Remedial Action Report:

BLM Red Top Retort Site
Wood River, Alaska

VOLUME I

Prepared for AQE, Inc.

Prepared by
P. Jeffrey Burton
Quest Environmental

January 1995

AQE TO1

QE 5231

Table of Contents

VOLUME I:

		Page
	Introduction: Project Purpose	1
1.0	Project Background and Summary	1
2.0	Methodology	3
3.0	Project Narrative	5
4.0	Analytical Results and Discussion	11
5.0	Quality Control	15
6.0	Drawings	15
7.0	Conclusions and Recommendations	18
8.0	Certification	20
9.0	Photographs	21

Tables

I	Excavation Pit Bottom Soils, Mercury Analysis Results	11
II	Environmental Monitoring, Mercury Vapor Analysis Results	12
III	Personnel Monitoring, Mercury Vapor Analysis Results	13
IV	Excavation Pit Bottom Soils, POL's Analyses Results	14
V	Stockpiled Soils, POL's Analyses Results	14
VI	Quality Control Precision Comparisons	15

Drawings

Fig. 1	Vicinity Map	16
Fig. 2	Site Map with Soil Sample Location Overlays	17

VOLUME II: All analytical laboratory sample data summaries, raw lab' sample data, internal lab' quality control data, and related lab' information is contained in Volume II of this report.

Introduction: Project Purpose

This report presents chemical and observational data collected and evaluated during remedial actions at the Red Top Retort Site. The site is administered by the U.S. Bureau of Land Management. The objectives of the Remedial Action were to mitigate contaminant exposure and implement appropriate and timely remedial responses. This report presents the Remedial Action activities implemented as a result of the Site Assessment data evaluation conducted during the Fall, 1994 field season and an analysis of and recommendations for future activities.

1.0 Project Background and Summary

1.1 Site Physical Setting

The site is located on the eastern bank of the Wood River, approximately 3/4 of a mile downstream from the point where the Wood River exits Aleknagik Lake, and approximately 18 miles north of the town of Dillingham, in the southwest quadrant of the State of Alaska. The site's legal description is Section 29, Township 10 South, Range 55 West, Seward Meridian.

The site is situated on the relatively inactive Wood River flood plain, and is formed primarily of riverine gravels containing varying amounts of silt, overlain with approximately 6" of humus and peat. Groundwater flows down the adjacent Marsh Mountain in a more-or-less southwesterly direction into the tide-influenced Wood River. No ponds, streams or other wetland features were observed, with the exception of a small stream approximately 400' south (downriver) of the site. Mean average precipitation, including snowfall, is 24.44 inches, according to the National Weather Service.

The site's primary permanent man-made feature, prior to removal associated with this project, was a modest shack constructed of wooden support posts and galvanized metal sides and roof, measuring approximately 18' by 12'. The shack sat in level attitude approximately 30' inland of the Wood River, and approximately 12 inches above the high river mark.

Small amounts of debris were scattered about the site, prior to removal associated with this project, including 22 steel barrels of 55 and 110-gallon volumes filled to varying levels with POL's identified in the Site Assessment report as primarily Bunker-C.

1.2 Site Historical Background

Cinnabar (mercuric sulfide), the primary ore of mercury, was discovered near the peak of Marsh Mountain in the 1940s. A small-scale mining project, which produced 60 flasks of mercury, operated between 1952-1955. The mercury ore was extracted from mineralized veins cutting the host rock.

The retort shack site was used to house the roasting/retorting (recovery through distillation) component of the mercury ore refining. A crushing (ball) mill was erected on Marsh Mountain, approximately 1 mile east of the retort shack, and crushed ore was transported by road to the site. Crushed ore was introduced into the roaster/retort cavity and mercury vapor was extracted by the application of wood-fueled heat. Liquid mercury was subsequently condensed within two air-cooled steel pipe sections (condensers).

The barrels of Bunker C distillate petroleum found on the site, according to anecdotal information, were to be used to more efficiently fuel the roaster/retort.

1.3 Initial Site Assessment Summary

An initial Site Assessment was conducted by QE on 27 June through 1 July, 1994. Soil, water, drummed product, material, and dust swipe samples were collected at the site and laboratory analyzed for their respective target contaminants and/or hazardous constituents.

1.3.1 Initial Site Assessment Conclusions

Site soils were found to be contaminated with elemental (free) mercury and relatively heavy molecular weight refined petroleum products (Bunker-C) to the extent that remediation was required under existing state and federal regulations. The subsurface aquifer did not appear to have been significantly impacted by either contaminant. Site biota may have been impacted by mercury and/or Bunker-C, but this possibility was considered slight given the low leachability of mercury from TCLP analysis and the lack of significant POL migration.

The retort shack structure itself was found to be contaminated with mercury which had escaped during the retort process and condensed on interior walls and the retort structures. These materials also required remediation.

Asbestos-containing materials in the form of cement asbestos board were discovered near the retort shack. Removal of the asbestos materials was deemed necessary in order to facilitate the remediation of other site contaminants.

Scattered about the site were 22 steel barrels of 55 and 110 gallon volumes filled to varying levels with Bunker-C. These required removal from the site to prevent further contamination to soils and groundwater.

For the purposes of a site risk assessment, mercury was identified as the contaminant of primary concern due to its intrinsic toxic properties and because of its potential for migration into critical exposure pathways. While still requiring remediation, other site contaminants were deemed much less significant.

1.3.2 Initial Site Assessment Recommendations

Two primary methods of soil remediation were considered: removal and stabilization. The proximity of the Wood River and the potential for contaminant migration which exists even in stabilized matrices was cause enough to reject stabilization as a viable alternative. Removal of the mercury / POL contaminated soils and transportation to a disposal facility was considered the best method to mitigate the site's contamination and, hence, reduce the risk of environmental exposure.

Recommendations for the remediation of the mercury-contaminated retort shack and related structures included demolition, cleaning, and packaging for off-site transport and disposal.

Asbestos-containing materials were to be packaged separately for off-site transport and disposal.

The 22 steel drums of (primarily) Bunker-C were to be transferred to new 55 gallon drums as necessary, to facilitate safe, off-site transport to a disposal or recycling facility.

1.4 Remedial Action Summary

Remedial Action activities were conducted by AQE on September 12,1994 through October 4, 1994. Elemental (free) mercury, mercuric sulfide (cinnabar), and Bunker-C contaminated soils were excavated and stored according to regulations. Mercury-contaminated building materials present on the site were demolished, cleaned, packaged, and stored. Asbestos-containing debris present on the site was packaged and stored. Soil, water, drummed product, and dust swipe samples collected at the site were analyzed by Laucks Testing Laboratories, Inc. of Seattle, Washington and Analytical Technologies, Inc. (ATI) of Renton, Washington.

All excavated soils, building materials, and asbestos debris remain on site and are properly packaged and/or stored for future transport to an off-site disposal or treatment facility. All contents (primarily Bunker-C) of the original 22 steel drums were barged to a recycling facility in Dillingham, Alaska.

2.0 Methodology

Mercury and its compounds are regulated under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA / SARA), which served to guide the remediation of the site's mercury contaminated soils and structures.

Bunker-C is not classified as a hazardous substance, however, once it reaches the soils and/or groundwater of the State of Alaska, it becomes regulated by the State of Alaska Department of Environmental Conservation (ADEC). Specifically, the ADEC's "Guidance for Storage, Remediation, and Disposal of Non-UST Petroleum Contaminated Soils", July 29, 1991 document was utilized to guide the remediation of the site's POL contaminated soils.

Asbestos is not classified as a hazardous substance, but the handling of asbestos-containing materials is regulated by the Federal Occupational Safety and Health Administration (OSHA), and the State of Alaska Department of Safety and Health (DOSH), and emissions of asbestos fibers are regulated by the National Emission Standards for Hazardous Air Pollutants (NESHAPS). The regulations promulgated by each of these agencies served to guide the clean-up of the site's asbestos-containing debris.

The remedial action assessment activities were performed in accordance with the basic quality controls and data quality objectives outlined in QE's ADEC approved Quality Assurance Program Plan (QAPP) by Gabrielle Mehnert (Chemist) and Harry Godwin (Industrial Hygienist) of QE. Although this assessment has no relationship with underground storage tanks, the same standards of quality control, sample collection, sample treatment and analytical methodologies were utilized. Sample quantities and methodologies are listed below (where not specifically identified, sample amounts include quality control replicate and split replicate samples).

- Twenty-two (22) soil samples were analyzed at Laucks by EPA Test Method 7471 for mercury.

- Nine (9) soil samples were analyzed at ATI by EPA Test Method 8100 (ADEC mod.) for Diesel Range Organics (DRO) as diesel, and Residual Range Organics (RRO) as 10w40 oil. These samples were also analyzed at ATI by EPA Test Method 418.1 for Total Petroleum Hydrocarbons (TPH).

- One (1) groundwater sample from the mine site was analyzed at ATI for mercury by EPA Test Method 7471.

- Two (2) water samples were taken of equipment decontamination rinsate. One (1) retort shack sheet metal decontamination rinsate water sample was analyzed at ATI by EPA Test Method 7471 for mercury, and one (1) equipment/personnel decontamination station rinsate water sample was analyzed at ATI by EPA Test Methods 8100 (ADEC mod.) and 418.1 for DRO/RRO and TPH, respectively.

- Three (3) swipe samples were collected from cleaned metal of the retort shack and analyzed at ATI for mercury by EPA Test Method 7471.

- Two (2) water samples were taken from the decon. rinsate from the cleaned drums and analyzed by ATI for mercury by EPA Test Method 7471.

- Two (2) samples were taken of biological materials and analyzed at ATI by EPA Test Method 7471. One sample was of alder leaves and another of alder stems.

- Three (3) soil samples were collected from the stockpiled material and analyzed at ATI by EPA Test Method 8100 (ADEC mod.) for Diesel Range Organics (DRO) as diesel, and Residual Range Organics (RRO) as 10w40 oil. These samples were also analyzed at ATI by EPA Test Method 418.1 for Total Petroleum Hydrocarbons (TPH).

Sixty six (66) field screening measurements were recorded to determine the presence of organic vapors associated with POL contamination of the site soils.

Laboratory samples were individually numbered at the time of collection within five series of samples according to the following method:

94RTM10 series, soil samples;

94RTM11 series, biological samples (alder leaves and stems);

94RTM12 series, surface mercury swipe samples;

94RTM13 series, surface water samples;

94RTM900X series, rinsate water samples.

Soil samples were collected into appropriate sized glass containers with new, clean disposable spoons. Surface water and rinsate water samples were collected directly into sample containers. Swipe samples were collected by rubbing a cotton swipe over a one-foot square area, and then sealing the swipe within a clean 40 mL glass container.

Samples were quickly containerized, and those requiring refrigeration were immediately put into a cooler kept at less than four degrees centigrade with artificial "ice".

Non-disposable sampling equipment was decontaminated with a solution of Simple Green and deionized water, followed by three rinses with distilled water.

Proper custody was maintained over samples at all times. Samples were shipped with chain-of-custody documents via Penn Air and Alaska Airlines to Laucks Testing Laboratories, Inc. in Seattle, WA and by Lynden Airfreight to ATI in Renton, WA.

3.0 Project Narrative

9/12/94:

The chemist, industrial hygienist , and other AQE personnel packed the necessary equipment and supplies required for the job at the QE warehouse in Anchorage. The crew departed Anchorage for Dillingham by a commercial airflight. The crew arrived in Dillingham where they inventoried and performed operational checks on the equipment.

9/13/94:

All AQE personnel arrived at the Red Top retort shack site by 1030.

The industrial hygienist (IH) performed operational checks on all equipment, inspected and tested all batteries, and calibrated the assessment instruments. The IH assessed worker safety requirements and discussed the use of personnel protective equipment (PPE) with all supervisors. Goggles and face shields were required during all phases of wood cutting and while the chipper was operated. All personnel using chainsaws were issued safety glasses. A site diagram was drawn and personnel familiarized themselves with the site features. An additional safety meeting was held after lunch covering topics such as required PPE for all zones, falling trees, and decontamination requirements. The IH provided Respirator Fit Test on two crewmen.

The chemist participated in the safety meetings and then roped off the Exclusion Zone. Drums, containing suspected contaminated material, were covered in tubs. The decontamination (decon) staging area was established.

The crew initiated tree removal along the east and north side of the retort shack. A worksite inspection was performed by the IH in mid-afternoon.

The operations center command post was established in the area devoid of trees east of the shack to lessen the chance of cross contamination into clean areas.

9/14/94:

Standby day due to inclement weather. The IH purchased additional items for hypothermia protection (wet/cold weather clothes). Paperwork - site map sampling points, event log, etc., was updated by the IH.

9/15/94:

The crew arrived onsite and the IH conducted a safety meeting covering chain saw safety, PPE, decon. area set up and operation, job requirements, and contamination control. The decon. station was set up under the supervision of the IH.

The IH suited up in a Sarenex suit with a full face MSA respirator to perform air sampling for mercury vapors onsite with a MSA mercury vapor test kit. No mercury was detected so the IH authorized the crew, with their required PPE, to start removing the brush surrounding the retort shack.

Additional equipment, including an ATV, were transported to the site. A barge containing additional supplies was unloaded in late afternoon.

9/16/94:

The crew arrived onsite at 1000 and the IH conducted a safety meeting covering daily job requirements, decon. procedures, usage of tyvex and Saranex suits, puncture and possible injection danger of exposed nails in scrap metal, and wood containing sharp metal pieces and safety in the exclusion zone including the prevention of cross contamination.

The chemist and the IH finished the set up of the decon. shower and cleanup of the area. The IH set out air sampling pumps and performed direct reading sampling for mercury vapors in the retort shack area. Several soil samples were collected and suspected visible mercury was observed.

The crew, in full face respirators and Sarenex suits, started building a containment berm and began demolition of the retort shack.

The IH performed post calibration and the required maintenance on the sampling pumps and the mercury vapor analyzer.

9/17/94:

The crew arrived onsite at 0915 and the IH conducted a safety meeting covering decon. procedures for short breaks, with an emphasis on standard operating procedures to ensure safety, and announced that heavy equipment will be onsite and the crew should be aware of the related hazards.

The IH started the personnel and environmental airborne mercury sampling. One personnel sampling pump faulted due to rain water entering the pump housing. The pump was replaced but the new pump also faulted. The pump was removed from the worker. The area pumps were checked during the day and both were found to be operational.

The Chemist conducted field screening of soils for POL-related organic vapors at the exclusion zone perimeter to establish horizontal "clean" lines. Site soils were organic rich with about one inch of organic debris covering soils. Several stained areas (suspected POL contamination) were identified.

Five laborers suited up and entered the Exclusion Zone to continue cleanup. The crew removed the drums containing Bunker-C for demolition, decontamination, and storage.

9/18/94:

The IH conducted a safety meeting at the boat landing which covered job requirements, excavation procedures, the possible presence of high levels of mercury, and extra precautions needed when cutting the retort furnace. The IH arrived on site at 1045 and set up environmental and personnel air sampling equipment. Field screening of the exclusion zone soils for POL-related organic vapors continued. The IH and the chemist also employed the mercury vapor analyzer at two inches above the ground to assist in identifying mercury "hot spots". These areas were highlighted for the crew. Air sampling pumps were checked several times during the day for proper calibration.

The work crew continued the dismantling of the retort shack by tearing down the brick furnace. Free mercury was unearthed during this demolition.

9/19/94:

The IH conducted a safety meeting covering the need for awareness of the areas of high level mercury contamination, the need to stay clear of moving equipment, and the necessity of immediate replacement of torn or defective PPE.

Air sampling pumps were deployed. The bulldozer operator got a superficial injury to his nose. The IH inspected the injury and applied a bandaid.

The crew remained outside the Exclusion Zone in the morning to let the mercury vapors dissipate from the previous day's excavation activities. Equipment was staged for better access to the Exclusion Zone.

The IH and chemist traveled to the mine site in the afternoon Three batteries were removed from the mine with one battery remaining under house site #1.

9/20/94:

Standby day due to inclement weather.

9/21/94:

The IH conducted a safety meeting covering the need to wear goggles or a faceshield to avert potential injury, heavy equipment safety, the need to watch out for finger injuries when the totes are being stacked, and the need to tie barrels together as they are not steady when being moved by the forklift.

The crew repaired the camp from the storm damage of the previous day. They then started decontaminating the barrels and cutting with a torch for eventual disposal. Several items (chipper, generator, and spray washer) were broken and needed repair. Wood chipping continued along with widening and flattening the work area for long-term storage of the totes.

The crew spread out polyethylene sheeting as a decon. pad for the heavy equipment. The crew decontaminated the backhoe. Construction was started on the perimeter security fence.

The chemist worked on the chain-of -custody documents and prepared to ship all previously collected samples destined for laboratory analysis.

9/22/94:

The IH conducted a safety meeting covering the exclusion of smoking and eating in the decon. area, the need for crewmen to wear faceshields or goggles when cutting with the torch, and the need for extra caution when working around heavy equipment. Work continued on the security fence. The backhoe was used to dig a trench to control surface runoff of the work area. All barrels were cleaned, cut up, and put in totes.

9/23/94:

The IH conducted a safety meeting covering the use of PPE and the "buddy system".

The crew laid down a polyethylene cover over the muddy walking trail. The equipment was restaged to allow better movement. Three sides of the perimeter security fence were completed. The barge was repositioned. Material was stacked in the storage area. Ten product samples (liquid) were collected from the steel drums by the chemist.

9/24/94:

The IH conducted a safety meeting covering the need for suits and respirators when entering the Exclusion Zone, the need for careful driving of four wheelers, and need for care in handling totes so as not to crush fingers.

The jet boat was missing from the landing. It was found about one half mile from the boat landing.

The forklift was removed from the Exclusion Zone and decontaminated. The sampling drums were staged in the holding area. The air sampling pumps and mercury vapor analyzer were checked and air sampling began. The retort shack area was excavated.

Two decontamination rinsate water samples were collected from the cleaned steel drums for lab' analysis (mercury).

9/25/94:

Items covered by the IH in the safety meeting included personal work breaks while in the Exclusion Zone, need to improve decon. of PPE, the need to clean face and hands with wipes, and the need for rubber gloves and heavy rain gear when working with mercury / POL contaminated soil.

The generator was repaired and water was heated for decon. use. The backhoe got stuck while excavating in the retort area. One equipment operator and two laborers were working in the Exclusion Zone. Forty two totes were filled on this day.

9/26/94:

Items covered by the IH in the safety meeting included safe loading of totes, heavy equipment operator safety, the need to work safely even if it takes longer, tight working area for heavy equipment, and the continued need to follow decon. procedures.

Excavation continued in the retort area until the backhoe broke down, requiring replacement parts.

9/27/94:

The IH conducted the safety meeting and covered the requirement to not wear tyvex suits when cutting with the torch, the fact that a new backhoe arrived and to be careful since the new one has an arm with a greater swing, and that a forklift may be needed to remove the broken backhoe. The IH conducted air monitoring for mercury in the Exclusion Zone with all readings below the Threshold Limit Value (TLV) and no visible signs of mercury.

The retort was cut and packaged in totes. As of this date, 131 totes had been loaded and stored.

9/28/94:

The IH conducted a safety meeting covering the need to decontaminate all personnel and equipment leaving the Exclusion Zone, the need for continued safe work practices, and the need to be aware of cold stress as temperatures drop below freezing.

The IH investigated an injury to the Principal Investigator, Clifford Elsmann. Mr. Elsmann slipped while standing on the bull bulldozer and hit his ribs on the tracks. He reported to the hospital for X-rays. His ribs were bruised but there was no medication or further medical treatment needed.

The crew performed equipment maintenance, readied totes, excavated and loaded contaminated soils into totes.

9/29/94:

The IH covered boating safety, accident reporting, and awareness of heavy equipment safety. The IH also collected airborne mercury samples.

The large bulldozer began the final leveling of the excavation area. The loading of totes continued. Crew members were delegated to clean up the camp.

The chemist conducted thirty-one field screening and found POL contamination extending under the barge to the edge of the riverbank. There was a noticeable POL stain and odor down to the 2-2 1/2 inch depth. The low-level stockpile of POL and mercury contaminated soils totaled about 60 cubic yards as of this date.

9/30/94:

Seven field screenings were conducted by the chemist. Twenty project and two split replicate soil samples were collected from the exclusion zone excavation pit bottom for lab' analysis (mercury).

10/1/94:

The chemist began collecting three swipe samples from the decontaminated sheet metal. One decontamination rinsate water sample was collected from the sheet metal for lab' analysis (mercury), and one decon. station rinsate water sample was collected for lab' analysis (DRO/RRO, TPH). Two biological samples were collected, consisting of alder leaves and stems, to be lab' analyzed for mercury content.

10/2/94:

The crew finished excavation of the path, removing POL contaminated soil. Field screening of pit bottom soils was conducted in the area where surface POL staining was previously noted (prior to excavation). The chemist collected three soil samples from the suspect high level mercury/diesel contaminated stockpiled soils. Five soil samples were collected from the exclusion zone excavation pit bottom soils. A surface water sample was collected from the cinnabar mine site.

10/3/94:

The crew was on standby.

10/4/94:

The crew demobilized and returned to Anchorage.

4.0 Analytical Results and Discussion

4.1 Mercury in Soil

Site soils, particularly within and proximal to the retort shack, were heavily contaminated with elemental (free) mercury prior to removal and storage.

Soil samples were collected from the Exclusion Zone excavation pit bottom to demonstrate the level of contamination in the remaining soils. Laboratory analysis results ranged from 0.1 to 97 mg/Kg mercury. These results are detailed in Table 1. Sample locations are illustrated on Figure 2.

TABLE 1: Excavation Pit Bottom Soils, Mercury Analysis Results

Sample #	Date Collected	Sampling Location Points	Result (mg/Kg)
94RTM10-01	9/30/94	7	0.1
94RTM10-02	9/30/94	15	0.5
94RTM10-03	9/30/94	17	0.5
94RTM10-04	9/30/94	16	0.4
94RTM10-05	9/30/94	10	0.3
94RTM10-06	9/30/94	14	8.7
94RTM10-07	9/30/94	12	53
94RTM10-08	9/30/94	25	97
94RTM10-09	9/30/94	8	23
94RTM10-10	9/30/94	6	18
94RTM10-11	9/30/94	13	5.6
94RTM10-12	9/30/94	11	0.3
94RTM10-13	9/30/94	5	2.5
94RTM10-14	9/30/94	18	30
94RTM10-15	9/30/94	20	2.9
94RTM10-16	9/30/94	29	5.2
94RTM10-17	9/30/94	9	12
94RTM10-18	9/30/94	19	39
94RTM10-19	9/30/94	30	40
94RTM10-20	9/30/94	31	0.2
94RTM10-21	9/30/94	QC of 10-15	3.1
94RTM10-22	9/30/94	QC of 10-13	11

4.2 Mercury Vapor

Mercury vapor sampling was conducted by the IH in work areas and on personnel. All of these values are far less than the permissable exposure level (0.01 mg/m^3) as established by federal regulations.

Twenty three (23) environmental mercury vapor samples were collected (Sample #'s A01-A23). Analysis results ranged from 0.00038 to 0.00103 mg/m^3, calculated as a Time Weighted Average (TWA). These results are detailed in Table 2.

TABLE 2: Environmental Monitoring, Mercury Vapor Analysis Results

Sample #	Date Collected	Sampling Location	Result (mg/m^3)
A01	9/16/94	upwind 50'	0.00039
A02	9/16/94	downwind 50'	0.00041
A03	9/17/94	upwind 50'	0.00043
A04	9/17/94	downwind 50'	0.00044
A05	9/18/94	forklift cab	0.00045
A06	9/18/94	upwind 20'	0.00045
A07	9/18/94	downwind 30'	0.00042
A08	9/19/94	upwind 30'	0.00044
A09	9/19/94	downwind 30'	0.00042
A10	9/24/94	upwind 30'	0.00041
A11	9/24/94	downwind 30'	0.00045
A12	9/25/94	upwind 30'	0.00041
A13	9/25/94	downwind 30'	0.00044
A14	9/26/94	upwind 30'	0.00042
A15	9/26/94	downwind 30'	0.00103
A16	9/26/94	downwind 30'	0.00063
A17	9/26/94	upwind 30'	0.00042
A18	9/27/94	upwind 30'	0.00078
A19	9/27/94	downwind 30'	0.00044
A20	9/28/94	upwind 30'	0.00042
A21	9/28/94	downwind 30'	0.00045
A22	9/29/94	upwind 30'	0.00041
A23	9/29/94	downwind 30'	0.00038

Note: Upwind and downwind sampling locations are relative to the exclusion zone perimeter.

Fourteen (14) personnel mercury vapor samples were collected (Sample #'s P01-P13, E01). Analysis results ranged from 0.00035 to 0.001742 mg/m^3 calculated as a TWA. These results are detailed in Table 3.

TABLE 3: Personnel Monitoring, Mercury Vapor Analysis Results

Sample #	Date Collected	Personnel	Result (mg/m^3)
P01	9/16/94	Lori Golden	0.00041
P02	9/17/94	Michael Tuckness	0.01000
P03	9/18/94	Harry Godwin	0.00057
P04	9/24/94	Glenn Frankel	0.00089
P05	9/24/95	Lori Golden	0.00212
P06	9/25/94	Glenn Frankel	0.00050
P08	9/26/94	Dave Herrmann	0.01742
P09	9/26/94	Marty Larsen	0.00042
P10	9/27/94	John Broad	0.00264
P11	9/28/94	Dave Herrmann	0.00126
P12	9/29/94	Lori Golden	0.00048
P13	9/29/94	Marty Larsen	0.00041

4.3 Mercury in Other Matrices

Analytical results of mercury swipe sampling (Sample #'s 94RTM12-01 through 94RTM12-03), collected from cleaned surfaces of the demolished retort shack, were 86, 14, and 13 mg/Kg mercury, respectively.

Analytical results of the decontamination rinsate water sample (Sample # 94RTM9004), collected during the cleaning of the demolished retort shack metal surfaces, was 0.16 mg/L mercury.

Analytical results of the decontamination rinsate water samples (Sample #'s 94RTM9001 and 94RTM9002), collected during the decontamination of the steel drums, were 0.075 (barrels 1-5) and 0.048 (barrels 6-10) mg/L mercury.

Analytical results of the biological samples of alder leaves (Sample # 94RTM11-01) and alder stems (94RTM11-02) were 0.82 and 0.86 mg/Kg of mercury, respectively.

Analytical results of the surface water sample (94RTM13-01), collected from within a tunnel at the Red Top cinnabar mine site was 0.00027 mg/L mercury.

4.4 POL's in Excavation Pit Bottom Soils

Portions of the site soils were determined to be heavily contaminated with Bunker-C refined petroleum prior to excavation. Analytical results of the soil samples (94RTM10-26 through

94RTM10-31), collected from the Exclusion Zone excavation pit bottom, ranged from none detected to 5800 mg/Kg DRO, from <21 to <740 mg/Kg RRO, and from none detected to 88 mg/Kg TPH. These results are detailed in Table 4. Sample locations are shown on Figure 2.

TABLE 4: Excavation Pit Bottom Soils, POL's Analyses Results

Sample #	Date Collected	Sampling Location Points	TPH (mg/Kg)	DRO (mg/Kg)	RRO (mg/Kg)
94RTM10-26	10/2/94	5	None Detected	<11	<21
94RTM10-27	10/2/94	3	48	5800	<740
94RTM10-28	10/2/94	14	None Detected	<17	<34
94RTM10-29	10/2/94	6	None Detected	170	390
94RTM10-30	10/2/94	17	None Detected	28	<31
94RTM10-31	10/2/94	QC of 10-27	88	730	140

4.5 POL's in Stockpile Samples

Three samples (94RTM10-23 through 94RTM10-25) were collected from the excavated soils stockpiled for long term storage (in totes). Laboratory analytical results for these samples are detailed in Table 5.

TABLE 5: Stockpiled Soils, POL Analyses Results

Sample #	Date Collected	TPH (mg/Kg)	DRO(mg/Kg)	RRO (mg/Kg)
94RTM10-23	10/2/94	180,000	110,000	83,000
94RTM10-24	10/2/94	2,300	3,200	3,500
94RTM10-25	10/2/94	5,300	2,100	2,500

4.6 POL's in other Matrices

Analytical results of the decon. station rinsate water sample (Sample # 94RTM9003), collected from the third stage of the decontamination station, was 13 mg/L DRO and 84 mg/L TPH.

5.0 Quality Control

Quality assurance objectives for this project are discussed below. Table 6 compares project and QC replicate sample results.

- Field personnel used proper sample collection and handling procedures.
- Field equipment calibration standards were met.
- The Relative Percent Difference (RPD) between split-replicate samples was within bounds except for project / QC sample sets 94RTM10-27 / 94RTM10-31 and 94RTM10-13 / 94RTM10-22, which had RPD's well in excess of the 40% maximum allowable. This lack of precision is not interpreted as significant to project goals.
- Internal laboratory quality assurance objectives were not all met. The water method blank sent to ATI was outside the ATI specified control limits. There was insufficient sample to re-extract the entire QC batch, since all associated QC was deemed acceptable the data was reported. The following surrogates were outside ATI criteria: Sample # 94RTM10-27 and Sample # 94RTM10-23. The analysis necessitated a dilution which caused the surrogates to be unrecoverable. All associated QC was within ATI specified criteria. These departures are not considered sufficient to significantly impact project data.
- All sample holding times were met.
- The percent completeness goal for the project was met.

TABLE 6: QC Precision Comparisons

ANALYTE	PROJECT #/ RESULT	REPLICATE #/ RESULT	RPD	GOAL
DRO	94RTM10-27 / 5800	94RTM10-31 / 730	155	<40
GRO	94RTM10-27 / 140	94RTM10-31 / 140	0	<40
MERCURY	94RTM10-15 / 2.9	94RTM10-21 / 3.1	6.7	<40
MERCURY	94RTM10-13 / 2.5	94RTM10-22 / 11	126	<40

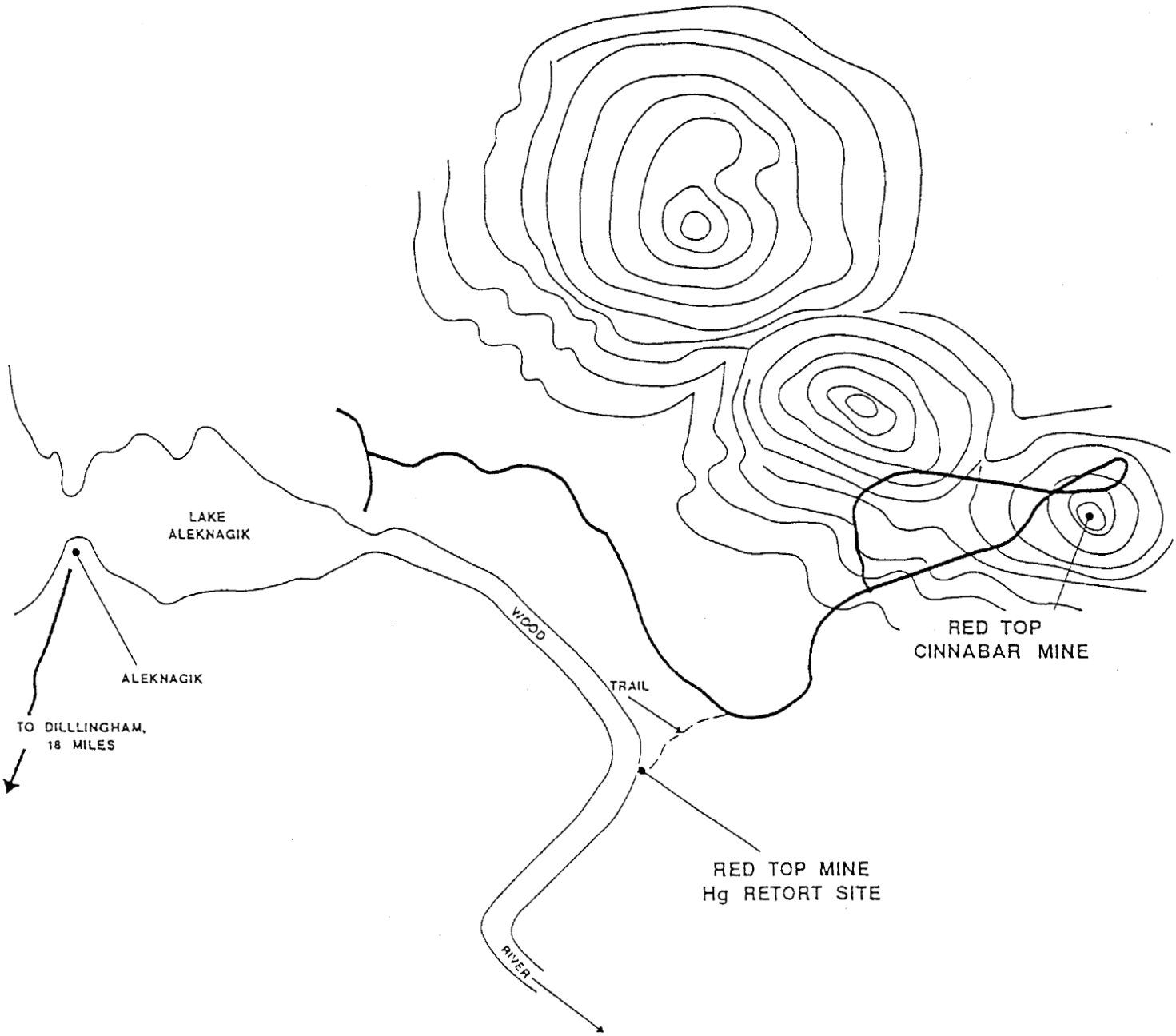
Overall field quality and data quality objectives for this project are considered acceptable.

6.0 Drawings

The following drawings are presented for informational purposes only. Scales are approximate.

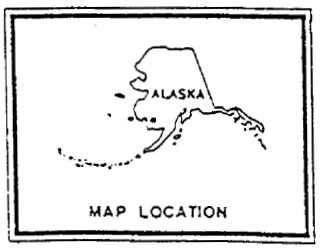
6.1 Vicinity Map

6.2 Site Map with Soil Sample Location Overlays



MILES

1/2 1/4 0 1/2 1

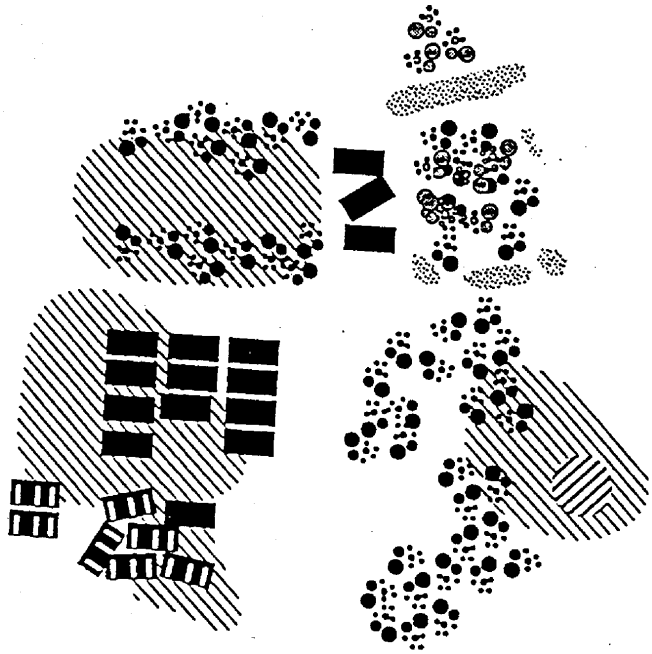


N

Drawn by CJE July, 1994	Scale: 1"= 1/2 Mile
Vicinity Map, Red Top Retort Site Wood River, Ak	
Quest Environmental	Fig. 1

OVERLAY 1 KEY:

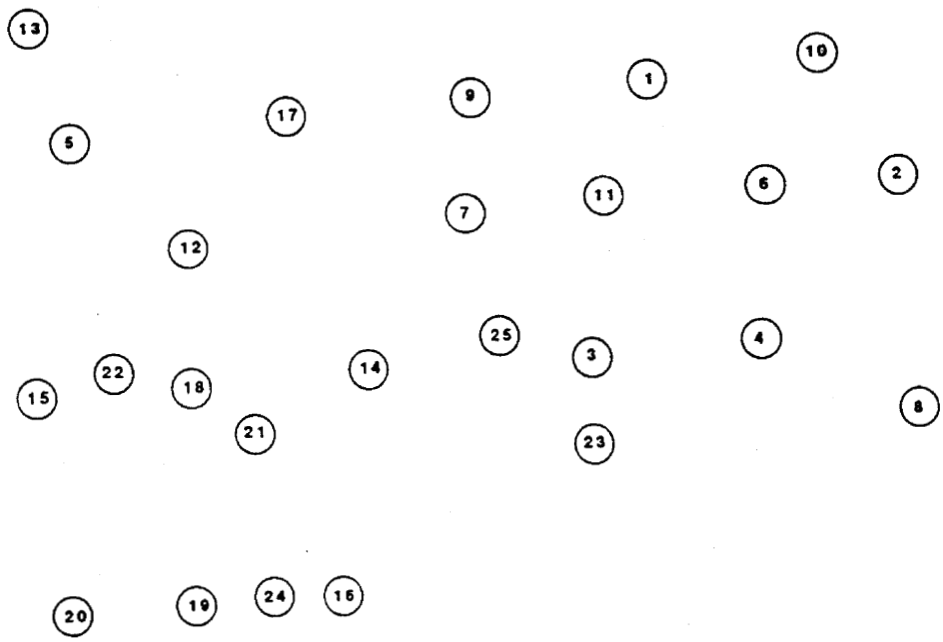
- FREE MERCURY – ≤ 1mm
- SURFACE POL STAINING
- CAB SPILL
- 55-GALLON DRUM
- 110-GALLON DRUM
- CINNABAR ORE
- PROCESSED CINNABAR (SLAG)

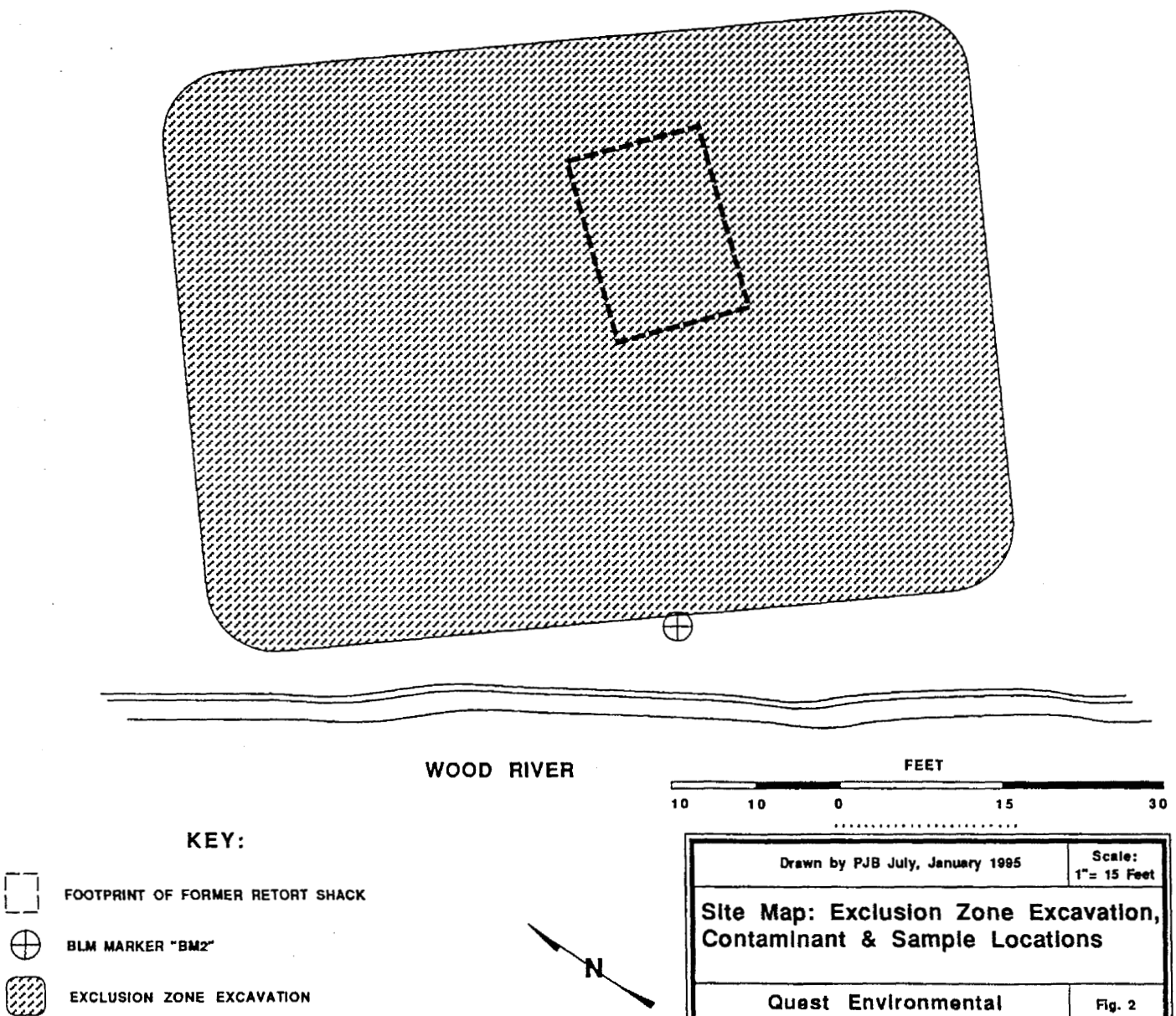


OVERLAY 2:

LABORATORY SOIL SAMPLING LOCATION POINTS AND ANALYTICAL RESULTS FOR MERCURY & POL's

SAMPLING LOCATION POINT	SAMPLE #	MERCURY (mg/Kg)	TPH (mg/Kg)	DRO (mg/Kg)	RRO (mg/Kg)
1	94RTM10-01	0.1			
2	94RTM10-02	0.5			
3	94RTM10-03	0.5			
4	94RTM10-04	0.4			
5	94RTM10-05	0.3			
6	94RTM10-06	8.7			
7	94RTM10-07	53			
8	94RTM10-08	97			
9	94RTM10-09	23			
10	94RTM10-10	18			
11	94RTM10-11	5.6			
12	94RTM10-12	0.3			
13	94RTM10-13	2.5			
14	94RTM10-14	30			
15	94RTM10-15	2.9			
16	94RTM10-16	5.2			
17	94RTM10-17	12			
18	94RTM10-18	39			
19	94RTM10-19	40			
20	94RTM10-20	0.2			
21	94RTM10-26	---	ND	<11	<21
22	94RTM10-27	---	49	5800	<740
23	94RTM10-28	---	ND	<17	<34
24	94RTM10-29	---	ND	170	390
25	94RTM10-30	---	ND	28	<31




WOOD RIVER
FEET
10 10 0 15 30
KEY:
FOOTPRINT OF FORMER RETORT SHACK
BLM MARKER "BM2"
EXCLUSION ZONE EXCAVATION
N
Drawn by PJB July, January 1995
Scale: 1"= 15 Feet
Site Map: Exclusion Zone Excavation, Contaminant & Sample Locations
Quest Environmental
Fig. 2

7.0 Conclusions and Recommendations

The following conclusions and recommendations have been developed in part as a result of historical, field and laboratory data interpretation.

7.1 Conclusions

7.1.1 Mercury

All sources (contaminated retort shack & related equipment) of potential future contamination of site soils by elemental (free) mercury have been cleaned and packaged for long-term storage until determination of disposal method.

The mercury levels in the remaining soils at the Exclusion Zone's excavation pit bottom are all less than 100 mg/Kg mercury. The site's mercury cleanup level for soils has been set at 100 mg/Kg. The RCRA Toxicity Characteristics rule for defining mercury-contaminated soils as being a regulated toxic waste requires a Toxicity Characteristics Leaching Procedure (TCLP) extraction to produce a leachate level of 0.2 mg/L or greater. Soil samples collected during the initial site assessment were not found to produce a TCLP leachate level of 0.2 mg/L or more, even when the corresponding mercury content of the soil sample exceeded 4300 mg/Kg.

The mercury levels in site biota, as demonstrated in lab' samples 94RTM11-01 & 11-02, may reflect elevated levels of naturally occuring mercury in the site soils, in the form of cinnabar. These mercury content levels (0.82 & 0.86 mg/Kg) are nontheless far to low to produce a corresponding TCLP leachate level of 0.2 mg/L.

7.1.2 POL's

All sources (22 steel drums containing Bunker-C) of potential future contamination to site soils by POL's have been removed from the site.

The initial site assessment data produced an ADEC "Level A" cleanup level for soils contaminated with petroleum hydrocarbons. "Level A" corresponds to a cleanup level of 100 mg/Kg or less for diesel range organic hydrocarbons (DRO's). This cleanup level was not achieved, as two of the five pit bottom soil samples exceeded 100 mg/Kg of DRO.

7.1.3 Asbestos

The asbestos debris discovered at the site, found in the form of cement asbestos board, was cleaned up to the extent that no visible debris remained. The debris is properly packaged and remains on site for future transportation to an off-site disposal facility.

7.2 Recommendations

7.2.1 Mercury

Based on the field data and analytical results of the excavation pit bottom samples, it is recommended that the site be closed as regards elemental (free) Mercury contamination. The extent of naturally occuring Mercury (cinnabar) indicates that the target clean-up level (100

mg/Kg) would be an acceptable level to eliminate the elemental Mercury at the site, caused by the application of the retort operation.

Disposal process for the Mercury contaminated soil requires additional research. As of the date of this report, elemental Mercury requires treatment prior to disposal (landfilling) as regulated by the U.S. E.P.A. Land Band Act. Due to the lack of Mercury processing facilities within the Western United States and the site's location, research and development of a portable Mercury treatment system may facilite a more economic and effecient process. We recommend that research be conducted to determine the type and extent of new technology available for elemental Mercury treatment prior to finalizing a disposal recommendation.

7.2.2 POL's

As aforementioned, POL contamination still exist at the site at two points within the excavation area. These areas require further excavation until the target clean-up level of 100 mg/Kg has been achieved.

7.2.3 Asbestos

It is recommended that the containerized asbestos debris be transported to the closest disposal facility and disposed of according to the State of Alaska asbestos disposal regulation.

8.0 Certification

I certify that I have personally examined and am familiar with the information in this and all attached documents and based upon my inquiry of the individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete.

P Jeffrey Burton Date: 1/23/95

P. Jeffrey Burton, Quest Environmental

9.0 Photographs

The following photographs were taken during the course of the project.

PHOTO #1

VIEW OF COMMENCEMENT OF SITE BRUSHING

PHOTO #2

VIEW OF ESTABLISHING SITE BRUSHING BOUNDARIES

PHOTO #3

VIEW OF CONSTRUCTING COMMAND POST

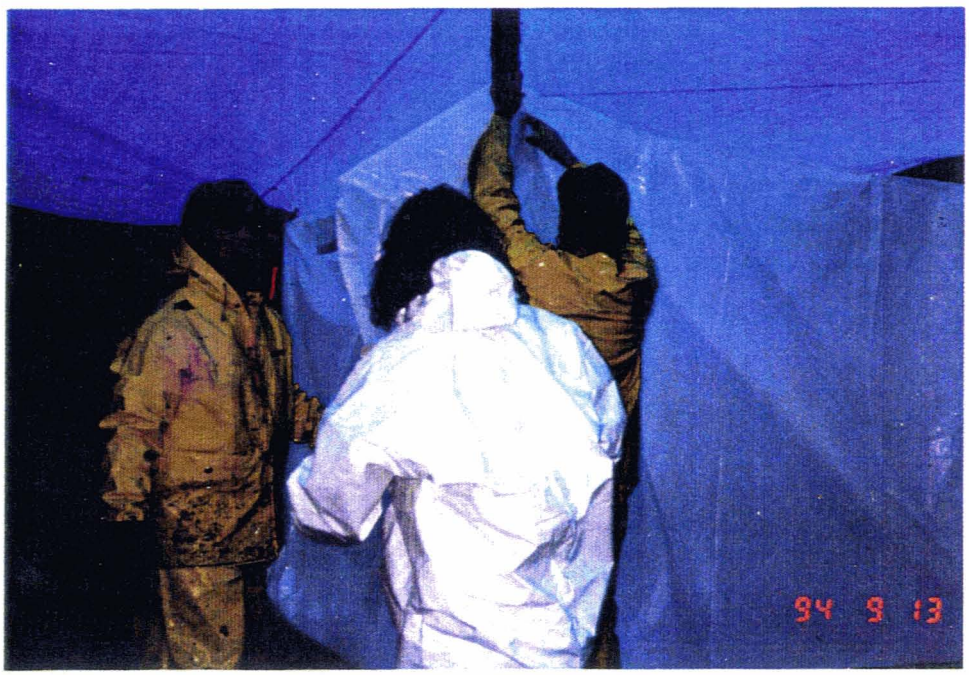


PHOTO #4

VIEW OF CONSTRUCTING PERSONNEL DECONTAMINATION SYSTEM

PHOTO #5

VIEW OF BARGE LANDING WITH PROJECT EQUIPMENT

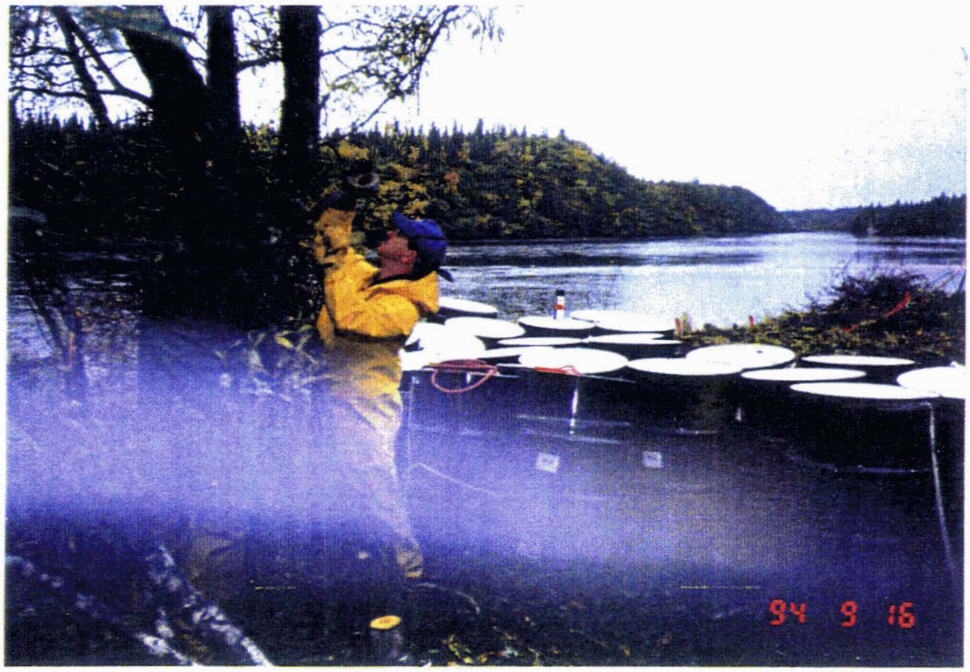


PHOTO #6

VIEW OF STAGING 55 GALLON FOR FUEL TRANSFER

PHOTO #7

CONSTRUCTION OF EQUIPMENT DECONTAMINATION SYSTEM

PHOTO #8

VIEW OF OLD DRUMS CONTAINING POL AND RETORT SHACK AFTER BRUSHING

PHOTO #9

CONSTRUCTION AND STAGING OF TOTE'S FOR SOILS STORAGE

PHOTO #10

FRONT VIEW OF RETORT PRIOR TO DEMOLITION

PHOTO #11

VIEW OF RETORT FROM COMMAND POST

PHOTO #12

VIEW OF I.H. TESTING SCUBA EQUIPMENT FOR SITE ACCESS

PHOTO #13

BRUSHING AREA NORTH OF RETORT SHACK FOR CONSTRUCTION OF TOTE STORAGE AREA

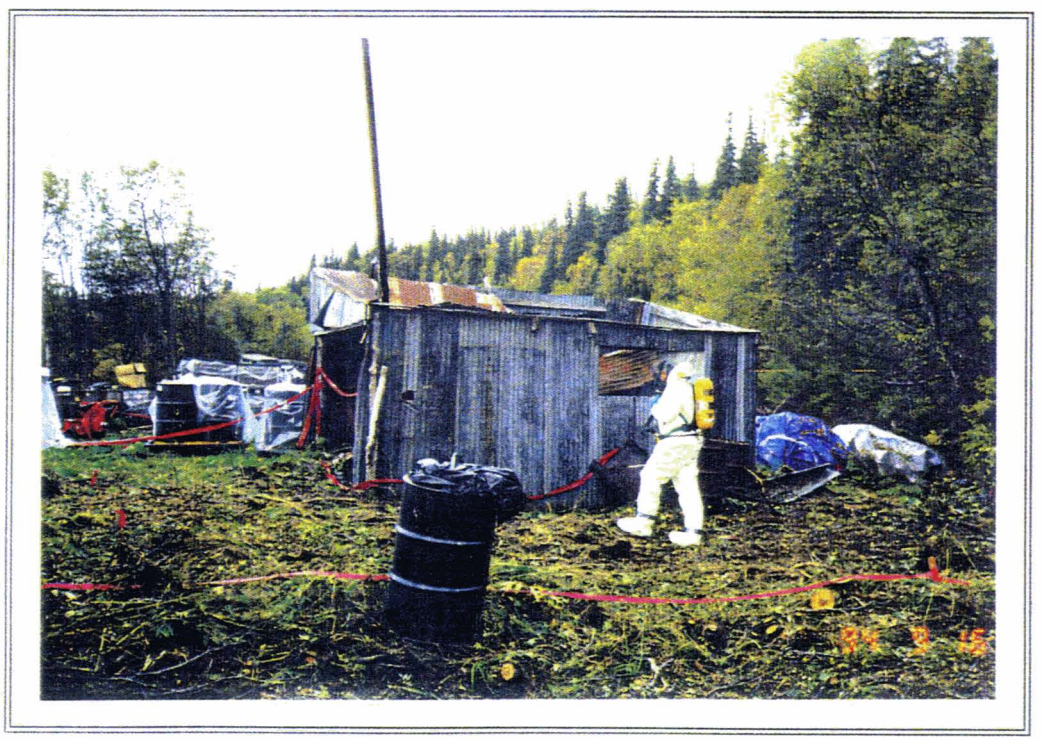


PHOTO #14

I.H. CONDUCTING VAPOR SCREENING AROUND RETORT

PHOTO #15

I.H. CONDUCTING VAPOR SCREENING AROUND RETORT

PHOTO #16

COMMENCING DEMOLITION OF RETORT SHACK

PHOTO #17

DEMOLITION OF RETORT SHACK

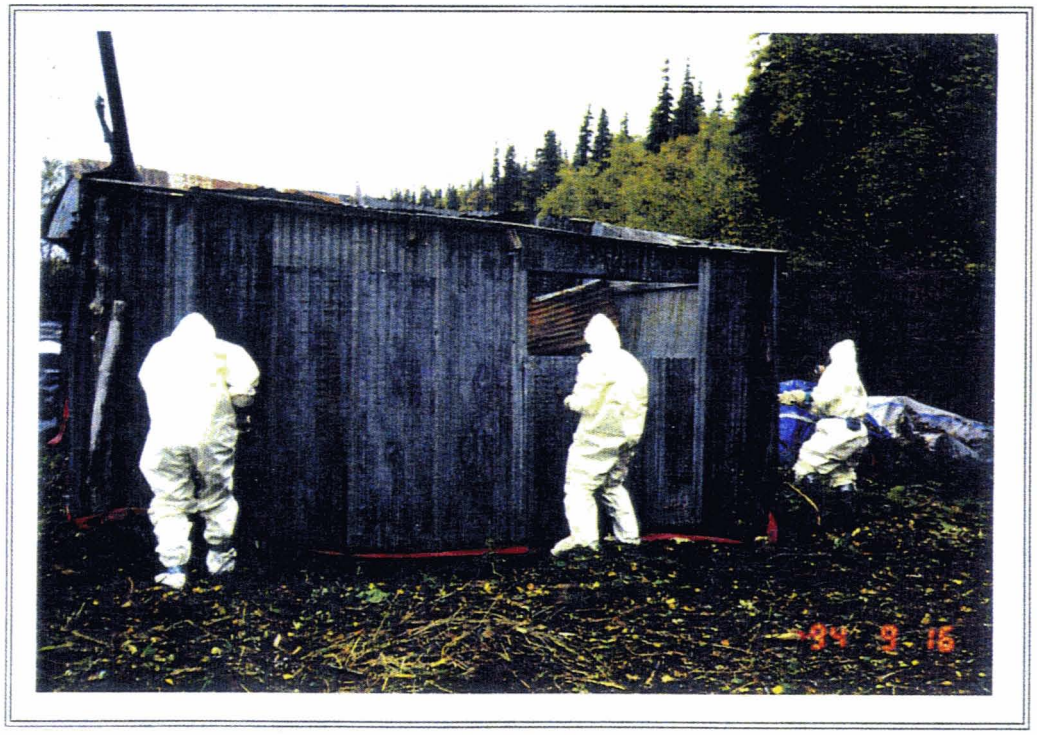


PHOTO #18

DEMOLITION OF RETORT SHACK

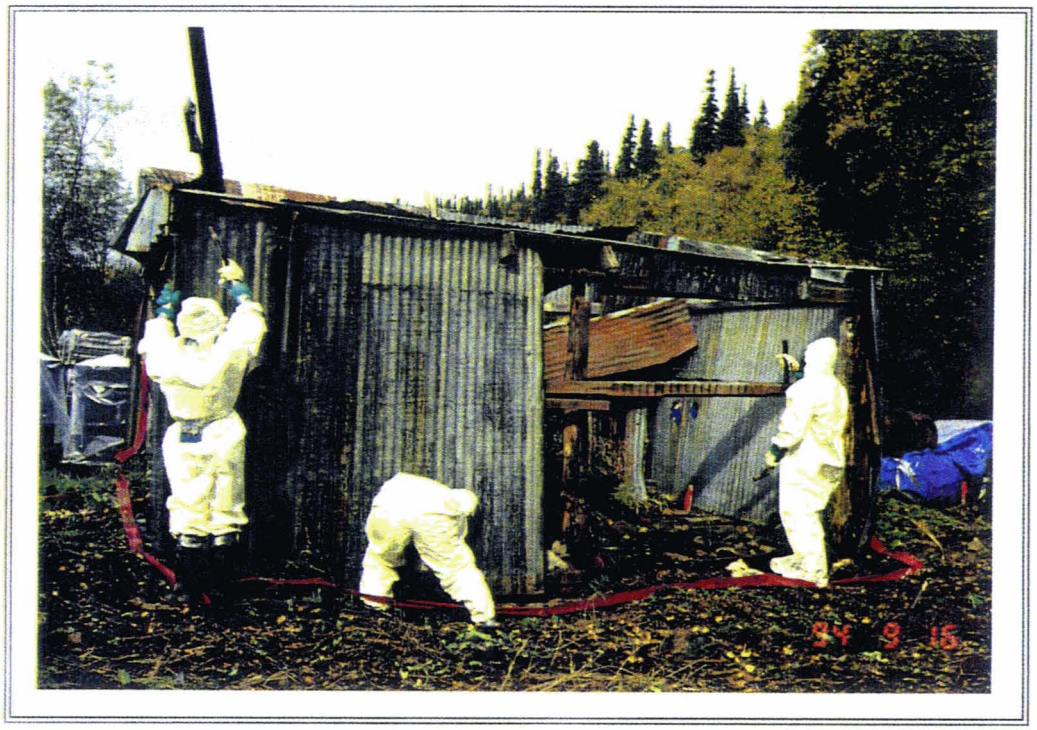


PHOTO #19

DEMOLITION OF RETORT SHACK

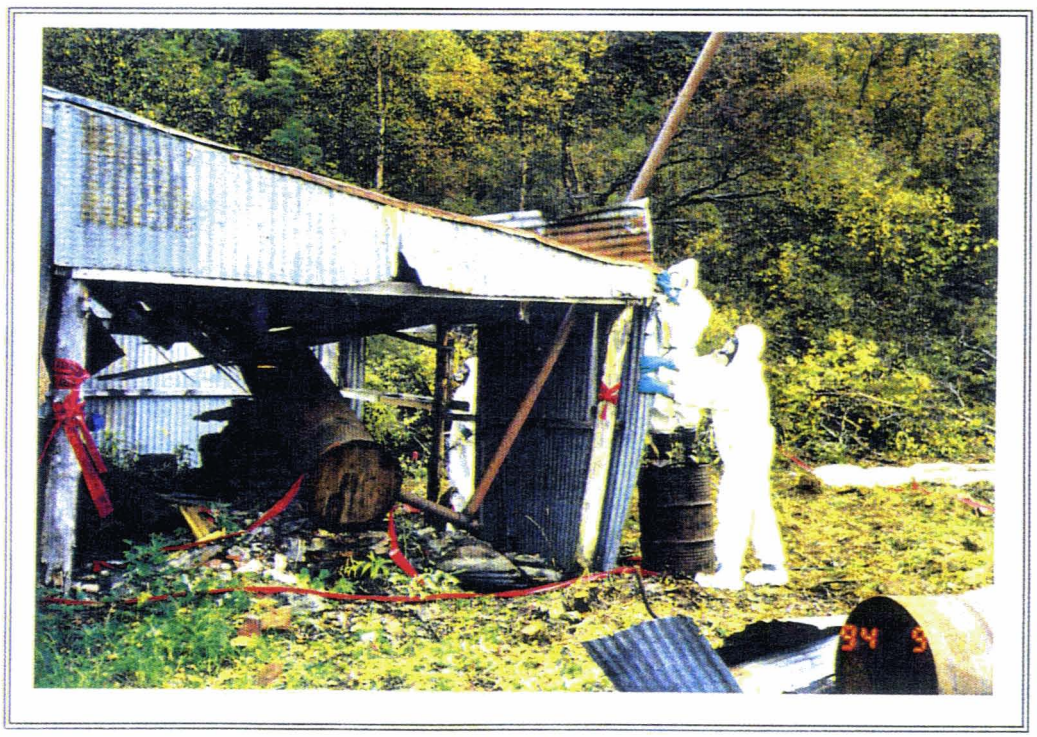


PHOTO #20

VIEW OF DEMOLITION OF RETORT SHACK

PHOTO #21

DEMOLITION OF RETORT SHACK

PHOTO #22

DEMOLITION OF RETORT SHACK

PHOTO #23

DEMOLITION OF RETORT SHACK

PHOTO #24

DEMOLITION OF RETORT SHACK

PHOTO #25

DEMOLITION OF RETORT SHACK

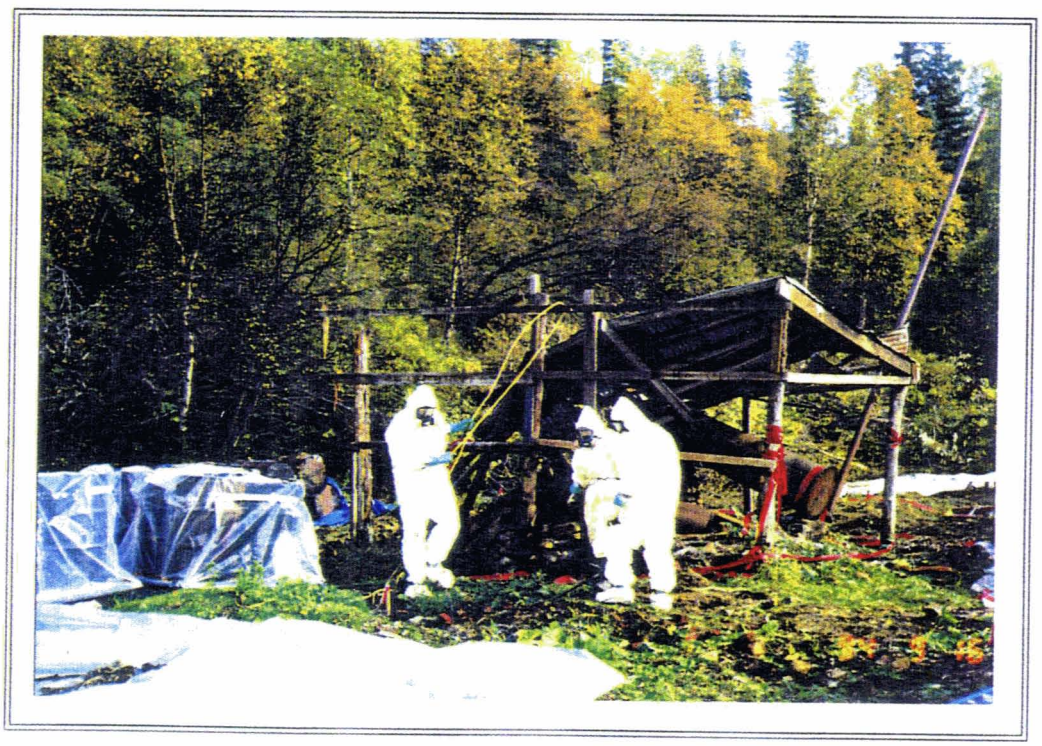


PHOTO #26

DEMOLITION OF RETORT SHACK

PHOTO #27

DEMOLITION OF RETORT SHACK

PHOTO #28

DEMOLITION OF RETORT SHACK

PHOTO #29

DEMOLITION OF RETORT

PHOTO #30

DEMOLITION OF RETORT

PHOTO #31

DEMOLITION OF RETORT

PHOTO #33

INITIAL DRUM LOADING INTO EQUIPMENT DECONTAMINATION SYSTEM

PHOTO #34

SPREADING POLY SHEETING FOR SCRAP METAL WRAPPING

PHOTO #35

CLEANED SCRAP METAL STACKED PRIOR TO POLY WRAPPING

PHOTO #36

SCRAP METAL WRAPPING

PHOTO #37

LOADING MISCELLANEOUS SCRAP FOR CONTAINERIZATION

PHOTO #38

WOOD CHIPPING AND GRADING FOR TOTE STOARGE AREA

PHOTO #39

MOVING RETORT METAL INTO DECON. SYSTEM

PHOTO #40

MOVING RETORT METAL INTO DECON SYSTEM

PHOTO #41

BRICK UNDER RETORT

PHOTO #42

COMMENCEMENT OF SITE EXCAVATION

PHOTO #43

EXCAVATION OF SITE

PHOTO #44

EXCAVATION OF SITE

PHOTO #45

EXCAVATION OF SITE

PHOTO #46

LOADING TOTES WITH CONTAMINATED SOIL

PHOTO #47

SITE EXCAVATION AND DECON SYSTEM

PHOTO #48

CLEANING EXTERIOR OF DRUMS OF SOIL RESIDUE

PHOTO #49

SITE EXCAVATION

PHOTO #50

COMMENCEMENT OF STORAGE FENCING CONSTRUCTION

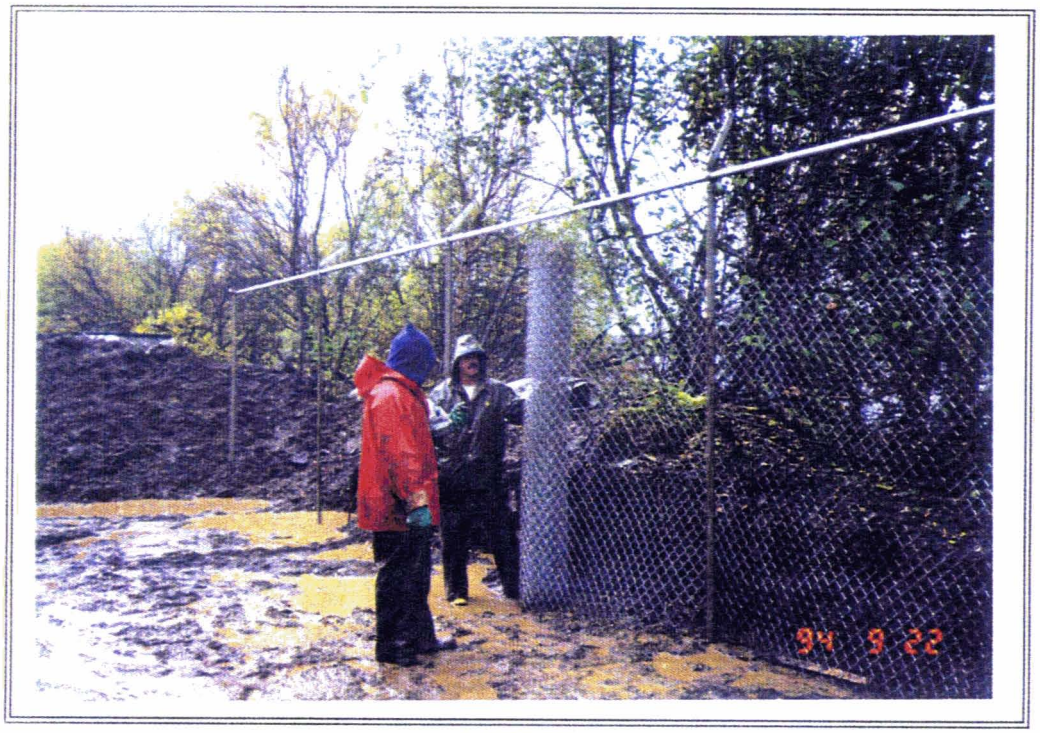


PHOTO #51

CONSTRUCTION ENCLOSURE FOR STORAGE AREA

PHOTO #52

CONSTRUCTING FENCING FOR ENCLOSURE AREA

PHOTO #53

CONSTRUCTION ENCLOSURE FOR STORAGE AREA

PHOTO #54

CONSTRUCTING FENCING FOR ENCLOSURE AREA

PHOTO #55

CONSTRUCTION ENCLOSURE FOR STORAGE AREA

PHOTO #56

CONSTRUCTING FENCING FOR ENCLOSURE AREA

PHOTO #57

CONSTRUCTION ENCLOSURE FOR STORAGE AREA

PHOTO #58

STACKING TOTES WITHIN ENCLOSED AREA

PHOTO #59

GRADING SITE FOR DEMOBILIZATION

PHOTO #60

GRADING SITE FOR DEMOBILIZATION

PHOTO #61

EXCAVATION PIT AFTER GRADING, FACING SOUTH

PHOTO #62

EXCAVATION PIT AFTER GRADING, FACING NORTH