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SAMPLING AND ANALYSIS PLAN

Cornerstone Park Brownfields Project Henderson, Nevada

Prepared for:

City of Henderson
240 Water Street
Henderson, Nevada 89015

On behalf of:

State of Nevada
Division of Environmental Protection
901 S. Stewart Street, Suite 4001
Carson City, NV 89701

January 27, 2011
(Revision 0)

Sampling and Analysis Plan for:

Cornerstone Park
City of Henderson
240 Water Street
Henderson, Nevada 89015

December 14, 2010 (Revision 0)
Date

Project Manager: ____________________________________

QA Manager: _______________________________________.

NDEP QC Coordinator for the Nevada Brownfields Program: ______________________________

NDEP Brownfields Program Coordinator: ______________________________

For EPA use:

Approved by EPA Project Manager: Date:

______________________________ ______________________________

Expedited Review? ___ Yes ___ No

Received by QA Office: Date:

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________________________________ ____________________

Reviewed by: Date

Approved:

____

Region 9 Quality Assurance Manager

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APPENDICES

1. INTRODUCTION

McGinley and Associates, Inc. (MGA) has prepared this Sampling and Analysis Plan (SAP) for assessment activities to be conducted in the Cornerstone Park redevelopment area, Henderson, Nevada. This SAP addresses environmental sampling to be conducted at Assessor Parcel Numbers (APNs) 178-16-501-001, 178-16-510-002, 178-16-710-002, 178-16-601-004, 178-16-601-003, 178-16-710-001in Henderson (the Site). These assessment activities are being funded by the United States Environmental Protection Agency (USEPA) Brownfields Assessment Grant RP00T10001-1. The Brownfields grant is for assessment of hazardous substances. This SAP was prepared in accordance with the Nevada Division of Environmental Protection (NDEP) Quality Assurance Program Plan (QA Program Plan) for the Nevada Brownfields Program (NBP) (NDEP 2007).

Current and historical operations in the redevelopment area include a sand and gravel mining operation, concrete plant, and an asphalt batch plant. Data from previous investigations indicate that groundwater is contaminated with perchlorate and soils may also be contaminated with perchlorate.

The purpose of this project is to assess the occurrence and extent of perchlorate contamination of soil and surface water in the vicinity of the two water bodies on site. Samples of soil and surface water will be analyzed for perchlorate in a fixed analytical laboratory.

1.1 Site Name

The Cornerstone Park (APNs listed above), is the focus of this investigation.

1.2 Site Location

The site is located in Henderson, Nevada (Figure 1). The study area comprises the parcels listed above, and is bounded on the east by Stephanie Street, on the south by Wigwam Parkway, on the west by a residential development, and on the north by railroad tracks. This area, which covers approximately 103 acres, is slated for redevelopment as a park

1.3 Responsible Agency

This project is being conducted for the City of Henderson (Henderson) through USEPA Brownfields Assessment Grant RP00T10001-1. The NDEP is providing technical and programmatic assistance to Henderson, and the investigation will conform to the NBP's QA Program Plan (NDEP, 2007).

1.4 Project Organization

Title/Responsibility	Name	Phone
City of Henderson		
Environmental Programs Manager – project oversight, assist with site access agreements, liaison with USEPA Project officer	Brenda Pohlmann	(702) 267-1306

NDEP		
Program Coordinator for the Nevada Brownfields Program – Project coordination, liaison with USEPA	David Friedman	(775) 687-9385
Quality Coordinator for the Nevada Brownfields Program – Review SAP, quality assurance	Mary Siders	(775) 687-9496
USEPA		
USEPA Project Manager – Work plan review	Carolyn Douglas	(415) 972-3092
McGinley and Associates, Inc.		
Principal – senior review, regulatory liaison	Joe McGinley	(775) 829-2245
Project Manager – project management, regulatory liaison, coordinate field activities, data review, report preparation.	Brian Rakvica	(702) 375-9945
Quality Manager – oversee implementation of SAP, review QA/QC procedures.	Brian Giroux	(775) 829-2245
Environmental Scientist – oversee field activities, site safety, collect soil samples, classify soils, coordinate disposal of investigation-derived waste	Rosangela Wacaser	(702) 990-8392
Technician – conduct soils and surface water sampling	Devin Gordon	(702) 371-7864
CAD Operator – CAD support	Tim Dory	(775) 829-2245
Administrative Assistant – administrative support	Linda Comstock	(775) 829-2245
Contractors/Vendors		
Eagle Drilling Services, LLC – soil boring installation	Felicia Sanders	(702) 341-5873
TBE – assess for underground utilities in areas where drilling is conducted	Rick Torrens	(702) 458-4092
Alpha Analytical – analysis of soil and surface water samples	Tammy Brace	(775) 355-1044
Neptune and Company, Inc. – validation of data.	David Gratson	(505) 662-0707
The Fehling Group – quantitative health risk assessment services.	Kurt Fehling	(415) 897-6600
PBS&J – survey water surface elevation and soil boring locations	Eric Chrsitensen	(702) 263-7275
H2O Environmental – dispose of investigation-derived waste	To be determined	(702) 396-4148

1.5 Statement of the Specific Problem

Properties upgradient of the Site have historically manufactured perchlorate. These practices have resulted in the contamination of groundwater with perchlorate. The groundwater daylights in the surface water bodies at the Site. Perchlorate in the groundwater and surface water exceeds regulatory action levels. Surface water has also caused contamination of shoreline soils. The magnitude and extent of perchlorate contamination in soil and surface water is not known. Additional data are needed to assess the magnitude and or delineate the extent of perchlorate contamination in soil and surface water.

2. BACKGROUND

The Site was historically used as a sand and gravel pit, for concrete production, and as an asphalt batch plant. Previous investigations yielded samples of groundwater and surface water containing concentrations of perchlorate that exceeded regulatory action levels. The magnitude and extent of perchlorate contamination in soil and surface water are not known.

2.1 Sampling Area Description

The study area (the Site) occupies approximately 103 acres in a predominantly vacant series of lots in Henderson, Nevada (Figure 1). The area is bounded on the east by Stephanie Street, on the south by Wigwam Parkway, on the west by a residential development, and on the north by railroad tracks.

As shown on Figure 1, there are two bodies of water. Sampling will be conducted throughout the surface water bodies and on the shore line. The proposed sampling locations are indicated in Figure 2.

2.2 Operational History

The Site was historically used as a sand and gravel mining operation, for concrete production, and as an asphalt batch plant. The site is currently vacant.

2.3 Previous Investigations/Regulatory Involvement

The Site and adjacent parts of the greater Cornerstone area have been investigated by several parties for differing reasons. Each of these investigations is discussed below.

In January 2001, a report titled “Risk Assessment Hanson Las Vegas Quarry, Henderson, Nevada” (B&C, 2001) was published; this report discussed the quality of the surface water, groundwater and soils. Samples were taken from inside and adjacent to the subject Site. Perchlorate concentrations in surface water were reported between 63 and 79 micrograms per liter (µg/l); perchlorate concentrations in groundwater were reported between 8.8 and 510 µg/l; and perchlorate concentrations in surface soils were reported between non-detect and 190 micrograms per kilogram (µg/kg). B&C concluded that the subject site was suitable for its intended use as a park and a school.

In February 2004, Ninyo & Moore (N&M) conducted a Phase I Environmental Site Assessment (ESA) for most of the Site. This ESA provided no additional information from the January 2001 report regarding the contamination at the Site. The ESA was conducted in compliance with the American Society for Testing and Materials (ASTM) Standard E-1527-00 to identify any *recognized environmental conditions* (RECs) at the Site.

In May 2004, N&M submitted a Phase II SAP for soils, groundwater and surface water to the NDEP.

In June 2005 N&M presented the results of the SAP in a Phase II ESA report. Additional groundwater monitoring wells were installed and sampled, and additional soil and surface water samples were taken. In soils, total petroleum hydrocarbons (TPH) were detected above the State Action Level of 100 milligrams per kilogram (mg/kg); however, it was determined that the quantity of soil was less than the 3 cubic yard (cy) reporting level. All perchlorate detected in soils was below the USEPA Region 9 Preliminary Remediation Goal (PRG) of 7.8 mg/kg for residential soils. In groundwater, TPH and VOCs were all reported as non-detect or below Action Levels. Perchlorate concentrations ranged from 33 to 85 µg/l in groundwater. In surface water, TPH and VOCs were all reported as non-detect or below Action Levels. Perchlorate concentrations ranged from 37 to 39 µg/l in surface water.

Quarterly groundwater and surface water monitoring was conducted from October 2005 until June 2006 for total dissolved solids, select cations and anions and perchlorate. Groundwater samples contained perchlorate from 17 to 77 µg/l. Surface water samples contained from 19 to 59 µg/l perchlorate. It was noted that the concentrations in the surface water appeared to correlate to the concentrations in groundwater and this provides for a line of evidence that the surface water is the surface expression of shallow groundwater.

2.4 Geological Information

The Site lies within the southeastern portion of the Las Vegas Valley, which is part of the Basin and Range Physiographic Province. The Las Vegas Valley is a topographic depression (basin) that trends northwest/southeast across Clark County. It is approximately 50 miles in length and as much as 25 miles across. The basin is filled with sedimentary deposits derived from the surrounding mountain ranges. The site is dominated by Quaternary alluvial deposits at the surface and in the quarry walls that are characterized by volcanic boulder and cobble clasts within generally very coarse-grained to fine-grained strata. Some sand, silty sand and clay interbeds occur throughout the succession. Localized zones of caliche can be found along the quarry walls.

Due to the limited information collected from previous studies groundwater flow beneath the Site is not well understood; however, groundwater flow appears to be to the east-northeast. Based on historical drilling logs, the first groundwater interface appears at a depth of 30 to 60 feet below ground surface (bgs). As noted above, the quarry lake is believed to be the surface expression of the near-surface shallow groundwater, given the general correlation in water level elevations reported previously.

2.5 Environmental and/or Human Impact

No adverse human health effects associated with the soil and surface water contamination have been reported or documented. However, the potential exists for receptors to interact with the surface water and adjacent soils.

2.6 Conceptual Site Model (CSM)

The source of contamination at the site is perchlorate-contaminated groundwater, which subsequently impacted shoreline soils. The Site is proposed for redevelopment as a park.

During the construction phase of redevelopment, construction workers may be affected by perchlorate-contaminated soils as these soils are reworked and graded. After the site has been redeveloped as a park, recreational users may be affected by the perchlorate-contaminated soils and surface water during recreational activities. Each of these sources, receptors and pathways will be evaluated in the final report.

3. PROJECT DATA QUALITY OBJECTIVES

3.1 Project Task and Problem Definition

The purpose of this investigation is to assess the surface soil and surface water for contamination resulting from historical operations conducted upgradient of the Site. Definitive (laboratory) data will be collected during this investigation.

Definitive data (if above the provisional State Action Level of 18 µg/l in groundwater) will be used to conduct a human health risk assessment (HHRA) to determine if the Site is acceptable for the proposed use as a park.

3.2 Data Quality Objectives (DQOs)

The DQO process (USEPA 2006) is a systematic planning tool that is used to establish performance or acceptance criteria. These criteria, in turn, serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of a study. The DQO process consists of seven iterative steps, as described in the following sections and summarized in Table 1.

3.2.1 Step 1: State the Problem

Soil, groundwater and surface water were contaminated by perchlorate released during past activities upgradient of the Site. Concentrations of perchlorate in the groundwater and surface water exceed provisional regulatory action levels; however, the extent of perchlorate contamination in soil and surface water is not known. Additional data are needed to define the extent of contamination and to evaluate whether the site is acceptable for the proposed use as a park. In addition, it is unknown if the upgradient sources are continuing to impact the site.

3.2.2 Step 2: Identify Decisions

As additional soil and surface water data are collected from the Site, these data will be evaluated to determine if contaminant concentrations exceed media-specific action levels or provisional action levels, as appropriate. Nevada Administrative Code (NAC) 445A.2272 describes establishment of action levels for soil. Consistent with this approach the NDEP Basic Comparison Level (BCL) for residential soil is the appropriate perchlorate action level and will be used in this study. The NDEP provisional action level of 18 µg/l perchlorate will be used for surface water.

The extent and magnitude of contamination must be delineated to address the question of whether contaminant concentrations are acceptable for exposures under the proposed uses of this property.

Perchlorate concentrations in surface water will also be assessed versus historical data to determine if upgradient sources are continuing to affect the site.

Results from the proposed investigation will be used to determine if additional assessment is required to assess potential risks to human health. Specific study questions posed under Step 2 are provided in Table 1, the DQO summary table.

3.2.3 Step 3: Identify Inputs

Information required to address project objectives includes historical data, proposed qualitative and quantitative data to be collected under this study, all geologic and hydrologic data compiled for the area, knowledge of utility corridors and other infrastructure in the area that may influence contaminant migration, and regulatory action levels.

Analytical testing of soil and groundwater samples shall be conducted by Alpha Analytical (Alpha) of Las Vegas, Nevada. Alpha's DQOs for the analytical testing are provided in Appendix A.

3.2.4 Step 4: Define Study Boundaries

The proposed investigation shall extend areally throughout both surface water bodies and to a depth of ten feet below the water surface. The investigation for soils shall extend no more than 100 feet from the shoreline and shall extend to a depth of ten feet bgs to address human health exposures for the risk assessment needs. The duration of the assessment activities described in this SAP is approximately one month.

3.2.5 Step 5: Develop Decision Rules

Decision rules are specified in Table 1, and specify actions based on qualitative and definitive data. Laboratory analytical data for the sampled media (soil and surface water) will be compared to action levels and provisional action levels identified in Section 3.2.2. For contaminants detected in soil, Nevada statutes require that site-specific action levels be an appropriate level of concentration that is based on the protection of public health and safety and the environment as determined through the use of the Integrated Risk Information System (IRIS) adopted by the USEPA, to be used when inhalation, ingestion, or dermal exposure is the primary exposure pathway; or a background concentration.

For perchlorate in drinking water, NDEP provides a provisional action level of 18 µg/l. This perchlorate drinking water action level was derived from USEPA guidance that derived an "interim action level" pending the final risk characterization. However, rather than define a single value, USEPA provides a range of 4 to 18 µg/L. NDEP has selected the upper end of this range, 18 µg/L, as the state's provisional action level. This action level has been used in NDEP Bureau of Water Pollution Control permits, and has been extensively referenced by the NDEP's Bureau of Corrective Actions.
Specifics of the NDEP decision-making process on this provisional action level may be found at the following web addresses:

http://ndep.nv.gov/bca/file/990618_epa_interim_guidance_clo4.pdf

http://ndep.nv.gov/bca/file/030122_status_memo_interim_guidance_clo4.pdf

http://www.epa.gov/fedfac/pdf/perchlorate_guidance.pdf

http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/3dc283e6c5d6056f88257426007417a2/0bcc6573e6440c0c882570070063c2de/$file/perch_99.pdf.

Exposure point concentrations (EPCs; e.g., 95th upper confidence limit on the mean) will be calculated from the analytical data for surface water samples collected as part of this SAP. The EPCs will be used to estimate non-carcinogenic health hazards under a recreational exposure scenario.

Historical concentrations of perchlorate in surface water will be statistically compared to concentrations collected as part of this SAP. The purpose of this statistical analysis is to determine if current concentrations are greater than historical concentrations or equal to or less than historical concentrations to guide the risk assessment. This information will in turn, be used to guide the conduct of the risk assessment as further discussed below. Depending on the statistical distributions of the historical and current data, a two sample statistical test will be performed to test the null hypothesis that the current concentrations are less than or equal to the historical levels. The statistical methods presented in USEPA (2006) guidance for data quality assessment will be used. If current perchlorate concentrations in surface water are statistically significantly higher than historical concentrations, then it is likely that the upgradient source is unmitigated, indicating that future recreational users of the surface water body may be exposed to concentrations of perchlorate greater than those under a recreational use scenario. In this event, MGA will back-calculate a target concentration for perchlorate in surface water that equates to a non-carcinogenic hazard index of one. Perchlorate data for future samples of surface water may be compared to the target concentration to determine if the measured perchlorate concentrations are acceptable for the recreational end use. Should concentrations be decreasing or steady, then the surface water data collected as part of this SAP will be used to estimate potential health hazards. Finally, the uncertainty analysis of the human health risk assessment will discuss the on-going debate regarding the toxicology of perchlorate and how this may affect the end use for the surface water (i.e., recreation).

3.2.6 Step 6: Specify Tolerable Limits on Decision Errors

This is not a statistically based study; sampling locations will be selected based on professional judgment and field conditions (i.e., visual evidence of salts).

3.2.7 Step 7: Optimize the Sampling Design

Optimization was completed via discussions with the project team and by reviewing historical data sets. The number of samples selected is believed to represent the minimum number of samples that will be needed to develop an adequate data set based on professional judgment and experience.

The DQOs are summarized in Table 1. Analytical testing of soil and surface water samples shall be conducted by Alpha, as noted above. Alpha’s DQOs for the analytical testing are provided in Appendix A.

Laboratory analytical data will be compared (on a datum-by-datum basis) to the action levels and provisional action levels (Table 2). If the data are found to be inadequate for conducting a human health risk assessment (if necessary), then a supplemental SAP shall be prepared to further assess the extent of contamination and determine if the concentrations of perchlorate are high enough to pose an unacceptable risk..

3.3 Data Quality Indicators (DQIs)

Data quality indicators (precision, accuracy, representativeness, completeness, comparability and sensitivity [i.e., PARCCS parameters]) refer to quality control criteria established for various aspects of data gathering, sampling, and/or analyses. Precision is the degree of mutual agreement between or among independent measurements of a similar property (usually reported as standard deviation (SD) or relative percent difference) and relates to the analysis of duplicate laboratory or field samples. Accuracy is the degree of agreement of a measurement with a known or true value and is determined by comparing the reported laboratory value for a sample to a known or true concentration (i.e. matrix spikes, surrogate spikes, laboratory control samples and performance samples). Representativeness is the expression of the degree to which data accurately and precisely represent a characteristic of an environmental condition or population and relates to the method of collecting samples and determining sampling locations. Completeness is expressed as the percent of valid usable data obtained compared to the amount that was expected. Comparability expresses the degree of confidence with which one data set can be compared to another. Sensitivity is defined by the laboratory detection limits and are generally expressed in terms of method detection limits (MDLs) or reporting limits (RLs).

Precision and Accuracy: The measurement quality objectives (MQOs) for precision and accuracy for the analyses of the specific chemicals of concern (COCs) are summarized in Table 3.

Representativeness: Sample locations were selected using professional judgment and knowledge of geologic and hydrogeologic conditions and groundwater hydraulic conditions and will adequately represent site conditions in the area being investigated.

Completeness: Data collection may be inhibited by geologic conditions and/or underground utilities. The project goal is to obtain at least 90% of the soil and groundwater samples outlined in this SAP.

Comparability: The laboratory that will be used for analytical testing of soil and groundwater samples collected during this investigation (Alpha) is certified by the NDEP for standard analyses under the Clean Water Act and the Safe Drinking Water Act as described in Appendix A of the NBP QA Program Plan (NDEP, 2007). Relevant SOPs from Alpha for the analyses to be conducted during this investigation (i.e. USEPA Method 314.0) are provided in Appendix B. Analytical testing of soil and surface water investigations collected during previous assessment activities conducted in the study area were also analyzed using USEPA Method 314.0.

Sensitivity:

The laboratory reporting limit for each analyte is summarized in Table 2. The reporting limits are well below the action levels and provisional action levels and are adequate for this investigation.

3.4 Data Review and Validation

Data verification is the process of evaluating the completeness, correctness, conformance, and compliance of a specific data set against the method, procedural, or contractual requirements. Data verification evaluates whether sampling protocols, SOPs, and analytical methods were followed during data generation. Verification also involves examining the data for errors or omissions. Field and laboratory staff will verify that the work is producing appropriate outputs.

Data validation is a systematic process for reviewing a body of data against a pre-established set of acceptance criteria defined in this plan. Data validation is an analyte- and sample-specific process that extends the evaluation of data beyond data verification and is performed to determine the analytical quality of a specific data set. Validation involves a detailed examination of the data package to determine whether MQOs for precision, accuracy, and sensitivity have been met. For this environmental assessment, the intent of the data review and validation process is to verify that the specified levels of precision, accuracy, reproducibility, completeness, comparability, and analytical sensitivity of the final results are achieved, with respect to the project MQOs, and that the data fulfill project DQOs.

MGA's QA officer (in concert with our data validation sub-contractor) will supervise or perform data quality assessment tasks. MGA will consistently evaluate and document measurement data to monitor consistency with MQOs, to quantitatively assess data quality, and to identify potential limitations to data use. MGA will review field and analytical laboratory data generated for this project, including the following:

- Chain of custody documentation;
- Laboratory batch QC frequency; and,
- Results of batch and field QC analyses;

Field Measurements: Field measurements are not expected to be used on this Site, however, daily field logs will record all pertinent qualitative and quantitative field observations.

Laboratory Data: Alpha will generate and review all laboratory data. Each data point will be assessed as non-qualified or qualified based upon the acceptance criteria. Data may be qualified as "estimated" (J-qualified); these data are used as is. Some data may be qualified as "rejected" (R-qualified) if critical QC parameters are not met; these data are unusable for any purpose. Sample re-analysis, for data not meeting MQOs, will be considered as a possible corrective action. Third-party data validation will be performed by MGA's designated sub-contractor.

3.5 Data Management

Soil and groundwater sampling will be conducted in accordance with MGA's SOPs (Appendix C). A unique identification number will be assigned to each sample. The number will be an alphanumeric sequence that serves as an acronym to identify the sample. For soil samples the sample location and sample depth will be incorporated into the sample identification designation. For groundwater samples the sample location shall be incorporated into the sample ID. The following format will be used for the sample designation:

Soil Samples**:**

Sample ID: BRN002-MW-01-05 BRN002 - MGA Project Number

MW-01 5 feet - Sample location (i.e. borehole for well MW-1) and depth (feet below ground surface)

Surface Water Samples**:**

Sample ID: BRN002-SW-01-00-01

BRN002 - MGA Project Number

SW-01-01 - Sample location (SW-1), depth (feet below water surface) and sample

number (i.e., first sample)

Field logs shall be maintained throughout the project. The following information shall be included on the field logs: weather conditions, description of activities conducted, dates and times, field observations, deviations from sampling program, names of onsite personnel, sample locations, sample depths and geologic conditions.

Soil and surface water samples will be preserved in a cooler at 4^{o}C pending delivery to the laboratory. Soil and groundwater samples shall be submitted to the laboratory under chain-of-custody protocol. A copy of Alpha's chain-of-custody form is provided in Appendix D.

Analytical data and laboratory QA/QC reports will be transmitted electronically to MGA. Data shall be formatted to facilitate data validation. All soil and surface water analytical data will be entered and maintained in an electronic database (i.e., Microsoft Excel).

3.6 Assessment Oversight

Prior to starting field activities, the SAP will be reviewed by the Project Team. The Health and Safety Plan (Appendix F) will be reviewed by all on-site personnel. The Project Manager will communicate with field personnel on a daily basis. The MGA QA Officer will oversee QC of all field activities. If modifications to the proposed sampling program are required due to field conditions, the Project Manager shall be notified for direction. Any modifications to the sampling plan will be documented in the field logs and in the project report as "deviations from the sampling plan."

4. SAMPLING RATIONALE

Professional judgment was used to select sampling locations that are likely to provide data to address project DQOs (Table 1). Decision statements formulated in the project DQOs are largely concerned with delineating the extent and magnitude of contamination

4.1 Soil Sampling

If visual evidence of salt staining is present, a designated sampling location will be moved to sample the salt-stained location. If no salt staining is evident, the judgmental sampling locations on Figure 2 will be used. Samples will be collected at the surface and at 10 feet bgs to address the range of potential receptors (as described above in Section 3.2.4) and the soil horizons that they will encounter.

4.2 Sediment Sampling

Not applicable, sampling of sediments is not included in the scope of this investigation.

4.3 Surface Water Sampling

Samples will be collected at two and ten feet below the water surface to be consistent with previous sampling events and to address the anticipated range of depths that could be encountered by receptors. Sampling locations are shown on Figure 2.

4.4 Biological Sampling

Not applicable, biological sampling is not included in the scope of this investigation.

5. REQUEST FOR ANALYSIS

Laboratory analyses are discussed in Section 5.1 below.

5.1 Analyses Narrative

5.1.1 Soil samples

It is anticipated that approximately twenty four soil samples will be collected for analytical testing. The soil samples will be collected as described in Section 4.1 and analyzed for perchlorate by USEPA Method 314.0.

5.1.2 Surface Water samples

Surface water samples will be collected from six unique locations at two depths from each water body for a total of 24 samples. A unique identification number shall be assigned to the duplicate sample so that it is blind to the laboratory. The surface water samples will be analyzed for perchlorate by USEPA Method 314.0.

5.2 Analytical Laboratory

All analytical testing shall be conducted by Alpha. Analytical testing and sample handling shall be conducted in accordance with Alpha's SOPs (Appendices A and B). Additionally, Sections B4 and B5 of the NBP QA Program Plan discuss analytical methods and QC measures, and Appendix E describes approved analytical methods for NBP projects.

6. FIELD METHODS AND PROCEDURES

Field activities shall be conducted in accordance with the SOPs provided in Appendix C.

6.1 Field Equipment

6.1.1 List of Equipment Needed

6.1.1.1 Soil Sampling

- field logbook and field data sheets
- hollow stem auger drill rig with 2" split spoon sampler
- sample containers
- cooler
- ice
- sample labels
- personal protective equipment (Level D)
- barricades, signage and caution tape
- 55-gallon drum and drum labels
- decontamination supplies

6.1.1.2 Surface Water Sampling

- field logbook and field data sheets
- personal protective equipment (Level D) plus personal flotation device
- boat and oars
- Kemmerer or Bacon Bomb Sampler
- tape measure
- 55-gallon drums and drum labels
- disposable polyethylene bailers

- nitrile gloves
- sample containers
- sample labels
- decontamination supplies
- cooler
- ice

6.1.2 Calibration of Field Equipment

Not applicable, field equipment is not included in the scope of this investigation.

6.2 Field Screening

Not applicable, field screening is not included in the scope of this investigation.

6.3 Soil Sampling

6.3.1 Surface Soil Sampling

Surface soils sampling will be conducted in accordance with the MGA's SOP in Appendix C.

6.3.2 Subsurface Soil Sampling

Sub-surface soils sampling will be conducted in accordance with MGA's SOP in Appendix C.

6.4 Sediment Sampling

Not applicable, sediment sampling is not included in the scope of this investigation.

6.5 Water Sampling

6.5.1 Surface Water Sampling

Surface water sampling will be conducted in accordance with MGA's SOP in Appendix C.

6.5.2 Groundwater Sampling

Not applicable, groundwater sampling is not included in the scope of this investigation.

6.5.2.1 Water Level Measurements

Surface water elevations will be measured by a State of Nevada licensed surveyor.

6.5.2.2 Well Sampling

Not applicable, well sampling is not included in the scope of this investigation.

6.6 Biological Sampling

Not applicable, biological sampling is not included in the scope of this investigation.

6.7 Decontamination Procedures

All field equipment which comes in contact with potentially contaminated soil or surface water will be decontaminated in accordance with MGA's SOP (Appendix C). Decontamination will occur prior to and after each use of a piece of equipment. Wastewater generated during decontamination procedures will be placed in 55-gallon drums, labeled and stored in a designated area pending off-site disposal.

7. SAMPLE CONTAINERS, PRESERVATION AND STORAGE

7.1 Soil Samples

Soil samples will be collected in dedicated sample containers provided by the analytical laboratory. The soil samples will be delivered to the laboratory within 24 hours of sample collection. Appendix C provides MGA's SOPs for sampling.

7.2 Sediment Samples

Not applicable, sediment sampling is not included in the scope of this investigation.

7.3 Surface Water Samples

Surface water samples will be collected in sample containers specified in the SOPs in Appendix C. Please note that the standard surface water sampling procedure is modified by the notification provided by NDEP's Bureau of Water Quality Planning, Laboratory certification Branch. This modified procedure is also provided in Attachment C. The samples will be chilled to 4^0 C immediately upon collection.

7.4 Biological Samples

Not applicable, biological sampling is not included in the scope of this investigation.

8. DISPOSAL OF RESIDUAL MATERIALS

Waste generated during this investigation includes soil cuttings (from the installation of soil borings), decontamination fluids, used personal protective equipment (PPE) and disposable sampling equipment.

Decontamination fluids will consist of deionzied or distilled water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal with the soil cuttings. The water and water with detergent will be poured into the drums with the soil cuttings.

Waste soil and decontamination fluids will be drummed and will be disposed of by H2O Environmental in Las Vegas, Nevada after analytical data are received from the laboratory. Drums will be labeled as waste with "characterization pending" until the analytical data are received. While waiting for the analytical data, the drums will be transported off-site to a secure location (the H20 Environmental Warehouse), because the Site does not have any access controls in place.

Disposable sampling equipment and used PPE will be double bagged and placed in a municipal refuse dumpster.

9. SAMPLE DOCUMENTATION AND SHIPMENT

9.1 Field Notes

9.1.1 Field Logbooks

Field logs will be completed describing all field activities. Field logs will be maintained in a binder or bound, will have consecutively numbered pages, will be legible, written in black ink and signed by the individual making the entries. The following information will be included in the field logs:

- project name and location
- driller name
- subsurface geologic conditions
- sample location and description
- site plan showing sample location and measured distances
- sampler’s name (s)
- date and time of sample collection
- designation of sample as composite or grab
- type of sample (e.g., soil or water)
- type of sampling equipment used
- field instrument readings and calibration
- field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- preliminary sample descriptions (e.g., for soils: soil texture, moisture level [dry, moist, wet]; for water: clear with slight solvent odor)
- sample preservation
- lot number of the sample containers, sample identification numbers and explanatory codes, and chain-of-custody form numbers
- name of recipient laboratory

In addition to the sampling information, the following specific information will also be recorded in the field logbook for each day of sampling:

- team members and their responsibilities
- time of arrival/entry on site and time of site departure
- summary of meetings or discussions with contractor or other agencies
- deviations from SAP, HASP and QA/QC procedures
- changes in personnel and responsibilities with reasons for the changes
- levels of safety protection
- calibration readings for any equipment used and equipment model and serial number

9.1.2 Photographs

Photographs will be taken at the select sampling locations. They will serve to verify information entered in the field logbook. For each photograph taken, the following information will be written in the logbook:

- time, date, location, and weather conditions
- description of the subject photographed
- name of person taking the photograph

9.2 Labeling

All samples collected will be labeled in a clear and precise manner for proper identification in the field and for tracking in the laboratory. A copy of the labels that will be used is provided in Appendix E. The samples will have pre-assigned, identifiable, and unique numbers. At a minimum the sample labels will contain the following information: sampling location, date and time of collection, analytical parameter(s), and method of preservation. Every sample will be assigned a unique sample number.

9.3 Sample Chain-of-Custody Forms and Custody Seals

All samples shall be delivered to the laboratory under chain-of-custody protocol. A copy of the Alpha's chain-of-custody form is provided in Appendix D. The sample labels shall be wrapped around the cap.

9.4 Packaging and Shipment

Samples shall be placed in a sturdy cooler. Bubble wrap shall be placed in the bottom of the cooler. Sample containers shall be placed in containers provided by the laboratory. Ice shall be packed in zip-locked, double plastic bags. Empty space in the cooler shall be filled with bubble wrap. Appendix C provides MGA's SOP for sample packaging and shipping.

10. QUALITY CONTROL

10.1 Field Quality Control Samples

Appendix C provides MGA's SOP for field QC.

10.1.1 Assessment of Field Contamination (Blanks)

10.1.1.1 Equipment Blanks

No equipment blanks will be collected during this investigation.

10.1.1.2 Field Blanks

No field blanks will be collected during this investigation.

10.1.1.3 Trip Blanks

No trip blanks will be collected during this investigation.

10.1.1.4 Equipment Rinsate Blanks

One rinsate per day will be collected for each matrix.

10.1.1.5 Temperature Blanks

For each cooler that is transported to the laboratory a 40 mL VOA vial will be included that is marked "temperature blank." This blank will be used by the sample custodian to check the temperature of samples upon receipt.

10.1.2 Assessment of Field Variability (Field Duplicates or Co-located Samples)

A duplicate water sample will be collected for laboratory quality control purposes. When collecting the duplicate water sample the sample containers with the two different sample identification numbers will alternate in the filling sequence. The duplicate samples will be preserved, packaged, and sealed in the same manner as the other samples of the same matrix. A separate sample number and station number will be assigned to the duplicate sample such that it is blind to the laboratory.

10.2 Background Samples

No background samples will be collected during this investigation.

10.3 Field Screening and Confirmation Samples

No field screening or confirmation samples will be collected during this investigation.

10.4 Laboratory Quality Control Samples

Laboratory QC (e.g., matrix spike/matrix spike duplicate samples) samples will be analyzed to monitor the precision and accuracy of its analytical procedures. The volume of the collected soil samples will be adequate to conduct the analysis and the laboratory QC analysis; therefore, no separate soil samples will be collected for laboratory QC purposes.

For water samples, double volumes of samples are supplied to the laboratory for QC purposes. Two sets of sample containers will be filled at one of the sampling locations. All sample containers will be labeled with a single sample number and both sets of sample containers will be submitted to the laboratory for QC purposes. The laboratory will be alerted as to which sample is to be used for QC analysis by a notation on the sample container label and the chain-of-custody record. Appendix B provides a description of QC measures in Alpha's SOP for perchlorate analysis.

11. FIELD VARIANCES

As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this SAP. When appropriate, the QA officer will be notified and a verbal approval will be obtained before implementing the changes. Modifications to the approved SAP will be documented in the sampling project report.

12. FIELD HEALTH AND SAFETY PROCEDURES

A site-specific Health and Safety Plan is provided in Appendix F. The HASP shall be reviewed by all onsite personnel prior to commencing with field activities.

13. SCHEDULE FOR SOIL AND GROUNDWATER INVESTIGATION

MGA will commence with the activities proposed herein upon receiving approval of this work plan. It is anticipated that field activities will be completed within 30 to 60 days of receiving work plan approval. The exact date will be contingent on driller availability and on receiving site access agreements from offsite property owners.. A draft report of findings will be submitted within 30 days of completing field activities.

14. REFERENCES

Risk Assessment Hanson Las Vegas Quarry, Henderson, Nevada, January 2001, Brown and Caldwell (B&C).

Cornerstone Redevelopment Brownfields Phase II Site Investigation September 2005 Quarterly Sampling, Henderson, Nevada, October 27, 2005, Kleinfelder.

Cornerstone Redevelopment Brownfields Phase II Site Investigation December 2005 Quarterly Sampling, Henderson, Nevada, February 2, 2006, Kleinfelder.

Cornerstone Redevelopment Brownfields Phase II Site Investigation March 2006 Quarterly Sampling, Henderson, Nevada, April 20, 2006, Kleinfelder.

Quarterly Monitoring Report Second Quarter 2006 Cornerstone Redevelopment Brownfields Phase II Site Investigation, June 20, 2006, Kleinfelder.

Final Nevada Brownfields Program Quality Assurance Program Plan, May 20, 2007, Nevada Division of Environmental Protection (NDEP).

August 2010 Basic Comparison Levels – Updated User's Guide and Table, September 1, 2010, NDEP.

Phase I Environmental Site Assessment Cornerstone Redevelopment Area, Las Vegas, Nevada, February 24, 2004, Ninyo & Moore (N&M).

Sampling and Analysis Plan Phase II Site Investigation Cornerstone Redevelopment Area, Las Vegas, Nevada, May 27, 2004, N&M

Phase II Environmental Site Assessment Cornerstone Redevelopment Area, Las Vegas, Nevada, June 30, 2005, Ninyo & Moore (N&M).

Data Quality Assessment: Statistical Methods for Practitioners. February 2006. USEPA EPA QA/G-9S

Table 1. DQO Summary Table for Soil and Surface Water Investigation for Cornerstone Park

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
State the Problem	**Identify the Decisions**	**Identify the Inputs to the Decisions**	**Define Study Boundaries**	**Develop Decision Rules**	**Specify Tolerable Limits on Errors**	**Optimize Sampling Design**
Upgradient historical property uses included perchlorate manufacturing. Surface water and groundwater have been contaminated by perchlorate. Perchlorate concentrations in the surface water and groundwater exceed regulatory action levels. Surface water also has caused contamination of the shoreline soils. The magnitude and or extent of perchlorate contamination in soil and surface water is not known. Additional data are needed to assess the magnitude and or delineate the extent of surface and soil contamination. It is not clear if upgradient sources are continuing to impact the site.	1) Do perchlorate concentrations in the soil exceed Nevada Action Levels? 2) Do perchlorate concentrations in the surface water exceed the provisional Nevada action level? 3) Is there a potentially complete pathway for perchlorate-contaminated soil or surface water to adversely affect human health or the environment? 4) Is additional assessment required to assess potential risks to human health from perchlorate contamination of soils and surface water at the site? 5) Do perchlorate concentrations in samples collected for this study exceed concentrations for historical data?	Analytical data for soil and surface water samples (quantitative data) State action levels (existing or derived) for contaminants in soil and surface water. Potential receptors and completed exposure pathways Pathways for impacts to human health Knowledge of future development plans. Historical surface water data.	Sampling to be conducted around periphery of study area (see Figure 2). Investigation shall extend laterally and vertically as required to adequately delineate lateral and vertical extent of soil and surface water contamination. This phase of the investigation is estimated to take 60 to 90 days from the time of state concurrence with the SAP until the draft report is submitted.	1) If perchlorate concentrations reported by the analytical laboratory exceed the state action levels for soils, then a human health risk assessment will be conducted to evaluate whether there is an unacceptable risk to humans based upon the intended land use. 2) If perchlorate concentrations reported by the analytical laboratory exceed the state provisional action levels for surface water, then a human health risk assessment will be conducted to evaluate whether there is an unacceptable risk to humans based upon the intended land use. 3) If there is a potentially complete pathway for perchlorate-contaminated soil or surface water to adversely affect human health and the environment, then a human health risk assessment will be conducted to evaluate whether there is an unacceptable risk to humans based upon the intended land use. 4) If additional assessment is required to assess potential risks to human health from perchlorate contamination of soils and surface water at the site, then an addendum to this SAP will be proposed. 5) If perchlorate concentrations in surface water exceed historical concentrations, it will be assumed that the upgradient sources are unmitigated and that the human health risk assessment will need to consider a range of perchlorate concentrations for surface water as discussed in Section 3.2.5.	The number of samples to be collected is not statistically based and will depend on the number of samples required to adequately delineate the extent of soil and groundwater contamination. The location and number of samples collected will be based on field observations and professional judgment. MQOs and DQIs established for analytical data are described in the NBP QA Program Plan.	Analytical data for perchlorate in samples of soil and surface water will be evaluated to select locations for additional sampling and investigation, if warranted.

Table 2. Reporting Limits and Nevada Action Levels for Contaminants of Concern				
Contaminant of Concern	**Laboratory Reporting Limit**		**Nevada Action Level**	
	Soil (µg/Kg)	**Groundwater (µg/L)**	**Soil[1] (mg/Kg)**	**Surface Water[2] (µg/L)**
Perchlorate	20	2.0	54.8	18

[1] NDEP, 2010

[2] Nevada provisional action level for perchlorate in drinking water is 18 µg/L.

Table 3: Method Precision and Accuracy Goals for Select Inorganic Ions (USEPA Method 314.0)				
Matrix Spike Compound	**Soil**		**Water**	
	% Recovery	**RPD%**	**% Recovery**	**RPD%**
Perchlorate	80-120	15	80-120	15

RPD	Relative Percent Difference
314.0	Perchlorate By Ion Chromatography

REFERENCE	DESIGNED	BH
	DRAWN	TAD
	CHECKED	
	APPROVED	

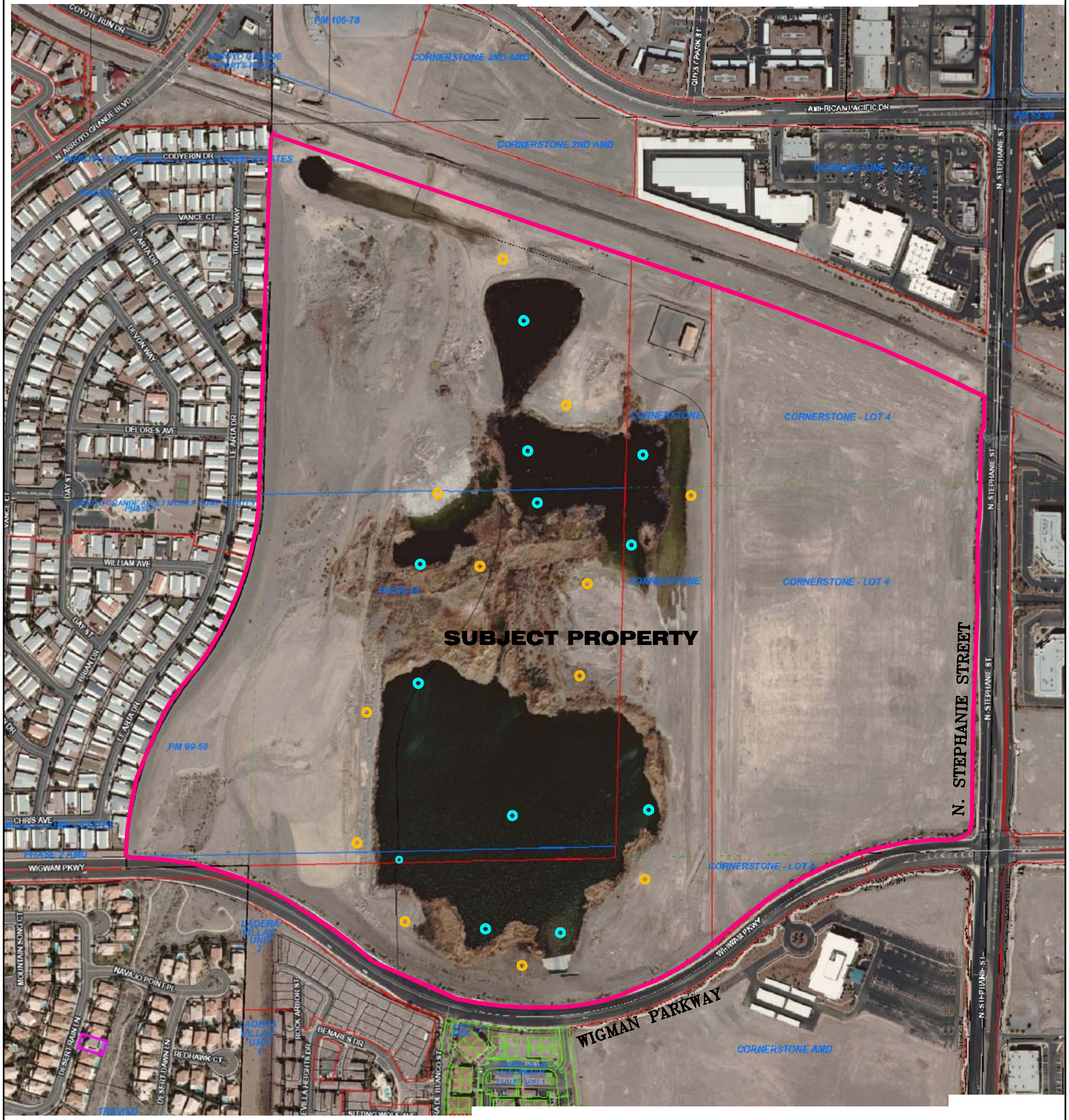
REVISIONS No.	DESCRIPTION	BY	DATE
△			
△			
△			
△			

FIGURE 1

PROJECT LOCATION MAP
-SHOWING-
CORNERSTONE SITE
LAS VEGAS, NEVADA

McGinley & Associates

SCALE: AS SHOWN	REVISION
JOB NO. LV-BRN-002	A



LEGEND

- ○ WATER SAMPLE LOCATION
- ○ SOIL SAMPLE LOCATION

N

0 250 500

FEET

REFERENCE	DESIGNED	BH
	DRAWN	TAD
	CHECKED	
	APPROVED	

REVISIONS No.	DESCRIPTION	BY	DATE
△			
△			
△			

FIGURE 2

SITE MAP
-SHOWING-
CORNERSTONE SITE
LAS VEGAS, NEVADA

McGinley & Associates

SCALE: AS SHOWN	REVISION
JOB NO. LV-BRN-002	A

Z:\Projects\Drafting\LV-BRN-002\LV-BRN-002-02.dwg 12/08/10 08:56 TAD

APPENDIX A

Laboratory Data Quality Objectives and Sample Handling Procedures

Appendix A Data Quality Objectives

A1 Generation of Control Limits

A1.1 LFB and LFM recovery data was compiled for both water and soil matrices. Statistical analyses was performed on those data sets to generate control limits. However, control limits cannot be set any wider than the method specified criteria, for method 314. Therefore, statistically derived windows are not used for this procedure.

A2 Method 314.0

A2.1 Accuracy limits of acceptability are method defined for the LFB and LFM.

A2.2 Precision limit is method defined at ≤15%RPD.

Method 314.0
Water/Solid Matrix

Analyte	LFB	LFM	
	Accuracy Window %	Accuracy Window %	RPD %
Perchlorate	85-115	80-120	15

C1 Appendix C California - Drinking Water Notification and Reporting

C2 References

C2.1 California Code of Regulations (CCR) Title 22, Social Security; Division 4, Environmental Health; Chapter 19, Certification of Environmental Laboratories; Article 10, Notification and Reporting, § 64819**.**

C3 Introduction

C3.1 California regulations related to drinking water are particularly concerned with perchlorate levels in transient, non-transient community, non-community water systems. The Division of Environmental Health has established a protocol for monitoring, reporting and notification of samples containing perchlorate which exceed the Maximum Contamination Limit (MCL) of 6 ug/L for this analyte.

C3.2 In excessive amounts, perchlorate may interfere with iodine uptake into the thyroid gland.

C4 Perchlorate Health Effects

C4.1 In adults, the thyroid gland helps regulate the metabolism by releasing hormones, while in children, the thyroid helps in proper child hood development.

C4.2 While perchlorate only affects the thyroid gland, it is not stored in the body, it is not metabolized, and any effects of perchlorate on the thyroid gland are fully reversible once exposure stops. There is some concern on perchlorate's possible effects on fetuses, newborns and children, but no clear definitive data exists and studies are mixed on this issue.

C4.3 The current California standard of 6 ug/L perchlorate for drinking water is specifically designed to protect infants.

C5 Notification and Reporting

C5.1 When samples are logged into our LIM system, for perchlorate analysis and these samples are designated as originating from a drinking water source, the LIM system will produce a Drinking Water Notification and Reporting Form. This form is a listing of the samples in the work order, its associated identification, the designated contact person with phone numbers and a section for detailing a history of phone conversations, essentially a phone log.

C5.2 If the presence of perchlorate exceeds a level of 6 ug/L the following actions are taken:

C5.2.1 The water supplier’s designated contact person is notified as soon as possible, but certainly within 24 hours of sample analysis;

C5.2.2 This phone conversation, time of notification or attempted notification is documented on the Drinking Water Notification and Reporting Form;

C5.2.3 The notification to the water supplier’s contact person must be made to a “live voice”. Do not leave a message on an answering machine.

C5.2.4 If the contact person cannot be reached directly (live phone conversation) within 24 hours, the California State Drinking Water Program designated contact person must be notified. This person can be reached through the water supplier’s Water Quality Emergency Notification Plan.

C5.3 Responsibilities

C5.3.1 It is the responsibility of the sample log-in personnel to determine if the samples are from a California drinking water system that would require notification, under CCR-22. The sample log-in personnel have the further responsibility of ensuring the Drinking Water Notification and Reporting Form is included in the client file folder and the analyst made aware of the work order status.

C5.3.2 It is the responsibility of the sample log-in personnel to ensure the client contact information is correct and up to date, and the California SDWA designted contact person (person identified on the water supplier’s Water Quality Emergency Notification Plan) is correct and up to date.

C5.3.3 It is the responsibility of the analyst, to document the concentration levels for those samples which exceed the 6 u/L MCL for perchlorate on the Drinking Water Notification and Reporting Form and notify Alpha’s Project Coordinator as soon as possible.

Note: This document is to be maintained with the client file folder at all times.

C5.3.4 It is the responsibility of Alpha’s Project Coordinator to notify, document and report these results to the designated contact person or to the California Department of Public Health Drinking Water Program.

D1 Appendix D Department of Defense (DoD)

D2 References

D2.1 Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories, Version 4.1, April, 2009.

D3 Introduction

D3.1 The following requirement are specific to the DoD and in some cases represents departures from the EPA methods.

D3.2 In some cases the DoD requirements are clarifications to the NELAC System 5 requirements and EPA methods which are not specified in the method but does provide guidance.

D3.3 In some cases the DoD requirements are generic and could be added to the SOP in an updated revision.

D4 Internal Chain of Custody Policy

D4.1 It is a policy when providing analytical data in support of the various DoD projects that all sample custodians, (e.g., sample log-in, extraction chemists, analysts, and sample disposal personnel) will use Alpha's Internal C-O-C procedure.

D5 Manual Integrations

D5.1 When manual integrations are performed, to include initial calibration, QC data and sample data, raw data records shall include a complete audit trail for those manipulations, raw data output showing the results of manual integration (i.e., chromatograms of manually integrated peaks), and notation of rationale, date, and signature/initial of person performing the manual integration operation.

D5.2 Audit trails are most easily produced by printing a "before" and "after" chromatogram and initialing and dating the printouts. This procedure does not imply that an additional electronic data file needs to be kept; however, it does imply the final data file be fully supported electronically.

D5.3 In addition, the "before" data file chromatogram needs to be printed in such a manner to visually verify the manual manipulation of peaks and/or a notation of rationale. This does not imply each and every peak be printed out on individual pages, but it is a strong suggestion that a "clear picture speaks a thousand words."

D5.4 The principal purpose of printing a "before" and "after" chromatogram is to develop and track a complete audit trail of all manual integrations.

D5.5 The Case Narrative should identify samples and analytes for which manual integrations were performed.

D6 DoD Quality Control Requirements

D6.1 Method Blank (MB)

The goal for each method blank is to have no detectable contaminants; however, if the MB is contaminated, than it must be critically evaluated as to the nature of the interference and the effect on the analysis of each sample within the batch.

D6.1.1 Acceptance Criteria

The DoD has placed additional requirements for the evaluation and review of method blank data. The MB is considered contaminated if any of the following conditions exist:

D6.1.1.1 The concentration of any target analyte in the blank exceeds ½ the reporting limit as established by the test method or by regulation, AND is greater than 1/10 of the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).

D6.1.1.2 The blank contamination otherwise affects the sample results as per the test measurements or the individual project data quality objectives.

D6.1.2 Corrective Action

D6.1.2.1 When a MB is determined to be contaminated, the source of the contamination should be investigated, measures taken to eliminate the problem and the corrective action documented.

D6.1.2.2 If the method blank is contaminated as described above, the affected samples should be reextracted/reanalyzed in a subsequent batch, except when sample results are below the LOD.

D6.1.2.3 Flagging

If reanalysis cannot be performed such as insufficient sample volume remaining for reprocessing, the results must be qualified and explained in the case narrative. Apply the B flag to all results for the specific analyte in all samples in the associated preparatory batch.

D6.2 Laboratory Control Sample (LCS)

D6.2.1 Acceptance Criteria

D6.2.1.1 DoD has not established windows of acceptability. In-house windows are to be used.

D6.2.2 Corrective Actions

D6.2.2.1 Any affected samples associated with an out-of-control LCS is reextracted/reanalyzed or flag the results in all associated samples with a Q flag.

D6.3 Matrix Spike (MS)

D6.3.1 Acceptance Criteria

D6.3.1.1 DoD has not established window of acceptability. In-house windows are to be used.

D6.3.2 Corrective Action

D6.3.2.1 If the MS/MSD fail, report the native sample data uncorrected for recovery, and report the MS/MSD results and indicate the matrix effect problem by flagging the results in the parent sample as well as the MS/MSD with a J flag.

D6.3.2.2 If the MS/MSD has a calculated relative percent difference (RPD) greater than 15%, flag the results in the parent sample as well as the MS/MSD with a J flag.

D6.4 Data Flags

D6.4.1 J - Estimated: The analyte was positively identified; the quantitation is an estimation.

D6.4.2 B - Blank contamination: The recorded result is associated with a contaminated blank.

D6.4.3 Q - One or more quality control criteria failed.

D7 Spike Verification

D7.1 Spike mixes are prepared, analyzed and evaluated as an LCS prior to use with field samples. This spike confirmation is required by DoD to preclude any potential problems that might arise from using a new unproved spike mix.

D7.2 Spike mix confirmation analysis is documented with the quantitation report and retained with the associated C of A to maintain standard integrity.

ANALYTICAL REPORT

Alpha Analytical, Inc.--Sparks Office
255 Glendale Avenue
Sparks, NV 89431
Job: Example Project Workorder

Attn: Randy Gardner
Phone: (775) 355-1044
Fax:

Alpha Analytical Number: AAI99999999-01A
Client I.D. Number: WATER

Sampled: 12/06/10 00:00
Received: 12/06/10
Extracted:
Analyzed:

Perchlorate by Ion Chromatography
EPA Method 314.0

Compound	Concentration	Reporting Limit	Compound	Concentration	Reporting Limit
1 Perchlorate	ND	2.0 µg/L			

ANALYTICAL REPORT

Alpha Analytical, Inc.--Sparks Office
255 Glendale Avenue
Sparks, NV 89431
Job: Example Project Workorder

Attn: Randy Gardner
Phone: (775) 355-1044
Fax:

Alpha Analytical Number: AAI99999999-02A
Client I.D. Number: SOIL

Sampled: 12/06/10 00:00
Received: 12/06/10
Extracted:
Analyzed:

Perchlorate by Ion Chromatography
EPA Method 314.0

	Compound	Concentration	Reporting Limit		Compound	Concentration	Reporting Limit
1	Perchlorate	ND	20	µg/Kg			

Date: *07-Dec-10*

QC Summary Report

Work Order: 99999999

Method Blank

Type: **MBLK** Test Code: **EPA Method 314.0**
File ID: **14**
Batch ID: **25550**
Analysis Date: **11/24/2010 12:25**
Sample ID: **MB-25550**
Units : **µg/L**
Run ID: **IC_3_101124A**
Prep Date: **11/24/2010 11:29**

Analyte	Result	PQL	SpkVal	SpkRefVal	%REC	LCL(ME)	UCL(ME)	RPDRefVal	%RPD(Limit)	Qual
Perchlorate	ND	2								

Laboratory Fortified Blank

Type: **LFB** Test Code: **EPA Method 314.0**
File ID: **15**
Batch ID: **25550**
Analysis Date: **11/24/2010 12:44**
Sample ID: **LFB-25550**
Units : **µg/L**
Run ID: **IC_3_101124A**
Prep Date: **11/24/2010 11:29**

Analyte	Result	PQL	SpkVal	SpkRefVal	%REC	LCL(ME)	UCL(ME)	RPDRefVal	%RPD(Limit)	Qual
Perchlorate	21.3	2	25		85	85	115			

Sample Matrix Spike

Type: **LFM** Test Code: **EPA Method 314.0**
File ID: **18**
Batch ID: **25550**
Analysis Date: **11/24/2010 13:39**
Sample ID: **10112402-04ALFM**
Units : **µg/L**
Run ID: **IC_3_101124A**
Prep Date: **11/24/2010 11:29**

Analyte	Result	PQL	SpkVal	SpkRefVal	%REC	LCL(ME)	UCL(ME)	RPDRefVal	%RPD(Limit)	Qual
Perchlorate	24.7	2	25	0	99	80	120			

Sample Matrix Spike Duplicate

Type: **LFMD** Test Code: **EPA Method 314.0**
File ID: **19**
Batch ID: **25550**
Analysis Date: **11/24/2010 13:57**
Sample ID: **10112402-04ALFMD**
Units : **µg/L**
Run ID: **IC_3_101124A**
Prep Date: **11/24/2010 11:29**

Analyte	Result	PQL	SpkVal	SpkRefVal	%REC	LCL(ME)	UCL(ME)	RPDRefVal	%RPD(Limit)	Qual
Perchlorate	25.5	2	25	0	102	80	120	24.73	3.1(15)	

Comments:

Calculations are based off of raw (non-rounded) data. However, for reporting purposes, all QC data is rounded to three significant figures. Therefore, hand calculated values may differ slightly.

Date: *07-Dec-10*

QC Summary Report

Work Order: 99999999

Method Blank

Type: **MBLK** Test Code: **EPA Method 314.0**
File ID:
Batch ID: **25510** Analysis Date: **12/07/2010 00:00**
Sample ID: **MBLK_25510** Units : **µg/Kg** Run ID: **Manual_99999999** Prep Date: **12/07/2010 00:00**

Analyte	Result	PQL	SpkVal	SpkRefVal	%REC	LCL(ME)	UCL(ME)	RPDRefVal	%RPD(Limit)	Qual
Perchlorate	ND	20								

Laboratory Control Spike

Type: **LCS** Test Code: **EPA Method 314.0**
File ID:
Batch ID: **25510** Analysis Date: **12/07/2010 00:00**
Sample ID: **LFB_25510** Units : **µg/Kg** Run ID: **Manual_99999999** Prep Date: **12/07/2010 00:00**

Analyte	Result	PQL	SpkVal	SpkRefVal	%REC	LCL(ME)	UCL(ME)	RPDRefVal	%RPD(Limit)	Qual
Perchlorate	250	20	250		100	85	115			

Sample Matrix Spike

Type: **MS** Test Code: **EPA Method 314.0**
File ID:
Batch ID: **25510** Analysis Date: **12/07/2010 00:00**
Sample ID: **LFM_25510** Units : **µg/Kg** Run ID: **Manual_99999999** Prep Date: **12/07/2010 00:00**

Analyte	Result	PQL	SpkVal	SpkRefVal	%REC	LCL(ME)	UCL(ME)	RPDRefVal	%RPD(Limit)	Qual
Perchlorate	250	20	250	0	100	80	120			

Sample Matrix Spike Duplicate

Type: **MSD** Test Code: **EPA Method 314.0**
File ID:
Batch ID: **25510** Analysis Date: **12/07/2010 00:00**
Sample ID: **LFMD_25510** Units : **µg/Kg** Run ID: **Manual_99999999** Prep Date: **12/07/2010 00:00**

Analyte	Result	PQL	SpkVal	SpkRefVal	%REC	LCL(ME)	UCL(ME)	RPDRefVal	%RPD(Limit)	Qual
Perchlorate	250	20	250	0	100	80	120	250	0.0(15)	

Comments:

Calculations are based off of raw (non-rounded) data. However, for reporting purposes, all QC data is rounded to three significant figures. Therefore, hand calculated values may differ slightly.

APPENDIX B

Laboratory SOP for Perchlorate Analysis

8.0 ANALYTICAL PROCEDURES

8.1 INTRODUCTION

8.1.1 Standardized analytical methods used by Alpha are generally published methods from recognized federal agencies (i.e., SW-846, Standard Methods, EPA's Methods for the Determination of Organic Compounds in Drinking Water etc.).

8.1.2 Most standardized methods require an initial demonstration of capability study which generates precision and accuracy data establishing a baseline typical of routine analysis. The initial demonstration of capability studies are used primarily to preclude a laboratory from analyzing unknown samples via a new, unfamiliar method prior to obtaining some experience with it.

It is Alpha's policy to demonstrates the ability to perform that method of analysis with the prescribed degree of precision and accuracy before using an analytical method to analyze environmental samples.

8.2 ANALYTICAL METHODS

Standardized analytical methods are described by a set of written procedures completely defining the techniques used to process a sample and obtain analytical results. Descriptions of analytes, sample matrix, sample preparation, types and quantities of reagents, instrumental calibration and measurement parameters, and computations are all integral parts of a complete method.

8.2.1 Selection of Methods

Analytical methods are selected for environmental testing, including methods for sampling, to meet the needs of our clients and which are cited in regulation as the appropriate methods for the specific regulatory programs.

8.2.2 Sources of Standardized Methods

8.2.2.1 Alpha uses standardized methods for commonly encountered analytes in order to provide a common point of reference, and to establish standard practices that allow inter-laboratory comparison of data. Alpha uses methods that are program specific and are typically referenced in the regulatory literature.

8.2.2.2 In addition to specifying sample preparation and analytical procedures, each method also typically specifies calibration procedures, calibration acceptance criteria, methods of preparing standard solutions, and preparation of QC samples.

8.2.2.3 The latest valid edition of these referenced methods are used unless it is not appropriate or impossible to do.

8.2.2.4 Requested methods of analysis are used unless it is not appropriate, or if we are not certified for the requested method and an equivalent certified method exists, then that method will be used.

8.2.2.5 When the client does not specify a method of analysis, Alpha only uses methods that have been fully documented and validated and the client informed of the chosen method.

8.2.2.6 When a client proposes a method that is considered to be inappropriate or out of date, the client is informed as to the problem and instructed as to the most appropriate method.

8.2.3 Procedure Manual

Analytical method used in our facility has an associated in-house analytical SOP and in total comprise our Procedure Manual. These SOPs are written, reviewed, approved, and distributed according to the procedures outlined in Appendix D. When the referenced method is ambiguous or does not provide sufficient information, our in-house analytical SOP clarifies those issues detailed in Clarification Boxes.

8.2.4 Laboratory Developed Methods

If an analytical test method is developed by Alpha, it will be planned and executed in a well organized, scientifically supported manner. As method development proceeds, the modifications, changes, experiments, etc. are communicated to all involved personnel, in order to keep them abreast of those changes.

8.2.5 Non-Standard Methods

In the event that analyses must be conducted for compounds for which no reliable method exists, development of a method will be conducted under the supervision of the Technical Director. As part of the method development, and to ensure continuous quality of data, QC criteria is initially proposed and established that is consistent with similar methods or technology. At a minimum the following QC requirements are addressed:

- Calibration,
- Contamination,
- Precision and accuracy,
- Interference, and
- Analyte identification.

When testing of the analytical procedure has been successfully completed, the method is evaluated for scientific and technical soundness and is documented in the standardized format.

8.3 SUMMARY OF ANALYTICAL PROCEDURES

The analytical and extraction procedures presented in the following sections are methods currently used at Alpha Analytical in support of the various environmental regulatory programs. A brief description of the methods are in the subsections following the tables.

8.4 ANALYTICAL METHODS IN SUPPORT OF THE SAFE DRINKING WATER ACT (SDWA)

A series of inorganic methods of analysis are found in Methods for Chemical Analysis of Water and Wastes. These are a series of wet chemistry and various metals methods used in support of the Safe Drinking Water Act (SDWA). Standard Methods for the Examination of Water and Wastewater is also used in support of the SDWA; however, this reference contains inorganic wet chemistry, metals and organic methods of analysis. An additional series of methods written by the EPA covering all methods required under the SDWA is found in Methods for the Determination of Organic and Inorganic Compounds in Drinking Water and associated supplements. Methods of analysis Alpha Analytical uses in support of the SDWA is as follows:

SDWA Methods of Analysis
Table 8-1

EPA METHODS	STANDARD METHODS	PARAMETERS
	Inorganic	
120.1	SM2510B	Conductivity
150.2	SM4500H B	pH
	SM2540C	TDS
180.1	SM2130B	Turbidity
200.8		Metals
300.0		Anions
	SM2320B	Alkalinity
314.0		Perchlorate
	SM4500Cl G	Free Residual Chlorine
	SM3500Cr D	Chromium VI
	SM2340B	Hardness (calculated)
	Organic	
524.2		Volatile Organics

8.4.1 Conductivity - EPA Method 120.1/Standard Method 2510B

Conductivity is the ability of a solution to pass a current. The amount of current a solution may conduct is proportional to the number of ions present in the sample. Therefore, conductivity is a measure of the total ionic concentration in a sample. Specific conductance of a sample is determined by the use of a self-contained conductivity meter at 25°C, thus standardizing the measurement by compensating for cell geometry and temperature.

8.4.2 pH - EPA Method 150.2/Standard Method 4500H B

The pH of a sample is determined electrometrically using a combination electrode. The pH meter is calibrated using a series of standard pH buffers at a known pH.

8.4.3 Total Dissolved Solids (TDS) - Standard Method 2540C

A sample is filtered through a standard glass-fiber filter, and the filtrate is evaporated to dryness in a pre-weighed crucible and dried to a constant weight in an oven at a final fixed temperature of 180°C. The increase in weight over that of the empty crucible represents the total dissolved solids.

8.4.4 Turbidity - EPA Method 180.1/Standard Method 2130B

Turbidity measurement is based upon a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension.

8.4.5 Metals - EPA Method 200.8

This procedure is a multi-elemental procedure for the determination of analytes by ICP-MS in environmental samples. Elements in solution are introduced by pneumatic nebulization and the resulting aerosol is transported by argon gas into a radio frequency plasma where the energy transfer process causes desolvation of the elements followed by atomization and ionization. The ions produced by high temperatures are entrained in the plasma gas and introduced, by means of a vacuum interface, into a mass spectrometer. The ions produced are sorted according to their mass-to-charge ratios by a quadrapole mass spectrometer and detected with the assistance of a electron multiplier. Isobaric elemental interferences and interferences from polyatomic ions derived from the plasma gas, reagents and sample matrix are corrected by the data acquisition software.

8.4.5.1 For the determination of total recoverable metals, analytes are solubilized by gentle refluxing with nitric and hydrochloric acids i.e., block digestion. After cooling, the sample is brought back to its original volume, mixed and centrifuged or allowed to settle overnight prior to filtration and sample analysis.

8.4.5.2 For the determination of dissolved metals in a filtered sample, or the direct analysis of analytes in drinking water samples where the sample turbidity is <1 NTU, the sample is made ready for analysis by the addition of nitric acid prior to sample analysis.

8.4.6 Anions - EPA Method 300.0

A small volume of sample is introduced into an ion chromatograph to flush and fill a fixed volume sample loop. The sample is then injected into a mobile phase eluent of carbonate-bicarbonate. The anions are separated and measured using an Ion Chromatograph (IC) comprised of a guard column, an analytical column, a suppressor device and the conductivity detector. The suppressor device reduces the amount of background conductivity of the carbonate-bicarbonate eluent to a negligible level. Anions are identified based on their retention times compared to known standards.

8.4.7 Alkalinity - Standard Method 2320B

An unaltered sample is titrated to an electrometrically determined end point of pH 4.5 for total alkalinity and to a second endpoint of 8.3 if the speciation of alkalinity is required. The sample is not filtered, diluted, concentrated, or altered in any way.

For samples of low alkalinity (less than 20 mg $CaCO_3$/L) an extrapolation technique is used to determine the equivalence point. The amount of standard acid required to reduce the pH exactly 0.30 pH units beyond the normal end point of 4.5 corresponds to an exact doubling of the hydrogen ion concentration.

8.4.7.1 Chemical Reactions

Sulfuric acid (hydrochloric acid may also be used) reacts with three forms of alkalinity converting them to water or carbonic acid. If hydroxide is present, it reacts to form water:

$$2OH- + H_2SO_4 \rightleftarrows 2H_2O + SO_4^{2-}$$

This conversion usually is complete at a pH of approximately 10. Phenolphthalein alkalinity is determined by titration to an end point of pH 8.3, which corresponds to the conversion of carbonate to bicarbonate.

$$2CO_3^{2-} + H_2SO_4 \rightleftarrows 2HCO_3^- + SO_4^{2-}$$

If hydroxide is present, titration to pH 8.3 will indicate the alkalinity due to all of the hydroxide plus one-half of the carbonate. Continued titration to pH 4.5 completes the conversion of carbonate plus any bicarbonate present to carbonic acid. This value is termed total alkalinity.

$$2HCO_3^- + H_2SO_4 \rightleftarrows 2H_2CO_3 + SO_4^{2-}$$

8.4.8 Perchlorate - EPA Method 314.0

A volume of sample is introduced into an ion chromatograph to flush and fill a fixed volume sample loop. The sample is then injected into a mobile phase eluent of 70 mM KOH. The perchlorate anion is separated and measured using an IC comprised of a guard column, an analytical column, a suppresser device and the conductivity detector. The suppressor device reduces the amount of background conductivity of the KOH eluent to yield a baseline with no more than 4-5 nanosiemen (nS) noise/drift per minute. Perchlorate is identified based on its retention time compared to known standards. Quantitation is accomplished by measuring peak area and comparing it to a calibration curve generated from known standards.

8.4.9 Free Residual Chlorine - Standard Method 4500Cl G

Free residual chlorine also known as free available chlorine exists in most waters as hypochlorous acid (HOCl) or hypochlorite ion (OCl^-). These analytes react immediately with DPD (N,N-diethyl-p-phenylenediamine) indicator to form a pink color. The intensity of the pink color is proportional to the chlorine concentration. Chlorine is measured at a wavelength of 530nm.

8.4.10 Chromium VI - Standard Method 3500Cr D

Hexavalent chromium is determined colorimetrically by a reaction with diphenylcarbazide in an acid solution. A purple color will appear if hexavalent chromium is present in the absence of interfering analytes. The concentration of hexavalent chromium is determined by its absorbance measured photometrically at a wavelength of 540 nm.

8.4.11 Hardness (Calculated) - Standard Method 2340B

Total hardness is defined as the sum of calcium and magnesium concentrations, both expressed as calcium carbonate, in milligrams per liter. Although hardness can be determined in a number of ways, the preferred procedure is to compute hardness from the results of separate determinations of calcium and magnesium as a ratio to calcium carbonate. Therefore, the calculation of "Hardness (calc), mg equivalent $CaCO_3$ = 2.497 [Ca, mg/L] + 4.118 [Mg, mg/L].

APPENDIX C

MGA SOPs

GENERAL FIELD SAMPLING GUIDELINES

SOP#: 2001
DATE: 08/11/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide general field sampling guidelines that will assist REAC personnel in choosing sampling strategies, location, and frequency for proper assessment of site characteristics. This SOP is applicable to all field activities that involve sampling.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent on site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. EPA endorsement or recommendation for use.

2.0 METHOD SUMMARY

Sampling is the selection of a representative portion of a larger population, universe, or body. Through examination of a sample, the characteristics of the larger body from which the sample was drawn can be inferred. In this manner, sampling can be a valuable tool for determining the presence, type, and extent of contamination by hazardous substances in the environment.

The primary objective of all sampling activities is to characterize a hazardous waste site accurately so that its impact on human health and the environment can be properly evaluated. It is only through sampling and analysis that site hazards can be measured and the job of cleanup and restoration can be accomplished effectively with minimal risk. The sampling itself must be conducted so that every sample collected retains its original physical form and chemical composition. In this way, sample integrity is insured, quality assurance standards are maintained, and the sample can accurately represent the larger body of material under investigation.

The extent to which valid inferences can be drawn from a sample depends on the degree to which the sampling effort conforms to the project's objectives. For example, as few as one sample may produce adequate, technically valid data to address the project's objectives. Meeting the project's objectives requires thorough planning of sampling activities, and implementation of the most appropriate sampling and analytical procedures. These issues will be discussed in this procedure.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample to be collected, and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest. Sample preservation, containers, handling, and storage for air and waste samples are discussed in the specific SOPs for air and waste sampling techniques.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

The nature of the object or materials being sampled may be a potential problem to the sampler. If a material is homogeneous, it will generally have a uniform composition throughout. In this case, any sample increment can be considered representative of the material. On the other hand, heterogeneous samples present problems to the sampler because of changes in the material over distance, both laterally and vertically.

Samples of hazardous materials may pose a safety threat to both field and laboratory personnel. Proper health and safety precautions should be implemented when handling this type of sample.

Environmental conditions, weather conditions, or non-target chemicals may cause problems and/or interferences when performing sampling activities or when sampling for a specific parameter. Refer to the specific SOPs for sampling techniques.

5.0 EQUIPMENT/APPARATUS

The equipment/apparatus required to collect samples must be determined on a site specific basis. Due to the wide variety of sampling equipment available, refer to the specific SOPs for sampling techniques which include lists of the equipment/apparatus required for sampling.

6.0 REAGENTS

Reagents may be utilized for preservation of samples and for decontamination of sampling equipment. The preservatives required are specified by the analysis to be performed. Decontamination solutions are specified in ERT SOP #2006, Sampling Equipment Decontamination.

7.0 PROCEDURE

7.1 Types of Samples

In relation to the media to be sampled, two basic types of samples can be considered: the environmental sample and the hazardous sample.

Environmental samples are those collected from streams, ponds, lakes, wells, and are off-site samples that are not expected to be contaminated with hazardous materials. They usually do not require the special handling procedures typically used for concentrated wastes. However, in certain instances, environmental samples can contain elevated concentrations of pollutants and in such cases would have to be handled as hazardous samples.

Hazardous or concentrated samples are those collected from drums, tanks, lagoons, pits, waste piles, fresh spills, or areas previously identified as contaminated, and require special handling procedures because of their potential toxicity or hazard. These samples can be further subdivided based on their degree of hazard; however, care should be taken when handling and shipping any wastes believed to be concentrated regardless of the degree.

The importance of making the distinction between environmental and hazardous samples is two-fold:

(1) Personnel safety requirements: Any sample thought to contain enough hazardous materials to pose a safety threat should be designated as hazardous and handled in a manner which ensures the safety of both field and laboratory personnel.

(2) Transportation requirements: Hazardous samples must be packaged, labeled, and shipped according to the International Air Transport Association (IATA) Dangerous Goods Regulations or Department of Transportation (DOT) regulations and U.S. EPA guidelines.

7.2 Sample Collection Techniques

In general, two basic types of sample collection techniques are recognized, both of which can be used for either environmental or hazardous samples.

Grab Samples

A grab sample is defined as a discrete aliquot representative of a specific location at a given point in time. The sample is collected all at once at one particular point in the sample medium. The representativeness of such samples is defined by the nature of the materials being sampled. In general, as sources vary over time and distance, the representativeness of grab samples will decrease.

Composite Samples

Composites are nondiscrete samples composed of more than one specific aliquot collected at various sampling locations and/or different points in time. Analysis of this type of sample produces an average value and can in certain instances be used as an alternative to analyzing a number of individual grab samples and calculating an average value. It should be noted, however, that compositing can mask problems by diluting isolated concentrations of some hazardous compounds below detection limits.

Compositing is often used for environmental samples and may be used for hazardous samples under certain conditions. For example, compositing of hazardous waste is often performed after compatibility tests have been completed to determine an average value over a number of different locations (group of drums). This procedure generates data that can be useful by providing an average concentration within a number of units, can serve to keep analytical costs down, and can provide information useful to transporters and waste disposal operations.

For sampling situations involving hazardous wastes, grab sampling techniques are generally preferred because grab sampling minimizes the amount of time sampling personnel must be in contact with the wastes, reduces risks associated with compositing unknowns, and eliminates chemical changes that might occur due to compositing.

7.3 Types of Sampling Strategies

The number of samples that should be collected and analyzed depends on the objective of the investigation. There are three basic sampling strategies: random, systematic, and judgmental sampling.

Random sampling involves collection of samples in a nonsystematic fashion from the entire site or a specific portion of a site. Systematic sampling involves collection of samples based on a grid or a pattern which has been previously established. When judgmental sampling is performed, samples are collected only from the portion(s) of the site most likely to be contaminated. Often, a combination of these strategies is the best approach depending on the type of the suspected/known contamination, the uniformity and size of the site, the level/type of information desired, etc.

7.4 QA Work Plans (QAWP)

A QAWP is required when it becomes evident that a field investigation is necessary. It should be initiated in conjunction with, or immediately following, notification of the field investigation. This plan should be clear and concise and should detail the following basic components, with regard to sampling activities:

- Objective and purpose of the investigation.
- Basis upon which data will be evaluated.
- Information known about the site including location, type and size of the facility, and length of operations/abandonment.
- Type and volume of contaminated material, contaminants of concern (including concentration), and basis of the information/data.
- Technical approach including media/matrix to be sampled, sampling equipment to be used, sample equipment decontamination (if necessary), sampling design and rationale, and SOPs or description of the procedure to be implemented.
- Project management and reporting, schedule, project organization and responsibilities, manpower and cost projections, and required deliverables.
- QA objectives and protocols including tables summarizing field sampling and QA/QC analysis and objectives.

Note that this list of QAWP components is not all-inclusive and that additional elements may be added or altered depending on the specific requirements of the field investigation. It should also be recognized that although a detailed QAWP is quite important, it may be impractical in some instances. Emergency responses and accidental spills are prime examples of such instances where time might prohibit the development of site-specific QAWPs prior to field activities. In such cases, investigators would have to rely on general guidelines and personal judgment, and the sampling or response plans might simply be a strategy based on preliminary information and finalized on site. In any event, a plan of action should be developed, no matter how concise or informal, to aid investigators in maintaining a logical and consistent order to the implementation of their task.

7.5 Legal Implications

The data derived from sampling activities are often introduced as critical evidence during litigation of a hazardous waste site cleanup. Legal issues in which sampling data are important may include cleanup cost recovery, identification of pollution sources and responsible parties, and technical validation of remedial design methodologies. Because of the potential for involvement in legal actions, strict adherence to technical and administrative SOPs is essential during both the development and implementation of sampling activities.

Technically valid sampling begins with thorough planning and continues through the sample collection and analytical procedures. Administrative requirements involve thorough, accurate documentation of all sampling activities. Documentation requirements include maintenance of a chain of custody, as well as accurate records of field activities and analytical instructions. Failure to observe these procedures fully and consistently may result in data that are questionable, invalid and non-defensible in court, and the consequent loss of enforcement proceedings.

8.0 CALCULATIONS

Refer to the specific SOPs for any calculations which are associated with sampling techniques.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

Refer to the specific SOPs for the type and frequency of QA/QC samples to be analyzed, the acceptance criteria for the QA/QC samples, and any other QA/QC activities which are associated with sampling techniques.

10.0 DATA VALIDATION

Refer to the specific SOPs for data validation activities that are associated with sampling techniques.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA, and corporate health and safety procedures.

SURFACE WATER SAMPLING

SOP#: 2013
DATE: 11/17/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) is applicable to the collection of representative liquid samples, both aqueous and non-aqueous from streams, rivers, lakes, ponds, lagoons, and surface impoundments. It includes samples collected from depth, as well as samples collected from the surface.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure or other procedure limitations. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Sampling situations vary widely, therefore, no universal sampling procedure can be recommended. However, sampling of both aqueous and non-aqueous liquids from the above mentioned sources is generally accomplished through the use of one of the following samplers or techniques:

- Kemmerer bottle
- Bacon bomb sampler
- Dip sampler
- Direct method

These sampling techniques will allow for the collection of representative samples from the majority of surface waters and impoundments encountered.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Once samples have been collected, the following procedure should be followed:

1. Transfer the sample(s) into suitable, labeled sample containers.

2. Preserve the sample if appropriate, or use pre-preserved sample bottles. Do not overfill bottles if they are pre-preserved.

3. Cap the container, place in a ziploc plastic bag and cool to 4°C.

4. Record all pertinent data in the site logbook and on field data sheets.

5. Complete the Chain of Custody record.

6. Attach custody seals to cooler prior to shipment.

7. Decontaminate all sampling equipment prior to the collection of additional samples with that sampling device.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary interferences or potential problems with surface water sampling. These include cross contamination of samples and improper sample collection.

1. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Refer to the Sampling Equipment Decontamination SOP.

2. Improper sample collection can involve using contaminated equipment, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed area.

Following proper decontamination procedures and minimizing disturbance of the sample site will eliminate these problems.

5.0 EQUIPMENT/APPARATUS

Equipment needed for collection of surface water samples may include (depending on technique chosen):

- Kemmerer bottles
- Bacon bomb sampler
- Dip sampler
- Line and messengers
- Sample bottles/preservatives
- Ziploc bags
- Ice
- Coolers
- Chain of Custody records, custody seals
- Field data sheets
- Decontamination equipment
- Maps/plot plan
- Safety equipment
- Compass
- Tape measure
- Survey stakes, flags, or buoys and anchors
- Camera and film
- Logbook/waterproof pen
- Sample bottle labels

6.0 REAGENTS

Reagents will be utilized for preservation of samples and for decontamination of sampling equipment. The preservatives required are specified by the analysis to be performed.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.

2. Obtain the necessary sampling and monitoring equipment.

3. Decontaminate or pre-clean equipment, and ensure that it is in working order.

4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.

5. Perform a general site survey prior to site entry, in accordance with the site specific Health and Safety Plan.

6. Use stakes, flagging, or buoys to identify and mark all sampling locations. If required the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. If collecting sediment samples, this procedure may disturb the bottom.

7.2 Representative Sampling Considerations

In order to collect a representative sample, the hydrology and morphometrics of a stream or impoundment should be determined prior to sampling. This will aid in determining the presence of phases or layers in lagoons, or impoundments, flow patterns in streams, and appropriate sample locations and depths.

Water quality data should be collected in impoundments, and to determine if stratification is present. Measurements of dissolved oxygen, pH, and temperature can indicate if strata exist which would effect analytical results. Measurements should be collected at one-meter intervals from the substrate to the surface using the appropriate instrument (i.e., a Hydrolab or equivalent).

Water quality measurements such as dissolved oxygen, pH, temperature, conductivity, and oxidation-reduction potential can assist in the interpretation of analytical data and the selection of sampling sites and depths when surface water samples are collected.

Generally, the deciding factors in the selection of a sampling device for sampling liquids in streams, rivers, lakes, ponds, lagoons, and surface impoundments are:

1. Will the sample be collected from shore or from a boat?
2. What is the desired depth at which you wish to collect the sample?
3. What is the overall depth and flow direction of river or stream?
4. What type of sample will be collected (i.e., water or lagoon liquids)?

7.2.1 Sampler Composition

The appropriate sampling device must be of a proper composition. Selection of samplers constructed of glass, stainless steel, PVC or PFTE (Teflon) should be based upon the analyses to be performed.

7.3 Sample Collection

7.3.1 Kemmerer Bottle

A Kemmerer bottle (Figure 1, Appendix A) may be used in most situations where site access is from a boat or structure such as a bridge or pier, and where samples at depth are required. Sampling procedures are as follows:

1. Use a properly decontaminated Kemmerer bottle. Set the sampling device so that the sampling end pieces (upper and lower stoppers) are pulled away from the sampling tube (body), allowing the substance to be sampled to pass through this tube.
2. Lower the pre-set sampling device to the predetermined depth. Avoid bottom disturbance.
3. When the Kemmerer bottle is at the required depth, send down the messenger, closing the sampling device.
4. Retrieve the sampler and discharge from the bottom drain the first 10-20 mL to clear any potential contamination of the valve. Transfer the sample to the appropriate sample container.

7.3.2 Bacon Bomb Sampler

A bacon bomb sampler (Figure 2, Appendix A) may be used in situations similar to those outlined for the Kemmerer bottle. Sampling procedures are as follows:

1. Lower the bacon bomb sampler carefully to the desired depth, allowing the line for the trigger to remain slack at all times. When the desired depth is reached, pull the trigger line until taut. This will allow the sampler to fill.
2. Release the trigger line and retrieve the sampler.
3. Transfer the sample to the appropriate sample container by pulling up on the trigger.

7.3.3 Dip Sampler

A dip sampler (Figure 3, Appendix A) is useful in situations where a sample is to be recovered from an outfall pipe or along a lagoon bank where direct access is limited. The long handle on such a device allows access from a discrete location. Sampling procedures are as follows:

1. Assemble the device in accordance with the manufacturer's instructions.
2. Extend the device to the sample location and collect the sample by dipping the sampler into the substance.
3. Retrieve the sampler and transfer the sample to the appropriate sample container.

7.3.4 Direct Method

For streams, rivers, lakes, and other surface waters, the direct method may be utilized to collect water samples from the surface directly into the sample bottle. This method is not to be used for sampling lagoons or other impoundments where contact with contaminants is a concern.

Using adequate protective clothing, access the sampling station by appropriate means. For shallow stream stations, collect the sample under the water surface while pointing the sample container upstream; the container must be upstream of the collector. Avoid disturbing the substrate. For lakes and other impoundments, collect the sample under the water surface avoiding surface debris and the boat wake.

When using the direct method, do not use pre-preserved sample bottles as the collection method may dilute the concentration of preservative necessary for proper sample preservation.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following general QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and corporate health and safety procedures.

More specifically, when sampling lagoons or surface impoundments containing known or suspected hazardous substances, adequate precautions must be taken to ensure the safety of sampling personnel. The sampling team member collecting the sample should not get too close to the edge of the impoundment, where bank failure may cause him/her to lose his/her balance. The person performing the sampling should be on a lifeline and be wearing adequate protective equipment. When conducting sampling from a boat in an impoundment or flowing waters, appropriate boating safety procedures should be followed.

12.0 REFERENCES

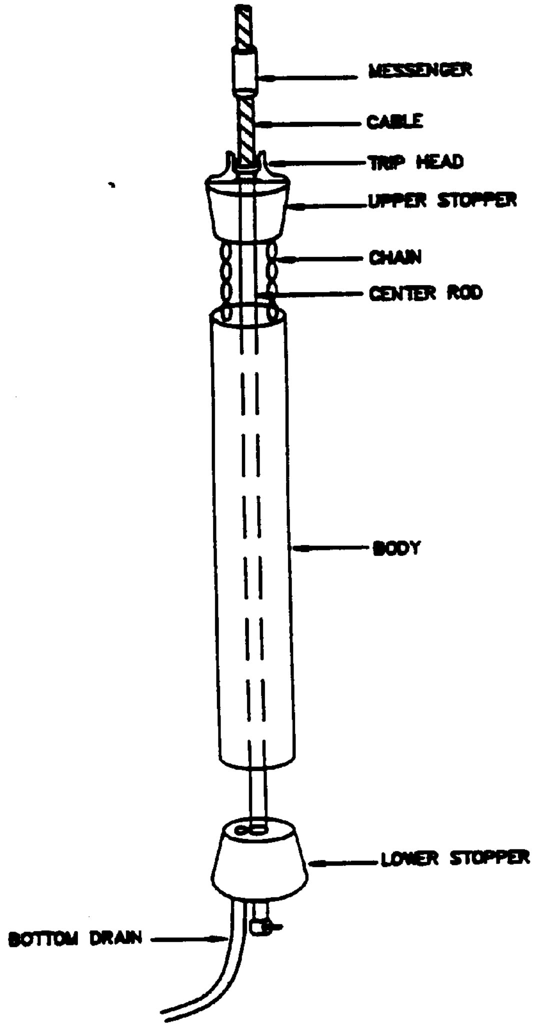
U.S. Geological Survey. 1977. National Handbook or Recommended Methods for Water Data Acquisition. Office of Water Data Coordination Reston, Virginia. (Chapter Updates available).

U.S. Environmental Protection Agency. 1984. Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA/600/4-84-076.

APPENDIX A

Figures

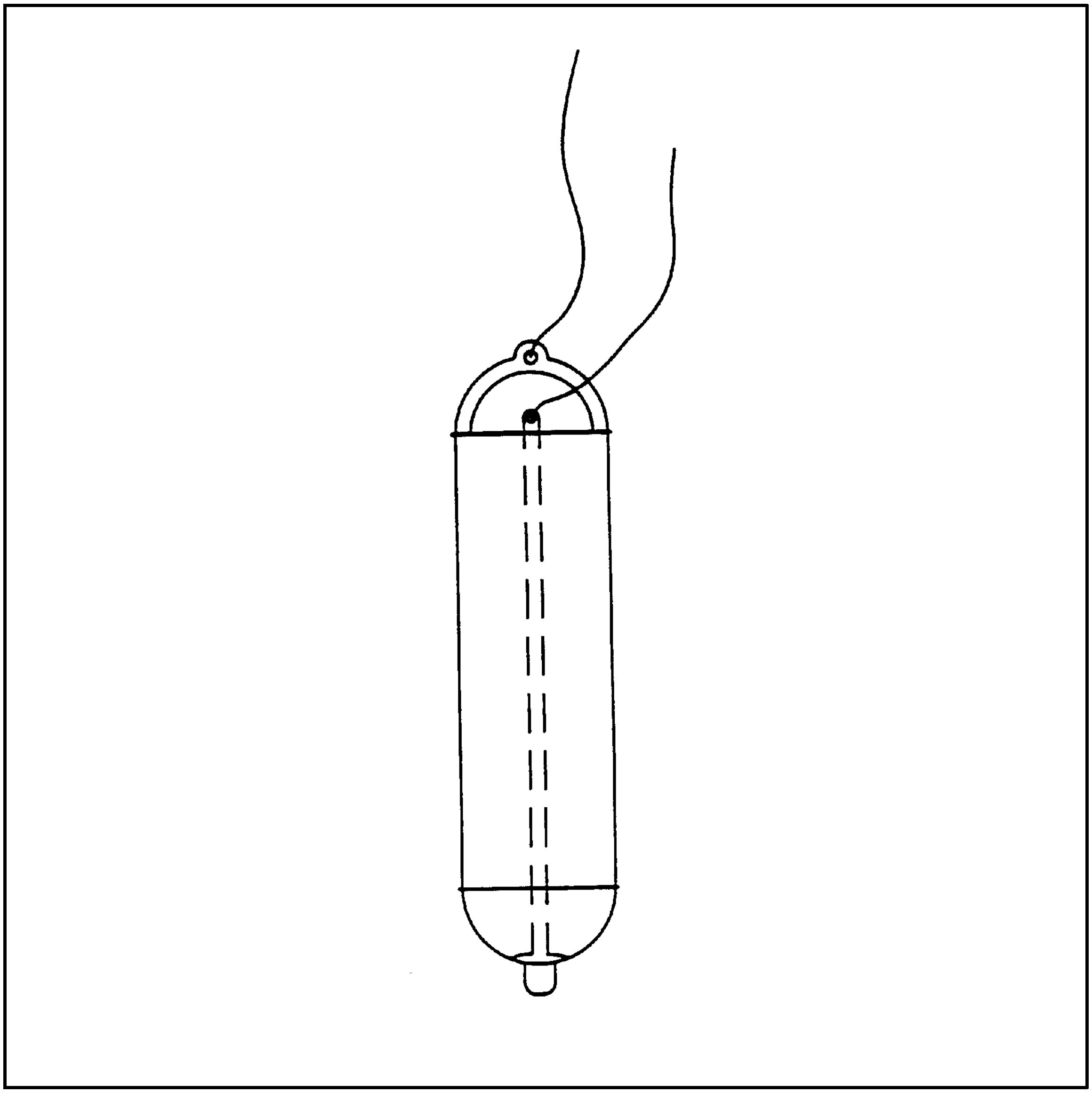
FIGURE 1. Kemmerer Bottle



APPENDIX A (Cont'd)

Figures

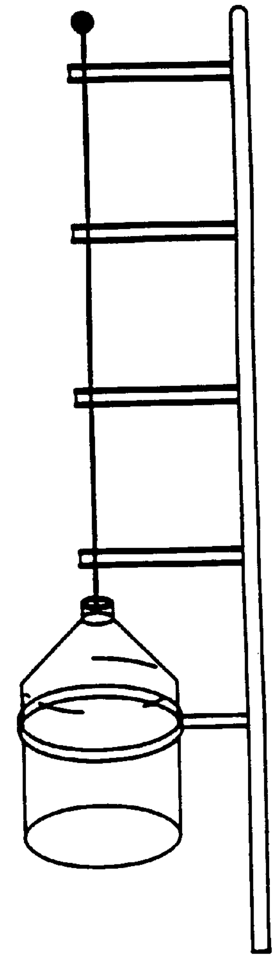
FIGURE 2. Bacon Bomb Sampler



APPENDIX A (Cont'd)

Figures

FIGURE 3. Dip Sampler



U. S. EPA ENVIRONMENTAL RESPONSE TEAM

STANDARD OPERATING PROCEDURES

SOP: 2012
PAGE: 1 of 13
REV: 0.0
DATE: 02/18/00

SOIL SAMPLING

CONTENTS

SUPERCEDES: SOP #2012; Revision 0.0; 11/16/94; U.S. EPA Contract 68-C4-0022.

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to describe the procedures for the collection of representative soil samples. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push, or other mechanized equipment (except for a back-hoe). Analysis of soil samples may determine whether concentrations of specific pollutants exceed established action levels, or if the concentrations of pollutants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the actual procedures used should be documented and described in an appropriate site report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and scoop. Sampling at greater depths may be performed using a hand auger, continuous flight auger, a trier, a split-spoon, or, if required, a backhoe.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Chemical preservation of solids is not generally recommended. Samples should, however, be cooled and protected from sunlight to minimize any potential reaction. The amount of sample to be collected and proper sample container type are discussed in ERT/REAC SOP #2003 Rev. 0.0 08/11/94, *Sample Storage, Preservation and Handling*.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary potential problems associated with soil sampling - cross contamination of samples and improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results.

5.0 EQUIPMENT

Soil sampling equipment includes the following:

- Maps/plot plan
- Safety equipment, as specified in the site-specific Health and Safety Plan
- Survey equipment or global positioning system (GPS) to locate sampling points
- Tape measure
- Survey stakes or flags
- Camera and film
- Stainless steel, plastic, or other appropriate homogenization bucket, bowl or pan
- Appropriate size sample containers
- Ziplock plastic bags
- Logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels
- Cooler(s)
- Ice
- Vermiculite
- Decontamination supplies/equipment
- Canvas or plastic sheet
- Spade or shovel
- Spatula
- Scoop
- Plastic or stainless steel spoons
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Split spoons
- Vehimeyer soil sampler outfit
    - Tubes
    - Points
    - Drive head
    - Drop hammer
    - Puller jack and grip
- Backhoe

6.0 REAGENTS

Reagents are not used for the preservation of soil samples. Decontamination solutions are specified in ERT/REAC SOP #2006 Rev. 0.0 08/11/94, *Sampling Equipment Decontamination*, and the site specific work plan.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies required.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or pre-clean equipment, and ensure that it is in working order.

4. Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.

6. Use stakes, flagging, or buoys to identify and mark all sampling locations. Specific site factors, including extent and nature of contaminant, should be considered when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared by the property owner or the On-Scene-Coordinator (OSC) prior to soil sampling; and utility clearance should always be confirmed before beginning work.

7.2 Sample Collection

7.2.1 Surface Soil Samples

Collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. Surface material is removed to the required depth and a stainless steel or plastic scoop is then used to collect the sample.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials should not be used. Plating is particularly common with garden implements such as potting trowels.

The following procedure is used to collect surface soil samples:

1. Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.

2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.

3. If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers

This system consists of an auger, or a thin-wall tube sampler, a series of extensions, and a "T" handle (Figure 1, Appendix A). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. If a core sample is to be collected, the auger tip is then replaced with a thin wall tube sampler. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected from the thin wall tube sampler.

Several types of augers are available; these include: bucket type, continuous flight (screw), and post-hole augers. Bucket type augers are better for direct sample recovery because they provide a large volume of sample in a short time. When continuous flight augers are used, the sample can be collected directly from the flights. The continuous flight augers are satisfactory when a composite of the complete soil column is desired. Post-hole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil and cannot be used below a depth of approximately three feet.

The following procedure is used for collecting soil samples with the auger:

1. Attach the auger bit to a drill rod extension, and attach the "T" handle to the drill rod.

2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first three to six inches of surface soil for an area approximately six inches in radius around the drilling location.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger, collect the sample after the auger is removed from the hole and proceed to Step 10.

5. Remove auger tip from the extension rods and replace with a pre-cleaned thin wall tube sampler. Install the proper cutting tip.

6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Do not scrape the borehole sides. Avoid hammering the rods as the vibrations may cause the boring walls to collapse.

7. Remove the tube sampler, and unscrew the drill rods.

8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container. Sample homogenization is not required.

10. If volatile organic analysis is to be performed, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly.

    When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.

12. Abandon the hole according to applicable state regulations. Generally, shallow holes can simply be backfilled with the removed soil material.

7.2.3 Sampling with a Trier

The system consists of a trier, and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

The following procedure is used to collect soil samples with a sampling trier:

1. Insert the trier (Figure 2, Appendix A) into the material to be sampled at a 0° to 45° angle from horizontal. This orientation minimizes the spillage of sample.

2. Rotate the trier once or twice to cut a core of material.

3. Slowly withdraw the trier, making sure that the slot is facing upward.

4. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18 or 24 inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should be performed in accordance with ASTM D1586-98, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".

The following procedures are used for collecting soil samples with a split spoon:

1. Assemble the sampler by aligning both sides of barrel and then screwing the drive shoe on the bottom and the head piece on top.

2. Place the sampler in a perpendicular position on the sample material.

3. Using a well ring, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result.

4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.

5. Withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2 and 3 1/2 inch diameters. A larger barrel may be necessary to obtain the required sample volume.

6. Without disturbing the core, transfer it to appropriate labeled sample container(s) and seal tightly.

7.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil, when detailed examination of soil characteristics are required. This is probably the most expensive sampling method because of the relatively high cost of backhoe operation.

The following procedures are used for collecting soil samples from test pits or trenches:

1. Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of overhead and buried utilities.

2. Review the site specific Health & Safety plan and ensure that all safety precautions including appropriate monitoring equipment are installed as required.

3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.

4. A shovel is used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.

5. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

6. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7. Abandon the pit or excavation according to applicable state regulations. Generally, shallow excavations can simply be backfilled with the removed soil material.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration

activities must occur prior to sampling/operation, and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OHSA and corporate health and safety procedures, in addition to the procedures specified in the site specific Health & Safety Plan..

12.0 REFERENCES

Mason, B.J. 1983. Preparation of Soil Sampling Protocol: Technique and Strategies. EPA-600/4-83-020.

Barth, D.S. and B.J. Mason. 1984. Soil Sampling Quality Assurance User's Guide. EPA-600/4-84-043.

U.S. Environmental Protection Agency. 1984 Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA-600/4-84-076.

de Vera, E.R., B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. Samplers and Sampling Procedures for Hazardous Waste Streams. EPA-600/2-80-018.

ASTM D 1586-98, ASTM Committee on Standards, Philadelphia, PA.

APPENDIX A
Figures
SOP #2012
February 2000

FIGURE 1. Sampling Augers

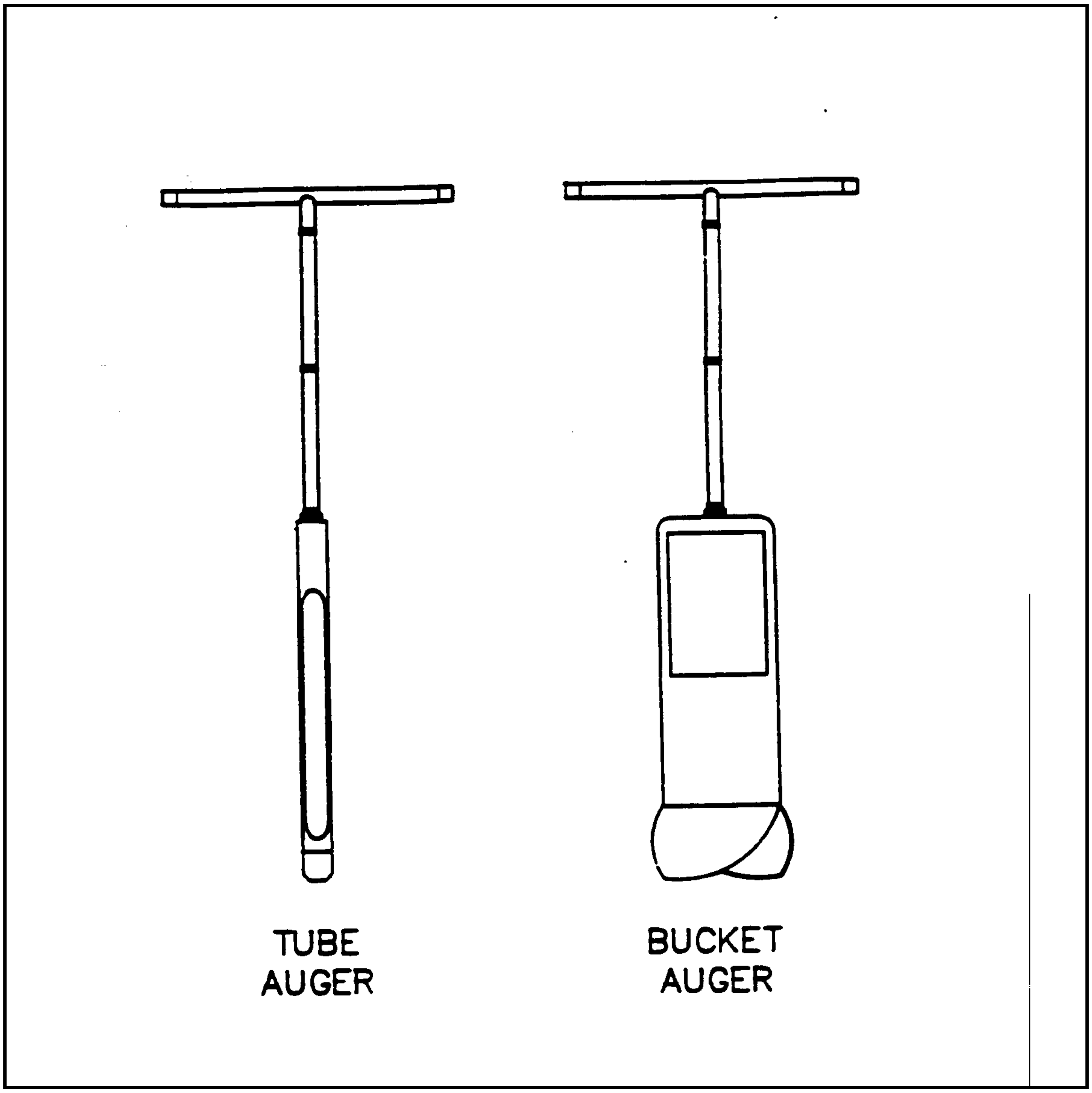
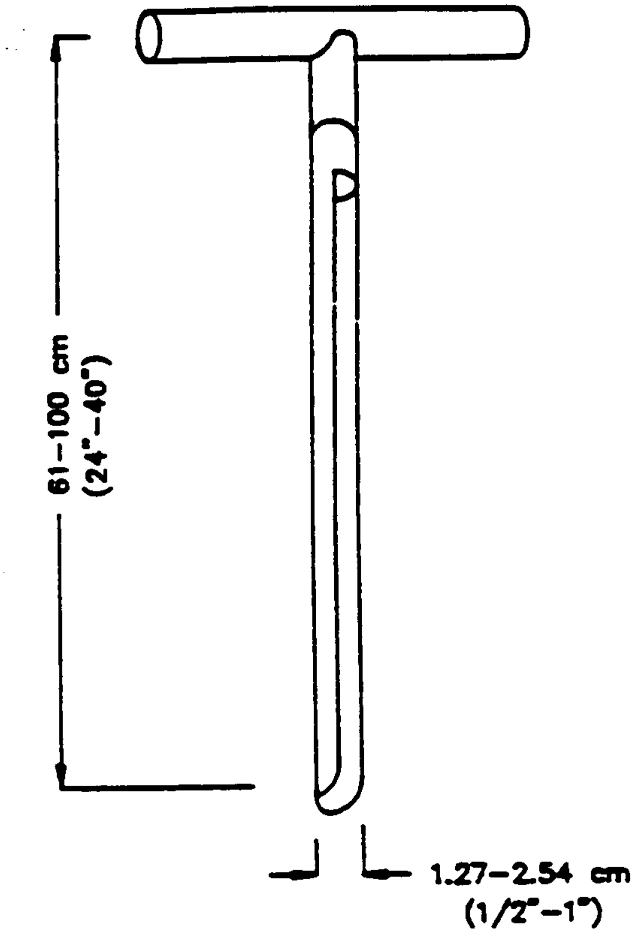


FIGURE 2. Sampling Trier



SAMPLING EQUIPMENT DECONTAMINATION

SOP#: 2006
DATE: 08/11/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide a description of the methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination and to provide general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations as per 29 Code of Federal Regulations (CFR) 1910.120. This SOP does not address personnel decontamination.

These are standard (i.e. typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitation, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Removing or neutralizing contaminants from equipment minimizes the likelihood of sample cross contamination, reduces or eliminates transfer of contaminants to clean areas, and prevents the mixing of incompatible substances.

Gross contamination can be removed by physical decontamination procedures. These abrasive and non-abrasive methods include the use of brushes, air and wet blasting, and high and low pressure water cleaning.

The first step, a soap and water wash, removes all visible particulate matter and residual oils and grease. This may be preceded by a steam or high pressure water wash to facilitate residuals removal. The second step involves a tap water rinse and a distilled/deionized water rinse to remove the detergent. An acid rinse provides a low pH media for trace metals removal and is included in the decontamination process if metal samples are to be collected. It is followed by another distilled/deionized water rinse. If sample analysis does not include metals, the acid rinse step can be omitted. Next, a high purity solvent rinse is performed for trace organics removal if organics are a concern at the site. Typical solvents used for removal of organic contaminants include acetone, hexane, or water. Acetone is typically chosen because it is an excellent solvent, miscible in water, and not a target analyte on the Priority Pollutant List. If acetone is known to be a contaminant of concern at a given site or if Target Compound List analysis (which includes acetone) is to be performed, another solvent may be substituted. The solvent must be allowed to evaporate completely and then a final distilled/deionized water rinse is performed. This rinse removes any residual traces of the solvent.

The decontamination procedure described above may be summarized as follows:

1. Physical removal
2. Non-phosphate detergent wash
3. Tap water rinse
4. Distilled/deionized water rinse
5. 10% nitric acid rinse
6. Distilled/deionized water rinse
7. Solvent rinse (pesticide grade)
8. Air dry
9. Distilled/deionized water rinse

If a particular contaminant fraction is not present at the site, the nine (9) step decontamination procedure specified above may be modified for site specificity. For example, the nitric acid rinse may be eliminated if metals are not of concern at a site. Similarly, the solvent rinse may be eliminated if organics are not of concern at a site. Modifications to the standard procedure should be documented in the site specific work plan or subsequent report.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample to be collected and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest.
More specifically, sample collection and analysis of decontamination waste may be required before beginning proper disposal of decontamination liquids and solids generated at a site. This should be determined prior to initiation of site activities.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

- The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be analyte free (specifically for the contaminants of concern).

- The use of an untreated potable water supply is not an acceptable substitute for tap water. Tap water may be used from any municipal or industrial water treatment system.

- If acids or solvents are utilized in decontamination they raise health and safety, and waste disposal concerns.

- Damage can be incurred by acid and solvent washing of complex and sophisticated sampling equipment.

5.0 EQUIPMENT/APPARATUS

Decontamination equipment, materials, and supplies are generally selected based on availability. Other considerations include the ease of decontaminating or disposing of the equipment. Most equipment and supplies can be easily procured. For example, soft-bristle scrub brushes or long-handled bottle brushes can be used to remove contaminants. Large galvanized wash tubs, stock tanks, or buckets can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags can help segregate contaminated equipment. Contaminated liquid can be stored temporarily in metal or plastic cans or drums.

The following standard materials and equipment are recommended for decontamination activities:

5.1 Decontamination Solutions

- Non-phosphate detergent
- Selected solvents (acetone, hexane, nitric acid, etc.)
- Tap water
- Distilled or deionized water

5.2 Decontamination Tools/Supplies

- Long and short handled brushes
- Bottle brushes
- Drop cloth/plastic sheeting
- Paper towels
- Plastic or galvanized tubs or buckets
- Pressurized sprayers (H_2O)
- Solvent sprayers
- Aluminum foil

5.3 Health and Safety Equipment

Appropriate personal protective equipment (i.e., safety glasses or splash shield, appropriate gloves, aprons or coveralls, respirator, emergency eye wash)

5.4 Waste Disposal

- Trash bags
- Trash containers
- 55-gallon drums
- Metal/plastic buckets/containers for storage and disposal of decontamination solutions

6.0 REAGENTS

There are no reagents used in this procedure aside from the actual decontamination solutions. Table 1 (Appendix A) lists solvent rinses which may be required for elimination of particular chemicals. In general, the following solvents are typically utilized for decontamination purposes:

- 10% nitric acid is typically used for inorganic compounds such as metals. An acid rinse may not be required if inorganics are not a contaminant of concern.
- Acetone (pesticide grade)(1)
- Hexane (pesticide grade)(1)
- Methanol(1)

(1) - Only if sample is to be analyzed for organics.

7.0 PROCEDURES

As part of the health and safety plan, a decontamination plan should be developed and reviewed. The decontamination line should be set up before any personnel or equipment enter the areas of potential exposure. The equipment decontamination plan should include:

- The number, location, and layout of decontamination stations.
- Decontamination equipment needed.
- Appropriate decontamination methods.
- Methods for disposal of contaminated clothing, equipment, and solutions.
- Procedures can be established to minimize the potential for contamination. This may include: (1) work practices that minimize contact with potential contaminants; (2) using remote sampling techniques; (3) covering monitoring and sampling equipment with plastic, aluminum foil, or other protective material; (4) watering down dusty areas; (5) avoiding laying down equipment in areas of obvious contamination; and (6) use of disposable sampling equipment.

7.1 Decontamination Methods

All samples and equipment leaving the contaminated area of a site must be decontaminated to remove any contamination that may have adhered to equipment. Various decontamination methods will remove contaminants by: (1) flushing or other physical action, or (2) chemical complexing to inactivate contaminants by neutralization, chemical reaction, disinfection, or sterilization.

Physical decontamination techniques can be grouped into two categories: abrasive methods and non-abrasive methods, as follows:

7.1.1 Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing and wearing away the top layer of the surface containing the contaminant. The mechanical abrasive cleaning methods are most commonly used at hazardous waste sites. The following abrasive methods are available:

Mechanical

Mechanical methods of decontamination include using metal or nylon brushes. The amount and type of contaminants removed will vary with the hardness of bristles, length of time brushed, degree of brush contact, degree of contamination, nature of the surface being cleaned, and degree of contaminant adherence to the surface.

Air Blasting

Air blasting equipment uses compressed air to force abrasive material through a nozzle at high velocities. The distance between nozzle and surface cleaned, air pressure, time of application, and angle at which the abrasive strikes the surface will dictate cleaning efficiency. Disadvantages of this method are the inability to control the amount of material removed and the large amount of waste generated.

Wet Blasting

Wet blast cleaning involves use of a suspended fine abrasive. The abrasive/water mixture is delivered by compressed air to the contaminated area. By using a very fine abrasive, the amount of materials removed can be carefully controlled.

7.1.2 Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off a surface with pressure. In general, the equipment surface is not removed using non-abrasive methods.

Low-Pressure Water

This method consists of a container which is filled with water. The user pumps air out of the container to create a vacuum. A slender nozzle and hose allow the user to spray in hard-to-reach places.

High-Pressure Water

This method consists of a high-pressure pump, an operator controlled directional nozzle, and a high-pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) and flow rates usually range from 20 to 140 liters per minute.

Ultra-High-Pressure Water

This system produces a water jet that is pressured from 1,000 to 4,000 atmospheres. This ultra-high-pressure spray can remove tightly-adhered surface films. The water velocity ranges from 500 meters/second (m/s) (1,000 atm) to 900 m/s (4,000 atm). Additives can be used to enhance the cleaning action.

Rinsing

Contaminants are removed by rinsing through dilution, physical attraction, and solubilization.

Damp Cloth Removal

In some instances, due to sensitive, non-waterproof equipment or due to the unlikelihood of equipment being contaminated, it is not necessary to conduct an extensive decontamination procedure. For example, air sampling pumps hooked on a fence, placed on a drum, or wrapped in plastic bags are not likely to become heavily contaminated. A damp cloth should be used to wipe off contaminants which may have adhered to equipment through airborne contaminants or from surfaces upon which the equipment was set.

Disinfection/Sterilization

Disinfectants are a practical means of inactivating infectious agents. Unfortunately, standard sterilization methods are impractical for large equipment. This method of decontamination is typically performed off-site.

7.2 Field Sampling Equipment Decontamination Procedures

The decontamination line is setup so that the first station is used to clean the most contaminated item. It progresses to the last station where the least contaminated item is cleaned. The spread of contaminants is further reduced by separating each decontamination station by a minimum of three (3) feet. Ideally, the contamination should decrease as the equipment progresses from one station to another farther along in the line.

A site is typically divided up into the following boundaries: Hot Zone or Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ), and the Support or Safe Zone (SZ). The decontamination line should be setup in the Contamination Reduction Corridor (CRC) which is in the CRZ. Figure 1 (Appendix B) shows a typical contaminant reduction zone layout. The CRC controls access into and out of the exclusion zone and confines decontamination activities to a limited area. The CRC boundaries should be conspicuously marked. The far end is the hotline, the boundary between the exclusion zone and the contamination reduction zone. The size of the decontamination corridor depends on the number of stations in the decontamination process, overall dimensions of the work zones, and amount of space available at the site. Whenever possible, it should be a straight line.

Anyone in the CRC should be wearing the level of protection designated for the decontamination crew. Another corridor may be required for the entry and exit of heavy equipment. Sampling and monitoring equipment and sampling supplies are all maintained outside of the CRC. Personnel don their equipment away from the CRC and enter the exclusion zone through a separate access control point at the hotline. One person (or more) dedicated to decontaminating equipment is recommended.

7.2.1 Decontamination Setup

Starting with the most contaminated station, the decontamination setup should be as follows:

Station 1: Segregate Equipment Drop

Place plastic sheeting on the ground (Figure 2, Appendix B). Size will depend on amount of equipment to be decontaminated. Provide containers lined with plastic if equipment is to be segregated. Segregation may be required if sensitive equipment or mildly contaminated equipment is used at the same time as equipment which is likely to be heavily contaminated.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

As indicated in 7.1.2, a high-pressure wash may be required for compounds which are difficult to remove by washing with brushes. The elevated temperature of the water from the high-pressure washers is excellent at removing greasy/oily compounds. High pressure washers require water and electricity.

A decontamination pad may be required for the high-pressure wash area. An example of a wash pad may consist of an approximately 1 1/2 foot-deep basin lined with plastic sheeting and sloped to a sump at one corner. A layer of sand can be placed over the plastic and the basin is filled with gravel or shell. The sump is also lined with visqueen and a barrel is placed in the hole to prevent collapse. A sump pump is used to remove the water from the sump for transfer into a drum.

Typically heavy machinery is decontaminated at the end of the day unless site sampling requires that the machinery be decontaminated frequently. A separate decontamination pad may be required for heavy equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Prior to setting up Station 3, place plastic sheeting on the ground to cover areas under Station 3 through Station 10.
Fill a wash basin, a large bucket, or child's swimming pool with non-phosphate detergent and tap water. Several bottle and bristle brushes to physically remove contamination should be dedicated to this station . Approximately 10 - 50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 4: Water Basin

Fill a wash basin, a large bucket, or child's swimming pool with tap water. Several bottle and bristle brushes should be dedicated to this station. Approximately 10-50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 5: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to contain the water during the rinsing process. Approximately 10-20 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 6: Nitric Acid Sprayers

Fill a spray bottle with 10% nitric acid. An acid rinse may not be required if inorganics are not a contaminant of concern. The amount of acid will depend on the amount of equipment to be decontaminated. Provide a 5-gallon bucket or basin to collect acid during the rinsing process.

Station 7: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 8: Organic Solvent Sprayers

Fill a spray bottle with an organic solvent. After each solvent rinse, the equipment should be rinsed with distilled/deionized water and air dried. Amount of solvent will depend on the amount of equipment to decontaminate. Provide a 5-gallon bucket or basin to collect the solvent during the rinsing process.

Solvent rinses may not be required unless organics are a contaminant of concern, and may be eliminated from the station sequence.

Station 9: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 10: Clean Equipment Drop

Lay a clean piece of plastic sheeting over the bottom plastic layer. This will allow easy removal of the plastic in the event that it becomes dirty. Provide aluminum foil, plastic, or other protective material to wrap clean equipment.

7.2.2 Decontamination Procedures

Station 1: Segregate Equipment Drop

Deposit equipment used on-site (i.e., tools, sampling devices and containers, monitoring instruments radios, clipboards, etc.) on the plastic drop cloth/sheet or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross contamination. Loose leaf sampling data sheets or maps can be placed in plastic zip lock bags if contamination is evident.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

Use high pressure wash on grossly contaminated equipment. Do not use high- pressure wash on sensitive or non-waterproof equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Scrub equipment with soap and water using bottle and bristle brushes. Only sensitive equipment (i.e., radios, air monitoring and sampling equipment) which is waterproof should be washed. Equipment which is not waterproof should have plastic bags removed and wiped down with a damp cloth. Acids and organic rinses may also ruin sensitive equipment. Consult the manufacturers for recommended decontamination solutions.

Station 4: Equipment Rinse

Wash soap off of equipment with water by immersing the equipment in the water while brushing. Repeat as many times as necessary.

Station 5: Low-Pressure Rinse

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 6: Nitric Acid Sprayers (required only if metals are a contaminant of concern)

Using a spray bottle rinse sampling equipment with nitric acid. Begin spraying (inside and outside) at one end of the equipment allowing the acid to drip to the other end into a 5-gallon bucket. A rinsate blank may be required at this station. Refer to Section 9.

Station 7: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 8: Organic Solvent Sprayers

Rinse sampling equipment with a solvent. Begin spraying (inside and outside) at one end of the equipment allowing the solvent to drip to the other end into a 5-gallon bucket. Allow the solvent to evaporate from the equipment before going to the next station. A QC rinsate sample may be required at this station.

Station 9: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure washer.

Station 10 : Clean Equipment Drop

Lay clean equipment on plastic sheeting. Once air dried, wrap sampling equipment with aluminum foil, plastic, or other protective material.

7.2.3 Post Decontamination Procedures

1. Collect high-pressure pad and heavy equipment decontamination area liquid and waste and store in appropriate drum or container. A sump pump can aid in the collection process. Refer to the Department of Transportation (DOT) requirements for appropriate containers based on the contaminant of concern.

2. Collect high-pressure pad and heavy equipment decontamination area solid waste and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

3. Empty soap and water liquid wastes from basins and buckets and store in appropriate

drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

4. Empty acid rinse waste and place in appropriate container or neutralize with a base and place in appropriate drum. pH paper or an equivalent pH test is required for neutralization. Consult DOT requirements for appropriate drum for acid rinse waste.

5. Empty solvent rinse sprayer and solvent waste into an appropriate container. Consult DOT requirements for appropriate drum for solvent rinse waste.

6. Using low-pressure sprayers, rinse basins, and brushes. Place liquid generated from this process into the wash water rinse container.

7. Empty low-pressure sprayer water onto the ground.

8. Place all solid waste materials generated from the decontamination area (i.e., gloves and plastic sheeting, etc.) in an approved DOT drum. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

9. Write appropriate labels for waste and make arrangements for disposal. Consult DOT regulations for the appropriate label for each drum generated from the decontamination process.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITYASSURANCE/ QUALITY CONTROL

A rinsate blank is one specific type of quality control sample associated with the field decontamination process. This sample will provide information on the effectiveness of the decontamination process employed in the field.

Rinsate blanks are samples obtained by running analyte free water over decontaminated sampling equipment to test for residual contamination. The blank water is collected in sample containers for handling, shipment, and analysis. These samples are treated identical to samples collected that day. A rinsate blank is used to assess cross contamination brought about by improper decontamination procedures. Where dedicated sampling equipment is not utilized, collect one rinsate blank per day per type of sampling device samples to meet QA2 and QA3 objectives.

If sampling equipment requires the use of plastic tubing it should be disposed of as contaminated and replaced with clean tubing before additional sampling occurs.

10.0 DATA VALIDATION

Results of quality control samples will be evaluated for contamination. This information will be utilized to qualify the environmental sample results in accordance with the project's data quality objectives.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow OSHA, U.S. EPA, corporate, and other applicable health and safety procedures.

Decontamination can pose hazards under certain circumstances. Hazardous substances may be incompatible with decontamination materials. For example, the decontamination solution may react with contaminants to produce heat, explosion, or toxic products. Also, vapors from decontamination solutions may pose a direct health hazard to workers by inhalation, contact, fire, or explosion.

The decontamination solutions must be determined to be acceptable before use. Decontamination materials may degrade protective clothing or equipment; some solvents can permeate protective clothing. If decontamination materials do pose a health hazard, measures should be taken to protect personnel or substitutions should be made to eliminate the hazard. The choice of respiratory protection based on contaminants of concern from the site may not be appropriate for solvents used in the decontamination process.

Safety considerations should be addressed when using abrasive and non-abrasive decontamination equipment. Maximum air pressure produced by abrasive equipment could cause physical injury. Displaced material requires control mechanisms.

Material generated from decontamination activities requires proper handling, storage, and disposal. Personal Protective Equipment may be required for these activities.

Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard (i.e., acetone, alcohol, and trisodiumphosphate).

In some jurisdictions, phosphate containing detergents (i.e., TSP) are banned.

12.0 REFERENCES

Field Sampling Procedures Manual, New Jersey Department of Environmental Protection, February, 1988.

A Compendium of Superfund Field Operations Methods, EPA 540/p-87/001.

Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, USEPA Region IV, April 1, 1986.

Guidelines for the Selection of Chemical Protective Clothing, Volume 1, Third Edition, American Conference of Governmental Industrial Hygienists, Inc., February, 1987.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October, 1985.

APPENDIX A

Table

Table 1. Soluble Contaminants and Recommended Solvent Rinse

TABLE 1
Soluble Contaminants and Recommended Solvent Rinse

SOLVENT(1)	EXAMPLES OF SOLVENTS	SOLUBLE CONTAMINANTS
Water	Deionized water Tap water	Low-chain hydrocarbons Inorganic compounds Salts Some organic acids and other polar compounds
Dilute Acids	Nitric acid Acetic acid Boric acid	Basic (caustic) compounds (e.g., amines and hydrazines)
Dilute Bases	Sodium bicarbonate (e.g., soap detergent)	Acidic compounds Phenol Thiols Some nitro and sulfonic compounds
Organic Solvents (2)	Alcohols Ethers Ketones Aromatics Straight chain alkalines (e.g., hexane) Common petroleum products (e.g., fuel, oil, kerosene)	Nonpolar compounds (e.g., some organic compounds)
Organic Solvent(2)	Hexane	PCBs

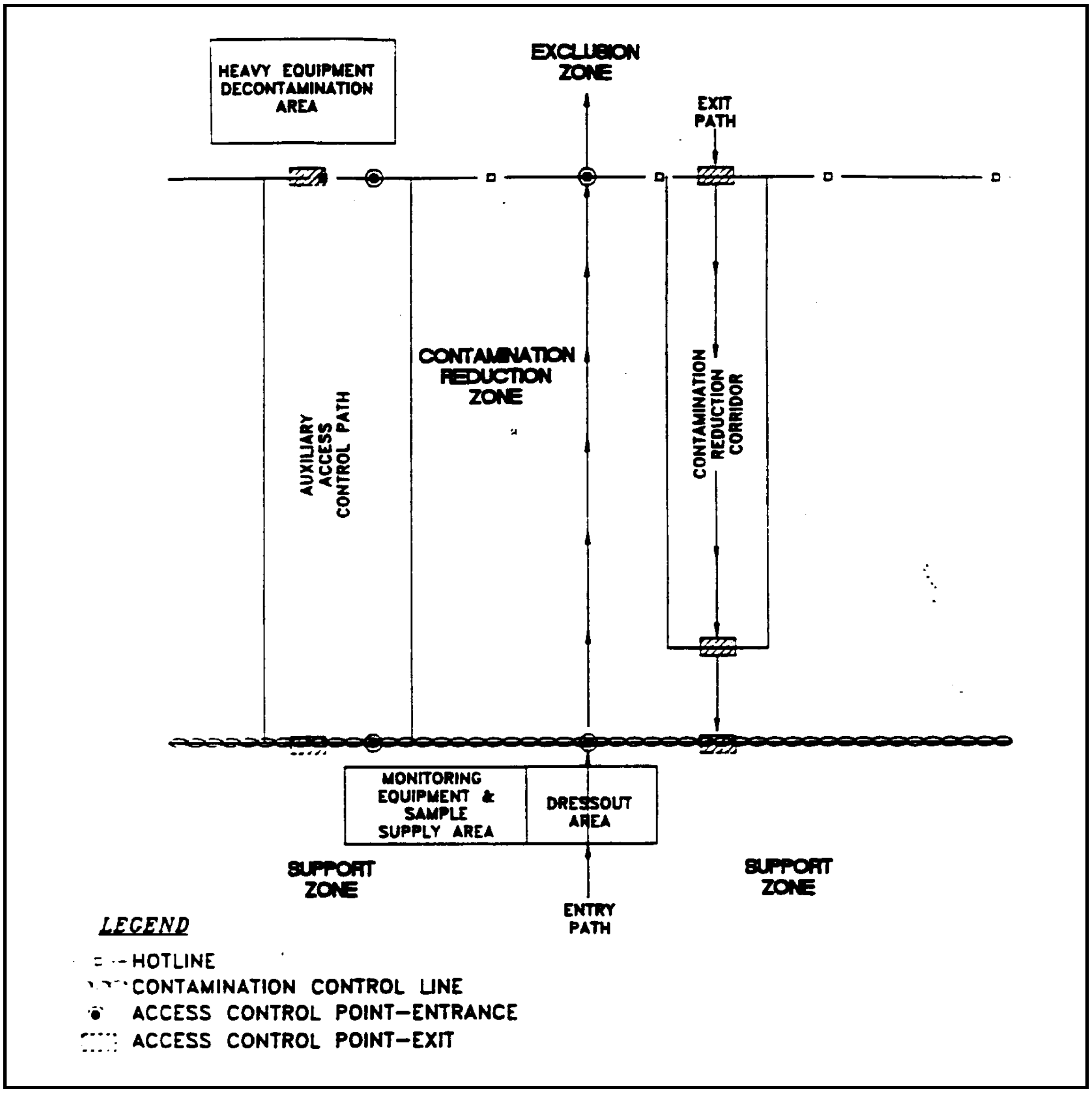
(1) - Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard

(2) - WARNING: Some organic solvents can permeate and/or degrade the protective clothing

APPENDIX B

Figures

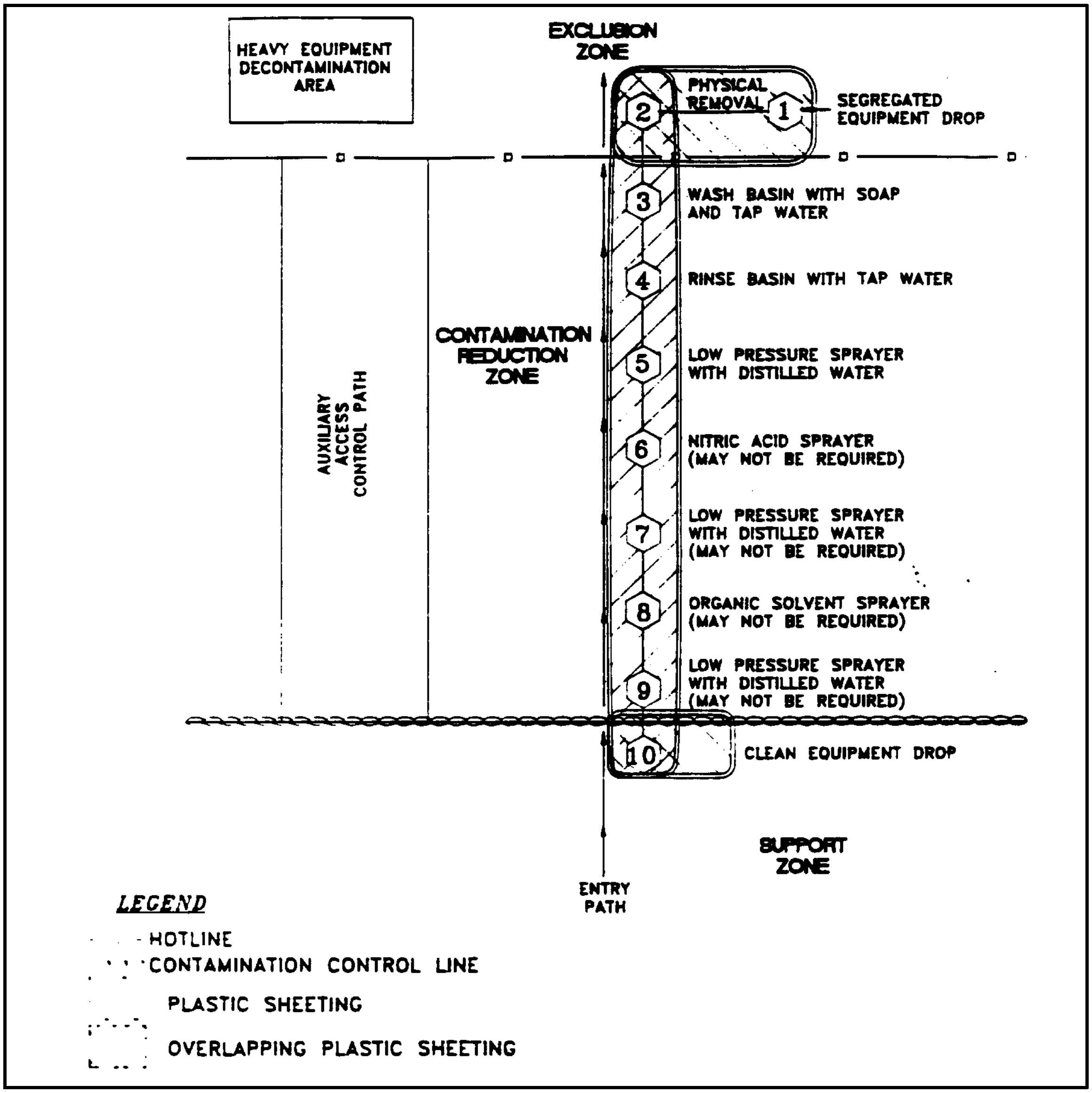
Figure 1. Contamination Reduction Zone Layout



APPENDIX B (Cont'd.)

Figures

Figure 2. Decontamination Layout



APPENDIX D

Chain-of-Custody Form

55041

Billing Information:

Company Name ______
Attn: ______
Address ______
City, State, Zip ______
Phone Number ______ Fax ______

Alpha Analytical, Inc.
255 Glendale Avenue, Suite 21
Sparks, Nevada 89431-5778
Phone (775) 355-1044
Fax (775) 355-0406

Samples Collected From Which State?
AZ ____ ***CA*** ____ ***NV*** ____ ***WA*** ____ ***DOD Site*** ____
ID ____ ***OR*** ____ ***OTHER*** ____ ***Page #*** ____ ***of*** ____

Consultant / Client Name

Address

City, State, Zip

Job #

Job Name

Report Attention / Project Manager

Name: ______
Email: ______
Phone: ______ Mobile: ______

P.O. #

Analyses Required

Data Validation
Level: III or IV

EDD / EDF? YES ____ *NO* ____
Global ID # ______

Time Sampled	Date Sampled	Matrix* See Key Below	Lab ID Number (*Office Use Only*)	Sample Description	*TAT*	*Field Filtered*	# Containers**								REMARKS
			FOR												
			LAB												
			USE												
			ONLY												

ADDITIONAL INSTRUCTIONS:

I, (field sampler), attest to the validity and authenticity of this sample. I am aware that tampering with or intentionally mislabeling the sample location, date or time of collection is considered fraud and may be grounds for legal action. Sampled By: ______

Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:
Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:
Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:

*Key: AQ - Aqueous SO - Soil WA - Waste OT - Other AR - Air **: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The report for the analysis of the above samples is applicable only to those samples received by the laboratory with this coc. The liability of the laboratory is limited to the amount paid for the report.

APPENDIX E

Sample Label

Alpha Analytical, Inc.
255 Glendale Ave, Suite 21
Sparks, Nevada 89431-5778
(775) 355-1044

Analysis		Preservatives
8081 ____________	8082 __________	HCl ______________
TPH Ext. _________	8270 __________	$Na_2S_2O_3$ ___________
TPH Gas _________	8260 __________	H_2SO_4 ____________
BTXE ____________	MTBE _________	HNO_3 _____________
Other ____________	Other _________	Other _____________

Client ____

Time/Date ____

Sample Description ____________________________________

LAB ID __________________________ ____________________
(lab use only)

APPENDIX F

Site Health and Safety Plan

McGinley & Associates

Reno Office
815 Maestro Dr.
Reno, NV 89511
Ph: 775.829.2245
Fax: 775.829.2213

Las Vegas Office
6280 S. Valley View Blvd.
Suite 604
Las Vegas, NV 89118
Ph: 702.260.4961
Fax: 702.260.4968

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| Soil and Groundwater Remediation

| Regulatory Compliance

| Environmental Audits

| Hydrogeology

| Hazmat Response

HEALTH AND SAFETY PLAN

Brownfields Project
Environmental Sampling
Cornerstone Park

Prepared for:

City of Henderson
240 Water Street
Henderson, Nevada 89015

Prepared by:
McGinley & Associates, Inc.

DECEMBER, 2010

TABLE OF CONTENTS

1. INTRODUCTION

McGinley & Associates, Inc. (MGA) is pleased to submit this Health and Safety Plan (HASP) detailing environmental control procedures and personal safety precautions being performed on behalf of the City of Henderson. This HASP addresses activities associated with environmental sampling to be conducted at Assessor Parcel Numbers (APNs) 178-16-501-001; 178-16-510-002; 178-16-710-002; 178-16-601-004; 178-16-601-003; 178-16-710-001; 178-16-599-044; 178-16-299-006; 178-16-699-001; and 178-16-399-001 in Henderson, Nevada (the Site).

Planned Site activities will include;

- Site reconnaissance,
- Hollow stem auger drilling, and
- Soil and surface water sampling.

1.1 Scope and Applicability of the Site Health and Safety Plan

The purpose of this Site Health and Safety Plan is to define the requirements and designate protocols to be followed at the site during investigation activities. Applicability extends to all government employees, property owners, contractors, and subcontractors.

All personnel on site, contractors and subcontractors included, shall be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. This HASP summarizes those hazards in *Section 3* and defines protective measures planned for the site. <u>This plan must be reviewed and an agreement to comply with the requirements must be signed by all personnel prior to entering any hazardous work areas.</u> An Agreement of Compliance is provided in Appendix A.

During development of this plan consideration was given to current safety standards as defined by EPA/OSHA/NIOSH, health effects and standards for known contaminants, and procedures designed to account for the potential for exposure to unknown substances. Specifically, the following reference sources were consulted:

- OSHA 29 CFR part 1910.120: General Industry Standards
- U.S. Coast Guard (USCG) Operating Safety Guidance
- NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidelines
- (ACGIH) Threshold Limit Values

1.2 On-Site Personnel

All personnel entering the designated hazardous work areas at the Site will be required to read and verify compliance with the provisions of this HASP. Personnel are also expected to comply with any relevant OSHA requirements such as medical monitoring (*Section 6.0*), training (*Section. 4.0*), and respiratory protection. Each person will also be expected to provide their own protective equipment.

In the event that a person does not adhere to the provisions of the HASP, he/she will be requested to leave the work area. All non-conformance incidents will be recorded in the site log.

2. KEY PERSONNEL

The Site Health and Safety Officer (HSO) has total responsibility for ensuring that the provisions of this HASP are adequate and implemented in the field. Changing field conditions may require decisions to be made concerning adequate protection programs. Therefore, it is vital that personnel assigned as HSO be experienced and meet the additional training requirements specified by OSHA in 29 CFR 1910.120. The following personnel are critical to the planned activities at the Site. The organizational structure will be reviewed and updated periodically by the site supervisor.

Title/Responsibility	Name	Phone
City of Henderson		
Environmental Programs Manager – project oversight, assist with site access agreements, liaison with EPA Project officer	Brenda Pohlmann	(702) 267-1306
McGinley and Associates, Inc.		
Project Manager – project management, regulatory liaison, coordinate field activities, data review, report preparation.	Brian Rakvica	(702) 375-9945
Environmental Scientist – oversee field activities, site safety, collect soil samples, classify soils, coordinate disposal of investigation-derived waste	Rosangela Wacaser	(702) 990-8392
Technician – conduct soils and surface water sampling	Devin Gordon	(702) 371-7864
Contractors/Vendors		
Eagle Drilling Services, LLC – soil boring installation	Felicia Sanders	(702) 341-5873
TBE – assess for underground utilities in areas where drilling is conducted	Rick Torrens	(702) 458-4092
Alpha Analytical – analysis of soil and surface water samples	Tammy Brace	(775) 355-1044
The Fehling Group – quantitative health risk assessment services.	Kurt Fehling	(415) 897-6600
H2O Environmental – dispose of investigation-derived waste	To be determined	(702) 396-4148

2.1 Site Specific Health and Safety Personnel

The HSO is also responsible for conducting site inspections on a regular basis in order to ensure the effectiveness of this plan.

The HSO at the site is: Brian Rakvica

Designated alternates include: Rosangela Wacaser and Devin Gordon

2.2 Organizational Responsibility

City of Henderson:	Party initiating investigation of suspected perchlorate impacts to soil and surface water.
MGA:	Primary agent for City of Henderson providing field services and project oversight of soil and groundwater sampling.
Subcontractors:	Various companies and organizations providing services or skilled trades.

3. TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS

3.1 Historical Overview of Site

Current and historical operations in the redevelopment area include a sand and gravel mining operation; concrete plant; and as an asphalt batch plant. Data from previous investigations indicate that groundwater and surface water is contaminated with perchlorate and soils may also be contaminated with perchlorate.

The purpose of this project is to assess the occurrence and extent of soil and surface water contamination relating to perchlorate in the vicinities of the two water bodies on site. Samples of soil and surface water will be analyzed for perchlorate in a fixed analytical laboratory.

In June 2005 groundwater monitoring wells were installed and sampled. Perchlorate detected in soils was recorded at up to 190 micrograms per kilogram (ug/kg) which is below the USEPA Region 9 Preliminary Remediation Goal (PRG) for residential soils. In groundwater perchlorate concentrations ranged from 33 to 85 micrograms per liter (µg/l). In surface water perchlorate concentrations ranged from 37 to 39 µg/l. Concentrations appeared to vary on a seasonal basis.

3.2 Task by Task Risk Analysis

The evaluation of hazards is based upon the knowledge of the site background presented in *Section 3.1*, and anticipated risks posed by the specific operations.

The following subsections describe generalized tasks or operations in terms of the associated hazards. In addition, the protective measures to be implemented during initiation of those operations are also identified. The following table provides a summary of potential chemical hazards at the site.

CHEMICAL HAZARDS OF CONCERN

Contaminant	Permissible exposure limit (PEL)	Source	Primary Routes of Exposure
Perchlorate*	15 mg/m3	Air, soil, and water	Inhalation, absorption

***** As nuisance dust
Mg/m3: Milligrams per cubic meter of air

3.3 Task Hazard Descriptions

3.3.1 Subsurface Investigation

Safe work practices for all field personnel during drilling operations include:

- All overhead and buried utilities must be surveyed, located, marked and noted prior to exploratory boring or excavation activity;
- The drill rig, including its mast, shall not be operated within 20 feet of a power line. Remember that hoist lines and overhead power lines can be moved toward each other by the wind;
- All drilling and sampling equipment must be cleaned before proceeding to the site. Drilling or sampling equipment must be cleaned after each use. Cleaning should be done with a hot-water pressure washer or with a trisodium phosphate (TSP) wash and distilled water rinse;
- Work in *cleaner* areas should be conducted first, where practical;
- The minimum number of personnel necessary to achieve the objectives should be within 25 feet of the drilling or excavation activity. If emergency personnel, backup contract/subcontract personnel or observers are at the site, they should remain 25 feet from the drilling or sampling activity, where practical;
- When sampling soil, water or product, neoprene or nitrile gloves should be worn to prevent skin contact with petroleum products; and
- Air-purifying respirators shall be accessible for immediate use.

Additional safety procedures for monitoring drilling activities include:

- Do not allow the drill rig to be driven from hole-to-hole with the mast in the raised position;
- Surveying of overhead and buried utilities is a “must” on every boring. They should be located, and emphasized on all boring location plans and boring assignment sheets;
- When overhead electrical power lines exist at or near a drilling site, consider all wires to be alive and dangerous;
- Watch for sagging power lines before entering a site. Do not lift power lines to gain entrance call your supervisor or project engineer;
- Do not allow the mast to be raised or the drill rig to be operated within 20 feet of a power line, or if known, the minimum clearance stipulated by Federal, State, and local regulations;
- Keep in mind that both hoist lines and overhead power lines can be moved toward each other by the wind;
- When your rig has the *OK* to set up 20 feet from a power line, remember that it is not allowed, by Company policy, to extend sampling rods above the top of the drill mast;

- Underground electricity is as dangerous as overhead electricity. Be aware and always suspect the existence of underground utilities such as electrical power, gas petroleum, telephone, sewer and water;
- It is the responsibility of the driller to be aware of the dangers of underground utilities and to be on the watch for physical signs of underground utilities. However, the initial responsibility of locating, emphasizing on-site plan and contacting utility owners lies with BPBC;
- The operator of a drill rig should never leave the controls when the rig is in operation. If the operator must leave the controls, the transmission controlling the rotary must be placed in the neutral position and place the feed control lever in neutral. If the operator leaves the vicinity of the rig, the drill engine must be shut off;
- Practice good housekeeping - keep excess material well out of the way and in a neat pile. All tools and equipment should have its own place and when not in use they should be stored there;
- Use protective clothing, as warranted. Hardhats, close-fitting gloves, welding glasses, safety glasses, safety belts, safety boots, etc. will be worn when appropriate;
- Ear protection must be worn by employees drilling in an enclosed area (i.e., next to high walls or buildings) and when core drilling for a 6- to 8-hour period. OSHA regulations require that ear protection be worn by employees exposed to noise above 85 decibels (on a time weighted average); and
- Running is generally not allowed, except in a life-threatening situation.

3.3.2 Surface Water Sampling

- When collecting samples near water or from a boat all staff and contractors shall be wearing a properly secured personal flotation device (PFD). When sampling, two people must be present at all times.
- Wear a USCG-approved PFD, and depending on the air and water temperature, a float coat or survival suit for protection against hypothermia.
- Avoid boat measurements upstream of bridges or other obstructions that do not provide sufficient clearance for the boat, equipment, and passengers to safely pass under.

4. PERSONNEL TRAINING REQUIREMENTS

Consistent with OSHA's 29 CFR 1910.120, regulation covering Hazardous Waste Operations and Emergency Response and, OSHA’s 29 CFR 1926 Construction Industry Standards, workers are required to be trained in accordance with those standards. At a minimum, all personnel are required to be trained to recognize the hazards on-site and the provisions of this HASP.

4.1 Pre-assignment and Annual Refresher Training

Prior to arrival on site, each employer will be responsible for certifying that his/her employees meet the requirements of training, consistent with OSHA 29 CFR 1910.120

paragraph (e)(3) or (e)(9). The employer should be able to provide a document certifying that each general site worker has received 40 hours of instruction off the site, and 24 hours of training for any workers who are on site only occasionally for a specific task. If an individual employee has work experience and/or training that is equivalent to that provided in the initial training, an employer may waive the 40-hour training so long as that equivalent experience is documented or certified. All personnel must also receive 8 hours of refresher training annually.

4.2 Training and Briefing Topics

The following items may be discussed by a qualified individual at the site pre-entry briefing(s) and at periodic tailgate safety meetings.

Physical hazards
Emergency response plan
Training requirements
Respiratory protection
Site Control
Heavy machinery
Chemical hazards
Air Monitoring
Animal bites and stings
Medical surveillance
Personal protective equipment
Spill Containment

5. PERSONAL PROTECTIVE EQUIPMENT TO BE USED

This section describes the general requirements of the EPA designated Levels of Protection (A-D), and the specific levels of protection required for each task at the site.

5.1 Levels of Protection

Personnel wear protective equipment when response activities involve known or suspected atmospheric contamination vapors, gases, or particulate that may be generated by site activities, or when direct contact with skin-affecting substances may occur. The specific levels of protection and necessary components for each have been divided into four categories according to the degrees of protection afforded:

Level A:	Should be worn when the highest level of respiratory, skin, and eye protection is needed.
Level B:	Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection. Level B is the primary level of choice when encountering unknown environments.
Level C:	Should be worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.
Level D:	Should be worn only as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.

Modifications of these levels are permitted, and routinely employed during site work activities to maximize efficiency. For example, Level C respiratory protection and Level D skin protection may be required for a given task. Likewise the type of chemical protective ensemble (i.e., material, format) will depend upon contaminants and degrees of contact. The Level of Protection selected is based upon the following:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- Potential for exposure to substances in air, liquids, or other direct contact with material due to work being done.
- Knowledge of chemicals on-site along with properties such as toxicity, route of exposure, contaminant matrix, and adequate warning properties

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better identified. For all unknown situations on this site, Level D is the highest level anticipated.

5.2 Recommended Levels of Protection- Task Specific

The following specific personnel protective ensembles are recommended for the site:

Level D - All subsurface investigation activities.

***Trenching and Drilling* - (Level D)**

Boots - Sturdy steel toe

Outer Gloves - Leather

Outer Garment/Coveralls

Hardhat

Safety Glasses

***Soil Sampling* - (Level D)**

Outer Gloves - Nitrile

Outer Garment/Coveralls - Tyvek

Hardhat

Safety Glasses

***Surface Water Sampling* - (Level D)**

Outer Gloves - Nitrile

Outer Garment/Coveralls - Tyvek

Personal Flotation Device – USCG Approved Type I, II, or III

Hardhat

Tinted Safety Glasses

5.3 Reassessment of Protection Program

The Level of Protection provided by PPE selection shall be upgraded or downgraded based upon a change in site conditions or findings of investigations. When a significant change occurs, the hazards should be reassessed and the HASP updated. Some indicators of the need for reassessment are:

- Commencement of a new work phase, such as the start of unexpected sampling or work that begins on a different portion of the site.
- Change in job tasks during a work phase.
- When temperature extremes or individual medical considerations limit the effectiveness of PPE.
- Contaminants other than those previously identified are encountered
- Change in ambient levels of contaminants.
- Change in work scope which affects the degree of contact with contaminants.

6. SOP FOR RESPIRATORY PROTECTION

Not required for site activities at this time.

6.1 SOP for Personal Protective Equipment

Proper inspection of PPE features several sequences of inspection depending upon specific articles of PPE and it's frequency of use. The different levels of inspection are as follows:

- Inspection and operational testing of equipment received from the factory or distributor;
- Inspection of equipment as it is issued to workers;
- Inspection after use or training and prior to maintenance;
- Periodic inspection of stored equipment; and
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

The primary inspection of PPE in use for activities at the site will occur prior to immediate use and will be conducted by the user. This ensures that the specific device or article has been checked-out by the user and that the user is familiar with its use.

7. MEDICAL SURVEILLANCE REQUIREMENTS

Medical monitoring programs are designed to track the physical condition of employees on a regular basis as well as survey pre-employment or baseline conditions prior to potential exposures. The medical surveillance program is a part of each employers Health and Safety program. Exposure to toxic materials are not anticipated at the Site.

7.1 Exposure/Injury/Medical Support

As a follow-up to an injury or possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing. Depending upon the type of exposure, it is critical to perform follow-up testing within 24-48 hours. It will be up to the employer's medical consultant to advise the type of test required to accurately monitor for exposure effects.

8. FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING

This section explains the general concepts of an air monitoring program and specifies the surveillance activities that will take place during project completion at the site if conditions are warranted.

The purpose of air monitoring is to identify and quantify airborne contaminants in order to verify and determine the level of worker protection needed. Initial screening for identification is often qualitative, i.e., the contaminant, or the class to which it belongs, is demonstrated to be present but the determination of its concentration (quantification) must await subsequent testing. Two principal approaches are available for identifying and/or quantifying airborne contaminants:

- The on-site use of direct-reading instruments.
- Laboratory analysis of air samples obtained by gas sampling bag, collection media (i.e., filter, sorbent), and/or wet-contaminant collection methods.

9. SITE CONTROL MEASURES

The following section defines measures and procedures for maintaining site control. Site control is an essential component in the implementation of the site health and safety program.

9.1 Site Communications Plan

Successful communications between field teams and contact with personnel in the support zone is essential. The following communications systems will be available during activities at the site.

- Hand Signals
- Verbal
- Honk Vehicle Horn - Evacuate immediately

Signal	Definition
Hands on top of head	Need assistance
Thumbs up	OK/I am all right/I understand
Thumbs down	No/negative
Arms waving upright	Send backup support

Grip partners wrist	Exit area immediately

9.2 Safe Work Practices

The following is a list of standing orders for the duration of the project.

- No smoking, eating, or drinking in areas where there is a potential of cross contamination or risk of fire or explosion.
- No horse play.
- Implement the communications system.
- Line of sight must be in position.
- Wear the appropriate level of protection as defined in the Safety Plan.
- No unauthorized entry into hazardous work areas by unauthorized personnel.

10. DECONTAMINATION PLAN

Consistent with the levels of protection required, the decontamination process provides a step by step representation of the personnel decontamination steps for level D and C. These procedures should be modified to suit site conditions and protective ensembles in use. Decontamination involves the orderly controlled removal of contaminants. All site personnel should minimize contact with contaminants in order to minimize the need for extensive decontamination.

10.1 Personnel Decontamination

All workers exposed to Perchlorate will be required to enact an orderly removal of contaminated PPE. This can be accomplished through repeated change of disposable garments and or PPE wash at the end of the shift. Workers shall be instructed to the importance of decontamination to prevent cross contamination.

10.2 Sampling Equipment Decontamination

Sampling equipment and heavy equipment may be decontaminated in accordance with procedures as defined in the work plan or as follows:

- Sampling equipment will be rinsed using water and a 5% tri-sodium phosphate solution (or an acceptable substitute).
- Sampling equipment will be decontaminated between taking samples to prevent cross contamination.
- Disposable sampling equipment shall be utilized wherever practical to minimize employee exposure and possible cross contamination between sampling events.

11. EMERGENCY RESPONSE / CONTINGENCY PLAN

This section describes contingencies and emergency planning procedures to be implemented at the Site. This plan is compatible with local, state and federal disaster and emergency management plans as appropriate.

11.1 Pre-Emergency Planning

A field pre-construction / field activities meeting will be conducted at the project site approximately one week prior to implementation of field services. The meeting will include personnel from MGA and the selected contractors. Each of the activities and procedures presented will be reviewed during this meeting.

In addition, tailgate site safety discussions will be held daily. All employees will be trained in and reminded of provisions of the emergency response plan, communication systems, and evacuation routes. The plan will be reviewed and revised if necessary, on a regular basis by the HSO. This will ensure that the plan is adequate and consistent with prevailing site conditions.

11.2 Emergency Recognition/Prevention

Section 3 provides a listing of chemical hazards onsite. Additional hazards as a direct result of site activities are listed in Section 3.3 as are prevention and control techniques/mechanisms. Personnel will be familiar with techniques of hazard recognition from pre-assignment training and site specific briefings. The HSO is responsible for ensuring that prevention devices or equipment is available to personnel.

11.3 Evacuation Routes/Procedures

In the event of an emergency which necessitates an evacuation of the site, the following alarm procedures will be implemented.

Evacuation alarm notification should be made using three long blasts on a vehicle horn, supplemented using the hand signals and / or verbal orders. All personnel should evacuate upwind of any activities. Insure that a predetermined location is identified off-site in case of an emergency, so that all personnel can be accounted for. Personnel will remain at that area until the re-entry is authorized.

11.4 Emergency Contact/Notification System

The following list provides names and telephone numbers for emergency contact personnel. In the event of a medical emergency, personnel will take direction from the HSO and notify the appropriate emergency organization. In the event of a fire or spill, the site supervisor will notify the appropriate local, state, and federal agencies.

Emergency Telephone Numbers

Organization	Telephone
Fire	911
Police:	911
Ambulance:	911
St Rose Dominican Hospital:	702-564-2622
McGinley and Associates	702-260-4961 or 775-829-2245
NDEP	702-486-2850
Regional EPA:	415-744-1500
EPA Emergency Response Team:	908-321-6660
National Response Center:	800-424-8802
Center for Disease Control:	404-488-4100
Chemtrec:	800-424-9555

11.5 Nearest Medical Assistance

A map of the route to the nearest medical facility which can provide emergency care for individuals who may experience an injury or exposure on site is included in Appendix B of this HASP. St Rose Dominican Hospital: 564-2622 is located at 102 E. Lake Mead Parkway, Henderson. The route to the hospital should be verified by the HSO, and should be familiar to all site personnel.

11.6 Emergency Medical Treatment Procedures

Any person who becomes ill or injured in the hazardous material work area must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket.) First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the project manager.

11.7 Fire or Explosion

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the project manager or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on site.

If it is safe to do so, site personnel may:

Use fire fighting equipment available on site to control or extinguish the fire; and,

Remove or isolate flammable or other hazardous materials which may sustain a fire.

11.8 Spill or Leaks

In the event of a spill or a leak, site personnel will:

Inform their supervisor immediately;

Locate the source of the spillage and stop the flow if it can be done safely; and,

Begin containment and recovery of the spilled materials.

11.9 Emergency Equipment/Facilities

All emergency equipment will be located in the command post and / or support zone.

First aid kit

Fire extinguisher

Mobile telephone

Eye wash

12. SPILL CONTAINMENT PROGRAM

The procedures defined in this section comprise the spill containment program in place for activities at the Site.

Where spills, leaks, or ruptures may occur, adequate quantities of spill containment equipment (absorbent, pillows, etc.) will be stationed in the immediate area. The spill containment program must be sufficient to contain small and incidental spills generally associated with sampling operations. All drums and containers used during the spill clean-up shall meet the appropriate DOT, OSHA, and EPA regulations for the waste that they will contain.

Drums and containers shall be inspected and their integrity assured prior to being moved.

Operations on site will be organized so as to minimize the amount of drum or container movement.

Employees involved in the drum or container operations shall be warned of the hazards associated with the containers.

Drums or containers that cannot be moved without failure, shall be emptied into a sound container.

13. HAZARD COMMUNICATION

In order to comply with 29 CFR 1910.1200, Hazard Communication, the following written Hazard Communication Program has been established. All employees will be briefed on this program, and have a written copy for review.

A. CONTAINER LABELING

All containers received on site will be inspected to ensure the following:

- all containers will be clearly labeled as to the contents;
- the appropriate hazard warnings will be noted; and
- the name and address of the manufacturer will be listed.

All secondary containers will be labeled with either an extra copy of the original manufacturer's label or with generic labels which have a block for identify and blocks for the hazard warning.

B. MATERIAL SAFETY DATA SHEETS (MSDSs)

Copies of MSDSs for all hazardous chemicals known on site will be maintained in the work area. MSDSs will be available to all employees for review during each work shift.

C. EMPLOYEE TRAINING AND INFORMATION

Prior to starting work, each employee will attend a health and safety orientation and will receive information and training on the following:

(1) an overview of the requirements contained in the Hazard Communication Standard, 29 CFR 1910.1200;

(2) chemicals present in their workplace operations;

(3) location and availability of a written hazard program;

(4) physical and health effects of the hazardous chemicals;

(5) methods and observation techniques used to determine the presence or release of hazardous chemicals;

(6) how to lessen or prevent exposure to these hazardous chemicals through usage of control/work practices and personal protective equipment;

(7) emergency procedures to follow if they are exposed to these chemicals;

(8) how to read labels and review MSDSs to obtain appropriate hazard information;

(9) specialized hot work and tank processing techniques.

REFERENCE		
DESIGNED		BH
DRAWN		TAD
CHECKED		
APPROVED		

REVISIONS No.	DESCRIPTION	BY	DATE

FIGURE 1

SITE MAP
-SHOWING-
CORNERSTONE SITE
LAS VEGAS, NEVADA

McGinley & Associates

SCALE: AS SHOWN
JOB NO. LV-BRN-002
REVISION
A

Z:\Projects\Drafting\LV-BRN-002\LV-BRN-002-01 ALT.dwg 12/08/10 09:05 TAD

APPENDIX A

Agreement of Compliance

HASP

Statement of Compliance

I have read and understand the HASP for the site investigation of shallow surface soil and water at the project site in Henderson, Nevada.

I agree to comply with the contents of the HASP and understand that not doing so may be reason for discharge from the site.

____ Date:____________________

____ Date:____________________

____ Date:____________________

____ Date:____________________

____ Date:____________________

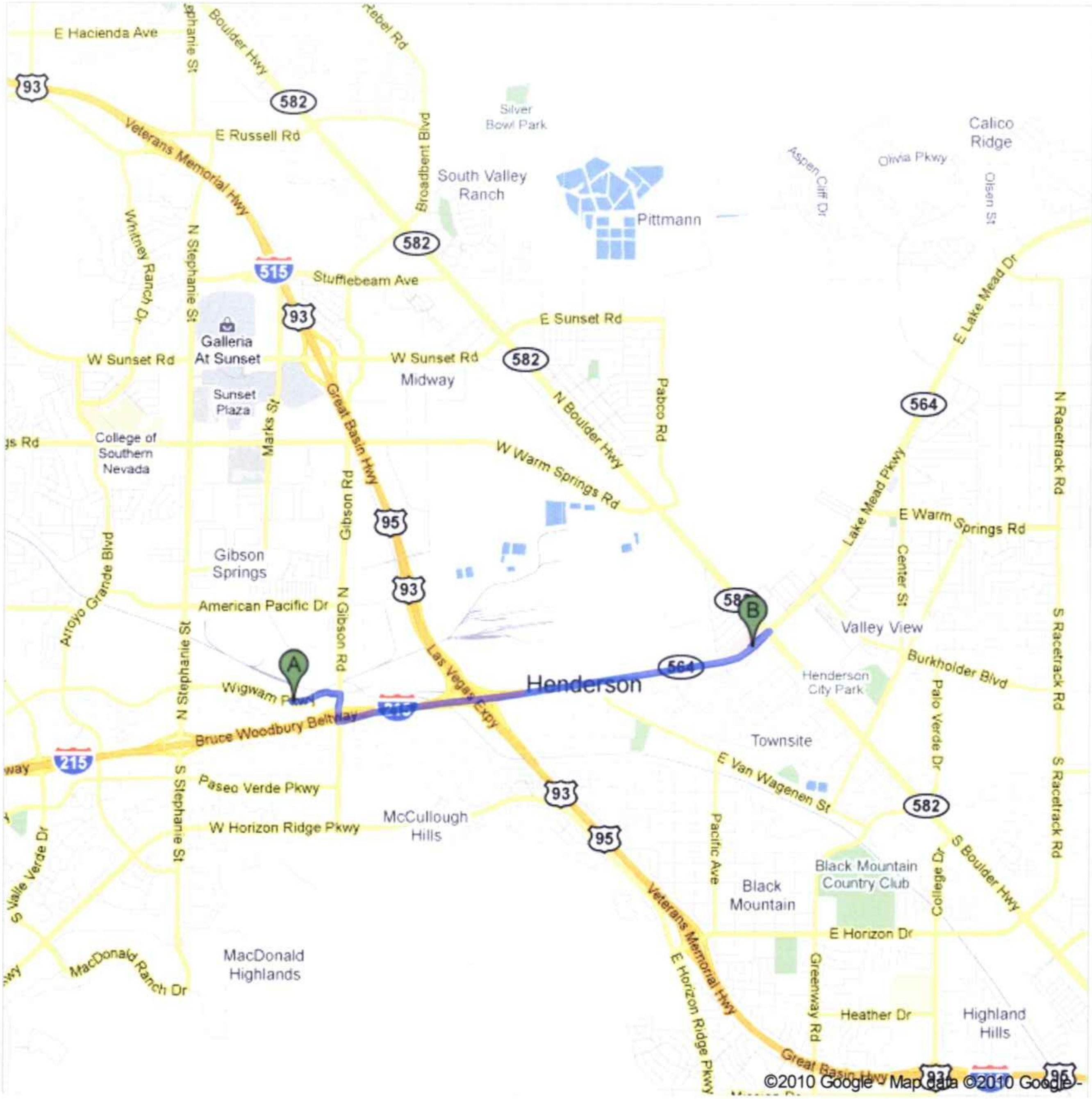
____ Date:____________________

APPENDIX B

Route to Nearest Medical Assistance

Google maps

Directions to St Rose Dominican Hospitals
102 E Lake Mead Pkwy, Henderson, NV 89015-5524 - (702) 564-2622
3.4 mi – about **7 mins**



Wigwam Pkwy

1. Head **east** on **Wigwam Pkwy** toward **N Gibson Rd**	go 0.3 mi total 0.3 mi
2. Turn right at **N Gibson Rd** About 1 min	go 0.2 mi total 0.5 mi
3. Turn left to merge onto **I-215 E** About 2 mins	go 1.0 mi total 1.5 mi
4. Continue onto **NV-564 E/Lake Mead Pkwy** About 3 mins	go 1.8 mi total 3.2 mi
5. Make a U-turn at **NV-582 N** Destination will be on the right About 1 min	go 0.2 mi total 3.4 mi

St Rose Dominican Hospitals
102 E Lake Mead Pkwy, Henderson, NV 89015-5524 - (702) 564-2622