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TREATABILITY TESTING WORKPLAN, VERSION 1.1

SURFACE WATER INTERIM MEASURES/INTERIM REMEDIAL ACTION SOUTH WALNUT CREEK BASIN OPERABLE UNIT NO. 2

U.S. Department of Energy
Rocky Flats Plant
Golden, Colorado

Prepared By:

EG&G Rocky Flats, Inc.
Environmental Restoration
Remediation Programs Division

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
CDH	Colorado Department of Health
CFR	Code of Federal Regulations
CLP	Contract Laboratory Procedure
CLP	Certified Laboratory Procedure
CMP	Corrugated Metal Pipe
DQO	Data Quality Objectives
EPA	Environmental Protection Agency
ER	Environmental Restoration
FTU	Field Treatability Unit
GAC	Granular Activated Carbon
HP	Horsepower
HSP	Health and Safety Plan
IAG	Interagency Agreement
IM/IRAP/EA	Interim Measures/Interim Remedial Action Plan/Environmental Assessment
MDA	Minimum Detection Activity
NS	No Standard
OU	Operable Unit
PA	Protected Area
PCB	Polychlorinated Biphenyl
PQL	Practical Quantitation Limits
QAA	Quality Assurance Addendum
EAPJP	EG&G Rocky Flats Sitewide Quality Assurance Plan
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RFP	Rocky Flats Plant
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SOP	Sitewide Standard Operating Procedures
SOPA	Standard Operating Procedures Addendum
SS	Solids Sample
SW	Surface Water
TCLP	Toxicity Characteristics Leaching Procedure
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

This Workplan details the field treatability study to be conducted within a portion of the South Walnut Creek drainage for removal of organic and radionuclide contamination. This is an Interim Measure/Interim Remedial Action (IM/IRA) conducted under CERCLA in accordance with the Interagency Agreement (IAG) schedule.

The treatment system to be provided under this IM/IRA will include chemical treatment followed by cross flow filtration for removal of precipitated metals and suspended particulates which may contain adsorbed radionuclides. Sequentially, treatment will then provide for removal of volatile organic contamination by adsorption on Granular Activated Carbon (GAC). Successful demonstration of this system will provide transition to routine operation pending completion of the Record of Decision (ROD).

Testing of the treatment is to be conducted in field scale equipment to conserve time and resources. Bench-scale testing will be avoided because surface water contamination levels are below target treatment levels currently. Also, treatment process capability is "robust" and can reliably be increased to treat levels of contamination for which they were designed.

The treatment system will be deployed in two steps with the initial GAC system being operated in May, 1991. Evaluation of carbon's effectiveness in removing VOCs will be the initial goal. Operational effectiveness will be advanced by study of backwashing requirements and bio-fouling tendencies if they are experienced. The full treatability system addressed in this workplan is scheduled for operation in October, 1991.

1.0 INTRODUCTION

This Workplan provides delineation of the Interim Measure Interim Remedial Action (IM/IRA) for Operable Unit No. 2 (OU 2) within a portion of the South Walnut Creek drainage basin. These surface waters, posing no threat to public health and the environment, are treated at Pond C-2 prior to discharge off-site for removal of volatile organic contaminants and suspended particulates to which radionuclides, if present, are likely to adsorb. Implementation of this IM/IRA will mitigate downstream migration of these contaminants to Pond C-2.

This IM/IRA provides for collection of surface water from stations SW-59, SW-61 and SW-132 except during periods of abnormally high flow. Treatment will employ chemical treatment/membrane microfiltration for removal of radionuclides and granular activated carbon (GAC) units for removal of organic materials. Treated waters will be returned to South Walnut Creek.

Testing of the treatment is to be conducted in field scale equipment to conserve time and resources. Bench-scale testing will be avoided because surface water contamination levels are below target treatment levels currently. Also, treatment process capability is "robust" and can reliably be increased to treat levels of contamination for which they were designed.

These events are governed by the IAG schedule. Field treatability testing began in May, 1991, using the GAC unit alone; the scheduled date for operating the entire system including chemical treatment/cross-flow filtration is October 30, 1991. IAG milestones also include draft and final Treatability Test Reports scheduled for April 2 and June 2, 1992, respectively.

This Workplan (Version 1.1) describes the objectives and approaches to the complete field treatability program in detail. Included are descriptions of surface water characterization, test objectives, test procedures and evaluation methods applicable to surface waters and residuals.

To conserve text, extensive reference is made to the Surface Water Interim Measures/Interim Remedial Action Plan/Environmental Assessment and Decision Document and also other applicable documents, including the Quality Assessment Project Plan (QAPjP), the Quality Assurance Addendum (QAA) Version 2.4 and Sampling and Analysis Plan (SAP) dated April 1991, the Health and Safety Plan (H&P) and the Operating and Maintenance (O&M) Manual, dated May, 1991.

2.0 PROJECT BACKGROUND AND SCOPE

This section presents an overview of the Workplan for conducting the treatability studies with the surface waters of interest. Included are:

- Surface water characterization data and requirements for treated effluent
- Descriptions of treatment technology to be applied
- Estimates of residuals to be generated from treatment

Subsequent sections describe test objectives, equipment, procedures, analysis of results. Related documentation concerning Project Management, Health and Safety, Quality Assurance, Sampling and Analysis and Operation an Maintenance manuals are incorporated by reference. Also, background information is to be found in the IM/IRAP. Final reporting and other schedule milestones are present in concluding paragraphs.

As noted, the GAC units were placed in service in mid-May. Operating data is being newly acquired and may lead to "late" modification of this workplan.

2.1 Characterization and Flow

Table 1 presents the design basis for the surface water treatment plant. The influent constituent concentrations presented are estimated from a flow-weighted maximum concentration model based on the maximum constituent concentrations observed at the SW-59 and SW-61 collection points. Unfortunately, concentration data for station SW-132 were not gathered until recent months, thus data for this discharge were not available for use in the treatment system design model. The water quality characteristics of this stream were assumed to be similar to that

TABLE 2-1

BASIS FOR DESIGN OF SURFACE WATER TREATMENT PLANT

	Units	Influent Concentration[a]	Effluent Requirements[b]
Organics			
1,1-Dichloroethene	µg/	142	7
1,1-Dichloroethane	µg/	6	1U*
1,2-Dichloroethene (total)	µg/	10	1U*
Chloroform	µg/	82	1U
Carbon Tetrachloride	µg/	219	5U
Trichloroethene	µg/	153	5U*
Tetrachloroethene	µg/	279	1U
Dissolved Metals			
Beryllium	mg/	0.0053	0.1
Manganese	mg/	0.5790	0.050
Strontium	mg/	0.8396	0.396**
Tin	mg/	0.9036	0.100
Total Metals			
Aluminum (Al)	mg/	25.1214	0.2U
Antimony (Sb)	mg/	0.0655	0.060
Barium (Ba)	mg/	1.8530	1.000
Beryllium (Be)	mg/	0.0519	0.1
Cadmium (Cd)	mg/	0.0132	0.01
Chromium (Cr)	mg/	0.1918	0.05
Cobalt (Co)	mg/	0.1232	0.050
Copper (Cu)	mg/	0.2664	0.2
Iron (Fe)	mg/	183.9643	1.000
Lead (Pb)	mg/	0.1954	0.05
Lithium (Li)	mg/	0.4100	2.500
Manganese (Mn)	mg/	3.3068	1.000
Mercury (Hg)	mg/	0.0022	0.002
Molybdenum (Mo)	mg/	0.1574	0.100
Nickel (Ni)	mg/	0.2239	0.2
Selenium (Se)	mg/	0.0070	0.01
Strontium (Sr)	mg/	0.8600	0.382**
Vanadium (V)	mg/	0.5019	0.1
Zinc (Zn)	mg/	1.3475	2.0

TABLE 2-1 (cont.)

BASIS FOR DESIGN OF SURFACE WATER TREATMENT PLANT

	Units	Influent Concentration[a]	Effluent Requirements[b]
Dissolved Radionuclides			
Gross Alpha	pCi/	20.11	11
Gross Beta	pCi/	39.90	19
Total Uranium	pCi/	9.96	10
Total Radionuclides			
Gross Alpha	pCi/	730	11
Gross Beta	pCi/	545	19
Plutonium 239,240	pCi/	3.28	0.05
Americium 241	pCi/	0.53	0.05
Total Uranium	pCi/	11.69	10

* No ARAR standard exists for this constituent; effluent requirement is TBC concentration, considered as an IM/IRA treatment goal.

** No ARAR or TBC standard exists for this constituent; effluent requirement is background concentration, considered as an IM/IRA treatment goal.

a The influent concentrations are based on flow-weighted maximum concentrations of collection stations. The calculation is explained in detail in the IM/IRAP.

b Based on Applicable or Relevant and Appropriate Requirements (ARARs). The "U" designation following many of the effluent concentrations indicates that the concentration is the detection limit for that constituent.

at SW-61. Initial data on alpha and beta activity suggest that the assumption was valid. A plan view of the collection system is presented in Figure 2-1.

Flow estimates are developed in the decision document. Treatment system capacity is provided at 60 gpm.

Strict application of the flow weighted concentration model predicts vinyl chloride, methylene chloride and acetone influent concentrations above their respective ARAR values. However, examination of the detailed surface water data reveals that these constituents are not likely to be present in the influent at levels above ARAR. Vinyl chloride, methylene chloride and acetone were detected at levels above ARAR only at stations SW-56, SW-60 and SW-101. Contaminated surface water from these stations will be collected at the downstream station SW-61 where vinyl chloride, methylene chloride and acetone have always been estimated below detection limits and/or were also present in the associated laboratory blanks. These compounds, therefore, have not been included in the basis for design of the surface water treatment plant.

2.2 Treatment System Description

This section of the Workplan describes the treatment system which provides, sequentially, for collection and equalization, removal of radionuclides as suspended or precipitated material by chemical precipitation/membrane filtration and finally removal of VOCs by sorbtion on granular activated carbon (GAC). A flow diagram is shown in Figure 2-1.

2.2.1 Collection and Equalization

As shown in Figure 2-2, surface water will be collected at three locations, SW-61, SW-59, and SW-132. Each location will be equipped with a precast reinforced concrete catch basin inside of which will be a stainless steel pump controlled by a float switch. The collected surface water will be pumped from the basins to a 10,000 gallon equalization tank.

Coll.
Points

PROCESS
SHEET.

The tank will be constructed of cross-linked polyethylene, and will be fitted with inlets and outlets at the top and bottom, respectively. The tank will have a manway with a threaded lid on top to allow access. A vent will be fitted with a vapor-phase GAC unit. Product levels within the tank will be continuously displayed inside the trailer. This indicator will provide both visible and audible alarms at 5 percent, 90 percent, and 95 percent capacities to alert the operator of low level, high level, and overflow potential, respectively. The tank will be anchored in accordance with RFP Standard SC-106, Rev. E, for Important-Low Hazard Seismic Loading. Flow to and from equalization will be recorded.

The process systems will be contained in 48' x 8'6" trailers. The flow of treated effluent will be controlled and indicated by a flowmeter located downstream of the final treatment units.

2.2.2 Precipitation/Membrane Filtration

Water will be pumped from the equalization tank to three stirred reactor vessels sequentially. In the first, coagulant iron (ferric) salt will be admixed by transfer of prepared liquid feed from an adjacent "day tank." Flow will be repumped to the second tank in which the pH will be raised to alkaline conditions by addition of lime slurry transferred from a day tank. In the third tank, flocculant aid will be added under conditions of gentle stirring so as to create agglomeration of floc particles. This precipitate will be pumped continuously through the membrane filter and back to a decanting vessel from the bottom of which solids will be withdrawn to maintain the desired solids concentration in the feed transferred to the membrane filter. Solids (in slurry) will be withdrawn from the bottom of the decanter and sent to a settling vessel from which supernatant will be returned to the head of the process and solids will be pumped to a plate-and-frame filter.

Filtrate from the membrane units will be repumped and transferred to the final treatment downstream. Periodic backwash water and sterilizing washwaters from the membrane filters will be returned to the equalization vessel. The former backwash may be required to free the membrane of fine particles which become embedded and "plug" the pores. The latter washwater may be required periodically to remove biological growth from the membrane if it occurs and causes "sliming." Dilute sodium hypochlorite will be used for this purpose.

2.2.3 Granular Activated Carbon (GAC) Treatment

Filtered membrane filter effluent will be transferred to a storage tank at atmospheric pressure. The filtered solution will be pumped to Granular Activated Carbon (GAC) units which will be two individual 2,000-pound carbon adsorption units placed in series, with two additional units on line in series to allow continuous treatment if the lead carbon vessel becomes ineffective in removing contaminants. The carbon units utilize a down-flow design, with screened discharge to retain the carbon within the vessel. All wetted parts will be constructed of type 316 stainless steel. The vessels will be skid mounted and will be connected to the system by quick release couplings and teflon lined hoses to facilitate removal and replacement.

Treated water will be returned to South Walnut Creek immediately downstream from SW 132 through schedule 80 PVC piping. Recirculation lines will be provided to return the treated water to the tank or redirect it through the system for backwashing operations.

All piping, fittings, and couplings will be constructed of treated schedule 80 PVC. Ball valves will be true-union type with teflon seats and elastomeric backing cushions (also teflon). Gate valves will be constructed of PVC. Piping will be supported by rigid steel framework which will be sectional to allow segmented removal for modifications or repair.

2.3 Management of Residuals

The generation of residuals is an expected occurrence in that design and operation of the treatment system provides for their accumulation and removal. The generation of "product" solids is estimated at 1 barrel per day. The extent to which even minor quantities of other residuals may be encountered is presently unknown. Specifically, accumulation of other solids requiring disposal may occur as follows:

- Collection/Flow equalization system
  - Sediments may collect in the tank bottom
- Coagulation/Flocculation System
  - Residuals in aquous media flow to the filters
  - If organic vapors are emitted, a gas collection system could be required. Vapor phase GAC adsorbption would be a possible residual in this event.
- Membrane filtration
  - Solids will be returned to the decanter along with backwash waters
  - Sterilizing washes will be returned to the equalization vessel
- Decanter Vessel
  - Solids will be discharged to the settling vessel
- Final Settling Tank/Plate and Frame Filter
  - Settling tank supernatant will be returned to the equalization vessel; solids will be flushed to feed the filter
  - Filter effluent will be returned to the equalization vessel
  - Filter solids, combined with filter cake and filter cloth (and filter aid, if any is used) will constitute the bulk of the residual from the system.
- GAC System
  - Solids which pass through the membrane filters and are retained on the GAC, then backwashed into the flow equalization tank
  - Possible radionuclide accumulation on the GAC which complicates its ultimate disposal as a "mixed waste"
  - Possible biological floc accumulation on the GAC

Generation of liquids which require disposal is limited to purge water at sample taps during taking of samples. This water can be returned to the flow equalization tank along with backwash water.

The contribution of personal protection equipment (PPE) will be minimal, since Level D personnel attire is planned. Minimal trash or broken or expendable items of sampling materials is envisioned.

3.0 TREATABILITY TESTING OBJECTIVES

The primary objective of this IRA is to determine the effectiveness of the treatment system as a hole in removing radionuclides and volatile organic compounds from the surface water flows tributary to South Walnut Creek. Associated with this objective is the criterion of reproducibility of results.

There are several secondary objectives associated with elements of this treatment system (subsystems).

- For the collection/equalization subsystem, determining improved characterization of the flows influent to the Field Treatability Unit (FTU).
  - Flow rate
  - Analyte and water quality characteristics
  - VOC breathing losses
- For the precipitation subsystem, determining:
  - Dosage of coagulant, mixing and residence time
  - Dosage of precipitation agent, pH, mixing conditions and residence time
  - Dosage of flocculating agent, mixing conditions and residence time
  - Presence of VOCs in head space of reactor vessels
- For the crossflow membrane filtration subsystem, determining:
  - Appropriate solids concentration in influent to the membrane filter
  - Solids removal rate from the decanter
  - Appropriate flux rate through the filter
  - Backwashing cycle, pressure drop
  - Possible accumulation of slimes, removal methods and cycles.
- For the dewatering vessel, determining:
  - Settling times
  - Need for sludge conditioning
  - Presence of VOCs in the head space

- For the plate and frame filter, determining:
  - Operating conditions, pressure drop, cycle time
  - Characteristics of filter cake (water content, density, radioactivity, VOC content, washability and quantity)
- For the GAC system, determining:
  - Breakthrough and cycling of columns
  - Backwashing requirements, if any
  - Sterilizing requirements, if any
  - Accumulation of radionuclides, if any
  - Operating conditions, column cycling and breakthrough

Technical objectives and associated data quality objectives (DQOs) for this IRA are as specified in the QAA (Version 2.4) and the Sampling and Analysis Plan (SAP). These will be met by sampling and analysis of water and solids at myriad points within the FTU as presented in the SAP. Pressure drop measurements will be used in addition to gauge filter effectiveness, backwash requirements and to identify possible bio-fouling problems at various points in the system.

As specified in the SAP, data validation is not required nor contemplated. Data will be inputted to the RFEDS system.

4.0 TEST EQUIPMENT

No special test equipment is contemplated, provided design conditions are easily achieved. If jar testing with a small water side-stream appears expedient to try alternate coagulants, flocculent aids or filter aids for conducting the precipitation, minor test equipment would be needed. Also, if improved carbons are sought, then a small, water side-stream will be diverted to test alternative GAC columns for evaluation. These procedures are well documented in the literature if needed.

5.0 TEST PROCEDURE

The SAP details the specifics of sampling and analysis as well as requirements for measurement of field parameters. The O&M manual details requirements for measurement of flow, pressure and liquid level at various points in the FTU.

6.0 ANALYSIS OF RESULTS

The effectiveness of the field treatability unit will be measured in terms of reliably achieving design performance in effecting removals of contamination. Measures of effectiveness will also be applied to the subsystems which comprise the FTU. Relevant operational parameters for each are shown in Table 6-1 together with associated variables used in determining effectiveness.

6.1 Total System Effectiveness

Performance measurement will be based on removals and approach to ARARs using average values of influent and daily composited effluent samples for VOCs and radionuclides. Values of both VOCs and radionuclides are expected to be very low, essentially near detection limits (DLs) and minimal detectable activity (MDA). Statistical comparisons of means will therefore be necessary to determine treatment effectiveness. Comparisons will be performed using analysis of variance and Duncan's multiple range test.

6.2 Collection, Equalization and Return Flow Conveyances

Evaluation of mechanical system performance will provide a straightforward assessment of system reliability. Averaging of flows and contaminant concentrations into the equalization tank will permit better comparison of design options by refining knowledge of presence and levels of contamination.

6.3 Coagulation System

Use of ferric sulfate is contemplated, however other reagents could be employed depending upon the performance of the integrated precipitation/flocculation/filtration system. An initial dose rate of 20 ppm ferric ion is planned.

TABLE 6-1

ANALYSIS OF RESULTS

Sub-system	Parameter	Reference	Determination
Entire Field Treatability			
	Total System Unit Effectiveness	SAP	(1) Attainment of ARARs (2) Comparison of influent v. Effluent quality (3) Reproducibility of results (4) Apply statistical analysis if data from (1) and (2) warrant
		O&M	(5) Per cent system outage
Collection/Equalization			
	Characterization of influent	SAP O&M	(1) Periodic sampling and guaging of equalization vessel contents
	Pump outage	O&M	(1) Per cent availability v. "demand"
	System integrity	O&M	(1) Leak detection sensor reading
	Breathing losses of VOCs through tank vent	SAP	(1) Analysis of vapor phase GAC trap
	Accumulation of sediments in tank bottom	O&M	(1) Inspection

TABLE 6-1 (cont'd)

Sub-system	Parameter	Reference	Determination
Coagulation Addition			
	Coagulation dose, mix time agitation	SAP O&M	(1) Sampling, guaging of reagent day tank
	VOCs in head space	O&M HSP	(1) HNU sampling of head space
Precipitation			
	Precipitant dose mix time, agitation	SAP O&M	(1) Analytes of concern (2) pH (ORP?) (3) Sampling of reagent day tank (4) Field parameters (TSS)
	VOCs in head space	O&M HSP	(1) HNU sampling of head space
Flocculation			
	Flocculant dose, mix time agitation	SAP O&M	(1) Analytes of concern (2) Field parameters (TSS) (3) Settling characteristics
	VOCs in head space	O&M HSP	(1) HNU sampling of head space
	Flocculant aid	SAP	(1) Consider sludge conditioner

TABLE 6-1 (cont'd)

Sub-system	Parameter	Reference	Determination
Crossflow Membrane Filter			
	Removals	SAP	(1) Influent v. effuent quality for analytes of concern
	Performance	O&M	(1) Flux (2) Pressure and pressure drop (3) TSS in feed
	Backwash	O&M	(1) Interval, duration
	Possible Sterilization	O&M	(1) Slime accumulation (inspection) (2) Cleaning solution dose, duration
Dewatering Vessel			
	Solids removals	O&M	(1) Settling times (2) Need for conditioning
	VOCs in head space	O&M HSP	(1) HNU sampling of head space
Plate and Frame Filter			
	Solids removal	O&M	(1) Pressure and pressure drop (2) Effluent quality for analytes of interest (3) Field parameters (TSS) (4) Cycle time (5) Associated cake thickness

TABLE 6-1 (cont'd)

Sub-system	Parameter	Reference	Determination
			(6) Filter characteristics (water content, density, radionuclide content, VOC content, washability to remove VOCs)
pH Adjustment			
	pH	O&M	(1) pH of treated membrane filter effluent
GAC			
	VOC removal	SAP	(1) Determination of the variation of organic concentrations of influent and effluent for the lead and lag columns with time at specified residence times (2) Determination of breakthrough in terms of throughput volumes at specified residence times (3) Initiate side stream bench-scale scale testing with alternative carbon if warranted (4) Reproducibility of results obtained in (1) and (2) (5) Apply statistical analysis if data from (1), (2) and (4) warrant

TABLE 6-1 (cont'd)

Sub-system	Parameter	Reference	Determination
	Sediment Accumulation	O&M	(1) Increase in pressure drop across the units will be cause to backwash the GAC column.
	Backwashing	O&M	(1) The duration of backwash required to effect a return to previous pressure drop will be taken as a measure of backwashing effectiveness. (2) Any hysteresis will be noted and (a) scouring improved or (b) inspection conducted to observe bio-fouling.
	Biofouling	O&M	(1) If determined to be present by inspection, (a) disinfection will be conducted with dilute sodium hypochlorite (household bleach) and (b) backwashing testing will be repeated
	Radionuclide Contamination		(1) If occurring, can only be deter mined by radionuclide analysis. (2) Specific analytes will be identified. (3) Alpha and Beta measurements may, however, be used for screening

6.4 Precipitation

Use of 5% lime slurry is planned to attain pH 9.5 using rapid mixing conditions and approximately 20 minutes holding time initially. Limestone could be economically preferred and therefore will be evaluated in jar tests.

6.5 Flocculation

A variety of flocculating agents are available to hasten particle agglomoration, settling and sludge stability. Initially, a cationic polymer will be used. Use of clays and sludge conditioners will be considered depending upon initial results. Use of jar tests is an easily available option using simple equipment in accordance with well documented procedures.

6.6 Crossflow/Membrane Filter

Evaluation of filtration rate is straightforward at rated system pressures and pressure drops across the unit. Backwashing and the possible need for using cleaning solutions will be evaluated but are not expected to be of concern.

6.7 pH Adjustment

Effluent from the fiter will require pH adjustment to permit reintroduction to South Walnut Creek. Use of hydrochloric acid from a day tank into a stirred reaction vessel will adjust pH to 7.0.

6.8 Dewatering

There is concern that precipitates of metal hydroxides may, because of their flocculant nature, sorb VOCs at various points in the precipitation/flocculation/dewatering process and subsequently create fugitive emissions. An air cleaning unit may be required to handle all these sources if this happens and measurement of ambient air indicates a concern for health and safety.

6.9 Plate and Frame Filter

Evaluation will be straightforward. Filter cake generation rate, under conservative conditions, will produce as estimated 4cfd. This quantity, if filter aid is not required, will cause a 20 sf filter to be cycled 4 times per day.

6.10 GAC Treatment

The evaluation of removals of VOCs and of carbon loading is straightforward, and, as mentioned, because of the approach of organic values in treated effluent to near DL values, statistical analysis as earlier referenced is warranted.

7.0 REPORTING AND SCHEDULE

In addition to the draft and final Treatability Test Reports required by the IAG, monthly progress reports will detail the work being conducted hereunder.

In addition, the following milestones have been established for this IRA:

GAC Sub-System Startup	May 13, 1991
Complete Treatability System Startup	October 30, 1991
Draft Treatability Test Report	April 2, 1992
Final Treatability Test Report	June 2, 1992

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