Remediation Feasibility Study

Former Garland Shopping Center
East of Washington Street on Garland Drive
Northglenn, Colorado

Northglenn Urban Renewal Authority

11701 Community Center Drive | Northglenn, Colorado 80233

September 10, 2019 | Project No. 500557005

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

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11701 Community Center Drive | Northglenn, Colorado 80233

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EXECUTIVE SUMMARY

This report presents the results of a Remediation Feasibility Study conducted for the former Garland Shopping Center located east of the intersection of Washington Street and Garland Drive in Northglenn, Adams County, Colorado (site). Based on previous sampling data collected by Ninyo & Moore, a tetrachloroethene (PCE) plume appears to have migrated beneath Garland Drive south of the site. The Feasibility Study was designed to further characterize/delineate the PCE plume, verify the location of the PCE plume in the subsurface at the site, and assess specific groundwater conditions favorable for three potential remediation methods.

Northglen Urban Renewal Authority (NURA) (client) authorized Ninyo & Moore to conduct this Feasibility Study with the objective of comparing two proposed remediation methods, Localized Biosubstrate Injection and E-Redox® Technology, for the known PCE plume. A third remediation method, Zero-Valent Iron (ZVI) injection, was also considered based on the preliminary results of the Feasibility Study.

Ninyo & Moore installed four new groundwater monitoring wells (VCUP-1, VCUP-2, VCUP-3, and VCUP-4) as shown on Figure 2. The wells were developed and groundwater samples were collected and submitted to a Colorado-registered analytical laboratory. The samples were analyzed for volatile organic compounds (VOCs), to assess presence and concentrations of PCE and potential degradation products; and a list of water quality parameters including anions, cations, common electron acceptors and donors, to understand groundwater conditions as favorable or unfavorable for the proposed potential remediation methods.

Physical geology and soil types were recorded and presented as boring logs in Appendix A. Bedrock surface and groundwater elevation maps were created previously and updated with data obtained during this Feasibility Study. The updated maps are included as Figures 3 and 4. These maps serve to help understand the bedrock surface topography as it relates to the assumed groundwater flow direction. The bedrock surface appears to form a channel that allows for flow along the bedrock surface from the WalMart property to MW-17R and to the new VCUP-3. PCE is a denser-than-water, non-aqueous phase liquid (DNAPL) and will sink in its undissolved state. Based on the nature of PCE as a DNAPL, it is likely that undissolved PCE would sink and flow along the bedrock surface.

Dissolved phase PCE (that which has combined with water to form a diluted solution) would flow in the assumed direction of groundwater flow. At the Garland site, it appears that the PCE plume flows to the south-southeast and likely “puddles” in a depression in the bedrock surface centralized around MW-17R but extending southeastward toward VCUP-3.

Most recent PCE concentrations are summarized on Figure 5 to illustrate the probable plume location and concentrations.

When PCE naturally attenuates, or degrades by naturally occurring processes in a groundwater system, PCE may undergo reductive dechlorination. The process of reductive dechorination of PCE degrades PCE to trichloroethylene (TCE), then cis-1,2-dichloroethylene (cis-1,2-DCE), then vinyl chloride, and finally ethene and/or ethane. PCE was the only VOC reported in the groundwater samples collected from the site. No degradation products were reported. This indicates that reductive dechorination is not currently occurring at the Garland Site.

The first, most economical remediation method considered for the Garland site was the injection of a biosubstrate media in the groundwater system in the area of highest PCE concentrations. The bisubstrate media would ideally feed the naturally-occurring reductive dechlorination processes in a groundwater system. However, the lack of degradation products and the water quality parameters (anions/cations/electron acceptors and donors) indicate no naturally-occurring reductive dechlorination is occurring and this method would likely be unsuccessful.

The second remediation method considered for the Garland site was the E-Redox® technology invented and offered by Advanced Environmental Technologies, LLC (AET). The E-Redox® method uses two electrodes in groundwater monitoring wells on two sides of the PCE plume to generate an electric field using a battery concept that degrades PCE using an abiotic dechlorination process. This means no biological processes are required, although they may result from the process. Due to previous In-Situ Chemical Oxidation (ISCO) injections at the Garland site, the groundwater is sufficiently conductive for this process to be effective. The limitations of this method are more logistical relating to location of a power source, protection of the system, and long-term operations and maintenance of the equipment.

A third remediation method was considered for the Garland site that also works to degrade PCE through abiotic dechlorination, Zero-Valent Iron (ZVI) injections. ZVI triggers the same reaction in the groundwater system as the E-Redox® method, however it is most effective in sandy and coarse-grained soil types. The saturated aquifer material encountered at the Garland site is primarily clay with some silt and sand. Some case studies indicate that hydrofracturing the aquifer material prior to injections paired with the use of nanoZVI (smaller than average particles) may lead to wider distribution of the ZVI media.

Based on the results of this Feasibility Study, E-Redox® appears to be the most viable method to remediate the site of the three methods evaluated.

1 INTRODUCTION

1.1 Project Description

This report presents the results of a Remediation Feasibility Study conducted for the former Garland Shopping Center located east of the intersection of Washington Street and Garland Drive in Northglenn, Adams County, Colorado. Based on previous sampling data collected by Ninyo & Moore, a tetrachloroethene (PCE) plume appears to have migrated beneath Garland Drive to the south. Figure 1 shows the site location and Figure 2 shows a more detailed site plan.

Ninyo & Moore has conducted this Feasibility Study with the objective of comparing feasibility for two remediation options with the addition of a third remediation option during the preliminary data analysis. The two remediation options initially considered for the purpose of remediating the remaining PCE plume included localized Bioremediation Injection and E-Redox® Technology. The third remediation option considered was Zero-Valent Iron (ZVI) injection.

The Feasibility Study was designed to further characterize/delineate the PCE in the subsurface at the site and assess specific groundwater conditions favorable for the success of the proposed potential remediation options.

1.2 Environmental Setting

1.2.1 Bedrock Surface

The bedrock surface contour map (Figure 3) was initially created using boring log data from multiple previous investigations conducted by Ninyo & Moore and others. Survey data was not available in every case and some elevations were estimated using publicly available ground surface elevation information and boring logs. The ground surface at the site generally slopes to the south-southeast and bedrock appears to fluctuate dramatically with a channel-like feature from the center of the WalMart property to the southeast beneath the Gethesmane Church property.

1.2.2 Groundwater Flow Direction

Based on data collected by Ninyo & Moore during this study and multiple previous investigations, the groundwater flow direction has been determined to be south-southeast. Figure 4 is an updated potentiometric (groundwater) surface.

Based on readings taken by Ninyo & Moore during the most recent sampling on July 25 and 26, 2019, depth-to-groundwater in the existing and newly-installed monitoring wells ranged

from 18.01 to 23.04 feet below the top of casings. Groundwater levels and flow direction can fluctuate due to seasonal variations, groundwater withdrawal or injection, and other factors.

1.2.3 Aquifer Conditions

Soils encountered during this study and multiple previous investigations indicate the saturated alluvial material that is considered the shallow alluvial aquifer at the Garland site is primarily clay material with some areas of silty sandy clay. Clay material is generally characterized as having low hydraulic conductivity.

2 FEASIBILITY STUDY FIELD ACTIVITIES

2.1 Groundwater Monitoring Well Installation

On April 16, 2019 Ninyo & Moore submitted a Notice of Intent to Construct Monitoring Holes to the Colorado Department of Water Resources (DWR). The DWR response and acknowledgment are included in Appendix B.

Ninyo & Moore installed a total of four groundwater monitoring wells at the site. One well, VCUP-1, was installed on the WalMart property, and the three remaining wells, VCUP-2, VCUP-3, and VCUP-4, were installed on the Gethsemane Lutheran Church property. Figure 2 shows the location of these and select previously installed monitoring wells. Monitoring wells were constructed using schedule 40 polyvinyl chloride (PVC), with .010 size slot screen. Sand pack was paced two feet or more above the top of the screened section. Hydrated bentonite was then placed to create a seal, followed by soil cuttings to approximately one foot below ground surface (bgs). Wells were completed using traffic-rated road boxes and concrete.

Prior to sampling each monitoring well was developed to help ensure hydraulic connection was made between the surrounding groundwater and monitoring well. Well development consisted of surging each well for five minutes, followed by purging 10 casing volumes of water.

On July 25, 2019 while purging each well field measurements for pH, temperature, specific conductance, oxidations-reduction potential (ORP), total dissolved solids, and dissolved oxygen (DO) were documented. Field measurements are provided on Groundwater Sampling Field Data Sheets included in Appendix C and summarized in Table 3.

2.2 Groundwater Table Measurements

On July 25, 2019, prior to well purging and after well development, Mr. Robert Hodges, Senior Staff Environmental Scientist with Ninyo & Moore, measured the depth to static groundwater from the top-of-casing (TOC) in monitoring wells VCUP-1, VCUP-2, VCUP-3, and VCUP-4 to be 18.43 feet below TOC, 20.30 feet below TOC, 22.00 feet below TOC, and 23.04 feet below TOC, respectively.

On July 26, 2019, prior to collecting groundwater samples, Mr. Hodges measured the depth to static groundwater from TOC in monitoring wells VCUP-1, VCUP-2, VCUP-3, and VCUP-4 to be 18.01 feet below TOC, 20.35 feet below TOC, 22.09 feet below TOC, and 22.98 feet below TOC, respectively.

On August 5, 2019 Mr. Hodges measured the depth to static groundwater from TOC in monitoring wells VCUP-1, VCUP-2, VCUP-3, VCUP-4, and MW-17R to be 18.04 feet below TOC, 20.51 feet below TOC, 22.26 feet below TOC, 23.16 feet below TOC, and 20.46 feet below TOC, respectively.

On August 5, 2019 VCUP-1, VCUP-2, VCUP-3, and VCUP-4 were roughly surveyed to allow for groundwater and bedrock elevations to be inferred. Current and historic groundwater elevation data are presented on Figure 4 to depict an approximated potentiometric surface map.

2.3 Groundwater Sampling and Laboratory Analysis

On July 26, 2019 groundwater samples were collected from VCUP-1, VCUP-2, VCUP-3, and VCUP-4. Prior to sample collection, wells were developed to help ensure connectivity with formation water by purging ten casing volumes of water using a new, disposable bailer for each well. Following purging, groundwater samples were collected from each well, and placed in laboratory-supplied containers, labeled, and stored in a cooler with ice under chain-of-custody documentation for transport to the analytical laboratory. The groundwater samples were analyzed for the following:

- Chloroethenes using EPA Method 8260
- Electron Donors / Electron Acceptors / Chemistry
    - Dissolved Organic Carbon
    - Nitrate
    - Manganese
    - Ferric Iron

- Ferrous Iron
- Sulfate
- Ethene
- Carbon Dioxide
- Chloride
- Alkalinity

Laboratory results are summarized in Tables 1 and 2 and laboratory reports are included in Appendix D.

2.4 Decontamination Procedures

Decontamination was conducted prior to and after each use of a piece of equipment during drilling, well development, and sampling. Disposable sampling equipment, such as polyethylene bailers intended for one-time use, was not decontaminated. Nitrile gloves were changed between each sample location to decrease the potential of cross contamination.

3 GROUNDWATER CHEMISTRY

A summary of groundwater field chemistry and laboratory analytical results is presented on Tables 1, 2, and 3. Copies of the field data sheets are included in Appendix C and laboratory analytical reports are included in Appendix D. Reported concentrations of PCE were compared to the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD) Regulation No. 41 – The Basic Standards for Ground Water.

3.1 PCE

Prior to this Feasibility Study, the most recent sample collected from monitoring well MW-5R was collected on September 6, 2017. The reported PCE concentration in MW-5R was 10 micrograms per liter (µg/L), which is below the CDPHE Groundwater Quality Standard of 17 µg/L

The most recent sample collected from monitoring well MW-10 was collected on December 20, 2018. The reported PCE concentration in MW-10 was 8.5 µg/L, which is below the CDPHE Groundwater Quality Standard of 17 µg/L.

The most recent sample collected from monitoring well MW-17R was collected on December 20, 2018. The reported PCE concentration in MW-17R was 120 µg/L, which exceeds the CDPHE Groundwater Quality Standard of 17 µg/L.

PCE concentrations from samples collected on July 26, 2019 from VCUP-1, VCUP-2, VCUP-3, and VCUP-4 were reported below laboratory reporting limits in monitoring wells VCUP-1, VCUP-2, and VCUP-4. The sample collected from monitoring well VCUP-3 was reported to be 49 µg/L, which exceeds the CDPHE Groundwater Quality Standard of 17 µg/L.

Laboratory analytical results are summarized in Table 1 and laboratory reports are included in Appendix D. PCE concentrations are shown on Figure 5.

3.2 Dissolved Gasses

Ethene was not reported above the laboratory reporting limit in the samples collected from VCUP-1, VCUP-2, VCUP-3, and VCUP-4 on July 26, 2019. Laboratory analytical results are summarized in Table 2 and laboratory reports are included in Appendix D.

3.3 Total Metals

Iron was reported in all four samples collected on July 26, 2019. The reported iron concentrations were 9.345 milligrams per liter (mg/L) in sample VCUP-1-7-26-19, 17.09 mg/L in sample VCUP-2-7-26-19, 4.403 mg/L in sample VCUP-3-7-26-19, and 7.846 mg/L in sample VCUP-4-7-26-19. The iron concentration is the sum of ferrous iron and ferric iron. The laboratory analyzed all four samples collected on July 26, 2019 for ferrous iron. Ferrous iron was not detected in any of the samples analyzed above the laboratory reporting limit. Therefore, the concentration of ferric Iron and iron are the same.

Manganese was reported in all four samples collected on July 26, 2019. The reported concentration of manganese in sample VCUP-1-7-26-19 was 0.122 mg/L, in sample VCUP-2-7-26-19 it was 0.41 mg/L, in sample VCUP-3-7-26-19 it was 0.0488 mg/L, and in sample VCUP-4-7-26-19 it was 0.586 mg/L. Laboratory analytical results are summarized in Table 2 and laboratory reports are included in Appendix D.

3.4 Anions

Chloride, sulfate, and nitrate were reported in all four samples collected on July 26, 2019. The reported chloride concentrations were 463 mg/L in sample VCUP-1-7-26-19, 116 mg/L in VCUP-2-7-26-19, 413 mg/L in sample VCUP-3-7-26-19, and 561 mg/L in sample VCUP-4-7-26-19.

Sulfate concentrations were reported in VCUP-1-7-26-19, VCUP-2-7-26-19, VUP-3-7-26-19, and VCUP-4-7-26-19 to be 1,740 mg/L, 1,890 mg/L, 2,050 mg/L, and 2,370 mg/L respectively.

The concentration of nitrate was reported to be 7.04 mg/L in sample VCUP-1-7-26-19, 13.1 in sample VCUP-2-7-26-19, 12.90 in sample VCUP-3-7-26-19, and 7.09 in sample VCUP-4-7-26-19. Laboratory analytical results are summarized in Table 2 and laboratory reports are included in Appendix D.

3.5 Alkalinity

Total alkalinity is a measure of carbonate, bicarbonate, and hydroxide alkalinity. The concentrations of carbonate and hydroxide alkalinity was not reported above the laboratory reporting limit of 10.0 mg/L. Bicarbonate was reported in each sample collected on July 26, 2019. The reported bicarbonate concentrations were 390 mg/L in sample VCUP-1-7-26-19, 510 mg/L in VCUP-2-7-26-19, 390 mg/L in sample VCUP-3-7-26-19, and 560 mg/L in sample VCUP-4-7-26-19. Laboratory analytical results are summarized in Table 2 and laboratory reports are included in Appendix D.

3.6 pH

pH values were reported to be between 7.54 and 7.92 in samples collected on July 26, 2019. The pH was reported to be 7.54 in sample VCUP-1-7-26-19. The pH was reported to be 7.71 in sample VCUP-2-7-26-19. The pH was reported to be 7.94 in sample VCUP-3-7-26-19. The pH was reported to be 7.82 in sample VCUP-4-7-26-19. Laboratory analytical results are summarized in Table 2 and laboratory reports are included in Appendix D. The laboratory reported pH values (Table 2) slightly different than the field measured pH values (Table 3), measured during well development and purging for sampling.

3.7 Carbon Dioxide

The carbon dioxide concentration was reported to be 23.0 mg/L in sample VCUP-1-7-26-19. The carbon dioxide concentration was reported to be 20.0 mg/L in sample VCUP-2-7-26-19. The carbon dioxide concentration was reported to be 12.0 mg/L in sample VCUP-3-7-26-19. The carbon dioxide concentration was reported to be 17.0 mg/L in sample VCUP-4-7-26-19. Laboratory analytical results are summarized in Table 2 and laboratory reports are included in Appendix D.

3.8 Dissolved Organic Carbon

Dissolved organic carbon (DOC) was reported in all four samples collected on July 26, 2019. The reported iron concentrations were 8.6 mg/L in sample VCUP-1-7-26-19, 6.1 mg/L in sample VCUP-2-7-26-19 and VCUP-4-7-26-19, and 4.6 mg/L in sample VCUP-3-7-26-19. Laboratory analytical results are summarized in Table 2 and laboratory reports are included in Appendix D.

3.9 Field Chemistry

- Total Dissolved Solids (TDS) measurements ranged from 2.2 mg/l in VCUP-1 to 2.7 mg/l in VCUP-3 and VCUP-4.
- Temperature was measured in degrees of Celsius and ranged from 17.5 in VCUP-4 to 19.9 in VCUP-1.
- pH is a unitless quantity and ranged from 7.46 in VCUP-4 to 7.94 in VCUP-1.
- Conductance ranged from 0.0036 micro Siemens per centimeter (mS/cm) in VCUP-1 to 0.0043 mS/cm in VCUP-4.
- Oxidation-Reduction Potential (ORP) ranged from 172 millivolts (mV) to 203 mV.
- Dissolved oxygen ranged from 5.78 mg/l in VCUP-4 to 6.92 mg/l in VCUP-1.

Results for field measured chemistry are summarized in Table 3.

4 FEASIBILITY OF REMEDIATION ALTERNATIVES

4.1 Biosubstrate Injections

Remediation of PCE at the site through injection of a biosubstrate solution is accomplished through a process known as enhanced reductive dechlorination. Reductive dechlorination is a naturally-occurring process which is enhanced through the addition of a biosubstrate solution. Two microbial reactions by bacteria in the soil drive the process of reductive dechlorination. The first reaction causing the generation of hydrogen, which fuels the second reaction causing reductive dechlorination. In the reductive dechlorination reaction, PCE in the soil acts as an electron acceptor while the biosubstrate solution acts as an electron donor by generating hydrogen. This process breaks PCE down into cis-dichloroethene (DCE) and vinyl chloride (VC), which is then broken down by the same process into methane, ethane, and ethene (US EPA, 2018).

Parameters considered as indicators of conditions favorable to long-term success of the biosubstrate injections are discussed below (US EPA, 2018). Favorable conditions would indicate that reductive dechlorination is occurring naturally or that the potential exists for the process to occur.

- **Ferric and Ferrous Iron:** Ferric Iron [Fe(III)] can be an electron acceptor for microbial respiration for the dechlorination process. Depleted levels of Fe(III) may indicate reductive conditions in the groundwater. During the reductive dechlorination process ferric iron reduces to produce ferrous iron. Elevated levels of ferrous iron indicate that iron reduction, and therefore anaerobic dechlorination, is occurring.

The absence of ferrous iron in samples collected at the site indicates that reductive dechlorination is not occurring. However, the presence of ferric iron in samples collected at the site may act as an electron acceptor if an electron donor is introduced.

- **Chloride:** Chloride is produced during the dechlorination process. Elevated chloride concentrations may indicate that dechlorination is occurring (or has occurred). Chloride concentrations reported in groundwater collected ranged from 116 mg/l in VCUP-2 to 561 mg/l in VCUP-4. Changes in chloride concentrations spatially may indicate the presence or absence of other major ions due to soil type or higher levels of chloride may indicate areas where dechlorination has occurred at the site. Spatially, at the Garland site, the highest concentration of chloride was reported in the sample collected from VCUP-4 with relatively high concentrations reported in samples collected form VCUP-1 and VCUP-3 and a significantly lower concentration in VCUP-2. Based on these concentrations, it might appear that dechlorination has occurred more frequently in the vicinity of VCUP-4 than VCUP-2. However, this pattern of relative dechlorination alone does not indicate dechlorination is occurring in the groundwater system at the Garland site.

- **Sulfate:** Sulfate can be an electron acceptor for microbial respiration needed for the dechlorination process. Depleted levels of sulfate may indicate reductive conditions in the groundwater. Sulfate levels less than 20 mg/L are favorable for anaerobic dechlorination. High sulfate levels in combination with absence of DOC indicate promotion of anaerobic degradation may be necessary with the addition of substrate. Sulfate levels reported in groundwater samples collected ranged from 1,740 mg/l in VCUP-1 to 2,370 mg/l in VCUP-4. The groundwater samples indicate high levels of sulfate at the site, which may be less than ideal for reductive dechlorination using a biosubstrate. Sulfate may leach into groundwater from shales common in the Denver Formation bedrock.

- **Nitrate:** Nitrate can be an electron acceptor for microbial respiration needed for the dechlorination process. Depleted levels of nitrate may indicate reductive conditions in the groundwater. Nitrate concentrations of less than 1.0 mg/L are desirable. Nitrate concentrations reported in groundwater samples collected from the site ranged from 7.04 mg/l in VCUP-1 to 13.1 mg/l in VCUP-2. The groundwater samples indicate the levels of nitrate in groundwater at the site exceed what is desirable for the dechlorination process.

- **Alkalinity:** Alkalinity (as Calcium Carbonate) is used in conjunction with groundwater pH to determine the buffering capacity of the groundwater to neutralize acid compounds generated during the dechlorination process. This parameter becomes important as a baseline value during the dechlorination process. Ideal conditions would reflect increased alkalinity with a stable pH. Alkalinity values ranged from 390 mg/l in VCUP-1 and VCUP-3 to 560 mg/l in VCUP-4. Alkalinity values over 500 mg/l are considered high.

- **pH:** pH is a measure of acidity in groundwater. Ideal conditions for biological processes (including microbial respiration) is from pH 6 to pH 8. pH levels of the samples collected at the site range from 7.54 in VCUP-1 to 7.94 in VCUP-3. The pH range in groundwater at the site is ideal for reductive dechlorination to occur. The reductive dechlorination process generates acidic byproducts that reduce the pH in groundwater. The ideal range of pH values at the site indicate the dechlorination process is not active at the site.

- **Carbon Dioxide:** Carbon dioxide (CO_2) is generated by the dechlorination process as a byproduct of aerobic and anaerobic degradation of chlorinated compounds. Elevated concentrations of CO_2 indicate microbial activity has occurred. Carbon dioxide concentrations in groundwater samples collected at the site ranged from 12 mg/l in VCUP-3 to 23 mg/l in VCUP-1. These are not considered elevated levels of carbon dioxide indicating no reductive dechorination is likely occurring at the site.

- **Dissolved Organic Carbon:** Dissolved organic carbon (DOC) levels less than 20 mg/L with elevated concentrations of alternate electron acceptors (ferric iron, sulfate, and nitrate for example), and elevated concentrations VOCs indicate no anaerobic degradation is currently active at the site.

Based on the metrics listed above and the lack of PCE daughter products, it appears that reductive dechlorination is not occurring at the site. In order for biosubstrate addition to be an effective method for remediation, the processes should be present to some degree.

4.2 E-Redox® Technology

Remediation of PCE at the site through E-Redox® technology would be accomplished by electrochemically inducing an oxidation-reduction reaction to degrade the PCE. E-Redox® requires two electrodes be placed, one on either side of the PCE plume. Electric currents passed between the two electrodes cause the intermediate soil particles to act as "micro-electrodes" triggering and sustaining multiple redox reactions across the surrounded plume.

AET's E-Redox® technology establishes low-intensity electric fields within the contaminated matrix, manipulates redox conditions and matrix surface charge, and promotes contaminant transformation and degradation. The E-Redox® technology has been patented and commercially applied for enhancing chlorinated solvents reduction in groundwater, and field tested for reducing other groundwater contaminants such as perchlorate. Recent field applications of the E-Redox® technology indicate that the induced reduction reactions include abiotic dechlorination of chlorinated solvents, as evidenced by the production of acetylene, eliminating the common generation of dichloroethene and vinyl chloride. Enhanced back diffusion of chlorinated compounds from the solid matrix into the aqueous phase was also observed and such process substantially benefits mass removal and degradation reactions. The advantages of the E-Redox® technology include its applicability in tight matrix (not limited to permeability), low energy requirement, no consumable material requirements, and rapid abiotic reactions.

The E-Redox® process does not depend on the biological reductive dechlorination as does the biosubstrate injection method explained in Section 4.1; but rather works through a process known as abiotic dechlorination. The fact that reductive dechlorination is not evident in the groundwater does not impact the efficacy of the E-Redox® process at this site. Groundwater at the Garland site has a high redox potential, or reduction potential, as evidenced by the presence of ferric iron and the absence of ferrous iron. E-Redox® reportedly will lower redox potential within hours to days to the range favorable for biological reductive dechlorination. Higher (more positive) redox potential indicates a tendency to gain electrons from newly introduced compounds meaning the current groundwater conditions are high in electron acceptors; therefore, the E-Redox® process

reduces the tendency of the groundwater system to accept electrons and increases the tendency to contribute electrons to newly introduced or formed compounds. This describes a reducing system that will allow for reductive dechlorination to occur.

The groundwater at the Garland site has a high conductivity, adequate for the E-Redox® process, due to the previous injections of electron donors (oxidants) at the site. This method should be successful at the Garland site and may cause conditions in the groundwater system to be ideal for the biosubstrate injections or other supplemental methods, if necessary.

Limitations for the application of E-Redox® at this project site include the placement of a power source in the proximity of the existing monitoring wells for use as the cathode and anode for the system and protection of the power supply. The location of the PCE plume is centralized around MW-17R located in Northglenn Right-of-Way along the south side of Garland Drive and also extends to the southeast beneath the Gethesmane Church property.

4.3 Zero-Valent Iron (ZVI) Injections

Zero-Valent Iron (ZVI) injections also work through the abiotic dechlorination process. The limitation of ZVI for this project would include low permeability in the saturated zone that may reduce the extent of distribution in the zone of contamination. The saturated alluvium encountered during drilling for this study consisted of clay in VCUP-1, VCUP-3, and VCUP-4, with silty sandy clay and clay in VCUP-2. In general, clay is the least permeable of the alluvial soil types, which is less than ideal for ZVI injections. ZVI injections in clay soils may require hydrofracturing of the aquifer material prior to injection. Additionally, use of nanoZVI (nZVI) solution with ZVI particles smaller than 40 nanometers may increase the success of this method. The limitations of this method for this project include the short-term passivation of the media, meaning the media may require recharging with additional injection events.

5 SUMMARY AND CONCLUSIONS

In summary, four groundwater monitoring wells were installed at the site as part of the Feasibility Study. One well, VCUP-1, was installed on the WalMart property, and the remaining three wells, VCUP-2, VCUP-3, and VCUP-4, were installed on the Gethsemane Lutheran Church property. One groundwater sample was collected from each of the four wells and analyzed for VOCs, ethene, iron, ferrous iron, ferric iron, manganese, chloride, sulfate, nitrate, alkalinity, pH, carbon dioxide, and dissolved organic carbon.

One VOC, PCE, was reported in groundwater sample VCUP-3-7-26-19, collected from the Gethsemane Lutheran Church property. Other VOCs on the laboratory analyte list were not detected above laboratory reporting limits in the other three samples. The reported PCE concentration from sample VCUP-3-7-26-19 exceeds the CDPHE Groundwater Quality Standard of 17 µg/L.

The samples were also analyzed for a list of water quality parameters including anions, cations, common electron acceptors and donors, to understand groundwater conditions as favorable or unfavorable for the potential remediation methods.

Physical geology and soil types were recorded and presented as boring logs in Appendix A. Bedrock surface and groundwater elevation maps were created previously and updated with data obtained during this feasibility study. The updated maps are included as Figures 3 and 4. These maps serve to help understand the bedrock surface topography as it relates to the assumed groundwater flow direction. The bedrock surface appears to form a channel that allows for flow along the bedrock surface from the new WalMart property to MW-17R and to the new VCUP-3. PCE is a denser-than-water non-aqueous phase liquid (DNAPL) and will sink in its undissolved state. Based on the nature of PCE as a DNAPL, it is likely that undissolved PCE would sink and flow along the bedrock surface.

Dissolved phase PCE (that which has combined with water to form a diluted solution) would flow in the assumed direction of groundwater flow. At the Garland site, it appears that the PCE plume flows to the south-southeast and likely “puddles” in a depression in the bedrock surface centralized around MW-17R but extending southeast toward VCUP-3.

Most recent PCE concentrations are summarized on Figure 5 to illustrate the probable plume location and concentrations.

When PCE naturally attenuates, or degrades by naturally -occurring processes in a groundwater system, PCE may undergo reductive dechlorination. The process of reductive dechorination of PCE degrades PCE to trichloroethylene (TCE), then cis-1,2-dichloroethylene (cis-1,2-DCE), then vinyl chloride, and finally ethene and/or ethane. PCE was the only VOC reported in the groundwater samples collected from the site. No degradation products were reported. This indicates that reductive dechorination is not currently occurring at the Garland Site.

The first, most economical remediation method considered for the Garland Site was the injection of a biosubstrate media in the groundwater system in the area of highest PCE concentrations. The bisubstrate media would ideally feed the naturally occurring reductive dechlorination

processes in a groundwater system. However, the lack of degradation products and the water quality parameters (anions/cations/electron acceptors and donors) indicate no naturally-occurring reductive dechlorination is occurring and this method would likely be unsuccessful.

The second remediation method considered for the Garland site was the E-Redox® technology invented and offered by AET. The E-Redox® method uses two electrodes in groundwater monitoring wells on two sides of the PCE plume to generate an electric field using a battery concept that degrades PCE using an abiotic dechlorination process. This means no biological processes are required, although they may result from the process. Due to previous In-Situ Chemical Oxidation (ISCO) injections at the Garland Site, the groundwater is sufficiently conductive for this process to be effective. The limitations of this method are more logistical relating to location of a power source, protection of the system, and long-term operations and maintenance of the equipment.

A third remediation method was considered for the Garland site that also works to degrade PCE through abiotic dechlorination, Zero-Valent Iron (ZVI) injections. ZVI triggers the same reaction in the groundwater system as the E-Redox® method, however it is most effective in sandy and coarse-grained soil types. The saturated, aquifer material, encountered at the Garland site is primarily clay with some silt and sand. Some case studies indicate that hydrofracturing the aquifer material prior to injections paired with the use of nanoZVI (smaller than average particles) may lead to wider distribution of the ZVI media.

Based on the results of this Feasibility Study, E-Redox® appears to be the most viable method to remediate the site of the three methods evaluated.

6 RECOMMENDATIONS

Based on the results of this feasibility study, Ninyo & Moore recommends the following:

- Preparation and submittal of an application to the CDPHE's Voluntary Cleanup Program (VCUP) including a complete remedial action plan (RAP) and cost estimate.
- Contracting with AET to install and implement the pilot test phase for the E-Redox® remediation method.

7 LIMITATIONS

The environmental services described in this report have been conducted in general accordance with current regulatory guidelines and the standard-of-care exercised by environmental consultants performing similar work in the project area. Variations in site conditions may exist and

conditions not observed or described in this report may be encountered during subsequent activities. Please also note that this study did not include an evaluation of geotechnical conditions or potential geologic hazards.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires any additional information, or has questions regarding content, interpretations presented, or completeness of this document.

Ninyo & Moore's opinions and recommendations regarding environmental conditions, as presented in this report, are based on limited subsurface assessment and chemical analysis. Further assessment of potential adverse environmental impacts from past on-site and/or nearby use of hazardous materials may be accomplished by a more comprehensive assessment. The samples collected and used for testing, and the observations made, are believed to be representative of the area(s) evaluated; however, conditions can vary significantly between sampling locations. Variations in soil and/or groundwater conditions will exist beyond the points explored in this evaluation.

The environmental interpretations and opinions contained in this report are based on the results of laboratory tests and analyses intended to detect the presence and concentration of specific chemical or physical constituents in samples collected from the subject site. The testing and analyses have been conducted by an independent laboratory which is accredited by the EPA or applicable state certification programs to conduct such tests. Ninyo & Moore has no involvement in, or control over, such testing and analysis. Ninyo & Moore, therefore, disclaims responsibility for any inaccuracy in such laboratory results.

Ninyo & Moore's conclusions and opinions are based on an analysis of the observed site conditions. It should be understood that the conditions of a site can change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

8 REFERENCES

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TABLES

Table 1 - Summary of Groundwater Sample Analytical Results-VOCs		
Sample ID:	**Date Sampled**	**Tetrachloroethene (PCE)**
Volatile Organic Compounds (VOCs) µg/L		
MW-5R	9/6/2017	**10**
MW-10	12/20/2018	**8.5**
MW-17R	12/20/2018	**120**
VCUP-1-7-26-19	7/26/2019	<1.0
VCUP-2-7-26-19	7/26/2019	<1.0
VCUP-3-7-26-19	7/26/2019	**49**
VCUP-4-7-26-19	7/26/2019	<1.0
CDPHE Groundwater Quality Standard		**17 µg/L**

Notes:

µg/L = milligrams per liter.

<x = below laboratory reporting limit.

Bold indicates concentration exceeds laboratory reporting limit.

RED indicates concentration exceeds the CDPEH Groundwater Quality Standard.

CDPHE Groundwater Quality Standard, December 2016.

VOCs were analyzed by EPA Method 8260B.

Table 2 - Summary of Groundwater Sample Analytical Results-General Water Quality				
Sample ID:	**VCUP-1-7-26-19**	**VCUP-2-7-26-19**	**VCUP-3-7-26-19**	**VCUP-4-7-26-19**
Date Sampled:	**7/26/19**	**7/26/19**	**7/26/19**	**7/26/19**
Dissolved Gases (mg/L)				
Ethene	<0.010	<0.010	<0.010	<0.010
Total Metals (mg/L)				
Iron	**9.345**	**17.09**	**4.403**	**7.846**
Ferrous Iron	<0.02000	<0.02000	<0.02000	<0.02000
Ferric Iron	**9.345**	**17.09**	**4.403**	**7.846**
Manganese	**0.122**	**0.41**	**0.0488**	**0.586**
Anions (mg/L)				
Chloride	**463**	**116**	**413**	**561**
Sulfate	**1,740**	**1,890**	**2,050**	**2,370**
Nitrate	**7.04**	**13.1**	**12.90**	**7.09**
Alkalinity (mg/L)				
Calcium Carbonate	**390**	**510**	**390**	**560**
pH				
pH	**7.54**	**7.71**	**7.94**	**7.82**
Carbon Dioxide (mg/L)				
CO_2	**23.0**	**20.0**	**12.0**	**17.0**
Dissolved Organic Carbon (mg/L)				
Carbon	**8.6**	**6.1**	**4.6**	**6.1**

Notes:

mg/L = milligrams per liter.

<x = below laboratory reporting limit.

Dissolved Gasses were analyzed by Method RSK-175 mod.

Total Metals were analyzed by EPA Method 200.8.

Ferrous Iron was analyzed by Method SM3500-Fe.

Ferric Iron was calculated from the concentration of Iron and Ferrous Iron.

Anions were analyzed by EPA Method 300.0.

Alkalinity was analyzed by Method SM2320-B.

Carbon Dioxide was analyzed by Method SM4500CO2 D-2011.

Dissolved Organic Carbon was analyzed by EPA Method 415.1.

Table 3 - Summary of Groundwater Field Chemistry Data				
Sample ID:	**VCUP-1**	**VCUP-2**	**VCUP-3**	**VCUP-4**
Date Sampled:	**7/26/19**	**7/26/19**	**7/26/19**	**7/26/19**
Total Dissolved Solids (mg/l)	2.2	2.5	2.7	2.7
Temperature (°C)	19.9	18.5	17.7	17.5
pH	7.94	7.84	7.73	7.46
Conductance (mS/cm)	0.0036	0.0039	0.0042	0.0043
Oxidative-Reductive Potential (mV)	172	173	188	203
Dissolved Oxygen (mg/l)	6.92	6.56	5.87	5.78

Notes:

mg/L = milligrams per liter.

°C = degrees Celsius

pH is a unitless quantity

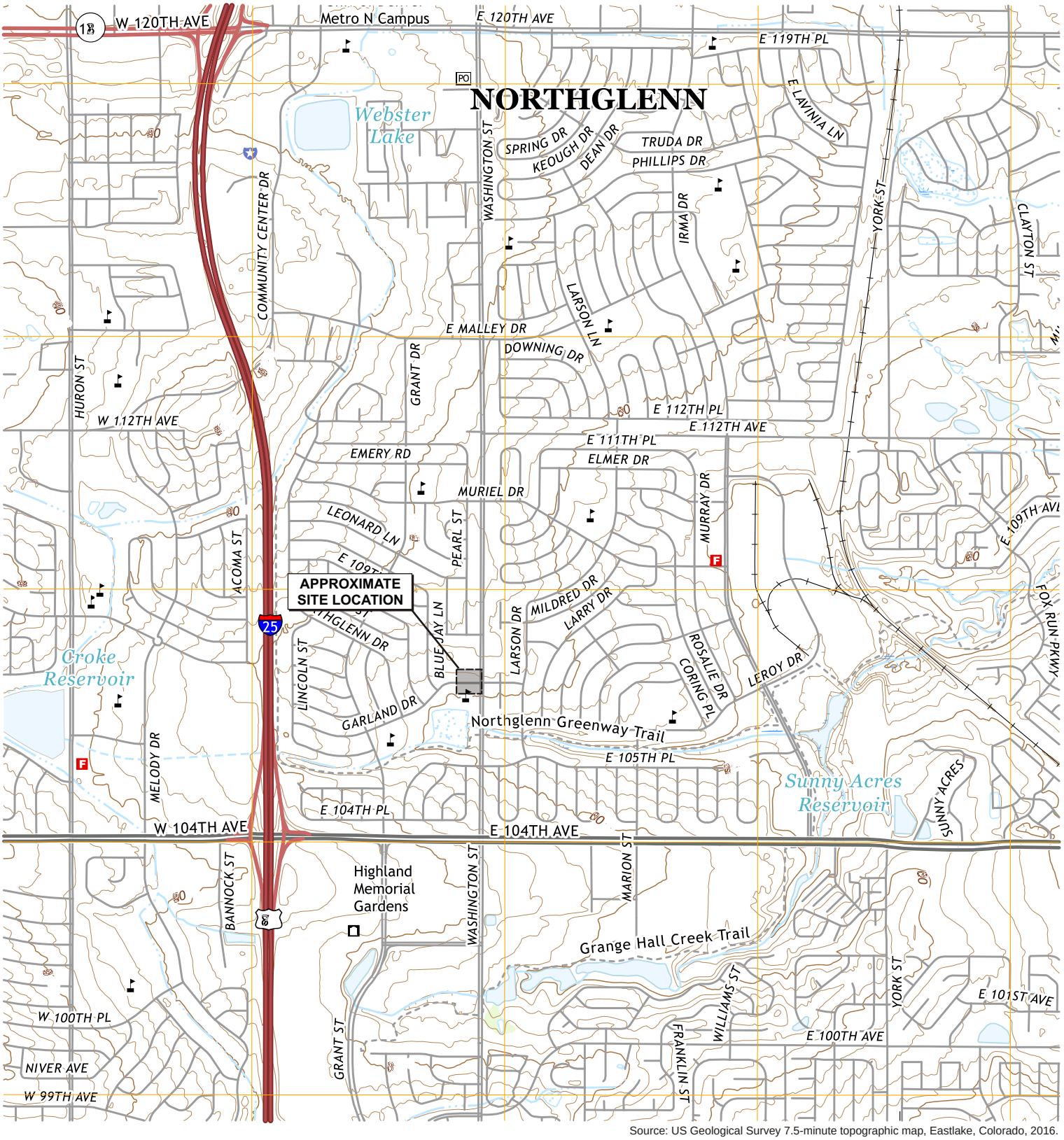
mS/cm = micro Siemens per centimeter

mV = millivolt

measurements shown in the table were taken after the purge water had reached assumed equilibrium

field measurements taken using YSI-Pro-ODO

FIGURES



Source: US Geological Survey 7.5-minute topographic map, Eastlake, Colorado, 2016.

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

FIGURE 1

SITE LOCATION

NURA - FEASIBILITY STUDY
EAST OF INTERSECTION OF WASHINGTON STREET AND GARLAND DRIVE
NORTHGLENN, COLORADO

500557005 | 9/19

Ninyo & Moore
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bsm file no: 0557vmap0919

Source: NAVTEQ, 05/31/18.

N

FEET

0 110

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

FIGURE 2

SITE PLAN WITH CURRENT AND HISTORIC SAMPLE LOCATIONS

NURA - FEASIBILITY STUDY
EAST OF INTERSECTION OF WASHINGTON STREET AND GARLAND DRIVE
NORTHGLENN, COLORADO

500557005 | 9/19

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

bsm file no: 0557blm0919

Source: NAVTEQ, 05/31/18.

N

FEET

0 110

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

FIGURE 3

BEDROCK CONTOUR MAP

NURA - FEASIBILITY STUDY
EAST OF INTERSECTION OF WASHINGTON STREET AND GARLAND DRIVE
NORTHGLENN, COLORADO

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

500557005 | 8/19

bsm file no: 0557bed0919

Source: NAVTEQ, 05/31/18.

N

FEET

0 110

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

FIGURE 4

GROUNDWATER ELEVATIONS

NURA - FEASIBILITY STUDY
EAST OF INTERSECTION OF WASHINGTON STREET AND GARLAND DRIVE
NORTHGLENN, COLORADO

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

500557005 | 8/19

bsm file no: 0557pce0919

Source: NAVTEQ, 05/31/18.

N

FEET

0 110

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

FIGURE 5

PCE CONCENTRATIONS IN GROUNDWATER

NURA - FEASIBILITY STUDY
EAST OF INTERSECTION OF WASHINGTON STREET AND GARLAND DRIVE
NORTHGLENN, COLORADO

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bsm file no: 0557pce0919

APPENDIX A

Boring Logs

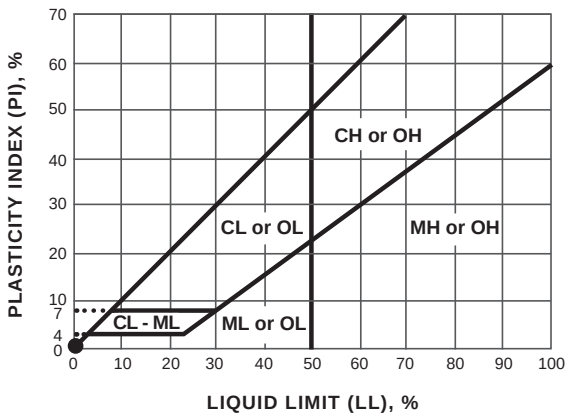
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS	
			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	**GRAVEL** more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	**SILT and CLAY** liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSIS-TENCY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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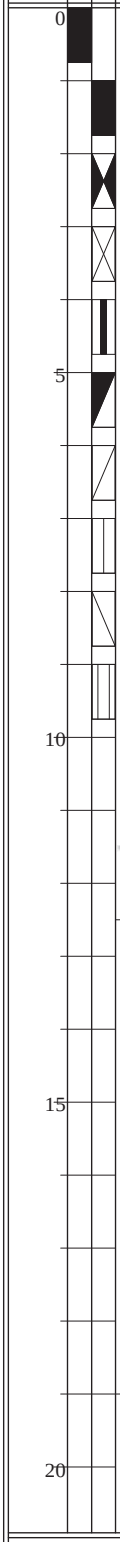
USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

BORING LOG EXPLANATION SHEET



Bulk sample.

Modified split-barrel drive sampler.

2-inch inner diameter split-barrel drive sampler.

No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.

Sample retained by others.

Standard Penetration Test (SPT).

No recovery with a SPT.

Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.

No recovery with Shelby tube sampler.

Continuous Push Sample.

Seepage.

Groundwater encountered during drilling.

Groundwater measured after drilling.

MAJOR MATERIAL TYPE (SOIL):
Solid line denotes unit change.

Dashed line denotes material change.

Attitudes: Strike/Dip
b: Bedding
c: Contact
j: Joint
f: Fracture
F: Fault
cs: Clay Seam
s: Shear
bss: Basal Slide Surface
sf: Shear Fracture
sz: Shear Zone
sbs: Shear Bedding Surface

The total depth line is a solid line that is drawn at the bottom of the boring.

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BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

DATE DRILLED 5/28/2019 BORING NO. VCUP-1

GROUND ELEVATION NOT SURVEYED SHEET 1 OF 3

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0									ASPHALT = Approximately 8 inches thick.
								CH	ALLUVIUM: Light brown, moist, fat CLAY.
5									
10									
15									
20									

FIGURE A - 1

Ninyo & Moore
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FORMER GARLAND SHOPPING CENTER VCUP
NORTHGLENN, COLORADO

DATE DRILLED 5/28/2019 BORING NO. VCUP-1

GROUND ELEVATION NOT SURVEYED SHEET 2 OF 3

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								CH	ALLUVIUM: (continued) Light brown, moist, fat CLAY.
25									Dark brown.
				▽					@28': Groundwater encountered during drilling.
30									
35									
40									Total Depth = 39 feet. Groundwater encountered at a depth of approximately 28 feet during drilling.

DATE DRILLED 5/28/2019 BORING NO. VCUP-1

GROUND ELEVATION NOT SURVEYED SHEET 3 OF 3

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40									Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. Boring was hand augered to 5 feet by Ninyo & Moore. Site Services Drilling use the direct-push drilling method to advance the hole to depth.
45									
50									
55									
60									

DATE DRILLED 5/29/2019 BORING NO. VCUP-2

GROUND ELEVATION NOT SURVEYED SHEET 1 OF 2

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							CH	FILL: Brown, moist, fat CLAY.
5							CH	ALLUVIUM: Brown, moist, fat CLAY with sand. Decrease in sand content.
10								
15							SC-SM	Brown, wet, silty sandy CLAY. @17': Groundwater encountered during drilling.
20								

FIGURE A - 4

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FORMER GARLAND SHOPPING CENTER VCUP
NORTHGLENN, COLORADO

500557005 | 6/19

DATE DRILLED 5/29/2019 BORING NO. VCUP-2

GROUND ELEVATION NOT SURVEYED SHEET 2 OF 2

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								CH	ALLUVIUM: (continued) Brown, wet, fat CLAY.
25									
30									
35									
									Total Depth = 36 feet. Groundwater encountered at a depth of approximately 17 feet during drilling. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. Boring was hand augered to 5 feet by Ninyo & Moore. Site Services Drilling use the direct-push drilling method to advance the hole to depth.
40									

DATE DRILLED 5/28/2019 BORING NO. VCUP-3

GROUND ELEVATION NOT SURVEYED SHEET 1 OF 3

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								SC-SM	FILL: Light brown, dry, silty sandy CLAY.
5								SC-SM	ALLUVIUM: Light brown, dry, silty sandy CLAY.
10									
15									
20									

FIGURE A - 6

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

FORMER GARLAND SHOPPING CENTER VCUP
NORTHGLENN, COLORADO

500557005 | 6/19

DATE DRILLED 5/28/2019 BORING NO. VCUP-3

GROUND ELEVATION NOT SURVEYED SHEET 2 OF 3

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								SC-SM	ALLUVIUM: (continued) Light brown, dry, silty sandy CLAY.
25									
				▽				CH	Light brown, wet, fat CLAY. @29': Groundwater encountered during drilling.
30									
35									
									Total Depth = 39 feet. Groundwater encountered at a depth of approximately 29 feet during drilling.
40									

FIGURE A - 7

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

FORMER GARLAND SHOPPING CENTER VCUP
NORTHGLENN, COLORADO

500557005 | 6/19

DATE DRILLED 5/28/2019 BORING NO. VCUP-3

GROUND ELEVATION NOT SURVEYED SHEET 3 OF 3

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40									Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. Boring was hand augered to 5 feet by Ninyo & Moore. Site Services Drilling use the direct-push drilling method to advance the hole to depth.
45									
50									
55									
60									

DATE DRILLED 5/28/2019 BORING NO. VCUP-4

GROUND ELEVATION NOT SURVEYED SHEET 1 OF 3

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								CH	ALLUVIUM: Light brown, dry, fat CLAY.
5									
10									
15									
20									

FIGURE A - 9

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

FORMER GARLAND SHOPPING CENTER VCUP
NORTHGLENN, COLORADO

DATE DRILLED 5/28/2019 BORING NO. VCUP-4

GROUND ELEVATION NOT SURVEYED SHEET 2 OF 3

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								CH	ALLUVIUM: (continued) Light brown, dry, fat CLAY.
25				▽					@26': Groundwater encountered during drilling.
30									
35									
40									Total Depth = 39 feet. Groundwater encountered at a depth of approximately 26 feet during drilling.

DATE DRILLED 5/28/2019 BORING NO. VCUP-4

GROUND ELEVATION NOT SURVEYED SHEET 3 OF 3

METHOD OF DRILLING HAND AUGER/CME-55 (SITE SERVICES DRILLING)

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY REH LOGGED BY REH REVIEWED BY

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	PID READING (PPM)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40									Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. Boring was hand augered to 5 feet by Ninyo & Moore. Site Services Drilling use the direct-push drilling method to advance the hole to depth.
45									
50									
55									
60									

APPENDIX B

Monitoring Well Notice-of-Intent

From:	erica.gutierrez@state.co.us on behalf of DWRPermitsOnline, DNR
To:	Robert Hodges
Subject:	Re: Notice of Intent to Construct Monitoring Holes
Date:	Tuesday, April 16, 2019 4:19:52 PM
Attachments:	image001.png image002.png image003.png

Thank you for your submission. This form does not require payment of a fee.

Check status of permit applications / updates to well permits at: https://dnrweb.state.co.us/cdss/WellPermits

…

DWR Permits Online
Colorado Division of Water Resources
303-866-3581 (extension 0)
http://water.state.co.us/Home/Pages/default.aspx

On Tue, Apr 16, 2019 at 3:47 PM Robert Hodges <rhodges@ninyoandmoore.com> wrote:

> Hello,
>
> Please see the attached notice of intent to construct monitoring holes. If there are any problems or if you need any further information just let me know.
>
> Thank you,
>
> **Robert Hodges**
>
> Senior Staff Environmental Scientist
>
> **Ninyo & Moore**
>
> Geotechnical & Environmental Sciences Consultants
>
> 6001 South Willow Drive, Ste 195 | Greenwood Village, CO 80111
>
> (303) 629-6000 (**x11919**) | (309) 231-8223 (Cell)
>
> **www.ninyoandmoore.com**
>
> 30+ Years of Quality Service

DIV 1

RECEIVED
APR 16 2019
WATER RESOURCES
STATE ENGINEER
COLO

GWS-51
02/2017

NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)

Please type or print legibly in black or blue ink or file online, dwrpermitsonline@state.co.us

State of Colorado, Office of the State Engineer 1313 Sherman St, Room 821, Denver, CO 80203 Phone 303-866-3581 www.water.state.co.us

Well Owner Name(s): Ninyo + Moore

Address: 6001 S. Willow Dr. # 195 Greenwood Village, CO

Phone: (303) 629-6000

Email: rhodges@ninyoandmoore.com

Landowner's Name: _____

Please check one and complete as indicated including contact info:

☐ Water Well Driller Licensed in Colorado - Lic. No. _____

☐ Professional Engineer Registered in Colorado - Reg. No. _____

☐ Professional Geologist per C.R.S. 23-41-208(b)

■ Other – anyone directly employed by or under the supervision of a licensed driller, registered professional engineer or professional geologist

Contact / Company Robert Hodges / Ninyo + Moore

Address 6001 S. Willow Dr. #195

City, State & Zip Greenwood Village, CO 80111

Phone (303) 629-6000

Email rhodges@ninyoandmoore.com

Print Name: Robert Hodges

Signature or enter full name here: RH

Location: Section 10

Township 2 ☐N ■S, Range 68 ☐E ■W, 6th PM

County: Adams

Subdivision: _____

Lot: _____ Block: _____ Filing: _____

Site/Property Address 10675 Washington Street Northglenn, Co 80233

GPS Location in UTM format if known:

Set GPS unit to true north, datum NAD83, and use meters for the distance units, ☐Zone 12 or ■Zone 13.

Easting 1864.8 Northing 15630

# of Monitoring Holes to be constructed in 6 HF W I R 4

Estimated Depth 40' Ft., Aquifer _____

Purpose of Monitoring Hole(s) Groundwater sampling

Anticipated Date of Construction: 4/30/19

Date Notice Submitted: 4/16/19

(Must be at least 3 days prior to construction)

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE

FOR OFFICE USE ONLY

59534 - MH

Div. 1 WD 2 Bas _____ MD _____

PROCESSED BY Justin Arboleda

DATE ACKNOWLEDGED 4/16/2019

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT SHALL BE AVAILABLE AT THE DRILLING SITE.

1) Notice was provided to the State Engineer at least 72 hours prior to construction of monitoring & observation hole(s).

2) Construction of the hole(s) must be completed within 90 days of the date notice was given to the State Engineer. Testing and/or pumping shall not exceed a total of 200 hours unless prior written approval is obtained from the State Engineer. Water diverted during testing must not be used for beneficial purposes. The owner of the hole(s) is responsible for obtaining permit(s) and complying with all rules and regulations pertaining to the discharge of fluids produced during testing.

3) All work must comply with the Water Well Construction Rules, 2 CCR 402-2. Standard permit application and work report forms are found on the DWR website at http://www.water.state.co.us. Well Construction and Yield Estimate Reports (GWS-31) must be completed for each hole drilled. The licensed contractor or authorized individual must submit the completed forms to this office within 60 days of monitoring hole completion. Aquifer testing information must be submitted on Well Yield Test Report (GWS-39).

4) Unless a well permit is obtained or variance approved, the hole(s) must be plugged and sealed within eighteen (18) months after construction. An Abandonment Report (GWS-09) must be submitted within 60 days of plugging & sealing. The above MH acknowledgement number, owner's structure name, and owner's name and address must be provided on all well permit application(s), well construction and abandonment reports.

5) A MONITORING HOLE CANNOT BE CONVERTED TO A PRODUCTION WATER WELL, except for purposes of remediation (recovery) or as a permanent dewatering system, if constructed in accordance with the Water Well Construction Rules and policies of the State Engineer.

6) IF HOLES WILL NOT BE CONSTRUCTED UNDER THIS NOTICE WITHIN 90 DAYS, PLEASE WRITE "NO HOLES CONSTRUCTED" ON A COPY OF THE ACKNOWLEDGED NOTICE WITH THE FILE NUMBER AND EMAIL TO THE DIVISION OF WATER RESOURCES AT DWRpermitsonline@state.co.us.

THIS ACKNOWLEDGEMENT OF NOTICE DOES NOT INDICATE THAT WELL PERMIT(S) CAN BE APPROVED.

Incomplete forms or Notice provided less than 72 hours prior to well construction will not be acknowledged

STATE OF COLORADO

DWRPermitsOnline, DNR <dnr_dwrpermitsonline@state.co.us>

Notice of Intent to Construct Monitoring Holes

1 message

Robert Hodges <rhodges@ninyoandmoore.com> Tue, Apr 16, 2019 at 3:47 PM
To: "dwrpermitsonline@state.co.us" <dwrpermitsonline@state.co.us>

Hello,

Please see the attached notice of intent to construct monitoring holes. If there are any problems or if you need any further information just let me know.

Thank you,

Robert Hodges

Senior Staff Environmental Scientist

Ninyo & Moore

Geotechnical & Environmental Sciences Consultants

6001 South Willow Drive, Ste 195 | Greenwood Village, CO 80111

(303) 629-6000 (**x11919**) | (309) 231-8223 (Cell)

www.ninyoandmoore.com

30+ Years of Quality Service

GSW-51.pdf
111K

APPENDIX C

Field Data Sheets

Ninyo & Moore

GROUNDWATER SAMPLING FIELD DATA SHEET

Project Name: NURA - Feasibility Study
Site: NURA Date: 7/25/19 Sampler: REH
Project No.: 500557005 Weather: 90's Sunny
Monitoring Well ID: VCUP-1 Vapor Monitoring Results (ppmv): BZ= WH=

Casing Diameter: ☒ 2" ☐ 4" ☐ 6" ☐ Other Casing Material: ☒ SCH 40-PVC ☐ Other
Total Depth (ft-TOC): 38.45
Depth to Water (ft-TOC): 18.43
Floating Immiscible Layer Observed?
Floating Immiscible Layer Thickness (feet):
Water Column Height (feet): 20.02
2" = 0.16
4" = 0.65 gal/ft = 3.2 x3= 32
6" - 1.47
Min. Purge Volume (gallons)

Water Level Measurement Equip: Cleaned:
Purging Method/Equipment: Cleaned:
Pump Lines/Bailer Ropes-New or Cleaned?
Temp./pH Meter: Calibration (date/time):
Conductivity Meter: Calibration (date/time):
Comments:

pH STND.	Field pH	Field Temp °F
4.0		
7.0		

TDS mg/L °C mS/cm

Time	Purge Vol (Gal)	~~Totalizer Reading (Gal)~~	TEMP. (~~°F~~)	pH	COND. (~~µS/cm~~)	ORP (mV)	DO (mg/L)	COMMENTS (color, turbidity, odor, sheen, etc.):	
15:55	5.0	2.9	19.7	7.73	.0043	187	6.16	Cloudy	
16:09	10.0	2.9	19.4	7.85	.0044	177	6.37	Cloudy	
16:25	15.0	2.5	19.9	8.10	.0038	174	6.29	Cloudy	Brown
16:39	17.5	2.2	19.9	7.94	.0036	172	6.39	Cloudy	Brown
	25.0								
	32.0								

Dry

Total Volume Purged (gallon): Time Finished Purging:

Sampling Method/Equipment: PVC Bailer
Bailer Rope-New or Cleaned?:
Sample Time:
Sample ID:
Replicate ID (if appl.)
Laboratory:
Comments:

Parameter	USEPA Method	Containers/Volume/Type (VOA/Glass/Plastic)	Pres.
TPH-g/ TEX/MTBE'	8015m	4 x 40mL VOA	°4 C, HCl

17 gallons purged - can feel bottom 1/2 bailer
17.5 empty

Ninyo & Moore

GROUNDWATER SAMPLING FIELD DATA SHEET

Project Name: NURA - Feasibility Study
Site: NURA Date: 7/25/19 Sampler: RELL
Project No.: 500557005 Weather: 90's Sunny
Monitoring Well ID: VCUP-2 Vapor Monitoring Results (ppmv): BZ= WH=

Casing Diameter: [X] 2" [ ] 4" [ ] 6" [ ] Other Casing Material: [ ] SCH 40-PVC [ ] Other
Total Depth (ft-TOC): 36.00
Depth to Water (ft-TOC): 20.30
Floating Immiscible Layer Observed?
Floating Immiscible Layer Thickness (feet):
Water Column Height (feet): 15.7
2" = 0.16
4" = 0.65
6" - 1.47
gal/ft = 2.512 x3= 25.12
Min. Purge Volume (gallons) 25.2

Water Level Measurement Equip: Cleaned:
Purging Method/Equipment: Cleaned:
Pump Lines/Bailer Ropes-New or Cleaned?
Temp./pH Meter: Calibration (date/time):
Conductivity Meter: Calibration (date/time):
Comments:

pH STND.	Field pH	Field Temp °F
4.0		
7.0		

TDS (mg/L) mS/cm

Time	Purge Vol (Gal)	~~Totalizer Reading (Gal)~~	°C TEMP. ~~(°F)~~	pH	COND. ~~(µS/cm)~~	ORP (mV)	DO mg/L	COMMENTS (color, turbidity, odor, sheen, etc.):	
11:15	5.0	3.1	20.9	7.45	.0047	197	630.9	Cloudy	Brown
11:37	10.0	2.7	18.6	7.88	.0044	190	4.85	V Cloudy	Brown
11:51	15.0	2.6	19.0	7.77	.0041	179	5.38	V Cloudy	Brown
12:09	20.0	2.7	19.1	7.87	.0042	182	5.51	Vcloudy	Brown
12:25	25.2	2.5	18.5	7.84	.0039	173	6.20	Vcloudy	Brown

Total Volume Purged (gallon): Time Finished Purging:

Sampling Method/Equipment: PVC Bailer
Bailer Rope-New or Cleaned?:
Sample Time:
Sample ID:
Replicate ID (if appl.)
Laboratory:
Comments:

Parameter	USEPA Method	Containers/Volume/Type (VOA/Glass/Plastic)	Pres.
TPH-g/ TEX/MTBE'	8015m	4 x 40mL VOA	°4 C, HCl

Ninyo & Moore

GROUNDWATER SAMPLING FIELD DATA SHEET

Project Name: Nura - Feasibility Study
Site: Nura
Date: 7/25/19
Sampler: EM
Project No.: 500557005
Weather: 90's Sunny
Monitoring Well ID: VCUP-3
Vapor Monitoring Results (ppmv): BZ= WH=

Casing Diameter: [X] 2" [ ] 4" [ ] 6" [ ] Other
Casing Material: [ ] SCH 40-PVC [ ] Other
Total Depth (ft-TOC): 37.93
Depth to Water (ft-TOC): 22.00
Floating Immiscible Layer Observed?
Floating Immiscible Layer Thickness (feet):
2" = 0.16
4" = 0.65
6" - 1.47
Water Column Height (feet): 15.93
gal/ft = 2.55 x3= 25.5
Min. Purge Volume (gallons) 25.5

Water Level Measurement Equip: Cleaned:
Purging Method/Equipment: Cleaned:
Pump Lines/Bailer Ropes-New or Cleaned?
Temp./pH Meter: Calibration (date/time):
Conductivity Meter: Calibration (date/time):
Comments:

pH STND.	Field pH	Field Temp °F
4.0		
7.0		

TDS mg/L °C mS/cm

Time	Purge Vol (Gal)	Totalizer Reading (Gal)	TEMP. (°F)	pH	COND. (µS/cm)	ORP (mV)	DO mg/L	COMMENTS (color, turbidity, odor, sheen, etc.):	
14:21	5.0	2.8	18.1	7.69	.0043	191	5.65	V cloudy	Brown
14:33	10.0	2.9	17.3	7.75	.0043	183	6.26	V cloudy	Brown
14:45	15.0	2.7	17.2	7.83	.0043	184	6.37	V cloudy	Brown
14:57	20.0	2.7	17.9	7.75	.0042	182	6.22	V cloudy	Brown
15:07	25.5	2.7	17.7	7.83	.0042	188	6.63	V cloudy	Brown

Total Volume Purged (gallon): Time Finished Purging:

Sampling Method/Equipment: PVC Bailer
Bailer Rope-New or Cleaned?:
Sample Time:
Sample ID:
Replicate ID (if appl.)
Laboratory:
Comments:

Parameter	USEPA Method	Containers/Volume/Type (VOA/Glass/Plastic)	Pres.
TPH-g/ TEX/MTBE'	8015m	4 x 40mL VOA	°4 C, HCl

Ninyo & Moore

GROUNDWATER SAMPLING FIELD DATA SHEET

Project Name: Nura - Feasibility Study

Site: Nura | Date: 7/25/19 | Sampler: REH

Project No.: 500557005 | Weather: 90's Sunny

Monitoring Well ID: VCUP-4 | Vapor Monitoring Results (ppmv): | BZ= | WH=

Casing Diameter: [X] 2" [ ] 4" [ ] 6" [ ] Other | Casing Material: [ ] SCH 40-PVC [ ] Other

Total Depth (ft-TOC): 38.64

Depth to Water (ft-TOC): 23.04

Floating Immiscible Layer Observed?

Floating Immiscible Layer Thickness (feet):

Water Column Height (feet): 15.6

2" = 0.16
4" = 0.65
6" - 1.47

gal/ft = 24.96 x3= 23.0

Min. Purge Volume (gallons) 23.0

Water Level Measurement Equip: | Cleaned:

Purging Method/Equipment: | Cleaned:

Pump Lines/Bailer Ropes-New or Cleaned?

Temp./pH Meter: | Calibration (date/time):

Conductivity Meter: | Calibration (date/time):

Comments:

pH STND.	Field pH	Field Temp °F
4.0		
7.0		

TDS mg/L oC , mS/cm

Time	Purge Vol (Gal)	Totalizer Reading ~~(Gal)~~	TEMP. ~~(°F)~~	pH	COND. ~~(µS/cm)~~	ORP (mV)	DO mm Hg	COMMENTS (color, turbidity, odor, sheen, etc.):	
09:27	5.0	2.9	17.4	6.16	.0045	254	630.9	V. Cloudy	Brown
09:46	10.0	3.3	17.2	6.42	.0051	255	630.9	V. Cloudy	Brown
10:06	15.0	2.6	18.4	7.06	.0041	218	630.8	V. Cloudy	Brown
10:22	20.0	2.3	18.2	7.25	.0044	203	630.8	V. Cloudy	Brown
10:34	25.0	2.7	17.5	7.46	.0043	203	630.8	V. Cloudy	Brown

Total Volume Purged (gallon): | Time Finished Purging:

Sampling Method/Equipment: PVC Bailer

Bailer Rope-New or Cleaned?:

Sample Time:

Sample ID:

Replicate ID (if appl.)

Laboratory:

Comments:

Parameter	USEPA Method	Containers/Volume/Type (VOA/Glass/Plastic)	Pres.
TPH-g/ TEX/MTBE'	8015m	4 x 40mL VOA	°4 C, HCl

7/26/19 REH 90's Sunny

0800 REH arrived @ N&M office. Updated Beth about prior days work. loaded up with sampling equipment.

0900 REH left N&M office for site. Stopped in @ Walmart to pick up ice for sample coolers.

0945 Set up @ VCUP-1 to begin sampling. DTW = 18.01

1015 Collected Sample VCUP-1-7-26-19

DO	6.92	mg/L
PH	7.39	
Cond	.0049	ms/cm
TDS	3.2	mg/L
Temp	19.4	°C
ORP	202	mV

1038 Set up @ VCUP-2 to begin sampling. DTW = 20.35.

1056 Collected sample VCUP-2-7-26-19

DO	6.56	mg/L
pH	7.39	
Cond	.0050	ms/cm
TDS	3.3	mg/L
Temp	~~20.6~~ 19.6	°C
ORP	196	mV

1112 Setting up @ VCUP-3 to begin sampling DTW = 22.09

1134 Collected sample VCUP-3-7-26-19

DO	5.87
pH	7.63
Cond	.0044
TDS	2.9
Temp	17.7
ORP	192

1150 Setting up @ VCUP-4 to begin sampling. DTW = 22.98

1211 Collected sample VCUP-4-7-26-19

DO	5.78
pH	7.44
Cond	.0046
TDS	3.0
Temp	18.9
ORP	198

12:20 Packing up equipment.

12:35 Heading to Northglenn water treatment plant to collect soil + decon samples

1306 Collected sample of soil from 3 different drums
Soil-7-26-19

1316 Off-site for Summit.

8/5/19 REH 90's Sunny

12:45 REH arrived on site to measure waterlevels + survey well elevations

VCUP-1: 18.04/18.53
5307.28 to cover
VCUP-2: 20.51/21.05
5305.33 to cover
VCUP-3: 22.26/22.81
5305.78 to cover
VCUP-4: 23.16/23.61
5306.25 to cover
MW-17R: 20.46/20.99

14:00 REH off site.

APPENDIX D

Laboratory Analytical Results

Summit Scientific

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

August 06, 2019

Beth McDonald

Ninyo & Moore

6001 S Willow Dr #195

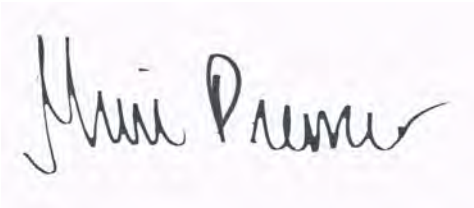
Greenwood Village, CO 80111

RE: NVRA - Feasibility Study

Work Order # 1907328

Enclosed are the results of analyses for samples received by Summit Scientific on 07/26/19 14:00. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Muri Premer For Ben Shrewsbury

Laboratory Manager

S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
VCUP-1-7-26-19	1907328-01	Water	07/26/19 10:15	07/26/19 14:00
VCUP-2-7-26-19	1907328-02	Water	07/26/19 10:56	07/26/19 14:00
VCUP-3-7-26-19	1907328-03	Water	07/26/19 11:34	07/26/19 14:00
VCUP-4-7-26-19	1907328-04	Water	07/26/19 12:11	07/26/19 14:00
Soil - 7-26-19	1907328-05	Soil	07/26/19 13:06	07/26/19 14:00

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

1907328

Summit Scientific

S2

4653 Table Mountain Drive ♦ Golden, Colorado 80403
303-277-9310 ♦ 303-374-5933 (f)

Client: Ninyo + Moore
Address: 6001 S. Willow Dr. #195
City/State/Zip: Greenwood Village, CO 80111
Phone: (303) 629-6000
Sampler Name: Robert Hodges

Project Manager: Beth McDonald
E-Mail: bmcdonald@ninyoandmoore.com
Project Name: NURA - Feasibility Study
Project Number: 500557005

					Preservative				Matrix				Analysis Requested								Special Instructions					
ID	Sample Description	Date Sampled	Time Sampled	# of containers	HCl	HNO3	None	Other	Water	Soil	Air-Canister #	Other	Chloroethenes	Dissolved Organic Carbon	Nitrate	Manganese	Ferric Iron	Ferrous Iron	Sulfate	Ethene	Carbon Dioxide	Chloride	Alkalinity	VOCs	Chlorinated VOCs	
1	VCUP-1-7-26-19	7/26/19	10:15	10	3	1	6		X				X	X	X	X	X	X	X	X	X	X	X		-	
2	VCUP-2-7-26-19	7/26/19	10:56	10	3	1	6		X				X	X	X	X	X	X	X	X	X	X	X			
3	VCUP-3-7-26-19	7/26/19	11:34	10	3	1	6		X				X	X	X	X	X	X	X	X	X	X	X			
4	VCUP-4-7-26-19	7/26/19	12:11	10	3	1	6		X				X	X	X	X	X	X	X	X	X	X	X			
5	Soil-7-26-19	7/26/19	13:06	3			3			X															X	
6																										
7																										
8																										
9																										
10																										

Relinquished by:	Date/Time:	Received by:	Date/Time:
[signature]	7/26/19 14:00	[signature]	7-26-19 14:00
Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:

Turn Around Time (Check)
Same Day ___ 72 hours ___
24 hours ___ Standard X
48 hours ___

Sample Integrity:
Temperature Upon Receipt: 3.5
Samples Intact: (Yes) No

Notes:
Please composite Soil-7-26-19

Sample Receipt Checklist

S2 Work Order 1907328

Client: Ninyo & Moore Client Project ID: NURA - Feasibility Study

Shipped Via: H.D./P.U./FedEx/UPS/USPS/Other_____ Airbill #: _____

☑ ☐ ☐ ☐ ☐

Matrix (check all that apply): ☐ Air ☐ Soil/Solid ☑ Water ☐ Other:_____ (Describe)

Temp (°C)	3.5

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature at 4°C +/- 2°C (1)? NOTE: If samples are delivered the same day of sampling, this requirement is met provided that there is evidence that cooling has begun.	✓			On Ice
Were all samples received intact (1)?	✓			
Was adequate sample volume provided (1)?	✓			
If custody seals are present, are they intact (1)?			✓	
Are samples with holding times due within 48 hours sample due within 48 hours present?	✓			DOC,Ferrous Iron
Is a chain-of-custody (COC) form present and filled out completely (1)?	✓			
Does the COC agree with the number and type of sample bottles received (1)?	✓			
Do the sample IDs on the bottle labels match the COC (1)?	✓			
Is the COC properly relinquished by the client w/ date and time recorded (1)?	✓			
For volatiles in water – is there headspace present? **If yes, contact client and note in narrative.**		✓		
Are samples preserved that require preservation **(excluding cooling)** (1)? Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect	✓			HCl HNO3 H2SO4
If samples are acid preserved for metals, is the pH ≤ 2(1)? Record the pH in Comments.	✓			
If dissolved metals are requested, were samples field filtered?				
Additional Comments (if any):				

(1) **If NO, then contact the client before proceeding with analysis and note in case narrative.**

MP	Muri Premer	7/26/19
Custodian Printed Name or Initials	**Signature of Custodian**	**Date/Time**

S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-1-7-26-19

1907328-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **07/26/19 10:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bromochloromethane	ND	5.0	ug/l	1	1907384	07/29/19	07/31/19	EPA 8260B	
Bromodichloromethane	ND	2.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	1.0	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Chlorodibromomethane	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
Chloroform	ND	3.0	"	"	"	"	"	"	
Chloromethane	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	1.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	1.0	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	"	"	"	"	"	"	
Tetrachloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
Trichloroethene	ND	1.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	1.0	"	"	"	"	"	"	
Vinyl chloride	ND	1.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	1.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	1.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane (EDC)	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-1-7-26-19

1907328-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,3-Dichlorobenzene	ND	1.0	ug/l	1	1907384	07/29/19	07/31/19	EPA 8260B	
1,3-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	1.0	"	"	"	"	"	"	

Date Sampled: **07/26/19 10:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*92.3 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*105 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*106 %*	*21-167*		"	"	"	"	

Dissolved Gases by RSK-175

Date Sampled: **07/26/19 10:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ethene	ND	0.010	mg/L	1	1908011	08/01/19	08/05/19	RSK-175 mod	

Total Metals by EPA Method 200.8

Date Sampled: **07/26/19 10:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Iron	**9.345**	0.01000	mg/L	1	1907387	07/29/19	07/29/19	EPA 200.8	
Manganese	**0.122**	0.00100	"	"	"	"	"	"	

Ferrous Iron

Date Sampled: **07/26/19 10:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ferrous Iron	ND	0.02000	mg/L	1	1907424	07/26/19	07/31/19	SM3500-Fe	

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-1-7-26-19

1907328-01 (Water)

Summit Scientific

Calculated Analysis

Date Sampled: **07/26/19 10:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ferric Iron	**9.345**	0.01000	mg/L	1	1907427	07/31/19	07/31/19	Calculation	

Anions by EPA Method 300.0

Date Sampled: **07/26/19 10:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chloride	**463**	12.0	mg/L	200	1907407	07/26/19	07/26/19	EPA 300.0	
Nitrate as N	**7.04**	0.0500	"	1	"	"	"	"	
Sulfate	**1740**	60.0	"	200	"	"	"	"	

Alkalinity by SM2320

Date Sampled: **07/26/19 10:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Total Alkalinity	**390**	10.0	mg/L as CaCO3	1	1908009	08/01/19	08/02/19	SM2320-B	
Carbonate	ND	10.0	"	"	"	"	"	"	
Bicarbonate	**390**	10.0	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	10.0	"	"	"	"	"	"	

Carbon Dioxide Calculated

Date Sampled: **07/26/19 10:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Carbon dioxide	**23.0**	10.0	mg/L	1	1908029	08/02/19	08/02/19	Calculation	

pH by SM4500

Date Sampled: **07/26/19 10:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-1-7-26-19

1907328-01 (Water)

Summit Scientific

pH by SM4500

pH	**7.54**	1.00	pH Units	1	1908028	07/26/19	07/28/19	SM4500-H+ B

S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-2-7-26-19

1907328-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **07/26/19 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bromochloromethane	ND	5.0	ug/l	1	1907384	07/29/19	07/31/19	EPA 8260B	
Bromodichloromethane	ND	2.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	1.0	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Chlorodibromomethane	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
Chloroform	ND	3.0	"	"	"	"	"	"	
Chloromethane	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	1.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	1.0	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	"	"	"	"	"	"	
Tetrachloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
Trichloroethene	ND	1.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	1.0	"	"	"	"	"	"	
Vinyl chloride	ND	1.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	1.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	1.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane (EDC)	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-2-7-26-19

1907328-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,3-Dichlorobenzene	ND	1.0	ug/l	1	1907384	07/29/19	07/31/19	EPA 8260B	
1,3-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	1.0	"	"	"	"	"	"	

Date Sampled: **07/26/19 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*89.0 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*99.3 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*105 %*	*21-167*		"	"	"	"	

Dissolved Gases by RSK-175

Date Sampled: **07/26/19 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ethene	ND	0.010	mg/L	1	1908011	08/01/19	08/05/19	RSK-175 mod	

Total Metals by EPA Method 200.8

Date Sampled: **07/26/19 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Iron	**17.09**	0.01000	mg/L	1	1907387	07/29/19	07/29/19	EPA 200.8	
Manganese	**0.410**	0.00100	"	"	"	"	"	"	

Ferrous Iron

Date Sampled: **07/26/19 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ferrous Iron	ND	0.02000	mg/L	1	1907424	07/26/19	07/31/19	SM3500-Fe	

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-2-7-26-19

1907328-02 (Water)

Summit Scientific

Calculated Analysis

Date Sampled: **07/26/19 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ferric Iron	**17.09**	0.01000	mg/L	1	1907427	07/31/19	07/31/19	Calculation	

Anions by EPA Method 300.0

Date Sampled: **07/26/19 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chloride	**116**	12.0	mg/L	200	1907407	07/26/19	07/26/19	EPA 300.0	
Sulfate	**1890**	60.0	"	"	"	"	"	"	
Nitrate as N	**13.1**	0.0500	"	1	"	"	"	"	

Alkalinity by SM2320

Date Sampled: **07/26/19 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Total Alkalinity	**510**	10.0	mg/L as CaCO3	1	1908009	08/01/19	08/02/19	SM2320-B	
Carbonate	ND	10.0	"	"	"	"	"	"	
Bicarbonate	**510**	10.0	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	10.0	"	"	"	"	"	"	

Carbon Dioxide Calculated

Date Sampled: **07/26/19 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Carbon dioxide	**20.0**	10.0	mg/L	1	1908029	08/02/19	08/02/19	Calculation	

pH by SM4500

Date Sampled: **07/26/19 10:56**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-2-7-26-19

1907328-02 (Water)

Summit Scientific

pH by SM4500

pH	**7.71**	1.00	pH Units	1	1908028	07/26/19	07/28/19	SM4500-H+ B

S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-3-7-26-19

1907328-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **07/26/19 11:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bromochloromethane	ND	5.0	ug/l	1	1907384	07/29/19	07/31/19	EPA 8260B	
Bromodichloromethane	ND	2.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	1.0	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Chlorodibromomethane	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
Chloroform	ND	3.0	"	"	"	"	"	"	
Chloromethane	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	1.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	1.0	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	"	"	"	"	"	"	
Tetrachloroethene	**49**	1.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
Trichloroethene	ND	1.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	1.0	"	"	"	"	"	"	
Vinyl chloride	ND	1.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	1.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	1.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane (EDC)	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-3-7-26-19

1907328-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,3-Dichlorobenzene	ND	1.0	ug/l	1	1907384	07/29/19	07/31/19	EPA 8260B	
1,3-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	1.0	"	"	"	"	"	"	

Date Sampled: **07/26/19 11:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*87.2 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*98.5 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*92.0 %*	*21-167*		"	"	"	"	

Dissolved Gases by RSK-175

Date Sampled: **07/26/19 11:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ethene	ND	0.010	mg/L	1	1908011	08/01/19	08/05/19	RSK-175 mod	

Total Metals by EPA Method 200.8

Date Sampled: **07/26/19 11:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Iron	**4.403**	0.01000	mg/L	1	1907387	07/29/19	07/29/19	EPA 200.8	
Manganese	**0.0488**	0.00100	"	"	"	"	"	"	

Ferrous Iron

Date Sampled: **07/26/19 11:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ferrous Iron	ND	0.02000	mg/L	1	1907424	07/26/19	07/31/19	SM3500-Fe	

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-3-7-26-19

1907328-03 (Water)

Summit Scientific

Calculated Analysis

Date Sampled: **07/26/19 11:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ferric Iron	**4.403**	0.01000	mg/L	1	1907427	07/31/19	07/31/19	Calculation	

Anions by EPA Method 300.0

Date Sampled: **07/26/19 11:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chloride	**413**	12.0	mg/L	200	1907407	07/26/19	07/26/19	EPA 300.0	
Nitrate as N	**12.9**	0.0500	"	1	"	"	"	"	
Sulfate	**2050**	60.0	"	200	"	"	"	"	

Alkalinity by SM2320

Date Sampled: **07/26/19 11:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Total Alkalinity	**390**	10.0	mg/L as CaCO3	1	1908009	08/01/19	08/02/19	SM2320-B	
Carbonate	ND	10.0	"	"	"	"	"	"	
Bicarbonate	**390**	10.0	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	10.0	"	"	"	"	"	"	

Carbon Dioxide Calculated

Date Sampled: **07/26/19 11:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Carbon dioxide	**12.0**	10.0	mg/L	1	1908029	08/02/19	08/02/19	Calculation	

pH by SM4500

Date Sampled: **07/26/19 11:34**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-3-7-26-19

1907328-03 (Water)

Summit Scientific

pH by SM4500

pH	**7.94**	1.00	pH Units	1	1908028	07/26/19	07/28/19	SM4500-H+ B

S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-4-7-26-19

1907328-04 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **07/26/19 12:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bromochloromethane	ND	5.0	ug/l	1	1907384	07/29/19	07/31/19	EPA 8260B	
Bromodichloromethane	ND	2.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	1.0	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Chlorodibromomethane	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
Chloroform	ND	3.0	"	"	"	"	"	"	
Chloromethane	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	1.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	1.0	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	"	"	"	"	"	"	
Tetrachloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
Trichloroethene	ND	1.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	1.0	"	"	"	"	"	"	
Vinyl chloride	ND	1.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	1.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	1.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane (EDC)	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-4-7-26-19

1907328-04 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,3-Dichlorobenzene	ND	1.0	ug/l	1	1907384	07/29/19	07/31/19	EPA 8260B	
1,3-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	1.0	"	"	"	"	"	"	

Date Sampled: **07/26/19 12:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*78.6 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*98.0 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*105 %*	*21-167*		"	"	"	"	

Dissolved Gases by RSK-175

Date Sampled: **07/26/19 12:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ethene	ND	0.010	mg/L	1	1908011	08/01/19	08/05/19	RSK-175 mod	

Total Metals by EPA Method 200.8

Date Sampled: **07/26/19 12:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Iron	**7.846**	0.01000	mg/L	1	1907387	07/29/19	07/29/19	EPA 200.8	
Manganese	**0.586**	0.00100	"	"	"	"	"	"	

Ferrous Iron

Date Sampled: **07/26/19 12:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ferrous Iron	ND	0.02000	mg/L	1	1907424	07/26/19	07/31/19	SM3500-Fe	

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-4-7-26-19

1907328-04 (Water)

Summit Scientific

Calculated Analysis

Date Sampled: **07/26/19 12:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Ferric Iron	**7.846**	0.01000	mg/L	1	1907427	07/31/19	07/31/19	Calculation	

Anions by EPA Method 300.0

Date Sampled: **07/26/19 12:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sulfate	**2370**	60.0	mg/L	200	1907407	07/26/19	07/26/19	EPA 300.0	
Nitrate as N	**7.09**	0.0500	"	1	"	"	"	"	
Chloride	**561**	12.0	"	200	"	"	"	"	

Alkalinity by SM2320

Date Sampled: **07/26/19 12:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Total Alkalinity	**560**	10.0	mg/L as CaCO3	1	1908009	08/01/19	08/02/19	SM2320-B	
Carbonate	ND	10.0	"	"	"	"	"	"	
Bicarbonate	**560**	10.0	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	10.0	"	"	"	"	"	"	

Carbon Dioxide Calculated

Date Sampled: **07/26/19 12:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Carbon dioxide	**17.0**	10.0	mg/L	1	1908029	08/02/19	08/02/19	Calculation	

pH by SM4500

Date Sampled: **07/26/19 12:11**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

VCUP-4-7-26-19

1907328-04 (Water)

Summit Scientific

pH by SM4500

pH	**7.82**	1.00	pH Units	1	1908028	07/26/19	07/28/19	SM4500-H+ B

S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Soil - 7-26-19

1907328-05 (Soil)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **07/26/19 13:06**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bromochloromethane	ND	5.0	ug/kg	1	1908001	08/01/19	08/02/19	EPA 8260B	
Bromodichloromethane	ND	5.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	5.0	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	"	"	"	"	"	"	
Chlorodibromomethane	ND	10	"	"	"	"	"	"	
Chloroethane	ND	5.0	"	"	"	"	"	"	
Chloroform	ND	5.0	"	"	"	"	"	"	
Chloromethane	ND	15	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	5.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	5.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	5.0	"	"	"	"	"	"	
Methylene Chloride	ND	15	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	5.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	5.0	"	"	"	"	"	"	
Trichloroethene	ND	5.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	"	"	"	"	"	"	
Vinyl chloride	ND	5.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	5.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	5.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	5.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	10	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	15	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	"	"	"	"	"	"	
1,2-Dichloroethane (EDC)	ND	5.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	5.0	"	"	"	"	"	"	

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Soil - 7-26-19

1907328-05 (Soil)

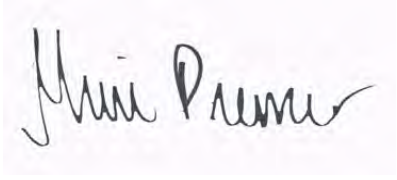
Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,3-Dichlorobenzene	ND	5.0	ug/kg	1	1908001	08/01/19	08/02/19	EPA 8260B	
1,3-Dichloropropane	ND	5.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	10	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	"	"	"	"	"	"	

Date Sampled: **07/26/19 13:06**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*91.4 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*96.5 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*107 %*	*21-167*		"	"	"	"	



S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes

Batch 1907384 - EPA 5030 Water MS

Blank (1907384-BLK1) Prepared: 07/29/19 Analyzed: 07/31/19

Benzene	ND	1.0	ug/l
Bromobenzene	ND	1.0	"
Bromochloromethane	ND	5.0	"
Bromodichloromethane	ND	2.0	"
Bromoform	ND	1.0	"
Bromomethane	ND	1.0	"
Carbon tetrachloride	ND	1.0	"
Chlorobenzene	ND	1.0	"
Chlorodibromomethane	ND	1.0	"
Chloroethane	ND	1.0	"
Chloroform	ND	3.0	"
Chloromethane	ND	1.0	"
cis-1,2-Dichloroethene	ND	1.0	"
cis-1,3-Dichloropropene	ND	1.0	"
Dibromomethane	ND	1.0	"
Dichlorodifluoromethane	ND	1.0	"
Di-isopropyl ether	ND	5.0	"
Ethyl tert-butyl ether	ND	10	"
Ethylbenzene	ND	1.0	"
Hexachlorobutadiene	ND	1.0	"
m,p-Xylene	ND	2.0	"
Isopropylbenzene	ND	1.0	"
Methyl tert-butyl ether	ND	5.0	"
Methylene Chloride	ND	5.0	"
Naphthalene	ND	1.0	"
n-Butylbenzene	ND	1.0	"
n-Propylbenzene	ND	1.0	"
o-Xylene	ND	1.0	"
p-Isopropyltoluene	ND	1.0	"
sec-Butylbenzene	ND	1.0	"
Styrene	ND	1.0	"
Tert-amyl methyl ether	ND	1.0	"
Tert-butyl alcohol	ND	20	"
tert-Butylbenzene	ND	1.0	"
Tetrachloroethene	ND	1.0	"
Toluene	ND	1.0	"
trans-1,2-Dichloroethene	ND	1.0	"
trans-1,3-Dichloropropene	ND	1.0	"

Summit Scientific

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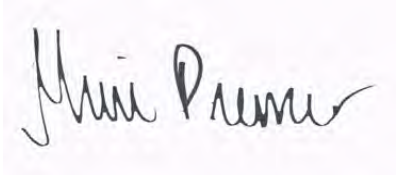
S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1907384 - EPA 5030 Water MS										
Blank (1907384-BLK1)				Prepared: 07/29/19 Analyzed: 07/31/19						
Trichloroethene	ND	1.0	ug/l							
Trichlorofluoromethane	ND	1.0	"							
Vinyl chloride	ND	1.0	"							
1,1,1,2-Tetrachloroethane	ND	1.0	"							
1,1,1-Trichloroethane	ND	1.0	"							
1,1,2,2-Tetrachloroethane	ND	1.0	"							
1,1,2-Trichloroethane	ND	1.0	"							
1,1-Dichloroethane	ND	1.0	"							
1,1-Dichloroethene	ND	1.0	"							
1,1-Dichloropropene	ND	1.0	"							
1,2,3-Trichlorobenzene	ND	1.0	"							
1,2,3-Trichloropropane	ND	1.0	"							
1,2,4-Trichlorobenzene	ND	1.0	"							
1,2,4-Trimethylbenzene	ND	1.0	"							
1,2-Dibromo-3-chloropropane	ND	1.0	"							
1,2-Dibromoethane (EDB)	ND	1.0	"							
1,2-Dichlorobenzene	ND	1.0	"							
1,2-Dichloroethane (EDC)	ND	1.0	"							
1,2-Dichloropropane	ND	1.0	"							
1,3,5-Trimethylbenzene	ND	1.0	"							
1,3-Dichlorobenzene	ND	1.0	"							
1,3-Dichloropropane	ND	1.0	"							
1,4-Dichlorobenzene	ND	1.0	"							
2,2-Dichloropropane	ND	1.0	"							
2-Chlorotoluene	ND	1.0	"							
4-Chlorotoluene	ND	1.0	"							
Surrogate: 1,2-Dichloroethane-d4	*9.26*		*"*	*13.3*		*69.5*	*23-173*			
Surrogate: Toluene-d8	*13.3*		*"*	*13.3*		*99.7*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*13.6*		*"*	*13.3*		*102*	*21-167*			



S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1907384 - EPA 5030 Water MS										
LCS (1907384-BS1)				Prepared: 07/29/19 Analyzed: 07/31/19						
Benzene	48.8	1.0	ug/l	50.0		97.6	70-130			
Bromobenzene	47.6	1.0	"	50.0		95.2	70-130			
Bromochloromethane	44.2	5.0	"	50.0		88.5	70-130			
Bromodichloromethane	45.0	2.0	"	50.0		90.0	70-130			
Bromoform	46.6	1.0	"	50.0		93.3	70-130			
Bromomethane	58.2	1.0	"	50.0		116	70-130			
Carbon tetrachloride	44.5	1.0	"	50.0		89.0	70-130			
Chlorobenzene	52.6	1.0	"	50.0		105	70-130			
Chlorodibromomethane	46.6	1.0	"	50.0		93.3	70-130			
Chloroethane	54.1	1.0	"	50.0		108	70-130			
Chloroform	48.3	3.0	"	50.0		96.6	70-130			
Chloromethane	51.1	1.0	"	50.0		102	70-130			
cis-1,2-Dichloroethene	45.3	1.0	"	50.0		90.6	70-130			
cis-1,3-Dichloropropene	43.8	1.0	"	50.0		87.7	70-130			
Dibromomethane	39.4	1.0	"	50.0		78.8	70-130			
Dichlorodifluoromethane	40.6	1.0	"	50.0		81.2	70-130			
Di-isopropyl ether	47.1	5.0	"	50.0		94.2	70-130			
Ethyl tert-butyl ether	45.7	10	"	50.0		91.5	70-130			
Ethylbenzene	56.1	1.0	"	50.0		112	70-130			
Hexachlorobutadiene	54.3	1.0	"	50.0		109	70-130			
m,p-Xylene	109	2.0	"	100		109	70-130			
Isopropylbenzene	53.9	1.0	"	50.0		108	70-130			
Methyl tert-butyl ether	44.1	5.0	"				70-130			
Methylene Chloride	60.3	5.0	"	50.0		121	70-130			
Naphthalene	41.0	1.0	"	50.0		82.0	70-130			
n-Butylbenzene	53.7	1.0	"	50.0		107	70-130			
n-Propylbenzene	52.4	1.0	"	50.0		105	70-130			
o-Xylene	54.6	1.0	"	50.0		109	70-130			
p-Isopropyltoluene	51.3	1.0	"	50.0		103	70-130			
sec-Butylbenzene	51.0	1.0	"	50.0		102	70-130			
Styrene	51.7	1.0	"	50.0		103	70-130			
Tert-amyl methyl ether	44.9	1.0	"	50.0		89.7	70-130			
Tert-butyl alcohol	255	20	"	250		102	70-130			
tert-Butylbenzene	51.0	1.0	"	50.0		102	70-130			
Tetrachloroethene	51.0	1.0	"	50.0		102	70-130			
Toluene	47.6	1.0	"	50.0		95.1	70-130			
trans-1,2-Dichloroethene	52.2	1.0	"	50.0		104	70-130			
trans-1,3-Dichloropropene	42.8	1.0	"	50.0		85.7	70-130			

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1907384 - EPA 5030 Water MS										
LCS (1907384-BS1)				Prepared: 07/29/19 Analyzed: 07/31/19						
Trichloroethene	58.6	1.0	ug/l	50.0		117	70-130			
Trichlorofluoromethane	46.8	1.0	"	50.0		93.7	70-130			
Vinyl chloride	50.2	1.0	"	50.0		100	70-130			
1,1,1,2-Tetrachloroethane	51.3	1.0	"	50.0		103	70-130			
1,1,1-Trichloroethane	48.8	1.0	"	50.0		97.5	70-130			
1,1,2,2-Tetrachloroethane	43.3	1.0	"	50.0		86.6	70-130			
1,1,2-Trichloroethane	41.9	1.0	"	50.0		83.7	70-130			
1,1-Dichloroethane	50.6	1.0	"	50.0		101	70-130			
1,1-Dichloroethene	46.8	1.0	"	50.0		93.7	70-130			
1,1-Dichloropropene	48.6	1.0	"	50.0		97.2	70-130			
1,2,3-Trichlorobenzene	47.0	1.0	"	50.0		93.9	70-130			
1,2,3-Trichloropropane	44.2	1.0	"	50.0		88.4	70-130			
1,2,4-Trichlorobenzene	45.9	1.0	"	50.0		91.8	70-130			
1,2,4-Trimethylbenzene	50.7	1.0	"	50.0		101	70-130			
1,2-Dibromo-3-chloropropane	53.0	1.0	"	50.0		106	70-130			
1,2-Dibromoethane (EDB)	44.4	1.0	"	50.0		88.7	70-130			
1,2-Dichlorobenzene	48.2	1.0	"	50.0		96.5	70-130			
1,2-Dichloroethane (EDC)	42.0	1.0	"	50.0		84.1	70-130			
1,2-Dichloropropane	45.6	1.0	"	50.0		91.2	70-130			
1,3,5-Trimethylbenzene	52.2	1.0	"	50.0		104	70-130			
1,3-Dichlorobenzene	48.4	1.0	"	50.0		96.7	70-130			
1,3-Dichloropropane	43.4	1.0	"	50.0		86.8	70-130			
1,4-Dichlorobenzene	49.9	1.0	"	50.0		99.9	70-130			
2,2-Dichloropropane	44.9	1.0	"	50.0		89.9	70-130			
2-Chlorotoluene	51.1	1.0	"	50.0		102	70-130			
4-Chlorotoluene	50.8	1.0	"	50.0		102	70-130			
Surrogate: 1,2-Dichloroethane-d4	*12.0*		*"*	*13.3*		*90.3*	*23-173*			
Surrogate: Toluene-d8	*12.6*		*"*	*13.3*		*94.9*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*14.0*		*"*	*13.3*		*105*	*21-167*			

S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1907384 - EPA 5030 Water MS										
Matrix Spike (1907384-MS1)	**Source: 1907328-01**			Prepared: 07/29/19 Analyzed: 07/31/19						
Benzene	53.6	1.0	ug/l	50.0	ND	107	70-130			
Bromobenzene	49.0	1.0	"	50.0	ND	98.0	70-130			
Bromochloromethane	44.8	5.0	"	50.0	ND	89.6	70-130			
Bromodichloromethane	51.5	2.0	"	50.0	ND	103	70-130			
Bromoform	49.0	1.0	"	50.0	ND	98.0	70-130			
Bromomethane	48.2	1.0	"	50.0	ND	96.3	70-130			
Carbon tetrachloride	49.2	1.0	"	50.0	ND	98.3	70-130			
Chlorobenzene	53.4	1.0	"	50.0	ND	107	70-130			
Chlorodibromomethane	46.5	1.0	"	50.0	ND	93.0	70-130			
Chloroethane	54.6	1.0	"	50.0	ND	109	70-130			
Chloroform	50.0	3.0	"	50.0	ND	100	70-130			
Chloromethane	52.0	1.0	"	50.0	ND	104	70-130			
cis-1,2-Dichloroethene	49.2	1.0	"	50.0	ND	98.3	70-130			
cis-1,3-Dichloropropene	49.0	1.0	"	50.0	ND	98.0	70-130			
Dibromomethane	40.0	1.0	"	50.0	ND	80.1	70-130			
Dichlorodifluoromethane	50.1	1.0	"	50.0	ND	100	70-130			
Di-isopropyl ether	45.9	5.0	"	50.0	ND	91.9	70-130			
Ethyl tert-butyl ether	46.7	10	"	50.0	ND	93.4	70-130			
Ethylbenzene	55.3	1.0	"	50.0	ND	111	70-130			
Hexachlorobutadiene	45.0	1.0	"	50.0	ND	90.0	70-130			
m,p-Xylene	104	2.0	"	100	ND	104	70-130			
Methyl tert-butyl ether	46.6	5.0	"		ND		70-130			
Isopropylbenzene	53.3	1.0	"	50.0	ND	107	70-130			
Methylene Chloride	50.5	5.0	"	50.0	ND	101	70-130			
Naphthalene	45.7	1.0	"	50.0	ND	91.4	70-130			
n-Butylbenzene	39.1	1.0	"	50.0	ND	78.1	70-130			
n-Propylbenzene	51.2	1.0	"	50.0	ND	102	70-130			
o-Xylene	53.8	1.0	"	50.0	ND	108	70-130			
p-Isopropyltoluene	53.5	1.0	"	50.0	ND	107	70-130			
sec-Butylbenzene	48.6	1.0	"	50.0	ND	97.2	70-130			
Styrene	52.2	1.0	"	50.0	ND	104	70-130			
Tert-amyl methyl ether	45.6	1.0	"	50.0	ND	91.2	70-130			
Tert-butyl alcohol	269	20	"	250	ND	108	70-130			
tert-Butylbenzene	53.2	1.0	"	50.0	ND	106	70-130			
Tetrachloroethene	51.8	1.0	"	50.0	ND	104	70-130			
Toluene	52.9	1.0	"	50.0	ND	106	70-130			
trans-1,2-Dichloroethene	53.5	1.0	"	50.0	ND	107	70-130			
trans-1,3-Dichloropropene	45.8	1.0	"	50.0	ND	91.7	70-130			

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1907384 - EPA 5030 Water MS										
Matrix Spike (1907384-MS1)	**Source: 1907328-01**			Prepared: 07/29/19 Analyzed: 07/31/19						
Trichloroethene	56.8	1.0	ug/l	50.0	ND	114	70-130			
Trichlorofluoromethane	47.7	1.0	"	50.0	ND	95.4	70-130			
Vinyl chloride	48.8	1.0	"	50.0	ND	97.6	70-130			
1,1,1,2-Tetrachloroethane	51.0	1.0	"	50.0	ND	102	70-130			
1,1,1-Trichloroethane	50.8	1.0	"	50.0	ND	102	70-130			
1,1,2,2-Tetrachloroethane	43.4	1.0	"	50.0	ND	86.8	70-130			
1,1,2-Trichloroethane	47.6	1.0	"	50.0	ND	95.2	70-130			
1,1-Dichloroethane	52.4	1.0	"	50.0	ND	105	70-130			
1,1-Dichloroethene	48.6	1.0	"	50.0	ND	97.2	70-130			
1,1-Dichloropropene	53.1	1.0	"	50.0	ND	106	70-130			
1,2,3-Trichlorobenzene	52.8	1.0	"	50.0	ND	106	70-130			
1,2,3-Trichloropropane	44.6	1.0	"	50.0	ND	89.2	70-130			
1,2,4-Trichlorobenzene	47.3	1.0	"	50.0	ND	94.7	70-130			
1,2,4-Trimethylbenzene	52.6	1.0	"	50.0	ND	105	70-130			
1,2-Dibromo-3-chloropropane	52.1	1.0	"	50.0	ND	104	70-130			
1,2-Dibromoethane (EDB)	41.6	1.0	"	50.0	ND	83.2	70-130			
1,2-Dichlorobenzene	51.9	1.0	"	50.0	ND	104	70-130			
1,2-Dichloroethane (EDC)	49.7	1.0	"	50.0	ND	99.4	70-130			
1,2-Dichloropropane	48.5	1.0	"	50.0	ND	97.0	70-130			
1,3,5-Trimethylbenzene	55.1	1.0	"	50.0	ND	110	70-130			
1,3-Dichlorobenzene	52.5	1.0	"	50.0	ND	105	70-130			
1,3-Dichloropropane	46.1	1.0	"	50.0	ND	92.2	70-130			
1,4-Dichlorobenzene	52.3	1.0	"	50.0	ND	105	70-130			
2,2-Dichloropropane	43.8	1.0	"	50.0	ND	87.5	70-130			
2-Chlorotoluene	53.6	1.0	"	50.0	ND	107	70-130			
4-Chlorotoluene	54.7	1.0	"	50.0	ND	109	70-130			
Surrogate: 1,2-Dichloroethane-d4	*15.3*		*"*	*13.3*		*115*	*23-173*			
Surrogate: Toluene-d8	*14.0*		*"*	*13.3*		*105*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*13.2*		*"*	*13.3*		*99.0*	*21-167*			

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1907384 - EPA 5030 Water MS										
Matrix Spike Dup (1907384-MSD1)	**Source: 1907328-01**			Prepared: 07/29/19 Analyzed: 07/31/19						
Benzene	49.7	1.0	ug/l	50.0	ND	99.4	70-130	7.53	30	
Bromobenzene	53.4	1.0	"	50.0	ND	107	70-130	8.61	30	
Bromochloromethane	52.8	5.0	"	50.0	ND	106	70-130	16.4	30	
Bromodichloromethane	50.9	2.0	"	50.0	ND	102	70-130	1.23	30	
Bromoform	55.7	1.0	"	50.0	ND	111	70-130	12.8	30	
Bromomethane	48.0	1.0	"	50.0	ND	96.1	70-130	0.249	30	
Carbon tetrachloride	47.5	1.0	"	50.0	ND	94.9	70-130	3.50	30	
Chlorobenzene	51.6	1.0	"	50.0	ND	103	70-130	3.39	30	
Chlorodibromomethane	54.5	1.0	"	50.0	ND	109	70-130	15.9	30	
Chloroethane	48.5	1.0	"	50.0	ND	97.1	70-130	11.8	30	
Chloroform	51.4	3.0	"	50.0	ND	103	70-130	2.84	30	
Chloromethane	45.5	1.0	"	50.0	ND	91.0	70-130	13.4	30	
cis-1,2-Dichloroethene	49.0	1.0	"	50.0	ND	98.0	70-130	0.387	30	
cis-1,3-Dichloropropene	49.9	1.0	"	50.0	ND	99.8	70-130	1.78	30	
Dibromomethane	48.4	1.0	"	50.0	ND	96.8	70-130	18.9	30	
Dichlorodifluoromethane	44.8	1.0	"	50.0	ND	89.6	70-130	11.1	30	
Di-isopropyl ether	50.6	5.0	"	50.0	ND	101	70-130	9.58	30	
Ethyl tert-butyl ether	50.4	10	"	50.0	ND	101	70-130	7.56	30	
Ethylbenzene	51.0	1.0	"	50.0	ND	102	70-130	7.98	30	
Hexachlorobutadiene	47.5	1.0	"	50.0	ND	95.1	70-130	5.49	30	
m,p-Xylene	99.1	2.0	"	100	ND	99.1	70-130	5.16	30	
Isopropylbenzene	49.6	1.0	"	50.0	ND	99.3	70-130	7.13	30	
Methyl tert-butyl ether	53.6	5.0	"		ND		70-130	14.0	30	
Methylene Chloride	47.8	5.0	"	50.0	ND	95.5	70-130	5.48	30	
Naphthalene	52.5	1.0	"	50.0	ND	105	70-130	13.8	30	
n-Butylbenzene	48.9	1.0	"	50.0	ND	97.8	70-130	22.3	30	
n-Propylbenzene	50.8	1.0	"	50.0	ND	102	70-130	0.902	30	
o-Xylene	50.1	1.0	"	50.0	ND	100	70-130	7.06	30	
p-Isopropyltoluene	50.7	1.0	"	50.0	ND	101	70-130	5.34	30	
sec-Butylbenzene	49.8	1.0	"	50.0	ND	99.6	70-130	2.42	30	
Styrene	51.4	1.0	"	50.0	ND	103	70-130	1.68	30	
Tert-amyl methyl ether	51.7	1.0	"	50.0	ND	103	70-130	12.5	30	
Tert-butyl alcohol	269	20	"	250	ND	107	70-130	0.0930	30	
tert-Butylbenzene	51.3	1.0	"	50.0	ND	103	70-130	3.63	30	
Tetrachloroethene	50.3	1.0	"	50.0	ND	101	70-130	2.96	30	
Toluene	51.6	1.0	"	50.0	ND	103	70-130	2.41	30	
trans-1,2-Dichloroethene	47.5	1.0	"	50.0	ND	95.0	70-130	11.8	30	
trans-1,3-Dichloropropene	51.7	1.0	"	50.0	ND	103	70-130	12.0	30	

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1907384 - EPA 5030 Water MS										
Matrix Spike Dup (1907384-MSD1)	**Source: 1907328-01**			Prepared: 07/29/19 Analyzed: 07/31/19						
Trichloroethene	48.4	1.0	ug/l	50.0	ND	96.8	70-130	15.9	30	
Trichlorofluoromethane	49.1	1.0	"	50.0	ND	98.1	70-130	2.87	30	
Vinyl chloride	47.0	1.0	"	50.0	ND	94.0	70-130	3.80	30	
1,1,1,2-Tetrachloroethane	52.7	1.0	"	50.0	ND	105	70-130	3.30	30	
1,1,1-Trichloroethane	45.8	1.0	"	50.0	ND	91.6	70-130	10.4	30	
1,1,2,2-Tetrachloroethane	54.5	1.0	"	50.0	ND	109	70-130	22.8	30	
1,1,2-Trichloroethane	49.0	1.0	"	50.0	ND	98.1	70-130	2.92	30	
1,1-Dichloroethane	49.1	1.0	"	50.0	ND	98.1	70-130	6.68	30	
1,1-Dichloroethene	47.3	1.0	"	50.0	ND	94.7	70-130	2.61	30	
1,1-Dichloropropene	49.4	1.0	"	50.0	ND	98.9	70-130	7.08	30	
1,2,3-Trichlorobenzene	52.5	1.0	"	50.0	ND	105	70-130	0.665	30	
1,2,3-Trichloropropane	55.1	1.0	"	50.0	ND	110	70-130	20.9	30	
1,2,4-Trichlorobenzene	48.2	1.0	"	50.0	ND	96.5	70-130	1.93	30	
1,2,4-Trimethylbenzene	50.8	1.0	"	50.0	ND	102	70-130	3.52	30	
1,2-Dibromo-3-chloropropane	41.4	1.0	"	50.0	ND	82.7	70-130	23.0	30	
1,2-Dibromoethane (EDB)	55.3	1.0	"	50.0	ND	111	70-130	28.2	30	
1,2-Dichlorobenzene	52.7	1.0	"	50.0	ND	105	70-130	1.57	30	
1,2-Dichloroethane (EDC)	52.5	1.0	"	50.0	ND	105	70-130	5.42	30	
1,2-Dichloropropane	51.6	1.0	"	50.0	ND	103	70-130	6.19	30	
1,3,5-Trimethylbenzene	50.7	1.0	"	50.0	ND	101	70-130	8.37	30	
1,3-Dichlorobenzene	53.4	1.0	"	50.0	ND	107	70-130	1.66	30	
1,3-Dichloropropane	53.7	1.0	"	50.0	ND	107	70-130	15.2	30	
1,4-Dichlorobenzene	52.0	1.0	"	50.0	ND	104	70-130	0.671	30	
2,2-Dichloropropane	47.8	1.0	"	50.0	ND	95.6	70-130	8.80	30	
2-Chlorotoluene	51.1	1.0	"	50.0	ND	102	70-130	4.83	30	
4-Chlorotoluene	53.0	1.0	"	50.0	ND	106	70-130	3.12	30	
Surrogate: 1,2-Dichloroethane-d4	*15.1*		*"*	*13.3*		*113*	*23-173*			
Surrogate: Toluene-d8	*13.4*		*"*	*13.3*		*101*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*13.6*		*"*	*13.3*		*102*	*21-167*			

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S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908001 - EPA 5030 Soil MS										
Blank (1908001-BLK1)				Prepared: 08/01/19 Analyzed: 08/02/19						
Benzene	ND	2.0	ug/kg							
Bromobenzene	ND	5.0	"							
Bromochloromethane	ND	5.0	"							
Bromodichloromethane	ND	5.0	"							
Bromoform	ND	5.0	"							
Bromomethane	ND	10	"							
Carbon tetrachloride	ND	5.0	"							
Chlorobenzene	ND	5.0	"							
Chlorodibromomethane	ND	10	"							
Chloroethane	ND	5.0	"							
Chloroform	ND	5.0	"							
Chloromethane	ND	15	"							
cis-1,2-Dichloroethene	ND	5.0	"							
cis-1,3-Dichloropropene	ND	5.0	"							
Dibromomethane	ND	5.0	"							
Dichlorodifluoromethane	ND	5.0	"							
Di-isopropyl ether	ND	5.0	"							
Ethyl tert-butyl ether	ND	10	"							
Ethylbenzene	ND	5.0	"							
Hexachlorobutadiene	ND	5.0	"							
Isopropylbenzene	ND	5.0	"							
m,p-Xylene	ND	10	"							
Methyl tert-butyl ether	ND	15	"							
Methyl ethyl ketone	ND	10	"							
Naphthalene	ND	10	"							
n-Butylbenzene	ND	5.0	"							
Methylene Chloride	ND	15	"							
n-Propylbenzene	ND	5.0	"							
o-Xylene	ND	5.0	"							
p-Isopropyltoluene	ND	10	"							
sec-Butylbenzene	ND	5.0	"							
Styrene	ND	10	"							
Tert-amyl methyl ether	ND	5.0	"							
Tert-butyl alcohol	ND	20	"							
tert-Butylbenzene	ND	5.0	"							
Tetrachloroethene	ND	5.0	"							
Toluene	ND	5.0	"							
trans-1,2-Dichloroethene	ND	5.0	"							

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

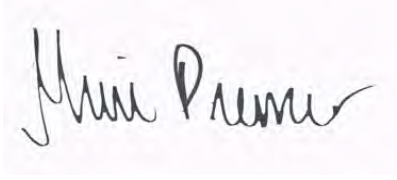
S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908001 - EPA 5030 Soil MS										
Blank (1908001-BLK1)				Prepared: 08/01/19 Analyzed: 08/02/19						
trans-1,3-Dichloropropene	ND	5.0	ug/kg							
Trichloroethene	ND	5.0	"							
Trichlorofluoromethane	ND	5.0	"							
Vinyl chloride	ND	5.0	"							
1,1,1,2-Tetrachloroethane	ND	5.0	"							
1,1,1-Trichloroethane	ND	5.0	"							
1,1,2,2-Tetrachloroethane	ND	5.0	"							
1,1,2-Trichloroethane	ND	5.0	"							
1,1-Dichloroethane	ND	5.0	"							
1,1-Dichloroethene	ND	5.0	"							
1,1-Dichloropropene	ND	5.0	"							
1,2,3-Trichlorobenzene	ND	5.0	"							
1,2,3-Trichloropropane	ND	10	"							
1,2,4-Trichlorobenzene	ND	5.0	"							
1,2,4-Trimethylbenzene	ND	5.0	"							
1,2-Dibromo-3-chloropropane	ND	15	"							
1,2-Dibromoethane (EDB)	ND	5.0	"							
1,2-Dichlorobenzene	ND	5.0	"							
1,2-Dichloroethane (EDC)	ND	5.0	"							
1,2-Dichloropropane	ND	5.0	"							
1,3,5-Trimethylbenzene	ND	5.0	"							
1,3-Dichlorobenzene	ND	5.0	"							
1,3-Dichloropropane	ND	5.0	"							
1,4-Dichlorobenzene	ND	5.0	"							
2,2-Dichloropropane	ND	10	"							
2-Chlorotoluene	ND	5.0	"							
4-Chlorotoluene	ND	5.0	"							
Surrogate: 1,2-Dichloroethane-d4	*36.4*		"	*40.0*		*91.0*	*23-173*			
Surrogate: Toluene-d8	*38.6*		"	*40.0*		*96.4*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*42.5*		"	*40.0*		*106*	*21-167*			



S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908001 - EPA 5030 Soil MS										
LCS (1908001-BS1)				Prepared: 08/01/19 Analyzed: 08/02/19						
Benzene	130	2.0	ug/kg	150		86.9	70-130			
Bromobenzene	141	5.0	"	150		93.9	70-130			
Bromochloromethane	138	5.0	"	150		92.2	70-130			
Bromodichloromethane	136	5.0	"	150		90.7	70-130			
Bromoform	145	5.0	"	150		96.5	70-130			
Bromomethane	159	10	"	150		106	70-130			
Carbon tetrachloride	108	5.0	"	150		71.9	70-130			
Chlorobenzene	138	5.0	"	150		91.9	70-130			
Chlorodibromomethane	143	10	"	150		95.6	70-130			
Chloroethane	118	5.0	"	150		78.8	70-130			
Chloroform	130	5.0	"	150		86.8	70-130			
Chloromethane	130	15	"	150		86.6	70-130			
cis-1,2-Dichloroethene	134	5.0	"	150		89.1	70-130			
cis-1,3-Dichloropropene	135	5.0	"	150		89.9	70-130			
Dibromomethane	141	5.0	"	150		94.1	70-130			
Dichlorodifluoromethane	125	5.0	"	150		83.4	70-130			
Di-isopropyl ether	172	5.0	"	150		115	70-130			
Ethyl tert-butyl ether	135	10	"	150		90.3	70-130			
Ethylbenzene	128	5.0	"	150		85.6	70-130			
Hexachlorobutadiene	115	5.0	"	150		76.9	70-130			
Isopropylbenzene	124	5.0	"	150		82.9	70-130			
m,p-Xylene	257	10	"	300		85.7	70-130			
Methyl tert-butyl ether	139	15	"				70-130			
Methyl ethyl ketone	ND	10	"				70-130			
Naphthalene	147	10	"	150		97.8	70-130			
n-Butylbenzene	113	5.0	"	150		75.3	70-130			
Methylene Chloride	138	15	"	150		92.0	70-130			
n-Propylbenzene	122	5.0	"	150		81.7	70-130			
o-Xylene	136	5.0	"	150		90.4	70-130			
p-Isopropyltoluene	120	10	"	150		80.2	70-130			
sec-Butylbenzene	119	5.0	"	150		79.6	70-130			
Styrene	140	10	"	150		93.3	70-130			
Tert-amyl methyl ether	139	5.0	"	150		92.6	70-130			
Tert-butyl alcohol	795	20	"	750		106	70-130			
tert-Butylbenzene	125	5.0	"	150		83.1	70-130			
Tetrachloroethene	119	5.0	"	150		79.3	70-130			
Toluene	127	5.0	"	150		84.9	70-130			
trans-1,2-Dichloroethene	120	5.0	"	150		80.2	70-130			

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908001 - EPA 5030 Soil MS										
LCS (1908001-BS1)				Prepared: 08/01/19 Analyzed: 08/02/19						
trans-1,3-Dichloropropene	135	5.0	ug/kg	150		89.9	70-130			
Trichloroethene	125	5.0	"	150		83.4	70-130			
Trichlorofluoromethane	134	5.0	"	150		89.6	70-130			
Vinyl chloride	113	5.0	"	150		75.1	70-130			
1,1,1,2-Tetrachloroethane	139	5.0	"	150		92.8	70-130			
1,1,1-Trichloroethane	110	5.0	"	150		73.2	70-130			
1,1,2,2-Tetrachloroethane	139	5.0	"	150		93.0	70-130			
1,1,2-Trichloroethane	139	5.0	"	150		92.8	70-130			
1,1-Dichloroethane	127	5.0	"	150		84.7	70-130			
1,1-Dichloroethene	112	5.0	"	150		75.0	70-130			
1,1-Dichloropropene	110	5.0	"	150		73.4	70-130			
1,2,3-Trichlorobenzene	139	5.0	"	150		92.5	70-130			
1,2,3-Trichloropropane	149	10	"	150		99.1	70-130			
1,2,4-Trichlorobenzene	129	5.0	"	150		86.1	70-130			
1,2,4-Trimethylbenzene	127	5.0	"	150		84.8	70-130			
1,2-Dibromo-3-chloropropane	147	15	"	150		98.2	70-130			
1,2-Dibromoethane (EDB)	146	5.0	"	150		97.6	70-130			
1,2-Dichlorobenzene	141	5.0	"	150		94.3	70-130			
1,2-Dichloroethane (EDC)	138	5.0	"	150		92.1	70-130			
1,2-Dichloropropane	135	5.0	"	150		89.8	70-130			
1,3,5-Trimethylbenzene	125	5.0	"	150		83.1	70-130			
1,3-Dichlorobenzene	136	5.0	"	150		90.6	70-130			
1,3-Dichloropropane	145	5.0	"	150		97.0	70-130			
1,4-Dichlorobenzene	135	5.0	"	150		89.8	70-130			
2,2-Dichloropropane	131	10	"	150		87.5	70-130			
2-Chlorotoluene	133	5.0	"	150		88.8	70-130			
4-Chlorotoluene	133	5.0	"	150		88.8	70-130			
Surrogate: 1,2-Dichloroethane-d4	*37.7*		*"*	*40.0*		*94.4*	*23-173*			
Surrogate: Toluene-d8	*39.6*		*"*	*40.0*		*98.9*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*40.0*		*"*	*40.0*		*100*	*21-167*			

Summit Scientific

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S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908001 - EPA 5030 Soil MS										
Matrix Spike (1908001-MS1)	**Source: 1907328-05**			Prepared: 08/01/19 Analyzed: 08/02/19						
Benzene	125	2.0	ug/kg	150	ND	83.1	70-130			
Bromobenzene	130	5.0	"	150	ND	86.8	70-130			
Bromochloromethane	136	5.0	"	150	ND	90.8	70-130			
Bromodichloromethane	131	5.0	"	150	ND	87.1	70-130			
Bromoform	133	5.0	"	150	ND	88.6	70-130			
Bromomethane	157	10	"	150	ND	105	70-130			
Carbon tetrachloride	111	5.0	"	150	ND	73.9	70-130			
Chlorobenzene	128	5.0	"	150	ND	85.5	70-130			
Chlorodibromomethane	135	10	"	150	ND	89.9	70-130			
Chloroethane	122	5.0	"	150	ND	81.1	70-130			
Chloroform	126	5.0	"	150	ND	84.0	70-130			
Chloromethane	146	15	"	150	ND	97.1	70-130			
cis-1,2-Dichloroethene	131	5.0	"	150	ND	87.1	70-130			
cis-1,3-Dichloropropene	128	5.0	"	150	ND	85.5	70-130			
Dibromomethane	134	5.0	"	150	ND	89.2	70-130			
Dichlorodifluoromethane	139	5.0	"	150	ND	92.5	70-130			
Di-isopropyl ether	172	5.0	"	150	ND	115	70-130			
Ethyl tert-butyl ether	133	10	"	150	ND	88.8	70-130			
Ethylbenzene	121	5.0	"	150	ND	80.9	70-130			
Hexachlorobutadiene	127	5.0	"	150	ND	84.5	70-130			
Isopropylbenzene	119	5.0	"	150	ND	79.4	70-130			
m,p-Xylene	246	10	"	300	ND	81.9	70-130			
Methyl tert-butyl ether	137	15	"		ND		70-130			
Methyl ethyl ketone	ND	10	"		ND		70-130			
Naphthalene	133	10	"	150	ND	88.8	70-130			
n-Butylbenzene	107	5.0	"	150	ND	71.1	70-130			
n-Propylbenzene	117	5.0	"	150	ND	77.8	70-130			
Methylene Chloride	138	15	"	150	ND	92.0	70-130			
o-Xylene	126	5.0	"	150	ND	84.1	70-130			
p-Isopropyltoluene	113	10	"	150	ND	75.5	70-130			
sec-Butylbenzene	113	5.0	"	150	ND	75.3	70-130			
Styrene	129	10	"	150	ND	86.2	70-130			
Tert-amyl methyl ether	137	5.0	"	150	ND	91.5	70-130			
Tert-butyl alcohol	895	20	"	750	ND	119	70-130			
tert-Butylbenzene	117	5.0	"	150	ND	78.1	70-130			
Tetrachloroethene	116	5.0	"	150	ND	77.1	70-130			
Toluene	124	5.0	"	150	ND	82.5	70-130			
trans-1,2-Dichloroethene	121	5.0	"	150	ND	80.5	70-130			

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908001 - EPA 5030 Soil MS										
Matrix Spike (1908001-MS1)	**Source: 1907328-05**			Prepared: 08/01/19 Analyzed: 08/02/19						
trans-1,3-Dichloropropene	128	5.0	ug/kg	150	ND	85.5	70-130			
Trichloroethene	124	5.0	"	150	ND	82.8	70-130			
Trichlorofluoromethane	111	5.0	"	150	ND	74.3	70-130			
Vinyl chloride	116	5.0	"	150	ND	77.4	70-130			
1,1,1,2-Tetrachloroethane	131	5.0	"	150	ND	87.5	70-130			
1,1,1-Trichloroethane	113	5.0	"	150	ND	75.3	70-130			
1,1,2,2-Tetrachloroethane	128	5.0	"	150	ND	85.3	70-130			
1,1,2-Trichloroethane	130	5.0	"	150	ND	87.0	70-130			
1,1-Dichloroethane	126	5.0	"	150	ND	84.2	70-130			
1,1-Dichloroethene	118	5.0	"	150	ND	78.5	70-130			
1,1-Dichloropropene	112	5.0	"	150	ND	74.7	70-130			
1,2,3-Trichlorobenzene	119	5.0	"	150	ND	79.4	70-130			
1,2,3-Trichloropropane	137	10	"	150	ND	91.4	70-130			
1,2,4-Trichlorobenzene	115	5.0	"	150	ND	76.5	70-130			
1,2,4-Trimethylbenzene	120	5.0	"	150	ND	79.9	70-130			
1,2-Dibromo-3-chloropropane	136	15	"	150	ND	90.6	70-130			
1,2-Dibromoethane (EDB)	134	5.0	"	150	ND	89.6	70-130			
1,2-Dichlorobenzene	130	5.0	"	150	ND	86.5	70-130			
1,2-Dichloroethane (EDC)	131	5.0	"	150	ND	87.4	70-130			
1,2-Dichloropropane	128	5.0	"	150	ND	85.3	70-130			
1,3,5-Trimethylbenzene	120	5.0	"	150	ND	79.7	70-130			
1,3-Dichlorobenzene	125	5.0	"	150	ND	83.2	70-130			
1,3-Dichloropropane	134	5.0	"	150	ND	89.3	70-130			
1,4-Dichlorobenzene	124	5.0	"	150	ND	82.9	70-130			
2,2-Dichloropropane	128	10	"	150	ND	85.4	70-130			
2-Chlorotoluene	124	5.0	"	150	ND	82.9	70-130			
4-Chlorotoluene	125	5.0	"	150	ND	83.3	70-130			
Surrogate: 1,2-Dichloroethane-d4	*38.9*		*"*	*40.0*		*97.2*	*23-173*			
Surrogate: Toluene-d8	*40.5*		*"*	*40.0*		*101*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*40.0*		*"*	*40.0*		*100*	*21-167*			

S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908001 - EPA 5030 Soil MS										
Matrix Spike Dup (1908001-MSD1)	**Source: 1907328-05**			Prepared: 08/01/19 Analyzed: 08/02/19						
Benzene	127	2.0	ug/kg	150	ND	84.4	70-130	1.53	30	
Bromobenzene	130	5.0	"	150	ND	86.7	70-130	0.138	30	
Bromochloromethane	134	5.0	"	150	ND	89.6	70-130	1.29	30	
Bromodichloromethane	132	5.0	"	150	ND	88.1	70-130	1.16	30	
Bromoform	132	5.0	"	150	ND	88.0	70-130	0.679	30	
Bromomethane	138	10	"	150	ND	92.0	70-130	13.1	30	
Carbon tetrachloride	113	5.0	"	150	ND	75.4	70-130	2.04	30	
Chlorobenzene	127	5.0	"	150	ND	84.9	70-130	0.705	30	
Chlorodibromomethane	133	10	"	150	ND	89.0	70-130	1.03	30	
Chloroethane	119	5.0	"	150	ND	79.2	70-130	2.37	30	
Chloroform	127	5.0	"	150	ND	84.4	70-130	0.404	30	
Chloromethane	144	15	"	150	ND	96.0	70-130	1.12	30	
cis-1,2-Dichloroethene	129	5.0	"	150	ND	85.9	70-130	1.32	30	
cis-1,3-Dichloropropene	129	5.0	"	150	ND	86.1	70-130	0.723	30	
Dibromomethane	135	5.0	"	150	ND	90.3	70-130	1.23	30	
Dichlorodifluoromethane	154	5.0	"	150	ND	103	70-130	10.4	30	
Di-isopropyl ether	141	5.0	"	150	ND	94.0	70-130	19.9	30	
Ethyl tert-butyl ether	134	10	"	150	ND	89.0	70-130	0.202	30	
Ethylbenzene	121	5.0	"	150	ND	80.4	70-130	0.595	30	
Hexachlorobutadiene	122	5.0	"	150	ND	81.2	70-130	3.96	30	
Isopropylbenzene	117	5.0	"	150	ND	78.3	70-130	1.47	30	
m,p-Xylene	242	10	"	300	ND	80.6	70-130	1.65	30	
Methyl tert-butyl ether	137	15	"		ND		70-130	0.131	30	
Methyl ethyl ketone	ND	10	"		ND		70-130		30	
Naphthalene	129	10	"	150	ND	86.3	70-130	2.86	30	
n-Butylbenzene	133	5.0	"	150	ND	88.8	70-130	22.1	30	
Methylene Chloride	144	15	"	150	ND	96.0	70-130	4.26	30	
n-Propylbenzene	115	5.0	"	150	ND	76.7	70-130	1.45	30	
o-Xylene	125	5.0	"	150	ND	83.4	70-130	0.835	30	
p-Isopropyltoluene	111	10	"	150	ND	74.2	70-130	1.76	30	
sec-Butylbenzene	111	5.0	"	150	ND	74.2	70-130	1.50	30	
Styrene	127	10	"	150	ND	84.5	70-130	2.04	30	
Tert-amyl methyl ether	136	5.0	"	150	ND	90.8	70-130	0.724	30	
Tert-butyl alcohol	815	20	"	750	ND	109	70-130	9.41	30	
tert-Butylbenzene	116	5.0	"	150	ND	77.4	70-130	0.874	30	
Tetrachloroethene	114	5.0	"	150	ND	75.8	70-130	1.62	30	
Toluene	124	5.0	"	150	ND	82.6	70-130	0.0485	30	
trans-1,2-Dichloroethene	117	5.0	"	150	ND	78.0	70-130	3.20	30	

Summit Scientific

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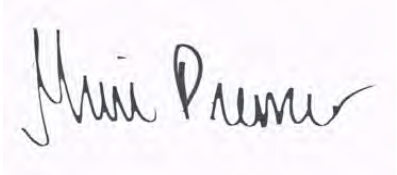
Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908001 - EPA 5030 Soil MS										
Matrix Spike Dup (1908001-MSD1)	**Source: 1907328-05**			Prepared: 08/01/19 Analyzed: 08/02/19						
trans-1,3-Dichloropropene	129	5.0	ug/kg	150	ND	86.1	70-130	0.723	30	
Trichloroethene	125	5.0	"	150	ND	83.3	70-130	0.698	30	
Trichlorofluoromethane	110	5.0	"	150	ND	73.4	70-130	1.16	30	
Vinyl chloride	115	5.0	"	150	ND	77.0	70-130	0.622	30	
1,1,1,2-Tetrachloroethane	129	5.0	"	150	ND	86.0	70-130	1.66	30	
1,1,1-Trichloroethane	115	5.0	"	150	ND	76.5	70-130	1.48	30	
1,1,2,2-Tetrachloroethane	127	5.0	"	150	ND	84.9	70-130	0.493	30	
1,1,2-Trichloroethane	131	5.0	"	150	ND	87.7	70-130	0.756	30	
1,1-Dichloroethane	124	5.0	"	150	ND	82.5	70-130	1.99	30	
1,1-Dichloroethene	116	5.0	"	150	ND	77.1	70-130	1.83	30	
1,1-Dichloropropene	112	5.0	"	150	ND	75.0	70-130	0.428	30	
1,2,3-Trichlorobenzene	114	5.0	"	150	ND	76.0	70-130	4.43	30	
1,2,3-Trichloropropane	137	10	"	150	ND	91.1	70-130	0.329	30	
1,2,4-Trichlorobenzene	106	5.0	"	150	ND	70.9	70-130	7.63	30	
1,2,4-Trimethylbenzene	119	5.0	"	150	ND	79.2	70-130	0.805	30	
1,2-Dibromo-3-chloropropane	136	15	"	150	ND	90.8	70-130	0.132	30	
1,2-Dibromoethane (EDB)	134	5.0	"	150	ND	89.5	70-130	0.0893	30	
1,2-Dichlorobenzene	126	5.0	"	150	ND	83.9	70-130	3.00	30	
1,2-Dichloroethane (EDC)	132	5.0	"	150	ND	88.0	70-130	0.661	30	
1,2-Dichloropropane	131	5.0	"	150	ND	87.4	70-130	2.41	30	
1,3,5-Trimethylbenzene	118	5.0	"	150	ND	78.7	70-130	1.26	30	
1,3-Dichlorobenzene	122	5.0	"	150	ND	81.2	70-130	2.46	30	
1,3-Dichloropropane	134	5.0	"	150	ND	89.2	70-130	0.134	30	
1,4-Dichlorobenzene	120	5.0	"	150	ND	80.3	70-130	3.19	30	
2,2-Dichloropropane	126	10	"	150	ND	83.9	70-130	1.82	30	
2-Chlorotoluene	123	5.0	"	150	ND	82.3	70-130	0.775	30	
4-Chlorotoluene	123	5.0	"	150	ND	81.9	70-130	1.77	30	
Surrogate: 1,2-Dichloroethane-d4	*39.1*		*"*	*40.0*		*97.8*	*23-173*			
Surrogate: Toluene-d8	*40.6*		*"*	*40.0*		*101*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*40.0*		*"*	*40.0*		*99.9*	*21-167*			



S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Dissolved Gases by RSK-175 - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908011 - * DEFAULT PREP *** **										
Blank (1908011-BLK1)				Prepared: 08/01/19 Analyzed: 08/05/19						
Ethene	ND	0.010	mg/L							
Ethane	ND	0.010	"							
Surrogate: Propane	*0.178*		*"*	*0.222*		*79.9*	*70-130*			
LCS (1908011-BS1)				Prepared: 08/01/19 Analyzed: 08/05/19						
Ethene	0.073	0.010	mg/L	0.0728		100	70-130			
Ethane	0.079	0.010	"	0.0798		99.2	70-130			
Surrogate: Propane	*0.120*		*"*	*0.139*		*86.2*	*70-130*			
Duplicate (1908011-DUP1)		**Source: 1907328-01**		Prepared: 08/01/19 Analyzed: 08/05/19						
Ethene	ND	0.010	mg/L		ND				30	
Ethane	ND	0.010	"		ND				30	
Surrogate: Propane	*0.180*		*"*	*0.222*		*81.2*	*70-130*			
Matrix Spike (1908011-MS1)		**Source: 1907328-01**		Prepared: 08/01/19 Analyzed: 08/05/19						
Ethene	0.084	0.010	mg/L	0.0728	ND	115	70-130			
Ethane	0.087	0.010	"	0.0798	ND	109	70-130			
Surrogate: Propane	*0.130*		*"*	*0.139*		*93.4*	*70-130*			

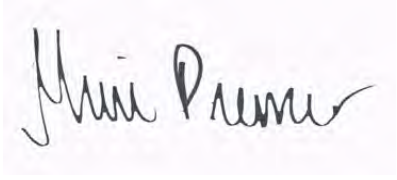
S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Total Metals by EPA Method 200.8 - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1907387 - EPA 200.8										
Blank (1907387-BLK1)				Prepared & Analyzed: 07/29/19						
Iron	ND	0.01000	mg/L							
Manganese	ND	0.00100	"							
LCS (1907387-BS1)				Prepared & Analyzed: 07/29/19						
Iron	4.962	0.01000	mg/L	5.00		99.2	85-115			
Manganese	0.468	0.00100	"	0.500		93.6	85-115			
Duplicate (1907387-DUP1)	**Source: 1907329-02**			Prepared & Analyzed: 07/29/19						
Iron	0.7203	0.01000	mg/L		0.7211			0.115	20	
Manganese	0.0988	0.00100	"		0.0980			0.849	20	
Matrix Spike (1907387-MS1)	**Source: 1907329-02**			Prepared & Analyzed: 07/29/19						
Iron	4.890	0.01000	mg/L	5.00	0.7211	83.4	70-130			
Manganese	0.589	0.00100	"	0.500	0.0980	98.2	70-130			
Matrix Spike Dup (1907387-MSD1)	**Source: 1907329-02**			Prepared & Analyzed: 07/29/19						
Iron	4.996	0.01000	mg/L	5.00	0.7211	85.5	70-130	2.15	25	
Manganese	0.600	0.00100	"	0.500	0.0980	100	70-130	1.80	25	



S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Ferrous Iron - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1907424 - General Preparation										
Blank (1907424-BLK1)				Prepared: 07/26/19 Analyzed: 07/31/19						
Ferrous Iron	ND	0.02000	mg/L							
LCS (1907424-BS1)				Prepared: 07/26/19 Analyzed: 07/31/19						
Ferrous Iron	1.09	0.02000	mg/L	1.00		109	80-120			
Duplicate (1907424-DUP1)		**Source: 1907328-01**		Prepared: 07/26/19 Analyzed: 07/31/19						
Ferrous Iron	ND	0.02000	mg/L		ND				200	
Matrix Spike (1907424-MS1)		**Source: 1907328-01**		Prepared: 07/26/19 Analyzed: 07/31/19						
Ferrous Iron	1.05	0.02000	mg/L	1.00	ND	105	75-125			
Matrix Spike Dup (1907424-MSD1)		**Source: 1907328-01**		Prepared: 07/26/19 Analyzed: 07/31/19						
Ferrous Iron	1.07	0.02000	mg/L	1.00	ND	107	75-125	1.89	20	

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

Anions by EPA Method 300.0 - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1907407 - General Preparation										
Blank (1907407-BLK1)				Prepared: 07/26/19 Analyzed: 07/30/19						
Nitrate as N	ND	0.0500	mg/L							
Chloride	ND	0.0600	"							
Sulfate	ND	0.300	"							
LCS (1907407-BS1)				Prepared & Analyzed: 07/26/19						
Sulfate	15.9	0.300	mg/L	15.0		106	90-110			
Chloride	3.23	0.0600	"	3.00		108	90-110			
Nitrate as N	3.27	0.0500	"	3.00		109	90-110			
Duplicate (1907407-DUP1)	**Source: 1907328-01**			Prepared & Analyzed: 07/26/19						
Nitrate as N	7.01	0.0500	mg/L		7.04			0.512	20	
Chloride	ND	0.0600	"		463				20	QM-02
Sulfate	ND	0.300	"		1740				20	QM-02
Matrix Spike (1907407-MS1)	**Source: 1907328-01**			Prepared & Analyzed: 07/26/19						
Sulfate	ND	0.300	mg/L	15.0	1740	NR	80-120			QM-02
Nitrate as N	9.78	0.0500	"	3.00	7.04	91.3	80-120			
Chloride	ND	0.0600	"	3.00	463	NR	80-120			QM-02

S2

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Alkalinity by SM2320 - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908009 - General Preparation										
Blank (1908009-BLK1)				Prepared: 08/01/19 Analyzed: 08/02/19						
Total Alkalinity	ND	10.0	mg/L as CaCO3							
Carbonate	ND	10.0	"							
Bicarbonate	ND	10.0	"							
Hydroxide Alkalinity	ND	10.0	"							
LCS (1908009-BS1)				Prepared: 08/01/19 Analyzed: 08/02/19						
Total Alkalinity	110	10.0	mg/L as CaCO3	100		110	80-120			
Duplicate (1908009-DUP1)		**Source: 1907328-01**		Prepared: 08/01/19 Analyzed: 08/02/19						
Total Alkalinity	390	10.0	mg/L as CaCO3		390			0.00	20	
Carbonate	ND	10.0	"		ND				20	
Bicarbonate	390	10.0	"		390			0.00	20	
Hydroxide Alkalinity	ND	10.0	"		ND				20	
Matrix Spike (1908009-MS1)		**Source: 1907328-01**		Prepared: 08/01/19 Analyzed: 08/02/19						
Total Alkalinity	480	10.0	mg/L as CaCO3	100	390	90.0	80-120			
Matrix Spike Dup (1908009-MSD1)		**Source: 1907328-01**		Prepared: 08/01/19 Analyzed: 08/02/19						
Total Alkalinity	480	10.0	mg/L as CaCO3	100	390	90.0	80-120	0.00	20	

S2

Ninyo & Moore	Project: NVRA - Feasibility Study	
6001 S Willow Dr #195	Project Number: 500557005	**Reported:**
Greenwood Village CO, 80111	Project Manager: Beth McDonald	08/06/19 12:18

pH by SM4500 - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1908028 - General Preparation										
LCS (1908028-BS1)				Prepared: 07/26/19 Analyzed: 07/28/19						
pH	9.41	1.00	pH Units	9.23		102	90-110			
Duplicate (1908028-DUP1)		**Source: 1907328-01**		Prepared: 07/26/19 Analyzed: 07/28/19						
pH	7.58	1.00	pH Units		7.54			0.529	20	

Colorado Analytical LABORATORIES, INC.

Analytical Results

TASK NO: 190726064

Report To: Paul Shrewsbury
Company: Summit Scientific
741 Corporate Circle, Suite J
Golden CO 80401

Bill To: Accounts Payable
Company: Summit Scientific
741 Corporate Circle, Suite J
Golden CO 80401

Task No.: 190726064
Client PO:
Client Project:

Date Received: 7/26/19
Date Reported: 7/31/19
Matrix: Water - Ground

Customer Sample ID UCUP-1-7-26-19
Sample Date/Time: 7/26/19 10:15 AM
Lab Number: 190726064-01

Test	Result	Method	ML	Date Analyzed	Analyzed By
Dissolved Organic Carbon	**8.6 mg/L**	SM 5310-C	0.5 mg/L	7/30/19	ISG

Abbreviations/ References:

ML = Minimum Level = LRL = RL
mg/L = Milligrams Per Liter or PPM
ug/L = Micrograms Per Liter or PPB
mpn/100 mls = Most Probable Number Index/ 100 mls
Date Analyzed = Date Test Completed

DATA APPROVED FOR RELEASE BY

Colorado Analytical LABORATORIES, INC.

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741 Corporate Circle, Suite J
Golden CO 80401

Bill To: Accounts Payable
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741 Corporate Circle, Suite J
Golden CO 80401

Task No.: 190726064
Client PO:
Client Project:

Date Received: 7/26/19
Date Reported: 7/31/19
Matrix: Water - Ground

Customer Sample ID UCUP-2-7-26-19
Sample Date/Time: 7/26/19 10:56 AM
Lab Number: 190726064-02

Test	Result	Method	ML	Date Analyzed	Analyzed By
Dissolved Organic Carbon	**6.1 mg/L**	SM 5310-C	0.5 mg/L	7/30/19	ISG

Abbreviations/ References:

ML = Minimum Level = LRL = RL
mg/L = Milligrams Per Liter or PPM
ug/L = Micrograms Per Liter or PPB
mpn/100 mls = Most Probable Number Index/ 100 mls
Date Analyzed = Date Test Completed

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Company: Summit Scientific
741 Corporate Circle, Suite J
Golden CO 80401

Bill To: Accounts Payable
Company: Summit Scientific
741 Corporate Circle, Suite J
Golden CO 80401

Task No.: 190726064
Client PO:
Client Project:

Date Received: 7/26/19
Date Reported: 7/31/19
Matrix: Water - Ground

Customer Sample ID UCUP-3-7-26-19
Sample Date/Time: 7/26/19 11:34 AM
Lab Number: 190726064-03

Test	Result	Method	ML	Date Analyzed	Analyzed By
Dissolved Organic Carbon	**4.6 mg/L**	SM 5310-C	0.5 mg/L	7/30/19	ISG

Abbreviations/ References:

ML = Minimum Level = LRL = RL
mg/L = Milligrams Per Liter or PPM
ug/L = Micrograms Per Liter or PPB
mpn/100 mls = Most Probable Number Index/ 100 mls
Date Analyzed = Date Test Completed

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Analytical Results

TASK NO: 190726064

Report To: Paul Shrewsbury
Company: Summit Scientific
741 Corporate Circle, Suite J
Golden CO 80401

Bill To: Accounts Payable
Company: Summit Scientific
741 Corporate Circle, Suite J
Golden CO 80401

Task No.: 190726064
Client PO:
Client Project:

Date Received: 7/26/19
Date Reported: 7/31/19
Matrix: Water - Ground

Customer Sample ID UCUP-4-7-26-19
Sample Date/Time: 7/26/19 12:11 PM
Lab Number: 190726064-04

Test	Result	Method	ML	Date Analyzed	Analyzed By
Dissolved Organic Carbon	**6.1 mg/L**	SM 5310-C	0.5 mg/L	7/30/19	ISG

Abbreviations/ References:

ML = Minimum Level = LRL = RL
mg/L = Milligrams Per Liter or PPM
ug/L = Micrograms Per Liter or PPB
mpn/100 mls = Most Probable Number Index/ 100 mls
Date Analyzed = Date Test Completed

DATA APPROVED FOR RELEASE BY

Chain of Custody Form

Colorado Analytical LABORATORIES, INC

Commerce City Lab
10411 Heinz Way
Commerce City CO 80640

Lakewood Service Center
12860 W. Cedar Dr, 100A
Lakewood CO 80228

Phone: 303-659-2313

www.coloradolab.com

Report To Information	Bill To Information (If different from report to)	Project Name / Number
Company Name: Summit Scientific	Company Name: ____	____
Contact Name: Muri Premer / Paul Shrewsbury	Contact Name: ____	____
Address: 4653 Table Mountain Drive	Address: ____	Task Number (Lab Use Only)
City Golden State CO Zip 80403	City State Zip	CAL Task No. 190726064
Phone: 303-277-9310	Phone:	
Email: mpremer@s2scientific.com /	Email: pshrewsbury@s2scientific.com	EMN
Sample Collector:		
Sample Collector Phone:	PO No.:	

Page 5 of 5

Sample Matrix (Select One Only)

Waste Water ☐ Soil ☐ Drinking Water ☐
Ground Water ☒ Sludge ☐
Surface Water ☐

Date	Time	Sample ID	No. of Containers	Grab	Composite	Tests Requested: Diss. Organic C
7-26-19	10:15	UCUP-1-7-26-19		☐	☐	☒
	10:56	UCUP-2-7-26-19		☐	☐	☒
	11:34	UCUP-3-7-26-19		☐	☐	☒
✕	12:11	UCUP-4-7-26-19		☐	☐	☒
				☐	☐	☐
				☐	☐	☐
				☐	☐	☐
				☐	☐	☐
				☐	☐	☐
				☐	☐	☐

Instructions:

C/S Info:

Deliver Via:

C/S Charge ☐

Seals Present Yes ☐ No ☒

Temp. 7.6 °C/Ice Y

Sample Pres. Yes ☐ No ☐

Relinquished By:	Date/Time:	Received By:	Date/Time:	Relinquished By:	Date/Time:	Received By:	Date/Time:
	7-26-19 15:25		7/26/19 1528				

Ninyo & Moore 6001 S Willow Dr #195 Greenwood Village CO, 80111	Project: NVRA - Feasibility Study Project Number: 500557005 Project Manager: Beth McDonald	**Reported:** 08/06/19 12:18

Notes and Definitions

QM-02	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Ninyo & Moore

Geotechnical & Environmental Sciences Consultants

6001 South Willow Drive, Suite 195 | Greenwood Village, Colorado 80111 | p. 303.629.6000

ARIZONA | CALIFORNIA | COLORADO | NEVADA | TEXAS | UTAH

www.ninyoandmoore.com