PROJECT PLANNING DOCUMENTS
CHARACTERIZATION AND SITE INVESTIGATION
AT
CULROSS MINE AND MILLSITE
CHUGACH NATIONAL FOREST, ALASKA

AUGUST 1, 2005

Prepared For:

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APPENDICES

1.0 INTRODUCTION

NORTECH *Environmental Engineering & Industrial Hygiene* (***NORTECH***) has been retained by the United States Forest Service (FS) to complete characterization and site investigation activities at Culross Mine and Millsite. This document includes the project planning information necessary for the project, except for the Health and Safety Plan which is being submitted separately.

2.0 PROJECT BACKGROUND, OBJECTIVE AND SCOPE OF WORK

This project entails performing a site investigation at the Culross Mine and Millsite located within the Chugach National Forest on Culross Island, on the Southeast side of Culross Bay in Prince William Sound. The legal description is Section 35, Township 8 North, Range 7 East of the Seward Meridian (Seward C-4 quadrangle map). The legal description falls within the administrative boundaries of the Glacier Ranger District.

The intent of this task order is to evaluate the tailings and waste rock generated from the abandoned mine to determine if it poses a risk to human health and the environment as defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

The basis for the site investigation will be to augment existing site information provided and reviewed in the preparation of this work plan. The previous studies coupled with new field data and observations will be combined to produce the final PA/SI report. All field sampling activities will be conducted with hand tools, no heavy equipment is included in the scope of work.

The end product of this investigation will be an investigative report that presents sufficient data to evaluate the nature and extent of hazardous substances that may be present in various pathways at the site and their effects to human and ecological receptors.

Figures and maps showing project locations and proposed activities are included in Appendix 1.

3.0 PREVIOUS INVESTIGATIONS

NORTECH reviewed the following historical site-specific documents provided by the FS. See Figures in Appendix for locations referenced.

3.1 1995 Discovery Project Report Summary

Summary Report Site Discovery Project, Culross Mine Site, Chugach National Forest, prepared by Ecology & Environment, Inc. March 1995.

Base/neutral and acid extractable organic compounds (BNAs) and heavy metals were detected. Heavy metals including arsenic, cadmium, chromium, lead, and mercury were detected at elevated levels at the Chilean Mill, the Gibson Grinder and/or the tailing pile locations. BNAs (semivolatiel [SVOC] organic compounds) were identified in soils beneath the wood stave pipeline leading to the millsite.

No human targets were reported. An unnamed stream that traverses adjacent to the milsite and empties into Culross Bay supports undocumented adromous fisheries. Insufficient evidence was compiled to establish a reportable quantity release of CERLCA hazardous substances from the site. The site was given a low priority for further CERCLA evaluation. Report recommends posting a general warning at the site, removing unsafe physical underground mine hazards (completed, 2004/2005) and performing a CERCLA preliminary assessment of the Culross Mine Site. This study documents the results of this PA/SI examination.

3.2 1997 BLM Filed Inventory Examination

Culross Mine S102 Chugach National Forest Inventory Examination; BLM field report, 1997.

Field sampling effort focused on collecting background and downstream water samples for RCRA 8 metals and hardness to further address the potential risk to public recreationists and the fisheries resource in Culross Bay.

Mine tailings located adjacent to the beach reported to “contain visible quantities of mercury as well as other heavy metals”. A single background sample was non-detect for metals. Levels of arsenic downstream of adits and mill site exceeded the National Toxic Rule (0.18 ug/l) but were below the Alaska Freshwater criteria (50 ug/l when taken, 10 mg/L in 2005). No other heavy metals were reported. Corrective action to address adit drainage and tailings pile leachate (apparent sources of contamination) not justified or cost effective based on limited data available. Mine is an attractive nuisance to recreational visitors and should be posted regarding the hazards present.

3.3 1998 Field Visit Analytical Results

A lab report for a single soil sample from the stream bed adjacent to the tailings pile indicates analysis for 13 priority pollutant metals at the site. Elevated levels appear to be limited to arsenic and mercury, while some other RCRA metals were also detected at low levels. Non-RCRA metals were also detected, but most were well below action levels.

4.0 PROJECT SCHEDULE AND KEY PERSONNEL

4.1 Project Schedule

Based on calendar realities (previous commitments), contract schedules and discussions with FS personnel, the following schedule has been developed for the project major milestones. This schedule is considered aggressive for completing the planning documents and coordinating the field work. Logistical support provided by the FS is restricted to the week of August 8-12, and this constraint controls the planning and execution stages of the project The remaining work schedule is considered reasonable and minor adjustments are feasible if necessary.

Project Milestone	Anticipated Date
Notice to Proceed	July 22, 2005
Draft Planning Documents	Aug 2, 2005
Site Visit	August 9-12, 2005
Draft Report	Within 30 days of results
Final Report	November 30, 2005

4.2 Project Organization

The project will be executed for the Forest Service by ***NORTECH*** under the direction of ***NORTECH***'s contract/project manager (CPM). ***NORTECH*** understands that the FS will provide an on-scene coordinator during the site visit phase of the project that will verify the work is being completed according to the plans. The ***NORTECH*** CPM will work closely with the FS personnel to insure that all aspects of the field work scope are completed. Key project personnel and contact information is summarized below.

Title	Name	Organization, Telephone
NORTECH Contract/Project Manager	John Hargesheimer, PE, CIH	***NORTECH***, (907)452-5688 cell (907)590-0055

Title	Name	Organization, Telephone
Contracting Officer	Dean Graham	USFS, (907)586-7912
QA/QC Officer	Peter Beardsley, PE	***NORTECH,*** (907)452-5688
Contracting Officer Representative/On-Scene Coordinator	Ken Maas	USFS, (907)586-8784
Site Safety and Health Officer (SSHO) and Site Supervisor	John Hargesheimer, PE, CIH, or Dennis Boyce	***NORTECH***, (907)452-5688 Dennis cell (907)590-0057

Other ***NORTECH*** personnel may be used during this project. The FS COR and On-scene coordinator will be notified of contract and/or project manager personnel assignments to the extent possible at least seven days prior to field activities or within 7 days of project re-assignment.

4.3 Personnel Responsibilities and Authority

The ***NORTECH*** project management objective is to provide experienced workers to the project as well as provide management with the site-specific information that is necessary to make informed decisions. Direction and administration of the program is performed through the project manager with input from the contract manager and quality assurance manager.

The **Contract/Project Manager** (CPM) is the primary point of contact with FS personnel responsible for directing day-to-day activities, including preparation of project documents, field activities, schedules, personnel assignments and reporting activities. He has authorization capability to manage the project budget, coordinate subcontractors and suppliers, and office support as necessary to complete the project.

The **Site Safety Health Officer** (SSHO) is responsible for promoting and assuring safe work practices during project operations and site activities. The SSHO has the authority to stop work when a hazard is observed. The FS COR/On Scene Coordinator also has this authority.

The ***NORTECH*** personnel proposed for this project are ADEC Qualified Samplers and have the qualifications to be site supervisor. In general, the responsibilities of this position are execution of the sampling and analysis plan.

5.0 SITE SPECIFIC ACTIVITIES

This section describes the planned mobilization/demobilization and the Preliminary Assessment/Site Investigation (PA/SI) specific activities to be completed. Specific sampling practices are described in more detail in the Sampling and Analysis Plan (SAP) located in Section 7.0. The PA/SI activities are based on the site conditions reported from the documents reviewed and ***NORTECH***'s experience completing similar work. The specific methods and activities may be modified in the field as necessary with appropriate documentation and reporting to successfully and safely complete the objectives of the project. If these practices markedly affect the approved workplan, ADEC personnel will be notified of this change as soon as is practicable.

5.1 Mobilization/Demobilization

The project will be completed in a single mobilization/demobilization of crew and supplies to complete the PA/SI. ***NORTECH*** personnel will meet the FS Ranger boat in Whittier and complete work during an August 9th through 12th, 2005 window. The FS will provide a Ranger Boat to transport crew from Whittier to the mine site in Culross Bay, as well as a skiff and personal flotation devices for daily transport to and from the beach near the millsite

5.2 Site Investigation

NORTECH shall perform a site investigation and conduct limited sampling activities at the Culross Millsite. The Culross site qualified for National Register listing due to the impressive array of artifacts present at the millsite. The report upon which this listing was based went on to suggest that small-scale sediment sampling as envisioned for this study is not considered an adverse effect. The FS will supply a cultural resource specialist to oversee sampling, if necessary. During the site investigation ***NORTECH*** shall collect pertinent information to address the following items:

- Identify nature and extent of the release or threat of a release, through soil, sediment, rock and water samples as detailed in the Section 7, including background samples as appropriate to satisfy Environmental Protection Agency requirements for Hazard Ranking System Scoring.
- Evaluate possible threat to recreational public, ecological receptors, and the environment (e.g. evaluate potential pathways and targets).

- Evaluate magnitude of these threats based on exposure risks (from each identified hazardous waste stream) and develop a preliminary conceptual site model.
- Removal determination factors (40 CFR300.415 (b) (2) i-viii, specified in the NCP).

No underground entry into abandoned mine workings is authorized under the terms of this task order. However, acid-base accounting (SOBEK test) will be completed for a representative collection of waste rock in the waste rock dumps outside the adit openings. These samples will provide a basis to determine the future impacts from waste rock piles to the water pathway.

6.0 RECORD KEEPING AND REPORTING

6.1 Field Notes

Field activities will be reported in a standard bound field notebook and then summarized into a daily report format that covers the same major topics, but in less detail. Documentation will be sufficient to enable participants to reconstruct events that occurred during the project accurately and objectively at a later time. Information recorded will include: personnel and equipment onsite, weather conditions, work activities performed, field tests and results, laboratory sample collection, discussions with inspectors, quantities of materials moved and/or collected, occurrence of site meetings, survey information (GPS coordinates), photograph information, and other project relevant field information. The daily reports with a copy of the detailed field notes are transmitted to the client on a daily basis or no later than 48 hours of demobilizing from the field.

6.2 Final Report

The final report for this project will summarize field activities, lab results, conclusions and recommendations, as appropriate for the project. The report will be comprehensive and include figures, tables, and copies of lab reports and other project documents. Draft and revised final reports will be submitted in accordance with the schedule.

7.0 SAMPLING AND ANALYSIS PLAN (SAP)

7.1 Objective

The project will be conducted in general accordance with the ADEC guidance on conducting site characterizations and cleanups listed in ADEC's regulations, including the

Standard Sampling Procedures (SSP), and the project work plans. The objectives of the field screening and sampling efforts are to:

- Facilitate the collection of necessary field data,
- Identify and delineate contamination,
- Proper documentation and identification of PA/SI field samples.
- Provide sufficient data to generate an HRS score for the site.

7.2 Field screening Equipment and Methodology

The contaminants of concern for this site are primarily metals associated with previously mined site materials. Additional field screening performed as part of this study will include delineating the aerial extent of upland tailings deposited near the millsite, based on visual characteristics of the soil profile. Although not quantitative, this qualitative assessment will be used to generate a rough volume estimate to aid future planning of removal strategies

Soil and sediment sampling will be completed with hand tools. A hand held GPS unit will be employed to locate key site attributes and sampling points.

Mine waste leachate contamination of surface waters is also a concern. Leachate and stream will also be visually inspected and GPS located. Filtered and raw surface water samples will be collected with hand sampling equipment. A peristaltic pump and/or a hand pump with a 0.45 micron membrane filter will be used to provide filtered water samples. The peristaltic pump option will require battery power, only available on board the boat, therefore peristaltic pump sample filtering will be done after sample collection in the field immediately upon returning to the boat. The following field parameters will be recorded in the field HORIBA Model U-22 field monitor at the time of sample collection: pH, conductivity, temperature, dissolved oxygen, turbidity, salinity, and total dissolved solids

7.3 Field and Laboratory Sampling Plan

Previous site investigations discussed previously have identified the following areas of concern which will be the primary target areas to be sampled during the site investigation:

- Background Water Quality up stream from adits
- Drainage from adits into eastern lake
- Adit Waste Rock Pile

- Water quality in Culross Bay streams downstream from mill
- Soils under wood-stave pipeline
- Mill site and tailings pile
- Stream sediments adjacent to millsite into Culross Bay

7.4.1 Soil and Sediment Samples

Surface and subsurface soil samples will be collected using a combination of hand equipment, such as shovels, trowels, and spoons and disposable sampling equipment such as gloves. ***NORTECH*** and the FS On-Scene Coordinator will concur on final sample locations in the field based on observed site conditions. ***NORTECH*** will visually inspect each sample and classify each soil sample. Sample description information will be documented in the field notes. Sampling equipment that contacts environmental media will be decontaminated both before initial use and between sampling locations, to avoid cross contamination. Samples will be placed in the appropriate sampling container, sealed, and placed promptly on ice in a cooler in the custody of ***NORTECH*** personnel.

Soil and sediment samples will consist of eight primary samples and a set of QA/QC samples that includes a field duplicate, a matrix spike sample, and a matrix spike duplicate, for a total of 11 samples. Contaminants of concern analyzed during this study are based on those found in exceedance of cited criteria during previous investigations. While only arsenic and mercury were previously identified as the primary contaminates of concern soil and sediment samples collected for this effort will be analyzed for RCRA 8 metals using 6000/7000 series methods.

A worst-case tailings sample will be analyzed by synthetic precipitate leaching procedure (SPLP). The SPLP method is designed to mimic the effect of acidic rainfall on wastes and soils.

The approximate locations for the following sediment/soil samples are shown in figure 3.

- Confirmation sample of sediment at S001 location (1997)
- Culross Bay Inter-tidal area
- Background sediment co-located with background surface water sample on Creek 1 to the southwest
- Between eastern and western lake

The location and purpose of the remaining maximum 11 specified soil/sediment samples in the contract will be determined in the field and/or completed as QA/QC samples.

7.4.2 Surface Water Samples

Surface waters will be tested in the field and through laboratory methods. Up to three locations will be selected for testing based on the observed site conditions and locations of previous samples. The following field parameters will be recorded in the field at the time of sample collection: pH, conductivity, temperature, dissolved oxygen, turbidity, salinity, and total dissolved solids. Both total and filtered surface water samples will be collected at each location. Specific metal analysis, either total or dissolved, will be based on the Aquatic life, chronic exposure criteria for fresh waters as depicted on Table 1B. A total of six laboratory samples is identified in the project cost breakdown and includes an appropriate quantity of QA/QC samples. Two SVOC samples are also included to assess the water downstream of the wood-stave pipeline and will be analyzed by the PAH SIMS for the 16 ADEC indicator compounds. The following three water sample locations are depicted on Figure 3.

- Background Creek 2 upstream of confluence with Creek 1 co-located with soil/sediment background sample.
- Confirmation sample at the same location that WA03 was taken
- Downstream of the confluence of Stream 1 and 2 immediately prior to discharge to Culross Bay.

Remaining surface water sample locations will be based on actual field conditions and determined in the field with the FS On-Scene Coordinator.

7.4.3 Waste Rock Samples

Waste rock samples from dumps outside the adit portals at 190 foot elevation will be collected for acid-base accounting (ABA, Sobek method) to measure the balance between potentially acid-generating minerals (maximum potential acidity) and acid-neutralizing minerals (neutralization potential) from the waste rock piles. Samples will be analyzed using the basic ABA package that includes total sulfur, paste pH, acid potential, neutralization potential, fizz rating. No QA/QC waste rock samples will be collected.

7.5 Sample Analysis and Management

Sample management includes proper sample designation, preservation and labeling; established procedures for sample handling, storage, packaging, and shipment; and sample documentation including taking field notes, establishing and maintaining sample chain of custody, and taking digital photographs. ***NORTECH*** will be responsible for

informing the laboratory as to the actual sampling dates, number of samples, analytical methods, standard turn-around time, sample matrix, and project name. Specific sample management procedures are described in ADEC's SPP and the quality control section of this document.

Field screening samples will be disposed of at the work site on the day of testing in the location from which each was collected. .

Analytical samples will be collected and stored in the laboratory supplied cooler during the project. Analytical work for this project will be conducted by Analytica Group, which has current ADEC certification for the analyses planned for this project. Analytica Group has internal procedures for sample management that will be used to manage samples after delivery to the laboratory. The acid-base accounting samples will be sent to ALS Chemex.

Laboratory analysis will be as follows:

- RCRA 8 Metals (soil/sediments) by SW 6010B/7421 ICP
- RCRA 8 Metals (water) by SW 6010B/245.1 ICP
- TCLP, SPLP (Soils (6020/ 7470)
- SVOC's (water) by PAH SIMS (8270)
- Acid Base Accounting (SOBEK method)

8.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN (QA/QC)

The Quality Assurance/ Quality Control (QA/QC) program described in this section is the project Quality Assurance Project Plan (QAPP). The QAPP is designed to ensure that all project data collected during the Characterization and Corrective Actions are scientifically sound, of known quality, thoroughly documented, and legally defensible.

8.1 Quality Objectives and Criteria for Measurement Data

The project data quality objectives (DQO) are to identify the concentrations of contaminants of concern and document threats or potential threats to public health and/or the environment posed by the site. The DQO process applied to this project generally follows that described in the *Guidance for the Data Quality Objectives Process*, published by the EPA.

8.2 Data Quality Objectives (DQOs)

Laboratory analyses will be conducted in accordance with ADEC Contract Laboratory Program protocols. The laboratory will employ those methods identified in Tables 1A, 1B, and 2 iin Appendix 1, unless otherwise approved by the QA Officer. The Quality Assurance (QA) objectives described here are used to determine the acceptability of data. These objectives set the total acceptable error due to sample collection, preparation and analysis. Section 3.2 outlines DQIs and corrective actions are outlined in Section 3.3.

8.3 Data Quality Indicators (DQIs)

Data Quality Indicators (DQIs) are:

- Representativeness
- Comparability
- Completeness
- Precision
- Accuracy

The goals for these DQIs were developed for this project following ADEC guidelines. Tables 1A and 1B in Appendix 2 present the QA objectives for measurement of analytical data and quality control (QC) guidelines for precision and accuracy. Other DQI goals are included in the ADEC standard sampling procedures guidance and in the laboratory quality assurance manual. The subcontract laboratory quality assurance plan is available in ***NORTECH's*** Fairbanks office located at 2400 College Road, Fairbanks, Alaska 99709.

8.4 Corrective Actions

Corrective actions are measures to correct or otherwise handle unacceptable deviations in sampling or analysis. An example of a corrective action is re-analysis of affected samples or reporting of questionable data with a note of explanation. The nature of the deviation will determine the appropriate corrective action.

The corrective action for invalid samples will depend on the overall completeness of the data set. If the 90% completeness objective for the project is met and observations and field screening do not indicate an invalid sample was collected at a location with higher than the average contamination levels, then an explanatory note will accompany the data report and no further corrective action is required. If the 90% completeness objective for

samples at site is not met or observations and field screening indicate an invalid sample was collected at a location with higher than the average contamination levels at the site, then sample(s) may be recollected at the proper location on the site, properly analyzed, and reported with an explanatory note.

Problems with data processing, management or analysis will be typically discovered during data reduction, validation and reporting. If problems occur, the QA Officer or other appropriate person will be notified and the error corrected.

Other unforeseen problems may interfere with meeting the data quality objectives. Appropriate corrective actions will be taken for these problems.

8.5 Special Training Requirements and Certification

All personnel directly involved in data gathering activities must be familiar with the portions of this QAPP appropriate to their roles in the project. Field personnel will be trained in compliance with applicable OSHA requirements and will also be experienced or instructed in working with or around hazardous waste and responding to emergency situations. Field personnel must also be familiar with the site specific Health and Safety Plan before beginning field activities. Personnel collecting environmental samples will ADEC Qualified Persons.

Special training requirements required for this project are limited to the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) class. Additional experience using individual pieces of field equipment (i.e. peristaltic pump, HORIBA monitor, hand tools, etc) is also necessary, but does not require formal training or specialty certification.

The investigation will be conducted by qualified personnel with previous experience conducting similar characterization and corrective actions. It is anticipated that at least two qualified personnel will be utilized to complete each of the necessary field activities, including collecting samples and documenting site activities. The site supervisor will be assigned to verify correct sampling procedures, validate sampling results, and inspect supplies for acceptability.

8.6 Data Generation and Acquisition

Sampling of soils, sediments, tailings and surface water at the site is anticipated during the investigation, as outlined in the scope of work and this project planning document. Samples will be collected from locations or features deemed appropriate in the field to

characterize and/or close specific issues. Sample locations will be selected with the concurrence of the FS on-site coordinator. Approximate locations of samples are depicted in Figure 3.

At the time of sampling, site-specific conditions (i.e., topography or visual evidence of contamination) will be evaluated and incorporated, when applicable, into the placement of sampling locations. Other conditions potentially contributing to the projected sampling locations include new observations or information obtained in the field that warrant an altered sampling approach, such as new potential exposure pathways or difficulty reaching the desired soil sampling locations due to adverse site conditions. Every attempt will be made to collect representative samples with the equipment available at the site.

8.6.1 Field Screening and Laboratory Sampling Methods

Field screening will be visual by qualified geologists and environmental professionals. Detailed information about field screening methodology, procedures, and cleanup criteria can be found in the SAP section above.

Soil samples will be collected to characterize contamination, to confirm the field screening methods, and to provide data upon which to evalutate potential risk to human and ecological receptors. Contaminated areas will be identified through visible examination and soil screening process. The field effort will be focused on areas where former reports have indicated contamination and/or on-site activities may have resulted in contamination to the site. Surface soil samples will be collected by scraping and/or digging to expose fresh material and then collecting representative samples with a clean sampling device. Soil will be placed into clean glass sample containers, appropriately labeled, and placed into an on-site cooler with ice until they can be transported under chain-of-custody to an approved laboratory for chemical analysis. Sample containers will be filled to the brim and the lid screwed on securely.

Water samples will be collected in clean glass sample containers, appropriately labeled, and placed into an on-site cooler with ice until they can be transported under chain-of-custody to an approved laboratory for chemical analysis. Sample containers will be filled in the order of volatilization sensitivity

8.6.2 Sampling Equipment Decontamination

NORTECH anticipates very little decontamination of equipment will be necessary during this project. Where feasible, disposable sampling devices will be used to avoid

decontamination. The following procedures will be implemented in the event decontamination of sampling equipment is necessary:

- Clean with water and Alconox detergent using a brush if necessary to remove particulate matter and surface films.
- Rinse thoroughly with clean water.
- Air dry the equipment completely.
- Remove the equipment from the decontamination area and wrap in aluminum foil or a ziploc bag.

8.6.3 Sample Handling and Chain-of-Custody Requirements

The soil and water samples will be submitted to Analytica Group laboratories in Anchorage, Alaska and ALS Chemex in Fairbanks, Alaska. Samples will be hand-delivered or shipped to the laboratories under chain of custody during the investigation. Sample handling, transport, and analysis will be arranged so that the recommended maximum holding times shown in Table 2 are not exceeded. All samples will be stored in a cooler with ice immediately after collection, and transported under chain-of-custody directly to the laboratory. The chain-of-custody requirements will follow ADEC guidance. The laboratory provides chain-of-custody and receipt verification for samples that are shipped internally and will follow its internal chain-of-custody procedures as stated in the laboratory QA Manual.

Sample containers will be labeled using waterproof ink directly on labels securely fastened to the container. The following information will be recorded on the sample label: sample number, date collected, time collected, name of sampler, and the analysis required. Each sample collected will be assigned a unique identity using an identification code based on a consistent sample designation. The sample designation scheme will be designed to suit the needs of the field staff, data management and data users and will not be provided to the analytical laboratory.

The following information will be recorded in the field notes: sample identification, sample location, date and time collected, matrix, sample depth and additional observations. Examples of the type of additional information includes specific soil type, coloration, floor or sidewall sample, visible or olfactory indications of contaminants, moisture content, etc.

Sample identification will be sufficient to enable cross-reference with the project logbook. For chain-of-custody purposes, all field QA/QC samples will be subject to the same custodial procedures and documentation as site samples.

8.7 Analytical Methods

Tables 1A, 1B, and 2 in Appendix 1 provide a listing of potential analytes that may be measured during the sampling phases of this investigation. The analytical methods used to determine analyte concentration, the practical quantitation limits of the methods, and the analytical sensitivity required by the preliminary remediation goals are also provided. Analytica Group, the project laboratory, will be completing the laboratory analysis of all of the samples. The Quality Assurance (QA) Manager will verify prior to the analysis of the samples that the laboratory has an ADEC-approved QA Plan, ADEC-approved Standard Operating Procedures (SOP) for each type of analysis and matrix, and is capable of meeting the DQIs described above.

Only new, commercially-cleaned, acid-washed sample containers will be used. All sample containers will be inspected before transit to the site to ensure that they have undamaged lids and are tightly sealed. Containers and lids will be re-inspected at the site. Containers which have lost lids or that have been damaged will not be used.
Water samples will be preserved according to standard laboratory protocols described in table 2

8.8 Quality Control Requirements

Quality control (QC) includes both field and laboratory procedures. Comparison of acceptable tolerances and actually derived values for each required QC element will accompany each project report. QC checks for sample collection will be accomplished by a combination of chain-of-custody protocols and laboratory QA as prescribed in the sampling or analytical methods. No QC samples (i.e., double blind performance evaluation samples) are planned for this activity outside of normal laboratory QC criteria outlined in the analytical methods. The QA Manager will verify that the laboratory follows an ADEC-approved QA plan regarding laboratory QC samples (such as method blanks, matrix spikes, surrogate spikes, standard references, and check standards). All of the analyses that will be performed for this project will produce definitive data. DQI targets for this project are specified are summarized in Tables 1A and 1B. Bias on estimated flagged data shall be determined by the validation process. The laboratory's DQOs for completeness and the field team's ability to meet the DQO for representativeness are set at 90%. Precision and accuracy targets are also outlined in Tables 1A and 1B. In addition to primary samples a representative set of QAQC samples including duplicates (1 per 10 samples per matrix), matrix spike (MS) sample and Matrix spike duplicate (MSD) samples will be collected for soil, sediment and surface water samples (1 per 20 samples per matrix) . No QA/QC samples are required for waste rock sample analysis.

Laboratory QC functions may include;

- Surrogates
- Retention Time Standard
- Column Performance
- Laboratory Spike and Laboratory Spike Duplicates
- Reagent Blanks
- Reference Samples
- Bottle Blanks
- Method Detection

8.9 Instrument/Equipment Testing, Inspection, and Maintenance

Testing, inspection, and maintenance methods and frequency for instruments and field equipment will be based on: type of instrument, Its stability characteristics, accuracy, sensitivity, and precision required by the project, intended use of the instrument, Manufacturer's recommendations, other conditions affecting measurement or operational control. All instruments and equipment used during sample analyses will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations, as well as criteria set forth in the applicable analytical methodology references and/or in accordance with the laboratory's Quality Assurance Manual and Standard Operating Procedures.

The field equipment used during this project may include a peristaltic pump, hand tools and a HORIBA water quality testing unit. Testing, inspection, and maintenance of these instruments will be performed in accordance with the manufacturer's recommendations. Spare parts or replacement units for the field equipment will be available from the manufacturer generally within 48 hours.

Equipment used by ***NORTECH*** in the field is subject to standard preventive maintenance schedules established by corporate equipment protocols. When in use, equipment will be inspected at least twice daily, once before startup in the morning and again at the end of the work shift before overnight storage or return to the charging rack. Regular maintenance, such as cleaning of lenses, replacement of in-line filters, and removal of accumulated dust, is to be conducted according to manufacturer's recommendations and in the field as needed, whichever is appropriate. Preventive maintenance activities will be entered in the site field logbook and the equipment maintenance file.

In addition to preventive maintenance procedures, daily calibration checks will be performed at the beginning and end of each field day, as well as every four hours during

continuous use. Additional calibration checks will be performed as necessary. All field calibration will be noted in the field logbooks. Laboratory equipment will be handled according to the standard laboratory operating procedures and QA plan.

Any field or laboratory instrument that is in disrepair or out of calibration will be segregated, clearly marked, and not used until the proper level of repair and/or calibration has been undertaken. If an instrument has repeated failures, it will be replaced.

8.10 Inspection/Acceptance Requirements for Supplies and Consumables

This information is described in the ADEC SSP and the project plans and guidance contained in these documents will be used to ensure the validity of data generated for this project. Sample jars are pre-cleaned by the manufacturer and certification documenting this is enclosed with each box of jars. Non-dedicated equipment will be verified to be uncontaminated by the site supervisor. The site supervisor will also have primary responsibility for identifying and enforcing the acceptance criteria for supplies and consumables needed for completing this investigation. The supplies will be accepted if they arrive in their original packaging, undamaged, and with chain-of-custody seals (if applicable).

8.11 Data Acquisition Requirements (Non-Direct Measurements)

Non-direct measurement data for this project will be limited to utilizing data from previous reports to identify areas of the site that need to be addressed during these site activities. The previous data was collected under an USFS direction and is considered acceptable in its current form.

8.12 Data Management

Hardcopy and electronic data results from the subcontracted commercial laboratory will be delivered to ***NORTECH*** upon completion of each sample delivery group. Data validation will be performed as listed in the Data Reduction, Validation and Reporting Section. ***NORTECH*** will use Microsoft Access or Excel software and the major data items captured to create a complete chemical analytical dataset

8.13 Assessments and Response Actions

FS personnel may conduct an audit of the field activities for this project. The auditor will have the authority to issue a stop work order upon finding a significant condition that would adversely affect the quality and usability of the data. FS personnel will have the

responsibility for initiating and implementing response actions associated with findings identified during the site audit. Once the response actions have been implemented, the USFS personnel may perform a follow-up audit to verify and document that the response actions were implemented effectively. In-house audits performed by the ***NORTECH*** QA officer may be conducted in accordance with the ***NORTECH's*** Standard Operating Procedures. FS personnel are expected to be onsite during the planned field activities.

If major deviations from the QA requirements of the project and the laboratory SOW were observed in the data validation process, the ***NORTECH*** Project Manager will contact the laboratory to correct the problem. If the laboratory is not responsive to the request, the QA Officer will inform the project manager of the situation. A brief narrative will be written explaining the contract deviations and recommendations will be given based on the quality of the submitted data. Reduced payment and/or re-analysis at the laboratory's expense shall be pursued by the project manager. Re-sampling and subsequent re-analysis will be decided by the project manager.

Additional sampling for corrective actions and/or any addendum to this QAPP shall be documented appropriately.

8.14 Reports to Management

Debriefing of the FS COR will be the responsibility of the ***NORTECH*** Project Manager or designee. This will be conducted on a daily or as needed basis. Laboratory deliverables will be as specified in the laboratory subcontract bid specification package for commercial laboratory analyses. Once the project is complete and the resulting data is obtained, the ***NORTECH*** Project Manager will assist in preparation of a final project report. The report will include a summary of the activities performed during the project and the resulting data (along with any statements concerning data quality). The report will be approved by the USFS COR prior to forwarding to other individuals and/or regulatory agencies.

8.15 Data Reduction, Validation, and Reporting

Data reduction describes the handling of standard, sample and blank results, and how results are used in calculating final results. Data validation is the systematic process of reviewing the data against criteria to assure adequacy. Data reporting details how reports are to be generated and content.

8.15.1 Reduction

The purpose of data reduction is to compile, condense, and simplify information into a more easily understood product. Much of data reduction will occur in the laboratory and the product furnished by the laboratory will be examined using standard statistical techniques and further reduced as necessary to provide a clear, concise summary of laboratory results for the project.

8.15.2 Field Validation

All information collected through the field documentation process will be checked prior to leaving the site for:

- qualitative completeness
- errors
- unexpected results (including possible explanations)
- adherence to specified sampling procedures

8.15.3 Laboratory Validation

Laboratory data validation will occur at three levels:

- The analyst will document and evaluate the analytical results using procedures set out in the approved QA Manual
- The laboratory supervisor will examine the sample results and any attached documentation or explanations of the analyst
- The laboratory QA officer, or other appropriate individual in the laboratory, will review the data a final time and provide written verification that the previously described steps were implemented

Review of laboratory data will include:

- completeness
- adherence to the Laboratory SOP for the analyte of concern
- adherence to the laboratory's quality assurance procedures

The review will focus on the establishment of detection and control limits. Any deviations will be flagged for discussion in final reports and possible corrective action. Identified deviations will include:

- any limits outside of the acceptable range
- lack of documentation showing the establishment of necessary controls
- unexplainable results or trends

8.15.4 Sample Validity

Samples collected in accordance with the procedures outlined in this QA/QC plan and in accordance with the Sampling plan will be considered valid unless otherwise indicated. Samples not collected in accordance with this plan will be considered invalid. In certain cases, a sample otherwise considered invalid may be considered valid, if a written explanation justifying the validity of the sample accompanies the data report. Invalid samples will accompany the data report and will result in appropriate corrective action, as outlined later in this plan.

9.0 LIMITATIONS

While ***NORTECH*** has reviewed the historical reports and believes that the activities and methods described in this work plan are appropriate, reasonable alternative field procedures may be utilized to perform the activities necessary under this contract. Alternative procedures may be necessary based on changes that have occurred on the site, unforeseen site conditions, and/or changes in USFS or ADEC requirements. If necessary, alternative methodology utilized by ***NORTECH*** will be appropriate, safe, within industry standards, and approved by the FS COR as necessary.