EMID-700598

DEPARTMENT OF ENERGY
Environmental Management Los Alamos Field Office (EM-LA)
Los Alamos, New Mexico 87544

SEP 30 2019

Mr. John E. Kieling
Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Dear Mr. Kieling:

Subject: Submittal of the 2019 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area

Enclosed please find two hard copies with electronic files of the "2019 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area." This report summarizes activities Newport News Nuclear BWXT-Los Alamos, LLC, completed from August 2018 to July 2019 related to the deep groundwater investigation corrective measures evaluation for Consolidated Unit 16-021(c)-99, the Technical Area 16 260 Outfall. This report is being submitted to fulfill Fiscal Year 2019 Milestone 17 in Appendix B of the 2016 Compliance Order on Consent.

If you have any questions, please contact Pat McGuire at (315) 420-5629 (patrick.mcguire@em-la.doe.gov) or Cheryl Rodriguez at (505) 257-7941 (cheryl.rodriguez@em.doe.gov).

Sincerely,

Arturo Q. Duran
Compliance and Permitting Manager
Environmental Management
Los Alamos Field Office

Enclosures:
1. Two hard copies with electronic files – 2019 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area (EM2019-0316)

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EM-LA-N3B-30AD-00507

September 2019
EM2019-0316

2019 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area

N3B Los Alamos

EM2019-0316

2019 Annual Long-Term Monitoring and Maintenance Report for Corrective Measures Implementation at Former 260 Outfall Area

September 2019

Responsible program director:

Printed Name	Signature	Title	Organization	Date
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Responsible N3B representative:

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Erich Evered		Program Manager	N3B Environmental Remediation Program	9/24/2019

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Arturo Q. Duran		Compliance and Permitting Manager	Office of Quality and Regulatory Compliance	9/30/2019

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1.0 INTRODUCTION

This "2019 Annual Long-Term Monitoring and Maintenance Report for Corrective Measures Implementation (CMI) at the Former 260 Outfall Area" within Technical Area 16 (TA-16) at Los Alamos National Laboratory (LANL or the Laboratory) follows the Long-Term Monitoring and Maintenance Plan requirements specified in Appendix A to the "Remedy Completion Report for Corrective Measures Implementation at Consolidated Unit 16-021(c)-99" (LANL 2017, 602597). This annual Long-Term Monitoring and Maintenance Report covers the reporting period from August 2018 to July 2019.

The former 260 Outfall area consists of the high explosives (HE) machining building (building 16-260) and associated sumps, drainlines, and troughs that discharged into the 260 Outfall drainage channel. The 260 Outfall drainage channel consists of the outfall, a former settling pond, and the lower portion of the drainage channel leading to Cañon de Valle (Figure 1.0-1). Historically, HE-contaminated water from the outfall entered the former settling pond and drained into the 260 Outfall drainage channel.

The corrective measures were implemented to address HE associated with the 260 Outfall, including RDX (Royal Demolition Explosive) and barium (a byproduct of processing HE Baratol), which are the primary contaminants addressed in the CMI remedy completion report (LANL 2017, 602597) and discussed in this report. Other compounds associated with the 260 Outfall include HMX (Her Majesty's Explosive), TNT (2,4,6-trinitrotoluene), volatile organic compounds (VOCs), metals, and HE byproducts and degradation products. As part of the long-term monitoring and maintenance plan, other analytes measured include semivolatile organic compounds (SVOCs), general inorganics, nitrogen-15/oxygen-18 isotopes in nitrate, and radionuclides. Where appropriate, these compounds are screened in accordance with the criteria set forth by the 2016 Compliance Order on Consent, and any compounds exceeding their respective screening levels are further discussed in this report. Additionally, field parameters (e.g., dissolved oxygen, oxidation-reduction potential [ORP], pH, specific conductance, temperature, and turbidity) were collected at select locations, and measurement results are provided.

This report discusses the monitoring and maintenance of the Outfall 260 former settling pond cap; monitoring of the surge bed water levels; monitoring of water quality at SWSC Spring, Burning Ground Spring, Martin Spring, and the PRB alluvial seep (16-61439); and monitoring of groundwater and surface water (base flow) quality at select locations within Cañon de Valle, S-Site Canyon, Pajarito Canyon, Water Canyon, and Fishladder Canyon.

1.1 Regulatory Context

Long-term monitoring and maintenance activities follow the approach put forth in the remedy completion report for corrective measures at Consolidated Unit 16-012(c)-99 (LANL 2017, 602597). The long-term water quality monitoring activities complement and integrate with the "Interim Facility-Wide Groundwater Monitoring Plan for the 2019 Monitoring Year, October 2018–September 2019" (IFGMP) for groundwater and surface water monitoring (N3B 2018, 700000). The Laboratory has implemented the IFGMP in accordance with Section XII of the 2016 Compliance Order on Consent. The long-term monitoring and maintenance plan was included in the CMI remedy completion report, Appendix A (LANL 2017, 602597). The New Mexico Environment Department (NMED) approved the CMI remedy completion report on November 27, 2017 (NMED 2017, 602758).

Monitoring of groundwater from springs (including SWSC, Burning Ground, Bulldog, and Martin), alluvial wells, and intermediate and regional wells in the vicinity and downgradient of the 260 Outfall has historically been conducted as part of the TA-16 260 monitoring group activities conducted under the IFGMP. With the completion of surface CMI activities at Consolidated Unit 16-021(c)-99 and NMED's

approval of the “Remedy Completion Report for Corrective Measures Implementation at Consolidated Unit 16-021(c)-99,” including the long-term monitoring and maintenance plan (LANL 2017, 602597; NMED 2017, 602758), the monitoring of surface water, alluvial groundwater, and springs has been incorporated into the IFGMP.

1.2 Conceptual Model for Transport of RDX and Barium

RDX and barium were the primary chemicals of concern (COCs) in alluvial groundwater during the surface CMIs from 1999 to 2010 (LANL 2007, 098192). RDX is the most significant COC within Cañon de Valle and Water Canyon (LANL 2017, 602597). RDX is a mobile compound that does not sorb strongly to environmental media and is readily transported in water. RDX dissolved in groundwater will partition between dissolved RDX and sorbed RDX. RDX sorbs minimally to tuff and sediment, with greater sorption if organic carbon is present. RDX can be degraded both biologically (i.e., microbial degradation) and chemically (hydrolysis) (LANL 2017, 602597).

A review of the concentrations of RDX detected in alluvial monitoring wells indicates long-term declines. The CMI remedy completion report (LANL 2017, 602597) reported that the majority of detections of RDX in alluvial wells in Cañon de Valle were near or below the screening level of 9.66 µg/L. Occasionally during the past 15 yr of monitoring, there have been higher concentrations of RDX observed in alluvial monitoring wells downstream of the 260 Outfall. These transient values were associated with spring snowmelt wet periods. Figure 1.2-1 shows the mean daily flow hydrograph for the SWSC Spring from December 2016 to August 2019. The figure shows increased flow of the SWSC Spring discharge in the spring of 2019, supporting the premise that the spring of 2019 was unusually wet.

Although the majority of RDX concentrations in discharges from SWSC, Burning Ground, and Martin Springs and 16-02656 (PRB Alluvial Seep) from 2000 to 2019 were above the 9.66-µg/L screening level, overall concentrations are declining, likely because of the RDX source-reduction actions that were implemented at Outfall 260 (LANL 2017, 602597). In March 2019, higher than normal levels of RDX in SWSC Spring were measured, which can be associated with the wet winter season and spring snowmelt.

RDX concentrations at the base flow monitoring point in Cañon de Valle below Material Disposal Area (MDA) P are generally less than the NMED screening level of 9.66 µg/L but are occasionally found in higher concentrations during wet periods. RDX concentrations at the other base-flow monitoring locations (Pajarito below S&N Ancho E Basin confluence, between E252 and Water at Beta, and Water at Beta) are well below the 9.66-µg/L screening level.

The overall long-term decrease in RDX concentrations in shallow water reflects multiple factors, including the elimination of the original outfall source of RDX with cessation of National Pollutant Discharge Elimination System discharges into Cañon de Valle, surface removal activities conducted in 2001 and during the surface CMI in 2009 and 2010, and long-term reduction of RDX from the system from natural degradation processes.

Concentration trends for HE compounds have been variable and range from generally declining to stable for an extended period of time. The March 2019 sampling results did show a spike in RDX concentrations at SWSC Spring; however, consistent with the description in the CMI remedy completion report (LANL 2017, 602597), the current concentrations of RDX detected in the springs are considered protective of nearby surface water and alluvial groundwater because the concentrations decrease dramatically as the distance increases away from the source. The objective of long-term monitoring at each spring is to ensure concentrations remain low or stable with time and the regional aquifer is protected.

Barium was targeted for removal in addition to RDX during Outfall 260 source-removal activities. With the cessation of discharge from Outfall 260 to Cañon de Valle, the estimated inventory of barium has been significantly reduced (LANL 2002, 073706); however, elevated barium concentrations in Cañon de Valle alluvial groundwater and surface water persist (LANL 2017, 602597).

Barium mobility is controlled by sorption and the dynamics of surface and alluvial hydrology. Barium continues to be mobilized by fluctuating water levels in the alluvium. Barium is also irreversibly removed from groundwater when barite (barium sulfate) precipitates; however, because witherite (barium carbonate) is also present and dissolves when wet, barium concentrations in alluvial groundwater remain elevated, buffered by the geochemical processes (LANL 2017, 602597).

Barium is more persistent in shallow groundwater within Cañon de Valle and, to a lesser extent, in Martin Spring in S-Site Canyon; however, barium is not likely to migrate to perched-intermediate groundwater or the regional aquifer given its sorptive characteristics, making it considerably less mobile than RDX in oxidizing groundwater. Although it is well-buffered in the near-surface system, natural sorptive processes slowly remove barium from the system. Barium is elevated only in the surface and alluvial systems, and its mobility is limited by conditions in near-surface soils and alluvial groundwater. In addition to flushing dissolved barium from pore water and desorbing any reversibly sorbed barium, higher alluvial groundwater levels can dissolve barium minerals, primarily witherite, present in the unsaturated zone (Reid et al. 2005, 093660). Alternatively, declining alluvial groundwater levels will precipitate barium minerals. The presence of barium minerals partially buffers barium concentrations in surface waters and significantly buffers barium concentrations in alluvial waters (Reid et al. 2005, 093660).

Barium concentrations in alluvial groundwater within Cañon de Valle continue to be elevated. Concentrations in spring water are generally less than the 2000-µg/L screening level. Barium concentrations show a long-term decline in alluvial groundwater samples collected from location CDV-16-02656, located upgradient of the former PRB, suggesting a diminishing source; however, location CDV-16-611923, upstream of the former PRB cutoff wall, showed a significant spike in barium concentrations after the PRB was installed in 2010. After the cutoff wall was installed, water levels in the alluvium above the cutoff wall rose, saturating sediments that likely contained witherite, which is the mobile fraction of barium. As the witherite dissolved, barium concentrations in groundwater spiked. The elevated barium eventually dissipated after flooding breached the cutoff wall in 2011.

Surface water and alluvial groundwater include a mix of spring water and water from upgradient locations and sources. Barium concentrations at surface water and alluvial monitoring locations have been steadily declining and are currently low and stable with some seasonally driven variability, specifically at Burning Ground Spring and SWSC Spring. Barium concentrations at surface and alluvial monitoring locations are steadily declining, except at CDV-16-02659, CDV-16-611923, and 16-61439, where barium concentrations are above the screening level.

The CMI performance objectives were to reduce concentrations of barium and RDX in alluvial groundwater to prevent their migration to deeper groundwater. The long-term monitoring and maintenance plan established performance-monitoring points as follows: the five existing alluvial wells in Cañon de Valle, three existing alluvial wells in S-Site Canyon, two surface-water sampling points along the perennial surface water reach of Cañon de Valle, one surface water sampling point in S-Site Canyon, and at the springs.

1.3 Monitoring Objectives

Key objectives of the long-term monitoring program include the following:

- Monitoring effectiveness of the low-permeability cap and surge-bed grouting to ensure infiltrating water does not encounter and mobilize residual COCs in the outfall area and underlying shallow vadose zone.
- Monitoring the long-term trend in COC concentrations (primarily HE and barium) in springs, surface water, and alluvial groundwater to ensure historically declining and/or stable concentrations persist.

2.0 LONG-TERM MONITORING AND MAINTENANCE SAMPLING AND RESULTS

Section 2.0 presents the data collected for this 2019 annual Long-Term Monitoring and Maintenance Report. The focus of the discussion is RDX and barium, identified as the primary COCs targeted in the corrective measures implemented at former 260 Outfall. Other constituents are monitored as part of long-term monitoring and maintenance, and sampling results for all constituents monitored in the 2019 long-term monitoring and maintenance program are provided in this report. The results are screened against their respective screening levels, and the constituents that exceed their screening levels are discussed in more detail in this report.

2.1 Sampling

The purpose of the long-term monitoring activities is to assess the long-term effectiveness of the CMI for Consolidated Unit 16-021(c)-99, to monitor the long-term trends in COC concentrations, and to support continuous evaluation of the conceptual model for the fate and transport of residual COCs in nearby springs, surface water, and alluvial groundwater.

Sampling of groundwater, surface water, and springs for the TA-16 260 monitoring group is conducted semiannually (LANL 2017, 602406). In the CMI remedy completion report, Appendix A (LANL 2017, 602597), the analytes and sampling frequencies proposed in the IFGMP (N3B 2018, 700000) for alluvial groundwater, surface water, and springs for the TA-16 260 monitoring group have been adapted as the long-term monitoring requirements for the former 260 Outfall area. Table 2.1-1 summarizes the monitoring locations (i.e., TA-16 260 monitoring group), parameters measured, and sampling frequencies for the springs, alluvial groundwater, and surface waters that make up the 2019 long-term monitoring program. The suite of compounds measured includes HEXMOD (i.e., RDX, HMX, TNT, and degradation byproducts), VOCs, metals, SVOCs, general inorganics, radionuclides, and nitrogen-15/oxygen-18 isotopes in nitrate. In addition, field parameters (e.g., dissolved oxygen, ORP, pH, specific conductivity, temperature, and turbidity) were also collected. Table 2.1-2 provides a list of the field parameters and measurement results. Appendix A provides the field forms associated with sample collection.

2.2 Results

This section presents the results for the primary COCs associated with the Outfall 260 drainage channel (i.e., RDX and barium) and the concentrations measured in the springs, surface water, and alluvial groundwater in Cañon de Valle, S-Site Canyon, Pajarito Canyon, Water Canyon, and Fishladder Canyon. The other constituents monitored as part of the long-term monitoring and maintenance plan are screened against their respective screening levels, and any exceedances identified are further discussed in this section. All validated analytical results are provided in Appendix B.

To present and evaluate the results from the sampling events, the data are organized by canyon, beginning with the most upgradient sample location and moving downgradient within each canyon, as follows:

- Cañon de Valle segment 1
  - CDV-16-02656 (background)
  - CDV-16-02657r
  - SWSC Spring
  - Burning Ground Spring
- Cañon de Valle segment 2
  - 16-61439 (PRB alluvial seep)
  - CDV-16-611923
  - CDV-16-611937
  - Cañon de Valle below MDA P
  - CDV-16-02659
- S-Site Canyon
  - Martin Spring
  - MSC-16-06293
  - MSC-16-06294
- Pajarito Canyon
  - Bulldog Spring
  - Pajarito below S&N Ancho E Basin Confluence (Confluence)
- Water Canyon
  - Between E252 and Water at Beta
  - Water at Beta
- Fishladder Canyon
  - FLC-16-25280

The long-term monitoring and maintenance plan prescribes the sampling of spring water, surface water, and alluvial groundwater on a semiannual frequency. The 2019 long-term monitoring and maintenance plan sampling events were performed in August 2018 and March 2019. Table 2.2-1 presents the RDX results by canyon or canyon segment. Barium levels are monitored in filtered samples collected from spring water, surface water, and alluvial groundwater. Table 2.2-2 presents the barium results by canyon or canyon segment.

The SWSC Spring sample CAWA-19-167501 result (296 µg/L) is flagged with a J+ (Table 2.2-1), indicating there is uncertainty in the estimated value, which is high and does not reflect an accurate value. Carryover of RDX was identified (i.e., RDX from previous samples remained in the gas chromatograph column and eluted with the RDX in the SWSC Spring sample, causing the result to be elevated), as observed in RDX being detected in the quality control blank sample and in other problems with the

laboratory's quality control. The laboratory's case narrative for this sample's analysis describes multiple laboratory issues with the HE analyses, such as laboratory quality control samples and calibration verification samples not meeting the proper recovery requirements. In addition, sample collection logs also show a negative HE field spot test for this sample, which further points to problems with the laboratory analysis.

The long-term monitoring and maintenance plan prescribes monitoring spring water, surface water, and alluvial groundwater for other constituents besides RDX and barium. Table 2.1-1 provides a list of compounds monitored in the 2019 sampling events. Analytes with screening levels were screened against those levels. If there are any exceedances, they are discussed in section 4.3. Table 2.2-3 presents the analytes that exceeded their respective screening levels.

3.0 INSPECTION AND MAINTENANCE

Sections 3.1 and 3.2, respectively, discuss (1) the inspection and maintenance approach for the low-permeability cap on the former settling pond and (2) monitoring of the surge bed monitoring well installed to monitor the effectiveness of the injection grouting.

3.1 Low-Permeability Cap

The objective of the low-permeability cap on top of the former settling pond is to prevent surface water run-on and infiltration into the outfall area and underlying shallow vadose zone that contain residual RDX. The low-permeability cap is inspected semiannually for evidence of settling, cracking, erosion, water ponding, undesirable vegetation growth, and animal intrusion. Each year, inspections are conducted in March or April to check for damage that may be associated with winter and snowmelt conditions and in September to monitor for damage from summer rainfall runoff.

In the September 2018 inspection of the low-permeability cap, no erosion, cracking, settlement, or ponding water was observed. There was no evidence of burrowing animals or undesirable vegetative growth, and the slopes were observed to be adequate for water runoff. No maintenance items were identified during the inspection.

In the April 2019 inspection of the low-permeability cap, no cracking, settlement, or ponding water was observed. There was no evidence of burrowing animals, and the slopes were observed to be adequate for water runoff. A sapling growing on the northeast end of the cap was removed. On the northeast side of the cap, a small rill appeared to cause water to flow towards the cap, causing slight erosion of the cap. In July 2019, the cap was revisited and the erosion appeared minimal due to the vegetative growth covering the area. The erosion rill will be inspected during the September 2019 inspection and if required, maintenance will be performed to mediate any potential erosion of the cap. The inspection forms used to document the fall and spring inspections are provided in Appendix C.

Storm water run-on and runoff controls are in place to prevent erosion of the low-permeability cap and to prevent runoff and sediment from moving farther down the 260 Outfall drainage channel. Monitoring and maintenance of the storm water control structures at the former 260 Outfall area continue under the Laboratory's National Pollutant Discharge Elimination System Individual Permit for Stormwater Discharges (Individual Permit), issued by the U.S. Environmental Protection Agency, Region 6, on September 30, 2010 (LANL 2017, 602284). Storm water controls installed at the site under the Individual Permit currently include vegetation, earthen berms, curbing, riprap, a rock check dam, and the low-permeability cap; therefore, an additional inspection of the low-permeability cap is performed when these controls are inspected as required by the Individual Permit. An inspection of the storm water control

structures, including the low-permeability cap at the former 260 Outfall area was performed on April 9, 2019. The inspection form is provided in Appendix C.

3.2 Surge Bed Monitoring Well

The surge bed monitoring well was installed to evaluate the effectiveness of the grout injected into the subsurface surge bed and of the low-permeability cap by monitoring for the appearance of water in the surge bed. Observations of water levels in the surge bed monitoring well during semiannual inspections have confirmed no detectable volume of water within the well. Additionally, throughout the monitoring year 2019 season, water levels have been monitored by a dedicated in-well transducer; no water has been detected in the surge bed monitoring well. The raw transducer data are provided in Appendix D.

4.0 DISCUSSION AND CONCLUSIONS

This section discusses the RDX and barium results from the August 2018 and March 2019 sampling events and how the results compare with the historical trends and support the conceptual model. In addition, this section describes other analytes (e.g., aluminum, iron, manganese, boron, tetrachloroethene [PCE]) detected above their respective screening levels and how these relate to the conditions in the alluvial groundwater.

4.1 RDX

The complete RDX data records for Cañon de Valle segments 1 and 2 are presented in Figures 4.1-1 and 4.1-2, respectively. These figures provide a comprehensive review of the RDX concentrations in waters in each segment and how the RDX sample results compare with the historical data trends. As described in Section 2.2, however, the SWSC Spring result from March 2019 does not provide an accurate RDX value and the result is estimated to be high; therefore, the data trend shown on Figure 4.1-1 for the SWSC Spring does not reflect actual conditions. Based on a review of these data, except for SWSC Spring, it can be concluded that the temporal and spatial trends and conditions in the surface water, alluvial groundwater, and springs are consistent with the concept that RDX concentrations are in long-term decline and are still considered protective of the regional groundwater; however, transient increases in RDX concentrations are observed during wet periods.

Plate 1 shows the spatial distribution of RDX across Cañon de Valle since the completion of the CMI. This plate illustrates a spike in RDX concentrations across sampling locations in Cañon de Valle in the spring of 2019, with a decrease in RDX concentrations downgradient of the source and an overall long-term continued decline in RDX concentrations since the completion of the corrective measures.

The S-Site Canyon RDX data record is shown in Figure 4.1-3, and the spatial distribution of RDX detected since the corrective measures is provided on Plate 1. The Martin Spring water RDX concentrations remain above the screening level, although the sample results are consistent with the conclusion that RDX levels continue to decline over time. Plate 1 shows declining levels of RDX across the canyon with no impacts to surface water downgradient of Martin Spring, suggesting the RDX concentration in Martin Spring is a localized condition.

The Pajarito Canyon locations include a spring location at Bulldog Spring and a surface water location at the Confluence. Figure 4.1-4 presents the data record for both locations. Historically, Bulldog Spring water RDX concentrations are below the screening level, as demonstrated in the results of the samples collected in August 2018 and March 2019. At the Confluence surface water location, the RDX results are

consistent with past data—concentrations are below 9.66 µg/L and support the sharply decreasing trend in RDX concentration.

The Water Canyon RDX data record is presented in Figure 4.1-5. Figure 4.1-5 demonstrates that the samples are consistent with historical results, which indicate RDX is well below the screening level or not detected.

Figure 4.1-6 presents the data record for the Fishladder Canyon. August 2018 samples were not available because the location was dry at the time of sampling; however, the March 2019 sampling event took place, and the sampling results displayed an RDX concentration of 3.9 µg/L, well below the screening level. The historical record indicates no impacts to Fishladder Canyon alluvial groundwater above the RDX screening level.

The sample results support the conceptual model for RDX by demonstrating the following:

- Concentrations of RDX in alluvial monitoring wells continue to show long-term declines.
- Most alluvial wells in Cañon de Valle are near or below the screening level of 9.66 µg/L, except at CDV-16-02657r. CDV-16-02657r is usually dry, and this is the first sample collected from this location in the monitoring and maintenance program. The RDX concentration in March 2019 displayed a value of 148 µg/L.
- RDX concentrations in water from Burning Ground, SWSC, and Martin Springs as well as PRB alluvial seep (16-61439) are above the 9.66-µg/L screening level.
- Concentration trends for RDX are variable but are generally declining or stable for an extended period of time; however, there is a transient increase in RDX concentrations due to wet conditions in the spring of 2019.
- The current concentrations of RDX detected in the springs suggest the water is recovering from RDX concentrations and is not impacting alluvial groundwater, as concentrations indicate a dramatic decrease away from the source but may influence surface water RDX concentration during unusually wet years.

The sample results are consistent with past RDX concentration results and do not indicate a change to the conceptual site model. In addition, the monitoring and observations support the conclusion that the low-permeability cap and the stabilized surge bed remedies continue to be effective.

4.2 Barium

Barium concentration data records for the Cañon de Valle segments 1 and 2 are presented in Figures 4.2-1 and 4.2-2, respectively. These figures provide a comprehensive review of barium impacts to each segment since the start of the IFGMP program and a comparison of the sample barium results with the existing data trends. A review of these data indicate that the temporal and spatial trends, and conditions in the surface water, alluvial groundwater, and springs, are consistent with conditions described in the CMI remedy report (LANL 2017, 602597); therefore, these conditions are still considered protective of the regional groundwater.

Plate 2 shows the spatial distribution of barium across Cañon de Valle since the completion of the CMI. In general, barium concentrations at each location are detected below the screening level except for samples collected from 16-61439 (PRB alluvial seep), CDV-16-611923, and CDV-16-02659. CDV-16-611937 barium concentrations declined between March 2018 (3470 µg/L) and August 2019

(148 µg/L); however, the barium results support the conclusion that barium levels are declining at each location along the canyon where the barium concentrations exceed the screening level.

In S-Site Canyon, Pajarito Canyon, Water Canyon, and Fishladder Canyon, barium is not detected above the 2000-µg/L screening level, which is consistent with the historical data record as seen in Figure 4.2-3 (S-Site Canyon), Figure 4.2-4 (Pajarito Canyon), Figure 4.2-5 (Water Canyon), and Figure 4.2-6 (Fishladder Canyon).

Based on the sample results and comparison with the existing barium data records, the following observations support the conceptual model:

- Concentrations in springs are less than the 2000-µg/L screening level, except at 16-61439 (PRB alluvial seep).
- Barium concentrations at 16-61439 remain above 2000 µg/L but continue to show long-term decline.
- Barium concentrations in Cañon de Valle show a long-term decline in surface water and alluvial groundwater.
- The other canyons in the long-term monitoring and maintenance plan sampling program are not impacted with barium above the screening level.

As the sample results are consistent with past barium concentration results and the conceptual site model, no change to the conceptual model is indicated by these results. The barium results are congruent with the RDX results and support the finding of the continued effectiveness of the low-permeability cap and the stabilized surge bed.

4.3 Other Analytes Exceeding their Respective Screening Levels

All the compounds monitored as part of the long-term monitoring and maintenance plan sampling program were screened against their respective screening levels. Based on these results, iron, manganese, boron, aluminum, and PCE were identified as compounds exceeding screening levels. Table 2.2-3 presents the analytes exceeding their respective screening levels.

Iron and manganese from the August 2018 sampling event exceeded their respective screening levels from the sample collected at CDV-16-611937. Alluvial groundwater conditions at sample location CVD-16-611937 were reducing in August 2018. In August 2018, the dissolved oxygen concentration was measured at 0.46 mg/L and the ORP was measured at -62.6 mV, indicating reducing conditions. Reducing conditions at CVD-16-611937 in August 2018 are likely due to the lack of fresh water flushing the groundwater at this location.

The samples collected from Cañon de Valle location CVD-16-611937 in August 2018 (CAWA-18-160290) exceeded the iron and manganese screening levels of 1000 µg/L and 200 µg/L, respectively. One reason for these detections is the redox-sensitive nature of these compounds, as localized conditions become more reduced in the alluvial groundwater and the anaerobic bacteria convert iron and manganese into their more reduced (and more soluble) forms. The detection of iron and manganese above their screening levels in the August 2018 sample, therefore, correlates well with the reducing conditions in the alluvial groundwater at this localized location.

The March 2019 sampling results showed all locations sampled contained iron, with a range from 121 µg/L to 4690 µg/L in filtered samples. Iron concentrations exceeded 1000 µg/L in all samples except those collected from CDV-16-02656 (882 µg/L), 16-61439 (808 µg/L), CDV-16-61123 (121 µg/L), and

Cañon de Valle below MDA P (592 µg/L). These results can be explained by the relationship between iron concentration and turbidity. Figure 4.3-1 shows iron concentrations versus turbidity levels measured in the water samples. There is a position correlation between iron concentrations and turbidity levels. The sample preparation for metals requires filtering the water sample. The filtering process includes passing the water through a 0.45-µm glass filter; however, colloidal particles smaller than 0.45 µm, in the range of 0.001 to 0.044 µm, will pass through the filter, carrying iron with them. As shown on Figure 4.3-1, iron concentrations exceed the 1000-µg/L screening level with turbidity levels above 25 nephelometric turbidity units (NTUs). Manganese was detected above its screening level in the sample collected from CDV-16-611937 (2100 µg/L) in August 2018.

In addition to iron, other compounds that exceeded their screening levels include aluminum, boron, and PCE. Boron was detected in the August 2018 sample collected at Martin Spring (1140 µg/L) and the March 2019 sample from MSC-16-06293 (946 µg/L). Elevated concentrations of boron in Martin Spring water are well documented and relate to historical Laboratory releases at TA-16 (LANL 2018, 602963). Aluminum and PCE were both detected in the March 2019 sampling event. Aluminum was detected in the sample from MSC-16-06294 (8770 µg/L), and PCE was detected at 189 µg/L in the sample collected from FLC-16-25280.

4.4 Conclusions

The CMI objectives were to reduce the concentrations of barium and RDX in alluvial groundwater to prevent the migration of these compounds into deeper groundwater. The long-term monitoring and maintenance plan was implemented to (1) monitor the performance of the CMI in terms of these objectives to evaluate the effectiveness of the low-permeability cap and surge-bed grouting in ensuring that infiltrating water does not encounter and mobilize residual RDX in the outfall area and underlying shallow vadose zone and (2) monitor the long-term trend in concentrations of RDX and barium in springs, surface water, and alluvial groundwater to ensure historically declining and/or stable concentrations persist. The 2019 sampling and inspection program has met these objectives.

5.0 RECOMMENDATIONS

Newport News Nuclear BWXT-Los Alamos, LLC (N3B) recommends that the long-term monitoring and maintenance plan be continued through the monitoring year 2020. Sampling and inspection will be continuous to evaluate the effectiveness of the low-permeability cap and surge-bed grouting and monitor the long-term trends in COC (RDX and barium) concentrations. Alluvial groundwater, surface water, and spring water are anticipated to continue showing stable or declining concentrations of RDX and barium. If the data show a significant increase in COC concentrations over time, the conditions in the vicinity of former 260 Outfall will be reassessed to identify the cause and evaluate whether additional corrective action is necessary.

Because of the uncertainty of the March 2019 SWSC Spring RDX sample result, a sample will be collected as soon as practicable to assess if the concentration of RDX in SWSC Spring water is actually elevated and there is an increase in the RDX concentration trend at this location. SWSC Spring was scheduled to be sampled in August 2019, as part of the 2019 IFGMP but the spring was dry. Gage Station 256, just downstream of the SWSC discharge location, will be monitored. If SWSC Spring is discharging water, a sample will be collected and sent to the laboratory for HE analysis. The sample result will be reported to NMED within 30 days after the data has been validated.

Inspections of the low-permeability cap and surge bed will continue on a semiannual basis. If maintenance items are identified, they will be directly addressed and reported in the subsequent annual report.

6.0 REFERENCES AND MAP DATA SOURCES

6.1 References

The following reference list includes documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. This information is also included in text citations. ERIDs were assigned by the Laboratory's Associate Directorate for Environmental Management (IDs through 599999); ESHIDs were assigned by the Laboratory's Associate Directorate for Environment, Safety, and Health (IDs 600000 through 699999); and EMIDs are assigned by N3B (IDs 700000 and above). IDs are used to locate documents in N3B's Records Management System and in the Master Reference Set. The NMED Hazardous Waste Bureau and N3B maintain copies of the Master Reference Set. The set ensures that NMED has the references to review documents. The set is updated when new references are cited in documents.

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LANL (Los Alamos National Laboratory), March 2018. "Compendium of Technical Reports Related to the Deep Groundwater Investigation for the RDX Project at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-18-21326, Los Alamos, New Mexico. (LANL 2018, 602963)

N3B (Newport News Nuclear BWXT-Los Alamos, LLC), May 2018. "Interim Facility-Wide Groundwater Monitoring Plan for the 2019 Monitoring Year, October 2018–September 2019," Newport News Nuclear BWXT-Los Alamos, LLC, document EM2018-0004, Los Alamos, New Mexico. (N3B 2018, 700000)

NMED (New Mexico Environment Department), November 27, 2017. "Approval with Modifications, Remedy Completion Report for Corrective Measures Implementation at Consolidated

Unit 16-021(c)-99," New Mexico Environment Department letter to D. Hintze (DOE-NA-LA) and B. Robinson (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2017, 602758)

Reid, K.D., S.L. Reneau, B.D. Newman, and D.D. Hickmott, August 2005. "Barium and High Explosives in a Semiarid Alluvial System, Cañon de Valle, New Mexico," *Vadose Zone Journal,* Vol. 4, pp. 744–759. (Reid et al. 2005, 093660)

6.2 Map Data Sources

Hillshade; Los Alamos National Laboratory, ER-ES, As published; \\slip\gis\Data\HYP\LiDAR\2014Bare_Earth\BareEarth_DEM_Mosiac.gdb; 2014.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010.

Unpaved road; Los Alamos National Laboratory, ER-ES, As published, GIS projects folder; \\slip\GIS\Projects\14-Projects\14-0062\project_data.gdb; digitized_site_features; digitized_road; 2017.

Paved Road Arcs; Los Alamos National Laboratory, FWO Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010.

Drainage Channel; Los Alamos National Laboratory, ER-ES, As published, GIS projects folder; \\slip\GIS\Projects\11-Projects\11-0108\\gdb\gdb_11-0108_generic.mdb; drainage; 2017.

TA-16 260 Outfall, As Published, GIS project folder: Q:\14-Projects\14-0080\project_data.gdb\ polygon\outfall_260

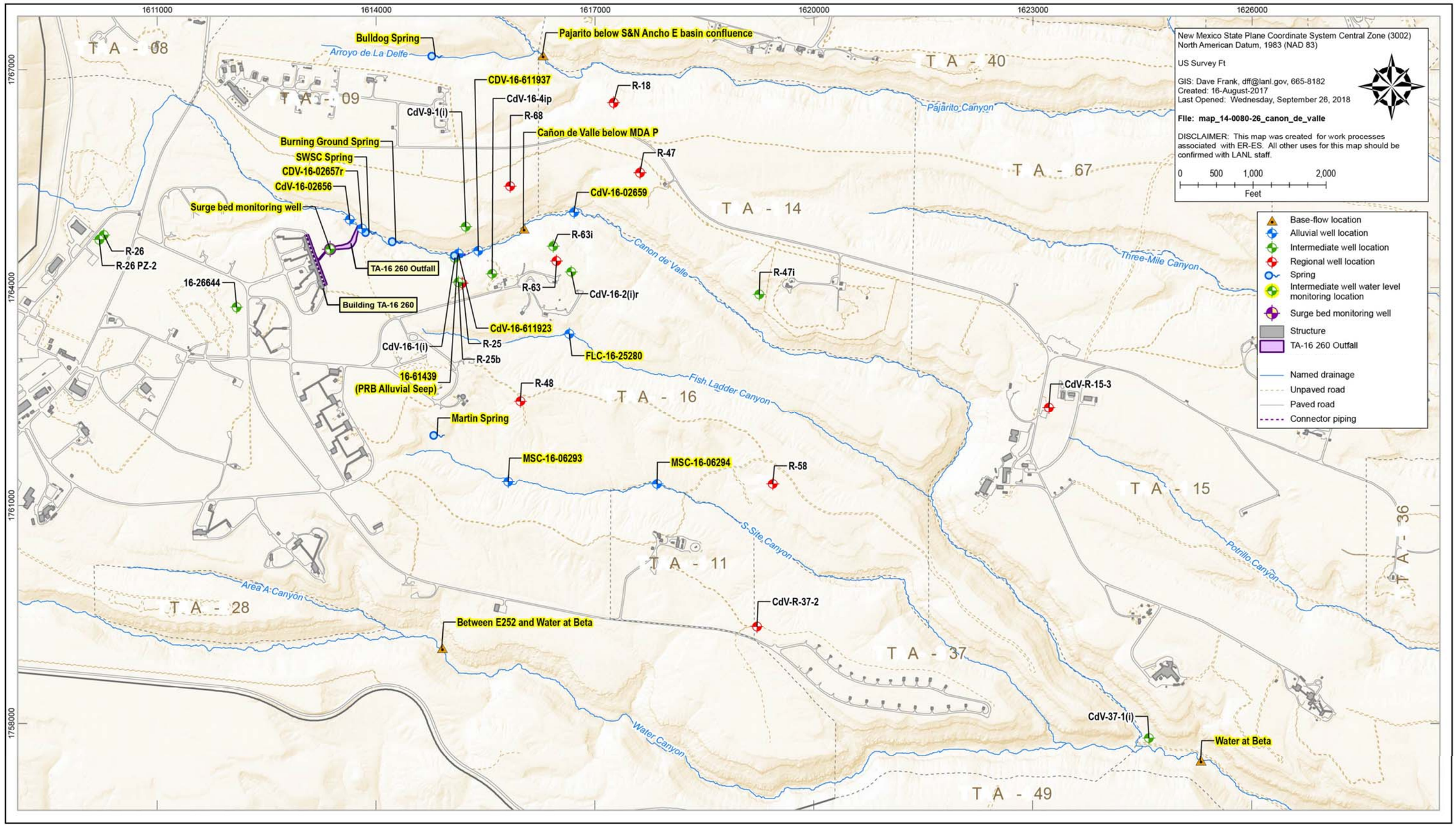
M Wall-PRB, As Published, GIS project folder: Q:\14-Projects\14-0080\project_data.gdb\line\wall_PRB

Connector piping, As Published, GIS project folder: Q:\14-Projects\14-0080\project_data.gdb\line\connector_piping

Tech areas; Los Alamos National Laboratory, Database Connections\GIS.PUB.PRD1.sde\PUB.Boundaries\PUB.tecareas

Tech Areas line; Los Alamos National Laboratory, Database Connections\GIS.PUB.PRD1.sde\PUB.Boundaries\PUB.tecareas_line

PUB.prs_all_reg_admin; Los Alamos National Laboratory, Database Connections\GIS.PUB.PRD1.sde\PUB.Regulatory\PUB.prs_all_reg_admin



Note: Yellow highlights indicate locations of interest in this report.

Figure 1.0-1 Long-Term Monitoring and Maintenance Plan locations

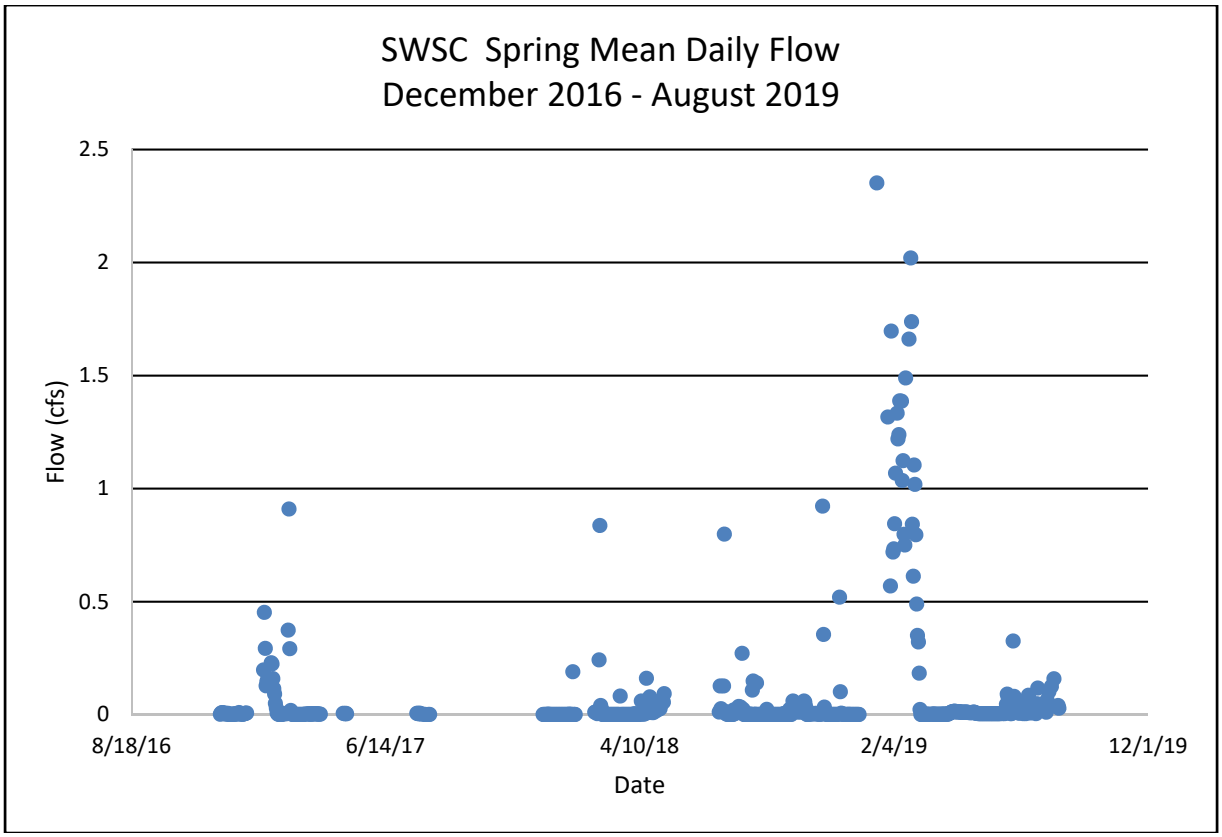


Figure 1.2-1 Hydrograph showing the Mean Daily Flow of SWSC Spring

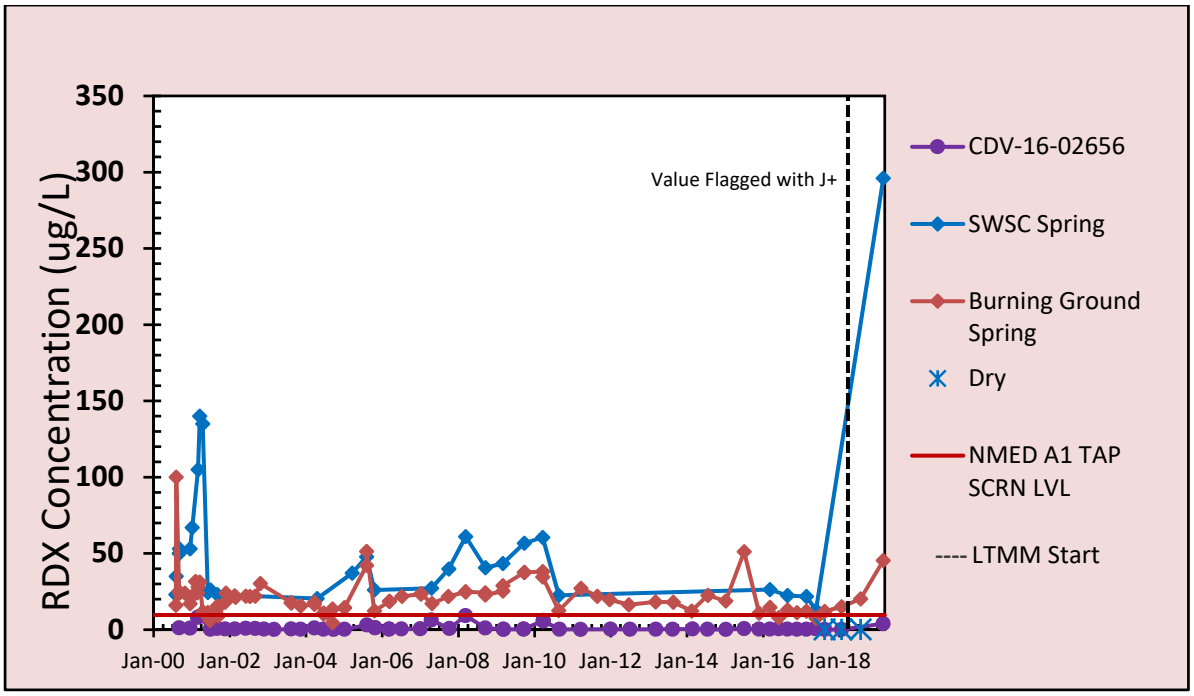


Figure 4.1-1 Cañon de Valle segment 1 RDX data record

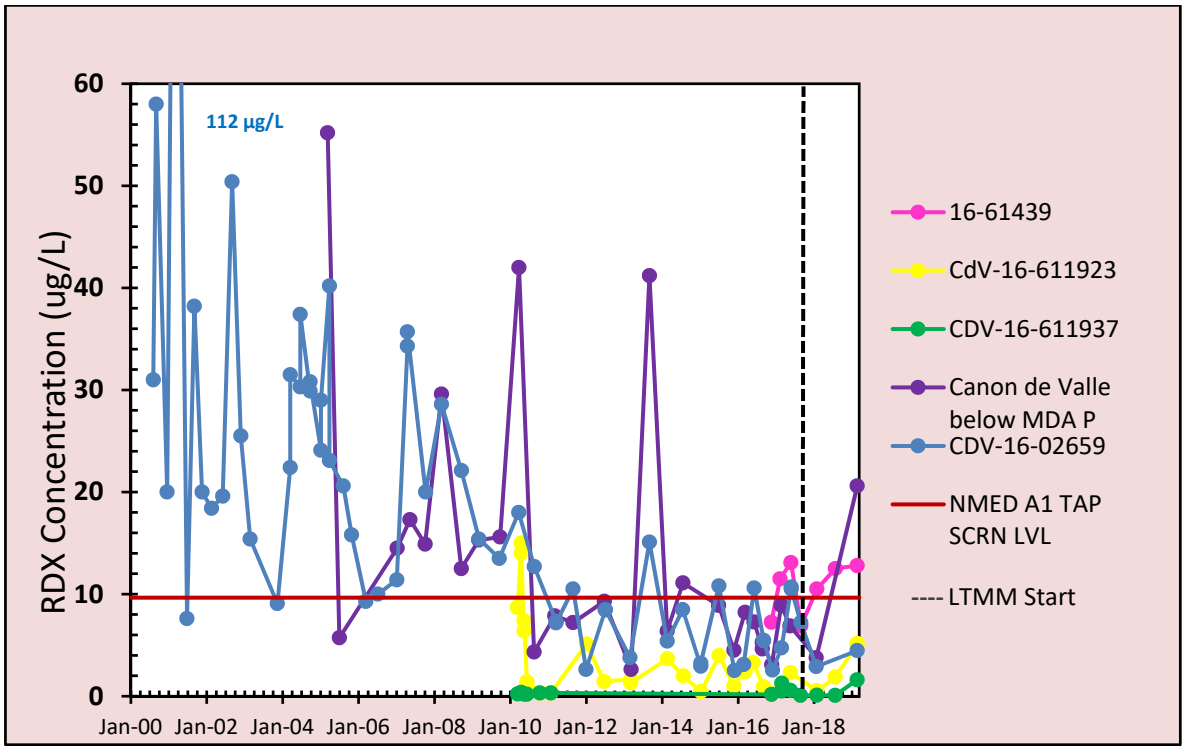


Figure 4.1-2 Cañon de Valle segment 2 RDX data record

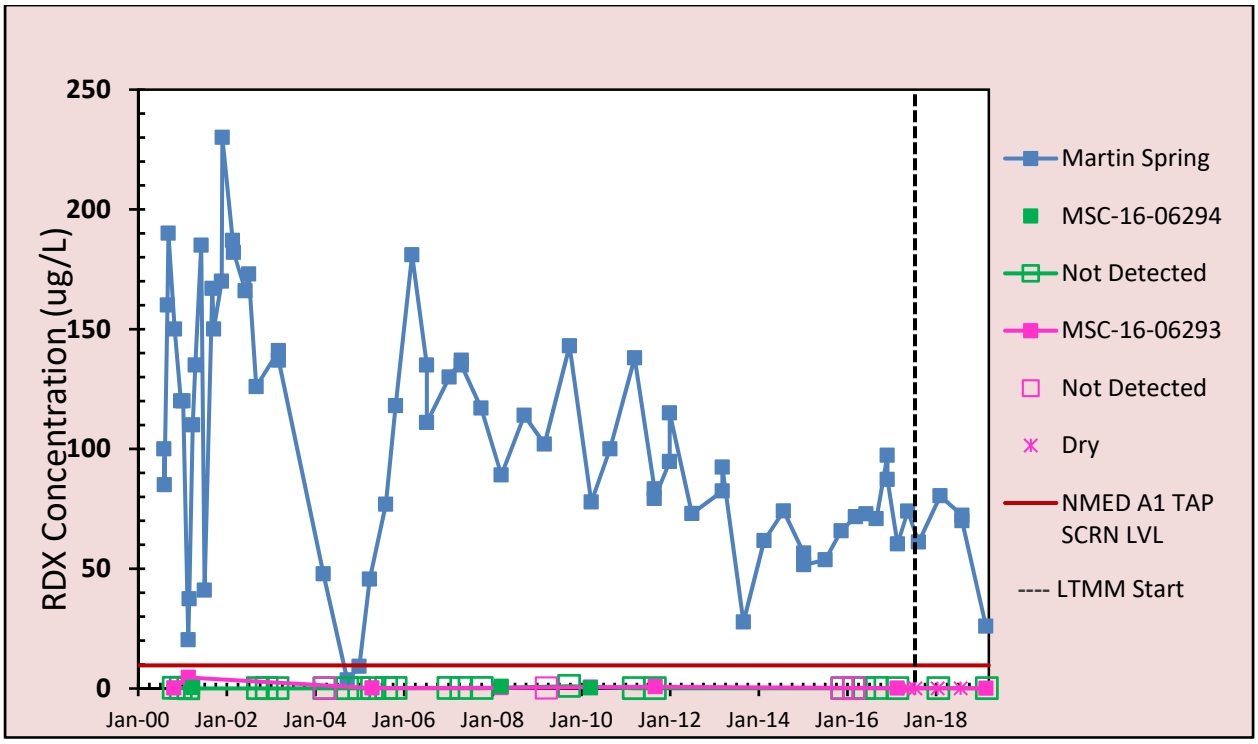


Figure 4.1-3 S-Site Canyon RDX data record

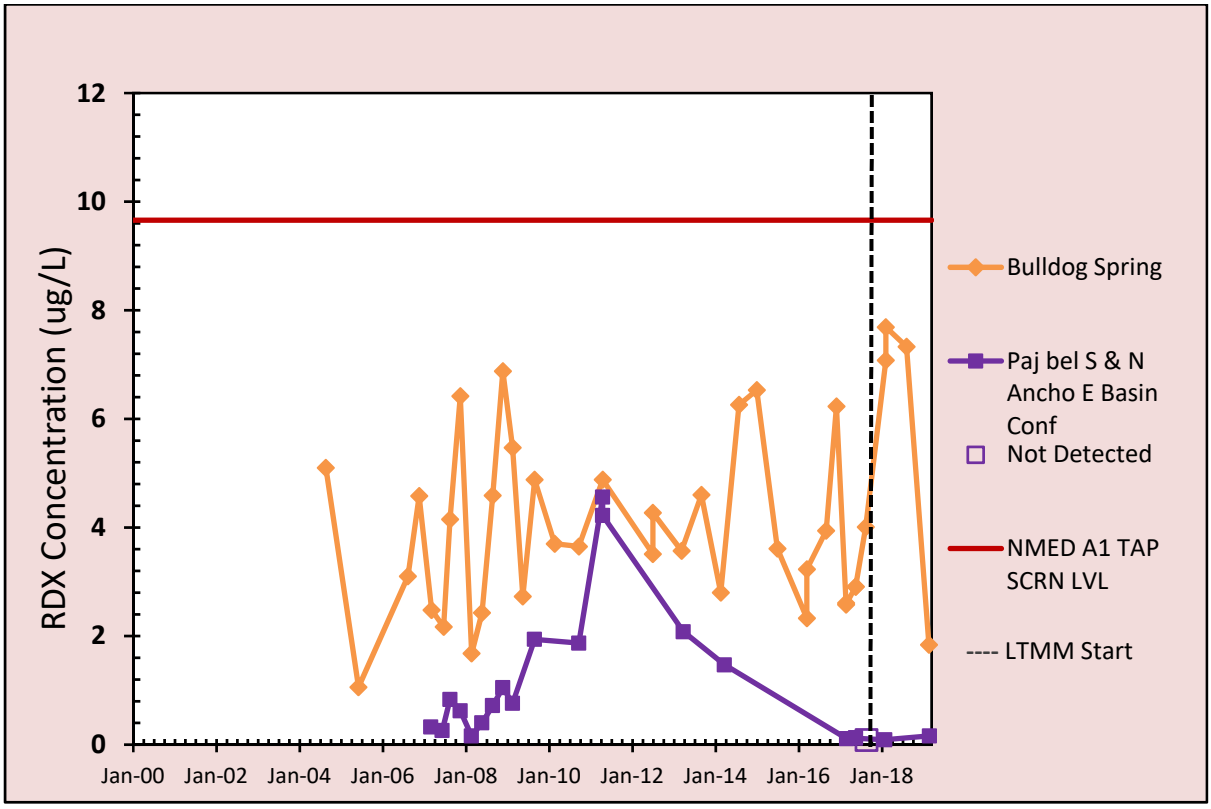


Figure 4.1-4 Pajarito Canyon RDX data record

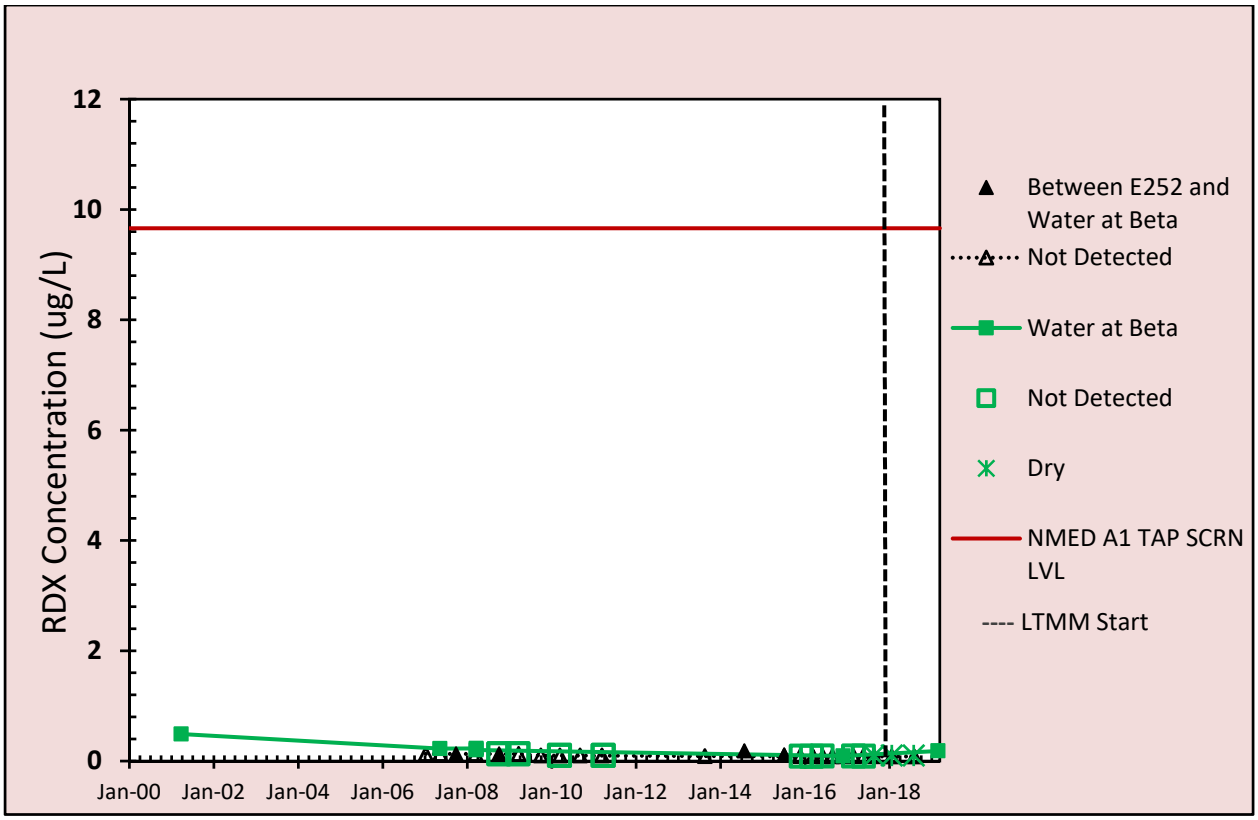


Figure 4.1-5 Water Canyon RDX data record

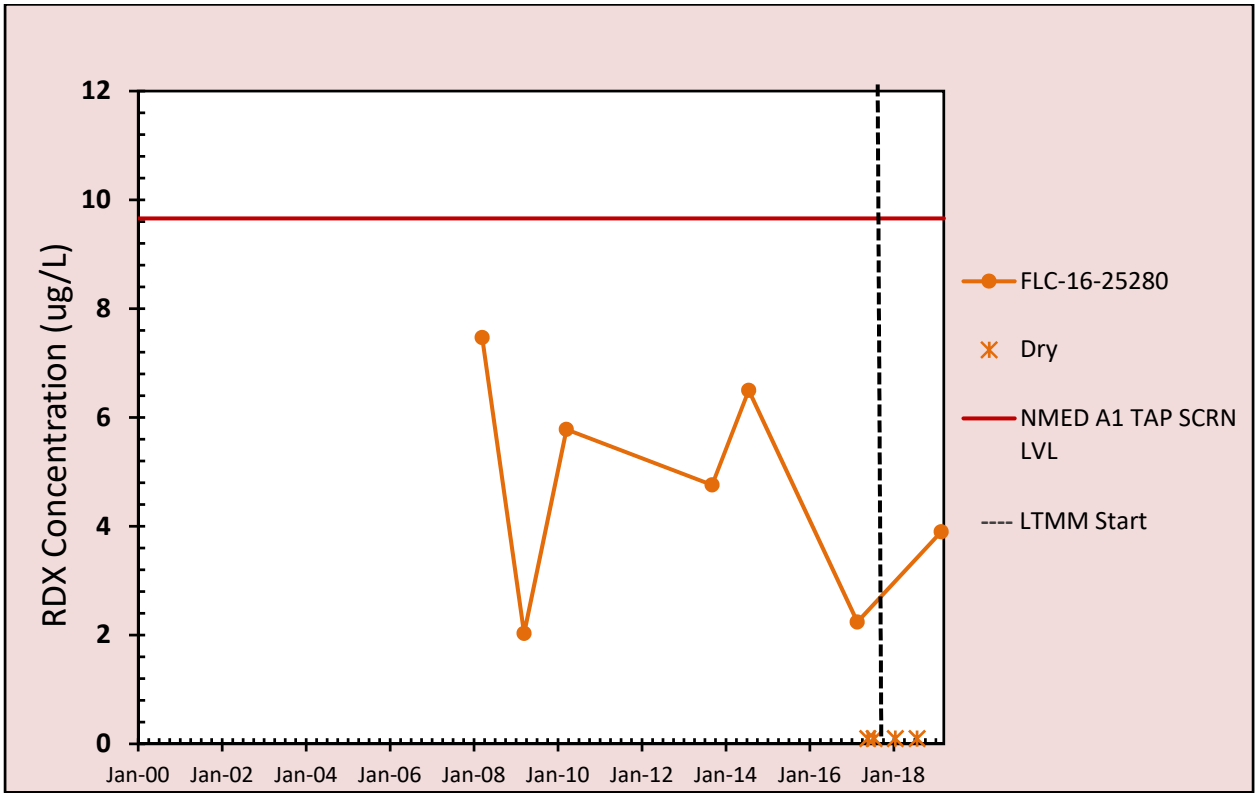


Figure 4.1-6 Fishladder Canyon RDX data record

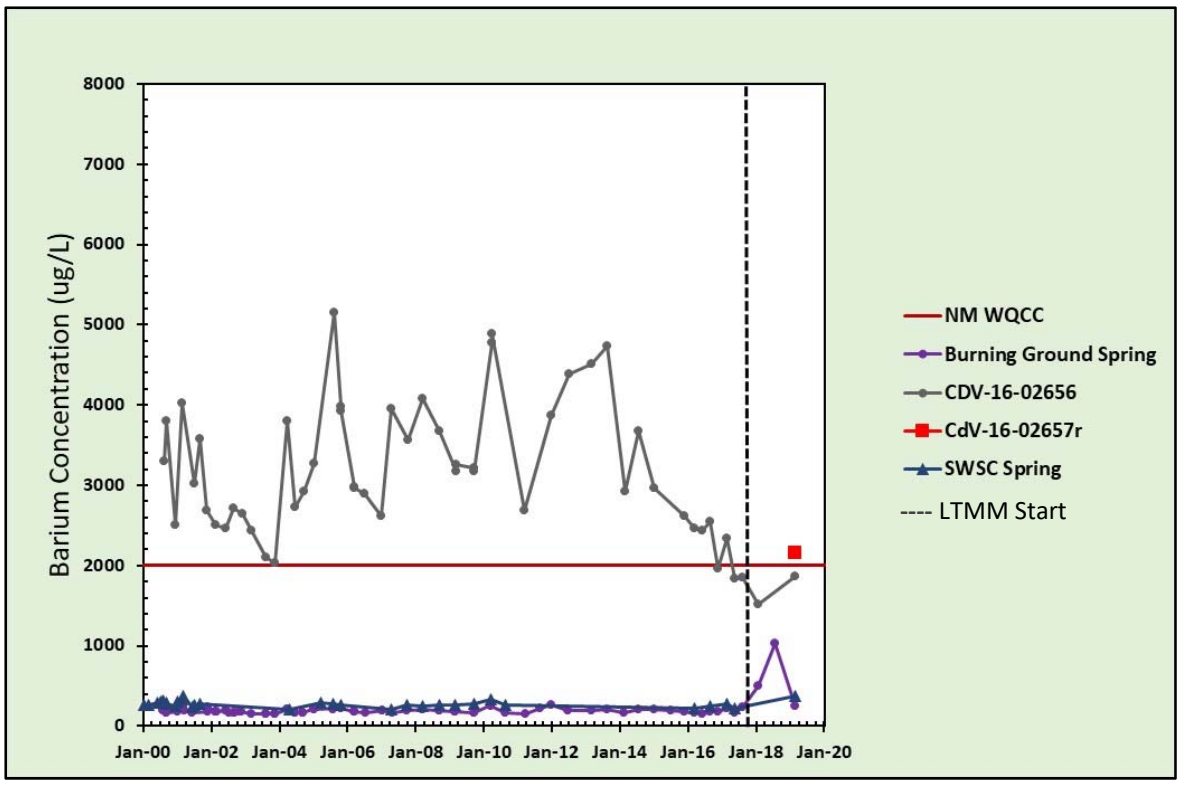


Figure 4.2-1 Cañon de Valle segment 1 barium data record

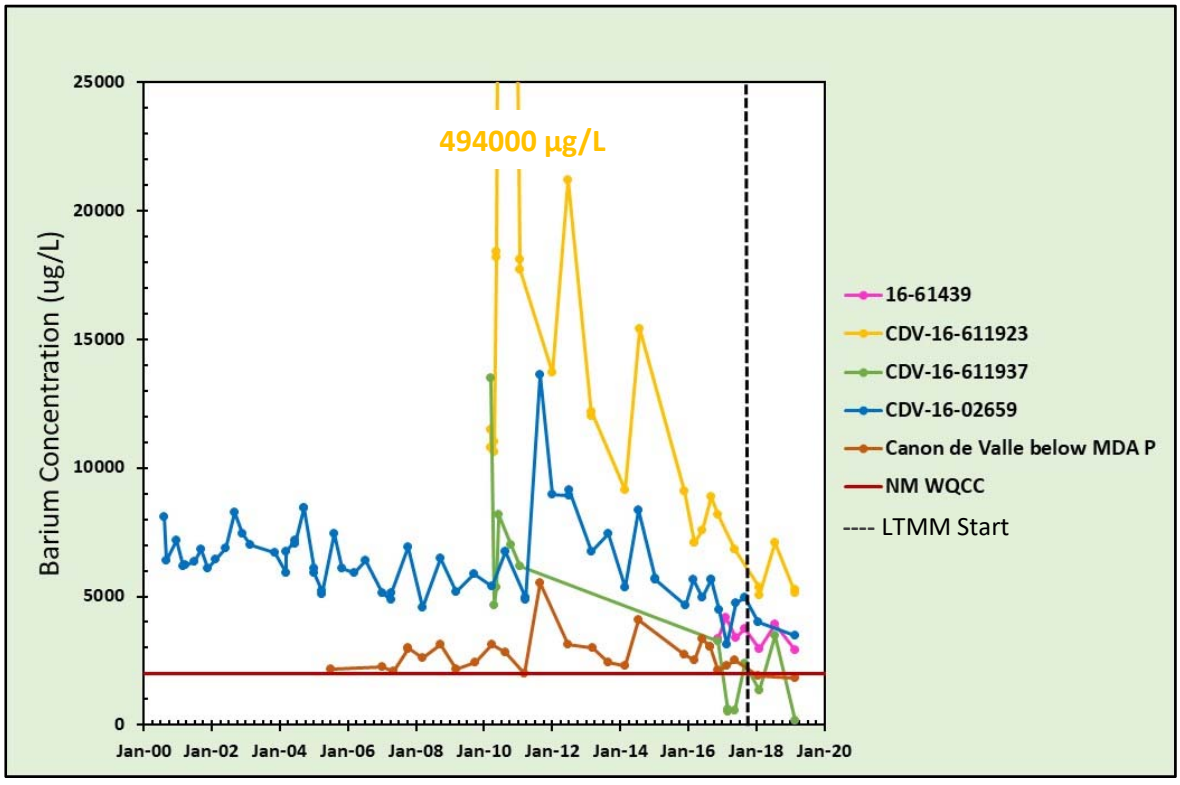


Figure 4.2-2 Cañon de Valle segment 2 barium data record

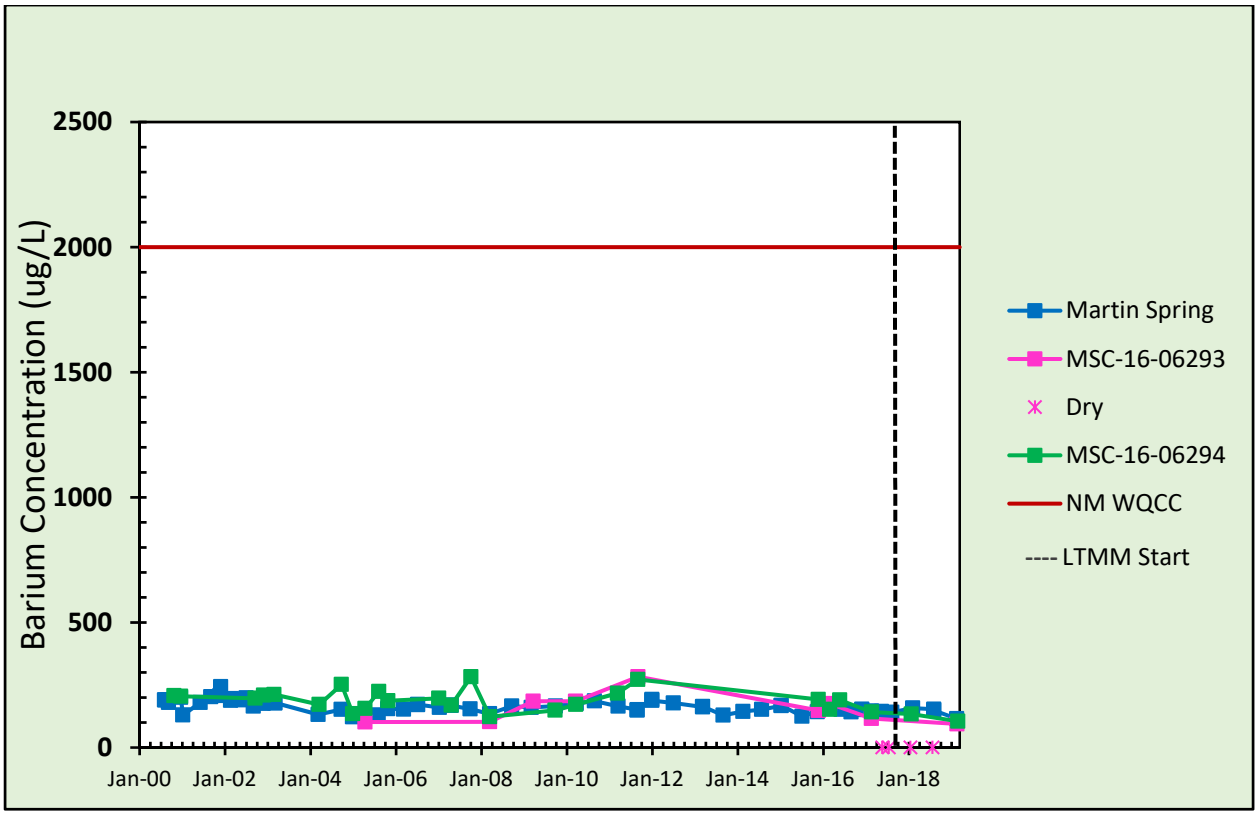


Figure 4.2-3 S-Site Canyon barium data record

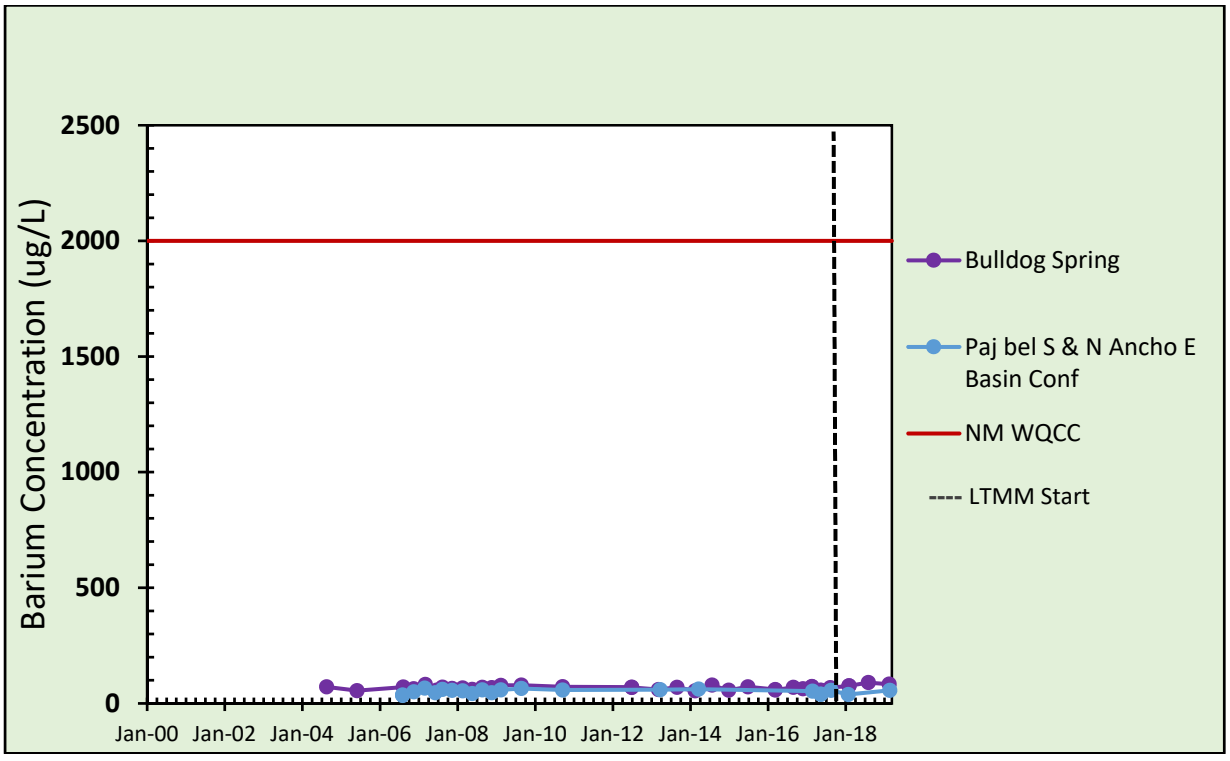


Figure 4.2-4 Pajarito Canyon barium data record

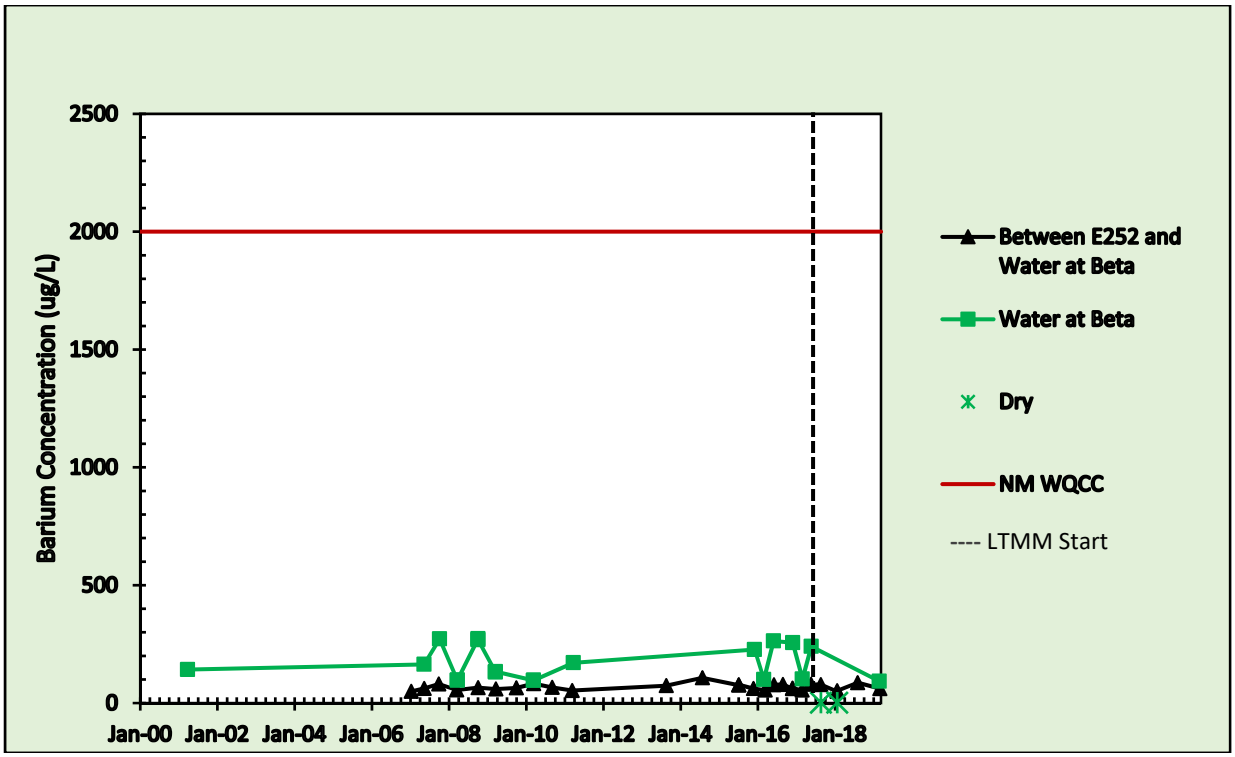


Figure 4.2-5 Water Canyon barium data record

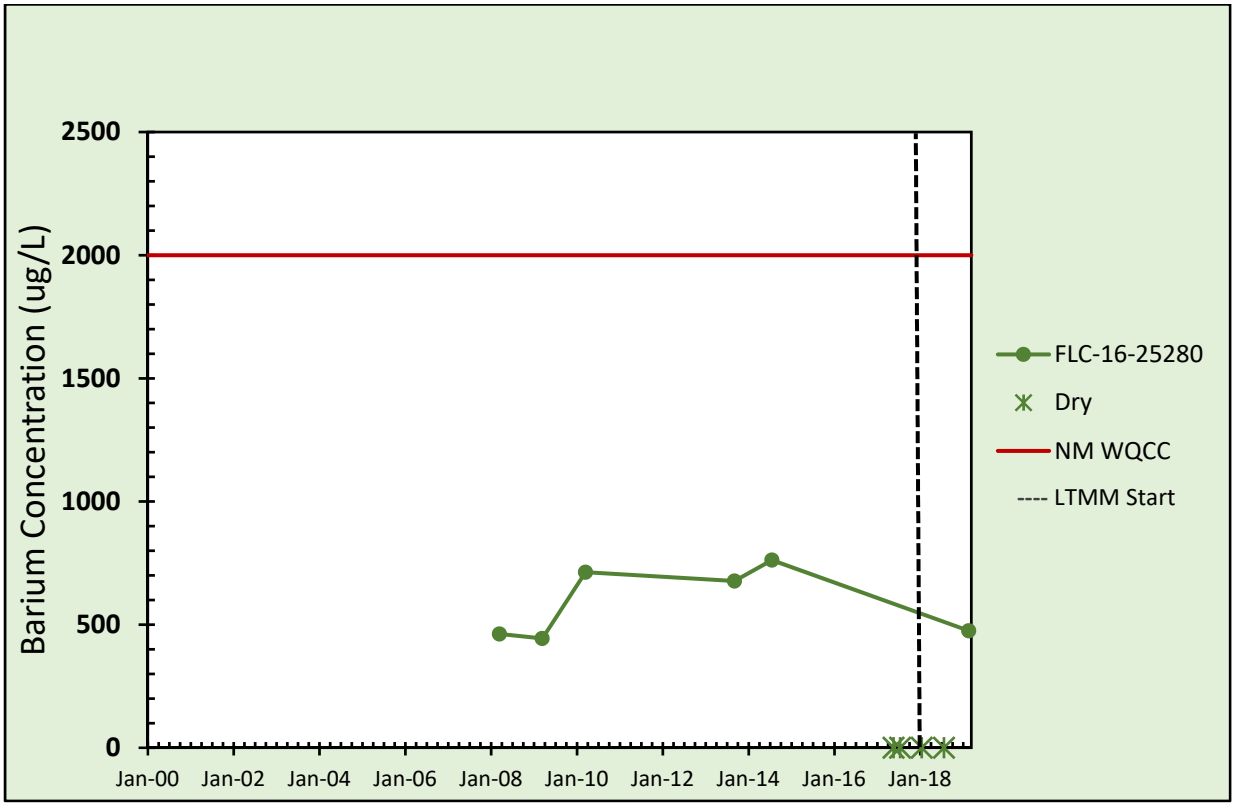


Figure 4.2-6 Fishladder Canyon barium data record

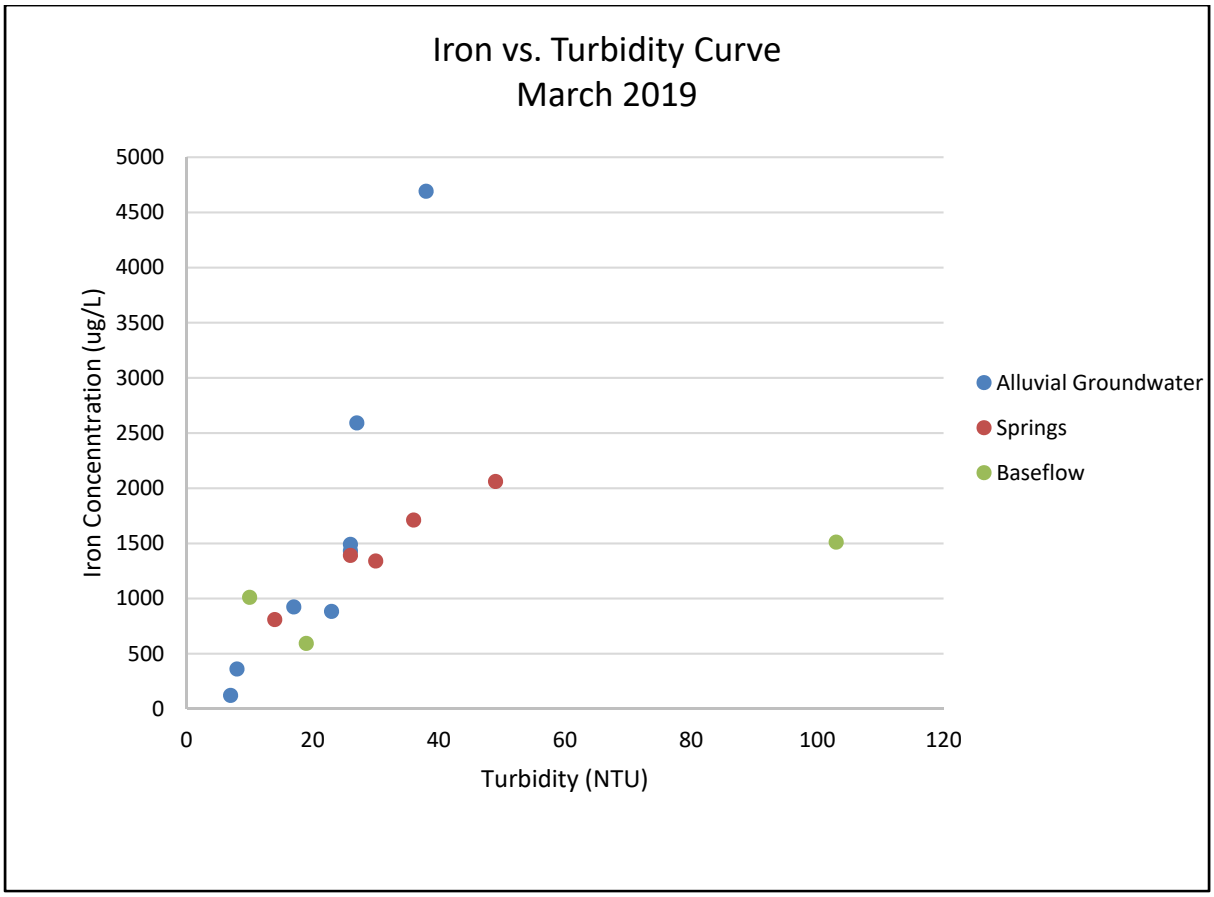


Figure 4.3-1 Iron concentration verses turbidity levels measured in water samples

Table 2.1-1
2019 Monitoring Locations and Analytes

Canyon	Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	HEXMOD	Radionuclides	Low-Level Tritium	General Inorganics	$^{15}N/^{18}O$ Isotopes in Nitrate
Cañon de Valle 1	CDV-16-02656	Alluvial	S[a]	S	B[b]	S	B	NM[c]	S	NM
	CDV-16-02657r	Alluvial	S	S	B	S	B	NM	S	NM
	SWSC Spring	Spring	S	S	B	S	B	NM	S	A[d]
	Burning Ground Spring	Spring	S	S	B	S	B	A	S	A
Cañon de Valle 2	16-61439 (PRB Alluvial Seep)	Spring	S	S	B	S	B	NM	S	NM
	CDV-16-611923	Alluvial	S	S	B	S	B	NM	S	NM
	CDV-16-611937	Alluvial	S	S	B	S	B	NM	S	NM
	Cañon de Valle below MDA P	Base flow	S	S	B	S	B	NM	S	NM
	CDV-16-02659	Alluvial	S	S	B	S	B	NM	S	NM
S-Site Canyon	Martin Spring	Spring	S	S	B	S	B	A	S	A
	MSC-16-06293	Alluvial	S	S	B	S	B	NM	S	NM
	MSC-16-06294	Alluvial	S	S	B	S	B	NM	S	NM
Pajarito Canyon	Bulldog Spring	Spring	S	S	B	S	B	NM	S	A
	Pajarito below S-N Ancho E Basin Confluence	Base flow	S	S	B	S	B	NM	S	NM
Water Canyon	Between E252 and Water at Beta	Baseflow	S	S	B	S	B	NM	S	NM
	Water at Beta	Base flow	S	S	B	S	B	NM	S	NM
Fishladder Canyon	FLC-16-25280	Alluvial	S	S	B	S	B	NM	S	NM
n/a[e]	Surge Bed Monitor Well	Surge Bed (Intermediate)	S	S	S	S	NM	NM	S	NM

[a] S = Semiannual (two times per year).

[b] B = Biennial (one time per 2 years).

[c] NM = Not measured. This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

[d] A = Annual.

[e] n/a = Not applicable.

Table 2.1-2
Long-Term Monitoring and Maintenance Plan Sampling Program Field Parameters

Watershed	Location	Date	Screen Top Depth (ft)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	pH (SU[a])	Specific Conductance (µS/cm)	Temperature (deg C)	Turbidity (NTU)	Comments
Cañon de Valle 1	CDV-16-02656	08/11/2018	3	NS[b]	NS	NS	NS	NS	NS	Insufficient water for sampling
		03/16/2019	3	4.69	161.5	6.54	281.2	6.5	22.97	
	CDV-16-02657r	08/11/2018	1.35	NS	NS	NS	NS	NS	NS	Location dry
		03/18/2019	1.35	7.13	203	6.63	218.1	3.6	25.92	
	SWSC Spring	08/11/2018	n/a[c]	NS	NS	NS	NS	NS	NS	Location dry
		03/16/2019	n/a	8.11	30.12	6.95	264.2	8.8	8.11	
	Burning Ground Spring	08/11/2018	n/a	8.32	NM[d]	7.22	249.2	11.4	3.8	
		03/16/2019	n/a	8.21	NM	7.28	260.4	9.7	26.14	
Cañon de Valle 2	16-61439 (PRB Alluvial Seep)	08/13/2018	n/a	7.48	9.8	7.11	258.7	13.1	9.8	
		03/11/2019	n/a	9.11	14	7.23	275.5	5	14	
	CDV-16-611923	08/11/2018	3.2	1.69	247.2	6.36	287.7	14.2	16.9	
		03/11/2019	3.2	6.87	208.8	6.6	347	3.7	7.05	
	CDV-16-611937	08/11/2018	3	0.46	-62.6	6.62	248.4	11.5	6.70*	
		03/11/2019	3	2.3	178.2	5.34	269.9	3	17.34	
	Cañon de Valle below MDA P	08/10/2018	n/a	NS	NS	NS	NS	NS	NS	Location dry
		03/11/2019	n/a	9.73	NM	7.72	235.5	3.9	18.66	
	CDV-16-02659	08/10/2018	1.7	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
		03/11/2019	1.7	6.53	202.2	6.73	248.7	3.6	7.62	

Table 2.1-2 (continued)

Watershed	Location	Date	Screen Top Depth (ft)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	pH (SU[a])	Specific Conductance (µS/cm)	Temperature (deg C)	Turbidity (NTU)	Comments
S-Site Canyon	Martin Spring	08/22/2018	n/a	7.42	NM	7.4	332.3	12.6	8.7	
		03/06/2019	n/a	7.31	NM	7.18	256.1	10.4	49.3	
	MSC-16-06293	08/10/2018	2	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
		03/08/2019	2	6.01	218	7.02	461.6	4.8	25.58	
	MSC-16-06294	08/10/2018	2.5	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
		03/15/2019	2.5	2.52	161.6	6.49	116.4	3.1	76.57	
Pajarito Canyon	Bulldog Spring	08/22/2018	n/a	8.32	NM	7.66	361.5	12.1	12.3	
		03/6/2019	n/a	8.29	NM	7.6	285.1	10	36.1	
	Pajarito below S-N Ancho E Basin Confluence	08/14/2018	n/a	NS	NS	NS	NS	NS	NS	Location dry
		03/12/2019	n/a	9.37	NM	7.44	200	6.2	103	
Water Canyon	Between E252 and Water at Beta	08/21/2018	n/a	7.21	NM	8.21	197.6	22.2	5.9	
		03/19/2019	n/a	9.75	NM	7.81	181.5	5.8	9.75	
	Water at Beta	08/17/2018	n/a	NS	NS	NS	NS	NS	NS	Location dry
		03/15/2019	n/a	10.1	NM	7.91	171.6	3.5	20.56	
Fishladder Canyon	FLC-16-25280	08/10/2018	2	NS	NS	NS	NS	NS	NS	Location dry
		03/08/2019	2	5.5	212	5.68	174.9	3	26.81	

[a] SU = Standard unit.

[b] NS = Not sampled.

[c] n/a = Not applicable.

[d] NM = Not measured. This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

Table 2.2-1
RDX Concentrations in Groundwater, Surface Water, and Springs

Canyon	Location	Sample	Depth to Top of Screen (ft)	Date	Field Prep	Field QC[a] Type	Result (µg/L)	NMED Screening Levels[b]	Comments
Cañon de Valle 1	CDV-16-02656	NS[c]	3	08/11/2018	NS	NS	NS	9.66	
		CAWA-19-167542	3	03/16/2019	UF[d]	REG[e]	3.93	9.66	
	CDV-16-02657r	NS	1.35	08/11/2018	NS	NS	NS	9.66	Location dry
		CAWA-19-167545	1.35	03/16/2019	UF	REG	148	9.66	
	SWSC Spring	NS	n/a[f]	08/11/2018	NS	NS	NS	9.66	Location dry
		CAWA-19-167501	n/a	03/16/2019	UF	REG	296 J+[g]	9.66	Result is undergoing validation.
	Burning Ground Spring	CAWA-18-160246	n/a	08/11/2018	UF	REG	20.2	9.66	
		CAWA-19-167527	n/a	03/16/2019	UF	REG	45.4	9.66	
Cañon de Valle 2	16-61439 (PRB Alluvial Seep)	CAWA-18-160254	n/a	08/13/2018	UF	REG	12.5	9.66	
		CAWA-19-167536	n/a	03/11/2019	UF	REG	12.8	9.66	
	CDV-16-611923	CAWA-18-160282	3.2	08/11/2018	UF	REG	1.87	9.66	
		CAWA-19-167551	3.2	03/11/2019	UF	REG	5.13	9.66	
		CAWA-19-167731	3.2	03/11/2019	UF	FD[h]	5.16	9.66	
	CDV-16-611937	CAWA-18-160291	3	08/11/2018	UF	REG	ND[i] (0.086)	9.66	
		CAWA-19-167561	3	03/11/2019	UF	REG	1.61	9.66	
	Cañon de Valle below MDA P	NS	n/a	08/10/2018	NS	NS	NS	9.66	Location dry
		CAWA-19-167398	n/a	03/11/2019	UF	REG	20.6	9.66	
	CDV-16-02659	NS	1.7	08/10/2018	NS	NS	NS	9.66	Insufficient water for sampling
		CAWA-19-167548	1.7	03/11/2019	UF	REG	4.47	9.66	
S-Site Canyon	Martin Spring	CAWA-18-160249	n/a	08/22/2018	UF	REG	72.3	9.66	
		CAWA-18-160252	n/a	08/22/2018	UF	FD	70	9.66	
		CAWA-19-167532	n/a	03/06/2019	UF	REG	26	9.66	

Table 2.2-1 (continued)

Canyon	Location	Sample	Depth to Top of Screen (ft)	Date	Field Prep	Field QC[a] Type	Result (µg/L)	NMED Screening Level[b]	Comments
S-Site Canyon (cont.)	MSC-16-06293	NS	2	08/10/2018	NS	NS	NS	9.66	Insufficient water for sampling
		CAWA-19-167554	2	03/08/2019	UF	REG	0.0978 J[j]	9.66	
	MSC-16-06294	NS	2.5	08/10/2018	NS	NS	NS	9.66	Insufficient water for sampling
		CAWA-19-167558	2.5	03/15/2019	UF	REG	ND (0.092)	9.66	
Pajarito Canyon	Bulldog Spring	CAPA-18-160407	n/a	08/22/2018	UF	REG	7.33	9.66	
		CAPA-19-167673	n/a	03/06/2019	UF	REG	1.84	9.66	
	Pajarito below S&N Ancho E Basin Confluence	NS	n/a	8/14/2018	NS	NS	NS	9.66	Location dry
		CAPA-19-167670	n/a	03/12/2019	UF	REG	0.161 J	9.66	
Water Canyon	Between E252 and Water at Beta	CAWA-18-160226	n/a	08/21/2018	UF	REG	ND (0.0833)	9.66	
		CAWA-19-167497	n/a	3/15/2019	UF	REG	0.184 J	9.66	
	Water at Beta	NS	n/a	08/17/2018	NS	NS	NS	9.66	Location dry
		CAWA-19-167497	n/a	03/15/2019	UF	REG	0.184 J	9.66	
Fishladder Canyon	FLC-16-25280	NS	2	08/10/2018	NS	NS	NS	9.66	Location dry
		CAWA-19-167539	2	03/08/2019	UF	REG	3.9	9.66	

Note: (0.087) = Method detection limit.

[a] QC = Quality control.

[b] NMED Tap Water Screening Levels specified in the June 2019 Table A-1 of "Risk Assessment Guidance for Site Investigations and Remediation."

[c] NS = Not sampled.

[d] UF = Unfiltered sample.

[e] REG = Regular.

[f] n/a = Not applicable.

[g] J+= Higher estimated value.

[h] FD = Field duplicate.

[i] ND = Not detected.

[j] J = Estimated value.

Table 2.2-2
Barium Concentrations in Groundwater, Surface Water, and Springs

Canyon	Location	Sample	Depth to Top of Screen (ft)	Date	Field Prep	Field QC Type[a]	Result (µg/L)	Screening Level[b]	Comments
Cañon de Valle 1	CDV-16-02656	NS[c]	3	NS	NS	NS	NS	2000	Insufficient water for sampling
		CAWA-19-167541	3	03/16/2019	F[d]	REG[e]	1870	2000	
	CDV-16-02657r	NS	1.35	08/11/2018	NS	NS	NS	2000	Location dry
		CAWA-19-167544	1.35	03/16/2019	F	REG	2160	2000	
	SWSC Spring	NS	n/a[f]	08/11/2018	NS	NS	NS	2000	Location dry
		CAWA-19-167729	n/a	03/16/2019	F	REG	381	2000	
	Burning Ground Spring	CAWA-18-160245	n/a	08/11/2018	F	REG	1030	2000	
		CAWA-19-167526	n/a	03/16/2019	F	REG	248	2000	
Cañon de Valle 2	16-61439 (PRB Alluvial Seep)	CAWA-18-160253	n/a	08/13/2018	F	REG	3930	2000	
		CAWA-19-167535	n/a	03/11/2019	F	REG	2900	2000	
	CDV-16-611923	CAWA-18-160281	3.2	08/11/2018	F	REG	7080	2000	
		CAWA-19-167550	3.2	03/11/2019	F	REG	5130	2000	
		CAWA-19-167730	3.2	03/11/2019	F	FD[g]	5280	2000	
	CDV-16-611937	CAWA-18-160290	3	08/11/2018	F	REG	3470	2000	
		CAWA-19-167560	3	03/11/2019	F	REG	148	2000	
	Cañon de Valle below MDA P	NS	n/a	08/10/2018	NS	NS	NS	2000	Location Dry
		CAWA-19-167397	n/a	03/11/2019	F	REG	1840	2000	
	CDV-16-02659	NS	1.7	08/10/2018	NS	NS	NS	2000	Insufficient water for sampling
		CAWA-19-167547	1.7	03/11/2019	F	REG	3460	2000	
S-Site Canyon	Martin Spring	CAWA-18-160248	n/a	08/22/2018	F	REG	153	2000	
		CAWA-18-160251	n/a	08/22/2018	F	FD	149	2000	
		CAWA-19-167531	n/a	03/06/2019	F	REG	115	2000	
	MSC-16-06293	NS	2	08/10/2018	NS	NS	NS	2000	Insufficient water for sampling
		CAWA-19-167553	2	03/08/2019	F	REG	94.1	2000	
	MSC-16-06294	NS	2.5	08/10/2018	NS	NS	NS	2000	Insufficient water for sampling
		CAWA-19-167557	2.5	03/15/2019	F	REG	105	2000	

Table 2.2-2 (continued)

Canyon	Location	Sample	Depth to Top of Screen (ft)	Date	Field Prep	Field QC[a] Type	Result (µg/L)	Screening Level[b]	Comments
Pajarito Canyon	Bulldog Spring	CAPA-18-160406	n/a	08/22/2018	F	REG	90	2000	
		CAPA-19-167672	n/a	03/06/2019	F	REG	82.9	2000	
	Pajarito below S&N Ancho E Basin Confluence	NS	n/a	08/14/2018	NS	NS	NS	2000	Location dry
		CAPA-19-167669	n/a	03/12/2019	F	REG	56.4	2000	
Water Canyon	Between E252 and Water at Beta	CAWA-18-160225	n/a	08/21/2018	F	REG	86.2	2000	
		CAWA-19-167493	n/a	03/19/2019	F	REG	61.1	2000	
	Water at Beta	NS	n/a	08/17/2018	NS	NS	NS	2000	Location dry
		CAWA-19-167496	n/a	03/15/2019	F	REG	92.4	2000	
Fishladder Canyon	FLC-16-25280	NS	2	08/10/2018	NS	NS	NS	2000	Location dry
		NS	2	03/08/2019	F	REG	475	2000	

[a] QC = Quality control.

[b] New Mexico Water Quality Control Commission Groundwater Standards.

[c] NS = Not sampled.

[d] F = Filtered sample.

[e] REG = Regular.

[f] n/a = Not applicable.

[g] FD = Field duplicate.

Table 2.2-3
Analytes Exceeding Screening Levels

Canyon	Location	Sample	Depth to Top of Screen (ft)	Date	Field QC[a] Type	Analyte	Result (µg/L)	Screening Level[b]	Field Prep Code
Cañon de Valle 1	CdV-16-02657r	CAWA-19-167544	1.35	03/16/2019	REG[c]	Iron	1430	1000	F[d]
	SWSC Spring	CAWA-19-167729	n/a[e]	03/16/2019	REG	Iron	1340	1000	F
	Burning Ground Spring	CAWA-19-167526	n/a	03/16/2019	REG	Iron	1390	1000	F
Cañon de Valle 2	CDV-16-611937	CAWA-18-160290	3.0	08/11/2018	REG	Iron	9480	1000	F
	CDV-16-611937	CAWA-18-160290	3.0	08/11/2018	REG	Manganese	2100	200	F
	CDV-16-611937	CAWA-19-167560	3.0	03/11/2019	REG	Manganese	323	200	F
Fish Ladder Canyon	FLC-16-25280	CAWA-19-167538	2.6	03/08/2019	REG	Tetrachloroethene	189	5	UF
	FLC-16-25280	CAWA-19-167538	2.6	03/08/2019	REG	Iron	2590	1000	F
S-Site Canyon	Martin Spring	CAWA-18-160248	n/a	08/22/2018	REG	Boron	1140	750	F
	Martin Spring	CAWA-19-167531	n/a	03/06/2019	REG	Iron	2060	1000	F
	MSC-16-06293	CAWA-19-167553	2.0	03/08/2019	REG	Boron	946	750	F
	MSC-16-06293	CAWA-19-167553	2.0	03/08/2019	REG	Iron	1490	1000	F
	MSC-16-06294	CAWA-19-167557	2.0	03/08/2019	REG	Aluminum	8770	750	F
	MSC-16-06294	CAWA-19-167557	2.5	03/15/2019	REG	Iron	4670	1000	F
Pajarito Canyon	Bulldog Spring	CAPA-19-167672	n/a	03/06/2019	REG	Iron	1710	1000	F
	Paj bel S-N Anch E Basin conf	CAPA-19-167669	n/a	03/12/2019	REG	Iron	1510	1000	F
Water Canyon	Water at Beta	CAWA-19-167496	n/a	03/15/2019	REG	Iron	1010	1000	F

[a] QC = Quality control.

[b] New Mexico Water Quality Control Commission Groundwater Standards.

[c] REG = Regular.

[d] F = Filtered.

[e] n/a = Not applicable.

Appendix A

Field Forms Associated with Sample Collection

August/September 2018 Field Forms

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8/21/18 Between E252 and Water @ Beta

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos National Laboratory

Spring/Surface Water Sampling Field Data Sheet

Site name: Between E252 & Water@Beta **Date:** **Onsite time:** 1045 DST

Objective: Sample per applicable docs on pg. 3 **Weather:** Partly Cloudy w/ temps in 70's

Sampling crew: T. Bonham, D. Jaramillo & A. Stanfield

Two-minute safety drill: Hiking Bear activity & Hydration + PI

Meters calibrated at (location) SMO **by** (whom) D. Jaramillo **at** (time) 0730

YSI Meter number: 70 **Turbidimeter serial number:** NA

Sample Retrieval **Date:** 8/21/2018 **Time:** 1050 **Method:** DP

Sample Event ID: 11923 **Sample ID Numbers:** CAWA-18-160226, 160225, 160227 & 160968

FIELD PARAMETERS

pH (su): 8.21	Sp. Cond. (µS/cm): 197.6	Turbidity (NTU): 5.9
Temperature (°C): 22.2	DO (mg/L): 7.21	Q (gpm): 4.49

Explanation of Q method, including calculations: 3" Modified Parshall Flume
GHT=0.05' = 0.010 CFS x 448.83 = 4.49 GPM

Contact waste: 1/2 gal

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type:	Spring		(Baseflow) (persistent flow)		
Sample location:	(Bank)	Wading	Station Gage: at / above / below		
	Midstream natural feature	Other (specify):			
Description of Sampling Site:	Pool	(Riffle)	Eddy	Diffuse	Other
	Written description: NA				
Substrate:	(Bedrock)	Concrete	(Cobble)	(Gravel)	(Sand) Mud
Stage Conditions:	Stable: (normal) / low / high	Falling	Rising	Other (specify):	
Hydraulic Event:	(Routine)	Snowmelt	Flood	Drought	Other (specify):
Stream Color:	Brown	(Clear) Green	Blue	Gray	Other (specify):
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other
	Written description: NA				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA		Units: NA	
GPS point #2:	Name:	Coordinates:		Units:	
Photo #1:	Description:	Facing:	Time: NA	Taken by:	
Photo #2:	Description:	Facing:	Time:	Taken by:	
Photo #3:	Description:	Facing:	Time:	Taken by:	

Other notes: D. Jaramillo conducts HESPot test; Results Negative
D. Jaramillo Preserves Samples; A. Stanfield QA's

Offsite time: 1130 **Relinquish samples at SMO**, care of P. Mark at (time) 1340

Objectives met? Yes

8/21/18

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Burning Ground Spring

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos NATIONAL LABORATORY

Spring/Surface Water Sampling Field Data Sheet

Site name: Burning Ground Spring	**Date:** 8-11-2018	**Onsite time:** 1145 DST
Objective: Sample per reference docs on pg. 3		**Weather:** Sunny & clear / 80's
Sampling crew: T. Bonham, D. Scramillo & T. Vander Vis		
Two-minute safety drill: PPE, slippery surfaces around spring & biohazards		
Meters calibrated at (location) SMO	**by (whom)** T. Vander Vis	**at (time)** 0730
YSI Meter number: 70	**Turbidimeter serial number:** NA	
Sample Retrieval **Date:** 8-11-2018	**Time:** 1150	**Method:** PP
Sample Event ID: 1923	**Sample ID Numbers:** CAWA-14-160246; 160245 & 16247	

FIELD PARAMETERS

pH (su): 7.22	Sp. Cond. (µS/cm): 249.2	Turbidity (NTU): 3.8
Temperature (°C): 11.4	DO (mg/L): 8.32	Q (gpm): 7.63 GPM

Explanation of Q method, including calculations: measured using a 3" modified Parshall flume below the source to catch all flow. GHT = 0.07' = 0.017 CFS = 7.63 GPM

Height of water above V-notch = 0.11'

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type:	(Spring)			Baseflow (persistent flow)	
Sample location:	Bank	Wading		Station Gage: at / above / below	
	Midstream natural feature	(Other (specify): Pool @ Source			
Description of Sampling Site:	(Pool)	Riffle	Eddy	Diffuse	Other
	Written description: NONE				
Substrate:	Bedrock	Concrete	(Cobble)	~~Gravel~~	(Sand) Mud
Stage Conditions:	Stable: (normal) / low / high		Falling	Rising	Other (specify):
Hydraulic Event:	(Routine)	Snowmelt	Flood	Drought	Other (specify):
Stream Color:	Brown	(Clear)	Green	Blue	Gray	Other (specify):
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other
	Written description: NA				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA			Units: NA
GPS point #2:	Name: ↓	Coordinates: ↓			Units: ↓
Photo #1:	Description: NA	Facing: NA	Time: NA		Taken by: NA
Photo #2:	Description: ↓	Facing: ↓	Time: ↓		Taken by: ↓
Photo #3:	Description: ↓	Facing: ↓	Time: ↓		Taken by: ↓

Other notes: D. Scramillo conducts HE spot test; Results negative

Contact waste: ½ gal.

Offsite time: 1220	**Relinquish samples at SMO**, care of P. Mork	at (time) 0745
Objectives met? Yes		

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Martin Spring

TV 8-22-18

ATTACHMENT 2

Records Use Only

SOP-5224-2

Los Alamos National Laboratory

Spring/Surface Water Sampling Field Data Sheet

Site name: Martin Spring **Date:** 8-22-18 **Onsite time:** 1050 DST
Objective: sample spring per applicable SOPs and doc **Weather:** 60s, rainy
Sampling crew: T.VanderVis, T. Bonham, D. Jaramillo
Two-minute safety drill: Safe hiking, possible thunderstorms
Meters calibrated at (location) SMO by (whom) D. Jaramillo at (time) 0730 DST
YSI Meter number: 70 **Turbidimeter serial number:** NA
Sample Retrieval **Date:** 8-22-18 **Time:** 1100 DST **Method:** PP
Sample Event ID: 11923 **Sample ID Numbers:** CAWA-18-160249, -160248, -160250, -160252, -160251

FIELD PARAMETERS

pH (su): 7.40 Sp. Cond. (µS/cm): 332.3 Turbidity (NTU): 8.7
Temperature (°C): 12.6 DO (mg/L): 7.42 Q (gpm): 0.44 gpm

Explanation of Q method, including calculations:
30s - 800 mL, -820 mL, -880 mL

$\frac{833\,mL}{30s} \times \frac{1L}{1000\,mL} \times \frac{1\,gal.}{3.785\,L} \times \frac{60s}{1m} = 0.44\,gpm$

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type: (Spring) Baseflow (persistent flow)
Sample location: Bank Wading Station Gage: at / above / below Midstream natural feature Other (specify): weirbox
Description of Sampling Site: Pool Riffle Eddy Diffuse Other
Written description: weirbox at source
Substrate: Bedrock Concrete Cobble Gravel (Sand) (Mud) Other (specify):
Stage Conditions: Stable: (normal) / low / high Falling Rising Other (specify):
Hydraulic Event: (Routine) Snowmelt Flood Drought Other (specify):
Stream Color: Brown (Clear) Green Blue Gray Other (specify):
Description of flow: Turbulent (Laminar) Recirculating Stagnant Other
Written description: none

Photos and GPS

GPS point #1: Name: Coordinates: Units:
GPS point #2: Name: Coordinates: Units:
Photo #1: Description: Facing: Time: Taken by:
Photo #2: Description: Facing: Time: Taken by:
Photo #3: Description: Facing: Time: Taken by:

TV 8-22-18

Other notes: HE spot test yields negative result. D. Jaramillo preserves samples, T. Bonham QAs **Contact waste:** 0.5 gal.
Offsite time: 1200 DST **Relinquish samples at SMO, care of** ~~E. Popova~~ P. Mark TV 8-22-18 at (time) 1320 DST
Objectives met? yes

TV 8-22-18

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PRB Alluvial Seep (16-61439)

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos NATIONAL LABORATORY

Spring/Surface Water Sampling Field Data Sheet

Site name: PRB Alluvial Seep (16-61439) **Date:** 8/13/2018 **Onsite time:** 1410 DST

Objective: Sample per reference documentation on Pg. 3 **Weather:** Sunny, 80s & Breezy

Sampling crew: T. Barnhorn & D. Jaramillo

Two-minute safety drill: Hiking, PPE, Snakes

Meters calibrated at (location) SMO **by** (whom) D. Jaramillo **at** (time) 0730

YSI Meter number: 60 **Turbidimeter serial number:** NA

Sample Retrieval **Date:** 8/13/2018 **Time:** 1413 **Method:** PP

Sample Event ID: 11923 **Sample ID Numbers:** CAWA-18-160254, 160253, 160255

FIELD PARAMETERS

pH (su): 7.11 | Sp. Cond. (µS/cm): 258.7 | Turbidity (NTU): 9.8

Temperature (°C): 13.1 | DO (mg/L): 7.48 | Q (gpm): 0.42

Explanation of Q method, including calculations: manual measurement using 1gal bag & graduated cyl

[1.58L/min + 1.60L/min + 1.60L/min] / 3 = 1.59L/min x 1gal/3.785L = 0.42 GPM

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type: Spring | Baseflow (persistent flow)

Sample location: Bank | Wading | Station Gage: at / above / below

Midstream natural feature | Other (specify):

Description of Sampling Site: Pool | Riffle | Eddy | Diffuse | Other

Written description: Small Pool @ Source

Substrate: Bedrock | Concrete | Cobble | Gravel | Sand | Mud

Stage Conditions: Stable: normal / low / high | Falling | Rising | Other (specify):

Hydraulic Event: Routine | Snowmelt | Flood | Drought | Other (specify):

Stream Color: Brown | Clear | Green | Blue | Gray | Other (specify):

Description of flow: Turbulent | Laminar | Recirculating | Stagnant | Other

Written description: NA

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA	NA	Units: NA	
GPS point #2:	Name:	Coordinates:		Units:	
Photo #1:	Description:	Facing:	Time:	Taken by:	
Photo #2:	Description:	Facing:	Time:	Taken by:	
Photo #3:	Description:	Facing:	Time:	Taken by:	

Other notes: D. Jaramillo Conducts HE Spot test, Results Negative 8/13/18

Contact waste: ½ gal.

Offsite time: 1515 **Relinquish samples at SMO,** care of R. Orsdoff at (time) 1405

Objectives met? Yes

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Groundwater Sampling Log

IFWGMP/MY: 2018 Q: 4	LSD: 7443.18 ft. msl	Well Diameter: 2 inches	Date: 8-11-2018
Watershed: Water/CdV	Water Level: NA ft. msl	Top of Screen: 3930 ft.	Notes:
Well: CdV-16-07656	*TD: mTD = 11.05' BTOC	Bottom of Screen: 3925.0 ft.	NONE
Sampling Device: PP	*DTW: 10.65' BTOC	Water Column: 0.40 ft.	
Measuring Point: LSD	Drop Pipe: NA gal.	1CV: 0.07 gal.	Packer Pressure
* Completion Depth: TD		3CV: 0.20 gal.	Before: psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	2.30 ft.	Actuation: 115 psi
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: psi
			After: psi

TIME MST / DST TB Stability:	pH SU ≤ 0.2 STU variance	TEMP °C	SPEC COND µs/cm ± 3% (>100) ± 5% (≤100)	DO mg/l ≤ 0.3 mg/l variance	Turb NTU <10 or ± 10%	HACH Yes or No	ORP mV	Water Level* ft. BTOC	Discharge Rate (GPM)	NOTES
1118	Pump on									
1123	Pump off; no water; move down tubing									
1124	Pump on; water to surface									
1126	Pump off; Purged dry before we were able to fill flow through cell									
1126	DTW = 11.06' BTOC									
1130	DTW = 11.00' BTOC crew off Site									
1235	DTW = 11.00' BTOC; No observable recharge (CAWW)									

8/11/2018

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste: 1/4	gal.	Drum#: Existing	
*Purge Water: 0.05	gal.	Drum#'s: 1493	1 Liter Poly
Total Waste Water: 0.05	gal.		

Final Water Level: 11.00 ft BTOC 8/11/18

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

Well Name: CdV-16-02656		Date: 8/11/2018	Time onsite (MST): 0934	Activity: Manual IV & Sampling	
Personnel: T. Bonham, T. Vander Vis & D. Sommille				Cable Length(ft):	Cable SN: 236870
Telemetry: Yes \ No (circled)	Pull Transducer Yes \ No (circled)	New Transducer Needed: Yes \ No (circled) New LT SN: NA		Memory % remaining: NA	Battery % remaining: NA
Connect Time: NA	Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): NA		P (psi): NA	T (C): NA	Slop Test: Yes \ No (circled) NA	Change Desicant: Yes \ No (circled) \ NA
Last Start Date: NA		Data File Name: NA			

Measuring Point: TOC (top outer casing) (circled)	TIC (inner)	Stick-up Measured on Site ☐	Previous MP Used ☒	
Time (MST):	0954	Water Level Meter Serial No. 34244		Notes: NONE
DTW (ft bMP):	10.65' bTOC	Measurements in feet		
Time (MST):	0957	LSD ft	7443.18' msl	
DTW (ft bMP):	10.65' bTOC	MP Height ft.	+ 2.30'	
Time (MST):	8/11/18	MP Elevation	= 7445.48 msl	
DTW (ft bMP):		DTW:	- 10.65' bTOC	
Time (MST):	0957	Groundwater Elevation (GWE) Reference Level	7434.83' msl	
TD (ft bMP):	11.05' bTOC			
		Zip Tie on Kellim's Grip:	Yes	

Transducer Redeployed and Programming

Part 3: Transducer Deployment Worksheet				Part 4: Programming & Final Readings	
WL Reading Time (MST).		Programming Time:		Time (MST)	Reading
WL (transducer reading) (ft).		New Test Name:			
GWE from MM	8/11/18	Reference Level.			
Difference in value:		Current Depth:		8/11/18	
Error tolerance of transducer:		Meas. Interval			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.			Synch Clocks: Yes \ No (circled)		
Deleted Tests: NA					QA Date and Initial:

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information					
Well Name: CdV-16-02657r		Date: 8/11/18	Time onsite (MST): 1139	Activity: GW Sampling	
Personnel: A. Stanfield, D. Hughes, A. Vigil				Cable Length(ft):	Cable SN:
Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN:		Memory % remaining:	Battery % remaining: 8/11/18
Connect Time:	Transducer SN:	New LT PSI Rating: 8/11/18	Manufacture Date:	Log Note Memory %	Log Note Battery %
Water Level (ft)		P (psi):	T [C]	Stop Test: Yes \ No	Change Desicant: Yes \ No \ NA
Last Start Date:		Data File Name: NA			
PART 2: Manual Measurements					
Measuring Point: TOC (top outer casing) (TIC (inner))		Stick-up Measured on Site ☐		Previous MP Used X	
Time (MST):	1140	Water Level Meter Serial No. 34242		**Notes:**	
DTW (ft bMP):	7.20' BTIC	Measurements in feet		• 2 min safety: hiking on uneven surfaces, saftey/work procedures	
Time (MST):	1143	LSD ft	7430.22' msl	• Dry: V @ TD = 7.20' BTIC	
DTW (ft bMP):	7.20' BTIC	MP Height ft.	+ 3.64		
Time (MST):	8/11/18	MP Elevation	= 7433.86' msl		
DTW (ft bMP):		DTW:	- 7.20' BTIC		
Time (MST):	1143	Groundwater Elevation (GWE) Reference Level	7441.06' msl		
TD (ft bMP):	7.20' BTIC				
		Zip Tie on Kellim's Grip:	NA		
Transducer Performance and Programming					
Part 3: Transducer Error\Drift Acceptance		**Part 4: Programming & Final Readings**			
WL Reading Time (MST):		Progamming Time:		Time (MST):	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level: 8/11/18			
Difference in value:		Current Depth:			8/11/18
Error tolerance of transducer:		Meas. Interval:			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ (No)			
Deleted Tests: NA				QA: Date and Initial: 8-27-2018 TV	

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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity
CdV-16-02659	8-10-18	0901 DST	Presweep

Personnel:	Cable Length(ft):	Cable SN:
T. VanderVis, A. Vigil, D. Hughes	10ft	236863

Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN:	Memory % remaining:	Battery % remaining:
Connect Time:	Transducer SN:	New LT PSI Rating:	Manufacture Date:	Log Note Memory %: ~~Log Note Battery %~~
Water Level (ft):		P (psi):	T [C] TV 8-10-18	Stop Test: Yes \ No: Change Desicant: Yes \ No \ NA
Last Start Date:		Data File Name:		

PART 2: Manual Measurements

Measuring Point: (TOC (top outer casing)) TIC (inner) | Stick-up Measured on Site ☐ | Previous MP Used ☒

Time (MST):	0901	Water Level Meter Serial No.: 34242	**Notes:** ~~None~~ TV 8-10-18 Changed lock from ESH403 to M3R-2
DTW (ft bMP):	10.63' TV 8-10-18	Measurements in feet	
Time (MST):	0906	LSD ft: 7300.5	
DTW (ft bMP):	10.6063 TV 8-10-18	MP Height ft.: + 3.24	
Time (MST):	TV 8-10-18	MP Elevation: = 7303.74	
DTW (ft bMP):		DTW: - 10.63	
Time (MST):	0902	Groundwater Elevation (GWE) Reference Level: 7293.11	
TD (ft bMP):	10.86		
		Zip Tie on Keilim's Grip: NA	

Transducer Performance and Programming

Part 3: Transducer Error\Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST):		Progamming Time:		Time (MST)	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM:		Reference Level:			
Difference in value:		Current Depth:		TV 8-10-18	
Error tolerance of transducer:		Meas. Interval:			
☐ Within New Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
~~15 PSI-0.03ft 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.~~		Synch Clocks: Yes \ No			
Deleted Tests:					QA Date and Initial

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8/11/18

CdV-16-611923

Groundwater Sampling Log

IFW/CMP MY: 2018 Q: 4 | LSD: 7376.43 ft. msl | Well Diameter: 2 inches | Date: 8/11/18
Watershed: Water/CdV | Water Level: NA ft. msl | Top of Screen: 5.0 ft.BTIC | Notes: ☒ in screened interval
Well: CdV-16-611923 | *TD: =mTD= 11.35 'BTIC | Bottom of Screen: 10.0 ft.BTIC
Sampling Device: PP | *DTW: 8.39 | Water Column: 2.96 ft.
Measuring Point: BTIC | Drop Pipe: NA gal. | 1CV: 0.48 gal. | Packer Pressure
* Completion Depth: mTD | | 3CV: 1.45 gal. | Before: NA psi
[* ft. BTOC / BTIC / BGS / MSL] Note MP height (stickup) of TOC/TIC for Alluvials NA ft. | Actuation: psi
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3) | Opening: psi | After: psi

TIME MST (DST)	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1041	Pump on; Water to surface									
1042	8.26	14.8	293.2	3.09	47.3	N	188.5	8.54	0.12	cloudy; no odor
1045	6.93	14.2	287.9	1.64	25.7	↓	218.7	8.55	↓	↓
1048	6.57	14.2	288.4	1.73	22.5	Y	233.9	8.56		
1051	6.41	14.2	287.6	1.69	19.6	↓	243.4	8.57		
1054	6.36	14.2	288.1	1.68	16.9	↓	248.3	8.57	↓	↓
1055	Pause pump; Prepare to sample > 3 CVs purged									
1057	Pump on; Begin Sampling									
1112	Pump off; Sampling complete									

8/11/18

8/11/18

Yes in HACH column = HACH Turbidimeter #20 used because cloudiness distorting turbidity

Contact Waste:	1/2 gal.	Drum#:	Pending characterization
*Purge Water:	1.56 gal.	Drum#'s:	1820
Total Waste Water:	1.57 gal.		5 gal carbon sub

Final Water Level: 8.49 ft BTIC

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

8/11/18

CdV-16-611923

ER-SOP-20032 IPC-6

Attachment 3
Compliance Checklist

8/11/18
Well Name: ~~8/11/18~~ CdV-16-611923
Date: 8/11/18

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments: An extra 2.25 CVs purged to wait for stability in pH + turb.
Flow Meter (Manual)	Drop Pipe: NA 3 CVs: 1.45	NA	1.56	3.25	(Y) N	

	Stable for three consecutive readings?				
Parameters collected at proper intervals? (HH:MM)	pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%.	Comments: Sampled after 3 CVs purged regardless of stability per SOP.
1048	6.57	1.73	288.4	22.5	
1051	6.41	1.69	287.6	19.6	
1054	6.36	1.68	288.1	16.9	
Calculations:	Highest: 6.57	Highest: 1.73	Median: 288.1	Median: 19.6	
	Lowest: 6.36	Lowest: 1.68	Median +5 %: 296.7	Median +10 %: 21.6	
	Difference: 0.21	Difference: 0.05	Median -5 %: 279.5	Median -___%: 17.6	
(Y) N	8/11/18 (Y) (N)	(Y) N	(Y) N	Y (N)	

SOP Requirements Met?	Comments:
(Y) N	None

8/11/18

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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information					
Well Name: CdV-16-611923		Date: 8-10-18	Time onsite (MST): 0937	Activity: Presweep	
Personnel: T. VanderVis, A. Vigil, D. Hughes				Cable Length(ft): 12	Cable SN: 227809
Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN:		Memory % remaining:	Battery % remaining:
Connect Time:	Transducer SN:	New LT PSI Rating:	Manufacture Date:	Log Note Memory %:	Log Note Battery %:
Water Level (ft)		P (psi): TV 8-10-18	T (C)	Stop Test: Yes \ No	Change Desicant: Yes \ No \ NA
Last Start Date:		Data File Name:			
PART 2: Manual Measurements					
Measuring Point: TOC (top outer casing)		TIC (inner)	Stick-up Measured on Site ☐	Previous MP Used ☒	
Time (MST):	0937	Water Level Meter Serial No.: 34242		**Notes:** none	
DTW (ft bMP):	7.99	Measurements in feet			
Time (MST):	0950	LSD ft	7376.43		
DTW (ft bMP):	7.99	MP Height ft.	+ 0.00		
Time (MST):		MP Elevation	= 7376.43		
DTW (ft bMP):		DTW:	- 7.99		
Time (MST):	0943	Groundwater Elevation (GWE) Reference Level	7368.44		
TD (ft bMP):	11.35				
		Zip Tie on Kellim's Grip:	NA		
Transducer Performance and Programming					
Part 3: Transducer Error\Drift Acceptance		**Part 4: Programming & Final Readings**			
WL Reading Time (MST):		Progamming Time:		Time (MST)	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level			
Difference in value:		Current Depth: TV 8-10-18			
Error tolerance of transducer:		Meas. Interval			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			
Deleted Tests: none					QA Date and Initial

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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information					
Well Name: CdV-16-611923		Date: 8/11/18	Time onsite (MST): 0922	Activity: GW Sampling	
Personnel: A. Stanfield, D. Hughes, A. Vigil				Cable Length(ft): 12	Cable SN: 227809
Telemetry: Yes \ (No)	Pull Transducer: Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA		Memory % remaining: NA	Battery % remaining: NA
Connect Time: NA	Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): NA		P (psi): NA	T [C]: NA	Stop Test: Yes \ No: NA	Change Desicant: Yes \ No \ (NA)
Last Start Date: NA		Data File Name: NA			

PART 2: Manual Measurements				
Measuring Point: TOC (top outer casing) (TIC (inner))		Stick-up Measured on Site ☐	Previous MP Used ☒	
Time (MST): 0930		Water Level Meter Serial No. 34242		**Notes:** None
DTW (ft bMP): 8.39' BTIC		Measurements in feet		
Time (MST): 0933		LSD ft:	7376.43' msl	
DTW (ft bMP): 8.39' BTIC		MP Height ft:	+ 0.00	
Time (MST): 8/11/18		MP Elevation:	= 7376.43' msl	
DTW (ft bMP):		DTW:	- 8.39' BTIC	
Time (MST): 0934		Groundwater Elevation (GWE) Reference Level:	7368.04' msl	
TD (ft bMP): 11.35' BTIC				
		Zip Tie on Kellim's Grip: NA		

Transducer Performance and Programming

Part 3: Transducer Error\Drift Acceptance		**Part 4: Programming & Final Readings**			
WL Reading Time (MST):		Progamming Time:		Time (MST):	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level:			
Difference in value:		Current Depth:			
Error tolerance of transducer:		Meas. Interval:			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 300 PSI-1.16 ft.		Synch Clocks: Yes \ (No)			
Deleted Tests: NA					QA. Date and Initial: 8-27-2018 TV

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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information					
Well Name: MSC-16-06293		Date: 8-10-2018	Time onsite (MST): ~~1005~~ 0859 8/10/18 [initials]	Activity: PresweePS	
Personnel: T. Bonham, A. Stanfield & D. Jaramillo				Cable Length(ft): 16	Cable SN: 227808
Telemetry: Yes \ (No)	Pull Transducer: Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA		Memory % remaining: NA	Battery % remaining: NA
Connect Time: NA	Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): NA		P (psi): NA	T [C]: NA	Stop Test: Yes \ (No)	Change Desicant: Yes \ (No) \ NA
Last Start Date: NA		Data File Name: NA			

PART 2: Manual Measurements				
Measuring Point: TOC (top outer casing) (TIC (inner))		Stick-up Measured on Site ☐		Previous MP Used ✗
Time (MST): 0904		Water Level Meter Serial No. 34244		**Notes:** Eminent Safety: Hiking & contact w/ access control
DTW (ft bMP): 10.48' bTIC		Measurements in feet		Weather: Partly cloudy & 80's
Time (MST): 0907		LSD ft: 7370.79' msl		Objective: Check water level of well
DTW (ft bMP): 10.48' bTIC		MP Height ft: +2.59		* no electronics allowed in WFO area
Time (MST): 8/10/18 [initials]		MP Elevation: = 7373.38' msl		
DTW (ft bMP):		DTW: - 10.48' bTIC		Note: MTD - DTW = 0.22' of water
Time (MST): 0907		Groundwater Elevation (GWE) Reference Level: 7362.90' msl [Sump water]		Sump length = 0.30'
TD (ft bMP): 10.70' bTIC				∇ is in the sump (CANW)
		Zip Tie on Kellim's Grip: Yes		

Transducer Performance and Programming					
Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Progamming Time:		Time (MST)	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level:			
Difference in value:	8/10/2018	Current Depth:		8/10/2018	
Error tolerance of transducer:		Meas. Interval:			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.			Synch Clocks: Yes \ (No)		
Deleted Tests: NA					QA: Date and Initial:

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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date	Time onsite (MST)	Activity	
MSC-16-06294	8/10/2018	1320	PreSweep	
Personnel: T. Bonham, D. Jaramillo & A. Stanford + RCT			Cable Length(ft): 20	Cable SN: 236866
Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN: NA	Memory % remaining: NA	Battery % remaining: NA
Connect Time: NA	Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): NA		P (psi): NA	T [C]: NA	Stop Test: Yes \ No	Change Desicant: Yes \ No \ NA
Last Start Date: NA		Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) TIC (inner) | Stick-up Measured on Site ☐ | Previous MP Used ☒

Time (MST)	1322	Water Level Meter Serial No. 34244	**Notes:** 2 minute Safety: RCT, Heat & weather; Partly cloudy, 80's & breezy Objective: manual II TD-DTW = 0.67' water column
DTW (ft bMP)	10.39' btic	Measurements in feet	
Time (MST)	1325	LSD ft: 7288.44' msl	
DTW (ft bMP)	10.39' btic	MP Height ft.: +3.07	
Time (MST)	8/10/2018	MP Elevation: =7291.51' msl	
DTW (ft bMP)		DTW: -10.39' btic	
Time (MST)	1325	Groundwater Elevation (GWE) Reference Level: 7281.12' msl	
TD (ft bMP)	11.06' btic		
		Zip Tie on Kellim's Grip: NO	

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Progamming Time		Time (MST)	Reading
WL (transducer reading) (ft)		New Test Name			
GWE from MM		Reference Level			
Difference in value:		Current Depth			
Error tolerance of transducer:		Meas. Interval			
☐ Within Error Tolerance		Start Date: 8/10/2018			
☐ Outside Error Tolerance		Start Time			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			
Deleted Tests: NA					QA Date and Initial

8/11/18

CdV-16-611937

Groundwater Sampling Log

IRWGMP MY: 2018 Q: 4	LSD: 7359.59 ft. msl	Well Diameter: 2 inches	Date: 8/11/18
Watershed: Water/CdV	Water Level: NA ft. msl	Top of Screen: 6.0 ft. BTIC	Notes: WL in screened interval
Well: CdV-16-611937	*TD: = mTD = 11.56' BTIC	Bottom of Screen: 11.0 ft. BTIC	
Sampling Device: PP	*DTW: 7.57' BTIC	Water Column: 3.99 ft.	
Measuring Point: BTIC	Drop Pipe: NA gal.	1CV: 0.65 gal.	Packer Pressure
* Completion Depth: mTD		3CV: 1.95 gal.	Before: NA psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	3.0 ft.	Actuation: psi
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump Intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: psi
			After: psi

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1149	Pump on; Water to surface Q=0.075 gpm (manual measure using graduated cylinder)									
1151	7.32	14.2	266.6	2.09	14.1	N	-79.5	8.53	0.075	organic matter; no odor; clear
1154	6.83	12.4	256.4	0.91	15.1		-64.6	8.76	↓	↓
1157	6.63	12.2	248.8	0.85	17.0		-53.0	9.12	0.075	↓
1200	6.61	12.0	251.0	0.73	14.2		-59.6	9.32	↓	some floating particulates; clear; slight organic odor;
1203	6.62	11.8	251.8	0.61	12.6	↓	-65.1	9.49	↓	↓
1206	6.62	11.6	250.4	0.53	9.96	Y	-65.0	9.60	↓	↓
1209	6.62	11.5	249.4	0.48	6.40		-63.9	9.67	↓	↓
1212	6.62	11.5	248.2	0.46	6.70	↓	-62.4	9.75	↓	↓
1212	Pause pump; Prepare to sample									
1216	Pump on; Begin sampling									
1243	Sampling complete; Pump off									
					8/11/18					

8/11/18

Yes in HACH column = HACH Turbidimeter #20 used because particulates distorting turb

Contact Waste:	1/2 gal.	Drum#: Pending characterization	Final Water Level: 9.87 ft BTIC	
*Purge Water:	1.58 gal.	Drum#'s: 1892	5 gal carboys @ SMO	*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)
Total Waste Water:	1.59 gal.			

70 72

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DST

8/11/18

CdV-16-611937

ER-SOP-20032 IPC-6

Attachment 3

Compliance Checklist

Well Name: CdV-16-611937

Date: 8/11/18

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter (Manual)	Drop Pipe: NA 3 CVs: 1.95	NA	1.58	2.42	(Y) N	An extra 1.42 CVs purged to allow turbidity to stabilize.

	Stable for three consecutive readings?				
Parameters collected at proper intervals? (HH:MM)	pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%.	Comments:
1206	6.62	0.53	250.4	9.96	None
1209	6.62	0.48	249.4	6.40	
1212	6.62	0.46	248.2	6.70	
Calculations:	Highest: 6.62	Highest: 0.53	Median: 249.4	Median: 6.70	
	Lowest: 6.62	Lowest: 0.46	Median +3 %: 256.9	Median +NA%: <10	
	Difference: 0.00	Difference: 0.07	Median -3 %: 241.9	Median -NA%: <10	
(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	

SOP Requirements Met?	Comments:
(Y) N	None

8/11/18

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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity
CdV-16-611937	81018	0927	~~Prew~~ TV 81018 Presweep

Personnel:	Cable Length(ft):	Cable SN:
T. VanderVis, A. Vigil, D. Hughes	13	487736

Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN:	Memory % remaining:	Battery % remaining:
Connect Time:	Transducer SN:	New LT PSI Rating:	Manufacture Date:	Log Note Memory %: / Log Note Battery %:
Water Level (ft):		P (psi):	T (C): TV 8-10-18	Stop Test: Yes \ No / Change Desicant: Yes \ No \ NA
Last Start Date:		Data File Name:		

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) TIC (inner) Stick-up Measured on Site ☐ Previous MP Used ☐

Time (MST):	0927	Water Level Meter Serial No.: 34242	**Notes:**
DTW (ft bMP):	7.59	Measurements in feet	
Time (MST):	0930	LSD ft:	Well is not dry
DTW (ft bMP):	7.59	MP Height ft: +	
Time (MST):		MP Elevation: =	
DTW (ft bMP):	TV 8-10-18	DTW: TV 8-10-18	
Time (MST):	0928	Groundwater Elevation (GWE) Reference Level:	
TD (ft bMP):	11.56		
		Zip Tie on Kellim's Grip:	

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST):		Progamming Time:		Time (MST):	Reading:
WL (transducer reading) (ft):		New Test Name:			
GWE from MM:		Reference Level:			
Difference in value:		Current Depth: TV 8-10-18			
Error tolerance of transducer:		Meas. Interval:			
☐ Within tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			

Deleted Tests: none

QA Date and Initial:

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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name:	Date:	Time onsite (MST):	Activity:	
CdV-16-611937	8/1/18	1035	GW Sampling	
Personnel: A. Stanfield, D. Hughes, A. Vigil			Cable Length(ft): 13	Cable SN: 487736
Telemetry: Yes \ (No) / Pull Transducer: Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA		Memory % remaining:	Battery % remaining:
Connect Time: NA / Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: 8/1/18	Log Note Battery %
Water Level (ft): NA	P (psi): NA	T (C): NA	Stop Test: Yes \ No	Change Desicant: Yes \ No \ NA
Last Start Date: NA	Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) (TIC (inner)) Stick-up Measured on Site ☐ Previous MP Used ☑

Time (MST):	1042	Water Level Meter Serial No. 34242	**Notes:** None
DTW (ft bMP):	7.57' BTIC	Measurements in feet	
Time (MST):	1045	LSD ft. 7359.59' msl	
DTW (ft bMP):	7.57' BTIC	MP Height ft. + 3.0	
Time (MST): 8/1/18		MP Elevation = 7362.59' msl	
DTW (ft bMP):		DTW: - 7.57' BTIC	
Time (MST):	1046	Groundwater Elevation (GWE) Reference Level 7355.02' msl	
TD (ft bMP):	11.56' BTIC		
		Zip Tie on Kellim's Grip: No	

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST):		Progamming Time:		Time (MST):	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level 8/1/18			
Difference in value:		Current Depth:			
Error tolerance of transducer:		Meas. Interval:		8/1/18	
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			

Deleted Tests: NA

QA. Date and Initial: 8-27-2018 TV

Manual Groundwater Level Measurements

Reference

Document No. ER-SOP-20243
Revision: 1, IPC-1
Effective Date: 3/1/2017
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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date	Time onsite (MST)	Activity	
Surgebed Monitoring Well 16-61398	8-11-2018	0900	Manual WL & Sample	
Personnel			Cable Length(ft)	Cable SN
T. Benham, T. Vandervis & D. Jaremillo			30	529149

Telemetry Yes \ No	Pull Transducer Yes \ No	New Transducer Needed: Yes \ No New LT SN:	Memory % remaining	Battery % remaining
		NA	NA	NA

Connect Time	Transducer SN	New LT PSI Rating	Manufacture Date	Log Note Memory %	Log Note Battery %
NA	NA	NA	NA	NA	NA

Water Level (ft)	P (psi)	T (C)	Stop Test: Yes \ No	Change Desicant: Yes \ No \ NA
NA	NA	NA		

Last Start Date	Data File Name
NA	NA

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) TIC (inner) | Stick-up Measured on Site ☐ | Previous MP Used ☒

Time (MST)	0905	Water Level Meter Serial No.	34244
DTW (ft bMP)	22.82' BTOC (DRY)	Measurements in feet	
Time (MST)	0908	LSD ft	7533.05' msl
DTW (ft bMP)	22.82' BTOC (DRY)	MP Height ft	+2.63'
Time (MST)		MP Elevation	= 7536.48' msl
DTW (ft bMP)	8-11-2018	DTW	- 22.82' BTOC (DRY)
Time (MST)	0908	Groundwater Elevation (GWE) Reference Level	7513.66' msl [DRY]
TD (ft bMP)	22.82' BTOC		
		Zip Tie on Kellim's Grip:	NO

Notes: Well dry to TD

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance

WL Reading Time (MST)	
WL (transducer reading) (ft)	
GWE from MM	
Difference in value:	
Error tolerance of transducer:	8/11/2018
☐ Within Error Tolerance	
☐ Outside Error Tolerance	

Part 4: Programming & Final Readings

		Time (MST)	Reading
Progamming Time			
New Test Name			
Reference Level			
Current Depth			
Meas. Interval	6/1/2018		
Start Date			
Start Time			

15 PSI-0.03ft 30 PSI-0.07 ft 100 PSI-0.23 ft 500 PSI-1.16 ft

Synch Clocks: Yes \ No

Deleted Tests: NA

QA Date and Initial

Bulldog Spring

TV 8-22-18

ATTACHMENT 2

Records Use Only

SOP-5224-2

Los Alamos NATIONAL LABORATORY

Spring/Surface Water Sampling Field Data Sheet

Site name: Bulldog Spring **Date:** 8-22-18 **Onsite time:** 0905 DST
Objective: Sample site per applicable SOPs and doc. **Weather:** partly cloudy, 70s
Sampling crew: T. VanderVis, T. Bonham, D. Jaramillo
Two-minute safety drill: Safe hiking, possible thunderstorms
Meters calibrated at (location) GMO **by (whom)** D. Jaramillo **at (time)** 730 PST
YSI Meter number: 70 **Turbidimeter serial number:**
Sample Retrieval **Date:** 8-22-18 **Time:** 0920 DST **Method:** PP
Sample Event ID: 11923 **Sample ID Numbers:** CAPA-18-160407, -160406, -160408

FIELD PARAMETERS

pH (su): 7.66 Sp. Cond. (µS/cm): 361.5 Turbidity (NTU): 12.3
Temperature (°C): 12.1 DO (mg/L): 8.32 Q (gpm): 0.36

Explanation of Q method, including calculations:
30s - 720mL
- 680mL
- 680mL
693mL / 30s × 1L / 1000mL × 1 Gal / 3.785L × 60s / 1 min = 0.36 gpm
TV 8-22-18
Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type: (Spring)
Sample location: Bank Wading Baseflow (persistent flow) Station Gage: at / above / below
Midstream natural feature Other (specify): small pool below source
Description of Sampling Site: (Pool) Riffle Eddy Diffuse Other
Written description: small pool below source
Substrate: Bedrock Concrete Cobble (Gravel) (Sand) (Mud)
Stage Conditions: Stable (normal) / low / high Falling Rising Other (specify):
Hydraulic Event: (Routine) Snowmelt Flood Drought Other (specify):
Stream Color: Brown (Clear) Green Blue Gray Other (specify):
Description of flow: Turbulent (Laminar) Recirculating Stagnant Other
Written description: none

Photos and GPS

GPS point #1:	Name:	Coordinates:			Units:
GPS point #2:	Name:	Coordinates: TV 8-22-18			Units:
Photo #1:	Description:		Facing:	Time:	Taken by:
Photo #2:	Description:		Facing:	Time:	Taken by:
Photo #3:	Description:		Facing:	Time:	Taken by:

Other notes: HE Spot test yields negative results
D. Jaramillo preserves samples, T. Bonham QAs
Contact waste: 0.5 gal.
Offsite time: 1000 DST **Relinquish samples at SMO**, care of P. Mark E. Popova at (time) 1320 DST
TV 8-22-18
Objectives met? yes

TV 8-22-18

March/April 2019 Field Forms

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3-11-2019

CdV Below MDA P

ATTACHMENT 2

Records Use Only

Los Alamos NATIONAL LABORATORY

SOP-5224-2

Spring/Surface Water Sampling Field Data Sheet

Site name: CdV Below Mda P	**Date:** 3-11-2019	**Onsite time:** 1200 DST
Objective: Sample per reference doc. Pg. 3		**Weather:** Cloudy, 30's rain
Sampling crew: T. Bonham, K. Tow & D. Jaramillo		
Two-minute safety drill: Hiking on uneven gravel surfaces		
Meters calibrated at (location) SMO	**by** (whom) T. Venteris	**at** (time) 0745
YSI Meter number: 50	**Turbidimeter serial number:** NA	
Sample Retrieval	**Date:** 3-11-2019	**Time:** 1205 **Method:** PP
Sample Event ID: 12266	**Sample ID Numbers:** CAWA-19-167383-167387A-167392	

FIELD PARAMETERS

pH (su): 7.72	Sp. Cond. (µS/cm): 235.5	Turbidity (NTU): 18.66
Temperature (°C): 3.9	DO (mg/L): 9.73	Q (gpm): 93.36

Explanation of Q method, including calculations: 3" Modified Parshall Flume

GHT=0.34' ~~3/11/2019~~ .208CFS X 448.83 = 93.36GPM

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type:	Spring			(Baseflow) (persistent flow)	
Sample location:	Bank	Wading		Station Gage: at / above / below	
	(Midstream natural feature)	Other (specify):			
Description of Sampling Site:	Pool	(Riffle)	Eddy	Diffuse	Other
	Written description: NA				
Substrate:	Bedrock	Concrete	(Cobble)	(Gravel)	(Sand) (Mud)
Stage Conditions:	Stable: (normal) / low / high		Falling	Rising	Other (specify):
Hydraulic Event:	(Routine)	Snowmelt	Flood	Drought	Other (specify):
Stream Color:	Brown	(Clear)	Green	Blue	Gray	Other (specify):
Description of flow:	(Turbulent)	Laminar	Recirculating	Stagnant	Other
	Written description: Water has a Gray/Blue cloudy tint				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA			Units: NA
GPS point #2:	Name: ↓	Coordinates: ↓			Units: ↓
Photo #1:	Description: Sample Source	Facing: SW	Time: 1210		Taken by: T. Bonham
Photo #2:	Description: above	Facing: SW	Time: ↓		Taken by: ↓
Photo #3:	Description: Below	Facing: NE	Time: ↓		Taken by: ↓

Other notes: D. Saramillo conducts HE SPill test; Results = negative
D. Saramillo Preserves Samples; T. Bonham QA's

Contact waste: ½ gal.

Offsite time: 1235 **Relinquish samples at SMO**, care of K. Papova **at** (time) 1450

Objectives met? Yes

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Between E252 and Water at Beta

TV 3-19-19

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos NATIONAL LABORATORY EST. 1943

Spring/Surface Water Sampling Field Data Sheet

Site name: Between E252 and Water at Beta	**Date:** 3-19-19	**Onsite time:** 1027 DST
Objective: Sample per applicable SOPs and doc.		**Weather:** Sunny, 40s
Sampling crew: T. VanderVis, M. Shendo, T. Walker		
Two-minute safety drill: Safe hiking, possible wildlife		
Meters calibrated at (location) SMO **by** (whom) J. Meyer		**at** (time) 803
YSI Meter number: 60	**Turbidimeter serial number:** NA	
Sample Retrieval **Date:** 3-19-19	**Time:** 1030	**Method:** PP, DC
Sample Event ID: 12266	**Sample ID Numbers:** CAWA-19-167494, -167493, -167495, -167719	

FIELD PARAMETERS

pH (su): 7.81	Sp. Cond. (µS/cm): 181.5	Turbidity (NTU): 9.92
Temperature (°C): 5.8	DO (mg/L): 9.75	Q (gpm): 2617

Explanation of Q method, including calculations: Float method

W = 3.70 ft
Havg = 0.68 ft
Vavg = 20 ft / 8.3 s = 2.41 ft/s

Area = 2.52 ft²
Q = 2.52 ft² · 2.41 ft/s = 5.83 cfs = 2617 gpm

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type:	Spring			Baseflow (persistent flow)	
Sample location:	Bank	Wading		Station Gage: at / above / below	
	Midstream natural feature	Other (specify): NA			
Description of Sampling Site:	Pool	Riffle	Eddy	Diffuse	Other
	Written description: midstream				
Substrate:	Bedrock	Concrete	Cobble	Gravel	Sand / Mud
Stage Conditions:	Stable: normal / low / high	Falling	Rising	Other (specify): NA	
Hydraulic Event:	Routine	Snowmelt	Flood	Drought	Other (specify): ↓
Stream Color:	Brown	Clear	Green	Blue / Gray	Other (specify): ↓
Description of flow:	Turbulent	Laminar	Recirculating	Stagnant	Other
	Written description: ET TV 3-19-19 none				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA		Units: NA
GPS point #2:	Name: ↓	Coordinates: ↓		Units: ↓
Photo #1:	Description: above source	Facing: W	Time: 1035	Taken by: T. VanderVis
Photo #2:	Description: source	Facing: W	Time: ↓	Taken by: ↓
Photo #3:	Description: below source	Facing: E	Time: ↓	Taken by: ↓

Other notes: HE spot test yields negative results, DI machine at Pueblo being maintained; given okay to collect PEB at 1217. T Walker preserves samples; M. Shendo QAs. Contact waste: 0.5 gal.

Offsite time: 1130 **Relinquish samples at SMO**, care of K. Popova at (time) 1300

Objectives met? yes

TV 3-19-19

3/15/19 Water at Beta

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos NATIONAL LABORATORY

Spring/Surface Water Sampling Field Data Sheet

Site name: Water to Beta	**Date:** 3/15/19	**Onsite time:** 1044 DST
Objective: Sample per all SOPs on pg. 3 of this logbook		**Weather:** sunny, 30s
Sampling crew: A. Vigil, A. Stanfield, J. Meyer.		
Two-minute safety drill: hiking on slippery snow, Gate 9, high flow		
Meters calibrated at (location) SMO **by** (whom) J. Meyer		**at** (time) 0836 DST
YSI Meter number: 50	**Turbidimeter serial number:** NA	
Sample Retrieval **Date:** 3/15/19	**Time:** 1045 DST	**Method:** DC
Sample Event ID: 12266	**Sample ID Numbers:** CAWA-19-167497, -167496, -167499, -167498	

FIELD PARAMETERS

pH (su): 7.91	Sp. Cond. (µS/cm): 17.6	Turbidity (NTU): 20.58
Temperature (°C): 3.5	DO (mg/L): 10.10	Q (gpm): NC

Explanation of Q method, including calculations: Unable to collect flow rate due to volume of flow.

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type:	Spring			(Baseflow (persistent flow))	
Sample location:	(Bank)	Wading		Station Gage: at / above / below	
	Midstream natural feature	Other (specify):			
Description of Sampling Site:	Pool	(Riffle)	Eddy	Diffuse	Other
	Written description: NA				
Substrate:	Bedrock	Concrete	(Cobble)	(Gravel)	(Sand) Mud
Stage Conditions:	Stable: normal / low (High)		Falling	Rising	Other (specify):
Hydraulic Event:	Routine	(Snowmelt)	Flood	Drought	Other (specify):
Stream Color:	Brown	Clear	(Green)	Blue	(Gray) Other (specify): Cloudy
Description of flow:	(Turbulent)	Laminar	Recirculating	Stagnant	Other
	Written description: Snowmelt, high flow				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA			Units: NA
GPS point #2:	Name: ↓	Coordinates: ↓			Units: ↓
Photo #1:	Description: upstream	Facing: NW	Time: 1100		Taken by: A. Stanfield
Photo #2:	Description: downstream	Facing: E	Time: ↓		Taken by: ↓
Photo #3:	Description: source	Facing: E	Time: ↓		Taken by: ↓

Other notes: A. Vigil conducts HE spot test, results negative
A. Vigil preserves samples, A. Stanfield QAs

Contact waste: 1 gal.

Offsite time: 1110 DST | **Relinquish samples at SMO**, care of K. Ellers at (time) 1545 DST

Objectives met? Yes

A. 3/15/19

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TV 3-16-19

Burning Ground Spring

ATTACHMENT 2

SOP-5224-2

Spring/Surface Water Sampling Field Data Sheet

Records Use Only

Los Alamos NATIONAL LABORATORY

Site name: Burning Ground Spring	**Date:** 3-16-19	**Onsite time:** 0830 TV 3-16-19 0930 DST
Objective: Sample spring per SOPs and documentation		**Weather:** Sunny, 30s
Sampling crew: T. VanderVis, K. Reid, A. Vigil		
Two-minute safety drill: Snowy/muddy conditions, safe hiking		
Meters calibrated at (location) SMO	**by** (whom) K. Tow	**at** (time) 1642
YSI Meter number: 50	**Turbidimeter serial number:** NA	
Sample Retrieval **Date:** 3-16-19	**Time:** 0842 TV 3-16-19	**Method:** PP
Sample Event ID: 12266	**Sample ID Numbers:** CAWA-19-167529, -167526, -167527	

FIELD PARAMETERS

pH (su): 7.28	Sp. Cond. (µS/cm): 260.4	Turbidity (NTU): 26.14
Temperature (°C): 9.7	DO (mg/L): 8.21	Q (gpm): 30

Explanation of Q method, including calculations: 7.2cm in Vnoten .23 staff plate

$\frac{2gal}{45}$; $\frac{2gal}{45}$; $\frac{2gal}{45}$ $\frac{2gal}{45} \times \frac{60s}{1min} = 30gpm$

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type:	(Spring)			Baseflow (persistent flow)	
Sample location:	Bank		Wading	Station Gage: at / above / below	
	(Midstream natural feature)		Other (specify): NA		
Description of Sampling Site:	Pool	Riffle	Eddy	Diffuse	Other
	Written description: midstream below source				
Substrate:	Bedrock	Concrete	(Cobble)	(Gravel)	Sand / Mud
Stage Conditions:	Stable: (normal) / low / high		Falling	Rising	Other (specify): NA
Hydraulic Event:	(Routine)	Snowmelt	Flood	Drought	Other (specify):
Stream Color:	Brown	(Clear)	Green	Blue	Gray / Other (specify):
Description of flow:	(Turbulent)	Laminar	Recirculating	Stagnant	Other
	Written description: ~~None~~ TV 3-16-19 cloudy; brown tint				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA			Units: NA
GPS point #2:	Name:	Coordinates:			Units:
Photo #1:	Description: looking Down Stream		Facing: N	Time: 0954	Taken by: T. VanderV. S
Photo #2:	Description: looking upstream		Facing: ~~N~~ TV 3-16-19 S	Time:	Taken by:
Photo #3:	Description: Source		Facing: S	Time:	Taken by:

Other notes: HE spot test yield negative results
1 Virgil preserves samples, T. VanderV. S QAs
Contact waste: 0.5 gal.

Offsite time: ~~1040~~ 0910 TV 3-16-19 **Relinquish samples at SMO**, care of K. Popova at (time) 0735 3-18-19

Objectives met? yes

TV 3-16-19

3/6/2019

Martin Spring

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ATTACHMENT 2

SOP-5224-R2 — 3-6-2019 TB

Spring/Surface Water Sampling Field Data Sheet

Records Use Only — Los Alamos National Laboratory

Site name: Martin Spring	**Date:** 3-6-2019	**Onsite time:** 1200 DSI
Objective: Sample per applicable reference doc. Pg. 3		**Weather:** Cloudy & 40's

Sampling crew: T. Benham, T. Walker, A. Stecker & D. Jaramillo

Two-minute safety drill: hiking, PPE & Slippery / lose surfaces

Meters calibrated at (location) SMO **by** (whom) D. Jaramillo **at** (time) 0730

YSI Meter number: 50	**Turbidimeter serial number:** 6

Sample Retrieval	**Date:** 3-6-2019	**Time:** 1225	**Method:** PP
Sample Event ID: 1226C	**Sample ID Numbers:** CAwA-19-167531, -167532 & -167534		

FIELD PARAMETERS

pH (su): 7.18	Sp. Cond. (µS/cm): 256.1	Turbidity (NTU): 49.3
Temperature (°C): 10.4	DO (mg/L): 7.31	Q (gpm): 8.90

Explanation of Q method, including calculations: Bag w/ Graduated cup

$\frac{1.65L}{3sec} \times \frac{1.70L}{3sec} \times \frac{1.67L}{3sec} \times \frac{1.65L}{3sec} \times \frac{1.75L}{3sec} = \frac{1.684L}{3sec} \times \frac{20sec}{1/3min} = \frac{33.68L}{min} \times \frac{1Gal}{3.785L} = $ 8.90 GPM

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type:	(Spring)			Baseflow (persistent flow)	
Sample location:	Bank		Wading	Station Gage: at / above / below	
	Midstream natural feature		Other (specify): Pool in Weir Box		
Description of Sampling Site:	(Pool)	Riffle	Eddy	Diffuse	Other
	Written description: below boulder in Weir Box				
Substrate:	Bedrock	Concrete	Cobble	(Gravel)	(Sand) / Mud
Stage Conditions:	Stable: (normal) / low / high	Falling	Rising	Other (specify):	
Hydraulic Event:	(Routine)	Snowmelt	Flood	Drought	Other (specify):
Stream Color:	Brown	(Clear) / Green	Blue	Gray	Other (specify):
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other
	Written description: Cloudy w/ Grey+Blue hue				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA		Units: NA
GPS point #2:	Name: ↓	Coordinates: ↓		Units: ↓
Photo #1:	Description: Source	Facing: N	Time: 1230	Taken by: T. Benham
Photo #2:	Description: below Source	Facing: SE	Time: ↓	Taken by: ↓
Photo #3:	Description: above Source	Facing: NW	Time: ↓	Taken by: TB ↓

Other notes: A. Stecker conducts HE spot test; Results = Negative
D. Jaramillo Preserves Samples; A. Stecker QA's

Contact waste: ½ gal.

3-6-2019 TB

Offsite time: 1315 **Relinquish samples at SMO**, care of K. Popova at (time) 1350

Objectives met? Yes

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PRB Alluvial Seep (16-61439)

Tr 3-11-19

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos NATIONAL LABORATORY

Spring/Surface Water Sampling Field Data Sheet

Site name: PRB Alluvial Seep	**Date:** 3-11-19	**Onsite time:** 1301 DST
Objective: sample per SOPs and documentation		**Weather:** rainy, 30s
Sampling crew: T. VanderVis, M. Shenda, A. Vigil		
Two-minute safety drill: safe hiking in snow / rain		
Meters calibrated at (location) SMO	**by** (whom) K. Tow	**at** (time) 730
YSI Meter number: 60	**Turbidimeter serial number:** NA	
Sample Retrieval **Date:** 3-11-19	**Time:** 1306	**Method:** DP
Sample Event ID: 12266	**Sample ID Numbers:** CAWA-19-167535, -167536, -167537	

FIELD PARAMETERS

pH (su): 7.23	Sp. Cond. (µS/cm): 275.5	Turbidity (NTU): 14.00
Temperature (°C): 5.0	DO (mg/L): 9.11	Q (gpm): 4.76

Explanation of Q method, including calculations:

$\frac{3000\,mL}{10\,s} \times 6 \qquad \frac{18{,}000\,mL}{1\,min} \times \frac{1\,Gal}{3785\,mL} = 4.76\ gpm$

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type:	(Spring)			Baseflow (persistent flow)	
Sample location:	Bank	Wading		Station Gage: at / above / below	
	Midstream natural feature	Other (specify): pool below source			
Description of Sampling Site:	(Pool)	Riffle	Eddy	Diffuse	Other
	Written description: pool below source				
Substrate:	Bedrock	Concrete	(Cobble)	(Gravel)	(Sand) Mud
Stage Conditions:	Stable: (normal) / low / high	Falling	Rising	Other (specify): NA	
Hydraulic Event:	(Routine)	Snowmelt	Flood	Drought	Other (specify):
Stream Color:	Brown	(Clear)	Green	Blue	Gray	Other (specify):
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other
	Written description: none				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA			Units: NA
GPS point #2:	Name: ↓	Coordinates: ↓			Units: ↓
Photo #1:	Description: NA	Facing: NA	Time: NA	Taken by: NA	
Photo #2:	Description: ↓	Facing: ↓	Time: ↓	Taken by: ↓	
Photo #3:	Description: ↓	Facing: ↓	Time: ↓	Taken by: ↓	

Other notes: HE spot test yields negative results
A. Vigil preserves samples; M. Shenda QAs

Contact waste: 0.5 gal.

Tr 3-11-19

Offsite time: 1335 **Relinquish samples at SMO**, care of K. Popova at (time) 1500

Objectives met? yes

40

TV 3-16-19

SWSC Spring

ATTACHMENT 2

SOP-5224-2

Spring/Surface Water Sampling Field Data Sheet

Records Use Only

Los Alamos NATIONAL LABORATORY

Site name: SWSC Spring	**Date:** 3-16-19	**Onsite time:** ~~0915~~ 1015 DST TV 3-16-19
Objective: Sample spring per SOPs and documentation		**Weather:** Sunny, 30s
Sampling crew: T. VanderVis, K. Reid, A. Vigil		
Two-minute safety drill: safe hiking in snowy/muddy conditions		
Meters calibrated at (location) 3M0	**by** (whom) K. Tow	**at** (time) 1642
YSI Meter number: 50	**Turbidimeter serial number:** NA	
Sample Retrieval **Date:** 3-16-19	**Time:** ~~1018~~ 0918 TV 3-16-19	**Method:** PP
Sample Event ID: 12266	**Sample ID Numbers:** CAWA	

FIELD PARAMETERS

pH (su): 6.95	Sp. Cond. (µS/cm): 264.2	Turbidity (NTU): 30.12
Temperature (°C): 8.8	DO (mg/L): 8.11	Q (gpm): 0.87

Explanation of Q method, including calculations: Vnotch = 1.80 cm

380 mL 7s
380 mL 7s
390 mL 7s

$\frac{383\text{mL}}{7\text{s}} \wedge \frac{60\text{s}}{1\text{min}} \times \frac{3.28\text{L}}{1\text{min}} \times \frac{1\text{Gal}}{~~3.975~~ 3.785\text{L}}$ TV 3-16-19 = 0.87 gpm

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type:	(Spring)				Baseflow (persistent flow)	
Sample location:	Bank		Wading		Station Gage: at / above / below	
	(Midstream natural feature)		Other (specify): NA			
Description of Sampling Site:	(Pool)	Riffle	Eddy	Diffuse	Other	
	Written description: pool below source cleared of leaves					
Substrate:	Bedrock	Concrete	Cobble	(Gravel)	Sand	(Mud)
Stage Conditions:	Stable: (normal) / low / high		Falling	Rising	Other (specify): NA	
Hydraulic Event:	(Routine)	Snowmelt TV 3-16-19	Flood	Drought	Other (specify): ↓	
Stream Color:	Brown	(Clear)	Green	Blue	Gray	Other (specify): Cloudy
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other	
	Written description: Cloudy					

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA			Units: NA
GPS point #2:	Name: ↓	Coordinates: ↓			Units: ↓
Photo #1:	Description: looking upstream	Facing: SW	Time: 1026		Taken by: T. VanderVis
Photo #2:	Description: Source	Facing: SW	Time: ↓		Taken by: ↓
Photo #3:	Description: looking downstream	Facing: NE	Time: ↓		Taken by: ↓

Other notes: HE spot test yeilds negative results
A. Vigil preserves samples; T. VanderVis QAs

Contact waste: 0.5 gal.

Offsite time: 0940 **Relinquish samples at SMO**, care of K. Popova at (time) 0735 3-18-19

Objectives met? yes

TV 3-16-19

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FLC-16-25280

03/08/19

Note: See pg. 161 of this logbook for morning activities
DST 1255 Crew on site @ FLC-16-25280
Zminute Safety: PPE, trip hazards & wind
Weather: cloudy & 40's w/ wind
Objective: Purge & Sample FLC-16-25280 per all applicable reference documentation found on pg. 3 of this logbook
1257 DTW = 5.10' BTIC
1300 DTW = 5.10' BTIC mTD = 7.43' BTIC WC = 2.33'
2"ID 1CV = (0.163 gal/ft) WC = 0.38 gallons
3CV = (1CV x 3) = 1.14 gallons
1307 Pump on; water to surface @Q = 0.08 gpm (measured in graduated cup)
1308 Flowthrough cell full; begin logging parameters on YSI #50
File: FLC-16-25280 & GW Sampling Log
1312 1CV purged; Parameters unstable & not enough parameters collected for compliance checklist.
1320 Pump paused; over 1CV purged & parameters stable
1325 Pump on; begin Sampling
1340 Sampling complete; Pump off
Note: M. Shendo conducts HE spot test; Results = Negative
Note: A. Vigil preserves Samples; M. Shendo QA's
Summary: objective met to purge & sample FLC-16-25280 per all applicable reference documentation on pg. 3 of this logbook
Note: See pgs. 165-166 for parameters, final IT, waste info & compliance checklist
1355 Crew off site
1435 Relinquish Samples to SMO c/o: R. Onstott
Event ID: 1226C
SampleID's: CAWA-19-167539, -167538 & -167540

3-8-2019 TB

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Groundwater Sampling Log

IFWGMP MY: 2019 Q: 2
Watershed: Water/CdV
Well: FLC-16-25260
Sampling Device: PP
Measuring Point: L
* Completion Depth:
[* ft. BTOC / BTIC / BGS / MSL]

LSD: 7352.7 ft. msl
Water Level: 7350.42 ft. msl
*TD: = MTD = 7.43 'BTIC
*DTW: 5.10'BTIC
Drop Pipe: NA gal.

Well Diameter: 2 inches
Top of Screen: 5.22 ft. BTIC
Bottom of Screen: 6.82 ft. BTIC
Water Column: 2.33 ft.
1CV: 0.38 gal.
3CV: 1.14 gal.

Note MP height (stickup) of TOC/TIC for Alluvials 2.62 ft.

Date: 3-8-2019 TB
Notes: NONE

Packer Pressure
Before: TB psi
Actuation: 3-8-19 TB psi
Opening: TB psi
After: psi

DTW = (LSD - Water Level)..... **Water Column** = (TD - DTW)..... **Drop Pipe** = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)

TIME MST (DST)	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1307	Pump on; Water to surface @ Qc						0.08	6PM		
1308	6.69	4.8	172.8	7.54	30.58	N	168.1	5.12	0.08	cloudy w/ Green hue & odorless
1311	5.76	3.1	171.6	5.99	27.48		191.9	5.12		
1314	5.70	3.0	174.4	5.70	26.77		202.6	5.12		
1317	5.69	3.0	174.9	5.55	26.71		208.4	5.12		
1320	5.68	3.0	175.0	5.50	26.77		212.1	5.12		
1320	Pump paused; CW ICV purged & Parameters Stable									
1325	~~Sampling~~ 3/8/19 TB Complete; Pump off						Pump on; Begin Sampling			
1340	Sampling complete; Pump off									

3-8-2019 TB

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste: 1/2 gal.
*Purge Water: 1.04 gal.
Total Waste Water: 1.14 gal.

Drum#: Municipal
Drum#'s: 1910 5 gallon carboy

Final Water Level: 5.10 3-8-19 TB ft. BTIC

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

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3-8-19TB

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Attachment 3
Compliance Checklist

Well Name: FLC-16-25750
Date: 3-8-2019

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter / Manual	Drop Pipe: NA 3 CVs: 1.14	NA	1.04	2.74	(Y) N	Purged an extra 1.74 cv's for stability, in DO & to get enough Parameters

	Stable for three consecutive readings?				
Parameters collected at proper intervals? (HH:MM)	pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%,	Comments:
1314	5.70	5.70	174.4	26.77	NONE
1317	5.69	5.55	174.9	26.71	
1320	5.68	5.50	175.0	26.77	
Calculations: Highest:	5.70	5.70	Median: 174.9	Median: 26.77	
Lowest:	5.68	5.50	Median + 3 %: 180.1	Median + 3 %: 29.44	
Difference:	0.02	0.20	Median - 3 %: 169.7	Median - 3 %: 24.10	
	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N

SOP Requirements Met?	Comments:
(Y) N	NONE

3-8-19TB

ATTACHMENT 1

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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name: FLC-16-25280	Date: 3-8-2019	Time onsite (MST): 1255	Activity: Manual I for Sampling	
Personnel: T. Benham, M. Stead & A. Vigil			Cable Length(ft): NA	Cable SN: NA
Telemetry: Yes \ (No)	Pull Transducer: Yes \ (No)	New Transducer Needed. Yes \ (No) New LT SN: NA	Memory % remaining: NA	Battery % remaining: NA
Connect Time: NA	Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): NA	P (psi): NA	T (C): NA	Stop Test: Yes \ (No) NA	Change Desicant: Yes \ No \ (NA)
Last Start Date: NA	Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) (TIC (inner)) | Stick-up Measured on Site ☐ | Previous MP Used ☒

Time (MST)	1257	Water Level Meter Serial No. 34243		Notes:
DTW (ft bMP)	5.10' bTIC	Measurements in feet		
Time (MST)	1300	LSD ft	7352.9' msl	
DTW (ft bMP)	5.10' bTIC	MP Height ft.	+2.62'	
Time (MST)	~~3-8-19 TB~~	MP Elevation	= 7355.52' msl	
DTW (ft bMP)		DTW	-5.10' bTIC	
Time (MST)	1300	Groundwater Elevation (GWE) Reference Level	7350.42' msl	
TD (ft bMP)	7.43' bTIC			
		Zip Tie on Kellim's Grip: NA		

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Progamming Time		Time (MST)	Reading
WL (transducer reading) (ft)		New Test Name			
GWE from MM		Reference Level			
Difference in value:		Current Depth			
Error tolerance of transducer:		Meas. Interval			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft 30 PSI-0.07 ft 100 PSI-0.23 ft 500 PSI-1.16 ft		Synch Clocks: Yes \ No			

(Part 3/Part 4 lined out: 3-8-2019 TB)

Deleted Tests:

QA Date and initial:

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Groundwater Sampling Log

FWQMP MY: 2019 Q: 2	LSD: 7443.18 ft. msl	Well Diameter: 2 inches	Date: 3-16-2019
Watershed: Water/CdV	Water Level: 7441.41 ft. msl	Top of Screen: 5.30 ft. BTOC	Notes:
Well: CdV-16-02656	*TD: =MTD: 10.99' BTOC	Bottom of Screen: 11.0 ft. BTOC	NONE
Sampling Device: PP	*DTW: 4.07' BTOC	Water Column: 6.92 ft.	
Measuring Point: ft. BTOC	Drop Pipe: NA gal.	1CV: 1.13 gal.	Packer Pressure
* Completion Depth: TD		3CV: 3.38 gal.	Before: ____ psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	2.30 ft.	Actuation: 1.5 ____ psi
DTW = (LSD - Water Level)..... Water Column = (TD - DTW)..... Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: ____ psi
			After: ____ psi

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTOC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
0853	Pump on; Water to surface @ Q=0.13 GPM									
0854	7.48	5.4	280.9	7.32	57.11	N	119.3	4.28	0.13	cloudy w/no odor
0857	6.81	6.2	274.8	5.35	30.33		134.9	4.36		
0900	6.63	6.4	277.3	5.28	24.50		147.6	4.36		
0903	6.55	6.4	280.7	4.84	23.48		154.6	4.36		Slightly cloudy w/no odor
0906	6.53	6.5	280.9	4.71	23.16		159.0	4.37		
0909	6.54	6.5	281.2	4.69	22.97		161.6	4.38		
0909	Pump paused; over 1CV purged & parameters stable									
0912	Pump on; Begin Sampling									
0928	Sampling complete; Pump off									

3-16-2019

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste: 1/2	gal.	Drum#: Municipal	
*Purge Water: 2.08	gal.	Drum#'s: 1927	5 gallon Carboy
Total Waste Water: 2.18	gal.		

Final Water Level: 4.21 ft BTOC 3/16/2019

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

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3/16/19 TB

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Attachment 3

Compliance Checklist

Well Name: CdV-16-02656

Date: 3-16-2019

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter (Manual)	Drop Pipe: NA 3 CVs: 3.38	NA	2.08	1.84	(Y) N	Purged extra Volumes for Stability in Turbidity, pH & DO

	Stable for three consecutive readings?				
Parameters collected at proper intervals? (HH:MM)	pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%,	Comments:
0903	6.55	4.84	280.7	23.48	
0906	6.53	4.71	280.9	23.16	
0906	6.54	4.69	281.2	22.97	
Calculations:	Highest: 6.55	Highest: 4.84	Median: 280.9	Median: 23.16	NONE
	Lowest: 6.53	Lowest: 4.69	Median + 3%: 289.3	Median + 10%: 25.47	
	Difference: 0.02	Difference: 0.15	Median - 3%: 272.5	Median - 10%: 20.85	
	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N

SOP Requirements Met?	Comments:
(Y) N	NONE

3/16/19 TB

ATTACHMENT 1
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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity:	
CdV-16-02656	3-16-2019	0835	Manual IT for Sampling	
Personnel: T. Benham, J. Romero & K. Tow			Cable Length(ft): NA	Cable SN: NA
Telemetry: Yes \ (No)	Pull Transducer: Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA	Memory % remaining: NA	Battery % remaining: NA
Connect Time: NA	Transducer SN: NA	New LT PSI Rating: NA / Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): NA		P (psi): NA / T [C]: NA	Stop Test: Yes \ (No): NA	Change Desicant: Yes \ (No) \ NA
Last Start Date: NA		Data File Name: NA		

PART 2: Manual Measurements

Measuring Point: (TOC) (top outer casing) TIC (inner) | Stick-up Measured on Site ☐ | Previous MP Used ☒

Time (MST):	0840	Water Level Meter Serial No.: 34244	**Notes:** NONE
DTW (ft bMP):	4.07' BTOC	Measurements in feet	
Time (MST):	0843	LSD ft: 7443.18' msl	
DTW (ft bMP):	4.07' BTOC	MP Height ft.: +2.30'	
Time (MST):	3/16/19 TB	MP Elevation: = 7445.48' msl	
DTW (ft bMP):		DTW: - 4.07' BTOC	
Time (MST):	0843	Groundwater Elevation (GWE) Reference Level: 7441.41' msl	
TD (ft bMP):	10.99' BTOC		
		Zip Tie on Kellim's Grip: NA	

Transducer Performance and Programming

Part 3: Transducer Error\Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST):		Progamming Time:		Time (MST):	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level:			
Difference in value:		Current Depth:			
Error tolerance of transducer:		Meas. Interval:			
☐ Within Error Tolerance		Start Date:	3-16-2019 TB		
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			
Deleted Tests:					QA. Date and Initial:

CdV-16-02657r

03/16/19

Note: See pgs. 32 of this logbook for morning activities

DST 0937 Crew on Site @ cdv-16-02657r

0937 2 minute safety: Hiking, PPE & Wet/icy changing conditions

Weather: Sunny & 30's w/ light breeze

Objective: Purge & Sample cdv-16-02657r per all applicable refrence documentation found on pg. 3 of this logbook

0939 DTW = 5.41' BTIC

0942 DTW = 5.41' BTIC TD = 7.21' BTIC WC = (TD-DTW) = 1.80'

SM/TMB #1/11 ID 1cv = (0.04 gal/ft) WC = 0.07 gallons

3cv = (1cv x 3) = 0.22 gallons

0956 pump on; No water

0957 pump off, Crew lowers tubing

Note: Crew unable to fit Waterlevel tape into casing w/ tubing. We will collect initial & Final FP

1004 Pump on; water to surface @ Q = 0.04 Gpm (manually w/ Graduated cup)

1006 Flow through cell full; Begin logging parameters on YSI #60

File: cdv-16-02657r, Low Sampling log & I-Pad #3: T. Banham

1012 pump paused; over 3cv's purged & parameters unstable

1013 Pump on; Begin Sampling

1014 J. Romero Conducts HE spot test; Results = Negative

1035 ~~1035~~ SM/TMB Sampling Complete; Pump off

1040 Crew off Site

Note: K. Tow preserves Samples; T. Banham QA's

Summary: Objective met to purge & Sample cdv-16-02657r per all applicable refrence documentation found on pg. 3 of this logbook. Deviations @ unable to collect enough parameters & unable to collect FP during purge.

Note: See pgs. 36-37 for parameters, final FP, Waste info & compliance checklist

7-18-19 0735 Relinquish Samples to SMO c/o: K. Popova

Event ID: 12266

Sample ID's: CAWA-19-167545, -167544 & -167546

3-16-2019 TB

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Groundwater Sampling Log

IFWGMP MY: 2019 Q: 2	LSD: 7430.22 ft. msl	Well Diameter: 1 inches		Date: 3-16-2019
Watershed: Water/CdV	Water Level: 7428.46 ft. msl	Top of Screen: 5.0 ft. BTIC		Notes: If not able to be collected during Purge.
Well: CdV-16-026571	*TD: =mTD= 7.21' BTIC	Bottom of Screen: 7.0 ft. BTIC		
Sampling Device: PP	*DTW: 5.41' BTIC	Water Column: 1.80 ft.		
Measuring Point: ft. BTIC	Drop Pipe: NA gal.	1CV: 0.07 gal.		Packer Pressure
* Completion Depth: TD		3CV: 0.22 gal.		Before: 3-16-2019TB psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	3.65 ft.		Actuation: psi
DTW = (LSD - Water Level)..... Water Column = (TD - DTW)..... Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)				Opening: psi
				After: psi

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
0956	Pump on; no water									
0957	Pump off; crew lower tubing									
1004	Pump on; water to surface @ 0.04 GPM									
1006	7.20	3.7	225.8	7.60	52.17	N	202.8	NC	0.04	cloudy w/ no odor
1009	7.21	3.6	219.3	7.20	27.01	↓	203.2	↓	↓	↓
1012	6.64	3.6	218.1	7.13	25.89	↓	203.0	↓	↓	↓
1012	Pump paused									
1013	Pump on; Begin sampling									
1035	Sampling Complete; Pump off									

3-16-2019TB

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste: 1/2 gal.	Drum#: Municipal	Final Water Level: 5.41 ft BTIC 3/16/19TB	
*Purge Water: 0.32 gal.	Drum#'s: 1926 5gallon Corboy	*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)	
Waste Water: 0.33 gal.			

3/16/19TB

ER-SOP-20032 IPC-6

Attachment 3
Compliance Checklist

Well Name: CdV-16.02857r
Date: 3-16-2019

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter (Manual)	Drop Pipe: NA 3 CVs: 0.22	NA	0.32	4.57	(Y) N	Purged extra to get 3 parameters & b/c all parameters unstable

	Stable for three consecutive readings?				
Parameters collected at proper intervals? (HH:MM)	pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%,	Comments:
1006	7.20	7.60	255.8	52.19	All Parameters unstable @ 3CV's
1009	7.21	7.20	219.3	27.01	
1012	6.64	7.13	218.1	25.89	
Calculations:	Highest: 7.20	Highest: 7.60	Median: 219.3	Median: 27.01	
	Lowest: 6.64	Lowest: 7.13	Median + 3 %: 225.8	Median + 10 %: 29.71	
	Difference: 0.56	Difference: 0.47	Median - 3 %: 212.8	Median - 10 %: 24.31	
(Y) N	Y (N)	Y (N)	Y (N)	Y (N)	

SOP Requirements Met?	Comments:
(Y) N	Purged after 3CV's purged per alluvial well SOP requirements

3/16/19TB

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information					
Well Name: CdV-16-02657r	Date: 3-16-2019	Time onsite (MST): 0937	Activity: Manual IF for Sampling		
Personnel: T. Benham, K. Taw & I. Romero			Cable Length(ft): NA	Cable SN: NA	
Telemetry: Yes \ (No)	Pull Transducer: Yes \ (No) NA	New Transducer Needed: Yes \ (No) New LT SN: NA	Memory % remaining: NA	Battery % remaining: NA	
Connect Time: NA	Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): NA		P (psi): NA	T [C]: NA	Stop Test: Yes \ (No) NA	Change Desicant: Yes \ (No) \ NA NA
Last Start Date: NA		Data File Name: NA			

PART 2: Manual Measurements				
Measuring Point: TOC (top outer casing) ~~TIC (inner)~~		Stick-up Measured on Site ☐	Previous MP Used ☒	
Time (MST): 0939		Water Level Meter Serial No. 34244		**Notes:** NO NE
DTW (ft bMP): 5.41'6TIC		Measurements in feet		
Time (MST): 0942		LSD ft	7430.22'msl	
DTW (ft bMP): 5.41'6TIC		MP Height ft.	+ 3.65'	
Time (MST): ~~3-16-2019~~		MP Elevation	= 7433.87'msl	
DTW (ft bMP):		DTW:	- 5.41'6TIC	
Time (MST):		Groundwater Elevation (GWE) Reference Level	7428.46'msl	
TD (ft bMP): 7.21'6TIC		Zip Tie on Kellim's Grip: NA		

Transducer Performance and Programming					
Part 3: Transducer Error\Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Progamming Time:		Time (MST):	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level:			
Difference in value:		Current Depth:			
Error tolerance of transducer:		Meas. Interval:			
☐ Within Error Tolerance		Start Date:	3-16-2019		
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			
Deleted Tests:				QA. Date and Initial:	

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Groundwater Sampling Log

IFWGMPMY: 2019 Q: 2	LSD: 7300.50' msl ft. msl	Well Diameter: 4 inches	Date: 3-11-2019
Watershed: Water/CdV	Water Level: 7295.09 ft. msl	Top of Screen: 4.94 ft. BTOC	Notes: NONE
Well: CdV-16-02657	*TD: = MTD = 10.88' BTOC	Bottom of Screen: 9.94 ft. BTOC	
Sampling Device: 3 gallon SPP	*DTW: 5.65' BTOC	Water Column: 5.23 ft.	Packer Pressure
Measuring Point: ft. BTOC	Drop Pipe: NA gal.	1CV: 3.42 gal.	Before: ___ psi
* Completion Depth: TD		3CV: 10.25 gal.	Actuation: ___ psi
	Note MP height (stickup) of TOC/TIC for Alluvials 3.24 ft.		Opening: ___ psi
[* ft. BTOC / BTIC / BGS / MSL]			After: ___ psi

DTW = (LSD - Water Level)......Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTOC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1017	Pump on; water to surface @ Q = 0.09 GPM									
1018	7.70	4.4	255.7	7.96	15.57	N	202.1	5.70	0.09	Clear w/no odor
1021	6.81	3.9	250.4	7.14	10.00		218.6	5.71		
1024	6.69	3.8	249.3	6.86	8.72		217.6	5.70		
1027	6.68	3.8	248.9	6.74	8.18		214.4	5.70		
1030	6.68	3.7	249.0	6.67	8.17		211.1	5.70		
1033	6.68	3.7	248.8	6.64	7.92		208.8	5.70		
1036	6.69	3.7	248.7	6.61	7.85		206.9	5.70		
1039	6.69	3.7	248.7	6.59	7.82		205.7	5.70		
1042	6.70	3.6	248.8	6.57	7.74		204.5	5.70		
1045	6.70	3.6	248.7	6.56	7.69		203.5	5.70		
1048	6.71	3.6	248.7	~~6.55~~ 3/11/19TB	7.63		203.0	5.70		
1051	6.72	3.6	248.8	6.53	7.60		202.6	5.70		
1054	6.72	3.6	248.7	6.52	7.54		202.3	5.70		
1057	6.73	3.6	248.7	6.53	7.65		202.2	5.70		3-11-19TB
1057	1cv purged + stable parameters; Pump on @ 1100 begin sampling; Pump off @ 1109									

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste: 1/2 gal.	Drum#: Municipal		Final Water Level: 5.74 ft BTOC
*Purge Water: 3.60 gal.	Drum#'s: 1614	5 gallon carboy	*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)
Total Waste Water: 3.70 gal.			

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3/11/19TB

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Attachment 3

Compliance Checklist

Well Name: CdV-16-02659

Date: 3-11-2019

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter (Manual)	Drop Pipe: NA 3 CVs: 10.25	NA	3.60	1.05	(Y) N	NONE

	Stable for three consecutive readings?				Comments:
Parameters collected at proper intervals? (HH:MM)	pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%,	
1051	6.72	6.53	248.6	7.60	
1054	6.72	6.52	248.7	7.54	
1057	6.73	6.53	248.7	7.65	
Calculations:	Highest: 6.73	Highest: 6.53	Median: 248.7	Median: 7.60	NONE
	Lowest: 6.72	Lowest: 6.52	Median + 3 %: 256.1	Median +10 %: <10	
	Difference: 0.01	Difference: 0.01	Median - 3 %: 241.3	Median -10 %: <10	
(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	

SOP Requirements Met?	Comments:
(Y) N	NONE

3/11/19TB

ATTACHMENT 1
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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name: CdV-16-02659	Date: 3-11-2019	Time onsite (MST): 1003	Activity: Manual II for Sampling
Personnel: T. Barham, D. Jaramillo & K. Tow		Cable Length(ft): NA	Cable SN: NA
Telemetry: Yes \ (No)	Pull Transducer: Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA	Memory % remaining: NA	Battery % remaining: NA
Connect Time: NA	Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): NA		P (psi): NA	T (C): NA	Stop Test: Yes \ (No)	Change Desicant: Yes \ No \ (NA)
Last Start Date: NA		Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: (TOC (top outer casing)) TIC (inner) | Stick-up Measured on Site ☐ Previous MP Used ☒

Time (MST)	1006	Water Level Meter Serial No. 34243	
DTW (ft bMP)	5.65' bTOC	Measurements in feet	
Time (MST)	1009	LSD ft	7300.50' msl
DTW (ft bMP)	5.65' bTOC	MP Height ft.	+3.24'
~~Time (MST)~~	3-11-19 TB	MP Elevation	=7303.74' msl
~~DTW (ft bMP)~~		DTW	-5.65' bTOC
Time (MST)		Groundwater Elevation (GWE) Reference Level	7298.09' msl
TD (ft bMP)			
		Zip Tie on Kellim's Grip: NA	

Notes: NONE

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings		Time (MST)	Reading
WL Reading Time (MST)		Progamming Time:			
WL (transducer reading) (ft)		New Test Name:			
GWE from MM		Reference Level			
Difference in value:		Current Depth:			
Error tolerance of transducer:		Meas. Interval			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			

Deleted Tests:

QA Date and Initial

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TW 3-11-19

CdV-16-611923

Groundwater Sampling Log

IFWGMP MY: 2019 Q: 2	LSD: 7376.43 ft. msl	Well Diameter: 2 inches	Date: 3-11-19
Watershed: Water/CdV	Water Level: NA ft. msl	Top of Screen: 5.0 ft. btic	Notes: ∇ in screened interval
Well: CdV-16-611923	*TD= ~~11.67~~ 11.34' btic	Bottom of Screen: 10.0 ft. btic	
Sampling Device: PP	*DTW= ~~5.72' btic~~ 7.16' btic	Water Column: 4.18 ft.	
Measuring Point: TIC	Drop Pipe: None gal.	1CV: 0.68 gal.	Packer Pressure
* Completion Depth: mTD		3CV: 2.04 gal.	Before: NA psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	NA ft.	Actuation: psi
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: psi
			After: psi

TIME (MST) / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. btic	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1054	pump on; water to surface									
1055	6.51	4.0	344.3	8.91	52.50	N	155.1	7.19	0.09	Cloudy, Odor
1058	6.52	3.7	346.6	6.95	37.72		169.7	7.19		
1101	6.54	3.7	346.1	6.81	25.99 28.3 TW 3-11-19		177.8	7.19		
1104	6.57	3.7	345.7	6.84	14.12		186.6	7.20		
1107	6.58	3.7	346.5	6.97	10.78		193.6	7.20		
1110	6.59	3.7	346.7	6.92	9.32		199.3	7.21		
1113	6.59	3.7	346.9	6.89	7.98		204.7	7.21		
1116	6.60	3.7	347.0	6.87	7.00		209.0	7.21		
1116	1 CV purged and parameters stable; pump paused to prepare									
1118	Pump on; begin sampling									
1156	Sampling complete; pump off									
			TW 3-11-19							

Yes in HACH column = HACH Turbidimeter #NA used because NA

Contact Waste:	0.5 gal.	Drum#: Municipal	
*Purge Water:	1.89 gal.	Drum#'s:	5 gal. carboy
Total Waste Water:	5.4 gal.	#1605	

Final Water Level: 7.10 ft btic

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

TW 3-11-19

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CdV-16-611923

TV 3-11-19

ER-SOP-20032 Rev 6.0

Attachment 3
Compliance Checklist

Well Name: CdV-16-611923
Date: 3-11-19

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter / (Manual)	Drop Pipe: NA 3 CVs: 2.04	NA	1.89	2.78	(Y) N	1.78 CV extra for turb. Stability

	Stable for three consecutive readings?				
Parameters collected at proper intervals? (HH:MM)	pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%.	Comments:
1110	6.59	6.92	346.7	9.32	none
1113	6.59	6.89	346.9	7.98	
1116	6.60	6.87	347.0	7.00	
Calculations: Highest:	6.60	6.92	Median: 346.9	Median: 4.10	
Calculations: Lowest:	6.59	6.87	Median +3 %: 357.3	Median +NA %: 4.10	
Calculations: Difference:	0.01	0.05	Median -3 %: 336.5	Median NA%: 4.10	
	(Y) N	(Y) N	(Y) N	(Y) N	(Y) N

SOP Requirements Met?	Comments:
(Y) N	none

TV 3-11-19

ATTACHMENT 1
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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity
CdV-16-611923	3-11-19	1135 DST	GW sampling

Personnel:					
T.VanderVir, A.Vigil, M.Snendo				Cable Length(ft):	Cable SN:
Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN:		Memory % remaining:	Battery % remaining:
Connect Time:	Transducer SN:	New LT PSI Rating:	Manufacture Date:	Log Note Memory % TV 3-11-19	Log Note Battery % TV 3-11-19
Water Level (ft) TV 3-11-19		P (psi):	T [C]	Stop Test: Yes \ No	Change Desicant: Yes \ No \ NA
Last Start Date:		Data File Name:			TV 3-11-19

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) TIC (inner) Stick-up Measured on Site ☐ Previous MP Used ☒

Time (MST)	1140	Water Level Meter Serial No.	34244
DTW (ft bMP):	7.16	Measurements in feet	
Time (MST)	1143	LSD ft	7376.43
DTW (ft bMP)	7.16	MP Height ft.	+ 0.00
Time (MST)	NA	MP Elevation	= 7376.43
DTW (ft bMP):	NA	DTW:	- 7.16
Time (MST)	1143	Groundwater Elevation (GWE) Reference Level	7369.27
TD (ft bMP):	11.34		
		Zip Tie on Keilim's Grip:	None

Notes: TV 3-11-19

Transducer Performance and Programming

Part 3: Transducer Error\Drift Acceptance

WL Reading Time (MST)		Progamming Time:	
WL (transducer reading) (ft):		New Test Name:	
GWE from MM		Reference Level	
Difference in value:		Current Depth:	
Error tolerance of transducer:		Meas. Interval	
☐ Within Error Tolerance		Start Date:	
☐ Outside Error Tolerance		Start Time:	

15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft. Synch Clocks: Yes \ No

Deleted Tests: None

Part 4: Programming & Final Readings

Time (MST)	Reading

TV 3-11-19

QA Date and Initial

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Groundwater Sampling Log

IFWGMP MY: 2019 Q: 2	LSD: 7370.79 ft. msl	Well Diameter: 4 inches	Date: 3-8-2019
Watershed: Water/CdV	Water Level: 7369.32 ft. msl	Top of Screen: 4.59 ft. BTIC	Notes: V. Strong 3-5-19
Well: MSC-16-06293	*TD: =mTD: 10.70' BTIC	Bottom of Screen: 9.59 ft. BTIC	
Sampling Device: PP	*DTW: 4.06' BTIC	Water Column: 6.64 ft.	
Measuring Point: BTIC	Drop Pipe: NA gal.	1CV: 4.34 gal.	Packer Pressure
* Completion Depth: TD		3CV: 13.01 gal.	Before: 30 psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	3.52 ft.	Actuation: 30 psi
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: psi
			After: psi

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1054	Pump on; water to surface @ Q=0.10 GPM									
1055	7.29	5.4	437.2	6.95	18.08	N	206.6	4.27	0.10	very cloudy w/ green tint + marker
1058	Pause Pump; tubing not long enough									
1102	Pump on; water to surface @ Q=0.10 GPM									
1102	7.02	6.2	488.2	7.01	72.73	N	242.8	4.45	0.10	cloudy w/ Green tint & odorless
1105	7.05	5.5	491.3	7.04	44.74		245.2	4.70		
1108	7.06	5.3	488.4	7.06	38.95		243.3	4.87		
1111	7.05	5.2	486.6	6.52	35.37		239.8	5.04		
1114	7.04	5.2	485.6	6.53	34.39		236.6	5.16		
1117	7.04	5.1	483.4	6.47	35.89		233.3	5.28		
1120	7.03	5.0	482.2	6.43	35.90		230.6	5.39		
1123	7.03	5.0	481.9	6.40	35.71		227.8	5.50		
1126	7.03	5.0	481.2	6.39	35.63		225.9	5.55		
1129	7.04	5.0	480.7	6.38	35.29		223.9	5.61		
1132	7.04	5.0	479.9	6.38	34.84		222.1	5.67		
1135	7.03	5.0	477.8	6.38	33.67		220.8	5.71		

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste: 1/2 gal. Drum#: Municipal

*Purge Water: 4.90 gal. Drum#'s: 1909 5 gallon carboy

Total Waste Water: 4.95 gal.

Final Water Level*: 5.69 ft BTIC

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

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Groundwater Sampling Log

IFWGMP MY: Q:	LSD: ft. msl	Well Diameter: inches	Date:
Watershed:	Water Level: ft. msl	Top of Screen: ft.	Notes:
Well:	*TD:	Bottom of Screen: ft.	
Sampling Device:	*DTW:	Water Column: ft.	
Measuring Point:	Drop Pipe: gal.	1CV: gal.	Packer Pressure
* Completion Depth:		3CV: gal.	Before:____psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	ft.	Actuation:____psi
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening:____psi After:____psi

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1138	7.03	4.9	475.6	6.38	32.57	N	220.1	5.75	0.10	cloudy w/Green tint & odorless
1141	7.03	4.9	469.7	6.26	28.82	↓	219.3	5.79	↓	↓
1144	7.03	4.8	464.5	6.11	26.57	↓	218.6	5.83	↓	↓
1147	7.02	4.8	461.7	6.01	25.58	↓	218.1	5.86	↓	↓
1147	Pause Pump; over 1CV purged & parameters stable									
1150	Pump on; begin Sampling									
1212	Sampling complete; Pump off									

3-8-2019 TB

3-8-19 TB

Yes in HACH column = HACH Turbidimeter #____ used because ____		Final Water Level: ft____
Contact Waste: gal.	Drum#: 3-8-19 TB	
*Purge Water: gal.	Drum#'s:	*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)
Total Waste Water: gal.		

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3-8-19 TB

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Attachment 3
Compliance Checklist

Well Name: MSC-16-06293
Date: 3-8-2019

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter (Manual)	Drop Pipe: NA 3 CVs: 13.01	NA	4.90	1.13	(Y) N	Purged an extra 0.13 cv's to get Stable turbidity

	Stable for three consecutive readings?				
Parameters collected at proper intervals? (HH:MM)	pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%,	Comments:
1141	7.03	6.26	469.7	28.82	NA
1144	7.03	6.11	464.5	26.57	
1147	7.02	6.01	461.7	25.58	
Calculations:	Highest: 7.03	Highest: 6.26	Median: 464.5	Median: 26.57	
	Lowest: 7.02	Lowest: 6.01	Median + 3 %: 478.4	Median + 10 %: 29.22	
	Difference: 0.01	Difference: 0.25	Median - 3 %: 450.56	Median - 10 %: 23.92	
(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	

SOP Requirements Met?	Comments:
(Y) N	NA

3-8-19 TB

ATTACHMENT 1
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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity
MSC-16-06293	3-8-2019	1040	Manual IV for Sampling

Personnel:	Cable Length(ft):	Cable SN:
T. Bonham, M. Shendo & A. Vigil	NA	NA

Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed. Yes \ No New LT SN:	Memory % remaining:	Battery % remaining:
		NA	NA	NA

Connect Time:	Transducer SN:	New LT PSI Rating:	Manufacture Date:	Log Note Memory %	Log Note Battery %
NA	NA	NA	NA	NA	NA

Water Level (ft)	P (psi):	T [C]	Stop Test: Yes \ No	Change Desiccant: Yes \ No \ NA
NA	NA	NA		

Last Start Date:	Data File Name:
NA	NA

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) / TIC (inner) | Stick-up Measured on Site ☐ | Previous MP Used ☒

Time (MST)	1046	Water Level Meter Serial No.	34243
DTW (ft bMP):	4.06 'btic	Measurements in feet	
Time (MST)	1049	LSD ft	7370.79 'msl
DTW (ft bMP)	4.06 'btic	MP Height ft.	+2.59'
Time (MST)	4-1913	MP Elevation	=7373.38 'msl
DTW (ft bMP):		DTW:	-4.06 'btic
Time (MST)	1049	Groundwater Elevation (GWE) Reference Level	7369.32 'msl
TD (ft bMP):	17.70		
		Zip Tie on Keilin's Grip:	NA

Notes: NONE

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance

WL Reading Time (MST)		Progamming Time:	
Wt. (transducer reading) (ft):		New Test Name:	
GWE from MM		Reference Level	
Difference in value:		Current Depth:	
Error tolerance of transducer:		Meas. Interval	
☐ Within Error Tolerance		Start Date:	3-8-2019 T13
☐ Outside Error Tolerance		Start Time:	

15 PSI-0.03ft 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft. Synch Clocks: Yes \ No

Deleted Tests:

Part 4: Programming & Final Readings

Time (MST)	Reading

QA Date and Initial

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Groundwater Sampling Log

IFWGMP MY: 2019 Q: 2	LSD: 7288.44 ft. msl	Well Diameter: 4 inches	Date: 3-19-2019
Watershed: Lower/CdV	Water Level: 7287.39 ft. msl	Top of Screen: 5.57 'BTIC ft. BTIC	Notes:
Well: MSC-16-06294	*TD: = MD = 11.10' BTIC	Bottom of Screen: 10.37 ft. BTIC	NONE
Sampling Device: PP	*DTW: 4.18' BTIC	Water Column: 6.92 ft.	
Measuring Point: ft. BTIC	Drop Pipe: NA gal.	1CV: 4.52 gal.	Packer Pressure
* Completion Depth: TD		3CV: 13.56 gal.	Before: ____ psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	3.07 ft.	Actuation: 3/19/19TB psi
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: ____ psi
			After: ____ psi

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1051	Pump on; water to surface @ Q=0.10 GPM									
1052	8.09	4.5	194.3	8.16	32a.06	N	151.0	4.50	0.10	Cloudy w/green hue & no odor
1057	6.74	4.1	164.3	4.12	163.50		146.0	4.65		
1102	6.58	3.9	148.6	3.45	106.25		145.6	4.82		
1107	6.53	3.6	135.3	2.93	82.68		145.5	4.94		
1112	6.52	3.4 2.36 3/19/19TB	126.4	2.76	77.73		147.4	4.99		Slightly cloudy w/ green hue & no odor
1117	6.50	3.30 2.44 3/19/19TB	122.2	2.74	77.93		150.7	5.04		
1122	6.50	3.1	120.2	2.73	7582		154.0	5.09		
1127	6.49	3.2	118.9	2.61	77.25		156.9	5.11		
1132	6.49	3.2	117.6	2.53	76.91		159.3	5.13		
1137	6.49	3.1	116.5	2.52	76.72		161.6	5.16		
1137	Pump paused; 1CV purged & Parameters stable									
1138	Pump on; Begin Sampling									
1151	Sampling complete; Pump off									
				3/19/19TB						

Yes in HACH column = HACH Turbidimeter #NA used because NA

Contact Waste: 1/2	gal.	Drum#: 1622	1 gallon carboy
*Purge Water: 4.60	gal.	Drum#'s: 1621	5 gallon carboy
Total Waste Water: 4.70	gal.		

Final Water Level: 5.11 3/19/19TB ft. BTIC

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

3/15/19 TB

ER-SOP-20032 IPC-6

Attachment 3
Compliance Checklist

Well Name: MSC-16-06274
Date: 3/15/2019

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter / Manual	Drop Pipe: NA 3 CVs: 13.56	NA	4.60	1.02	(Y) N	NONE

	Stable for three consecutive readings?				Comments:
Parameters collected at proper intervals? (HH:MM)	pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%,	
1127	6.49	2.61	118.9	77.25	
1132	6.49	2.53	117.6	76.91	
1137	6.49	2.52	116.5	76.72	
Calculations:	Highest: NA	Highest: 2.61	Median: 117.6	Median: 76.91	NONE
	Lowest: NA	Lowest: 2.52	Median + 3%: 121.1	Median + 10%: 84.60	
	Difference: 0.00	Difference: 0.09	Median - 3%: 114.1	Median - 10%: 69.22	
(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	

SOP Requirements Met?	Comments:
(Y) N	NONE

3/15/19 TB

ATTACHMENT 1
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Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date	Time onsite (MST)	Activity	
MSC-16-06294	3/14/2019	1040	Manual IV for Sampling	
Personnel: T. Benham, T. VanderVis, K. Tow & K. Reid			Cable Length(ft): NA	Cable SN: NA
Telemetry: Yes \ (No)	Pull Transducer: Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA	Memory % remaining: NA	Battery % remaining: NA
Connect Time: NA	Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA
Log Note Battery %: NA				
Water Level (ft): NA	P (psi): NA	T [C]: NA	Stop Test: Yes \ (No): NA	Change Desicant: Yes \ No \ (NA)
Last Start Date: NA	Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) (TIC (inner)) | Stick-up Measured on Site ☐ | Previous MP Used ☒

Time (MST)	1041	Water Level Meter Serial No. 34243	**Notes:** NONE
DTW (ft bMP)	4.18' BTIC	Measurements in feet	
Time (MST)	1044	LSD ft: 7288.44' msl	
DTW (ft bMP)	4.18' BTIC	MP Height ft.: +3.07'	
Time (MST)	3/14/2019 JB	MP Elevation: =7291.57' msl	
DTW (ft bMP)		DTW: -4.18' BTIC	
Time (MST)	1044	Groundwater Elevation (GWE) Reference Level: 7287.39' msl	
TD (ft bMP)	4.18' BTIC		
		Zip Tie on Keilin's Grip: NA	

Transducer Performance and Programming

Part 3: Transducer Error\Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Progamming Time		Time (MST)	Reading
WL (transducer reading) (ft)		New Test Name			
GWE from MM		Reference Level			
Difference in value:		Current Depth			
Error tolerance of transducer:		Meas. Interval	3/14/2019 JB		
☐ Within Error Tolerance		Start Date			
☐ Outside Error Tolerance		Start Time			
15 PSI-0.03ft 30 PSI-0.07 ft 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			
Deleted Tests:				QA Date and Initial	

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TV 3-11-19

CdV-16-611937

Groundwater Sampling Log

IFWGMP MY: 2019 Q: 2
Watershed: Water/CdV
Well: CdV-16-611937
Sampling Device: PP
Measuring Point: ~~MTD~~ btic
* Completion Depth: MTD
[* ft. BTOC / BTIC / BGS / MSL]

LSD: 7359.59 ft. msl
Water Level: NA ft. msl
*TD = MTD = 11.57' btic
*DTW = 5.72' btic
Drop Pipe: None gal.

Well Diameter: 2 inches
Top of Screen: 6.0 ft. btic
Bottom of Screen: 11.0 ft. btic
Water Column: 5.85 ft.
1CV: 0.95 gal.
3CV: 2.86 ~~3.44~~ gal.
Note MP height (stickup) of TOC/TIC for Alluvials ~~NA~~ 3.0 ft.

Date: 3-11-19
Notes: none

Packer Pressure
Before: NA psi
Actuation: psi
Opening: psi
After: psi

DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)

TIME (MST / DST)	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH (Yes or No)	ORP mV	Water Level* ft. btic	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
0935	pump on; water to surface									
0937	7.07	4.7	304.7	4.99	61.00	N	158.9	5.61	0.08	slightly brown hue, odorless, cloudy
0940	5.57	4.2	267.8	2.62	39.57		192.3	5.61		
0943	5.40	3.8	265.7	2.33	32.99		205.1	5.68		
0946	5.38	3.4	266.6	2.58	23.31		206.6	5.68		
0949	5.35	3.2	269.5	2.69	19.59		199.8	5.61		
0952	5.37	3.1	269.3	2.49	17.80		185.6	5.61		
0955	5.37	3.1	270.2	2.35	17.82		171.5	6.11		
0958	5.33	3.0	271.0	2.31	17.30		177.7	6.12		
0958	Pump paused to prepare to sample; 1CV purged and parameters stable									
1002	Pump on; begin sampling									
1029	Pump off; sampling complete									

TV 3-11-19

Yes in HACH column = HACH Turbidimeter # NA used because NA

Final Water Level: 5.59 ft btic

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

Contact Waste:	0.5	gal.	Drum#: municipal
*Purge Water:	1.68	gal.	Drum#'s: #1604 5 gal. carboy
Total Waste Water:	4.00	gal.	

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TV 3-11-19

CdV-16-611937

ER-SOP-20032 R C-6

Attachment 3
Compliance Checklist

Well Name: CdV-16-611937
Date: 3-11-19

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter / (Manual)	Drop Pipe: NA; 3 CVs: 2.86	NA	1.68	1.77	(Y) N	0.77 CV extra for DO and turb. Stability

Parameters collected at proper intervals? (HH:MM)	pH ≤0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%.	Comments:
	Stable for three consecutive readings?				
0952	5.37	2.49	269.3	17.80	none
0955	5.37	2.35	270.2	17.82	
0958	5.33	2.31	271.0	17.30	
Calculations:	Highest: 5.37	Highest: 2.49	Median: 270.2	Median: 17.80	
	Lowest: 5.33	Lowest: 2.31	Median + 3 %: 278.3	Median + 10 %: 19.58	
	Difference: 0.04	Difference: 0.18	Median - 3 %: 262.1	Median - 10 %: 16.02	
(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	

SOP Requirements Met?	Comments:
(Y) N	none

TV 3-11-19

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity
CdV-16-611937	3-11-19	1025 DST	GW sampling

Personnel: T.VanderVis, M.Snendo, A.Vigil

Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN:		Cable Length(ft):	Cable SN:
Connect Time:	Transducer SN:	New LT PSI Rating:	Manufacture Date:	Memory % remaining:	Battery % remaining:
Water Level (ft)		P [psi] TV 3-11-19	T [C]	Log Note Memory % TV 3-11-19	Log Note Battery %
Last Start Date:		Data File Name: TV 3-11-19		Stop Test: Yes \ No	Change Desicant: Yes \ No \ NA

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) TIC (inner) Slick-up Measured on Site ☐ Previous MP Used ☒

Time (MST)	1026	Water Level Meter Serial No.	34244
DTW (ft bMP):	5.72	Measurements in feet	
Time (MST)	1029	LSD ft	7359.585
DTW (ft bMP)	5.72	MP Height ft.	+ 3.0
Time (MST)	NA	MP Elevation	= 7362.585
DTW (ft bMP)	NA	DTW:	- 5.72
Time (MST)	1029	Groundwater Elevation (GWE) Reference Level	7356.865
TD (ft bMP):	11.57		
		Zip Tie on Kellin's Grip:	NA

Notes: None

Transducer Performance and Programming

Part 3: Transducer Error\Drift Acceptance

WL Reading Time (MST)	
WL (transducer reading) (ft)	
GWE from MM	
Difference in value:	
Error tolerance of transducer:	
☐ Within Error Tolerance	
☐ Outside Error Tolerance	

15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.

Part 4: Programming & Final Readings

		Time (MST)	Reading
Progamming Time:			
New Test Name:			
Reference Level:			
Current Depth:			
Meas. Interval	TV 3-11-19		
Start Date:			
Start Time:			
Synch Clocks: Yes \ No			

Deleted Tests:

QA Date and Initial

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity:	
Surge bed Monitoring Well	3-16-2019	0815	Manual ~~T~~ for Sampling	
Personnel: T. Bonham, K. TOW & J. Romero			Cable Length(ft): NA	Cable SN: NA
Telemetry: (Yes) \ No	Pull Transducer: Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA	Memory % remaining: NA	Battery % remaining: NA
Connect Time: NA	Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): NA		P (psi): NA	T [C]: NA	Stop Test: (Yes) \ No	Change Desicant: Yes \ (No) \ NA
Last Start Date: NA		Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) (TIC (inner)) Stick-up Measured on Site ☐ Previous MP Used ☒

Time (MST):	0816	Water Level Meter Serial No. 34244	**Notes:** MTD = 22.84' 6 TIC
DTW (ft bMP):	Dry to TD	Measurements in feet	
Time (MST):		LSD ft: 3-16-19 TB	
DTW (ft bMP):	3-16-19 TB	MP Height ft: +	
Time (MST):		MP Elevation: =	
DTW (ft bMP):		DTW: -	
Time (MST):	0816	Groundwater Elevation (GWE) Reference Level: DRY	
TD (ft bMP):	22.84		
		Zip Tie on Kellim's Grip: NA	

Transducer Performance and Programming

Part 3: Transducer Error\Drift Acceptance

WL Reading Time (MST):	
WL (transducer reading) (ft):	
GWE from MM	
Difference in value:	
Error tolerance of transducer:	
☐ Within Error Tolerance	
☐ Outside Error Tolerance	

15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.

Deleted Tests:

Part 4: Programming & Final Readings

Progamming Time:		Time (MST):	Reading
New Test Name:			
Reference Level:			
Current Depth:			
Meas. Interval: 3-16-2019 TB			
Start Date:			
Start Time:			
Synch Clocks: Yes \ No			

QA Date and Initial:

Appendix B

Analytical Suites and Results
(on CD included with this document)

Appendix C

Inspection Forms

Inspection Report
Corrective Measures at Consolidation Unit 16-021(c)-99

Date/Time: 9/26/18 1645

Report Number: 2

Weather: Partly cloudy, 70°F

Personnel: P. McGuire
E. Johns
B. Wallis

Low-Permeability Cap Inspection

	Yes	No	Comments
Is there evidence of new settlement?		✓	
Is there evidence of cracking?		✓	
Is there evidence of erosion/rutting?		✓	
Is there evidence of ponding?		✓	
Is there evidence of burrowing animals?		✓	
Is there evidence of undesirable vegetative growth?		✓	
Are the slopes adequate for surface water drainage?	✓		
Is there evidence of soil movement/slope instability? (example: cracks in the soil running parallel to the slope or soil sloughing)		✓	

Are there any additional conditions during the inspections that require attention?

None overall good conditions

N3B Los Alamos

Signature: P. McGuire

Inspection Report
Corrective Measures at Consolidation Unit 16-021(c)-99

Date/Time: 4.9.19
1655

Report Number: 3

Weather: Cloudy mid-low 60°

Personnel: John Wilcox
David Woody
Josh Faulconer
Ashley Kowalewski

Low-Permeability Cap Inspection

	Yes	No	Comments
Is there evidence of new settlement?		✓	
Is there evidence of cracking?		✓	
Is there evidence of erosion/rutting?	✓		gravel missing due to channel forming
Is there evidence of ponding?		✓	
Is there evidence of burrowing animals?		✓	
Is there evidence of undesirable vegetative growth?	✓		Sapling growing on North edge, clipped down though
Are the slopes adequate for surface water drainage?	✓		
Is there evidence of soil movement/slope instability? (example: cracks in the soil running parallel to the slope or soil sloughing)		✓	

Are there any additional conditions during the inspections that require attention?
More gravel needs to be added to cap, as well as the path of erosion on the north/west side of the cap.

N3B Los Alamos

Signature: Ashley Kowalewski

Appendix D

Surge Bed Monitoring Well Transducer Data
(on CD included with this document)