.001	0.001
GW20-08-8885 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.24	0.01	0.023	0.000	2.47	0.01	0.029	0.000	0.001
GW20-08-8896 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.22	0.01	0.022	0.000	2.44	0.02	0.026	0.000	0.001
GW20-08-9009 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.18	0.01	0.022	0.000	2.48	0.00	0.026	0.000	0.001
GW20-08-9020 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.06	0.02	0.020	0.000	2.23	0.02	0.023	0.000	0.001
GW20-08-8901 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.30	0.00	0.024	0.000	2.61	0.01	0.027	0.000	0.001
GW20-08-9025 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.48	0.01	0.025	0.000	2.73	0.00	0.029	0.000	0.001
GW20-08-8899 (F)	11/30/2007	12/3/2007	0.00005	<IDL	2.23	0.02	0.023	0.000	2.60	0.02	0.028	0.000	0.001
GW20-08-9023 (NF)	11/30/2007	12/3/2007	0.00005	<IDL	2.09	0.02	0.020	0.000	2.34	0.01	0.025	0.000	0.001

[a]F = Filtered.

[b]NF = Nonfiltered.

[c]IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.

[d]U = Nondetect.

Table A-1
Laboratory-Measured Analytical Results for R-20 Screen 1

Sample ID	Date Collected	Date Received	stdev (Mo)	Na rslt	stdev (Na)	Ni rslt	stdev (Ni)	NO2(ppm)	NO2-N rslt	NO2-N (U)	NO3 ppm	NO3-N rslt	C2O4 rslt
R-20 Screen 1													
GW20-08-8880 (F[a])	11/29/2007	11/29/2007	<IDL	1.1	0.0	0.001	<IDL	0.01	0.003	U	0.17	0.038	0.01
GW20-08-9004 (NF[b])	11/29/2007	11/29/2007	<IDL	0.9	0.0	0.007	0.000	0.01	0.003	U	0.05	0.011	0.01
GW20-08-8883 (F)	11/30/2007	12/3/2007	0.000	13.3	0.1	0.001	0.000	0.01	0.003	U	1.00	0.225	0.01
GW20-08-9007 (NF)	11/30/2007	12/3/2007	<IDL	14.1	0.1	0.003	0.000	0.01	0.003	U	0.64	0.145	0.01
GW20-08-8887 (F)	11/30/2007	12/3/2007	0.000	13.7	0.0	0.001	<IDL	0.01	0.003	U	1.09	0.246	0.01
GW20-08-9011 (NF)	11/30/2007	12/3/2007	<IDL	14.0	0.1	0.002	0.000	0.01	0.003	U	0.74	0.167	0.01
GW20-08-8888 (F)	11/30/2007	12/3/2007	0.000	13.5	0.1	0.007	0.001	0.01	0.003	U	1.03	0.232	0.01
GW20-08-9012 (NF)	11/30/2007	12/3/2007	0.000	13.3	0.1	0.006	0.000	0.01	0.003	U	0.94	0.211	0.01
GW20-08-8889 (F)	11/30/2007	12/3/2007	0.000	13.0	0.1	0.001	0.000	0.01	0.003	U	1.32	0.298	0.01
GW20-08-9013 (NF)	11/30/2007	12/3/2007	0.000	13.7	0.0	0.002	0.000	0.01	0.003	U	0.91	0.206	0.01
GW20-08-8890 (F)	11/30/2007	12/3/2007	0.000	13.7	0.1	0.007	0.000	0.01	0.003	U	1.26	0.284	0.01
GW20-08-9014 (NF)	11/30/2007	12/3/2007	0.000	13.8	0.0	0.006	0.000	0.01	0.003	U	1.00	0.225	0.01
GW20-08-8891 (F)	11/30/2007	12/3/2007	0.000	13.1	0.2	0.001	<IDL	0.01	0.003	U	1.33	0.299	0.01
GW20-08-9015 (NF)	11/30/2007	12/3/2007	0.000	13.4	0.1	0.002	0.000	0.01	0.003	U	1.04	0.235	0.01
GW20-08-8892 (F)	11/30/2007	12/3/2007	0.000	13.0	0.1	0.001	0.000	0.01	0.003	U	1.21	0.273	0.01
GW20-08-9016 (NF)	11/30/2007	12/3/2007	0.000	13.5	0.1	0.002	0.000	0.01	0.003	U	1.13	0.254	0.01
GW20-08-8893 (F)	11/30/2007	12/3/2007	0.000	13.8	0.1	0.001	0.000	0.01	0.003	U	1.31	0.297	0.01
GW20-08-9017 (NF)	11/30/2007	12/3/2007	0.000	13.8	0.0	0.002	0.000	0.01	0.003	U	1.15	0.259	0.01
GW20-08-8875 (F)	11/30/2007	12/3/2007	0.000	13.2	0.1	0.001	0.000	0.01	0.003	U	1.40	0.316	0.01
GW20-08-8882 (F)	11/30/2007	12/3/2007	0.000	13.0	0.0	0.002	0.000	0.01	0.003	U	1.34	0.304	0.01
GW20-08-8998 (NF)	11/30/2007	12/3/2007	<IDL	0.2	0.0	0.001	<IDL	0.01	0.003	U	0.01	0.002(U)	0.01
GW20-08-8999 (NF)	11/30/2007	12/3/2007	0.000	13.1	0.1	0.001	0.000	0.01	0.003	U	1.13	0.255	0.01
GW20-08-9006 (NF)	11/30/2007	12/3/2007	0.000	13.2	0.0	0.001	0.000	0.01	0.003	U	1.18	0.266	0.01
GW20-08-8894 (F)	11/30/2007	12/3/2007	0.000	12.8	0.2	0.001	0.000	0.01	0.003	U	1.36	0.307	0.01
GW20-08-9018 (NF)	11/30/2007	12/3/2007	0.000	11.7	0.1	0.001	0.000	0.01	0.003	U	1.14	0.257	0.01
GW20-08-8895 (F)	11/30/2007	12/3/2007	0.000	13.1	0.1	0.001	0.000	0.01	0.003	U	1.36	0.308	0.01
GW20-08-9019 (NF)	11/30/2007	12/3/2007	0.000	12.2	0.2	0.001	0.000	0.01	0.003	U	1.19	0.269	0.01
GW20-08-8885 (F)	11/30/2007	12/3/2007	0.000	12.8	0.0	0.002	0.000	0.01	0.003	U	1.42	0.320	0.01
GW20-08-8896 (F)	11/30/2007	12/3/2007	0.000	12.8	0.1	0.001	0.000	0.01	0.003	U	1.35	0.306	0.01
GW20-08-9009 (NF)	11/30/2007	12/3/2007	0.000	12.6	0.0	0.001	0.000	0.01	0.003	U	1.25	0.282	0.01
GW20-08-9020 (NF)	11/30/2007	12/3/2007	0.000	11.6	0.1	0.002	0.000	0.01	0.003	U	1.11	0.250	0.01
GW20-08-8901 (F)	11/30/2007	12/3/2007	0.000	12.9	0.1	0.001	0.000	0.01	0.003	U	1.37	0.310	0.01
GW20-08-9025 (NF)	11/30/2007	12/3/2007	0.000	13.6	0.1	0.001	0.000	0.01	0.003	U	1.09	0.246	0.01
GW20-08-8899 (F)	11/30/2007	12/3/2007	0.000	13.0	0.1	0.001	0.000	0.01	0.003	U	1.47	0.331	0.01
GW20-08-9023 (NF)	11/30/2007	12/3/2007	0.000	11.7	0.1	0.001	0.000	0.01	0.003	U	1.13	0.256	0.01

[a]F = Filtered.

[b]NF = Nonfiltered.

[c]IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.

[d]U = Nondetect.

Table A-1
Laboratory-Measured Analytical Results for R-20 Screen 1

Sample ID	Date Collected	Date Received	C2O4 (U)	Pb rslt	stdev (Pb)	Lab pH	PO4(-3) rslt	Rb rslt	stdev (Rb)	S2- rslt	Sb rslt	stdev (Sb)	Se rslt
R-20 Screen 1													
GW20-08-8880 (F[a])	11/29/2007	11/29/2007	U	0.0002	<IDL	5.93	0.02	0.001	<IDL	—	0.001	<IDL	0.001
GW20-08-9004 (NF[b])	11/29/2007	11/29/2007	U	0.0086	0.0006	9.00	0.02	0.003	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-8883 (F)	11/30/2007	12/3/2007	U	0.0013	0.0004	8.28	0.03	0.009	0.002	—	0.001	<IDL	0.001
GW20-08-9007 (NF)	11/30/2007	12/3/2007	U	0.0061	0.0001	8.36	0.02	0.007	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-8887 (F)	11/30/2007	12/3/2007	U	0.0006	0.0000	8.33	0.04	0.005	0.000	—	0.001	<IDL	0.001
GW20-08-9011 (NF)	11/30/2007	12/3/2007	U	0.0049	0.0000	8.37	0.01(U)	0.007	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-8888 (F)	11/30/2007	12/3/2007	U	0.0026	0.0001	8.11	0.01(U)	0.006	0.000	—	0.001	<IDL	0.001
GW20-08-9012 (NF)	11/30/2007	12/3/2007	U	0.0089	0.0007	8.34	0.02	0.006	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-8889 (F)	11/30/2007	12/3/2007	U	0.0010	0.0002	8.36	0.06	0.006	0.001	—	0.001	<IDL	0.001
GW20-08-9013 (NF)	11/30/2007	12/3/2007	U	0.0037	0.0005	8.35	0.01	0.007	0.001	0.01(U)	0.001	<IDL	0.001
GW20-08-8890 (F)	11/30/2007	12/3/2007	U	0.0025	0.0002	8.29	0.04	0.006	0.001	—	0.001	<IDL	0.001
GW20-08-9014 (NF)	11/30/2007	12/3/2007	U	0.0042	0.0000	8.32	0.02	0.006	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-8891 (F)	11/30/2007	12/3/2007	U	0.0007	0.0000	8.29	0.04	0.007	0.000	—	0.001	<IDL	0.001
GW20-08-9015 (NF)	11/30/2007	12/3/2007	U	0.0035	0.0002	8.32	0.01(U)	0.006	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-8892 (F)	11/30/2007	12/3/2007	U	0.0011	0.0001	8.19	0.02	0.005	0.000	—	0.001	<IDL	0.001
GW20-08-9016 (NF)	11/30/2007	12/3/2007	U	0.0022	0.0000	8.30	0.01	0.006	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-8893 (F)	11/30/2007	12/3/2007	U	0.0010	0.0000	8.23	0.04	0.005	0.000	—	0.001	<IDL	0.001
GW20-08-9017 (NF)	11/30/2007	12/3/2007	U	0.0020	0.0003	8.30	0.01	0.006	0.001	0.01(U)	0.001	<IDL	0.001
GW20-08-8875 (F)	11/30/2007	12/3/2007	U	0.0013	0.0002	8.20	0.03	0.006	0.001	—	0.001	<IDL	0.001
GW20-08-8882 (F)	11/30/2007	12/3/2007	U	0.0016	0.0003	8.17	0.02	0.007	0.001	—	0.001	<IDL	0.001
GW20-08-8998 (NF)	11/30/2007	12/3/2007	U	0.0002	<IDL	5.54	0.01(U)	0.001	<IDL	0.01(U)	0.001	<IDL	0.001
GW20-08-8999 (NF)	11/30/2007	12/3/2007	U	0.0018	0.0000	8.26	0.01(U)	0.005	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-9006 (NF)	11/30/2007	12/3/2007	U	0.0018	0.0000	8.28	0.01(U)	0.006	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-8894 (F)	11/30/2007	12/3/2007	U	0.0010	0.0001	8.17	0.03	0.005	0.000	—	0.001	<IDL	0.001
GW20-08-9018 (NF)	11/30/2007	12/3/2007	U	0.0017	0.0002	8.23	0.01(U)	0.006	0.001	0.01(U)	0.001	<IDL	0.001
GW20-08-8895 (F)	11/30/2007	12/3/2007	U	0.0010	0.0000	8.10	0.03	0.005	0.000	—	0.001	<IDL	0.001
GW20-08-9019 (NF)	11/30/2007	12/3/2007	U	0.0018	0.0003	8.21	0.02	0.007	0.001	0.01(U)	0.001	<IDL	0.001
GW20-08-8885 (F)	11/30/2007	12/3/2007	U	0.0019	0.0006	8.12	0.04	0.008	0.002	—	0.001	<IDL	0.001
GW20-08-8896 (F)	11/30/2007	12/3/2007	U	0.0009	0.0000	8.07	0.02	0.005	0.000	—	0.001	<IDL	0.001
GW20-08-9009 (NF)	11/30/2007	12/3/2007	U	0.0015	0.0000	8.20	0.01	0.005	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-9020 (NF)	11/30/2007	12/3/2007	U	0.0016	0.0002	8.20	0.01	0.006	0.001	0.01(U)	0.001	<IDL	0.001
GW20-08-8901 (F)	11/30/2007	12/3/2007	U	0.0010	0.0000	8.06	0.02	0.005	0.000	—	0.001	<IDL	0.001
GW20-08-9025 (NF)	11/30/2007	12/3/2007	U	0.0010	0.0000	7.74	0.01	0.005	0.000	0.01(U)	0.001	<IDL	0.001
GW20-08-8899 (F)	11/30/2007	12/3/2007	U	0.0009	0.0000	8.07	0.03	0.005	0.000	—	0.001	<IDL	0.001
GW20-08-9023 (NF)	11/30/2007	12/3/2007	U	0.0022	0.0004	5.13	0.01	0.006	0.001	0.01(U)	0.001	<IDL	0.001

[a]F = Filtered.

[b]NF = Nonfiltered.

[c]IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.

[d]U = Nondetect.

Table A-1
Laboratory-Measured Analytical Results for R-20 Screen 1

Sample ID	Date Collected	Date Received	stdev (Se)	Si rslt	stdev (Si)	SiO2 rslt	stdev (SiO2)	Sn rslt	stdev (Sn)	SO4(-2) rslt	Sr rslt
R-20 Screen 1											
GW20-08-8880 (F[a])	11/29/2007	11/29/2007	<IDL	0.6	0.0	1.2	0.0	0.001	<IDL	0.55	0.011
GW20-08-9004 (NF[b])	11/29/2007	11/29/2007	<IDL	2.4	0.1	5.2	0.1	0.001	<IDL	0.66	0.063
GW20-08-8883 (F)	11/30/2007	12/3/2007	<IDL	30.6	0.2	65.5	0.5	0.001	<IDL	3.65	0.199
GW20-08-9007 (NF)	11/30/2007	12/3/2007	<IDL	34.6	0.4	74.0	1.0	0.001	<IDL	3.66	0.172
GW20-08-8887 (F)	11/30/2007	12/3/2007	<IDL	32.5	0.3	69.6	0.6	0.001	<IDL	3.48	0.123
GW20-08-9011 (NF)	11/30/2007	12/3/2007	<IDL	35.4	0.3	75.8	0.6	0.001	<IDL	3.56	0.154
GW20-08-8888 (F)	11/30/2007	12/3/2007	<IDL	32.6	0.4	69.8	0.9	0.001	<IDL	3.43	0.131
GW20-08-9012 (NF)	11/30/2007	12/3/2007	<IDL	42.6	3.1	91.1	6.7	0.001	<IDL	3.41	0.155
GW20-08-8889 (F)	11/30/2007	12/3/2007	<IDL	31.4	0.3	67.1	0.6	0.001	<IDL	3.36	0.136
GW20-08-9013 (NF)	11/30/2007	12/3/2007	<IDL	35.5	0.2	75.9	0.4	0.001	<IDL	3.35	0.158
GW20-08-8890 (F)	11/30/2007	12/3/2007	<IDL	32.8	0.3	70.1	0.7	0.001	<IDL	3.32	0.132
GW20-08-9014 (NF)	11/30/2007	12/3/2007	<IDL	35.1	0.3	75.1	0.6	0.001	<IDL	3.29	0.142
GW20-08-8891 (F)	11/30/2007	12/3/2007	<IDL	31.9	0.3	68.2	0.7	0.001	<IDL	3.25	0.148
GW20-08-9015 (NF)	11/30/2007	12/3/2007	<IDL	34.4	0.2	73.6	0.5	0.001	<IDL	3.27	0.138
GW20-08-8892 (F)	11/30/2007	12/3/2007	<IDL	31.4	0.1	67.2	0.1	0.001	<IDL	3.15	0.125
GW20-08-9016 (NF)	11/30/2007	12/3/2007	<IDL	33.9	0.3	72.6	0.5	0.001	<IDL	3.37	0.130
GW20-08-8893 (F)	11/30/2007	12/3/2007	<IDL	33.3	0.2	71.2	0.5	0.001	<IDL	3.13	0.119
GW20-08-9017 (NF)	11/30/2007	12/3/2007	<IDL	35.3	0.4	75.6	0.8	0.001	<IDL	3.14	0.135
GW20-08-8875 (F)	11/30/2007	12/3/2007	<IDL	32.2	0.3	68.9	0.7	0.001	<IDL	3.08	0.142
GW20-08-8882 (F)	11/30/2007	12/3/2007	<IDL	32.0	0.3	68.5	0.6	0.001	<IDL	3.03	0.155
GW20-08-8998 (NF)	11/30/2007	12/3/2007	<IDL	0.4	0.0	1.0	0.0	0.001	<IDL	0.03	0.001
GW20-08-8999 (NF)	11/30/2007	12/3/2007	<IDL	33.4	0.1	71.5	0.3	0.001	<IDL	3.05	0.116
GW20-08-9006 (NF)	11/30/2007	12/3/2007	<IDL	33.5	0.3	71.6	0.5	0.001	<IDL	3.11	0.127
GW20-08-8894 (F)	11/30/2007	12/3/2007	<IDL	32.0	0.2	68.5	0.5	0.001	<IDL	3.02	0.115
GW20-08-9018 (NF)	11/30/2007	12/3/2007	<IDL	29.3	0.3	62.7	0.5	0.001	<IDL	3.02	0.145
GW20-08-8895 (F)	11/30/2007	12/3/2007	<IDL	33.3	0.1	71.2	0.3	0.001	<IDL	3.00	0.111
GW20-08-9019 (NF)	11/30/2007	12/3/2007	<IDL	31.0	0.7	66.4	1.5	0.001	<IDL	2.97	0.150
GW20-08-8885 (F)	11/30/2007	12/3/2007	<IDL	33.1	0.0	70.8	0.0	0.001	<IDL	2.98	0.168
GW20-08-8896 (F)	11/30/2007	12/3/2007	<IDL	32.7	0.2	69.9	0.4	0.001	<IDL	2.99	0.109
GW20-08-9009 (NF)	11/30/2007	12/3/2007	<IDL	32.8	0.2	70.3	0.4	0.001	<IDL	2.99	0.113
GW20-08-9020 (NF)	11/30/2007	12/3/2007	<IDL	30.1	0.5	64.5	1.0	0.001	<IDL	2.96	0.143
GW20-08-8901 (F)	11/30/2007	12/3/2007	<IDL	33.8	0.4	72.2	0.9	0.001	<IDL	2.96	0.108
GW20-08-9025 (NF)	11/30/2007	12/3/2007	<IDL	35.3	0.3	75.6	0.7	0.001	<IDL	2.95	0.114
GW20-08-8899 (F)	11/30/2007	12/3/2007	<IDL	33.7	0.5	72.1	1.1	0.001	<IDL	2.94	0.112
GW20-08-9023 (NF)	11/30/2007	12/3/2007	<IDL	30.5	0.1	65.2	0.3	0.001	<IDL	2.94	0.132

[a]F = Filtered.

[b]NF = Nonfiltered.

[c]IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.

[d]U = Nondetect.

Table A-1
Laboratory-Measured Analytical Results for R-20 Screen 1

Sample ID	Date Collected	Date Received	stdev (Sr)	Th rslt	stdev (Th)	Ti rslt	stdev (Ti)	Tl rslt	stdev (Tl)	U rslt	stdev (U)	V rslt
R-20 Screen 1												
GW20-08-8880 (F[a])	11/29/2007	11/29/2007	0.001	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0002	<IDL	0.001
GW20-08-9004 (NF[b])	11/29/2007	11/29/2007	0.003	0.001	<IDL	0.041	0.001	0.001	<IDL	0.0006	0.0000	0.003
GW20-08-8883 (F)	11/30/2007	12/3/2007	0.042	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0014	0.0003	0.006
GW20-08-9007 (NF)	11/30/2007	12/3/2007	0.002	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0026	0.0000	0.005
GW20-08-8887 (F)	11/30/2007	12/3/2007	0.001	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0009	0.0000	0.004
GW20-08-9011 (NF)	11/30/2007	12/3/2007	0.002	0.001	0.000	0.009	0.000	0.001	<IDL	0.0020	0.0000	0.004
GW20-08-8888 (F)	11/30/2007	12/3/2007	0.005	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0008	0.0000	0.004
GW20-08-9012 (NF)	11/30/2007	12/3/2007	0.002	0.002	0.000	0.003	0.000	0.001	<IDL	0.0014	0.0001	0.004
GW20-08-8889 (F)	11/30/2007	12/3/2007	0.022	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0010	0.0001	0.004
GW20-08-9013 (NF)	11/30/2007	12/3/2007	0.020	0.001	<IDL	0.010	0.004	0.001	<IDL	0.0016	0.0002	0.005
GW20-08-8890 (F)	11/30/2007	12/3/2007	0.009	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0009	0.0000	0.004
GW20-08-9014 (NF)	11/30/2007	12/3/2007	0.003	0.001	<IDL	0.008	0.000	0.001	<IDL	0.0013	0.0000	0.004
GW20-08-8891 (F)	11/30/2007	12/3/2007	0.006	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0009	0.0000	0.004
GW20-08-9015 (NF)	11/30/2007	12/3/2007	0.001	0.001	<IDL	0.010	0.000	0.001	<IDL	0.0013	0.0000	0.004
GW20-08-8892 (F)	11/30/2007	12/3/2007	0.003	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0008	0.0001	0.004
GW20-08-9016 (NF)	11/30/2007	12/3/2007	0.000	0.001	<IDL	0.005	0.000	0.001	<IDL	0.0010	0.0000	0.004
GW20-08-8893 (F)	11/30/2007	12/3/2007	0.002	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0008	0.0000	0.004
GW20-08-9017 (NF)	11/30/2007	12/3/2007	0.013	0.001	<IDL	0.010	0.000	0.001	<IDL	0.0010	0.0001	0.005
GW20-08-8875 (F)	11/30/2007	12/3/2007	0.020	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0009	0.0001	0.004
GW20-08-8882 (F)	11/30/2007	12/3/2007	0.020	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0010	0.0002	0.005
GW20-08-8998 (NF)	11/30/2007	12/3/2007	<IDL	0.001	<IDL	0.002	0.002	0.001	<IDL	0.0002	<IDL	0.001
GW20-08-8999 (NF)	11/30/2007	12/3/2007	0.001	0.001	<IDL	0.002	0.000	0.001	<IDL	0.0010	0.0000	0.004
GW20-08-9006 (NF)	11/30/2007	12/3/2007	0.002	0.001	<IDL	0.002	0.000	0.001	<IDL	0.0009	0.0000	0.004
GW20-08-8894 (F)	11/30/2007	12/3/2007	0.001	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0007	0.0000	0.003
GW20-08-9018 (NF)	11/30/2007	12/3/2007	0.019	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0010	0.0001	0.005
GW20-08-8895 (F)	11/30/2007	12/3/2007	0.000	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0007	0.0000	0.004
GW20-08-9019 (NF)	11/30/2007	12/3/2007	0.023	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0011	0.0002	0.005
GW20-08-8885 (F)	11/30/2007	12/3/2007	0.042	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0011	0.0003	0.006
GW20-08-8896 (F)	11/30/2007	12/3/2007	0.002	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0007	0.0000	0.004
GW20-08-9009 (NF)	11/30/2007	12/3/2007	0.001	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0007	0.0000	0.004
GW20-08-9020 (NF)	11/30/2007	12/3/2007	0.026	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0010	0.0002	0.005
GW20-08-8901 (F)	11/30/2007	12/3/2007	0.003	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0007	0.0000	0.004
GW20-08-9025 (NF)	11/30/2007	12/3/2007	0.001	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0007	0.0000	0.004
GW20-08-8899 (F)	11/30/2007	12/3/2007	0.000	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0007	0.0000	0.004
GW20-08-9023 (NF)	11/30/2007	12/3/2007	0.018	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0009	0.0001	0.005

[a]F = Filtered.

[b]NF = Nonfiltered.

[c]IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.

[d]U = Nondetect.

Table A-1
Laboratory-Measured Analytical Results for R-20 Screen 1

Sample ID	Date Collected	Date Received	stdev (V)	Zn rslt	stdev (Zn)	TDS (ppm)	Cations	Anions	Balance
R-20 Screen 1									
GW20-08-8880 (F[a])	11/29/2007	11/29/2007	<IDL	0.002	0.000	14	0.16	0.18	-0.07
GW20-08-9004 (NF[b])	11/29/2007	11/29/2007	0.000	0.524	0.010	54	0.98	0.39	0.44
GW20-08-8883 (F)	11/30/2007	12/3/2007	0.001	0.009	0.001	189	1.44	1.68	-0.08
GW20-08-9007 (NF)	11/30/2007	12/3/2007	0.000	0.085	0.000	207	1.75	1.74	0.00
GW20-08-8887 (F)	11/30/2007	12/3/2007	0.000	0.005	0.000	193	1.45	1.70	-0.08
GW20-08-9011 (NF)	11/30/2007	12/3/2007	0.000	0.061	0.000	206	1.66	1.72	-0.02
GW20-08-8888 (F)	11/30/2007	12/3/2007	0.000	0.027	0.001	193	1.44	1.60	-0.05
GW20-08-9012 (NF)	11/30/2007	12/3/2007	0.000	0.069	0.000	219	1.63	1.69	-0.02
GW20-08-8889 (F)	11/30/2007	12/3/2007	0.001	0.007	0.001	189	1.41	1.68	-0.09
GW20-08-9013 (NF)	11/30/2007	12/3/2007	0.001	0.051	0.008	203	1.59	1.69	-0.03
GW20-08-8890 (F)	11/30/2007	12/3/2007	0.000	0.034	0.002	193	1.45	1.58	-0.05
GW20-08-9014 (NF)	11/30/2007	12/3/2007	0.000	0.059	0.000	200	1.53	1.68	-0.05
GW20-08-8891 (F)	11/30/2007	12/3/2007	0.000	0.005	0.000	189	1.40	1.66	-0.08
GW20-08-9015 (NF)	11/30/2007	12/3/2007	0.000	0.041	0.000	198	1.50	1.68	-0.06
GW20-08-8892 (F)	11/30/2007	12/3/2007	0.000	0.009	0.000	189	1.42	1.57	-0.05
GW20-08-9016 (NF)	11/30/2007	12/3/2007	0.000	0.029	0.001	196	1.46	1.66	-0.06
GW20-08-8893 (F)	11/30/2007	12/3/2007	0.000	0.009	0.000	193	1.45	1.57	-0.04
GW20-08-9017 (NF)	11/30/2007	12/3/2007	0.001	0.030	0.002	199	1.49	1.65	-0.05
GW20-08-8875 (F)	11/30/2007	12/3/2007	0.001	0.010	0.001	189	1.39	1.53	-0.05
GW20-08-8882 (F)	11/30/2007	12/3/2007	0.001	0.013	0.002	188	1.39	1.53	-0.05
GW20-08-8998 (NF)	11/30/2007	12/3/2007	<IDL	0.001	<IDL	2	0.02	0.00	0.81
GW20-08-8999 (NF)	11/30/2007	12/3/2007	0.000	0.025	0.001	193	1.43	1.53	-0.03
GW20-08-9006 (NF)	11/30/2007	12/3/2007	0.000	0.025	0.000	193	1.45	1.65	-0.06
GW20-08-8894 (F)	11/30/2007	12/3/2007	0.000	0.010	0.000	188	1.38	1.52	-0.05
GW20-08-9018 (NF)	11/30/2007	12/3/2007	0.001	0.026	0.003	182	1.35	1.52	-0.06
GW20-08-8895 (F)	11/30/2007	12/3/2007	0.000	0.013	0.000	191	1.42	1.52	-0.03
GW20-08-9019 (NF)	11/30/2007	12/3/2007	0.001	0.029	0.003	185	1.37	1.61	-0.08
GW20-08-8885 (F)	11/30/2007	12/3/2007	0.001	0.018	0.005	190	1.40	1.59	-0.06
GW20-08-8896 (F)	11/30/2007	12/3/2007	0.000	0.012	0.000	188	1.39	1.50	-0.04
GW20-08-9009 (NF)	11/30/2007	12/3/2007	0.000	0.018	0.000	189	1.38	1.59	-0.07
GW20-08-9020 (NF)	11/30/2007	12/3/2007	0.001	0.024	0.004	182	1.33	1.51	-0.06
GW20-08-8901 (F)	11/30/2007	12/3/2007	0.000	0.012	0.000	191	1.40	1.51	-0.04
GW20-08-9025 (NF)	11/30/2007	12/3/2007	0.000	0.018	0.001	192	1.45	1.44	0.00
GW20-08-8899 (F)	11/30/2007	12/3/2007	0.000	0.013	0.000	191	1.41	1.50	-0.03
GW20-08-9023 (NF)	11/30/2007	12/3/2007	0.001	0.024	0.004	102	1.33	0.17	0.77

[a]F = Filtered.

[b]NF = Nonfiltered.

[c]IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.

[d]U = Nondetect.

Table A-2
Laboratory-Measured Analytical Results for R-20 Screen 2

Sample ID	Date Collected	Date Received	ER/RRES-WQH	Time	Field pH	Temp ©	Cond (uS/cm)	Dissolved O2 (mg/L)	Turb (NTU)	ORP (mV)	Discharge rate (gal./min)
R-20 Screen 2											
GW20-08-9118 (NF[a])	12/3/2007	12/4/2007	08-312	1330	8.42	19.2	164.7	0.4	331	293	1.44
GW20-08-8959 (F[b])	12/3/2007	12/4/2007	08-311	1330	8.42	19.2	164.7	0.4	331	293	1.44
GW20-08-9074 (NF)	12/3/2007	12/4/2007	08-312	1335	8.45	19	156.7	0.5	299	281	1.44
GW20-08-8944 (F)	12/3/2007	12/4/2007	08-311	1335	8.45	19	156.7	0.5	299	281	1.44
GW20-08-9075 (NF)	12/3/2007	12/4/2007	08-312	1340	8.46	19.1	151.2	0.5	207	255	1.44
GW20-08-8945 (F)	12/3/2007	12/4/2007	08-311	1340	8.46	19.1	151.2	0.5	207	255	1.44
GW20-08-9076 (NF)	12/3/2007	12/4/2007	08-312	1345	8.47	18.9	149.3	0.5	1674	243	1.44
GW20-08-8946 (F)	12/3/2007	12/4/2007	08-311	1345	8.47	18.9	149.3	0.5	1674	243	1.44
GW20-08-9077 (NF)	12/3/2007	12/4/2007	08-312	1350	8.49	18.7	148.3	0.5	130	235	1.44
GW20-08-8947 (F)	12/3/2007	12/4/2007	08-311	1350	8.49	18.7	148.3	0.5	130	235	1.44
GW20-08-9078 (NF)	12/3/2007	12/4/2007	08-312	1355	8.5	18.6	147.1	0.5	90.6	234	1.44
GW20-08-8948 (F)	12/3/2007	12/4/2007	08-311	1355	8.5	18.6	147.1	0.5	90.6	234	1.44
GW20-08-9079 (NF)	12/3/2007	12/4/2007	08-312	1405	8.48	18.5	145.6	0.5	65.2	204	1.44
GW20-08-8949 (F)	12/3/2007	12/4/2007	08-311	1405	8.48	18.5	145.6	0.5	65.2	204	1.44
GW20-08-9080 (NF)	12/3/2007	12/4/2007	08-312	1415	8.41	18.6	144.6	0.5	45.5	187	1.44
GW20-08-8950 (F)	12/3/2007	12/4/2007	08-311	1415	8.41	18.6	144.6	0.5	45.5	187	1.44
GW20-08-9119 (NF)	12/3/2007	12/4/2007	08-312	1425	8.45	18.5	144.5	0.5	37	178	1.44
GW20-08-8960 (F)	12/3/2007	12/4/2007	08-311	1425	8.45	18.5	144.5	0.5	37	178	1.44
GW20-08-9081 (NF)	12/3/2007	12/4/2007	08-312	1455	8.46	18.7	143.7	0.6	14.8	164	1.41
GW20-08-8951 (F)	12/3/2007	12/4/2007	08-311	1455	8.46	18.7	143.7	0.6	14.8	164	1.41
GW20-08-9082 (NF)	12/3/2007	12/4/2007	08-312	1525	8.15	18.6	142.9	0.6	8.59	159	1.41
GW20-08-8952 (F)	12/3/2007	12/4/2007	08-311	1525	8.15	18.6	142.9	0.6	8.59	159	1.41
GW20-08-9083 (NF)	12/3/2007	12/4/2007	08-312	1555	7.68	18.5	141.9	0.6	7.99	159	1.41
GW20-08-8953 (F)	12/3/2007	12/4/2007	08-311	1555	7.68	18.5	141.9	0.6	7.99	159	1.41
GW20-08-9066 (NF)	12/3/2007	12/4/2007	08-312	1625	8.35	18.9	141.1	0.7	6.37	164	1.41
GW20-08-9068 (NF)	12/3/2007	12/4/2007	08-312	1625	8.35	18.9	141.1	0.7	6.37	164	1.41
GW20-08-9122 (NF)	12/3/2007	12/4/2007	08-312	1625	8.35	18.9	141.1	0.7	6.37	164	1.41
GW20-08-8938 (F)	12/3/2007	12/4/2007	08-311	1625	8.35	18.9	141.1	0.7	6.37	164	1.41
GW20-08-8963 (F)	12/3/2007	12/4/2007	08-311	1625	8.35	18.9	141.1	0.7	6.37	164	1.41
GW20-08-9121 (NF)	12/3/2007	12/4/2007	08-318	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
GW20-08-9084 (NF)	12/4/2007	12/4/2007	08-318	1010	8.2	20.1	29.7	1.47	70.6	266	1.23
GW20-08-8954 (F)	12/4/2007	12/4/2007	08-317	1010	8.2	20.1	29.7	1.47	70.6	266	1.23
GW20-08-9085 (NF)	12/4/2007	12/4/2007	08-318	1110	8.42	20.7	28.7	1.14	15.2	201	1.23
GW20-08-8955 (F)	12/4/2007	12/4/2007	08-317	1110	8.42	20.7	28.7	1.14	15.2	201	1.23
GW20-08-9086 (NF)	12/4/2007	12/4/2007	08-318	1210	8.38	20.9	28.4	1.37	8.35	197	1.23
GW20-08-8956 (F)	12/4/2007	12/4/2007	08-317	1210	8.38	20.9	28.4	1.37	8.35	197	1.23
GW20-08-9087 (NF)	12/4/2007	12/4/2007	08-318	1310	8.35	20.9	27.9	1.61	5.3	162	1.23
GW20-08-8957 (F)	12/4/2007	12/4/2007	08-317	1310	8.35	20.9	27.9	1.61	5.3	162	1.23
GW20-08-9088 (NF)	12/4/2007	12/4/2007	08-318	1410	8.34	19.5	27.9	1.57	6.1	153	1.23
GW20-08-8958 (F)	12/4/2007	12/4/2007	08-317	1410	8.34	19.5	27.9	1.57	6.1	153	1.23
GW20-08-8962 (F)	12/4/2007	12/4/2007	08-317	1440	8.34	18.7	27.8	1.65	4.15	158	1.23
GW20-08-9072 (NF)	12/5/2007	12/5/2007	08-332	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
GW20-08-8942 (F)	12/5/2007	12/5/2007	08-331	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured

[a] NF = Nonfiltered.
[b] F = Filtered.
[c] IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.
[d] U = Nondetect.

Table A-2
Laboratory-Measured Analytical Results for R-20 Screen 2

Sample ID	Date Collected	Date Received	Ag rslt	stdev (Ag)	Al rslt	stdev (Al)	As rslt	stdev (As)	B rslt	stdev (B)	Ba rslt	stdev (Ba)	Be rslt
R-20 Screen 2													
GW20-08-9118 (NF[a])	12/3/2007	12/4/2007	0.001	<IDL[c]	1.451	0.129	0.0016	0.0001	0.017	0.000	0.168	0.003	0.001
GW20-08-8959 (F[b])	12/3/2007	12/4/2007	0.001	<IDL	0.092	0.002	0.0010	0.0000	0.016	0.000	0.087	0.003	0.001
GW20-08-9074 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.959	0.061	0.0015	0.0001	0.042	0.001	0.161	0.005	0.001
GW20-08-8944 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.161	0.002	0.0010	0.0000	0.036	0.000	0.082	0.000	0.001
GW20-08-9075 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.557	0.049	0.0013	0.0001	0.032	0.000	0.127	0.001	0.001
GW20-08-8945 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.208	0.004	0.0011	0.0000	0.031	0.001	0.088	0.001	0.001
GW20-08-9076 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.392	0.005	0.0012	0.0001	0.033	0.000	0.113	0.010	0.001
GW20-08-8946 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.094	0.001	0.0010	0.0000	0.023	0.000	0.079	0.009	0.001
GW20-08-9077 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.413	0.013	0.0011	0.0000	0.027	0.001	0.104	0.002	0.001
GW20-08-8947 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.133	0.001	0.0010	0.0001	0.020	0.000	0.075	0.002	0.001
GW20-08-9078 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.332	0.006	0.0011	0.0000	0.023	0.000	0.103	0.000	0.001
GW20-08-8948 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.065	0.002	0.0010	0.0000	0.047	0.000	0.078	0.000	0.001
GW20-08-9079 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.272	0.005	0.0010	0.0000	0.021	0.000	0.093	0.000	0.001
GW20-08-8949 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.015	0.000	0.0010	0.0000	0.036	0.000	0.082	0.001	0.001
GW20-08-9080 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.230	0.003	0.0010	0.0000	0.020	0.000	0.091	0.001	0.001
GW20-08-8950 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.059	0.000	0.0010	0.0000	0.029	0.000	0.082	0.002	0.001
GW20-08-9119 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.259	0.003	0.0010	0.0000	0.015	0.000	0.097	0.001	0.001
GW20-08-8960 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.043	0.001	0.0010	0.0001	0.021	0.000	0.089	0.005	0.001
GW20-08-9081 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.117	0.001	0.0010	0.0000	0.019	0.000	0.081	0.001	0.001
GW20-08-8951 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.014	0.000	0.0009	0.0000	0.025	0.001	0.082	0.001	0.001
GW20-08-9082 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.115	0.001	0.0010	0.0000	0.017	0.000	0.082	0.001	0.001
GW20-08-8952 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.007	0.000	0.0009	0.0001	0.023	0.000	0.085	0.003	0.001
GW20-08-9083 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.113	0.001	0.0009	0.0000	0.016	0.000	0.075	0.002	0.001
GW20-08-8953 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.040	0.001	0.0010	0.0001	0.018	0.001	0.095	0.010	0.001
GW20-08-9066 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.007	0.000	0.0002	<IDL	0.015	0.000	0.001	<IDL	0.001
GW20-08-9068 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.048	0.001	0.0008	0.0000	0.063	0.001	0.073	0.000	0.001
GW20-08-9122 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.086	0.002	0.0009	0.0000	0.019	0.000	0.084	0.005	0.001
GW20-08-8938 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.005	0.000	0.0008	0.0000	0.017	0.000	0.081	0.001	0.001
GW20-08-8963 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.007	0.000	0.0009	0.0001	0.022	0.001	0.081	0.003	0.001
GW20-08-9121 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.062	0.002	0.0008	0.0000	0.055	0.002	0.082	0.001	0.001
GW20-08-9084 (NF)	12/4/2007	12/4/2007	0.001	<IDL	0.616	0.036	0.0010	0.0000	0.027	0.001	0.113	0.004	0.001
GW20-08-8954 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.020	0.000	0.0009	0.0000	0.020	0.001	0.089	0.003	0.001
GW20-08-9085 (NF)	12/4/2007	12/4/2007	0.001	<IDL	0.316	0.157	0.0009	0.0000	0.024	0.001	0.086	0.001	0.001
GW20-08-8955 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.050	0.001	0.0008	0.0000	0.020	0.000	0.088	0.001	0.001
GW20-08-9086 (NF)	12/4/2007	12/4/2007	0.001	<IDL	0.186	0.025	0.0009	0.0000	0.022	0.000	0.090	0.002	0.001
GW20-08-8956 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.022	0.003	0.0012	0.0003	0.060	0.003	0.132	0.039	0.001
GW20-08-9087 (NF)	12/4/2007	12/4/2007	0.001	<IDL	0.092	0.001	0.0008	0.0000	0.020	0.000	0.080	0.004	0.001
GW20-08-8957 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.012	0.000	0.0008	0.0000	0.038	0.002	0.086	0.008	0.001
GW20-08-9088 (NF)	12/4/2007	12/4/2007	0.001	<IDL	0.080	0.005	0.0009	0.0000	0.019	0.000	0.084	0.004	0.001
GW20-08-8958 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.004	0.000	0.0008	0.0000	0.024	0.001	0.092	0.002	0.001
GW20-08-8962 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.007	0.000	0.0008	0.0000	0.019	0.000	0.086	0.001	0.001
GW20-08-9072 (NF)	12/5/2007	12/5/2007	0.001	<IDL	0.042	0.000	0.0002	<IDL	0.019	0.000	0.018	0.000	0.001
GW20-08-8942 (F)	12/5/2007	12/5/2007	0.001	<IDL	0.003	0.000	0.0002	<IDL	0.037	0.000	0.008	0.000	0.001

[a] NF = Nonfiltered.
[b] F = Filtered.
[c] IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.
[d] U = Nondetect.

Table A-2
Laboratory-Measured Analytical Results for R-20 Screen 2

Sample ID	Date Collected	Date Received	stdev (Be)	Br(-) ppm	TOC rslt	Ca rslt	stdev (Ca)	Cd rslt	stdev (Cd)	Cl(-) ppm	Co rslt	stdev (Co)	Alk-CO3 rslt
R-20 Screen 2													
GW20-08-9118 (NF[a])	12/3/2007	12/4/2007	<IDL	0.03	2.06	21.8	0.0	0.001	<IDL	3.48	0.001	0.000	0.8
GW20-08-8959 (F[b])	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	14.1	0.1	0.001	<IDL	3.51	0.003	0.000	0.8
GW20-08-9074 (NF)	12/3/2007	12/4/2007	<IDL	0.03	2.14	20.7	0.1	0.001	<IDL	3.47	0.001	0.000	7.6
GW20-08-8944 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	13.4	0.1	0.001	<IDL	3.53	0.001	<IDL	0.8
GW20-08-9075 (NF)	12/3/2007	12/4/2007	<IDL	0.03	1.98	18.1	0.1	0.001	<IDL	3.46	0.002	0.000	7.64
GW20-08-8945 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	13.4	0.1	0.001	<IDL	3.56	0.001	0.000	0.8
GW20-08-9076 (NF)	12/3/2007	12/4/2007	<IDL	0.02	1.86	17.8	0.0	0.001	<IDL	3.47	0.001	<IDL	7.63
GW20-08-8946 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	12.9	0.1	0.001	<IDL	3.55	0.002	0.000	0.8
GW20-08-9077 (NF)	12/3/2007	12/4/2007	<IDL	0.03	1.88	16.0	0.1	0.001	<IDL	3.43	0.001	<IDL	0.8
GW20-08-8947 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	13.7	0.1	0.001	<IDL	3.50	0.001	<IDL	0.8
GW20-08-9078 (NF)	12/3/2007	12/4/2007	<IDL	0.03	1.90	15.7	0.1	0.001	<IDL	3.43	0.001	<IDL	0.8
GW20-08-8948 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	13.9	0.1	0.001	<IDL	3.48	0.001	<IDL	0.8
GW20-08-9079 (NF)	12/3/2007	12/4/2007	<IDL	0.03	1.88	15.0	0.1	0.001	<IDL	3.42	0.001	<IDL	0.8
GW20-08-8949 (F)	12/3/2007	12/4/2007	<IDL	0.02	Not Measured	13.6	0.0	0.001	<IDL	3.50	0.001	<IDL	0.8
GW20-08-9080 (NF)	12/3/2007	12/4/2007	<IDL	0.03	2.07	14.6	0.1	0.001	<IDL	3.41	0.001	<IDL	6
GW20-08-8950 (F)	12/3/2007	12/4/2007	<IDL	0.02	Not Measured	13.3	0.1	0.001	<IDL	3.45	0.001	<IDL	0.8
GW20-08-9119 (NF)	12/3/2007	12/4/2007	<IDL	0.03	2.12	14.4	0.0	0.001	<IDL	3.39	0.001	<IDL	0.8
GW20-08-8960 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	13.8	0.1	0.001	<IDL	3.44	0.009	0.000	0.8(U)
GW20-08-9081 (NF)	12/3/2007	12/4/2007	<IDL	0.03	2.06	13.5	0.1	0.001	<IDL	3.43	0.001	<IDL	5.75
GW20-08-8951 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	13.5	0.1	0.001	<IDL	3.43	0.001	<IDL	0.8(U)
GW20-08-9082 (NF)	12/3/2007	12/4/2007	<IDL	0.03	2.14	14.0	0.1	0.001	<IDL	3.58	0.001	<IDL	0.8(U)
GW20-08-8952 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	13.5	0.1	0.001	<IDL	3.40	0.001	<IDL	0.8(U)
GW20-08-9083 (NF)	12/3/2007	12/4/2007	<IDL	0.03	2.13	13.5	0.0	0.001	<IDL	3.35	0.001	<IDL	0.8(U)
GW20-08-8953 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	13.1	0.1	0.001	<IDL	3.34	0.003	0.000	0.8(U)
GW20-08-9066 (NF)	12/3/2007	12/4/2007	<IDL	0.01U)	0.36	0.1	0.0	0.001	<IDL	0.01(U)	0.001	<IDL	0.8(U)
GW20-08-9068 (NF)	12/3/2007	12/4/2007	<IDL	0.03	2.14	13.1	0.1	0.001	<IDL	3.32	0.001	<IDL	0.8(U)
GW20-08-9122 (NF)	12/3/2007	12/4/2007	<IDL	0.03	2.16	12.6	0.0	0.001	<IDL	3.32	0.001	<IDL	0.8(U)
GW20-08-8938 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	12.5	0.1	0.001	<IDL	3.38	0.001	<IDL	0.8(U)
GW20-08-8963 (F)	12/3/2007	12/4/2007	<IDL	0.03	Not Measured	12.8	0.1	0.001	<IDL	3.35	0.001	<IDL	0.8(U)
GW20-08-9121 (NF)	12/3/2007	12/4/2007	<IDL	0.02	1.46	12.9	0.1	0.001	<IDL	3.00	0.001	<IDL	0.8(U)
GW20-08-9084 (NF)	12/4/2007	12/4/2007	<IDL	0.03	2.28	15.1	0.0	0.001	<IDL	3.19	0.001	<IDL	0.8(U)
GW20-08-8954 (F)	12/4/2007	12/4/2007	<IDL	0.03	Not Measured	13.4	0.0	0.001	<IDL	3.26	0.001	<IDL	6.63
GW20-08-9085 (NF)	12/4/2007	12/4/2007	<IDL	0.03	1.85	13.5	0.1	0.001	<IDL	3.17	0.001	<IDL	0.8(U)
GW20-08-8955 (F)	12/4/2007	12/4/2007	<IDL	0.02	Not Measured	12.8	0.0	0.001	<IDL	3.15	0.004	0.000	5.58
GW20-08-9086 (NF)	12/4/2007	12/4/2007	<IDL	0.02	1.65	12.8	0.1	0.001	<IDL	3.14	0.001	<IDL	0.8(U)
GW20-08-8956 (F)	12/4/2007	12/4/2007	<IDL	0.03	Not Measured	12.8	0.1	0.001	<IDL	3.14	0.001	<IDL	0.8(U)
GW20-08-9087 (NF)	12/4/2007	12/4/2007	<IDL	0.02	1.61	12.6	0.0	0.001	<IDL	3.03	0.001	<IDL	0.8(U)
GW20-08-8957 (F)	12/4/2007	12/4/2007	<IDL	0.02	Not Measured	12.7	0.1	0.001	<IDL	3.09	0.001	<IDL	0.8(U)
GW20-08-9088 (NF)	12/4/2007	12/4/2007	<IDL	0.03	1.51	12.7	0.1	0.001	<IDL	3.02	0.001	<IDL	0.8(U)
GW20-08-8958 (F)	12/4/2007	12/4/2007	<IDL	0.02	Not Measured	12.4	0.1	0.001	<IDL	3.04	0.001	<IDL	0.8(U)
GW20-08-8962 (F)	12/4/2007	12/4/2007	<IDL	0.02	Not Measured	12.1	0.0	0.001	<IDL	3.02	0.001	<IDL	0.8(U)
GW20-08-9072 (NF)	12/5/2007	12/5/2007	<IDL	Not Measured	0.67	1.6	0.0	0.001	<IDL	Not Measu	0.001	<IDL	0.8(U)
GW20-08-8942 (F)	12/5/2007	12/5/2007	<IDL	Not Measured	Not Measured	0.7	0.0	0.001	<IDL	Not Measu	0.001	0.000	0.8(U)

[a] NF = Nonfiltered.
[b] F = Filtered.
[c] IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.
[d] U = Nondetect.

Table A-2
Laboratory-Measured Analytical Results for R-20 Screen 2

Sample ID	Date Collected	Date Received	Cr rslt	stdev (Cr)	Cs rslt	stdev (Cs)	Cu rslt	stdev (Cu)	F(-) ppm	Fe rslt	stdev (Fe)	Alk-CO3+HCO3 rslt
R-20 Screen 2												
GW20-08-9118 (NF[a])	12/3/2007	12/4/2007	0.010	0.000	0.001	<IDL	0.007	0.000	0.33	4.47	0.07	87.0
GW20-08-8959 (F[b])	12/3/2007	12/4/2007	0.002	0.000	0.001	<IDL	0.006	0.000	0.33	0.24	0.00	83.2
GW20-08-9074 (NF)	12/3/2007	12/4/2007	0.009	0.000	0.001	<IDL	0.007	0.000	0.33	4.21	0.07	79.0
GW20-08-8944 (F)	12/3/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.001	0.000	0.33	0.29	0.00	81.6
GW20-08-9075 (NF)	12/3/2007	12/4/2007	0.007	0.000	0.001	<IDL	0.004	0.000	0.33	2.73	0.02	78.1
GW20-08-8945 (F)	12/3/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.002	0.000	0.33	0.38	0.00	81.2
GW20-08-9076 (NF)	12/3/2007	12/4/2007	0.007	0.001	0.001	<IDL	0.004	0.000	0.33	2.43	0.02	77.6
GW20-08-8946 (F)	12/3/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.001	<IDL	0.33	0.23	0.00	80.7
GW20-08-9077 (NF)	12/3/2007	12/4/2007	0.006	0.000	0.001	<IDL	0.003	0.000	0.33	2.13	0.00	81.1
GW20-08-8947 (F)	12/3/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.006	0.000	0.33	0.24	0.00	80.7
GW20-08-9078 (NF)	12/3/2007	12/4/2007	0.006	0.000	0.001	<IDL	0.003	0.000	0.33	1.93	0.02	87.5
GW20-08-8948 (F)	12/3/2007	12/4/2007	0.006	0.000	0.001	<IDL	0.001	<IDL	0.32	0.22	0.00	79.6
GW20-08-9079 (NF)	12/3/2007	12/4/2007	0.006	0.000	0.001	<IDL	0.004	0.000	0.33	1.63	0.01	75.2
GW20-08-8949 (F)	12/3/2007	12/4/2007	0.003	0.000	0.001	<IDL	0.001	<IDL	0.32	0.16	0.00	79.2
GW20-08-9080 (NF)	12/3/2007	12/4/2007	0.006	0.001	0.001	<IDL	0.002	0.000	0.32	1.61	0.02	74.6
GW20-08-8950 (F)	12/3/2007	12/4/2007	0.003	0.000	0.001	<IDL	0.002	0.000	0.32	0.20	0.00	78.6
GW20-08-9119 (NF)	12/3/2007	12/4/2007	0.006	0.000	0.001	<IDL	0.002	0.000	0.32	1.34	0.00	78.5
GW20-08-8960 (F)	12/3/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.002	0.000	0.31	0.24	0.00	76.4
GW20-08-9081 (NF)	12/3/2007	12/4/2007	0.005	0.000	0.001	<IDL	0.002	0.000	0.32	1.10	0.01	73.7
GW20-08-8951 (F)	12/3/2007	12/4/2007	0.003	0.000	0.001	<IDL	0.003	0.000	0.31	0.43	0.00	77.3
GW20-08-9082 (NF)	12/3/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.001	0.000	0.32	0.99	0.00	78.2
GW20-08-8952 (F)	12/3/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.001	0.000	0.30	0.48	0.01	77.0
GW20-08-9083 (NF)	12/3/2007	12/4/2007	0.005	0.000	0.001	<IDL	0.002	0.000	0.31	1.04	0.00	78.1
GW20-08-8953 (F)	12/3/2007	12/4/2007	0.006	0.001	0.001	<IDL	0.001	0.000	0.30	0.64	0.01	77.0
GW20-08-9066 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.001	<IDL	0.001	<IDL	0.01(U)	0.01	<IDL	5.63
GW20-08-9068 (NF)	12/3/2007	12/4/2007	0.005	0.000	0.001	<IDL	0.001	0.000	0.30	1.03	0.00	85.3
GW20-08-9122 (NF)	12/3/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.004	0.000	0.30	1.05	0.01	76.6
GW20-08-8938 (F)	12/3/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.001	0.000	0.34	0.70	0.01	76.9
GW20-08-8963 (F)	12/3/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.001	<IDL	0.30	0.71	0.00	75.5
GW20-08-9121 (NF)	12/3/2007	12/4/2007	0.006	0.000	0.001	<IDL	0.002	0.000	0.28	1.48	0.03	75.4
GW20-08-9084 (NF)	12/4/2007	12/4/2007	0.008	0.001	0.001	<IDL	0.003	0.000	0.29	2.49	0.01	82.2
GW20-08-8954 (F)	12/4/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.001	<IDL	0.29	0.90	0.02	77.1
GW20-08-9085 (NF)	12/4/2007	12/4/2007	0.005	0.000	0.001	<IDL	0.002	0.000	0.29	1.24	0.01	77.4
GW20-08-8955 (F)	12/4/2007	12/4/2007	0.003	0.000	0.001	<IDL	0.002	0.000	0.29	0.59	0.02	71.7
GW20-08-9086 (NF)	12/4/2007	12/4/2007	0.005	0.000	0.001	<IDL	0.003	0.000	0.29	1.17	0.01	76.6
GW20-08-8956 (F)	12/4/2007	12/4/2007	0.009	0.003	0.001	<IDL	0.001	0.000	0.28	0.72	0.02	76.6
GW20-08-9087 (NF)	12/4/2007	12/4/2007	0.005	0.000	0.001	<IDL	0.002	0.000	0.28	1.27	0.01	75.9
GW20-08-8957 (F)	12/4/2007	12/4/2007	0.005	0.000	0.001	<IDL	0.001	<IDL	0.28	0.80	0.02	76.0
GW20-08-9088 (NF)	12/4/2007	12/4/2007	0.006	0.001	0.001	<IDL	0.002	0.000	0.28	1.33	0.03	75.5
GW20-08-8958 (F)	12/4/2007	12/4/2007	0.005	0.000	0.001	<IDL	0.002	0.000	0.28	0.74	0.01	75.6
GW20-08-8962 (F)	12/4/2007	12/4/2007	0.004	0.000	0.001	<IDL	0.001	<IDL	0.28	1.21	0.01	75.6
GW20-08-9072 (NF)	12/5/2007	12/5/2007	0.002	0.000	0.001	<IDL	0.005	0.000	Not Measured	1.64	0.01	5.03
GW20-08-8942 (F)	12/5/2007	12/5/2007	0.001	<IDL	0.001	<IDL	0.001	<IDL	Not Measured	0.03	0.00	4.10

[a] NF = Nonfiltered.
[b] F = Filtered.
[c] IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.
[d] U = Nondetect.

Table A-2
Laboratory-Measured Analytical Results for R-20 Screen 2

Sample ID	Date Collected	Date Received	Hg rslt	stdev (Hg)	K rslt	stdev (K)	Li rslt	stdev (Li)	Mg rslt	stdev (Mg)	Mn rslt	stdev (Mn)	Mo rslt
R-20 Screen 2													
GW20-08-9118 (NF[a])	12/3/2007	12/4/2007	0.00005	<IDL	3.23	0.01	0.025	0.001	4.14	0.64	0.134	0.000	0.001
GW20-08-8959 (F[b])	12/3/2007	12/4/2007	0.00005	<IDL	2.90	0.02	0.023	0.000	2.34	0.02	0.039	0.001	0.002
GW20-08-9074 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	3.30	0.07	0.024	0.000	3.32	0.05	0.117	0.001	0.001
GW20-08-8944 (F)	12/3/2007	12/4/2007	0.00005	<IDL	3.03	0.01	0.024	0.000	2.39	0.02	0.034	0.000	0.002
GW20-08-9075 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	3.03	0.04	0.024	0.000	2.86	0.02	0.093	0.004	0.001
GW20-08-8945 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.80	0.01	0.022	0.000	2.22	0.01	0.033	0.000	0.002
GW20-08-9076 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.99	0.01	0.023	0.000	2.72	0.02	0.079	0.000	0.001
GW20-08-8946 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.74	0.01	0.022	0.000	2.16	0.01	0.031	0.000	0.002
GW20-08-9077 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.94	0.01	0.023	0.000	2.63	0.01	0.064	0.000	0.002
GW20-08-8947 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.90	0.01	0.023	0.000	2.28	0.01	0.031	0.000	0.002
GW20-08-9078 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.97	0.02	0.024	0.000	2.63	0.02	0.061	0.001	0.002
GW20-08-8948 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.93	0.01	0.023	0.000	2.30	0.01	0.025	0.000	0.002
GW20-08-9079 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.98	0.00	0.024	0.000	2.53	0.01	0.050	0.000	0.002
GW20-08-8949 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.78	0.01	0.022	0.000	2.19	0.01	0.028	0.000	0.002
GW20-08-9080 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.80	0.02	0.023	0.000	2.42	0.02	0.047	0.000	0.002
GW20-08-8950 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.65	0.04	0.021	0.000	2.11	0.02	0.026	0.000	0.002
GW20-08-9119 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.87	0.01	0.023	0.000	2.40	0.02	0.041	0.000	0.002
GW20-08-8960 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.64	0.05	0.021	0.001	2.13	0.03	0.039	0.001	0.002
GW20-08-9081 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.78	0.01	0.023	0.000	2.35	0.01	0.035	0.000	0.002
GW20-08-8951 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.77	0.01	0.023	0.000	2.24	0.01	0.028	0.000	0.002
GW20-08-9082 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.80	0.02	0.023	0.001	2.32	0.02	0.032	0.000	0.002
GW20-08-8952 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.46	0.04	0.020	0.000	2.00	0.04	0.025	0.000	0.002
GW20-08-9083 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.78	0.01	0.023	0.000	2.34	0.02	0.033	0.000	0.002
GW20-08-8953 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.60	0.01	0.022	0.000	2.21	0.01	0.031	0.000	0.002
GW20-08-9066 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	0.01	<IDL	0.001	<IDL	0.01	<IDL	0.001	<IDL	0.001
GW20-08-9068 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.70	0.01	0.023	0.000	2.27	0.01	0.031	0.000	0.002
GW20-08-9122 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.70	0.03	0.023	0.000	2.26	0.02	0.031	0.000	0.002
GW20-08-8938 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.65	0.01	0.022	0.000	2.21	0.02	0.028	0.000	0.002
GW20-08-8963 (F)	12/3/2007	12/4/2007	0.00005	<IDL	2.65	0.02	0.022	0.000	2.16	0.00	0.028	0.000	0.002
GW20-08-9121 (NF)	12/3/2007	12/4/2007	0.00005	<IDL	2.70	0.03	0.023	0.000	2.42	0.04	0.035	0.001	0.002
GW20-08-9084 (NF)	12/4/2007	12/4/2007	0.00005	<IDL	2.75	0.02	0.022	0.000	2.82	0.03	0.058	0.001	0.002
GW20-08-8954 (F)	12/4/2007	12/4/2007	0.00005	<IDL	2.86	0.09	0.024	0.001	2.46	0.07	0.038	0.001	0.002
GW20-08-9085 (NF)	12/4/2007	12/4/2007	0.00005	<IDL	2.60	0.02	0.021	0.000	2.44	0.04	0.037	0.000	0.002
GW20-08-8955 (F)	12/4/2007	12/4/2007	0.00005	<IDL	2.47	0.07	0.020	0.001	2.10	0.06	0.032	0.001	0.002
GW20-08-9086 (NF)	12/4/2007	12/4/2007	0.00005	<IDL	2.44	0.02	0.021	0.000	2.36	0.01	0.034	0.000	0.002
GW20-08-8956 (F)	12/4/2007	12/4/2007	0.00005	<IDL	2.49	0.10	0.021	0.001	2.24	0.07	0.029	0.001	0.001
GW20-08-9087 (NF)	12/4/2007	12/4/2007	0.00005	<IDL	2.36	0.03	0.020	0.000	2.28	0.02	0.033	0.000	0.002
GW20-08-8957 (F)	12/4/2007	12/4/2007	0.00005	<IDL	2.10	0.05	0.017	0.001	1.91	0.04	0.024	0.001	0.001
GW20-08-9088 (NF)	12/4/2007	12/4/2007	0.00005	<IDL	2.23	0.02	0.019	0.000	2.16	0.02	0.032	0.000	0.002
GW20-08-8958 (F)	12/4/2007	12/4/2007	0.00005	<IDL	1.69	0.04	0.013	0.000	1.60	0.02	0.021	0.000	0.002
GW20-08-8962 (F)	12/4/2007	12/4/2007	0.00005	<IDL	2.35	0.01	0.020	0.000	2.23	0.01	0.031	0.000	0.002
GW20-08-9072 (NF)	12/5/2007	12/5/2007	0.00005	<IDL	0.22	0.00	0.001	0.000	0.19	0.00	0.013	0.000	0.001
GW20-08-8942 (F)	12/5/2007	12/5/2007	0.00005	<IDL	0.16	0.00	0.001	<IDL	0.09	0.00	0.003	0.000	0.001

[a] NF = Nonfiltered.
[b] F = Filtered.
[c] IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.
[d] U = Nondetect.

Table A-2
Laboratory-Measured Analytical Results for R-20 Screen 2

Sample ID	Date Collected	Date Received	stdev (Mo)	Na rslt	stdev (Na)	Ni rslt	stdev (Ni)	NO2(ppm)	NO2-N rslt	NO3 ppm	NO3-N rslt	C2O4 rslt
R-20 Screen 2												
GW20-08-9118 (NF[a])	12/3/2007	12/4/2007	0.000	14.5	0.1	0.004	0.000	0.01	0.003	0.59	0.132	0.01
GW20-08-8959 (F[b])	12/3/2007	12/4/2007	0.000	14.3	0.1	0.001	0.000	0.01	0.003	0.71	0.160	0.01
GW20-08-9074 (NF)	12/3/2007	12/4/2007	0.000	14.8	0.1	0.005	0.000	0.01	0.003	0.70	0.158	0.01
GW20-08-8944 (F)	12/3/2007	12/4/2007	0.000	15.0	0.0	0.001	0.000	0.01	0.003	0.78	0.177	0.01
GW20-08-9075 (NF)	12/3/2007	12/4/2007	0.000	14.4	0.1	0.003	0.000	0.01	0.003	0.82	0.186	0.01
GW20-08-8945 (F)	12/3/2007	12/4/2007	0.000	13.8	0.1	0.001	0.000	0.01	0.003	0.82	0.185	0.01
GW20-08-9076 (NF)	12/3/2007	12/4/2007	0.000	14.4	0.2	0.003	0.000	0.01	0.003	0.87	0.196	0.01
GW20-08-8946 (F)	12/3/2007	12/4/2007	0.000	13.6	0.0	0.001	0.000	0.01	0.003	0.91	0.205	0.01
GW20-08-9077 (NF)	12/3/2007	12/4/2007	0.000	13.9	0.0	0.003	0.000	0.01	0.003	0.93	0.209	0.01
GW20-08-8947 (F)	12/3/2007	12/4/2007	0.000	14.0	0.0	0.001	0.000	0.01	0.003	0.95	0.214	0.01
GW20-08-9078 (NF)	12/3/2007	12/4/2007	0.000	14.2	0.1	0.003	0.000	0.01	0.003	0.96	0.217	0.01
GW20-08-8948 (F)	12/3/2007	12/4/2007	0.000	14.1	0.0	0.001	0.000	0.01	0.003	1.00	0.226	0.01
GW20-08-9079 (NF)	12/3/2007	12/4/2007	0.000	14.1	0.0	0.002	0.000	0.01	0.003	1.06	0.240	0.01
GW20-08-8949 (F)	12/3/2007	12/4/2007	0.000	13.5	0.0	0.001	0.000	0.01	0.003	1.07	0.241	0.01
GW20-08-9080 (NF)	12/3/2007	12/4/2007	0.000	13.5	0.1	0.002	0.000	0.01	0.003(U)	1.08	0.244	0.01
GW20-08-8950 (F)	12/3/2007	12/4/2007	0.000	12.9	0.1	0.001	0.000	0.01	0.003(U)	1.09	0.246	0.01
GW20-08-9119 (NF)	12/3/2007	12/4/2007	0.000	13.4	0.1	0.002	0.000	0.01	0.003(U)	1.12	0.252	0.01
GW20-08-8960 (F)	12/3/2007	12/4/2007	0.000	13.0	0.3	0.002	0.000	0.01	0.003(U)	1.11	0.252	0.01
GW20-08-9081 (NF)	12/3/2007	12/4/2007	0.000	13.6	0.1	0.002	0.000	0.01	0.003(U)	1.20	0.270	0.01
GW20-08-8951 (F)	12/3/2007	12/4/2007	0.000	13.6	0.1	0.001	0.000	0.01	0.003(U)	1.20	0.272	0.01
GW20-08-9082 (NF)	12/3/2007	12/4/2007	0.000	13.3	0.1	0.002	0.000	0.01	0.003(U)	1.29	0.290	0.01
GW20-08-8952 (F)	12/3/2007	12/4/2007	0.000	12.2	0.2	0.001	0.000	0.01	0.003(U)	1.24	0.279	0.01
GW20-08-9083 (NF)	12/3/2007	12/4/2007	0.000	13.3	0.1	0.002	0.000	0.01	0.003(U)	1.27	0.287	0.01
GW20-08-8953 (F)	12/3/2007	12/4/2007	0.000	12.9	0.1	0.002	0.000	0.01	0.003(U)	1.28	0.289	0.01
GW20-08-9066 (NF)	12/3/2007	12/4/2007	0.000	0.3	0.0	0.001	0.000	0.01	0.003(U)	0.01	0.002(U)	0.01
GW20-08-9068 (NF)	12/3/2007	12/4/2007	0.000	13.4	0.0	0.001	0.000	0.01	0.003(U)	1.30	0.293	0.01
GW20-08-9122 (NF)	12/3/2007	12/4/2007	0.000	13.4	0.1	0.002	0.000	0.01	0.003(U)	1.30	0.294	0.01
GW20-08-8938 (F)	12/3/2007	12/4/2007	0.000	13.2	0.1	0.001	0.000	0.01	0.003(U)	1.34	0.302	0.01
GW20-08-8963 (F)	12/3/2007	12/4/2007	0.000	13.0	0.0	0.001	0.000	0.01	0.003(U)	1.30	0.294	0.01
GW20-08-9121 (NF)	12/3/2007	12/4/2007	0.000	12.9	0.2	0.002	0.000	0.01	0.003(U)	1.39	0.314	0.01
GW20-08-9084 (NF)	12/4/2007	12/4/2007	0.000	12.8	0.1	0.002	0.000	0.01	0.003(U)	0.64	0.145	0.01
GW20-08-8954 (F)	12/4/2007	12/4/2007	0.000	13.5	0.3	0.001	0.000	0.01	0.003(U)	0.88	0.198	0.01
GW20-08-9085 (NF)	12/4/2007	12/4/2007	0.000	12.7	0.0	0.002	0.000	0.01	0.003(U)	1.27	0.286	0.01
GW20-08-8955 (F)	12/4/2007	12/4/2007	0.000	11.9	0.3	0.002	0.000	0.01	0.003(U)	1.27	0.288	0.01
GW20-08-9086 (NF)	12/4/2007	12/4/2007	0.000	12.1	0.1	0.002	0.000	0.01	0.003(U)	1.34	0.302	0.01
GW20-08-8956 (F)	12/4/2007	12/4/2007	0.000	12.4	0.5	0.002	0.000	0.06	0.018	1.35	0.304	0.01
GW20-08-9087 (NF)	12/4/2007	12/4/2007	0.000	11.9	0.1	0.002	0.000	0.01	0.003(U)	1.36	0.308	0.01
GW20-08-8957 (F)	12/4/2007	12/4/2007	0.000	10.4	0.2	0.001	0.000	0.01	0.003(U)	1.38	0.312	0.01
GW20-08-9088 (NF)	12/4/2007	12/4/2007	0.000	11.3	0.1	0.002	0.000	0.01	0.003(U)	1.40	0.317	0.01
GW20-08-8958 (F)	12/4/2007	12/4/2007	0.000	8.6	0.1	0.001	0.000	0.01	0.003(U)	1.39	0.314	0.01
GW20-08-8962 (F)	12/4/2007	12/4/2007	0.000	11.8	0.1	0.001	0.000	0.01	0.003(U)	1.40	0.316	0.01
GW20-08-9072 (NF)	12/5/2007	12/5/2007	0.000	0.7	0.0	0.002	0.000	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
GW20-08-8942 (F)	12/5/2007	12/5/2007	0.000	0.6	0.0	0.001	0.000	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured

[a] NF = Nonfiltered.
[b] F = Filtered.
[c] IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.
[d] U = Nondetect.

Table A-2
Laboratory-Measured Analytical Results for R-20 Screen 2

Sample ID	Date Collected	Date Received	C2O4 (U)	Pb rslt	stdev (Pb)	Lab pH	PO4(-3) rslt	Rb rslt	stdev (Rb)	S2- rslt	Sb rslt	stdev (Sb)
R-20 Screen 2												
GW20-08-9118 (NF[a])	12/3/2007	12/4/2007	U[c]	0.0082	0.0004	8.18	0.15	0.010	0.000	0.01(U)	0.001	<IDL
GW20-08-8959 (F[b])	12/3/2007	12/4/2007	U	0.0009	0.0000	8.09	0.17	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9074 (NF)	12/3/2007	12/4/2007	U	0.0070	0.0001	8.31	0.15	0.012	0.000	0.03	0.001	<IDL
GW20-08-8944 (F)	12/3/2007	12/4/2007	U	0.0008	0.0000	8.11	0.17	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9075 (NF)	12/3/2007	12/4/2007	U	0.0049	0.0001	8.32	0.15	0.009	0.001	0.02	0.001	<IDL
GW20-08-8945 (F)	12/3/2007	12/4/2007	U	0.0010	0.0000	8.08	0.17	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9076 (NF)	12/3/2007	12/4/2007	U	0.0040	0.0001	8.29	0.15	0.008	0.000	0.01	0.001	<IDL
GW20-08-8946 (F)	12/3/2007	12/4/2007	U	0.0006	0.0000	8.20	0.16	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9077 (NF)	12/3/2007	12/4/2007	U	0.0032	0.0002	8.30	0.14	0.008	0.000	0.01	0.001	<IDL
GW20-08-8947 (F)	12/3/2007	12/4/2007	U	0.0007	0.0000	8.21	0.16	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9078 (NF)	12/3/2007	12/4/2007	U	0.0028	0.0000	7.72	0.15	0.007	0.000	0.01(U)	0.001	<IDL
GW20-08-8948 (F)	12/3/2007	12/4/2007	U	0.0005	0.0000	8.16	0.18	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9079 (NF)	12/3/2007	12/4/2007	U	0.0021	0.0001	7.53	0.14	0.007	0.000	0.01(U)	0.001	<IDL
GW20-08-8949 (F)	12/3/2007	12/4/2007	U	0.0004	0.0000	8.16	0.15	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9080 (NF)	12/3/2007	12/4/2007	U	0.0019	0.0000	8.27	0.13	0.007	0.000	0.01(U)	0.001	<IDL
GW20-08-8950 (F)	12/3/2007	12/4/2007	U	0.0005	0.0000	8.09	0.15	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9119 (NF)	12/3/2007	12/4/2007	U	0.0015	0.0000	8.08	0.12	0.007	0.000	0.01(U)	0.001	<IDL
GW20-08-8960 (F)	12/3/2007	12/4/2007	U	0.0008	0.0000	7.97	0.14	0.007	0.000	Not Measured	0.001	<IDL
GW20-08-9081 (NF)	12/3/2007	12/4/2007	U	0.0010	0.0000	8.21	0.12	0.006	0.000	0.01(U)	0.001	<IDL
GW20-08-8951 (F)	12/3/2007	12/4/2007	U	0.0005	0.0000	8.05	0.14	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9082 (NF)	12/3/2007	12/4/2007	U	0.0008	0.0000	8.16	0.11	0.006	0.000	0.01(U)	0.001	<IDL
GW20-08-8952 (F)	12/3/2007	12/4/2007	U	0.0006	0.0000	8.06	0.12	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9083 (NF)	12/3/2007	12/4/2007	U	0.0008	0.0000	8.14	0.09	0.006	0.000	0.010	0.001	<IDL
GW20-08-8953 (F)	12/3/2007	12/4/2007	U	0.0006	0.0001	8.06	0.11	0.007	0.001	Not Measured	0.001	<IDL
GW20-08-9066 (NF)	12/3/2007	12/4/2007	U	0.0002	<IDL	7.37	0.01(U)	0.001	<IDL	0.01(U)	0.001	<IDL
GW20-08-9068 (NF)	12/3/2007	12/4/2007	U	0.0007	0.0000	8.23	0.10	0.005	0.000	0.01(U)	0.001	<IDL
GW20-08-9122 (NF)	12/3/2007	12/4/2007	U	0.0009	0.0000	8.00	0.09	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-8938 (F)	12/3/2007	12/4/2007	U	0.0007	0.0000	8.07	0.11	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-8963 (F)	12/3/2007	12/4/2007	U	0.0005	0.0000	7.90	0.11	0.006	0.000	0.01(U)	0.001	<IDL
GW20-08-9121 (NF)	12/3/2007	12/4/2007	U	0.0003	0.0000	7.84	0.07	0.006	0.000	0.01(U)	0.001	<IDL
GW20-08-9084 (NF)	12/4/2007	12/4/2007	U	0.0032	0.0001	7.94	0.09	0.008	0.001	0.01(U)	0.001	<IDL
GW20-08-8954 (F)	12/4/2007	12/4/2007	U	0.0005	0.0000	8.25	0.10	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9085 (NF)	12/4/2007	12/4/2007	U	0.0008	0.0000	8.07	0.10	0.006	0.000	0.01(U)	0.001	<IDL
GW20-08-8955 (F)	12/4/2007	12/4/2007	U	0.0004	0.0000	8.22	0.11	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9086 (NF)	12/4/2007	12/4/2007	U	0.0007	0.0000	8.06	0.10	0.006	0.000	0.01(U)	0.001	<IDL
GW20-08-8956 (F)	12/4/2007	12/4/2007	U	0.0004	0.0001	8.16	0.09	0.009	0.002	Not Measured	0.001	<IDL
GW20-08-9087 (NF)	12/4/2007	12/4/2007	U	0.0005	0.0000	7.97	0.08	0.006	0.000	0.01(U)	0.001	<IDL
GW20-08-8957 (F)	12/4/2007	12/4/2007	U	0.0003	0.0000	8.10	0.08	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-9088 (NF)	12/4/2007	12/4/2007	U	0.0007	0.0000	7.96	0.08	0.006	0.000	0.041	0.001	<IDL
GW20-08-8958 (F)	12/4/2007	12/4/2007	U	0.0003	0.0000	8.08	0.09	0.006	0.000	Not Measured	0.001	<IDL
GW20-08-8962 (F)	12/4/2007	12/4/2007	U	0.0002	0.0000	8.05	0.09	0.005	0.000	Not Measured	0.001	<IDL
GW20-08-9072 (NF)	12/5/2007	12/5/2007	Not Measured	0.0043	0.0001	5.62	Not Measured	0.001	<IDL	0.03	0.001	<IDL
GW20-08-8942 (F)	12/5/2007	12/5/2007	Not Measured	0.0002	<IDL	5.87	Not Measured	0.001	<IDL	Not Measured	0.001	<IDL

[a] NF = Nonfiltered.
[b] F = Filtered.
[c] IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.
[d] U = Nondetect.

Table A-2
Laboratory-Measured Analytical Results for R-20 Screen 2

Sample ID	Date Collected	Date Received	Se rslt	stdev (Se)	Si rslt	stdev (Si)	SiO2 rslt	stdev (SiO2)	Sn rslt	stdev (Sn)	SO4(-2) rslt	Sr rslt	stdev (Sr)
R-20 Screen 2													
GW20-08-9118 (NF[a])	12/3/2007	12/4/2007	0.001	<IDL	37.8	0.5	80.9	1.1	0.001	<IDL	10.7	0.345	0.000
GW20-08-8959 (F[b])	12/3/2007	12/4/2007	0.001	<IDL	33.0	0.1	70.7	0.2	0.001	<IDL	10.5	0.238	0.004
GW20-08-9074 (NF)	12/3/2007	12/4/2007	0.001	<IDL	36.3	0.6	77.7	1.3	0.001	<IDL	10.7	0.348	0.007
GW20-08-8944 (F)	12/3/2007	12/4/2007	0.001	<IDL	34.7	0.1	74.2	0.2	0.001	<IDL	10.7	0.228	0.001
GW20-08-9075 (NF)	12/3/2007	12/4/2007	0.001	<IDL	34.8	0.3	74.5	0.6	0.001	<IDL	10.8	0.314	0.015
GW20-08-8945 (F)	12/3/2007	12/4/2007	0.001	<IDL	32.5	0.2	69.6	0.4	0.001	<IDL	10.8	0.238	0.003
GW20-08-9076 (NF)	12/3/2007	12/4/2007	0.001	<IDL	33.9	0.3	72.5	0.6	0.001	<IDL	10.8	0.266	0.007
GW20-08-8946 (F)	12/3/2007	12/4/2007	0.001	<IDL	31.6	0.2	67.6	0.5	0.001	<IDL	10.7	0.244	0.003
GW20-08-9077 (NF)	12/3/2007	12/4/2007	0.001	<IDL	34.7	0.3	74.2	0.7	0.001	<IDL	10.6	0.274	0.006
GW20-08-8947 (F)	12/3/2007	12/4/2007	0.001	<IDL	34.2	0.3	73.2	0.6	0.001	<IDL	10.7	0.236	0.000
GW20-08-9078 (NF)	12/3/2007	12/4/2007	0.001	<IDL	34.5	0.1	73.9	0.2	0.001	<IDL	10.6	0.252	0.006
GW20-08-8948 (F)	12/3/2007	12/4/2007	0.001	<IDL	34.6	0.3	74.1	0.7	0.001	<IDL	10.6	0.225	0.000
GW20-08-9079 (NF)	12/3/2007	12/4/2007	0.001	<IDL	35.1	0.2	75.1	0.4	0.001	<IDL	10.5	0.237	0.003
GW20-08-8949 (F)	12/3/2007	12/4/2007	0.001	<IDL	33.3	0.2	71.3	0.4	0.001	<IDL	10.5	0.224	0.002
GW20-08-9080 (NF)	12/3/2007	12/4/2007	0.001	<IDL	34.3	0.4	73.4	0.8	0.001	<IDL	10.4	0.232	0.002
GW20-08-8950 (F)	12/3/2007	12/4/2007	0.001	<IDL	32.5	0.5	69.6	1.1	0.001	<IDL	10.4	0.239	0.001
GW20-08-9119 (NF)	12/3/2007	12/4/2007	0.001	<IDL	34.9	0.2	74.6	0.4	0.001	<IDL	10.4	0.250	0.004
GW20-08-8960 (F)	12/3/2007	12/4/2007	0.001	<IDL	32.9	0.5	70.4	1.1	0.001	<IDL	10.5	0.260	0.002
GW20-08-9081 (NF)	12/3/2007	12/4/2007	0.001	<IDL	35.4	0.3	75.7	0.7	0.001	<IDL	10.4	0.227	0.001
GW20-08-8951 (F)	12/3/2007	12/4/2007	0.001	<IDL	34.9	0.4	74.6	0.9	0.001	<IDL	10.3	0.234	0.000
GW20-08-9082 (NF)	12/3/2007	12/4/2007	0.001	<IDL	35.5	0.3	76.0	0.6	0.001	<IDL	10.4	0.214	0.002
GW20-08-8952 (F)	12/3/2007	12/4/2007	0.001	<IDL	31.3	0.5	66.9	1.1	0.001	<IDL	10.2	0.236	0.002
GW20-08-9083 (NF)	12/3/2007	12/4/2007	0.001	<IDL	35.9	0.4	76.8	0.8	0.001	<IDL	9.89	0.220	0.005
GW20-08-8953 (F)	12/3/2007	12/4/2007	0.001	<IDL	34.2	0.2	73.3	0.5	0.001	<IDL	9.82	0.262	0.020
GW20-08-9066 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.4	0.0	0.9	0.0	0.001	<IDL	0.02	0.001	<IDL
GW20-08-9068 (NF)	12/3/2007	12/4/2007	0.001	<IDL	34.8	0.2	74.4	0.5	0.001	<IDL	9.61	0.199	0.001
GW20-08-9122 (NF)	12/3/2007	12/4/2007	0.001	<IDL	35.1	0.4	75.0	0.8	0.001	<IDL	9.63	0.226	0.000
GW20-08-8938 (F)	12/3/2007	12/4/2007	0.001	<IDL	34.4	0.4	73.6	0.8	0.001	<IDL	9.70	0.223	0.008
GW20-08-8963 (F)	12/3/2007	12/4/2007	0.001	<IDL	33.7	0.0	72.2	0.0	0.001	<IDL	9.70	0.218	0.001
GW20-08-9121 (NF)	12/3/2007	12/4/2007	0.001	<IDL	37.2	0.7	79.6	1.4	0.001	<IDL	7.05	0.207	0.005
GW20-08-9084 (NF)	12/4/2007	12/4/2007	0.001	<IDL	36.8	0.5	78.8	1.1	0.001	<IDL	8.28	0.250	0.005
GW20-08-8954 (F)	12/4/2007	12/4/2007	0.001	<IDL	35.0	1.4	74.8	2.9	0.001	<IDL	8.24	0.238	0.004
GW20-08-9085 (NF)	12/4/2007	12/4/2007	0.001	<IDL	35.9	0.2	76.8	0.5	0.001	<IDL	8.09	0.230	0.005
GW20-08-8955 (F)	12/4/2007	12/4/2007	0.001	<IDL	31.9	1.0	68.2	2.1	0.001	<IDL	8.03	0.232	0.000
GW20-08-9086 (NF)	12/4/2007	12/4/2007	0.001	<IDL	35.5	0.2	76.0	0.4	0.001	<IDL	7.78	0.211	0.001
GW20-08-8956 (F)	12/4/2007	12/4/2007	0.001	<IDL	34.3	1.1	73.4	2.4	0.001	<IDL	7.79	0.344	0.094
GW20-08-9087 (NF)	12/4/2007	12/4/2007	0.001	<IDL	34.8	0.3	74.5	0.6	0.001	<IDL	7.33	0.200	0.004
GW20-08-8957 (F)	12/4/2007	12/4/2007	0.001	<IDL	29.2	0.8	62.5	1.7	0.001	<IDL	7.38	0.221	0.011
GW20-08-9088 (NF)	12/4/2007	12/4/2007	0.001	<IDL	33.4	0.3	71.5	0.7	0.001	<IDL	7.23	0.213	0.005
GW20-08-8958 (F)	12/4/2007	12/4/2007	0.001	<IDL	24.6	0.4	52.7	0.8	0.001	<IDL	7.21	0.217	0.004
GW20-08-8962 (F)	12/4/2007	12/4/2007	0.001	<IDL	34.6	0.4	74.1	0.8	0.001	<IDL	7.04	0.207	0.002
GW20-08-9072 (NF)	12/5/2007	12/5/2007	0.001	<IDL	1.5	0.0	3.3	0.0	0.001	<IDL	Not Measured	0.014	0.000
GW20-08-8942 (F)	12/5/2007	12/5/2007	0.001	<IDL	0.9	0.0	1.9	0.0	0.001	<IDL	Not Measured	0.009	0.000

[a] NF = Nonfiltered.
[b] F = Filtered.
[c] IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.
[d] U = Nondetect.

Table A-2
Laboratory-Measured Analytical Results for R-20 Screen 2

Sample ID	Date Collected	Date Received	Th rslt	stdev (Th)	Ti rslt	stdev (Ti)	Tl rslt	stdev (Tl)	U rslt	stdev (U)	V rslt	stdev (V)	Zn rslt	stdev (Zn)
R-20 Screen 2														
GW20-08-9118 (NF[a])	12/3/2007	12/4/2007	0.001	0.000	0.033	0.006	0.001	<IDL	0.0020	0.0002	0.006	0.000	0.552	0.002
GW20-08-8959 (F[b])	12/3/2007	12/4/2007	0.001	<IDL	0.008	0.000	0.001	<IDL	0.0011	0.0000	0.002	0.000	0.043	0.001
GW20-08-9074 (NF)	12/3/2007	12/4/2007	0.004	0.000	0.006	0.001	0.001	<IDL	0.0021	0.0000	0.006	0.001	0.466	0.000
GW20-08-8944 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.012	0.000	0.001	<IDL	0.0010	0.0000	0.003	0.000	0.048	0.000
GW20-08-9075 (NF)	12/3/2007	12/4/2007	0.002	0.000	0.005	0.002	0.001	<IDL	0.0015	0.0000	0.005	0.000	0.321	0.003
GW20-08-8945 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.015	0.000	0.001	<IDL	0.0011	0.0000	0.003	0.000	0.056	0.001
GW20-08-9076 (NF)	12/3/2007	12/4/2007	0.002	0.000	0.003	0.000	0.001	<IDL	0.0014	0.0000	0.005	0.001	0.279	0.001
GW20-08-8946 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.008	0.000	0.001	<IDL	0.0008	0.0000	0.003	0.000	0.031	0.001
GW20-08-9077 (NF)	12/3/2007	12/4/2007	0.001	0.000	0.006	0.001	0.001	<IDL	0.0013	0.0000	0.004	0.000	0.205	0.001
GW20-08-8947 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.005	0.000	0.001	<IDL	0.0008	0.0000	0.003	0.000	0.033	0.000
GW20-08-9078 (NF)	12/3/2007	12/4/2007	0.001	0.000	0.010	0.006	0.001	<IDL	0.0012	0.0000	0.004	0.000	0.191	0.002
GW20-08-8948 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.005	0.000	0.001	<IDL	0.0009	0.0000	0.004	0.000	0.024	0.001
GW20-08-9079 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.005	0.000	0.001	<IDL	0.0011	0.0000	0.004	0.000	0.132	0.001
GW20-08-8949 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0008	0.0000	0.003	0.000	0.014	0.001
GW20-08-9080 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.005	0.001	0.001	<IDL	0.0011	0.0000	0.004	0.000	0.116	0.003
GW20-08-8950 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0008	0.0000	0.003	0.000	0.013	0.001
GW20-08-9119 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.004	0.000	0.001	<IDL	0.0010	0.0000	0.004	0.000	0.083	0.001
GW20-08-8960 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0010	0.0001	0.004	0.000	0.015	0.000
GW20-08-9081 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0009	0.0000	0.004	0.000	0.049	0.001
GW20-08-8951 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0008	0.0000	0.004	0.000	0.012	0.002
GW20-08-9082 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.002	0.000	0.001	<IDL	0.0009	0.0000	0.004	0.000	0.032	0.001
GW20-08-8952 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0008	0.0001	0.004	0.000	0.011	0.001
GW20-08-9083 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0009	0.0001	0.004	0.000	0.025	0.000
GW20-08-8953 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0010	0.0001	0.005	0.000	0.011	0.001
GW20-08-9066 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.002	0.002	0.001	<IDL	0.0002	<IDL	0.001	<IDL	0.001	Not Measured
GW20-08-9068 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.001	0.000	0.001	<IDL	0.0009	0.0000	0.004	0.000	0.026	0.000
GW20-08-9122 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0009	0.0000	0.004	0.000	0.025	0.001
GW20-08-8938 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0009	0.0000	0.004	0.000	0.010	0.000
GW20-08-8963 (F)	12/3/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0008	0.0000	0.004	0.000	0.013	0.000
GW20-08-9121 (NF)	12/3/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0010	0.0000	0.005	0.000	0.021	0.000
GW20-08-9084 (NF)	12/4/2007	12/4/2007	0.001	0.000	0.012	0.000	0.001	<IDL	0.0015	0.0000	0.005	0.001	0.134	0.001
GW20-08-8954 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0009	0.0000	0.003	0.000	0.029	0.000
GW20-08-9085 (NF)	12/4/2007	12/4/2007	0.001	<IDL	0.005	0.002	0.001	<IDL	0.0011	0.0000	0.004	0.000	0.040	0.000
GW20-08-8955 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0009	0.0000	0.003	0.000	0.013	0.000
GW20-08-9086 (NF)	12/4/2007	12/4/2007	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0012	0.0000	0.004	0.000	0.036	0.001
GW20-08-8956 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0015	0.0004	0.007	0.002	0.011	0.001
GW20-08-9087 (NF)	12/4/2007	12/4/2007	0.001	<IDL	0.003	0.000	0.001	<IDL	0.0010	0.0000	0.005	0.000	0.026	0.000
GW20-08-8957 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0011	0.0001	0.005	0.000	0.010	0.001
GW20-08-9088 (NF)	12/4/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0010	0.0000	0.005	0.000	0.020	0.000
GW20-08-8958 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0010	0.0000	0.004	0.000	0.008	0.001
GW20-08-8962 (F)	12/4/2007	12/4/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0010	0.0001	0.004	0.000	0.013	0.000
GW20-08-9072 (NF)	12/5/2007	12/5/2007	0.001	<IDL	0.002	0.000	0.001	<IDL	0.0002	<IDL	0.001	<IDL	0.062	0.053
GW20-08-8942 (F)	12/5/2007	12/5/2007	0.001	<IDL	0.002	<IDL	0.001	<IDL	0.0002	<IDL	0.001	<IDL	0.001	Not Measured

[a] NF = Nonfiltered.
[b] F = Filtered.
[c] IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.
[d] U = Nondetect.

Table A-2
Laboratory-Measured Analytical Results for R-20 Screen 2

Sample ID	Date Collected	Date Received	TDS (ppm)	Cations	Anions	Balance
R-20 Screen 2						
GW20-08-9118 (NF[a])	12/3/2007	12/4/2007	235	2.18	1.83	0.09
GW20-08-8959 (F[b])	12/3/2007	12/4/2007	204	1.60	1.74	-0.04
GW20-08-9074 (NF)	12/3/2007	12/4/2007	228	2.07	1.92	0.04
GW20-08-8944 (F)	12/3/2007	12/4/2007	207	1.61	1.72	-0.04
GW20-08-9075 (NF)	12/3/2007	12/4/2007	218	1.87	1.90	-0.01
GW20-08-8945 (F)	12/3/2007	12/4/2007	201	1.54	1.72	-0.06
GW20-08-9076 (NF)	12/3/2007	12/4/2007	215	1.84	1.89	-0.01
GW20-08-8946 (F)	12/3/2007	12/4/2007	197	1.49	1.71	-0.07
GW20-08-9077 (NF)	12/3/2007	12/4/2007	210	1.71	1.72	0.00
GW20-08-8947 (F)	12/3/2007	12/4/2007	204	1.56	1.71	-0.05
GW20-08-9078 (NF)	12/3/2007	12/4/2007	216	1.71	1.82	-0.03
GW20-08-8948 (F)	12/3/2007	12/4/2007	204	1.58	1.69	-0.03
GW20-08-9079 (NF)	12/3/2007	12/4/2007	204	1.66	1.62	0.01
GW20-08-8949 (F)	12/3/2007	12/4/2007	199	1.53	1.68	-0.05
GW20-08-9080 (NF)	12/3/2007	12/4/2007	205	1.60	1.78	-0.05
GW20-08-8950 (F)	12/3/2007	12/4/2007	196	1.48	1.67	-0.06
GW20-08-9119 (NF)	12/3/2007	12/4/2007	204	1.58	1.67	-0.03
GW20-08-8960 (F)	12/3/2007	12/4/2007	195	1.51	1.61	-0.03
GW20-08-9081 (NF)	12/3/2007	12/4/2007	205	1.54	1.75	-0.06
GW20-08-8951 (F)	12/3/2007	12/4/2007	200	1.53	1.62	-0.03
GW20-08-9082 (NF)	12/3/2007	12/4/2007	204	1.55	1.64	-0.03
GW20-08-8952 (F)	12/3/2007	12/4/2007	190	1.44	1.61	-0.05
GW20-08-9083 (NF)	12/3/2007	12/4/2007	203	1.53	1.62	-0.03
GW20-08-8953 (F)	12/3/2007	12/4/2007	197	1.48	1.60	-0.04
GW20-08-9066 (NF)	12/3/2007	12/4/2007	7	0.02	0.09	-0.66
GW20-08-9068 (NF)	12/3/2007	12/4/2007	207	1.50	1.73	-0.07
GW20-08-9122 (NF)	12/3/2007	12/4/2007	199	1.48	1.59	-0.04
GW20-08-8938 (F)	12/3/2007	12/4/2007	197	1.46	1.60	-0.05
GW20-08-8963 (F)	12/3/2007	12/4/2007	194	1.46	1.58	-0.04
GW20-08-9121 (NF)	12/3/2007	12/4/2007	200	1.48	1.51	-0.01
GW20-08-9084 (NF)	12/4/2007	12/4/2007	211	1.63	1.65	-0.01
GW20-08-8954 (F)	12/4/2007	12/4/2007	205	1.55	1.78	-0.07
GW20-08-9085 (NF)	12/4/2007	12/4/2007	200	1.51	1.57	-0.02
GW20-08-8955 (F)	12/4/2007	12/4/2007	189	1.41	1.66	-0.08
GW20-08-9086 (NF)	12/4/2007	12/4/2007	197	1.44	1.55	-0.04
GW20-08-8956 (F)	12/4/2007	12/4/2007	194	1.44	1.55	-0.04
GW20-08-9087 (NF)	12/4/2007	12/4/2007	193	1.40	1.52	-0.04
GW20-08-8957 (F)	12/4/2007	12/4/2007	179	1.31	1.53	-0.08
GW20-08-9088 (NF)	12/4/2007	12/4/2007	189	1.37	1.52	-0.05
GW20-08-8958 (F)	12/4/2007	12/4/2007	166	1.17	1.52	-0.13
GW20-08-8962 (F)	12/4/2007	12/4/2007	192	1.37	1.51	-0.05
GW20-08-9072 (NF)	12/5/2007	12/5/2007	13	0.14	0.08	0.24
GW20-08-8942 (F)	12/5/2007	12/5/2007	8	0.07	0.07	0.03

[a] NF = Nonfiltered.
[b] F = Filtered.
[c] IDL = Instrument-detection limit, which is equivalent to not detected, denoted as U.
[d] U = Nondetect.

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	ER/RRES-WQH	Field Prep	Ag rslt (ppm)	stdev (Ag)	Al rslt (ppm)	stdev (Al)	As rslt (ppm)	stdev (As)
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	08-860	UF[b]	0.001	U[c]	0.013	0.000	0.0002	U
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	08-860	UF	0.001	U	0.004	0.000	0.0011	0.0000
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	08-861	UF	0.001	U	0.003	0.000	0.0002	U
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	08-861	UF	0.001	U	0.001	U	0.0002	U
GW20-08-11447 FB	2	3/20/2008	3/20/2008	08-860	UF	0.001	U	0.005	0.000	0.0002	U
GW20-08-11450	2	3/20/2008	3/20/2008	08-860	UF	0.001	U	0.200	0.017	0.0011	0.0000
GW20-08-11451	2	3/20/2008	3/20/2008	08-860	UF	0.001	U	0.056	0.001	0.0009	0.0001
GW20-08-11452	2	3/20/2008	3/20/2008	08-860	UF	0.001	U	0.134	0.017	0.0009	0.0001
GW20-08-11453	2	3/20/2008	3/20/2008	08-860	UF	0.001	U	0.033	0.001	0.0009	0.0000
GW20-08-11454	2	3/20/2008	3/20/2008	08-860	UF	0.001	U	0.020	0.000	0.0009	0.0000
GW20-08-11455	2	3/20/2008	3/20/2008	08-860	UF	0.001	U	0.017	0.000	0.0009	0.0001
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	08-860	UF	0.001	U	0.024	0.000	0.0010	0.0000
GW20-08-11432	1	3/21/2008	3/21/2008	08-860	UF	0.001	U	0.046	0.000	0.0009	0.0000
GW20-08-11433	1	3/21/2008	3/21/2008	08-860	UF	0.001	U	0.010	0.000	0.0002	U
GW20-08-11439	1	3/21/2008	3/21/2008	08-860	UF	0.001	U	0.281	0.008	0.0002	U
GW20-08-11440	1	3/21/2008	3/21/2008	08-860	UF	0.001	U	0.304	0.003	0.0011	0.0000
GW20-08-11441	1	3/21/2008	3/21/2008	08-860	UF	0.001	U	0.157	0.005	0.0009	0.0000
GW20-08-11442	1	3/21/2008	3/21/2008	08-860	UF	0.001	U	0.025	0.002	0.0009	0.0000
GW20-08-11443	1	3/21/2008	3/21/2008	08-860	UF	0.001	U	0.028	0.000	0.0009	0.0000
GW20-08-11444	1	3/21/2008	3/21/2008	08-860	UF	0.001	U	0.039	0.000	0.0009	0.0000
GW20-08-11479	2	3/20/2008	3/20/2008	08-861	UF	0.001	U	0.017	0.000	0.0010	0.0000
GW20-08-11478	2	3/20/2008	3/20/2008	08-861	UF	0.001	U	0.006	0.000	0.0008	0.0000
GW20-08-11480	2	3/20/2008	3/20/2008	08-861	UF	0.001	U	0.014	0.001	0.0008	0.0000
GW20-08-11481	2	3/20/2008	3/20/2008	08-861	UF	0.001	U	0.006	0.000	0.0009	0.0000
GW20-08-11482	2	3/20/2008	3/20/2008	08-861	UF	0.001	U	0.004	0.000	0.0009	0.0000
GW20-08-11483	2	3/20/2008	3/20/2008	08-861	UF	0.001	U	0.010	0.000	0.0010	0.0000
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	08-861	UF	0.001	U	0.003	0.000	0.0009	0.0000
GW20-08-11460	1	3/21/2008	3/21/2008	08-861	UF	0.001	U	0.012	0.000	0.0009	0.0000
GW20-08-11467	1	3/21/2008	3/21/2008	08-861	UF	0.001	U	0.011	0.000	0.0011	0.0000
GW20-08-11468	1	3/21/2008	3/21/2008	08-861	UF	0.001	U	0.008	0.000	0.0011	0.0000
GW20-08-11469	1	3/21/2008	3/21/2008	08-861	UF	0.001	U	0.007	0.000	0.0009	0.0000
GW20-08-11470	1	3/21/2008	3/21/2008	08-861	UF	0.001	U	0.006	0.000	0.0010	0.0000
GW20-08-11471	1	3/21/2008	3/21/2008	08-861	UF	0.001	U	0.011	0.001	0.0010	0.0000
GW20-08-11486	1	3/21/2008	3/21/2008	08-861	UF	0.001	U	0.011	0.000	0.0009	0.0000
GW20-08-11504	2	3/20/2008	3/20/2008	08-862	UF	0.001	U	0.007	0.000	0.0010	0.0000
GW20-08-11505	2	3/20/2008	3/20/2008	08-862	UF	0.001	U	0.004	0.000	0.0008	0.0000
GW20-08-11506	2	3/20/2008	3/20/2008	08-862	UF	0.001	U	0.003	0.000	0.0008	0.0000
GW20-08-11507	2	3/20/2008	3/20/2008	08-862	UF	0.001	U	0.003	0.000	0.0009	0.0000
GW20-08-11508	2	3/20/2008	3/20/2008	08-862	UF	0.001	U	0.003	0.000	0.0009	0.0000
GW20-08-11509	2	3/20/2008	3/20/2008	08-862	UF	0.001	U	0.003	0.000	0.0009	0.0000
GW20-08-11494	1	3/21/2008	3/21/2008	08-862	UF	0.001	U	0.008	0.000	0.0012	0.0000
GW20-08-11495	1	3/21/2008	3/21/2008	08-862	UF	0.001	U	0.005	0.000	0.0010	0.0001
GW20-08-11496	1	3/21/2008	3/21/2008	08-862	UF	0.001	U	0.009	0.000	0.0016	0.0000
GW20-08-11497	1	3/21/2008	3/21/2008	08-862	UF	0.001	U	0.007	0.000	0.0010	0.0000
GW20-08-11498	1	3/21/2008	3/21/2008	08-862	UF	0.001	U	0.012	0.000	0.0009	0.0000
GW20-08-11499	1	3/21/2008	3/21/2008	08-862	UF	0.001	U	0.004	0.000	0.0009	0.0000
GW20-08-11501	1	3/21/2008	3/21/2008	08-862	UF	0.001	U	0.004	0.000	0.0009	0.0000
GW20-08-11530	2	3/20/2008	3/20/2008	08-863	UF	0.001	U	0.046	0.000	0.0009	0.0000
GW20-08-11531	2	3/20/2008	3/20/2008	08-863	UF	0.001	U	0.042	0.000	0.0008	0.0000
GW20-08-11532	2	3/20/2008	3/20/2008	08-863	UF	0.001	U	0.059	0.000	0.0009	0.0000
GW20-08-11533	2	3/20/2008	3/20/2008	08-863	UF	0.001	U	0.051	0.003	0.0008	0.0000
GW20-08-11534	2	3/20/2008	3/20/2008	08-863	UF	0.001	U	0.068	0.005	0.0009	0.0001
GW20-08-11535	2	3/20/2008	3/20/2008	08-863	UF	0.001	U	0.058	0.001	0.0009	0.0000
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	08-863	UF	0.001	U	0.072	0.006	0.0009	0.0000

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	ER/RRES-WQH	Field Prep	Ag rslt (ppm)	stdev (Ag)	Al rslt (ppm)	stdev (Al)	As rslt (ppm)	stdev (As)
GW20-08-11514	1	3/21/2008	3/21/2008	08-863	UF	0.001	U	0.065	0.002	0.0009	0.0000
GW20-08-11520	1	3/21/2008	3/21/2008	08-863	UF	0.001	U	0.091	0.001	0.0010	0.0000
GW20-08-11521	1	3/21/2008	3/21/2008	08-863	UF	0.001	U	0.081	0.003	0.0010	0.0000
GW20-08-11522	1	3/21/2008	3/21/2008	08-863	UF	0.001	U	0.082	0.004	0.0010	0.0000
GW20-08-11523	1	3/21/2008	3/21/2008	08-863	UF	0.001	U	0.105	0.000	0.0009	0.0000
GW20-08-11524	1	3/21/2008	3/21/2008	08-863	UF	0.001	U	0.073	0.000	0.0009	0.0000
GW20-08-11525	1	3/21/2008	3/21/2008	08-863	UF	0.001	U	0.074	0.006	0.0008	0.0000

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	B rslt (ppm)	stdev (B)	Ba rslt (ppm)	stdev (Ba)	Be rslt (ppm)	stdev (Be)	Br(-) ppm	TOC rslt (ppm)
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	0.002	0.000	0.002	0.000	0.001	U	—[d]	0.55
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	0.002	0.000	0.001	U	0.001	U	—	1.15
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	0.002	0.000	0.001	U	0.001	U	0.01(U)	—
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	0.002	0.000	0.001	U	0.001	U	0.01(U)	—
GW20-08-11447 FB	2	3/20/2008	3/20/2008	0.008	0.000	0.001	U	0.001	U	—	0.47
GW20-08-11450	2	3/20/2008	3/20/2008	0.023	0.000	0.165	0.001	0.001	U	—	2.97
GW20-08-11451	2	3/20/2008	3/20/2008	0.019	0.000	0.117	0.001	0.001	U	—	2.21
GW20-08-11452	2	3/20/2008	3/20/2008	0.017	0.001	0.109	0.000	0.001	U	—	2.19
GW20-08-11453	2	3/20/2008	3/20/2008	0.016	0.000	0.107	0.001	0.001	U	—	1.93
GW20-08-11454	2	3/20/2008	3/20/2008	0.015	0.000	0.100	0.001	0.001	U	—	1.71
GW20-08-11455	2	3/20/2008	3/20/2008	0.015	0.000	0.100	0.001	0.001	U	—	1.69
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	0.028	0.000	0.102	0.001	0.001	U	—	1.62
GW20-08-11432	1	3/21/2008	3/21/2008	0.057	0.001	0.064	0.000	0.001	U	—	0.96
GW20-08-11433	1	3/21/2008	3/21/2008	0.015	0.001	0.001	U	0.001	U	—	0.47
GW20-08-11439	1	3/21/2008	3/21/2008	0.023	0.001	0.082	0.001	0.001	U	—	2.64
GW20-08-11440	1	3/21/2008	3/21/2008	0.017	0.000	0.071	0.000	0.001	U	—	1.01
GW20-08-11441	1	3/21/2008	3/21/2008	0.015	0.000	0.067	0.000	0.001	U	—	0.95
GW20-08-11442	1	3/21/2008	3/21/2008	0.013	0.000	0.064	0.000	0.001	U	—	0.97
GW20-08-11443	1	3/21/2008	3/21/2008	0.013	0.000	0.062	0.000	0.001	U	—	0.91
GW20-08-11444	1	3/21/2008	3/21/2008	0.036	0.000	0.067	0.000	0.001	U	—	1.02
GW20-08-11479	2	3/20/2008	3/20/2008	0.031	0.000	0.109	0.000	0.001	U	0.02	—
GW20-08-11478	2	3/20/2008	3/20/2008	0.060	0.001	0.131	0.000	0.001	U	0.02	—
GW20-08-11480	2	3/20/2008	3/20/2008	0.021	0.000	0.107	0.002	0.001	U	0.01	—
GW20-08-11481	2	3/20/2008	3/20/2008	0.022	0.000	0.108	0.001	0.001	U	0.03	—
GW20-08-11482	2	3/20/2008	3/20/2008	0.026	0.000	0.101	0.001	0.001	U	0.02	—
GW20-08-11483	2	3/20/2008	3/20/2008	0.024	0.000	0.099	0.000	0.001	U	0.02	—
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	0.014	0.000	0.098	0.001	0.001	U	0.02	—
GW20-08-11460	1	3/21/2008	3/21/2008	0.026	0.000	0.065	0.001	0.001	U	0.03	—
GW20-08-11467	1	3/21/2008	3/21/2008	0.019	0.000	0.066	0.000	0.001	U	0.03	—
GW20-08-11468	1	3/21/2008	3/21/2008	0.017	0.000	0.067	0.000	0.001	U	0.02	—
GW20-08-11469	1	3/21/2008	3/21/2008	0.015	0.000	0.065	0.000	0.001	U	0.03	—
GW20-08-11470	1	3/21/2008	3/21/2008	0.014	0.000	0.066	0.000	0.001	U	0.02	—
GW20-08-11471	1	3/21/2008	3/21/2008	0.014	0.000	0.066	0.000	0.001	U	0.03	—
GW20-08-11486	1	3/21/2008	3/21/2008	0.014	0.000	0.066	0.001	0.001	U	0.02	—
GW20-08-11504	2	3/20/2008	3/20/2008	0.024	0.000	0.131	0.001	0.001	U	—	—
GW20-08-11505	2	3/20/2008	3/20/2008	0.020	0.000	0.110	0.000	0.001	U	—	—
GW20-08-11506	2	3/20/2008	3/20/2008	0.018	0.000	0.105	0.001	0.001	U	—	—
GW20-08-11507	2	3/20/2008	3/20/2008	0.017	0.000	0.104	0.001	0.001	U	—	—
GW20-08-11508	2	3/20/2008	3/20/2008	0.058	0.001	0.100	0.000	0.001	U	—	—
GW20-08-11509	2	3/20/2008	3/20/2008	0.030	0.000	0.098	0.001	0.001	U	—	—
GW20-08-11494	1	3/21/2008	3/21/2008	0.014	0.000	0.068	0.000	0.001	U	—	—
GW20-08-11495	1	3/21/2008	3/21/2008	0.061	0.001	0.069	0.000	0.001	U	—	—
GW20-08-11496	1	3/21/2008	3/21/2008	0.031	0.000	0.066	0.000	0.001	U	—	—
GW20-08-11497	1	3/21/2008	3/21/2008	0.020	0.000	0.067	0.000	0.001	U	—	—
GW20-08-11498	1	3/21/2008	3/21/2008	0.017	0.000	0.066	0.000	0.001	U	—	—
GW20-08-11499	1	3/21/2008	3/21/2008	0.015	0.000	0.065	0.001	0.001	U	—	—
GW20-08-11501	1	3/21/2008	3/21/2008	0.014	0.000	0.066	0.000	0.001	U	—	—
GW20-08-11530	2	3/20/2008	3/20/2008	0.021	0.000	0.119	0.001	0.001	U	—	—
GW20-08-11531	2	3/20/2008	3/20/2008	0.017	0.000	0.102	0.000	0.001	U	—	—
GW20-08-11532	2	3/20/2008	3/20/2008	0.015	0.000	0.093	0.000	0.001	U	—	—
GW20-08-11533	2	3/20/2008	3/20/2008	0.013	0.000	0.094	0.000	0.001	U	—	—
GW20-08-11534	2	3/20/2008	3/20/2008	0.013	0.000	0.091	0.001	0.001	U	—	—
GW20-08-11535	2	3/20/2008	3/20/2008	0.014	0.000	0.086	0.001	0.001	U	—	—
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	0.021	0.000	0.088	0.001	0.001	U	—	—

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	B rslt (ppm)	stdev (B)	Ba rslt (ppm)	stdev (Ba)	Be rslt (ppm)	stdev (Be)	Br(-) ppm	TOC rslt (ppm)
GW20-08-11514	1	3/21/2008	3/21/2008	0.014	0.000	0.060	0.000	0.001	U	—	—
GW20-08-11520	1	3/21/2008	3/21/2008	0.014	0.000	0.047	0.000	0.001	U	—	—
GW20-08-11521	1	3/21/2008	3/21/2008	0.013	0.000	0.053	0.000	0.001	U	—	—
GW20-08-11522	1	3/21/2008	3/21/2008	0.014	0.001	0.053	0.001	0.001	U	—	—
GW20-08-11523	1	3/21/2008	3/21/2008	0.064	0.001	0.054	0.000	0.001	U	—	—
GW20-08-11524	1	3/21/2008	3/21/2008	0.033	0.000	0.058	0.000	0.001	U	—	—
GW20-08-11525	1	3/21/2008	3/21/2008	0.024	0.000	0.057	0.000	0.001	U	—	—

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Ca rslt (ppm)	stdev (Ca)	Cd rslt (ppm)	stdev (Cd)	Cl(-) ppm	ClO4(-) ppm	Co rslt (ppm)	stdev (Co)
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	0.22	0.00	0.001	U	—	—	0.001	U
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	0.06	0.00	0.001	U	—	—	0.001	U
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	0.18	0.01	0.001	U	0.15	0.001(U)	0.001	0.000
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	0.04	0.00	0.001	U	0.03	0.001(U)	0.003	0.000
GW20-08-11447 FB	2	3/20/2008	3/20/2008	0.02	0.00	0.001	U	—	—	0.001	U
GW20-08-11450	2	3/20/2008	3/20/2008	18.03	0.05	0.001	U	—	—	0.001	U
GW20-08-11451	2	3/20/2008	3/20/2008	13.61	0.13	0.001	U	—	—	0.001	U
GW20-08-11452	2	3/20/2008	3/20/2008	13.45	0.02	0.001	U	—	—	0.001	U
GW20-08-11453	2	3/20/2008	3/20/2008	12.48	0.03	0.001	U	—	—	0.001	U
GW20-08-11454	2	3/20/2008	3/20/2008	11.90	0.07	0.001	U	—	—	0.001	U
GW20-08-11455	2	3/20/2008	3/20/2008	11.70	0.06	0.001	U	—	—	0.001	U
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	11.93	0.04	0.001	U	—	—	0.001	U
GW20-08-11432	1	3/21/2008	3/21/2008	11.1	0.1	0.001	U	—	—	0.001	U
GW20-08-11433	1	3/21/2008	3/21/2008	0.05	0.01	0.001	U	—	—	0.001	U
GW20-08-11439	1	3/21/2008	3/21/2008	13.2	0.1	0.001	U	—	—	0.002	0.000
GW20-08-11440	1	3/21/2008	3/21/2008	11.3	0.0	0.001	U	—	—	0.001	U
GW20-08-11441	1	3/21/2008	3/21/2008	11.0	0.1	0.001	U	—	—	0.001	U
GW20-08-11442	1	3/21/2008	3/21/2008	10.8	0.1	0.001	U	—	—	0.001	U
GW20-08-11443	1	3/21/2008	3/21/2008	10.6	0.0	0.001	U	—	—	0.001	U
GW20-08-11444	1	3/21/2008	3/21/2008	11.45	0.03	0.001	U	—	—	0.001	U
GW20-08-11479	2	3/20/2008	3/20/2008	13.33	0.05	0.001	U	2.49	0.002(U)	0.001	U
GW20-08-11478	2	3/20/2008	3/20/2008	15.12	0.14	0.001	U	2.55	0.002(U)	0.001	0.000
GW20-08-11480	2	3/20/2008	3/20/2008	12.78	0.05	0.001	U	2.47	0.002(U)	0.001	U
GW20-08-11481	2	3/20/2008	3/20/2008	12.24	0.06	0.001	U	2.43	0.002(U)	0.005	0.000
GW20-08-11482	2	3/20/2008	3/20/2008	11.94	0.04	0.001	U	2.42	0.002(U)	0.001	U
GW20-08-11483	2	3/20/2008	3/20/2008	11.88	0.08	0.001	U	2.40	0.002(U)	0.001	U
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	11.92	0.03	0.001	U	2.39	0.002(U)	0.001	U
GW20-08-11460	1	3/21/2008	3/21/2008	11.54	0.07	0.001	U	2.67	0.001(U)	0.001	U
GW20-08-11467	1	3/21/2008	3/21/2008	12.44	0.05	0.001	U	2.61	0.007	0.001	U
GW20-08-11468	1	3/21/2008	3/21/2008	11.85	0.07	0.001	U	2.60	0.002(U)	0.001	U
GW20-08-11469	1	3/21/2008	3/21/2008	11.87	0.04	0.001	U	2.62	0.007	0.002	0.000
GW20-08-11470	1	3/21/2008	3/21/2008	11.87	0.01	0.001	U	2.67	0.002(U)	0.001	U
GW20-08-11471	1	3/21/2008	3/21/2008	11.93	0.06	0.001	U	2.64	0.002(U)	0.001	U
GW20-08-11486	1	3/21/2008	3/21/2008	11.95	0.04	0.001	U	2.62	0.002(U)	0.005	0.000
GW20-08-11504	2	3/20/2008	3/20/2008	14.98	0.06	0.001	U	Not Analyzed	Not Analyzed	0.006	0.000
GW20-08-11505	2	3/20/2008	3/20/2008	13.07	0.04	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11506	2	3/20/2008	3/20/2008	12.73	0.03	0.001	U	Not Analyzed	Not Analyzed	0.001	0.000
GW20-08-11507	2	3/20/2008	3/20/2008	12.32	0.05	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11508	2	3/20/2008	3/20/2008	11.86	0.01	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11509	2	3/20/2008	3/20/2008	11.59	0.10	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11494	1	3/21/2008	3/21/2008	12.96	0.10	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11495	1	3/21/2008	3/21/2008	12.36	0.01	0.001	U	Not Analyzed	Not Analyzed	0.001	0.000
GW20-08-11496	1	3/21/2008	3/21/2008	12.18	0.06	0.001	U	Not Analyzed	Not Analyzed	0.002	0.000
GW20-08-11497	1	3/21/2008	3/21/2008	12.30	0.05	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11498	1	3/21/2008	3/21/2008	12.07	0.02	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11499	1	3/21/2008	3/21/2008	12.27	0.01	0.001	U	Not Analyzed	Not Analyzed	0.002	0.000
GW20-08-11501	1	3/21/2008	3/21/2008	12.19	0.04	0.001	U	Not Analyzed	Not Analyzed	0.001	0.000
GW20-08-11530	2	3/20/2008	3/20/2008	14.63	0.08	0.001	U	Not Analyzed	Not Analyzed	0.003	0.000
GW20-08-11531	2	3/20/2008	3/20/2008	12.96	0.04	0.001	U	Not Analyzed	Not Analyzed	0.002	0.000
GW20-08-11532	2	3/20/2008	3/20/2008	12.30	0.03	0.001	U	Not Analyzed	Not Analyzed	0.002	0.000
GW20-08-11533	2	3/20/2008	3/20/2008	11.79	0.03	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11534	2	3/20/2008	3/20/2008	11.48	0.08	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11535	2	3/20/2008	3/20/2008	11.38	0.06	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	11.55	0.03	0.001	U	Not Analyzed	Not Analyzed	0.001	U

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Ca rslt (ppm)	stdev (Ca)	Cd rslt (ppm)	stdev (Cd)	Cl(-) ppm	ClO4(-) ppm	Co rslt (ppm)	stdev (Co)
GW20-08-11514	1	3/21/2008	3/21/2008	12.05	0.05	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11520	1	3/21/2008	3/21/2008	12.83	0.04	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11521	1	3/21/2008	3/21/2008	12.00	0.06	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11522	1	3/21/2008	3/21/2008	11.93	0.03	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11523	1	3/21/2008	3/21/2008	11.86	0.05	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11524	1	3/21/2008	3/21/2008	11.63	0.05	0.001	U	Not Analyzed	Not Analyzed	0.001	U
GW20-08-11525	1	3/21/2008	3/21/2008	11.73	0.05	0.001	U	Not Analyzed	Not Analyzed	0.001	U

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Alk-CO3 rslt (ppm)	ALK-CO3 (U)	Cr rslt (ppm)	stdev (Cr)	Cs rslt (ppm)	stdev (Cs)	Cu rslt (ppm)	stdev (Cu)
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	0.80	U	0.001	U	0.001	U	0.001	—
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	0.80	U	0.001	U	0.001	U	0.001	—
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	Not Analyzed	Not analyzed	0.001	U	0.001	U	0.001	—
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	Not Analyzed	Not analyzed	0.001	U	0.001	U	0.001	—
GW20-08-11447 FB	2	3/20/2008	3/20/2008	0.80	U	0.001	0.000	0.001	U	0.000	0.000
GW20-08-11450	2	3/20/2008	3/20/2008	0.80	U	0.003	0.000	0.001	U	0.001	0.000
GW20-08-11451	2	3/20/2008	3/20/2008	0.80	U	0.004	0.000	0.001	U	0.001	0.000
GW20-08-11452	2	3/20/2008	3/20/2008	0.80	U	0.004	0.000	0.001	U	0.002	0.000
GW20-08-11453	2	3/20/2008	3/20/2008	0.80	U	0.004	0.000	0.001	U	0.001	0.000
GW20-08-11454	2	3/20/2008	3/20/2008	0.80	U	0.004	0.000	0.001	U	0.001	—
GW20-08-11455	2	3/20/2008	3/20/2008	0.80	U	0.004	0.000	0.001	U	0.001	—
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	0.80	U	0.004	0.000	0.001	U	0.005	0.000
GW20-08-11432	1	3/21/2008	3/21/2008	4.64	Not analyzed	0.003	0.000	0.001	U	0.003	0.000
GW20-08-11433	1	3/21/2008	3/21/2008	0.80	U	0.001	U	0.001	U	0.001	—
GW20-08-11439	1	3/21/2008	3/21/2008	0.80	U	0.003	0.000	0.001	U	0.005	0.000
GW20-08-11440	1	3/21/2008	3/21/2008	6.24	Not analyzed	0.004	0.000	0.001	U	0.002	0.000
GW20-08-11441	1	3/21/2008	3/21/2008	0.80	U	0.003	0.000	0.001	U	0.001	0.000
GW20-08-11442	1	3/21/2008	3/21/2008	0.80	U	0.003	0.000	0.001	U	0.001	0.000
GW20-08-11443	1	3/21/2008	3/21/2008	0.80	U	0.003	0.000	0.001	U	0.001	0.000
GW20-08-11444	1	3/21/2008	3/21/2008	0.80	U	0.004	0.000	0.001	U	0.001	0.000
GW20-08-11479	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11478	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.001	0.000
GW20-08-11480	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.001	—
GW20-08-11481	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.004	0.000	0.001	U	0.002	0.000
GW20-08-11482	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.001	—
GW20-08-11483	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.004	0.000	0.001	U	0.001	—
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.005	0.000	0.001	U	0.001	—
GW20-08-11460	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.002	0.000
GW20-08-11467	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.001	0.000	0.001	U	0.001	—
GW20-08-11468	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11469	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11470	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.001	—
GW20-08-11471	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	0.000
GW20-08-11486	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.001	0.000
GW20-08-11504	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.002	0.000
GW20-08-11505	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.000	0.000
GW20-08-11506	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.001	—
GW20-08-11507	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.004	0.000	0.001	U	0.001	—
GW20-08-11508	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.001	—
GW20-08-11509	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.001	—
GW20-08-11494	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.001	U	0.001	U	0.001	—
GW20-08-11495	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11496	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.003	0.000	0.001	U	0.002	0.000
GW20-08-11497	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11498	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11499	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11501	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11530	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.001	U	0.001	U	0.001	—
GW20-08-11531	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.001	0.000	0.001	U	0.001	—
GW20-08-11532	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11533	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11534	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11535	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	Not Analyzed	Not analyzed	0.002	0.000	0.001	U	0.001	—

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Alk-CO3 rslt (ppm)	ALK-CO3 (U)	Cr rslt (ppm)	stdev (Cr)	Cs rslt (ppm)	stdev (Cs)	Cu rslt (ppm)	stdev (Cu)
GW20-08-11514	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.001	0.000	0.001	U	0.001	—
GW20-08-11520	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.001	U	0.001	U	0.001	—
GW20-08-11521	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.001	0.000	0.001	U	0.001	—
GW20-08-11522	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.001	0.000	0.001	U	0.001	—
GW20-08-11523	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.001	0.000	0.001	U	0.001	0.000
GW20-08-11524	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.001	0.000	0.001	U	0.001	—
GW20-08-11525	1	3/21/2008	3/21/2008	Not Analyzed	Not analyzed	0.001	0.000	0.001	U	0.001	—

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	F(-) ppm	Fe rslt (ppm)	stdev (Fe)	Alk-CO_3+HCO_3 rslt (ppm)	Hg rslt (ppm)	stdev (Hg)	K rslt (ppm)	stdev (K)
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	—	0.08	0.00	0(U)	0.00005	U	0.01	U
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	—	0.01	U	0(U)	0.00005	U	0.01	U
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	0.01(U)	0.01	U	—	0.00005	U	0.01	U
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	(U)	0.02	0.00	—	0.00005	U	0.01	U
GW20-08-11447 FB	2	3/20/2008	3/20/2008	—	0.01	U	0(U)	0.00005	U	0.01	U
GW20-08-11450	2	3/20/2008	3/20/2008	—	0.77	0.00	98.7	0.00005	U	2.56	0.03
GW20-08-11451	2	3/20/2008	3/20/2008	—	0.17	0.00	88.3	0.00005	U	2.34	0.01
GW20-08-11452	2	3/20/2008	3/20/2008	—	0.13	0.00	85.8	0.00005	U	2.28	0.02
GW20-08-11453	2	3/20/2008	3/20/2008	—	0.11	0.00	81.8	0.00005	U	2.30	0.01
GW20-08-11454	2	3/20/2008	3/20/2008	—	0.07	0.00	79.3	0.00005	U	2.27	0.01
GW20-08-11455	2	3/20/2008	3/20/2008	—	0.07	0.00	78.4	0.00005	U	2.22	0.01
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	—	0.07	0.00	81.0	0.00005	U	2.34	0.01
GW20-08-11432	1	3/21/2008	3/21/2008	—	0.10	0.00	77.1	0.00005	U	2.28	0.01
GW20-08-11433	1	3/21/2008	3/21/2008	—	0.04	0.00	0(U)	0.00005	U	0.06	0.00
GW20-08-11439	1	3/21/2008	3/21/2008	—	1.80	0.01	86.0	0.00005	U	2.20	0.01
GW20-08-11440	1	3/21/2008	3/21/2008	—	0.29	0.00	76.3	0.00005	U	2.26	0.02
GW20-08-11441	1	3/21/2008	3/21/2008	—	0.13	0.00	82.0	0.00005	U	2.26	0.00
GW20-08-11442	1	3/21/2008	3/21/2008	—	0.11	0.00	81.9	0.00005	U	2.23	0.01
GW20-08-11443	1	3/21/2008	3/21/2008	—	0.09	0.00	81.4	0.00005	U	2.09	0.01
GW20-08-11444	1	3/21/2008	3/21/2008	—	0.16	0.00	81.1	0.00005	U	2.254	0.005
GW20-08-11479	2	3/20/2008	3/20/2008	0.36	0.05	0.00	—	0.00005	U	2.43	0.01
GW20-08-11478	2	3/20/2008	3/20/2008	0.33	0.05	0.00	—	0.00005	U	2.68	0.01
GW20-08-11480	2	3/20/2008	3/20/2008	0.35	0.05	0.00	—	0.00005	U	2.40	0.01
GW20-08-11481	2	3/20/2008	3/20/2008	0.35	0.04	0.00	—	0.00005	U	2.38	0.01
GW20-08-11482	2	3/20/2008	3/20/2008	0.36	0.04	0.00	—	0.00005	U	2.34	0.01
GW20-08-11483	2	3/20/2008	3/20/2008	0.34	0.05	0.00	—	0.00005	U	2.34	0.01
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	0.35	0.05	0.00	—	0.00005	U	2.24	0.01
GW20-08-11460	1	3/21/2008	3/21/2008	0.33	0.04	0.00	—	0.00005	U	2.214	0.013
GW20-08-11467	1	3/21/2008	3/21/2008	0.28	0.20	0.00	—	0.00005	U	2.356	0.018
GW20-08-11468	1	3/21/2008	3/21/2008	0.32	0.06	0.00	—	0.00005	U	2.317	0.011
GW20-08-11469	1	3/21/2008	3/21/2008	0.29	0.10	0.00	—	0.00005	U	2.284	0.007
GW20-08-11470	1	3/21/2008	3/21/2008	0.29	0.05	0.00	—	0.00005	U	2.271	0.006
GW20-08-11471	1	3/21/2008	3/21/2008	0.28	0.04	0.00	—	0.00005	U	2.236	0.006
GW20-08-11486	1	3/21/2008	3/21/2008	0.32	0.06	0.00	—	0.00005	U	2.256	0.010
GW20-08-11504	2	3/20/2008	3/20/2008	Not Analyzed	0.05	0.00	—	0.00005	U	2.62	0.01
GW20-08-11505	2	3/20/2008	3/20/2008	Not Analyzed	0.06	0.00	—	0.00005	U	2.38	0.01
GW20-08-11506	2	3/20/2008	3/20/2008	Not Analyzed	0.05	0.00	—	0.00005	U	2.36	0.01
GW20-08-11507	2	3/20/2008	3/20/2008	Not Analyzed	0.04	0.00	—	0.00005	U	2.35	0.01
GW20-08-11508	2	3/20/2008	3/20/2008	Not Analyzed	0.05	0.00	—	0.00005	U	2.44	0.01
GW20-08-11509	2	3/20/2008	3/20/2008	Not Analyzed	0.04	0.00	—	0.00005	U	2.32	0.01
GW20-08-11494	1	3/21/2008	3/21/2008	Not Analyzed	0.14	0.00	—	0.00005	U	2.425	0.003
GW20-08-11495	1	3/21/2008	3/21/2008	Not Analyzed	0.06	0.00	—	0.00005	U	2.543	0.020
GW20-08-11496	1	3/21/2008	3/21/2008	Not Analyzed	0.05	0.00	—	0.00005	U	2.368	0.012
GW20-08-11497	1	3/21/2008	3/21/2008	Not Analyzed	0.05	0.00	—	0.00005	U	2.341	0.012
GW20-08-11498	1	3/21/2008	3/21/2008	Not Analyzed	0.04	0.00	—	0.00005	U	2.294	0.009
GW20-08-11499	1	3/21/2008	3/21/2008	Not Analyzed	0.04	0.00	—	0.00005	U	2.293	0.025
GW20-08-11501	1	3/21/2008	3/21/2008	Not Analyzed	0.04	0.00	—	0.00005	U	2.290	0.008
GW20-08-11530	2	3/20/2008	3/20/2008	Not Analyzed	0.02	0.00	—	0.00005	U	2.65	0.03
GW20-08-11531	2	3/20/2008	3/20/2008	Not Analyzed	0.03	0.00	—	0.00005	U	2.45	0.01
GW20-08-11532	2	3/20/2008	3/20/2008	Not Analyzed	0.03	0.00	—	0.00005	U	2.58	0.25
GW20-08-11533	2	3/20/2008	3/20/2008	Not Analyzed	0.03	0.00	—	0.00005	U	2.32	0.01
GW20-08-11534	2	3/20/2008	3/20/2008	Not Analyzed	0.03	0.00	—	0.00005	U	2.30	0.01
GW20-08-11535	2	3/20/2008	3/20/2008	Not Analyzed	0.03	0.00	—	0.00005	U	2.33	0.01
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	Not Analyzed	0.02	0.00	—	0.00005	U	2.32	0.01

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	F(-) ppm	Fe rslt (ppm)	stdev (Fe)	Alk-CO_3+HCO_3 rslt (ppm)	Hg rslt (ppm)	stdev (Hg)	K rslt (ppm)	stdev (K)
GW20-08-11514	1	3/21/2008	3/21/2008	Not Analyzed	0.09	0.00	—	0.00005	U	2.252	0.021
GW20-08-11520	1	3/21/2008	3/21/2008	Not Analyzed	0.03	0.00	—	0.00005	U	2.485	0.015
GW20-08-11521	1	3/21/2008	3/21/2008	Not Analyzed	0.04	0.00	—	0.00005	U	2.364	0.015
GW20-08-11522	1	3/21/2008	3/21/2008	Not Analyzed	0.03	0.00	—	0.00005	U	2.435	0.020
GW20-08-11523	1	3/21/2008	3/21/2008	Not Analyzed	0.02	0.00	—	0.00005	U	2.414	0.015
GW20-08-11524	1	3/21/2008	3/21/2008	Not Analyzed	0.02	0.00	—	0.00005	U	2.310	0.003
GW20-08-11525	1	3/21/2008	3/21/2008	Not Analyzed	0.03	0.00	—	0.00005	U	2.284	0.017

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Li rslt (ppm)	stdev (Li)	Mg rslt (ppm)	stdev (Mg)	Mn rslt (ppm)	stdev (Mn)	Mo rslt (ppm)	stdev (Mo)
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	0.001	U	0.05	0.00	0.001	0.000	0.001	U
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	0.001	U	0.01	U	0.001	0.000	0.001	U
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	0.001	U	0.03	0.00	0.003	0.000	0.001	U
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	0.001	U	0.01	U	0.005	0.000	0.001	U
GW20-08-11447 FB	2	3/20/2008	3/20/2008	0.006	0.010	0.01	U	0.001	U	0.001	U
GW20-08-11450	2	3/20/2008	3/20/2008	0.023	0.000	3.10	0.03	0.122	0.004	0.002	0.000
GW20-08-11451	2	3/20/2008	3/20/2008	0.021	0.000	2.66	0.01	0.081	0.000	0.002	0.000
GW20-08-11452	2	3/20/2008	3/20/2008	0.021	0.000	2.56	0.02	0.071	0.000	0.002	0.000
GW20-08-11453	2	3/20/2008	3/20/2008	0.022	0.000	2.51	0.02	0.063	0.000	0.002	0.000
GW20-08-11454	2	3/20/2008	3/20/2008	0.021	0.000	2.46	0.01	0.054	0.001	0.002	0.000
GW20-08-11455	2	3/20/2008	3/20/2008	0.021	0.000	2.44	0.00	0.048	0.000	0.001	0.000
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	0.022	0.000	2.51	0.02	0.050	0.000	0.002	0.000
GW20-08-11432	1	3/21/2008	3/21/2008	0.021	0.000	2.25	0.01	0.016	0.001	0.001	0.000
GW20-08-11433	1	3/21/2008	3/21/2008	0.006	0.010	0.01	U	0.001	U	0.001	U
GW20-08-11439	1	3/21/2008	3/21/2008	0.021	0.000	2.55	0.01	0.062	0.001	0.001	0.000
GW20-08-11440	1	3/21/2008	3/21/2008	0.021	0.000	2.29	0.01	0.021	0.000	0.001	0.000
GW20-08-11441	1	3/21/2008	3/21/2008	0.021	0.000	2.20	0.01	0.016	0.000	0.001	0.000
GW20-08-11442	1	3/21/2008	3/21/2008	0.021	0.000	2.21	0.01	0.014	0.000	0.001	0.000
GW20-08-11443	1	3/21/2008	3/21/2008	0.020	0.000	2.18	0.00	0.015	0.000	0.001	0.000
GW20-08-11444	1	3/21/2008	3/21/2008	0.022	0.000	2.369	0.009	0.015	0.000	0.001	0.000
GW20-08-11479	2	3/20/2008	3/20/2008	0.021	0.000	2.60	0.01	0.084	0.001	0.002	0.000
GW20-08-11478	2	3/20/2008	3/20/2008	0.023	0.000	2.77	0.02	0.079	0.002	0.002	0.000
GW20-08-11480	2	3/20/2008	3/20/2008	0.022	0.000	2.55	0.01	0.069	0.002	0.002	0.000
GW20-08-11481	2	3/20/2008	3/20/2008	0.021	0.000	2.50	0.02	0.069	0.002	0.002	0.000
GW20-08-11482	2	3/20/2008	3/20/2008	0.022	0.000	2.50	0.01	0.056	0.000	0.002	0.000
GW20-08-11483	2	3/20/2008	3/20/2008	0.021	0.000	2.48	0.02	0.050	0.001	0.002	0.000
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	0.021	0.000	2.45	0.01	0.050	0.000	0.002	0.000
GW20-08-11460	1	3/21/2008	3/21/2008	0.022	0.000	2.296	0.004	0.013	0.000	0.001	0.000
GW20-08-11467	1	3/21/2008	3/21/2008	0.022	0.000	2.287	0.010	0.025	0.000	0.002	0.000
GW20-08-11468	1	3/21/2008	3/21/2008	0.022	0.000	2.247	0.005	0.013	0.000	0.001	0.000
GW20-08-11469	1	3/21/2008	3/21/2008	0.022	0.000	2.224	0.014	0.015	0.000	0.001	0.000
GW20-08-11470	1	3/21/2008	3/21/2008	0.022	0.000	2.304	0.005	0.013	0.000	0.001	0.000
GW20-08-11471	1	3/21/2008	3/21/2008	0.022	0.000	2.360	0.008	0.013	0.000	0.001	0.000
GW20-08-11486	1	3/21/2008	3/21/2008	0.023	0.000	2.367	0.012	0.020	0.000	0.001	0.000
GW20-08-11504	2	3/20/2008	3/20/2008	0.023	0.000	2.79	0.01	0.090	0.000	0.002	0.000
GW20-08-11505	2	3/20/2008	3/20/2008	0.021	0.000	2.63	0.02	0.081	0.000	0.002	0.000
GW20-08-11506	2	3/20/2008	3/20/2008	0.021	0.000	2.54	0.01	0.073	0.001	0.002	0.000
GW20-08-11507	2	3/20/2008	3/20/2008	0.021	0.000	2.51	0.06	0.060	0.001	0.002	0.000
GW20-08-11508	2	3/20/2008	3/20/2008	0.022	0.000	2.49	0.02	0.053	0.000	0.002	0.000
GW20-08-11509	2	3/20/2008	3/20/2008	0.021	0.000	2.45	0.03	0.051	0.003	0.002	0.000
GW20-08-11494	1	3/21/2008	3/21/2008	0.023	0.000	2.329	0.010	0.022	0.000	0.001	0.000
GW20-08-11495	1	3/21/2008	3/21/2008	0.023	0.000	2.306	0.007	0.015	0.000	0.001	0.000
GW20-08-11496	1	3/21/2008	3/21/2008	0.022	0.000	2.245	0.005	0.021	0.000	0.002	0.000
GW20-08-11497	1	3/21/2008	3/21/2008	0.022	0.000	2.332	0.008	0.015	0.001	0.001	0.000
GW20-08-11498	1	3/21/2008	3/21/2008	0.022	0.000	2.359	0.003	0.014	0.000	0.001	0.000
GW20-08-11499	1	3/21/2008	3/21/2008	0.022	0.000	2.367	0.029	0.014	0.000	0.001	0.000
GW20-08-11501	1	3/21/2008	3/21/2008	0.022	0.000	2.365	0.013	0.015	0.001	0.001	0.000
GW20-08-11530	2	3/20/2008	3/20/2008	0.023	0.000	2.81	0.03	0.085	0.001	0.002	0.000
GW20-08-11531	2	3/20/2008	3/20/2008	0.022	0.000	2.68	0.01	0.075	0.001	0.002	0.000
GW20-08-11532	2	3/20/2008	3/20/2008	0.022	0.000	2.60	0.01	0.067	0.002	0.002	0.000
GW20-08-11533	2	3/20/2008	3/20/2008	0.021	0.000	2.46	0.01	0.056	0.002	0.002	0.000
GW20-08-11534	2	3/20/2008	3/20/2008	0.021	0.000	2.46	0.01	0.049	0.001	0.002	0.000
GW20-08-11535	2	3/20/2008	3/20/2008	0.022	0.000	2.49	0.02	0.045	0.000	0.002	0.000
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	0.021	0.000	2.45	0.01	0.045	0.000	0.002	0.000

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Li rslt (ppm)	stdev (Li)	Mg rslt (ppm)	stdev (Mg)	Mn rslt (ppm)	stdev (Mn)	Mo rslt (ppm)	stdev (Mo)
GW20-08-11514	1	3/21/2008	3/21/2008	0.022	0.000	2.323	0.007	0.012	0.000	0.001	0.000
GW20-08-11520	1	3/21/2008	3/21/2008	0.022	0.000	2.247	0.002	0.015	0.000	0.001	0.000
GW20-08-11521	1	3/21/2008	3/21/2008	0.022	0.000	2.256	0.012	0.011	0.000	0.001	0.000
GW20-08-11522	1	3/21/2008	3/21/2008	0.022	0.000	2.310	0.010	0.010	0.000	0.001	0.000
GW20-08-11523	1	3/21/2008	3/21/2008	0.022	0.000	2.306	0.026	0.011	0.000	0.001	0.000
GW20-08-11524	1	3/21/2008	3/21/2008	0.022	0.000	2.348	0.011	0.011	0.000	0.001	0.000
GW20-08-11525	1	3/21/2008	3/21/2008	0.022	0.000	2.339	0.011	0.011	0.001	0.001	0.000

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Na rslt (ppm)	stdev (Na)	Ni rslt (ppm)	stdev (Ni)	NO2(ppm)	NO2-N rslt	NO2-N (U)	NO3 ppm
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	0.13	0.00	0.001	U	—	—	—	—
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	0.07	0.00	0.001	U	—	—	—	—
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	0.07	0.00	0.001	U	0.01	0.003	U	0.01
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	0.08	0.00	0.001	U	0.01	0.003	U	0.01
GW20-08-11447 FB	2	3/20/2008	3/20/2008	0.05	0.00	0.001	U	—	—	—	—
GW20-08-11450	2	3/20/2008	3/20/2008	13.5	0.1	0.004	0.000	—	—	—	—
GW20-08-11451	2	3/20/2008	3/20/2008	12.2	0.0	0.002	0.000	—	—	—	—
GW20-08-11452	2	3/20/2008	3/20/2008	11.9	0.1	0.002	0.000	—	—	—	—
GW20-08-11453	2	3/20/2008	3/20/2008	11.8	0.1	0.002	0.000	—	—	—	—
GW20-08-11454	2	3/20/2008	3/20/2008	11.6	0.0	0.002	0.000	—	—	—	—
GW20-08-11455	2	3/20/2008	3/20/2008	11.5	0.1	0.002	0.000	—	—	—	—
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	11.9	0.1	0.002	0.000	—	—	—	—
GW20-08-11432	1	3/21/2008	3/21/2008	12.1	0.0	0.005	0.000	—	—	—	—
GW20-08-11433	1	3/21/2008	3/21/2008	0.25	0.00	0.001	U	—	—	—	—
GW20-08-11439	1	3/21/2008	3/21/2008	12.1	0.1	0.003	0.000	—	—	—	—
GW20-08-11440	1	3/21/2008	3/21/2008	12.4	0.1	0.002	0.000	—	—	—	—
GW20-08-11441	1	3/21/2008	3/21/2008	12.3	0.1	0.001	0.000	—	—	—	—
GW20-08-11442	1	3/21/2008	3/21/2008	12.1	0.1	0.001	0.000	—	—	—	—
GW20-08-11443	1	3/21/2008	3/21/2008	11.5	0.0	0.001	0.000	—	—	—	—
GW20-08-11444	1	3/21/2008	3/21/2008	12.6	0.1	0.001	0.000	—	—	—	—
GW20-08-11479	2	3/20/2008	3/20/2008	12.0	0.0	0.002	0.000	0.01	0.003	U	0.73
GW20-08-11478	2	3/20/2008	3/20/2008	13.5	0.1	0.002	0.000	0.01	0.003	U	0.01
GW20-08-11480	2	3/20/2008	3/20/2008	12.1	0.1	0.002	0.000	0.01	0.003	U	0.05
GW20-08-11481	2	3/20/2008	3/20/2008	11.8	0.1	0.002	0.000	0.01	0.003	U	0.33
GW20-08-11482	2	3/20/2008	3/20/2008	11.6	0.4	0.002	0.000	0.01	0.003	U	0.17
GW20-08-11483	2	3/20/2008	3/20/2008	11.5	0.0	0.002	0.000	0.01	0.003	U	0.21
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	11.5	0.1	0.002	0.000	0.01	0.003	U	0.64
GW20-08-11460	1	3/21/2008	3/21/2008	12.6	0.1	0.004	0.000	0.01	0.003	U	0.36
GW20-08-11467	1	3/21/2008	3/21/2008	13.5	0.1	0.001	0.000	0.01	0.003	U	0.10
GW20-08-11468	1	3/21/2008	3/21/2008	13.2	0.1	0.001	0.000	0.01	0.003	U	0.21
GW20-08-11469	1	3/21/2008	3/21/2008	12.9	0.1	0.001	0.000	0.01	0.003	U	0.47
GW20-08-11470	1	3/21/2008	3/21/2008	12.9	0.0	0.001	0.000	0.01	0.003	U	0.36
GW20-08-11471	1	3/21/2008	3/21/2008	12.7	0.1	0.001	0.000	0.01	0.003	U	0.12
GW20-08-11486	1	3/21/2008	3/21/2008	12.6	0.1	0.002	0.000	0.01	0.003	U	0.69
GW20-08-11504	2	3/20/2008	3/20/2008	13.6	0.1	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11505	2	3/20/2008	3/20/2008	11.9	0.0	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11506	2	3/20/2008	3/20/2008	11.7	0.0	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11507	2	3/20/2008	3/20/2008	11.6	0.1	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11508	2	3/20/2008	3/20/2008	11.6	0.0	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11509	2	3/20/2008	3/20/2008	11.3	0.2	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11494	1	3/21/2008	3/21/2008	13.7	0.1	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11495	1	3/21/2008	3/21/2008	13.3	0.1	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11496	1	3/21/2008	3/21/2008	12.7	0.0	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11497	1	3/21/2008	3/21/2008	12.7	0.0	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11498	1	3/21/2008	3/21/2008	12.4	0.0	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11499	1	3/21/2008	3/21/2008	12.3	0.1	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11501	1	3/21/2008	3/21/2008	12.4	0.0	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11530	2	3/20/2008	3/20/2008	13.6	0.0	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11531	2	3/20/2008	3/20/2008	12.1	0.1	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11532	2	3/20/2008	3/20/2008	12.1	0.1	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11533	2	3/20/2008	3/20/2008	11.6	0.1	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11534	2	3/20/2008	3/20/2008	11.4	0.1	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11535	2	3/20/2008	3/20/2008	11.6	0.1	0.002	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	11.2	0.1	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Na rslt (ppm)	stdev (Na)	Ni rslt (ppm)	stdev (Ni)	NO2(ppm)	NO2-N rslt	NO2-N (U)	NO3 ppm
GW20-08-11514	1	3/21/2008	3/21/2008	12.2	0.1	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11520	1	3/21/2008	3/21/2008	13.0	0.1	0.001	U	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11521	1	3/21/2008	3/21/2008	12.8	0.1	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11522	1	3/21/2008	3/21/2008	12.8	0.1	0.001	U	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11523	1	3/21/2008	3/21/2008	12.5	0.1	0.001	0.000	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11524	1	3/21/2008	3/21/2008	12.2	0.1	0.001	U	Not Analyzed	Not Analyzed	—	Not Analyzed
GW20-08-11525	1	3/21/2008	3/21/2008	12.1	0.1	0.001	U	Not Analyzed	Not Analyzed	—	Not Analyzed

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	NO3-N rslt	C2O4 rslt (ppm)	Pb rslt (ppm)	stdev (Pb)	pH	PO4(-3) rslt (ppm)	Rb rslt (ppm)	stdev (Rb)
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	—	—	0.0002	U	7.23	—	0.001	U
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	—	—	0.0002	U	5.18	—	0.001	U
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	0.00	0.01(U)	0.0002	U	—	0.01(U)	0.001	U
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	0(U)	0.01(U)	0.0002	U	—	0.01(U)	0.001	U
GW20-08-11447 FB	2	3/20/2008	3/20/2008	—	—	0.0002	U	5.43	—	0.001	U
GW20-08-11450	2	3/20/2008	3/20/2008	—	—	0.0030	0.0000	7.77	—	0.006	0.000
GW20-08-11451	2	3/20/2008	3/20/2008	—	—	0.0006	0.0000	7.77	—	0.005	0.000
GW20-08-11452	2	3/20/2008	3/20/2008	—	—	0.0005	0.0000	7.83	—	0.005	0.000
GW20-08-11453	2	3/20/2008	3/20/2008	—	—	0.0004	0.0000	7.86	—	0.005	0.000
GW20-08-11454	2	3/20/2008	3/20/2008	—	—	0.0002	U	7.91	—	0.005	0.000
GW20-08-11455	2	3/20/2008	3/20/2008	—	—	0.0002	U	7.92	—	0.005	0.000
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	—	—	0.0004	0.0000	7.80	—	0.005	0.000
GW20-08-11432	1	3/21/2008	3/21/2008	—	—	0.0021	0.0000	8.04	—	0.004	0.000
GW20-08-11433	1	3/21/2008	3/21/2008	—	—	0.0002	U	5.67	—	0.001	U
GW20-08-11439	1	3/21/2008	3/21/2008	—	—	0.0049	0.0000	8.00	—	0.005	0.000
GW20-08-11440	1	3/21/2008	3/21/2008	—	—	0.0016	0.0000	8.20	—	0.005	0.000
GW20-08-11441	1	3/21/2008	3/21/2008	—	—	0.0012	0.0000	8.17	—	0.004	0.000
GW20-08-11442	1	3/21/2008	3/21/2008	—	—	0.0010	0.0000	8.18	—	0.004	0.000
GW20-08-11443	1	3/21/2008	3/21/2008	—	—	0.0010	0.0000	8.16	—	0.004	0.000
GW20-08-11444	1	3/21/2008	3/21/2008	—	—	0.0010	0.0000	8.18	—	0.004	0.000
GW20-08-11479	2	3/20/2008	3/20/2008	0.16	0.01(U)	0.0004	0.0000	Not Analyzed	0.13	0.005	0.000
GW20-08-11478	2	3/20/2008	3/20/2008	0.00	0.01(U)	0.0002	U	Not Analyzed	0.15	0.005	0.000
GW20-08-11480	2	3/20/2008	3/20/2008	0.01	0.01(U)	0.0002	U	Not Analyzed	0.03	0.005	0.000
GW20-08-11481	2	3/20/2008	3/20/2008	0.07	0.01(U)	0.0003	0.0000	Not Analyzed	0.03	0.005	0.000
GW20-08-11482	2	3/20/2008	3/20/2008	0.04	0.01(U)	0.0002	U	Not Analyzed	0.01(U)	0.005	0.000
GW20-08-11483	2	3/20/2008	3/20/2008	0.05	0.01(U)	0.0002	U	Not Analyzed	0.02	0.005	0.000
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	0.14	0.01(U)	0.0002	U	Not Analyzed	0.02	0.005	0.000
GW20-08-11460	1	3/21/2008	3/21/2008	0.08	0.01(U)	0.0014	0.0001	Not Analyzed	0.01(U)	0.004	0.000
GW20-08-11467	1	3/21/2008	3/21/2008	0.02	0.01(U)	0.0009	0.0000	Not Analyzed	0.01(U)	0.004	0.000
GW20-08-11468	1	3/21/2008	3/21/2008	0.05	0.01(U)	0.0006	0.0000	Not Analyzed	0.01(U)	0.004	0.000
GW20-08-11469	1	3/21/2008	3/21/2008	0.11	0.01(U)	0.0007	0.0000	Not Analyzed	0.01(U)	0.004	0.000
GW20-08-11470	1	3/21/2008	3/21/2008	0.08	0.01(U)	0.0007	0.0000	Not Analyzed	0.01(U)	0.004	0.000
GW20-08-11471	1	3/21/2008	3/21/2008	0.03	0.01(U)	0.0007	0.0000	Not Analyzed	0.01(U)	0.004	0.000
GW20-08-11486	1	3/21/2008	3/21/2008	0.16	0.01(U)	0.0007	0.0000	Not Analyzed	0.01(U)	0.004	0.000
GW20-08-11504	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0006	0.0000	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11505	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11506	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11507	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11508	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11509	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11494	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0007	0.0000	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11495	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0006	0.0000	Not Analyzed	Not Analyzed	0.004	0.000
GW20-08-11496	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0011	0.0000	Not Analyzed	Not Analyzed	0.007	0.000
GW20-08-11497	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0008	0.0000	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11498	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0007	0.0000	Not Analyzed	Not Analyzed	0.004	0.000
GW20-08-11499	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0006	0.0000	Not Analyzed	Not Analyzed	0.004	0.000
GW20-08-11501	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0007	0.0000	Not Analyzed	Not Analyzed	0.004	0.000
GW20-08-11530	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11531	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11532	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11533	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11534	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11535	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.005	0.000

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	NO3-N rslt	C2O4 rslt (ppm)	Pb rslt (ppm)	stdev (Pb)	pH	PO4(-3) rslt (ppm)	Rb rslt (ppm)	stdev (Rb)
GW20-08-11514	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0003	0.0000	Not Analyzed	Not Analyzed	0.004	0.000
GW20-08-11520	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.004	0.000
GW20-08-11521	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0002	U	Not Analyzed	Not Analyzed	0.004	0.000
GW20-08-11522	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0003	0.0000	Not Analyzed	Not Analyzed	0.004	0.000
GW20-08-11523	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0003	0.0000	Not Analyzed	Not Analyzed	0.004	0.000
GW20-08-11524	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0003	0.0000	Not Analyzed	Not Analyzed	0.004	0.000
GW20-08-11525	1	3/21/2008	3/21/2008	Not Analyzed	Not Analyzed	0.0003	0.0000	Not Analyzed	Not Analyzed	0.004	0.000

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	S2- rslt (ppm)	Sb rslt (ppm)	stdev (Sb)	Se rslt (ppm)	stdev (Se)	Si rslt (ppm)	stdev (Si)	SiO2 rslt (ppm)
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	0.01(U)	0.001	U	0.001	U	0.04	0.01	0.09
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	0.01(U)	0.001	U	0.001	U	0.01	0.00	0.03
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	—	0.001	U	0.001	U	0.03	0.00	0.06
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	—	0.001	U	0.001	U	0.01	0.00	0.02
GW20-08-11447 FB	2	3/20/2008	3/20/2008	0.01(U)	0.001	U	0.001	U	0.28	0.00	0.6
GW20-08-11450	2	3/20/2008	3/20/2008	0.01(U)	0.001	U	0.001	U	35.0	0.3	74.9
GW20-08-11451	2	3/20/2008	3/20/2008	0.01(U)	0.001	U	0.001	U	36.1	0.3	77.2
GW20-08-11452	2	3/20/2008	3/20/2008	0.01(U)	0.001	U	0.001	U	35.7	0.1	76.5
GW20-08-11453	2	3/20/2008	3/20/2008	0.01(U)	0.001	U	0.001	U	36.8	0.3	78.8
GW20-08-11454	2	3/20/2008	3/20/2008	0.01(U)	0.001	U	0.001	U	36.6	0.3	78.3
GW20-08-11455	2	3/20/2008	3/20/2008	0.01(U)	0.001	U	0.001	U	36.9	0.1	79.1
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	0.01(U)	0.001	U	0.001	U	38.3	0.2	81.9
GW20-08-11432	1	3/21/2008	3/21/2008	0.01(U)	0.001	U	0.001	U	32.4	0.1	69.3
GW20-08-11433	1	3/21/2008	3/21/2008	0.01(U)	0.001	U	0.001	U	0.03	0.00	0.07
GW20-08-11439	1	3/21/2008	3/21/2008	0.01	0.001	U	0.001	U	31.6	0.3	67.6
GW20-08-11440	1	3/21/2008	3/21/2008	0.01(U)	0.001	U	0.001	U	33.3	0.1	71.2
GW20-08-11441	1	3/21/2008	3/21/2008	0.01(U)	0.001	U	0.001	U	32.6	0.1	69.8
GW20-08-11442	1	3/21/2008	3/21/2008	0.01(U)	0.001	U	0.001	U	32.3	0.1	69.1
GW20-08-11443	1	3/21/2008	3/21/2008	0.01(U)	0.001	U	0.001	U	31.3	0.3	66.9
GW20-08-11444	1	3/21/2008	3/21/2008	0.01(U)	0.001	U	0.001	U	34.9	0.1	74.6
GW20-08-11479	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	35.1	0.1	75.1
GW20-08-11478	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	34.1	0.3	73.0
GW20-08-11480	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	36.0	0.2	77.0
GW20-08-11481	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	36.7	0.3	78.6
GW20-08-11482	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	37.2	0.4	79.7
GW20-08-11483	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	37.2	0.2	79.7
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	37.0	0.5	79.2
GW20-08-11460	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.1	0.4	73.0
GW20-08-11467	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	33.7	0.3	72.1
GW20-08-11468	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.7	0.0	74.2
GW20-08-11469	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.2	0.2	73.1
GW20-08-11470	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.6	0.1	74.1
GW20-08-11471	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.7	0.2	74.3
GW20-08-11486	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	35.1	0.1	75.2
GW20-08-11504	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	34.7	0.2	74.2
GW20-08-11505	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	35.3	0.2	75.6
GW20-08-11506	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	35.5	0.5	76.0
GW20-08-11507	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	36.6	0.4	78.4
GW20-08-11508	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	36.9	0.1	78.9
GW20-08-11509	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	36.5	0.5	78.2
GW20-08-11494	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.4	0.2	73.6
GW20-08-11495	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	35.0	0.1	74.9
GW20-08-11496	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.2	0.3	73.2
GW20-08-11497	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.7	0.2	74.3
GW20-08-11498	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.8	0.2	74.6
GW20-08-11499	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	35.0	0.2	74.8
GW20-08-11501	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	35.0	0.3	74.9
GW20-08-11530	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	34.4	0.2	73.6
GW20-08-11531	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	36.0	0.4	77.0
GW20-08-11532	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	36.1	0.2	77.4
GW20-08-11533	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	35.9	0.1	76.8
GW20-08-11534	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	36.6	0.3	78.3
GW20-08-11535	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	37.3	0.4	79.8
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	—	0.001	U	0.001	U	36.8	0.2	78.7

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	S2- rslt (ppm)	Sb rslt (ppm)	stdev (Sb)	Se rslt (ppm)	stdev (Se)	Si rslt (ppm)	stdev (Si)	SiO2 rslt (ppm)
GW20-08-11514	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.2	0.3	73.2
GW20-08-11520	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	33.0	0.0	70.5
GW20-08-11521	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.6	0.2	74.1
GW20-08-11522	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	35.4	0.4	75.7
GW20-08-11523	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.4	0.2	73.5
GW20-08-11524	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.3	0.2	73.5
GW20-08-11525	1	3/21/2008	3/21/2008	—	0.001	U	0.001	U	34.5	0.1	73.8

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	stdev (SiO2)	Sn rslt (ppm)	stdev (Sn)	SO4(-2) rslt (ppm)	Sr rslt (ppm)	stdev (Sr)	Th rslt (ppm)	stdev (Th)
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	0.02	0.001	U	—	0.001	0.000	0.001	U
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	0.01	0.001	U	—	0.001	U	0.001	U
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	0.01	0.001	U	0.63	0.001	0.000	0.001	U
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008		0.001	U	0.06	0.001	U	0.001	U
GW20-08-11447 FB	2	3/20/2008	3/20/2008	0.0	0.001	U	—	0.001	U	0.001	U
GW20-08-11450	2	3/20/2008	3/20/2008	0.7	0.001	U	—	0.297	0.002	0.001	U
GW20-08-11451	2	3/20/2008	3/20/2008	0.6	0.001	U	—	0.210	0.001	0.001	U
GW20-08-11452	2	3/20/2008	3/20/2008	0.2	0.001	U	—	0.202	0.002	0.001	U
GW20-08-11453	2	3/20/2008	3/20/2008	0.6	0.001	U	—	0.192	0.000	0.001	U
GW20-08-11454	2	3/20/2008	3/20/2008	0.7	0.001	U	—	0.178	0.001	0.001	U
GW20-08-11455	2	3/20/2008	3/20/2008	0.2	0.001	U	—	0.172	0.001	0.001	U
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	0.5	0.001	U	—	0.182	0.001	0.001	U
GW20-08-11432	1	3/21/2008	3/21/2008	0.1	0.001	U	—	0.111	0.000	0.001	U
GW20-08-11433	1	3/21/2008	3/21/2008	0.00	0.001	U	—	0.001	U	0.001	U
GW20-08-11439	1	3/21/2008	3/21/2008	0.7	0.001	U	—	0.130	0.001	0.001	U
GW20-08-11440	1	3/21/2008	3/21/2008	0.2	0.001	U	—	0.118	0.001	0.001	U
GW20-08-11441	1	3/21/2008	3/21/2008	0.3	0.001	U	—	0.117	0.001	0.001	U
GW20-08-11442	1	3/21/2008	3/21/2008	0.3	0.001	U	—	0.114	0.001	0.001	U
GW20-08-11443	1	3/21/2008	3/21/2008	0.7	0.001	U	—	0.108	0.001	0.001	U
GW20-08-11444	1	3/21/2008	3/21/2008	0.3	0.001	U	—	0.122	0.001	0.001	U
GW20-08-11479	2	3/20/2008	3/20/2008	0.3	0.001	U	3.32	0.206	0.001	0.001	U
GW20-08-11478	2	3/20/2008	3/20/2008	0.7	0.001	U	2.79	0.273	0.002	0.001	U
GW20-08-11480	2	3/20/2008	3/20/2008	0.5	0.001	U	3.29	0.200	0.002	0.001	U
GW20-08-11481	2	3/20/2008	3/20/2008	0.6	0.001	U	3.64	0.188	0.001	0.001	U
GW20-08-11482	2	3/20/2008	3/20/2008	1.0	0.001	U	3.90	0.180	0.001	0.001	U
GW20-08-11483	2	3/20/2008	3/20/2008	0.4	0.001	U	3.92	0.176	0.001	0.001	U
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	1.0	0.001	U	3.86	0.177	0.000	0.001	U
GW20-08-11460	1	3/21/2008	3/21/2008	0.9	0.001	U	3.10	0.120	0.002	0.001	U
GW20-08-11467	1	3/21/2008	3/21/2008	0.6	0.001	U	3.25	0.143	0.001	0.001	U
GW20-08-11468	1	3/21/2008	3/21/2008	0.0	0.001	U	3.11	0.129	0.001	0.001	U
GW20-08-11469	1	3/21/2008	3/21/2008	0.5	0.001	U	3.00	0.127	0.002	0.001	U
GW20-08-11470	1	3/21/2008	3/21/2008	0.2	0.001	U	3.04	0.128	0.001	0.001	U
GW20-08-11471	1	3/21/2008	3/21/2008	0.4	0.001	U	3.00	0.127	0.002	0.001	U
GW20-08-11486	1	3/21/2008	3/21/2008	0.3	0.001	U	2.96	0.125	0.001	0.001	U
GW20-08-11504	2	3/20/2008	3/20/2008	0.5	0.001	U	Not Analyzed	0.281	0.002	0.001	U
GW20-08-11505	2	3/20/2008	3/20/2008	0.5	0.001	U	Not Analyzed	0.205	0.002	0.001	U
GW20-08-11506	2	3/20/2008	3/20/2008	1.0	0.001	U	Not Analyzed	0.199	0.001	0.001	U
GW20-08-11507	2	3/20/2008	3/20/2008	0.8	0.001	U	Not Analyzed	0.188	0.001	0.001	U
GW20-08-11508	2	3/20/2008	3/20/2008	0.1	0.001	U	Not Analyzed	0.174	0.001	0.001	U
GW20-08-11509	2	3/20/2008	3/20/2008	1.0	0.001	U	Not Analyzed	0.172	0.002	0.001	U
GW20-08-11494	1	3/21/2008	3/21/2008	0.3	0.001	U	Not Analyzed	0.149	0.001	0.001	U
GW20-08-11495	1	3/21/2008	3/21/2008	0.2	0.001	U	Not Analyzed	0.131	0.001	0.001	U
GW20-08-11496	1	3/21/2008	3/21/2008	0.5	0.001	U	Not Analyzed	0.128	0.001	0.001	U
GW20-08-11497	1	3/21/2008	3/21/2008	0.4	0.001	U	Not Analyzed	0.126	0.001	0.001	U
GW20-08-11498	1	3/21/2008	3/21/2008	0.4	0.001	U	Not Analyzed	0.124	0.001	0.001	U
GW20-08-11499	1	3/21/2008	3/21/2008	0.5	0.001	U	Not Analyzed	0.123	0.001	0.001	U
GW20-08-11501	1	3/21/2008	3/21/2008	0.6	0.001	U	Not Analyzed	0.125	0.001	0.001	U
GW20-08-11530	2	3/20/2008	3/20/2008	0.5	0.001	U	Not Analyzed	0.282	0.001	0.001	U
GW20-08-11531	2	3/20/2008	3/20/2008	0.9	0.001	U	Not Analyzed	0.209	0.002	0.001	U
GW20-08-11532	2	3/20/2008	3/20/2008	0.4	0.001	U	Not Analyzed	0.198	0.000	0.001	U
GW20-08-11533	2	3/20/2008	3/20/2008	0.3	0.001	U	Not Analyzed	0.185	0.001	0.001	U
GW20-08-11534	2	3/20/2008	3/20/2008	0.6	0.001	U	Not Analyzed	0.174	0.001	0.001	U
GW20-08-11535	2	3/20/2008	3/20/2008	0.9	0.001	U	Not Analyzed	0.174	0.003	0.001	U
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	0.5	0.001	U	Not Analyzed	0.172	0.001	0.001	U

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	stdev (SiO2)	Sn rslt (ppm)	stdev (Sn)	SO4(-2) rslt (ppm)	Sr rslt (ppm)	stdev (Sr)	Th rslt (ppm)	stdev (Th)
GW20-08-11514	1	3/21/2008	3/21/2008	0.7	0.001	U	Not Analyzed	0.121	0.001	0.001	U
GW20-08-11520	1	3/21/2008	3/21/2008	0.0	0.001	U	Not Analyzed	0.139	0.001	0.001	U
GW20-08-11521	1	3/21/2008	3/21/2008	0.5	0.001	U	Not Analyzed	0.127	0.001	0.001	U
GW20-08-11522	1	3/21/2008	3/21/2008	0.8	0.001	U	Not Analyzed	0.126	0.001	0.001	U
GW20-08-11523	1	3/21/2008	3/21/2008	0.4	0.001	U	Not Analyzed	0.123	0.001	0.001	U
GW20-08-11524	1	3/21/2008	3/21/2008	0.4	0.001	U	Not Analyzed	0.120	0.001	0.001	U
GW20-08-11525	1	3/21/2008	3/21/2008	0.2	0.001	U	Not Analyzed	0.120	0.001	0.001	U

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Ti rslt (ppm)	stdev (Ti)	Tl rslt (ppm)	stdev (Tl)	U rslt (ppm)	stdev (U)	V rslt (ppm)	stdev (V)
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	0.002	U	0.001	U	0.0002	U	0.001	U
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	0.002	U	0.001	U	0.0002	U	0.001	U
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	0.002	U	0.001	U	0.0002	U	0.001	U
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	0.002	U	0.001	U	0.0002	U	0.001	U
GW20-08-11447 FB	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0002	U	0.000	0.000
GW20-08-11450	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0014	0.0000	0.004	0.000
GW20-08-11451	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0010	0.0000	0.004	0.000
GW20-08-11452	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.004	0.000
GW20-08-11453	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0001	0.005	0.000
GW20-08-11454	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.005	0.000
GW20-08-11455	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.005	0.000
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0012	0.0000	0.006	0.000
GW20-08-11432	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0008	0.0000	0.005	0.000
GW20-08-11433	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0002	U	0.001	U
GW20-08-11439	1	3/21/2008	3/21/2008	0.007	0.000	0.001	U	0.0014	0.0000	0.006	0.000
GW20-08-11440	1	3/21/2008	3/21/2008	0.006	0.000	0.001	U	0.0010	0.0000	0.005	0.000
GW20-08-11441	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0009	0.0000	0.005	0.000
GW20-08-11442	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11443	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0008	0.0000	0.005	0.000
GW20-08-11444	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0008	0.0000	0.005	0.000
GW20-08-11479	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.003	0.000
GW20-08-11478	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0009	0.0000	0.004	0.000
GW20-08-11480	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0010	0.0000	0.004	0.000
GW20-08-11481	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.005	0.000
GW20-08-11482	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.005	0.000
GW20-08-11483	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0012	0.0000	0.006	0.000
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.006	0.000
GW20-08-11460	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11467	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0009	0.0000	0.005	0.000
GW20-08-11468	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0008	0.0000	0.005	0.000
GW20-08-11469	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0008	0.0000	0.005	0.000
GW20-08-11470	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11471	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0008	0.0000	0.005	0.000
GW20-08-11486	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11504	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.003	0.000
GW20-08-11505	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0009	0.0000	0.004	0.000
GW20-08-11506	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0010	0.0000	0.004	0.000
GW20-08-11507	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.005	0.000
GW20-08-11508	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.005	0.000
GW20-08-11509	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.006	0.000
GW20-08-11494	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0010	0.0000	0.005	0.000
GW20-08-11495	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0008	0.0000	0.005	0.000
GW20-08-11496	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0013	0.0000	0.007	0.000
GW20-08-11497	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0008	0.0000	0.005	0.000
GW20-08-11498	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11499	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11501	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11530	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0010	0.0000	0.003	0.000
GW20-08-11531	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0009	0.0000	0.004	0.000
GW20-08-11532	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0010	0.0000	0.004	0.000
GW20-08-11533	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.005	0.000
GW20-08-11534	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.005	0.000
GW20-08-11535	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0010	0.0000	0.005	0.000
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	0.002	U	0.001	U	0.0011	0.0000	0.006	0.000

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Ti rslt (ppm)	stdev (Ti)	Tl rslt (ppm)	stdev (Tl)	U rslt (ppm)	stdev (U)	V rslt (ppm)	stdev (V)
GW20-08-11514	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11520	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0009	0.0000	0.005	0.000
GW20-08-11521	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0008	0.0000	0.004	0.000
GW20-08-11522	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11523	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11524	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000
GW20-08-11525	1	3/21/2008	3/21/2008	0.002	U	0.001	U	0.0007	0.0000	0.005	0.000

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Zn rslt (ppm)	stdev (Zn)	TDS (ppm)	Cations	Anions	Balance
GW20-08-11434 EQB	NA[a]	3/19/2008	3/19/2008	0.007	0.000	1	Not Applicable	Not Applicable	Not Applicable
GW20-08-11435 EQB	NA	3/19/2008	3/19/2008	0.001		1	Not Applicable	Not Applicable	Not Applicable
GW20-08-11462 EQB	NA	3/19/2008	3/19/2008	0.001		1	0.02	0.02	0.00
GW20-08-11463 EQB	NA	3/19/2008	3/19/2008	0.001		0	0.01	0.00	1.00
GW20-08-11447 FB	2	3/20/2008	3/20/2008	0.001	U	2	Not Applicable	Not Applicable	Not Applicable
GW20-08-11450	2	3/20/2008	3/20/2008	0.176	0.004	213	Not Applicable	Not Applicable	Not Applicable
GW20-08-11451	2	3/20/2008	3/20/2008	0.022	0.001	198	Not Applicable	Not Applicable	Not Applicable
GW20-08-11452	2	3/20/2008	3/20/2008	0.018	0.001	194	Not Applicable	Not Applicable	Not Applicable
GW20-08-11453	2	3/20/2008	3/20/2008	0.013	0.000	191	Not Applicable	Not Applicable	Not Applicable
GW20-08-11454	2	3/20/2008	3/20/2008	0.007	0.000	187	Not Applicable	Not Applicable	Not Applicable
GW20-08-11455	2	3/20/2008	3/20/2008	0.008	0.000	187	Not Applicable	Not Applicable	Not Applicable
GW20-08-11446 DUP	2	3/20/2008	3/20/2008	0.014	0.000	193	Not Applicable	Not Applicable	Not Applicable
GW20-08-11432	1	3/21/2008	3/21/2008	0.032	0.000	179	Not Applicable	Not Applicable	Not Applicable
GW20-08-11433	1	3/21/2008	3/21/2008	0.009	0.000	1	Not Applicable	Not Applicable	Not Applicable
GW20-08-11439	1	3/21/2008	3/21/2008	0.225	0.008	187	Not Applicable	Not Applicable	Not Applicable
GW20-08-11440	1	3/21/2008	3/21/2008	0.024	0.001	183	Not Applicable	Not Applicable	Not Applicable
GW20-08-11441	1	3/21/2008	3/21/2008	0.018	0.000	181	Not Applicable	Not Applicable	Not Applicable
GW20-08-11442	1	3/21/2008	3/21/2008	0.013	0.000	180	Not Applicable	Not Applicable	Not Applicable
GW20-08-11443	1	3/21/2008	3/21/2008	0.013	0.000	176	Not Applicable	Not Applicable	Not Applicable
GW20-08-11444	1	3/21/2008	3/21/2008	0.016	0.001	186	Not Applicable	Not Applicable	Not Applicable
GW20-08-11479	2	3/20/2008	3/20/2008	0.015	0.000	113	1.48	0.17	0.79
GW20-08-11478	2	3/20/2008	3/20/2008	0.004	0.000	114	1.65	0.15	0.83
GW20-08-11480	2	3/20/2008	3/20/2008	0.004	0.000	114	1.45	0.16	0.80
GW20-08-11481	2	3/20/2008	3/20/2008	0.005	0.000	115	1.40	0.17	0.78
GW20-08-11482	2	3/20/2008	3/20/2008	0.005	0.000	115	1.38	0.17	0.78
GW20-08-11483	2	3/20/2008	3/20/2008	0.005	0.000	115	1.37	0.17	0.78
GW20-08-11474 DUP	2	3/20/2008	3/20/2008	0.005	0.000	115	1.36	0.18	0.77
GW20-08-11460	1	3/21/2008	3/21/2008	0.021	0.000	109	1.47	0.17	0.79
GW20-08-11467	1	3/21/2008	3/21/2008	0.016	0.000	109	1.47	0.16	0.80
GW20-08-11468	1	3/21/2008	3/21/2008	0.008	0.000	110	1.42	0.16	0.80
GW20-08-11469	1	3/21/2008	3/21/2008	0.009	0.000	109	1.40	0.16	0.79
GW20-08-11470	1	3/21/2008	3/21/2008	0.009	0.000	110	1.41	0.16	0.80
GW20-08-11471	1	3/21/2008	3/21/2008	0.009	0.000	110	1.41	0.15	0.81
GW20-08-11486	1	3/21/2008	3/21/2008	0.013	0.000	111	1.40	0.16	0.79
GW20-08-11504	2	3/20/2008	3/20/2008	0.017	0.000	109	Not Applicable	Not Applicable	Not Applicable
GW20-08-11505	2	3/20/2008	3/20/2008	0.004	0.000	106	Not Applicable	Not Applicable	Not Applicable
GW20-08-11506	2	3/20/2008	3/20/2008	0.005	0.000	106	Not Applicable	Not Applicable	Not Applicable
GW20-08-11507	2	3/20/2008	3/20/2008	0.005	0.000	108	Not Applicable	Not Applicable	Not Applicable
GW20-08-11508	2	3/20/2008	3/20/2008	0.005	0.000	108	Not Applicable	Not Applicable	Not Applicable
GW20-08-11509	2	3/20/2008	3/20/2008	0.006	0.000	106	Not Applicable	Not Applicable	Not Applicable
GW20-08-11494	1	3/21/2008	3/21/2008	0.012	0.000	105	Not Applicable	Not Applicable	Not Applicable
GW20-08-11495	1	3/21/2008	3/21/2008	0.008	0.000	106	Not Applicable	Not Applicable	Not Applicable
GW20-08-11496	1	3/21/2008	3/21/2008	0.027	0.000	103	Not Applicable	Not Applicable	Not Applicable
GW20-08-11497	1	3/21/2008	3/21/2008	0.015	0.000	104	Not Applicable	Not Applicable	Not Applicable
GW20-08-11498	1	3/21/2008	3/21/2008	0.010	0.000	104	Not Applicable	Not Applicable	Not Applicable
GW20-08-11499	1	3/21/2008	3/21/2008	0.012	0.000	104	Not Applicable	Not Applicable	Not Applicable
GW20-08-11501	1	3/21/2008	3/21/2008	0.009	0.000	104	Not Applicable	Not Applicable	Not Applicable
GW20-08-11530	2	3/20/2008	3/20/2008	0.001	0.000	108	Not Applicable	Not Applicable	Not Applicable
GW20-08-11531	2	3/20/2008	3/20/2008	0.001	0.000	108	Not Applicable	Not Applicable	Not Applicable
GW20-08-11532	2	3/20/2008	3/20/2008	0.001	0.000	107	Not Applicable	Not Applicable	Not Applicable
GW20-08-11533	2	3/20/2008	3/20/2008	0.001	0.000	105	Not Applicable	Not Applicable	Not Applicable
GW20-08-11534	2	3/20/2008	3/20/2008	0.001	U	106	Not Applicable	Not Applicable	Not Applicable
GW20-08-11535	2	3/20/2008	3/20/2008	0.002	0.000	108	Not Applicable	Not Applicable	Not Applicable
GW20-08-11527 DUP	2	3/20/2008	3/20/2008	0.001	0.000	107	Not Applicable	Not Applicable	Not Applicable

Table A-3
Laboratory-Measured Analytical Results for R-20 Screens 1 and 2, March 2008

Sample ID	Screen	Date Collected	Date Received	Zn rslt (ppm)	stdev (Zn)	TDS (ppm)	Cations	Anions	Balance
GW20-08-11514	1	3/21/2008	3/21/2008	0.001	U	102	Not Applicable	Not Applicable	Not Applicable
GW20-08-11520	1	3/21/2008	3/21/2008	0.004	0.000	102	Not Applicable	Not Applicable	Not Applicable
GW20-08-11521	1	3/21/2008	3/21/2008	0.001	0.000	104	Not Applicable	Not Applicable	Not Applicable
GW20-08-11522	1	3/21/2008	3/21/2008	0.002	0.000	106	Not Applicable	Not Applicable	Not Applicable
GW20-08-11523	1	3/21/2008	3/21/2008	0.001	0.000	103	Not Applicable	Not Applicable	Not Applicable
GW20-08-11524	1	3/21/2008	3/21/2008	0.001	0.000	102	Not Applicable	Not Applicable	Not Applicable
GW20-08-11525	1	3/21/2008	3/21/2008	0.004	0.000	103	Not Applicable	Not Applicable	Not Applicable

Appendix B

Evaluation of Water Quality Using Well Screen Analysis Methodology

Table B-1
Results of Well Screen Analysis for R-20 Screen 1
During the November 30, 2007 Pumping Test

Well	Port depth (ft)	Scr #	Sample Collection Date	Event	Tritium (pCi/L)	Modern Water?	3H Plume?	Field pH	Low pH?	High pH?	Test Gen-1	Alkalinity (mg/L CaCO3)	Test Gen 2	Turbidity (NTU)	Test Gen-3	Acetone (ug/L)	Test B1	NH3-N (mg/L)	Test B2	TKN (mg/L)	Test B3	TOC (mg/L)	Lab Qual Code
						pCi/L >UL 1	**pCi/L >UL 17**		**SU >LL 6.4**	**SU <UL 9.0**			**mg/L <UL 157**		**NTU <UL 5**		**ug/L <UL 5**		**mg/L <UL 0.05**		**mg/L <UL 0.46**		
R-20	907	1	30-Nov-07	1	ND	ND	ND	8.21 Fld	Yes	Yes	P	80 UF	P	164	Fail	ND	ND	ND	ND	ND	ND	1.1	UF
R-20	907	1	30-Nov-07	2	ND	ND	ND	8.27 Fld	Yes	Yes	P	79 UF	P	123	Fail	ND	ND	ND	ND	ND	ND	1.0	UF
R-20	907	1	30-Nov-07	3	ND	ND	ND	8.40 Fld	Yes	Yes	P	77 UF	P	101	Fail	ND	ND	ND	ND	ND	ND	0.9	UF
R-20	907	1	30-Nov-07	4	ND	ND	ND	8.41 Fld	Yes	Yes	P	77 UF	P	58	Fail	ND	ND	ND	ND	ND	ND	1.0	UF
R-20	907	1	30-Nov-07	5	ND	ND	ND	8.46 Fld	Yes	Yes	P	77 UF	P	43.5	Fail	ND	ND	ND	ND	ND	ND	0.9	UF
R-20	907	1	30-Nov-07	6	ND	ND	ND	8.48 Fld	Yes	Yes	P	77 UF	P	31	Fail	ND	ND	ND	ND	ND	ND	1.0	UF
R-20	907	1	30-Nov-07	7	ND	ND	ND	8.49 Fld	Yes	Yes	P	76 UF	P	31	Fail	ND	ND	ND	ND	ND	ND	0.9	UF
R-20	907	1	30-Nov-07	8	ND	ND	ND	8.47 Fld	Yes	Yes	P	77 UF	P	19.5	Fail	ND	ND	ND	ND	ND	ND	1.0	UF
R-20	907	1	30-Nov-07	9	ND	ND	ND	8.47 Fld	Yes	Yes	P	83 UF	P	16.2	Fail	ND	ND	ND	ND	ND	ND	1.0	UF
R-20	907	1	30-Nov-07	10	ND	ND	ND	8.47 Fld	Yes	Yes	P	76 UF	P	14.1	Fail	ND	ND	ND	ND	ND	ND	1.0	UF
R-20	907	1	30-Nov-07	11	ND	ND	ND	8.45 Fld	Yes	Yes	P	82 UF	P	10.7	Fail	ND	ND	ND	ND	ND	ND	1.0	UF
R-20	907	1	30-Nov-07	12	ND	ND	ND	8.43 Fld	Yes	Yes	P	82 UF	P	9.54	Fail	ND	ND	ND	ND	ND	ND	1.0	UF
R-20	907	1	30-Nov-07	13	ND	ND	ND	8.42 Fld	Yes	Yes	P	75 UF	P	8.01	Fail	ND	ND	ND	ND	ND	ND	1.2	UF
R-20	907	1	30-Nov-07	14	ND	ND	ND	8.10 Fld	Yes	Yes	P	76 UF	P	7.5	Fail	ND	ND	ND	ND	ND	ND	1.06	UF
R-20	907	1	30-Nov-07	15	ND	ND	ND	8.37 Fld	Yes	Yes	P	81 UF	P	7.42	Fail	ND	ND	ND	ND	ND	ND	1.15	UF
R-20	907	1	30-Nov-07	16	ND	ND	ND	8.35 Fld	Yes	Yes	P	80 UF	P	7.06	Fail	ND	ND	ND	ND	ND	ND	1.08	UF

Note: Threshold values revised 8-Nov-07; identical to those used in DQM.
* — = No drilling flags assigned.

Table B-1
Results of Well Screen Analysis for R-20 Screen 1
During the November 30, 2007 Pumping Test

Well	Port depth (ft)	Scr #	Sample Collection Date	Event	Test B4	Ba ug/L	Test D3	Test E1	Ca mg/L	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	DO	Test C11	ClO4 ug/L
					mg/L <UL 1.37		**ug/L >LL 1.4**	**ug/L <UL 57**		**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**		**mg/L >LL 2**	
R-20	907	1	30-Nov-07	1	P	92	P	Fail	12.0	Yes	Yes	P	2.8	P	0.27	P	2.34	P	0.225	P	P	281	P	1.0	Fail	<5
R-20	907	1	30-Nov-07	2	P	57	P	P	11.8	Yes	Yes	P	2.7	P	0.27	P	2.43	P	0.246	P	P	231	P	1.0	Fail	<5
R-20	907	1	30-Nov-07	3	P	62	P	Fail	11.8	Yes	Yes	P	2.8	P	0.27	P	2.39	P	0.232	P	P	222	P	1.0	Fail	<5
R-20	907	1	30-Nov-07	4	P	67	P	Fail	11.8	Yes	Yes	P	1.8	P	0.27	P	2.30	P	0.298	P	P	199	P	1.1	Fail	<5
R-20	907	1	30-Nov-07	5	P	60	P	Fail	11.7	Yes	Yes	P	2.8	P	0.27	P	2.41	P	0.284	P	P	175	P	1.1	Fail	<5
R-20	907	1	30-Nov-07	6	P	68	P	Fail	11.5	Yes	Yes	P	2.8	P	0.27	P	2.32	P	0.299	P	P	160	P	1.2	Fail	<5
R-20	907	1	30-Nov-07	7	P	54	P	P	11.8	Yes	Yes	P	2.8	P	0.26	P	2.29	P	0.273	P	P	146	P	1.2	Fail	<5
R-20	907	1	30-Nov-07	8	P	50	P	P	11.7	Yes	Yes	P	3.0	P	0.26	P	2.40	P	0.297	P	P	140	P	1.2	Fail	<5
R-20	907	1	30-Nov-07	9	P	67	P	Fail	11.2	Yes	Yes	P	2.8	P	0.26	P	2.36	P	0.316	P	P	142	P	1.2	Fail	<5
R-20	907	1	30-Nov-07	10	P	70	P	Fail	11.4	Yes	Yes	P	2.8	P	0.26	P	2.33	P	0.304	P	P	139	P	1.3	Fail	<5
R-20	907	1	30-Nov-07	11	P	49	P	P	11.3	Yes	Yes	P	2.8	P	0.26	P	2.34	P	0.307	P	P	144	P	1.4	Fail	<5
R-20	907	1	30-Nov-07	12	P	59	P	Fail	11.5	Yes	Yes	P	2.8	P	0.26	P	2.47	P	0.308	P	P	149	P	1.3	Fail	<5
R-20	907	1	30-Nov-07	13	P	85	P	Fail	11.5	Yes	Yes	P	2.7	P	0.27	P	2.47	P	0.320	P	P	166	P	1.6	Fail	<5
R-20	907	1	30-Nov-07	14	P	57	P	P	11.3	Yes	Yes	P	2.7	P	0.26	P	2.44	P	0.306	P	P	128	P	1.3	Fail	<5
R-20	907	1	30-Nov-07	15	P	54	P	P	11.2	Yes	Yes	P	2.7	P	0.27	P	2.61	P	0.310	P	P	132	P	1.3	Fail	<5
R-20	907	1	30-Nov-07	16	P	53	P	P	11.4	Yes	Yes	P	2.7	P	0.26	P	2.60	P	0.331	P	P	173	P	1.9	Fail	<5

Note: Threshold values revised 8-Nov-07; identical to those used in DQM.
* — = No drilling flags assigned.

Table B-1
Results of Well Screen Analysis for R-20 Screen 1
During the November 30, 2007 Pumping Test

Well	Port depth (ft)	Scr #	Sample Collection Date	Event	Lab Qual Code	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	Sulfide	Test C2	B ug/L	Test A1	Cr (F) ug/L	Test Gen 6	Test C9
						<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**		**mg/L <UL 0.01**		**<UL 38.77**		**<UL 5.75**	**ug/L >LL 0.39**
R-20	907	1	30-Nov-07	1	U	DL	DL	0.03	mg/L as PO4	P	13.3	7.3	P	3.7	P	P	0.01	P	25	P	5.0	P	P
R-20	907	1	30-Nov-07	2	U	DL	DL	0.04	mg/L as PO4	P	13.7	7.7	P	3.5	P	P	0.01	P	23	P	3.0	P	P
R-20	907	1	30-Nov-07	3	U	DL	DL	0.01	mg/L as PO4	P	13.5	7.5	P	3.4	P	P	0.01	P	19	P	3.0	P	P
R-20	907	1	30-Nov-07	4	U	DL	DL	0.06	mg/L as PO4	P	13.0	11.2	P	3.4	P	P	0.01	P	17	P	4.0	P	P
R-20	907	1	30-Nov-07	5	U	DL	DL	0.04	mg/L as PO4	P	13.7	7.6	P	3.3	P	P	0.01	P	16	P	4.0	P	P
R-20	907	1	30-Nov-07	6	U	DL	DL	0.04	mg/L as PO4	P	13.1	7.3	P	3.3	P	P	0.01	P	16	P	4.0	P	P
R-20	907	1	30-Nov-07	7	U	DL	DL	0.02	mg/L as PO4	P	13.0	7.2	P	3.2	P	P	0.01	P	15	P	3.0	P	P
R-20	907	1	30-Nov-07	8	U	DL	DL	0.04	mg/L as PO4	P	13.8	7.2	P	3.1	P	P	0.01	P	32	P	3.0	P	P
R-20	907	1	30-Nov-07	9	U	DL	DL	0.03	mg/L as PO4	P	13.2	7.3	P	3.1	P	P	0.01	P	64	Fail	4.0	P	P
R-20	907	1	30-Nov-07	10	U	DL	DL	0.02	mg/L as PO4	P	13.0	7.3	P	3.0	P	P	0.01	P	41	Fail	6.0	Fail	P
R-20	907	1	30-Nov-07	11	U	DL	DL	0.03	mg/L as PO4	P	12.8	6.9	P	3.0	P	P	0.01	P	28	P	3.0	P	P
R-20	907	1	30-Nov-07	12	U	DL	DL	0.03	mg/L as PO4	P	13.1	7.3	P	3.0	P	P	0.01	P	36	P	4.0	P	P
R-20	907	1	30-Nov-07	13	U	DL	DL	0.04	mg/L as PO4	P	12.8	7.2	P	3.0	P	P	0.01	P	28	P	6.0	Fail	P
R-20	907	1	30-Nov-07	14	U	DL	DL	0.02	mg/L as PO4	P	12.8	7.4	P	3.0	P	P	0.01	P	22	P	3.0	P	P
R-20	907	1	30-Nov-07	15	U	DL	DL	0.02	mg/L as PO4	P	12.9	7.4	P	3.0	P	P	0.01	P	20	P	5.0	P	P
R-20	907	1	30-Nov-07	16	U	DL	DL	0.03	mg/L as PO4	P	13.0	7.6	P	2.9	P	P	0.01	P	26	P	6.0	Fail	P

Note: Threshold values revised 8-Nov-07; identical to those used in DQM.
* — = No drilling flags assigned.

Table B-1
Results of Well Screen Analysis for R-20 Screen 1
During the November 30, 2007 Pumping Test

Well	Port depth (ft)	Scr #	Sample Collection Date	Event	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	Test E5
						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**	**ug/L <UL 1.9**
R-20	907	1	30-Nov-07	1	4.0	P	0.8	NA	150	Fail	1840	No	12.3	Fail	19	P	1	P	199	P	P	1.4	P	P	P
R-20	907	1	30-Nov-07	2	5.0	P	1.7	NA	170	Fail	1660	No	9.8	P	20	P	1	P	123	P	P	0.9	P	P	P
R-20	907	1	30-Nov-07	3	4.0	P	1.3	NA	180	Fail	1570	No	8.7	P	21	P	7	P	131	P	P	0.8	P	P	P
R-20	907	1	30-Nov-07	4	6.0	P	1.5	NA	200	Fail	1640	No	8.2	P	21	P	1	P	136	P	P	1.0	P	P	P
R-20	907	1	30-Nov-07	5	4.0	P	1.0	NA	180	Fail	1440	No	8.0	P	21	P	7	P	132	P	P	0.9	P	P	P
R-20	907	1	30-Nov-07	6	4.0	P	1.0	NA	190	Fail	1490	No	7.8	P	19	P	1	P	148	P	P	0.9	P	P	P
R-20	907	1	30-Nov-07	7	5.0	P	1.7	NA	330	Fail	1310	No	4.0	P	21	P	1	P	125	P	P	0.8	P	P	P
R-20	907	1	30-Nov-07	8	6.0	P	2.0	NA	460	Fail	1490	No	3.2	P	34	P	1	P	119	P	P	0.8	P	P	P
R-20	907	1	30-Nov-07	9	5.0	P	1.3	NA	570	Fail	1290	No	2.3	P	21	P	1	P	142	P	P	0.9	P	P	P
R-20	907	1	30-Nov-07	10	4.0	P	0.7	NA	600	Fail	1290	No	2.2	P	23	P	2	P	155	P	P	1.0	P	P	P
R-20	907	1	30-Nov-07	11	6.0	P	2.0	NA	780	Fail	1240	No	1.6	P	26	P	1	P	115	P	P	0.7	P	P	P
R-20	907	1	30-Nov-07	12	7.0	P	1.8	NA	1080	Fail	1410	No	1.3	P	25	P	1	P	111	P	P	0.7	P	P	P
R-20	907	1	30-Nov-07	13	4.0	P	0.7	NA	1240	Fail	1650	No	1.3	P	29	P	2	P	168	P	P	1.1	P	P	P
R-20	907	1	30-Nov-07	14	6.0	P	2.0	NA	1150	Fail	1430	No	1.2	P	26	P	1	P	109	P	P	0.7	P	P	P
R-20	907	1	30-Nov-07	15	4.0	P	0.8	NA	1390	Fail	1900	No	1.4	P	27	P	1	P	108	P	P	0.7	P	P	P
R-20	907	1	30-Nov-07	16	6.0	P	1.0	NA	1580	Fail	1690	No	1.1	P	28	P	1	P	112	P	P	0.7	P	P	P

Note: Threshold values revised 8-Nov-07; identical to those used in DQM.
* — = No drilling flags assigned.

Table B-1
Results of Well Screen Analysis for R-20 Screen 1
During the November 30, 2007 Pumping Test

Well	Port depth (ft)	Scr #	Sample Collection Date	Event	V ug/L	Test C4	Zn ug/L	Test D4	Tests Passed	Tests Failed	Total Tests With P/Fail Outcome	% Pass	Is 3H detected?	General Indicators	Category C		General Indicators						
															Redox Indicators		**Mod water**	**Gen-1**	**Gen-2**	**Gen-3**	**Gen-4**	**Gen-5**	**Gen-6**
						>LL 2.27		**ug/L >LL 0.4**							**Fe/Mn Fe**	**NO3**	**3H UL=1**	**In pH range**	**Alk UL=52**	**Turb UL=5**	**ClO4 UL=0.5**	**NO3-N UL=0.89**	**Cr UL=5.75**
R-20	907	1	30-Nov-07	1	6	P	9	P	29	5	34	85	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	2	4	P	5	P	31	3	34	91	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	3	4	P	27	P	30	4	34	88	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	4	4	P	7	P	30	4	34	88	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	5	4	P	34	P	30	4	34	88	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	6	4	P	5	P	30	4	34	88	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	7	4	P	9	P	31	3	34	91	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	8	4	P	9	P	31	3	34	91	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	9	5	P	10	P	30	4	34	88	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	Fail
R-20	907	1	30-Nov-07	10	3	P	13	P	29	5	34	85	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	11	4	P	10	P	31	3	34	91	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	12	6	P	13	P	30	4	34	88	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	13	6	P	18	P	29	5	34	85	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	Fail
R-20	907	1	30-Nov-07	14	4	P	12	P	31	3	34	91	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	15	4	P	12	P	31	3	34	91	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	P
R-20	907	1	30-Nov-07	16	4	P	13	P	30	4	34	88	ND	Turb	Fe	DO	ND	P	P	Fail	DL	P	Fail

Note: Threshold values revised 8-Nov-07; identical to those used in DQM.
* — = No drilling flags assigned.

Table B-1
Results of Well Screen Analysis for R-20 Screen 1
During the November 30, 2007 Pumping Test

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 B UL=39	**A2 Cl UL=3.6**	**A3 Na UL=24.**	**A4 SO4 UL=7.2**	**A5 F UL=0.**	**A6 PO4 UL=3.4**	**B1 Ace 5**	**B2 NH3 0.05**	**B3 TKN 0.35**	**B4 TOC 1.37**	**C1 SO4 LL=1.65**	**C2 S UL=0.0**	**C3 ORP LL=0**	**C4 V LL=2.27**	**C5 Fe UL=14**	**C6 Mn UL=124**	**C7 ClO4 LL=0.2**	**C8 U LL=0.06**	**C9 Cr LL=0.3**	**C10 NO3-N LL=0.0**	**C11 DO LL=2**	**D1 U LL=0.0**
R-20	907	1	30-Nov-07	1	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	2	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	3	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	4	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	5	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	6	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	7	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	8	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	9	Fail	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	10	Fail	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	11	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	12	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	13	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	14	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	15	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P
R-20	907	1	30-Nov-07	16	P	P	P	P	P	P	ND	ND	ND	P	P	P	P	P	Fail	P	DL	P	P	P	Fail	P

Note: Threshold values revised 8-Nov-07; identical to those used in DQM.
* — = No drilling flags assigned.

Table B-1
Results of Well Screen Analysis for R-20 Screen 1
During the November 30, 2007 Pumping Test

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 Sr LL=44	**D3 Ba LL=4.**	**D4 Zn LL=0.4**	**E1 Ba UL=57**	**E2a Ca LL=4.3**	**E2b Ca UL=42**	**E2 Ca In**	**E3 Mg UL=4.2**	**E4 Sr UL=540**	**E5 U UL=1.90**	**F1 FeT UL=500**	**F2 FeR UL=10**	**F3 CrT UL=10**	**F4 CrR UL=5**	**F5 Ni UL=5**	**A**	**B**	**C**	**D**	**E**	**F**
R-20	907	1	30-Nov-07	1	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–*	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	2	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	3	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	4	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	5	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	6	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	7	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	8	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	9	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	10	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	11	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	12	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	13	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	14	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	15	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–
R-20	907	1	30-Nov-07	16	P	P	P	P	P	P	P	P	P	P	No	P	P	NA	P	–	Organics	Fe	–	–	–

Note: Threshold values revised 8-Nov-07; identical to those used in DQM.
* — = No drilling flags assigned.

Table B-2
Results of Well Screen Analysis for R-20 Screen 2 During the December 3–4, 2007 Pumping Test

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 $CaCO_3$)	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**	Test E2b **mg/L <UL 42**
R-20	1150	2	3-Dec-07	1	ND	ND	ND	8.42 Fld	Yes	Yes	P	83 F	P	331	Fail	ND	ND	ND	ND	ND	ND	2.1	UF	Fail	92	P	Fail	14.1	Yes	Yes
R-20	1150	2	3-Dec-07	10	ND	ND	ND	8.46 Fld	Yes	Yes	P	77 F	P	14.8	Fail	ND	ND	ND	ND	ND	ND	2.1	UF	Fail	67	P	Fail	13.5	Yes	Yes
R-20	1150	2	4-Dec-07	18	ND	ND	ND	8.34 Fld	Yes	Yes	P	76 F	P	6.1	Fail	ND	ND	ND	ND	ND	ND	1.5	UF	Fail	52	P	P	12.7	Yes	Yes

* — = No drilling flags assigned.

Table B-2
Results of Well Screen Analysis for R-20 Screen 2 During the December 3–4, 2007 Pumping Test

Well	Port depth (ft)	Scr #	Sample Collection Date	Event	Test E2 **Within Range**	Cl mg/L	Test A1 **mg/L <UL 3.6**	F mg/L	Test A2 **mg/L <UL 0.57**	Mg mg/L	Test E3 **mg/L <UL 4.2**	NO3-N mg/L	Test Gen-5 **<UL 0. 89**	Test C10 **mg/L >LL 0.01**	ORP	Test C3 **mV >LL 0**	DO	Test C11 **mg/L >LL 2**	ClO4 ug/L	Lab Qual Code	Test Gen-4 **<UL 0.5**	Test C7 **ug/L >LL 0.22**	PO4-P **Threshold as P 0.34**	UOM	Test A6 **mg/L P <UL 0.08**	Na mg/L	Molar ratio Na/Cl	Test A4 **mg/L <UL 25**	SO4 mg/L	Test C1 **mg/L >LL 1.7**	Test A5 **mg/L <UL 7.2**
R-20	1150	2	3-Dec-07	1	P	3.5	P	0.33	P	2.32	P	0.160	P	P	293	P	ND	ND	<5	U	DL	DL	0.17	mg/L as PO4	P	14.3	6.3	P	10.5	P	Fail
R-20	1150	2	3-Dec-07	10	P	3.4	P	0.31	P	2.24	P	0.272	P	P	164	P	ND	ND	<5	U	DL	DL	0.14	mg/L as PO4	P	13.6	6.2	P	10.3	P	Fail
R-20	1150	2	4-Dec-07	18	P	3.0	P	0.28	P	1.60	P	0.312	P	P	153	P	ND	ND	<5	U	DL	DL	0.09	mg/L as PO4	P	8.6	4.4	P	7.4	P	Fail

* — = No drilling flags assigned.

Table B-2
Results of Well Screen Analysis for R-20 Screen 2 During the December 3–4, 2007 Pumping Test

Well	Port depth (ft)	Scr #	Sample Collection Date	Event	Sulfide	Lab Qual Code	Test C2 **mg/L <UL 0.01**	B ug/L	Test A1 **<UL 38.8**	Cr (F) ug/L	Test Gen-6 **<UL 5.75**	Test C9 **ug/L >LL 0.39**	Cr (NF) ug/L	Test F3 **ug/L <UL 10**	Ratio Cr (NF/F)	Test F4 **Ratio <UL 5**	Fe (F) ug/L	Test C5 **ug/L <UL 147**	Fe (NF) ug/L	Test F1 **ug/L <UL 1270**	Ratio Fe(NF/F)	Test F2 **Ratio <UL 10**	Mn (F) ug/L	Test C6 **ug/L <UL 124**	Ni (F) ug/L	Test F5 **ug/L <UL 50**	Sr ug/L	Test D2 **ug/L >LL 44**	Test E3 **ug/L <UL 540**	U ug/L	Test C8 **ug/L >LL 0.06**	Test D1 **ug/L >LL 0.06**	Test E5 **ug/L <UL 1.9**	V ug/L
R-20	1150	2	3-Dec-07	1	0.01	U	P	16	P	2.0	P	P	10.0	P	5.0	NA	240	Fail	4470	No	18.6	Fail	39	P	1	P	238	P	P	1.1	P	P	P	2
R-20	1150	2	3-Dec-07	10	0.01	U	P	25	P	3.0	P	P	5.0	P	1.7	NA	430	Fail	1100	Yes	2.6	P	35	P	1	P	234	P	P	0.8	P	P	P	4
R-20	1150	2	4-Dec-07	18	0.041	U	Fail	24	P	6.0	Fail	P	5.0	P	0.8	NA	740	Fail	1330	No	1.8	P	21	P	1	P	217	P	P	1.0	P	P	P	4

* — = No drilling flags assigned.

Table B-2
Results of Well Screen Analysis for R-20 Screen 2 During the December 3–4, 2007 Pumping Test

Well	Port depth (ft)	Scr #	Sample Collection Date	Event	Test C4	Zn ug/L	Test D4	Tests Passed	Tests Failed	Total tests with P/Fail outcome	% Pass	Is 3H Detected?	General Indicators							Category A Inorganic Indicators						Category B Organic Indicators			
							ug/L						Mod water	Gen-1	Gen-	Gen-3	Gen-4	Gen-5	Gen-6	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4
					>LL		>LL						3H	In pH	Alk	Turb	ClO4	NO3-N	Cr	B	Cl	Na	SO4	F	PO4	Ace	NH3	TKN	TOC
					2.27		0.4						UL=1	Range	UL=5	UL=5	UL=0.5	UL=0.89	UL=5.75	UL=39	UL=3.6	UL=24.	UL=7.2	UL=0.	UL=3.4	5	0.05	0.35	1.37
R-20	1150	2	3-Dec-07	1	P	43	P	29	5	34	85	ND	ND	P	P	Fail	DL	P	P	P	P	P	Fail	P	P	ND	ND	ND	Fail
R-20	1150	2	3-Dec-07	10	P	12	P	31	3	34	91	ND	ND	P	P	Fail	DL	P	P	P	P	P	Fail	P	P	ND	ND	ND	Fail
R-20	1150	2	4-Dec-07	18	P	8	P	30	4	34	88	ND	ND	P	P	Fail	DL	P	Fail	P	P	P	Fail	P	P	ND	ND	ND	Fail

* — = No drilling flags assigned.

Table B-2
Results of Well Screen Analysis for R-20 Screen 2 During the December 3–4, 2007 Pumping Test

Well	Port depth (ft)	Scr #	Sample Collection Date	Event	Category C1 Redox (SO4)			Category C2 Redox (Fe/Mn)						Category C3 Redox (NO3)		Category D Adsorption				Category E Carbonate Mineralogy						
					C1 SO4 LL=1.65	**C2 S UL=0.0**	**C3 ORP LL=0**	**C4 V LL=2.27**	**C5 Fe UL=14**	**C6 Mn UL=124**	**C7 ClO4 LL=0.2**	**C8 U LL=0.06**	**C9 Cr LL=0.3**	**C10 NO3-N LL=0.0**	**C11 DO LL=2**	**D1 U LL=0.0**	**D2 Sr LL=44**	**D3 Ba LL=4.**	**D4 Zn LL=0.4**	**E1 Ba UL=57**	**E2a Ca LL=4.3**	**E2b Ca UL=42**	**E2 Ca In**	**E3 Mg UL=4.2**	**E4 Sr UL=540**	**E5 U UL=1.90**
R-20	1150	2	3-Dec-07	1	P	P	P	P	Fail	P	DL	P	P	P	Fail	P	P	P	P	Fail	P	P	P	P	P	P
R-20	1150	2	3-Dec-07	10	P	P	P	P	Fail	P	DL	P	P	P	Fail	P	P	P	P	Fail	P	P	P	P	P	P
R-20	1150	2	4-Dec-07	18	P	Fail	P	P	Fail	P	DL	P	P	P	ND	P	P	P	P	Fail	P	P	P	P	P	P

* — = No drilling flags assigned.

Table B-2
Results of Well Screen Analysis for R-20 Screen 2 During the December 3–4, 2007 Pumping Test

Well	Port depth (ft)	Scr #	Sample Collection Date	Event	Category F Metal Corrosion					Categories under Which Drilling Flags Are to Be Assigned					
					F1 FeT UL=500	**F2 FeR UL=10**	**F3 CrT UL=10**	**F4 CrR UL=5**	**F5 Ni UL=5**	**A**	**B**	**C**	**D**	**E**	**F**
R-20	1150	2	3-Dec-07	1	No	P	P	NA	P	—	TOC	Fe	—	Ba	—
R-20	1150	2	3-Dec-07	10	No	P	P	NA	P	—	TOC	Fe	—	Ba	—
R-20	1150	2	4-Dec-07	18	No	P	P	NA	P	—	TOC	Fe	—	Ba	—

* — = No drilling flags assigned.

Appendix C

Video Logging (on DVD included with this report)

Appendix D

Input Data for PHREEQC Geochemical Modeling Calculations

Table D-1
Field Parameters and Chemical Analysis of Major and Minor Ions Concentration (in ppm) of Screen 1 of R-20 Samples used for PHREEQC Model Speciation Analysis and Saturated Indices Calculations

PHREEQC File ID	Sample ID	Date Collected	pH	T (°C)	Na	Ca	K	Mg	Fe	Ba	Al	Mn	Li
R-20 Screen 1													
S1_1	GW20-08-8883 (F)	11/30/2007	7.96	17.4	13.3	12.0	2.37	2.34	0.15	0.092	0.067	0.019	0.022
S1_2	GW20-08-8887 (F)	11/30/2007	8.21	17.9	13.7	11.8	2.45	2.43	0.17	0.057	0.046	0.020	0.023
S1_3	GW20-08-8888 (F)	11/30/2007	8.27	17.9	13.5	11.8	2.42	2.39	0.18	0.062	0.055	0.021	0.023
S1_4	GW20-08-8889 (F)	11/30/2007	8.4	18.6	13.0	11.8	2.30	2.30	0.20	0.067	0.043	0.021	0.021
S1_5	GW20-08-8890 (F)	11/30/2007	8.41	19.1	13.7	11.7	2.43	2.41	0.18	0.060	0.024	0.021	0.023
S1_6	GW20-08-8891 (F)	11/30/2007	8.46	19.7	13.1	11.5	2.31	2.32	0.19	0.068	0.015	0.019	0.022
S1_7	GW20-08-8892 (F)	11/30/2007	8.48	19.6	13.0	11.8	2.40	2.29	0.33	0.054	0.033	0.021	0.022
S1_8	GW20-08-8893 (F)	11/30/2007	8.49	19.3	13.8	11.7	2.49	2.40	0.46	0.050	0.016	0.034	0.023
S1_9	GW20-08-8875 (F)	11/30/2007	8.47	20.1	13.2	11.2	2.33	2.36	0.57	0.067	0.019	0.021	0.023
S1_10	GW20-08-8882 (F)	11/30/2007	8.47	20.1	13.0	11.4	2.29	2.33	0.60	0.070	0.035	0.023	0.022
S1_11	GW20-08-8894 (F)	11/30/2007	8.45	20.7	12.8	11.3	2.25	2.34	0.78	0.049	0.018	0.026	0.022
S1_12	GW20-08-8895 (F)	11/30/2007	8.43	20.2	13.1	11.5	2.29	2.47	1.08	0.059	0.022	0.025	0.023
S1_13	GW20-08-8885 (F)	11/30/2007	8.42	19.3	12.8	11.5	2.24	2.47	1.24	0.085	0.015	0.029	0.023
S1_14	GW20-08-8896 (F)	11/30/2007	8.42	19.3	12.8	11.3	2.22	2.44	1.15	0.057	0.018	0.026	0.022
S1_15	GW20-08-8901 (F)	11/30/2007	8.37	20.8	12.9	11.2	2.30	2.61	1.39	0.054	0.043	0.027	0.024
S1_16	GW20-08-8899 (F)	11/30/2007	8.35	19.8	13.0	11.4	2.23	2.60	1.56	0.053	0.027	0.028	0.023

Table D-1 (continued)

PHREEQC File ID	Sample ID	Date Collected	SiO_2	HCO_3	Cl	F	SO_4	NO_3	DO	Eh (m)[a]	Eh (C)[b]	E.B. (%)[c]
R-20 Screen 1												
S1_1	GW20-08-8883 (F)	11/30/2007	65.5	74.08	2.82	0.27	3.65	1.00	1	0.48	0.77	1.63
S1_2	GW20-08-8887 (F)	11/30/2007	69.6	71.86	2.73	0.27	3.48	1.09	1	0.43	0.75	3.66
S1_3	GW20-08-8888 (F)	11/30/2007	69.8	83.85	2.77	0.27	3.43	1.03	1	0.43	0.75	-3.58
S1_4	GW20-08-8889 (F)	11/30/2007	67.1	70.49	2.81	0.27	3.36	1.32	1.1	0.40	0.74	2.79
S1_5	GW20-08-8890 (F)	11/30/2007	70.1	82.93	2.79	0.27	3.32	1.26	1.1	0.38	0.74	-3.07
S1_6	GW20-08-8891 (F)	11/30/2007	68.2	70.33	2.80	0.27	3.25	1.33	1.2	0.36	0.73	2.55
S1_7	GW20-08-8892 (F)	11/30/2007	67.2	82.26	2.82	0.26	3.15	1.21	1.2	0.35	0.73	-3.75
S1_8	GW20-08-8893 (F)	11/30/2007	71.2	81.92	2.79	0.26	3.13	1.31	1.2	0.34	0.73	-2.08
S1_9	GW20-08-8875 (F)	11/30/2007	68.9	81.35	2.84	0.26	3.08	1.40	1.3	0.36	0.73	-3.84
S1_10	GW20-08-8882 (F)	11/30/2007	68.5	81.61	2.81	0.26	3.03	1.34	1.3	0.34	0.73	-3.89
S1_11	GW20-08-8894 (F)	11/30/2007	68.5	81.14	2.78	0.26	3.02	1.36	1.4	0.35	0.73	-4.08
S1_12	GW20-08-8895 (F)	11/30/2007	71.2	80.80	2.83	0.26	3.00	1.36	1.3	0.35	0.73	-2.45
S1_13	GW20-08-8885 (F)	11/30/2007	70.8	71.87	2.78	0.27	2.98	1.42	1.6	0.37	0.74	2.42
S1_14	GW20-08-8896 (F)	11/30/2007	69.9	80.02	2.78	0.26	2.99	1.35	1.6	0.33	0.74	-2.91
S1_15	GW20-08-8901 (F)	11/30/2007	72.2	80.07	2.81	0.27	2.96	1.37	1.3	0.34	0.73	-2.16
S1_16	GW20-08-8899 (F)	11/30/2007	72.1	79.55	2.77	0.26	2.94	1.47	1.9	0.38	0.74	-1.38

[a] Eh(m) = Eh (measured). It is derived from the field ORP measurement based on Eh (m) = ORP+Eref (the correction for Ag/AgCl electrode, saturated in KCl solution).

[b] Eh(c) = Eh (Calculated, derived from calculated pe based on Eh = pe*0.059).

[c] Electrical Balance (E.B.,%) = [(∑cations + ∑anions)/(∑ cations-∑anions)]*100. Differences in E.B. of up to 2% are inevitable for all laboratories; up to 5% is considered to be reasonable.

Table D-2
Field Parameters and Chemical Analysis of
Major and Minor Ions Concentration (in ppm) of Screen 2 of R-20 Samples
used for PHREEQC Model Speciation Analysis and Saturated Indices Calculations

PHREEQC File ID	Sample ID	Date Collected	pH	T (C)	Na	Ca	K	Mg	Fe	Ba	Al	Mn	Li
R-20 Screen 2													
S2_1	GW20-08-8959 (F)	12/3/2007	8.42	19.2	14.3	14.1	2.90	2.34	0.24	0.087	0.092	0.039	0.023
S2_2	GW20-08-8944 (F)	12/3/2007	8.45	19	15.0	13.4	3.03	2.39	0.29	0.082	0.161	0.034	0.024
S2_3	GW20-08-8945 (F)	12/3/2007	8.46	19.1	13.8	13.4	2.80	2.22	0.38	0.088	0.208	0.033	0.022
S2_4	GW20-08-8946 (F)	12/3/2007	8.47	18.9	13.6	12.9	2.74	2.16	0.23	0.079	0.094	0.031	0.022
S2_5	GW20-08-8947 (F)	12/3/2007	8.49	18.7	14.0	13.7	2.90	2.28	0.24	0.075	0.133	0.031	0.023
S2_6	GW20-08-8948 (F)	12/3/2007	8.5	18.6	14.1	13.9	2.93	2.30	0.22	0.078	0.065	0.025	0.023
S2_7	GW20-08-8949 (F)	12/3/2007	8.48	18.5	13.5	13.6	2.78	2.19	0.16	0.082	0.015	0.028	0.022
S2_8	GW20-08-8950 (F)	12/3/2007	8.41	18.6	12.9	13.3	2.65	2.11	0.20	0.082	0.059	0.026	0.021
S2_9	GW20-08-8960 (F)	12/3/2007	8.45	18.5	13.0	13.8	2.64	2.13	0.24	0.089	0.043	0.039	0.021
S2_10	GW20-08-8951 (F)	12/3/2007	8.46	18.7	13.6	13.5	2.77	2.24	0.43	0.082	0.014	0.028	0.023
S2_11	GW20-08-8952 (F)	12/3/2007	8.15	18.6	12.2	13.5	2.46	2.00	0.48	0.085	0.007	0.025	0.020
S2_12	GW20-08-8953 (F)	12/3/2007	7.68	18.5	12.9	13.1	2.60	2.21	0.64	0.095	0.040	0.031	0.022
S2_13	GW20-08-8938 (F)	12/3/2007	8.35	18.9	13.2	12.5	2.65	2.21	0.70	0.081	0.005	0.028	0.022
S2_14	GW20-08-8963 (F)	12/3/2007	8.35	18.9	13.0	12.8	2.65	2.16	0.71	0.081	0.007	0.028	0.022
S2_15	GW20-08-8954 (F)	12/4/2007	8.2	20.1	13.5	13.4	2.86	2.46	0.90	0.089	0.020	0.038	0.024
S2_16	GW20-08-8955 (F)	12/4/2007	8.42	20.7	11.9	12.8	2.47	2.10	0.59	0.088	0.050	0.032	0.020
S2_17	GW20-08-8956 (F)	12/4/2007	8.38	20.9	12.4	12.8	2.49	2.24	0.72	0.132	0.022	0.029	0.021
S2_18	GW20-08-8957 (F)	12/4/2007	8.35	20.9	10.4	12.7	2.10	1.91	0.80	0.086	0.012	0.024	0.017
S2_19	GW20-08-8958 (F)	12/4/2007	8.34	19.5	8.6	12.4	1.69	1.60	0.74	0.092	0.004	0.021	0.013
S2_20	GW20-08-8962 (F)	12/4/2007	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020

Table D-2 (continued)

PHRRQC File ID	Sample ID	Date Collected	SiO_2	HCO_3	Cl	F	PO4	SO_4	NO_3	DO	Eh (m)[a]	Eh (C)[b]	E.B. (%)[c]
R-20 Screen 2													
S2_1	GW20-08-8959 (F)	12/3/2007	70.7	82.396	3.51	0.33	0.17	10.5	0.71	0.4	0.50	0.73	-2.61
S2_2	GW20-08-8944 (F)	12/3/2007	74.2	80.753	3.53	0.33	0.17	10.7	0.78	0.5	0.48	0.73	-1.61
S2_3	GW20-08-8945 (F)	12/3/2007	69.6	80.435	3.56	0.33	0.17	10.8	0.82	0.5	0.46	0.73	-3.71
S2_4	GW20-08-8946 (F)	12/3/2007	67.6	79.878	3.55	0.33	0.16	10.7	0.91	0.5	0.45	0.73	-5.23
S2_5	GW20-08-8947 (F)	12/3/2007	73.2	79.900	3.50	0.33	0.16	10.7	0.95	0.5	0.44	0.73	-2.69
S2_6	GW20-08-8948 (F)	12/3/2007	74.1	78.847	3.48	0.32	0.18	10.6	1.00	0.5	0.44	0.73	-1.79
S2_7	GW20-08-8949 (F)	12/3/2007	71.3	78.383	3.50	0.32	0.15	10.5	1.07	0.5	0.41	0.73	-3.52
S2_8	GW20-08-8950 (F)	12/3/2007	69.6	77.756	3.45	0.32	0.15	10.4	1.09	0.5	0.39	0.73	-4.66
S2_9	GW20-08-8960 (F)	12/3/2007	70.4	75.591	3.44	0.31	0.14	10.5	1.11	0.5	0.38	0.73	-2.55
S2_10	GW20-08-8951 (F)	12/3/2007	74.6	76.458	3.43	0.31	0.14	10.3	1.20	0.6	0.37	0.73	-2.12
S2_11	GW20-08-8952 (F)	12/3/2007	66.9	76.236	3.40	0.30	0.12	10.2	1.24	0.6	0.36	0.75	-4.95
S2_12	GW20-08-8953 (F)	12/3/2007	73.3	76.166	3.34	0.30	0.11	9.82	1.28	0.6	0.36	0.78	-3.28
S2_13	GW20-08-8938 (F)	12/3/2007	73.6	76.068	3.38	0.34	0.11	9.70	1.34	0.7	0.37	0.74	-3.95
S2_14	GW20-08-8963 (F)	12/3/2007	72.2	74.742	3.35	0.30	0.11	9.70	1.30	0.7	0.37	0.74	-3.03
S2_15	GW20-08-8954 (F)	12/4/2007	74.8	70.470	3.26	0.29	0.10	8.24	0.88	1.47	0.47	0.7	3.69
S2_16	GW20-08-8955 (F)	12/4/2007	68.2	66.078	3.15	0.29	0.11	8.03	1.27	1.14	0.40	0.75	1.44
S2_17	GW20-08-8956 (F)	12/4/2007	73.4	75.842	3.14	0.28	0.09	7.79	1.35	1.37	0.40	0.73	-2.85
S2_18	GW20-08-8957 (F)	12/4/2007	62.5	75.206	3.09	0.28	0.08	7.38	1.38	1.61	0.37	0.73	-7.02
S2_19	GW20-08-8958 (F)	12/4/2007	52.7	74.805	3.04	0.28	0.09	7.21	1.39	1.57	0.36	0.74	-11.98
S2_20	GW20-08-8962 (F)	12/4/2007	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65	0.36	0.75	-3.79

[a] Eh(m) stands for Eh(measured). It is derived from the field ORP measurement based on Eh(m)=ORP+Eref (the correction for Ag/AgCl electrode, saturated in KCl solution).

[b] Eh(c) stands for Eh(Calculated, derived from calculated pe based on Eh=pe*0.059).

[c] Electrical Balance (E.B.,%) = [(∑cations + ∑anions)/(∑ cations-∑ anions)]*100.

Table D-3
Field Parameters and Chemical Analysis of Major and Minor Ions Concentration (in ppm) of Screen 2 of R-20 Sample (Sample ID: GW20-08-8962 (F), Date Collected: 12/4/2007) used for PHREEQC Model Adding O_2, Oxidation of Pyrite and Equilibration with Calcite and Gypsum

PHREEQC File #	O_2 added (mole)	Case#/Step#	pH	T (C)	Na	Ca	K	Mg	Fe	Ba	Al	Mn	Li
Case 1													
Dis_Pyrite_1	0.01	1	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_1	0.02	2	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_1	0.03	3	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_1	0.04	4	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Case 2													
Dis_Pyrite_2	0.025	1	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_2	0.05	2	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_2	0.075	3	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_2	0.1	4	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Case 3													
Dis_Pyrite_3	0.1	1	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_3	0.2	2	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_3	0.3	3	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_3	0.4	4	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Case 4													
Dis_Pyrite_4	0.25	1	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_4	0.5	2	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_4	0.75	3	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020
Dis_Pyrite_4	1	4	8.34	18.7	11.8	12.1	2.35	2.23	1.21	0.086	0.007	0.031	0.020

Table D-3 (continued)

PHREEQC File #	O_2 added (mole)	Case#/Step#	SiO_2	HCO_3	Cl^-	F^-	PO_4^{-3}	SO_4^{-2}	NO_3	DO
Case 1										
Dis_Pyrite_1	0.01	1	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_1	0.02	2	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_1	0.03	3	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_1	0.04	4	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Case 2										
Dis_Pyrite_2	0.025	1	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_2	0.05	2	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_2	0.075	3	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_2	0.1	4	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Case 3										
Dis_Pyrite_3	0.1	1	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_3	0.2	2	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_3	0.3	3	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_3	0.4	4	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Case 4										
Dis_Pyrite_4	0.25	1	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_4	0.5	2	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_4	0.75	3	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65
Dis_Pyrite_4	1	4	74.1	74.762	3.02	0.28	0.09	7.04	1.40	1.65

Appendix E

PHREEQC Geochemical Modeling Results

Table E-1
Major Iron Species Concentration in R-20 Screen 1 Samples

PHREEQC File ID	Fe (Measured) (M)	Modeled Fe(II) (M)	Modeled Fe(III)(M)	Fe(III) (M)		
				$Fe(OH)_3$	$Fe(OH)^{2+}$	$Fe(OH)_4^-$
S1_1	2.7e-006	6.205e-017	2.686e-006	2.259e-006	2.832e-007	1.440e-007
S1_2	3e-006	2.347e-017	3.045e-006	2.570e-006	1.771e-007	2.975e-007
S1_3	3.2e-006	1.975e-017	3.224e-006	2.702e-006	1.623e-007	3.595e-007
S1_4	3.5e-006	1.151e-017	3.582e-006	2.918e-006	1.257e-007	5.385e-007
S1_5	3.3e-006	1.034e-017	3.224e-006	2.612e-006	1.076e-007	5.044e-007
S1_6	3.4e-006	8.144e-018	3.403e-006	2.706e-006	9.655e-008	6.003e-007
S1_7	6e-006	1.352e-017	5.910e-006	4.669e-006	1.600e-007	1.081e-006
S1_8	8.2e-006	1.802e-017	8.238e-006	6.497e-006	2.206e-007	1.521e-006
S1_9	1e-005	2.377e-017	1.021e-005	8.068e-006	2.765e-007	1.864e-006
S1_10	1.1e-005	2.503e-017	1.075e-005	8.492e-006	2.911e-007	1.962e-006
S1_11	1.4e-005	3.476e-017	1.397e-005	1.108e-005	3.870e-007	2.505e-006
S1_12	1.9e-005	5.358e-017	1.934e-005	1.549e-005	5.795e-007	3.277e-006
S1_13	2.2e-005	5.930e-017	2.221e-005	1.793e-005	7.142e-007	3.567e-006
S1_14	2.1e-005	5.663e-017	2.060e-005	1.662e-005	6.627e-007	3.310e-006
S1_15	2.5e-005	8.947e-017	2.489e-005	2.023e-005	8.458e-007	3.821e-006
S1_16	2.8e-005	9.998e-017	2.794e-005	2.292e-005	1.050e-006	3.967e-006

Table E-2
Major Iron Species Concentration in R-20 Screen 2 Samples

PHREEQC File ID	Fe (Measured) (M)	Fe(II) (M)	Fe(III)(M)	Fe(III) (M)		
				$Fe(OH)_3$	$Fe(OH)_2^+$	$Fe(OH)_4^-$
S2_1	4.34e-006	1.712e-017	4.298e-006	3.468e-006	1.395e-007	6.905e-007
S2_2	5.23e-006	1.698e-017	5.194e-006	4.157e-006	1.574e-007	8.792e-007
S2_3	6.8e-006	2.120e-017	6.806e-006	5.427e-006	1.997e-007	1.179e-006
S2_4	4.16e-006	1.230e-017	4.119e-006	3.278e-006	1.189e-007	7.222e-007
S2_5	4.2e-006	1.174e-017	4.298e-006	3.401e-006	1.190e-007	7.785e-007
S2_6	3.93e-006	1.028e-017	3.940e-006	3.108e-006	1.068e-007	7.251e-007
S2_7	2.87e-006	8.175e-018	2.866e-006	2.278e-006	8.227e-008	5.052e-007
S2_8	3.57e-006	1.390e-017	3.582e-006	2.908e-006	1.228e-007	5.509e-007
S2_9	4.36e-006	1.386e-017	4.298e-006	3.451e-006	1.335e-007	7.139e-007
S2_10	7.71e-006	2.274e-017	7.701e-006	6.156e-006	2.306e-007	1.314e-006
S2_11	8.6e-006	1.002e-016	8.597e-006	7.280e-006	5.591e-007	7.576e-007
S2_12	1.14e-005	1.003e-015	1.146e-005	9.077e-006	2.067e-006	3.187e-007
S2_13	1.25e-005	5.790e-017	1.254e-005	1.032e-005	4.932e-007	1.723e-006
S2_14	1.26e-005	5.848e-017	1.272e-005	1.047e-005	5.002e-007	1.748e-006
S2_15	1.61e-005	1.179e-016	1.612e-005	1.357e-005	8.673e-007	1.686e-006
S2_16	1.05e-005	3.019e-017	1.057e-005	8.463e-006	3.168e-007	1.787e-006
S2_17	1.29e-005	4.358e-017	1.289e-005	1.044e-005	4.253e-007	2.029e-006
S2_18	1.44e-005	5.297e-017	1.433e-005	1.170e-005	5.100e-007	2.120e-006
S2_19	1.32e-005	5.163e-017	1.325e-005	1.091e-005	5.179e-007	1.821e-006
S2_20	2.16e-005	8.352e-017	2.167e-005	1.790e-005	8.819e-007	2.892e-006

Table E-3
Calculated Saturation Indices (SI) for Screen 1 of R-20 Samples from December 2007 Sampling Events

Phase	Formula in PHREEQC	Calculated SI for Screen 1 of R-20 Samples[a]							
		S1_1	S1_2	S1_3	S1_4	S1_5	S1_6	S1_7	S1_8
Albite	NaAlSi3O8	0.71	0.6	0.67	0.44	0.23	n/a[b]	0.25	0.05
Ca-Montmorillonite	Ca0.165Al2.33Si3.67O10(OH)2	5.63	4.76	4.82	4.13	3.51	2.8	3.54	2.92
Chalcedony	SiO2	0.68	0.69	0.69	0.66	0.67	0.7	0.65	0.68
Chlorite(14A)	Mg5Al2Si3O10(OH)8	n/a	0.58	1.17	1.98	1.78	1.8	2.52	2.1
Fe(OH)3(a)	Fe(OH)3	2.5	2.52	2.54	2.53	2.45	2.4	2.67	2.84
Gibbsite	Al(OH)3	1.34	0.91	0.92	0.65	0.36	0.1	0.41	0.1
Goethite	FeOOH	8.11	8.15	8.18	8.19	8.13	8.1	8.37	8.52
Hausmannite	Mn3O4	6.86	8.3	8.59	9.4	9.38	9.7	9.78	10.43
Hematite	Fe2O3	18.2	18.28	18.33	18.36	18.24	18	18.7	19.02
Illite	K0.6Mg0.25Al2.3Si3.5O10(OH)2	4.87	4.21	4.31	3.73	3.14	2.5	3.23	2.64
K-feldspar	KAlSi3O8	2.4	2.28	2.35	2.1	1.89	1.6	1.92	1.72
K-mica	KAl3Si3O10(OH)2	10.65	9.66	9.77	8.98	8.19	7.3	8.31	7.49
Kaolinite	Al2Si2O5(OH)4	5.73	4.89	4.93	4.32	3.77	3.2	3.8	3.24
Manganite	MnOOH	4.95	5.37	5.46	5.66	5.6	5.6	5.67	5.93
Pyrolusite	MnO2	8.7	9.16	9.26	9.52	9.49	9.6	9.62	9.85
Quartz	SiO2	1.13	1.14	1.14	1.11	1.12	1.1	1.09	1.12
Sepiolite	Mg2Si3O7.5OH:3H2O	n/a	n/a	0.1	n/a	0.69	0.8	0.88	1.02
Talc	Mg3Si4O10(OH)2	1.29	2.99	3.32	4.06	4.3	4.6	4.63	4.81
Phase	Formula in PHREEQC	S1_9	S1_10	S1_11	S1_12	S1_13	S1_14	S1_15	S1_16
Albite	NaAlSi3O8	0.71	0.6	0.67	0.44	0.23		0.25	0.05
Ca-Montmorillonite	Ca0.165Al2.33Si3.67O10(OH)2	5.63	4.76	4.82	4.13	3.51	2.8	3.54	2.92
Chalcedony	SiO2	0.68	0.69	0.69	0.66	0.67	0.7	0.65	0.68
Chlorite(14A)	Mg5Al2Si3O10(OH)8	n/a	0.58	1.17	1.98	1.78	1.8	2.52	2.1
Fe(OH)3(a	Fe(OH)3	2.5	2.52	2.54	2.53	2.45	2.4	2.67	2.84
Gibbsite	Al(OH)3	1.34	0.91	0.92	0.65	0.36	0.1	0.41	0.1
Goethite	FeOOH	8.11	8.15	8.18	8.19	8.13	8.1	8.37	8.52
Hausmannite	Mn3O4	6.86	8.3	8.59	9.4	9.38	9.7	9.78	10.43
Hematite	Fe2O3	18.2	18.28	18.33	18.36	18.24	18	18.7	19.02
Illite	K0.6Mg0.25Al2.3Si3.5O10(OH)2	4.87	4.21	4.31	3.73	3.14	2.5	3.23	2.64
K-feldspar	KAlSi3O8	2.4	2.28	2.35	2.1	1.89	1.6	1.92	1.72
K-mica	KAl3Si3O10(OH)2	10.65	9.66	9.77	8.98	8.19	7.3	8.31	7.49
Kaolinite	Al2Si2O5(OH)4	5.73	4.89	4.93	4.32	3.77	3.2	3.8	3.24
Manganite	MnOOH	4.95	5.37	5.46	5.66	5.6	5.6	5.67	5.93
Pyrolusite	MnO2	8.7	9.16	9.26	9.52	9.49	9.6	9.62	9.85
Quartz	SiO2	1.13	1.14	1.14	1.11	1.12	1.1	1.09	1.12
Sepiolite	Mg2Si3O7.5OH:3H2O	n/a	n/a	0.1	n/a	0.69	0.8	0.88	1.02
Talc	Mg3Si4O10(OH)2	1.29	2.99	3.32	4.06	4.3	4.6	4.63	4.81

[a] PHREEQC file ID. Original samples ID can be retrieved from Table D-1 of Appendix D of this report.

[b] n/a = SI equal or below zero.

Table E-4
Calculated Saturation Indices (SI) for Screen 2 of R-20 Samples from December 2007 Sampling Events

Phase	Formula in PHREEQC[a]	Calculated SI for Screen 1of R-20 Samples[a]									
		S2_1	S2_2	S2_3	S2_4	S2_5	S2_6	S2_7	S2_8	S2_9	S2_10
Albite	NaAlSi3O8	0.83	1.17	1.15	0.78	1.05	0.77	0.1	0.62	0.5	0.09
Ca-Montmorillonite	Ca0.165Al2.33Si3.67O10(OH)2	4.86	5.46	5.58	4.74	5.21	4.5	3	4.49	4.1	3.03
Chalcedony	SiO2	0.68	0.7	0.67	0.66	0.7	0.7	0.7	0.68	0.7	0.71
Chlorite(14A)	Mg5Al2Si3O10(OH)8	2.94	3.74	3.82	3.08	3.72	3.2	1.6	2.14	2.2	1.52
Fe(OH)3(a	Fe(OH)3	2.57	2.66	2.77	2.54	2.59	2.56	2.4	2.53	2.6	2.85
Gibbsite	Al(OH)3	0.93	1.15	1.25	0.9	1.05	0.73	0.1	0.78	0.6	0.1
Goethite	FeOOH	8.25	8.33	8.45	8.23	8.26	8.22	8.1	8.19	8.3	8.51
Hausmannite	Mn3O4	10	10	10.1	10	10.1	9.86	9.9	9.49	10	9.88
Hematite	Fe2O3	18.5	18.7	18.9	18.5	18.5	18.4	18	18.6	19	19
Illite	K0.6Mg0.25Al2.3Si3.5O10(OH)2	4.51	5.14	5.25	4.42	4.91	4.21	2.7	4.11	3.8	2.71
K-feldspar	KAlSi3O8	2.55	2.89	2.87	2.5	2.79	2.5	1.8	2.35	2.2	1.82
K-mica	KAl3Si3O10(OH)2	9.99	10.8	11	9.88	10.5	9.54	7.6	9.48	9	7.59
Kaolinite	Al2Si2O5(OH)4	4.91	5.4	5.53	4.82	5.18	4.56	3.3	4.61	4.3	3.3
Manganite	MnOOH	5.76	5.8	5.79	5.8	5.85	5.78	5.8	5.66	5.9	5.79
Pyrolusite	MnO2	9.56	9.6	9.61	9.6	9.63	9.56	9.6	9.43	9.7	9.59
Quartz	SiO2	1.12	1.15	1.12	1.11	1.15	1.15	1.1	1.13	1.1	1.15
Sepiolite	Mg2Si3O7.5OH:3H2O	n/a[b]	0.89	0.79	0.76	0.98	1.04	0.9	0.54	0.7	0.88
Talc	Mg3Si4O10(OH)2	4.32	4.59	4.45	4.4	4.7	4.78	4.5	4.04	4.3	4.54

[a] PHREEQC file ID. Original samples ID can be retrieved from Table D-1 of Appendix D of this report.

[b] n/a = SI equal or below zero.

Table E-4 (continued)

Phase	Formula in PHREEQC[a]	Calculated SI for Screen 1of R-20 Samples[a]									
		S2_11	S2_12	S2_13	S2_14	S2_15	S2_16	S2_17	S2_18	S2_19	S2_20
Albite	NaAlSi3O8	n/a[b]	0.55	n/a	n/a	0.17	0.34	0.09	n/a	n/a	n/a
Ca-Montmorillonite	Ca0.165Al2.33Si3.67O10(OH)2	2.81	5.68	2.16	2.47	3.72	3.95	3.29	2.49	1.33	2.56
Chalcedony	SiO2	0.67	0.71	0.7	0.69	0.7	0.64	0.67	0.6	0.55	0.71
Chlorite(14A)	Mg5Al2Si3O10(OH)8	n/a	n/a	n/a	n/a	0.24	2.43	1.65	0.34	n/a	n/a
Fe(OH)3(a)	Fe(OH)3	2.93	3.03	3.06	3.07	3.11	2.86	2.94	2.99	3.05	3.31
Gibbsite	Al(OH)3	0.11	1.34	n/a	n/a	0.44	0.59	0.26	0.03	n/a	n/a
Goethite	FeOOH	8.59	8.69	8.73	8.74	8.82	8.6	8.68	8.73	8.74	8.98
Hausmannite	Mn3O4	8.18	5.9	9.4	9.41	9.34	10.3	9.9	9.54	9.21	9.68
Hematite	Fe2O3	19.2	19.35	19.4	19.46	19.6	19.2	19.4	19.46	19.5	19.9
Illite	K0.6Mg0.25Al2.3Si3.5O10(OH)2	2.23	4.72	1.77	2.07	3.23	3.59	2.91	2.04	0.82	2.13
K-feldspar	KAlSi3O8	1.36	2.27	1.33	1.45	1.9	2.05	1.78	1.24	0.56	1.45
K-mica	KAl3Si3O10(OH)2	7.15	10.52	6.41	6.82	8.37	8.82	7.9	6.89	5.41	6.86
Kaolinite	Al2Si2O5(OH)4	3.25	5.8	2.6	2.87	3.97	4.16	3.57	2.96	2.06	2.94
Manganite	MnOOH	5.23	4.48	5.61	5.61	5.48	5.7	5.57	5.46	5.51	5.75
Pyrolusite	MnO2	9.02	8.27	9.44	9.45	9.49	9.73	9.64	9.54	9.48	9.67
Quartz	SiO2	1.12	1.16	1.15	1.14	1.14	1.09	1.12	1.05	0.99	1.16
Sepiolite	Mg2Si3O7.5OH:3H2O	n/a	n/a	n/a	0.39	n/a	0.61	0.61	0.15	n/a	0.41
Talc	Mg3Si4O10(OH)2	2.37	n/a	3.88	3.82	3.31	4.32	4.31	3.65	2.91	3.84

[a] PHREEQC file ID. Original samples ID can be retrieved from Table D-1 of Appendix D of this report.

[b] n/a = SI equal or below zero.

Table E-5
PHREEQC Calculation Results for Amount of Oxygen Added and Equilibrium with Pyrite, Calcite and Gypsum

Steps	O_2 added (mole)	pH	pe	Pyrite (mole)	Goethite (mole)	Calcite (mole)	CO2(g) (mole)	Gypsum (mole)	SI_ Gypsum	Fe(II) (M)	Fe(III) (M)
Case 1	0	8.34	4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.2716	8.35e-017	2.167e-005
1	0.01	7.91	-3.68	-2.69E-03	2.71E-03	-5.03E-03	5.67E-03	0.00E+00	-0.6136	4.76e-008	2.278e-014
2	0.02	7.81	-3.53	-5.35E-03	5.38E-03	-1.03E-02	1.10E-02	0.00E+00	-0.204	8.12e-008	2.333e-014
3	0.03	7.76	-3.45	-8.02E-03	8.04E-03	-1.56E-02	1.64E-02	7.15E-04	0	1.08e-007	2.372e-014
4	0.04	7.76	-3.45	-1.07E-02	1.07E-02	-2.10E-02	2.17E-02	6.05E-03	0	1.08e-007	2.372e-014
Case 2	0	8.34	4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.2716	8.35e-017	2.167e-005
1	0.025	7.78	-3.48	-6.69E-03	6.71E-03	-1.30E-02	1.37E-02	0.00E+00	-0.0768	9.68e-008	2.357e-014
2	0.05	7.76	-3.45	-1.34E-02	1.34E-02	-2.63E-02	2.71E-02	1.14E-02	0	1.08e-007	2.372e-014
3	0.075	7.76	-3.45	-2.00E-02	2.00E-02	-3.96E-02	4.04E-02	2.47E-02	0	1.08e-007	2.372e-014
4	0.1	7.76	-3.45	-2.67E-02	2.67E-02	-5.30E-02	5.37E-02	3.81E-02	0	1.08e-007	2.372e-014
Case 3	0	8.34	4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.2716	8.35e-017	2.167e-005
1	0.1	7.76	-3.45	-2.67E-02	2.67E-02	-5.30E-02	5.37E-02	3.81E-02	0	1.08e-007	2.372e-014
2	0.2	7.76	-3.45	-5.34E-02	5.34E-02	-1.06E-01	1.07E-01	9.14E-02	0	1.08e-007	2.372e-014
3	0.3	7.76	-3.45	-8.00E-02	8.00E-02	-1.60E-01	1.60E-01	1.45E-01	0	1.08e-007	2.372e-014
4	0.4	7.76	-3.45	-1.07E-01	1.07E-01	-2.13E-01	2.14E-01	1.98E-01	0	1.08e-007	2.372e-014
Case 4	0	8.34	-3.45	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.2716	8.35e-017	2.167e-005
1	0.25	7.76	-3.45	-6.67E-02	6.67E-02	-1.33E-01	1.34E-01	1.18E-01	0	1.08e-007	2.372e-014
2	0.5	7.76	-3.45	-1.33E-01	1.33E-01	-2.66E-01	2.67E-01	2.52E-01	0	1.08e-007	2.372e-014
3	0.75	7.76	-3.45	-2.00E-01	2.00E-01	-4.00E-01	4.00E-01	3.85E-01	0	1.08e-007	2.372e-014
4	1	7.76	-3.45	-2.67E-01	2.67E-01	-5.33E-01	5.34E-01	5.18E-01	0	1.08e-007	2.372e-014

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