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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2

SEP 30 2008

DATE:

SUBJECT: Approval of the Remedial Action Report for Operable Unit 1 (former facility property), Li Tungsten Superfund Site, Glen Cove, NY

FROM: Ed Als, Remedial Project Manager E Als 9/30/08
Eastern NY Remediation Section

TO: Doug Garbarini, Chief
New York Remediation Branch

Attached for your approval is a Remedial Action Report, documenting the completion of the remedy for Operable Unit 1 (former facility property) of the Li Tungsten Superfund Site, Glen Cove, NY.

Please indicate your approval of this document by signing below.

Attachment

Approved:

Doug Garbarini, Chief — 10/22/08
New York Remediation Branch — Date

REMEDIAL ACTION REPORT
FOR
OPERABLE UNIT ONE
(LI TUNGSTEN FACILITY)

LI TUNGSTEN SUPERFUND SITE
GLEN COVE
NASSAU COUNTY, NEW YORK
SEPTEMBER 2008

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1.0 INTRODUCTION

This document presents the US Environmental Protection Agency's ("EPA") Remedial Action Report ("RAR") for operable unit 1 of the Li Tungsten Superfund site; namely, the remedial activities performed on Parcels A, B and C of the Li Tungsten former facility property in Glen Cove, NY. More specifically, this RAR describes activities performed to complete the excavation of an estimated 65,090 cubic yards (cy) of contaminated soils at the Li Tungsten former facility property, including the excavation and off-site disposal of an estimated 15,638 cy of contaminated soils from Parcel A and Lower Parcel C, and 49,452 cy of contaminated soils from Parcel B and Upper Parcel C. This RAR also describes the decontamination work performed at the Dickson Warehouse on Parcel C.

1.1 Site Description

The Li Tungsten Superfund site is located in Glen Cove, NY on the north coast of Long Island **(FIGURE 1).** EPA divided this site into four operable units ("OUs"). OU 1 consists of a former 26-acre tungsten processing facility ("former facility"). OU 2 is a nearby 23-acre property known as Captain's Cove where waste ore residuals from the former facility were disposed. OU 3 was a separate effort to measure radioactive contamination in buildings which was started in 1997, but cancelled in 1998 and all work subsumed by an EPA removal action. OU 4 addressed contamination in Glen Cove Creek as a result of radioactive slag from the former facility operations.

At the former facility property (OU 1), ore-processing operations were conducted on Parcel A, bordered by Glen Cove Creek to the south and Herbhill Road to the north, and on Parcel C, which is immediately west of Dickson Lane. Parcel B, which is bordered by Herbhill Road on the south and Dickson Lane on the west, is undeveloped and was used primarily for employee parking and land disposal of ore residuals.

The Captain's Cove property (OU 2) is approximately 1,000 feet west of the former facility property, bordered by Garvies Point Road to the north and Glen Cove Creek to the south. This property had been used as a dumping area for local residential, commercial and industrial wastes from the late 1950's through the 1970's. The operators of the former facility used the western and eastern portions of the Captain's Cove property to dispose of spent ore residuals.

Glen Cove Creek (OU 4) is a mile-long tidal creek discharging into Hempstead Harbor. The creek was channelized in the early 20th century by the US Army Corps of Engineers ("USACE") to serve as a Federal navigational channel and is maintained by the USACE. The navigational channel is approximately eight feet deep and 100 feet wide at the mouth of the Creek, then gradually narrows to a width of 50 feet within the remaining distance to the headwaters at the Charles Street bridge. The Creek is tidally influenced over its entire length. Commercial and industrial properties, marinas, a sewage treatment plant, and vacant State and Federal Superfund and Brownfields properties presently abut the Creek along its length.

FIGURE 2 depicts the relative locations of OU 1, OU 2, and OU 4.

1.2 Site History

The former facility (OU 1) was operated from 1942 to approximately 1984 by a succession of corporate entities, the last of which was the Li Tungsten Corporation. Operations involved the processing of ore and scrap tungsten concentrates to ammonium paratungstate ("APT") and subsequently formulating APT to metal tungsten powder and tungsten carbide powder. Other specialty products were also produced. This processing resulted in residues containing the naturally occurring radioactive elements thorium (Th), uranium (U), and radium (Ra), as well as the metals like arsenic, barium, bismuth, copper, cobalt, chromium, lead, manganese, mercury, nickel, vanadium and zinc. Ore residuals were deposited on Parcels B and C of the Li Tungsten property, as well as on Areas A and G on the Captain's Cove property. Most of the daily processing took place on Parcel A, while Parcel C was used for wastewater treatment, processing, storage, and disposal of ore residuals. Parcel B was used as a parking area, as well as for disposal of ore residuals. The facility was acquired by the Glen Cove Development Corporation ("GCDC") from the Wah Chang Smelting and Refining Corporation in 1984, and leased to the Li Tungsten Corporation until 1985 when it ceased operations and filed for bankruptcy.

Since the late 1950's, the Captain's Cove property (OU 2) had been a dump site for the disposal of incinerator ash, sewage sludge, rubbish, household debris, creek sediments and industrial wastes. Ore residuals from the former facility were also disposed of on the western and eastern ends of the property. The Captain's Cove property was purchased by Village Green Realty in 1983 in order to construct a condominium development. Redevelopment efforts were abandoned in the mid-1980's when the New York State Department of Environmental Conservation ("NYSDEC") designated the property as a State Superfund site. The NYSDEC requested that EPA address the radioactive contamination associated with the ore residuals from the former facility, while the State addressed other chemical contamination under the State Superfund program. EPA subsequently included those areas of Captain's Cove where ore residuals were disposed of as part of the Li Tungsten site in 1995 after further investigation and sampling indicated that the residuals likely originated from the former facility.

Glen Cove Creek (OU 4) is located in the City of Glen Cove on the north shore of Long Island and is tidally influenced along its entire length. The Creek has been channelized to serve as a 1.0 mile federal navigation channel and is maintained by the USACE, extending from Hempstead Harbor easterly to the head of navigation at Charles Street near the municipal center of Glen Cove. The USACE constructed the Glen Cove Creek navigational channel in 1935. USACE proceeded to perform maintenance dredging of the outer portions of the channel in 1948, 1960, 1965, and 1996 under the authority of the River and Harbor Act of 1925. The channel is intended to be maintained at a depth of eight feet at mean low water. In recent years, however, the depth of the inner portion (*i.e.*, the eastern end), has been reduced to zero feet at mean low water from years of siltation without maintenance dredging.

EPA's first involvement with this Site was the issuance of an Order to GCDC to perform a removal action at the former facility in 1989-90. A major removal action was performed by EPA's Removal Action Branch ("RAB") from 1996-98 to address the hazards associated with approximately 270 on-site storage and process tanks. These tanks were primarily above-ground on Parcel A, and distributed both inside and outside of site structures. As part of this second removal action, both the Dice Complex and the East building on Parcel A required demolition in order to safely access and dispose of tanks and associated piping. EPA performed a comprehensive remedial investigation/feasibility study/focused feasibility study ("RI"/"FS"/"FFS") at the Site from 1993 to 1999, which in addition to investigating the nature and extent of OU 1 and OU 2 contamination, also included interim cleanup activities such as debris and vegetation disposal, bulkhead repair, and ore consolidation/relocation. EPA signed a Record of Decision ("ROD") on September 30, 1999, which selected a comprehensive remedy for both the former facility and the Captain's Cove property. The selected remedy primarily involved excavation and off-site disposal of an estimated 67,000 "cy of radioactive and heavy-metals contaminated wastes. The NYSDEC also signed a State ROD in March 1999 for the chemical contamination at Captain's Cove, requiring excavation and off-site disposal of all hazardous wastes and debris which had been dumped in the interior part of the property.

After the 1999 ROD, EPA began negotiations with potentially responsible parties ("PRPs") for the Site. These negotiations were unsuccessful, resulting in EPA's issuance of a unilateral administrative order ("UAO") to PRPs in May 2000 to perform the remedial design ("RD") and a subsequent UAO in September 2000 to perform the remedial action. EPA separately negotiated a cost recovery settlement with the City of Glen Cove (a PRP as a result of previous ownership and operation of the Captain's Cove dumpsite), by which the City would provide funds to EPA to perform work at Captain's Cove. EPA proceeded to implement certain portions of the ROD using a combination of Federal funding and cost recovery funds provided by the City. For OU 1, EPA's actions were directed at the southern half of the former facility and included the excavation and off-site disposal of all heavy-metals contaminated soils, and the excavation and staging of radioactively contaminated soils in the Dickson Warehouse on Parcel C. For OU 2, EPA excavated all heavy metals and radioactive soils at Captain's Cove and staged them on that property for disposal. These remedial actions were all carried out by RAB.

As part of the UAO for remedial action, EPA directed the PRPs to complete the remedial actions required under the ROD i.e., dispose of the staged wastes at Captain's Cove and in the Dickson Warehouse, and perform remediation of the northern half of the former facility. The performing PRP, TDY Industries, Inc., complied with those portions of the remedy that were required at the former facility. In order to complete the off-site disposal work at Captain's Cove, an interim cost settlement was brokered among EPA, the US Department of Justice ("DOJ"), and several major Site PRPs, which resulted in a large enough source of funding for EPA, through an interagency agreement ("IAG") with the USACE, to provide contracting and construction management services to complete the remediation. All excavated and stockpiled contaminated soils were subsequently disposed of from Captain's Cove by December 2005, as documented in the EPA's September 2006 RAR for OU 2.

In September 2000, the USACE initiated navigational dredging for the inner half of Glen Cove Creek, using the recently remediated Parcel A of the former facility as a temporary dewatering area. The dredging was subsequently halted at the eastern end of Parcel A upon the discovery of petroleum-laden sediments. The dredging program to that point had yielded about 24,000 cy of the estimated 45,000 cy of material to be dredged. In May 2001, EPA determined that the dredged spoils which had been placed on Parcel A were contaminated with chunks of radioactive slag ranging from about one inch to six inches in diameter. EPA determined that the contaminated spoils on Parcel A qualified for a Superfund removal action. EPA subsequently issued a third UAO in August 2001 directing certain PRPs to segregate the slag from the contaminated sediments. TDY, pursuant to that UAO, proceeded to implement segregation activities on Parcel A in Summer 2002. TDY methodically spread and instrument-screened batches of dewatered sediments, followed by manual removal of any materials exhibiting radiation greater than the specified criteria. Afterwards, the City disposed of the remaining non-radioactive sediment at the North Hempstead Landfill for use as grading material, and the segregated radioactive materials were secured in the Dickson Warehouse on Parcel C for eventual disposal.

Meanwhile, EPA performed an FFS to develop alternatives for remediation of the slag contamination remaining in the Creek and issued a second ROD in March 2005 requiring remedial dredging. RD activities were completed in Spring 2006, and remedial action was initiated in the Fall 2006. All activities required to complete the OU 4 remedial dredging were performed between the Fall 2006 and Spring 2008, as documented in a separate RAR for OU 4 dated September 2008.

2.0 BACKGROUND OF OU 1

The selected remedy for soil in the September 1999 ROD for both the former facility (OU 1) and the Captain's Cove properties included excavation, segregation of waste streams, and off-site disposal of waste soils and sediments contaminated above the ROD's cleanup criteria, which were developed to accommodate commercial future use of the Site. The selected remedy for groundwater was no action, other than long-term groundwater monitoring of the Upper Glacial Aquifer in the vicinity of the Site to determine the effects of the soil remedy on groundwater quality. EPA anticipates that the excavation of inorganic and radioactive contamination to the specified cleanup levels will greatly reduce leaching of the contaminants from the soil to groundwater. As a result, the groundwater beneath the Site is expected to improve.

The ROD envisioned that the implementation of the selected remedy would allow commercial redevelopment of the Li Tungsten Superfund site in substantial conformance with the City of Glen Cove's 1998 Glen Cove Creek Revitalization Plan, which included both properties of the Li Tungsten Site:

> *"EPA and NYSDEC will attempt to expedite the implementation of the soil remedy for the southern portion of the Li Tungsten facility, encompassing Parcel A, lower Parcel B and lower Parcel C. The estimated volume of soil targeted for excavation in these areas is approximately 5,000-6,000 cy, a disproportionately small volume of the facility's contaminated soils. Fast tracking this portion of the remediation would allow for the accelerated placement of this portion of the property back into a commercially viable scenario. This potential action would not only facilitate the City's revitalization of the Creek area, it would also be consistent with EPA's 'Recycling Superfund Sites' initiative".*

In developing the ROD's soil cleanup levels, consideration was given to risks posed by the contaminants under the reasonably anticipated future use of the Site as a commercial "Seaport-style" tourist area; cleanup levels utilized by the NYSDEC and the NYS Department of Health ("DOH") for the State Superfund cleanup at Captain's Cove; and New York State Technical Assistance Guidance Memoranda ("TAGMs"). The contaminants of concern that were selected for the ROD's cleanup criteria were the radionuclides of the uranium-238 and thorium-232 decay series, as well as arsenic, lead, and PCBs. Arsenic and lead were also intended to be indicators for other co-located metal contaminants. Due to the spatial and vertical location of contaminants of concern determined during the RI/FS, EPA felt that achieving the cleanup levels for the indicator contaminants would also adequately address other site-related metals contamination in soils and sediments.

The ROD stated that excavation would yield an estimated 18,300 cy of radioactive wastes and 17,300 cy of nonradioactive metals-contaminated wastes at the former facility property (OU 1). The ROD encouraged segregation of radioactive and nonradioactive wastes in order to minimize the volume of material requiring expensive transportation and disposal at radioactive waste disposal facilities. The remaining nonradioactive wastes were anticipated to primarily contain heavy metals associated with the processed ores. Excavated soils that did not exceed cleanup levels or contain debris could be used as backfill.

Soon after the issuance of the ROD, EPA initiated a fund-lead response to expedite the soil remedy for Phase 1 of OU 1, which included the southern portion of the former facility property, encompassing Parcel A, lower Parcel B and lower Parcel C. The southern portion of the property was also a significant part of the City's Creek revitalization plan.

After remedial action began, the EPA issued an Explanation of Significant Differences (ESD) for the Site in November 2002 (EPA, 2002) to describe the increases in projected volume estimates of wastes requiring excavation pursuant to the 1999 ROD, from 69,350 cy to 132,100 cy. For OU 1, the excavation volume estimated in the ROD i.e., 35,600 cy, was re-estimated as 54,100 cy in the 2002 ESD.

In May 2005, EPA issued another ESD to re-evaluate the 1999 ROD's cleanup criteria in order to address the City of Glen Cove's decision to revise the Glen Cove Creek waterfront revitalization plan to include residential future use of the Site. EPA determined that the ROD's radiation criteria needed some revision, but that the arsenic and lead criteria were sufficiently protective of future residential use and need not be revised. The ESD also reserved judgment on the residential future use of Parcel A because of the possibility that contaminants other than those included in the ROD's cleanup criteria could pose a threat to future residential populations.

2.1 Remedial Action Objectives

The remedial action objectives ("RAOs") described in the 1999 ROD were:

Building Materials

- Prevent exposure to building materials contaminated with radionuclides or chemicals of concern;

- Eliminate hazards to future Site workers posed by unstable structures; and

- Remove any structural impediments that might interfere with pre-design sampling and implementation of soil and groundwater remediation.

Soil/Sediment

- Prevent or minimize exposure to contaminants of concern through inhalation, direct contact or ingestion; and

- Prevent or minimize cross-media impacts from contaminants of concern in soil/sediments migrating into underlying groundwater.

Groundwater/Ponded Water

- Prevent or minimize ingestion, dermal contact and inhalation of inorganic-contaminated groundwater "hot spot" areas on lower Parcel C and on Parcel A that are above State and Federal maximum contaminant levels ("MCLs");

- Restoration of groundwater quality to levels which meet State and Federal standards; and

- Remediation of contaminated surface water in on-site ponds to reduce risks to public health and the environment.

2.2 Cleanup Criteria

TABLE 1 contains the cleanup criteria presently in effect for the Site properties as a result of the 2005 ESD's revisions to the 1999 ROD, and therefore reflects the more stringent radiation cleanup criteria needed to allow residential development.

3.0 REMEDIAL CONSTRUCTION ACTIVITIES

In order to implement the fast-tracking of the selected remedy for the southern portion of the Li Tungsten Superfund site as described in the ROD i.e., Parcel A, lower Parcel B, and lower Parcel C, EPA decided to use its RAB to perform this part of the remedy. Remediation of the southern portion was designated "Phase 1" of the OU 1 response.

3.1 Phase 1

EPA's RAB mobilized to the former facility property in February 2000 to commence Phase 1 of OU 1. The scope of work specifically included the excavation of all soil and sediment exceeding the ROD cleanup criteria; demolition of the Carbide Building and Lab/Office/Wire Building complex and segregation and decontamination, if possible, of radioactive building debris; staging of excavated soil and building debris that exceeded radioactive cleanup criteria in the Dickson Warehouse for future off-site disposal by potentially responsible parties; disposal of any non-radioactive, heavy metals-contaminated soil as well as non-radioactive building debris at appropriate off-site disposal facilities; sampling/analysis to confirm excavation pits have met cleanup criteria; flushing, collection and disposal of contaminated sediments from storm sewers under the Phase 1 remediation area; and decommissioning of industrial well N1917 on Parcel A.

After work was initiated, subsequent increases in volume estimates and remediation costs caused EPA to reconsider the Phase 1 scope, resulting in the decision that work would be terminated after Parcel A and lower Parcel C had been remediated. Implementation of the remainder of OU 1, involving excavation of contaminated soil, sediment, and ore residuals from all of Parcel B as well as upper Parcel C, was reserved for a PRP response at a later date.

RAB filed Pollution Reports ("POLREPs"), for Phase 1 from February 21, 2000 through May 4, 2001. Copies of the initial and final POLREPS are included as **APPENDIX 2**. Mobilization activities included securing trailers, utilities, subcontractors, equipment and supplies. Local and County officials also received notification of the Phase 1 RA. Subsequently, from February 2000 to August 2001, RAB completed the Phase 1 excavation work of both radioactive and non-radioactive metals-contaminated soils on Parcel A and lower Parcel C. The radioactive soils were staged in the Dickson Warehouse anticipating future disposal by PRPs, while RAB disposed of the non-radioactive, metals-contaminated soils off-site. EPA's Interim Remedial Action ("IRA") Report dated September 28, 2001, for this action is attached as **APPENDIX 3** and provides remedial action details for the Phase 1 portion of OU 1.

3.2 Remediation of "Exempt Areas"

Subsequently, RAB returned and excavated 3 localized pockets of contamination within the Phase 1 area, designated as EA-3, EA-4, and EA-5, in October and November 2003. As part of this same action, RAB also excavated two additional areas located on the perimeter of Captain's Cove, i.e., Areas EA-1 and EA-2. These areas had initially been "exempted" because of logistical difficulties encountered during earlier excavation work. After excavation, RAB staged these contaminated soils on Captains Cove for eventual disposal. See **APPENDIX 4** for locations of exempt areas and RAB's post-excavation sampling results. Although EPA successfully remediated these areas to within radiation criteria, levels of arsenic and/or lead remain above cleanup criteria at the three Phase 1 locations, as more fully discussed under "***Remediation Flags***", below.

3.3 Dickson Warehouse Radioactive Stockpile Removal and Limited Parcel C Excavation

In August 2003, EPA ordered TDY Industries, a lead PRP for performance of work at the Site, to initiate the remainder of OU 1 work by removing and disposing of the radioactively impacted materials staged in the Dickson Warehouse. The period of performance for this task was January 26 through March 5, 2004. TDY's contractor, Environmental Chemical Corp ("ECC"), loaded and shipped approximately 5,180 tons of radioactively contaminated soils and ore residuals from the Dickson Warehouse to US Ecology in Idaho. During this action, TDY requested that EPA broaden its approval of the project work plans to allow for some excavation, transportation, and disposal of radioactively-contaminated soils located on upper Parcel C. These potential excavation areas had been delineated in TDY's final Remedial Design ("RD"). This excavation work was performed between March and April of 2004. ECC excavated and shipped an additional 3,527 tons of radioactively contaminated soils from upper Parcel C to US Ecology. The TDY OU 1 work performed in 2004 is detailed in ECC's IRA report dated November 9, 2004, and included as **APPENDIX 5 (IRA report without appendices).**

The remainder of Section 3 of this RAR specifically deals with those actions performed by TDY (with EPA and USACE oversight) on Parcels B and upper C required to complete the OU 1 scope of work.

3.4 Excavation of Parcel B and Upper Parcel C

The remedial activities conducted at Parcel B and upper Parcel C primarily consisted of the excavation and off-site disposal of soils impacted with radionuclides, arsenic, lead, and PCBs to satisfy cleanup criteria specified in the 1999 ROD, as revised by the 2005 ESD. Compliance with Site-wide cleanup criteria was demonstrated using the procedures in the *Multi-Agency Radiological Site Survey and Investigation Manual* ("MARSSIM") (EPA 402-R-97-016) and Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846).

The scope of work generally included the following tasks:

- Clearing and grubbing;
- Environmental monitoring;
- Excavation and stockpiling of soils impacted with radionuclides, metals, and PCBs;
- Transfer of excavated radioactive, PCB, and TCLP-failure soils into the Dickson Warehouse for temporary storage;
- Excavation and direct loading of metals-impacted soils into dump trucks or similar transport containers for off-site disposal;
- Performance of sampling and analysis to identify soils that meet the Waste Acceptance Criteria ("WAC") for the GROWS Landfill and Tullytown Resource Recovery Facility;
- Preparation of manifests and bills of lading for disposal of waste shipments;
- Performance of Final Status Surveys ("FSS") of excavated areas for radionuclides, metals, and PCBs in accordance with MARSSIM or SW-846, as appropriate; and
- Equipment decontamination, property re-grading and stabilization prior to demobilization from the Site;

3.4.1 Site Mobilization

TDY's contractor ECC mobilized to the Site on June 25, 2006. As part of mobilization, ECC filed a water use permit application with the City of Glen Cove. This permit authorized ECC to connect to the Glen Cove hydrant system and use City water for dust suppression and decontamination. Temporary power was installed at strategic locations to energize air monitoring stations and office trailer facilities. Portable electric generators were installed where power services could not be reasonably provided. Temporary waste loading stations complete with truck scales were constructed near excavation points or in areas where soil consolidation and conditioning would occur. A temporary construction office trailer and portable gamma spectroscopy laboratory was installed on the Site to support remediation work.

The Dickson Warehouse was inspected and access controls, such as temporary fencing, were established to ensure the interior of the Warehouse was adequate for storage of waste materials.

3.4.2 Work Zones

Site work zones with definitive boundaries were established to prevent or minimize exposure from project hazards and to reduce migration of contaminants into clean areas. ECC established and maintained three work zones at each parcel - the Support Zone ("SZ"), where personnel were not exposed to hazardous material; the Contamination Reduction Zone ("CRZ"), which was the area between the impacted area and the clean area, where equipment and personnel were monitored and decontaminated after leaving the EZ; and the Exclusion Zone ("EZ"), where the active excavation and contaminated materials handling took place. EZs were clearly marked with flagging, barricade tape, traffic cones, or other indicators to limit access. Only authorized, trained, and qualified personnel in the appropriate level of protection were admitted to the EZ.

Because excavation work was conducted incrementally within Parcels B and C, several CRZ locations and two SZ locations were established to facilitate the excavation process.

3.4.3 Clearing and Grubbing

The clearing and grubbing of Parcel B and upper Parcel C was performed in June/July and included delineation of work areas and areas of known contamination, clearing debris, and cutting of vegetation within the limits of the work area. Because established vegetation is one of the elements of stabilization, clearing and grubbing was minimized to the greatest extent practicable. Vegetation and debris removed from areas with known contamination were segregated from vegetation and debris removed from areas that were not contaminated. These materials were screened and found not to contain radionuclides or metals of concern above waste disposal criteria. Limited chipping and stump grinding was performed to obtain x-ray fluorescence ("XRF") samples that were used to verify that vegetation was not impacted with lead. All vegetative material was cleared as uncontaminated and deposited in a clean area until used for erosion control in accordance with the final Site stabilization plans for Parcel B and upper Parcel C.

At the conclusion of clearing and grubbing operations, air monitoring was initiated around Parcel B, prior to the start of excavation activities. Air monitoring was established around Parcel C on August 14, 2006, prior to the start of any intrusive activities there.

3.4.4 Excavation, Screening and Survey

TDY's RD had further delineated areas of Parcel B and upper Parcel C requiring excavation. ECC developed a written Field Implementation Guidance ("FIG") for the excavation of arsenic and lead impacted soil (**APPENDIX 6**). ECC conducted screening and surveying in increments of one foot or less during excavation of radiological- and metals-impacted soils from locations specified in the RD. Between the removal of each increment, ECC performed a Remedial Action Support Survey ("RASS"), which is a detailed instrumentation scan of the remaining soil surfaces using portable gamma radiation detectors and XRF instrumentation. This "in process" monitoring procedure combined with discreet soil sampling and analysis utilizing ECC's on-site laboratory and off-site laboratory data increased excavation efficiency while meeting the Site cleanup criteria.

A supplemental RASS survey was performed when excavation of radionuclide-impacted and metals-impacted soils was completed in an area. The supplemental RASS survey was performed in order to demonstrate that the Derived Concentration Guideline Limits ("DCGLs") as described in MARSSIM were met and that the Final Status Survey ("FSS") might proceed. Additional excavation was performed if an area of residual contamination was detected above the DCGLs. Once the removal of contaminated soils in a survey unit was completed, an FSS was performed. The Sampling and Analysis Plan ("SAP") for Parcel B and upper Parcel C is included as **APPENDIX 7** and describes the RASS and FSS procedures.

3.4.5 Radionuclide-impacted Soil

Excavation of radiologically impacted soil on Parcel B began on July 27, 2006 and on upper Parcel C on August 4, 2006 in the areas identified in **FIGURE 3**. An operator excavated to an initial depth of one foot. During all excavation work, ongoing radiological walkover surveys were performed to direct the operator. Additional lifts were collected when RASS results indicated radiological values above cleanup criteria. An estimated total of 1,965 cy of radiologically impacted soils were excavated from Parcel B and 231 cy of radiologically impacted soils were excavated from upper Parcel C and stockpiled in the Dickson Warehouse.

In those areas where excavation did not reach the depths shown in the RD excavation contours, test pits were sampled to confirm that sufficient material had been excavated. Eight test pits were sampled in the radiological area of Parcel B at depths from 2 to 6 feet, seven test pits were sampled in the radiological areas of Parcel C at depths from 2 to 3 feet and two test pits were sampled in Parcel C' at 2 feet. All test pits measured less than 14 microRoentgens per hour (uR/hour) and less than the Site-wide cleanup criteria.

A supplemental RASS was performed on Parcel B and upper Parcel C in July 2007. The RASS was performed using a portable gamma scintillator coupled to a scaler/ratemeter.

3.4.6 Metals-impacted Soil

Upon completion of the radioactive materials removal phase, the remedial setup was reconfigured for removal of the metals-impacted soils. ECC constructed a haul road on Parcel B permitting the excavation to proceed from north to south. Excavation of metals-impacted soil on Parcel B began in August 2006 and on Parcel C in November 2006 in the areas identified in the RD. An operator excavated to an initial depth of one foot. Additional lifts were then excavated when RASS XRF results still indicated lead or arsenic values above cleanup criteria. Samples were also collected for Toxicity Characteristic Leaching Procedure ("TCLP") lead and arsenic analyses to determine hazardous waste status under RCRA.

3.4.7 PCB-impacted Soil

The area denoted as the PCB dumping area in the middle of Parcel B was excavated and PCBs-impacted soils were removed. ECC excavated to an initial depth of one foot and performed additional one-foot lifts to excavate below PCB cleanup levels. In November 2006, field screening of PCBs in soils was undertaken to determine that PCB criteria were met in the PCB target areas. Samples were then collected to confirm that cleanup criteria had been achieved. An estimated total of 835 cy of PCB-impacted soils were excavated from Parcel B and were stockpiled in the Dickson Warehouse awaiting future disposition. No PCB-impacted soils were found on Parcel C.

PCB analytical results indicated that soils in the top two feet of the northern half of the PCB remedial area slightly exceeded the surface cleanup criterion of 1 milligram per killigram ("mg/kg"). Therefore, two feet of clean cover was placed over this area to ensure that the soils that slightly exceeded the surface criterion were now subject to, and in compliance with, the "at depth" criterion of 10 mg/kg. This clean cover soil must be maintained over the northern portion of the PCB area in order to meet the ROD's PCB cleanup criterion, as further discussed under "***Remediation Flags*"**, below.

3.4.8 Excavation Summary

See **FIGURE 4** for metals and PCB excavation areas. Excavated soils were segregated into separate stockpiles for non-RCRA metals, RCRA metals, radionuclides, and PCBs. Radionuclide, PCB, and RCRA soils were transferred to the Dickson Warehouse for future disposal.

The excavated soil quantities by contaminant category for the former facility property are provided in **TABLE 2.**

3.5 Confirmation and Characterization Surveys

Confirmation and Characterization Surveys ("CCS") were performed to demonstrate compliance with federal and state regulations that governed the transportation and disposal of wastes. The CCS also provided quantitative analytical data for Ra-226/ Ra-228, and for Th-230/ Th-232 concentrations present in excavated materials. The sampling was sufficient to demonstrate compliance to the following:

- The WAC for the selected disposal facilities;
- Reportable quantity criteria as defined by 49 CFR 172.101; and/or
- Specific activity limits of radioactive materials as stated in 49 CFR 173.403

Confirmation samples were collected from the excavated materials. The samples were analyzed at the on-site lab and/or at an off-site laboratory. Quality control of the on-site laboratory was maintained as defined by the procedures outlined in the Contractor Quality Control Plan, included as **APPENDIX 8**. Metals-impacted soil samples were initially screened with the XRF and/or sent for off-site analysis. The radiological samples were counted on-site using the Canberra high purity germanium ("HPGe") Gamma Spectroscopy System. The off-site laboratory reported concentration-based results for Ra-226, Ra-228, Th-230 and Th-232 and for arsenic and lead. The data was used to confirm that previously calculated correlations remained accurate for both the gamma scintillation and XRF instruments. In addition, the data were used to confirm that the characteristics of the waste material conformed to the GROWS/Tullytown facility WAC. The results were also used as additional indicators for the RASS surveys. Data for Ra-226, Ra-228, Th-230, and Th-232 were used to establish ratios between Ra-226 and Ra-228, and Th-230 and Th-232. Ratios were then used to calculate the concentration of Ra-228 and Th-230.

ECC characterized all excavated non-RCRA metals-impacted soil prior to acceptance of the waste by the GROWS/Tullytown disposal facility. The GROWS/Tullytown disposal facility required that the soils be appropriately characterized prior to facility acceptance as specified in their WAC requirements. A sample was collected for every 500 cy of impacted soil. Soils that met acceptance criteria were shipped to the GROWS/Tullytown facility for disposal. Other wastes not meeting the GROWS/Tullytown acceptance criteria were segregated and managed within the Dickson Warehouse based upon the type of contamination in the soil (radioactive, PCB, or RCRA-hazardous metals).

For metals-impacted soils that met GROWS/Tullytown acceptance criteria, tandem dump trucks were filled and presented with waste manifests and bills of lading for transportation to the GROWS/Tullytown disposal facility. Tare weights for each truck and gross loaded weights were recorded to calculate the net tonnage of soils. These net tonnages were then transferred to a master sheet to keep a running total of metals-impacted soils from Parcel B and Parcel C.

A total of 16,315 cy of metals-contaminated soils from Parcel B and 24,949 cy of metals–impacted soils from Parcel C were excavated and characterized.

3.6 Disposal of Dickson Warehouse Contents and Warehouse Decontamination

TDY remobilized to the Dickson Warehouse in November 2007 using a new contractor, URS. At this point, TDY was operating pursuant to the global Consent Judgment which had been entered in Federal Court on October 29, 2007. The scope of work generally included disposal of the stockpiled radioactive, RCRA-hazardous, and PCB-contaminated soils staged in the Warehouse, as well as testing and decontamination of the Warehouse itself.

3.6.1 Disposal of Radioactive, RCRA-hazardous, and PCBs-contaminated Soils

The PCBs stockpile in the Dickson Warehouse was shipped on November 12, 2007 to Wayne Disposal in Belleville, Michigan for disposal. The radiologically contaminated soil stockpile was shipped from November 13 through November 20 to US Ecology in Grand View, Idaho for disposal.

The RCRA-hazardous soils, which were contaminated with lead and classified as "D008" wastes, were first stabilized with Calciment® i.e., lime, inside the Dickson Warehouse prior to disposal. A treatability study was conducted in November 2007 to determine the proper proportion of Calciment® to be mixed with the RCRA soil. 500 cy of RCRA soil was laid out in a 6-inch lift on the concrete floor of the Dickson Warehouse. URS planned to use Calciment® to stabilize the RCRA soil. Based upon historical total and TCLP lead data, the addition of Calciment® at a rate of 5% by weight was expected to be sufficient to stabilize the lead to the Universal Treatment Standard ("UTS") as an Underlying Hazardous Constituent ("UHC") of 0.75 milligrams per liter ("mg/l") TCLP for lead. However, when actual stabilization proceeded, it was determined through sampling that additional Calciment®, i.e., as much as 10% by weight, was necessary for some of the lifts. To further facilitate the blending process, i.e., through using a bulldozer and loader to alternately till and tumble the mixture, the size of the lifts was reduced to 250 cy. Once sampling indicated that the lifts met the RCRA criteria, the stabilized RCRA soil was shipped during May/June 2008 to the GROWS/Tullytown facility in Morrisville, Pennsylvania.

3.6.2 Dickson Warehouse Decontamination

The decontamination of the Dickson Warehouse began on June 4th and was completed by July 25th, 2008.

Decontamination efforts began with the removal of debris located inside the Dickson Warehouse. The material was collected, dust removed via vacuuming as necessary, radiologically scanned for release, then placed into a roll-off box for disposal.

The debris removal operation was followed by vacuuming all horizontal surfaces inside the Warehouse. This operation was performed utilizing HEPA vacuum units and manlifts to access elevated areas of the structure. Once a vacuum unit was full of dust, the bag was removed and placed into a 55-gallon open-top drum.

Additional removal efforts were required for the floor area. Built-up dust and dirt required hand scraping to remove the gross material generated during the RCRA soil stabilization efforts. The hand scraping was followed by vacuuming either by the HEPA units or the use of a Tennant® sweeper. As the dust removal operation progressed, radiological scanning procedures were performed to identify remaining areas of elevated activity. Elevated activity levels were found in various locations on the concrete block walls (interior and exterior), the foundation walls (exterior), the concrete floor, and the roof area (near positive and passive vents as well as gutters).

To remediate these areas, various techniques were implemented. URS utilized a hand-held needle gun equipped with a shroud to remove identified areas located on the concrete block and foundation walls.

Three different scarifying units were used to address the radiologically elevated areas on the approximately 18,000 square feet of floor. The needle gun was used to remove identified material in areas that could not be remediated using larger units. A planer was used to scarify and remove elevated areas within 12- to 16-inches of walls, elevated pads, and columns in preparation for the shotblaster operation. This technique was also used to scarify the footprint of the PCB stockpile. The remediation of the floor area was completed utilizing a shotblaster unit.

The roof remediation consisted of the removal of contaminated roof materials and gutters.

Each remedial action was followed by instrument scanning or testing to verify the complete removal of elevated areas. If an additional area was identified, it was removed using one of the techniques described above depending on location and extent.

All building materials that were removed or drummed because of radioactivity were sent to US Ecology for disposal. Soil sweeping and other debris that was not radioactive was sent to GROWS/Tullytown landfill.

3.7 Grading and Stabilization

The grading plans for Parcel B and upper Parcel C are provided as **APPENDIX 9.** General post-remediation storm water management features included maintaining runoff flow patterns and discharge locations similar to existing conditions, and maximizing overland flow through vegetated areas. The methods of grading and stabilization included lot benching, brush barriers, run-on prevention barriers, slope erosion control, surface drains, overflow drains, and re-establishment of vegetative cover. Grading and restoration of Parcel B took place during May/June 2007 and the grading and restoration of upper Parcel C was performed during July 2007. The PCB northern excavation area in Parcel B was restored with two feet of clean soil cover, as described earlier. Supplemental fencing and signage were installed as necessary around Parcel B and upper Parcel C at the end of July 2007.

3.7.1 Construction Storm Water Management Practices

The management and treatment of on-site construction storm water was performed by ECC under water management plans for each Parcel. On-site storm water was collected in Baker frac tanks, allowed to settle, and then discharged through a filter to storm drains designated by the City of Glen Cove. Upon remediation of an area, ECC documented the remediation through a storm water diversion memorandum to EPA, which included all RASS and FSS supporting information and analysis. Thereafter, storm water from these remediated areas was not required to be collected and treated. A total of eight storm water diversion memoranda were prepared for Parcel B and upper Parcel C.

3.8 Demobilization

As part of final demobilization activities, URS completed the action items that were identified during a pre-final inspection that included modifications to promote drainage of the ponded water behind the wall located northeast of the Dickson Warehouse, modifications to promote drainage of the ponded water behind the wall located southwest of the Dickson Warehouse, repair the drainage ditch on the hillside located southwest of the Benbow Building, and reseed two areas.

URS also cleaned the equipment utilized to complete the project using hand scrapers, long-handled shovels, and brushes. Once the equipment was cleaned, each unit was scanned to release it for pickup. Various equipment, such as the site trailer, portajohns, trash receptacle, boom lift, forklift, excavator, and backhoe were picked up between personnel demobilization on July 27th and the August 1, 2008 final inspection. A compressed gas cylinder containing calibration gas was shipped back to the vendor after the final inspection and the fuel tank was picked up by the diesel fuel supplier on August 13, 2008 to complete demobilization activities.

3.9 Out of Scope Issues Affecting Remedial Efforts

The following project quality issues outside the planned remedial work were identified and mitigated during the course of the project.

Asbestos Abatement

Suspected asbestos-insulated piping was found buried along the eastern side of Parcel C in between the Dickson Warehouse and Benbow Building in December of 2006. In January of 2007, Tradewinds, an asbestos abatement contractor licensed by the State of New York, was contracted to perform asbestos abatement, and Jet Environmental was contracted to perform abatement air monitoring. All samples were less than or equal to 0.01 fibers per cubic centimeter as specified by applicable laws and regulations.

Diesel Spill

Approximately 100 gallons of diesel fuel from a generator fueled by an external tank spilled on September 6, 2006 and was released into the Dickson Warehouse, part of which migrated out of the south side of the Warehouse. Applicable authorities within the NYSDEC were notified, and emergency spill containment and cleanup actions were undertaken. After the necessary cleanup and removal actions had been completed, NYSDEC Spill Number 0606455 was closed.

Parcel B Holding Pond Breach

After work hours on November 16, 2006, a wall from the holding pond on Parcel B failed. The water from the pond flowed to the south side of Parcel B and overflowed the south catch basin. The overflow of water from the south side catch basin then continued out the silt fencing and hay bales on the south side of Parcel B across Herbhill Rd and onto Parcel A.

Air Monitor Generator Vandalism

The gate to Parcel B was found open on the evening of July 23, 2006. Upon further inspection, it was apparent that an attempt was made to either steal or vandalize the generator for air monitoring equipment. Fuel lines and electrical wires to the generator were cut. No fuel was spilled. The generator was promptly repaired and put back into service.

3.9 *Remediation Flags*

The following areas of the former facility property will require special consideration and/or restricted access in the future because contaminants of concern were left on the property above the ROD/ESD cleanup criteria.

Groundwater Beneath Parcels A, B, C and Environs

All excavation work during OU 1 by EPA, or by TDY with EPA oversight, occurred primarily in the vadose (unsaturated) zone above the water table. Radionuclide contamination above clean up criteria would continue to be excavated below the water table, but non-radioactive, heavy metals contamination would not. Little, if any, radioactive soils contamination was encountered below the water table, with the result that minimal excavation occurred below the water table. Therefore, there are sporadic occurrences of heavy metals contamination below the water table in the area of OU 1 (as well as contamination from volatile organic compounds ("VOCs") in the groundwater under Parcel A) which must preclude the use of groundwater in this area, particularly for potable uses. As required by the 1999 ROD, a groundwater monitoring program will be performed by TDY for 5 years at both OU 1 and OU 2 to monitor the progress of groundwater improvement now that the overlying contaminated soils have been removed.

Parcel A

During Phase 1 excavation work, Parcel A was remediated to the ROD cleanup criteria for commercial future use. The 2005 ESD recognized that while other portions of the Li Tungsten site could be used for residential future use if they were excavated to the modified cleanup criteria, Parcel A may have levels of polycyclic aromatic hydrocarbons ("PAHs") or possibly other contaminants that could preclude unrestricted residential use. Post-excavation confirmatory sampling has demonstrated that the overall cleanup performed during OUs 1 and 2 will permit residential use on these properties, with the continued exception of Parcel A, which is still deemed suitable only for commercial or industrial future use, as per the 1999 ROD.

A small area in the southwest corner of Parcel A may still have concentrations of arsenic above the water table that marginally exceed cleanup criteria, based on post-excavation data. Future intrusive activities in this area should take this possibility into account.

PCB Area on Parcel B

The area denoted as the PCB dumping area in the middle of Parcel B was excavated and the PCBs removed. Samples were then collected and it was determined that the alternative Site-wide cleanup level of 10 mg/kg for 2 feet below grade could be applied to the northern portion of the PCB area which did not meet the ROD cleanup criteria for surface soils. Subsequently, ECC placed 2 feet of clean backfill over the northern portion of the PCB remedial area. The clean cover must be maintained over the northern portion in order to meet the ROD cleanup standard. The need for maintenance of the clean cover must be communicated to future users of that section of Parcel B.

Side Wall Along Western Edge of Parcel C

As part of the upper Parcel C excavation, ECC surveyed the side wall area of the excavation west of the Dickson Warehouse at 10-meter grid nodes with an XRF unit. These survey results showed 12 locations with readings above the DCGL for arsenic and 2 locations with readings above the DCGL for lead. ECC obtained 4 FSS samples from this area which confirmed the elevated readings. This "line" of arsenic and lead contamination is an extension of a similar line of arsenic and lead contamination running along the western edge of lower Parcel C that was encountered by EPA during Phase 1.

In both cases, it was determined that further excavation along this line of heavy metals contamination is infeasible because of the existing utility and infrastructure present within the immediate area beyond the fence line, i.e., primarily two storm drain systems as well as underground electric services. In the area west of the Dickson Warehouse, ECC physically separated the contaminated area by covering it along its length with 15-mil puncture resistant poly sheeting. After the poly sheeting was installed, it was covered with clean fill.

Northeast Corner of Lower Parcel C

Arsenic contamination was left above cleanup criteria in the vicinity of a gas line along a short stretch of Garvies Point Road, abutting the east side of lower Parcel C.

In summary, future construction work has to take into account the above "legacies" of this Superfund property; therefore, it will be necessary to devise institutional constraints that will effectively minimize human exposures to these residual contaminants.

4.0 CHRONOLOGY OF EVENTS FOR OU 1

DATE	AGENT	ACTION
October 1992	USEPA	Final Site Listing on National Priorities List
September 1999	USEPA	Record of Decision for OU1/OU2
February 2000	RAB*/Earth Tech, Inc.	Mobilization: Parcel A remediation
May 2000	RAB/Earth Tech, Inc	Commencement of lower Parcel C remediation
July 2000	RAB/Earth Tech, Inc	Completion of Parcel A remediation
June 2001	RAB/Earth Tech, Inc	Completion of lower Parcel C Remediation
August 2001	USEPA	Final Inspection Parcels A and lower C
October 2003	USEPA	Parcels A and lower C "Exempt Area" remediation
January 2004	TDY/ECC/EPA oversight**	Mobilization to empty Dickson Warehouse
April 2004	TDY/ECC/EPA oversight	Warehouse emptied and limited radiation excavation work on upper Parcel C completed
June 2006	TDY/ECC/EPA oversight	Mobilization: Parcel B remediation
August 2006	TDY/ECC/EPA oversight	Commencement of upper Parcel C remediation
June 2007	TDY/URS/EPA oversight	Commencement of Dickson Warehouse decontamination
July 2007	TDY/ECC/EPA oversight	Completion of Parcel B remediation

July 2007	TDY/ECC/URS/EPA oversight	Completion of upper Parcel C remediation, including Warehouse decontamination
August 1, 2008	USEPA/NYSDEC/TDY/ City of Glen Cove	Final Inspection Parcels B and upper C

* US EPA's Removal Action Branch (RAB)
** work was performed by TDY, a PRP, with EPA oversight

5.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

5.1 *Phase 1*

EPA contractor Earth Tech Inc. developed a Quality Assurance Project Plan ("QAPP") for Phase 1 remediation work in response to the requirements in their subcontract. This document described the methods, standards, inspection, testing, and documentation requirements which were used to ensure quality control during excavation. This also included a description of the anticipated protocols for instrument surveying, sampling and analytical methods that would be used to determine the achievement of cleanup criteria during remedial action.

Excavation areas were labeled through use of an alphanumeric system. Confirmatory sampling for laboratory analysis to determine whether the cleanup levels had been met was performed in each excavation by sampling the "walls" and "floor" of the excavation. For each surface, five samples were typically secured, usually with one in the approximate center of the surface and the other four evenly distributed from the center. The five samples would then be composited and the results of the composited sample compared to the cleanup levels.

Analyses of the confirmatory soil samples for Parcels A and lower C during Phase 1 are summarized in the EPA's <u>Interim Remedial Action Report for Operable Unit 1 - Parcel A and Lower Parcel C</u> in **APPENDIX 3.**

5.2 *Parcel B and Upper C*

Excavation and confirmatory work was performed in accordance with the FIG (**APPENDIX 6).**

Upon completion of excavation work in an area, an FSS was performed in accordance with the EPA-approved Final Status Survey Plan ("FSSP") and in accordance with Chapter 9 of SW-846 for lead, arsenic, and PCBs, and in accordance with MARSSIM for radiological constituents. The FSS report ("FSSR") details the statistical analysis of the sample results and demonstrates that Parcel B, C, and C' meet the cleanup levels specified in the ROD for lead, arsenic, PCBs, Ra-226 + Ra-228, and Th-230 + Th-232, except as noted earlier under Section 3.9.

The EPA incrementally collected splits of ECC FSS samples for independent verification and assessment of compliance with the cleanup levels. The comparison of split sample analyses with those performed by ECC is presented in **APPENDIX 10.**

5.3 *Occupational and Environmental Monitoring*

ECC performed occupational and environmental monitoring during the impacted soils removal work at Parcel B and upper Parcel C between July 27, 2006 to August 2, 2007 in accordance with its *Health and Safety Contingency Plan* ("HSCP").

The key elements of the environmental and occupational monitoring programs were:

- Sampling and analysis of environmental air samples at the perimeter and an off-site (background) location;
- Environmental external exposure monitoring results from the perimeter and an off-site location;
- Sampling and analysis of occupational air samples; and
- Personnel external exposure monitoring results

5.3.1 Site Contaminant Characteristics for Monitoring

The site monitoring program was designed to address hazards related to both radionuclide and metals in the waste materials being handled. The primary radiological hazards were determined to be related to exposure to thorium, uranium, radium, and their respective decay products. Th-232 is the prominent isotope of concern present in the waste. Excavated soils in Parcel B and upper Parcel C were also impacted with lead and arsenic.

5.3.2 Monitoring Results

Occupational Monitoring

Thermo Luminescent Dosimeters ("TLDs") were assigned to all site personnel as required by the applicable work plans and procedures. TLDs were used from July 27, 2006 to June 12, 2007. The TLDs were evaluated offsite on a quarterly basis. No administrative action level for occupational exposure was exceeded. The ALARA planning objective of 300 millirem for the project was met.

Two metals, i.e., lead and arsenic, were identified as chemical contaminants of concern. These metals were monitored in the air from work areas and personnel breathing zones for the first six months of the project and were found to be either to be non-detectable or significantly below air concentration criteria. Occupational lead and arsenic air monitoring was then discontinued.

Environmental Monitoring

ECC installed nine environmental air monitoring stations. Four air monitoring stations were placed at fixed locations on the perimeter of upper Parcel C and four air monitoring stations were placed at fixed locations on the perimeter of Parcel B. The ninth air monitoring location, which was designated as the background reference location was located 1.6 miles southeast of the Site. Samples were scanned on-site for gross alpha and off-site for radioanalytical analysis.

One sample was collected from each perimeter station and evaluated on-site. Samples from two sample locations were also sent off-site for confirmatory Ra-226 and Th-232 analysis.

Radon etch cups were also placed at each of the fixed perimeter monitoring stations. The etch cups remained in place for the entire period of field work performance and subsequently were sent off-site for analysis. TLDs were also placed at each of the fixed monitoring stations. The TLDs remained in place for the entire execution of the project and subsequently were sent off-site for evaluation.

TABLE 3 lists project applicable regulatory standards for protecting the worker, the public, and the environment. Monitoring results did not exceed these criteria.

5.4 Demobilization

Demobilization included complete decontamination of all equipment and materials. Pressure washing equipment was employed to decontaminate equipment. All visible soil was removed to ensure no contaminants remained. Subsequent radionuclide surveys were performed to document that each item met the acceptable surface contamination criteria. All excavation and soil hauling equipment were also cleaned and surveyed to ensure they were free of visible soil and radionuclide contamination.

ECC installed perimeter fencing where necessary to ensure that the site boundary was clearly marked. Additional signs were posted on the fencing that read Private Property, No Trespassing, and No Dumping.

6.0 FINAL INSPECTIONS AND CERTIFICATIONS

An interim inspection after the completion of the Phase 1 work was performed by the EPA On-scene Coordinator and the Remedial Project Manager on August 2, 2001. On August 1, 2008, a final inspection of TDY's OU 1 work was performed. See **APPENDIX 11** for a punchlist of items/issues to be resolved prior to the final inspection. Present at the inspection were:

-Ed Als, Remedial Project Manager (US EPA)
-George Harris, Section Chief (NYSDEC-Albany)
-Rich McInerney, Construction Oversight Manager (US ACE)
-Edgard Bertaut, Performing Settling Defendant Technical Representative (TDY Industries, Inc)
-Jeff Calarie (URS Corporation)
-Andy Lombardo (SEC Corporation)
-Steve Cabrera (Dvirka and Bartilucci, on behalf of City of Glen Cove)
-Mike Posillico (RexCorp/Glen Isle)
-Ellis Koch (RexCorp/Glen Isle)
-Darren Monti (RexCorp/Glen Isle)
-Reuben Twersky (RexCorp/Glen Isle)
-Zeb Youngman (PW Grosser)
-Lisa Santoro (PW Grosser)

Based on this inspection, as well as the interim August 2, 2001 inspection for Phase 1 – OU 1, EPA believes that the remedial activities implemented during OU 1 are now fully completed and are in conformance with the requirements of the 1999 ROD, as revised by the 2005 ESD.

7.0 SUMMARY OF PROJECT COSTS

The estimated capital cost of both soil and groundwater portions of the OU 1 and OU 2 remedy that was outlined in the 1999 ROD was **$28,146,200.** The 30-year total present worth cost, including the implementation of the groundwater monitoring program, was **$28,764,200.**

The following actual obligation and cost information is derived from records that were issued subsequent to work being completed for OU 1 and OU 2:

OU 1 EPA Phase 1 (Parcel A and lower Parcel C) – **$4,368,000** (contracts, modifications, and EPA intramural costs)

OU 1 PRP remedial actions on Parcel B and Upper Parcel C – unknown

The ROD did not include separate cost estimates for OU 1 and OU 2. Likewise, the ROD also did not include an estimated cost for Phase 1, which was a portion of the OU 1 remedy. Nevertheless, EPA estimated at the commencement of Phase 1, based on the feasibility study estimate of contaminated soil in the Phase 1 area, that approximately **$2,000,000** would be necessary to complete the Phase 1 work.

Also, the OU 1 and OU 4 work that EPA directed TDY to complete was estimated by EPA and TDY jointly to cost **$10,700,000** when the Consent Judgment was lodged in early 2007. It is reasonably safe to assume that the great majority of TDY's costs were incurred during performance of OU 1 remediation. The **$10,700,000** estimate did not include the OU 1 work that TDY performed in early 2004 to empty the Dickson Warehouse and to perform limited excavation work on Upper Parcel C. Actual expenditures for any of the work performed by TDY on either OU 1 or OU 4 were not provided to EPA for this report].

EPA entered an interagency agreement ("IAG") with the USACE under which the USACE provided remedial action oversight of TDY's OU 1 remedial actions. Under this IAG, Army Corps personnel observed TDY's remedial activities and reported on an as-needed basis to the EPA RPM. The USACE also contracted with CDM to take split samples of an incremental portion of the TDY FSS samples and arrange for analysis at a separate laboratory to test the validity of the TDY analytical results. This IAG was for a total of **$210,000**, with an uncommitted balance of approximately $1,300 at the time of report preparation.

8.0 OBSERVATIONS AND LESSONS LEARNED

8.1 Volume Estimates

Volume estimates developed during the ROD's FS for OU 1 were underestimated, as documented in the November 2002 ESD. The original estimated volume of waste soils in the 1999 ROD for OU 1 was 35,600 cy. The revised estimate of the same volume in the November 2002 ESD was 54,100 cy, which included actual volumes of Parcels A and lower Parcel C, as well as re-estimated volumes for Parcel B and upper Parcel C as a result of TDY's additional RD sampling. The actual volume of waste soils for OU 1 (as described in **TABLE 2**) is 65,090 cy. Even with the use of XRF screening instrumentation to guide the excavation cut lines, the revised estimated volumes in the ESD were still exceeded by actual totals by about 20%.

One factor that significantly altered the ROD's original volume and cost estimates was the pervasiveness of arsenic above cleanup levels in areas not targeted by field studies, particularly the RI/FS. Arsenic is relatively mobile in soil compared to the radionuclides of concern, particularly in low pH environments of the sort that have typically existed on Parcel C. Lower Parcel C was a wastewater treatment area when the facility was operational, as well as an historical sink for upland acidic runoff from ore piles on upper Parcel C. While the mobility of arsenic was recognized during EPA's FS, the estimate of contaminated soil that was generated during the RI/FS did not sufficiently account for the chronically wet and acidic nature of the former facility property and the mobility of arsenic under such conditions.

8.2 Storm Water Management

Storm water management was a major project consideration because the slope of the properties toward the Creek, together with a shallow water table and multiple lenses of clay and glacial till, created the need for effective planning and management of runoff, not only during excavation activities but also for post-construction site stabilization, particularly in those areas where it was necessary to remove vegetation.

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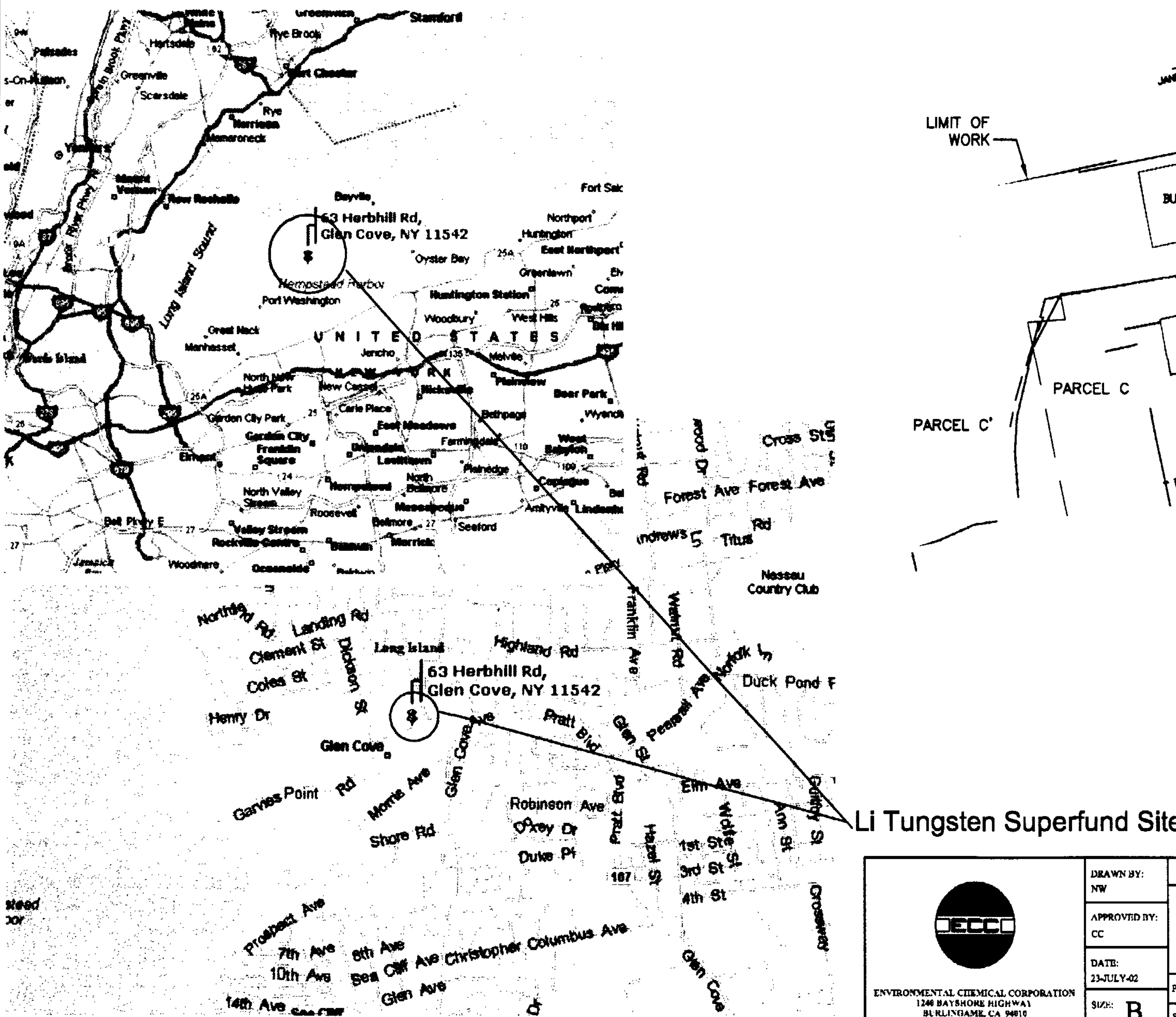
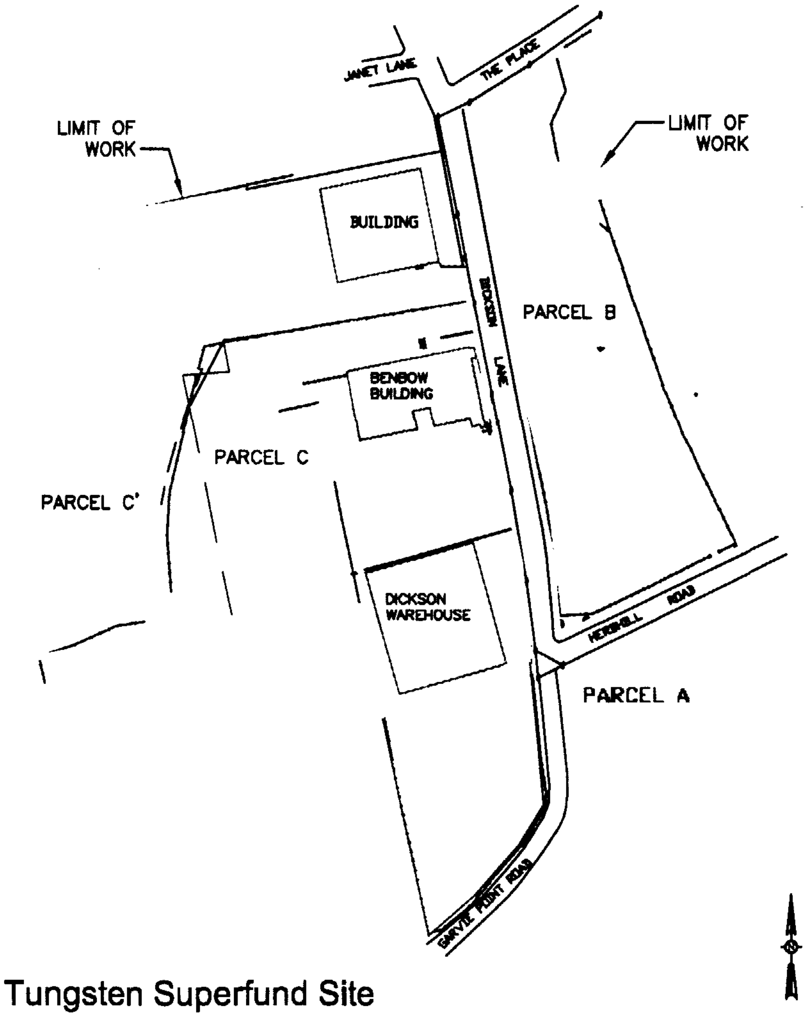
FIGURE 1 - Li Tungsten Location Map





ENVIRONMENTAL CHEMICAL CORPORATION
1240 BAYSHORE HIGHWAY
BURLINGAME, CA 94010

DRAWN BY: NW

APPROVED BY: CC

DATE: 23-JULY-02

SIZE: B

FIGURE 1-1, LI TUNGSTEN SITE LOCATION

REMEDIAL ACTION PARCEL B AND UPPER PARCEL C
LI TUNGSTEN SUPERFUND SITE
GLEN COVE, NEW YORK

PROJECT CODE:
CONTRACT CODE:

SCALE: NTS
FILENAME: FIGURE 1-1.DWG
SHEET: 1 OF 1
REV: -

FIGURE 2 - Li Tungsten Site Map Showing Operable Unit Locations

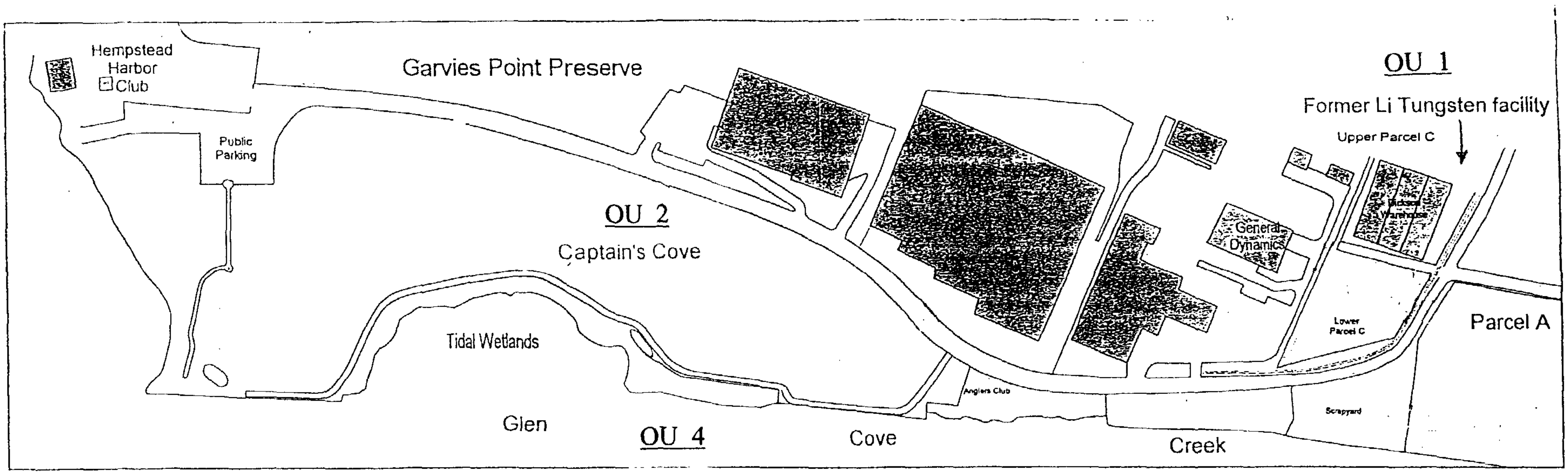
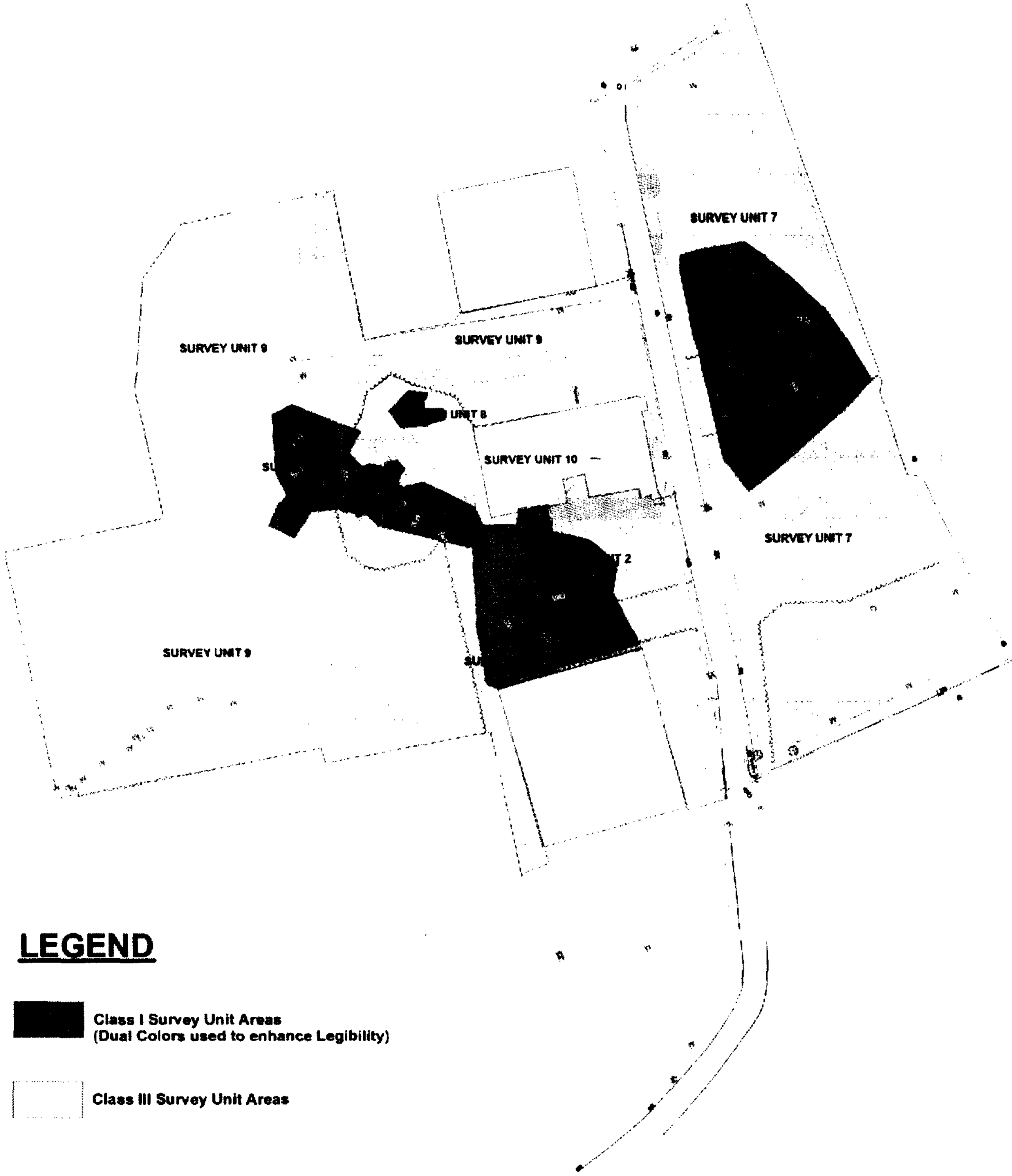


FIGURE 2

Li Tungsten Superfund Site - Operable Unit Location Map

FIGURE 3 – MARSSIM Radiological Survey Units for Parcel B and Upper Parcel C



LEGEND

Class I Survey Unit Areas
(Dual Colors used to enhance Legibility)

Class III Survey Unit Areas

0 200 400

Units in Feet (Scale is an approximation)

ECC
1746 Cole Boulevard
Building 21 Suite 360
Lakewood, CO 80401

Drawn by

Date

D

Radiological Site Layout of Class I & Class III Survey Units

Li Tungsten Superfund Site
Parcels C and B
Glencove, New York

Project Code . 560 . 000

FIGURE 4 – Metals and PCBs Excavation Areas for Parcel B and Upper Parcel C

LEGEND

Areas Identified in the FRD that did not warrant Remediation

Metals Area, Excavation Cut Lines

Excavation Cut Lines that required remediation not identified in FRD

Land Area Excavated and Sampled for PCBs

0 200 400

Measurement is in units of Feet. (Scale is an approximation)

N

NOTE: The areal layout is an approximation and is not intended to provide precise coordinates of the area surveyed

ECC
1746 Cole Boulevard
Building 21, Suite 350
Lakewood, CO 80401

Drawn by: PATIV

Revised 4/10/07

Date: 06/29/06

SIZE: D

Map of Metals & PCB Excavation Areas

Li Tungsten Superfund Site
Parcels C and B
Glencove, New York

Project Code : 5601.000

REV: 0

TABLE 1 – 1999 ROD Cleanup Criteria as Revised by May 2005 ESD

Site-Wide Cleanup Levels

Parameter	Cleanup Levels
Arsenic (soil)	24 mg/kg
Lead (soil)	400 mg/kg
Arsenic (sediments)[a]	6 mg/kg
Lead (sediments)[a]	31 mg/kg
Th-230 + Th-232 (soil)	≤ 5 pCi/g plus background level[b]
Ra-226 + Ra-228 (soil)	≤ 5 pCi/g plus background level[b]
PCBs in the dumping area (middle) of Parcel B (soil)	1 mg/kg in the top 2 feet
PCBs in the dumping area (middle) of Parcel B (soil)	10 mg/kg below the top 2 feet

[a] There are no locations in Parcels B and Upper Parcel C to which the criteria apply. Sediment criteria were obtained from the *Technical Guidance For Screening Impacted Sediment,* (Technical Guidance). Criteria are identified as "To Be Considered" Applicable or Relevant and Appropriate Requirements (ARARs). As defined in the Technical Guidance, sediments are "a collection of fine-, medium-, and coarse- grain materials and organic particles that are found at the bottom of lakes and ponds, rivers and streams, bays, estuaries, and oceans". Criteria for arsenic and lead are based on oligotrophic waters with low concentrations of metals-complexing ligands and are over protective when applied to eutrophic waters. (The Technical Guidance further cautions that a decision to remediate should not be based on exceedances of these criteria.) No areas have been identified within Parcels B and Upper Parcel C that meet the definition of sediment or the criteria upon which the sediment screening criteria are based.
[b] Background levels are approximately 1 pCi/g each for Th-230, Th-232, Ra-226, and Ra-228.

mg/kg = milligrams per kilograms
PCB = polychlorinated biphenyl
pCi/g = picocuries per gram
Ra-226 = Radium-226
Ra-228 = Radium-228
Th-230 = Thorium-230
Th-232 = Thorium-232

TABLE 2 - Excavated Soil Quantities for Parcels A, B, and C of the Former Facility Property

Excavated Soils – OU 1

Excavation Event	Non-RCRA Metals Impacted Soils (cy)	RCRA Impacted Soils (cy)	Radiologically Impacted Soils (cy)	PCB Impacted Soils (cy)
Parcel A	1,765	0	528	0
Parcel B	16,315	2,000	1,965	835
Lower Parcel C	12,157	0	1,188	0
Upper Parcel C	24,949	444	2,944 (includes soils excavated in 2004)	0
TOTAL	55,186	2,444	6,625	835

TABLE 3 - Air Monitoring Exposure Limits and Characteristics

Site Contaminant Exposure Limits and Characteristics

Chemical	PEL/TLV	Inhalation ALI (µCi)	Inhalation DAC (µCi/mL)	Effluent Concentration Air (µCi/mL)	IDLH (mg/m^3)	Soil Concentration (mg/kg)	Route of Entry	Target Organs	Symptoms
Arsenic	OSHA PEL ACGIH TLV 0.01 mg/m^3	--	--	--	5^{Ca}	3.02 – 248	Inhalation, Absorption, and Ingestion	Liver, kidneys, skin, lungs, lymphatic system	Ulceration of nasal septum, dermatitis, GI disturbances, and respiratory irritation
Lead	OSHA PEL ACGIH TLV 0.05 mg/m^3	--	--	--	100	--	Inhalation and Ingestion	Eyes, GI tract, central nervous system, kidneys, and blood	Weakness, facial pallor, abdominal pain, anemia, gingival lead line, and kidney disease.
Ra-226	--	6×10^{-1}	3×10^{-10}	9×10^{-13}	--	--	--	--	--
Th-232	--	1×10^{-3}	56×10^{-13}	--	--	--	--	--	--

ACGIH – American Conference Governmental Industrial Hygienist
ALI – Annual Limit Intake
Ca – Possible Occupational Carcinogen
DAC – Derived Air Concentration
IDLH – Defined as conditions that pose an immediate threat to life or health or conditions that pose an immediate threat or severe exposure to contaminants which are likely to have an adverse cumulative or delayed effect on health. If the contaminant concentration is above the IDLH levels, only a pressure-demand self contained breathing apparatus is allowed.
µCi – microcuries
µCi/mL – microcuries per milliliter
mg/kg – milligram per kilogram
mg/m^3 – milligrams per cubic meter
OSHA- Occupational Safety and Health Administration
PEL – Permissible Exposure Limits Established by federal or state OSHA. PELs may be expressed as an 8-hour Time Weighted Average or as a ceiling limit. PELs are enforceable by law.
TLV – Threshold limit values developed by ACGIH. TLVs are developed as guidelines to assist in the control of health hazards. These recommendations or guidelines are intended for use in the practice of industrial hygiene. They are not developed for use as legal standards.

APPENDIX 1 - References

EPA, 1999 *Region II Record of Decision for the Li Tungsten Superfund Site.* September 1999

EPA, 2002. *Explanation of Significant Differences, Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten property of the Li Tungsten Superfund Site.* November 2002.

EPA, 2005. *Explanation of Significant Differences, Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten property of the Li Tungsten Superfund Site.* May 2005.

EPA Removal Action Branch *POLREP No. 1 (*February 21, 2000*) through POLREP No. 43 (*May 4, 2001*)*

EPA, 2000 *Close Out Procedures for National Priorities List Sites, OSWER Directive 9320.2-09A January 2000*

ECC, 2002. *Final Remedial Work Plan, Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten property of the Li Tungsten Superfund Site.* September 2002.

ECC, 2003. *Health and Safety Contingency Plan* (HSCP). February 2003.

ECC, 2004. *Interim Remedial Action Report, Remedial Action the Li Tungsten property of the Li Tungsten Superfund Site.* 2004.

ECC, 2006. *Data Quality Summary Report, Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten property of the Li Tungsten Superfund Site.* November 2006

ECC, 2007. *Final Water Management Plan, Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten property of the Li Tungsten Superfund Site.* October 2007.

ECC, 2007. *DRAFT Final Status Survey Report, Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten property of the Li Tungsten Superfund Site.* September 2007.

ECC, 2008. *DRAFT Final Remedial Action Report: Remedial Actions at Parcel B and Parcel C, Li Tungsten Superfund Site, Glen Cove, New York.* August 2008

EPA, 1989. *A Guide for Determining Compliance with the Clean Air Act Standards for Radionuclide Emissions from NRC Licensed and Non-DOE Federal Facilities, Rev. 2. EPA520/1-89.002.* October 1989.

EPA, 1992. *Title 40 CFR Part 192.* 1992.

EPA, 2000a. *Multi-Agency Radiological Site Survey and Investigation Manual (MARSSIM)*
(EPA 402-R-97-016), August 2000.

EPA, 2000b. Test *Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846).* April 2000.

URS, 2008. *Dickson Warehouse: Soil Removal and Building Decontamination, Li Tungsten Superfund Site, Glen Cove, NY* DRAFT August 2008

URS, 2002. *100% Final Remedial Design for Parcel B and Upper Parcel C of the Li Tungsten property of the Li Tungsten Superfund Site*. January 2002.

APPENDIX 2 – Initial and Final EPA POLREPs for Phase 1

U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION REPORT

I. HEADING

Date: February 21, 2000

Subject: Li Tungsten Site
Glen Cove, Nassau County, New York
Removal Action: RV 4

From: Mark P. Pane, OSC
Removal Action Branch
Mark P. Pane

To: B. Bellow, EPA
R. Salkie, EPA
G. Zachos, EPA
J. Rotola, EPA
J. LaPadula, EPA
E. Als, EPA
R. Cahill, EPA
T. Johnson, EPA
P. Simon, EPA
C. Garvey, EPA
R. Byrnes, EPA, OIG
A. Tao, EPA, OPM
USCG, AST
START

POLREP NO. : **1 (Initial) [01/26/00 - 02/18/00] RV4**
Phase 1 of Operable Unit 1 of the ROD

II. BACKGROUND

Site No:	4L
CERCLIS No:	NYD986882660
Response Authority:	CERCLA
NPL Status:	Listed on October 5, 1992
ROD Signed:	September 30, 1999
State Notification:	NYSDEC Notified
Start Date:	January 27, 2000
Completion Date:	Ongoing
Status of Action Memorandum:	Approved January 18, 2000
Delivery Order Number:	99-08-019

III. SITE INFORMATION

A. Incident Category

CERCLA Incident category: Inactive Production Facility

B. Site Description

1. Site location

The Li Tungsten Site is located at 63 Herbhill Road, Glen Cove, Nassau County, New York, 11542. It is surrounded by active commercial facilities with the closest residential area less than 1/4 mile to the North and Glen Cove Creek to the South. The Site is comprised of four distinct parcels of land designated by EPA as A, B, C and C' and occupies a total of 26 acres of land.

Parcel A is seven acres in size and housed the main operations of the facility. Past removal actions have razed all but three of the buildings on this Parcel, namely: the Carbide Building, the Loung Building and the Office/Laboratory Building. Parcel B is six acres in size and was used for employee parking and dumping of tungsten ore residue. Parcel C is ten acres in size and houses the Dickson Warehouse and Benbow Buildings. The Dickson Warehouse contains approximately 4,000 cubic yards of soil/solid material staged from earlier Site activities. The Benbow Building is vacant. Parcel C' is three acres in size adjoining Parcel C and is vacant.

The facility operated between 1942 and 1985 and employed numerous separation and extraction procedures to obtain purified metal, mainly tungsten, from various ore concentrate sources. Mechanical, physical and chemical methods or combinations of all three were used to obtain the final product. Over 270 tanks, reactor vessels and specialty equipment used in these procedures were removed during previous EPA actions completed in August, 1998.

The City of Glen Cove is actively engaged in a revitalization program for approximately 200 acres of land surrounding the Glen Cove Creek which includes the Li Tungsten Site. The plans include construction of a boardwalk, restaurants, hotels and a conference center around the high speed ferry terminal which is operating in nearby Captains Cove.

2. Description of threat

The immediate threats posed by this Site were mitigated during the removal action RV3 completed by EPA in August, 1998. During this action, EPA removed and disposed of 271 tanks, 325 drums, 4,289 tons of waste solids, 14,700 gallons of tank liquids, 378,218 gallons of contaminated water and 689 tons of asbestos containing waste. During RV3, EPA also demolished and disposed of the entire Dice Complex, Lower Warehouse and East Building and removed all combustible materials from the Laboratory/Office Building.

The threats being addressed in this removal action include contaminated soil identified during the RI which exceeds the health based risk criteria established in the ROD. Approximately 6,000 cubic yards of this material exists on the southern half of the Site. The soil is believed to be contaminated with radioactive Thorium and Radium and the metals arsenic and lead. In addition to the contaminated soil, demolition and disposal of the Carbide Building and Office/Laboratory Building is also scheduled. Remediation of the southern half of the Site is a critical element in the City of Glen Cove's revitalization plans. Remediation of the remaining contaminated areas of the Site will take place under Phase II which will follow this action.

C. Preliminary Assessment/Site Inspection Results

The RI began in August, 1996 and the data collected during this investigation led to the Record of Decision which was signed in September 30, 1999. The ROD calls for continued monitoring of the groundwater and remediation of contaminated soil. The soil remediation is being phased to support the City of Glen Cove revitalization efforts which includes utilizing the southern half of the Li Tungsten property. The action memorandum which authorized funding to conduct these activities was approved on January 18, 2000.

IV. RESPONSE INFORMATION

A. Situation

1. Current situation

On January 28, 2000, the ERRS RM and Foreman met with the OSC on Site. The meeting was to review the scope of work and discuss logistical concerns. The FCA mobilized the following week and initiated mobilization activities, including: securing trailers, utilities, subcontractors, equipment and supplies. The local and County officials were also notified of the planned action and have been active in supporting the planned removal action.

2. Removal activities to date

January 31 - February 11: During this period, preparations for mobilization were underway. On February 1, 2000, ERRS mobilized a loader to remove snow and allow the office trailers and utilities to be installed. Site set up activities continued including: utility markouts, trailer setup, vendor solicitations and the delivery of sanitary facilities.

February 14 - February 18: During this period, ERRS mobilized the remaining crew and equipment. Following a day to review the Site layout and the health and safety plan, especially radiation concerns, site work began. Demolition of the Office/Laboratory building was the main task completed this period. A room by room radiation survey was completed prior to all demolition activities. Following demolition, the debris was staged in a lay down area and screened for radiation again. All cleared material was transferred to the load out area where it was segregated and crushed for volume reduction. Each roll off box will be loaded and screened for radiation a final time prior to off site disposal.

Approximately 1/8 of a cubic yard of radiation contaminated soil was removed from room 21 of the Office Building. This material registered 250 ur/hr on field instrumentation. The material was transferred to the Dickson Warehouse for future disposal.

Room 24 of the Laboratory Building has not been demolished due to the presence of asbestos containing materials. This room will be left standing until a licensed subcontractor can be secured to remediate the asbestos containing material.

3. Enforcement

In July, 1989, EPA issued an Administrative Order on Consent to the property owner, Glen Cove Development Corporation. GCDC performed an initial clean up of some of the major environmental concerns at the site and work stopped in July, 1999. Since then, EPA has identified 28 additional PRPs and negotiations to have them fund or perform the remaining Site work have been unsuccessful. EPA is continuing negotiations with the PRPs.

B. **Planned Removal Activities**

EPA has two majors work items planned in this Removal Action. The first is building demolition and the second is soil excavation. Building demolition will proceed following radiation screening of each room and removal of any radiation contaminated material. Following demolition, the debris will be staged in a lay down area and screened again for radiation. After clearance, the debris will be moved to a staging area where it will be segregated and crushed for volume reduction. The debris will then be loaded in to roll off containers for off site disposal or recycling. Each loaded roll off box will be screened for radiation contamination prior to leaving the Site.

Soil excavation will begin at the east end of Parcel A and continue to all identified areas. Approximately 6,000 cubic yards of contaminated soil is believed to exist on the southern half of the Site. All excavated soil will be screened for radiation and staged according to its activity. Any material which exceeds the established radiological contamination levels will be staged in the Dickson Warehouse for future disposal. Non radiation contaminated soil in the identified areas will be sampled for RCRA characteristics and disposed of as required. The boundaries for each excavation area will be pursued until field screening results indicate no further contamination. When that point is reached, post excavation samples will be collected and sent off site for laboratory analysis. Pending the results of those analyses, the excavation will resume or the area will be backfilled with certified clean fill material from an outside source.

C. **Next Steps**

Demolition of the Laboratory Building will continue and demolition of the Carbide Building will begin. Debris generated from building demolition activities will be staged and segregated for disposal.

Excavation of contaminated soil will begin at the East end of Parcel A and proceed to the West end. Upon completion of work on Parcel A, activities will begin on Parcels B and C. Non radiation contaminated soil will be staged in the designated holding area on Parcel A.

D. **Key Issues**

The Site was in operation for over 40 years and is located in an industrial area. The areas identified for soil excavation activities are based on field samples collected during the RI which exceed health based concentrations established in the ROD. This removal action is the final remediation planned for this property. Any material found outside the known areas of contamination will be pursued and remediated to meet the criteria established in the ROD. This may lead to a significant increase in the amount of soil requiring disposal which will in turn impact the schedule and the funding requirements.

The COE is planning on dredging the Glen Cove Creek this Spring as part of the revitalization program planned for this area. The dredge spoils generated from this action will be staged on Parcels A and B for drying prior to disposal. The COE schedule may have to be adjusted based on the amount of soil EPA identifies and removes during this action.

V. COST INFORMATION (As of February 18, 2000)

	Amount Budgeted	Cost to Date	Amount Remaining
ERRS	$2,000,000	$ 53,995	$1,946,005
START	$ 100,000	$ 2,534	$ 97,466
EPA	$ 150,000	$ 5,500	$ 144,500
TOTAL	$2,250,000	$ 62,029	$2,187,971

The above accounting of expenditures is an estimate based on figures known to the OSC at the time this report was written. The cost accounting provided in this report does not necessarily represent an exact monetary figure which the government may include in any claim for cost recovery.

VI. DISPOSITION OF WASTES

Not applicable at this time

U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION REPORT

I. HEADING

Date: May 4, 2001

Subject: Li Tungsten Site
Glen Cove, Nassau County, New York
Remedial Action: RA 1
Phase 1 of Operable Unit 1 of the ROD

From: Mark P. Pane, OSC
Removal Action Branch

To:
B. Bellow, EPA
R. Salkie, EPA
G. Zachos, EPA
J. Rotola, EPA
J. LaPadula, EPA
E. Als, EPA
R. Cahill, EPA
T. Johnson, EPA
C. Garvey, EPA
J. Doyle, EPA
R. Byrnes, EPA, OIG
[redacted]
USCG, AST
RST (formerly START)

POLREP NO. : 43 [04/02/01 - 05/01/01]

II. BACKGROUND

Site No:	4L
CERCLIS No:	NYD986882660
Response Authority:	CERCLA
NPL Status:	Listed on October 5, 1992
ROD Signed:	September 30, 1999
State Notification:	NYSDEC Notified
Start Date:	January 27, 2000
Completion Date:	Ongoing
Status of Action Memorandum:	Approved January 18, 2000
Delivery Order Number:	99-08-019

III. SITE INFORMATION

The Li Tungsten Site is located at 63 Herbhill Road, Glen Cove, Nassau County, New York, 11542. It is surrounded by active commercial facilities with the closest residential area less than 1/4 mile to the North and Glen Cove Creek to the South. The Site is comprised of four distinct parcels of land designated by EPA as A, B, C and C' and occupies a total of 26 acres of land. Parcel A is 7 acres in size and housed the main facility operations. Past EPA actions had razed all but three of the buildings on this Parcel, namely: the Carbide Building, the Lounge Building and the Office/Laboratory Building. Parcel B is 6 acres in size and was used for employee parking and dumping of tungsten ore residue. Parcel C is 10 acres in size and houses the Dickson Warehouse and Benbow Buildings. At the start of this action, the Dickson Warehouse contained approximately 4,000 cubic yards of soil/solid material staged from earlier Site activities. The Benbow Building is vacant. Parcel C' is 3 acres of vacant land adjoining Parcel C.

The facility operated between 1942 and 1985 and employed numerous separation and extraction procedures to obtain purified metal, mainly tungsten, from various ore concentrate sources. Mechanical, physical and chemical methods or combinations of all three were used to obtain the final product. Over 270 tanks and reactor vessels along with drums and lab pack materials were abandoned in 1985 after the company filed for bankruptcy. EPA actions to mitigate the threats posed by these materials were completed in August, 1998.

The threats remaining on Site were listed in the ROD which was signed on September 30, 1999. The work plan to address these threats was divided into operable units and further divided into phases. The major components of Phase I of Operable Unit I includes excavation of soil contamination in known locations on Parcels A, B and C and the demolition of two buildings, namely the Carbide Building and the Office/Laboratory Building. This represents the southern most areas of the Site. The action memorandum which authorized funding to conduct these activities was approved on January 18, 2000.

This phase of the project coincides with the City of Glen Cove's revitalization program to re-use the southern portions of the Li Tungsten property. The plan calls for approximately 200 acres of land surrounding the Glen Cove Creek to be converted into a boardwalk, restaurants, hotel and a conference center to support the high speed ferry terminal which is operating in nearby Captains Cove. Also coinciding with the Phase I EPA action, the COE is dredging the inner section of Glen Cove Creek. The spoils from the dredging activity are being staged on Parcel A.

IV. RESPONSE INFORMATION

A. Planned Response Actions

Building demolition and soil excavation are the two major work items undertaken in this action. Demolition activities began in February15, 2000 and were completed on June 13, 2000. The demolition debris were screened for radiation prior to being crushed for volume reduction. The debris was then loaded into roll off containers for off site disposal or recycling. Each loaded roll off box was screened a final time for radiation contamination prior to leaving the Site.

Soil excavation began on February 28, 2000 and was completed on April 30, 2001. A total of 28 separate areas on Parcel A were identified and remediated through excavation. Approximately 2,800 cubic yards of soil and 1,800 tons of concrete were also removed from these areas. Approximately 11,370 cubic yards of soil was removed from 12 areas on Parcel C. Remediation of Parcel B was tasked to the PRPs under an Order.

The excavation of each area proceeded in similar fashion. A radiation walk over survey was conducted on suspected contaminated areas. Once identified, the excavation was conducted in two foot lifts with the base of the excavation being screened again for radiation to determine the need to continue. The excavation continued until radiation levels below 20,000 cpm or the ground water table was reached. The excavated soil was transferred to a staging area where it was laid out in six inch lifts and screened again. Samples from the area with the highest rad counts were collected and quick counted on site to determine rad concentrations. Any material exceeding the established radiological contamination levels of 5 pCi/g were transferred to the Dickson Warehouse for future disposal. Soil below the 5pCi/g were analyzed on site with an XRF unit to determine the concentrations of lead and arsenic. Material failing for these metals were staged for disposal while that which passed was used as fill material. The lateral and vertical boundaries for each excavation area were pursued until field screening results reached acceptable levels or the water table was encountered. Post excavation sampling of each area, for radiation and metals was then conducted utilizing the field equipment with verification from an outside laboratory. Following receipt of the laboratory results, the excavations were then backfilled with certified clean fill material and compacted.

B. Situation

1. Current situation

Excavation activities for Parcel A and lower Parcel C have been completed. Approximately 14,171 cubic yards of soil has been excavated from contaminated areas on Parcels A and C. Approximately 1,716 cubic yards of this soil was radiologically contaminated and has been transferred into the Dickson Warehouse for future disposal. Approximately 372 cubic yards of this soil was re-used as backfill. The remaining soil, approximately 12,083 cubic yards, has exceeded the cleanup levels for metals (lead and arsenic) and has been transported off site to various disposal facilities. A total of 702 truck loads, weighing approximately 11,320 tons, were utilized to dispose of this material. Approximately 10,683 cubic yards of fill material and 7,909 tons of stone have also been delivered to the Site for backfilling the open excavation areas.

2. Response activities to date

__April 2 to May 1, 2001__: Please refer to the attached map which identifies each of the work areas described below.

On April 18, 2001, ERRS re-mobilized personnel and equipment to initiate final load out of soil piles 9, 10, 11 and 12. Site preparation activities were conducted including, entrance and exit gate installations, internal road work grading and soil pile aeration. Load out commenced on April 19, 2001 and was completed on April 30, 2001. A total of 321 loads, weighing approximately 6,629 tons, were shipped off site during this period. This quantity covered the entire volume of soil staged from earlier and recent excavation activities.

The west wall of Lower Parcel C was also addressed this period. Arsenic and lead hot spots along this wall were removed to the extent possible without compromising the existing fence and underground utilities located on the adjacent property. Post excavation sampling showed residual contamination, however these areas were covered with clean fill and re-graded. No direct contact threat exists from this material and future land use for this Parcel will not involve these areas.

The North walls of Areas 13 and 13A were also excavated. These areas were known to be high in rad concentrations from earlier Site work but were left for now for logistical reasons. Excavation of these areas produced approximately 200 cubic yards of soil. Approximately 40 yards of this material was found to contain elevated arsenic levels and was disposed of along with waste pile 9. Approximately 54 yards of material was found to contain elevated rad levels and was transferred to the Dickson Warehouse for future disposal. The remaining 106 cubic yards was found to be clean and re-used as backfill. A radon flux test conducted in this area showed radon emissions to be within acceptable criteria.

All site equipment was deconned and personnel were de-mobilized on May 2, 2001.

Throughout this period dust monitoring was performed around the perimeter of the Site and found to be negative.

3. Enforcement

In July, 1989, EPA issued an Administrative Order on Consent to the property owner, Glen Cove Development Corporation (GCDC), to perform an initial clean up of some of the major environmental concerns at the Site. GCDC complied with the Order and completed their work in July, 1990. GCDC subsequently resolved their liability issues with other former Site owners in a judicial consent decree .

The remedy selected for the remediation of the Site was finalized in the ROD which was signed in September, 1999. Negotiations with GCDC to perform the remedial design cited in the ROD failed. Subsequently, a unilateral order was issued to 28 other parties in May, 2000 to perform this task. Negotiations with these parties to implement the remedial action were also unsuccessful and in September, 2000, they were unilaterally ordered to perform this task.

In September, 2000, the City of Glen Cove executed an agreement with EPA which provides up to $3 million to perform limited clean up activities at the Captains Cove property. The remediation of the Captains Cove property is included in the remedy for Li Tungsten since it is considered a satellite site.

On February 8, 2001, EPA directed the September, 2000 order recipients to modify the scope of the work as it had been defined in the order. The change required the recipients to (a) perform the design and remedy as selected in the ROD for the lower portion of Parcel B at the Li Tungsten property and (b) transport and dispose of all contaminated materials excavated from the Captain's Cove property, not merely the previously ordered radioactively contaminated materials, which is also called for in the ROD.

C. Next Steps

The Site will be graded and institutional controls will be installed to limit ponding of surface water. Replacement shrubs and trees will be installed as necessary to achieve initial site conditions. The await bills from Delivery Orders 19 and 39 will be finalized to determine the funding available to conduct the restoration activities.

D. Key Issues

The west wall of the property line still contains levels for arsenic and lead above the response criteria. Removal of this material would involve excavation on the adjacent property, digging in and around buried utilities and significant vegetation removal. In lieu of removal, the area was covered with approximately 2 to 3 feet of clean fill to remove any direct contact threat. Future use of this area, however unlikely, should take this remaining material into account.

The PRP's have initially complied with the Order to address Lower Parcel B and the remainder of the Site. Field work for RD was initiated in late March, 2001. The RD is due to EPA on May 20, 2001.

The City has formally proposed using the dredge spoils from Glen Cove Creek, currently being staged on Parcel A, as fill material for the Captains Cove Site. A response being prepared by EPA will deny this request based on insufficient chemical/physical analysis and logistical concerns.

V. COST INFORMATION (As of April 26, 2001)

	Amount Budgeted[2]	Cost to Date	Amount Remaining
ERRS	$4,437,000	$4,322,022	$ 114,978
RST	$ 150,000	$ 136,375	$ 13,625
EPA	$ 250,000	$ 235,700	$ 14,300
TOTAL	$4,837,000	$4,694,097	$ 142,903

1. The cost accounting provided in this report does not necessarily represent an exact monetary figure which the government may include in any claim for cost recovery.
2. ERRS funding for this action was approved under procurement requests HE-0036 in the amount of $2 million and HE-0172 in the amount of $2 million, both for delivery order #19. An additional $437,000 was approved under procurement request HE-0057 for delivery order #39. RST and EPA budgets are provided separately.
3. RST cost based on loaded estimated hourly rate of $50/hour. EPA cost based on loaded estimated hourly rate of $100/hour.

VI. DISPOSITION OF WASTES (During this Reporting Period)

Type of Waste	Quantity	Disposal Facility	Treatment	Shipping Dates	Manifest Numbers
Non hazardous soil	5536.6 Tons (Estimated) 270 Loads	G.R.O.W.S.[1]	Landfill	04/19/01 - 04/30/01	See Below

Non hazardous soil	**1092.2 Tons (Estimated) 51 Loads**	**T.R.R.F.**	**Landfill[2]**	**04/19/01 - 04/30/01**	**See Below**

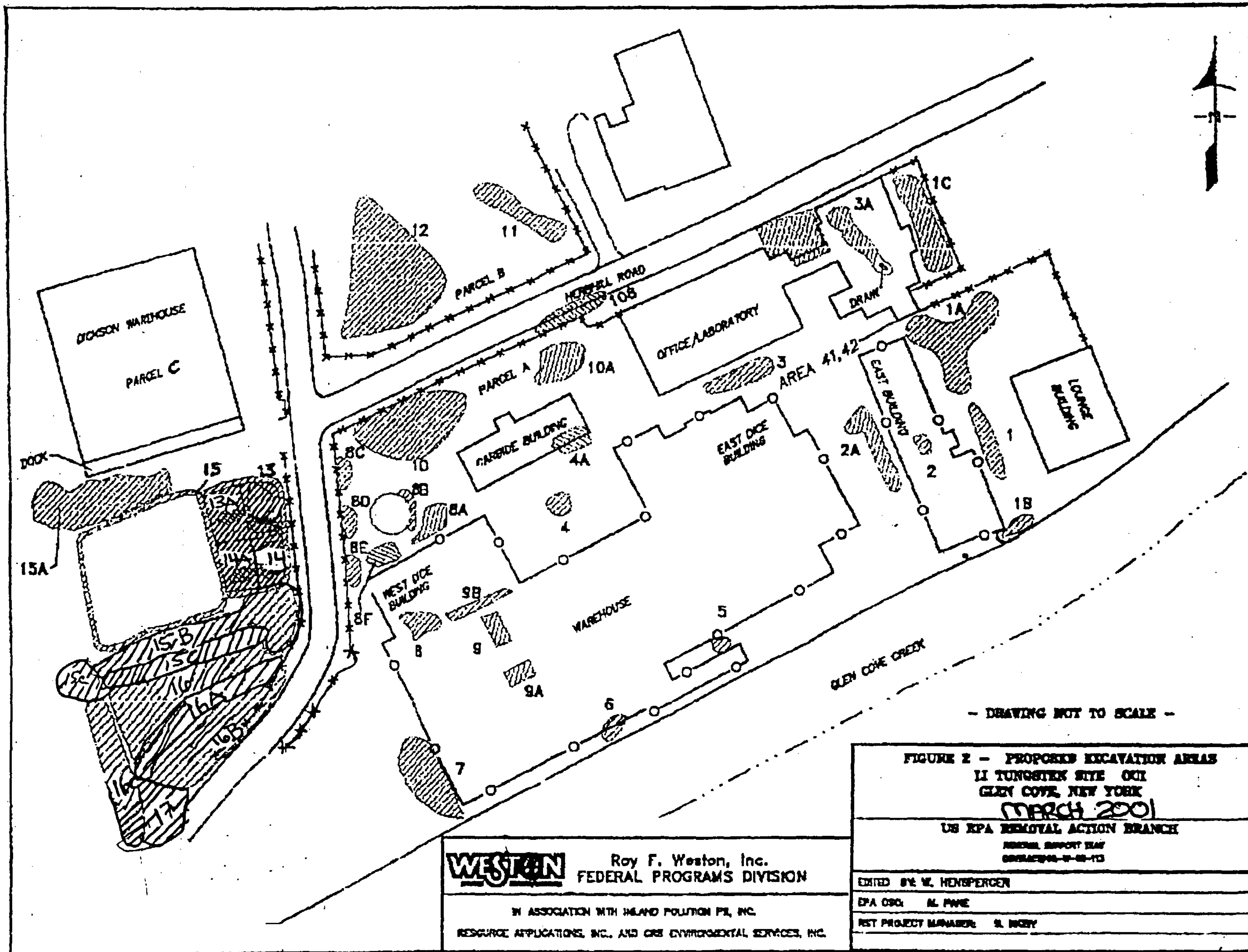
1. **G.R.O.W.S., Inc., 1513 Bordentown Road, Morrisville, PA 19067**
2. **T.R.R.F., 200 Bordentown Road, Tullytown, PA 19007**

MANIFEST NUMBERS:

G.R.O.W.S.: **03235 - 03239, 03244 - 03246, 03248 - 03249, 03254 - 03260, 03263 - 03267, 03277 - 03279, 03281, 03284, 03286, 03288 - 03295, 03300, 03305, 03310, 03321, 03328 - 03329, 03332 - 03349, 03351 - 03439, 03445 - 03559, 03564, 03694 - 03697, 03699**

T.R.R.F.: **03231 - 03234, 03240 - 03243, 03247, 03250 - 03253, 03261, 03262, 03268 - 03276, 03282, 03285, 03287, 03296 - 03299, 03302 - 03304, 03306 - 03309, 03311 - 03314, 03322 - 03327, 03330 - 03331, 03350**

Disposal location listed on generator copy of manifest may differ from executed copy of manifest due to late approval of second facility. Disposal location listed above were taken from executed copy of manifests provided by the disposal facilities and are believed accurate.


DICKSON WAREHOUSE
PARCEL C
DOCK
PARCEL B
PARCEL A
MORRIS ROAD
OFFICE/LABORATORY
DRAIN
EAST BUILDING
LOUNGE BUILDING
AREA 41,42
CARBIDE BUILDING
EAST DICE BUILDING
WEST DICE BUILDING
WAREHOUSE
GLEN COVE CREEK
1
1A
1B
1C
2
2A
3
3A
4
4A
5
6
7
8
8A
8B
8C
8D
8E
8F
9
9A
9B
10
10A
10B
11
12
13
13A
14
14A
15
15A
15B
15C
16
16A
16B
17
- DRAWING NOT TO SCALE -
FIGURE 2 - PROPOSED EXCAVATION AREAS
LI TUNGSTEN SITE OU1
GLEN COVE, NEW YORK
MARCH 2001
US EPA REMOVAL ACTION BRANCH
WESTON
Roy F. Weston, Inc.
FEDERAL PROGRAMS DIVISION
IN ASSOCIATION WITH INLAND POLLUTION PS, INC.
RESOURCE APPLICATIONS, INC., AND CRS ENVIRONMENTAL SERVICES, INC.
EDITED BY: W. HENSPERGER
EPA OSC:
RST PROJECT MANAGER:

APPENDIX 3 - Phase 1 Interim Remedial Action Report

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

SEP 28 2001
SEP 28 2001

DATE:

SUBJECT: Approval of the Remedial Action Report for Phase 1 of the Li Tungsten Superfund Site Remediation

FROM: Doug Garbarini, Chief
Eastern New York Remediation Section

TO: John E. La Padula, P.E., Chief
New York Remediation Branch

Attached for your approval is a Remedial Action Report documenting the completion of the Phase 1 work at the Li Tungsten Superfund site.

Please denote your approval of the subject document by signing below.

Attachment

Approved: John E. La Padula 9/28/01

John E. La Padula, P.E., Chief — Date
New York Remediation Branch

INTERIM
REMEDIAL ACTION REPORT
FOR
OPERABLE UNIT 1 - PARCEL A + LOWER PARCEL C
EXCAVATION AND OFFSITE DISPOSAL OF CONTAMINATED SOIL

LI TUNGSTEN SITE
GLEN COVE
NASSAU COUNTY, NEW YORK

SEPTEMBER 2001

TABLE OF CONTENTS

1.0 INTRODUCTION

This document presents the Remedial Action Report (RAR) for "Phase 1"of the operable unit (OU)1 remedy entailing excavation and offsite disposal of contaminated soil for the Li Tungsten Site in Glen Cove, Nassau County, New York. The scope of the Phase 1 RAR includes the southern half of the OU1 remediation area, involving Parcel A and lower Parcel C of the Li Tungsten facility.

1.1 Site Description

The Li Tungsten Superfund Site consists of a former 26 acre tungsten processing facility, as well as a nearby 23 acre property known as Captain's Cove where the tungsten facility operators disposed of waste slag. Ore-processing operations were conducted on Parcel A, bordered by Glen Cove Creek to the south and Herbhill Road to the north, and Parcel C, which is immediately west of Dickson Lane. Parcel B, which is bordered by Herbhill Road on the south and Dickson Lane on the west, is undeveloped and was used primarily for employee parking and land disposal of spent ore residuals. The Captain's Cove property is approximately 1000 feet west of the Li Tungsten facility, bordered by Garvies Point Road to the north and Glen Cove Creek to the south.

1.2 Site History

The Li Tungsten facility was operated from the 1940's to approximately 1984 by a succession of corporate entities, the last of which was the Li Tungsten Corporation. Operations involved the processing of ore and scrap tungsten concentrates to ammonium paratungstate (APT) and subsequently formulating APT to metal tungsten powder and tungsten carbide powder. Other specialty metal products were also produced. Most of the daily processing activity took place on Parcel A, while Parcel C was used for wastewater treatment, processing, storage and disposal of ore residuals. Parcel B was used as a parking area, as well as for disposal of ore residuals. The facility was acquired by the Glen Cove Development Corporation (GCDC) from the Wah Chang Smelting and Refining Corporation in 1984 and leased to the Li Tungsten Corporation. The Li Tungsten Corporation declared bankruptcy in 1985.

Since the late 1950's, Captain's Cove has been a dump site for the disposal of incinerator ash, sewage sludge, rubbish, household debris, Glen Cove Creek sediments and industrial wastes, including Li Tungsten ore residuals. The site was purchased by Village Green Realty in 1983 in order to construct a condominium development. Redevelopment efforts were abandoned in the mid-1980's when the New York State Department of Environmental Conservation (NYSDEC) designated the property as a State Superfund site. The NYSDEC requested that EPA address the contamination associated with the ore residuals from the Li Tungsten facility, while the State addressed other contamination under the State Superfund program. EPA subsequently included the areas of Captain's Cove where ore residuals were disposed as part of the Li Tungsten site after sampling showed that the residuals were similar to those at the Li Tungsten facility.

EPA activities at the Site included supervising a removal action performed by the GCDC at the Li Tungsten facility in 1989-90. A major removal action was performed by EPA's Removal Action Branch from 1996-98, primarily to address the hazards associated with approximately 270 on-site storage and process tanks. These tanks were primarily above-ground on Parcel A, and distributed both inside and outside of site structures. As part of the removal action, both the Dice Complex and the East building on Parcel A required demolition in order to safely access and dispose of tanks and associated piping.

EPA conducted a comprehensive remedial investigation/feasibility study (RI/FS) at the Site from 1993 to 1999, which also included interim cleanup activities such as debris and vegetation disposal, bulkhead repair, and ore consolidation/relocation. The EPA signed a Record of Decision (ROD) in September 1999 which selected a comprehensive remedy for both the Li Tungsten facility, which was designated OU1, and the Captain's Cove ore residual disposal areas (OU2). The selected remedy primarily involved excavation and off-site disposal of an estimated 67,000 cubic yards (cy) of radioactive and heavy-metals contaminated wastes.

The NYSDEC signed a State ROD in March 1999 for the chemical contamination at Captain's Cove, calling for excavation and off-site disposal of all hazardous wastes and debris outside of the ore residual disposal areas.

In December 1999, EPA issued general notice to the potentially responsible parties (PRPs) identified to date, providing them with the opportunity to perform the remedial design (RD) for the northern half of the Li Tungsten facility. EPA then issued special notice for implementation of the Phase 2 remedial action (RA) i.e., the remainder of OU1, comprising the northern half of the Li Tungsten facility, in March 2000. Negotiations with the PRPs were generally not successful, resulting in EPA's issuance of a unilateral administrative order (UAO) in May 2000 to perform the RD and a subsequent UAO in September 2000 to perform the RA. However, EPA separately negotiated a cost recovery settlement with one of the PRPs, the City of Glen Cove, by which the City would provide funds up to $3 million to EPA to perform RA work at Captain's Cove (OU2).

The Army Corps of Engineers initiated a dredging program for the inner half of Glen Cove Creek in September 2000, which yielded about 20,000 cy of dredge spoils before it was suspended as a result of the discovery of radioactive materials in the sediments presently drying on Parcel A. EPA's ROD did not call for the remediation of Glen Cove Creek. Although contamination of creek sediments with various heavy metals and organic compounds has been periodically confirmed through earlier sampling events, no radioactive contaminants were ever detected. EPA had given the Corps permission to dry the sediments on Parcel A of the Li Tungsten site, after completion of EPA's remediation of that parcel. The Corps wished to use Parcel A because it was large, vacant, and overlaid with concrete, which would serve as a barrier to any infiltration of elutriate from the drying spoils. Prior to the use of Parcel A, the Army Corps ensured the integrity of the concrete barrier through the use of concrete patches and synthetic membranes.

The City of Glen Cove is ultimately responsible for the disposal or beneficial reuse of the dried sediments. EPA has recently issued a UAO to several Li Tungsten PRPs to address the radioactive materials present in the dredged materials.

2.0 OPERABLE UNIT BACKGROUND

This RAR is for the completion of remedial action associated with Phase 1 of the Li Tungsten Site. Phase 1 is a fast track remediation of a portion of OU1, as described earlier in this document and in the **SELECTED REMEDY** portion of the September 1999 Record of Decision (ROD).

The selected remedy in the ROD at both the Li Tungsten facility and the Captain's Cove property included excavation, volume reduction, and off-Site disposal of all radioactive/chemical waste soil and sediments, consistent with the following cleanup levels:

PARAMETER	CLEANUP LEVEL	REMARKS
Lead	400 mg/kg	soil
Lead	31 mg/kg	sediment
Arsenic	24 mg/kg	soil
Arsenic	6 mg/kg	sediment
Radium^{226}	5 pCi/g	>background
Thorium^{232}	5 pCi/g	>background
PCBs	1 mg/kg	<2 feet depth (Parcel B)
PCBs	10 mg/kg	>2 feet depth (Parcel B)

mg/kg = milligram/kilogram
pCi/g = picocuries/gram

In developing the final soil cleanup levels, consideration was given to risks posed by the contaminants under the reasonably anticipated future use of the Site as a commercial "Seaport-style" tourist area; cleanup levels utilized by the NYSDEC and the NYS Department of Health for the State Superfund cleanup at Captain's Cove; and the New York State TAGMs. The selected contaminants are intended to be indicators for other co-located metal contaminants. Due to the spatial and vertical location of contaminants of concern determined during the RI/FS, achieving the cleanup levels for the indicator contaminants should also adequately address other site-related contamination in soils and sediments. In addition, total PCBs were found in significant concentrations only in the dumping area of Parcel B at the Li Tungsten facility; therefore, the cleanup levels for PCBs are meant to address the PCB contamination in that area.

The ROD estimated that excavation would yield an estimated 18,300 cy of radioactive wastes and 17,300 cy of nonradioactive metals-contaminated wastes at the Li Tungsten facility.
At Captain's Cove, excavation was estimated to yield 13,200 cy of radioactive wastes and 20,550 cy of nonradioactive, metals-contaminated wastes. Therefore, the total estimated Sitewide excavation volume was 69,350 cy (31,500 cy above radioactive criteria and 37,850 cy non-radioactive but otherwise contaminated). The ROD also encouraged segregation of radioactive and nonradioactive wastes in order to minimize the volume of material requiring disposal at expensive and distant radioactive waste disposal facilities. Some or all of the remaining non-radioactive wastes were anticipated to contain other contaminants, particularly heavy metals associated with the processed ores. These wastes would be disposed of at off-Site RCRA Subtitle D facilities, unless toxicity characteristic leaching procedure (TCLP) testing indicated that they were characteristically hazardous, in which case they would be disposed of at a RCRA Subtitle C facility. Excavated soils that did not exceed cleanup levels or contain debris could be used as backfill. In addition, a minimum of two feet of clean fill would be used to complete the backfilling to match the surrounding grade.

The ROD also required the following actions in addition to excavation:

- Off-site disposal of radioactive waste located in the Dickson Warehouse at an appropriately licensed facility;
- Building demolition at the Li Tungsten facility;
- Storm sewer and sump cleanouts at the Li Tungsten facility;
- Institutional controls governing the future use and construction at the Site;
- Decommissioning of Industrial Well N1917 on Parcel A;
- Collection and off-site disposal of contaminated surface water from Parcels B and C; and
- Implementation of a long-term groundwater monitoring program.

After evaluating various groundwater alternatives and consideration of community acceptance, the ROD also selected **No Action** to address contaminated groundwater at the Li Tungsten facility (OU1). Because there was no evidence of groundwater being contaminated with radionuclides at Captain's Cove, no remedial alternatives for groundwater were evaluated for OU2.

However, the ROD did require groundwater monitoring of the Upper Glacial Aquifer in the vicinity of the Site to determine the effects of the soil remedy on groundwater quality. EPA anticipates that the excavation of inorganic contamination to the specified cleanup levels will greatly reduce leaching of the contaminants of concern in the soil to groundwater. As a result, the groundwater beneath the Site is expected to improve after excavation is completed. Additional monitoring wells will be added to the existing monitoring well network to increase the network's coverage in areas of known contamination.

The ROD envisioned that the implementation of the selected remedy would allow redevelopment of the Li Tungsten Superfund Site in substantial conformance with the City of Glen Cove's Revitalization Plan. The accelerated placement of these properties back into a commercially viable scenario would also meet the primary objective of EPA's "Recycling Superfund Sites" initiative. Soon after the issuance of the ROD, EPA initiated a fund-lead response to expedite the soil remedy for Phase 1, which included the southern portion of the Li Tungsten facility, encompassing Parcel A, lower Parcel B and lower Parcel C. The estimated volume of soil requiring excavation in these areas was estimated at approximately 5,000-6,000 cy, a disproportionately small volume of the facility's contaminated soils. The southern portion of the Li Tungsten property is also a very significant part of the City's Creek revitalization plan.

Therefore, in February 2000, EPA mobilized its Removal Action Branch to the Site to perform Phase 1. The Phase 1 scope of work specifically included the excavation of all soil and sediment exceeding the ROD cleanup criteria; demolition of the Carbide Building and Lab/Office/Wire Building complex and segregation and decontamination, if possible, of radioactive building debris; staging of excavated soil and building debris that exceeded radioactive cleanup criteria in the Dickson Warehouse for future offsite disposal by potentially responsible parties; disposal of any non-radioactive, heavy metals-contaminated soil as well as non-radioactive building debris at appropriate off-site disposal facilities; sampling/analysis to confirm excavation pits have met cleanup criteria; flushing, collection and disposal of contaminated sediments from storm sewers under the Phase 1 remediation area; and decommissioning of industrial well N1917 on Parcel A.

After work was initiated, subsequent increases in volume estimates and remediation costs caused EPA to reconsider the scope of Phase 1, resulting in the decision that Phase 1 would be terminated when Parcel A and lower Parcel C had been remediated. Implementation of the remainder of OU1, involving excavation of contaminated soil, sediment, and ore residuals from all of Parcel B as well as upper Parcel C, is anticipated to be performed by PRPs at some future date.

3.0 REMEDIAL CONSTRUCTION ACTIVITIES

3.1 Details of Construction Activities

Construction activities were regularly documented by EPA's Removal Action Branch in pollution reports, or "POLREPS". The first POLREP for Phase 1 was filed on February 21, 2000 for the period covering 1/26/00 to 2/18/00. Mobilization activities included securing trailers, utilities, subcontractors, equipment and supplies. Local and County officials also received notification of the Phase 1 RA. The initial remediation strategy included the sequential remediation of the three Phase 1 Parcels, starting with Parcel A.

Parcel A

Initial activities on Parcel A included the demolition of the lab/office/wire complex of buildings, as well as the Carbide building. The East Building and the Dice complex of buildings had been razed during an earlier removal action, thereby leaving the Loung Building as the only remaining structure now present on Parcel A. Demolition proceeded after radiation screening of each room and removal of any radiation-contaminated or asbestos-containing material. Following demolition, debris was staged in a lay-down area and screened again for radiation, then segregated and crushed in preparation for offsite disposal or recycling. Radioactive debris was placed in interim storage in the Dickson Warehouse on Parcel C.

Next, soil excavation began at the east end of Parcel A and proceeded to all areas of contamination identified during the remedial investigation, as well as contaminated building sumps and additional areas identified through subsequent sampling activity and extended radiation screening during the course of Phase 1. All excavated soil was screened for radiation and staged according to its radioactivity. Any material exceeding radiation criteria was staged in the Dickson Warehouse, although pressure washing of radioactively contaminated debris was sometimes successful in decontaminating debris for off-site disposal. Non-radioactive soil in the identified areas was sampled for TCLP, as well as for target compounds and target analytes (TCL/TAL) and disposed of as appropriate. Boundaries for each excavation area were pursued until field screening results indicated no further contamination. At that point, post excavation samples were collected and sent offsite for laboratory analysis. For safety and logistical reasons, the excavation would be backfilled with certified clean fill material in anticipation of negative results. However, if the analyses indicated that the walls or floor of the area were still above cleanup criteria, re-excavation of the contaminated area was performed to remove the contaminated soil until the excavation was below cleanup criteria. If the floor of the excavation was contaminated, excavation would continue until cleanup criteria was achieved or the water table was encountered. If the water table was encountered first, the excavation would then be backfilled as long as radiation criteria had been met.

Remediation of Parcel A included the excavation of 28 discrete areas of contaminated soil. Work was often hampered by rain water runoff, underground springs, and a fluctuating groundwater table.

During the excavation work on Parcel A, storm sewers underlying the parcel were either flushed clear or, in the instance of one storm sewer pipe under the eastern end of the parcel, partially removed. Also, industrial well N1917 was decommissioned at the end of June 2000 by means of demolition of the small pump house over the wellhead, followed by removal of the pump and motor and subsequent filling of the well casing with a mixture of sand and concrete by a licensed well drilling subcontractor.

Due to contracting difficulties with a disposal subcontractor, offsite disposal of nonradioactive metals-contaminated soil staged on Parcel A was delayed in June 2000. In order to accommodate the Army Corps of Engineer's navigational of Glen Cove Creek dredging plans which called for the use of Parcel A in July as a sediment drying area, EPA transferred all the soil requiring offsite disposal to Parcel C. EPA had given prior approval of the use of Parcel A for the drying of dredged material, conditioned on the sealing of the concrete surfaces upon which the sediment would be placed. EPA completed transfer of the soil from Parcel A to Parcel C by June 17, 2000, which completed the remediation of Parcel A.

The final volumes and disposition of material removed from Parcel A are as follows:

Material Type	Quantity	Disposition
Debris - masonry	1783 tons	Waste Management, NY
- steel	310 tons	Mid Island Salvage, NY (recycled)
- construction	698 tons	Waste Management, NY
Asbestos	60 yards	Superior Greentree, PA
Soil - exceeds ROD radioactive criteria	528 yards	Dickson Warehouse
- nonradioactive, exceeds ROD metals criteria	2295 tons	Subtitle D landfill
RCRA hazardous waste	0	N/A
Protective equipment (PPE)	60 yards (estimated)	Subtitle D landfill

Parcel C

In early May 2000, as work was being completed on Parcel A, excavation activities began on Parcel C. Initially, a radiation survey was performed, followed by brush clearing and decontamination of the tank pad for the former 500,000 gallon oil tank for use as a soil staging area. Excavation work on Parcel C was now facilitated by the use of x-ray fluoresence (XRF) instrumentation and a Canberra Genie 2000 Spectroscopy Counting System, which were mobilized to the Site in May to improve the speed and accuracy of screening excavation samples for heavy metals and radionuclides, respectively. EPA's procedures for handling concrete, steel and other debris at Parcel C were similar to procedures utilized on Parcel A, with materials that exceeded radioactive criteria being sent to the Dickson Warehouse and other materials disposed or recycled offsite as appropriate. With the improvements in field screening capability, however, the excavation work now proceeded as follows: excavations were performed in two foot lifts, after which the floor of the excavation would be screened. The excavation would then continue in two foot lifts until screening levels suggested that the excavation was complete, or the water table was encountered. Excavated soil would then be transferred to a staging area and laid out in six inch layers and screened again. Samples from the area with the highest radiation counts would be collected and quick counted on-site to determine radioactivity. Any material exceeding the established radiological cleanup levels would then be transferred to the Dickson Warehouse. Soil below the radiation criteria would be analysed with an XRF unit to determine the concentrations of lead and arsenic. Material failing for these metals would be staged for disposal while that which passed was used as fill material. The lateral and vertical boundaries for each excavation area would be pursued until field screening results reached acceptable levels or the water table was encountered. Post excavation sampling of each area for radiation and metals would then be performed utilizing field instrumentation with verification from an outside laboratory. Following receipt of the lab results, the excavations would be backfilled with certified clean fill and compacted.

Remediation of Parcel C included the excavation of 10 areas of contaminated soil. While these areas were originally considered discrete, many of them became essentially contiguous as excavation progressed, primarily because the levels of arsenic contamination above cleanup levels proved to be more pervasive than originally estimated. Therefore, most of the areal extent of lower Parcel C actually required excavation.

Excavation work on lower Parcel C was severely impacted by limited operating space, as well as delays due to wet weather, with overland runoff collecting in excavation areas resulting in chronic saturated soil conditions. Toward the completion of remedial work, excavation on the southern end of lower Parcel C required importation of large quantities of powdered lime to help solidify the saturated soils requiring excavation.

The final volumes and disposition of material removed from Parcel C are as follows:

Material Type	Quantity	Disposition
Debris - masonry	30 tons	Waste Management, NY
- steel	0 tons	N/A
- construction	60 tons	Waste Management, NY
Asbestos	0 yards	N/A
Soil - exceeds ROD radioactive criteria	1188 yards	Dickson Warehouse
- nonradioactive, exceeds ROD metals criteria	15,804 tons	Subtitle D landfill
RCRA hazardous waste	0	N/A
Protective equipment (PPE)	90 yards (estimated)	Subtitle D landfill

4.0 CHRONOLOGY OF EVENTS FOR PHASE 1 OF OU1

October 1992	Final Listing on National Priorities List
September 1999	Record of Decision for OU1 and OU2
December 1999	Statement of Work for Phase 1, OU1
January 2000	Delivery Order/Notice to Proceed issued to contractor
February 2000	Mobilization to Site: Commencement of Parcel A remediation
May 2000	Commencement of Parcel C remediation
July 2000	Completion of Parcel A remediation
January 2001	Decision to remove lower Parcel B from SOW
June 2001	Completion of Parcel C Remediation
August 2001	Final Inspection

5.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

Earth Tech Inc. developed a Quality Assurance Project Plan (QAPP) in response to the requirements in their subcontract. This document described the methods, standards, inspection, testing, and documentation requirements which were used to ensure quality control during excavation. This also included a description of the anticipated protocols for instrument surveying, sampling and analytical methods that would be used to determine the achievement of cleanup criteria during remedial action.

Excavation areas were labelled through use of an alphanumeric system. Confirmatory sampling for laboratory analysis to determine whether the cleanup levels had been met was performed in each excavation by sampling the "walls" and "floor" of the excavation. For each surface, five samples were typically secured, usually with one in the approximate center of the surface and the other four evenly distributed from the center. The five samples would then be composited and the results of the composited sample compared to the cleanup levels described in **2.0 OPERABLE UNIT BACKGROUND,** above.

Analyses of the confirmatory soil samples for Parcels A and C are summarized below:

Excavation Areas - **PARCEL A**	Confirmatory Composite Sampling Results			
	Arsenic (mg/kg)	Lead (mg/kg)	Radium^{226} (pCi/g)	Thorium^{232} (pCi/g)
1	51	160	1.4	3.54
1a	26	200	1.48	3.16
1b			1.07	4.54
1c			.96	3.33
2	24	68	.92	2.32
2a	41	25	1	2.68
3	12	160	1.62	3.57
3a	28	180	1.12	1.29
4			1.12	1.29
4a			.89	4.85
5	580	100	.533	1.12
6			1.42	1.74
7	20	61	1.2	5.9*
8 (subareas a through f)	13	43	.8	1.52
9			1	1
9a	1.4	28	1	3.1
9b	110	190	1	3.1
10	2.1	28	.9	1.95
10a			.6	2.48
10b			.8	4.35
41			.9	1.2
42			.9	1.2
LOWER PARCEL C				
13	840	320		
13a	170	350	1	1
14	110	220		
14a	39	790	1	2.5
15	82	400	1	1
15a	20	40		
15b	58	150		
15c	12	32		
16	747	686		
17	1120	807		

* Area 7 could not be further excavated due to intrusion of water. This excavation was greater than 8 feet below grade. Background radiation levels were 1 pCi/gm

6.0 FINAL INSPECTIONS AND CERTIFICATIONS

On August 2, 2001, a final inspection of the completed remediation for Phase 1 was conducted at the Site. Present at the inspection was EPA's on-scene coordinator and remedial project manager. Based on the inspection, the Agency believes that the remedial measures implemented during Phase 1 by EPA's Removal Action Branch are now fully completed and in conformance with the Record of Decision. Therefore, this inspection has been deemed a final inspection. The NYS Department of Environmental Conservation has reviewed this Remedial Action Report and agrees with its findings.

7.0 SUMMARY OF PROJECT COSTS

The amount of extramural funds obligated for the remediation under Phase 1 was $4,437,000. As of July 2001, approximately $4,368,761 has been spent in completing the Phase 1 remedial work. It is anticipated that after final cost accounting is completed, the amount spent will be very close to the obligated amount. No operation and maintenance costs will be incurred as a result of Phase 1 implementation.

The ROD did not include an estimated cost for Phase 1, since Phase 1 only included a partial remediation of the Li Tungsten facility. Nevertheless, EPA estimated at the commencement of Phase 1 that, based on the feasibility study estimate of contaminated soil in the Phase 1 area, approximately $ 2 million would be necessary to complete the Phase 1 work. EPA anticipates that final cost accounting will result in Phase 1 costs in excess of 100% of the pre-remedial estimate. The reasons for the difference between estimated and actual cost are described more fully below, under **OBSERVATIONS AND LESSONS LEARNED.**

8.0 OBSERVATIONS AND LESSONS LEARNED

A major factor that significantly altered the original cost and schedule estimate for this project was the pervasiveness of arsenic above cleanup levels in areas not targeted by the RI/FS. Arsenic is relatively mobile in soil compared to the radionuclides of concern, particularly in low pH environments of the sort that have typically existed on lower Parcel C. Lower Parcel C was a wastewater treatment area when the facility was operational, as well as an historical sink for upland acidic runoff from ore piles on upper Parcel C. While the mobility of arsenic was recognized during EPA's feasibility study, the estimate of contaminated soil that was generated during the study did not sufficiently account for the chronically wet and acidic nature of lower Parcel C and the subsequent ease with which arsenic moved under such conditions. As a result, the initial estimate of contaminated soil was low. Cost and schedule impacts resulted as excavation under Phase 1 proceeded; consequently, EPA decided to limit the scope of Phase 1 by excluding lower Parcel B.

Other factors also impacted cost and schedule, but to a less significant degree. These factors included labor issues with local unions that were raised after EPA mobilized to the Site, which ultimately required EPA to modify its worker pay scale to reflect Long Island wages as per the Davis Bacon Wage Act. Frequent rain and generally wet conditions also significantly hampered excavation activity.

EPA's good relationships with the City government and other local stakeholders resulted in a minimum of distractions and interruptions from external parties. The Li Tungsten Task Force has provided a continuing forum for EPA to provide information on a regular basis to a representative group of parties interested in the Li Tungsten site. The formation of such a group would be a recommended approach in managing any large Superfund site with the potential for acute public interest or controversy.

9.0 CONTACT INFORMATION

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10.0 APPENDICES

A) List of References

B) Map of Site - Phase 1 project area + excavations

Approved:

John E. La Padula, P.E., Chief
New York Remediation Branch

9/28/01
Date

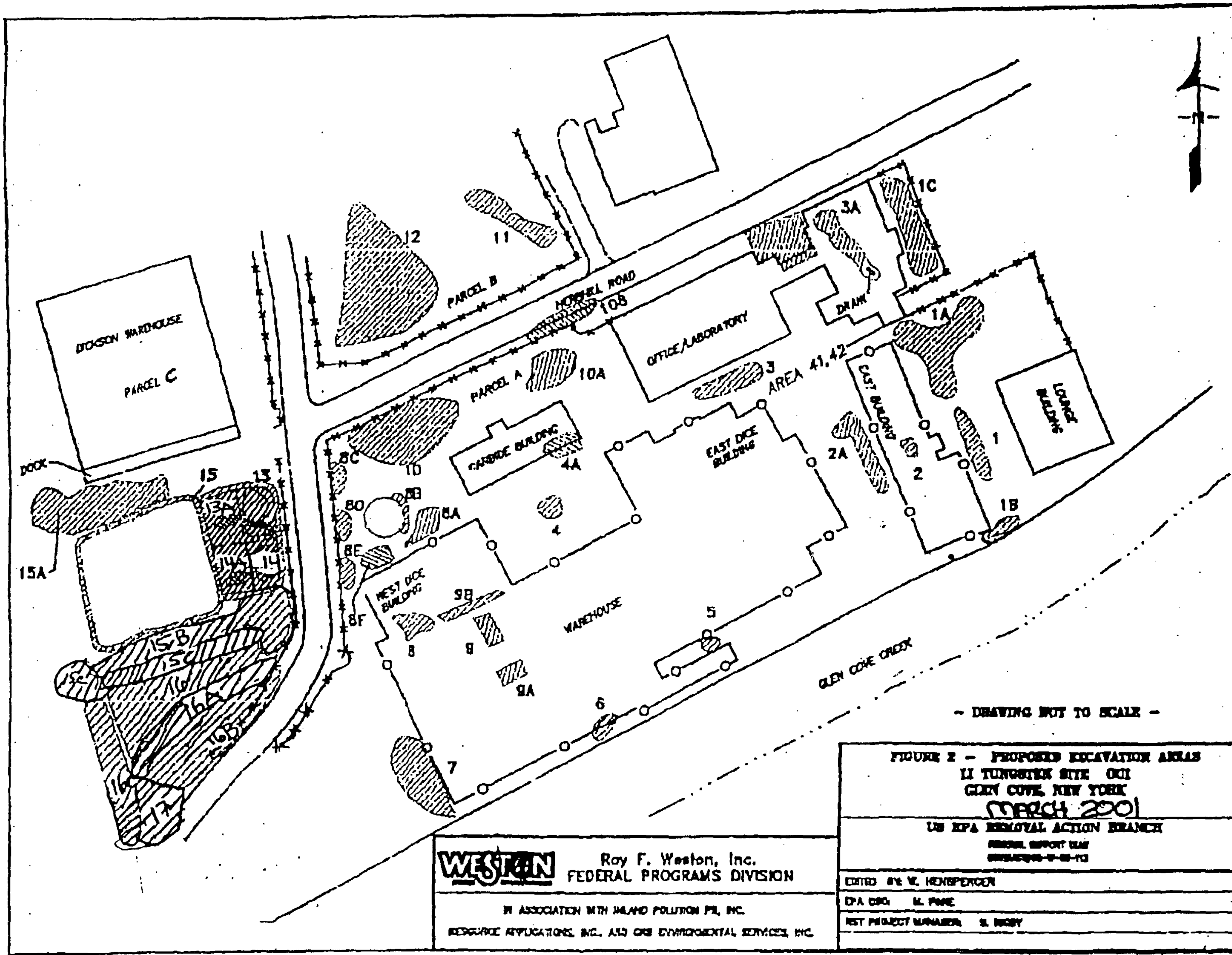
APPENDIX A

References:

1) EPA - Region II Record of Decision for the Li Tungsten Superfund Site - September 29, 1999

2) EPA Removal Action Branch - POLREP No. 1 (February 21, 2000) through POLREP No. 43 (May 4, 2001)

3) EPA - Close Out Procedures for National Priorities List Sites, OSWER Directive 9320.2-09A January 2000


DICKSON WAREHOUSE
PARCEL C
PARCEL B
PARCEL A
DOCK
HERBHILL ROAD
OFFICE/LABORATORY
CARBIDE BUILDING
EAST DICE BUILDING
WEST DICE BUILDING
WAREHOUSE
EAST BUILDING
LOUNGE BUILDING
DRAIN
AREA 41,42
GLEN COVE CREEK
1
1A
1B
1C
2
2A
3
3A
4
4A
5
6
7
8
8A
8B
8C
8D
8E
8F
9
9A
9B
10
10A
10B
11
12
13
13A
14
14A
15
15A
15B
15C
16
16A
16B
17
- DRAWING NOT TO SCALE -
FIGURE 2 - PROPOSED EXCAVATION AREAS
LI TUNGSTEN SITE OU1
GLEN COVE, NEW YORK
MARCH 2001
US EPA REMOVAL ACTION BRANCH
Roy F. Weston, Inc.
FEDERAL PROGRAMS DIVISION
IN ASSOCIATION WITH INLAND POLLUTION PR, INC.
RESOURCE APPLICATIONS, INC., AND CRS ENVIRONMENTAL SERVICES, INC.

Appendix B

APPENDIX 4 - Exempt Areas Remediation

Table 1

Li Tungsten Site
Lower Parcel C Exempt Area Remediation
October 2003

LOCATION	Exempted Gas Line Area					
	Date	Sample ID	Sample Type	Location**	Lead, ppm	Arsenic, ppm
EA-4	10/27/03	LPC-GA-EW3	Wall	1	45.5	48
EA-4	10/27/03	LPC-GA-EW4	Wall	2	17.7	14.3
EA-4	10/27/03	LPC-GA-WW3	Wall	3	17.9	62.6
EA-4	10/27/03	LPC-GA-WW4	Wall	4	9.24 ***	16.85 ***
EA-4	10/27/03	LPC-GA-NW1	Wall	5	22.6	421.4
EA-4	10/27/03	LPC-GA-F1	Floor	6	36.8	266.6
EA-4	10/27/03	LPC-GA-F2	Floor	7	263.5	965.5
EA-4	10/27/03	LPC-GA-F3	Floor	8	255.7	166.3
EA-4	10/27/03	LPC-GA-F4	Floor	9	301.8	408.4
EA-4	10/28/03	LPC-GA-EW5	Wall	10	55.7	1036
EA-4	10/28/03	LPC-GA-EW6	Wall	11	64.3	237.2
EA-4	10/28/03	LPC-GA-EW7	Wall	12	25.8	5.82 ***
EA-4	10/28/03	LPC-GA-EW8	Wall	13	16.3 ***	13.1 ***
EA-4	10/28/03	LPC-GA-EW9	Wall	14	20.1	11.77 ***
EA-4	10/28/03	LPC-GA-EW10	Wall	15	15.8	6.33 ***
	General Dynamics Exempted Area					
	Date	Sample ID		Location **	Lead, ppm	Arsenic, ppm
EA-3	10/29/03	LPC-GD-WW1	Wall	16	54.1	9.82 ***
EA-3	10/29/03	LPC-GD-WW2	Wall	17	1982	782.7
EA-3	10/29/03	LPC-GD-WW3	Wall	18	9559.7	193971.2
EA-3	10/29/03	LPC-GD-WW4	Wall	19	24.5	13.8
EA-3	10/29/03	LPC-GD-WW5	Wall	20	1427.2	745.7
EA-3	10/30/03	LPC-GD-WW6	Wall	21	13.8 ***	13.3
EA-3	10/30/03	LPC-GD-WW7	Wall	22	59.4	13.4
EA-3	10/30/03	LPC-GD-WW8	Wall	23	466.7	172.8
EA-3	10/30/03	LPC-GD-WW9	Wall	24	13	17.1
EA-3	10/30/03	GENERAL DYNAMIC-1	Floor*	25	133.8	33.4
EA-3	10/30/03	GENERAL DYNAMIC-2	Floor*	26	1433.1	242
EA-3	10/30/03	GENERAL DYNAMIC-3	Floor*	27	5895.4	1139.2

* Sample collected from the surface investigation conducted beyond the Li Tungsten Fence.
**For approximate sample location see attached maps
*** Value was below Limit of Detection (LOD) of instrument
ppm- Parts Per Million (mg/kg)

Li Tungsten Site

Exempted Areas 1 through 5

Post Excavation Radiological Data

SUMMARY TABLE (December 18, 2003)

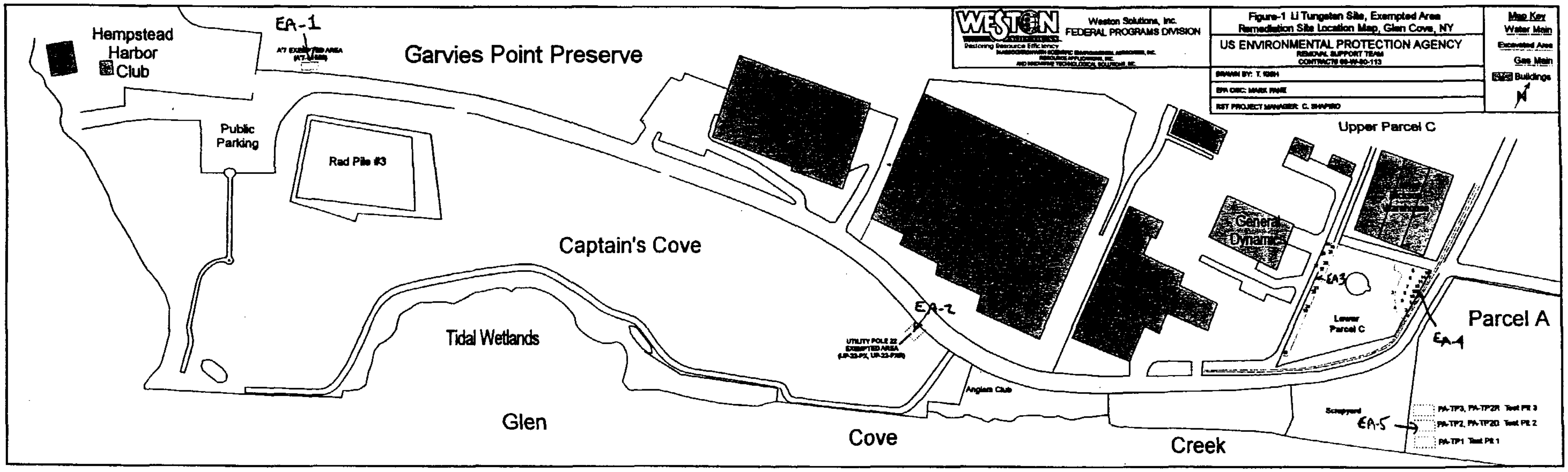
LOCATION	DESCRIPTION	Excavation Depth	Radium (pCi/g)	Thorium (pCi/g)	Total (pCi/g)
EA -1	Area A'7 around utility pole #5	10 - 12 feet	<1	<1	<1
EA-2	Area G around utility pole #22	8 -10 feet	<1	<1	<1
EA-3	West wall of Lower Parcel C bordering General Dynamics	6 - 10 feet	<1	<2	<2
EA-4	East Wall of Lower Parcel C bordering Garvies Point Road	6 - 10 feet	<2	<1	<2
EA-5	Test Pits on Parcel A Southwest corner adjacent to Doxey Property	6 - 12 feet	<1	<1	<1

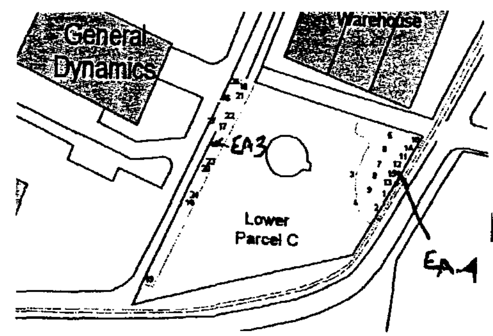
All sample data generated from composites collected from floors and walls of excavations.

LI TUNGSTEN SITE

EXEMPTED AREAS 1 THROUGH 5

POST EXCAVATION MAP





APPENDIX 5 – ECC Interim Remedial action Report for Dickson Warehouse and Limited Excavation on Parcel C

FINAL
INTERIM REMEDIAL ACTION REPORT

Post - Remedial Actions at Dickson Warehouse and Upper Parcel C
Li Tungsten Superfund Site, Glen Cove, New York

January 26, 2004 – April 21, 2004

Prepared for

TDY Industries, Inc.

November 9, 2004

Environmental Chemical Corporation
1746 Cole Blvd, Bldg 21, Suite 350
Lakewood, Colorado 80401

ECC

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LIST OF ACRONYMS AND ABBREVIATIONS

μ/Ci	Microcuries
μCi/ml	microcuries per milliliter
AL	Action Level
ALARA	as low as reasonably achievable
ALI	Annual Limits of Intake
BOL	Bill of Lading
CEDE	Committed Effective Dose Equivalent
CFR	Code of Federal Regulations
CGC	City of Glen Cove
cy	cubic yards
DAC	Derived Air Concentration
DGPS	Differential Global Positioning System
ECC	Environmental Chemical Corporation
ECL	Effluent Concentration Limit
E_m	Exposure Equivalent
EPA	United States Environmental Protection Agency
FRD	Final Remedial Design Report, Portions Of Li Tungsten Superfund Site City Of Glen Cove, Nassau County, New York
GCDA	Glen Cove Development Company
HEPA	High Efficiency Particulate Air
HSCP	Health and Safety Contingency Plan
IRA	Interim Remedial Action
IRAR	Interim Removal Action Report
MAC	Material Acceptance Criteria
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mg/m^3	milligrams per cubic meter
ml	Milliliters
mrem	Millirem
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
OSHA	The Occupational Safety And Health Administration
PCB	polycholorinated biphenyl
pCi/g	picocuries per gram
pCi/l	picocuries per liter
PF	protection factor
PM	Project Manager
PPE	Personal Protective Equipment
Ra	Radium
Ra-226	Radium-226
RAWP	Final Remedial Action Work Plan Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten Property of the Li Tungsten Superfund Site
RCRA	Resource Conservation and Recovery Act
RI/FS	Remediation Investigation/Feasibility Study
ROD	Record of Decision

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

SOW	Scope of Work
SSHO	Site Safety And Health Officer
TCLP	Toxic Characteristic Leachate Procedure
TEDE	Total Effective Dose Equivalent
Th	Thorium
Th-232	Thorium-232
TLD	Thermo Luminescent Dosimeters
TLV	threshold limit value
U	Uranium
U-238	Uranium-238
U-Nat	Natural Uranium
USACE	United States Army Corps Of Engineers
USEI	U.S. Ecology of Idaho
WAC	Waste Acceptance Criteria
WL	Working Levels

1.0 REPORT INTRODUCTION

Environmental Chemical Corporation (ECC) presents this Interim Remedial Action Report (IRAR) for the Li Tungsten Superfund Site (Site) in Glen Cove, New York for TDY Industries, Inc. This IRAR describes activities performed to complete the removal of the stockpiled materials in the Dickson Warehouse and the limited excavation and removal of contaminated soils at upper Parcel C. The location of the Li Tungsten Superfund Site is shown on Figure 1-1.

Section 2.0 of this report reviews the site history and overview of the scope of work. Section 3.0 describes the scope of work completed. Section 4.0 provides a detailed description of the remedial activities completed. Section 5.0 presents the health and safety monitoring for the work completed. Section 6.0 describes demobilization activities.

2.0 PROJECT DESCRIPTION AND SCOPE OF WORK

The following sections present a summary of the Site description, history, and characteristics. In addition, an overview of the remedy selection and design process is presented.

2.1 Site Description

The Site is located in a commercial area along the north side of Glen Cove Creek in the City of Glen Cove on Long Island, New York. The Site location and layout are shown on Figure 1-1. The area around the Site includes light and heavy industry, commercial businesses, a sewage treatment plant, a Nassau County public works facility, and five state or Federal Superfund sites.

The Site occupies approximately 26 acres and includes four parcels designated A, B, C, and C'. The layout of the Site is shown on Figure 1-1. Parcel A contained most of the buildings on the Site and was the location of the main operations center for the facility. Parcel B was generally undeveloped and contains a small pond, intermittent stream and a small wetland. Separate areas of Parcel B were used for parking, disposal, and employee picnicking. Parcel C includes two larger structures (the Benbow Building and the Dickson Warehouse), former surface water impoundments, and former locations of three above ground storage tanks. Parcel C' was not part of the active facility.

Residential housing is located north of the Site. Two Superfund sites lie adjacent to the facility. The Crown Dykman Superfund Site is east of the Li Tungsten property and the Mattice Petrochemical Superfund site is west of the property.

2.2 Site Background

Tungsten ore concentrates, as well as tungsten compounds and other metals, were processed at the Li Tungsten facility from 1942 to 1985. This processing resulted in metallic residues containing the naturally occurring radioactive elements thorium (Th), uranium (U), and radium (Ra), as well as the metals arsenic, barium, bismuth, copper, cobalt, chromium, lead, manganese, mercury, nickel, vanadium and zinc. Some metallic residues may have been deposited on Parcels B and C of the Li Tungsten property.

In 1984, the Glen Cove Development Company (GCDC) acquired the property. GCDC continued to lease the property to Li Tungsten Corporation until 1985 when the Li Tungsten Corporation ceased operations at the Site and filed for bankruptcy. The EPA issued an Administrative Order on Consent to GCDC in 1989 specifying nine Interim Remedial Actions (IRAs) including removal of anhydrous ammonia; removal of miscellaneous gas cylinders; removal of drummed materials, including 12 drums containing radioactive thorium metal; over packing and removal of laboratory chemicals; removal of polychlorinated biphenyl (PCB) transformers; and various additional characterization, sampling, and analyses. These nine IRAs were completed in 1990.

In 1993, the EPA developed a Remedial Investigation/Feasibility Study (RI/FS) Work Plan. As part of the RI/FS, additional IRAs were conducted during 1995-1996, and prior to performance of the RI field program. These IRAs were initiated in August 1995 and included: removal of debris and vegetation from the target areas of the RI including the inside of the Dickson Warehouse; removal of asbestos and structural repairs to the Dickson Warehouse; and relocation of approximately 5,000 cubic yards (cy) of tungsten ore residue from Parcels A and C to the Dickson warehouse where it remained stored in stockpiles. Since the IRAs, additional soil was placed in the Dickson Warehouse as a result of EPA Phase I RI activities.

2.3 Site Characteristics

Vegetation covers the ground surface over most of the Site. Natural vegetation in the area is predominantly shrubs, grasses, and grass-like plants. Groundwater monitoring wells have been installed at various locations around the Site. Generally, the ground surface slopes to the south toward Glen Cove Creek.

2.4 Overview of Remedy Selection and Design Process

The EPA issued a Record of Decision (ROD) for the Li Tungsten Superfund Site on September 30, 1999. The selected remedy for soils consisted of excavation and segregation of soils above the specified site cleanup criteria and offsite disposal at appropriately licensed facilities. Site-wide cleanup levels are presented in Table 1-1.

The EPA issued an Explanation of Significant Differences (ESD) for the Site dated November 2002.

The *(100%) Final Remedial Design for Parcel B and Upper Parcel C of the Li Tungsten property of Li Tungsten Superfund Site* (FRD) (URS, 2002) was submitted to the EPA on January 3, 2002. The FRD incorporated EPA's comments on the Pre-Final Remedial Design (95%). EPA approved the FRD by letter dated January 9, 2002.

In accordance with the *(100%) Final Remedial Design for Parcel B and Upper Parcel C of the Li Tungsten property of Li Tungsten Superfund Site* (URS, 2002), ECC prepared the *Remedial Action Work Plan, Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten Property of the Li Tungsten Superfund Site, September 2002* (RAWP) (ECC, 2002). The U.S. Environmental Protection Agency (EPA) issued comments on the RAWP by letter date January 2, 2003. ECC submitted a response to comments dated January 23, 2003.

2.5 Project Scope of Work

The remedial activities conducted at Parcel B and Upper Parcel C of the Li Tungsten Superfund Site consisted of excavation and offsite disposal of soils contaminated with radionuclides and soils contaminated with metals. Remedial activities also included offsite disposal of the soils staged in the Dickson Warehouse.

The scope of work included:

- Preparation of the Remedial Action Work Plan;

- Mobilization;
- Setup and Material Acceptance Criteria (MAC) and Waste Acceptance Criteria (WAC) sampling;
- Characterization and profiling for disposal of excavated material and material currently stockpiled in the Dickson Warehouse;
- Ongoing material confirmation sampling, as required, to assure material characteristics had not changed;
- Preparing Manifests or Bills of Lading of material shipments for recovery or disposal;
- Loading of stockpiled soil contaminated into intermodal containers or dump trucks;
- Clearing and grubbing;
- Precision excavation and stockpiling of soils contaminated with radionuclides and soils contaminated with metals;
- Decontamination of chassis, trucks, or the exterior of intermodal containers prior to leaving the Site;
- Site restoration;
- Demobilization; and
- Completion of the Interim Remedial Action Report.

3.0 SCOPE OF WORK – COMPLETED

ECC was contracted by TDY Inc. to complete the following remedial actions at the Li Tungsten Superfund Site in Glen Cove NY.

3.1 Dickson Warehouse Materials Removal

TDY was issued notice by EPA on August 22, 2003 to initiate removal and disposal of all contaminated soils staged in the Dickson Warehouse. EPA approved the related sections of the RAWP by letter dated August 22, 2003, a copy of which is included in Appendix A.

In accordance with the approved sections of the RAWP, ECC completed the removal of contaminated soil and debris from the Dickson Warehouse. The period of performance for this task was January 26 - March 5, 2004. Approximately 5,180 tons of waste materials were managed and shipped from the site. Details of this remedial action are provided in Section 4.1 of this IRAR.

3.2 Upper Parcel C - Soils Removal

On March 5, 2004, TDY requested that EPA broaden its approval of the project work plans to allow excavation, transportation, and disposal of soils in certain areas of Upper Parcel C and B. Specifically, the areas are identified in the FRD as Areas RA-A, RA-B, and RA-C. EPA responded on March 10, 2004, granting authorization to proceed with the work under five conditions. The conditional authorization letter is included in Appendix A. TDY responded to each of the conditions in a letter dated March 11, 2004 and subsequently issued notice to proceed to ECC. The TDY response to the EPA conditional authorization is provided in Appendix A.

In accordance with the approved sections of the RAWP, ECC performed excavation of radionuclide and metals-contaminated soils from the Li Tungsten Property – Upper Parcel C. The period of performance for these tasks was March 8, 2004 – April 21, 2004. Approximately 3,527 tons of wastes were managed and shipped from the site. Detail of this action is provided in Section 4.2 of this IRAR.

4.0 REMEDIAL ACTIVITIES

The following sections describe the work completed for the Dickson Warehouse Materials Removal and the Upper Parcel C Soil Removal. A photographic account of all activities is included in Appendix B.

4.1 Dickson Warehouse Contaminated Materials Removal (Phase I)

In accordance with the approved sections of the RAWP, ECC completed the removal of contaminated soil and debris from the Dickson Warehouse. The period of performance for this task was January 26 - March 5, 2004. Approximately 5,180 tons of waste materials were managed and shipped from the site.

This section provides a detailed description of all actions taken to successfully execute the removal and disposal of waste soils and debris from the Dickson Warehouse.

4.1.1 Dickson Waste Characterization

On November 10, 2003, ECC performed sampling of the soil and debris piles staged in the Dickson Warehouse to confirm reported characteristics and to ensure the waste would meet waste acceptance criteria of the selected disposal facility, U.S Ecology of Idaho (USEI).

Nine samples (eight samples and one duplicate sample) were analyzed for eight toxic metals per the Resource Conservation and Recovery Act (RCRA) using EPA Method 1311 to determine the toxicity characteristic leachate procedure (TCLP) concentrations. Additionally, these samples were analyzed for total concentrations of lead and arsenic using EPA Method 6010B. The analytical results are presented in Table 4-1.

Review of these results indicated that the wastes did not exhibit RCRA regulated levels of toxic metals per the guidelines of 40 Code of Federal Regulations (CFR) 261.24, Toxicity Characteristic.

The radionuclide concentrations in the waste from the Dickson Warehouse were determined by utilizing the historical data available in the FRD (January, 2002). These data were supplemented by the collection of additional soil samples during the November 2003 sampling activity. These data were used to compute a weighted average to express the aggregate activity of the waste material transported for disposal to U.S. Ecology. The weighted average is presented in Table 4-2.

It is noted that the soil and material removed from the Li Tungsten Superfund Site exhibited a high degree of variability for the radioactive concentrations reported for radium, thorium, and natural uranium (U-Nat). The isotopic ratios of the radionuclides were also highly variable.

A non-weighted average was calculated and used to transport the waste per Title 49, CFR Part 172, Subpart C, which requires that proper identification of hazardous materials contained in a shipment be provided. The non-weighted average served as a measure of the potential radiological hazards in a single intermodal shipment. The non-weighted average was provided as a "worst case scenario" for emergency response during transport to the trans-load facility in Jersey City, New Jersey and during rail shipments.

4.1.1.1 Classification of Waste (Dickson)

Based upon the waste characteristics and generator knowledge, the waste was profiled and accepted for disposal at the USEI facility. The proper shipping name selected for the Bills of Lading (BOL), in accordance with 49 CFR 172.101 was:

RQ, Environmental Hazardous Substances, Solid, n.o.s, (Radionuclides), 9, UN3077, PGIII.

4.1.2 Mobilization

ECC mobilized to the site beginning January 26, 2004. Resources mobilized included:

- Project team – 13 persons;
- Bulldozer, excavator, 2 wheel loaders, office trailer, man lift, power generator, concrete breaker;
- Health physics field instrumentation;
- Air monitoring equipment; and
- Exhaust fans / high efficiency particulate air (HEPA) filters.

A project kickoff meeting was held on February 3, 2004. The Attendee list is provided in Table 4-3.

As part of mobilization, ECC filed a water use permit application with the City of Glen Cove. This permit authorized ECC to connect to the Glen Cove hydrant system and use Glen Cove water for dust suppression and decontamination.

4.1.3 Site Inspection

ECC Project Manager (PM), Christian Canon, performed a site inspection of the Dickson Warehouse area at time of mobilization to document pre-existing site conditions. These conditions included:

- The Dickson Warehouse was not secure, and cats and raccoons were seen in and around the building;
- Most of the windows in the Dickson Warehouse were broken or missing;
- Many holes were present in the roof covering;
- Debris was present on the loading dock area, including several large heavy equipment tires;

- The loading dock had deteriorated and much of the edge was gone, exposing earth at the corners;
- Vegetation was growing on the loading dock;
- Water, presumably from melting snow/ice, was flowing from inside the warehouse, out one of the roll-up doors, and into the parking lot. (ECC immediately sandbagged the door crack and covered the area with plastic to minimize potential spread of contaminated sediment);
- The block walls of the structure were in poor condition. Evidence of significant deterioration and partial collapse was present;
- Many gaps existed in the perimeter fencing around Parcels B and C;
- The lot area in lower Parcel C was covered in 12 inches snow; and
- The lot surface was uneven and partially covered with cement.

4.1.4 Site Setup

Setup commenced by preparing the site for placement of temporary facilities. This entailed plowing the snow cover, removal of ice in areas of planned operation, and filling of potholes in the support zone.

A loading enclosure was constructed at the loading dock on the southern side of the warehouse. The enclosure helped contain the loading operation and delineate work zones more clearly. The enclosure included scaffolding on two sides of the enclosure to facilitate safe and efficient tarping and untarping of intermodal shipping containers. The loading enclosure included a hinged apron that was propped against the side of the truck during the loading process to prevent contaminated materials from escaping to the enclosure floor.

Temporary power was placed at strategic locations near the building and extended to remote locations to energize air monitoring stations. The air monitoring stations were placed at perimeter locations as indicated by Figure 4-1.

On the interior of the warehouse, ECC placed exhaust fans, which were fitted with a HEPA filter system to prevent contaminated dust from escaping with the exhausted air. In addition, a personnel and equipment decontamination station was established at the southwest corner man-way entrance of the warehouse.

4.1.5 Waste Processing, Loading, and Shipment

Loading took place in accordance with Section 4.5.6 of the RAWP. ECC chose to load the material from the warehouse to the shipping containers at the loading dock on the south side of Warehouse after assessment of the soil condition and structural condition of the warehouse.

Waste processing took place in incremental steps throughout the activity. The processing included knocking down staged waste piles, amending the materials with water to suppress dust, and adding equal parts of debris to the soil piles. Much of the debris required size reduction before placement into shipping containers.

Following radioactive screening surveys to ensure materials were approved for loading, wastes were staged into piles at the front of the warehouse. The wastes were loaded into the shipping containers from these staged piles. A front end loader, equipped with a digital scale, was utilized for the loading process, enabling ECC to accurately document the weight of each shipment.

From the support zone, empty trailers were hitched and pulled into the loading enclosure. Next, a trailer tarp was pulled forward to prepare for the loading step following removal of snow and water. After that, a plastic liner was placed into the container and the trailer was moved forward into the loading position. Each container was loaded with approximately 21.5 tons of waste materials. When loading was complete, the full container was moved forward to the tarping and survey position. If contaminated soil landed on the edges of the container, it was swept into the container. Once the container was tarped and the survey indicated the shipment could leave the controlled area, it was driven from the loading enclosure and staged in the support zone.

At the conclusion of each work shift, shipping documents were completed by ECC and signed by USACE personnel. Soils and debris from Dickson Warehouse were shipped using a straight BOL. Each evening all prepared shipments were transported from the site by USEI. Empty containers were returned for use the following work day.

Approximately 5,180 tons of wastes in 242 intermodal containers, were shipped from the Dickson Warehouse to USEI. Appendix C provides copies of each BOL and certificate of disposal.

4.1.5.1 Post Waste Removal – Radiological Status of Dickson Warehouse

All waste piles were removed from the warehouse. Only residual dirt/dust remains in the building interior.

No final status surveys or building decontamination took place. The Dickson Warehouse remains a controlled area and building components will exhibit both fixed and removable radionuclide contamination.

4.2 Upper Parcel C - Soils Removal (Phase II)

Authorized work in Upper Parcel C was focused in Areas RA-A and RA-B, identified in RAWP Figure 4-3. The actual excavation was completed beyond the anticipated areas as illustrated in Figure 4-3.

Although EPA gave authorization to complete work in Area RA-C, ECC did not execute removal activities in that area during this Interim Remedial Action. Therefore, the following discussions of removal activities refer to work in Areas RA-A and RA-B only.

ECC performed pre-removal characterization of the soils in Areas RA-A, RA-B and RA-C to ensure waste profiles were completed accurately and shipping categorizations were updated. The resulting analytical data indicated that radionuclide contamination was non-homogeneous.

Further, the data indicated that soils from contaminated zone RA-A also exceeded TCLP criteria for lead and hence would need to be managed, treated, and disposed of as a RCRA hazardous waste. The RCRA toxicity code for lead was added to the waste profile for the RA-A waste stream. Although radioactive, soils from Areas RA-B and RA-C were determined to be non-RCRA wastes.

4.2.1 Waste Characterization – Soils RA-A / RA-B

On February 27, 2004, ECC collected samples from soil located in Areas RA-A, RA-B, and RA-C in Upper Parcel C and Parcel B. The samples were analyzed for concentrations of toxic metals per EPA method 6010B. The results of the analyses are presented in Table 4-4, Metals Results – Areas RA-A RA-B and RA-C.

The conclusions made from these data were that the soil in Area RA-A exhibited RCRA regulated levels of toxic lead per the guidelines of 40 Code CFR 261.24, Toxicity Characteristic, and the waste was assigned the toxicity characteristic code D008.

The radiological characterization of the waste from Areas RA-A and RA-B was managed in a fashion similar to those of the Dickson Warehouse soils. As with Dickson Warehouse soils the characterization data from the FRD was supplemented with the collection and analysis of additional soil samples prior to the removal and transport of the material from these areas. The weighted averages for the soils from Areas RA-A and RA-B are presented in Table 4-5.

4.2.1.1 Classification of Waste (RA-A/RA-B)

Based upon the waste characteristics and generator knowledge information, the soil from Area RA-A was profiled and accepted for disposal at the USEI facility. The proper shipping name selected for the manifest, in accordance with 49 CFR 172.101, was:

RQ, Hazardous Waste Solid, n.o.s, 9, UN3077, PGIII.

Due to its lead content, shipment of soils from contaminated zone RA-A required use of a New York State Hazardous Waste Manifest. A Land Disposal Restriction form was also filed with the first shipment of this RCRA D008 waste.

Based upon the waste characteristics and generator knowledge information, the soil from Area RA-B was profiled and accepted for disposal at the USEI facility. The proper shipping name selected for the BOL, in accordance with 49 CFR 172.101, was:

RQ, Environmental Hazardous Substances, Solid, n.o.s, (Radionuclides), 9, UN3077, PGIII

4.2.2 Mobilization

Additional personnel and equipment were required and mobilized to perform the approved scope of work in Upper Parcel C. Additional resources mobilized included a forklift, an off-road reticulating dump truck, and a large excavator.

4.2.3 Site Setup

ECC utilized the Dickson Warehouse and loading enclosure for this work. The Dickson Warehouse offered shelter from weather events and a controlled environment to amend the soils.

To transfer the soil into the building, a large opening was made in the rear of the warehouse. Prior to modifying the building, an independent New York State Licensed Structural Engineer inspected the building and approved the creation of the opening.

Perimeter air monitors were moved to the north and west boundaries of Upper Parcel C to accommodate the expanded work area. Additional work zones were established and silt fencing was placed around the intended excavation areas. Perimeter fencing to the east and north of RA-A required repair to ensure site security measures were intact.

ECC utilized the data presented in the FRD and Differential Global Positioning System (DGPS) locations to mark the reported boundaries of Areas RA-A and RA-B.

Grubbing and clearing of trees, brush, concrete, and debris were required in both areas. A combination of heavy equipment and hand tools were used to complete these tasks.

4.2.4 Waste Excavation, Loading and Shipment

Excavation of contaminated zone RA-A began first in the areas identified in the FRD as the target areas. ECC operators carefully excavated to the target depth of 24 inches. During all excavation work, the health physics team performed ongoing walkover surveys to direct the operator. ECC performed soil excavations in areas outside the boundaries of contaminated zone RA-A as identified in the FRD, at the direction of TDY. The additional excavation was performed owing to the presence of contamination.

Waste soils were transported from contaminated zone RA-A using the excavator and reticulating dump. The soils had varying color and consistency but generally had high moisture content, greater than 22%. The natural subsurface stream that runs down the slope of contaminated zone RA-A, contributed to the high soil moisture content. Soils were offloaded directly into the rear of the Dickson Warehouse (north side) through the opening formed in the rear structure.

ECC loader operators then moved the material into stockpiles inside the warehouse. Using an excavator and loaders, ECC operators subsequently amended the high moisture content soil with no more than five percent, pelletized quicklime. This step substantially reduced the moisture content, making the soils compliant for shipment. Following an overnight drying period the stockpiles were moved to the front-warehouse loading stockpile where they were loaded into transport containers as described in Section 4.1.5 of this IRAR.

The excavation work in contaminated zone RA-B was accomplished using the same process as described for contaminated zone RA-A. Similarly, ECC health physics personnel were present during all excavation work to guide the excavator operators. This quality control mechanism limited the amount of over-excavation. It also led to the identification and removal of some contaminated soils in nearby areas outside of the borders delineated in the FRD.

At the conclusion of each work shift, shipping documents were completed by ECC and signed by USACE personnel. Due to its lead content, shipment of soils from contaminated zone RA-A required use of a New York State Hazardous Waste Manifest. A Land Disposal Restriction form was also filed with the first shipment of this RCRA D008 waste. Each evening all prepared shipments were transported from the site by USEI. Empty containers were returned for use the following work day.

Approximately 2,349 tons of wastes, containerized in 110 intermodal containers, were collected from contaminated zone RA-A and shipped to USEI for treatment and disposal. Appendix C provides copies of each New York State Hazardous Waste Manifest and Certificate of Disposal for these shipments.

Approximately 1,177 tons of wastes, containerized in 54 intermodal containers, were collected from contaminated zone RA-B and shipped to USEI for disposal. Appendix C presents copies of each BOL and Certificate of Disposal for these shipments.

4.2.5 Post Waste Removal – Radiological Status of Areas RA-A / RA-B

These remedial activities focused on the bulk excavation and removal of soils with radionuclide contamination. ECC did not perform MARSSIM – based surveys in the areas. Hence, determination of whether Site-Wide Cleanup Levels were met cannot be made at this time. All of Upper Parcel C therefore remains a controlled area.

Figure 4-2, Post Remedial Contact Exposure Rates in Areas RA-A / RA-B, provides a visual representation of residual contact exposure rate estimates for the excavated areas in Upper Parcel C. Figure 4-3, Post Remedial Topography, Areas RA-A/RA-B, illustrates the post remedial topography of the excavated areas in Parcel C.

5.0 HEALTH AND SAFETY

Throughout the execution of work described in this IRAR, ECC strictly complied with the provisions and requirements of the project *Health and Safety Contingency Plan* (HSCP) (ECC, 2003).

Construction safety, equipment maintenance, proper use of protection equipment, utilization of engineering controls, personnel exposure monitoring, and perimeter (environmental) surveillance were all part of ECC's site health and safety activities.

The ECC corporate safety officer completed two safety audits of the site, reflecting ECC's commitment to its safety program. Each 2-day audit evaluated all aspects of the HSCP implementation. During all other times the ECC PM, Christian Canon, and Site Safety and Health Officer, Peter Trujillo, performed daily safety inspections, process review, and near-miss reviews to encourage safety process improvement.

5.1 Summary of All Monitoring Activities

Table 5-1 is a summary of the applicable regulatory standards and results obtained from safety monitoring during both phases of work at the Li Tungsten Site. The data presented in Table 5-1 are also presented in Appendix D, where a more comprehensive discussion is presented along with examples of results-calculations.

Table 5-1 is provided to allow ready comparison of the maximum values obtained during the Li Tungsten remediation project during the period of February 2004 through May 2004 to the applicable standards.

Occupational and Environmental Monitoring – Phase I (Dickson Warehouse)

During the contaminated soils removal work at the Dickson Warehouse, ECC performed occupational and environmental monitoring, in accordance with the RAWP and HSCP to ensure protection of workers and the public. The monitoring period for this work was February 10 – March 5, 2004.

5.1.1 Site Contaminant Characteristics

The site monitoring program was designed to address hazards related to both radionuclide and metals in the waste materials being handled.

The primary radiological hazards were determined to be related to exposure to thorium, uranium, radium, and their respective decay products. Th-232 is the prominent isotope of concern present in the waste. Th-232 nuclear decay emits ionization radiation in the form of alpha and beta particles with secondary photon emissions occurring less frequently. U-238 is the prominent isotope of concern in uranium present in the waste. U-238 nuclear decay emits ionization radiation in the form of gamma rays and alpha and beta particles.

With a radioactive half-life of 1,600 years, Ra-226 is a prominent decay product of U-238. Ra-226 nuclear decay emits ionizing radiation primarily in the form of gamma rays and alpha particles.

The wastes staged in Dickson warehouse were also known to be contaminated with lead and arsenic.

5.1.2 Sampling Methods

In accordance with the site RAWP and HSCP, ECC completed exposure surveillance for the site contaminants.

Occupational monitoring was accomplished by:

- Collection and analysis of air samples from work areas and personnel breathing zones for evaluating internal exposures to radionuclides;
- Monitoring radon levels in work zones;
- Use of Thermo Luminescent Dosimeters (TLD) to measure external radiation exposures;
- Collection and analysis of air samples from work areas and personnel breathing zones for purpose of evaluating internal exposures to lead and arsenic; and
- Collection and analysis of a baseline, interim, and exit bioassay.

Environmental Monitoring was accomplished in the following ways:

- Collection and analysis of air samples from six fixed environmental air monitoring stations or sample locations: - five placed around the perimeter of Upper Parcel C for the purpose of evaluating internal exposures to radionuclides at the site boundary, and - a single station 1.6 miles southwest of the Site as a background reference station;
- Monitoring radon levels at site perimeter;
- Use of TLDs to measure external radiation exposures at the site boundary; and
- Site perimeter gamma walkover surveys.

5.1.3 Monitoring Activities Results Summary – Phase I

Occupational and environmental monitoring is described in the following sections. A summary discussion of the sample data evaluation methodology is provided as part of Appendix D.

<u>Occupational Air Monitoring – Derived Air Concentrations</u>

Samples were collected at the frequency as prescribed in the RAWP and HSCP. All samples were counted onsite and a portion was sent off site for radioanalysis to establish a correlation between onsite and off-site results. These data are presented in Appendix D-2, Tables 1 and 4, at the loading/stockpiling areas and the dock areas, respectively.

The maximum occupational airborne concentration recorded during Phase I, based on the gross alpha measurements, was 294% Derived Air Concentration (DAC). This concentration was measured during soil homogenization in the Dickson Warehouse. Personnel performing work associated with this task were required to wear full face Air Purifying Respiratory protection (Level C). Therefore, applying a protection factor (PF) of 50 reduces the %DAC to 5.88%.

The maximum occupational airborne concentration recorded during Phase I, based on the radioanalytical analysis measurements, was 34.7% DAC. Applying the PF of 50 reduces the %DAC to 0.69%. The corrected %DAC was used to calculate the employees' CEDE. The maximum occupational CEDE during Phase I were estimated to be 0.36 millirem (mrem).

The occupational DAC limits are based on Table 1, Column 3 of Appendix B of 10 CFR 20, Occupational Values, Inhalation DAC. The DAC values are derived limits intended to control chronic occupational exposures. The relationship between the DAC and the Annual Limits of Intake (ALI) is given by: DAC = ALI (in microcurie (u/Ci))/(2,000 hours per working year x 60 minutes/hour x $2x10^4$ milliliter (ml) l per minute) = (ALI / $2.4x10^9$) μCi/ml, where 2 x 10^4 ml is the volume of air breathed per minute at work by a reference person under working conditions of light work. The results of the individual radiolological exposure data will be incorporated into the annual reports that are provided to project personnel in accordance with the RAWP.

Occupational - Radon

Continuous radon monitoring was performed in the Dickson Warehouse during Phase I. The tabulated results are presented in Appendix D-2, Table 6.

The maximum occupation radon levels within the Dickson warehouse for Phase I were 4.0 picocurie / liter (pCi/l). The average radon levels were 2.03 pCi/l.

The Occupational Safety and Health Act (OSHA) limits cumulative radon exposure in the workplace to 30 pCi/L based on 40 working hours per week and according to Title 40 CFR Part 192, the limit for radon in air is provided in this standard as 0.02 working levels (WL) or 4 pCi/l, including background. EPA guidance documents related to radon in homes refer to this limit as an Action Level (AL). Radon concentrations that exceed the AL of 4 pCi/l warrant mitigation (EPA 1992). If the results were greater than the administrative limit an evaluation of the engineering controls in place would be examined. Measured occupational radon exposures did not exceed this administrative guide.

Occupational - TLD

TLDs were assigned to each site personnel as required by the applicable work plans and procedures. The TLDs were evaluated offsite at the end of Phase I. The maximum and average occupational external dose equivalent rate was 0 mrem (deep/lens) and 0 mrem (shallow). No administrative action level for occupational exposure was exceeded. The as low as reasonably achievable (ALARA) planning objective of 300 mrem for the removal action was met. The results of the individual radiolological exposure data will be incorporated into the annual reports provided to project personnel in accordance with the RAWP.

Occupational - Metals

In addition to the radiological contaminants of concern two metals, lead and arsenic were identified as non-radiological contaminants of concern. The standards presented in Title 29 CFR 1910, and 1926 provide the permissible exposure limits for lead and arsenic as presented below.

The guidance in the RAWP was used to determine the frequency of sampling for heavy metals. The RAWP also provides guidance regarding the evaluation of Time Weighted Averages for the contaminants of concern. Further additional guidance provided by the National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards was used. The NIOSH guidance suggests that substances affecting the same target organ should be considered to have an additive effect. The effects of lead and arsenic exposure both target the kidney and are therefore substances that are considered have and additive effect. The exposure equivalence of the mixture was therefore calculated. The analytical results of the occupational monitoring are presented Appendix D-3, Tables 1 and 3.

The maximum occupational metais concentration measured during Phase I was 2.17 exposure equivalent (E_m) (Appendix D-3, Table 1). Personnel performing work associated with this task were required to wear full face air purifying respiratory protection. This maximum concentration was measured during soil homogenization activities in the Dickson Warehouse. Applying a PF of 50, as all work was performed under Level C PPE, reduces the E_m to 0.043. Appendix D, Section 5.3 of this document details the methodology for calculating the exposure equivalent.

5.1.3.1 Environmental Monitoring Results

The results of ECC's Phase I environmental monitoring program indicate that no measured parameter exceeds the guidelines for potentially exposed members of the public.

Environmental Air Monitoring

Section 112 of the Clean Air Act authorizes EPA to promulgate the National Emission Standards for Hazardous Air Pollutants (NESHAPs). The EPA has promulgated the standards applicable to the emissions of radionuclides in 40 CFR 61, NESHAP. Subpart H, National Emission Standards for Emissions of Radionuclides other than Radon from DOE Facilities (for non-radon, radioactive constituents) and 40 CFR 61, NESHAP, Subpart I, National Emission Standards for Emissions from Facilities by the Nuclear Regulatory Commission and Federal Facilities not Covered by Subpart H.

The Project demonstrated compliance with the standards in 40 CFR 61, Subpart I, by installing six, environmental air monitoring stations. Five air monitoring stations were placed at fixed locations around Upper Parcel C; the sixth being located 1.6 miles southwest of the Site. The sixth station was designated the background reference location.

Further, an estimate to determine compliance, applicability and reporting requirements was performed in accordance with the guidance provided in "*A Guide for Determining Compliance with the Clean Air Act Standards for Radionuclide Emissions from NRC Licensed and Non-DOE Federal Facilities, Rev 2. EPA520/1-89.002, October 1989*".

While the methods for determining compliance do not directly estimate the radiation dose, '*they [the estimates] determine whether your emission could not cause a dose greater than the standard of [40 CFR 61, subpart I]' - EPA520/1-89.002, October 1989.* The very conservative estimate provided within the guidance document indicates that the radiological inventory of the entire site is well within the limits of compliance.

Samples were collected as prescribed in the RAWP and HSCP. One representative sample was collected from each perimeter station during Phase I and evaluated onsite. Samples from sample location Li-3 and Li-6 were also sent off site for radioanalysis. All data are presented in Appendix D-1.

The results of the air monitoring indicate the maximum calculated CEDE was 2.42 mrem/yr for Phase I (January 26 through March 5). The CEDE value was calculated using the analytical results of the air samples from perimeter air sample location Li-3. Li-3 was selected as the maximum gross alpha measurements were detected at Li-3 during Phase I. However, the calculated result for the background sample location, Li-6, was 3.14 mrem/yr for Phase I.

<u>Environmental Radon</u>

Radon etch cups were placed at each of the fixed perimeter monitoring stations. The etch cups remained in place for the entire execution of Phase I and subsequently were sent offsite for analysis. The data is presented in Appendix D-1, Table 8.

The maximum environmental radon levels for Phase I were 0.8 pCi/l. The average radon levels were 0.8 pCi/l.

In accordance with Title 40 CFR Part 192, the limit for radon in air is provided in this standard as 0.02 WL or 4 pCi/l, including background. EPA guidance documents related to radon in homes refer to this limit as an AL. Radon concentrations that exceed the AL of 4 pCi/l warrant mitigation (EPA, 1992). Though this limit is only applicable to buildings, these values were used as an administrative guide. The measured environmental radon exposures did not exceed this administrative guide

Environmental TLD

TLDs were placed at each of the fixed monitoring stations. The TLDs remained in place for the entire execution of Phase I and subsequently were sent offsite for evaluation. The data are presented in Appendix D-1, Table 9.

The maximum reported environmental average external dose equivalent rate recorded during Phase I was 3.34 mrem per week (including background). This measurement was recorded at sampling location Li-3. The environmental TLD located at the background station averaged 2.78 mrem per week for the same period. Other environmental TLDs showed external dose equivalent rates that averaged 3.00 mrem per week.

The dose limit is expressed as a total dose equivalent. The limit of 100-mrem total dose equivalent above background from all sources for a period of a year is specified in Title 10 CFR Part 20.1302 as the dose limit for members of the public. The dose limit is expressed as a total dose equivalent. The limit of 100-mrem total dose equivalent above background from all sources for a period of a year is specified in the standard. External gamma radiation dose and the doses from all releases are included in the calculation of the total dose equivalent. The 100-mrem total dose equivalent above background specified in this standard includes exposures from radon.

5.2 Occupational and Environmental Monitoring – Phase II (Upper Parcel C)

During the contaminated soils removal work at the Upper Parcel C, ECC performed occupational and environmental monitoring, in accordance with the RAWP and HSCP to ensure protection of workers and the public, respectively. The monitoring period for this work was March 5 – April 20, 2004 (Phase II).

5.2.1 Site Contaminant Characteristics

The site monitoring program was designed to address hazards related to both radionuclide and heavy metals contaminants in the waste materials being handled.

The primary radiological hazards are related to exposure to Th, U, Ra and their respective decay products, as described in Section 5.2.1 of this report.

The soil in Areas RA-A and RA-B in Upper Parcel C was also known to contain lead and arsenic.

5.2.2 Sampling Methods

In accordance with the site RAWP and HSCP, ECC designed exposure surveillance for the site contaminants.

Occupational monitoring was accomplished by:

- Collection and analysis of air samples from work areas and personnel breathing zones for evaluating internal exposures to radionuclides;
- Monitoring radon levels in work zones;
- Use of TLDs to measure external radiation exposures; and
- Collection and analysis of air samples from work areas and personnel breathing zones for purpose of evaluating internal exposures to the metals lead and arsenic.

Environmental Monitoring was accomplished by:

- Collection and analysis of air samples from six fixed environmental air monitoring stations placed around the perimeter of Upper Parcel C for the purpose of evaluating internal exposures to radionuclides at the site boundary;
- Monitoring radon levels at the site perimeter; and
- Use of TLDs to measure external radiation exposures at the site boundary.

5.2.3 Monitoring Activities Results Summary – Phase II

For each of the sampling methods described in 3.2.2, a summary describing the results of those activities follows. A summary discussion of the sample data evaluation methodology is provided as part of Appendix D.

Results of ECC's Phase II air monitoring program indicate that no measured parameter exceeds federal guidelines for doses calculated for potentially exposed site workers.

<u>Occupational Air Monitoring – Derived Air Concentrations</u>

Samples were collected at the frequency and using the methods as prescribed in the RAWP and HSCP. All samples were counted onsite and a portion was sent off site for radioanalysis. A correlation between the on site and off-site results was created. All data and dose conversions are presented in Appendix D-1, Table 2 and Tables 4 through 7.

The maximum occupational airborne concentration measured during Phase II, based on Gross Alpha Measurements was 24.4% DAC. Applying a PF of 50, as Level C PPE was employed, reduces the %DAC to 0.49%.

The maximum occupational airborne concentration measured during Phase II, based on the radioanalytical analysis measurements, was 5.78% DAC. Applying the PF of 50 reduces the %DAC to 0.12. The corrected %DAC was used when calculating the employees' CEDE. The maximum occupational CEDE during Phase II was estimated to be 0.14 mrem.

The occupational DAC limits are based on Table 1, Column 3 of Appendix B of 10 CFR 20, Occupational Values, Inhalation DAC. The DAC values are derived limits intended to control chronic occupational exposures. The relationship between the DAC and the ALI is given by: DAC = ALI (in μCi)/(2,000 hours per working year x 60 minutes/hour x $2x10^4$ ml per minute) = (ALI / $2.4x10^9$) μCi/ml, where 2 x 10^4 ml is the volume of air breathed per minute at work by a reference person under working conditions of light work. The results of the individual radiolological exposure data will be incorporated into the annual reports that are provided to project personnel in accordance with the RAWP.

Occupational Radon

Continuous radon monitoring was performed in the Dickson Warehouse during Phase II activities. Results were documented weekly and are presented in Appendix D-2, Table 6.

The maximum occupation radon levels measured in the Dickson warehouse during Phase II were 1.09 pCi/l. The Phase II average radon levels were 0.23 pCi/l.

The OSHA limits cumulative radon exposure in the workplace to 30 pCi/L based on 40 working hours per week and according to Title 40 CFR Part 192, the limit for radon in air is provided in this standard as 0.02 WL or 4 pCi/l, including background. EPA guidance documents related to radon in homes refer to this limit as an AL. Radon concentrations that exceed the AL of 4 pCi/l warrant mitigation (EPA 1992). If the results were greater than the AL an evaluation of the engineering controls in place would be examined. The measured occupational radon exposures did not exceed this AL.

Occupational TLD

TLDs were assigned to each site personnel as required by the applicable work plans and procedures. The TLDs were evaluated offsite at the end of Phase II.

The maximum and average occupational external dose equivalent rate was 0 mrem (deep/lens) and 0 mrem (shallow). No administrative action level for occupational exposure has been exceeded. The ALARA planning objective of 300 mrem for the removal action has been met. The results of the individual radiolological exposure data will be incorporated into the annual reports that are provided to project personnel in accordance with the RAWP.

Occupational - Metals

In addition to the radiological contaminants of concern two metals, lead and arsenic were identified as non-radiological contaminants of concern. The standards presented in Title 29 CFR 1910, and 1926 provide the permissible exposure limits for lead and arsenic as presented below. The standards are shown in Table 5-2.

The guidance in the RAWP was used to determine the frequency of sampling for metals. The RAWP also provides guidance regarding the evaluation of Time Weighted Averages for the contaminants of concern. Further additional guidance provided by the NIOSH Pocket Guide to Chemical Hazards was used. The NIOSH guidance suggests that substances affecting the same target organ should be considered to have an additive effect. The effects of lead and arsenic exposure both target the kidney and are therefore substances that are considered have and additive effect. The exposure equivalence of the mixture was therefore calculated. The analytical results of the occupational monitoring are presented Appendix D-2.

The maximum occupational metals exposure occurred during soil amendment actions within the Dickson Warehouse. The maximum occupational airborne concentration measured was 0.26 E_m. Applying a PF of 50, as Level C PPE was employed, reduces the E_m to 0.002. Appendix D, Section 5.3 of this document details the methodology for calculating the exposure equivalent.

5.2.3.1 Environmental Monitoring Results

The results of ECC's Phase II environmental monitoring program indicate that no measured parameter exceeds the guidelines for potentially exposed members of the public.

Environmental Air Monitoring

Section 112 of the Clean Air Act authorizes EPA to promulgate the NESHAPs. The EPA has promulgated the standards applicable to the emissions of radionuclides in 40 CFR 61, NESHAP. Subpart H, National Emission Standards for Emissions of Radionuclides other than Radon from DOE Facilities (for non-radon, radioactive constituents) and 40 CFR 61, NESHAP, Subpart I, National Emission Standards for Emissions from Facilities by the Nuclear Regulatory Commission and Federal Facilities not Covered by Subpart H.

The project demonstrated compliance with the standards in 40 CFR 61, Subpart I, by installing six, environmental air monitoring stations. Five air monitoring stations were placed at fixed locations around Upper Parcel C, the sixth being located 1.6 miles southwest of the Site. The sixth station was designated the background reference location.

Further, an estimate to determine compliance, applicability and reporting requirements was performed as described in Section 5.2.3.

Samples were collected as prescribed in the RAWP and HSCP. One representative sample was collected from each perimeter station during Phase I and evaluated onsite. Samples from sample locations Li-3 and Li-6 were also sent off site for radioanalysis. All data are presented in Appendix D-1.

Additionally, at the request of the EPA and with the concurrence of the stakeholders (EPA, Potentially Responsible Party (PRP)), an administrative limit / action limit of twenty percent of the annual standard in 40 CFR 61 was applied to the environmental gross alpha measurements, and weekly monitoring efforts were instituted. The weekly samples were evaluated onsite. The weekly samples results were used to create a monthly composite. The monthly composite values of those samples are presented in Appendix D-1. The sample composites collected from Stations Li-3 and Li-6 were also sent offsite for radioanalysis. Results are presented in Appendix D-1.

Using the sampling data results, CEDEs were calculated for each sampling period for each sampling location, including background. The maximum calculated CEDE for the general public during Phase II was 3.43 mrem/yr. The CEDE value was calculated from data obtained from sampling location Li-3. The background sampling location, Li-6, measured 5.54 mrem/yr for the same period (Appendix D-1, Table 16).

Environmental Radon

Radon etch cups were placed at each of the six sampling locations for the duration of Phase II activities. The etch cups were sent off site for evaluation. Results are provided in Appendix D-1, Table 8.

The maximum environmental radon levels for Phase II were 1.1 pCi/l. The average radon levels were 1.1 pCi/l.

In accordance with Title 40 CFR Part 192, the limit for radon in air is provided in this standard as 0.02 WL or 4 pCi/l, including background. EPA guidance documents related to radon in homes refer to this limit as an AL. Radon concentrations that exceed the AL of 4 pCi/l warrant mitigation (EPA 1992). Though this limit is only applicable to buildings these values were used as an administrative guide. The measured environmental radon exposures did not exceed this administrative guide.

Environmental - TLD

TLDs were placed at each of the 6 fixed monitoring stations. As with air sampling and the Phase I effort five locations were established around the perimeter of the site with the sixth monitoring station remained offsite and was used as a background reference station. The TLDs remained in place for the entire execution of Phase II and subsequently were sent offsite for evaluation. The data are presented in Appendix D-1, Table 9.

The maximum reported environmental average external dose equivalent rate measured during Phase II was 2.08 mrem per week (including background). This measurement was recorded at perimeter sampling location Li-4. The environmental TLD background measurement from sampling location Li-6 averaged 1.40 mrem/week for Phase II.

The dose limit is expressed as a total dose equivalent. The limit of 100-mrem total dose equivalent above background from all sources for a period of a year is specified in Title 10 CFR Part 20.1302 is the dose limit for members of the public. The dose limit is expressed as a total dose equivalent. External gamma radiation dose and the doses from all releases are included in the calculation of the total dose equivalent. The 100-mrem total dose equivalent above background specified in this standard includes exposures from radon.

6.0 DEMOBILIZATION

The demobilization process commenced following the final waste shipment on April 6, 2004.

6.1 Decontamination Procedures

Demobilization included complete decontamination of all equipment and materials. Steam-cleaning equipment was employed. This work was closely monitored by ECC project management and safety personnel. All visible soil was removed to ensure no metals contaminant remained. Subsequent radionuclide surveys were performed to document that each item met the acceptable surface contamination criteria as provided in Table 4-1 of the RAWP.

All shipment containers used during the project were also cleaned and surveyed to ensure they were free of visible dirt and radionuclide contamination. This work was performed by the transporter, USEI, and its subcontractors. Survey forms and photos of the their decontamination efforts are presented as Appendix E.

The loading enclosure was dismantled as part of demobilization. All contaminated portions were included with the final waste shipments. The loading dock scaffolding frame remains for re-use during future activities. A container was placed at the site to store materials for use when site work resumes.

In addition to release of project personnel and equipment, the demobilization process required reinforcement of site security features and erosion control measures. Description of those features follows in the next sections.

6.2 Site Security

As identified in the initial site inspection, the site lacked adequate perimeter fencing in many locations around Parcels B and C. ECC fortified and installed perimeter fencing to ensure that the site boundary was clearly marked. In some cases holes were patched and fencing posts were stabilized. In other areas, large sections of new wire fencing were installed.

ECC secured wood frame and plywood coverings to all ground-level openings to Dickson Warehouse to secure the building.

In two locations in Upper Parcel C where excavation work took place, small drop-offs, less than 4 feet, were created by the excavation work. In both cases, ECC installed orange snow-fencing to identify the hazard.

6.3 Erosion Control

During site work, erosion controls were in place and maintained to control work area run-on and run-off. At demobilization, these measures were fortified to ensure that contaminant migration from disturbed areas would remain controlled. Controls included silt fence placement around entire excavation areas, and placement of sandbag walls in two places on the concrete path to the west of Parcel C area RA-B. Additionally, silt fence fabric was stapled to the Parcel C southern boundary wooden fence and hay bales were staged at points where rainwater flowed from Dickson Warehouse and its southern loading dock.

7.0 REFERENCES

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TABLES

Table 1-1
Site-Wide Cleanup Levels

Parameter (In Soil)	Cleanup Levels
Arsenic	24 mg/kg
Lead	400 mg/kg
Thorium-232 (Th-232)	5 pCi/g above background level
Radium-226 (Ra-226)	5 pCi/g above background level

Note:
Background levels are 1 picocurie per gram (pCi/g) for Th-232 and 1 pCi/g for Ra-226.

Table 4-1
Dickson Waste Metals Results

		Sample Number									
Analyte	**Units**	**5601-111003-001**	**5601-111003-002**	**5601-111003-003**	**5601-111003-004**	**5601-111003-005**	**5601-111003-006**	**5601-111003-007**	**5601-111003-008**	**5601-111003-009**	**5601-111003-010**
Lead (Total)	mg/kg	2000	488	1080	1040	1680	808	1080	840	2610	1050
Arsenic (Total)	mg/kg	310	255	333	180	496	512	73.3	211	512	461
Silver (TCLP)	mg/kg	0.0048 u	0.0048 u	0.0048 u	0.0048 u	0.0048 u	0.0048 u	0.0048 u	0.0048 u	0.0048 u	0.0048 u
Arsenic (TCLP)	mg/kg	0.0252 u	0.0588	0.0587	0.0503	0.0482	0.0976	0.0252 u	0.0413	0.0274	0.092
Barium (TCLP)	mg/kg	0.182	0.0385	0.0593	0.0563	0.0888	0.0977	1.350	0.0808	0.0937	0.070
Cadmium (TCLP)	mg/kg	0.0565	0.008	0.125	0.0043	0.0712	0.0058	0.319	0.023	0.038	0.183
Chromium (TCLP)	mg/kg	0.0064	0.039	0.0174	1.750	0.006 u	0.006 u	0.180	0.0407	0.006 u	0.0343
Mercury (TCLP)	mg/kg	0.0023	0.00046	0.0001 u	0.00033	0.0001 u	0.0001 u	0.00054	0.00014	0.00015	0.0001 u
Lead (TCLP)	mg/kg	0.0114 u	0.0114 u	0.0114 u	0.0114 u	0.0247	0.0114 u	0.0114 u	0.0114 u	0.0229	0.0164 u
Selenium (TCLP)	mg/kg	0.0174 u	0.354	0.331	0.204	0.0174	0.0461	0.0174	0.193	0.0174	0.238

Notes:
U = qualified result, indicates that the parameter was not detected at or above the reporting limit. The associated numerical value is the sample detection limit.
Sample number 5601-111003-010 is a field replicate of sample 5601-111003-003.

TCLP = Toxicity Characteristic Leachate Procedure

Table 4-2
Radionuclide Activity Averages – Dickson Warehouse

	Th-232 pCi/g	Radium -226 pCi/g	Uranium Nat. pCi/g
Average	16.54	13.46	44.12
Median	7.30	6.19	17.25
Std deviation	17.05	11.80	54.02
Minimum	1.80	1.35	3.00
Maximum	135.50	70.30	398.20

Notes:
The maximum activities presented in this table were typically associated with point sources found within the soils admixture.

pCi/g = picocuries/gram

Table 4-3
Pre-Construction Meeting Attendee List

Name	Organization
Mayor MaryAnn Holzkamp	City of Glen Cove (CGC)
Rosemary Olsen	CGC
Nicholas DeSantis	CGC
Srikanth Honnur	CGC
Edgard Bertaut	TDY
Ed Als	EPA
Richard Dabal	US Army Corps of Engineers (USACE)
Marc Mizrahi	ECC
Christian Canon	ECC
Peter Trujillo	ECC
Tim Curtain	US Ecology of Idaho (USEI)

Table 4-4
Metals Results - Upper Parcel C Waste (RA-A/RA-B)

Sample Number	Silver mg/L	Arsenic mg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Mercury mg/L	Lead mg/L	Selenium mg/L
Ra-A001	0.18	0.03	0.17	0.00	0.01	0.00	114.0	0.03
Ra-A002	0.02	0.03	0.05	0.00	0.01	0.00	0.46	0.03
Ra-A003	0.17	0.03	0.01	0.00	0.01	0.00	96.40	0.03
Ra-B001	0.00	0.40	0.92	0.00	0.01	0.00	0.04	0.03
Ra-B002	0.00	0.04	0.73	0.00	0.01	0.00	0.02	0.03
Ra-C001	0.01	0.03	0.01	0.00	0.01	0.01	0.02	0.03
Ra-C002	0.00	0.03	0.64	0.07	0.01	0.00	0.11	0.03
Ra-C003	0.00	0.03	0.04	0.00	0.01	0.00	0.02	0.03

Notes:
mg/L = milligrams per liter

Table 4-5
Radionuclide Activity Averages - Upper Parcel C (RA-A/RA-B)

RA - A	Th-232 pCi/g	Radium -226 pCi/g	Uranium Nat. pCi/g
Average	15.08	26.58	6.87
Median	8.38	9.93	7.57
Std deviation	12.68	30.15	1.65
Minimum	6.98	8.04	4.83
Maximum*	34.8	73.5	8.38
RA - B	Th-232 pCi/g	Radium -226 pCi/g	Uranium Nat. pCi/g
Average	20.81	8.69	15.08
Median	15.10	8.04	8.38
Std deviation	24.83	7.96	19.52
Minimum	8.38	2.28	6.97
Maximum*	94.4	23.9	73.1

Notes:
* The maximum activities presented in this table were typically associated with point sources found within the soils admixture.

pCi/g = picocuries/gram

Table 5-1
Monitoring Results Summary

Standard / Guiding Documents	Discussion of Standard or Guideline	Analysis of Results
Title 40 Code of Federal Regulations (CFR) Part 61, Subpart H, I	Section 112 of the Clean Air Act authorizes EPA to promulgate the National Emission Standards for Hazardous Air Pollutants (NESHAPs). The EPA has promulgated the rules applicable to the emissions of radionuclides in 40 CFR 61, NESHAP. Subpart H, National Emission Standards for Emissions of Radionuclides other than Radon from DOE Facilities (for non-radon, radioactive constituents).	A estimate to determine compliance, applicability and reporting requirements was performed in accordance with the guidance provided in "*A Guide for Determining Compliance with the Clean Air Act Standards for Radionuclide Emissions from NRC Licensed and Non-DOE Federal Facilities, Rev 2. EPA520/1-89.002, October 1989*". The very conservative estimate provided within the guidance document indicate that the radiological inventory of the entire site. Applying the guidance provided within *EPA520/1-89.002, October 1989* indicate the entire site radiological inventory is well within the limits of compliance. The Project demonstrated compliance to 40 CFR 61, Subpart I, by installing six, environmental air monitoring stations. Five air monitoring stations were placed at fixed locations around Parcel C, the sixth being located 1.6 miles southwest of the site. The sixth station was designated the background reference location. The results of the air monitoring indicate the maximum calculated CEDE was 2.42. mrem/yr for Phase I. The CEDE value was calculated using the the analytical results of the air samples from perimeter air sample location Li-3. Li -3 was selected as the maximum gross alpha measurements were detected at Li-3 during Phase I. However, the background station, Li-6, was 3.14 mrem/yr for Phase I. The results of the air monitoring indicate the maximum calculated CEDE was 3.43. mrem/yr for Phase II. The CEDE value was calculated using the the analytical results of the air samples from perimeter air sample location Li-3. Li -3 was selected as the maximum gross alpha measurements were detected at Li-3 during Phase II. However, the background station, Li-6, was 5.54 mrem/yr for Phase II.

Table 5-1
Monitoring Results Summary

Standard / Guiding Documents	Discussion of Standard or Guideline	Analysis of Results
Title 40 CFR 192	40 CFR 192 sets the action level (AL) for radon in air in homes at 0.02 working levels (WL) or 4 pCi/l, including background. Radon concentrations that exceed the AL of 4 pCi/l require mitigation to reduce levels. The AL is applicable only to buildings.	ECC monitored the environmental radon levels via the use of Radon Track Etch Cups installing six, environmental air monitoring stations. Five air monitoring stations were placed at fixed locations around Parcel C, the sixth being located 1.6 miles southwest of the site. The sixth station was designated the background reference location.
	The limit for radon in air is provided in this standard as 0.02 working levels (WL) or 4 pCi/l, including background.	The maximum environmental radon level for Phase I were measured at 0.8 pCi/l. The maximum level measured during Phase II was 1.1pCi/l.
	It should be noted that the Environmental Protection Agency (EPA) and other public health officials publish radon guidelines, but these guidelines are not occupational safety and health standards and do not carry the weight of law. EPA recommends remediation when the radon level is 4 pCi/L or higher. Radon concentrations that exceed the Action Limit of 4 pCi/l require mitigation. ECC selected the EPA guideline for radon exposure levels as an administrative limit. ECC collected periodic field measurements of the radon concentrations. If the results were greater than the administrative limit an evaluation of the engineering controls in place were examined.	The maximum radon concentration measured during Phase I, including background was 4pCi/L. The average concentration measured during Phase I was calculated to be 2.03pCi/L, including background. The maximum radon concentration measured during Phase II, including background was 1.38pCi/L. The average concentration measured during Phase II was calculated to be 0.23pCi/L, including background. The average background level for radon exposure was found to be no greater than 1.1 pCi/L
10 CFR 20, Appendix B	Occupational derived air concentration (DAC) limits are based on Table 1, Column 3 of Appendix B to 10 CFR 20, Occupational Values, Inhalation DAC. The DAC values are derived limits intended to control chronic occupational exposures.	The maximum occupational airborne concentration observed during Phase I, based on the radio-analytical results, was 34.7% DAC. The maximum occupational exposure was observed during the homogenization process of soils within the Dickson Warehouse. Applying a protection factor (PF) of 50 reduces the %DAC to 0.69%. The maximum occupational CEDE during Phase I were estimated to be 0.36 milli rem (mrem). The maximum occupational airborne concentration observed during Phase II, based on the radio-analytical results, was 5.78% . The maximum occupational exposure was observed during the homogenization process of soils within the Dickson Warehouse. Derived Air Concentration. Applying a protection factor (PF) of 50 reduces the %DAC to 0.12%. The maximum

Table 5-1
Monitoring Results Summary

Standard / Guiding Documents	Discussion of Standard or Guideline	Analysis of Results
		occupational CEDE during Phase II was estimated to be 0.14 mrem
10 CFR20, Appendix B	Occupational exposure limits for radon-222 (with daughters present) for adult employees are set at 3x10-8 µCi/ml [30 pCi/L] averaged over a year (DAC-derived air concentrations).	The maximum radon concentration measured during Phase I, including background was 4pCi/L. The maximum radon exposure level was measured during the initial entry into the Dickson Warehouse. The average concentration measured during Phase I, within the Dickson warehouse, was calculated to be 2.03pCi/L, including background. The maximum radon concentration measured during Phase II, including background was 1.38pCi/L. The average concentration measured during Phase II was calculated to be 0.23pCi/L, including background. The average background level for radon exposure was found to be no greater than 1.1 pCi/L.
29 CFR 1910.1096, Radon Exposure Limits	OSHA imposes more stringent exposure limits for that those established by the NRC in 10 CFR 20, Appendix B. The OSHA limits is an average concentration for 40 hours in any workweek of 7 consecutive days. The applicable radon-222 exposure limit for adult employees is 1 x 10-7 microcuries per milliliter (µCi/ml) [100 picocuries / liter (pCi/L)] averaged over a 40-hour workweek.	The maximum radon concentration measured during Phase I, including background was 4pCi/L. The average concentration measured during Phase I was calculated to be 2.03pCi/L, including background. The maximum radon concentration measured during Phase II, including background was 1.38pCi/L. The average concentration measured during Phase II was calculated to be 0.23pCi/L, including background
10 CFR 20.1201	The following are the annual Occupation Dose Limits for Adults required by Title 10 Code Of Federal Regulations 20.1201 TEDE 5 REM CEDE to an one organ 50 REM Eye Dose Equivalent 15 REM Shallow Dose Equivalent 50 REM	The maximum and average occupational external dose equivalent rate for Phase I were below those measurable by the TLDs. The maximum and average occupational external dose equivalent rate for Phase II were below those measurable by the TLDs. (See also previous two entries)
29 CFR 1910,1926	Arsenic - OSHA PEL ACGIH TLV 0.01 mg/m^3	See cumulative results referenced in standards and guiding documents as The NIOSH Pocket Guide to Chemical Hazards

Table 5-1
Monitoring Results Summary

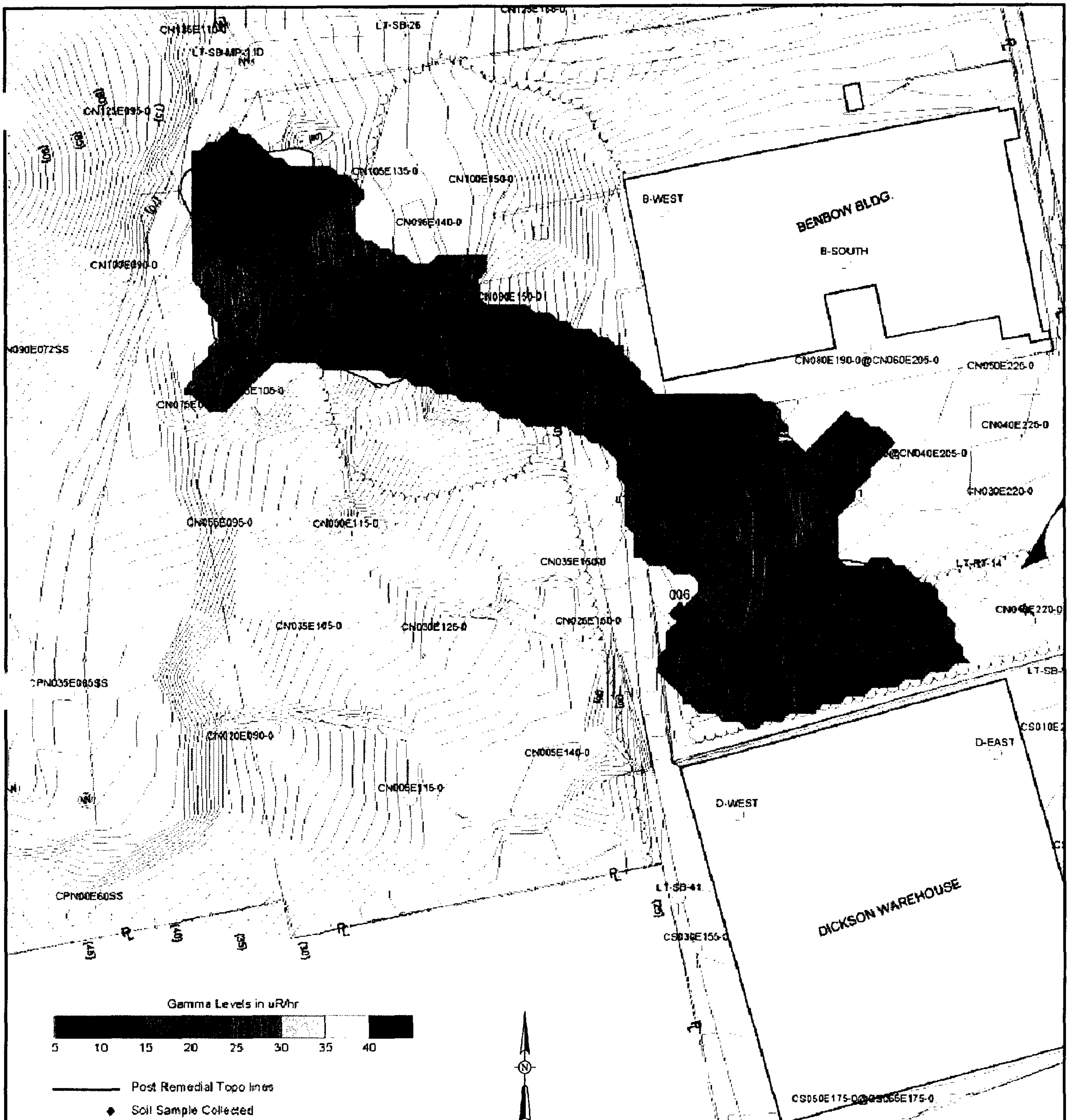
Standard / Guiding Documents	Discussion of Standard or Guideline	Analysis of Results
29 CFR 1910,1926	Lead - OSHA PEL ACGIH TLV 0.05 mg/m^3	See cumulative results referenced in standards and guiding documents as The NIOSH Pocket Guide to Chemical Hazards
The NIOSH Pocket Guide to Chemical Hazards	The NIOSH Pocket Guide to Chemical Hazards was used to determine that substances, lead and arsenic have additive effects. Those substances affecting the same target organ should be considered to have additive effects. The effects of lead and arsenic which both target the kidney, are substances that are considered additive, the combined effect, of the mixture was therefore calculated. If an airborne concentration exceeds the action limit of 0.5 E_m of the values an immediate evaluation of the activities that may produce elevated airborne concentrations and will include upgrading respiratory protection. (What substance of activity if being performed using the NIOSH method)	The maximum occupational metals (lead, arsenic) concentration was measured during task of soil homogenization in the Dickson Warehouse during Phase I. The maximum occupational airborne concentration for Phase I was 2.17 E_m. Applying a protection factor (PF) of 50 reduces the E_m to 0.043. The maximum occupational metals concentration (lead, arsenic) was measured during task of soil homogenization in the Dickson Warehouse during Phase II. The maximum occupational airborne concentration for Phase II was 0.26 E_m. Applying a protection factor (PF) of 50 reduces the E_m to 0.002.

Table 5-2
Metals Exposure Standards

Chemical	PEL/TLV	IDLH (mg/m^3)	Route of Entry	Target Organs
Arsenic	OSHA PEL ACGIH TLV 0.01 mg/m^3	Ca 5	Inhalation, Absorption, and Ingestion	Liver, kidneys, skin, lungs, lymphatic system
Lead	OSHA PEL ACGIH TLV 0.05 mg/m^3	100	Inhalation and Ingestion	Eyes, GI tract, central nervous system, kidneys, and blood

Notes:
mg/m^3 = milligrams per cubic meter
OSHA = Occupational Safety and Health Administration
PEL = Personal Exposure Limit
ACGIH = American Council of Governmental Industrial Hygienists
TCV = threshold limit value

FIGURES

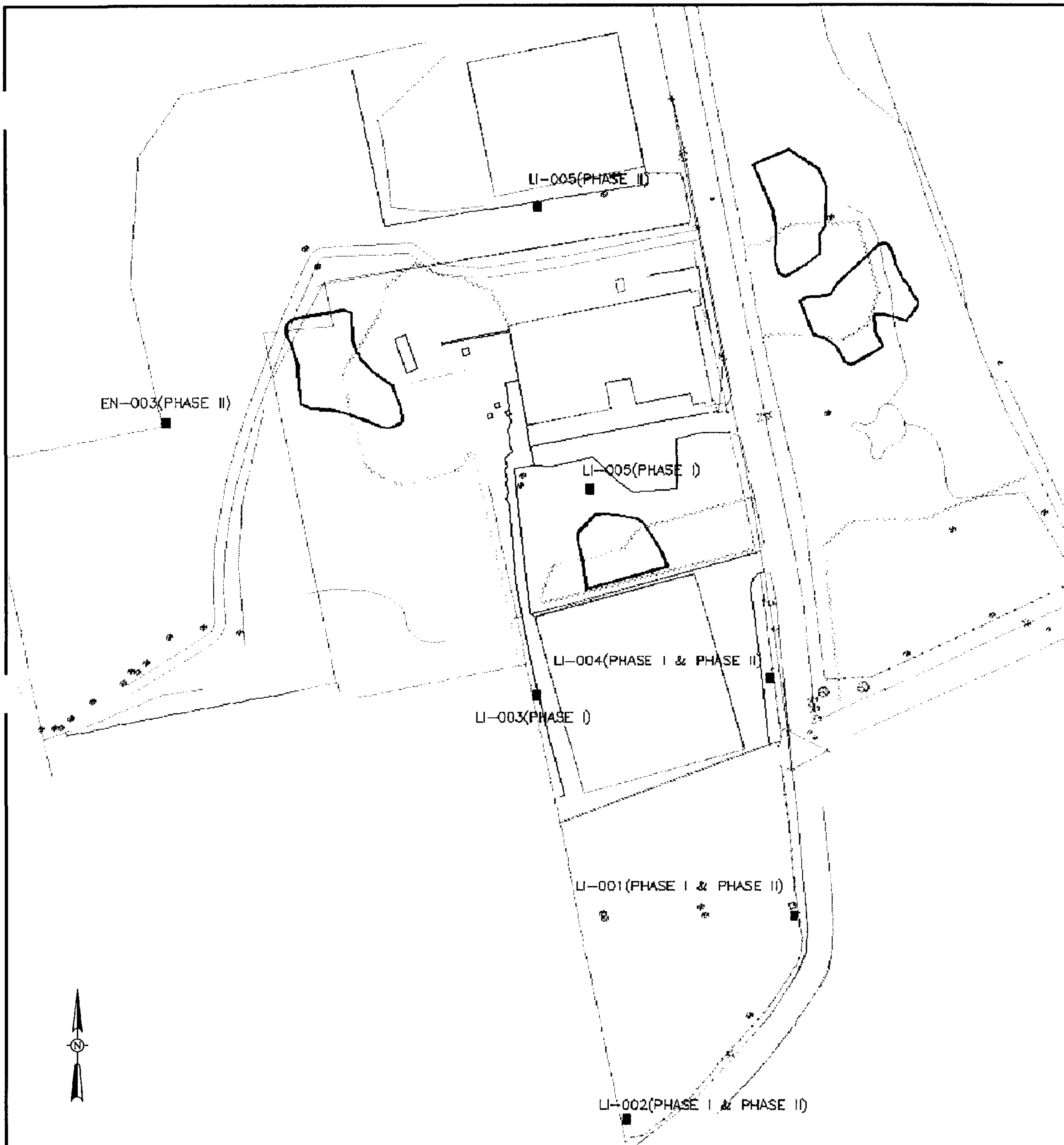


Note: Graphic representation should not be interpreted for pin point measurements at given locations

ENVIRONMENTAL CHEMICAL CORPORATION 1240 BAYSHORE HIGHWAY BURLINGAME, CA 94010	DRAWN BY: CC	**FIGURE 1 - POST REMEDIAL CONTACT EXPOSURE RATES IN AREAS RA-A AND RA-B**
	APPROVED BY: CC	LI TUNGSTEN SUPERFUND SITE POST - REMEDIAL ACTIONS AT DICKSON WAREHOUSE AND UPPER PARCEL C GLEN COVE, NEW YORK
	DATE: 05-OCT-04	PROJECT CODE: 5601 / CONTRACT CODE:
	SIZE: A	SCALE: NTS / FILENAME: LiTung.dwg / SHEET: - OF - / REV: -

ENVIRONMENTAL CHEMICAL CORPORATION
1240 BAYSHORE HIGHWAY
BURLINGAME, CA 94010

DRAWN BY: CC	**FIGURE 2 - POST REMEDIAL TOPOGRAPH IN AREAS RA-A AND RA-B**
APPROVED BY: CC	LI TUNGSTEN SUPERFUND SITE POST - REMEDIAL ACTIONS AT DICKSON WAREHOUSE AND UPPER PARCEL C
DATE: 05-OCT-04	GLEN COVE, NEW YORK PROJECT CODE: 5601 CONTRACT CODE:
SIZE: A	SCALE: NTS FILENAME: LiTung.dwg SHEET: - OF - REV: -



ENVIRONMENTAL CHEMICAL CORPORATION
1240 BAYSHORE HIGHWAY
BURLINGAME, CA 94010

DRAWN BY: CC	**FIGURE 3 - PERIMETER SAMPLING STATIONS**
APPROVED BY: CC	LI TUNGSTEN SUPERFUND SITE POST - REMEDIAL ACTIONS AT DICKSON WAREHOUSE AND UPPER PARCEL C GLEN COVE, NEW YORK
DATE: 05-OCT-04	PROJECT CODE: 5601 — CONTRACT CODE:
SIZE: A	SCALE: NTS — FILENAME: LiTung.dwg — SHEET: - OF - — REV: -

ENVIRONMENTAL CHEMICAL CORPORATION 1240 BAYSHORE HIGHWAY BURLINGAME, CA 94010	DRAWN BY: CC	FIGURE 4 - BACKGROUND REFERERNCE STATION
	APPROVED BY: CC	LI TUNGSTEN SUPERFUND SITE POST - REMEDIAL ACTIONS AT DICKSON WAREHOUSE AND UPPER PARCEL C GLEN COVE, NEW YORK
	DATE: 05-OCT-04	PROJECT CODE: 5601 CONTRACT CODE:
	SIZE: A	SCALE: NTS FILENAME: LiTung.dwg SHEET: - OF - REV: -

APPENDIX 6 – Field Implementation Guidance for Parcel B and Upper Parcel C

DRAFT
Field Implementation Guide
Chemical Remedial Action Support Survey
March 20, 2007

1.0 Purpose

To describe the processes and techniques for performing a remedial action support survey during the remediation of potentially metals contaminated soils at the Li Tungsten Superfund Site.

Methods provided in this Field Implementation Guide (FIG) are implemented with guidance from the PHP. The objective of this guidance is to describe the methods used to guide the excavation of material so that only the material requiring excavation to meet the site wide clean up criteria is excavated. Consult the PHP concerning deviations or clarification concerning the FIG.

2.0 Responsibilities

The Project Health Physicist is responsible for monitoring ongoing excavation progress and assuring that remedial action support survey is implemented appropriately to remove only what is necessary to meet the site wide clean up criteria. Health Physics Technicians and other trained personnel are responsible for executing and recording the chemical Remedial Action Support Survey (RASS).

3.0 Equipment

- Excavator with butter bar
- Innov –X, X-ray tube, X-Ray Fluorescence (XRF) instrumentation (gun) or
- Niton X-ray tube, X-Ray Fluorescence (XRF) instrumentation (gun)
- Trimble, Global Positioning System (GPS) instrumentation
- Marking Paint
- Note pad & pen

4.0 Technique

Step 1 Use the GPS unit to locate and mark out using spray paint the extent of candidate metals (i.e., arsenic, lead) contamination area.

Note: Surface area of the extent of metals contamination is identified in the Remedial Design (RD) cut lines and site knowledge.

Step 2 Perform scan of marked area on approximately 3 ft triangular centers using the XRF. Mark the locations as follows:

C for those locations that less than the site cleanup criteria

C* for those locations that are localized exceedances of the site cleanup criteria

* for those locations that still need to be excavated. Note mentally those locations that significantly exceed site cleanup criteria (at least 2X criteria – see Table 1).

Step 3 Excavate those "*" areas exceeding 2X criteria in approximately 6-inch lifts.

Step 4 Excavate those "*" areas less than 2X criteria in approximately 3-inch lifts.

Step 5 Repeat Steps 2 – 4 until approximately 80-percent of the excavated area is less than the site cleanup criteria for arsenic and lead.

Step 6 Once approximately 80-percent of the excavated area is less than the site cleanup criteria for arsenic and lead, proceed to the Final Remedial Action Status Survey, as described below.

Step 7 Locate and physically mark the locations or boundary of areas ready for the Final Remedial Action Status Survey.

Step 8 The Project Health Physicist provides the Health Physics Technician a 10-foot by 10-foot grid map of the area ready for Final Remedial Action Status Survey. Health Physics Technician will then perform point survey of the excavated area at each 10-foot grid node location as marked on the grid map. The Health Physics Technician documents XRF readings for each 10-foot grid node.

Step 9 Excavate the areas identified by the Project Health Physicist with four or more contiguous readings that are greater than 24 mg/kg for Arsenic or 400 mg/kg for Lead. Remove soil in only 3-inch lifts. Repeat Steps 2 -8 following the excavation of the target areas.

Table 1

Criteria's	Arsenic	Lead
Site Cleanup Criteria	24 mg/kg	400 mg/kg
10X Limit of Cleanup Criteria	240 mg/kg	4000 mg/kg
2X Limit of Cleanup Criteria	48 mg/kg	800 mg/kg

APPENDIX 7 – Sampling and Analysis Plan for Parcel B and Upper Parcel C

APPENDIX B
SAMPLING AND ANALYSIS PLAN

APPENDIX B
SAMPLING AND ANALYSIS PLAN

Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten Property of the Li Tungsten Superfund Site

Prepared at the Order of the

Environmental Protection Agency

June 2006

ECC
1746 Cole Blvd., Bldg. 21, Suite 350
Lakewood, Colorado 80401

LIST OF ACRONYMS AND ABBREVIATIONS

C_A	Average Concentration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CL	Confidence Level
CSS	Characterization Sampling and Surveys
DCGL	Derived Concentration Guideline Limits
$DCGL_{EMC}$	Derived Concentration Guideline Limits (small area)
$DCGL_W$	Derived Concentration Guideline Limits (large area)
DCQR	Data Quality Control Report
EDS	Explanation of Significant Difference
EPA	Environmental Protection Agency
EMC	Elevated Measurement Unit
F_A	Area Factor
FSS	Final Survey Status
GPS	Global Positioning System
H_O	Null Hypothesis
H_a	Alternative Hypothesis
HEPA	High Efficiency Particulate Air
HPT	Health Physicist Technician
LBGR	Lower Boundary of the Gray Region
MAC	Material Acceptance Criteria
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
m^2	square meters
MDA	minimal detectable activity
MDC_{scan}	minimal detectable concentration
mg/kg	milligrams per kilogram
NaI	Sodium Iodide
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
pCi/g	picocuries/gram
PHP	Project Health Physicist
Ra	Radium
RASS	Removal Action Support Surveys
ROD	Record of Decision
Th	Thorium
TLD	Thermal Luminescent Detectors
WAC	Waste Acceptance Criteria
WRS	Wilcoxon Rank Sum
XRF	X-ray Fluorescence

TABLE OF CONTENTS

1.0 TECHNICAL APPROACH FOR SOIL SAMPLING DESIGN

The remedial activities to be conducted at Parcel B and Upper Parcel C of the Li Tungsten Superfund Site (the Site) include the excavation and offsite disposal of soils contaminated with radionuclides and soils contaminated with metals to satisfy the Site Cleanup Criteria specified in the Record of Decision (ROD).

In May 2005, the EPA, Region 2, issued an Explanation of Significant Differences (ESD) concerning the Li Tungsten Superfund Site. The EPA issued the ESD to change the radiological cleanup criteria to address the City of Glen Cove's decision to revise the Glen Cove Creek waterfront revitalization plan to include residential future use of the Site.

Compliance with Site Cleanup Criteria will be demonstrated using the procedures in the Multi-Agency Radiological Site Survey and Investigation Manual (MARSSIM) (EPA 402-R-97-016) and Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). A single Final Status Survey Plan for the Li Tungsten site addressing compliance with the ROD criteria utilizing MARRSIM and SW-846 components will submitted after pre-excavation sampling is completed. A statistical analysis of the data obtained from the pre-excavation sampling will provide the basis of the number of samples to be collected during the final status survey.

1.1 Final Status Survey Design

MARSSIM defines a *survey unit* as a geographical area of specified size and shape for which a separate decision will be made whether or not that area meets the release criteria. This decision is made following a Final Status Survey (FSS) of the survey unit. Thus, a survey unit is an area for which a FSS is designed and conducted; data is evaluated; and, ultimately, results in a release decision. The FSS obtains data required for making the release decision, while avoiding the collection and analysis of an excess number of samples.

Usually, one of the following two conditions will lead to the determination that a particular survey unit requires further cleanup prior to being released for unrestricted use:

- The average level of residual radioactivity within the survey unit exceeds the cleanup criteria; or
- Small areas within the survey unit exhibit elevated residual radioactivity.

Sampling at discrete points within the survey unit will address the first condition (i.e., relatively uniform contamination). As used here, the term sampling refers to obtaining data from a subset of a population. Sampling includes both direct in-situ measurements and the collection of physical samples for laboratory analyses.

Sampling at discrete points within a survey unit may not be an efficient method of determining whether the second condition exists. Scanning is the preferred method for detecting isolated areas of elevated radioactivity.

A major component of survey designs is the efficient use of sampling at distinct locations combined with scanning to accurately determine the final status of a survey unit. The statistical procedures described in this section are used to establish the number of samples which will be collected at distinct locations and which will be necessary to determine if the average concentration in the survey unit exceeds the regulatory limit, with a specified degree of precision. Thus, these statistical procedures are essential in the planning and design of the FSS and the analysis and interpretation of the resulting data.

The survey and sampling approach for the Site described below encompass both sampling at discrete points and scanning of the excavation. In this manner, both the average level of residual radioactivity and areas of elevated residual radioactivity exceeding the cleanup criteria are addressed.

1.2 Release Criteria

The objective of remedial activities at the Site is to obtain the radiological and chemical (metals) release of the site without concern for excessive radioactive and chemical exposure to the general public. The Derived Concentration Guideline Limit (DCGL) is the soil cleanup criteria for both radiological and metals contaminants established in the ROD. Table 1-1 summarizes the site-wide soil cleanup levels established by the EPA and specified in the ROD, as adjusted by the ESD issued in 2005.

Table 1-1
Site-Wide Cleanup Levels

Parameter	Cleanup Levels
Arsenic (soil)	24 mg/kg
Lead (soil)	400 mg/kg
Arsenic (sediments)[a]	6 mg/kg
Lead (sediments)[a]	31 mg/kg
Thorium-230 + Thorium-232 (soil)	≤ 5 pCi/g plus background level[b]
Radium-226 + Radium-228 (soil)	≤ 5 pCi/g plus background level[b]
PCBs in the dumping area (middle) of Parcel B (soil)	1 mg/kg in the top 2 feet
PCBs in the dumping area (middle) of Parcel B (soil)	10 mg/kg in below 2 feet

[a] There are no locations in Parcels B and Upper Parcel C to which the criteria apply. Sediment criteria were obtained from the *Technical Guidance For Screening Contaminated Sediment,* (Technical Guidance). Criteria are identified as "To Be Considered" ARARs. As defined in the Technical Guidance, sediments are "a collection of fine-, medium-, and coarse- grain materials and organic particles that are found at the bottom of lakes and ponds, rivers and streams, bays, estuaries, and oceans". Criteria for arsenic and lead are based on oligotrophic waters with low concentrations of metals-complexing ligands and are over protective when applied to eutrophic waters. (The Technical Guidance further cautions that a decision to remediate should not be based on exceedances of these criteria.) No areas have been identified within Parcels B and Upper Parcel C that meet the definition of sediment or the criteria upon which the sediment screening criteria are based.
[b] Background levels are 1 picocurie per gram (pCi/g) each for Th-230, Th-232, Ra-226, and Ra-228.

1.3 Derived Concentration Guideline Levels

For remediation activities at the Site, the DCGL may be adjusted to address both wide range and localized residual contamination. The DCGL is referred to as the large area DCGL ($DCGL_W$) and the small area DCGL ($DCGL_{EMC}$).

The $DCGL_W$ assumes that residual radioactivity is uniformly distributed over a wide area (i.e., the entire site). The $DCGL_W$ is the cleanup criteria specified in the ROD.

Radiological release criteria are the sum of Ra-226 and Ra-228, and the sum of Th-230 and Th-232. Maximum reported concentrations for individual radionuclides are summed and compared to the release criteria and ratioed to the respective limit as a fraction and the summation of the individual isotope fractions are less than unity (i.e., 1). Unity is separate for the radium and the thorium radionuclides, as the cleanup criteria are not necessarily dose dependant. The mixture sum is stated as the condition:

$$\Sigma\ C_i/SG_i \leq 1$$

where;

C_i = concentration of the i^{th} radionuclide (pCi/g), and
SG_i = soil guideline of the i^{th} radionuclide (pCi/g).

Theoretical maximum concentrations of individual radionuclides of concern can be established using site-specific ratios of Ra-226 and Th-232 as supported by previous site investigations.

Reported analytical results for Ra-226 and Th-232 were obtained from the Final Remedial Design Report. (URS, 2002) Th-232 and Ra-228, as well as Th-230 and Ra-226, are anticipated to be in secular equilibrium in soils located at the site. Table 1-2 presents a total of 26 samples selected from previous investigations with reported analytical results for Ra-226 and Th-232. For each sample, the ratio of Th-232 to Ra-226 was calculated. An average of the ratios of Th-232 to Ra-226 was calculated to be 1.32. This ratio can then be applied to determine the relative ratio of Ra-226 to Ra-228, and for Th-232 to Th-230.

Table 1-2
Reported Analytical Results of Previous Investigations and Ratios

Sample ID	Th-232 (pCi/g)	Ra-226 (pCi/g)	Ratio Th-232 to Ra-226
BN010R260-1	0.941	0.809	1.16
BN050R275-0	1.62	2.12	0.76
BN090E2800/2	4.53	6.97	0.65
BN130E300-1	0.974	0.625	1.56
BN150E270-3	0.888	0.704	1.26
BN170E290-3	1.01	0.719	1.40
BS020E255-0	1.28	0.918	1.39
BS030E290-1	1.48	1.49	0.99
BS030E320-0	1.54	0.962	1.60
CN010E220-2	0.856	0.961	0.89
CN030E220-1	1	0.68	1.47
CN035E150-3	0.625	0.425	1.47
CN035E150-4	0.824	0.323	2.55
CN055E095-3	0.739	0.386	1.91
CN080E150-0/1	1.06	0.471	2.25
CN095E140-5	1.52	1.04	1.46
CN125E185-3	1.01	0.691	1.46
CPN040E000SS	0.693	0.56	1.24
CPN135E110SS	0.466	0.398	1.17
DUP-16	0.66	0.939	0.70
DUP-17	20.6	10.4	1.98
DUP-3	0.573	0.583	0.98
DUP-4	1.36	0.939	1.45
DUP-9	4.2	6.94	0.61
DWC-12-E2	65.6	397	0.17
DWC-4	18.6	11.3	1.65

Using the ratio calculated for Th-232 to Ra-226, radionuclide specific maximum concentrations can be determined for purposes of demonstrating compliance to the release criteria. The calculation of the maximum concentration of Th-232 in relation to the total concentration of Th-232 and Th-230 is provided as an example.

$$F_{Th-232} = \frac{X_{Th-232}}{X_{Th-232} + X_{Th-230}}$$

where:

F_{Th-232}	=	Fraction of Th-232	
X_{Th-232}	=	Relative value of Th-232	= 1.32
X_{Th-230}	=	Relative value of Th-230	= 1.0

The value of $F_{Th\text{-}232}$ is calculated as 0.57. The maximum concentration of Th-232 is then calculated as:

$$C_{Th-232} \leq F_{Th-232}\, x DCGL_{Th-232+Th-230}$$

where:

$C_{Th\text{-}232}$	=	Concentration of Thorium-232
$F_{Th\text{-}232}$	=	0.57
$DCGL_{Th\text{-}232 + Th\text{-}230}$	≤	5 pCi/g plus background

The maximum concentration of Th-232 is then calculated as less and equal to 2.8 pCi/g. Table 1-3 lists the calculated maximum concentration for each of the radionuclides of concern. Values presented in Table1-3 will be used to evaluating the elevated measurement comparison (EMC) and the adequacy of the scanning method selected for the remedial action support and final status surveys.

Table 1-3
Maximum Concentrations of Radionuclides of Concern

Parameter (In Soil)	Release Criteria
Th-230 and Th-232, combined *Maximum concentration Th-232* *Maximum concentration Th-230*	≤ 5 pCi/g plus background *≤2.85 pCi/g (excluding background)* *≤2.15 pCi/g (excluding background*
Ra-226 and Ra-228, combined *Maximum concentration Ra-226* *Maximum concentration Ra-228*	≤ 5 pCi/g plus background *≤2.15 pCi/g (excluding background)* *≤2.85 pCi/g (excluding background)*

The $DCGL_{EMC}$ assumes that residual radioactivity is concentrated in a much smaller area and represents a small percentage of the survey unit.

The $DCGL_{EMC}$ may be greater than but not less than the $DCGL_W$. The ratio of the $DCGL_{EMC}$ to the $DCGL_W$ defines a radionuclide-specific area factor, F_A, and is defined as:

$$DCGL_{EMC} = (F_A)(DCGL_W)$$

when the residual radioactivity is confined to an area of size, A. The method for calculating the $DCGL_{EMC}$ is discussed in Section 2.3, *Elevated Measurement Comparison.*

1.4 Background Reference Areas

A background reference area is a geographical area from which representative samples of background conditions are selected for comparison with samples collected in specific survey units at the remediated site (NUREG 1505). The background reference area has similar physical, chemical, radiological, and biological characteristics to the site being remediated, but is not contaminated by site activities (NUREG 1505). The distribution of background measurements in the reference area should be the same as that expected if the reference area was contaminated.

Additional reference samples may be taken from sampling locations if required to meet the criteria of the statistically determined number of final status survey samples. The radioisotope specific activity values obtained from these investigations will be adjusted using DCGLs, compared to the survey unit, and used to determine if the site cleanup criteria were achieved.

1.5 Survey Unit Classification

Portions of the Site have been classified as impacted or non-impacted. According to MARSSIM, impacted areas have a potential for radioactive contamination (based on historical data) or contain known radioactive contamination (based on past or preliminary radiological surveillance). This includes areas where:

- Radioactive materials were used and stored;
- Records of spills, discharges, or other unusual occurrences resulting in the spread of contamination; and
- Radioactive material was buried or disposed.

Areas immediately surrounding or adjacent to these locations are included in this classification due to the potential for the inadvertent spread of contamination.

Non-impacted areas are those areas identified through knowledge of site history or previous survey information where there is no reasonable possibility for residual radioactive contamination. The criteria used for this segregation need not be as strict as those used to demonstrate final compliance with site cleanup criteria.

Areas with the potential for residual contamination (impacted areas) are further divided into one of three groups, as defined by MARSSIM:

Class 1 Areas - Areas that have, or had prior to remediation, a potential for radioactive contamination (based on site operating history) or known contamination (based on previous radiological surveys). Examples of Class 1 areas include:

- Site areas previously subjected to remedial actions;
- Locations where leaks or spills are known to have occurred;
- Former burial or disposal sites;
- Waste storage sites; and
- Areas with contaminants in discrete solid pieces of material with high specific activity.

Class 2 Areas - These areas have, or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the $DCGL_W$. Changing the classification of an area from Class 1 to Class 2 must be justified by showing that the existing data (scoping surveys or characterization surveys) provides a degree of confidence that no individual measurement will exceed the $DCGL_W$. Other justifications for a change in the classification of an area may be appropriate based on the outcome of the data quality objective process. Examples of areas that might be classified as Class 2 for the FSS include:

- Locations where radioactive materials were present in an unsealed form (e.g. process facilities);
- Potentially contaminated transport routes;
- Areas downwind from stack release points;
- Upper walls and ceilings of some buildings or rooms subjected to airborne radioactivity; and
- Areas on the perimeter of former contamination control areas.

Class 3 Areas - Impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the $DCGL_W$, based on site operating history and previous radiological surveys. Examples of areas that might be classified as Class 3 include:

- Buffer zones around Class 1 or Class 2 areas; and
- Areas with very low potential for residual contamination but insufficient information to justify a non-impacted classification.

Areas excavated for radiological purposes at the Site will be designated Class 1 Areas. Locations of areas that may exceed the cleanup criteria are presented in the Remedial Design of the Li Tungsten Superfund Site (URS Corporation, 2001). The haul road between RB-A and RB-B will be designated as a Class 2 survey unit. The remainder of the site was surveyed and cleared per MARSSIM during the RD and thus will be treated as non-impacted.

1.6 Statistical Concepts

This section introduces several terms and concepts associated with the statistical compliance verification methods implemented at the Site.

1.6.1 Null and Alternative Hypothesis

The decisions necessary to determine compliance with the soil cleanup criteria are based on precise statistical statements called hypotheses. These hypotheses will be tested using data from a survey unit. The state that is presumed to exist is expressed as the Null Hypothesis (H_0). For a given Null Hypothesis, a specified Alternative Hypothesis (H_a) is presented to express what is believed to be the state of reality if the null hypothesis is not true.

The hypotheses selected for the Site are as follows:

Null Hypothesis (H_0): The average concentration in the survey unit exceeds the average concentration in the reference area by more than the $DCGL_W$.

Alternative Hypothesis (H_a): The average concentration in the survey unit exceeds the average concentration in the reference area by less than the $DCGL_W$.

These hypotheses were chosen because the burden of proof is on the Alternative Hypothesis and is often referred to as Scenario A. Therefore, the survey unit will not be released until proven to satisfy the cleanup criteria. The measured average concentration in the survey unit must be less than the $DCGL_W$ in order to pass.

These hypotheses also were chosen because contamination below the $DCGL_W$ is measurable. Releasing a survey unit that requires additional remediation is an unacceptable alternative.

1.6.2 Type I and Type II Errors

As suggested above, there are two types of decision errors that can be made when performing the statistical tests described in this document; Type I error and Type II error. These designations are used to describe the relationship of errors to the Null and Alternative Hypothesis.

Type I Errors

A Type I error occurs when the Null Hypothesis is rejected when it is actually true. A Type I error is commonly referred to as false positive. The probability of a Type I error is denoted by α (alpha). Alpha is sometimes referred to as the size of the test. For example, with α set at 0.25, it is expected that 75% of the time the Null Hypothesis will be evaluated properly. Only 25% of the time the Null Hypothesis may be rejected when it is true.

The outcome of the Type I error would be a survey unit was released even though it had residual activity in excess of cleanup criteria. To reduce the probability of this occurring at the Site, α is set at 0.05. Therefore, it is expected that 95% of the time the Null Hypothesis will be evaluated properly and 5% of the time the Null Hypothesis may be rejected when it is true.

Type II Errors

A Type II error occurs when the Null Hypothesis is not rejected when it is actually false. A Type II error is commonly referred to as a false negative. The probability of a Type II error is usually denoted by β (beta). For example, with β set at 0.25, it is expected that 75% of the time the Null Hypothesis will be correctly rejected when it is false. Only 25% of the time will it be accepted when it is false.

The outcome of a Type II error would result in the further excavation of a survey unit that meets the cleanup criteria. To reduce the risk of a Type II error at the Site, β was set at 0.05.

1.6.3 Relative Shift

This section introduces several terms and statistical parameters that will be used to determine the number of data points needed to properly apply the non-parametric tests. The upper bound of the gray region is defined as the $DCGL_W$, and the lower bound of the gray region (LBGR) is a site-specific variable generally initially selected to equal one half the $DCGL_W$, and adjusted to provide an acceptable value for the relative shift.

The lower boundary of the gray region (LBGR) and the target values for α and β are selected during the data quality objective process. The width of the gray region, is a parameter that is central to Wilcoxon Rank Sum (WRS) test. This parameter also is referred to as the shift, Δ. The absolute size of the shift is actually of less importance than the relative shift Δ / σ, where σ is an estimate of the standard deviation of the measured values in the survey unit. This estimate of σ includes both the real spatial variability in the quantity being measured and the precision of the chosen measurement system. The relative shift, Δ / σ, is an expression of the resolution of the measurements in terms of measurement uncertainty.

The shift (Δ = $DCGL_W$ - LBGR), and the estimate standard deviation in the measurements of the reference area (σ_r) and contaminant area (σ_s), available from previous survey data, are used to calculate the relative shift, Δ / σ. The relative shift used to determine the number of samples to be taken from a survey unit.

After running the statistical tests, the actual standard deviation of each survey unit will be used to recalculate the relative shift and verify that enough samples were taken for the data set. If it is determined that an insufficient number of samples were taken, additional samples will be taken from that survey unit.

The locations of the samples within each survey unit will be determined using a grid and a random number generator. Final status sampling is described in depth in Section 2.1.6.

1.6.4 Two Sample Statistical Tests

The WRS test discussed in this section will be used to compare each survey unit with an appropriately chosen, site-specific reference area. This test was chosen because contamination is present in the background at the Site. An example is also provided to better illustrate the application of these statistical concepts.

The comparison of measurements from a reference area to the survey unit is made using the WRS test (also known as Mann-Whitney test) (MARSSIM). The WRS test will be conducted for each survey unit. In addition, an elevated measurement comparison (EMC) will be performed against each measurement to ensure that is does not exceed a specified investigation level, as discussed in Section 2.3.

The WRS test is effective when residual radioactivity is uniformly present throughout a survey unit (i.e., the sample distribution is symmetrical). The test is designed to detect whether or not activity exceeds the $DCGL_W$. The advantage of a non-parametric WRS test is that it does not assume that the data are normally or log-normally distributed. This is important because it is anticipated that the data may not be symmetrical. The WRS test also allows for "less than" measurements to be present in the reference area and survey units. The on-site spectroscopy unit will be adjusted to report activities that may be less than the minimal detectable activity, MDA. The reported activities that are less than the MDA will be qualified as estimated.

The Null Hypothesis tested by the WRS test at the Site is:

Null Hypothesis (H_0): The average concentration in the survey unit exceeds the average concentration in the reference area by more than the $DCGL_W$.

Alternative Hypothesis (H_a): The average concentration in the survey unit exceeds the average concentration in the reference area by less than the $DCGL_W$.

The Null Hypothesis is assumed to be true unless the statistical test indicates that it should be rejected in favor of the alternative. Any difference between the reference area and survey unit concentration distributions is assumed to be due to a shift in the survey unit concentrations to higher values (i.e. due to the presence of residual radioactivity in addition to background that exceeds cleanup criteria). Survey units may meet the release criteria even though some measurements may be greater than some reference area measurements. Also, survey unit measurements may exceed some reference area measurements by more than the $DCGL_W$. The result of the hypothesis test determines whether or not the survey unit as a whole meets the release criterion.

Two underlying assumptions of the WRS test are:

- Samples from the reference area and survey unit are independent, identically distributed random samples; and
- Each measurement is independent of every other measurement, regardless of the set of samples from which it came.

Performing the WRS Test

The WRS test is applied as outlined in the following six steps by MARSSIM:

Step 1

Obtain the adjusted reference area measurements, Z_i, by adding the $DCGL_W$ to each reference area measurement, X_I, ($Z_i = X_i + DCGL_W$).

Step 2

The *m* adjusted reference sample measurements, Z_I, from the reference area and the *n* sample measurements, Y_I, from the survey unit are pooled and ranked in order of increasing size from 1 to N, where $N = m + n$.

Step 3

If several measurements are tied (i.e., have the same value), they are all assigned the average rank of that group of tied measurements.

Step 4

If there are *t* "less than" values, they are all given the average of the ranks from 1 to *t*. Therefore, they are all assigned the rank $t(t+1)/2t = (t+1)/2$, which is the average of the first *t* integers. If there is more than one detection limit, all observations below the largest detection limit should be treated as "less than" values

Step 5

Sum the ranks of the adjusted measurements from the reference area, W_r. Note that since the sum of the first N integers is N(N+1)/2, one can equivalently sum the ranks of the measurements from the survey unit, W_s, and compute W_r = N(N+1)/2 B W_s.

Step 6

Compare W_r with the critical value given in MARSSIM for the appropriate values of *n*, *m*, and σ. If W_r is greater than the tabulated value, reject the Null Hypothesis that the survey unit exceeds the release criterion. The standard deviation of the sample set is then calculated to establish the relative shift of the test. The relative shift is used to investigate whether or not the survey unit has the proper number of samples. If it is determined that an insufficient number of samples were taken, additional samples will be taken from that survey unit.

1.6.5 Elevated Measurement Comparison

An EMC will be performed on localized areas with radioactive concentrations above the $DCGL_W$. An EMC is performed by comparing an area of elevated residual radioactivity to the $DCGL_{EMC}$. The $DCGL_{EMC}$ for the Site was initially calculated using an area of area of 10 square meters (m^2). The average concentration (C_A) of the area, A with elevated residual radioactivity is calculated with the following equation:

$$C_A = (F_A)(DCGL_W)$$

This calculated value for C_A cannot be exceeded for the survey unit to meet the cleanup criteria. Using an outdoor area factor of 7.8 for Ra 226 and Ra-228 combined, in an area of 10 m^2 (MARSSIM) and a $DCGL_W$ of 5, the $DCGL_{EMC}$ would be 39 pCi/g.

If a measurement exceeding the $DCGL_W$ is confirmed, the size of the area of elevated activity, A, and the average concentration, C_A, within it will be determined by sampling the area of elevated activity. Using the area factor, F_A, for the area, A, C_A will not exceed (F_A) * ($DCGL_W$).

The required minimal detectable concentration, MDC_{scan} of the walkover survey will be calculated to ensure that elevated areas are detected at the activity determined by the area factor. Section 2.1.5.1discusses the development of the required MDC_{scan}.

If the actual MDC_{scan} is less than the required MDC_{scan}, no additional sampling points are needed for the area of elevated activity. If the actual MDC_{scan} is greater than the required MDC_{scan}, the area factor that corresponds to the actual MDC_{scan} will be calculated using the following formula:

$$F_A = \frac{ActualMDC_{scan}}{DCGL}$$

The area of the elevated activity will then be divided by the total area of the survey unit to obtain the necessary number of sample locations within the area of elevated contamination. The calculated number of samples will be mathematically rounded to the nearest whole number. The spacing of the sample locations will then be calculated in the manner described in Section 2.1.1.

A calculation will be made after the EMC has been completed to ensure that the total activity in the survey unit satisfies the release criteria established for the Site. For the calculation, the average concentration in the elevated area, C_A, and the average concentration in the entire survey unit (d) are used:

$$\frac{\text{d}}{\text{DCGL}_\text{W}} + \frac{\text{(average concentration in elevated area - d)}}{\text{(area factor for elevated area)(DCGL}_\text{W}\text{)}} < 1$$

If the calculation result is greater than one, the survey unit fails to satisfy the release criteria and further excavation of the survey unit will be required.

2.0 SAMPLING LOCATIONS AND PROCEDURES

This section presents the technical approach and sampling strategy to be used during the following activities:

- Characterization Sampling and Surveys (CSS);
- Removal Action Support Surveys (RASS);
- FSS;
- Environmental Monitoring;
- Water Sampling; and
- Surface Contamination Surveys.

2.1 Characterization Sampling and Surveys

2.1.1 Site Grid System

A 10-meter grid system will be established over the areas to be excavated and will be based on existing survey control points. This grid system will be used for reference points for the Site.

2.1.2 Pre-Excavation Screening

ECC will perform pre-excavation screening surveys by making in-situ measurements with portable gamma scintillators and x-ray fluorescence (XRF) instrumentation. Contaminant readings for radionuclides and metals will be collected and reviewed to confirm the general nature, degree, and extent of previously documented contamination.

After the areas of contamination are confirmed, ECC will collect samples for characterization analyses. The characterization samples will be collected within the 10-meter grids falling above areas of confirmed contamination. The analytical data will be used to establish profiles for Li Tungsten material to demonstrate compliance with the federal and state transportation regulations and to ensure that the material conforms to the Material Acceptance Criteria (MAC) or Waste Acceptance Criteria (WAC) of selected disposal sites. The analyses also will provide quantitative values for Ra 226 and Th 232 concentrations in the excavated material and will be used to create a correlation for both the XRF instrumentation and the gamma scintillometers. Analytical results of Ra-226 will be utilized as a surrogate for Th-230, using pre-established ratios of Ra-226 to Th-230. Analytical results of Th-232 will be utilized as a surrogate for Ra-228, using pre-established ratios of Th-232 to Ra-228.

2.1.3 Correlations – XRF Instrumentation and Gamma Scintillometer

The correlations involve performing field measurements at selected soil sampling locations within the 10-meter grid nodes, collecting soil samples, and analyzing the soil samples at the on-site and/or off-site analytical laboratory. The samples will be collected from areas of confirmed contamination and areas lying outside those areas, but within the grid system. A minimum of 5 samples will be obtained for the XRF Instrument and the Gamma Scintillometer correlations. Additional sampling analytical results may be incorporated into the correlation as the excavation proceeds.

2.1.4 Confirmation and Characterization Surveys

The purpose of the CCS is to characterize materials prior to excavation and to confirm the activity of excavated materials destined for disposal.

The CCS is performed to demonstrate compliance with the federal and state regulations governing transportation of Li Tungsten material and the MAC or WAC for the off-site disposal facility. Confirmation samples will be collected from the excavated materials. The radiological confirmatory samples will be analyzed at the onsite laboratory. Confirmatory samples collected for lead and arsenic analysis will be sent to an offsite laboratory. Quality Control of the on-site laboratory will be maintained as defined by the procedures outlined in the Contractor Quality Assurance Project Plan included in Appendix C. The radiological samples will be counted on-site using the Canberra HPGe Gamma Spectroscopy System. Soil samples contaminated with metals will be initially screened with the XRF instrument and /or sent for off-site analysis. The on-site and off-site laboratories will report concentration values for Ra-226 and Th-232 in pCi/g, and the off-site laboratory will report analytical results for arsenic and lead in milligrams per kilogram (mg/kg). The data will be used to confirm that previously calculated correlations remain accurate for both the gamma scintillation and XRF instruments. The data also will be used to confirm that the characteristics of the material conform to the disposal facility MAC or WAC as additional indicators for the RASS surveys. Analytical results of Ra-226 will be utilized as a surrogate for Th-230 as being in secular equilibrium. Analytical results of Th-232 will be utilized as a surrogate for Ra-228 as being in secular equilibrium.

The frequency of CCS will be determined by the difference between the average concentration of the residual contamination and the MAC or WAC. Fewer confirmatory samples will be collected and analyzed as the difference between the average concentration and the MAC and WAC increases.

The design of the CCS is based on the specific data quality requirements for transportation and disposal of the excavated material and the stringent demands of the RASS and FSS. The CSS provides information on variations in the contaminant distribution in an area. The contamination variation in a survey unit or grid area contributes to determining the number of data points, based on statistical tests, for the FSS.

For purposes of waste characterization and transportation, a minimum of two samples will be taken from a stockpile and analyzed by the on-site laboratory. The purpose of the samples is to verify that the upper 95% confidence limit of the average of the reported concentrations do not exceed the disposal facility WAC. The on-site laboratory using gamma spectroscopy analyzes all samples collected during the CCS. The analysis sequence files used by the on-site laboratory assume that the radioactive decay progeny are in secular equilibrium.

Sampling Methodology

Soil samples for grid characterization will be collected from the surface to the predetermined depth using a hand auger or by excavation. The sample material will be placed into a stainless steel bowl and thoroughly mixed an appropriate volume or sample material will be placed into a plastic one liter Marinelli container. The sample container will be surveyed for radiological contamination and transferred to the on-site laboratory for analysis. QA/QC samples will be collected as described in the CQAPP (Appendix C of the Work Plan).

2.1.5 Remedial Action Support Surveys

RASS for radionuclides will be performed to collect data for dual purposes. The RASS will be performed to assist with waste segregation and to demonstrate compliance to the $DCGL_w$ for both radionuclides and metals. For the radiological RASS, HPTs performing the RASS will scan the excavation with either a shielded two-inch by two-inch sodium iodide (NaI) detector coupled to a ratemeter/scaler or an unshielded two-inch by two-inch sodium iodide (NaI) detector coupled to a ratemeter/scaler. For the metals RASS, HPTs utilizing the established grid system, will take XRF measurements at the 10-meter grid nodes within a survey unit. Survey data will provide field crews with the necessary information to segregate materials between those materials placed in Dickson Warehouse and those sent to the non-radioactive, metals contaminated soils disposal facility

Additional soil sampling during the RASS may be performed if determined necessary by survey personnel. Soil sampling may be conducted if the RASS indicates additional excavation is required, but samples in close proximity to elevated readings are below the DCGLs.

Additional remediation may be performed if an area of residual radioactive material is detected above the DCGL. The elevated area will be flagged on an excavation map if further remediation is not feasible. A comprehensive survey and appraisal of the impact of the flagged area of elevated contamination will be performed during the FSS phase.

Scanning Minimal Detectable Concentration

In order for data collected during the FSS to be valid, the MDC_{scan} must be less than the $DCGL_W$. The MDC for the instruments and technique must be calculated and identified. The default MDC_{scan} for Th-232, as listed in MARSSIM will be used for the Li Tungsten Site. The default value for a 2 in. x 2 in. NaI detector is 1.77 pCi/g.[1] The weighted

[1] Default scanning MDC is based upon a background level of 10,000 cpm for a 2 in. by 2 in. NaI detector. The observation interval was 1-sec and the level of performance was selected to yield d'of 1.38.

cpm/μR/hr is a value of 830.

If the background value of the selected instrument differs from the value of 10,000 cpm, the MDC_{scan} using the equations below as referenced in MARSSIM. An example of the calculation for MDC_{scan} is as follows:

$$MDC_{scan} = 0.99 x MDER$$

where;

$$MDER = \frac{117.1\sqrt{bcpm/60}}{cpm/\mu R/hr}$$

where;

MDER=	Minimal Detectable Exposure Rate	
bcpm =	background cpm	
cpm/μR/hr	=	count rate to exposure ratio for Th-232

The equation used in the example and to be applied during the RASS and the FSS incorporates a dN of 1.38 and a surveyor efficiency of 0.5.

The value of 5.06 uR/h will be used as the exposure rate for 5 pCi/g of Th-232 and its progeny. The exposure rate to soil concentration correlation was calculated using the default value as listed above. The calculation is as follows:

b_i	=	(10,000 cpm) x (1 sec) x (1 min/60 sec)	=	166.7 counts
MDCR	=	(1.38) x ($\sqrt{166.7}$) x (60 sec/1min)	=	1069 cpm
$MDCR_{surveyor}$	=	1069/$\sqrt{0.5}$	=	1511.7
MDER	=	1511.7/830	=	1.82 uR/h
MDC_{scan}	=	1.8 pCi/g = $\frac{(5\ pCi/g)(1.82 uR/h)}{\text{Exposure Rate per 5 pCi/g}}$		

Solving the above equation gives an exposure rate per 5 pCi/g equal to 5.06 μR/hr.

Using 5.06 uR/hr for 5 pCi/g and a cpm/uR/hr for a 2 in. x 2 in. NaI detector connected to a scaler/ratemeter, an initial action level of 4,200 cpm above background. This is the action level that will be implemented in the field during the scanning surveys. The cpm value will be verified in the field using laboratory samples as a comparison. This will provide a correlation of cpm versus the concentrations of the residual radionuclides present at Li Tungsten.

The standard MDC_{scan} value for Th-232 is less than the maximum activity concentration for Th-232 of 2.85 pCi/g. The MDC_{scan} required to detect an area of elevated activity will be calculated using the following equation from MARSSIM:

$$MDC_{scan}\text{ (required)} = (DCGLw)*(F_A)$$

The sensitive MDC_{scan} for Th-232 will be used in the field as the conservative screening method. The scanning method must be verified in the field in order to determine of the variance from background is consistently detectable. The actual MDC_{scan} will be compared to the required MDC_{scan} to assure that adequate sensitivity is met.

The *a priori* determination of the MDC_{scan} using Th-232 as the illustrative radioisotope of concern demonstrates that the scanning technique is less than maximum concentration for Th-232 of 2.8 pCi/g, therefore meeting the combined DCGL for Th-230 and Th-232.

2.1.6 Radiological Final Status Survey

The results of the FSS determine if residual radiological concentrations present in soil meet the radiological soil cleanup goals presented in Table 1-1. Analytical parameters for FSS include Ra-226 and Th-232.

2.2 Scanning Survey

A scanning survey for external gamma exposure will be performed during the FSS. The PHP will select the survey instruments and survey techniques that adequately detect residual radioactive contamination due to Th-232, Ra-226, and the respective radioactive progeny. A two - inch by two - inch NaI detector connected to a scaler/ratemeter will be used to perform the scanning survey. General area and integrated readings will be recorded for each survey unit using a global positioning system (GPS) unit. The Health Physicist Technician, HPT, will perform the survey by holding the detector close to the ground surface while slowly walking the area of the survey unit.

2.3 Elevated Measurement Comparison

The FSS addresses the concern for small areas of elevated radioactivity by using a simple comparison to the investigation level as an alternative to statistical methods. The EMC technique represents a conservative approach, because every measurement needs to be below an action level based on the surface area of residual contamination.

If the average radionuclide concentration of the area of elevated radioactivity is greater than the radionuclide-specific DCGL, then the area will be excavated and the excavated material will be stockpiled for disposal. Any area that can not be excavated will be marked on the map and incorporated into the FSS documentation and evaluation as detailed in Section 2.1.6.

2.4 Location and Frequency of Samples

Survey units will be limited to a maximum area of approximately 2,000 m^2, as evaluated for a Class 1 survey unit (MARSSIM). The Final Remedial Design Report for the Li Tungsten Site (URS Corporation, 2002) lists six survey units. The number of sampling points based on the existing data are as follows:

- Unit 1 – 14 sampling points
- Unit 2 – 8 sampling points
- Unit 3 – 6 sampling points
- Unit 4 – 12 sampling points
- Unit 5 – 5 sampling points
- Unit 6 – 16 sampling points

These sampling points are estimates as presented in the FRD. The actual numbers of sample points will be determined using in-process data according to the requirements of MARSSIM.

Final status sampling will be performed using a random-start systematic pattern. The sampling will be performed using triangular grids. The surface area for the grids eligible for final status will be estimated and the following equation will be used to determine to spacing of the systematic pattern:

$$L = \sqrt{\frac{A}{0.866n}}$$

where,

n	=	Number of samples (to be determined following the CCS);
A	=	Surface area of grids eligible for final status; and
L	=	Spacing of the systematic pattern.

A random number generator will be used to identify a coordinate location. After L is determined, a row of points will be identified parallel to the x axis, at intervals of L. A second row of points will be identified parallel to the initial row and at a perpendicular distance equal to 0.866*L from the first row. Sampling locations along the second row will be midway between the points on the first row. This process will be repeated for successive parallel rows to determine the sampling locations in each grid. If sampling locations fall outside the grid, additional sampling locations will be identified using the process described above. This process will continue until the appropriate number of sampling locations is achieved.

2.5 Sampling Methodology

Samples for the FSS will be collected using a stainless steel trowel at a depth of 15 centimeters. The sample will be placed into a stainless steel bowl and thoroughly mixed.

The homogenized soil will then be placed in a plastic one-liter Marinelli container. The sample containers will be surveyed for radiological contamination in accordance with Section 2.8 of this document and transferred to the laboratory for analysis. QA/QC samples will be collected as described in the CQAPP.

2.6 Survey Unit Release-Radiological Sampling

Areas of elevated contamination that were not excavated will be incorporated into the statistical tests that are performed during the FSS. The WRS test will be performed once the EMC criteria is achieved. After the WRS test on the survey unit is complete and the survey unit satisfies the radionuclide cleanup goals, the survey unit will be released. The WRS Test and procedure is discussed in Section 1.12.

The areas that fail to meet the limiting criteria of the EMC could not be excavated and/or fails to pass the WRS Test will require additional review. Such areas will be evaluated according to the ROD for the Site.

2.6.1 Dickson Warehouse

ECC plans to achieve the unrestricted release of the Dickson Warehouse by decontaminating the structure, as necessary, and surveying potentially contaminated surfaces according to FRD specification 02221 and accepted MARSSIM protocol. Following a structural stability survey, ECC will perform decontamination tests on select surfaces to determine the effectiveness of power-washing and vacuuming with High Efficiency Particulate Air (HEPA) filters. Assuming the decontamination tests are successful, ECC will zone the survey areas according to MARSSIM protocol and proceed with decontamination.

As required by design specification 02221-5 Section 3.4, water used for decontamination will be metered and all resulting wastewater will be collected and measured. The volume of water used during decontamination will be noted in the Daily Quality Control Report (DQCR). Other materials generated during decontamination will be collected and consolidated with similar materials.

2.6.2 Metals Sampling – Final Status

Sampling and analysis for metals will be conducted to ensure that the chemical contaminants of concern are remediated to cleanup levels and to provide screening data for compliance with the MAC or WAC of the disposal facility. Sampling and analysis for metals will be conducted in accordance with the protocols presented in SW-846. Analytical parameters for metals sampling include arsenic and lead.

2.6.3 Sampling Protocol

Samples for the FSS will be collected using a stainless steel trowel at a depth of 15 centimeters. The sample material will be placed into stainless steel bowl and thoroughly mixed. The homogenized soil will be placed in an appropriate container. The sample containers will be surveyed for radiological contamination in accordance with Section 2.8 of this document and transferred to the laboratory for analyses. QA/QC samples will be collected as described in the CQAPP.

2.6.4 Sampling Locations

Sampling locations will be determined using a systematic random sampling method. A random number generator derives a northern and eastern starting location. A triangular grid system is then established using a spacing, L. The L value is calculated using the following equation obtained from MARSSIM:

$$L = \sqrt{\frac{A}{0.866n}}$$

where,

A	=	Area for metals sampling
n	=	Estimated number of sample locations.

Sampling locations will be established east and west of the initial random starting location. The sampling locations in the second row are midway between those of the first row. The sampling location distance is appropriate for a triangular grid system. This will be repeated for all sampling locations.

2.7 Data Evaluation

A sampling location with metal concentrations above the cleanup criteria in Table 1-1 will be excavated and stockpiled for disposal. Sample results that indicate the cleanup criteria for metals have been achieved will be evaluated to determine the confidence level of the data population.

For the set of data, S^2, the standard deviation (S), and the standard error of the mean (S_0) will be calculated. The formula for calculating S follows (SW-846):

$$S = \sqrt{S^2}$$

The formula for calculating S_0 is (SW-846):

$$S_{\bar{x}} = \frac{S}{\sqrt{n}}$$

The confidence level (CL) is then determined. The formula for calculating the CL is (SW-846):

$$CL = \bar{x} \pm t_{.20} * S_{\bar{x}}$$

The population set is considered uncontaminated if a sufficient number of samples were collected and the upper limit of the CL is less than the cleanup criteria for each metal contaminant of concern. The number of samples for each metal contaminant of concern is calculated in the sample, S^2.

2.8 Environmental Monitoring

Continuous airborne particulate samples will be collected on weekly basis and analyzed weekly on-site for gross alpha activity. The off-site laboratory will analyze 10% of the monthly composited samples. Each exposure pathway will be monitored for releases due to on-site activities. Gamma exposure will be monitored using thermoluminescent dosimetry (TLD) badges attached to the environmental monitoring stations. As a minimum, site walk-around gamma surveys will be taken weekly to provide more frequent measurements as on-site conditions change. Air samplers will be operated at the perimeter of the Site to measure airborne particulate radioactivity concentrations. Measured activities will be compared to the 10 CFR 20 airborne effluent concentration limit for Ra 226 (9×10^{-13} µCi/ml-air) and Th 232 (6×10^{-15} µCi/ml-air) in unrestricted areas which results in a dose to a member of the public of 50 mrem/yr. In addition to radioactive particulates, specific air monitoring will be utilized to sample any potential dispersion of metals or excessive fugitive dust, if necessary. If an airborne effluent concentration exceeds the action limit of 20 % of Table 2 of Appendix B to 10 CFR 20, an immediate evaluation of the activities that may produce elevated airborne concentrations will include the following considerations:

- Incorporate additional containment structures; and
- Increase wetting techniques and other engineering controls.

Outdoor Radon concentrations will be measured continuously using Alpha Track Etch Cups. Radon detectors will be placed in the environmental monitoring stations and will be read quarterly.

External gamma radiation dose will be measured using TLDs at each environmental monitoring station. The detectors are made of inorganic crystals, such as lithium flouride. The TLDs will be exchanged and analyzed quarterly.

2.9 Water Sampling

Sediment and erosion controls will be placed during the early phases of the remedial action. ECC will utilize the guidance of FRD specification 01560 and will include provisions for controlling surface water runoff and subsurface water. Runoff water will be diverted to prevent ponding in excavation areas. Samples of potentially contaminated water will be collected for analyses. Analysis may include pH and radionuclide assessment. If not contaminated, the water will be filtered for particulates and reused on site for dust suppression.

2.10 Influent/Effluent Sampling

Water samples will be collected from the sampling port of the influent pipeline prior to entering the treatment process system to monitor influent contaminant concentrations. Influent water samples will be analyzed for gross alpha/beta, Ra-226/228, and pH. Data collected from these sampling events will evaluate the water, which comes into contact with the excavation and will be used to evaluate whether the water requires filtration for future use as dust suppression or discharge. Water collected from runoff, ponding areas, and decontamination operations will be used for dust suppression in clean areas of the site. ECC will use this sampling / analysis process to periodically confirm contaminated water is not being applied to clean areas of the site.

Location and Frequency of Samples

Influent water samples will be collected from a tank on a batch basis. Discrete (grab) water samples will be collected directly into sample containers.

Sampling Methodology

Samples will be placed into appropriate sample containers. All sample containers will be triple rinsed with sample water prior to collection except for pre-preserved sample containers. QC samples will be collected for according to the CQAPP.

APPENDIX 8 – Contractor Quality Control Plan for Parcel B and Upper Parcel C

APPENDIX C
CONTRACTOR QUALITY CONTROL PLAN
(AMENDMENT)

APPENDIX C
CONTRACTOR QUALITY ASSURANCE PROJECT PLAN AMENDMENT

Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten Property of the Li Tungsten Superfund Site

Prepared at the Order of the

Environmental Protection Agency

June 2006

ECC
1746 Cole Blvd., Bldg. 21, Suite 350
Lakewood, Colorado 80401

The following Section 1.0 will replace Section 1.0 through Section 1.1 in the URS CQAPP; subsequent sections will be renumbered:

1.0 PROJECT ORGANIZATION AND PERSONNEL

The project organization is shown in Figure 1-1. Key personnel and their responsibilities for the tasks described in the Remedial Action Work Plan (RAWP) are listed below. As required by the AO, ECC will provide a New York State licensed engineer to provide oversight on all engineering matters.

1.1 Program Manager

The ECC Program Manager (PgM), Mr. Marc Mizrahi, is responsible for overall conformance of the work to Federal, State, and local regulations. PgM duties and responsibilities include the following:

- Contract execution oversight;
- Overall contract conformance to remedial design requirements and specifications, including technical, cost, and schedule;
- Overall responsibility for the success and proper execution of the Contract and all task orders;
- Tracking proposed changes to the project SOW;
- Communicating directly with performing parties regarding project execution and accountability;
- Review and timely submission of all required submittals;
- Designation of the Project Manager (PM) and Quality Control System Manager (QCSM); and
- Allocation of sufficient resources to ensure successful completion of the scope of work.

1.2 Project Manager

Mr. Phil O'Dwyer is the PM for this project. Mr. O'Dwyer reports directly to the PgM and will officially represent the Contractor in all project-related activities. The PM duties and responsibilities include the following:

- Initiation of project planning and implementation of project activities;
- Managing the project budget and schedule, with concurrence from the PgM, ensuring Contract requirements are satisfied;
- Managing all field construction activities, including the direction of project staff and subcontractors in accordance with requirements of the Contract documents;
- Tracking proposed changes to the project SOW;
- Communicating directly with the performing parties regarding project execution and accountability;

- Coordinating with the QCSM to ensure compliance with standard protocols and procedures and implementation of the RAWP;
- Ensuring Quality Control (QC) reporting and submittal requirements are completed;
- Coordinating with the Site Health and Safety Officer (HSO) to ensure implementation of the Health and Safety Contingency Plan (HSCP); and
- Procuring equipment, material, and supplies.

1.3 Construction Superintendent

Mr. Tom Gilbertson is the Construction Superintendent (CS) for this project. The CS duties and responsibilities include the following:

- Project planning;
- Maintaining the project budget and schedule up to date ensuring daily Contract administrative requirements are satisfied;
- Managing all field construction activities, including the direction of project staff and subcontractors in accordance with requirements of the Contract documents and Federal, State, and local regulations governing the project;
- Coordinating with the QCSM to ensure compliance with standard protocols and procedures and implementation of the RAWP;
- Coordinating with the HSO to ensure implementation of the HSCP;
- Maintaining the project activities logbook; and
- Procuring equipment, material, and supplies.

1.4 Quality Control System Manager

The QCSM for this project is Ms. Mirna Zahlan. Ms. Zahlan will report directly to the ECC Environmental Division Director, Mr. August Ochabauer, and has the authority to act independently in all QC matters. This person will provide part time oversight to the project and will not typically be onsite. The QCSM duties include the following:

- Supervising QC aspects of the project to ensure compliance with Contract plans and specifications as defined in the Contractor Quality Assurance Project Plan (CQAPP);
- Managing project QC;
- Approving all submittals and supervising all QC procedures;
- Maintaining communication between project management and project team members; and
- Acting as the primary spokesman on quality matters when interfacing with external organizations.

ECC's QCSM, Ms. Mirna Zahlan, will assume the responsibilities of the Construction Quality Assurance (CQA) Official, CQA Certifying Engineer, and CQA Monitors.

1.5 Certified Health Physicist

Mr. Keith Anderson is the Certified Health Physicist (CHP) for this project. His CHP responsibilities include development and implementation of all radiation safety activities. He also is responsible for the project radiation-monitoring program. In addition, the CHP will oversee all operations relating to radioactive material sampling and develop the supporting data for meeting the respective disposal facility Waste Acceptance Criteria (WAC). He also will be responsible for final status survey plans, performance of site audits, signing the HSCP, and development of data to demonstrate compliance with the remedy. He supervises the Project Health Physicist (PHP) and the HSO regarding radiation safety monitoring and reporting functions.

1.6 Site Health and Safety Officer and Project Health Physicist

Mr. Ted Johnson is the HSO and PHP. Mr. Johnson reports to the CHP and PM and will oversee the daily coordination of all radiation safety activities, including surveys, routine and special monitoring, sampling, and other health physics requirements. The HSO/PHP will operate radiation detection instruments, perform nuclear statistics collation and integration, and assist in the interpretation of analytical results. He will be responsible for maintaining proper operating conditions and calibration records for all radiation detection equipment. The PHP is responsible for supervising sampling tasks to ensure compliance with the project plans and specifications. To carry out these responsibilities, the PHP has the authority to perform the following functions:

- Implementing and enforcing the HSCP;
- Ensuring site compliance with Federal, State, and Occupational Safety and Health Administration (OSHA) safety and health regulations;
- Coordinating modifications to the HSCP with the ECC Safety and Health Manager, Corporate Certified Industrial Hygienist (CIH) and CHP;
- Maintaining the Safety and Health Logbook;
- Ensuring that the quality of data meets project QC objectives;
- Providing recommendations concerning project QC objectives;
- Ensuring consistent QC procedures are in-place during the performance of project sampling and analysis activities;
- Ensuring that QC procedures for the sampling activities are conducted in a manner consistent with EPA guidance and the CQAPP;
- Recommending corrective action procedures to maintain project QC objectives;
- Evaluating data deliverables for compliance with CQAPP requirements;
- Coordinating the implementation of laboratory and field audits with the CHP;
- Conducting field and laboratory audits to ensure that project QC requirements are implemented;
- Reviewing field and laboratory audit reports with the CHP and assist in implementing any corrective action identified by the field or laboratory audits;
- Providing technical guidance to the project management team;
- Implementing project QC requirements and coordinate field and laboratory data validation;

- Ensuring that corrective actions are implemented when out-of-control situations are identified;
- Performing announced and unannounced audits during sample collection;
- Checking chain-of-custody records for correctness and accuracy; and
- Reviewing analytical procedures and results to evaluate the analytical QC parameters of reported analytical results.

1.7 Radiochemist

The Radiochemist (RC) is responsible for the day to day operations of the on-site laboratory and will report to the PHP. The RC will calibrate and operate the gamma spectroscopy system and perform moisture testing. The RC generates on-site laboratory QC and analytical reports and is responsible for maintaining the on-site laboratory equipment.

The RC also coordinates shipment of samples for offsite alpha spectroscopy analysis and reviews data from that qualified laboratory.

1.8 Health Physics Technician

The Health Physics Technicians (HPTs) report to and interface with the HSO, CHP, and PHP for survey protocol and technical issues. The HPTs perform the radiation and metals monitoring of the materials for disposal purposes and maintain the radioactive survey records of the materials and the site. They also perform site safety monitoring activities as required to support the HSO. In addition, HPTs will collect and provide construction quality assurance data related to their duties to the PM.

1.9 Contract Laboratories

The laboratories identified in this section will be utilized for offsite analytical services as required by this CQAPP and project specifications. ECC's Project Manager will provide the facilities with the CQAPP and will ensure each maintain the required certifications. ECC will secure authorization from performing parties prior to sample shipment in the event other laboratories are considered.

SIMA Labs
Christy Music
3954 Cornell Rd.
Cincinnati, OH 45252
(513) 489-2001

Lionville Labs
Judy Stone
208 Welsch Pool Rd.
Lionville, PA 19341
(610) 280-3000

Eberline Services
Oak Ridge National Laboratory
601 Scarboro Road
Oak Ridge, TN 37830
(865) 481-0683

Paragon Analytical
Ken Campbell
225 Commerce Dr.
Ft. Collins, CO. 80524
(800) 443-1511

Figure 1-1 will replace Figure 1.1 in the URS CQAPP.

The following Section 1.3 will replace Section 1.3 in the URS CQAPP:

1.3 PROJECT DESCRIPTION

This CQAPP provides details of project management, data acquisition requirements, assessment and oversight, and data validation and usability to demonstrate that all construction activities are performed in accordance with the approved design for the RA work. The major types of activities to be conducted in this project are the following:

1. Appointment of special, qualified personnel as listed in Section 1.0 Project Management. These personnel will be responsible for assessing the QA/QC requirements and implementing those requirements, in accordance with the procedures described in this CQAPP.
2. Decontaminate and release aboveground structures in accordance with the United States Nuclear Regulatory Commission (USNRC) and USDOE release criteria. Excavate contaminated materials from within the defined soil limits as determined from previous RD fieldwork and investigations.
3. Confirm that the extent of contamination has been identified, the exposed soil surfaces contain contamination below clean-up levels established in the Record of Decision (ROD) for Arsenic, Lead, Radium-226, and Thorium-232, and that no further action is required.
4. Restore disturbed areas of the site to conditions established in the Specifications, which include obtaining the measurements necessary to approve backfill soil materials in accordance with American Society of Testing and Materials (ASTM) USDOE, and USEPA standards.
5. Certify that the excavated soil material located in the stockpile area meets Department of Transportation (DOT) and disposal facility requirements.

6. Assess the quality of laboratory and field equipment, materials, personnel and the preparation of engineering documents as discussed below in Section 3.0 of this CQAPP.
7. Produce and submit project documentation and reporting as required by the specifications and described further in Section 1.5 of this CQAPP.

Once the appropriate personnel are appointed, the Contractor will clear and grub the work area and set up to begin excavation in accordance with specifications. Included in the remedial activity is the decontamination of the Dickson Warehouse and setting up of contamination controls. The details of these activities are described in the specifications.

In order to confirm the limits of contamination and that outside these limits required no further action, sampling, sampling analysis and the interpretation of the resulting data was performed in accordance with the Multi-Agency Radiation Site Survey and Investigation Manual (MARSSIM). MARSSIM was developed and accepted jointly by the USEPA, USNRC, US Department of Defense, and USDOE to guide users through the process of identifying, characterizing, and delineating radioactive contamination and the final status survey technique (i.e., confirmation that contamination has been removed).

In order to dispose of the excavated material, characterization sampling will be performed in accordance with SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods and/or the requirements of the chosen disposal facility. To perform activities 2, 4, and 6 from above, sampling, field screening/measurements, and laboratory analysis will be conducted per this CQAPP and as discussed in the specifications.

The RA work will include the acquisition of environmental data generated from direct field measurement activities, environmental media sampling, and laboratory analyses. As performed in the supplemental investigation (SI) and discussed in the corresponding Remedial Design Work Plan (RDWP), this RA phase of work is limited to Parcel B and the upper portions of Parcel C at the site (See Drawings). Direct field measurements and sample results from laboratory analyses will be compared to the Preliminary Remedial Goals (PRO) for the contaminants of concern (See Section 2.0 of CQAPP and specifications) to establish the limits of excavation. These results plus the results from additional characterization samples taken from the stockpiled waste will be compared to appropriate waste disposal facility criteria and Department of Transportation and State regulations for waste profiling and certification during waste transportation and disposal. The other testing that will be performed during this work effort includes the evaluation of imported fill. Only the material obtained from offsite sources will be tested in accordance with ASTM, USDOE and USEPA standards.

Data acquisition techniques that will be conducted include radiological and metals soil screening, confirmatory soil sampling, building surface contamination screening, and characterization sampling of stockpiled soil. The analyses performed using these techniques include, but are not limited to, gamma screening, gamma and alpha spectroscopy, x-ray fluorescence, Toxicity Characteristic Leachate Procedure (TCLP), inorganic and organic analyses, physical parameters, etc. The collection of these data, the corresponding analyses/measurements, and specific requirements are discussed in more detail in Section 2.0 of this CQAPP and the specifications.

Products of the RA work effort will include field logs/records, measurement and analysis results, location-specific field data tables, and laboratory analytical data packages. Supporting documentation will consist of field notebooks, chain-of-custody, and sample shipping receipts. Quality assessment will be accomplished via the performance and system audits as discussed in Section 3 of this CQAPP. Data validation is addressed in Section 4 of this CQAPP, and the schedule for the implementation of the field and laboratory activities is contained in Section 10 of the Final Remedial Design Report.

The following Section 1.5.2 will replace Section 1.5.2 in the URS CQAPP:

1.5.2 Observation Logs and Testing Data

Observation logs and testing data sheets will be prepared daily by the Health Physics Technicians. In addition to the applicable items above, these logs and data sheets will include the following information:

- Descriptions and specific locations of areas being tested and/or observed and documented descriptions and locations of ongoing construction;
- Equipment and personnel in each work area, including subcontractors;
- Locations where tests and samples were taken;
- Calibrations or recalibrations of test equipment, and actions taken as a result of recalibration, when applicable;
- Quality verification documentation of offsite materials and data received; and
- Decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard quality.

The Health Physics Technicians will check that no fields are left blank on the log sheets.

The following Section 1.5.3 will replace Section 1.5.3 in the URS CQAPP:

1.5.3 Construction Problem and Solution Reports

Reports describing special construction situations will be prepared by the CQA personnel discovering the problem. The reports will be cross-referenced with specific observation logs and testing data sheets and include the following information in addition to those items listed above, where applicable:

- A detailed description of the situation or deficiency;
- The location and probable cause of the situation or deficiency;
- How and when the situation or deficiency was found or located;
- Documentation of the response to the situation or deficiency;
- Results of any responses;
- Measures taken to prevent a similar situation from occurring in the future; and

- The signature of the Project Manager indicating concurrence, in addition to signatures of the CQA Official and Health Physics Technicians.

The Project Manager will be informed of any significant recurring nonconformance with the specifications or Drawings. The Project Manager will then determine the cause of the nonconformance and recommend appropriate changes in procedures or specifications. These changes will be submitted to the Program Manager for approval. When this type of evaluation is made, the results will be documented, and the Program Manager will approve any revision to procedures or specifications. A summary of supporting data sheets and a reduced-scale Site Plan showing location incident will be prepared and kept current at the site by the CQA Monitor(s).

The following Section 1.5.5 will replace Section 1.5.5 in the URS CQAPP:

1.5.5 Progress Reports

Separate from the daily reports listed above, summary progress reports will be prepared by the CQA Monitor(s) on a monthly basis, or at time intervals established at the pre-construction meeting. At a minimum, these reports will include the following information:

- A unique identifying sheet number for cross-referencing and document control;
- The date, project name, location, and other information;
- A summary of work activities during progress reporting period;
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period;
- A summary of test results, failures, and any retests; and
- The signature of the CQA Official.

The following Table 3 will replace Table 3 in the URS CQAPP:

TABLE 3 SAMPLING DESIGN SPECIFICATIONS

Sampling Effort	*Methodology/Rationale*	*Matrix Location*	*Sample # and/or Frequency*	*Field Procedure #*
Excavation screening and sampling	MARSSIM	Surface and loose soil	Based on location of excavation limit – See Specifications	R100, 101, 102, 105, 106, R401, 402, 403
Building Surfaces	MARSSIM	Surface concrete	Based on grid size	100, 101, 102, 103, 104, 107, R209
Final status survey	MARSSIM	Surface soil		R100, 101, 102, 105, 106, R401, 402, 403
Stockpiled soil	SW-846	Loose soil		R402

The following section will replace in entirety the sections Excavation Support Surveys and Final Status Survey, located within Section 2.1.2 in the URS CQAPP:

Excavation Support Surveys

The objective of the excavation support survey program is to continuously refine the excavation limits, guide the excavation in depth and horizontal extent, and determine when the excavation is ready for final status survey (FSS). The excavation support survey is designed to detect the presence of contaminants of concern at or above the cleanup criteria using relatively simple equipment that give the user real-time data concerning the surficial soils. In accordance with the cleanup goals established for the site, support survey equipment will have the capability to detect the contaminants of concern at or below the remediation goals.

Pre-excavation surveys will be conducted over all estimated excavation areas, including the limits of subsequent lifts. The pre-excavation survey will establish a 10-meter grid over the estimated excavation area extending no less than 10 meters beyond the estimated limits. A scan for metals or radioactivity of each grid will be conducted prior to excavation in order to refine the estimated excavation limits. The estimated excavation limits will subsequently be adjusted as appropriate. Samples will be collected from the grid node locations. The samples will be counted using a Canberra Spectroscopy system at the onsite field laboratory and the samples for metals analysis will be analyzed onsite and then sent to the offsite laboratory. The results of these analyses and surveys will be compiled and a correlation will be established and used to convert the radionuclide units of counts per minute (cpm) to picocuries per gram (pCi/g), and to confirm the results of the x-ray fluorescence (XRF) instrumentation.

As excavation progresses, the full time survey personnel will scan the land area to be excavated and other material on a regular frequency to guide the excavation progress and direction.

Following the brief field analysis, material from approximately 10 percent of the scans will be collected and transferred to sample containers and delivered to the field laboratory where they will be counted on a Canberra Gamma Spectroscopy system or XRF, depending on the target contaminant. These results together with the field screening results, and the correlation between laboratory and field established during the pre-excavation survey will be used to reduce the field data to the units of milligrams per kilogram (mg/Kg) or pCi/g, as appropriate. The volume of samples counted by the onsite laboratory could potentially become overwhelming; therefore, the frequency of 10 percent will be used as a guideline and may be subject to change. Table 4 presents an estimate of the screening and sampling/analyses effort required to support the excavation activities as designed.

Final Status Survey

Upon completion of the excavations and prior to backfilling a FSS will be performed on areas that have been excavated or disturbed during the process of remediation. This FSS will be performed in accordance with MARSSIM. The FSS for remediated areas contaminated with radionuclides will consist of a 100% coverage scan using the appropriate scanning equipment, and confirmatory soil sampling and analyses. The FSS for the remediated metals areas will be determined using a systematic random sampling method as described in Section 2.6.4 of the SAP. Confirmatory sample collection and analyses will be accomplished at a minimum frequency developed by SW-846. The estimated screening and sampling/analyses effort for the FSS is included in Table 4. The frequency of confirmation samples will be determined by the difference between the average concentration of the residual concentration and MAC or WAC criteria. ECC will document the frequency and difference of CQA samples collected in daily logbooks.

The following Section 2.2 will replace Section 2.2 through Section 2.2.1 in the URS CQAPP. The following sections will be renumbered:

2.2 SAMPLE HANDLING AND CUSTODY

The following protocol will be applied to all sampling during the Li Tungsten Remedial Action Work. Some variations in sample handling and custody will exist between samples collected for onsite analysis and samples collected for offsite analysis.

Custody refers to how the samples are tracked and kept in possession by authorized parties (i.e. sample collectors, laboratory sample custodians, etc.), and of how the transfer of sample possession is documented. Custodial possession is critical to show that samples have not been tampered with and remain representative of the site.

A sample is physical evidence collected from a site or facility. Sample handling and custody serves to maintain sample representativeness (i.e. the degree to which samples reflect the matrix sampled), and serves as a means of tracking samples. Every sample will be given a unique field sample designation for identification purposes. Proper sample handling and custody maintains sample representativeness by controlling and preserving samples to prevent sample degradation and to prevent cross-contamination by proper packaging. Sample handling and custody entails selection of proper sample container, sample preservation, shipping, sample custody, chain of custody, and sample packaging.

A stringent program of custody procedures will be utilized to assure that each sample is accounted for from the time of collection to completion of analysis. To maintain a record of sample collection, transfer between personnel, shipment, and receipt by the laboratory, documentation in logbooks and a Chain-of-Custody Record will be employed.

2.2.1 Sample Identification

The method of sample identification used depends on the type of sample collected. Samples collected for specific field analyses or measurement data will be recorded directly in bound field logbooks and/or recorded directly on the Chain-of-Custody Record, with identifying information, while in the custody of the samplers.

All sample identification, chain-of-custody records, receipts for sample forms, and field records will be recorded with waterproof, non-erasable ink. If errors are made in any of these documents, corrections will be made by crossing a single line through the error and entering the correct information. All corrections will be initialed and dated. If possible, all corrections will be made by the individual making the error. If information is entered onto sample labels, logbooks, or sample containers using stick-on labels, the labels will not be capable of being removed without leaving obvious indications of the attempt. Labels will never be placed over previously recorded information. Corrections to information recorded on stick-on labels will be made as stated above.

Sampling locations will be numbered sequentially and a sketch provided showing sample numbers and their corresponding locations. Every sample will be given a unique sample designation for identification purposes. The numbering system will be coordinated with the on-site representative to ensure that the proposed sample identifiers are discrete. The sample identification will be a series of letters and numbers consisting of three or four character strings, as follows:

PPPP-hhhh-xaaa

- X PPPP is the 4 digit project code number (5601)
- X "hhhh" is the unique identification assigned to each sampling location:

  EA = Excavation Area
  DC = Drum Contents
  DS = Debris Sampled
  IF = Imported Fill
  PT= Post Treatment
  MS = Metals contaminated soil
  FT = Water samples from frac tanks
  DT = Demonstration Testing
  OT = Operational Testing
  IW = Incineration Waste
  UW = Upwind (air monitoring)
  DW = Down wind (air monitoring)
  SC = School Zone (air monitoring)
  WZ = Work Zone (air monitoring)
  SW = Source Water
  FD = Final Decontamination
  EW = Excavation Water
  WW = Waste Water

- X "x" describes the sample matrix:
  1 = soil
  2 = water/liquid
  3 = debris
  4 = air

- X "aaa" represents the sample number

The sample number "5601-EA01-1001" indicates that the sample is:

- X Collected for Project No. 5601;
- X Collected at Excavation Area 1; and
- X Is the first soil sample from Excavation Area 1.

2.2.2 Sample Preservation

Certified, commercially clean sample containers shall be used to submit samples for analysis. Sample jars or bottles will have a certificate of analysis from the manufacturer, which shows the bottles, or jars are contaminant free. Bottles or jars with preservatives added at the laboratory may lack these certificates. The laboratory will be questioned to determine that preservatives were added to certified commercially clean containers. Clean containers ensure samples are not cross-contaminated. The bottle or jar with the proper septum will be specified in the Sampling and Analysis Plan.

Sample preservation, as dictated by SW-846 method requirements, ensures samples are representative of the matrix sampled, by preventing sample degradation, volatilization, or precipitation. Samples are preserved by addition of chemical preservatives to the sample and/or by cooling the samples to 4 degrees Centigrade immediately upon sample collection. Typically, chemical preservatives are added to the sample bottle by the contract laboratory before the bottles are shipped to the site, and the bottles should indicate the added preservative. Generally, preservatives are not added to sample containers used for solid samples. The Sampling and Analysis Plan will be referenced to ensure the correct preservatives were added to the bottles by the laboratory for the types of analyses needed. Contact the laboratory for more containers if the containers are not preserved or if preservatives must be added in the field. Check the preservative levels in the bottles least once during the beginning of the project. Determine if the preservative pH is within required limits by sample preservation as specified in the Field Sampling Plan. Some sample matrices may require additional preservative. If the pH is not in the proper range, notify the contract laboratory.

2.2.3 Sample Labels

Samples collected for laboratory analyses are identified by using sample labels that are attached to each individual sample container. In some cases the sample labels may have to be included with or wrapped around the samples. The sample labels are sequentially numbered and are accountable documents after they are completed and attached to a sample or other physical evidence. The following information, at a minimum, will be included on the sample label using waterproof, non-erasable ink:

- Project number;
- Unique sample number and sample location;
- Date and time of sample collection;
- Sample description and location;
- Designation of the sample as a grab or composite;
- The signature of either the sampler(s) or the designated sampling team leader and the field sample custodian (if appropriate);

- Whether the sample is preserved or unpreserved; and
- The general types of analyses to be performed.

2.2.4 Custody Seal

After collection, separation, identification, and preservation, the sample will be maintained under chain-of-custody procedures. Possession must be traceable from the time the samples are collected until valid analytical results are obtained. The custody seal will be attached to the outside of each sample container in such a manner that it is necessary to break it in order to open the container. The date and signature(s) of the sampler(s) will be written on the custody seal, at a minimum.

2.2.5 Sample Custody

A sample is considered under custody if any one of the following conditions is met:

- It is in the actual possession of an investigator;
- It is in the view of an investigator, after being in their physical possession;
- It was in the physical possession of an investigator and then they secured it to prevent tampering; and/or
- It is placed in a designated secure area with limited or controlled access.

2.2.6 Chain-of-Custody Record

All sample shipments to on-site or off-site laboratories will be accompanied by the Chain-of-Custody (COC) record identifying its contents. The original COC record will be shipped along with the samples, while the person who initiates the record (the originator) will retain a copy. COC procedures are comprised of the following elements: 1) maintaining sample custody and 2) documentation of samples for evidence. The COC record ensures that samples are traced from the time of field collection until valid analytical results have been obtained.

When responsibility of a group of samples changes several times, each custodian is not required to retain a copy of the COC record, as long as the original COC record indicates that each person accepting the samples has subsequently relinquished custody appropriately. COC forms will be completed according to the following protocol:

- The originator will fill in all requested information from the sample labels;
- The originator will sign and date the "Relinquished by" box and keep the copy;
- The original COC record sheet will be shipped with the samples. The originator will retain a copy of the COC record. A plastic shipping envelope will be taped to the inside of the cooler top and the remaining two copies of the chain-of-custody will be inserted;
- The person receiving custody will check the sample label information against the COC record, and will also check sample condition and note anything unusual under "Remarks" on the COC form;

- The person receiving custody will sign in the adjacent "Received by" box and retain a copy of the COC record;
- The Date/Time will be the same for both signatures, since custody must be transferred between two individuals. However, when samples are shipped via common carrier (e.g., Federal Express), the date/time will not be the same for both signatures;
- When samples are shipped via common carrier, the original COC form will be shipped with the samples and the shipper (e.g., Field Sample Custodian) will keep a copy. The shipper will also keep all shipping paper, bills of lading, etc.;
- In all cases, it must be readily apparent on the COC form that the person releasing custody has relinquished it to the next custodian; and
- If samples are left unattended or a person refuses to sign, this must be documented and explained on the COC record.

2.2.7 Representative Sample Document

A representative sample document will be completed for each sample collected. The representative sample document will record the complete history of each sample, including the sample source, date collected, sample methodology, sample size and container, sample number, and the analyses required. This document will be signed by the sampler and will remain with the project records.

2.2.8 Sample Handling and Shipping

Sample material will be placed into appropriate, pre-labeled, and preserved sample bottles or jars and the sample containers will be placed on ice at 4 degrees Centigrade in an insulated cooler. The cooler will remain under observation in a shaded area. Custody over the samples will be maintained. Samples will be documented in the field logbook.

Excess soil and/or water will be removed from the sample containers before storing or shipping the samples. Appropriate PPE, as described in the Health and Safety Plan, will be worn while handling samples.

Prior to shipping the samples, COC documentation will be prepared. The COC and sample label information will be checked for agreement. The COC will accurately indicate all of the samples in the cooler. Sample containers will be wrapped in bubble wrap and placed in re-sealing storage bags prior to being placed in the cooler. The completed COC record will be inserted into a plastic bag and the plastic bag will be taped to the inside top of the cooler lid. A copy of the COC record will be retained. The method to maintaining custody for onsite and offsite samples differs slightly. The PHP and the onsite lab technician will manage onsite samples via use of logbooks and secured storage areas. These individuals will maintain control over the samples during their evaluation and any storage period. The discussion regarding packaging that follows does not apply to samples collected for onsite-only analyses.

Prior to placing sample containers in the cooler, 3 inches of packing material (waterproof Styrofoam "peanuts") will be placed on the bottom of the cooler. Sample containers will be placed upright inside the cooler. Ice in doubled re-sealing bags will be placed around the sample containers and on top of the sample containers. All voids will be filled with packing material. The cooler drain port will be taped shut. The cooler lid will be secured with strapping tape. Two custody seals will be placed across the cooler lid, one on the front and one on the back.

The laboratory will be notified if sample shipments will arrive on the weekend to ensure a sample custodian is present to receive the samples. The laboratory also will be notified if the number of samples per day or type of analysis is greater than that specified in the laboratory contract.

If required in the Field Sampling Plan or if sent by the laboratory, a temperature blank will be included in the sample cooler. The laboratory will measure the temperature of the temperature blank to determine the temperature of the samples upon receipt at the laboratory.

Figure 2 of the URS CQAPP will be deleted.

The following Section 2.2.10 will replace Section 2.2.3 in the URS CQAPP:

2.2.10 Sampling Files Custody Procedures

The Project Manager, or appointed field supervisor is the custodian of the sampling file and will maintain the contents of sampling files for this project, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, correspondence, laboratory logbooks, and COC forms. The sampling file will be stored in a secure, limited-access area and under custody of the CQA Official, or appointed field supervisor. Analytical laboratories will retain all original raw data information (both hard copy and electronic) in a secure, limited-access area under custody of the Laboratory CQA Official.

The following Table will replace Table 6 in Section 2.4.4 in the URS CQAPP:

Table 6
Analytical Requirements

Parameter	Method	Container	Preservative	Holding Time
Radionuclides in Soil (Ra-226, Th-232, U-238, U-234) analyzed on-site	EPA 901.1	One 1-liter Marinelli	None	Allow for Ingrowth Radon/Thoron , if required
Radionuclides in Soil (Ra-226, Th-232, U-238, U-234) analyzed off-site	Uranium- EML-02 Thorium - EML Th-01 Ra-226 - EPA 903.0/9320	One 1-liter Marinelli	None	Allow for Ingrowth Radon/Thoron, if required
Radionuclides in Water (Ra-226, Ra-228, Th-232, Total U, Gross Alpha, Gross Beta) analyzed off-site	Ra-226 - EPA 903.0/9315 Ra-228 - EPA 904.0/9320 Thorium - EML Th-01 Total U - ASTM D5174 Gross Alpha/Beta - EPA 900.0	One three-liter, high density polyethylene bottle, with a Teflon-lined lid	HNO3 to pH<2	N/A
Metals in Soil (Antimony, Arsenic, Chromium, Lead, Mercury, Molybdenum, Thallium)	Antimony - 6010B/7041 Arsenic - 6010B/7060A Chromium - 6010B/7191 Lead - 6010B/7421 Mercury - 7471A Molybdenum - 6010B/7470A Thallium – 7841	8 oz glass jars, with Teflon- lined lids	Ice to 4 degrees C	28 days - Mercury / Six months
Metals in Water (Antimony, Arsenic, Chromium, Lead, Mercury, Molybdenum, Thallium)	Antimony - 6010B Arsenic - 6010B Chromium - 6010B Lead - 6010B Mercury - 7470A Molybdenum - 6010B Thallium – 7841	One 1-liter high density polyethylene bottle, with a Teflon-lined lid	Ice to 4 degrees C; HNO3 to pH<2	28 days - Mercury / Six months
PCBs in Soil	Aroclor 1016/1242 - 882 Aroclor 1248 - 882 Aroclor 1254 - 882 Aroclor 1260 -882 Aroclor 1262 -882 Aroclor 1268 - 882	4 oz glass jars, with Teflon- lined lids	Ice to 4 degrees C	14 days

* 10% of the samples collected for chemical analysis will be sent to an off-site laboratory analysis with a CLP data reporting format.
* This table also includes analytical requirements for WAC and MAC criteria.

The following Section 3.2 will replace in entirety Section 3.2 in the URS CQAPP:

3.2 QUALITY CONTROL INSPECTIONS

The different types of QC inspection activities that will be performed under the QC plan, include:

- Field Inspections - Primarily visual examinations, but may include measurements of materials and equipment being used, techniques employed, and the final products. These inspections confirm that a specific guideline, specification, or procedure for the activity is successfully completed. They are performed either during remedial activities and/or construction, or shortly after completion of the work. Field inspections include visual verification of the presence of TLDs and alpha track etch cups at environmental monitoring stations. The results will be documented in the Daily Quality Control Report (DQCR).

- Field Tests - Tests or analyses made in connection with the site activities. They are performed primarily on samples or construction activities to determine whether the project requirements are being met. Field tests are performed upon receipt of the material to provide prompt confirmation or rejection of the material. Construction work in-progress is tested to minimize the potential of removing future construction added to defective material or work. Field tests also include radiological surveys, which establish contamination levels at specific locations of land or materials and operational checks of air sampling equipment.

- Laboratory Tests - Testing performed by on-site or off-site laboratories on samples of materials that are used to characterize the materials and confirm performance and specification compliance. These tests are performed as soon as possible after samples are obtained to provide prompt confirmation or rejection of the material or the constructed work. Laboratory tests also include on-site laboratory analyses utilizing gamma spectroscopy.

- Surveys - Surveying includes the establishment of horizontal and/or vertical grade control for construction, establishment of elevation benchmark, reference/location surveys for structures, and topography, as appropriate.

Table 7 will be deleted from the URS CQAPP. The following Section 3.4 will replace in entirety Section 3.4 in the URS CQAPP:

3.4 PREVENTATIVE MAINTENANCE

A preventive maintenance schedule will be implemented by the laboratory to minimize downtime and interruption of analytical work, and performed on a routine basis. Laboratory group leaders are required to maintain a supply of items critical to the performance of their analytical instruments. A log shall be maintained by the group leader and analyst for each major instrument, which includes information on daily response and sensitivity checks for the instrument, a record of problems, and a record of maintenance and preventive maintenance services. It is also the responsibility of the contract laboratory to have a contingency plan in place to ensure sample holding times are not jeopardized in the case of equipment/instrumentation failure.

The Contractor's or subcontractor's field equipment will be maintained under a preventive maintenance program that allows downtime to be controlled and scheduled rather than occurring unexpectedly. The appropriate field personnel, at the start of each field day, will perform evaluations and acceptance testing of environmental sampling and measurement systems and their components. The evaluations will consist of calibrating the appropriate field equipment to recognized performance standards. If the results of the daily calibration are not within the specified acceptable limits listed in the SOPs, the equipment will be deemed unacceptable and tagged out for repair. Calibration tools, gases, liquids, instruments and operating instructions will be maintained with the respective equipment in the field. Daily calibration results will be recorded on daily forms and stored in the designated file storage area at the Li Tungsten Site.

The Contractor's or subcontractor's field personnel will complete a Daily Supplies and Consumables Checklist. This checklist will insure good quality standards and adequate quantities of field supplies and consumables. Personnel who complete the inspection are required to record any deficiencies or problems.

The following Section 3.5.1 will replace in entirety Section 3.5.1 in the URS CQAPP:

3.5.1 Reference Standards

Test methods for all soil materials will be carried out in accordance with approved methods including procedures developed by ASTM. Table 5 lists those tests that may be required in the course of this project with corresponding test method references.

Section 3.5.2 will be deleted from the URS CQAPP.

The following Section 3.5.3 will replace in entirety Section 3.5.3 in the URS CQAPP:

3.5.3 Soil Amendments

Inspection of Work

The CQA Monitor(s) will perform field inspections. Inspection will consist of periodic observation of the work to verify conformance with project specifications. Inspection work will include observation of sub-grade preparation; amendment application and removal of stone over 2 inches in any dimension during topsoil placement.

The Contractor will be responsible for notifying the CQA Official at the start of each workday if anticipated activities will require observation by CQA Monitor(s). If the Contractor intends to perform multiple activities which, pursuant to this CQAPP, require observation by separate CQA Monitor(s), then the Contractor will request in writing one or more additional CQA Monitor(s) and will not commence multiple activities until the required number of CQA Monitor(s) are present.

Section 3.6.2 will be deleted from the URS CQAPP.

The following paragraph will replace the first paragraph of Section 3.6.3 in the URS CQAPP:

All survey, layout, and related work will be performed under the direction of the Project Manager, with the exception of the pre-excavation survey. The pre-excavation survey will be performed under the direction of a surveyor, registered and licensed in the State of New York throughout the life of the project.

NOTE: The selection of the contract laboratory is ongoing. Prior to final selection, ECC will confirm the candidate contract lab possesses the certifications as presented in the URS CQAPP or acceptable equivalents. ECC will seek final approval for the contract laboratory at that time.

APPENDIX 9 – Grading and Stabilization Plans for Parcel B and Upper Parcel C

Li Tungsten Superfund Site Parcel B Stabilization Plan

Introduction

The remedial activities conducted at Parcel B of the Li Tungsten Superfund Site consisted of excavation (at various depths) and offsite disposal of soils exceeding the Cleanup Criteria specified in the United States Environmental Protection Agency's (USEPA) Record of Decision and the 2005 Explanation of Significant Differences. Prior to excavation, vegetation (predominantly trees, shrubs, grasses, and grass-like plants) was removed. Excavation of soil left Parcel B land areas denuded, with abrupt grade changes of up to 6 feet. The Parcel B ground surface generally, slopes down to the south toward Glen Cove Creek.

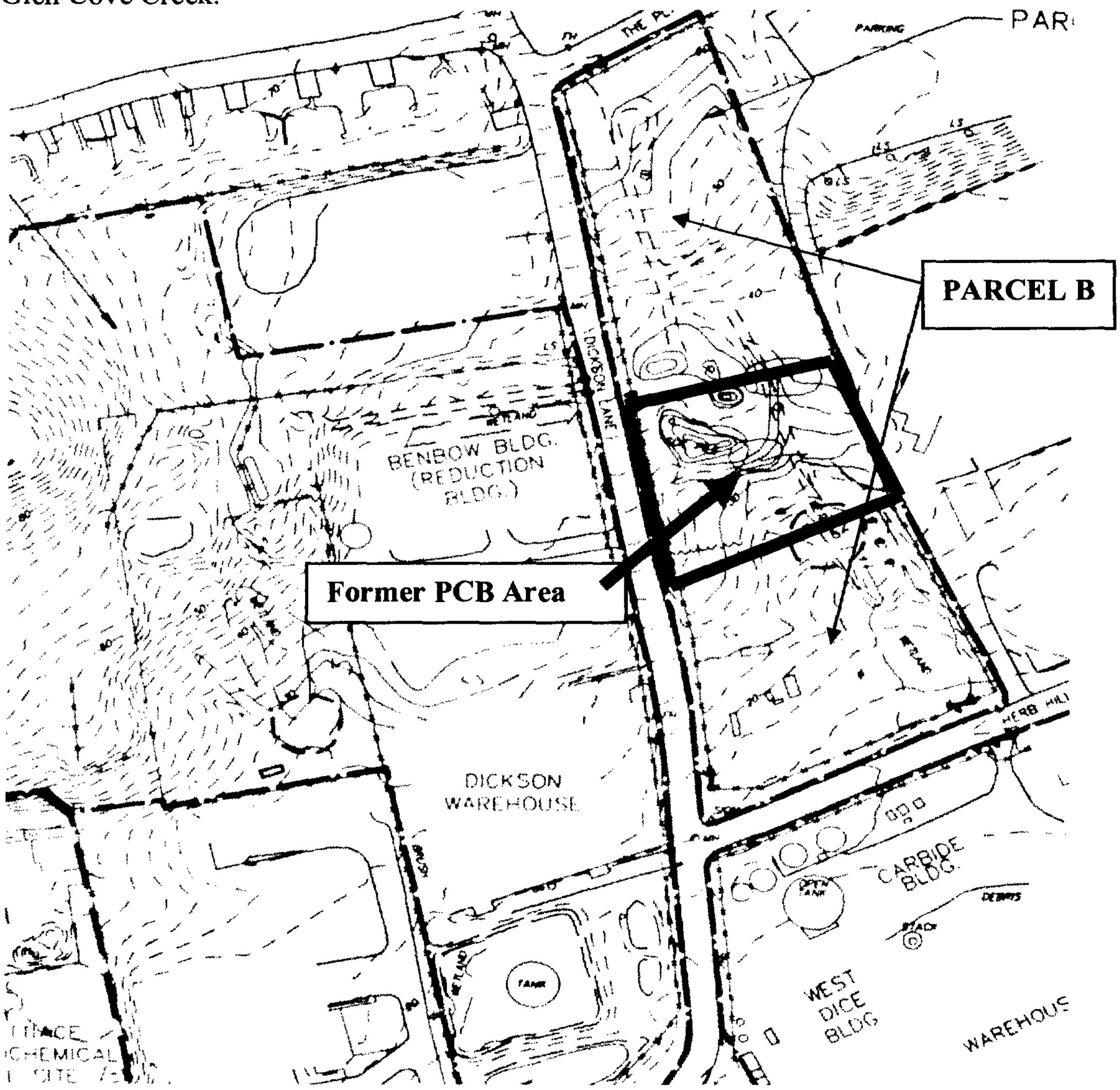


Figure 1. Li Tungsten Site Plan depicting Parcel B and original water flow path. In the former PCB area grading was performed so that all areas have 2 foot cover (minimum).

Plan objectives

The objectives of the Stabilization Plan are to remove abrupt drop-offs, control surface runoff, prevent surface run on to the property, and minimize soil erosion including sedimentation. The grading, engineering controls, and vegetation methods described in this plan are designed to stabilize the site, while requiring little maintenance.

Engineered Erosion Control Methods

Lot Benching
Lot benching will be the primary method of land grading for this area combined with the utilization of a bio-technical technique called "brush barriers". Lot benching is a grading process that reduces slope length and the potential for erosion. Lot benching removes irregular topography and depressions produced from remedial action excavations by leveling areas. These methods are very effective at reducing erosion on construction sites with sloping topography. The lot benching will reduce the slope and length of slope of disturbed areas, thereby reducing erosion potential and establish individual drainage patterns similar to the original topography of the pre-remediation land area.

Brush Barriers
The bio-technical "brush barriers" incorporates the use of woody material remnants from grubbing operations spread over slopes and at the base of slopes to form a check dam barrier at the toe of a fill slope. The brush material (typically <6" in diameter) is well tracked (pushed into the ground) into the surfaces to achieve good contact with soil. The brush mat may foster growth and provide plant cover, and the small pockets created by the overlapping branches will trap native seeds and provide an environment for germination and growth. During high water, a brush mat may trap sediments and support plant growth. Using brush and trees as a sediment control barrier offer an effective biodegradable and low maintenance erosion control treatment.

Broken concrete from Parcel C will be used on site for erosion control in lieu of rip rap. The size reduced concrete will have any residual soil removed through a water washing process. Broken concrete will be sampled for arsenic and lead and scanned for radiological contamination before using it as erosion control.

Application of methods

The grading and site erosion control methods described below will be applied at various areas of Parcel B, as shown on Figure 4.

Sloping - Abrupt drop-offs will be removed by grading. Sloped areas of the site will be compacted and sloped no steeper than 3 feet horizontal to every 1 foot vertical.

Benching - Graded areas be benched to reduce the slope and length of slope of disturbed areas. This lot benching technique minimizes the volume and velocity of runoff being directed over a slope to a lower elevation area.

Run-on Prevention - Grade elevations next to impervious road surfaces will be built up to prevent storm water run on into the Parcel B area.

Slope Erosion Control - Brush barriers or reinforced erosion control blankets will be placed across the slope and base of the down hill bench slopes to provide slope stabilization. Reinforced erosion control blankets will be used adjacent to road ways and installed per guidance in figure 2.

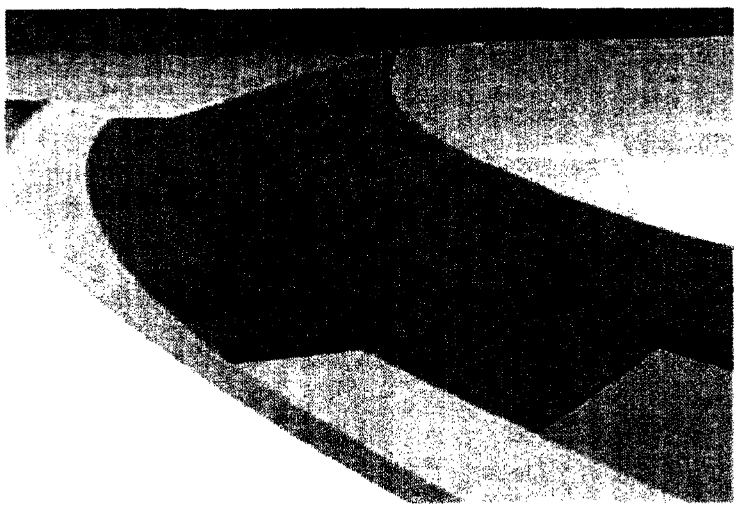


Figure 2. Slope Erosion Control using reinforced erosion control blankets

Flow dissipation - Check dams utilizing excess timber, sizes > 6", will be placed to dissipate sheet flow during future heavy precipitation events. The base of the compacted slopes may also utilize check dams constructed of large diameter tree trunks supplemented with rock as necessary to dissipate run off.

Surface Drains and Down Drain Pipe – Broken concrete sized to simulate rip rap will be used in surface drains and at the inlet/outlet of down drain pipe to dissipate fast moving discharges. The down drain pipe will transport water down slope, thereby bypassing potentially erodible areas.

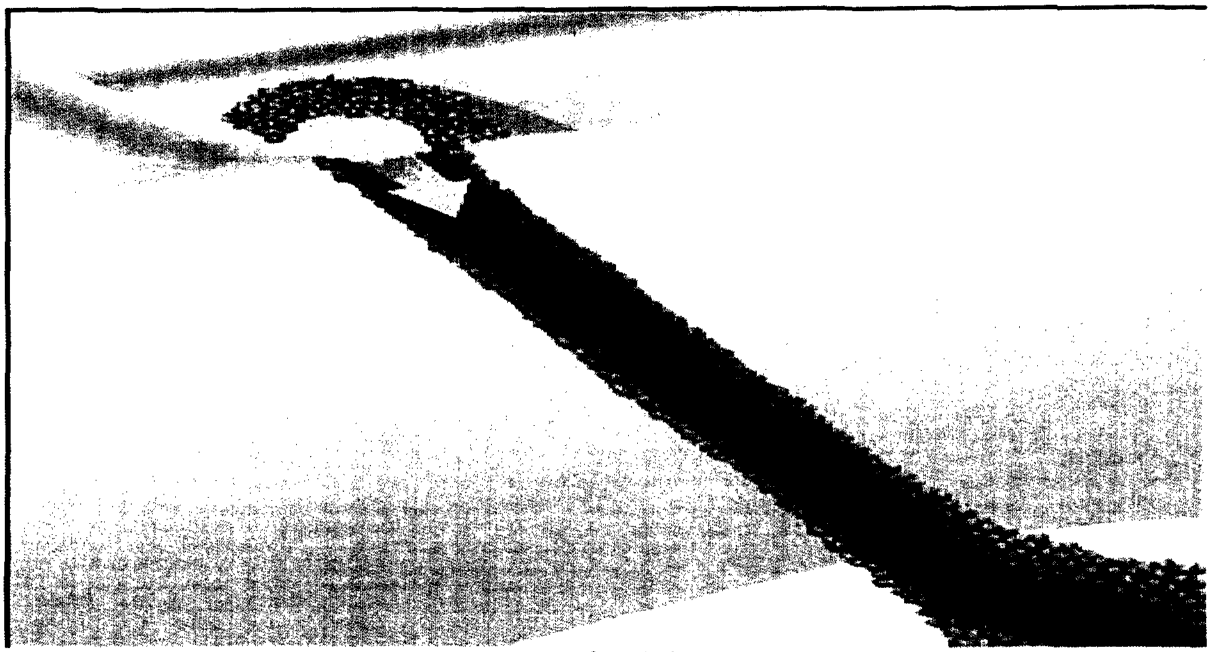


Figure 3. Surface drains

Overflow drain - A broken concrete filled excavation will be installed at the low point on Parcel B to collect site water drainage. A vertical stand pipe will be connected to the previously used storm drain inlet, thereby returning Parcel B water drainage to its prior configuration.
The perforated stand pipe will be installed using a sediment barrier designed to prevent sediment from entering the city storm water system. The sediment barrier will consist of a loose broken concrete filter, concrete perforated pipe exterior, and # 2 smaller stone filter. The top of the stand pipe will be at a lower elevation than adjacent Herb Hill Road to reduce the potential for ponding and overflow onto Herb Hill Road. (See Figure 5)

Vegetation - Areas with undisturbed vegetation will be left intact. These areas include lot boundary trees and shrub over growth. Re-vegetation of remaining areas will be accomplished by establishing new vegetation though broadcast seeding with a straw mulch matting to encourage rapid germination. Slopes adjacent to road ways extending to the base grade of Parcel B will be vegetated with fertilizer mixed with fast germinating seed or reinforced erosion control blankets.

Final inspection

The perimeter of the site will be maintained with 4 foot high fencing. The fencing will have "no trespassing" and "no dumping" signage. Large diameter logs will be used inside the fence as a deterrent to vehicle access to the site. A final inspection will be performed by ECC, TDY, and EPA upon completion.

Attachments

Figure 4 - Parcel B site map illustrating typical engineered erosion control methods.
Figure 5 - Parcel B Overflow Drain sketch.

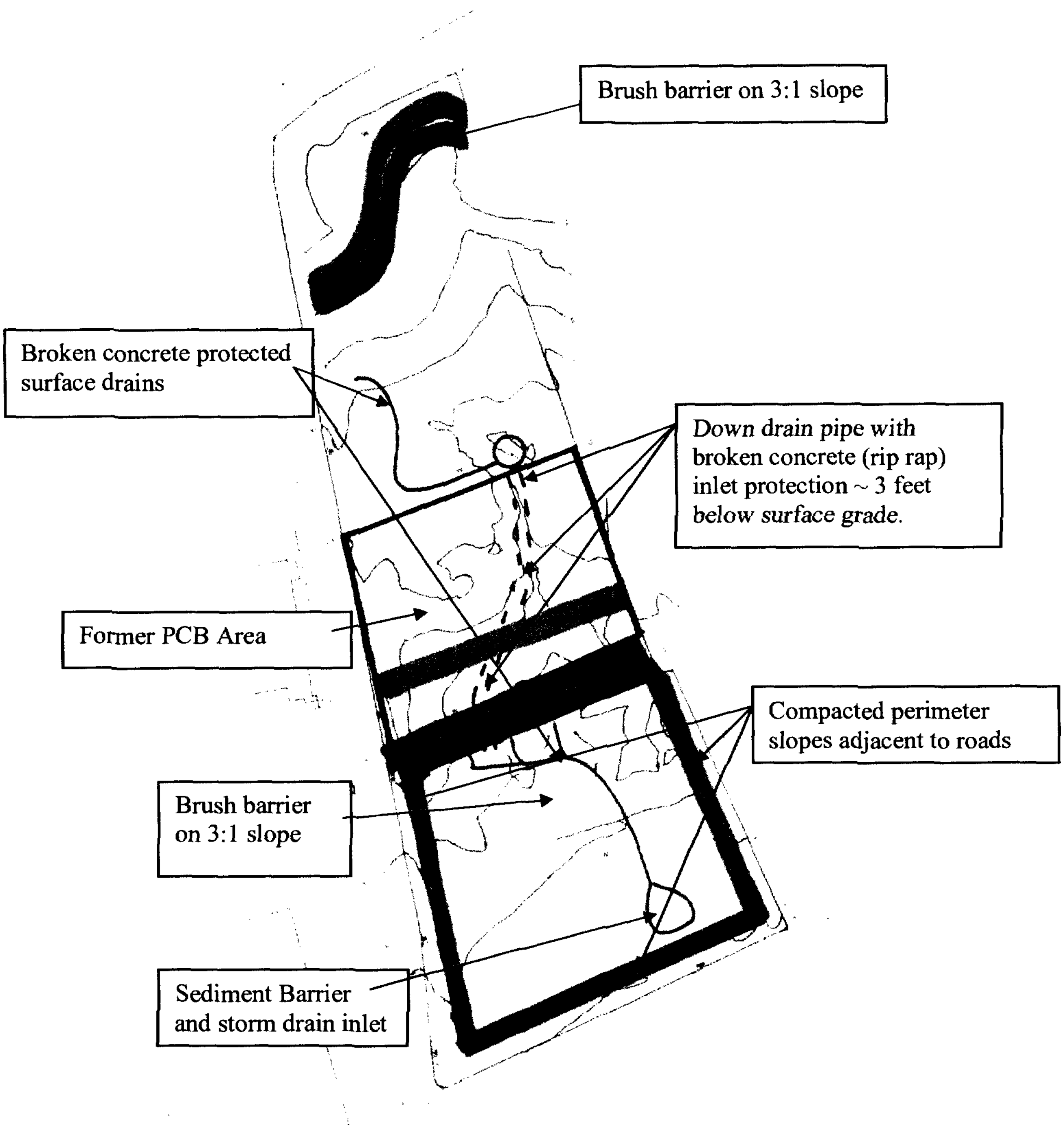


Figure 4 - Parcel B site map illustrating typical engineered erosion control methods. Note: In the former PCB area grading was performed so that all areas have 2 foot cover (minimum).

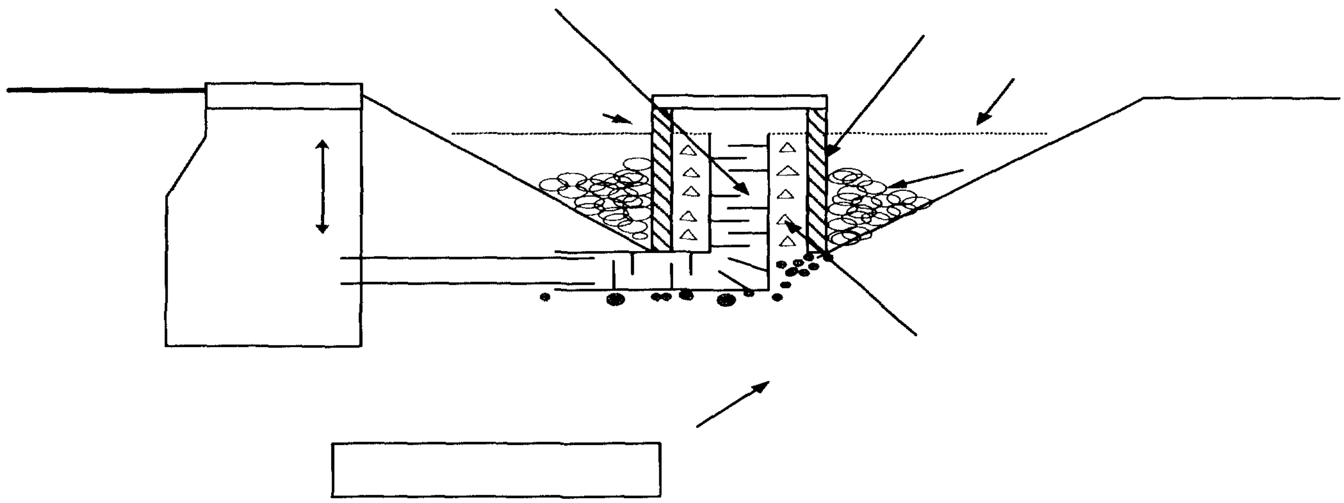


Figure 5 - Parcel B vertical stand pipe over flow drain sketch.

Herb Hill Road

2'

Storm
Drain

Li Tungsten Superfund Site Parcel C Stabilization Plan

Introduction

The remedial activities conducted at Parcel C of the Li Tungsten Superfund Site consisted of excavation (at various depths) and offsite disposal of soils exceeding the Cleanup Criteria specified in the United States Environmental Protection Agency's (USEPA) Record of Decision and the 2005 Explanation of Significant Differences. Prior to excavation, vegetation (predominantly trees, shrubs, grasses, and grass-like plants) was removed. Excavation of soil left Parcel C land areas denuded, with abrupt grade changes of up to 20 feet. The Parcel C ground surface generally slopes down to the southeast and south toward Glen Cove Creek.

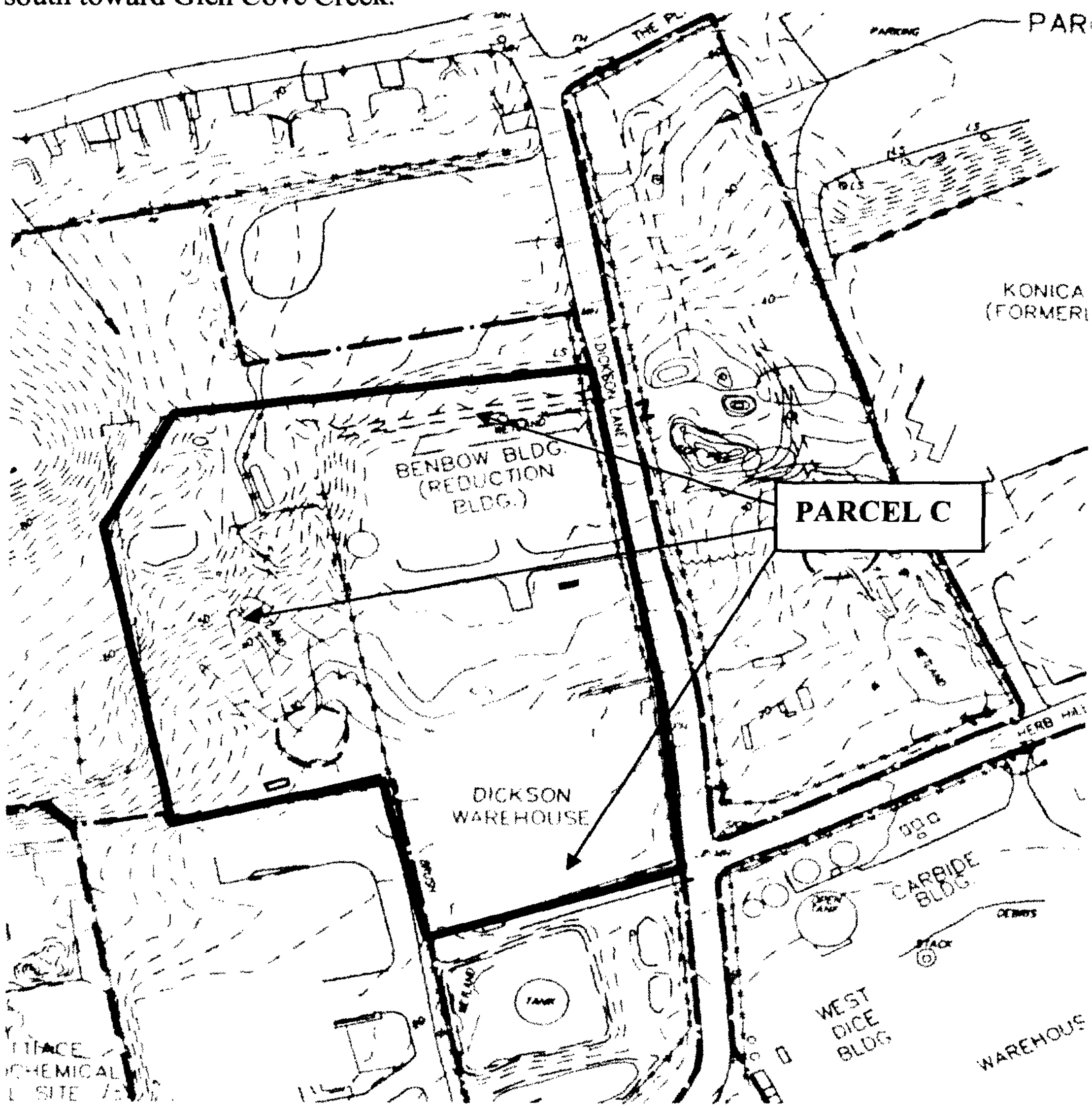


Figure 1. Li Tungsten Site Plan depicting Parcel C original water flow path.

Plan objectives

The objectives of the Stabilization Plan are to remove abrupt drop-offs, control surface runoff, prevent surface run on to the property, and minimize soil erosion including sedimentation. The grading, engineering controls, and vegetation methods described in this plan are designed to stabilize the site, while requiring little maintenance.

Engineered Erosion Control Methods

Lot Benching

Lot benching will be the primary method of land grading for this area combined with the utilization of a bio-technical technique called "brush barriers". Lot benching is a grading process that reduces slope length and the potential for erosion. Lot benching removes irregular topography and depressions produced from remedial action excavations by leveling areas. These methods are very effective at reducing erosion on construction sites with sloping topography. The lot benching will reduce the slope and length of slope of disturbed areas, thereby reducing erosion potential and establishing individual drainage patterns similar to the original topography of the pre-remediation land area.

Brush Barriers

The bio-technical "brush barriers" incorporate the use of woody material remnants from grubbing operations spread over slopes and at the base of slopes to form a check dam barrier at the toe of a fill slope. The brush material (typically <6" in diameter) is well tracked into the surfaces to achieve good contact with soil. The brush mat may foster growth and provide plant cover, and the small pockets created by the overlapping branches will trap native seeds and provide an environment for germination and growth. During high water, a brush mat may trap sediments and support plant growth. Using brush and trees as a sediment control barrier offers an effective biodegradable and low maintenance erosion control treatment.

Broken concrete from Parcel C will be used on site for erosion control in lieu of rip rap. The size reduced concrete will have any residual soil removed through a water washing process. Broken concrete will be sampled for arsenic and lead and scanned for radiological contamination before using it as erosion control.

Application of methods

The grading and site erosion control methods described below will be applied at various areas of Parcel C, as shown on Figure 4.

Sloping - Abrupt drop-offs will be removed by grading. Sloped areas of the site will be compacted and sloped no steeper than 3 feet horizontal to every 1 foot vertical.

Benching - Graded areas will be benched to reduce the slope and length of slope of disturbed areas. This lot benching technique minimizes the volume and velocity of runoff being directed over a slope to a lower elevation area.

Run-on Prevention - Grade elevations next to impervious road surfaces will be built up to prevent storm water run on into the Parcel C area.

Slope Erosion Control - Brush barriers or reinforced erosion control blankets will be placed across the slope and base of the down hill bench slopes to provide slope stabilization. Reinforced erosion control blankets will be used adjacent to road ways and installed per guidance in figure 2.

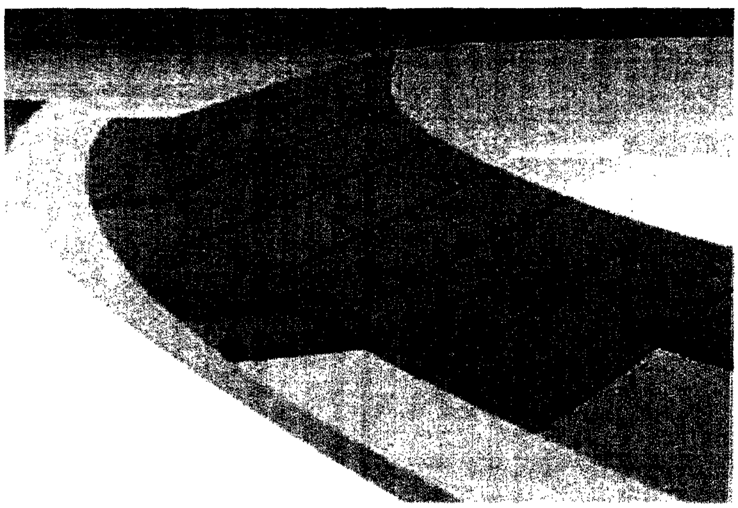


Figure 2. Slope Erosion Control using reinforced erosion control blankets

Flow dissipation - Check dams utilizing excess timber, sizes > 6", will be placed to dissipate sheet flow during future heavy precipitation events. The base of the compacted slopes may also utilize check dams constructed of large diameter tree trunks supplemented with broken concrete as necessary to dissipate run off.

Surface Drains – Broken concrete sized to simulate rip rap will be used in surface drains to dissipate fast moving discharges.

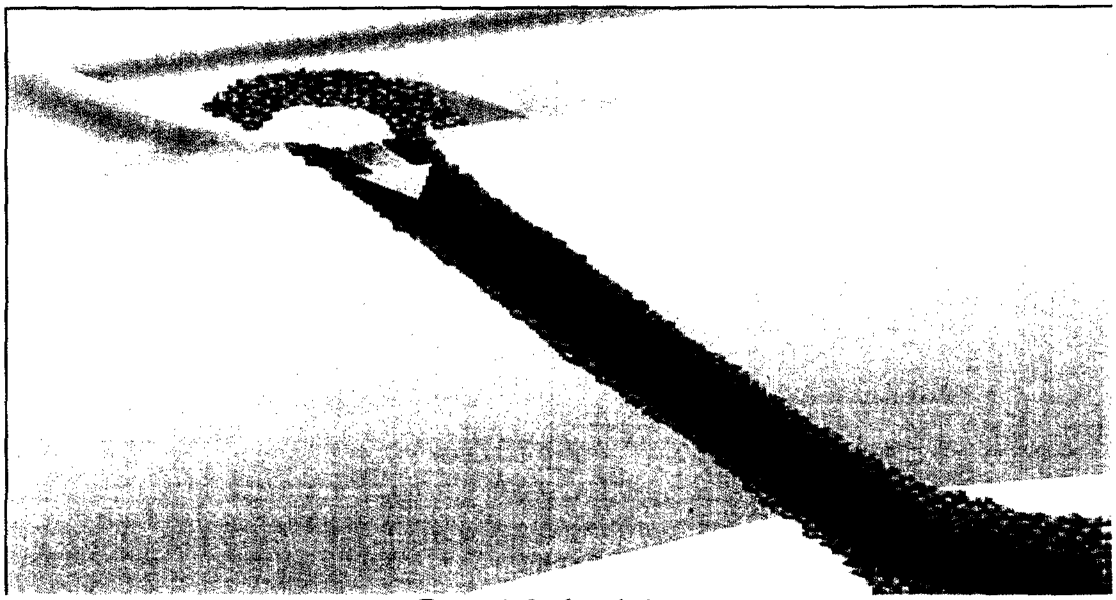


Figure 3. Surface drains

Overflow drain - A broken concrete filled excavation will be installed at the low point on Parcel C to collect site water drainage. A vertical stand pipe will be connected to the previously used storm drain inlet, thereby returning Parcel C water drainage to its prior configuration.

The perforated stand pipe will be installed using a sediment barrier designed to prevent sediment from entering the city storm water system. The sediment barrier will consist of a loose broken concrete filter, concrete perforated pipe exterior, and # 2 smaller stone filter. The top of the stand pipe will be at a lower elevation than adjacent property lot elevations to reduce the potential for ponding and overflow onto adjacent property (See Figure 5).

Vegetation - Areas with undisturbed vegetation will be left intact. These areas include lot boundary trees and shrub over growth. Re-vegetation of remaining areas will be accomplished by establishing new vegetation though broadcast seeding with a straw mulch matting to encourage rapid germination. Slopes adjacent to road ways extending to the base grade of Parcel C will be vegetated with fertilizer mixed with fast germinating seed or reinforced erosion control blankets.

Final inspection

The perimeter of the site will be maintained with 4 foot high fencing. The fencing will have "no trespassing" and "no dumping" signage. Large diameter logs may be used inside the fence as a deterrent to vehicle access to the site. A final inspection will be performed by ECC, TDY, and EPA upon completion.

Attachments

Figure 4 - Parcel C site map illustrating typical engineered erosion control methods.
Figure 5 - Parcel C Overflow Drain sketch.

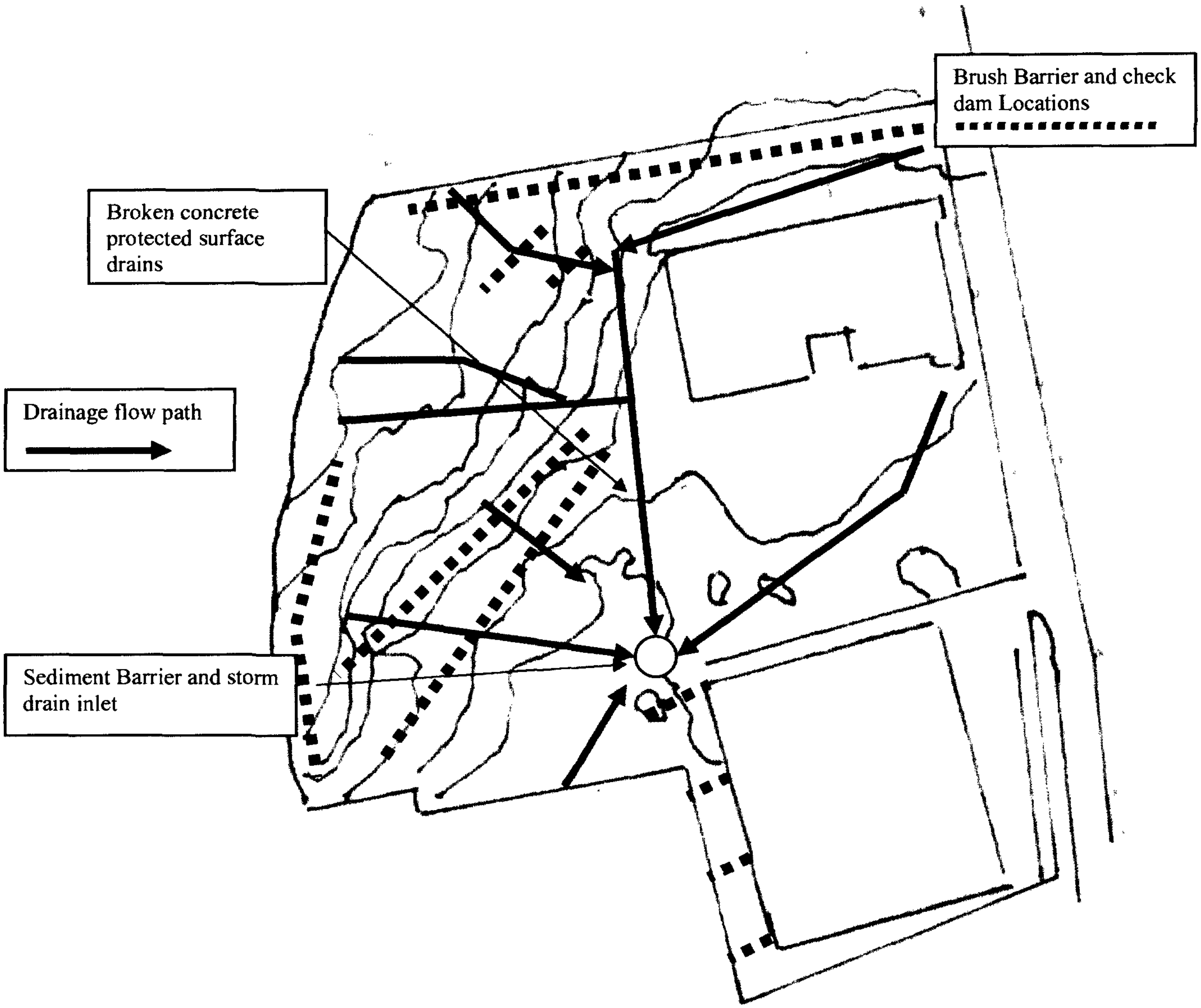


Figure 4 - Parcel C site map illustrating typical engineered erosion control methods.

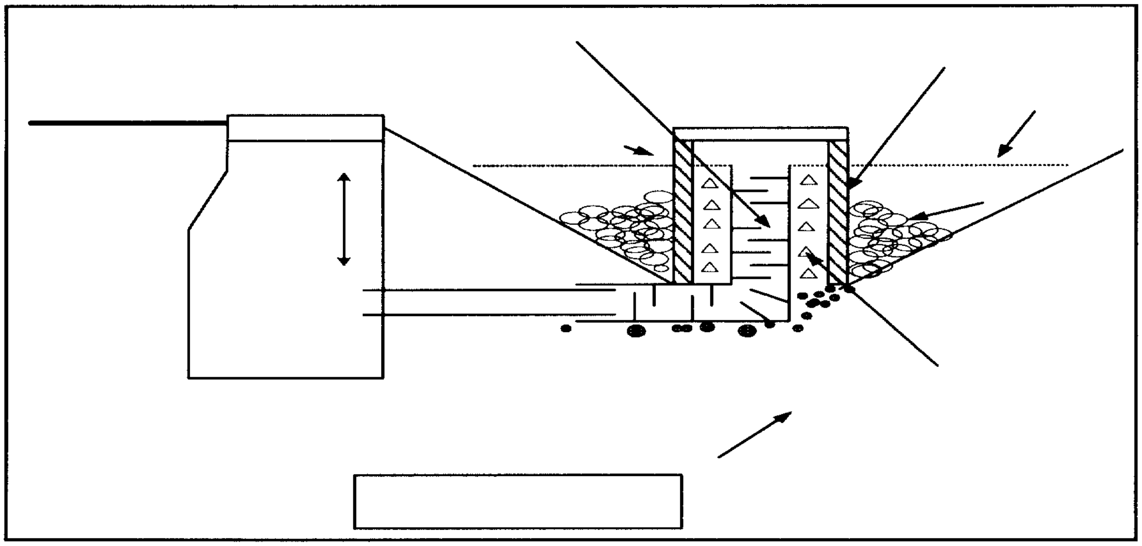


Figure 5 - Parcel C vertical stand pipe over flow drain sketch.

Herb Hill Road

2'

Storr
Drai

APPENDIX 10 – Comparison of Split Sample Results

Comparison of CDM Split and PRP Metals and PCBs Results
Li Tungsten Superfund Site
Parcels B and C

Split Sample Number	Lead		RPD	Difference	Arsenic		RPD	Difference	PCBs		RPD	Difference
	CDM	TDY/ECC		(Times)	CDM	TDY/ECC		(Times)	CDM	TDY/ECC		(Times)
5601-FSS-PB-1001	126	119	5.71	1.1	8.4	6.4	27.03	1.3	NA	NA		
5601-FSS-PB-1002B[1]	19.7	88.2	**126.97**	**4.5**	16.1	15.3	5.10	1.1	NA	NA		
5601-FSS-PB-1003B	8	221	**186.03**	**27.6**	6	68	**167.57**	**11.3**	NA	NA		
5601-FSS-PB-1008	61.1	54.9	10.69	1.1	7.4	6.9	6.99	1.1	NA	NA		
5601-FSS-PB-1014	6.5	8.5	26.67	1.3	1.9	2.2	14.63	1.2	NA	NA		
5601-FSS-PB-1017	10.5	4.7	**76.32**	2.2	2.9	3.5	18.75	1.2	NA	NA		
5601-FSS-PC-1006	2.7	2.9	7.14	1.1	1.1	1.1	0.00	1.0	NA	NA		
5601-FSS-PC-1007	12.3	15.3	21.74	1.2	7.9	7.5	5.19	1.1	NA	NA		
5601-FSS-PC-1019	11.7	14.4	20.69	1.2	2.6	1.2	73.68	2.2	NA	NA		
5601-FSS-PC-1021	7.7	9.9	25.00	1.3	3.4	10.3	**100.73**	3.0	NA	NA		
5601-FSS-PC-1024	55.8	50.5	9.97	1.1	6	5.2	14.29	1.2	NA	NA		
5601-FSS-PC-1027	11.6	42.1	**113.59**	3.6	4.8	7.2	40.00	1.5	NA	NA		
5601-FSS-PC-1028	3.6	3.1	14.93	1.2	1.7	1.8	5.71	1.1	NA	NA		
5601-FSS-PC-1032	32.7	26.5	20.95	1.2	5.2	9.5	**58.50**	1.8	NA	NA		
5601-FSS-PC-1039	31.8	26.2	19.31	1.2	12.1	40	**107.10**	3.3	NA	NA		
5601-FSS-PC-1002B[2]	7.1	90	**170.75**	**12.7**	3.7	5.3	35.56	1.4	NA	NA		
5601-FSS-PCB1-004	NA	NA			NA	NA			0.18	0.184	2.20	1.0
5601-FSS-PCB1-007[3]	NA	NA			NA	NA			61	0.693	**195.51**	**88.0**
5601-FSS-PCB1-022	NA	NA			NA	NA			0.08	0.742	**161.07**	**9.3**

RPD - Relative Percent Difference
NA - Not Analyzed
RPD Greater than 50% have been shown in bold.

[1] *TDY/ECC Sample name is 5601-FSS-PB-1002*
[2] TDY/ECC Sample name is 5601-FSS-PC-1002
[3] TDY/ECC Sample name is 5601-FSS-PCB1-1007-1

Comparison of CDM Split and PRP Radiochemistry Results
Li Tungsten Superfund Site
Parcels B and C

Split Sample Number	CDM		TDY/ECC		ND	CDM		TDY/ECC		ND
	Ra-226 (pCi/g)	Uncertainty (2 sigma)	Ra-226 (pCi/g)	Uncertainty (2 sigma)		Ra-228 (pCi/g)	Uncertainty (2 sigma)	Ra-228 (pCi/g)	Uncertainty (2 sigma)	
5601-FSS-SU1-1010	0.988	0.35	0.6	0.17	**1.99**	1.68	0.636	0.73	0.33	**2.65**
5601-FSS-SU2-1004	1.18	0.391	1.62	0.35	1.68	0.511	0.612	1.38	0.48	**2.23**
5601-FSS-SU2-1008	0.959	0.331	1.16	0.27	0.94	1.06	0.553	1.26	0.44	0.57
5601-FSS-SU3-1006	0.632	0.291	0.78	0.24	0.78	0.382	0.473	0.76	0.33	1.31
5601-FSS-SU4-1001	0.99	0.35	1.04	0.25	0.23	0.39	0.55	0.89	0.54	1.30
5601-FSS-SU4-1008	1.42	0.417	1.36	0.33	0.23	0.684	0.701	1.01	0.41	0.80
5601-FSS-SU5-1007	1.27	0.4	0.78	0.24	**2.10**	1.98	0.50	1	0.55	**2.63**
5601-FSS-SU5-1012	1.17	0.38	1.4	0.28	0.97	0.45	0.56	0.92	0.46	1.28
5601-FSS-SU6-1009	1.35	0.4	0.95	0.22	1.75	0.61	0.52	1	0.46	1.11
5601-FSS-SU7-1003	1.37	0.41	1.21	0.27	0.65	-0.66	0.53	0.76	0.34	**4.52**
5601-FSS-SU7-1008	0.734	0.204	1.21	0.28	**2.75**	0.824	0.207	1.23	0.45	1.64
5601-FSS-SU7-1011	0.88	0.286	0.97	0.26	0.47	1.12	0.479	0.81	0.51	0.89
5601-FSS-SU8-1001	0.68	0.27	0.83	0.23	0.84	0.43	0.44	1.11	0.47	**2.11**
5601-FSS-SU8-1009	1.56	0.45	1.24	0.29	1.21	1.20	0.49	1.3	0.43	0.30
5601-FSS-SU9-10B2[1]	1.21	0.37	0.8	0.24	1.85	1.22	0.48	1.1	1	0.22
5601-FSS-SU9-10B3[2]	1.06	0.36	0.78	0.23	1.30	1.63	0.61	0.29	0.44	**3.57**
5601-FSS-SU9-1004	0.67	0.3	0.64	0.23	0.16	1.29	0.46	0.59	0.55	1.95
5601-FSS-SU9-1007	0.72	0.314	0.82	0.23	0.51	0.877	0.385	1.25	0.48	1.21
5601-FSS-SU9-1011	0.806	0.321	1.17	0.27	1.74	0.2	0.42	1.01	0.42	**2.73**
5601-FSS-SU10-1010	1.83	0.491	2.16	0.4	1.04	4.15	0.725	4.66	0.67	1.03

ND - Normalized Difference
ND Greater than 1.96 have been shown in bold.

[1] TDY/ECC Sample name is 5601-FSS-SU9-002
[2] TDY/ECC Sample name is 5601-FSS-SU9-1003

Comparison of CDM Split and PRP Radiochemistry Results
Li Tungsten Superfund Site
Parcels B and C

Split Sample Number	CDM		TDY/ECC		ND	CDM		TDY/ECC		ND
	Th-230 (pCi/g)	Uncertainty (2 sigma)	Th-230 (pCi/g)	Uncertainty (2 sigma)		Th-232 (pCi/g)	Uncertainty (2 sigma)	Th-232 (pCi/g)	Uncertainty (2 sigma)	
5601-FSS-SU1-1010	0.679	0.247	0.58	0.13	0.71	0.91	0.298	0.75	0.15	0.96
5601-FSS-SU2-1004	1.14	0.338	0.78	0.16	1.93	1.06	0.319	0.95	0.18	0.60
5601-FSS-SU2-1008	1.39	0.429	0.78	0.16	**2.66**	1.37	0.425	1.1	0.21	1.14
5601-FSS-SU3-1006	0.814	0.278	0.47	0.12	**2.27**	0.869	0.287	0.82	0.18	0.29
5601-FSS-SU4-1001	0.94	0.32	0.66	0.12	1.64	1.05	0.35	0.77	0.13	1.50
5601-FSS-SU4-1008	1.97	0.544	1.56	0.38	1.24	1.62	0.467	1.71	0.4	0.29
5601-FSS-SU5-1007	1.07	0.34	0.61	0.14	**2.49**	1.25	0.37	0.72	0.16	**2.58**
5601-FSS-SU5-1012	1.11	0.34	0.6	0.14	**2.80**	0.80	0.27	0.63	0.15	1.10
5601-FSS-SU6-1009	0.75	0.26	0.63	0.15	0.79	0.75	0.26	0.72	0.17	0.21
5601-FSS-SU7-1003	0.78	0.25	0.92	0.21	0.87	0.81	0.26	1.08	0.23	1.56
5601-FSS-SU7-1008	1.14	0.344	0.6	0.13	**2.94**	0.947	0.3	0.65	0.14	1.79
5601-FSS-SU7-1011	0.943	0.288	0.78	0.16	0.99	0.908	0.28	1.03	0.19	0.72
5601-FSS-SU8-1001	1.11	0.36	0.59	0.13	**2.73**	0.88	0.30	0.8	0.17	0.44
5601-FSS-SU8-1009	1.19	0.36	0.96	0.2	1.11	1.71	0.47	1.39	0.26	1.21
5601-FSS-SU9-10B2[1]	1.40	0.41	0.52	0.11	**4.09**	1.24	0.38	0.59	0.13	**3.26**
5601-FSS-SU9-10B3[2]	1.36	0.43	0.47	0.09	**4.07**	1.40	0.44	0.68	0.12	**3.17**
5601-FSS-SU9-1004	0.86	0.29	0.48	0.09	**2.50**	0.58	0.22	0.55	0.1	0.25
5601-FSS-SU9-1007	0.747	0.289	0.71	0.15	0.23	1.01	0.348	0.88	0.17	0.67
5601-FSS-SU9-1011	0.67	0.26	0.61	0.13	0.41	0.73	0.273	0.92	0.18	1.16
5601-FSS-SU10-1010	2.41	0.67	2.48	0.43	0.18	6.38	1.54	6.6	1	0.24

ND - Normalized Difference
ND Greater than 1.96 have been shown in bold.

[1] TDY/ECC Sample name is 5601-FSS-SU9-002
[2] TDY/ECC Sample name is 5601-FSS-SU9-1003

APPENDIX 11 – Final Inspection Punchlist

Punchlist (August 1, 2008 Inspection) -

Outstanding tasks/issues to be resolved prior to Final Inspection

1) Remove cal gas cylinder - Andy Lombardo

2) Remove north Dickson Warehouse wall hanging block - done

3) Remove west Dickson Warehouse wall hanging block - done

4) Remove ECC scaffolding outside south side of Dickson Warehouse - done

5) Correct drainage outside southwest corner Dickson Warehouse - done

6) Ship radiological waste offsite for disposal - done

7) Remove seven empty drums from Dickson Warehouse - Jeff Calarie

8) Correct drainage north of wall above Dickson Warehouse - done

9) Seed area north of wall above Dickson Warehouse - done

10) Complete area factor calculations for Dickson Warehouse roof - Andy Lombardo

11) Repair drainage swale west of Benbow Building - done

12) Seed area near above drainage swale - done

13) Empty out office trailer - done

14) Remove trailer from site - Jeff Calarie has called this off rent

15) Remove two portajohns from site - Jeff Calarie has called these off rent

16) Remove trash dumpster from site - Jeff Calarie has called this in

17) Remove fuel dispensing unit from site - Jeff Calarie has called this off rent

18) Remove manlift, high-reach forklift, and backhoe from site - Jeff Calarie has called these off rent