



Transmittal Letter

November 19, 2019

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Transmittal Number: 54.02_354

To: **Rise Grass Valley Inc.**
 333 Crown Point Circle
 Suite 215
 Grass Valley, CA 9545

Attention: Benjamin Mossman
Re: Idaho Maryland WTP Design Report
Job Number: 54.02

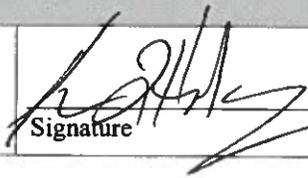
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IDAHO MARYLAND

WATER TREATMENT PLANT DESIGN REPORT

Prepared for:



November 2019



Prepared by:

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Planning · Design · Procurement · Construction · Operation

TABLE OF CONTENTS

| | | |
|-----|---|-----|
| 1.0 | INTRODUCTION | 1-1 |
| 2.0 | DISCUSSION | 2-1 |
| 2.1 | Background | 2-1 |
| 2.2 | Assessment | 2-2 |
| 2.3 | Testing | 2-3 |
| | 2.3.1 Test Methodology | 2-4 |
| 2.4 | Test Results | 2-4 |
| 3.0 | PROPOSED PROCESS LOCATION | 3-1 |
| 3.1 | Water Treatment Plant (WTP) | 3-1 |
| | 3.1.1 Geographic Coordinates | 3-1 |
| 4.0 | PROCESS DESCRIPTION | 4-1 |
| 5.0 | TECHNICAL SPECIFICATIONS | 5-1 |
| 5.1 | Major Equipment | 5-1 |
| 5.2 | Chemicals | 5-1 |
| 5.3 | Containment of Process Fluids and Chemicals | 5-1 |
| 5.4 | Waste Management | 5-2 |
| | 5.4.1 Liquid Waste | 5-2 |
| | 5.4.2 Solid Waste | 5-2 |
| 5.5 | Operations | 5-2 |
| 6.0 | QA/QC | 6-1 |
| 7.0 | DRAWINGS | 7-1 |

LIST OF APPENDICES

| | |
|---|---|
| A | Laboratory Results |
| B | Drawings and Performance Specifications |
| C | Equipment Data Sheets |
| D | Safety Data Sheets (SDS) |
| E | Testing Notes |

LIST OF TABLES

| | | |
|------------|--|-----|
| Table 2-1: | Rise Gold Corp. Idaho-Maryland Mine Basis of Design | 2-1 |
| Table 2-2: | Rise Gold Contaminants of Concern..... | 2-2 |
| Table 2-3: | Certified Laboratory Results and Discharge Allowances | 2-5 |
| Table 2-4: | Sample Designations Cross-Reference | 2-5 |
| Table 3-1: | Calculated Location Values | 3-1 |
| Table 5-1: | Chemical Type & Estimated Usage at the Idaho-Maryland Mine | 5-1 |

LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---------------------|--|
| AMSL | Above Mean Sea Level |
| As | Arsenic |
| CCR | California Code of Regulations |
| Fe | Iron |
| GAC | Granular Activated Carbon |
| gpm | Gallons per minute |
| gpm/ft ² | Gallon per minute per square foot |
| IX | Ion Exchange |
| KMnO ₄ | Potassium Permanganate |
| MDBM | Mount Diablo Base Meridian |
| mg/L | Milligrams per Liter |
| MMF | Mixed Media Filtration |
| Mn | Manganese |
| MnO ₂ | Manganese Dioxide |
| NaOCl | Sodium Hypochlorite |
| NBS | New Brunswick Shaft |
| NH ₃ | Ammonia |
| ORP | Oxidation Reduction Potential |
| PFD | Process Flow Diagram |
| pH | Potential of Hydrogen |
| QA/QC | Quality Assurance/Quality Control |
| SDS | Safety Data Sheets |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TSS | Total Suspended Solids |
| TTHM | Total Trihalomethane |
| ug/L | Micrograms per Liter |
| WTP | Water Treatment Plant |

1.0 INTRODUCTION

This report presents pertinent information for the Idaho-Maryland Mine underground dewatering project being proposed and implemented by Rise Gold Corporation (Rise Gold). The report is presented in the following manner:

- Section 1.0 introduces the report
- Section 2.0 presents a discussion of the project
- Section 3.0 presents the proposed process location
- Section 4.0 presents a process description
- Section 5.0 presents technical specifications
- Section 6.0 presents QA/QC for construction
- Section 7.0 presents drawings and specifications

2.0 DISCUSSION

2.1 Background

The New Brunswick Shaft (NBS) of the Idaho-Maryland Mine is located on private property owned by Rise Gold. The shaft is approximately 2.5 miles east of downtown Grass Valley, California, and is accessed off of East Bennett and Brunswick Roads. The NBS is situated in the northeast quadrant of Section 36, T 16 N, R 8 E, and in the northwest quadrant of Section 31, T 16N, R 9 E, Mount Diablo Base Meridian (MDBM).

The Idaho-Maryland Mine complex was a significant gold producer in California, with approximately 2.4 million ounces produced between 1866 and 1955. The mine closed in 1956. The mine property consists of 2,750 acres of deeded mineral rights including 119 acres of contiguous surface ownership centered on the NBS.

Rise Gold is in the planning and preparation phase to restart exploration and active mining activities at the Idaho-Maryland Mine. Linkan Engineering (Linkan) was commissioned by Rise Gold to evaluate water treatment options at the site. This evaluation was structured to facilitate the issuance of a permit for water treatment and discharge at the facility, with Rise Gold considering discharging treated water from their NBS underground workings into the South Fork of Wolf Creek. Currently, the shaft is flooded and will need to be dewatered prior to any exploration or mining activities. After initial dewatering, the shaft will need to be continuously dewatered as mining activities continue. All effluent discharges from the property will need to meet the requirements of the *California Regional Water Quality Control Board Central Valley Region NPDES No. CAG995002*.

As the first step in this evaluation, Linkan performed a scoping study that included water quality analysis, information regarding the effluent discharge allowances, and the flow volumes that would be required. This information served as the basis of design and is presented in Table 2-1.

Table 2-1: Rise Gold Corp. Idaho-Maryland Mine Basis of Design

| Design Criteria | |
|---|-----------------------------|
| The estimated volume of water in the shaft | 815 million gallons |
| Steady-state groundwater flow rate into the shaft | 750 gallon per minute (gpm) |
| Operational steady state dewatering flow rate | 2,500 gpm |
| Effluent receiver | South Fork of Wolf Creek |
| Discharge Standards | NPDES No. CAG995002 |

Constituents of concern identified in Linkan’s scope of work for treatment of the NBS water have been tabulated in Table 2-2, along with their corresponding concentrations and the NPDES No. CAG9950023 maximum contaminant level (MCL) standards for discharge.

Table 2-2: Rise Gold Contaminants of Concern

| Constituents of Concern | Reported Concentration milligrams per liter (mg/L) | NPDES No. CAG995002 MCL |
|-------------------------|--|----------------------------|
| Iron (Fe) | 1.6 | 0.3 |
| Manganese (Mn) | 0.27 | 0.05 |

NOTE 1: The values listed in Table 2-2 represent the highest concentrations noted in the California Laboratory Services report, *CLS Work Order #: 18B0794* for the samples designated ‘NBS’. All elevations sampled in the NBS showed similar concentrations to those listed.

NOTE 2: Fe and Mn are listed as secondary drinking water standards in California Code of Regulations (CCR) 17 & 22.

The water quality analysis indicated that Fe and Mn concentrations are noncompliant for regulatory discharge and that these elements will, therefore, need to undergo treatment for removal.

2.2 Assessment

Linkan evaluated the contaminants of concern and determined that from their type and concentrations that oxidation would be beneficial for their removal. Oxidation of aqueous Fe and Mn is an electrochemical process in which each metal reacts with oxygen occurring either naturally or as a chemically bound form. This reaction between the metal and the oxygen forms a hydrated species. This occurs in a 2-step mechanism in which there is an anodic dissolution of the aqueous metal, which loses electrons and becomes ionic and soluble in water. This is then followed by a cathodic reduction of oxygen, where it reacts with water and the available electrons lost from the metal, and this reaction yields hydroxide ions. These hydroxide ions then react with the metal ions and form metal hydroxides, which eventually become super-saturated in solution and begin to precipitate out as solid masses. These solid masses can then be removed by settling (sedimentation) and/or filtration, which are relatively simple and cost-effective mechanisms for removal. The oxidation can be induced by introducing oxygen into the water either by aerating the water to increase its dissolved oxygen levels or by introducing soluble chemicals (i.e. potassium permanganate { $KMnO_4$ } or sodium hypochlorite { $NaOCl$ }) which contain oxygen in their makeup.

Additionally, it was concluded that filtration through natural, mined manganese dioxide (MnO_2) media would be the preferred primary form of treatment. This is due to its efficient removal characteristics for Fe and Mn, and it was selected over oxidation followed by surface coated media such as greensand or uncoated media such as sand or mixed media filtration (MMF). This owes to the fact that mined MnO_2 will filter the solids that are precipitated during the oxidation process, and will also act to catalytically oxidize and adsorb any residual soluble Fe and Mn remaining in the feed water. And it will do this without needing to be regenerated with chemical additives, as is the case with greensand. Ion exchange (IX) was also evaluated by Linkan as a potential treatment, but the mined MnO_2 is lower in both purchase costs and operational costs, and has a simpler operational strategy, without frequent periodic chemical

regeneration or replacement needed. The use of IX resins for the removal of iron and manganese were also determined by Linkan to have limited viability for this application due to the requirement that the contaminants remain in dissolved form and exist at very low levels. This is due to the tendency of any oxygen present to react with the Fe and Mn and cause solids formation, therefore increasing the potential for plugging and buildup on the resin surface. Fe fouling is a common and sometimes irreversible problem with IX Fe and Mn treatment, and it was noted by Linkan that the potential for this type of fouling is high. This stems from the fact that oxygen levels of the NBS water are very low when it is first obtained from the shaft, with this low oxygen environment helping to keep the Fe and Mn in solution, but once exposed to ambient surface air the water was noted to react rapidly with the oxygen in the air and Fe and Mn precipitation would begin quickly. This observation excluded IX from process consideration.

The preferred filtration media, mined MnO₂, has highly efficient Fe and Mn removal characteristics due to adsorbing the oxidized species of Fe and Mn on the external as well as the porous internal structures of the media. This high adsorptive surface area and capacity can process water at a faster flow rate than traditional media, which keeps vessel sizes and numbers within reason for high throughput plants such as the Idaho-Maryland Mine, which is anticipated to operate at upwards of 2,500 gpm. And when compared to surface-activated media that utilizes an applied MnO₂ coating, such as greensand, the natural mined media has lower regeneration costs and longer service life projections. This is primarily due to the particles of the mined MnO₂ media having high purity, which allows for regeneration to occur primarily through periodic backwash events that cause particle attrition, exposing the fresh catalytically active surface area. Surface coated media uses KMnO₄ as a regenerant either applied continuously or intermittently. This chemical requires special handling and storage considerations which add cost and complexity. Uncoated sand or MMF media can also act as an effective filter for solids removal, but they lack catalytic oxidative properties that make the mined MnO₂ a more robust option.

Due to the aforementioned considerations and existing water conditions, it is Linkan's opinion that oxidation followed by mined MnO₂ media treatment will provide Rise Gold with an effective strategy in both terms of cost as well as efficiency for removing the contaminants of concern.

To empirically assess this treatment, Linkan requested NBS water to perform bench-scale tests. These tests and their results are outlined in the following sections:

2.3 Testing

Bench-scale tests were performed to verify the effectiveness of the prescribed treatment components, which consisted of oxidation of NBS water (via aeration, KMnO₄ or NaOCl) and filtration through natural, mined MnO₂ (pyrolusite) media, and through granular activated carbon (GAC). Samples containing each of the three oxidizing agents assessed were processed independently through each component of the treatment system, for a total of three individual tests. GAC tests were performed on the oxidized and MnO₂ media filtered water to assess additional removal of primary contaminants, as well as the removal of chemical oxidant residuals and disinfection byproducts that arise from the use of chlorine. GAC acts as a very high surface area filter that has an affinity for dissolved Fe and Mn (Fe(II) and

Mn(II), respectively), with the adsorption capacity for Fe(II) being somewhat higher due to the ionic radius and electronegativity differences. It is also commonly employed to remove chlorine and is an effective treatment for total trihalomethanes (TTHMs) that are formed from the reaction between chlorine and certain organics that may be present in the water that is undergoing treatment. Since it is an effective adsorbent for both contaminants of concern, and chlorine and its potential byproducts, it was included in the testing assessments.

2.3.1 Test Methodology

A 1” test column was constructed and packed with the selected MnO₂ media (brand name, ‘MangOx’). The raw feed water was then subjected to oxidation per the aforementioned treatments and was flowed through the column per the manufacturer’s suggested loading rate in gallons per minute per square foot of media (gpm/ft²). Additional aliquots of oxidized and MnO₂ filtered water were also passed through a GAC packed column at the manufacturer’s specified loading rate. Samples of all treatment conditions were collected and submitted for laboratory analyses.

2.4 Test Results

Laboratory testing using a California certified lab indicated that the treatment strategy was effective at removing the contaminants of concern in the samples that are listed as ‘GAC Effluent’, as shown in Table 2-3, with each oxidizing agent yielding regulatory compliant results as final effluent. The values denoted in red font are treated water values that are above the discharge allowance.

Table 2-3: Certified Laboratory Results and Discharge Allowances

| Sample Designation | Test | Fe (mg/L) | Mn (mg/L) | TTHMs (mg/L) | | | |
|--------------------------------------|--------|--------------|--------------|---------------|---------------|---------------|---------------|
| | Number | | | 1 | 2 | 3 | 4 |
| NBS Baseline | 1 | 1.400 | 0.240 | | | | |
| Aeration Pre-Columns | | 0.170 | 0.221 | | | | |
| Aeration-MnO2 Effluent | | <0.0091 | 0.022 | | | | |
| Aeration-GAC Effluent | | <0.0091 | 0.012 | | | | |
| KMnO4-MnO2 Effluent | 2 | <0.0091 | 0.037 | | | | |
| KMnO4-GAC Effluent | | <0.0091 | 0.012 | | | | |
| NBS Raw Baseline | 3 | | | <0.000061 | <0.00013 | <0.00016 | <0.00013 |
| NaOCl-MnO2 Effluent | | <0.0091 | 0.100 | 0.00036 | <0.00013 | <0.00016 | 0.0033 |
| NaOCl-GAC Effluent | | <0.0091 | 0.0093 | <0.000061 | <0.00013 | <0.00016 | <0.00013 |
| NPDES No. CAG995002 Allowance | | 0.300 | 0.050 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |

NOTE: THM #1 = Bromodichloromethane
 THM #2 = Dibromochloromethane
 THM #3 = Bromoform
 THM #4 = Chloroform

Refer to Appendix A for certified laboratory results. Table 2-4 provides a cross-reference of the sample designations used in Table 2-3 and those used for the laboratory submissions. The Fe and Mn result for the sample designated ‘Aeration Pre-Columns’ was obtained during field testing on 12/27/2018, and is therefore not listed in the laboratory results. This sample was oxidized for several days in ambient conditions and its oxidation reduction potential (ORP) increased 145 mV during this time over the initial aerated values obtained on 12/20/2018. Refer to Appendix E for field notes.

Table 2-4: Sample Designations Cross-Reference

| Sample Designation | Laboratory Report Designation |
|------------------------|-------------------------------|
| NBS Baseline | Rise Baseline |
| Aeration Pre-Columns | Aeration Pre-Columns |
| Aeration MnO2 Effluent | Aeration Post-MnO2 |
| Aeration GAC Effluent | Aeration Post-GAC |
| KMnO4-MnO2 Effluent | KMnO4-1.7ppm-MNO2 Effluent |
| KMnO4-GAC Effluent | KMnO4-1.7ppm-GAC Effluent |
| NBS Baseline | Rise Raw-NaOCl Test |
| NaOCl-MnO2 Effluent | NaOCl-1ppm-MnO2 Effluent |
| NaOCl-GAC Effluent | NaOCl-1ppm-GAC Effluent |

Table 2-3 indicates that treatment using aeration followed by filtration through natural, mined MnO₂ will remove the contaminants of concern to compliant levels. Under current conditions, this process requires no chemical additives and does not need GAC polishing to achieve compliance. It is, however, dependent on the post-aeration ORP of the feed water to reach a minimal value of +200 mV to be effective at transforming soluble Fe and Mn into their insoluble species. For this reason, to provide a treatment system capable of operating with varying feed water physical properties, it is Linkan's opinion that it would be advantageous to include chemical oxidation capabilities as a contingency.

It should also be noted that although the treatment does not require GAC for contaminant removal in the current water quality conditions, it is included in the process design to add robustness in the chance that feed water quality worsens during periods of active mining. GAC is an effective barrier for many water pollutants and is relatively inexpensive and capable of being thermally regenerated and reused. It can serve to remove organics such as those found in drilling fluids and other mining-related additives, and although the current water quality does not contain these types of contaminants, it is Linkan's opinion that a removal system is added into the Rise Gold design as a contingency.

3.0 PROPOSED PROCESS LOCATION

3.1 Water Treatment Plant (WTP)

The proposed WTP will be located at the Idaho-Maryland Mine near Grass Valley, CA. The site is located 2.5 miles south of the intersection between State Highway 20 and Brunswick Road and on the west side of Brunswick Road. Refer to Appendix B for a site location drawing.

3.1.1 Geographic Coordinates

The WTP will be located at the following coordinates:

Latitude 39°12'35.99"N
Longitude 121°0'57.62"W

Table 3-1: Calculated Location Values

| Position Type | Latitude - Longitude |
|-------------------------|----------------------------------|
| Degrees Lat Long | 39.2099972°, -121.0160056° |
| Degrees Minutes | 39°12.59983', -121°00.96033' |
| Degrees Minutes Seconds | 39°12'35.9900", -121°00'57.6200" |
| UTM | 10S 671295mE 4341955mN |
| UTM Centimeter | 10S 671295.52mE 4341955.87mN |
| MGRS | 10SFJ7129541955 |
| Grid North | 1.3° |
| GARS | 118LU43 |
| Maidenhead | CM99LF80BJ95 |
| GEOREF | DJPK59031259 |

Note: Based on degrees latitude longitude to seven decimal places.

Elevation is 2,755 feet above mean sea level (AMSL).

4.0 PROCESS DESCRIPTION

The proposed Idaho-Maryland Mine water treatment process is described in the following section. It should be noted that all of the proposed treatment components have been used successfully on an industrial scale for the contaminants of concern noted at the Rise Gold facility, with none of them being novel or experimental in any way. The science behind each proposed component is well understood and has been validated over years of application in facilities worldwide.

Influent to the process will be obtained at a dewatering design rate of 2,500 gpm from the NBS. The water will then be pumped to the existing clay-lined pond where an aeration system will be installed. It is anticipated that the aeration system will consist of a blower housed in a well-insulated and soundproof enclosure on the shore that will supply a high volume of air to submerged, horizontally constructed porous diffusers located within the clay-lined pond. The diffusers will emit a continuous plume of gas-flushing bubbles that will ideally be small in size and significant in numbers and will have a high overall amount of surface area for efficient mass transfer of oxygen. This aeration will oxidize a majority of the dissolved Fe and Mn in the water and will change their base states, and due to this, they will begin to precipitate out of solution. For Fe, the transformation will be from the soluble ferrous (Fe(II)) state to the insoluble ferric (Fe(III)) form, and for Mn this will be a transformation from the soluble manganous Mn (Mn(II)) state to the insoluble manganic Mn (Mn(IV)) form. A small dose of NaOCl or KMnO₄ will also be added to enhance the kinetics of the reaction under all surface conditions such as seasonal variations. The precipitated Fe and Mn in the water will then begin to settle to the bottom of the pond (sedimentation). The insoluble solids that do not settle in the pond will be conveyed to the WTP and filtered out within the anthracite cap section of the MnO₂ media, with any remaining soluble solids passing into the MnO₂ bed where they will be catalytically oxidized and adsorbed by the media itself. The water will then be pumped through GAC vessels which will act as a final Fe and Mn treatment polishing step to help ensure regulatory compliance.

This process will also reduce the concentrations of arsenic (As) and ammonia (NH₃), both of which have been detected in low concentrations in surface water seeps near the Idaho-Maryland Mine. As will be oxidized from its As(III) state to the As(V) state, and in this state will be adsorbed by the hydrous ferric oxide that forms from the oxidation of Fe in the water when it undergoes its electrochemical transformation during the treatment process. The Fe/As complex will then be adsorbed by the MnO₂ media, removing both contaminants. The low concentrations of NH₃ will be removed by the aeration process, with the natural pH of the water high enough for a small amount of the NH₃ to be in the gaseous NH₃ form, which will be liberated from the water through vigorous aeration. The efficiency of this aeration can be enhanced by increasing the pH and thereby generating more of the gaseous form. As a contingency, sodium hydroxide will be included in the permitting efforts for pH adjustments should it become necessary to treat NH₃ in higher concentrations than have been previously detected. This may occur as a result of explosives used during periods of active mining. Catalytic carbon can also be used in the GAC vessels, which is efficient for chloramine removal, so increases in NH₃ levels can also be

mitigated by the introduction of NaOCl as a chemical oxidant, which will form chloramine with the residual NH₃ and be removed along with the residual chlorine, TTHMs and other residual organics by this form of activated carbon.

The aeration process will also help liberate any of the volatile cis-1,2 DCE compound present in the mine waters. The quantity of cis-1,2-DCE detected in the mine water, at 4.0 ug/L, is less than the regulatory thresholds, and test work showed that after aeration the cis-1,2, DCE was reduced to less than 0.15 ug/L.

Periodic backwashes of the MnO₂ and GAC media vessels, which will release filtered and adsorbed solids, will be directed back to the clay-lined pond, where this water will be distributed into a segregated area for solids settling. The water used for backwashes will be post-treatment effluent that will be stored in a finished water tank. It is anticipated that the pond will require periodic but infrequent removal of settled solids.

The water stored in the finished water tank will also provide the final effluent, which will be pH adjusted to meet regulatory compliance standards prior to being discharged to the South Fork of Wolf Creek. It is anticipated that this pH adjustment is performed by adding a small dose of sulfuric acid to the treated effluent.

The water treatment plant will be designed to operate at flow rates up to 2,500 gpm. It is anticipated that the average treatment flow rate will be less than this maximum value once the mine is fully dewatered, and may average approximately 850 gpm during operations. The water treatment plant will be designed to run efficiently at either the maximum or lower flow rates expected during the life of the operation.

Refer to Appendix B for the proposed Process Flow Diagram (PFD) and proposed plant layout.

5.0 TECHNICAL SPECIFICATIONS

5.1 Major Equipment

Equipment data sheets for major equipment are presented in Appendix C.

5.2 Chemicals

Chemicals proposed to be used in the treatment process include sodium hydroxide, NaOCl, KMnO₄, and sulfuric acid. The process only requires one chemical oxidant (either NaOCl or KMnO₄). NaOCl is the preferred oxidant due to lower chemical consumption, easier plant operation and handling and storage considerations, and reduced cost. Any TTHMs created from using NaOCl are removed in the GAC process. KMnO₄ was also used in the pilot test and is included as a contingency. Sodium hydroxide is included as a contingency for enhancing NH₃ removal via aeration should it become necessary during mining operations. The projected consumption of these chemicals, when used, is presented in Table 5-1.

Table 5-1: Chemical Type & Estimated Usage at the Idaho-Maryland Mine

| Chemical | Estimated Usage | On-Site Storage Volume (gal) | Usage Description |
|----------------------|-----------------|------------------------------|-------------------|
| 12.5% NaOCl | 35 gal/day | 1,650 | Process |
| 3% KMnO ₄ | 224 gal/day | 7,500 | Process |
| 93% Sulfuric Acid | 19 gal/day | 1650 | Process |
| 50% Sodium Hydroxide | 72 gal/day | 1650 | Process |

It is anticipated that any flocculent used during active mining for underground total suspended solids (TSS) removal will not adversely affect the water treatment process since contact with contaminants on the surface would also yield settling in the clay-lined pond or filterable solids at the MnO₂ media vessels. However, the oxidant demand could increase due to oxidative destruction of any excess polymer that might be present.

Chemical storage areas are identified on the site layout drawing. Safety data sheets (SDS) are attached in Appendix D.

5.3 Containment of Process Fluids and Chemicals

The chemical storage will be in areas with secondary containment. Chemical piping will be routed to minimize exposure to personnel.

5.4 Waste Management

5.4.1 Liquid Waste

No liquid waste is anticipated to be generated using the proposed process.

5.4.2 Solid Waste

The major component of the solid waste will be generated from backwashing the MnO₂ and GAC vessels. This discharge will be directed back to the clay-lined pond where it will be contained, settled, and stored in between periodic pond cleaning events. The solid waste will then be characterized by toxicity characteristic leaching procedure (TCLP) testing or other means designated by the regulatory agencies and disposed of in accordance with applicable laws and regulations.

The quantity of Fe and Mn removed from the mine waters by treatment and stored in the pond are relatively small. Assuming a Fe content of 1.6 mg/L and Mn content of 0.3 mg/L, approximately 10.5 tons per year of iron and manganese residues would precipitate into the pond at the maximum flow rate of 2,500 gpm, and ~3.5 tons per year of Fe and Mn would precipitate at the average flow rate of 850 gpm.

5.5 Operations

The water treatment system will include instrumentation that will provide continuous feedback of stable operations. This will include pH, ORP, conductivity and turbidity measurements. Values that extend beyond predetermined control limits will initiate shutdown of the entire system and will prompt operator investigation, correction, and restart. The pH will provide feedback for the chemical doses of acids and bases. The ORP will provide feedback for oxidizing agent control. Conductivity and turbidity will provide effluent water quality in relation to discharge allowances.

It is anticipated that periodic field tests for Fe and Mn will be performed on the treated effluent on a continuing basis as part of standard operating procedures. Fe testing can also act as an indicator for the effective removal of As since the As will travel with the Fe as a complex. NH₃ testing can also be performed to monitor the effectiveness of the aeration system.

6.0 QA/QC

Quality assurance and quality control (QA/QC) for the project will be governed by adherence to the three main performance specifications presented in Appendix B, and the equipment data sheets presented in Appendix C.

7.0 DRAWINGS

Drawings are presented in Appendix B. Drawings include a PFD, site location, overall site plan, and plant layout.

APPENDIX A
LABORATORY RESULTS



CALIFORNIA LABORATORY SERVICES

Committed. Responsive. Flexible.

January 16, 2019

CLS Work Order #: 19A0196

COC #:

Sam Billin
Linkan Engineering
2720 Ruby Vista Drive
Elko, NV 89801

Project Name: Rise Gold

Enclosed are the results of analyses for samples received by the laboratory on 01/04/19 13:15. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233



CALIFORNIA LABORATORY SERVICES

Committed. Responsive. Flexible.

01/16/19 08:58

| | | |
|---|---|-------------------------------------|
| Linkan Engineering 2720 Ruby Vista Drive Elko, NV 89801 | Project: Rise Gold Project Number: 54.02.03 Project Manager: Sam Billin | CLS Work Order #: 19A0196 COC #: |
|---|---|-------------------------------------|

Metals by EPA 200 Series Methods

| Analyte | Result | MDL | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|--|--------|------|-----------------|-------|----------|---------|----------|----------|-----------|-------|
| Rise Baseline (19A0196-01) WW Sampled: 12/19/18 15:30 Received: 01/04/19 13:15 | | | | | | | | | | |
| Arsenic | ND | 5.0 | 5.0 | µg/L | 1 | 1900121 | 01/07/19 | 01/07/19 | EPA 200.7 | |
| Iron | 1400 | 9.1 | 100 | " | " | " | " | " | " | |
| Manganese | 240 | 0.92 | 20 | " | " | " | " | " | " | |
| Aeration Post-MnO2 (19A0196-02) WW Sampled: 12/20/18 14:00 Received: 01/04/19 13:15 | | | | | | | | | | |
| Arsenic | ND | 5.0 | 5.0 | µg/L | 1 | 1900121 | 01/07/19 | 01/07/19 | EPA 200.7 | |
| Iron | ND | 9.1 | 100 | " | " | " | " | " | " | |
| Manganese | 22 | 0.92 | 20 | " | " | " | " | " | " | |
| KMnO4-1.7ppm-MnO2 Effluent (19A0196-04) WW Sampled: 12/31/18 11:15 Received: 01/04/19 13:15 | | | | | | | | | | |
| Arsenic | ND | 5.0 | 5.0 | µg/L | 1 | 1900121 | 01/07/19 | 01/07/19 | EPA 200.7 | |
| Iron | ND | 9.1 | 100 | " | " | " | " | " | " | |
| Manganese | 37 | 0.92 | 20 | " | " | " | " | " | " | |
| NaOCl-1ppm-MnO2 Effluent (19A0196-06) WW Sampled: 12/31/18 15:30 Received: 01/04/19 13:15 | | | | | | | | | | |
| Arsenic | ND | 5.0 | 5.0 | µg/L | 1 | 1900121 | 01/07/19 | 01/07/19 | EPA 200.7 | |
| Iron | ND | 9.1 | 100 | " | " | " | " | " | " | |
| Manganese | 100 | 0.92 | 20 | " | " | " | " | " | " | |
| Aeration Post-GAC (19A0196-07) WW Sampled: 01/02/19 14:45 Received: 01/04/19 13:15 | | | | | | | | | | |
| Arsenic | ND | 5.0 | 5.0 | µg/L | 1 | 1900121 | 01/07/19 | 01/07/19 | EPA 200.7 | |
| Iron | ND | 9.1 | 100 | " | " | " | " | " | " | |
| Manganese | 12 | 0.92 | 20 | " | " | " | " | " | " | J |
| NaOCl-1ppm, GAC Effluent (19A0196-08) WW Sampled: 01/02/19 16:45 Received: 01/04/19 13:15 | | | | | | | | | | |
| Arsenic | ND | 5.0 | 5.0 | µg/L | 1 | 1900121 | 01/07/19 | 01/07/19 | EPA 200.7 | |
| Iron | ND | 9.1 | 100 | " | " | " | " | " | " | |
| Manganese | 9.3 | 0.92 | 20 | " | " | " | " | " | " | J |



CALIFORNIA LABORATORY SERVICES

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01/16/19 08:58

Linkan Engineering
2720 Ruby Vista Drive
Elko, NV 89801

Project: Rise Gold
Project Number: 54.02.03
Project Manager: Sam Billin

CLS Work Order #: 19A0196
COC #:

Metals by EPA 200 Series Methods

| Analyte | Result | MDL | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|---|-----------|------|-----------------|-------|----------|---------|----------|----------|-----------|-------|
| KMnO4-1.7-2, GAC Effluent (19A0196-09) WW Sampled: 01/03/19 11:00 Received: 01/04/19 13:15 | | | | | | | | | | |
| Arsenic | ND | 5.0 | 5.0 | µg/L | 1 | 1900121 | 01/07/19 | 01/07/19 | EPA 200.7 | |
| Iron | ND | 9.1 | 100 | " | " | " | " | " | " | |
| Manganese | 12 | 0.92 | 20 | " | " | " | " | " | " | J |



CALIFORNIA LABORATORY SERVICES

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01/16/19 08:58

| | | |
|---|---|-------------------------------------|
| Linkan Engineering 2720 Ruby Vista Drive Elko, NV 89801 | Project: Rise Gold Project Number: 54.02.03 Project Manager: Sam Billin | CLS Work Order #: 19A0196 COC #: |
|---|---|-------------------------------------|

Purgeables by EPA Method 624

| Analyte | Result | MDL | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|--|------------|-------|-----------------|--------|----------|---------|----------|----------|---------|-------------|
| Rise Baseline (19A0196-01) WW Sampled: 12/19/18 15:30 Received: 01/04/19 13:15 | | | | | | | | | | HT-1 |
| cis-1,2-Dichloroethene | 4.0 | 0.15 | 0.50 | µg/L | 1 | 1900140 | 01/07/19 | 01/08/19 | EPA 624 | |
| Surrogate: 1,2-Dichloroethane-d4 | | | 100 % | 65-135 | | " | " | " | " | |
| Surrogate: 4-Bromofluorobenzene | | | 115 % | 73-125 | | " | " | " | " | |
| Surrogate: Toluene-d8 | | | 89 % | 72-125 | | " | " | " | " | |
| Aeration Post-MnO2 (19A0196-02) WW Sampled: 12/20/18 14:00 Received: 01/04/19 13:15 | | | | | | | | | | HT-1 |
| cis-1,2-Dichloroethene | ND | 0.15 | 0.50 | µg/L | 1 | 1900140 | 01/07/19 | 01/08/19 | EPA 624 | |
| Surrogate: 1,2-Dichloroethane-d4 | | | 106 % | 65-135 | | " | " | " | " | |
| Surrogate: 4-Bromofluorobenzene | | | 113 % | 73-125 | | " | " | " | " | |
| Surrogate: Toluene-d8 | | | 95 % | 72-125 | | " | " | " | " | |
| Aeration Pre-Column (19A0196-03) WW Sampled: 12/20/18 09:00 Received: 01/04/19 13:15 | | | | | | | | | | HT-1 |
| cis-1,2-Dichloroethene | ND | 0.15 | 0.50 | µg/L | 1 | 1900140 | 01/07/19 | 01/08/19 | EPA 624 | |
| Surrogate: 1,2-Dichloroethane-d4 | | | 131 % | 65-135 | | " | " | " | " | |
| Surrogate: 4-Bromofluorobenzene | | | 114 % | 73-125 | | " | " | " | " | |
| Surrogate: Toluene-d8 | | | 94 % | 72-125 | | " | " | " | " | |
| KMnO4-1.7ppm-MnO2 Effluent (19A0196-04) WW Sampled: 12/31/18 11:15 Received: 01/04/19 13:15 | | | | | | | | | | |
| cis-1,2-Dichloroethene | 3.4 | 0.15 | 0.50 | µg/L | 1 | 1900140 | 01/07/19 | 01/08/19 | EPA 624 | |
| Surrogate: 1,2-Dichloroethane-d4 | | | 102 % | 65-135 | | " | " | " | " | |
| Surrogate: 4-Bromofluorobenzene | | | 114 % | 73-125 | | " | " | " | " | |
| Surrogate: Toluene-d8 | | | 84 % | 72-125 | | " | " | " | " | |
| Rise Raw-NaOCl Test (19A0196-05) WW Sampled: 12/31/18 13:00 Received: 01/04/19 13:15 | | | | | | | | | | |
| Bromodichloromethane | ND | 0.061 | 0.50 | µg/L | 1 | 1900140 | 01/07/19 | 01/08/19 | EPA 624 | |
| Bromoform | ND | 0.16 | 0.50 | " | " | " | " | " | " | |
| Chloroform | ND | 0.13 | 0.50 | " | " | " | " | " | " | |
| cis-1,2-Dichloroethene | 3.8 | 0.15 | 0.50 | " | " | " | " | " | " | |



CALIFORNIA LABORATORY SERVICES

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Linkan Engineering
2720 Ruby Vista Drive
Elko, NV 89801

Project: Rise Gold
Project Number: 54.02.03
Project Manager: Sam Billin

CLS Work Order #: 19A0196
COC #:

Purgeables by EPA Method 624

| Analyte | Result | MDL | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|--|-------------|-------|-----------------|--------|----------|---------|----------|----------|---------|-------|
| Rise Raw-NaOCl Test (19A0196-05) WW Sampled: 12/31/18 13:00 Received: 01/04/19 13:15 | | | | | | | | | | |
| Dibromochloromethane | ND | 0.13 | 0.50 | µg/L | 1 | 1900140 | " | 01/08/19 | EPA 624 | |
| Surrogate: 1,2-Dichloroethane-d4 | | | 106 % | 65-135 | | " | " | " | " | |
| Surrogate: 4-Bromofluorobenzene | | | 112 % | 73-125 | | " | " | " | " | |
| Surrogate: Toluene-d8 | | | 81 % | 72-125 | | " | " | " | " | |
| NaOCl-1ppm-MnO2 Effluent (19A0196-06) WW Sampled: 12/31/18 15:30 Received: 01/04/19 13:15 | | | | | | | | | | |
| Bromodichloromethane | 0.36 | 0.061 | 0.50 | µg/L | 1 | 1900140 | 01/07/19 | 01/08/19 | EPA 624 | J |
| Bromoform | ND | 0.16 | 0.50 | " | " | " | " | " | " | |
| Chloroform | 3.3 | 0.13 | 0.50 | " | " | " | " | " | " | |
| cis-1,2-Dichloroethene | 3.4 | 0.15 | 0.50 | " | " | " | " | " | " | |
| Dibromochloromethane | ND | 0.13 | 0.50 | " | " | " | " | " | " | |
| Surrogate: 1,2-Dichloroethane-d4 | | | 106 % | 65-135 | | " | " | " | " | |
| Surrogate: 4-Bromofluorobenzene | | | 111 % | 73-125 | | " | " | " | " | |
| Surrogate: Toluene-d8 | | | 96 % | 72-125 | | " | " | " | " | |
| Aeration Post-GAC (19A0196-07) WW Sampled: 01/02/19 14:45 Received: 01/04/19 13:15 | | | | | | | | | | |
| cis-1,2-Dichloroethene | ND | 0.15 | 0.50 | µg/L | 1 | 1900140 | 01/07/19 | 01/08/19 | EPA 624 | |
| Surrogate: 1,2-Dichloroethane-d4 | | | 114 % | 65-135 | | " | " | " | " | |
| Surrogate: 4-Bromofluorobenzene | | | 110 % | 73-125 | | " | " | " | " | |
| Surrogate: Toluene-d8 | | | 76 % | 72-125 | | " | " | " | " | |
| NaOCl-1ppm, GAC Effluent (19A0196-08) WW Sampled: 01/02/19 16:45 Received: 01/04/19 13:15 | | | | | | | | | | |
| Bromodichloromethane | ND | 0.061 | 0.50 | µg/L | 1 | 1900140 | 01/07/19 | 01/08/19 | EPA 624 | |
| Bromoform | ND | 0.16 | 0.50 | " | " | " | " | " | " | |
| Chloroform | ND | 0.13 | 0.50 | " | " | " | " | " | " | |
| cis-1,2-Dichloroethene | ND | 0.15 | 0.50 | " | " | " | " | " | " | |
| Dibromochloromethane | ND | 0.13 | 0.50 | " | " | " | " | " | " | |
| Surrogate: 1,2-Dichloroethane-d4 | | | 113 % | 65-135 | | " | " | " | " | |



CALIFORNIA LABORATORY SERVICES

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Linkan Engineering
2720 Ruby Vista Drive
Elko, NV 89801

Project: Rise Gold
Project Number: 54.02.03
Project Manager: Sam Billin

CLS Work Order #: 19A0196
COC #:

Purgeables by EPA Method 624

| Analyte | Result | MDL | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|---|--------|-------|-----------------|-------|----------|---------|----------|----------|---------|-------|
| NaOCI-1ppm, GAC Effluent (19A0196-08) WW Sampled: 01/02/19 16:45 Received: 01/04/19 13:15 | | | | | | | | | | |
| Surrogate: 4-Bromofluorobenzene | | | 110 % | | 73-125 | 1900140 | " | 01/08/19 | EPA 624 | |
| Surrogate: Toluene-d8 | | | 72 % | | 72-125 | " | " | " | " | |
| KMnO4-1.7-2, GAC Effluent (19A0196-09) WW Sampled: 01/03/19 11:00 Received: 01/04/19 13:15 | | | | | | | | | | |
| cis-1,2-Dichloroethene | ND | 0.15 | 0.50 | µg/L | 1 | 1900140 | 01/07/19 | 01/08/19 | EPA 624 | |
| Surrogate: 1,2-Dichloroethane-d4 | | | 117 % | | 65-135 | " | " | " | " | |
| Surrogate: 4-Bromofluorobenzene | | | 111 % | | 73-125 | " | " | " | " | |
| Surrogate: Toluene-d8 | | | 78 % | | 72-125 | " | " | " | " | |
| Trip Blanks (19A0196-10) Water Sampled: 01/03/19 10:15 Received: 01/04/19 13:15 | | | | | | | | | | |
| Bromodichloromethane | ND | 0.061 | 0.50 | µg/L | 1 | 1900140 | 01/07/19 | 01/08/19 | EPA 624 | |
| Bromoform | ND | 0.16 | 0.50 | " | " | " | " | " | " | |
| Chloroform | ND | 0.13 | 0.50 | " | " | " | " | " | " | |
| cis-1,2-Dichloroethene | ND | 0.15 | 0.50 | " | " | " | " | " | " | |
| Dibromochloromethane | ND | 0.13 | 0.50 | " | " | " | " | " | " | |
| Surrogate: 1,2-Dichloroethane-d4 | | | 104 % | | 65-135 | " | " | " | " | |
| Surrogate: 4-Bromofluorobenzene | | | 115 % | | 73-125 | " | " | " | " | |
| Surrogate: Toluene-d8 | | | 94 % | | 72-125 | " | " | " | " | |



CALIFORNIA LABORATORY SERVICES

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Linkan Engineering
2720 Ruby Vista Drive
Elko, NV 89801

Project: Rise Gold
Project Number: 54.02.03
Project Manager: Sam Billin

CLS Work Order #: 19A0196
COC #:

Metals by EPA 200 Series Methods - Quality Control

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

Batch 1900121 - EPA 200 Series

Blank (1900121-BLK1)

Prepared & Analyzed: 01/07/19

| | | | | | | | | | | | |
|-----------|----|------|-----|------|--|--|--|--|--|--|--|
| Arsenic | ND | 5.0 | 5.0 | µg/L | | | | | | | |
| Iron | ND | 9.1 | 100 | " | | | | | | | |
| Manganese | ND | 0.92 | 20 | " | | | | | | | |

LCS (1900121-BS1)

Prepared & Analyzed: 01/07/19

| | | | | | | | | | | | |
|-----------|------|------|-----|------|------|--|-----|--------|--|--|--|
| Arsenic | 1050 | 5.0 | 5.0 | µg/L | 1000 | | 105 | 85-115 | | | |
| Iron | 917 | 9.1 | 100 | " | 1000 | | 92 | 85-115 | | | |
| Manganese | 1030 | 0.92 | 20 | " | 1000 | | 103 | 85-115 | | | |

Matrix Spike (1900121-MS1)

Source: 19A0196-01 Prepared & Analyzed: 01/07/19

| | | | | | | | | | | | |
|-----------|------|------|-----|------|------|------|-----|--------|--|--|--|
| Arsenic | 997 | 5.0 | 5.0 | µg/L | 1000 | ND | 100 | 70-130 | | | |
| Iron | 2100 | 9.1 | 100 | " | 1000 | 1370 | 72 | 70-130 | | | |
| Manganese | 1170 | 0.92 | 20 | " | 1000 | 236 | 93 | 70-130 | | | |



CALIFORNIA LABORATORY SERVICES

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Linkan Engineering
2720 Ruby Vista Drive
Elko, NV 89801

Project: Rise Gold
Project Number: 54.02.03
Project Manager: Sam Billin

CLS Work Order #: 19A0196
COC #:

Purgeables by EPA Method 624 - Quality Control

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

Batch 1900140 - EPA 5030 Water MS

Blank (1900140-BLK1)

Prepared: 01/07/19 Analyzed: 01/08/19

| | | | | | | | | | | | |
|------------------------------------|----|-------|------|------|--|--|--|--|--|--|--|
| Benzene | ND | 0.057 | 0.30 | µg/L | | | | | | | |
| Bromodichloromethane | ND | 0.061 | 0.50 | " | | | | | | | |
| Bromoform | ND | 0.16 | 0.50 | " | | | | | | | |
| Bromomethane | ND | 0.20 | 0.50 | " | | | | | | | |
| Carbon tetrachloride | ND | 0.092 | 0.50 | " | | | | | | | |
| Chlorobenzene | ND | 0.11 | 0.30 | " | | | | | | | |
| Chloroethane | ND | 0.20 | 0.50 | " | | | | | | | |
| 2-Chloroethylvinyl ether | ND | 0.11 | 2.0 | " | | | | | | | |
| Chloroform | ND | 0.13 | 0.50 | " | | | | | | | |
| Chloromethane | ND | 0.29 | 0.50 | " | | | | | | | |
| Dibromochloromethane | ND | 0.13 | 0.50 | " | | | | | | | |
| 1,2-Dichlorobenzene | ND | 0.042 | 0.30 | " | | | | | | | |
| 1,3-Dichlorobenzene | ND | 0.081 | 0.30 | " | | | | | | | |
| 1,4-Dichlorobenzene | ND | 0.061 | 0.30 | " | | | | | | | |
| Dichlorodifluoromethane (Freon 12) | ND | 0.37 | 0.50 | " | | | | | | | |
| 1,1-Dichloroethane | ND | 0.12 | 0.50 | " | | | | | | | |
| 1,2-Dichloroethane | ND | 0.054 | 0.50 | " | | | | | | | |
| 1,1-Dichloroethene | ND | 0.092 | 0.50 | " | | | | | | | |
| cis-1,2-Dichloroethene | ND | 0.15 | 0.50 | " | | | | | | | |
| trans-1,2-Dichloroethene | ND | 0.13 | 0.50 | " | | | | | | | |
| 1,2-Dichloropropane | ND | 0.057 | 0.50 | " | | | | | | | |
| cis-1,3-Dichloropropene | ND | 0.097 | 0.50 | " | | | | | | | |
| trans-1,3-Dichloropropene | ND | 0.12 | 0.50 | " | | | | | | | |
| Ethylbenzene | ND | 0.090 | 0.30 | " | | | | | | | |
| Methylene chloride | ND | 0.24 | 0.50 | " | | | | | | | |
| 1,1,2,2-Tetrachloroethane | ND | 0.13 | 0.50 | " | | | | | | | |
| Tetrachloroethene | ND | 0.12 | 0.50 | " | | | | | | | |
| Toluene | ND | 0.10 | 0.30 | " | | | | | | | |
| 1,1,1-Trichloroethane | ND | 0.18 | 0.50 | " | | | | | | | |
| 1,1,2-Trichloroethane | ND | 0.098 | 0.50 | " | | | | | | | |
| Trichloroethene | ND | 0.11 | 0.50 | " | | | | | | | |



CALIFORNIA LABORATORY SERVICES

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Linkan Engineering
2720 Ruby Vista Drive
Elko, NV 89801

Project: Rise Gold
Project Number: 54.02.03
Project Manager: Sam Billin

CLS Work Order #: 19A0196
COC #:

Purgeables by EPA Method 624 - Quality Control

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

Batch 1900140 - EPA 5030 Water MS

Blank (1900140-BLK1)

Prepared: 01/07/19 Analyzed: 01/08/19

| | | | | | | | | | | | |
|---|-------------|------|------|------|-------------|--|------------|---------------|--|--|--|
| Trichlorofluoromethane | ND | 0.20 | 0.50 | µg/L | | | | | | | |
| 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113) | ND | 0.15 | 0.50 | " | | | | | | | |
| Vinyl chloride | ND | 0.17 | 0.50 | " | | | | | | | |
| Xylenes (total) | ND | 0.35 | 0.50 | " | | | | | | | |
| <i>Surrogate: 1,2-Dichloroethane-d4</i> | <i>10.1</i> | | | " | <i>10.0</i> | | <i>101</i> | <i>65-135</i> | | | |
| <i>Surrogate: Toluene-d8</i> | <i>9.27</i> | | | " | <i>10.0</i> | | <i>93</i> | <i>72-125</i> | | | |
| <i>Surrogate: 4-Bromofluorobenzene</i> | <i>11.3</i> | | | " | <i>10.0</i> | | <i>113</i> | <i>73-125</i> | | | |

LCS (1900140-BS1)

Prepared & Analyzed: 01/07/19

| | | | | | | | | | | | |
|------------------------------------|------|-------|------|------|------|--|-----|--------|--|--|--|
| Benzene | 24.6 | 0.057 | 0.30 | µg/L | 20.0 | | 123 | 37-151 | | | |
| Bromodichloromethane | 14.9 | 0.061 | 0.50 | " | 20.0 | | 75 | 35-155 | | | |
| Bromoform | 13.9 | 0.16 | 0.50 | " | 20.0 | | 70 | 45-169 | | | |
| Bromomethane | 15.0 | 0.20 | 0.50 | " | 20.0 | | 75 | 10-242 | | | |
| Carbon tetrachloride | 17.2 | 0.092 | 0.50 | " | 20.0 | | 86 | 70-140 | | | |
| Chlorobenzene | 17.6 | 0.11 | 0.30 | " | 20.0 | | 88 | 37-160 | | | |
| Chloroethane | 23.9 | 0.20 | 0.50 | " | 20.0 | | 119 | 14-230 | | | |
| Chloroform | 21.2 | 0.13 | 0.50 | " | 20.0 | | 106 | 51-138 | | | |
| Chloromethane | 19.7 | 0.29 | 0.50 | " | 20.0 | | 98 | 10-273 | | | |
| Dibromochloromethane | 17.9 | 0.13 | 0.50 | " | 20.0 | | 90 | 53-149 | | | |
| 1,2-Dichlorobenzene | 23.6 | 0.042 | 0.30 | " | 20.0 | | 118 | 18-190 | | | |
| 1,3-Dichlorobenzene | 22.3 | 0.081 | 0.30 | " | 20.0 | | 111 | 59-156 | | | |
| 1,4-Dichlorobenzene | 21.8 | 0.061 | 0.30 | " | 20.0 | | 109 | 18-190 | | | |
| Dichlorodifluoromethane (Freon 12) | 18.7 | 0.37 | 0.50 | " | 20.0 | | 93 | 50-150 | | | |
| 1,1-Dichloroethane | 24.8 | 0.12 | 0.50 | " | 20.0 | | 124 | 59-155 | | | |
| 1,2-Dichloroethane | 21.1 | 0.054 | 0.50 | " | 20.0 | | 105 | 49-155 | | | |
| 1,1-Dichloroethene | 16.6 | 0.092 | 0.50 | " | 20.0 | | 83 | 5-234 | | | |
| trans-1,2-Dichloroethene | 24.4 | 0.13 | 0.50 | " | 20.0 | | 122 | 54-156 | | | |
| 1,2-Dichloropropane | 21.8 | 0.057 | 0.50 | " | 20.0 | | 109 | 5-210 | | | |
| cis-1,3-Dichloropropene | 12.8 | 0.097 | 0.50 | " | 20.0 | | 64 | 5-227 | | | |
| trans-1,3-Dichloropropene | 14.5 | 0.12 | 0.50 | " | 20.0 | | 73 | 17-183 | | | |
| Ethylbenzene | 20.0 | 0.090 | 0.30 | " | 20.0 | | 100 | 37-162 | | | |



CALIFORNIA LABORATORY SERVICES

Committed. Responsive. Flexible.

01/16/19 08:58

Linkan Engineering
2720 Ruby Vista Drive
Elko, NV 89801

Project: Rise Gold
Project Number: 54.02.03
Project Manager: Sam Billin

CLS Work Order #: 19A0196
COC #:

Purgeables by EPA Method 624 - Quality Control

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

Batch 1900140 - EPA 5030 Water MS

LCS (1900140-BS1)

Prepared & Analyzed: 01/07/19

| | | | | | | | | | | | |
|----------------------------------|------|-------|------|------|------|--|-----|--------|--|--|--|
| Methylene chloride | 26.5 | 0.24 | 0.50 | µg/L | 20.0 | | 132 | 5-221 | | | |
| 1,1,2,2-Tetrachloroethane | 25.2 | 0.13 | 0.50 | " | 20.0 | | 126 | 46-148 | | | |
| Tetrachloroethene | 16.6 | 0.12 | 0.50 | " | 20.0 | | 83 | 64-148 | | | |
| Toluene | 19.3 | 0.10 | 0.30 | " | 20.0 | | 97 | 47-150 | | | |
| 1,1,1-Trichloroethane | 18.1 | 0.18 | 0.50 | " | 20.0 | | 91 | 52-162 | | | |
| 1,1,2-Trichloroethane | 18.7 | 0.098 | 0.50 | " | 20.0 | | 94 | 52-150 | | | |
| Trichloroethene | 22.0 | 0.11 | 0.50 | " | 20.0 | | 110 | 71-157 | | | |
| Trichlorofluoromethane | 15.6 | 0.20 | 0.50 | " | 20.0 | | 78 | 47-181 | | | |
| Vinyl chloride | 22.0 | 0.17 | 0.50 | " | 20.0 | | 110 | 10-251 | | | |
| Surrogate: 1,2-Dichloroethane-d4 | 8.39 | | | " | 10.0 | | 84 | 65-135 | | | |
| Surrogate: Toluene-d8 | 8.20 | | | " | 10.0 | | 82 | 72-125 | | | |
| Surrogate: 4-Bromofluorobenzene | 10.7 | | | " | 10.0 | | 107 | 73-125 | | | |

LCS Dup (1900140-BSD1)

Prepared & Analyzed: 01/07/19

| | | | | | | | | | | | |
|------------------------------------|------|-------|------|------|------|--|-----|--------|-----|----|--|
| Benzene | 24.8 | 0.057 | 0.30 | µg/L | 20.0 | | 124 | 37-151 | 0.6 | 30 | |
| Bromodichloromethane | 17.2 | 0.061 | 0.50 | " | 20.0 | | 86 | 35-155 | 14 | 30 | |
| Bromoform | 15.9 | 0.16 | 0.50 | " | 20.0 | | 79 | 45-169 | 13 | 30 | |
| Bromomethane | 19.2 | 0.20 | 0.50 | " | 20.0 | | 96 | 10-242 | 24 | 30 | |
| Carbon tetrachloride | 16.9 | 0.092 | 0.50 | " | 20.0 | | 84 | 70-140 | 2 | 30 | |
| Chlorobenzene | 20.4 | 0.11 | 0.30 | " | 20.0 | | 102 | 37-160 | 15 | 30 | |
| Chloroethane | 23.6 | 0.20 | 0.50 | " | 20.0 | | 118 | 14-230 | 1 | 30 | |
| Chloroform | 20.5 | 0.13 | 0.50 | " | 20.0 | | 103 | 51-138 | 3 | 30 | |
| Chloromethane | 18.8 | 0.29 | 0.50 | " | 20.0 | | 94 | 10-273 | 5 | 30 | |
| Dibromochloromethane | 17.7 | 0.13 | 0.50 | " | 20.0 | | 89 | 53-149 | 1 | 30 | |
| 1,2-Dichlorobenzene | 23.0 | 0.042 | 0.30 | " | 20.0 | | 115 | 18-190 | 2 | 30 | |
| 1,3-Dichlorobenzene | 21.5 | 0.081 | 0.30 | " | 20.0 | | 108 | 59-156 | 3 | 30 | |
| 1,4-Dichlorobenzene | 21.3 | 0.061 | 0.30 | " | 20.0 | | 106 | 18-190 | 3 | 30 | |
| Dichlorodifluoromethane (Freon 12) | 19.1 | 0.37 | 0.50 | " | 20.0 | | 96 | 50-150 | 2 | 30 | |
| 1,1-Dichloroethane | 18.1 | 0.12 | 0.50 | " | 20.0 | | 91 | 59-155 | 31 | 30 | |
| 1,2-Dichloroethane | 20.2 | 0.054 | 0.50 | " | 20.0 | | 101 | 49-155 | 4 | 30 | |
| 1,1-Dichloroethane | 17.1 | 0.092 | 0.50 | " | 20.0 | | 85 | 5-234 | 3 | 30 | |

QR-2



CALIFORNIA LABORATORY SERVICES

Committed. Responsive. Flexible.

01/16/19 08:58

Linkan Engineering
2720 Ruby Vista Drive
Elko, NV 89801

Project: Rise Gold
Project Number: 54.02.03
Project Manager: Sam Billin

CLS Work Order #: 19A0196
COC #:

Purgeables by EPA Method 624 - Quality Control

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

Batch 1900140 - EPA 5030 Water MS

LCS Dup (1900140-BSD1)

Prepared & Analyzed: 01/07/19

| | | | | | | | | | | |
|----------------------------------|------|-------|------|------|------|-----|--------|------|----|------|
| trans-1,2-Dichloroethene | 16.9 | 0.13 | 0.50 | µg/L | 20.0 | 84 | 54-156 | 36 | 30 | QR-2 |
| 1,2-Dichloropropane | 21.7 | 0.057 | 0.50 | " | 20.0 | 108 | 5-210 | 0.6 | 30 | |
| cis-1,3-Dichloropropene | 16.8 | 0.097 | 0.50 | " | 20.0 | 84 | 5-227 | 27 | 30 | |
| trans-1,3-Dichloropropene | 14.4 | 0.12 | 0.50 | " | 20.0 | 72 | 17-183 | 1 | 30 | |
| Ethylbenzene | 23.0 | 0.090 | 0.30 | " | 20.0 | 115 | 37-162 | 14 | 30 | |
| Methylene chloride | 18.2 | 0.24 | 0.50 | " | 20.0 | 91 | 5-221 | 37 | 30 | QR-2 |
| 1,1,2,2-Tetrachloroethane | 25.0 | 0.13 | 0.50 | " | 20.0 | 125 | 46-148 | 0.8 | 30 | |
| Tetrachloroethene | 16.5 | 0.12 | 0.50 | " | 20.0 | 83 | 64-148 | 0.4 | 30 | |
| Toluene | 22.4 | 0.10 | 0.30 | " | 20.0 | 112 | 47-150 | 15 | 30 | |
| 1,1,1-Trichloroethane | 17.9 | 0.18 | 0.50 | " | 20.0 | 89 | 52-162 | 1 | 30 | |
| 1,1,2-Trichloroethane | 18.7 | 0.098 | 0.50 | " | 20.0 | 93 | 52-150 | 0.2 | 30 | |
| Trichloroethene | 22.0 | 0.11 | 0.50 | " | 20.0 | 110 | 71-157 | 0.05 | 30 | |
| Trichlorofluoromethane | 16.5 | 0.20 | 0.50 | " | 20.0 | 83 | 47-181 | 6 | 30 | |
| Vinyl chloride | 20.6 | 0.17 | 0.50 | " | 20.0 | 103 | 10-251 | 6 | 30 | |
| Surrogate: 1,2-Dichloroethane-d4 | 8.83 | | | " | 10.0 | 88 | 65-135 | | | |
| Surrogate: Toluene-d8 | 10.0 | | | " | 10.0 | 100 | 72-125 | | | |
| Surrogate: 4-Bromofluorobenzene | 10.7 | | | " | 10.0 | 107 | 73-125 | | | |



CALIFORNIA LABORATORY SERVICES

Committed. Responsive. Flexible.

01/16/19 08:58

Linkan Engineering
2720 Ruby Vista Drive
Elko, NV 89801

Project: Rise Gold
Project Number: 54.02.03
Project Manager: Sam Billin

CLS Work Order #: 19A0196
COC #:

Notes and Definitions

| | |
|------|---|
| QR-2 | The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on percent recoveries and completeness of QC data. |
| J | Detected but below the Reporting Limit; therefore, result is an estimated concentration. |
| HT-1 | The sample was received outside of the EPA recommended holding time. |
| DET | Analyte DETECTED |
| ND | Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified) |
| NR | Not Reported |
| dry | Sample results reported on a dry weight basis |
| RPD | Relative Percent Difference |

This is a “MDL Report”, thus if the report denotes an “ND” for a particular analyte, it should be noted that the analyte was not detected at or above the MDL.



CHAIN OF CUSTODY

CLS ID No.; 19A0196

LOG WEB COC

| REPORT TO: | | | CLIENT JOB NUMBER | | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | |
|--|--------------|-------------------------------------|---|---------------|-----------------------|---|----------|----------|--------------------------------|-----|---|----------------------|---|---|----|
| NAME AND ADDRESS <i>Linkan Engineering</i> | | | <i>54,02.03</i> | | | PRESERVATIVES <i>Cis-1,2-DCE</i> <i>Fe, Mn</i> <i>TTHM, HAAS</i> | | | | | EDF REPORT <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO | | | | |
| <i>2720 Ruby Vista Dr.</i> | | | DESTINATION LABORATORY | | | | | | | | GLOBAL ID: _____ | | | | |
| <i>Elko, NV 89801</i> | | | <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA 95742 | | | | | | | | CDPH WRITE ON EDT TRANSMISSION? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | |
| PROJECT MANAGER <i>Sam Billin</i> PHONE# <i>(775) 777-9003</i> | | | <input type="checkbox"/> OTHER | | | | | | | | STATE SYSTEM NUMBER _____ | | | | |
| PROJECT NAME <i>Rise Gold</i> | | | | | | | | | | | IF "YES" PLEASE ENTER THE SOURCE NUMBER(S). | | | | |
| SAMPLED BY <i>Jason Wheeler</i> | | | | | | | | | | | COMPOSITE: | | | | |
| JOB DESCRIPTION <i>Testing</i> | | | | | | | | | | | TURN AROUND TIME | | | | |
| SITE LOCATION <i>Idaho - Maryland</i> | | | | | | | | | | | SPECIAL INSTRUCTIONS | | | | |
| | | | | | | | | | | | OR | | | | |
| | | | | | | | | | | | ALT. ID: | | | | |
| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | CONTAINER NO. | TYPE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | | | | | | DAY | DAY | DAY | DAY | DAY | | | | | |
| <i>12/19/18</i> | <i>15:30</i> | <i>Rise Baseline</i> | <i>waste water</i> | <i>4</i> | <i>Glass, plastic</i> | <i>1,2</i> | <i>X</i> | <i>X</i> | | | | | | | |
| <i>12/20/18</i> | <i>14:00</i> | <i>Aeration Post-MnO2</i> | <i>WW</i> | <i>4</i> | <i>"</i> | <i>1,2</i> | <i>X</i> | <i>X</i> | | | | | | | |
| <i>12/20/18</i> | <i>9:00</i> | <i>Aeration Pre-column</i> | <i>"</i> | <i>3</i> | <i>Glass</i> | <i>1</i> | <i>X</i> | | | | | | | | |
| <i>12/31/18</i> | <i>11:15</i> | <i>KMnO4-1.7ppm-MnO2 Effluent</i> | | <i>4</i> | <i>Glass, plastic</i> | <i>1,2</i> | <i>X</i> | <i>X</i> | | | | | | | |
| <i>12/31/18</i> | <i>13:00</i> | <i>Rise Raw - NaOCl Test</i> | <i>WW</i> | <i>3</i> | <i>Glass</i> | <i>1</i> | <i>X</i> | | <i>X</i> | | | | | | |
| <i>12/31/18</i> | <i>15:30</i> | <i>NaOCl-1ppm-MnO2 Effluent</i> | <i>WW</i> | <i>4</i> | <i>Glass, plastic</i> | <i>1,2</i> | <i>X</i> | <i>X</i> | <i>X</i> | | | | | | |
| <i>1/2/19</i> | <i>14:45</i> | <i>Aeration post-GAC</i> | <i>WW</i> | <i>4</i> | <i>"</i> | <i>1,2</i> | <i>X</i> | <i>X</i> | | | | | | | |
| <i>1/2/19</i> | <i>16:45</i> | <i>NaOCl-1ppm, GAC Effluent</i> | <i>WW</i> | <i>4</i> | <i>"</i> | <i>1,2</i> | <i>X</i> | <i>X</i> | <i>X</i> | | | | | | |
| <i>1/3/19</i> | | <i>KMnO4-1.7-2ppm, GAC Effluent</i> | <i>WW</i> | <i>4</i> | <i>"</i> | <i>1,2</i> | <i>X</i> | <i>X</i> | | | | | | | |
| SUSPECTED CONSTITUENTS | | | | | | PRESERVATIVES: (1) HCL (2) HNO3 (3) - COLD (4) = NaOH (5) = H2SO4 (6) = Na2S2O8 (7) = | | | | | | | | | |
| RELINQUISHED BY (SIGN) | | | PRINT NAME / COMPANY | | | DATE / TIME | | | RECEIVED BY (SIGN) | | | PRINT NAME / COMPANY | | | |
| <i>[Signature]</i> | | | <i>Scott Bacter Linkan</i> | | | <i>1/3/19 1015</i> | | | <i>[Signature]</i> | | | | | | |
| REC'D AT LAB BY: | | | DATE / TIME: | | | CONDITIONS / COMMENTS: | | | | | | | | | |
| <i>[Signature]</i> | | | <i>1/4/19</i> | | | <i>1315</i> | | | <i>(0.9)</i> | | | | | | |
| SHIPPED BY: | | | <input type="checkbox"/> FED X | | | <input checked="" type="checkbox"/> UPS | | | <input type="checkbox"/> OTHER | | | AIR BILL # | | | |

View - Lab file copy Terms and Conditions Invoice - Lab file copy Terms and Conditions Good - Project Mgr. Field Samples/Terms and conditions

Scott Furnas

From: Mark Smith <marks@californialab.com>
Sent: Friday, January 04, 2019 6:14 AM
To: Scott Furnas; shellief@californialab.com
Subject: Fwd: Lab Samples for Linkan Engineering

These samples should arrive this morning. The HAA will not be able to be run, due to improper preservation (client aware)
Please share this with sample Receiving. They should analyze by 624 low level (TTHM and cis-1,2-DCE) & Fe & Mn only
Thanks

Mark Smith
Operations Manager
CLS Labs
Sent from my iPhone

Begin forwarded message:

From: Scott Barton <scott.barton@linkan.biz>
Date: January 3, 2019 at 11:56:46 AM PST
To: Mark Smith <marks@californialab.com>, Nicole Burgess <nicole.burgess@linkan.biz>
Subject: RE: Lab Samples for Linkan Engineering

Hi Mark –
The Ni and TTLC was for a different project. We also discussed a second project with TTHM testing and cis -1,2 DCE. My recollection was that TTHM was quantified as a whole and reported as chloroform, bromoform, dibromochloromethane and dibromochloromethane for the same price. So, if you could please review our COC and advise on the cost (we have a budget and so would like to know if we are within it).

Also, in regard to the first set of samples that we sent for Ni and TTLC, with the project name “McLaughlin”, can you please provide a status and estimated completion time. Thanks.

Scott Barton
Process Scientist



office: 775.777.8003 x305 fax: 775.777.8004
direct: 775.299.3587 cell: 775.443.7293

2720 Ruby Vista Drive • Suite 101
Elko, Nevada 89801

linkan.biz • scott.barton@linkan.biz

PLEASE NOTE: This message, including any attachments, may include privileged, confidential and/or inside information. Any distribution or use of this communication by anyone other than the intended recipient is strictly prohibited and may be unlawful. If you are not the intended recipient, please notify the sender by replying to this message and then delete it from your system.

CLS LABS
SAMPLE RECEIVING EXCEPTION REPORTS

CLS Labs Job # 19A0196

Problem discovered by: MATT

Date: 1/4/19

Nature of problem

- 1) NO SAMPLE TIME FOR -09.
- 2) NO REQUESTED ANALYSIS FOR TRIP BLANKS ON COC.
- 3) SAMPLE -01, -02, -03 - 624 OUT OF HOLD TIME

Client contacted? Yes No Spoke With: SAM BILLIN

By whom: MATT Date: 1/4/19 Time: 1330 HRS

Client instructions:

- 1) TIME OF SAMPLE FOR -09 IS 11:00
- 2) CREATE NEW SAMPLE FOR TRIP BLANKS ON WORK ORDER RUN GLA L.L. AT TIME OF REQUISITION.

Resolution of problem:

- 1) LOGGED IN AS PER CLIENT INSTRUCTION
- 2) LOGGED IN AS PER CLIENT INSTRUCTION
- 3) LOGGED IN REGARDLESS



CALIFORNIA LABORATORY SERVICES

Committed. Responsive. Flexible.

January 28, 2019

CLS Work Order #: 18B0794

COC #:

Dr. Andrew Kopania
EMKO Environmental, Inc.
551 Lakecrest Dr.
El Dorado Hills, CA 95762

Project Name: Rise

Enclosed are the results of analyses for samples received by the laboratory on 02/16/18 14:40. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233



CALIFORNIA LABORATORY SERVICES

Committed. Responsive. Flexible.

01/28/19 16:03

EMKO Environmental, Inc.
551 Lakecrest Dr.
El Dorado Hills, CA 95762

Project: Rise
Project Number: [none]
Project Manager: Dr. Andrew Kopania

CLS Work Order #: 18B0794
COC #:

Conventional Chemistry Parameters by APHA/EPA Methods

| Analyte | Result | MDL | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|--|--------|-------|-----------------|-------|----------|---------|----------|----------|-----------|-------|
| NBS-265 (18B0794-05) Water Sampled: 02/15/18 15:33 Received: 02/16/18 14:40 | | | | | | | | | | |
| Nitrate as N | 0.23 | 0.053 | 0.40 | mg/L | 1 | 1801394 | 02/16/18 | 02/16/18 | EPA 300.0 | J |



CALIFORNIA LABORATORY SERVICES

Committed. Responsive. Flexible.

01/28/19 16:03

EMKO Environmental, Inc.
551 Lakecrest Dr.
El Dorado Hills, CA 95762

Project: Rise
Project Number: [none]
Project Manager: Dr. Andrew Kopania

CLS Work Order #: 18B0794
COC #:

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

| Analyte | Result | MDL | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|--------|-------|-----------------|-------|-------------|---------------|------|-------------|------|-----------|-------|
| Batch 1801394 - General Prep | | | | | | | | | | | |
| Blank (1801394-BLK1) Prepared & Analyzed: 02/16/18 | | | | | | | | | | | |
| Nitrate as N | ND | 0.053 | 0.40 | mg/L | | | | | | | |
| LCS (1801394-BS1) Prepared & Analyzed: 02/16/18 | | | | | | | | | | | |
| Nitrate as N | 2.01 | 0.053 | 0.40 | mg/L | 2.00 | | 100 | 80-120 | | | |
| LCS Dup (1801394-BSD1) Prepared & Analyzed: 02/16/18 | | | | | | | | | | | |
| Nitrate as N | 2.01 | 0.053 | 0.40 | mg/L | 2.00 | | 100 | 80-120 | 0.04 | 20 | |
| Matrix Spike (1801394-MS1) Source: 18B0794-01 Prepared & Analyzed: 02/16/18 | | | | | | | | | | | |
| Nitrate as N | 2.31 | 0.053 | 0.40 | mg/L | 2.00 | 0.319 | 100 | 80-120 | | | |
| Matrix Spike Dup (1801394-MSD1) Source: 18B0794-01 Prepared & Analyzed: 02/16/18 | | | | | | | | | | | |
| Nitrate as N | 2.36 | 0.053 | 0.40 | mg/L | 2.00 | 0.319 | 102 | 80-120 | 2 | 20 | |



EMKO Environmental, Inc.
551 Lakecrest Dr.
El Dorado Hills, CA 95762

Project: Rise
Project Number: [none]
Project Manager: Dr. Andrew Kopania

CLS Work Order #: 18B0794
COC #:

Notes and Definitions

| | |
|-----|---|
| J | Detected but below the Reporting Limit; therefore, result is an estimated concentration. |
| DET | Analyte DETECTED |
| ND | Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified) |
| NR | Not Reported |
| dry | Sample results reported on a dry weight basis |
| RPD | Relative Percent Difference |

This is a “MDL Report”, thus if the report denotes an “ND” for a particular analyte, it should be noted that the analyte was not detected at or above the MDL.

1830794 cooler: NPDES # 2

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 187399

| | | | | | | | | | | | | | | | | |
|--|--|---|--|---------------------------|---------|-----------|--------------|-------------|--------------------|------------|---------|---|--|--|--|--|
| REPORT TO: | | CLIENT JOB NUMBER | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | | | | |
| NAME AND ADDRESS EMKO Environmental, Inc 551 Lakeside Dr. El Dorado Hills, CA 95762 | | DESTINATION LABORATORY <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA 95742 | | PRESERVATIVES | Ammonia | BOD & TSS | Coliform 15T | Gross Alpha | Radium 226 | Radium 228 | Uranium | EDF REPORT <input type="checkbox"/> YES <input type="checkbox"/> NO | | | | |
| PROJECT MANAGER Andy Kopania 916-718-5511 | | <input type="checkbox"/> OTHER | | | | | | | | | | GLOBAL ID: _____ | | | | |
| PROJECT NAME Rise | | | | | | | | | | | | COMPOSITE: _____ | | | | |
| SAMPLED BY AK | | | | | | | | | | | | FIELD CONDITIONS: _____ | | | | |
| JOB DESCRIPTION email results to: akopania@sbcglobal.net | | | | | | | | | | | | | | | | |
| SITE LOCATION | | | | | | | | | | | | | | | | |

| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | CONTAINER | | PRESERVATIVES | TURN AROUND TIME | | | | | SPECIAL INSTRUCTIONS | | |
|---------|-------|-----------------------|--------|-----------|----------------|---------------|------------------|-------|-------|-------|----|----------------------|-----|--|
| | | | | NO. | TYPE | | 1 DAY | 2 DAY | 3 DAY | 5 DAY | OR | ALT. | ID: | |
| 2-13-18 | 13:30 | D-1 | W | 2 | 1L poly | 2 | | | | | | | | |
| | | | | 1 | 120ml coliform | 3 | | | | | | | | |
| | | | | 1 | 250ml poly | 5 | X | | | | | | | |
| | | | | 1 | 1L poly | 2 | | | | X | | | | |
| | | | | 1 | 1L poly | 2 | | | | | | | X | |
| 2-13-18 | 12:50 | ED-1 | W | 3 | 1L poly | 2 | | | | | | | | |
| | | | | 1 | 120ml coliform | 3 | | | | | | | | |
| | | | | 1 | 1L poly | 2 | | | | | | | X | |
| | | | | 1 | 1L poly | 3 | | | | | X | | | |
| | | | | 1 | 1L poly | 3 | X | | | | | | | |
| | | | | 1 | 250ml poly | 5 | X | | | | | | | |

| | | | | | | | |
|-------------------------------|--|--------------------------------|--|------------------------------|------------|---|-------|
| SUSPECTED CONSTITUENTS | | PRESERVATIVES: | | (1) HCL | (3) = COLD | (5) = H ₂ SO ₄ | (7) = |
| | | | | (2) HNO ₃ | (4) = NaOH | (6) = Na ₂ S ₂ O ₈ | |
| RELINQUISHED BY (SIGN) | | PRINT NAME / COMPANY | | DATE / TIME | | RECEIVED BY (SIGN) | |
| | | A. Kopania / EMKO | | 2/16/18 14:35 | | | |
| RECD AT LAB BY | | DATE / TIME | | CONDITIONS / COMMENTS | | | |
| | | 2-16-18 HPLC | | 2-5 | | | |
| SHIPPED BY: | | <input type="checkbox"/> FED X | | <input type="checkbox"/> UPS | | <input type="checkbox"/> OTHER | |
| | | | | | | AIR BILL # | |

Gold-Project Mgr./Field Sample/Terms and Conditions
Print - Origin/Terms and Conditions
Yellow - Lab file copy/Terms and Conditions
White-Lab/Terms and conditions

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 187398

18B0794 cooler: DRAIN 2

| | | | | | | | | | | | | | | |
|---|-------|---|--------|---|-------------|--------------------------------|---|----------------------|---|-------|-------|-------|------|-------------|
| REPORT TO: | | CLIENT JOB NUMBER | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | | |
| NAME AND ADDRESS EMKO Environmental, Inc. 551 Lakeside Dr. El Dorado Hills, CA 95762 | | DESTINATION LABORATORY | | PRESERVATIVES Metals - see list General Mineral Cyanide + Amenable Cyan. Vol / TPHG SVOC PCB TPHD + MD | | | | | EDF REPORT <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | | |
| PROJECT MANAGER Andy Kepania PROJECT NAME R. SW | | <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA 95742 | | | | | | | GLOBAL ID: _____ | | | | | |
| SAMPLED BY AK | | <input type="checkbox"/> OTHER | | COMPOSITE: | | | | | FIELD CONDITIONS: | | | | | |
| JOB DESCRIPTION email results to: akepania@sbcglobal.net | | | | TURN AROUND TIME | | | | | SPECIAL INSTRUCTIONS | | | | | |
| SITE LOCATION | | | | | | | | | OR | | | | | |
| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | CONTAINER NO. | TYPE | | | | 1 DAY | 2 DAY | 3 DAY | 5 DAY | ALT. | ID: |
| 2-13-18 | 13:30 | D-1 | W | 1 | 250ml Amber | 3 | | | | | | | | |
| | | | | 4 | VOA | 1 | | | | | | | | |
| | | | | 1 | 1L poly | 3 | X | | | | | | | |
| | | | | 1 | 500ml poly | 2 | X | | | | | | | |
| | | | | 1 | 250ml poly | 4 | | X | | | | | | |
| | | | | 1 | 1L Amber | 3 | | | | | | | | |
| | | | | 2 | 1L Amber | 3 | | | | X | | | | |
| 2-13-18 | 12:50 | ED-1 | | 1 | 250ml Amber | 3 | | | | | | | | |
| | | | | 4 | VOA | 1 | | | | | | | | INVOICE TO: |
| | | | | 1 | 1L poly | 3 | X | | | | | | | |
| | | | | 1 | 500ml poly | 2 | X | | | | | | | PO # |
| | | | | 1 | 250ml poly | 4 | | X | | | | | | QUOTE # |
| | | | | 3 | 1L Amber | 3 | | | X | X | | | | |
| SUSPECTED CONSTITUENTS | | | | PRESERVATIVES: | | | | | (1) HCL (2) HNO ₃ (3) = COLD (4) = NaOH (5) = H ₂ SO ₄ (6) = Na ₂ S ₂ O ₅ (7) = | | | | | |
| RELINQUISHED BY (SIGN) | | PRINT NAME / COMPANY | | DATE / TIME | | RECEIVED BY (SIGN) | | PRINT NAME / COMPANY | | | | | | |
| | | A. Kepania/Emko | | 2/16/18 14:35 | | | | | | | | | | |
| REC'D AT LAB BY | | DATE / TIME | | CONDITIONS / COMMENTS | | | | | | | | | | |
| | | 2-16-18 1440 | | 25. | | | | | | | | | | |
| SHIPPED BY: | | <input checked="" type="checkbox"/> FED X | | <input type="checkbox"/> UPS | | <input type="checkbox"/> OTHER | | AIR BILL # | | | | | | |

Gold-Project Mgr./Field Sampler/Terms and conditions
Pink- Origin/Terms and Conditions
Yellow- Lab file copy/Terms and Conditions
White- Lab/Terms and conditions

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.;

LOG No 187401

18B0794 COOLER: NPDES #1

| | | | | | | | | | | | |
|---|--|---|--|--|--|--|--|--|--|--|--|
| REPORT TO: | | CLIENT JOB NUMBER | | ANALYSIS REQUESTED | | | GEOTRACKER: | | | | |
| NAME AND ADDRESS EMKO Environmental, Inc 551 Lakeside Dr El Dorado Hills, CA 95762 | | DESTINATION LABORATORY <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA 95742 | | PRESERVATIVES Ammonia BOD + TSS Coliform 1ST Gross Alpha Radium 226 Radium 228 Uranium | | | EDF REPORT <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | |
| PROJECT MANAGER Anbu Kupania 916-718-5511 | | <input type="checkbox"/> OTHER | | | | | GLOBAL ID: _____ | | | | |
| PROJECT NAME Rise | | | | | | | COMPOSITE: | | | | |
| SAMPLED BY AK | | | | | | | FIELD CONDITIONS: | | | | |
| JOB DESCRIPTION email results to: akupania@sbcglobal.net | | | | | | | TURN AROUND TIME | | | | |
| SITE LOCATION | | | | | | | SPECIAL INSTRUCTIONS | | | | |

| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | CONTAINER | | PRESERVATIVES | TURN AROUND TIME | | | | | SPECIAL INSTRUCTIONS | | | |
|---------|-------|-----------------------|--------|-----------|------------|---------------|------------------|-------|-------|-------|----|----------------------|--|--|--|
| | | | | NO. | TYPE | | 1 DAY | 2 DAY | 3 DAY | 5 DAY | OR | ALT. ID: | | | |
| 2-15-10 | 10:40 | IMD-1 | W | 4 | 1L poly | 2 | | | | | | | | | |
| | | | | 2 | 1L poly | 3 | X | | X | | | | | | |
| | | | | 1 | 120ml poly | | | | X | | | | | | |
| | | | | 1 | 250ml poly | 5 | X | | | | | | | | |
| 2-15-10 | 9:45 | IMD-2 | | 4 | 1L poly | 2 | | | X | X | X | | | | |
| | | | | 2 | 1L poly | 3 | | X | | X | | | | | |
| | | | | 1 | 120ml poly | | | | X | | | | | | |
| | | | | 1 | 250ml poly | 5 | X | | | | | | | | |
| 2-15-10 | 15:33 | NGS-265 | | 4 | 1L poly | 2 | | | X | X | X | | | | |
| | 15:33 | | | 2 | 1L poly | 3 | | X | | X | | | | | |
| | 13:40 | | | 1 | 120ml poly | | | | X | | | | | | |
| | 15:33 | | | 1 | 250ml poly | 5 | X | | | | | | | | |

| | | | | | | | | | | |
|------------------------|--------------------------------|------------------------------|--------------------------------|----------------------|----------------------|------------|------------|--------------------------------------|---|-------|
| SUSPECTED CONSTITUENTS | | PRESERVATIVES: | | (1) HCL | (2) HNO ₃ | (3) = COLD | (4) = NaOH | (5) = H ₂ SO ₄ | (6) = Na ₂ S ₂ O ₃ | (7) = |
| RELINQUISHED BY (SIGN) | PRINT NAME / COMPANY | DATE / TIME | RECEIVED BY (SIGN) | PRINT NAME / COMPANY | | | | | | |
| | A. Kupania / EMKO | 2/14/10 14:35 | | | | | | | | |
| REC'D AT LAB BY | DATE / TIME | CONDITIONS / COMMENTS | | | | | | | | |
| | 2-16-10 1440 | 2-S | | | | | | | | |
| SHIPPED BY | <input type="checkbox"/> FED X | <input type="checkbox"/> UPS | <input type="checkbox"/> OTHER | AIR BILL # | | | | | | |

White-Lab Terms and conditions; Yellow- Lab the copy Terms and Conditions; Pink- Origin Terms and Conditions; Gold-Project Mgr Field Sampler/Terms and conditions

Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 186636

13B0794

color: SHAFT 2

REPORT TO:

CLIENT JOB NUMBER

ANALYSIS REQUESTED

GEOTRACKER:

NAME AND ADDRESS
 Emko Environmental, Inc.
 551 Lakecrest Dr.
 El Dorado Hills, CA 95762
 PROJECT MANAGER
 Andy Kopania 916-718-5511
 PROJECT NAME
 Rise
 SAMPLED BY
 AK
 JOB DESCRIPTION
 email results to:
 akopania@sbcglobal.net
 SITE LOCATION

DESTINATION LABORATORY

CLS (916) 638-7301
 3249 FITZGERALD RD.
 RANCHO CORDOVA, CA
 95742

OTHER

PRESERVATIVES

Metals - See List
 General Minerals
 Cyanide + Amenable Cyan.
 VOC/TPHG
 SVOC
 PCB
 TPHD + MO

EDF REPORT YES NO
 GLOBAL ID: _____

COMPOSITE:

FIELD CONDITIONS:

TURN AROUND TIME

SPECIAL INSTRUCTIONS

| 1 DAY | 2 DAY | 3 DAY | 5 DAY |
|-------|-------|-------|-------|
| | | | |

OR
 ALT. ID:

| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | CONTAINER | | | | | | | | | |
|---------|-------|-----------------------|--------|-----------|-------------|---|---|---|--|--|--|--|--|
| | | | | NO. | TYPE | | | | | | | | |
| 2-15-17 | 14:30 | NBS-1300 | W | 4 | 40mL VOA | 1 | | | | | | | |
| | 14:30 | | | 2 | 1L Amber | 3 | | | | | | | |
| | 16:35 | | | 1 | 1L Amber | 3 | | | | | | | |
| | 16:35 | | | 1 | 1L poly | 3 | X | | | | | | |
| | 16:35 | | | 1 | 500mL poly | 2 | X | | | | | | |
| | 16:35 | | | 1 | 250mL poly | 4 | | X | | | | | |
| 2-15-17 | 18:10 | NBS-2300 | | 1 | 250mL Amber | 3 | | | | | | | |
| | | | | 1 | 1L Amber | 3 | | | | | | | |
| | | | | 1 | 1L poly | 3 | X | | | | | | |
| | | | | 1 | 500mL poly | 2 | X | | | | | | |
| | | | | 1 | 250mL Amber | 3 | | | | | | | |
| | | | | 1 | 1L poly | 3 | | | | | | | |
| | | | | 1 | 500mL poly | 2 | X | | | | | | |
| | | | | 1 | 250mL Amber | 3 | | | | | | | |
| | | | | 1 | 250mL poly | 4 | | | | | | | |

see shellie for specific METALS to be analyzed

SUSPECTED CONSTITUENTS

PRESERVATIVES: (1) HCL (2) HNO₃ (3) = COLD (4) = NaOH (5) = H₂SO₄ (6) = Na₂S₂O₅ (7) =

| | | | | |
|------------------------|--|-----------------------|--------------------|----------------------|
| RELINQUISHED BY (SIGN) | PRINT NAME / COMPANY | DATE / TIME | RECEIVED BY (SIGN) | PRINT NAME / COMPANY |
| | A. Kopania / Emko | 2/16/18 14:35 | | |
| REC'D AT LAB BY | DATE / TIME | CONDITIONS / COMMENTS | | |
| | 2-16-18 1440 | 2-5 | | |
| SHIPPED BY | <input type="checkbox"/> FED X <input type="checkbox"/> UPS <input type="checkbox"/> OTHER | AIR BILL # | | |

Good Project Mgr Field Sample Terms and conditions
 Pink - Original Terms and Conditions
 Yellow - Lab file copy Terms and Conditions
 White - Lab Terms and conditions

1800794

cooler: SHAFT 2

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 186635

| | | | | | | | | | | | | | | | | | | | | | | |
|--|-------|---|--------|------------------------------|---|--------------------------------|---|---------------------------------|--------------------|--------------------------|--|---|--|-------|--|----------------------|-------|-------|-------|-------|------|-----|
| REPORT TO: | | CLIENT JOB NUMBER | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | | | | | | | | | | |
| NAME AND ADDRESS Emko Environmental, Inc. 551 Lakecrest Dr El Dorado Hills CA 95762 | | DESTINATION LABORATORY <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA. 95742 | | PRESERVATIVES | Ammonia BOD + TSS Coliform BT Cress Alpha Radium 226 Radium 228 Uranium | | | | | | EDF REPORT <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | | | | | | | | |
| PROJECT MANAGER Andra Kopania 916-718-5511 | | <input type="checkbox"/> OTHER | | | | | | | | | GLOBAL ID: _____ | | | | | | | | | | | |
| PROJECT NAME Kiser | | | | | | | | | | | COMPOSITE: | | | | | | | | | | | |
| SAMPLED BY AK | | | | | | | | | | | FIELD CONDITIONS: | | | | | | | | | | | |
| JOB DESCRIPTION email results to: akopania@sbcglobal.net | | | | | | | | | | | TURN AROUND TIME | | | | | SPECIAL INSTRUCTIONS | | | | | | |
| SITE LOCATION | | | | | | | | | | | | | | | | OR | | | | | | |
| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | | | | | | | | CONTAINER NO | TYPE | | | | | 1 DAY | 2 DAY | 3 DAY | 5 DAY | ALT. | ID: |
| 2-15-18 | 18:10 | NBS-2300 | W | | | | | | | | 1 | 1L poly | | | | | | | | | | |
| | | | | | | | | | | | 2 | 1L poly | | | | | | | | | | |
| | | | | | | | | | | | 1 | 1L poly | | | | | | | | | | |
| | | | | 1 | 120ml Coliform | | X | | | | | | | | | | | | | | | |
| | | | | 1 | 250ml poly | | X | | | | | | | | | | | | | | | |
| | | | | 1 | 1L poly | | X | | | | | | | | | | | | | | | |
| | | | | 1 | 1L poly | | | X | | | | | | | | | | | | | | |
| SUSPECTED CONSTITUENTS | | | | | | PRESERVATIVES: | | (1) HCL (2) HNO ₃ | | (3) = COLD (4) = NaOH | | (5) = H ₂ SO ₄ (6) = Na ₂ S ₂ O ₈ | | (7) = | | | | | | | | |
| RELINQUISHED BY (SIGN) | | PRINT NAME / COMPANY | | DATE / TIME | | RECEIVED BY (SIGN) | | PRINT NAME / COMPANY | | | | | | | | | | | | | | |
| | | A Kopania / Emko | | 2/16/18 14:35 | | | | | | | | | | | | | | | | | | |
| REC'D AT LAB BY: | | DATE / TIME | | CONDITIONS / COMMENTS: | | | | | | | | | | | | | | | | | | |
| | | 2-16-18 1440 | | 2-6 | | | | | | | | | | | | | | | | | | |
| SHIPPED BY: | | <input type="checkbox"/> FED X | | <input type="checkbox"/> UPS | | <input type="checkbox"/> OTHER | | AIR BILL # | | | | | | | | | | | | | | |

Gold-Project Mgr./Field Sampler/Terms and conditions
Pink- Origin/Terms and Conditions
Yellow- Lab file copy/Terms and Conditions
White-Lab/Terms and conditions

1860-794

Locker: SHAFT 1

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 186634

| REPORT TO: | | | CLIENT JOB NUMBER | | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | | | | | | |
|--|------------------------|-----------------------|---|---------------|-------------|--|-------|-------|--------------------|--|--|----------------------|--|--|--|----------------------|--|--|--|--|
| NAME AND ADDRESS EMKO Environmental, Inc. 551 Lakewest Dr. El Dorado Hills CA 95762 | | | DESTINATION LABORATORY <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA 95742 | | | PRESERVATIVES Metals - see List General Minerals Cyanide + Ammonia Cyan. VOC / TPH6 SVOC PCB TPHD + MD | | | | | EDF REPORT <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | | | | | | |
| PROJECT MANAGER Andy Kopania 916-714-5511 | | | <input type="checkbox"/> OTHER | | | | | | | | COMPOSITE: | | | | | GLOBAL ID: _____ | | | | |
| PROJECT NAME Rise | | | | | | | | | | | FIELD CONDITIONS: | | | | | TURN AROUND TIME | | | | |
| SAMPLED BY AK | | | | | | | | | | | JOB DESCRIPTION email results to: akopania@sbcylab.net | | | | | SPECIAL INSTRUCTIONS | | | | |
| SITE LOCATION | | | | | | | | | | | OR | | | | | | | | | |
| | | | | | | | | | | | ALT. ID: | | | | | | | | | |
| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | CONTAINER NO. | TYPE | 1 DAY | 2 DAY | 3 DAY | 5 DAY | see Shellie for specific METALS to be analyzed | | | | | | | | | | |
| 2-15-18 | 17:20 | NBS-1600 | W | 1 | 1L amber | | | | | | | | | | | | | | | |
| | 17:20 | | | 1 | 500mL poly | X | | | | | | | | | | | | | | |
| | 17:20 | | | 1 | 250mL poly | | X | | | | | | | | | | | | | |
| | 17:20 | | | 1 | 250mL amber | | | | X | | | | | | | | | | | |
| 2-15-18 | 17:40 | | | 1 | 1L poly | | X | | | | | | | | | | | | | |
| 2-16-18 | 11:44 12:38 | | | 4 | 40mL vial | | | X | | | | | | | | | | | | |
| 2-16-18 | 11:44 12:38 | | | 2 | 1L amber | | | | X | | | | | | | | | | | |
| SUSPECTED CONSTITUENTS | | | | | | PRESERVATIVES: (1) HCL (2) HNO ₃ (3) = COLD (4) = NaOH (5) = H ₂ SO ₄ (6) = Na ₂ S ₂ O ₈ (7) = | | | | | | | | | | | | | | |
| RELINQUISHED BY (SIGN) | | | PRINT NAME / COMPANY | | | DATE / TIME | | | RECEIVED BY (SIGN) | | | PRINT NAME / COMPANY | | | | | | | | |
| | | | A. Kopania / EMKO | | | 2/16/18 14:35 | | | | | | | | | | | | | | |
| REC'D AT LAB BY | | | DATE / TIME | | | CONDITIONS / COMMENTS | | | | | | | | | | | | | | |
| | | | 2-16-18 1440 | | | 25 | | | | | | | | | | | | | | |
| SHIPPED BY | | | <input checked="" type="checkbox"/> FED X <input type="checkbox"/> UPS <input type="checkbox"/> OTHER | | | AIR BILL # | | | | | | | | | | | | | | |

Gold-Project Mgr./Field Sampler/Terms and conditions
Pink - Origin/Terms and Conditions
Yellow - Lab file copy/Terms and Conditions
White - Lab/Terms and conditions

CLS LABS
SAMPLE RECEIVING EXCEPTION REPORTS

CLS Labs Job # 1330794

Problem discovered by: 

Date: 2/16/13

Nature of problem

Sulfite Chlorine, Total Chlorine, Residual Ph Dissolved O2

BOD, 1ST, NO2, NO3, MBAS

(Circle analysis above) Received out of HOLD time.

Client contacted? Yes _____ No _____ Spoke With: _____

By whom: _____ Date: ___/___/___ Time: _____ HRS

Client instructions:

Resolution of problem:

Logged in regardless and will be ran for analysis requested.

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 187399

18B074 cooler: NPDES # 2

| REPORT TO: | | | CLIENT JOB NUMBER | | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | | | |
|--|-------|-----------------------|---|---------------|-------------------|--|---|---|--------------------|---|---|----------------------|--|--|--|--|--|
| NAME AND ADDRESS EMKO Environmental, Inc 551 Lakeside Dr. El Dorado Hills, CA 95762 | | | DESTINATION LABORATORY <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA 95742 | | | PRESERVATIVES Ammonia BOD + TSS Calcium 15T Gross Alpha Radium 226 Radium 228 Uranium | | | | | EDF REPORT <input type="checkbox"/> YES <input type="checkbox"/> NO | | | | | | |
| PROJECT MANAGER Andy Kopania 916-718-5511 | | | <input type="checkbox"/> OTHER | | | | | | | | GLOBAL ID: _____ | | | | | | |
| PROJECT NAME Rise | | | | | | COMPOSITE: | | | | | FIELD CONDITIONS: | | | | | | |
| SAMPLED BY AK | | | | | | TURN AROUND TIME | | | | | SPECIAL INSTRUCTIONS | | | | | | |
| JOB DESCRIPTION email results to: akopania@sbcglobal.net | | | | | | 1 DAY 2 DAY 3 DAY 5 DAY | | | | | OR ALT. ID: | | | | | | |
| SITE LOCATION | | | | | | | | | | | | | | | | | |
| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | CONTAINER NO. | TYPE | | | | | | | | | | | | |
| 2-13-18 | 13:30 | D-1 | W | 2 | 1L poly | 2 | | | | | | | | | | | |
| | | | | 1 | 120ml calibration | 3 | | | | | | | | | | | |
| | | | | 1 | 250ml poly | 5 | X | | | | | | | | | | |
| | | | | 1 | 1L poly | 2 | | | | X | | | | | | | |
| | | | | 1 | 1L poly | 2 | | | | | | X | | | | | |
| | | | | 1 | 1L poly | 3 | | | X | | | | | | | | |
| | | | | 1 | 1L poly | 3 | | X | | | | | | | | | |
| 2-13-18 | 12:50 | ED-1 | | 3 | 1L poly | 2 | | | | X | X | | | | | | |
| | | | | 1 | 120ml calibration | 3 | | | X | | | | | | | | |
| | | | | 1 | 1L poly | 2 | | | | | | X | | | | | |
| | | | | 1 | 1L poly | 3 | | | X | | | | | | | | |
| | | | | 1 | 1L poly | 3 | | X | | | | | | | | | |
| | | | | 1 | 250ml poly | 5 | X | | | | | | | | | | |
| SUSPECTED CONSTITUENTS | | | | | | PRESERVATIVES: (1) HCL (2) HNO ₃ (3) = COLD (4) = NaOH (5) = H ₂ SO ₄ (6) = Na ₂ S ₂ O ₅ (7) = | | | | | | INVOICE TO: | | | | | |
| RELINQUISHED BY (SIGN) | | | PRINT NAME / COMPANY | | | DATE / TIME | | | RECEIVED BY (SIGN) | | | PRINT NAME / COMPANY | | | | | |
| | | | A. Kopania / EMKO | | | 2/16/18 14:35 | | | | | | | | | | | |
| RECD AT LAB BY | | | DATE / TIME | | | CONDITIONS / COMMENTS | | | | | | | | | | | |
| | | | 2-16-18 | | | HALLO | | | | | | 2-5 | | | | | |
| SHIPPED BY | | | <input type="checkbox"/> FED X <input type="checkbox"/> UPS <input type="checkbox"/> OTHER | | | AIR BILL # | | | | | | | | | | | |

Yellow - Lab file copy Terms and Conditions White - Lab Terms and Conditions Pink - Original Terms and Conditions Gold - Project Mgr./Lead Sampler/Terms and conditions

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 187401

18B0794

COOLER: NPDES #1

| REPORT TO: | | | CLIENT JOB NUMBER | | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | |
|--|-------|-----------------------|--|-----|----------------|--|---|---|--------------------|---|--|----------------------|------------|--|--|
| NAME AND ADDRESS EMKO Environmental, Inc 551 Lakecrest Dr El Dorado Hills, CA 95762 | | | DESTINATION LABORATORY <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD RANCHO CORDOVA, CA 95742 | | | PRESERVATIVES Ammonia BOD + TSS Coliform / ST Gross Alpha Radium 226 Radium 228 Uranium | | | | | EDF REPORT <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | |
| PROJECT MANAGER Ande Kupanin 916-718-5511 | | | <input type="checkbox"/> OTHER | | | | | | | | GLOBAL ID: _____ | | | | |
| PROJECT NAME Rise | | | | | | COMPOSITE: | | | | | FIELD CONDITIONS: | | | | |
| SAMPLED BY AK | | | | | | TURN AROUND TIME | | | | | SPECIAL INSTRUCTIONS | | | | |
| JOB DESCRIPTION email results to: akepanin@sbcglobal.net | | | | | | 1 DAY | | | | | OR | | | | |
| SITE LOCATION | | | | | | 2 DAY | | | | | ALT. ID: | | | | |
| | | | | | | 3 DAY | | | | | | | | | |
| | | | | | | 5 DAY | | | | | | | | | |
| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | NO. | CONTAINER TYPE | 2 | 3 | 5 | 1 | 2 | 3 | 5 | INVOICE TO | | |
| 2-15-10 | 10:40 | IMD-1 | W | 4 | 1L poly | X | X | X | | | | | | | |
| | | | | 2 | 1L poly | X | X | | | | | | | | |
| | | | | 1 | 120ml coliform | | X | | | | | | | | |
| | | | | 1 | 250ml poly | X | | | | | | | | | |
| 2-15-10 | 9:45 | IMD-2 | | 4 | 1L poly | | | X | X | X | | | | | |
| | | | | 2 | 1L poly | X | X | | | | | | | | |
| | | | | 1 | 120ml coliform | | X | | | | | | | | |
| | | | | 1 | 250ml poly | X | | | | | | | | | |
| 2-15-10 | 15:33 | NBS-265 | | 4 | 1L poly | | | X | X | X | | | | | |
| | 15:33 | | | 2 | 1L poly | X | X | | | | | | | | |
| | 13:40 | | | 1 | 120ml coliform | | X | | | | | | | | |
| | 15:33 | | | 1 | 250ml poly | X | | | | | | | | | |
| SUSPECTED CONSTITUENTS | | | | | | PRESERVATIVES: (1) HCL (2) HNO ₃ (3) = COLD (4) = NaOH (5) = H ₂ SO ₄ (6) = Na ₂ S ₂ O ₃ (7) = | | | | | | | | | |
| RELINQUISHED BY (SIGN) | | | PRINT NAME / COMPANY | | | DATE / TIME | | | RECEIVED BY (SIGN) | | | PRINT NAME / COMPANY | | | |
| | | | A. Kupanin / EMKO | | | 2/14/10 14:35 | | | | | | | | | |
| RECD AT LAB BY | | | DATE / TIME | | | CONDITIONS / COMMENTS | | | | | | | | | |
| | | | 2-16-10 1440 | | | 2-S | | | | | | | | | |
| SHIPPED BY | | | <input type="checkbox"/> FED X <input type="checkbox"/> UPS <input type="checkbox"/> OTHER | | | AIR BILL # | | | | | | | | | |

Gold-Project Mgr./Field Sampler/Terms and conditions
Pink- Origin/Terms and Conditions
Yellow- Lab file copy/Terms and Conditions
White-Lab/Terms and conditions

18B 0794

Cooler: DRAIN 1

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 187400

| | | | | | | | | | | | | | | | |
|---|--|--|---|--|--|--|--|--|--|--|---|--|--|--|--|
| REPORT TO: | | | CLIENT JOB NUMBER | | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | |
| NAME AND ADDRESS EMKO Environmental, Inc 551 Lakecrest Dr. El Dorado Hills, CA 95762 | | | DESTINATION LABORATORY <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA 95742 | | | PRESERVATIVES Metals - see List General Mineral Cyanide + Ammonia Cyanide VOL / TPH-G SVOC PCB TPHD + MO | | | | | EDF REPORT <input type="checkbox"/> YES <input type="checkbox"/> NO | | | | |
| PROJECT MANAGER Andy Kopania PHONE# 916-718-5511 | | | <input type="checkbox"/> OTHER | | | | | | | | GLOBAL ID: _____ | | | | |
| PROJECT NAME Rise | | | OTHER | | | COMPOSITE: | | | | | FIELD CONDITIONS: | | | | |
| SAMPLED BY AK | | | JOB DESCRIPTION email results to: akopania@sbcglobal.net | | | TURN AROUND TIME | | | | | SPECIAL INSTRUCTIONS | | | | |
| SITE LOCATION | | | OR | | | 1 DAY | | | | | 2 DAY | | | | |
| DATE | | | TIME | | | SAMPLE IDENTIFICATION | | | | | MATRIX | | | | |
| NO. | | | TYPE | | | CONTAINER | | | | | ALT. ID: | | | | |
| 2-15-18 | | | 10:40 | | | IMD-1 | | | | | W | | | | |
| ↓ | | | ↓ | | | ↓ | | | | | ↓ | | | | |
| 2-15-18 | | | 9:45 | | | IMD-2 | | | | | W | | | | |
| ↓ | | | ↓ | | | ↓ | | | | | ↓ | | | | |
| SUSPECTED CONSTITUENTS | | | PRESERVATIVES: | | | (1) HCL (2) HNO ₃ | | | | | (3) = COLD (4) = NaOH | | | | |
| RELINQUISHED BY (SIGN) | | | PRINT NAME / COMPANY | | | DATE / TIME | | | | | RECEIVED BY (SIGN) | | | | |
| A. Kopania | | | A. Kopania / EmKO | | | 2/16/18/14:35 | | | | | | | | | |
| RECD AT LAB BY | | | DATE / TIME | | | CONDITIONS / COMMENTS | | | | | AIR BILL # | | | | |
| SHIPPED BY | | | <input type="checkbox"/> FED X | | | <input type="checkbox"/> UPS | | | | | <input type="checkbox"/> OTHER | | | | |
| 2/16/18 | | | 1440 | | | 25- | | | | | | | | | |

Gold-Project Mgr / Field Sampler Terms and Conditions
Pink - Origin/Terms and Conditions
Yellow - Lab file copy/Terms and Conditions
White - Lab/Terms and Conditions

13B0799

CL SHAFT 1

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 186621

| REPORT TO: | | CLIENT JOB NUMBER | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------|---|--------|---|--------------|--------------------|---|----------------------|---|---|---|---|--|-------|-------|-------|-------|-------|--|--|--|--|--|---|--|--|--|--|----------|--|--|--|
| NAME AND ADDRESS EMKO Environmental, Inc. 551 Lakeside Dr. El Dorado Hills, CA 95762 | | DESTINATION LABORATORY | | PRESERVATIVES Metals - see List General Minerals Cyanide + Ammonia Lyso VUL/TPHC SVOC PCB TPH D+MU | | | | | EDF REPORT <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | | | | | | | | | | | | | | | | | | | | |
| PROJECT MANAGER Ande Kopania 916-718-5511 | | <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA 95742 | | | | | | | GLOBAL ID: _____ | | | | | | | | | | | | | | | | | | | | | | | |
| PROJECT NAME Rise | | <input type="checkbox"/> OTHER | | COMPOSITE: | | | | | FIELD CONDITIONS: | | | | | | | | | | | | | | | | | | | | | | | |
| SAMPLED BY AK | | | | TURN AROUND TIME | | | | | SPECIAL INSTRUCTIONS | | | | | | | | | | | | | | | | | | | | | | | |
| JOB DESCRIPTION email results to: akopania@shyglobal.net | | | | <table border="1"> <tr> <th colspan="5">OR</th> </tr> <tr> <th>1 DAY</th> <th>2 DAY</th> <th>3 DAY</th> <th>4 DAY</th> <th>5 DAY</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> | | | | | OR | | | | | 1 DAY | 2 DAY | 3 DAY | 4 DAY | 5 DAY | | | | | | <table border="1"> <tr> <th colspan="2">ALT. ID:</th> </tr> <tr> <td></td> <td></td> </tr> </table> | | | | | ALT. ID: | | | |
| OR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 DAY | 2 DAY | 3 DAY | 4 DAY | 5 DAY | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ALT. ID: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SITE LOCATION | | | | | | | | | see Shellie for specific METALS to be analyzed | | | | | | | | | | | | | | | | | | | | | | | |
| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | CONTAINER NO. | TYPE | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-15-18 | 13:40 | NBS-265 | W | 4 | 40 mL VVA | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 13:42 | | | 2 | 1L Amber | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 15:33 | | | 1 | amber | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 13:40 | | | 1 | 250 mL poly | 4 | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| | 13:40 | | | 1 | 500 mL poly | 2 | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 13:42 | | | 1 | 250 mL Amber | 3 | | | | | | X | | | | | | | | | | | | | | | | | | | | |
| | 15:33 | | | 1 | 1L poly | 3 | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| | 14:05 | NBS-900 | | 4 | 40 mL VVA | 1 | | | X | | | | | | | | | | | | | | | | | | | | | | | |
| | 14:05 | | | 3 | 1L Amber | 3 | | | | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 16:00 | | | 1 | 1L poly | 3 | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| | 16:00 | | | 1 | 250 mL Amber | 3 | | | | | | X | | | | | | | | | | | | | | | | | | | | |
| | 16:00 | | | 1 | 500 mL poly | 2 | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 16:00 | | | 1 | 250 mL poly | 4 | | | X | | | | | | | | | | | | | | | | | | | | | | | |
| SUSPECTED CONSTITUENTS | | | | PRESERVATIVES: | | | | | (1) HCL (2) HNO ₃ (3) = COLD (4) = NaOH (5) = H ₂ SO ₄ (6) = Na ₂ S ₂ O ₅ (7) = | | | | | | | | | | | | | | | | | | | | | | | |
| RELINQUISHED BY (SIGN) | | PRINT NAME / COMPANY | | DATE / TIME | | RECEIVED BY (SIGN) | | PRINT NAME / COMPANY | | | | | | | | | | | | | | | | | | | | | | | | |
| | | A Kopania / EMKO | | 2/16/18 14:35 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REC'D AT LAB BY: | | DATE / TIME | | CONDITIONS / COMMENTS: | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 2/16/18 14:00 | | 2-5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SHIPPED BY: | | <input type="checkbox"/> FEDX <input type="checkbox"/> UPS <input type="checkbox"/> OTHER | | AIR BILL # | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

White-Lab Terms and Conditions Yellow-Lab file copy/terms and Conditions Pink- Origin/Terms and Conditions Gold-Project Mgr./Field Sampler/Terms and Conditions

SL

13B0794

COOLER: SHAFT 2

Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 186636

| REPORT TO: NAME AND ADDRESS EMKO Environmental, Inc. 551 Lakewest Dr. El Dorado Hills, CA 95762 PROJECT MANAGER: Andy Kapania 916-718-5511 PROJECT NAME: Rise SAMPLED BY: AK JOB DESCRIPTION: email results to: akapania@sbcglobal.net SITE LOCATION: | | | CLIENT JOB NUMBER: DESTINATION LABORATORY: <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA 95742 <input type="checkbox"/> OTHER | | ANALYSIS REQUESTED METALS - see List General Minerals Cyanide + Ammonia Cyan VOC / TPH6 SVOC PCB TPHD + MO | | | GEOTRACKER: EDF REPORT <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO GLOBAL ID: | | | | | | | | |
|---|-------|-----------------------|--|---------------|--|--|--------------------------------|--|---|-----------------------|--|--|--|-------|--|--|
| | | | | | | | | COMPOSITE: FIELD CONDITIONS: | | | | | | | | |
| | | | | | | | | TURN AROUND TIME 1 DAY 2 DAY 3 DAY 5 DAY | | | | SPECIAL INSTRUCTIONS OR ALT. ID: | | | | |
| | | | | | | | | | | | | see shellie for specific METALS to be analyzed | | | | |
| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | CONTAINER NO. | TYPE | | | | | | | | | | | |
| 2-15-17 | 14:30 | NBS-1300 | W | 4 | 40mL VOA | | | | | | | | | | | |
| | 14:30 | | | 2 | 1L Amber | | | | | | | | | | | |
| | 16:35 | | | 1 | 1L Amber | | | | | | | | | | | |
| | 16:35 | | | 1 | 1L poly | | | X | | | | | | | | |
| | 16:35 | | | 1 | 500mL poly | | | X | | | | | | | | |
| | 16:35 | | | 1 | 250mL poly | | | | X | | | | | | | |
| | 16:35 | | | 1 | 250mL poly | | | | | | | | | | | |
| 2-15-17 | 18:10 | NBS-2300 | | 1 | 1L Amber | | | | | | | | | | | |
| | | | | 1 | 1L poly | | | X | | | | | | | | |
| | | | | 1 | 500mL poly | | | X | | | | | | | | |
| | | | | 1 | 250mL poly | | | | | | | | | | | |
| | | | | 1 | 4mL Amber | | | | | | | | | | | |
| | | | | 1 | 250mL poly | | | | | | | | | | | |
| SUSPECTED CONSTITUENTS | | | | | PRESERVATIVES: | | | (1) HCL (2) HNO ₃ | | (3) = COLD (4) = NaOH | | (5) = H ₂ SO ₄ (6) = Na ₂ S ₂ O ₅ | | (7) = | | |
| RELINQUISHED BY (SIGN) | | | PRINT NAME / COMPANY | | DATE / TIME | | RECEIVED BY (SIGN) | | | PRINT NAME / COMPANY | | | | | | |
| | | | A. Kapania / EMKO | | 2/16/18 14:35 | | | | | | | | | | | |
| REC'D AT LAB BY | | | | | DATE / TIME | | CONDITIONS / COMMENTS | | | | | | | | | |
| | | | | | 2-16-18 14:40 | | | | | 2-5 | | | | | | |
| SHIPPED BY | | | <input type="checkbox"/> FED X | | <input type="checkbox"/> UPS | | <input type="checkbox"/> OTHER | | | AIR BILL # | | | | | | |

Gold-Project Mgr./Field Sampler/Terms and conditions
 Pink- Origin/Terms and Conditions
 Yellow- Lab file copy/Terms and Conditions
 White-Lab/Terms and conditions

1800714

COOLER: SHAFT 2

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.: _____

LOG No 186635

| | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--------------------------------|--|--|--------------------------------|--|--|--|--|--|--|--|--|--|---|--|--|--|--|
| REPORT TO: | | | CLIENT JOB NUMBER | | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | | | | | | |
| NAME AND ADDRESS <i>Enko Environmental, Inc.</i> | | | DESTINATION LABORATORY | | | PRESERVATIVES | | | | | EDF REPORT <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | | | | | | |
| 551 Lakewood Dr | | | 3249 FITZGERALD RD. | | | | | | | | <i>Ammonia</i> <i>BOD + TSS</i> <i>CALITUM 15T</i> <i>Gross Alpha</i> <i>Radium 226</i> <i>Radium 228</i> <i>Uranium</i> | | | | | GLOBAL ID: _____ | | | | |
| El Dorado Hills CA 95762 | | | RANCHO CORDOVA, CA. | | | | | | | | | | | | | COMPOSITE: | | | | |
| PROJECT MANAGER <i>Andee Kopania</i> PHONE# <i>916-718-5511</i> | | | 95742 | | | | | | | | | | | | | FIELD CONDITIONS: | | | | |
| PROJECT NAME <i>Rise</i> | | | <input type="checkbox"/> OTHER | | | | | | | | | | | | | TURN AROUND TIME | | | | |
| SAMPLED BY <i>AK</i> | | | | | | OR | | | | | SPECIAL INSTRUCTIONS | | | | | | | | | |
| JOB DESCRIPTION <i>email results to:</i> | | | | | | | | | | | | | | | | ALT. | | | | |
| SITE LOCATION <i>akopania@sbcglobal.net</i> | | | | | | 1 DAY | | | | | 2 DAY | | | | | | | | | |
| | | | | | | | | | | | | | | | | 3 DAY | | | | |
| | | | | | | INVOICE TO: | | | | | PO # | | | | | | | | | |
| | | | | | | | | | | | | | | | | QUOTE # | | | | |
| | | | | | | PRESERVATIVES: | | | | | (1) HCL | | | | | | | | | |
| | | | | | | | | | | | | | | | | (2) HNO₃ | | | | |
| | | | | | | (4) = NaOH | | | | | (5) = H₂SO₄ | | | | | | | | | |
| | | | | | | | | | | | | | | | | (6) = Na₂S₂O₃ | | | | |
| | | | | | | RELINQUISHED BY (SIGN) | | | | | PRINT NAME / COMPANY | | | | | | | | | |
| | | | | | | | | | | | | | | | | DATE / TIME | | | | |
| | | | | | | PRINT NAME / COMPANY | | | | | RECD AT LAB BY: | | | | | | | | | |
| | | | | | | | | | | | | | | | | DATE / TIME | | | | |
| | | | | | | SHIPPED BY: | | | | | AIR BILL # | | | | | | | | | |
| | | | | | | | | | | | | | | | | <input type="checkbox"/> FED X | | | | |
| | | | | | | <input type="checkbox"/> OTHER | | | | | 260 | | | | | | | | | |

White-Lab Terms and conditions Yellow-Lab file copy/Terms and Conditions Pink-Original Terms and Conditions Gold-Project Mgr./Field Sampler/Terms and conditions

1830 799

Cooler: SHAFT 1

CLS - Labs

CHAIN OF CUSTODY

CLS ID No.:

LOG No 186634

| REPORT TO: | | | CLIENT JOB NUMBER | | | ANALYSIS REQUESTED | | | | | GEOTRACKER: | | | | | | | | | | | | | | | | | | |
|---|------------------------|-----------------------|--|--------------|-------------|---|-------|-------|-------|--|--|-----------------------|--|--|--|--|--|--------------------|--|--|--|--|--|----------------------|--|--|--|--|--|
| NAME AND ADDRESS EMKO Environmental, Inc. 551 Lakeside Dr. El Dorado Hills, CA 95762 | | | DESTINATION LABORATORY | | | PRESERVATIVES Metals - see List General Minerals Cyanide + Ammonia/Lyon VOC/TPH6 SVOC PCB TPHD & MD | | | | | EDF REPORT <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | | | | | | | | | | | | | | | |
| PROJECT MANAGER Andy Kopania 916-714-5511 | | | <input checked="" type="checkbox"/> CLS (916) 638-7301 3249 FITZGERALD RD. RANCHO CORDOVA, CA 95742 | | | | | | | | GLOBAL ID: _____ | | | | | | | | | | | | | | | | | | |
| PROJECT NAME Rise | | | <input type="checkbox"/> OTHER | | | | | | | | COMPOSITE: _____ | | | | | | | | | | | | | | | | | | |
| SAMPLED BY AK | | | | | | | | | | | FIELD CONDITIONS: _____ | | | | | | | | | | | | | | | | | | |
| JOB DESCRIPTION email results to: akopania@sbcylab.net | | | | | | TURN AROUND TIME | | | | | SPECIAL INSTRUCTIONS | | | | | | | | | | | | | | | | | | |
| SITE LOCATION | | | | | | | | | | | OR | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | ALT. ID: | | | | | | | | | | | | | | | | | | |
| DATE | TIME | SAMPLE IDENTIFICATION | MATRIX | CONTAINER NO | TYPE | 1 DAY | 2 DAY | 3 DAY | 5 DAY | see shellie for specific METALS to be analyzed | | | | | | | | | | | | | | | | | | | |
| 2-15-18 | 17:20 | NBS-1600 | W | 1 | 1L amber | | | | | | | | | | | | | | | | | | | | | | | | |
| | 17:20 | | | 1 | 500ml Poly | X | | | | | | | | | | | | | | | | | | | | | | | |
| | 17:20 | | | 1 | 250ml poly | | X | | | | | | | | | | | | | | | | | | | | | | |
| | 17:20 | | | 1 | 250ml amber | | | | X | | | | | | | | | | | | | | | | | | | | |
| 2-15-18 | 17:20 | | | 1 | 1L poly | | X | | | | | | | | | | | | | | | | | | | | | | |
| 2-16-18 | 11:44 12:38 | | | 4 | 40ml vial | | | X | | | | | | | | | | | | | | | | | | | | | |
| 2-16-18 | 11:44 12:38 | | | 2 | 1L amber | | | | X | | | | | | | | | | | | | | | | | | | | |
| SUSPECTED CONSTITUENTS | | | | | | PRESERVATIVES: | | | | | | INVOICE TO: | | | | | | | | | | | | | | | | | |
| | | | | | | (1) HCL (2) HNO ₃ (3) = COLD (4) = NaOH (5) = H ₂ SO ₄ (6) = Na ₂ S ₂ O ₈ (7) = | | | | | | PO # | | | | | | | | | | | | | | | | | |
| RELINQUISHED BY (SIGN) | | | | | | PRINT NAME / COMPANY | | | | | | DATE / TIME | | | | | | RECEIVED BY (SIGN) | | | | | | PRINT NAME / COMPANY | | | | | |
| | | | | | | A. Kopania / EMKO | | | | | | 2/16/18 14:35 | | | | | | | | | | | | | | | | | |
| REC'D AT LAB BY | | | | | | DATE / TIME | | | | | | CONDITIONS / COMMENTS | | | | | | | | | | | | | | | | | |
| | | | | | | 2-16-18 1440 | | | | | | 25 | | | | | | | | | | | | | | | | | |
| SHIPPED BY | | | | | | <input checked="" type="checkbox"/> FED X <input type="checkbox"/> UPS <input type="checkbox"/> OTHER | | | | | | AIR BILL # | | | | | | | | | | | | | | | | | |

White-Lab Terms and conditions Yellow-Lab file copy Terms and Conditions Pink- Origin Terms and Conditions Gold-Project Mgr. Field Sampler Terms and conditions

CLS LABS
SAMPLE RECEIVING EXCEPTION REPORTS

CLS Labs Job # 13B0794

Problem discovered by: 

Date: 2/16/13

Nature of problem

| | | | | |
|---|-----------------|--------------------|--|--------------|
| Sulfite | Chlorine, Total | Chlorine, Residual |  | Dissolved O2 |
| <u>BOD, 1ST, NO2, NO3, MBAS</u> | | | | |
| <u>(Circle analysis above) Received out of HOLD time.</u> | | | | |

Client contacted? Yes No Spoke With: _____

By whom: _____ Date: ___ / ___ / ___ Time: _____ HRS

Client instructions:

Resolution of problem:

Logged in regardless and will be ran for analysis requested.

March 12, 2018

CLS Labs - Data Room
 3249 Fitzgerald Rd.
 Rancho Cordova, CA 95742

Lab ID : SP 1802199
 Customer : 2-19423

Laboratory Report

Introduction: This report package contains total of 10 pages divided into 3 sections:

- Case Narrative (2 pages) : An overview of the work performed at FGL.
- Sample Results (6 pages) : Results for each sample submitted.
- Quality Control (2 pages) : Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

| Sample Description | Date Sampled | Date Received | FGL Lab ID # | Matrix |
|--------------------|--------------|---------------|----------------|--------|
| D-1 | 02/13/2018 | 02/20/2018 | SP 1802199-001 | W |
| ED-1 | 02/13/2018 | 02/20/2018 | SP 1802199-002 | W |
| IMD-1 | 02/15/2018 | 02/20/2018 | SP 1802199-003 | W |
| IMD-2 | 02/15/2018 | 02/20/2018 | SP 1802199-004 | W |
| NBS-265 | 02/15/2018 | 02/20/2018 | SP 1802199-005 | W |
| NBS-2300 | 02/15/2018 | 02/20/2018 | SP 1802199-006 | W |

Sampling and Receipt Information: All samples were received in acceptable condition and within temperature requirements, unless noted on the Condition Upon Receipt (CUR) form. All samples arrived at 3 °C. All samples were prepared and analyzed within the method specified hold time. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the attached Chain of Custody and Condition Upon Receipt Form.

Quality Control: All samples were prepared and analyzed according to the following tables:

Radio QC

| | |
|-------|---|
| 900.0 | 02/27/2018:202830 All analysis quality controls are within established criteria. |
| | 02/27/2018:202831 All analysis quality controls are within established criteria. |
| | 02/27/2018:202832 All analysis quality controls are within established criteria. |
| | 02/27/2018:202833 All analysis quality controls are within established criteria. |
| | 02/26/2018:202214 All preparation quality controls are within established criteria. |
| 903.0 | 03/02/2018:203001 All analysis quality controls are within established criteria. |

March 12, 2018
CLS Labs - Data Room

Lab ID : SP 1802199
Customer : 2-19423

Radio QC

| | |
|---------|--|
| 903.0 | 03/03/2018:203001 All analysis quality controls are within established criteria. |
| | 02/26/2018:202232 All preparation quality controls are within established criteria, except: The following note applies to Total Alpha Radium (226): 435 Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery. |
| 908.0 | 03/01/2018:202962 All analysis quality controls are within established criteria. |
| | 02/26/2018:202224 All preparation quality controls are within established criteria. |
| Ra - 05 | 03/09/2018:203392 All analysis quality controls are within established criteria. |
| | 03/09/2018:203393 All analysis quality controls are within established criteria. |
| | 03/09/2018:203394 All analysis quality controls are within established criteria. |
| | 03/05/2018:202045 All preparation quality controls are within established criteria. |

Certification:: I certify that this data package is in compliance with ELAP standards, both technically and for completeness, except for any conditions listed above. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature.

KD:CEA

Approved By **David Terz, B.A., M.B.A.**



Digitally signed by David Terz, B.A., M.B.A.
Title: QA Director
Date: 2018-03-12



March 12, 2018

Lab ID : SP 1802199-001
Customer ID : 2-19423

CLS Labs - Data Room

3249 Fitzgerald Rd.
Rancho Cordova, CA 95742

Sampled On : February 13, 2018-13:30
Sampled By : Not Available
Received On : February 20, 2018-09:50
Matrix : Water

Description : D-1
Project : 18B0794

Sample Result - Radio

| Constituent | Result ± Error | MDA | Units | MCL/AL | Sample Preparation | | Sample Analysis | |
|--------------------------|----------------|-------|-------|--------|--------------------|-----------------------------|-----------------|-----------------------------|
| | | | | | Method | Date/ID | Method | Date/ID |
| Radio Chemistry | | | | | | | | |
| Gross Alpha | 0.057 ± 0.936 | 1.53 | pCi/L | 15/5 | 900.0 | 02/26/18-09:50 2P1802214 | 900.0 | 02/27/18-12:55 2A1802831 |
| Total Alpha Radium (226) | 0.000 ± 0.047 | 0.304 | pCi/L | 3 | 903.0 | 02/26/18-18:45 2P1802232 | 903.0 | 03/02/18-18:34 2A1803001 |
| Uranium | 0.229 ± 0.450 | 0.342 | pCi/L | 20 | 908.0 | 02/26/18-13:40 2P1802224 | 908.0 | 03/01/18-19:51 2A1802962 |
| Ra 228 | 0.000 ± 0.584 | 0.400 | pCi/L | 2 | Ra - 05 | 03/05/18-18:45 2P1802045 | Ra - 05 | 03/09/18-19:00 2A1803392 |

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

MDA = Minimum Detectable Activity (Calculated at the 95% confidence level) = Data utilized by DHS to determine matrix interference.
MCL / AL = Maximum Contamination Level / Action Level. Alpha's Action Level of 5 pCi/L is based on the Assigned Value (AV).
AV = Assigned Value(Gross Alpha Result + (0.84 x Error)). CCR Section 64442: Drinking Water Compliance Note: Do the following
If Gross Alpha's (AV) exceeds 5 pCi/L run Uranium. If Gross Alpha's (AV) minus Uranium exceeds 5 pCi/L run Radium 226.

Drinking Water Compliance:

Gross Alpha (AV) minus Uranium is less than or equal to 15 pCi/L
Uranium is less than or equal to 20 pCi/L
Radium 226 + Radium 228 is less than or equal to 5 pCi/L

Note: Samples are held for 3-6 months prior to disposal.



March 12, 2018

Lab ID : SP 1802199-002
Customer ID : 2-19423

CLS Labs - Data Room

3249 Fitzgerald Rd.
Rancho Cordova, CA 95742

Sampled On : February 13, 2018-12:50
Sampled By : Not Available
Received On : February 20, 2018-09:50
Matrix : Water

Description : ED-1
Project : 18B0794

Sample Result - Radio

| Constituent | Result ± Error | MDA | Units | MCL/AL | Sample Preparation | | Sample Analysis | |
|-----------------------------|----------------|-------|-------|--------|--------------------|-----------------------------|-----------------|-----------------------------|
| | | | | | Method | Date/ID | Method | Date/ID |
| Radio Chemistry | | | | | | | | |
| Gross Alpha | 0.784 ± 1.20 | 1.49 | pCi/L | 15/5 | 900.0 | 02/26/18-09:50 2P1802214 | 900.0 | 02/27/18-13:00 2A1802832 |
| Total Alpha Radium (226) | 0.096 ± 0.115 | 0.304 | pCi/L | 3 | 903.0 | 02/26/18-18:45 2P1802232 | 903.0 | 03/02/18-18:59 2A1803001 |
| Uranium | 0.000 ± 0.329 | 0.342 | pCi/L | 20 | 908.0 | 02/26/18-13:40 2P1802224 | 908.0 | 03/01/18-19:51 2A1802962 |
| Ra 228 | 0.143 ± 0.654 | 0.506 | pCi/L | 2 | Ra - 05 | 03/05/18-18:45 2P1802045 | Ra - 05 | 03/09/18-18:40 2A1803393 |

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

MDA = Minimum Detectable Activity (Calculated at the 95% confidence level) = Data utilized by DHS to determine matrix interference.
MCL / AL = Maximum Contamination Level / Action Level. Alpha's Action Level of 5 pCi/L is based on the Assigned Value (AV).
AV = Assigned Value(Gross Alpha Result + (0.84 x Error)). CCR Section 64442: Drinking Water Compliance Note: Do the following
If Gross Alpha's (AV) exceeds 5 pCi/L run Uranium. If Gross Alpha's (AV) minus Uranium exceeds 5 pCi/L run Radium 226.

Drinking Water Compliance:

Gross Alpha (AV) minus Uranium is less than or equal to 15 pCi/L
Uranium is less than or equal to 20 pCi/L
Radium 226 + Radium 228 is less than or equal to 5 pCi/L

Note: Samples are held for 3-6 months prior to disposal.



March 12, 2018

Lab ID : SP 1802199-003

Customer ID : 2-19423

CLS Labs - Data Room

3249 Fitzgerald Rd.
Rancho Cordova, CA 95742

Sampled On : February 15, 2018-10:40

Sampled By : Not Available

Received On : February 20, 2018-09:50

Matrix : Water

Description : IMD-1

Project : 18B0794

Sample Result - Radio

| Constituent | Result ± Error | MDA | Units | MCL/AL | Sample Preparation | | Sample Analysis | |
|-----------------------------|----------------|-------|-------|--------|--------------------|-----------------------------|-----------------|-----------------------------|
| | | | | | Method | Date/ID | Method | Date/ID |
| Radio Chemistry | | | | | | | | |
| Gross Alpha | 0.980 ± 1.27 | 1.58 | pCi/L | 15/5 | 900.0 | 02/26/18-09:50 2P1802214 | 900.0 | 02/27/18-13:05 2A1802833 |
| Total Alpha Radium (226) | 0.000 ± 0.046 | 0.304 | pCi/L | 3 | 903.0 | 02/26/18-18:45 2P1802232 | 903.0 | 03/02/18-23:07 2A1803001 |
| Uranium | 0.459 ± 0.551 | 0.342 | pCi/L | 20 | 908.0 | 02/26/18-13:40 2P1802224 | 908.0 | 03/01/18-19:51 2A1802962 |
| Ra 228 | 0.000 ± 0.588 | 0.506 | pCi/L | 2 | Ra - 05 | 03/05/18-18:45 2P1802045 | Ra - 05 | 03/09/18-19:00 2A1803393 |

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

MDA = Minimum Detectable Activity (Calculated at the 95% confidence level) = Data utilized by DHS to determine matrix interference.

MCL / AL = Maximum Contamination Level / Action Level. Alpha's Action Level of 5 pCi/L is based on the Assigned Value (AV).

AV = Assigned Value(Gross Alpha Result + (0.84 x Error)). CCR Section 64442: Drinking Water Compliance Note: Do the following

If Gross Alpha's (AV) exceeds 5 pCi/L run Uranium. If Gross Alpha's (AV) minus Uranium exceeds 5 pCi/L run Radium 226.

Drinking Water Compliance:

Gross Alpha (AV) minus Uranium is less than or equal to 15 pCi/L

Uranium is less than or equal to 20 pCi/L

Radium 226 + Radium 228 is less than or equal to 5 pCi/L

Note: Samples are held for 3-6 months prior to disposal.



March 12, 2018

Lab ID : SP 1802199-004
Customer ID : 2-19423

CLS Labs - Data Room

3249 Fitzgerald Rd.
Rancho Cordova, CA 95742

Sampled On : February 15, 2018-09:45
Sampled By : Not Available
Received On : February 20, 2018-09:50
Matrix : Water

Description : IMD-2
Project : 18B0794

Sample Result - Radio

| Constituent | Result ± Error | MDA | Units | MCL/AL | Sample Preparation | | Sample Analysis | |
|-----------------------------|----------------|-------|-------|--------|--------------------|-----------------------------|-----------------|-----------------------------|
| | | | | | Method | Date/ID | Method | Date/ID |
| Radio Chemistry | | | | | | | | |
| Gross Alpha | 1.78 ± 0.810 | 0.803 | pCi/L | 15/5 | 900.0 | 02/26/18-09:50 2P1802214 | 900.0 | 02/27/18-12:50 2A1802830 |
| Total Alpha Radium (226) | 0.094 ± 0.113 | 0.304 | pCi/L | 3 | 903.0 | 02/26/18-18:45 2P1802232 | 903.0 | 03/02/18-23:32 2A1803001 |
| Uranium | 0.000 ± 0.329 | 0.342 | pCi/L | 20 | 908.0 | 02/26/18-13:40 2P1802224 | 908.0 | 03/01/18-19:51 2A1802962 |
| Ra 228 | 0.113 ± 0.645 | 0.383 | pCi/L | 2 | Ra - 05 | 03/05/18-18:45 2P1802045 | Ra - 05 | 03/09/18-19:20 2A1803394 |

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

MDA = Minimum Detectable Activity (Calculated at the 95% confidence level) = Data utilized by DHS to determine matrix interference.
MCL / AL = Maximum Contamination Level / Action Level. Alpha's Action Level of 5 pCi/L is based on the Assigned Value (AV).
AV = Assigned Value(Gross Alpha Result + (0.84 x Error)). CCR Section 64442: Drinking Water Compliance Note: Do the following
If Gross Alpha's (AV) exceeds 5 pCi/L run Uranium. If Gross Alpha's (AV) minus Uranium exceeds 5 pCi/L run Radium 226.

Drinking Water Compliance:

Gross Alpha (AV) minus Uranium is less than or equal to 15 pCi/L
Uranium is less than or equal to 20 pCi/L
Radium 226 + Radium 228 is less than or equal to 5 pCi/L

Note: Samples are held for 3-6 months prior to disposal.



March 12, 2018

Lab ID : SP 1802199-005
Customer ID : 2-19423

CLS Labs - Data Room

3249 Fitzgerald Rd.
Rancho Cordova, CA 95742

Sampled On : February 15, 2018-15:33
Sampled By : Not Available
Received On : February 20, 2018-09:50
Matrix : Water

Description : NBS-265
Project : 18B0794

Sample Result - Radio

| Constituent | Result ± Error | MDA | Units | MCL/AL | Sample Preparation | | Sample Analysis | |
|-----------------------------|----------------|-------|-------|--------|--------------------|-----------------------------|-----------------|-----------------------------|
| | | | | | Method | Date/ID | Method | Date/ID |
| Radio Chemistry | | | | | | | | |
| Gross Alpha | 1.02 ± 1.24 | 1.49 | pCi/L | 15/5 | 900.0 | 02/26/18-09:50 2P1802214 | 900.0 | 02/27/18-12:55 2A1802831 |
| Total Alpha Radium (226) | 0.047 ± 0.092 | 0.304 | pCi/L | 3 | 903.0 | 02/26/18-18:45 2P1802232 | 903.0 | 03/02/18-23:56 2A1803001 |
| Uranium | 0.229 ± 0.450 | 0.342 | pCi/L | 20 | 908.0 | 02/26/18-13:40 2P1802224 | 908.0 | 03/01/18-19:51 2A1802962 |
| Ra 228 | 0.000 ± 0.546 | 0.400 | pCi/L | 2 | Ra - 05 | 03/05/18-18:45 2P1802045 | Ra - 05 | 03/09/18-19:40 2A1803392 |

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

MDA = Minimum Detectable Activity (Calculated at the 95% confidence level) = Data utilized by DHS to determine matrix interference.
MCL / AL = Maximum Contamination Level / Action Level. Alpha's Action Level of 5 pCi/L is based on the Assigned Value (AV).
AV = Assigned Value(Gross Alpha Result + (0.84 x Error)). CCR Section 64442: Drinking Water Compliance Note: Do the following
If Gross Alpha's (AV) exceeds 5 pCi/L run Uranium. If Gross Alpha's (AV) minus Uranium exceeds 5 pCi/L run Radium 226.

Drinking Water Compliance:

Gross Alpha (AV) minus Uranium is less than or equal to 15 pCi/L
Uranium is less than or equal to 20 pCi/L
Radium 226 + Radium 228 is less than or equal to 5 pCi/L

Note: Samples are held for 3-6 months prior to disposal.



March 12, 2018

Lab ID : SP 1802199-006
Customer ID : 2-19423

CLS Labs - Data Room

3249 Fitzgerald Rd.
Rancho Cordova, CA 95742

Sampled On : February 15, 2018-18:10
Sampled By : Not Available
Received On : February 20, 2018-09:50
Matrix : Water

Description : NBS-2300
Project : 18B0794

Sample Result - Radio

| Constituent | Result ± Error | MDA | Units | MCL/AL | Sample Preparation | | Sample Analysis | |
|-----------------------------|----------------|-------|-------|--------|--------------------|-----------------------------|-----------------|-----------------------------|
| | | | | | Method | Date/ID | Method | Date/ID |
| Radio Chemistry | | | | | | | | |
| Gross Alpha | 0.986 ± 1.25 | 1.48 | pCi/L | 15/5 | 900.0 | 02/26/18-09:50 2P1802214 | 900.0 | 02/27/18-13:00 2A1802832 |
| Total Alpha Radium (226) | 0.117 ± 0.122 | 0.304 | pCi/L | 3 | 903.0 | 02/26/18-18:45 2P1802232 | 903.0 | 03/03/18-00:21 2A1803001 |
| Uranium | 0.229 ± 0.450 | 0.342 | pCi/L | 20 | 908.0 | 02/26/18-13:40 2P1802224 | 908.0 | 03/01/18-19:51 2A1802962 |
| Ra 228 | 0.001 ± 0.672 | 0.506 | pCi/L | 2 | Ra - 05 | 03/05/18-18:45 2P1802045 | Ra - 05 | 03/09/18-19:20 2A1803393 |

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

MDA = Minimum Detectable Activity (Calculated at the 95% confidence level) = Data utilized by DHS to determine matrix interference.
MCL / AL = Maximum Contamination Level / Action Level. Alpha's Action Level of 5 pCi/L is based on the Assigned Value (AV).
AV = Assigned Value(Gross Alpha Result + (0.84 x Error)). CCR Section 64442: Drinking Water Compliance Note: Do the following
If Gross Alpha's (AV) exceeds 5 pCi/L run Uranium. If Gross Alpha's (AV) minus Uranium exceeds 5 pCi/L run Radium 226.

Drinking Water Compliance:

Gross Alpha (AV) minus Uranium is less than or equal to 15 pCi/L
Uranium is less than or equal to 20 pCi/L
Radium 226 + Radium 228 is less than or equal to 5 pCi/L

Note: Samples are held for 3-6 months prior to disposal.

March 12, 2018
 CLS Labs - Data Room

Lab ID : SP 1802199
 Customer : 2-19423

Quality Control - Radio

| Constituent | Method | Date/ID | Type | Units | Conc. | QC Data | DQO | Note |
|--------------------------|---------|--|--|--|--|---|---|------|
| Radio Alpha | 900.0 | 02/27/18:202830aat | CCV CCB | cpm cpm | 8203 | 41.0 % 0.10 | 35-47 0.2 | |
| | 900.0 | 02/27/18:202831aat | CCV CCB | cpm cpm | 8203 | 42.4 % 0.100 | 35-47 0.14 | |
| | 900.0 | 02/27/18:202832aat | CCV CCB | cpm cpm | 8203 | 40.2 % 0.0800 | 35-47 0.13 | |
| | 900.0 | 02/27/18:202833aat | CCV CCB | cpm cpm | 8203 | 41.3 % 0.1200 | 35-47 0.17 | |
| Gross Alpha | 900.0 | 02/26/18:202214aat | Blank LCS BS BSD BSRPD | pCi/L pCi/L pCi/L pCi/L pCi/L | 107.8 107.8 107.8 107.8 | 0.41 118 % 108 % 122 % 12.1% | 3 75-125 60-140 60-140 ≤30 | |
| Alpha | 903.0 | 03/03/18:203001aat | CCV CCB | cpm cpm | 8571 | 41.2 % 0.100 | 37-46 0.12 | |
| Total Alpha Radium (226) | 903.0 | 02/26/18:202232aat (SP 1802099-001) (SP 1802138-005) | RgBlk LCS MS MSD MSRPD MS MSD MSRPD | pCi/L pCi/L pCi/L pCi/L pCi/L pCi/L pCi/L pCi/L | 24.21 24.21 24.21 24.21 24.21 24.21 24.21 24.21 | -0.003 104 % 108 % 112 % 3.0% 94.6 % 109 % 13.9% | 2 52-107 43-111 43-111 ≤35.5 43-111 43-111 ≤35.5 | 435 |
| Alpha | 908.0 | 03/01/18:202962aat | CCV CCB | cpm cpm | 8571 | 40.8 % 0.0600 | 36-45 0.12 | |
| Uranium | 908.0 | 02/26/18:202224aat | RgBlk LRS BS BSD BSRPD | pCi/L pCi/L pCi/L pCi/L pCi/L | 26.84 26.84 26.84 26.84 26.84 | -0.02 59.8 % 112 % 119 % 5.5% | 1 54-105 75-125 75-125 ≤20 | |
| Beta | Ra - 05 | 03/09/18:203392emv | CCV CCB | cpm cpm | 8565 | 88.9 % 0.4000 | 84-94 0.48 | |
| | Ra - 05 | 03/09/18:203393emv | CCV CCB | cpm cpm | 8565 | 88.9 % 0.4000 | 84-94 0.58 | |
| | Ra - 05 | 03/09/18:203394emv | CCV CCB | cpm cpm | 8565 | 88.8 % 0.4000 | 84-94 0.51 | |
| Ra 228 | Ra - 05 | 03/05/18:202045emv | RgBlk LRS BS BSD BSRPD | pCi/L pCi/L pCi/L pCi/L pCi/L | 33.60 33.60 33.60 33.60 33.60 | 0.03 79.8 % 93.8 % 97.2 % 3.5% | 3 65-108 75-125 75-125 ≤25 | |

| Definition | |
|------------|--|
| CCV | : Continuing Calibration Verification - Analyzed to verify the instrument calibration is within criteria. |
| CCB | : Continuing Calibration Blank - Analyzed to verify the instrument baseline is within criteria. |
| Blank | : Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples. |
| RgBlk | : Method Reagent Blank - Prepared to correct for any reagent contributions to sample result. |
| LCS | : Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery. |
| LRS | : Laboratory Recovery Standard - Prepared to establish the batch recovery factor used in result calculations. |
| MS | : Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery. |
| MSD | : Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery. |
| BS | : Blank Spikes - A blank is spiked with a known amount of analyte. It is prepared to verify that the preparation process is not affecting analyte recovery. |
| BSD | : Blank Spike Duplicate of BS/BSD pair - A blank duplicate is spiked with a known amount of analyte. It is prepared to verify that the preparation process is not affecting analyte recovery. |

March 12, 2018
CLS Labs - Data Room

Lab ID : SP 1802199
Customer : 2-19423

Quality Control - Radio

| | |
|--------------------|---|
| Definition | |
| MSRPD | : MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis. |
| BSRPD | : BS/BSD Relative Percent Difference (RPD) - The BS relative percent difference is an indication of precision for the preparation and analysis. |
| DQO | : Data Quality Objective - This is the criteria against which the quality control data is compared. |
| Explanation | |
| 435 | : Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery. |

SUBCONTRACT ORDER

18B0794

1802199

SENDING LABORATORY:

CLS Labs
3249 Fitzgerald Rd.
Rancho Cordova, CA 95742
Phone: 916-638-7301
Fax: 916-638-4510
Project Manager: Mark Smith
Project: Rise

RECEIVING LABORATORY:

FGL Labs - Santa Paula
853 Corporation Street
Santa Paula, CA 93060
Phone : (805) 392-2000
Fax: (805) 525-4172

REVISED
2/20/18

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|------------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/15/18 13:30 | 18B0794-01 | 02/13/18 13:30 | 02/16/18 14:40 | Water |

Client sample ID: D-1
Laboratory sample ID: 18B0794-01
Please use client sample ID on all reports

Sampler:

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/15/18 13:30 | 18B0794-01 | 02/13/18 13:30 | 02/16/18 14:40 | Water |

Client sample ID: D-1
Laboratory sample ID: 18B0794-01
Please use client sample ID on all reports

Sampler:

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/15/18 13:30 | 18B0794-01 | 02/13/18 13:30 | 02/16/18 14:40 | Water |

Client sample ID: D-1
Laboratory sample ID: 18B0794-01
Please use client sample ID on all reports

Sampler:

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) |
|--------------------|--------------------|--------------------|--------------------|----------------------|
|--------------------|--------------------|--------------------|--------------------|----------------------|

| | | | |
|-----------------|---------|------------------|--------------|
| Relinquished By | Date | Received By | Date |
| WPS | 2/20/18 | 0950 [Signature] | 2/20/18 0950 |
| Relinquished By | Date | Received By | Date |

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|-----------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/15/18 13:30 | 18B0794-01 | 02/13/18 13:30 | 02/16/18 14:40 | Water |

Client sample ID: D-1

Sampler:

Laboratory sample ID: 18B0794-01

Please use client sample ID on all reports

REVISED
2/20/18

Containers Supplied:

1L Poly - HNO3 (A) 1L Poly - HNO3 (B) 1L Poly - HNO3 (C) 1L Poly - HNO3 (D) 1L Poly - Unpres (E)

| | | | |
|-----------------|---------|------------------|---------|
| Relinquished By | Date | Received By | Date |
| WPS | 2/20/18 | 0950 [Signature] | 2/20/18 |
| Relinquished By | Date | Received By | Date |

Shipped By

Airbill Number

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|-----------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/15/18 12:50 | 18B0794-02 | 02/13/18 12:50 | 02/16/18 14:40 | Water |

Client sample ID: ED-1
 Laboratory sample ID: 18B0794-02
 Please use client sample ID on all reports

Sampler:

REVISED
2/20/18

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/15/18 12:50 | 18B0794-02 | 02/13/18 12:50 | 02/16/18 14:40 | Water |

Client sample ID: ED-1
 Laboratory sample ID: 18B0794-02
 Please use client sample ID on all reports

Sampler:

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/15/18 12:50 | 18B0794-02 | 02/13/18 12:50 | 02/16/18 14:40 | Water |

Client sample ID: ED-1
 Laboratory sample ID: 18B0794-02
 Please use client sample ID on all reports

Sampler:

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/15/18 12:50 | 18B0794-02 | 02/13/18 12:50 | 02/16/18 14:40 | Water |

Client sample ID: ED-1
 Laboratory sample ID: 18B0794-02
 Please use client sample ID on all reports

Sampler:

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) |
|--------------------|--------------------|--------------------|--------------------|----------------------|
| | | | | |

| | | | |
|-----------------|---------|-------------|---------|
| Relinquished By | Date | Received By | Date |
| WPS | 2/20/18 | Amtec | 2/20/18 |
| 0950 | | | 0950 |
| Relinquished By | Date | Received By | Date |

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|---------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/17/18 10:40 | 18B0794-03 | 02/15/18 10:40 | 02/16/18 14:40 | Water |

Client sample ID: IMD-1

Sampler:

Laboratory sample ID: 18B0794-03

Please use client sample ID on all reports

REVISED
2/20/18

Containers Supplied:

| | | | | | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/17/18 10:40 | 18B0794-03 | 02/15/18 10:40 | 02/16/18 14:40 | Water |

Client sample ID: IMD-1

Sampler:

Laboratory sample ID: 18B0794-03

Please use client sample ID on all reports

Containers Supplied:

| | | | | | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 10:40 | 18B0794-03 | 02/15/18 10:40 | 02/16/18 14:40 | Water |

Client sample ID: IMD-1

Sampler:

Laboratory sample ID: 18B0794-03

Please use client sample ID on all reports

Containers Supplied:

| | | | | | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 10:40 | 18B0794-03 | 02/15/18 10:40 | 02/16/18 14:40 | Water |

Client sample ID: IMD-1

Sampler:

Laboratory sample ID: 18B0794-03

Please use client sample ID on all reports

Containers Supplied:

| | | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|
| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) |
|--------------------|--------------------|--------------------|--------------------|----------------------|

Relinquished By

Date

Received By

Date

WPS 2/20/18 0950

Antt 2/20/18 0950

Relinquished By

Date

Received By

Date

Shipped By

Airbill Number

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|------------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 09:45 | 18B0794-04 | 02/15/18 09:45 | 02/16/18 14:40 | Water |

Client sample ID: IMD-2
 Laboratory sample ID: 18B0794-04
 Please use client sample ID on all reports

Sampler:

REVISED
 2/20/18

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 09:45 | 18B0794-04 | 02/15/18 09:45 | 02/16/18 14:40 | Water |

Client sample ID: IMD-2
 Laboratory sample ID: 18B0794-04
 Please use client sample ID on all reports

Sampler:

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/17/18 09:45 | 18B0794-04 | 02/15/18 09:45 | 02/16/18 14:40 | Water |

Client sample ID: IMD-2
 Laboratory sample ID: 18B0794-04
 Please use client sample ID on all reports

Sampler:

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/17/18 09:45 | 18B0794-04 | 02/15/18 09:45 | 02/16/18 14:40 | Water |

Client sample ID: IMD-2
 Laboratory sample ID: 18B0794-04
 Please use client sample ID on all reports

Sampler:

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) |
|--------------------|--------------------|--------------------|--------------------|----------------------|
| | | | | |

| | | | |
|-----------------|--------------|-------------|--------------|
| Relinquished By | Date | Received By | Date |
| WPS | 2/20/18 0950 | Cumt | 2/20/18 0950 |
| Relinquished By | Date | Received By | Date |

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|-----------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/17/18 15:33 | 18B0794-05 | 02/15/18 15:33 | 02/16/18 14:40 | Water |

Client sample ID: NBS-265

Sampler:

Laboratory sample ID: 18B0794-05

Please use client sample ID on all reports

REVISED
2/20/18

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 15:33 | 18B0794-05 | 02/15/18 15:33 | 02/16/18 14:40 | Water |

Client sample ID: NBS-265

Sampler:

Laboratory sample ID: 18B0794-05

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 15:33 | 18B0794-05 | 02/15/18 15:33 | 02/16/18 14:40 | Water |

Client sample ID: NBS-265

Sampler:

Laboratory sample ID: 18B0794-05

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/17/18 15:33 | 18B0794-05 | 02/15/18 15:33 | 02/16/18 14:40 | Water |

Client sample ID: NBS-265

Sampler:

Laboratory sample ID: 18B0794-05

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) |
|--------------------|--------------------|--------------------|--------------------|----------------------|
| | | | | |

| | | | |
|-----------------|--------------|-------------|--------------|
| Relinquished By | Date | Received By | Date |
| WPS | 2/20/18 0950 | Cunitz | 2/20/18 0950 |
| Relinquished By | Date | Received By | Date |

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|---------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/17/18 18:10 | 18B0794-08 | 02/15/18 18:10 | 02/16/18 14:40 | Water |

Client sample ID: NBS-2300
 Laboratory sample ID: 18B0794-08
 Please use client sample ID on all reports

Sampler:

REVISED
 2/20/18

Containers Supplied:

| | | | | | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/17/18 18:10 | 18B0794-08 | 02/15/18 18:10 | 02/16/18 14:40 | Water |

Client sample ID: NBS-2300
 Laboratory sample ID: 18B0794-08
 Please use client sample ID on all reports

Sampler:

Containers Supplied:

| | | | | | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 18:10 | 18B0794-08 | 02/15/18 18:10 | 02/16/18 14:40 | Water |

Client sample ID: NBS-2300
 Laboratory sample ID: 18B0794-08
 Please use client sample ID on all reports

Sampler:

Containers Supplied:

| | | | | | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 18:10 | 18B0794-08 | 02/15/18 18:10 | 02/16/18 14:40 | Water |

Client sample ID: NBS-2300
 Laboratory sample ID: 18B0794-08
 Please use client sample ID on all reports

Sampler:

Containers Supplied:

| | | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|
| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) |
|--------------------|--------------------|--------------------|--------------------|----------------------|

| | | | |
|-----------------|--------------|-------------|--------------|
| Relinquished By | Date | Received By | Date |
| WPS | 2/20/18 0950 | Amc | 2/20/18 0950 |
| Relinquished By | Date | Received By | Date |

SUBCONTRACT ORDER

18B0794

1802199 1 of 8

#1 = 50lbs #2 51lbs

SENDING LABORATORY:

CLS Labs
3249 Fitzgerald Rd.
Rancho Cordova, CA 95742
Phone: 916-638-7301
Fax: 916-638-4510
Project Manager: Mark Smith

RECEIVING LABORATORY:

FGL Labs - Santa Paula
853 Corporation Street
Santa Paula, CA 93060
Phone : (805) 392-2000
Fax: (805) 525-4172

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|------------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/15/18 13:30 | 18B0794-01 | 02/13/18 13:30 | 02/16/18 14:40 | Water |

Client sample ID: D-1

Laboratory sample ID: 18B0794-01

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/15/18 13:30 | 18B0794-01 | 02/13/18 13:30 | 02/16/18 14:40 | Water |

Client sample ID: D-1

Laboratory sample ID: 18B0794-01

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/15/18 13:30 | 18B0794-01 | 02/13/18 13:30 | 02/16/18 14:40 | Water |

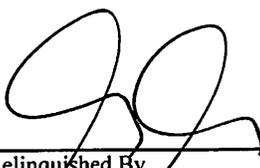
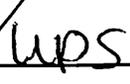
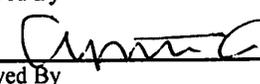
Client sample ID: D-1

Laboratory sample ID: 18B0794-01

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) |
|--------------------|--------------------|--------------------|--------------------|----------------------|
|--------------------|--------------------|--------------------|--------------------|----------------------|

 2-19-18.
 Relinquished By _____ Date _____ Received By _____ Date _____
 WPS 2/20/18 0950  2/20/18 0950
 Relinquished By _____ Date _____ Received By _____ Date _____

Shipped By  Airbill Number _____ Page 1 of 8

1. TRACKING #: 1Z 2A8 49X 13 9276 2133
 4. TRACKING #: 1Z 2A8 49X 13 9428 8125

SUBCONTRACT ORDER

1802199 2 of 8

18B0794

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|-----------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/15/18 13:30 | 18B0794-01 | 02/13/18 13:30 | 02/16/18 14:40 | Water |

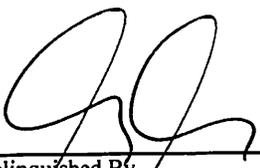
Client sample ID: D-1

Laboratory sample ID: 18B0794-01

Please use client sample ID on all reports

Containers Supplied:

1L Poly - HNO3 (A) 1L Poly - HNO3 (B) 1L Poly - HNO3 (C) 1L Poly - HNO3 (D) 1L Poly - Unpres (E)

 2-19-18
 Relinquished By _____ Date _____ Received By _____ Date _____
 UPS 2/20/18 0950 Curran 2/20/18 0950
 Relinquished By _____ Date _____ Received By _____ Date _____

Shipped By  UPS
 Airbill Number
 1. 122A849X1392762133
 4. 122A849X1394288125
 Page 2 of 8

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|-----------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/15/18 12:50 | 18B0794-02 | 02/13/18 12:50 | 02/16/18 14:40 | Water |

Client sample ID: ED-1
 Laboratory sample ID: 18B0794-02
 Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/15/18 12:50 | 18B0794-02 | 02/13/18 12:50 | 02/16/18 14:40 | Water |

Client sample ID: ED-1
 Laboratory sample ID: 18B0794-02
 Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/15/18 12:50 | 18B0794-02 | 02/13/18 12:50 | 02/16/18 14:40 | Water |

Client sample ID: ED-1
 Laboratory sample ID: 18B0794-02
 Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/15/18 12:50 | 18B0794-02 | 02/13/18 12:50 | 02/16/18 14:40 | Water |

Client sample ID: ED-1
 Laboratory sample ID: 18B0794-02
 Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) |
|--------------------|--------------------|--------------------|--------------------|----------------------|
|--------------------|--------------------|--------------------|--------------------|----------------------|

Relinquished By [Signature] Date 2-19-18 Received By [Signature] Date 2/20/18 0950
 Relinquished By MPS Date 2/20/18 0950 Received By [Signature] Date 2/20/18 0950

Shipped By [Signature] Airbill Number 1 122A849X1392702133

4 122A849X1394288125

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|---------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/17/18 10:40 | 18B0794-03 | 02/15/18 10:40 | 02/16/18 14:40 | Water |

Client sample ID: IMD-1

Laboratory sample ID: 18B0794-03

Please use client sample ID on all reports

Containers Supplied:

1L Poly - HNO3 (A) 1L Poly - HNO3 (B) 1L Poly - HNO3 (C) 1L Poly - HNO3 (D) 1L Poly - Unpres (E)

| | | | | | | | |
|-----------------|----|----------------|----------------|------------|----------------|----------------|-------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/17/18 10:40 | 18B0794-03 | 02/15/18 10:40 | 02/16/18 14:40 | Water |
|-----------------|----|----------------|----------------|------------|----------------|----------------|-------|

Client sample ID: IMD-1

Laboratory sample ID: 18B0794-03

Please use client sample ID on all reports

Containers Supplied:

1L Poly - HNO3 (A) 1L Poly - HNO3 (B) 1L Poly - HNO3 (C) 1L Poly - HNO3 (D) 1L Poly - Unpres (E)

| | | | | | | | |
|------------------|----|----------------|----------------|------------|----------------|----------------|-------|
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 10:40 | 18B0794-03 | 02/15/18 10:40 | 02/16/18 14:40 | Water |
|------------------|----|----------------|----------------|------------|----------------|----------------|-------|

Client sample ID: IMD-1

Laboratory sample ID: 18B0794-03

Please use client sample ID on all reports

Containers Supplied:

1L Poly - HNO3 (A) 1L Poly - HNO3 (B) 1L Poly - HNO3 (C) 1L Poly - HNO3 (D) 1L Poly - Unpres (E)

| | | | | | | | |
|------------------|----|----------------|----------------|------------|----------------|----------------|-------|
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 10:40 | 18B0794-03 | 02/15/18 10:40 | 02/16/18 14:40 | Water |
|------------------|----|----------------|----------------|------------|----------------|----------------|-------|

Client sample ID: IMD-1

Laboratory sample ID: 18B0794-03

Please use client sample ID on all reports

Containers Supplied:

1L Poly - HNO3 (A) 1L Poly - HNO3 (B) 1L Poly - HNO3 (C) 1L Poly - HNO3 (D) 1L Poly - Unpres (E)

Relinquished By:  Date: 2-19-18 -
 Relinquished By: UPS Date: 2/20/18 0950 Received By: CUNTC Date: 2/20/18 0950

Relinquished By: UPS
 Shipped By: 1. 122A849X1392762133
 4. 122A849X1394288129

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|------------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 09:45 | 18B0794-04 | 02/15/18 09:45 | 02/16/18 14:40 | Water |

Client sample ID: IMD-2

Laboratory sample ID: 18B0794-04

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 09:45 | 18B0794-04 | 02/15/18 09:45 | 02/16/18 14:40 | Water |

Client sample ID: IMD-2

Laboratory sample ID: 18B0794-04

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/17/18 09:45 | 18B0794-04 | 02/15/18 09:45 | 02/16/18 14:40 | Water |

Client sample ID: IMD-2

Laboratory sample ID: 18B0794-04

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/17/18 09:45 | 18B0794-04 | 02/15/18 09:45 | 02/16/18 14:40 | Water |

Client sample ID: IMD-2

Laboratory sample ID: 18B0794-04

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) |
|--------------------|--------------------|--------------------|--------------------|----------------------|
|--------------------|--------------------|--------------------|--------------------|----------------------|

[Handwritten Signature]

Relinquished By

Relinquished By

Shipped By

2-1978

| | | | |
|-----------------|--------------|-------------|--------------|
| Relinquished By | Date | Received By | Date |
| WPS | 2/20/18 0950 | Amtec | 2/20/18 0950 |
| Relinquished By | Date | Received By | Date |
| WPS | | | |

Airbill Number

1. 122A849X1392762133

4. 122A849X1394288125

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|-----------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/17/18 15:33 | 18B0794-05 | 02/15/18 15:33 | 02/16/18 14:40 | Water |

Client sample ID: NBS-265

Laboratory sample ID: 18B0794-05

Please use client sample ID on all reports

Containers Supplied:

1L Poly - HNO3 (A) 1L Poly - HNO3 (B) 1L Poly - HNO3 (C) 1L Poly - HNO3 (D) 1L Poly - Unpres (E)

| | | | | | | | |
|------------------|----|----------------|----------------|------------|----------------|----------------|-------|
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 15:33 | 18B0794-05 | 02/15/18 15:33 | 02/16/18 14:40 | Water |
|------------------|----|----------------|----------------|------------|----------------|----------------|-------|

Client sample ID: NBS-265

Laboratory sample ID: 18B0794-05

Please use client sample ID on all reports

Containers Supplied:

1L Poly - HNO3 (A) 1L Poly - HNO3 (B) 1L Poly - HNO3 (C) 1L Poly - HNO3 (D) 1L Poly - Unpres (E)

| | | | | | | | |
|------------------|----|----------------|----------------|------------|----------------|----------------|-------|
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 15:33 | 18B0794-05 | 02/15/18 15:33 | 02/16/18 14:40 | Water |
|------------------|----|----------------|----------------|------------|----------------|----------------|-------|

Client sample ID: NBS-265

Laboratory sample ID: 18B0794-05

Please use client sample ID on all reports

Containers Supplied:

1L Poly - HNO3 (A) 1L Poly - HNO3 (B) 1L Poly - HNO3 (C) 1L Poly - HNO3 (D) 1L Poly - Unpres (E)

| | | | | | | | |
|---------------|----|----------------|----------------|------------|----------------|----------------|-------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/17/18 15:33 | 18B0794-05 | 02/15/18 15:33 | 02/16/18 14:40 | Water |
|---------------|----|----------------|----------------|------------|----------------|----------------|-------|

Client sample ID: NBS-265

Laboratory sample ID: 18B0794-05

Please use client sample ID on all reports

Containers Supplied:

1L Poly - HNO3 (A) 1L Poly - HNO3 (B) 1L Poly - HNO3 (C) 1L Poly - HNO3 (D) 1L Poly - Unpres (E)

| | | | |
|--------------------|---------|--------------------|---------|
| Relinquished By | Date | Received By | Date |
| <i>[Signature]</i> | 2/20/18 | <i>[Signature]</i> | 2/20/18 |

| | | | |
|--------------------|---------|--------------------|---------|
| Relinquished By | Date | Received By | Date |
| <i>[Signature]</i> | 2/20/18 | <i>[Signature]</i> | 2/20/18 |

Shipped By *[Signature]* Airbill Number

1. 122A849X1392702133

4. 122A849X1394288125

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|-----------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/17/18 18:10 | 18B0794-08 | 02/15/18 18:10 | 02/16/18 14:40 | Water |

Client sample ID: NBS-2300

Laboratory sample ID: 18B0794-08

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-226 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 18:10 | 18B0794-08 | 02/15/18 18:10 | 02/16/18 14:40 | Water |

Client sample ID: NBS-2300

Laboratory sample ID: 18B0794-08

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Radium-228 (SUB) | 10 | 03/05/18 12:00 | 03/17/18 18:10 | 18B0794-08 | 02/15/18 18:10 | 02/16/18 14:40 | Water |

Client sample ID: NBS-2300

Laboratory sample ID: 18B0794-08

Please use client sample ID on all reports

Containers Supplied:

| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|----------------|----------------|-------|
| Uranium (SUB) | 10 | 03/05/18 12:00 | 03/17/18 18:10 | 18B0794-08 | 02/15/18 18:10 | 02/16/18 14:40 | Water |

Client sample ID: NBS-2300

Laboratory sample ID: 18B0794-08

Please use client sample ID on all reports

Containers Supplied:

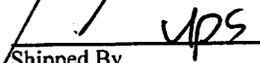
| 1L Poly - HNO3 (A) | 1L Poly - HNO3 (B) | 1L Poly - HNO3 (C) | 1L Poly - HNO3 (D) | 1L Poly - Unpres (E) |
|--------------------|--------------------|--------------------|--------------------|----------------------|
|--------------------|--------------------|--------------------|--------------------|----------------------|

Relinquished By:  Date: 2-19-18

Relinquished By: UPS Date: 2/20/18

Received By:  Date: 2/20/18

Received By: UPS Date: 2/20/18

Shipped By:  Airbill Number: 122A849X1392762133

1: 122A849X1394288125

4:

SUBCONTRACT ORDER

18B0794

1802199

| Analysis | TAT | Due | Expires | Laboratory ID | Sample Date | Received | Matrix |
|-----------------|-----|----------------|----------------|---------------|----------------|----------------|--------|
| Gross alpha SUB | 10 | 03/05/18 12:00 | 03/17/18 17:20 | 18B0794-09 | 02/15/18 17:20 | 02/16/18 14:40 | Water |

Client sample ID: NBS-1600
 Laboratory sample ID: 18B0794-09
 Please use client sample ID on all reports

Containers Supplied:

 2-1978 -
 Relinquished By _____ Date _____ Received By _____ Date _____
 WPS 2/20/18 0950 CURTIS 2/20/18 0950
 Relinquished By _____ Date _____ Received By _____ Date _____
 WPS

Shipped By _____ Airbill Number _____ Page 8 of 8
 1. 122A849X1392702133
 4. 122A849X1394288125

Subcontract Sample Receipt Checklist

CLS Work Order Number: 19B0794

Chain of Custody (COC) Information

Carrier Name UPS Yes No
Chain of custody present? Yes No
Chain of custody signed when relinquished and received? Yes No
Chain of custody agrees with sample labels? Yes Non-Compliant

Sample Receipt Information

Shipping container/cooler in good condition? Yes No Not Present
Samples in proper container/bottle? Yes Non-Compliant
Sample containers intact? Yes No
Sufficient sample volume for indicated test? Yes No

Sample Preservation and Hold Time (HT) Information

All samples received within holding time? Yes No
Temperature upon receipt: _____ C
Wet Ice present in Cooler? Yes No
Blue Ice present in Cooler? Yes No

Analytical Requirement Information

Are non-Standard or Modified methods requested? Yes No
Subcontract Lab CERTIFIED for the various methods requested? Yes No
Will Subcontract Lab be able to meet the turn-around time (TAT) requirements? Yes No

Subcontract Lab Information

Work Order Number assigned by Subcontract Lab _____

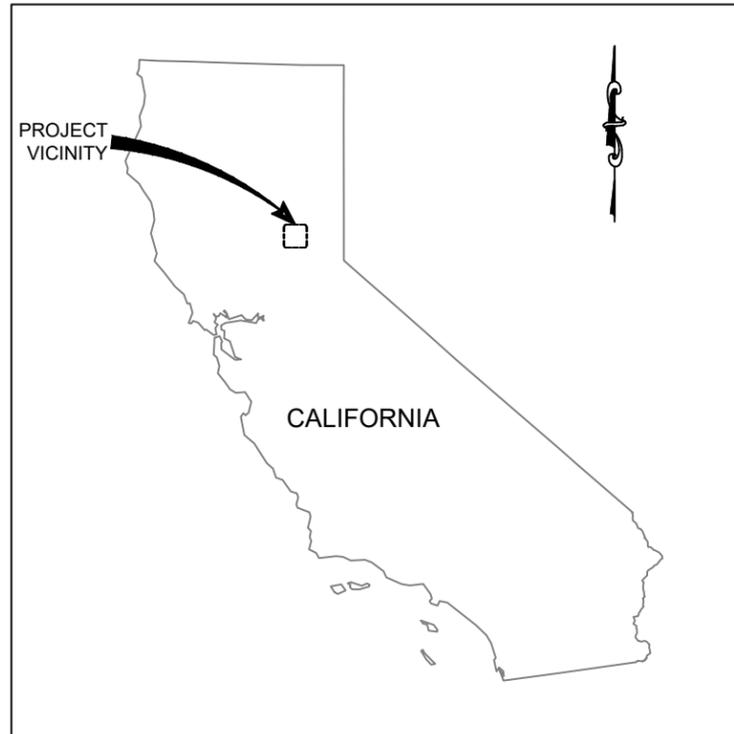
Date received at Subcontract Lab _____

If any items are check marked NO or are non-compliant, a phone call back to California Laboratory Services is required immediately. If all items are acceptable, a faxed copy of the signed sub chain of custody (COC) and the completed sample receipt check list is required within 24 hours of sample receipt.

APPENDIX B
DRAWINGS AND PERFORMANCE SPECIFICATIONS

RISE GRASS VALLEY INC. NEW BRUNSWICK SHAFT WTP

VICINITY



PREPARED BY:



2720 Ruby Vista Dr. Suite 101
Elko, NV 89801

REVISION: 0

ISSUE DATE: OCTOBER 30, 2019

ISSUED FOR: CONSTRUCTION

CLIENT INFORMATION: RISE GRASS VALLEY INC.

CLIENT ADDRESS: 333 CROWN POINT CIRCLE
SUITE 215
GRASS VALLEY, CA

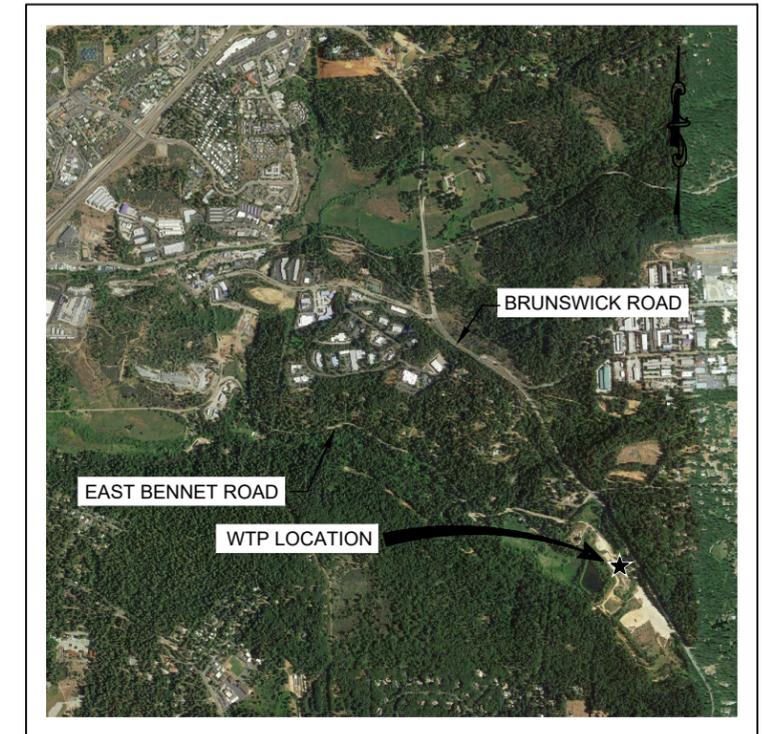
PROJECT LOCATION: GRASS VALLEY, CA

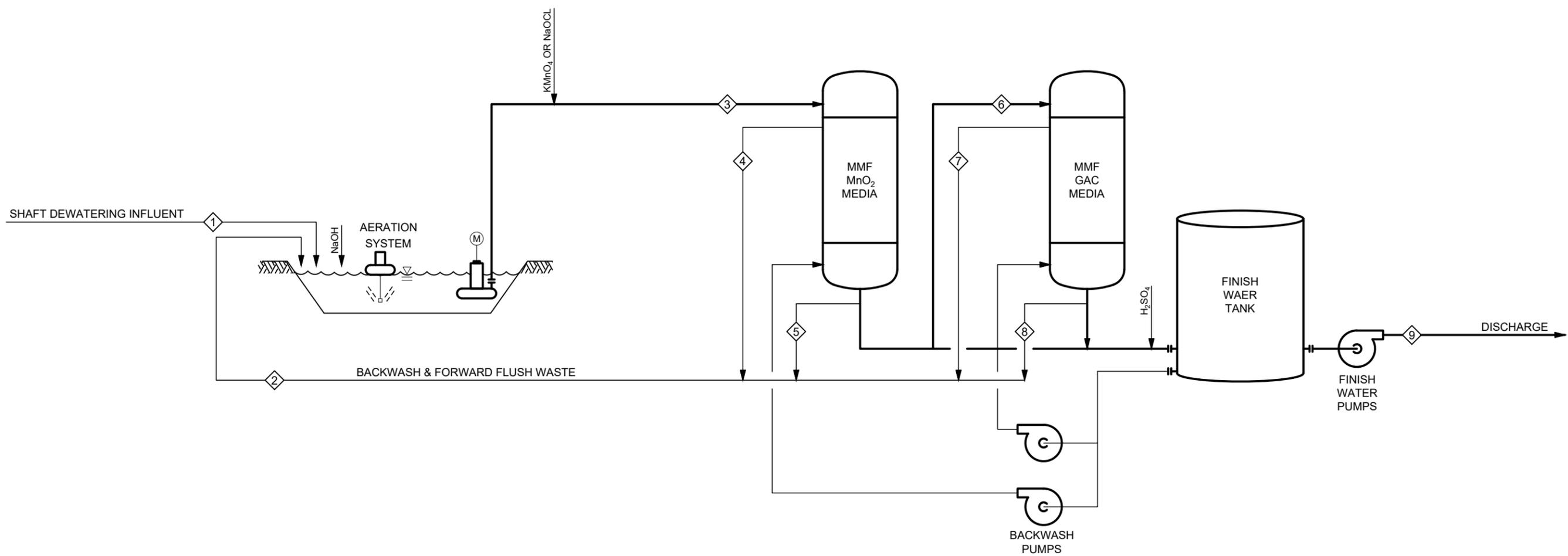
PROJECT NUMBER: 54.02

SHEET INDEX

| Count | Drawing Number | Description |
|-------|----------------|-------------------------------------|
| | General | |
| 1 | G-001 | Cover Sheet |
| 2 | G-100 | Process Flow Diagram & Mass Balance |
| | Civil | |
| 3 | C-100 | Overall site Plan |
| 4 | C-101 | Plant Layout Plan |

AERIAL





MASS BALANCE

DESIGN (2500 GPM DAILY AVG.)

| STREAM TAG | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------------------------------|---------------------|--------------------------|------------------------|----------------------------|---------------------------------|--------------------------------|------------------------------------|---|--------------|
| PROCESS PARAMETERS | INFLUENT FROM SHAFT | BACKWASH & FORWARD WASTE | MAGNESIUM DIOXIDE FEED | MAGNESIUM DIOXIDE BACKWASH | MAGNESIUM DIOXIDE FORWARD FLUSH | GRANULAR ACTIVATED CARBON FEED | GRANULAR ACTIVATED CARBON BACKWASH | GRANULAR ACTIVATED CARBON FORWARD FLUSH | FINISH WATER |
| DESIGN FLOW (MAX INSTANTANEOUS), GPM | 2,500 | 339 | 2,679 | 1,963 | 339.0 | 2,612.6 | 628 | 323 | 2,500 |
| DESIGN FLOW, GPD | 3,600,000 | 97,536 | 3,697,536 | 78,540 | 13,560 | 3,605,436 | 25,133 | 12,920 | 3,600,000 |
| TOTAL SUSPENDEDED SOLIDS, MG/L (%) | 6 | - | 0.5 | 24 | - | 0.1 | 14 | - | 0.1 |
| TOTAL SUSPENDEDED SOLIDS, LB/DAY | 180 | 18 | 15 | 15 | - | 3 | 3 | - | 3 |
| SERVICE FACTOR (HR/DAY) | 24.0 | | 23.0 | | | 23.0 | | | |

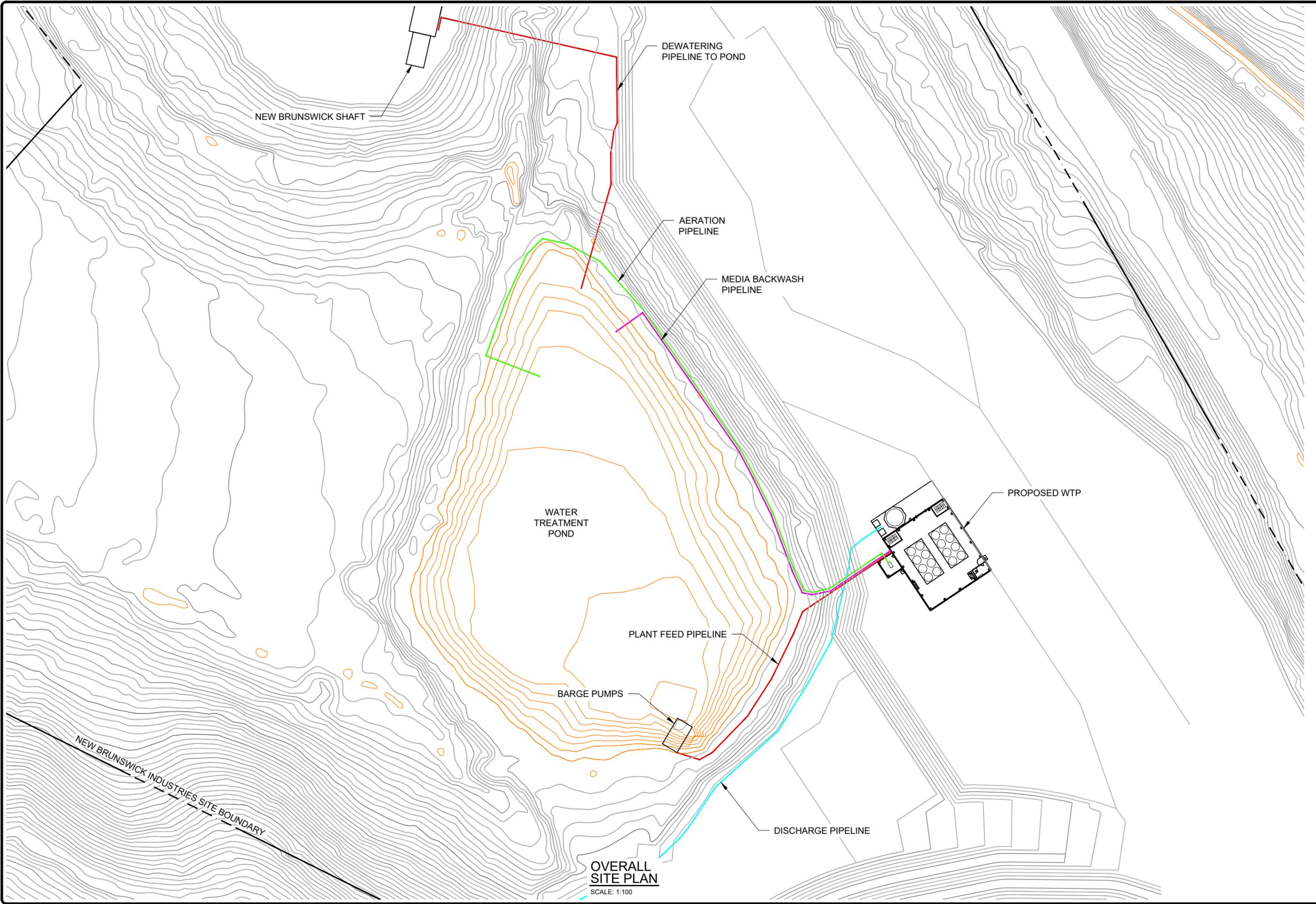
| REV. | DATE | REVISION DESCRIPTION |
|------|----------|-------------------------|
| 0 | 10/30/19 | ISSUED FOR CONSTRUCTION |

TITLE: PROCESS FLOW DIAGRAM
PROJECT: RISE GRASS VALLEY INC. NEW BRUNSWICK SHAFT WTP

| |
|---------------------------|
| PROJECT NO. 54.02 |
| DATE: OCTOBER 30, 2019 |
| SCALE: N/A |
| SHEET NO. |

10/30/2019 8:10 AM S:\Projects\54 Rise Gold\54.02 Idaho Maryland Updated Scoping Study\CADD\dwg\G-100.dwg

10/30/2019 8:11 AM S:\Projects\54 Rise Gold\54.02 Idaho Maryland Updated Scoping Study\CADD\dwg\C-100.dwg



OVERALL SITE PLAN
SCALE: 1:100

| REV. | DATE | REVISION DESCRIPTION |
|------|----------|-------------------------|
| 0 | 10/30/19 | ISSUED FOR CONSTRUCTION |
| | | |
| | | |
| | | |

TITLE: **OVERALL SITE PLAN SITE PLAN**

PROJECT: **RISE GRASS VALLEY INC.
NEWBRUNSWICK SHAFT WTP**

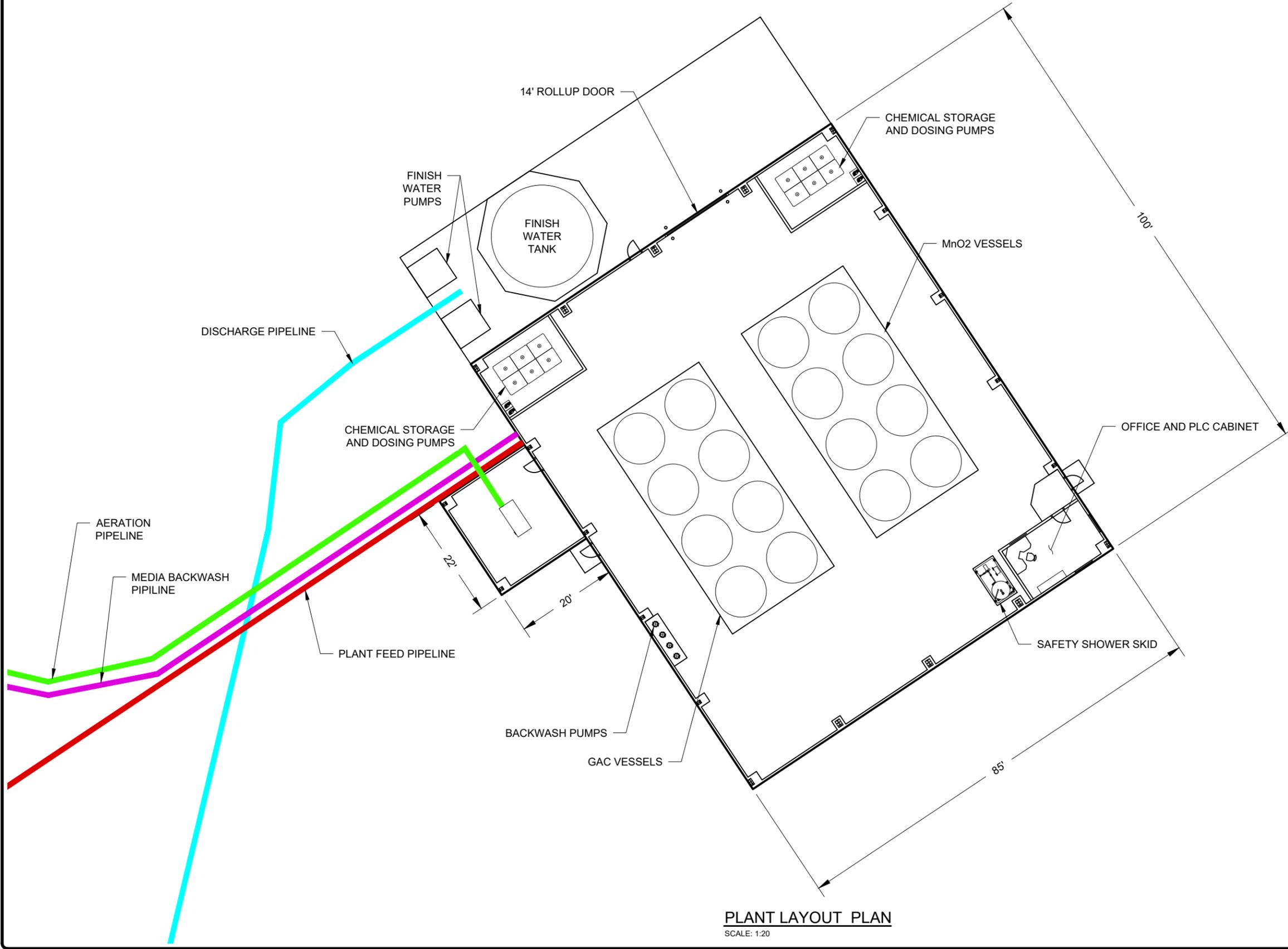
PROJECT NO. 54.02

DATE: OCTOBER 30, 2019

SCALE: 1:100

SHEET NO. **C-100**

10/30/2019 8:12 AM S:\Projects\54 Rise Gold\54.02 Idaho Maryland Updated Scoping Study\CADD\dwg\C-101.dwg



PLANT LAYOUT PLAN
SCALE: 1:20

| REV. | DATE | REVISION DESCRIPTION |
|------|----------|-------------------------|
| 0 | 10/30/19 | ISSUED FOR CONSTRUCTION |
| | | |
| | | |
| | | |

TITLE: **PLANT LAYOUT PLAN**
PROJECT: **RISE GRASS VALLEY GRASS VALLEY INC.
NEW BRUNSWICK SHAFT WTP**

| |
|---------------------------|
| PROJECT NO. 54.02 |
| DATE: OCTOBER 30, 2019 |
| SCALE: 1:20 |
| SHEET NO. C-101 |

APPENDIX C
EQUIPMENT DATA SHEETS

| PRESSURE VESSEL DATA SHEET | | | | | | | PROJECT No: | 54.02 | |
|--|------------|---|--------|------------------------------|------------|----------------------------|-------------|------------------------|--|
| DESCRIPTION: | | Manganese Dioxide Vessels | | | | CLIENT: | | Rise Grass Valley Inc. | |
| MANUFACTURER: | | - | | | | LOCATION: | | Grass Valley, CA | |
| MODEL NO: | | - | | | | DATE: | | 2019-03-29 | |
| TAG | Fitting | Dia. | Degree | Height | Projection | Description | DIAGRAM | | |
| LADDER | N/A | - | - | - | - | LADDER | | | |
| A | Manuf | Manuf | 0° | Top | Manuf | MANWAY | | | |
| B | Manuf | 2" to 3" | Manuf | Manuf | Manuf | INLET | | | |
| C | Manuf | 2" to 3" | Manuf | Manuf | Manuf | OUTLET | | | |
| D | Manuf | Manuf | - | Manuf | Manuf | DRAIN | | | |
| E | Window | Manuf | Manuf | Manuf | Manuf | Sight Glass | | | |
| F | | | | | | | | | |
| G | | | | | | | | | |
| L | | | | | | | | | |
| V | | | | | | | | | |
| PROCESS | | | | DESIGN | | | | | |
| Capacity - Design (gpm): | | 321 | | Mounting: | | Tank Stand | | | |
| Capacity - Max (gpm): | | 350 | | Overall Height: | | >=6' | | | |
| Retention Time: | | 1.7 min | | Diameter: | | 10' | | | |
| Flux Rate (gpm/ft²): | | 3.5-5 (4.3) | | Manganese Dioxide Bed Depth: | | 36" Min. | | | |
| Method of withdraw: | | Pressure | | Total Bed Depth: | | 44" Min. | | | |
| Loc. of withdraw: | | Manuf | | Quantity of Vessels: | | 8 | | | |
| Mixing: | | No | | Wall Thickness: | | Manuf | | | |
| Baffles: | | No | | Sidewall Height: | | Manuf | | | |
| ASME (Y/N): | | Yes | | Construction Materials: | | Manuf | | | |
| Code Stamp (psi): | | Manuf | | Interior Coating: | | Manuf | | | |
| Op. Pressure (psi): | | Manuf | | Exterior Coating: | | Manuf | | | |
| INSTRUMENTATION | | | | Anchorage Requirements: | | | | Manuf | |
| Sampling: | | Inlet and outlet sampling ports | | Lift Lug/Mounting Attach: | | | | Manuf | |
| Temperature: | | No | | Ladder: | | | | No | |
| Analytics: | | Inlet & Outlet Pressure | | Vessel Wt -Empty: | | | | Manuf | |
| Pressure: | | Inlet & Outlet Gauges | | Vessel Wt -Full: | | | | Manuf | |
| Controls: | | Automated valving for backwash and forward flush. | | Top/Bottom Head: | | | | Manuf | |
| | | | | Rating: | | | | ASME | |
| Remarks: Tank lining to protect from feed water. Sampling ports can be on skid piping and are not required on vessels. | | PROCESS DATA: | | | | DRAWING REFERENCE(S) | | | |
| | | Process Fluid: | | Water | | P&ID DRAWING NO. | | | |
| | | Pressure Max (psi): | | <100 | | P&ID TAG REFERENCE(S) | | | |
| | | Temperature Max.: | | 100°F | | SPECIFICATION REFERENCE(S) | | | |
| | | Specific Gravity: | | ~1 | | | | | |
| | | pH: | | 5-8 | | | | | |
| | | Conductivity: | | 300-600 µS | | | | | |
| | | HAZARDS: | | | | | | | |
| | | Flammable | | N/A | | X | | | |
| | | Corrosive | | Other | | | | | |
| Vapor | | | | | | | | | |
| No | DATE | BY | CHK | APP | REVISION | | | | |
| 0 | 2019-03-29 | JQG | SJB | SJB | Permit | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |



| PRESSURE VESSEL DATA SHEET | | | | | | | PROJECT No: | 54.02 | | |
|--|------------|--|--------|-----------------------|---------------------------|----------------------------|-------------|------------------------|--|--|
| DESCRIPTION: | | Granular Activated Carbon (GAC) Vessels | | | | | CLIENT: | Rise Grass Valley Inc. | | |
| MANUFACTURER: | | - | | | | | LOCATION: | Grass Valley, CA | | |
| MODEL NO: | | - | | | | | DATE: | 2019-03-29 | | |
| TAG | Fitting | Dia. | Degree | Height | Projection | Description | DIAGRAM | | | |
| LADDER | N/A | - | - | - | - | LADDER | | | | |
| A | Manuf | Manuf | 0° | Top | Manuf | MANWAY | | | | |
| B | Manuf | 2" to 3" | Manuf | Manuf | Manuf | INLET | | | | |
| C | Manuf | 2" to 3" | Manuf | Manuf | Manuf | OUTLET | | | | |
| D | Manuf | Manuf | - | Manuf | Manuf | DRAIN | | | | |
| E | Window | Manuf | Manuf | Manuf | Manuf | Sight Glass | | | | |
| F | | | | | | | | | | |
| G | | | | | | | | | | |
| L | | | | | | | | | | |
| V | | | | | | | | | | |
| PROCESS | | DESIGN | | | | | | | | |
| Capacity - Design (gpm): | | 313 | | | Mounting: | | Tank Stand | | | |
| Capacity - Max (gpm): | | 350 | | | Overall Height: | | >=6' | | | |
| Retention Time: | | 1.7 min | | | Diameter: | | 10' | | | |
| Flux Rate (gpm/ft ²): | | 3.5-5 (4.3) | | | GAC Bed Depth: | | 40" Min. | | | |
| Method of withdraw: | | Pressure | | | Total Bed Depth: | | 48" Min. | | | |
| Loc. of withdraw: | | Manuf | | | Quantity of Vessels: | | 8 | | | |
| Mixing: | | No | | | Wall Thickness: | | Manuf | | | |
| Baffles: | | No | | | Sidewall Height: | | Manuf | | | |
| ASME (Y/N): | | Yes | | | Construction Materials: | | Manuf | | | |
| Code Stamp (psi): | | Manuf | | | Interior Coating: | | Manuf | | | |
| Op. Pressure (psi): | | Manuf | | | Exterior Coating: | | Manuf | | | |
| INSTRUMENTATION | | Anchorage Requirements: | | | | | | | | |
| Sampling: | | Inlet and outlet sampling ports | | | Lift Lug/Mounting Attach: | | Manuf | | | |
| Temperature: | | No | | | Ladder: | | No | | | |
| Analytics: | | Inlet & Outlet Pressure | | | Vessel Wt -Empty: | | Manuf | | | |
| Pressure: | | Inlet & Outlet Gauges | | | Vessel Wt -Full: | | Manuf | | | |
| Controls: | | Manual valving for backwash and forward flush. | | | Top/Bottom Head: | | Manuf | | | |
| | | | | | Rating: | | ASME | | | |
| Remarks: Tank lining to protect from feed water. Sampling ports can be on skid piping and are not required on vessels. | | PROCESS DATA: | | DRAWING REFERENCE(S) | | | | | | |
| | | Process Fluid: | | Water | | | | | | |
| | | Pressure Max (psi): | | <100 | | | | | | |
| | | Temperature Max.: | | 100°F | | | | | | |
| | | Specific Gravity: | | ~1 | | | | | | |
| | | pH: | | 5-8 | | | | | | |
| | | Conductivity: | | 300-600 µS | | | | | | |
| | | HAZARDS: | | P&ID TAG REFERENCE(S) | | | | | | |
| | | Flammable | | N/A | X | | | | | |
| | | Corrosive | | Other | | | | | | |
| Vapor | | | | | | | | | | |
| No | DATE | BY | CHK | APP | REVISION | SPECIFICATION REFERENCE(S) | | | | |
| 0 | 2019-03-29 | JQG | SJB | SJB | Permit | | | | | |
| 1 | | | | | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | | | | | | | | |
| 4 | | | | | | | | | | |



| PUMP DATA SHEET | | | | PROJECT NO: | 54.02 | | | |
|--|---------------|-------------------------------------|--------------------------|-------------------------------------|-------------------------|-------------------|------------------------|--|
| DESCRIPTION: | | Pond Submersible Pumps | | CLIENT: | Rise Grass Valley Inc. | | | |
| MANUFACTURER: | | TBD | | LOCATION: | Grass Valley, CA | | | |
| MODEL NO: | | TBD | | DATE: | 2019-03-29 | | | |
| PROCESS DATA | | | | PUMPING REQUIREMENTS | | | | |
| Maximum Flow: | 1500 gpm | Temperature: | 33 - 80°F | | Viscosity: | ~1 cP | | |
| Design Flow: | 1340 gpm | TS (Total Solids)%: | <0.01% | | Duty (fluid): | 1340 gpm @ 180 ft | | |
| Nominal Flow: | 1340 gpm | TSS(Total Suspended Solids): | ~60 ppm | | S.G.: | ~1 | | |
| Process Fluid: | Settled Water | pH: | 5-8 | | Duty (water): | 1340 gpm @ 180 ft | | |
| RPM: | TBD | Vapor Pressure: | TBD | | NPSHa: | TBD | | |
| | | | | | | | | |
| | | | | | | | | |
| PUMP DESIGN | | | | | | | | |
| Nozzles | Size | Fitting | Type: | | Centrifugal | | Other Features: | |
| Suction: | TBD | 150# ANSI | Subtype: | | Submersible | | | |
| Discharge: | TBD | 150# ANSI | NPSHr: | | TBD | | | |
| Drain: | Manuf | Manuf | No Stages.: | | 1 | | | |
| Vent: | - | - | Impeller dia.: | | TBD | | | |
| | | | Estimated Weight: | | TBD | | | |
| DRIVE AND SEAL | | | | MATERIAL OF CONSTRUCTION | | | | |
| Packing or Seal: | TBD | Coupling Size: | TBD | | Casing: | TBD | | |
| Motor Shaft Size: | TBD | Impeller Type: | TBD | | Casing Coating: | TBD | | |
| Pump Shaft Size: | TBD | | | | Impeller: | TBD | | |
| RPM: | TBD | | | | Mechanical Seal: | TBD | | |
| | | | | | Pump O-Ring: | TBD | | |
| MOTOR | | | | ENVIRONMENT: | | | | |
| Manufacturer: | TBD | ELECTRICAL | | Location: | Outdoor/Barge | | | |
| Baseplate Size: | Manuf | 100 | HP | Corrosive Area: | no | | | |
| Enclosure: | TEFC | 460 | V | Dusty Area: | yes | | | |
| Service Factor: | 1.15 | 3 | Phase | Explosive Area: | no | | | |
| Full Load Amp: | - | 60 | Hz | Elevation (above Sea-Level): | 2755 | | | |
| MOTOR CONTROL | Remote | X | | Temperature Min.: | 15 °F | | | |
| local | - | VFD | X | Temperature Max.: | 108 °F | | | |
| CONTROL METHOD | | Level | X | Drawing No | | | | |
| Constant Pressure | - | Flow | X | C-100, C-101 | | | | |
| Differential Pressure | - | Other | - | P&ID Drawing No. | | | | |
| Remarks 2 Pumps operating in parallel with one additional pump on standby. | | | | G-100 | | | | |
| | | | | P&ID Tag Reference(s) | | | | |
| | | | | Pond Submersible Pumps | | | | |
| | | | | | | | | |
|  | | No | DATE | BY | CHK | APP | REVISION | |
| | | 0 | 2019-03-29 | JQG | SJB | SJB | Permit | |
| | | 1 | | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| | | 4 | | | | | | |
| 5 | | | | | | | | |

| PUMP DATA SHEET | | | | PROJECT NO: | 54.02 | | | |
|---|----------|----------------------------------|-------------------|----------------------------------|------------------------|-----------------|----------|--|
| DESCRIPTION: | | Manganese Dioxide Backwash Pumps | | CLIENT: | Rise Grass Valley Inc. | | | |
| MANUFACTURER: | | TBD | | LOCATION: | Grass Valley, CA | | | |
| MODEL NO: | | TBD | | DATE: | 2019-03-29 | | | |
| PROCESS DATA | | | | PUMPING REQUIREMENTS | | | | |
| Maximum Flow: | 2200 gpm | Temperature: | 33 - 80°F | Viscosity: | ~1 cP | | | |
| Design Flow: | 1964 gpm | TS (Total Solids)%: | <0.00% | Duty (fluid): | 1964 gpm @ 68 ft | | | |
| Nominal Flow: | 1964 gpm | TSS(Total Suspended Solids): | ~0 ppm | S.G.: | ~1 | | | |
| Process Fluid: | Water | pH: | 5-8 | Duty (water): | 1964 gpm @ 68 ft | | | |
| RPM: | TBD | Vapor Pressure: | TBD | NPSHa: | TBD | | | |
| | | | | | | | | |
| | | | | | | | | |
| PUMP DESIGN | | | | | | | | |
| Nozzles | Size | Fitting | Type: | Centrifugal | | Other Features: | | |
| Suction: | TBD | 150# ANSI | Subtype: | Frame Mounted | | | | |
| Discharge: | TBD | 150# ANSI | NPSHr: | TBD | | | | |
| Drain: | Manuf | Manuf | No Stages.: | 1 | | | | |
| Vent: | - | - | Impeller dia.: | TBD | | | | |
| | | | Estimated Weight: | TBD | | | | |
| DRIVE AND SEAL | | | | MATERIAL OF CONSTRUCTION | | | | |
| Packing or Seal: | TBD | Coupling Size: | TBD | Casing: | TBD | | | |
| Motor Shaft Size: | TBD | Impeller Type: | TBD | Casing Coating: | TBD | | | |
| Pump Shaft Size: | TBD | | | Impeller: | TBD | | | |
| RPM: | TBD | | | Mechanical Seal: | TBD | | | |
| | | | | Pump O-Ring: | TBD | | | |
| MOTOR | | | | ENVIRONMENT: | | | | |
| Manufacturer: | TBD | ELECTRICAL | | Location: | Outdoor/Barge | | | |
| Baseplate Size: | Manuf | 100 | HP | Corrosive Area: | no | | | |
| Enclosure: | TEFC | 460 | V | Dusty Area: | yes | | | |
| Service Factor: | 1.15 | 3 | Phase | Explosive Area: | no | | | |
| Full Load Amp: | - | 60 | Hz | Elevation (above Sea-Level): | 2755 | | | |
| MOTOR CONTROL | Remote | X | | Temperature Min.: | 15 °F | | | |
| local | VFD | X | | Temperature Max.: | 108 °F | | | |
| CONTROL METHOD | | Level | X | Drawing No | | | | |
| Constant Pressure | - | Flow | X | C-100, C-101 | | | | |
| Differential Pressure | - | Other | - | P&ID Drawing No. | | | | |
| Remarks 1 pump operating with one pump on standby. | | | | G-100 | | | | |
| | | | | P&ID Tag Reference(s) | | | | |
| | | | | Manganese Dioxide Backwash Pumps | | | | |
| | | | | | | | | |
|  | | No | DATE | BY | CHK | APP | REVISION | |
| | | 0 | 2019-03-29 | JQG | SJB | SJB | Permit | |
| | | 1 | | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| | | 4 | | | | | | |
| 5 | | | | | | | | |

| PUMP DATA SHEET | | | | PROJECT NO: | 54.02 | | | |
|---|---------|------------------------------|-------------------|------------------------------|------------------------|-----|-----------------|--|
| DESCRIPTION: | | GAC Backwash Pumps | | CLIENT: | Rise Grass Valley Inc. | | | |
| MANUFACTURER: | | TBD | | LOCATION: | Grass Valley, CA | | | |
| MODEL NO: | | TBD | | DATE: | 2019-03-29 | | | |
| PROCESS DATA | | | | PUMPING REQUIREMENTS | | | | |
| Maximum Flow: | 700 gpm | Temperature: | 33 - 80°F | Viscosity: | ~1 cP | | | |
| Design Flow: | 629 gpm | TS (Total Solids)%: | <0.00% | Duty (fluid): | 629 gpm @ 51 ft | | | |
| Nominal Flow: | 629 gpm | TSS(Total Suspended Solids): | ~0 ppm | S.G.: | ~1 | | | |
| Process Fluid: | Water | pH: | 5-8 | Duty (water): | 629 gpm @ 51 ft | | | |
| RPM: | TBD | Vapor Pressure: | TBD | NPSHa: | TBD | | | |
| | | | | | | | | |
| | | | | | | | | |
| PUMP DESIGN | | | | | | | | |
| Nozzles | Size | Fitting | Type: | | Centrifugal | | Other Features: | |
| Suction: | TBD | 150# ANSI | Subtype: | | Frame Mounted | | | |
| Discharge: | TBD | 150# ANSI | NPSHr: | | TBD | | | |
| Drain: | Manuf | Manuf | No Stages.: | | 1 | | | |
| Vent: | - | - | Impeller dia.: | | TBD | | | |
| | | | Estimated Weight: | | TBD | | | |
| DRIVE AND SEAL | | | | MATERIAL OF CONSTRUCTION | | | | |
| Packing or Seal: | TBD | Coupling Size: | TBD | Casing: | TBD | | | |
| Motor Shaft Size: | TBD | Impeller Type: | TBD | Casing Coating: | TBD | | | |
| Pump Shaft Size: | TBD | | | Impeller: | TBD | | | |
| RPM: | TBD | | | Mechanical Seal: | TBD | | | |
| | | | | Pump O-Ring: | TBD | | | |
| MOTOR | | | | ENVIRONMENT: | | | | |
| Manufacturer: | TBD | ELECTRICAL | | Location: | Outdoor/Barge | | | |
| Baseplate Size: | Manuf | 25 | HP | Corrosive Area: | no | | | |
| Enclosure: | TEFC | TBD | V | Dusty Area: | yes | | | |
| Service Factor: | 1.15 | TBD | Phase | Explosive Area: | no | | | |
| Full Load Amp: | - | TBD | Hz | Elevation (above Sea-Level): | 2755 | | | |
| MOTOR CONTROL | Remote | X | | Temperature Min.: | 15 °F | | | |
| local | VFD | X | | Temperature Max.: | 108 °F | | | |
| CONTROL METHOD | | Level | X | Drawing No | | | | |
| Constant Pressure | - | Flow | X | C-100, C-101 | | | | |
| Differential Pressure | - | Other | - | P&ID Drawing No. | | | | |
| Remarks 1 pump operating with one pump on standby. | | | | G-100 | | | | |
| | | | | P&ID Tag Reference(s) | | | | |
| | | | | GAC Backwash Pumps | | | | |
| | | | | | | | | |
|  | | No | DATE | BY | CHK | APP | REVISION | |
| | | 0 | 2019-03-29 | JQG | SJB | SJB | Permit | |
| | | 1 | | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| | | 4 | | | | | | |
| 5 | | | | | | | | |

| AERATION SYSTEM DATA SHEET | | | PROJECT No: | 54.02 | | | | |
|--|---|------------------------------|-----------------------|------------------------|---------------|-----|-----|----------|
| DESCRIPTION: | Turbine Aerator | | CLIENT: | Rise Grass Valley Inc. | | | | |
| MANUFACTURER: | TBD | | LOCATION: | Grass Valley, CA | | | | |
| MODEL NO: | TBD | | DATE: | 2019-03-29 | | | | |
| PROCESS Data | | | | | | | | |
| Maximum Flow | 1500 gpm | Temperature: | 33-80°F | | | | | |
| Design Flow | 1340 gpm | TS (Total Solids)%: | TBD | | | | | |
| Minimum Flow | 700 gpm | TSS(Total Suspended Solids): | TBD | | | | | |
| Process Fluid: | Shaft Water | pH: | 5-8 | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| AERATOR DESIGN | | | | | | | | |
| Type | Turbine Aerator | | | | | | | |
| Injection Rate: | 76 ft ³ /min | | | | | | | |
| | 4.7 lbs O ² /hr | | | | | | | |
| Mounting: | Closed cell, UV protected polyethylene pontoons with low water legs. | | | | | | | |
| | | | | | | | | |
| DRIVE AND SEAL | | | | | | | | |
| Packing or Seal: | Manuf | Shaft Material | 304 Stainles | | | | | |
| Motor Shaft Size: | 1" | | | | | | | |
| Aerator Shaft Size: | 1.5" | | | | | | | |
| | | | | | | | | |
| MOTOR | | | ENVIROMENT: | | | | | |
| Manufacturer: | Baldor | ELECTRICAL | | Location | Outdoor/Barge | | | |
| Model: | VECP3665T | 5 | HP | Corrosive Area | no | | | |
| Enclosure: | TEFC | 240/460 | V | Dusty Area | yes | | | |
| Service Factor: | TBD | 3 or 1 | Phase | Explosive Area | no | | | |
| Full Load Amp: | 13.2/6.6 | 60 | Hz | Temperature Min | 15 °F | | | |
| Motor Control | <input checked="" type="checkbox"/> Control Box <input type="checkbox"/> VFD | 1750 | RPM | Temperature Max | 108 °F | | | |
| Control Method | | | Drawing No | | | | | |
| <input checked="" type="checkbox"/> Manual <input type="checkbox"/> Other | | | C-100 | | | | | |
| Remarks | | | P&ID Drawing No. | | | | | |
| | | | G-100 | | | | | |
| | | | P&ID Tag Reference(s) | | | | | |
| | | | Turbine Aerator | | | | | |
| | | | No | DATE | BY | CHK | APP | REVISION |
| | | | 0 | 2019-03-29 | JQG | SJB | SJB | Permit |
| | | | 1 | | | | | |
| | | | 2 | | | | | |
| | | | 3 | | | | | |
| | | | 4 | | | | | |
| | | | 5 | | | | | |



APPENDIX D
SAFETY DATA SHEETS (SDS)

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 1 of 7

Manganese Dioxide

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : Manganese Dioxide

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: S25420

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:



Irritant

Acute toxicity (oral, dermal, inhalation), category 4

Acute toxicity - Inhalation - Category 4

Acute toxicity - Oral - Category 4

Signal word :Warning

Hazard statements:

Harmful if swallowed

Harmful if inhaled

Precautionary statements:

If medical advice is needed, have product container or label at hand

Keep out of reach of children

Read label before use

Do not eat, drink or smoke when using this product

Avoid breathing dust/fume/gas/mist/vapours/spray

Wash skin thoroughly after handling

Wash skin thoroughly after handling

Use only outdoors or in a well-ventilated area

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

Rinse mouth

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Call a POISON CENTER or doctor/physician if you feel unwell

Dispose of contents and container to an approved waste disposal plant

Other Non-GHS Classification:

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

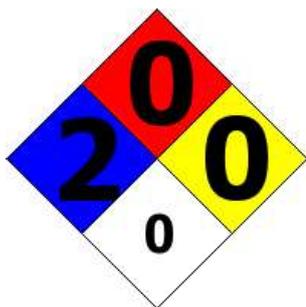
Page 2 of 7

Manganese Dioxide

WHMIS



NFPA/HMIS



NFPA SCALE (0-4)

| | |
|---------------------|---|
| Health | 2 |
| Flammability | 0 |
| Physical Hazard | 0 |
| Personal Protection | X |

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:

CAS 1313-13-9

Manganese oxide

>98 %

Percentages are by weight

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Loosen clothing as necessary and position individual in a comfortable position. Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen. Get medical assistance if cough or other symptoms appear.

After skin contact: Rinse/flush exposed skin gently using soap and water for 15-20 minutes. Seek medical advice if discomfort or irritation persists.

After eye contact: Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention if irritation persists or if concerned.

After swallowing: Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists. Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed:

Irritation, Nausea, Headache, Shortness of breath.;

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention, provide SDS document to physician. Physician should treat symptomatically.

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: Use appropriate fire suppression agents for adjacent combustible materials

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 3 of 7

Manganese Dioxide

or sources of ignition. Use water, dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam.

For safety reasons unsuitable extinguishing agents:

Special hazards arising from the substance or mixture:

Combustion products may include carbon oxides or other toxic vapors. Thermal decomposition can lead to release of irritating gases and vapors.

Advice for firefighters:

Protective equipment: Use NIOSH-approved respiratory protection/breathing apparatus.

Additional information (precautions): Move product containers away from fire or keep cool with water spray as a protective measure, where feasible. Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Wear protective equipment. Ensure that air-handling systems are operational. Ensure adequate ventilation.

Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13. Should not be released into environment.

Methods and material for containment and cleaning up:

Keep in suitable closed containers for disposal. Wear protective eyewear, gloves, and clothing. Refer to Section 8. Always obey local regulations. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect solids in powder form using vacuum with (HEPA filter). Evacuate personnel to safe areas.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Minimize dust generation and accumulation. Follow good hygiene procedures when handling chemical materials. Refer to Section 8. Do not eat, drink, smoke, or use personal products when handling chemical substances. Avoid contact with eyes, skin, and clothing.

Conditions for safe storage, including any incompatibilities:

Store away from incompatible materials. Protect from freezing and physical damage. Keep away from food and beverages. Provide ventilation for containers. Store in cool, dry conditions in well sealed containers. Store with like hazards

SECTION 8 : Exposure controls/personal protection



Control Parameters:

1313-13-9, Magnesium dioxide, ACGIH TLV TWA (inhalable particles) 0.02 mg/m³
1313-13-9, Magnesium dioxide, OSHA PEL TWA (Total Dust) 0.2 mg/m³

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 4 of 7

Manganese Dioxide

- Appropriate Engineering controls:** Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use under a fume hood
- Respiratory protection:** Not required under normal conditions of use. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. When necessary use NIOSH approved breathing equipment.
- Protection of skin:** Select glove material impermeable and resistant to the substance. Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves. Wear protective clothing.
- Eye protection:** Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses or goggles are appropriate eye protection.
- General hygienic measures:** Perform routine housekeeping. Wash hands before breaks and at the end of work. Avoid contact with skin, eyes, and clothing. Before wearing wash contaminated clothing.

SECTION 9 : Physical and chemical properties

| | | | |
|---|-----------------|--|--|
| Appearance (physical state,color): | Solid | Explosion limit lower: Explosion limit upper: | Not determined Not determined |
| Odor: | Not Determined | Vapor pressure: | Not determined |
| Odor threshold: | Not determined | Vapor density: | Not determined |
| pH-value: | Not Determined | Relative density: | 5.026 g/cm ³ |
| Melting/Freezing point: | 535 °C (995 °F) | Solubilities: | |
| Boiling point/Boiling range: | Not determined | Partition coefficient (n-octanol/water): | Not determined |
| Flash point (closed cup): | Not determined | Auto/Self-ignition temperature: | Not determined |
| Evaporation rate: | Not determined | Decomposition temperature: | Not determined |
| Flammability (solid,gaseous): | Not determined | Viscosity: | a. Kinematic: Not determined b. Dynamic: Not determined |
| Density: Not determined | | | |

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 5 of 7

Manganese Dioxide

SECTION 10 : Stability and reactivity

Reactivity:Nonreactive under normal conditions.

Chemical stability:Stable under normal conditions.

Possible hazardous reactions:None under normal processing

Conditions to avoid:Incompatible Materials.

Incompatible materials:Strong acids.Strong bases.Organic materials.

Hazardous decomposition products:

SECTION 11 : Toxicological information

Acute Toxicity: No additional information.

Chronic Toxicity: No additional information.

Corrosion Irritation: No additional information.

| | |
|-----------------------|----------------------------|
| Sensitization: | No additional information. |
|-----------------------|----------------------------|

| | |
|------------------------------------|----------------------------|
| Single Target Organ (STOT): | No additional information. |
|------------------------------------|----------------------------|

| | |
|----------------------------|----------------------------|
| Numerical Measures: | No additional information. |
|----------------------------|----------------------------|

| | |
|-------------------------|----------------------------|
| Carcinogenicity: | No additional information. |
|-------------------------|----------------------------|

| | |
|----------------------|----------------------------|
| Mutagenicity: | No additional information. |
|----------------------|----------------------------|

| | |
|-------------------------------|----------------------------|
| Reproductive Toxicity: | No additional information. |
|-------------------------------|----------------------------|

SECTION 12 : Ecological information

Ecotoxicity Persistence and degradability:

Bioaccumulative potential:

Mobility in soil:

Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Contact a licensed professional waste disposal service to dispose of this material.Dispose of empty containers as unused product.Product or containers must not be disposed with household garbage.It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11).Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations. Ensure complete and accurate classification.

SECTION 14 : Transport information

UN-Number

Not Regulated.

UN proper shipping name

Not Regulated.

Transport hazard class(es)

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 6 of 7

Manganese Dioxide

Packing group:Not Regulated

Environmental hazard:

Transport in bulk:

Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Acute

SARA Section 313 (Specific toxic chemical listings):

1313-13-9 N450 Manganese Compounds

RCRA (hazardous waste code):

None of the ingredients is listed

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

None of the ingredients is listed

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

None of the ingredients is listed

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

None of the ingredients is listed

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 10.24.2014

Page 7 of 7

Manganese Dioxide

material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:

IMDG: International Maritime Code for Dangerous Goods

IATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

CAS: Chemical Abstracts Service (division of the American Chemical Society)

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

DNEL: Derived No-Effect Level (REACH)

PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)

SARA: Superfund Amendments and Reauthorization Act (USA)

RCRA: Resource Conservation and Recovery Act (USA)

TSCA: Toxic Substances Control Act (USA)

NPRI: National Pollutant Release Inventory (Canada)

DOT: US Department of Transportation

Effective date : 10.24.2014

Last updated : 03.19.2015

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.04.2015

Page 1 of 7

Potassium Permanganate,

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : Potassium Permanganate,

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: S25497

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:



Oxidizing

Oxidizing solids, category 2



Irritant

Acute toxicity (oral, dermal, inhalation), category 4



Environmentally Damaging

Chronic hazards to the aquatic environment, category 1
Acute hazards to the aquatic environment, category 1



Corrosive

Skin corrosion, category 1B
Serious eye damage, category 1

Oxidizing Solids 2

Ac. Oral Tox. 4

Skin Corr. 1B

Eye. Damage 1

Aq. AcTox. 1

Aq. ChrTox. 1

Signal word :Danger

Hazard statements:

May intensify fire; oxidizer

Harmful if swallowed

Causes severe skin burns and eye damage

Causes serious eye damage

Very toxic to aquatic life with long lasting effects

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.04.2015

Page 2 of 7

Potassium Permanganate,

Precautionary statements:

If medical advice is needed, have product container or label at hand

Keep out of reach of children

Read label before use

Keep away from heat/sparks/open flames/hot surfaces. No smoking

Keep/Store away from clothing/combustible materials

Take any precaution to avoid mixing with combustibles

Do not breathe dust/fume/gas/mist/vapours/spray

Wash skin thoroughly after handling

Do not eat, drink or smoke when using this product

Avoid release to the environment

Wear protective gloves/protective clothing/eye protection/face protection

Immediately call a POISON CENTER or doctor/physician

Wash contaminated clothing before reuse

In case of fire: Use agents recommended in section 5 for extinction

Collect spillage

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

Rinse mouth

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting

IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Immediately call a POISON CENTER or doctor/physician

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do.

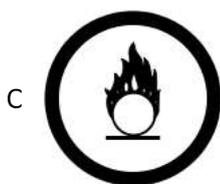
Continue rinsing

Store in a dry place

Dispose of contents and container as instructed in Section 13

Other Non-GHS Classification:

WHMIS



NFPA/HMIS



NFPA SCALE (0-4)

| | |
|---------------------|---|
| Health | 3 |
| Flammability | 0 |
| Physical Hazard | 2 |
| Personal Protection | X |

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.04.2015

Page 3 of 7

Potassium Permanganate,

| | | |
|---------------------------|------------------------|-------|
| CAS 7722-64-7 | Potassium Permanganate | >95 % |
| Percentages are by weight | | |

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen. Loosen clothing and place exposed in a comfortable position. Seek medical assistance if cough or other symptoms appear.

After skin contact: Immediately enter emergency shower rinsing while removing contaminated clothing and shoes. Immediately seek medical attention. Wash hands and exposed skin with soap and plenty of water.

After eye contact: Immediately seek medical attention. Continue rinsing eyes during transport to the hospital. Protect unexposed eye. Flush exposed eye gently using water for 15-20 minutes. Remove contact lenses while rinsing.

After swallowing: Rinse mouth with water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Immediately seek medical attention.

Most important symptoms and effects, both acute and delayed:

Irritation. Shortness of breath. Headache. Nausea. Dizziness. Central Nervous System impairment.

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention provide SDS document to physician. Physician should treat symptomatically.

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: Use water, dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam.

For safety reasons unsuitable extinguishing agents:

Special hazards arising from the substance or mixture:

Contact with other material may cause a fire. Some oxidizers may react explosively with hydrocarbons. Containers may explode when heated. Combustible dust formation is a risk. Thermal decomposition can lead to release of irritating gases and vapors.

Advice for firefighters:

Protective equipment: Wear protective eyewear, gloves, and clothing. Refer to Section 8.

Additional information (precautions): Avoid dust formation. Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation. Ensure that air-handling systems are operational.

Environmental precautions:

Should not be released into environment. Prevent from reaching drains, sewer, or waterway.

Methods and material for containment and cleaning up:

Pick up and arrange disposal without creating dust. Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet - brushing and place in container for disposal according to local regulations (see section 13). Wear protective eyewear, gloves, and clothing. Refer to Section 8. Always obey local regulations. If necessary use trained response staff or contractor. Evacuate personnel to safe areas. Containerize for disposal. Refer to Section 13. Keep in suitable closed containers for disposal.

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.04.2015

Page 4 of 7

Potassium Permanganate,

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Wash hands after handling. Avoid contact with skin and eyes. Discard contaminated materials. Avoid contact with skin, eyes, and clothing. Follow good hygiene procedures when handling chemical materials. Refer to Section 8. Follow proper disposal methods. Refer to Section 13. Do not eat, drink, smoke, or use personal products when handling chemical substances.

Conditions for safe storage, including any incompatibilities:

Protect from freezing and physical damage. Store in a cool location. Keep away from food and beverages. Protect from freezing and physical damage. Provide ventilation for containers. Keep container tightly sealed. Store away from incompatible materials.

SECTION 8 : Exposure controls/personal protection



Control Parameters:

7722-64-7, Potassium permanganate, C 5.000000 mg/m³ USA. OSHA 7722-64-7, Potassium permanganate, TWA 0.200000 mg/m³ USA. ACGIH 7722-64-7, Potassium permanganate, TWA 1.000000 mg/m³ USA. NIOSH

Appropriate Engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor and mists below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.

Respiratory protection:

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. When necessary use NIOSH approved breathing equipment. Use only under chemical fume hood.

Protection of skin:

Select glove material impermeable and resistant to the substance. Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves. Wear protective clothing.

Eye protection:

Tightly fitting safety goggles and faceshield (8 - inch minimum) are appropriate eye protection. Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses or goggles are appropriate eye protection.

General hygienic measures:

Perform routine housekeeping. Wash hands before breaks and immediately after handling the product. Avoid contact with skin, eyes, and clothing. Before reusing wash contaminated clothing.

SECTION 9 : Physical and chemical properties

| | | | |
|---|------------------|-------------------------------|----------------|
| Appearance (physical state,color): | Dark brown solid | Explosion limit lower: | Not Determined |
| | | Explosion limit upper: | Not Determined |

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.04.2015

Page 5 of 7

Potassium Permanganate,

| | | | |
|--------------------------------------|------------------------------|---|--|
| Odor: | Odorless | Vapor pressure: | Not Determined |
| Odor threshold: | Not Determined | Vapor density: | Not Determined |
| pH-value: | 7.2 - 9.7 at 20 g/l at 20 °C | Relative density: | 2.710 g/cm ³ |
| Melting/Freezing point: | > 240 °C | Solubilities: | Soluble in water: 65.1 g/l at 20 °C |
| Boiling point/Boiling range: | Not Determined | Partition coefficient (n-octanol/water): | Not Determined |
| Flash point (closed cup): | Not Determined | Auto/Self-ignition temperature: | Not Determined |
| Evaporation rate: | Not Determined | Decomposition temperature: | > 240 °C |
| Flammability (solid,gaseous): | Not Determined | Viscosity: | a. Kinematic: Not Determined b. Dynamic: Not Determined |
| Density: Not Determined | | | |

SECTION 10 : Stability and reactivity

Reactivity: Oxidizing Solid. Nonreactive under normal conditions.

Chemical stability: Stable under normal conditions.

Possible hazardous reactions: None under normal processing.

Conditions to avoid: Incompatible materials. Moisture , excess heat, and dust formation. Oxalates slowly corrode steel.

Incompatible materials: Strong reducing agents, Powdered metals, Peroxides, Zinc, Copper, Alcohols, Hydrogen fluoride, Acids, Sulfuric acid

Hazardous decomposition products: Potassium oxides, Manganese, or Manganese oxides. Formic acid.

SECTION 11 : Toxicological information

| | | |
|---|-----------|--|
| Acute Toxicity: | | |
| Oral: | 7722-64-7 | LD50 Oral - Rat - 1,090 mg/kg |
| Chronic Toxicity: No additional information. | | |
| Corrosion Irritation: | | |
| Dermal: | 7722-64-7 | Skin - Rabbit Result : Corrosive - 4 h |
| Sensitization: | | No additional information. |
| Single Target Organ (STOT): | | No additional information. |
| Numerical Measures: | | No additional information. |
| Carcinogenicity: | | No additional information. |
| Mutagenicity: | | No additional information. |
| Reproductive Toxicity: | | No additional information. |

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.04.2015

Page 6 of 7

Potassium Permanganate,

SECTION 12 : Ecological information

Ecotoxicity

7722-64-7: LC50 - Oncorhynchus mykiss (rainbow trout) - 0.3 - 0.6 mg/l - 96.0 h

7722-64-7: EC50 - Daphnia magna (Water flea) - 0.084 mg/l - 48 h

Persistence and degradability:

Bioaccumulative potential: 7722-64-7: Bioaccumulation Lamellibranchia (mussel). 7722-64-7: Bioconcentration factor (BCF) : < 10,000 Remarks : Can accumulate in aquatic organisms

Mobility in soil:

Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Contact a licensed professional waste disposal service to dispose of this material. Dispose of empty containers as unused product. Product or containers must not be disposed together with household garbage. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations. Ensure complete and accurate classification.

SECTION 14 : Transport information

UN-Number

1490

UN proper shipping name

Potassium permanganate

Transport hazard class(es)



Class:

5.1 Oxidizing substances

Packing group:II

Environmental hazard:

Transport in bulk:

Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Reactive, Acute

SARA Section 313 (Specific toxic chemical listings):

7722-64-7 Potassium Permanganate

RCRA (hazardous waste code):

None of the ingredients is listed

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 03.04.2015

Page 7 of 7

Potassium Permanganate,

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

7722-64-7 Potassium Permanganate 100 lb

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

None of the ingredients is listed

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

7722-64-7 Potassium Permanganate

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note: . The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:

Effective date : 03.04.2015

Last updated : 03.19.2015

SAFETY DATA SHEET

COCONUT SHELL ACTIVATED CARBON

DATE OF ISSUE: 02/24/2015

SECTION 1 – PRODUCT AND COMPANY INFORMATION

Product Name: ACTIVATED CARBON – Coconut Shell Based
Product Use: According to Manufacturer's recommendation
Company Identification: CALIFORNIA CARBON CO., INC.
2825 E. GRANT ST.
WILMINGTON, CA 90744
Telephone Number: 1-800-663-5830
1-562-436-1962
Fax Number: 1-562-437-1217
Email: CCarbon2@aol.com

SECTION II – HAZARDS IDENTIFICATION

OSHA Regulatory Status: Not regulated
HMIS Ratings: Health – 0
(NFPA) Flammability – 1
Reactivity – 0
Special – n/a

Key to Ratings

4 = Extreme/Severe
3 = High/Serious
2 = Moderate
1 = Slight
W = Water Reactive
OX = Oxidizer

Protective Equipment: Safety glasses with side shield or goggles, gloves, long sleeve shirt or lab coat, long pants recommended.
Health Effects: See Section IV
Environmental Effects: See Section XII



Hazard Symbol:

Eye Irritation Category 2B
Respiratory Irritation Category 3

Contact may cause eye irritation. Dust may be slightly irritating to eyes and respiratory track.
Wet activated carbon removes oxygen from air causing a severe hazard to workers in enclosed or confined space.

Precautionary Statements

Prevention: Avoid generation of dust during handling. Avoid breathing dust. Wash thoroughly after handling. Use in a well-ventilated area.
Response: IF INHALED: Remove to fresh air.
IF IN EYES: Rinse with water for several minutes. Remove contact lenses if present. Continue rinsing.
Storage: Store in a well-ventilated place. Keep container tightly closed.
Container Labeling: Not implemented at this time.

SECTION III – COMPOSITION/INFORMATION ON INGREDIENTS

| Chemical Identity (% by weight) | Common Name | CAS No. | Impurities |
|---------------------------------|------------------|------------|------------|
| 100% | Activated Carbon | 68647-86-9 | None |

SECTION IV – FIRST AID MEASURES

Routes of Exposure

| | |
|-----------------------------|--|
| Inhalation: | Dust may cause mild irritation to the upper respiratory tract. |
| Skin: | Dust may cause mild irritation, possible reddening. |
| Eyes: | Dust may cause mild irritation, possible reddening. |
| Ingestion: | Dust may cause mild irritation to digestive track resulting in nausea or diarrhea. |
| Signs/Symptoms of Exposure: | Dust may cause irritation and redness of eyes, irritation of skin and respiratory system. The effects of long-term, low-level exposures to this product have not been determined. |

Emergency and First Aid

| | |
|-------------|---|
| Procedures: | For Eye Contact: Immediately flush with copious amounts of water for at least 15 minutes, lifting both the upper and lower lids occasionally; seek medical attention. For Skin Contact: Wash with soap and water; seek medical attention. For Inhalation: Remove to fresh air and rest as needed; seek medical attention for any breathing difficulty. For Ingestion: Drink plenty of water; seek medical attention. |
|-------------|---|

Medical Conditions Generally

| | |
|-------------------------|---|
| Aggravated by Exposure: | People with pre-existing skin conditions or eye problems or impaired respiratory function may be more susceptible to the potential effects of the dust. |
|-------------------------|---|

SECTION V – FIRE FIGHTING MEASURES

| | |
|-------------------------------|--|
| Suitable Extinguishing Media: | Use an extinguishing media suitable for the surrounding fire. |
| Specific Hazards: | As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source. Activated carbon is difficult to ignite and tends to burn slowly (smolder) without producing smoke or flame. Carbon monoxide and carbon dioxide gas may be emitted upon combustion of material. Contact with strong oxidizers such as ozone or liquid oxygen may cause rapid combustion. |

Protective Equipment and Procedures:

Wear NIOSH approved self-contained breathing apparatus suitable for the surrounding fire.

SECTION VI – ACCIDENTAL RELEASE MEASURES

| | |
|----------------------------|--|
| Personal Precautions: | Wear protective equipment, keep unnecessary personnel away, and ventilate area of spill. |
| Environmental Precautions: | The material is not soluble, but can cause a particulate emission if discharged to waterways; therefore, dike all entrances to sewers and drains to avoid introducing the material into the waterways. |
| Containment and Clean-up: | Dike all entrances to sewers and drains. Vacuum or shovel spilled material and place in closed container for disposal. Remove product to appropriate storage area until it can be properly disposed of in accordance with local, state and federal regulations. Avoid dust formation. |

SECTION VII – HANDLING AND STORAGE

| | |
|--------------------------------|--|
| Precautions for Safe Handling: | Avoid prolonged contact with eyes and skin. Keep away from ignition sources. Use in well ventilated areas. Protect containers from physical damage. Wash hands after handling. |
| Conditions for Safe Storage: | Store in cool, dry, ventilated area and in closed containers. Keep away from oxidizers, heat or flames. Store away from ignition sources. |

SECTION XI – TOXICOLOGICAL INFORMATION

Acute Toxicity: Not Classified

Inhalation, Ingestion, Eye Irritation, Skin Irritation: See Section IV.

Sensitization: Not determined on the finished product.

Target Organ(s) or System: Eyes, skin and upper respiratory system.

Signs and Symptoms of Exposure: See Sections III and IV

Chronic Effects: Carcinogenicity, Mutagenicity, Reproductive Effects, Developmental Factors: Not determined on the finished product.

SECTION XII – ECOLOGICAL INFORMATION

Ecotoxicity, Persistence/Degradability, Bioaccumulation/Accumulation, Mobility in Environmental Media, Other Adverse Effects: Not determined on the finished product.

SECTION XIII – DISPOSAL CONSIDERATIONS

Vacuum or shovel material into a closed container. Storage and disposal should be in accordance with applicable local, state and federal laws and regulations. Local regulations may be more stringent than state or federal requirements. Activated Carbon is an adsorbent media; hazard classification is generally determined by the adsorbate that the carbon has picked up. Consult with the US EPA Guidelines listed in 40 CFR Part 261.3 for the classifications of hazardous waste prior to disposal.

SECTION XIV – TRANSPORT INFORMATION

Ship in accordance with all local, state, and federal laws and regulations.

UN Number: Not regulated

UN Proper Shipping Name: N/A

Transport Hazard Classes: N/A

Packing Group: N/A

Sea Pollutants: N/A

Special Precautions for user related to transport: N/A

Note: Under the UN classification for activated carbon, all activated carbons have been identified as a class 4.2 product. However this product has been tested according to the United Nations Transport of Dangerous Goods test protocol for a “self-heating substance” and it has been determined that this product does not meet the definition of a self-heating substance, or any other hazard class, and therefore should not be listed as a hazardous material. This information is applicable only for the Activated Carbon product identified in this document.

SECTION XV – REGULATORY INFORMATION

Carbon (7440-44-0): Listed on the United States TSCA Inventory

SECTION XVI – OTHER INFORMATION

The information contained herein is based on data considered accurate in light of current formulation. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.



SAFETY DATA SHEET

1. Identification

| | |
|--------------------------------------|---|
| Product identifier | Sodium hypochlorite solution - sodium hypochlorite 12.5% |
| Other means of identification | Not available. |
| Recommended use | Primarily used as a water treatment chemical as a disinfectant. Also used as a bleaching agent. |
| Recommended restrictions | None known. |

Manufacturer/Importer/Supplier/Distributor information

| | |
|-----------------------------------|---|
| Company name | Carus Corporation |
| Address | 315 5th Street Peru, Illinois 61354, USA |
| Telephone | (815) 223-1500 |
| Toll Free | (800) 435-6856 |
| Fax | (815) 224-6816 |
| E-mail | salesmkt@caruscorporation.com |
| Website | www.caruscorporation.com |
| Company name | Alexander Chemical Corporation, a Carus Group Inc. Company |
| Address | 7593 S. First Road, Kingsbury Industrial Park, Kingsbury, Indiana 46345, USA |
| Website | www.alexanderchemical.com |
| Company name | Sierra Chemical Co, a Carus Group Inc. Company |
| Address | 2302 Larkin Circle Sparks, Nevada 89431, USA |
| Website | www.sierrachemsales.com |
| Contact person | Dr. Chithambarathanu Pillai |
| Telephone | (800) 348-8827 - All other non-emergency inquiries about the product should be directed to the company |
| Emergency telephone number | For Hazardous Materials [or Dangerous Goods] Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC at CHEMTREC®, USA: 001 (800) 424-9300 CHEMTREC®, Mexico (Toll-Free - must be dialed from within country): 001-800-13-203-9987 CHEMTREC®, Other countries: 001 (703) 527-388 |

2. Hazard(s) identification

| | | |
|------------------------------|--|------------|
| Physical hazards | Corrosive to metals | Category 1 |
| Health Hazards | Skin corrosion/irritation | Category 1 |
| | Serious eye damage/eye irritation | Category 1 |
| Environmental hazards | Hazardous to the aquatic environment, acute hazard | Category 2 |
| OSHA defined hazards | Not classified. | |
| Label elements | | |



| | |
|--------------------------------|---|
| Signal word | Danger |
| Hazard statement | May be corrosive to metals. Causes severe skin burns and eye damage. Toxic to aquatic life. |
| Precautionary statement | |
| Prevention | Keep only in original container. Do not breathe mist or vapor. Wash thoroughly after handling. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. |

| | |
|--|--|
| Response | If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor. Wash contaminated clothing before reuse. Absorb spillage to prevent material damage. |
| Storage | Store locked up. Store in corrosive resistant container with a resistant inner liner. |
| Disposal | Dispose of contents/container in accordance with local/regional/national/international regulations. |
| Hazard(s) not otherwise classified (HNOC) | None known. |

3. Composition/information on ingredients

Mixtures

| Chemical name | CAS number | % |
|---------------------|------------|------|
| Sodium chloride | 7647-14-5 | 5-20 |
| Sodium hypochlorite | 7681-52-9 | 5-20 |
| Sodium hydroxide | 1310-73-2 | 1-5 |

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

| | |
|---|--|
| Inhalation | Move to fresh air. Call a physician if symptoms develop or persist. |
| Skin contact | Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse. |
| Eye contact | Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately. |
| Ingestion | Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. |
| Most important symptoms/effects, acute and delayed | Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. |
| Indication of immediate medical attention and special treatment needed | Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim under observation. Symptoms may be delayed. |
| General information | Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. |

5. Fire-fighting measures

| | |
|--|---|
| Suitable extinguishing media | Water fog. Foam. Dry chemical powder. Carbon dioxide (CO ₂). |
| Unsuitable extinguishing media | Do not use water jet as an extinguisher, as this will spread the fire. |
| Specific hazards arising from the chemical | During fire, gases hazardous to health may be formed. |
| Special protective equipment and precautions for firefighters | Self-contained breathing apparatus and full protective clothing must be worn in case of fire. |
| Fire fighting equipment/instructions | Move containers from fire area if you can do so without risk. |
| Specific methods | Use standard firefighting procedures and consider the hazards of other involved materials. |

6. Accidental release measures

| | |
|--|---|
| Personal precautions, protective equipment and emergency procedures | Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS. |
|--|---|

Methods and materials for containment and cleaning up

This product is miscible in water.

Large Spills: Stop the flow of material, if this is without risk. Use water spray to reduce vapors or divert vapor cloud drift. Dike the spilled material, where this is possible. Absorb spillage to prevent material damage. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions

Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Do not breathe mist or vapor. Do not get in eyes, on skin, or on clothing. Provide adequate ventilation. Wear appropriate personal protective equipment. Avoid release to the environment. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store locked up. Store in corrosive resistant container with a resistant inner liner. Keep only in the original container. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

| Components | Type | Value |
|----------------------------------|------|---------|
| Sodium hydroxide (CAS 1310-73-2) | PEL | 2 mg/m3 |

US. ACGIH Threshold Limit Values

| Components | Type | Value |
|----------------------------------|---------|---------|
| Sodium hydroxide (CAS 1310-73-2) | Ceiling | 2 mg/m3 |

US. NIOSH: Pocket Guide to Chemical Hazards

| Components | Type | Value |
|----------------------------------|---------|---------|
| Sodium hydroxide (CAS 1310-73-2) | Ceiling | 2 mg/m3 |

US. Workplace Environmental Exposure Level (WEEL) Guides

| Components | Type | Value |
|-------------------------------------|------|---------|
| Sodium hypochlorite (CAS 7681-52-9) | STEL | 2 mg/m3 |

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields (or goggles) and a face shield.

Skin protection

Hand protection

Wear appropriate chemical resistant gloves. Be aware that the liquid may penetrate the gloves. Frequent change is advisable. Nitrile or neoprene gloves are recommended.

Other

Wear appropriate chemical resistant clothing.

Respiratory protection

In case of insufficient ventilation, wear suitable respiratory equipment.

Thermal hazards

Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations

Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

| | |
|---|-------------------------|
| Physical state | Liquid. |
| Form | Greenish yellow liquid. |
| Color | Light greenish yellow. |
| Odor | Chlorine. |
| Odor threshold | Not available. |
| pH | 11.5 ±0.3 |
| Melting point/freezing point | -150 °F (-101.11 °C) |
| Initial boiling point and boiling range | > 212 °F (> 100 °C) |
| Flash point | Not available. |
| Evaporation rate | Not available. |
| Flammability (solid, gas) | Not available. |

Upper/lower flammability or explosive limits

| | |
|--------------------------------|----------------|
| Flammability limit - lower (%) | Not available. |
| Flammability limit - upper (%) | Not available. |
| Explosive limit - lower (%) | Not available. |
| Explosive limit - upper (%) | Not available. |

Vapor pressure Not available.

Vapor density Not available.

Relative density 1.09 -1.21

Solubility(ies)

Solubility (water) Completely soluble in water.

Partition coefficient (n-octanol/water) Not available.

Auto-ignition temperature Not available.

Decomposition temperature Not available.

Viscosity Not available.

10. Stability and reactivity

Reactivity May be corrosive to metals.

Chemical stability Material is stable under normal conditions.

Possibility of hazardous reactions No dangerous reaction known under conditions of normal use.

Conditions to avoid Contact with incompatible materials.

Incompatible materials Acids. Metals. Strong oxidizing agents.

Hazardous decomposition products No hazardous decomposition products are known. Contact with acids liberates toxic gas.

11. Toxicological information

Information on likely routes of exposure

Inhalation May cause irritation to the respiratory system. Prolonged inhalation may be harmful.

Skin contact Causes severe skin burns.

Eye contact Causes serious eye damage.

Ingestion Causes digestive tract burns.

Symptoms related to the physical, chemical and toxicological characteristics Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

Information on toxicological effects

Acute toxicity

| Components | Species | Test Results |
|---|--|---|
| Sodium chloride (CAS 7647-14-5) | | |
| Acute | | |
| <i>Dermal</i> | | |
| LD50 | Rabbit | > 10000 mg/kg |
| <i>Inhalation</i> | | |
| LC50 | Rat | > 42 mg/l, 1 Hours |
| <i>Oral</i> | | |
| LD50 | Rat | 3550 mg/kg |
| Sodium hydroxide (CAS 1310-73-2) | | |
| Acute | | |
| <i>Dermal</i> | | |
| LC50 | Rabbit | 1350 mg/kg, (Calculated) |
| <i>Oral</i> | | |
| LDLo | Rabbit | 500 mg/kg, (Calculated) |
| Sodium hypochlorite (CAS 7681-52-9) | | |
| Acute | | |
| <i>Dermal</i> | | |
| LD50 | Rabbit | > 20000 mg/kg |
| <i>Inhalation</i> | | |
| LC50 | Rat | > 10.5 mg/l, 1 Hours |
| <i>Oral</i> | | |
| LD50 | Rat | 8.91 g/kg |
| Skin corrosion/irritation | Causes severe skin burns and eye damage. | |
| Serious eye damage/eye irritation | Causes serious eye damage. | |
| Respiratory or skin sensitization | | |
| Respiratory sensitization | Not classified. | |
| Skin sensitization | This product is not expected to cause skin sensitization. | |
| Germ cell mutagenicity | No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic. | |
| Carcinogenicity | This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA. | |
| IARC Monographs. Overall Evaluation of Carcinogenicity | | |
| Sodium hypochlorite (CAS 7681-52-9) | | 3 Not classifiable as to carcinogenicity to humans. |
| OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) | | |
| Not listed. | | |
| Reproductive toxicity | This product is not expected to cause reproductive or developmental effects. | |
| Specific target organ toxicity - single exposure | Not classified. | |
| Specific target organ toxicity - repeated exposure | Not classified. | |
| Aspiration hazard | Not classified. | |
| Chronic effects | Prolonged inhalation may be harmful. | |

12. Ecological information

Ecotoxicity

| Components | Species | Test Results |
|---------------------------------|-----------------------|--------------------|
| Sodium chloride (CAS 7647-14-5) | | |
| Aquatic | | |
| Crustacea | LC50 Daphnia magna | 874 mg/l, 48 hours |

| Components | | Species | Test Results |
|--------------------------------------|---|--|------------------------------|
| Fish | LC50 | Rainbow trout,donaldson trout (Oncorhynchus mykiss) | 4747 - 7824 mg/l, 96 hours |
| Sodium hydroxide (CAS 1310-73-2) | | | |
| Aquatic | | | |
| Crustacea | EC50 | Water flea (Ceriodaphnia dubia) | 34.59 - 47.13 mg/l, 48 hours |
| Fish | LC50 | Western mosquitofish (Gambusia affinis) | 125 mg/l, 96 hours |
| Persistence and degradability | No data is available on the degradability of this product. | | |
| Bioaccumulative potential | No data available. | | |
| Mobility in soil | No data available. | | |
| Other adverse effects | No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component. | | |

13. Disposal considerations

| | |
|--|--|
| Disposal instructions | Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations. |
| Local disposal regulations | Dispose in accordance with all applicable regulations. |
| Hazardous waste code | D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel] The waste code should be assigned in discussion between the user, the producer and the waste disposal company. |
| Waste from residues / unused products | Dispose of in accordance with local regulations. |
| Contaminated packaging | Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied. |

14. Transport information

DOT

| | |
|-------------------------------------|---|
| UN number | UN1791 |
| UN proper shipping name | Hypochlorite solutions |
| Transport hazard class(es) | |
| Class | 8 |
| Subsidiary risk | - |
| Label(s) | 8 |
| Packing group | II |
| Environmental hazards | |
| Marine pollutant | Yes |
| Special precautions for user | Read safety instructions, SDS and emergency procedures before handling. |
| Special provisions | A7, B2, B15, IB2, IP5, N34, T7, TP2, TP24 |
| Packaging exceptions | 154 |
| Packaging non bulk | 202 |
| Packaging bulk | 242 |

IATA

| | |
|-------------------------------------|---|
| UN number | UN1791 |
| UN proper shipping name | Hypochlorite solution |
| Transport hazard class(es) | |
| Class | 8 |
| Subsidiary risk | - |
| Packing group | II |
| Environmental hazards | Yes |
| ERG Code | 8L |
| Special precautions for user | Read safety instructions, SDS and emergency procedures before handling. |

IMDG

| | |
|------------------|--------|
| UN number | UN1791 |
|------------------|--------|

| | |
|---|--|
| UN proper shipping name | HYPOCHLORITE SOLUTION |
| Transport hazard class(es) | |
| Class | 8 |
| Subsidiary risk | - |
| Label(s) | 8 |
| Packing group | II |
| Environmental hazards | |
| Marine pollutant | Yes |
| EmS | F-A, S-B |
| Special precautions for user | Read safety instructions, SDS and emergency procedures before handling. |
| Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code | This product is a liquid and when transported in bulk is covered under MARPOL 73/78 Annex II. This product is listed in the IBC Code. Ship type: 2 Pollution category: Y |

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

| | |
|-------------------------------------|--------|
| Sodium hydroxide (CAS 1310-73-2) | LISTED |
| Sodium hypochlorite (CAS 7681-52-9) | LISTED |

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)
Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label:

DANGER

Keep out of reach of children. Hazardous to Humans and domestic animals.
Corrosive, causes severe skin and eye irritation or chemical burns to broken skin.
Causes eye damage.
This pesticide is toxic to fish and aquatic organisms.
Strong oxidizing agent.

US. Massachusetts RTK - Substance List

Sodium hydroxide (CAS 1310-73-2)
Sodium hypochlorite (CAS 7681-52-9)

US. New Jersey Worker and Community Right-to-Know Act

Sodium hydroxide (CAS 1310-73-2)
Sodium hypochlorite (CAS 7681-52-9)

US. Pennsylvania Worker and Community Right-to-Know Law

Sodium hydroxide (CAS 1310-73-2)
Sodium hypochlorite (CAS 7681-52-9)

US. Rhode Island RTK

Sodium hydroxide (CAS 1310-73-2)
Sodium hypochlorite (CAS 7681-52-9)

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

| Country(s) or region | Inventory name | On inventory (yes/no)* |
|-----------------------------|---|------------------------|
| United States & Puerto Rico | Toxic Substances Control Act (TSCA) Inventory | Yes |

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

| | |
|---------------|------------------|
| Issue date | 03-November-2014 |
| Revision date | - |
| Version # | 01 |
| NFPA ratings | |



Disclaimer

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SAFETY DATA SHEET

1. Identification

Product identifier Sulfuric acid 93%

Other means of identification Not available.

Recommended use Sulfuric acid is an acid used in chemical industries, water treatment, fertilizer, pulp and paper applications.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Company name Carus Corporation
Address 315 5th Street
Peru, Illinois 61354, USA
Telephone (815) 223-1500
Toll Free (800) 435-6856
Fax (815) 224-6816
E-mail salesmkt@caruscorporation.com
Website www.caruscorporation.com

Company name Alexander Chemical Corporation, a Carus Group Inc. Company
Address 7593 S. First Road,
Kingsbury Industrial Park, Kingsbury, Indiana 46345, USA
Website www.alexanderchemical.com

Company name Sierra Chemical Co, a Carus Group Inc. Company
Address 2302 Larkin Circle
Sparks, Nevada 89431, USA
Website www.sierrachemsales.com

Contact person Dr. Chithambarathanu Pillai
Telephone (800) 348-8827 - All other non-emergency inquiries about the product should be directed to the company

Emergency telephone number For Hazardous Materials [or Dangerous Goods] Incidents ONLY

(spill, leak, fire, exposure or accident), call CHEMTREC at
CHEMTREC®, USA: 001 (800) 424-9300
CHEMTREC®, Mexico (Toll-Free - must be dialed from within country):
001-800-13-203-9987
CHEMTREC®, Other countries: 001 (703) 527-388

2. Hazard(s) identification

Physical hazards Corrosive to metals Category 1

Health Hazards Skin corrosion/irritation Category 1A
Serious eye damage/eye irritation Category 1

OSHA defined hazards Not classified.

Label elements



Signal word Danger

Hazard statement May be corrosive to metals. Causes severe skin burns and eye damage.

Precautionary statement

Prevention Do not breathe mist or vapor. Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling. Keep only in original container.

| | |
|--|--|
| Response | If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor. Absorb spillage to prevent material damage. |
| Storage | Store locked up. Store in corrosive resistant container with a resistant inner liner. |
| Disposal | Dispose of contents/container in accordance with local/regional/national/international regulations. |
| Hazard(s) not otherwise classified (HNOC) | None known. |

3. Composition/information on ingredients

Substances

| Chemical name | Common name and synonyms | CAS number | % |
|---------------|--------------------------|------------|----|
| Sulfuric acid | | 7664-93-9 | 93 |

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

| | |
|---|--|
| Inhalation | Move injured person into fresh air and keep person calm under observation. Get medical attention if symptoms occur. |
| Skin contact | Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Chemical burns must be treated by a physician. |
| Eye contact | Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Hold eyelids apart. Continue rinsing. Get medical attention immediately. |
| Ingestion | Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Do not induce vomiting. If vomiting occurs, the head should be kept low so that stomach vomit doesn't enter the lungs. Obtain medical attention and take along these instructions. |
| Most important symptoms/effects, acute and delayed | Corrosive. Prolonged contact causes serious eye and tissue damage. May cause burns in mucous membranes, throat, esophagus and stomach. Contact can cause corrosive burns, corneal damage, and blindness. Causes permanent skin damage (scarring). Causes respiratory tract burns. May cause lung edema. |
| Indication of immediate medical attention and special treatment needed | In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed. |
| General information | In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. In case of shortness of breath, give oxygen. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. |

5. Fire-fighting measures

| | |
|--|---|
| Suitable extinguishing media | Use fire-extinguishing media appropriate for surrounding materials. |
| Unsuitable extinguishing media | Do not use water jet as an extinguisher, as this will spread the fire. |
| Specific hazards arising from the chemical | Fire may produce irritating, corrosive and/or toxic gases. |
| Special protective equipment and precautions for firefighters | Firefighters should wear full protective clothing including self contained breathing apparatus. Structural firefighters protective clothing will only provide limited protection. |
| Fire fighting equipment/instructions | Use standard firefighting procedures and consider the hazards of other involved materials. Use water spray to cool unopened containers. Cool containers with flooding quantities of water until well after fire is out. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. |
| Specific methods | Use water spray to cool unopened containers. |
| General fire hazards | The product is non-combustible. Contact with certain metals liberates flammable gas. Contact with moisture or water may generate sufficient heat to ignite nearby combustible materials. |

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Keep unnecessary personnel away. Local authorities should be advised if significant spillages cannot be contained. Stay upwind. Keep out of low areas. Ensure adequate ventilation. Avoid contact with eyes, skin, and clothing. Avoid breathing mist or vapor. Use personal protection recommended in Section 8 of the SDS.

Methods and materials for containment and cleaning up

Should not be released into the environment.

Large Spills: Dike far ahead of liquid spill for later disposal. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal.

Small Spills: Absorb spill with vermiculite or other inert material. Clean contaminated surface thoroughly. After removal flush contaminated area thoroughly with water.

Never return spills in original containers for re-use.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not contaminate water.

7. Handling and storage

Precautions for safe handling

Handle and open container with care. Use only with adequate ventilation. Avoid contact with skin, eyes and clothing. Avoid breathing mist or vapor. Wash thoroughly after handling. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Keep in a well-ventilated place. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep this material away from food, drink and animal feed. Use care in handling/storage. Transfer and storage systems should be compatible and corrosion resistant.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

| Components | Type | Value |
|-------------------------------|------|---------------------|
| Sulfuric acid (CAS 7664-93-9) | PEL | 1 mg/m ³ |

US. ACGIH Threshold Limit Values

| Material | Type | Value | Form |
|---------------------------------------|---------|-----------------------|--------------------|
| Sulfuric acid (25%-95%) (CAS Mixture) | Ceiling | 2 mg/m ³ | |
| Components | Type | Value | Form |
| Sulfuric acid (CAS 7664-93-9) | TWA | 0.2 mg/m ³ | Thoracic fraction. |

US. NIOSH: Pocket Guide to Chemical Hazards

| Material | Type | Value |
|---------------------------------------|------|---------------------|
| Sulfuric acid (25%-95%) (CAS Mixture) | TWA | 2 mg/m ³ |
| Components | Type | Value |
| Sulfuric acid (CAS 7664-93-9) | TWA | 1 mg/m ³ |

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Provide adequate ventilation. Observe Occupational Exposure Limits and minimize the risk of inhalation of vapors. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear approved safety glasses or goggles.

Skin protection

Hand protection

Wear protective gloves. Be aware that the liquid may penetrate the gloves. Frequent change is advisable. Suitable gloves can be recommended by the glove supplier.

Other

Wear appropriate chemical resistant clothing. Protective shoes or boots. Structural firefighters protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations. Wear chemical protective equipment that is specifically recommended by the Personal Protective Equipment manufacturer.

Respiratory protection If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Use a NIOSH/MSHA approved air purifying respirator as needed to control exposure. Consult with respirator manufacturer to determine respirator selection, use, and limitations. Use positive pressure, air-supplied respirator for uncontrolled releases or when air purifying respirator limitations may be exceeded. Follow respirator protection program requirements (OSHA 1910.134 and ANSI Z88.2) for all respirator use.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product. Remove and isolate contaminated clothing and shoes. Handle in accordance with good industrial hygiene and safety practice. Launder contaminated clothing before reuse.

9. Physical and chemical properties

Appearance Colorless solution.

Physical state Liquid.

Form Liquid.

Color Colorless.

Odor Odorless.

Odor threshold Not available.

pH Not available.

Melting point/freezing point -21 - -10 °F (-29.44 - -23.33 °C)

Initial boiling point and boiling range 392 - 536 °F (200 - 280 °C)

Flash point Not applicable.

Evaporation rate Not applicable.

Flammability (solid, gas) Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) Not applicable.

Flammability limit - upper (%) Not applicable.

Vapor pressure 0 - 0.3 mm Hg at 100 °F / 38 °C

Vapor density Not applicable.

Relative density 1.84 ± 0.03

Relative density temperature 77 °F (25 °C)

Solubility(ies)

Solubility (water) Completely soluble in water.

Partition coefficient (n-octanol/water) No data available.

Auto-ignition temperature Not available.

Decomposition temperature Not available.

Viscosity Not applicable.

Other information

VOC (Weight %) Not applicable.

10. Stability and reactivity

Reactivity The product is non-reactive under normal conditions of use, storage and transport.

Chemical stability Stable at normal conditions.

Possibility of hazardous reactions Hazardous polymerization does not occur.

Conditions to avoid Water, moisture.

Incompatible materials Strong oxidizing agents. Reducing agents. Bases. Metals.

Hazardous decomposition products Sulfur oxides.

11. Toxicological information

Information on likely routes of exposure

| | |
|---------------------|---|
| Inhalation | Causes severe respiratory tract irritation. High concentrations: May cause lung damage. |
| Skin contact | Causes severe skin burns. |
| Eye contact | Causes severe eye burns. |
| Ingestion | Causes digestive tract burns. |

Symptoms related to the physical, chemical and toxicological characteristics Corrosive. Prolonged contact causes serious eye and tissue damage. May cause burns in mucous membranes, throat, esophagus and stomach. Contact can cause corrosive burns, corneal damage, and blindness. Causes permanent skin damage (scarring). Causes respiratory tract burns. May cause lung edema.

Information on toxicological effects

Acute toxicity Strongly corrosive.

| Components | Species | Test Results |
|-------------------|----------------|---------------------|
|-------------------|----------------|---------------------|

Sulfuric acid (CAS 7664-93-9)

Acute

Oral

LD50

Rat

2140 mg/kg

Skin corrosion/irritation Causes severe skin burns.

Serious eye damage/eye irritation Causes severe eye damage.

Respiratory or skin sensitization

Respiratory sensitization No data available.

Skin sensitization No data available.

Germ cell mutagenicity No data available.

Carcinogenicity Exposure to strong inorganic acid mists containing sulfuric acid has been classified as carcinogenic to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity Not expected to be a reproductive hazard.

Specific target organ toxicity - single exposure No data available.

Specific target organ toxicity - repeated exposure No data available.

Aspiration hazard Not classified.

Chronic effects May cause lung damage. Sulfuric acid fumes: Prolonged, repeated exposure to acid fumes/mists may cause chronic bronchitis, irritation of skin, mucous membranes and gastrointestinal tract and erosion of the teeth.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Persistence and degradability No data available.

Bioaccumulative potential No data available.

Mobility in soil The product is water soluble and may spread in water systems.

Other adverse effects The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Dispose of contents/container in accordance with local/regional/national/international regulations. Dispose in accordance with all applicable regulations.

Hazardous waste code D002: Waste Corrosive material [pH <=2 or >=12.5, or corrosive to steel]
Waste codes should be assigned by the user based on the application for which the product was used.

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Dispose of in accordance with local regulations. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number UN1830
UN proper shipping name Sulfuric acid
Transport hazard class(es)
Class 8
Subsidiary risk -
Label(s) 8
Packing group II
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Special provisions A3, A7, B3, B83, B84, IB2, N34, T8, TP2, TP12
Packaging exceptions 154
Packaging non bulk 202
Packaging bulk 242

DOT BULK

BULK

UN number UN1830
UN proper shipping name Sulfuric acid
Transport hazard class(es)
Class 8
Label(s) 8
Packing group II
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Special provisions A3, A7, B3, B83, B84, IB2, N34, T8, TP2, TP12
Packaging exceptions 154
Packaging non bulk 202
Packaging bulk 242

IATA

UN number UN1830
UN proper shipping name Sulphuric acid
Transport hazard class(es)
Class 8
Subsidiary risk -
Label(s) Packing group Environmental hazards 8
ERG Code II
No
8L
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number UN1830
UN proper shipping name SULPHURIC ACID
Transport hazard class(es)
Class 8
Subsidiary risk -
Label(s) Packing group Environmental hazards 8
II
Marine pollutant No
EmS F-A, S-B
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code This product is a liquid and when transported in bulk is covered under MARPOL 73/78 Annex II.
This product is listed in the IBC Code.
Ship type: 3
Pollution category: Y

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Sulfuric acid (CAS 7664-93-9) LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

| Chemical name | CAS number | Reportable quantity | Threshold planning quantity | Threshold planning quantity, lower value | Threshold planning quantity, upper value |
|---------------|------------|---------------------|-----------------------------|--|--|
| Sulfuric acid | 7664-93-9 | 1000 | 1000 lbs | | |

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

| Chemical name | CAS number | % by wt. |
|---------------|------------|----------|
| Sulfuric acid | 7664-93-9 | 25-95 |

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Sulfuric acid (CAS 7664-93-9)

Clean Water Act (CWA) Section 112(r) (40 CFR 68.130) Hazardous substance

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Sulfuric acid (CAS 7664-93-9) 6552

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Sulfuric acid (CAS 7664-93-9) 20 %WV

DEA Exempt Chemical Mixtures Code Number

Sulfuric acid (CAS 7664-93-9) 6552

Food and Drug Administration (FDA) Total food additive
Direct food additive
GRAS food additive

US state regulations WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

Sulfuric acid (CAS 7664-93-9)

US. New Jersey Worker and Community Right-to-Know Act

Sulfuric acid (CAS 7664-93-9)

US. Pennsylvania Worker and Community Right-to-Know Law

Sulfuric acid (CAS 7664-93-9)

US. Rhode Island RTK

Sulfuric acid (CAS 7664-93-9)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Sulfuric acid (CAS 7664-93-9)

International Inventories

| Country(s) or region | Inventory name | On inventory (yes/no)* |
|-----------------------------|---|------------------------|
| United States & Puerto Rico | Toxic Substances Control Act (TSCA) Inventory | Yes |

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 31-October-2014

Revision date -

Version # 01

NFPA ratings



References

Registry of Toxic Effects of Chemical Substances (RTECS)
GESTIS Substance Database
US. IARC Monographs on Occupational Exposures to Chemical Agents

Disclaimer

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Sierra Chemical Co.

Material Safety Data Sheet

This MSDS has been prepared within the guidelines of the Federal OSHA Hazard Communication Standard, 29CFR 1910.1200.

Product Name: Caustic Soda Solution 50%, Commercial Grade

NAOH

I. GENERAL INFORMATION

Manufacturer: Sierra Chemical Co.

Emergency Phone: (800) 424-9300

Address: 2302 Larkin Cr.

Information Phone: (775) 358-0888

Sparks, NV 89431

CHEMTREC Phone: (800) 424-9300

Issue Date: 03/23/2010

II. HAZARDS IDENTIFICATION

Color: Colorless

Physical State: Liquid above freezing point

Odor: Odorless

Hazards of Product: DANGER! Causes severe eye burns. Causes severe skin burns. Causes burns of the mouth and throat. Causes respiratory tract irritation. Aspiration hazard. Can enter lungs and cause damage. May react with water. Evacuate area. Keep upwind of spill

OSHA Hazard Communication Standard: This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200

III. COMPOSITION INFORMATION

| Componet | CAS# | Amount |
|------------------|-----------|----------|
| Water | 7732-18-5 | 49 – 51% |
| Sodium Hydroxide | 1310-73-2 | 51 – 49% |

IV. POTENTIAL HEALTH AFFECTS

Eye Contact: May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur. Mist may cause eye irritation.

Skin Contact: Brief contact may cause severe skin burns. Symptoms may include pain, severe local redness and tissue damage.

Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Inhalation: Mist may cause severe irritation of upper respiratory tract (nose and throat).

Ingestion: Swallowing may result in burns of the mouth and throat. Swallowing may result in



gastrointestinal irritation or ulceration.

Aspiration hazard: Aspiration into the lungs may occur during ingestion or vomiting, causing tissue damage or lung injury.

V. FIRST AID MEASURES

Eye Contact: Wash eyes immediately and continuously with water for 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Seek medical attention immediately, preferably from an ophthalmologist. Wash eyes in route if possible. Washing with water is the only acceptable method of removal of caustic soda (lye) from the eyes and skin. You may have 10 seconds or less to avoid serious permanent injury.

Skin Contact: Immediate continued and thorough washing in flowing water for at least 30 minutes is imperative while removing contaminated clothing. Prompt medical consultation is essential. Wash clothing before reuse. Properly dispose of leather items such as shoes, belts, and watchbands. Remove chemical goggles last to keep material from washing into the eyes. First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection).

Inhalation: Move person to fresh air. If not breathing, give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask, etc). If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

Ingestion: Do not induce vomiting. Give one cup (8 ounces or 240 ml) of water or milk if available and transport to a medical facility. Do not give anything by mouth unless the person is fully conscious.

Notes to Physician: Material is a strong alkali. First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). Due to irritant properties, swallowing may result in burns/ulceration of mouth, stomach and lower gastrointestinal tract with subsequent stricture. Aspiration of vomitus may cause lung injury. Suggest endotracheal/esophageal control if lavage is done. Eye irrigation may be necessary for an extended period of time to remove as much caustic as possible. Duration of irrigation and treatment is at the discretion of medical personnel. Maintain adequate ventilation and oxygenation of the patient. For burns of skin only. If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

VI. FIRE FIGHTING MEASURES

Extinguishing Media: This material does not burn. If exposed to fire from another source, use suitable extinguishing agent for that fire. Do not use water.

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Water is not recommended, but may be applied in large quantities as a fine spray when other extinguishing agents are not available. This material does not burn. Fight fire for other material that is burning.

Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available,



wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

Unusual Fire and Explosion Hazards: Product reacts with water. Reaction may produce heat and/or gases. This reaction may be violent. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Hazardous Combustion Products: Not applicable

VII. ACCIDENTAL RELEASE MEASURES

Steps to be taken if material is released or spilled: Contain spilled material if possible.

Small spills: Dilute with water.

Large spills: Dike area to contain spill. Collect in suitable and properly labeled containers. Attempt to neutralize by adding materials such as Acetic acid. See Section XIV, Disposal Considerations, for additional information.

Personal Precautions: Evacuate area. Only trained and properly protected personnel must be involved in clean-up operations. Refer to Section VIII, Handling, for additional precautionary measures. Keep upwind of spill. Ventilate area of leak or spill. See Section XI for more specific information. Use appropriate safety equipment. For additional information, refer to Section IX, Exposure Controls and Personal Protection.

Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section XIII, Ecological Information.

VIII. HANDLING AND STORAGE

General Handling: Do not get in eyes. Do not get on skin or clothing. Do not swallow. Avoid breathing mist. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

1. ALWAYS add caustic soda solution to water with constant agitation. NEVER add water to the caustic soda solution.

2. The water should be lukewarm (27-38°C or 80-100°F). NEVER start with hot or cold water. The addition of caustic soda to liquid will cause a rise in temperature. If caustic soda becomes concentrated in one area, is added too rapidly, or is added to hot or cold liquid, a rapid temperature increase can result in DANGEROUS mists, boiling or spattering which may cause an immediate VIOLENT ERUPTION. See Section IX, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Storage: Keep container closed.

Do not store in: Zinc. Aluminum. Brass. Tin. See Section XI for more specific information.

Storage temperature: > 16 °C

Shelf life: Use within 24 Months

**IX. EXPOSURE CONTROLS / PERSONAL PROTECTION****Exposure Limits**

| Component | List | Type | Value |
|------------------|------------|---------|--------------------|
| Sodium Hydroxide | ACGIH | Ceiling | 2mg/m ³ |
| | OSHA Table | PEL | 2mg/m ³ |
| | Z - 1 | | |

Personal Protection

Eye/Face Protection: Use chemical goggles. Eye wash and drench shower should be located in immediate work area.

Skin Protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task. Safety shower should be located in immediate work area. Remove contaminated clothing immediately, wash skin area with soap and water, and launder clothing before reuse or dispose of properly. Items which cannot be decontaminated, such as shoes, belts and watchbands, should be removed and disposed of properly.

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include Polyethylene. Neoprene. Natural rubber ("latex"). Polyvinyl chloride ("PVC" or "vinyl"). Nitrile/butadiene rubber ("nitrile" or "NBR"). Ethyl vinyl alcohol laminate ("EVAL"). Avoid gloves made of: Polyvinyl alcohol ("PVA"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. In misty atmospheres, use an approved particulate respirator.

Ingestion: Avoid ingestion of even very small amounts; do not consume or store food or tobacco in the work area; wash hands and face before smoking or eating.

Engineering Controls:

Ventilation: Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there is no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

X. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid above freezing point

Color: Colorless



Odor: Odorless

Flash Point – Closed Cup: None

Flammable Limits in Air:

Upper: Not applicable

Lower: Not applicable

Autoignition Temperature: Not applicable

Vapor Pressure: 1.5 mmHg @ 20 °C Literature

Vapor Density (air-1): Not applicable

Specific Gravity (H₂O = 1): 1.52 Literature

Liquid Density: 1.5 g/cm³ @ 20 °C Literature

Freezing Point: 14 °C (57 °F) Literature

Melting Point: 14 °C (57 °F) Calculated

pH: 14

Decomposition: No test data available

Kinematic Viscosity: 0.35 St @ 25 °C Calculated

Boiling Point (760 mmHg): 145 °C (293 °F) Literature

XI. STABILITY AND REACTIVITY

Stability/Instability: Stable under recommended storage conditions. See Storage, Section VIII.

Conditions to Avoid: Avoid moisture. Product absorbs carbon dioxide from the air.

Incompatible Materials: Heat is generated when mixed with water. Spattering and boiling can occur. Caustic soda solution reacts readily with various reducing sugars (i.e. fructose, galactose, and maltose, dry whey solids) to produce CO. Take precautions including monitoring the tank atmosphere for CO to ensure safety of personnel before vessel entry.

Avoid contact with: Acids. Glycols. Halogenated organics. Organic nitro compounds. Flammable hydrogen may be generated from contact with metals such as Zinc, Aluminum, Tin and Brass.

Hazardous Polymerization: Will not occur.

Thermal Decomposition: Does not decompose.

XII. TOXICOLOGICAL INFORMATION

Acute Toxicity

Ingestion: Single dose oral LD50 has not been determined.

Skin Absorption: The dermal LD50 has not been determined.

Repeated Dose Toxicity: Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.



Genetic Toxicology: For the major component(s); In vitro genetic toxicity studies were negative

XIII. ECOLOGICAL INFORMATION

Chemical Fate

Data for Component: Sodium Hydroxide

Movement & Partitioning: No bioconcentration is expected because of the relatively high water solubility. Potential for mobility in soil is very high (Koc between 0 and 50).

Partition coefficient, n-octanol/water (log Pow): -3.88 Estimated.

Partition coefficient, soil organic carbon/water (Koc): 14 Estimated.

Persistence and Degradability Biodegradation is not applicable.

Data for Component: Sodium Chloride

Movement and Partitioning: No bioconcentration is expected because of the relatively high water solubility. Potential for mobility in soil is very high (Koc between 0 and 50). Partitioning from water to n-octanol is not applicable.

Ecotoxicity

Data for Component: Sodium hydroxide. Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested). May increase pH of aquatic systems to > pH 10 which may be toxic to aquatic organisms.

Fish Acute & Prolonged Toxicity: LC50, rainbow trout (*Oncorhynchus mykiss*), 96 h: 45.5 mg/l

Aquatic Invertebrate Acute Toxicity: LC50, water flea *Daphnia magna*: 40 - 240 mg/l

Data for Component: Sodium Chloride. Material is practically non-toxic to aquatic organisms on an acute basis. (LC50/EC50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity: LC50, fathead minnow (*Pimephales promelas*): 10,610 mg/l

Aquatic Invertebrate Acute Toxicity: LC50, water flea *Daphnia magna*: 4,571 mg/l

Toxicity to Micro-organisms: IC50, OECD 209 Test; activated sludge, respiration inhibition: >1,000 mg/l

XIV. DISPOSAL CONSIDERATIONS

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL



OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted recycler.

XV. TRANSPORT INFORMATION

DOT Non-Bulk

Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
Hazard Class: 8 ID Number: UN1824 Packing Group: PG II

DOT Bulk

Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
Hazard Class: 8 ID Number: UN1824 Packing Group: PG II

IMDG

Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
Hazard Class: 8 ID Number: UN1824 Packing Group: PG II
EMS Number: F-A, S-B
Marine pollutant: No

ICAO/IATA

Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
Hazard Class: 8 ID Number: UN1824 Packing Group: PG II
Cargo Packing Instruction: 812
Passenger Packing Instruction: 808

Additional Information

Reportable quantity: 1,961 lb – SODIUM HYDROXIDE

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

XVI. REGULATORY INFORMATION

OSHA Hazard Communication Standard

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard: Yes
Delayed (Chronic) Health Hazard: No



Fire Hazard: No
Reactive Hazard: Yes
Sudden Release of Pressure Hazard: No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:

The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

| Component | CAS # | Amount |
|------------------|-----------|-----------|
| Sodium hydroxide | 1310-73-2 | <= 51.0 % |

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986):

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

U.S. Toxic Substances Control Act:

All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30. European Inventory of Existing Commercial Chemical Substances (EINECS). The components of this product are on the EINECS inventory or are exempt from inventory requirements.

CEPA - Domestic Substances List (DSL):

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

NFPA Hazard Rating System

| | | |
|---------------|-------------|-------------------|
| <u>Health</u> | <u>Fire</u> | <u>Reactivity</u> |
| 3 | 0 | 1 |



XVII. OTHER INFORMATION

Recommended Uses and Restrictions: Pulp and paper industry (pulping and bleaching, de-inking waste paper, water treatment). Textile industry (fiber processing and dyeing). Soaps and detergents industry (saponification of fats and oils, anionic surfactant manufacturing). Bleach manufacturing. Petroleum exploration and processing. Aluminum production. Chemical processing. Waste neutralization. Acid gas scrubbing. Neutralizing of acids and acid gases.

Legend

| | |
|--------|---|
| N/A: | Not available |
| W/W: | Weight/Weight |
| OEL: | Occupational Exposure Limit |
| STEL: | Short Term Exposure Limit |
| TWA: | Time Weighted Average |
| ACGIH: | American Conference of Governmental Industrial Hygienists, Inc. |

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APPENDIX E
TESTING NOTES



JOB Idaho - Maryland
SHEET NO. _____ OF _____
CALCULATED BY [Signature] DATE 12/20/18
CHECKED BY _____ DATE _____
SCALE _____

Baseline -
Fe - 1.13 mg/L
Mn - 0.291 mg/L

Aeration Pre-Filter (MnO₂) 240 mV ORP

Aeration Post-Filter (MnO₂)
Fe - ~~0.03~~ mg/L 0.01 mg/L
Mn - 0.03 mg/L (0.032 Dup mg/L)

12/27/18

KMnO₄ test



JOB Idaho Maryland
 SHEET NO. _____ OF _____
 CALCULATED BY JW DATE 12/27/18
 CHECKED BY _____ DATE _____
 SCALE _____

ORP Titration

Raw Water

used 5wt% Sodium bisulfite

~~to empty~~

| <u>Addition</u> | <u>ORP(mv)</u> | <u>Temp(°C)</u> | <u>Time</u> |
|-------------------|-----------------------|-----------------|-------------|
| Raw water | 201 | 13.9 | 11:05 am |
| 0.060 mL | 172 | 14.0 | |
| 0.1 mL | 149 | 14.0 | |
| 0.2 mL | 138 | 14.1°C | 11:15 |
| 1.0 mL | 121 | 14.1°C | |
| 2.0 mL | 105 105 | 13.5 | |

used 10wt% Sodium bisulfite

| | | | |
|--------|----|--------|--------------------------|
| 1.0 mL | 91 | | |
| 1.0 mL | 90 | | |
| 1.0 mL | 76 | 12.8°C | 11:25 Conductivity 770µS |

Added
 150mg → SMBS solid
 → 86 mV

1000mg 79 mV

2,000mg 80 mV PH=5.4 13.6°C /

4,000mg 80 mV

Add 7.65 mL 2N NaOH → pH=6.42 ORP=54mV

Added

| | |
|----------|----------|
| 250 mL | 50X NaOH |
| 1,200 mL | 50X NaOH |
| 1,000 mL | 50X NaOH |

pH = 6.56

pH = 7.09 ORP = 34 mV

pH = 7.56 ORP = 20 mV

cond = 8,308 μ S @ 14.2°C

Bench Test Plan

Idaho-Maryland

1 gpm

| Test ID | Date | Solution Strength | Process Dose | Process Flow | Chemistry Flow | Run Started | Run Ended | Time Sampled | pH | ORP | Cond. | Fe | Mn | Sampling | Notes |
|--------------------------------|------------|-------------------|--------------|--------------|----------------|-------------|-----------|--------------|----------------|-------------------|--------------|-----|------|---------------------------------|-------|
| | | wt% | ppm | mL/min | mL/min | HH:MM | HH:MM | HH:MM | pH unit | mV | µS | ppm | ppm | | |
| Raw | 12/27/2018 | | | | | | | | 7.38 11.0°C | 250mV @ 11.2°C | 7403.6 µS | | 0.23 | VOA | |
| KMNO4 - 14ppm - MnO2 Feed | 12/27/2018 | 1.05% | 14 | ~3,785 | 5.0 | | | | | | | | | | |
| KMNO4 - 14ppm - MnO2 Effluent | 12/27/2018 | 1.05% | 14 | ~3,785 | 5.0 | | | | | | | | | cis-1,2-DCE, Fe, Mn | |
| KMNO4 - 12ppm - MnO2 Feed | | 1.05% | 12 | ~3,785 | 4.3 | | | | | | | | | | |
| KMNO4 - 12ppm - MnO2 Effluent | | 1.05% | 12 | ~3,785 | 4.3 | | | | | | | | | cis-1,2-DCE, Fe, Mn | |
| KMNO4 - 16ppm - MnO2 Feed | | 1.05% | 16 | ~3,785 | 5.8 | | | | | | | | | | |
| KMNO4 - 16ppm - MnO2 Effluent | | 1.05% | 16 | ~3,785 | 5.8 | | | | | | | | | cis-1,2-DCE, Fe, Mn | |
| Raw? | | | | | | | | | | | | | | | |
| NaOCl - 3.1ppm - MnO2 Feed | | 0.24% | 3.128 | ~3,785 | 5.0 | | | | | | | | | | |
| NaOCl - 3.1ppm - MnO2 Effluent | | 0.24% | 3.128 | ~3,785 | 5.0 | | | | | | | | | TTHM, HAA5, cis-1,2-DCE, Fe, Mn | |

More Notes:

Bench Test Plan

0.0234 gpm

Decanted w/ a lot of settled iron
Idaho-Maryland

| Test ID | Date | Chem Solution Strength | Process Dose | Process Flow | Chemistry Flow | Run Started | Run Ended | Time Sampled | pH | ORP | Cond. | Fe | Mn | Sampling | Notes |
|---------------------------------|------------|------------------------|--------------|--------------|----------------|-------------|-----------|--------------|---------------|--------|----------------|------|-------|---------------------------------|---|
| | | wt% | ppm | mL/min | mL/min | HH:MM | HH:MM | HH:MM | pH unit | mV | µS | ppm | ppm | | |
| Raw | 12/27/2018 | | | | | | | 15:35 | 7.22 | 385 | 382.6 | 0.17 | 0.221 | cis-1,2-DCE | |
| KMNO4 - 2.5 ppm - MnO2 Feed | 12/27 | 0.0044% | 2.5 | ~89 | 5.0 | | | 16:03 | 7.54 @ 16°C | 507 | 372.4 @ 16°C | | 0.204 | Fe, Mn "Rise Raw-Decanted" | |
| KMNO4 - 2.5 ppm - MnO2 Effluent | 12/27 | 0.0044% | 2.5 | ~89 | 5.0 | 16:02 | 17:12 | 16:12 | 7.47 @ 16.5°C | 379 mV | 372.2 @ 16.5°C | 0.02 | 0.046 | cis-1,2-DCE, Fe, Mn | collected 1 gal H ₂ O Effluent |
| Raw? | | | | | | | | | | | | | | | |
| NaOCl - 2 ppm - MnO2 Feed | | 0.00355% | 2 | ~89 | 5.0 | | | | | | | | | TTHM, HAA5, cis-1,2-DCE, Fe, Mn | |
| NaOCl - 2 ppm - MnO2 Effluent | | 0.00355% | 2 | ~89 | 5.0 | | | | | | | | | TTHM, HAA5, cis-1,2-DCE, Fe, Mn | |

More Notes:

Bench Test Plan

Idaho-Maryland

0.0234 gpm

Decanted

| Test ID | Date | Chem Solution Strength | Process Dose | Process Flow | Chemistry Flow | Run Started | Run Ended | Time Sampled | pH | ORP | Cond. | Fe | Mn | Sampling | Notes |
|---------------------------------|----------|------------------------|--------------|--------------|----------------|-------------------------|-----------|--------------|----------------|---------------|-------------|------|-------|---------------------------------|-----------------------|
| | | wt% | ppm | mL/min | mL/min | HH:MM | HH:MM | HH:MM | pH unit | mV | µS | ppm | ppm | | |
| Raw | 12/28/18 | | | | | | | 09:38 | 7.23 | 377 15.9°C | 394.3 µS | 0.08 | 0.231 | cis-1,2-DCE | |
| KMNO4 - 2.5 ppm - MnO2 Feed | | 0.0044% | 2.5 | ~89 | 5.0 | 13:30 | | | | | | | | cis-1,2-DCE | Sampled before column |
| KMNO4 - 2.5 ppm - MnO2 Effluent | | 0.0044% | 2.5 | ~89 | 5.0 | 13:30 13:30 13:30 | | 14:00 | 6.93 20.6°C | 211 | 349.4 | 0.01 | 0.058 | cis-1,2-DCE, Fe, Mn | |
| Raw? | | | | | | | | | | | | | | | |
| NaOCl - 2 ppm - MnO2 Feed | | 0.00355% | 2 | ~89 | 5.0 | | | | | | | | | TTHM, HAA5, cis-1,2-DCE, Fe, Mn | |
| NaOCl - 2 ppm - MnO2 Effluent | | 0.00355% | 2 | ~89 | 5.0 | | | | | | | | | TTHM, HAA5, cis-1,2-DCE, Fe, Mn | |

More Notes:

12/28/18

Replace column media after trying (and failing) to backwash
 Rinsed column w/ tap water until Mn value = 0.041 ppm

- ~~Did not dose~~
- Dosed KMnO4 at first, but got high level of Mn - ~~13.45~~ 13.45
- Turned dose off and got low Mn - Mn = 0.058 ppm
- Ran ~ 2.5 gal of water w/out KMnO4 - Mn = 0.064 ppm

16:00 - Accidentally let feed water run out & column dried
- started water again and took sample $Mn = \cancel{0.89 \text{ ppm}}$
0.089 ppm

16:16

16:16 10.0 10.0 10.0 10.0

16:16 10.0 10.0 10.0 10.0

16:16 10.0 10.0 10.0 10.0

16:16 10.0 10.0 10.0 10.0



Finish K Mudy Testing

JOB Idaho - Maryland
SHEET NO. 1 OF _____
CALCULATED BY _____ DATE 12/31/18
CHECKED BY _____ DATE _____
SCALE _____

Raw water - 12/31

$Mn = 0.17 \text{ ppm}$

Filter water w/ 2 ppm maintenance dose:

$Mn = 0.062 \text{ ppm}$ @ 8:50 am

$Mn = 0.2 \text{ ppm}$ @ 9:15 am

Lowered Mn dose 9:20 am ^(2A) Dose: (24% on pump)

$Mn = 0.018 \text{ ppm}$ 10:00 am

$Mn = 0.265 \text{ ppm}$ 10:40 am

$Mn = 0.046 \text{ ppm}$ 10:50 am of composite sample

$Mn = 0.025 \text{ ppm}$ 10:57 am after stopping dose for 10 minutes

10:57 restarted dose @ ~20% pump speed
= 4.53 mL/min

$Mn = 0.04 \text{ ppm}$ 11:14 am = 1.72 mg/L

ORP = 393 mV @ 16.7°C

pH = 6.82

Cond. = ~~3.78~~ 378.0 μS



JOB Idaho - Maryland
SHEET NO. 2 OF _____
CALCULATED BY _____ DATE 12/31/18
CHECKED BY _____ DATE _____
SCALE _____

NaOCl Testing

Raw water - 12/31/18

pH = ~~6.7~~ 7.08 @ 15.3°C

ORP = 318 mV @ 15.3°C

Cond = 395.0 μ S

Fe = ~~0.2~~ 0.5 ppm

Mn = 0.197 ppm

started flowing with
20 ppm (0.00201%)
NaOCl @ 13:00

After NaOCl addition (~1 ppm)

pH = 7.83 @ 17.8°C

ORP = 278 mV

Cond = 401.6 μ S

Effluent - NaOCl addition (~1 ppm)

pH = 7.05

ORP = 135 mV @ 18.2°C

Cond = 390.5 @ 18.2°C

Fe = 0.01 ppm

Mn = 0.012 ppm

Effluent - NaOCl add (~1 ppm) - 15:08

Mn = 0.078 ppm

Free Cl₂ = 0.06 ppm (slight pink color)
0.18 ppm (stabilized after 1 min)

Composite sample (15:45) Mn =



JOB Idaho Maryland
SHEET NO. 3 OF _____
CALCULATED BY _____ DATE 12/31/18
CHECKED BY _____ DATE _____
SCALE _____

Composite NaOCl (ppm) Sample (18:45)

pH = 7.21 @ 18.1°C

ORP = 255mV

Cond = 384.4 @ 18.1°C

Fe = 0.01 ppm

Mn = 0.026 ppm

GAC Column

- Flush column
- Started 14:08
- Effluent: $Mn = 0.027 \text{ ppm}$
 $Fe = 0.04 \text{ ppm}$

Water from
aeration test.
"Fe - 0.01 ppm"
"Mn - 0.03 ppm"

Ended 15:30

Water from NaOCl test performed on 12/31/18

Start: 15:45 w/ flush using actual water $Fe = 0.01 \text{ ppm}$
 $Mn = 0.026 \text{ ppm}$

Effluent: $Mn = 0.025 \text{ ppm}$
 $Fe = 0.00 \text{ ppm}$
 $pH = 8.93 @ 20.4^\circ C$
 $ORP = 284 \text{ mV}$
 $Cond = 373.2 \mu S$

Feed: $pH = 7.65 @ 17.8^\circ C$
 $ORP = 410 \text{ mV}$
 $380.1 \mu S @ 18.0^\circ C$

= user input

Idaho Maryland
Permanganate Pump Sizing

Note that this calculation assume a 1:1 molar ratio between chlorine demand and potassium permanganate demand.

| Influent Water contaminant levels (mg/L) | Design | Max | No Ammonia rxn | Min |
|--|--------|-------|----------------|------|
| Fe | 1.6 | 1.7 | 1.6 | 1.5 |
| Mn | 0.25 | 0.3 | 0.25 | 0.23 |
| H2S | 0 | 0 | 0 | 0 |
| NH3 | 0 | 0.066 | 0 | 0 |

mg/L Cl needed 2.35 3.128 2.35 2.19

Chlorine Req. Continuous Regeneration

Cl2 Demand

| Design | Max |
|--------|------------|
| 2.35 | 3.128 mg/L |

KMnO4 molar mass

158.0336 g/mol

Cl2 molar mass

35.45 g/mol

Cl2 Demand

| Design | Max |
|------------|----------------|
| 6.6291E-05 | 8.82E-05 mol/L |

Dilution Calculations

| | |
|------------|-------------------|
| NaOCl | 8.25% |
| Dilution | 0.0002435 |
| V solution | 1 gal |
| V NaOCl | 0.0002435 gal |
| | 0.92 mL |
| Conc. | 0.00201% 20.1 ppm |

tried to match 5 ml dose on chem pump

| Chemical | NaOCl |
|----------|---------|
| 20.1 mg | 100 % |
| 1 L | 8.25 % |
| X | |
| 1 sg | 1 sg |
| 1.08 | 1.08 |
| X | |
| 1 ml | 1 ml |
| 1000 mg | 1000 mg |
| = | |
| 0.23 mL | 0.23 mL |
| L | |

0.85 mL/gal

| | |
|------------|------------------|
| KMnO4 | 0.0035% wt% |
| V solution | 1 gal |
| w solvent | 3.7854 kg |
| | 3785.4 g |
| w solute | 0.13 g 100%KMnO4 |
| w solute | 0.179 g 75%KMnO4 |

KMnO4 Demand

| Design | Below max | Max | TARGET |
|-------------|-----------|-----|--------|
| 10.47613427 | 12 | 2.3 | 2 |

mg/L

0.02344 gpm water flow rate
0.0035% KMnO4 Solution Concentration
1 Specific gravity KMnO4 Solution

KMnO4 Solution Dosing Rate

| Below max | Max | Above Max | 5.000126938 |
|------------|----------|-------------|-----------------------------|
| 29.9975915 | 5.749538 | 4.999598579 | mL/min of 0% KMnO4 Solution |
| 0.02999759 | 0.00575 | 0.004999599 | L/min of 0% KMnO4 Solution |
| 0.00792539 | 0.001519 | 0.001320898 | gpm of 0% KMnO4 Solution |
| 0.47552325 | 0.091142 | 0.079253874 | gph of 0% KMnO4 Solution |
| 11.4125579 | 2.187407 | 1.902092986 | gpd of 0% KMnO4 Solution |

NaOCl Demand

| Design | TARGET | Max | Above Max |
|--------|--------|-------|-----------|
| 2.35 | 1 | 3.128 | 4 |

mg/L

0.02344 gpm water flow rate
0.0020% NaOCl Solution Concentration
1 Specific gravity KMnO4 Solution

NaOCl Solution Dosing Rate

| Design | Max | Above Max |
|-------------|---------|-------------|
| 4.415978746 | 13.8132 | 17.66391498 |
| 0.004415979 | 0.01381 | 0.017663915 |
| 0.001166705 | 0.00365 | 0.00466682 |
| 0.070002305 | 0.21897 | 0.28000922 |
| 1.680055322 | 5.25521 | 6.720221288 |

mL/min of 0.002% KMnO4 Solution
L/min of 0.002% KMnO4 Solution
gpm of 0.002% KMnO4 Solution
gph of 0.002% KMnO4 Solution
gpd of 0.002% KMnO4 Solution