RED TOP MERCURY REPORT SAMPLING AND ANALYSIS PLAN NEAR DILLINGHAM, ALASKA

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TABLE OF CONTENTS

PAGE

I. INTRODUCTION

A. Introduction

This Contamination Assessment and Phase I Remedial Action Plan (Plan) has been prepared by the Anchorage District of the Bureau of Land Management for submittal to the Alaska Department of Environmental Conservation (ADEC). This Plan provides a comprehensive site characterization plan and a QA/QC plan for sampling of soils & water; laboratory analytical methods with QA/QC plan; plans to contain bunker C oil drums if showing evidence of leakage and contaminated soil treatment and/or disposal plans for both mercury and petroleum contaminated soils.

All work will be accomplished by contractor under BLM's Statewide contract. Our contractor will have an ADEC approved Quality Assurance Program Plan (QAPP) and a Health and Safety Plan. The Contamination Assessment and Phase I Remedial Action Plan with ADEC approval will in effect become our contractors Statement of Work.

The field work will be accomplished under two work plans. The first work plan, Site Characterization, is planned for late May or early June 1993 and task orders for that plan will be issued to BLM's Statewide Contractor in May. The second work plan, site remediation, which addresses soil treatment and/or disposal, is planned for August 1993 and task orders for that stage are planned for BLM's Statewide Contractor later in the summer.

B. Notice of Violation Requirements

This Plan and the field and laboratory work described herein are provided to satisfy the requirements set forth in the ADEC Notice of Violation (NOV) letter dated December 21, 1992 (see Appendix C). The NOV requires BLM to prepare and submit a Contamination Assessment and Phase I Remedial Action Plan to ADEC for review and approval. This plan will include:

- A brief project background description and an explanation of the purpose and the scope of work;
- A detailed account of the sampling program for mercury and petroleum contaminated soils and water explaining the types of field procedures used in the completion of this project;
- Site location information including diagrams depicting proposed sampling locations and depths:
- Analytical methods and QA/QC procedures employed to evaluate the accuracy and precision of the performed analyses and development of a Treatability Analysis; and;

- Development of a Cleanup Action level;
- Proposed alternatives for contaminated soil treatment and/or disposal plans for both Mercury and petroleum contaminated soils.

Based on the results of the ADEC sampling which indicated that a reportable quantity (RQ) may have been released to the environment, BLM reported this site to the National Response Center (NRC) on January 4, 1993. The NRC assigned report number 151600 to this site. This project is considered to be a short term removal action under the National Contingency Plan (NCP).

This plan is intended to fulfill all of the requirements set forth by the NOV.

II. PROJECT DESCRIPTION

A. Background

The Red Top Millsite (ie Retort Site) is a building (shack) approximately 12 feet wide by 16 feet long and is located in the Wood River floodplain approximately 30 feet inland from the river bank and 3 to 4 feet above the river level at low stage. The shack and retort equipment are situated in an area where the natural vegetation and organic layer were pushed aside so that construction would be on a gravel base. According to the sketch that was prepared by the ADEC during their Fall 1992 visit, the shack is about 45 feet from the eastern edge of the tidally influenced Wood River. The Wood River is about 500 feet wide and has a relatively flat gradient between tidewater (downstream) and Lake Aleknagik (upstream). The Wood River floodplain is less than 500 feet wide at the site and the area appears well drained with no side channels, ponds or wetlands present. There is a small unnamed stream about 400 feet south of the site. The fact that the 13 petroleum barrels have remained in place immediately inland from the river bank for some 40 years indicates that this is not an active floodplain. Groundwater flow direction is assumed to follow the general contours of the Wood River Valley toward Nushagak Bay to the south. The nearest well is most likely 1.5 miles upstream of the site in the village of Aleknagik. According to USGS maps there is no development on the east side of the river and downstream of the site. Access is by air to Aleknagik or Dillingham and then by boat from Aleknagik which is about one and a half miles northwest of the site or from Dillingham which is about sixteen miles southwest of the site. A small airstrip and trail from Aleknagik were originally used to provide

access but both are now probably unuseable for purposes of this project. This is a remote area and electricity, communications, water, sewage, shelter and medical facilities are not available at the site.
See Site Location Map [Appendix A - Plate 1] & DRAFT Site Background Report [Appendix B].

In the early 1940's miners discovered cinnabar in Arcana Creek and traced the source to the top of Marsh Mountain which is about one mile east of the retort site. A ball mill was constructed on top of Marsh Mountain and the cinnabar ore was crushed there and then transported to the retort site for further processing. A small Mercury retort operation was conducted at the site shortly after world War II and a total of about 25 flasks (75 lb/flask) of mercury was produced.

The retorting was very basic and was accomplished by removing the top of the retort, placing the cinnabar ore within the retort, replacing the top, then cooking the ore with a wood fire. The vaporized mercury would condense out on the sides of the condenser tube and collect at the bottom, where a valve was placed allowing the removal of essentially pure liquid mercury. The top would again be removed and the spent ore removed and replaced with fresh ore. Retorts are generally very effective at removing the mercury, with reported efficiency in the order of 99 percent. The 1150 gallons of Bunker C oil that was left on the site was apparently going to be used for a more sophisticated retort operation that was never developed. For all practical purposes all mining activity ceased at the retort site in the mid 1950's.

B. Scope of Plan

The primary objectives of this plan are to identify the location of all contaminant sources at Red Top Retort Site and to characterize the nature and extent of contamination at the Site for the purposes of selecting an appropriate remedial response this summer. Potential pathways include surface and ground water; atmospheric emmissions and direct onsite contact. Accordingly the following list details the specific sampling objectives at each known and/or suspected contaminant source at the Site:

- Determine the physical characteristics of on site soils, including grain size distribution, organic matter, moisture content, permeability, PH, EH and redox potential;

- Determine the lateral and vertical extent of total and TCLP mercury contamination in soils within and surrounding the retort shack;

- Determine the presence of mercury contamination in surface and groundwater downgradient from the retort shack;

- Determine surface water, groundwater and soil background level;

- Determine the leachability of the mercury through TCLP analysis (40 CFR 261.24);

- Determine through a regression equation the correlation between total and TCLP mercury;

- Based on sampling analysis determine total mercury cleanup action level;

- Determine through the treatability analysis most appropriate treatment alternative;

- Determine the extent of petroleum soil contamination, if any, and provide containment and removal plan for petroleum drums.

To accomplish these objectives, the following general field activities will be conducted during characterization:

- Wipe, building and brick samples will be collected from the retort shack;

- Surface and subsurface soil samples will be collected in and around the retort shack and analyzed for total mercury, TCLP mercury and hydrocarbons;

- Groundwater samples will be collected from a test boring upgradient of the retort shack and analyzed for total mercury (Plate 3 - Appendix A);

- Background soil, surface and groundwater samples will be taken upgradient of the site;

- Bulk soil sample of mercury contaminated soil will be taken from the retort shack area and a soils and treatability analysis will be conducted;

- Characterization contractor will inspect retort furnace for most appropriate method for dismantling and removal of free mercury during the remediation phase later in the summer; and

- Samples area will be field screened with a Mercury Vapor Analyzer and all mercury characterization samples will be analyzed at an off-site laboratory.

C. Previous Investigation Information

The organization Greenpeace and the ADEC made separate visits to this site in the Fall of 1992.

The Greenpeace Report is provided in Appendix D and the ADEC sampling results are provided in Appendix A - Plate 2. As can be seem from those samples, total mercury concentrations were found to be exceedingly high directly below a broken retort pipe (51,400 ppm by Greenpeace & 38,000 ppm by ADEC) and lesser concentrations were found in and immediately adjacent to the retort shack. Concentrations deceased with distance from the retort shack to low concentrations or non detectable concentrations at the sample points near Wood River 30 feet away. Water samples taken from the Wood River by Greenpeace detected no mercury.

Both Greenpeace and ADEC samples were analylized for total mercury, so the percentage of man caused free inorganic mercury and the leachability (TCLP) of both the free mercury and the mercury in cinnabar is unknown at this time.

III. SAMPLING PROGRAM

A. Soil Sampling for mercury at the Red Top Retort Site will be in accomplished in May/June 1993. Prior to entry and during any period when heat is being introduced to the area (fire, welder, torch etc.), the area will be field screened with a Mercury Vapor Analyzer (MVA) to determine areas of high concentrations of mercury vapor. If practical a recording MVA may be positioned downwind of the retort to determine releases to the atmoshere for an extended period of time.

If at any location during a test boring an impervious clay layer is encountered a sample will be taken at the top of the layer and the test boring will cease at that depth. Great care will be taken not to penetrate the clay layer.

If free liquid mercury is observed at the surface of a test boring or during the test boring the free mercury will either be removed by a suction pump or immobilized

with calcium polysulfide or sulfur or other chemicals. Under no circumstances should the test boring become a pathway for vertical migration of the mercury.

A total of 24 test borings will be completed throughout the site for mercury (Plate 3). Test borings 1 through 6 will be drilled to a depth of three feet and test borings 7 through 24 will be drilled to a depth of two feet. Soil samples will be collected from all of these borings at one foot intervals for laboratory analysis.

The 3 foot background testboring upgradient of the retort shack will be drilled to groundwater and soil samples will be taken at one foot intervals. The 3 foot test boring downgradient of the retort shack and adjacent to Wood River will be drilled to groundwater and soil samples will be taken at one foot intervals. Groundwater samples and one duplicate will be obtained from both of these locations (Plate 3 - Appendix A). Upon completion, these test borings will be marked with an identification stake to allow easy relocation of the test boring and backfilled at the completion of the remediation phase of the project.

If a clay layer is not present, fifty four primary soil samples will be collected of which 30 will analyzed by the laboratory during the first phase for total mercury. As soon as the total mercury analysis is available, twelve of the 30 samples will also be selected and analyzed for TCLP mercury. It is important to establish the leachability of the mercury and to determine whether or not there is a direct correlation between total and TCLP mercury at this site. Test borings 1 through 6 will have interval sample sets 0.0 - 1.0 and 2.0 - 3.0 analyzed while the other interval sample set (1.0 - 2.0) will be held pending analytical results from the aforementioned interval sample sets. Samples collected from test borings 7 through 24 will have interval sample set 0.0 - 1.0 analyzed while sample set 1.0 - 2.0 will be held pending analytical results.

Six (10%) Quality Assurance samples will be collected and analyzed in accordance with quality assurance procedures.

A composite sample of kiln bricks will be taken to determine the amount of mercury that has been absorbed during retorting operations. Several bricks will be selected at random, crushed, homogenized, and placed in a sample container. Wipe and material samples will be taken from an area of the retort shack that was closest to the retort and most likely to have been contaminated.

Four surface water samples will be taken from Wood River. One sample will be taken upstream of the retort as a background sample and the other three will be downgradient of the retort.

A bulk sample of several 5 gallon buckets of mercury contaminated soil will be obtained from within the retort shack and soils and treatability studies will be conducted in a laboratory. A homogenious sample will be analyzed for total and TCLP mercury.

A portion of this same homogenious sample will be sent to BLM's Denver Service Center for calibration of their Field Portable X-Ray Fluorescence (FPXRF) Analyzer to determine its adequacy for field use during the remediation phase. Another portion of this same homogenious sample will be analyzed using the enzyme-linked immunosorbent assay (ELISA) method to determine its adequacy for field use during the remediation phase.

Test boring locations, bulk sample location and ground water locations may be changed to meet unexpected field conditions. Proposed test boring locations are provided on Plate 3, Appendix A. ADEC existing (Fall 1992) sampling locations and results are provided on Plate 2, Appendix A.

B. Field Quality Assurance Procedures

This section presents the QA/QC procedures that will be used during the soil, wipe, building material and brick sampling program. The purpose of these procedures is to generate data that are accurate, precise, and that adequately represent soil conditions at the site. All procedures will be consistant with methods contained in "A Compendium of Superfund Field Operations Methods (EPA 1987). A QA/QC plan will be developed by our contractor and a copy will be provided to ADEC.

A portion of the homogenized sample will be placed in a plastic bottle for transport to the laboratory. The bottles will be completely filled and stored in cooler chests in the field. The bottles will be provided by the laboratory and will be prepared using procedures identified in SW-846 (EPA 1986).

Duplicate samples are required by the field QA/QC program and will be prepared using the techniques described above. Ten percent (6) of the total number of Phase I samples will be collected by field personnel to serve as QA/QC samples. These 6 samples will be collected from

different borings and from various depths and will be submitted to the laboratory for analysis based on the QA/QC procedures outlined in the Sampling Plan.

Wipe samples will be taken from sheetmetal walls or wooden structural framing that appears to have been in the most probable location to have been contaminated. If it is not possible to obtain wipe samples chips of wood will be obtained using a stainless steel knife and placed immediately into sample containers. A kiln brick will be taken from the area that is from an area of the kiln that would have most probably been contaminated. The brick or bricks will be placed in plastic bags for off site crushing and laboratory analysis.

Groundwater samples will be collected from a temporary monitoring well that is downgradient of the retort shack (see Plate 3 - Appendix A). Samples will be collected with disposable plastic bailers and transferred directly into a sample container. Conductivity, temperature and PH will be recorded in the logbook. PVC pipe will be inserted into the test boring hole below the groundwater level and a sample will be taken once the well water is free of suspended solids. At the completion of the remediation phase of the project the PVC casing will be removed and the test boring will be filled with grout.

Surface water samples from Wood River will be collected by hand-dipping the sample containers beneath the water surface. An attempt will be made to collect samples containing as little suspended solids as possible.

Two rinseate samples will be taken to insure that the sampling equipment is being decontaminated between sample collection points.

C. Decontamination

Since this project will involve several test borings, a decontamination (decon) area will be identified on-site. Depending upon the site entry monoriting with the MVA and the prevailing wind direction, this area will be placed near ADEC sample points #10 & #11 which is upgradient but close to the retort shack. Our contractor will be required to develop a decontamination plan and ADEC will be provided with a copy of that plan.

The sampling equipment will be decontaminated or disposed of between each sampling effort. If reused it will be washed in a detergent and water solution followed by a freshwater rinse and finally by a distilled water rinse.

Great care will be taken to ensure all of the sampling equipment will be thoroughly cleaned between each sampling effort to avoid cross-contamination of the soil samples. All disposable personal protective equipment along with any materials used for the decon pad, will be containerized and left on-site for future disposal upon completion of the remediation phase.

D. Documentation

Each sample container will be labeled and sealed after collection. Sample identification documents will be carefully prepared so that identification and chain-of-custody records can be maintained and sample disposition can be controlled. The following sample identification documents will be utilized: sample labels, chain-of-custody forms, and test boring drill logs.

Sample Labels

Sample labels will be used to identify the samples. Each label will contain the following information.

- Project number
- Test boring number
- Sample number
- Depth of collection
- Name of collector
- Date and time of collection
- Analysis to be performed

Chain-of-Custody Form

A chain-of-custody form will accompany every sample shipment to the laboratory to establish the documentation necessary to trace sample possession from the time of collection to receipt at the laboratory. The form will contain the following information:

- Project number
- Sample numbers
- Test boring numbers
- Name of collectors
- Dates and times of collection
- Analyses requested
- Signatures of persons involved in the chain of possession
- Inclusive dates and times of possession

The laboratory portion of the form will be completed by laboratory personnel and will contain the following information:

- Name of person receiving the sample
- Laboratory sample number
- Date of sample receipt
- Sample condition (recorded in section labeled "miscellaneous" or "remarks").

Test Boring Drill Logs

Information pertinent to the field investigation and health and safety monitoring will be recorded on the test boring log sheets. Information found on the logs will include the following:

- Project number
- Name of field crew members
- Types of equipment on-site
- Sample collection and measurement methods
- Monitoring equipment readings at each location
- Number and volume of samples taken
- Test boring designation and depth interval
- Description of location reference points
- Date and time of collection
- Sample identification numbers
- Sample description
- Field observations and comments

E. Sample Custody

Our contractor will be required to use standard operating procedures for sample custody. Sample custody will be addressed in detail in the contractors QA/QC plan a copy of which will be submitted to ADEC.

IV. PETROLEUM DRUM PLAN

A. Characterization

If the petroleum drums which reportedly contain Bunker C diesel fuel (Appendix D) are structurally intact they will be uprighted, grouped and placed on absorbant pad in a different location during site characterization. Samples will be taken from each drum and analyzed to confirm that the fuel is Bunker C. The area where the drums were located will be visually inspected to determine if any fuel has been released to the environment and the original location of the drums will be marked by stakes.

If there is evidence of a release to the soil, the area will be field screened using the ELISA method for

petroleum hydrocarbons. If offsite analysis is deemed necessary, samples will be analyzed for halogenated volatile organic compounds (HVOC) and benzene, toluene, ethylbenzene and xylenes (BTEX).

If the drums appear structurally unsafe the area will be visually inspected for release to the soil and samples will be obtained where possible using the above described methods and the problem will be dealt with during remediation.

B. Removal/Disposal Remediation of Contaminated Soil

If the fuel is Bunker C it will be burned on site as a heat source during remediation or disposed of locally to anyone who has a use for that product. If this is not possible the fuel will be removed to Anchorage and disposed of under EPA's oil burning specifications (40CFR 266.40).

If the Bunker C oil has been released to the soil the contaminated soil will be removed and placed in barrels and disposed of in accordance with ADEC standards. ELISA field test kits will be used to determine if all contaminated soils have been removed. Local gravels from the site will be used to backfill the excavated area.

If the barrels can not be moved, they will be heated and the product will be transferred to other drums and the empty drums will be removed from the site during remediation.

V. LABORATORY ANALYTICAL PROGRAM

At this stage BLM is not certain as to what ADEC and EPA certified laboratory will be used to do the analysis or the treatability studies. This section presents a discussion of a suggested laboratory analytical program. A brief discussion of the analytical methodologies is presented in Section V.A.

A. Analytical Methodologies

Previous soil sampling investigations at the Red Top Millsite identified elevated surface soil concentrations of total mercury. Therefore, the laboratory will be requested to analyze the soil samples for total and TCLP mercury by approved EPA methods. The following discussions of the methodologies which were used for total mercury analyses were taken in part from Test Methods For Evaluating Solid Waste (SW846): Volume 14: Laboratory Manual, Physical/Chemical Methods (EPA 1986).

1. TOTAL MERCURY

Analysis of the soil samples for total mercury will be completed according to the criteria outlined by EPA Method 7471 for cold vapor flameless atomic absorption. This procedure calls for a preliminary acid digestion of a 0.2 gram sample in a mixture of pure water and aqua regia. After a short period of heating, potassium permanganate is added, the sample is heated again, and chloride-hydroxylamine sulfate is added.

The concentration of mercury is a sample will be determined by the absorption of 253.7 nanometer radiation by the volatized mercury vapor, as it passed through a standard atomic absorption cell. Concentrations were calculated from a calibration curve. The typical detection limit for this technique per SY846 (EPA 1986) is 0.0002 milligrams per liter (mg/l).

TCLP MERCURY

TCLP analysis will either be TCLP Metals only SW 846, Method 1311 (Chem Lab Test code #12109) or TCLP extraction method 1311 and TCLP Hg metal method 7470.

B. Laboratory Quality Assurance Procedures

Our contractor will be required to have all samples analyzed at a laboratory that has EPA and ADEC certification. Our contractor will be required to submit a copy of the selected Laboratory's Quality Assurance Procedures prior to commencement of work.

C. Evaluation and Interpretation

Our contractor and/or the laboratory will be required to evaluate and interpret the results from the soil, water and air sample analyses and the soils analysis. Key steps follow:

- A risk analysis based on the results of the soil and water TCLP tests and the mercury vapor tests(MVA)will be prepared for this site.

- By using the results of the laboratory analysis and linear regression techniques, we will determine if there is a correlation between total and TCLP mercury at this site.

- A total mercury cleanup action level will be proposed and submitted to ADEC for review.

- A treatability study based on the bulk samples will determine the most appropriate treatment technique. The study will determine which treatment or disposal method (soil washing, concrete binding, chemical binding, retorting or disposal) is the most effective alternative.

VI. MERCURY TREATMENT AND/OR DISPOSAL OPTION ALTERNATIVES

There will be a nationwide mercury landfill ban effective May 8, 1993, so land disposal will be a more difficult and expensive option.

Regardless of which alternative is eventually selected, the first step will be the careful dismantling and retrieval by a suction pump of all free mercury that is located in the retort furnace.

We have reviewed several treatment alternatives and when the results of the site characterization work, BLM will propose a site remediation plan to the ADEC.

APPENDIX A

ILLUSTRATIONS

INDEX

DILLINGHAM, ALASKA

MAP REFERENCE 1954 (REVISED 1972)

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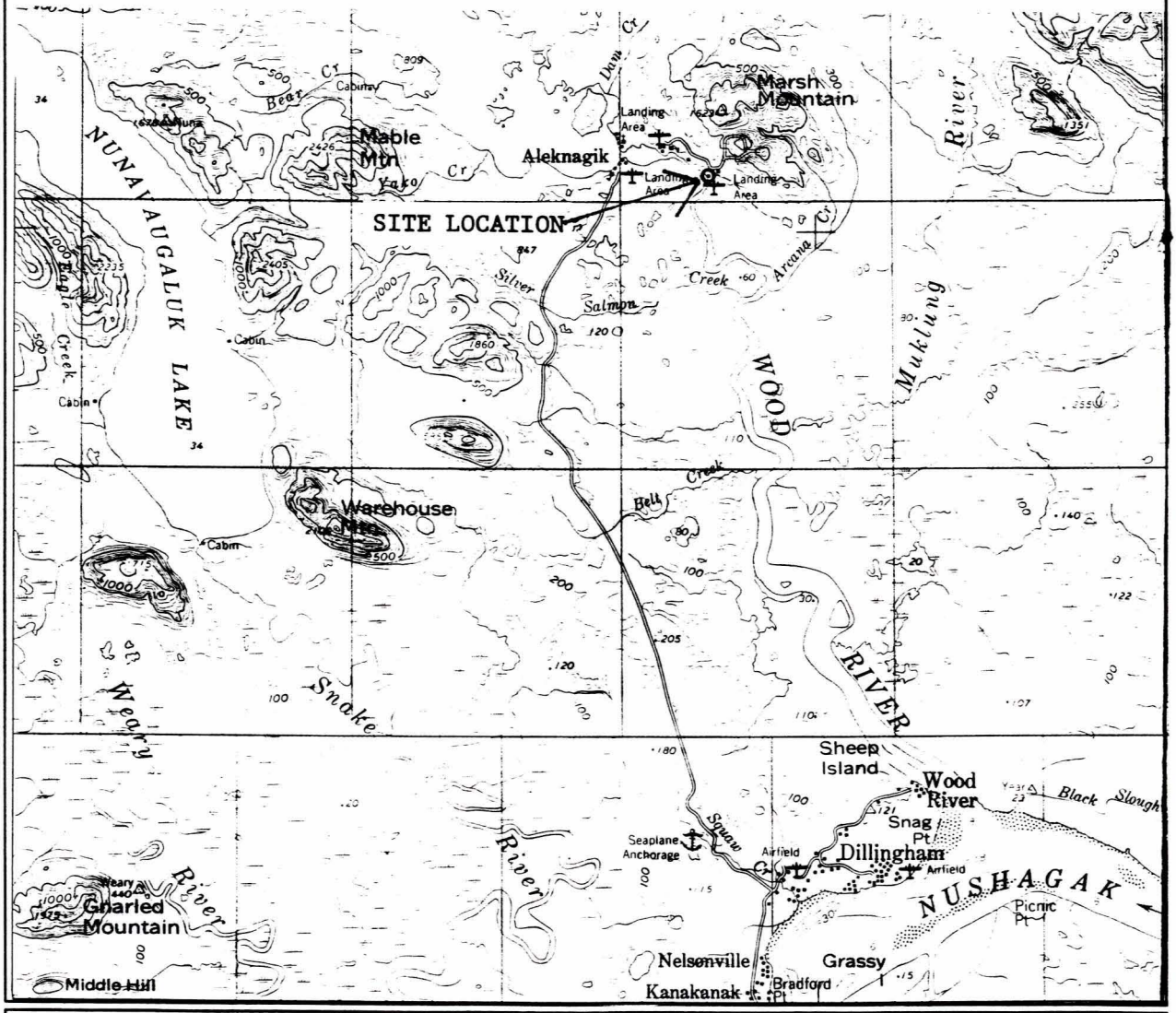
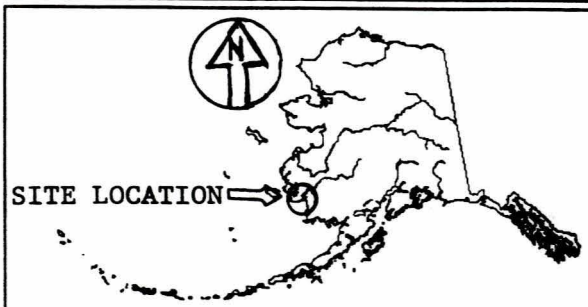




GENERAL SITE LOCATION

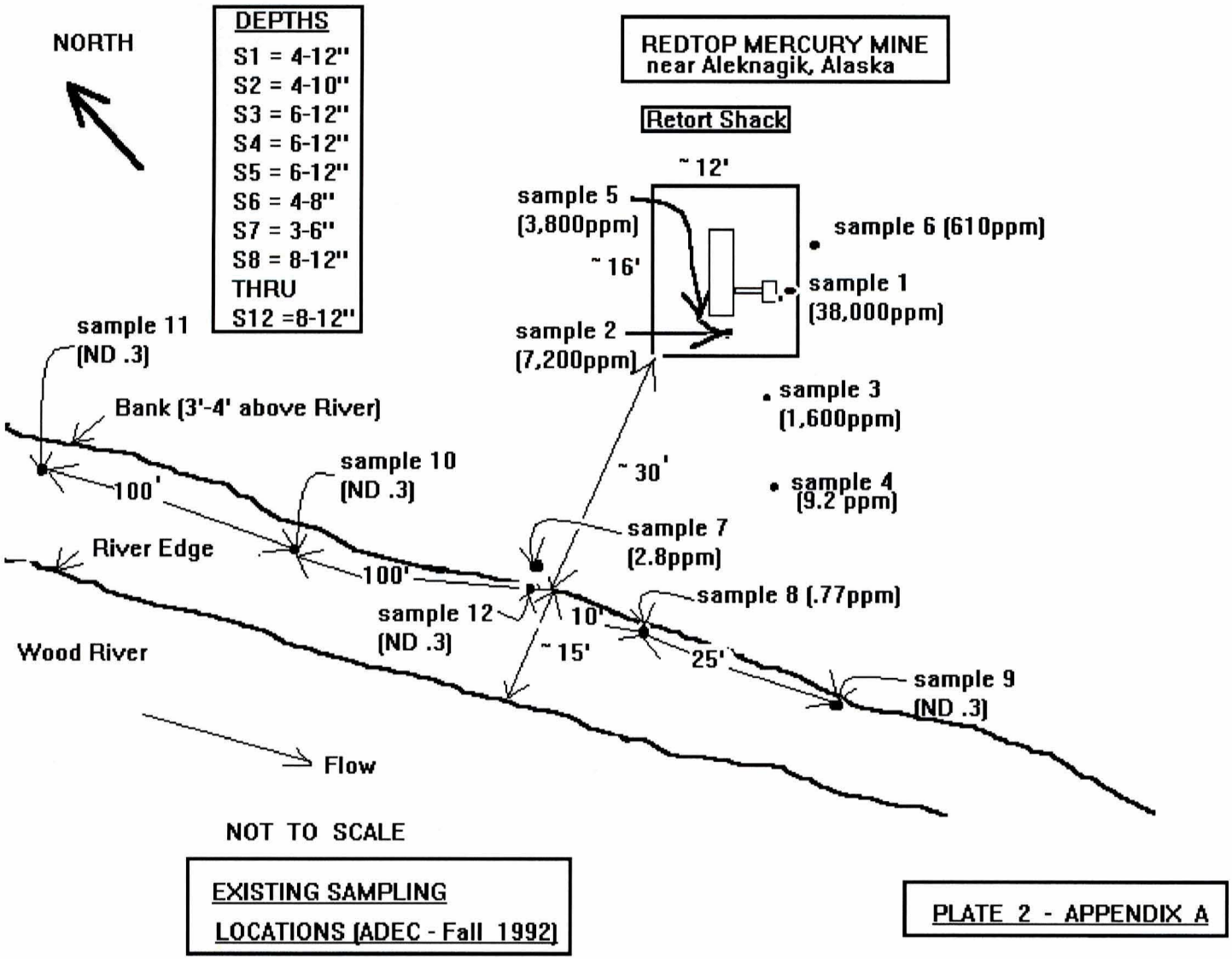
RED TOP MERCURY RETORT

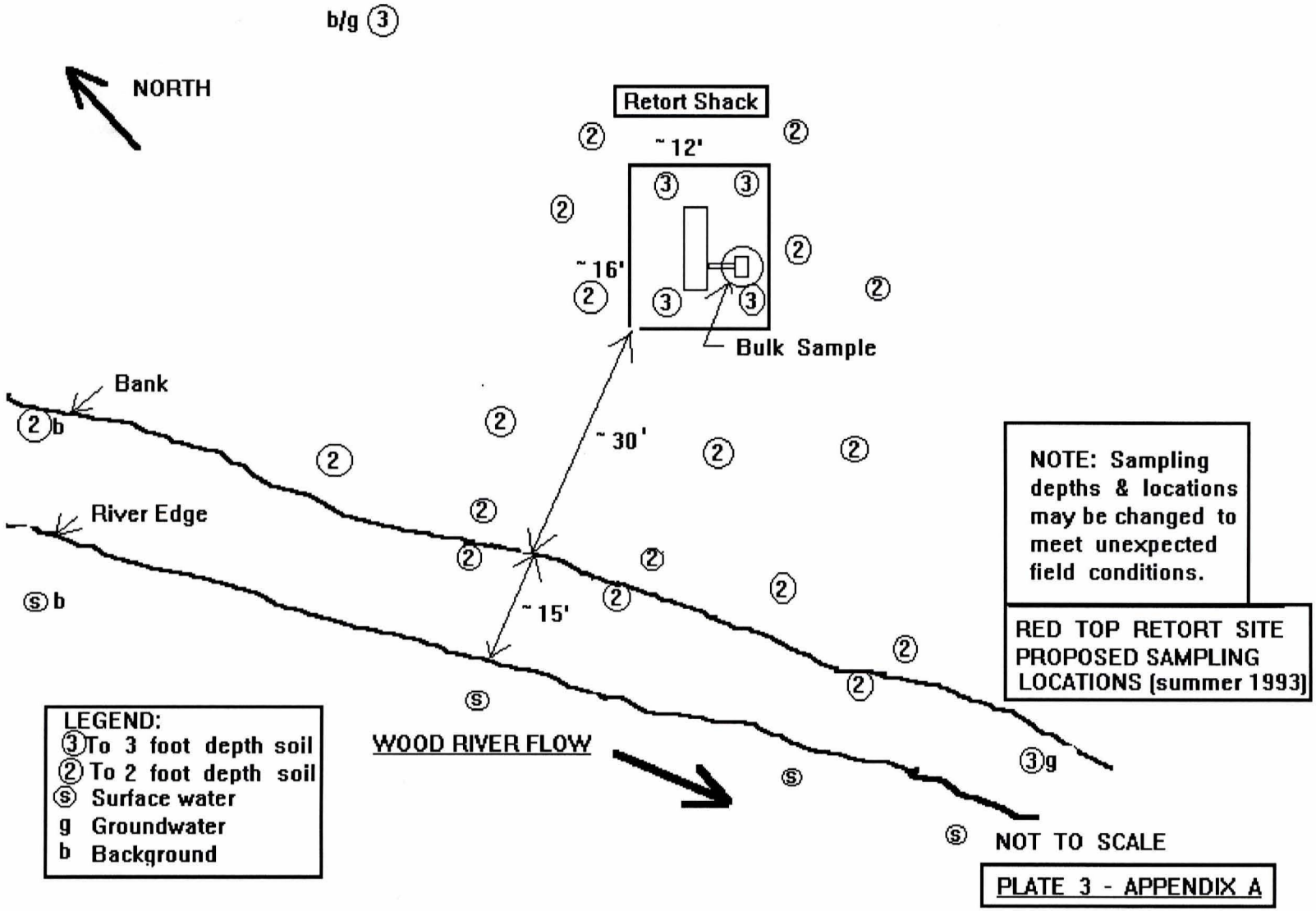
PROJECT SITE

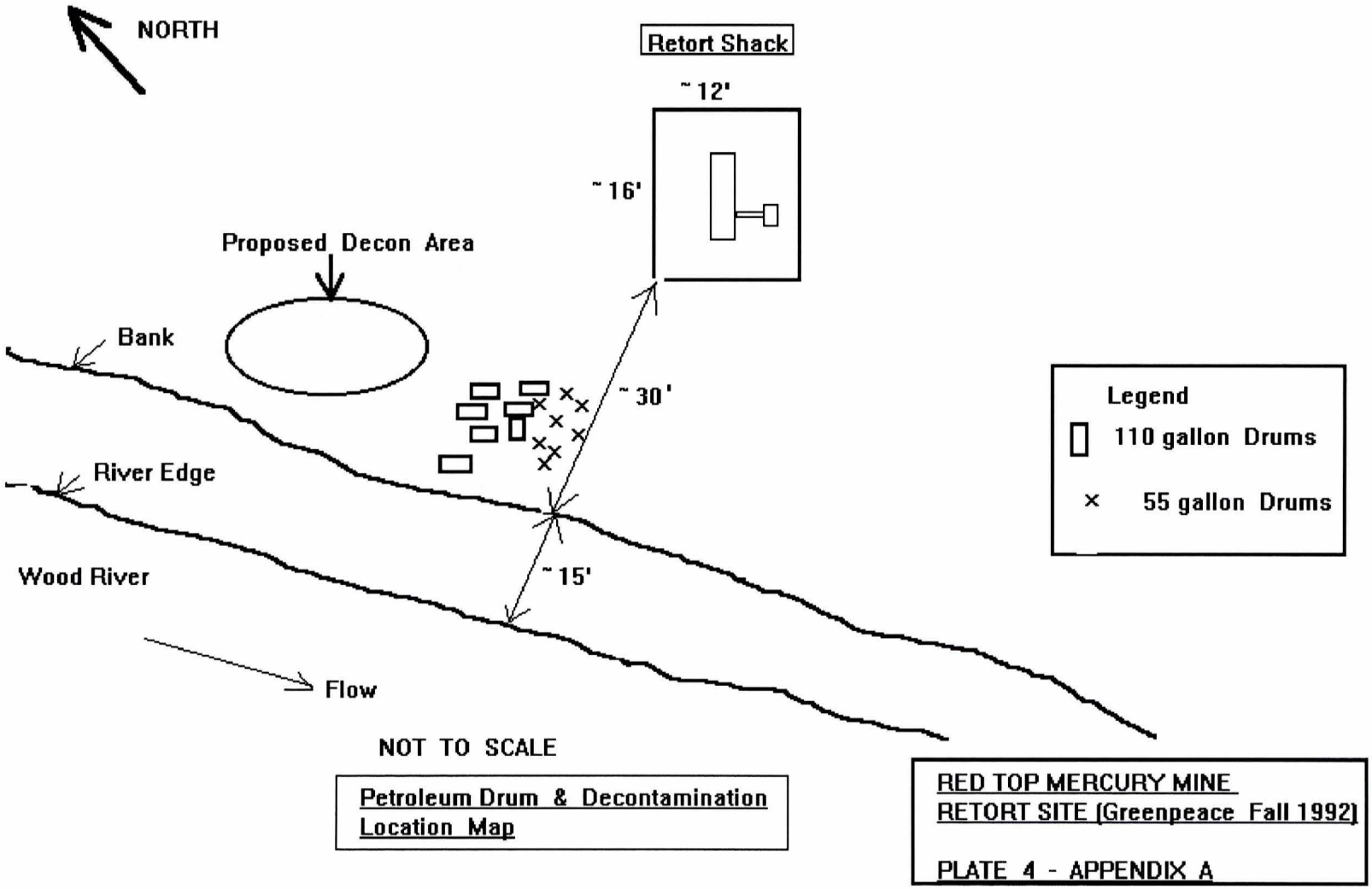
BUREAU OF LAND MANAGEMENT

ANCHORAGE DISTRICT OFFICE

PLATE 1 APPENDIX A


NORTH
DEPTHS
S1 = 4-12"
S2 = 4-10"
S3 = 6-12"
S4 = 6-12"
S5 = 6-12"
S6 = 4-8"
S7 = 3-6"
S8 = 8-12"
THRU
S12 =8-12"
REDTOP MERCURY MINE
near Aleknagik, Alaska
Retort Shack
~ 12'
sample 5
(3,800ppm)
~ 16'
sample 6 (610ppm)
sample 1
(38,000ppm)
sample 2
(7,200ppm)
sample 3
(1,600ppm)
~ 30'
sample 4
(9.2 ppm)
sample 11
(ND .3)
Bank (3'-4' above River)
sample 10
(ND .3)
100'
River Edge
100'
sample 7
(2.8ppm)
sample 8 (.77ppm)
sample 12
(ND .3)
10'
~ 15'
25'
sample 9
(ND .3)
Wood River
Flow
NOT TO SCALE
EXISTING SAMPLING
LOCATIONS (ADEC - Fall 1992)
PLATE 2 - APPENDIX A


b/g (3)
NORTH
Retort Shack
~ 12'
~ 16'
Bulk Sample
Bank
(2) b
~ 30'
River Edge
(s) b
~ 15'
WOOD RIVER FLOW
(3) g
(s)
(s)
NOT TO SCALE
NOTE: Sampling depths & locations may be changed to meet unexpected field conditions.
RED TOP RETORT SITE
PROPOSED SAMPLING
LOCATIONS (summer 1993)
LEGEND:
(3) To 3 foot depth soil
(2) To 2 foot depth soil
(s) Surface water
g Groundwater
b Background
PLATE 3 - APPENDIX A



NOT TO SCALE

Petroleum Drum & Decontamination Location Map

RED TOP MERCURY MINE
RETORT SITE (Greenpeace Fall 1992)

PLATE 4 - APPENDIX A