



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 10

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OFFICE OF
ENVIRONMENTAL CLEANUP

MEMORANDUM

DATE: September 20, 2010

SUBJECT: Approval and Funding for a Time-Critical Removal Action at the Salt Creek Park Firing Range Site, Port Angeles, Clallam County, Washington

FROM: Kathy Parker, On-Scene Coordinator *Kathy Parker*
Emergency Response Unit

THRU: Chris D. Field, Manager *Chris D. Field*
Emergency Response Unit

TO: Daniel D. Opalski, Director
Office of Environmental Cleanup

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the selected time-critical removal action described herein for the Salt Creek Park Firing Range Site ("Site") located near Port Angeles in Clallam County, Washington.

II. SITE CONDITIONS AND BACKGROUND

The CERCLIS ID for this Site is WAN001002870 and the Site ID is 10HY.

A. Site Description

1. Removal Site Evaluation

The Site is located in the 196-acre Salt Creek Recreation Area County Park located in Clallam County ("County"), Washington (see Figure 1 - Site Vicinity and Figure 2 - Site Features). The surrounding park includes camp and recreational vehicle sites, and the surrounding habitat includes upland forests, rocky bluffs and tide pools. The Site overlooks the Strait of Juan de Fuca and surface water from the Site drains toward the Strait. State land borders the property to the east and south.

The Site was used as a target range by the U.S. Government for a period of at least 17 years, from approximately 1942 to 1958 or 1959. A private sportsman's association was allowed to use the target range intermittently with permission from the US Government until 1958 or 1959 and then with permission from the County

until 1968. The County closed the firing range in 1968 to make use of the Salt Creek County Park ("Park") safer for other recreational users.

In 2008, a citizen reported to the Washington State Department of Ecology ("Ecology") concerns about soil lead contamination at the former Salt Creek Firing Range located within the Park. This person was concerned about people playing in the area and eating mushrooms growing in the lead-contaminated soil.

There is sufficient information, based on data collected at the Site in 2009 and spring of 2010, to indicate that impacts associated with soil lead contamination and increased metal concentrations in surface water and sediment are present at the Site and pose potential risks to human health and the environment.

2. Physical Location

The Site, which encompasses approximately one acre of the Park at this time, is located on what once was Camp Hayden, a World War II military camp. The Park received more than 100,000 visits in 2009, including day and overnight use, and many of those visiting walked the trails at and near the Site. The nearest resident lives within one-half mile of the Site. The geospatial coordinates of the Site are 48.16185 North Latitude, 123.69739 West Longitude and the County plat books indicate the Site is located on the west side of Section 22, Township 31 North, Range 8 West.

The northern edge of contamination at the Site is approximately 300 yards inland from water's edge of the Strait of Juan de Fuca. Drainage from the Site travels northward through wetland channels and exits through the face of cliffs overlooking a rocky beach into the Strait.

Rainfall is measured at a weather station located about a mile west of the Site. The approximate annual rainfall is 80.2 inches a year of which 38 inches falls in the three winter months of November, December and January.

There are no known threatened or endangered species or critical habitat at the Site. However, migratory birds, including the federally threatened Marbled Murrelet, (a small sea bird that nests in mature trees) are known to pass through the area. There are no known or identified historical landmarks or cultural structures with historical significance at the Site. although the former military buildings within the Park, but outside the boundaries of the Site, may have historical significance.

The Lower Elwah Klallam Tribe, a federally recognized Tribe, maintains shellfish beds and fishing areas in usual and accustomed places in the area of the Strait of Juan de Fuca adjacent to the Site. Commercial and recreational marine fishermen also harvest in the area.

3. Site Characteristics

Between 1942 and 1943, the U.S. Government acquired land through purchase, lease, donation, and condemnation and built the coastal artillery battery, Camp Hayden Military Reservation. Structures included four batteries and a gun installation in addition to a target range, barracks and other buildings. In 1949, the facility, including the target range, consisting of approximately 357.90 acres, was transferred to the US Coast Guard. The US Coast Guard continued to use the target range until 1957. Between 1958 and 1959, 252 acres were conveyed to Clallam County and approximately 512 acres were conveyed to the Washington State Department of Natural Resources (“DNR”). Property deeds for both entities included a recital of the former use of a portion of the properties as a target range.

The facility’s outdoor shooting range, while under Army ownership and with Army permission, was also used by an informal group of shooters known as the Sportsman’s Association beginning on or around 1946. During the US Coast Guard’s ownership of the property, the US Coast Guard used the range for target practice and US Coast Guard staff and members of the Sportsman’s Association used the range for recreational target practice. Use of the outdoor shooting range appears to have continued under the County’s ownership as a civilian 500-yard shooting range and later as a 200-yard shooting range until around 1968 when the County closed the firing range to make the park safer for other recreational users. The target supports are still visibly in place. The 200-yard shooting line was perched on an eight foot berm which has since been removed or flattened. Most of the hillside that was the impact zone appears to be located on DNR land.

The contaminated area is densely wooded with large trees, downed timber and native northwest underbrush such as Salal, Huckleberry, mushrooms, Oregon Grape and ferns.

4. Release or threatened release into the environment of a hazardous hazardous substance, or pollutant or contaminant

The contaminants of concern – lead and copper – are potential hazardous substances or pollutants or contaminants as defined by sections 101(14) and 101(33) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. section 9601(14) and (33).

Data regarding the nature and extent of contamination at the Salt Creek Firing Range are summarized below.

Clallam County Environmental Health Department

On October 27, 2008, the Clallam County Environmental Health Department (“CCEHD”) collected and analyzed seven soil samples for lead. The results

indicated that soil lead concentrations as high as 37,200 milligrams per kilogram (mg/kg) were present in the hillside which served as the shooting range impact zone, 615 mg/kg lead in the hillside behind the target zone, and 193 mg/kg lead in a berm in front of the target zone, next to a park walking path.

U.S. Environmental Protection Agency

In response to the citizen's report, EPA On-Scene Coordinator (OSC) Kathy Parker met with the citizen at the Site on May 13, 2009. Following this Site visit, and after a review of all available information, OSC Parker returned to the Site on August 4, 2009, with EPA's START contractor and collected additional soil samples to determine if the Site warranted further response action.

The analytical results revealed:

- Human Health

Lead was detected in surface soils on the impact hill at concentrations as high as 66,000 mg/kg. These surface soil lead levels on the impact hill significantly exceed the Washington State Model Toxics Control Act ("MTCA") Method A soil cleanup levels for lead for Unrestricted Land Uses of 250 mg/kg and the EPA Risk Assessment Information System – Preliminary Remediation Goal ("RAIS-PRG") human health action levels for recreational use for lead of 8,440 mg/kg. These action levels and the analytical data are presented in table 2.

- Ecological

Surface soils on the impact hill also exceed the Ecological Soil Screening Level (Eco-SSL) Plant and Eco-SSL Mammalian action levels for lead and copper. Sediments in the wetland exceed MTCA Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals for lead (50 mg/kg), copper (50 mg/kg) and zinc (86 mg/kg) and EPA Ecological Screening Values for lead (Mammalian at 56 mg/kg dry weight), copper (Mammalian at 49 mg/kg dry weight) and zinc (Mammalian at 79 mg/kg dry weight) (see Tables 2 and 3).

- Potential for migration to the surrounding environment

Synthetic Precipitation Leaching Procedure (SPLP) extracts from surface soils on the impact hill exceeded National Recommended Water Quality Criteria (NRWQC) action levels for lead and copper. All extracts were found to substantially exceed the NRWQC-CCC action levels for lead of 3.1 micrograms per liter (ug/L) and copper of 13.3 ug/L. Lead in the three soil extracts ranged between 800 to 1,400 ug/L while copper in the extracts ranged from 75 to 130 ug/L (see Table 5).

A Toxicity Characteristic Leaching Procedure (TCLP) extract of the soil contained 330 mg/L of lead. This result exceeds the Resource Conservation and Recovery Act ("RCRA") toxicity characteristic regulatory level of 5 milligrams per liter ("mg/L") thus indicating the soil would require disposal as a hazardous waste.

5. NPL Status

The Site is not listed on the National Priorities List (NPL) nor has the Site been proposed for the NPL.

6. Maps, figures, and other graphic representations

Refer to attached figures and tables for:

Figure 1	Site Vicinity Map
Figure 2	FPXRF Results for Lead
Figure 3	Laboratory Results for Lead Concentrations in Surface Soils
Figure 4	Laboratory Results for Copper Concentrations in Surface Soils
Figure 5	Wetland Drainage - Laboratory Results for Lead in Sediment and Surface Water
Figure 6	Wetland Drainage - Laboratory Results for Copper in Sediment and Surface Water
Figure 7	Conceptual Site Model
Table 1	(This table appears in section III.B.1) Health Effects of Specific Heavy Metals
Table 2	Removal Assessment: Metals Concentrations in Surface Soil
Table 3	Removal Assessment: Metals Concentrations in Sediments
Table 4	Removal Assessment: Metals Concentrations in Surface Waters
Table 5	Removal Assessment: Metals Concentrations in SPLP Extracts

B. Other Actions to Date

1. Previous Actions

In June 2010 and at EPA's request, the Clallam County Parks, Fair and Facilities Division (CCP) posted a temporary sign cautioning Park visitors to stay away from the contaminated area and not to eat mushrooms or other plants growing in the contaminated soil. EPA provided fact sheets and a brochure box to the Park Manager to post and hand out to Park visitors to inform and caution them about the lead contamination,

2. Current Actions

There are no ongoing removal activities undertaken by other government or private parties.

C. State and Local Authorities' Roles

1. State and Local Actions to Date

In June 2010, the Clallam County Parks, Fair and Facilities Division (CCP) posted a temporary sign cautioning Park visitors to stay away from the contaminated area and not to eat mushrooms or other plants growing in the contaminated soil.

In August 2010, the DNR had the property line surveyed near the contaminated area to determine whether DNR owned any of the contaminated property. DNR determined that the majority of the contamination is located on DNR property, however, the target berm and some of the wetland is on County property.

2. Potential for continued State/Local Response

At this time, the potential for continued state response is an unknown factor. However, given the current precarious budget situation at the state and local levels, the potential is presumed to be very low. The Washington Department of Ecology (Ecology) communicated to OSC Parker in a December 2, 2009 email that the Site has been listed in Ecology's cleanup data base as a confirmed, contaminated site. They suspended further investigation once EPA became engaged in assessing the site and the Toxics Cleanup Program lead for the area stated that he believes Ecology would welcome EPA's direct action on the Site. The CCP Director and the DNR have both stated that they do not have the expertise to perform the removal or the funding to hire contactors to perform the removal. DNR, in a letter to EPA dated June 7, 2010, indicated a willingness to discuss the work to be carried out but did not offer to undertake the removal action.

3. Informal government-to-government consultation with the Lower Elwha Klallam Tribe

In February 2010, informal government-to-government consultation was initiated with the Lower Elwha Klallam Tribe and provided the final EPA Removal Assessment report. The Tribe has been concerned for many years about lead contamination of their shellfish beds from run-off from the former shooting range at the Site and supports the removal action described herein. In September 2010, the Tribe was formally notified of the proposed removal action and offered an opportunity for formal government-to-government consultation.

III. THREATS TO PUBLIC HEALTH WELFARE OR ENVIRONMENT

The current conditions at this Site meet the following factors which indicate that the Site is a threat to the public health or welfare or the environment, and a removal action is appropriate under §300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

A. Threat to Public Health or Welfare

1. Actual or potential exposure to nearby human populations, animals or the food chain from hazardous substances or pollutants or contaminants [300.415(b)(2)(i)].

The contaminated soil is located in an unrestricted area adjacent to the Striped Peak hiking trail. The hiking trail is frequented by families, children, mushroom pickers, and other visitors. Containers used for human consumption were found in the contaminated area indicating visitors are entering the contaminated area and may be ingesting or tracking out contaminated soil. The Salt Creek Park Manager and other visitors have seen Park visitors picking berries and mushrooms in the area.

Park visitors could potentially be exposed to high levels of lead in the contaminated soil by direct contact and ingestion if they walk or sit on the soil and then transfer contaminated soil to their mouths. Mushroom pickers picking mushrooms growing in the lead-contaminated soil could expose themselves or others to lead poisoning by ingestion of lead-contaminated mushrooms. People who eat shellfish or other marine foods living or growing in the Strait of Juan de Fuca near the area where run-off from the contaminated area enters the Strait could potentially be ingesting lead-contaminated food.

The Lower Elwah Klallam Tribe's shellfish beds and fishing grounds are directly off-shore from the Park and contaminated area. Surface water leaving the Site flows to the North and drains into the Strait of Juan De Fuca. Shellfish are known to be able to take up heavy metals which could lead to contamination of the Tribe's food source.

Studies have identified the health effects of exposure to lead to be neurological and central nervous system effects and hematological and kidney effects (with higher susceptibility in children).

2. Weather conditions that may cause hazardous substances or pollutants to migrate or to be released [300.415(b)(2)(v)].

The Site averages eighty inches of precipitation each year, nearly half of which falls in the three winter months. This high volume of rainfall would have the effect of rapidly moving hazardous metals-contaminated sediment off-site and leaching hazardous metals into the surface water which will then run off-site, particularly in winter. The SPLP analytical results indicate this pathway exists.

3. The availability of other appropriate federal or state response mechanisms to respond to the release [300.415(b)(2)(vii)].

At this time, no other federal or state agency has the capacity to perform the removal action in a timely manner.

B. Threats to the Environment

1. Actual or potential exposure to nearby human populations, animals or the food chain from hazardous substances or pollutants or contaminants [300.415(b)(2)(i)].

As evidenced by the many burrows and frogs observed during the removal assessment, burrowing animals are active in the Site soils and frogs currently are living in the wetland. In this ecosystem, plants growing in the Site soils could take up heavy metals and animals eating the plants could concentrate the metals and be damaged by them. Animals eating the plants and burrowing animals and amphibians ingesting contaminated surface soils could be damaged by heavy metals. Higher-order predators, feeding on the animals could be damaged by the heavy metals. All these effects could lead to damage to the terrestrial ecosystem. This same pattern of ingestion and concentration of heavy metals leading to damage in organisms is present in the marine environment because that environment is receiving contaminated leachate and run-off from the Site.

Table 1 Health Effects of Specific Heavy Metals

	Health Effects from Excess Lead
Plants	Inhibits growth, reduces photosynthesis, reduces water absorption and transpiration, accelerates defoliation.
Animals	Encephalopathy preceded by gastrointestinal malfunction, maniacal behavior, locomotor disturbances, interferes with heme synthesis.
	Health Effects from Excess Copper
Plants	Wilting leaves, melanism, white twisted tips, reduction in panicle formation.
Animals	Chronic: cell degeneration, nausea, vomiting, pain, dizziness, jaundice, general debility Acute effects: fever, tachycardia, hypotension, oliguria, uremia, coma, cardiovascular collapse, death
	Zinc Health Effects from Excess Zinc
Plants	Iron chlorosis
Animals	Adversely affects tissues, interferes with absorption of copper, calcium and iron, inhibits erythrocyte production and function

2. Actual or potential contamination of drinking water supplies or sensitive ecosystems [300.415(b)(2)(ii)].

Surface water leaving the former shooting range area flows downhill to the North. Precipitation run-off from the contaminated area follows a small creek bed which splits into many meanders before spreading out into a wetland at the top of a cliff overlooking the Strait of Juan De Fuca. Water from that wetland drains through the face of the cliff onto the beach and into the Strait. Sediment samples in the

wetland drainage to the northwest of the impact area, and 100 linear feet and 200 linear feet along the wetland drainage from the target berm, showed elevated lead concentrations at two to four times that found in the background sample and one and one half to two times the background copper concentration (see Table 4). All sediment samples in the wetland drainage area adjacent to the target berm exceeded the 2001 EPA Ecological Screening Values for Copper, Lead and Zinc (see Table 3).

SPLP extracts from surface soils on the impact hill exceeded NRWQC action levels for lead and copper. Lead in the three soil extracts ranged between 800 to 1,400 ug/L while copper in the extracts ranged from 75 to 130 ug/L (see Table 5). All extracts were found to substantially exceed the NRWQC-CCC action levels lead (3.1 ug/L) and copper (13.3 ug/L) indicating that the soils can leach hazardous metals into surface water at levels of ecological concern.

3. High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate [300.415(b)(2)(iv)].

Elevated levels of lead and other toxic metals are present in the surface and near-surface soils at the Site and those metals are in chemical forms that are soluble in rain water at levels of concern for the local ecosystem. A physical pathway exists for precipitation run-off to carry the soluble heavy metals off-site and into the marine environment. Plants growing in the contaminated soil and the marine life forms off-shore from the beach can take up the heavy metals and the contamination can then spread through the food chain (see Figure 3, Conceptual Site Model).

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

Based on the analysis of the nature and extent of Site contamination, the following time-critical removal action is proposed to address the public health, welfare, and environmental threats discussed in Section III of this Action Memorandum.

A. Proposed Actions

1. Proposed Action Description

Excavation and Disposal of Contaminated Materials

An estimated total of 700 cubic yards of near-surface contaminated soils will be excavated from the impact zone, target berm, and wetland area to remove concentrations that exceed the calculated site-specific soil ecological cleanup level for lead of 120 mg/kg. By achieving this level for lead, Ecological Indicator Soil Cleanup Levels for copper, nickel and zinc and the site-specific RAIS-PRG-Recreational Use for lead of 8,440 mg/kg will also be met. Excavated areas will be graded to control surface water drainage and backfilled if necessary to restore grade. Disturbed areas will be stabilized to facilitate the reestablishment of vegetation.

The excavated soil will be tested for lead to determine the appropriate disposal facility, and the contaminated soil will be appropriately packaged and transported off-site to a RCRA-permitted facility for disposal.

Best-Management Practices (BMPs):

Temporary Best Management Practices (BMPs) will be implemented during cleanup activities to protect workers, recreationists, and the environment from short-term construction impacts such as erosion, sedimentation, fugitive dust, and other similar potential impacts. Additionally, conservation measures will be employed to preserve existing vegetation, where practicable.

Post removal site controls

DNR and the County have agreed to be responsible for maintaining any remaining temporary BMPs for erosion and sediment control and for ensuring revegetation of disturbed areas. Post-removal Site controls are not expected to be required at this time because the contaminants of concern are not expected to remain on-site at actionable concentrations.

2. Contribution to remedial performance

The proposed action may be the first and only action or one of a series of actions depending on post-removal findings and activities such as those necessary to maintain the protectiveness of the cleanup to prevent, minimize, or mitigate harm to public health or welfare or the environment, which may otherwise result from a release or threat of release. If future actions are required, the proposed removal action will likely not impede those actions based upon available information.

3. Engineering Evaluation/Cost Analysis (EE/CA)

This proposed action is for a time-critical removal action, and an EE/CA therefore is not required.

4. Applicable or relevant and appropriate requirements (ARARs)

The NCP requires that removal actions attain Applicable or Relevant and Appropriate Requirements (ARARs) under federal or state environment or facility siting laws, to the extent practicable. (40 CFR § 300.415(j)) In determining whether compliance with ARARs is practicable, EPA may consider the scope of the removal action and the urgency of the situation. (40 CFR § 300.415(j)) The scope of the removal action proposed in this Action Memorandum is limited.

State ARARs

Washington State Model Toxics Control Act [RCW 70.105D; WAC 173-340].

MTCA, including WAC 173-340-740 (unrestricted land use soil cleanup standards), -745 (industrial cleanup standards), and -7490 through -7494 (terrestrial ecological evaluation), is a potential ARAR under CERCLA and is applicable to soils across the Site under state law. The MTCA action levels that address human health and priority contaminants for ecological concern will be used during the removal action.

Washington State Hazardous Waste Management Act and Dangerous Waste Regulations [RCW 70.105; Chapter 173-303 WAC].

Washington State Dangerous Waste regulations govern the handling and disposition of dangerous waste, including identification, accumulation, storage, transport, treatment, and disposal. The Dangerous Waste regulations are potentially applicable to generating, handling, and managing dangerous waste at the Site, and would be potentially relevant and appropriate even if dangerous wastes are not managed during remediation.

Washington State Solid Waste Handling Standards [RCW 70.95; Chapter 173-350 WAC].

Washington State Solid Waste Handling Standards apply to facilities and activities that manage solid waste. The regulations set minimum functional performance standards for proper handling and disposal of solid waste; describe responsibilities of various entities; and stipulate requirements for solid waste handling facility location, design, construction, operation, and closure. This regulation is also potentially applicable or relevant and appropriate for management of excavated soil or debris that will be generated during the Site cleanup.

General Regulations for Air Pollution Sources - Washington State [RCW 70.94; Chapter 173-400 WAC].

The purpose of these regulations is to establish technically feasible and reasonably attainable standards, and to establish rules generally applicable to the control and/or prevention of the emission of air contaminants. Depending on the response action selected, these regulations are potentially applicable to the Site (e.g., generation of fugitive dust during soil excavation).

Federal ARARs

Endangered Species Act (ESA) [16 U.S.C. §§ 1531-1599]

The Endangered Species Act protects species of fish, wildlife, and plants that are listed as threatened or endangered with extinction. It also protects designated critical habitat for listed species. The requirements of this act are potentially applicable the Site since listed threatened or endangered species or habitat could potentially be impacted by the response action. Consistent with ESA Section 7, if any federally listed threatened or endangered species or critical habitat are identified at the Site and if the action may adversely affect such species and/or their habitat, EPA will consult with the USFW to ensure that response actions are conducted in a manner that is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of designated critical habitat.

Migratory Bird Treaty Act (MBTA), [16 U.S.C. §§ 701 - 712]

The MBTA makes it unlawful to “hunt, take, capture, kill” or take various other actions adversely affecting a broad range of migratory birds, including tundra swans, hawks, falcons, song birds, without prior approval by the U.S. Fish and Wildlife Service. (See 50 CFR 10.13 for the list of birds protected under the MBTA. If in doubt, consider all birds protected with the exception of European Sparrows, Starlings, and pigeons). Under the MBTA, permits may be issued for take (e.g. for research) or killing of migratory birds (e.g. hunting licenses). The mortality of migratory birds due to ingestion of contaminated sediments is not a permitted take under the MBTA. The MBTA and its implementing regulations are potentially relevant and appropriate for protecting migratory bird species identified in the vicinity of the Site. The selected response action will be carried out in a manner that avoids the taking or killing of protected migratory bird species including individual birds or their nests or eggs at or in the vicinity of the Site.

5. Project Schedule

Site work and is planned for October 2010 which is anticipated to be after attendance at the Park is reduced for the season but before winter rains make access to the excavation area difficult. Site work is expected to take approximately three weeks.

B. Estimated Costs*

ERRS Contractor costs (staff, travel, equipment)	\$225,000
START Contractor costs (staff, travel, equipment)	\$90,000
Contingency costs	\$65,000
Total Removal Project Ceiling	\$380,000

*EPA direct and indirect costs, although cost recoverable, do not count toward the Removal Ceiling for this removal action. Liable parties will be held financially responsible for costs incurred by the EPA as set forth in Section 107 of CERCLA.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If the proposed removal action should be delayed or not taken, hazardous substances will remain as potential human health and ecological threats and hazardous substances will remain a continuing source of solid or dissolved-phase contaminants.

VII. OUTSTANDING POLICY ISSUES

None

VIII. ENFORCEMENT

See the attached "Confidential Enforcement Addendum" for enforcement details.

IX. RECOMMENDATION

This decision document represents the selected removal action for this Site, developed in accordance with CERCLA, and not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at this Site meet the NCP section 300.415(b)(2) criteria for a removal action and I recommend your approval of the proposed removal action. The total project ceiling if approved will be \$380,000, all of which will come from the Regional Removal Allowance.

X. APPROVAL / DISAPPROVAL

 X Approval



Daniel D. Opalski, Director
Office of Environmental Cleanup

 9/23/2010
Date

_____ Disapproval

Daniel D. Opalski, Director
Office of Environmental Cleanup

Date

Figure 1. Site Overview

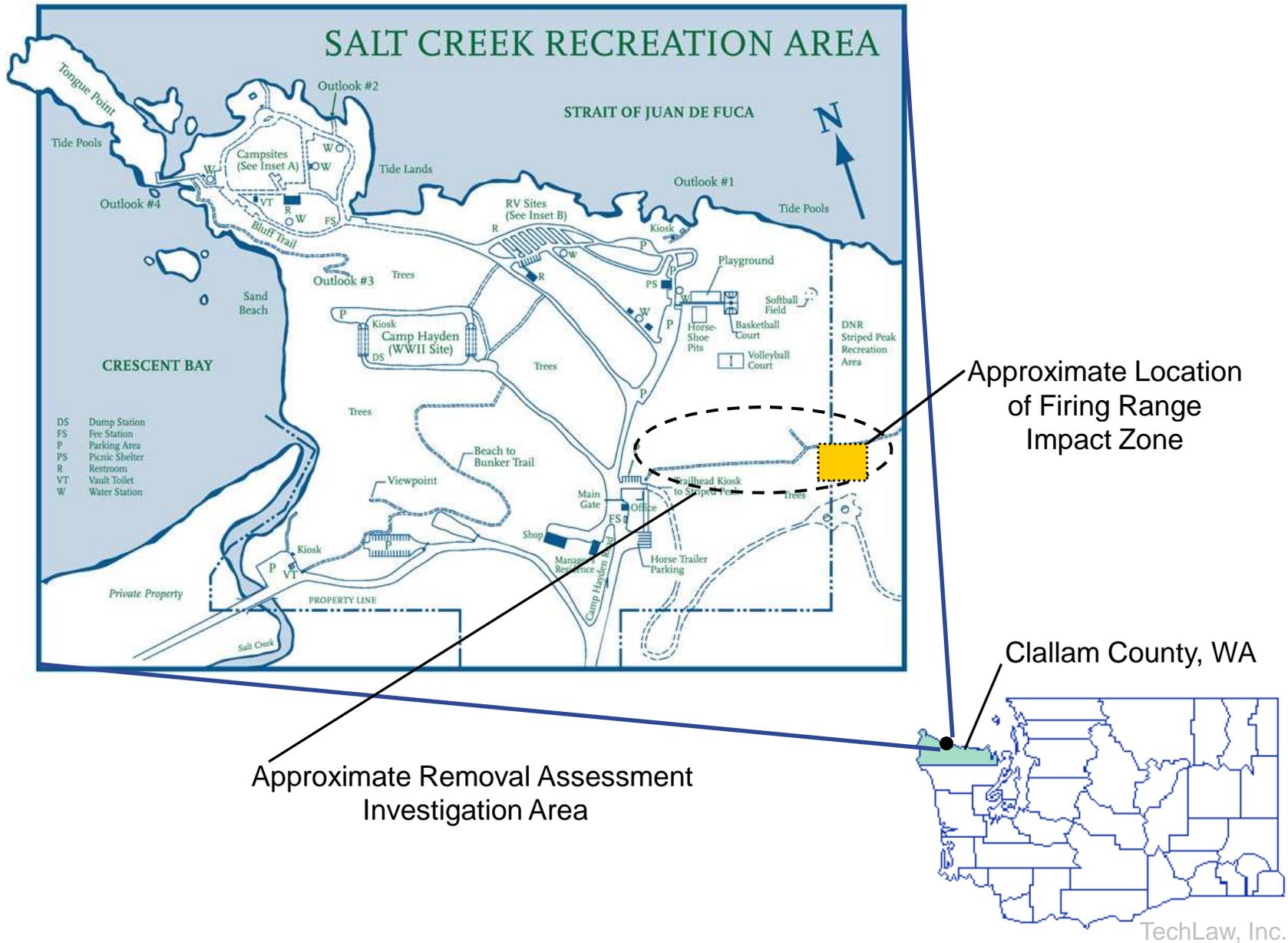


Figure 2. XRF Lead Results from 2009 EPA Removal Assessment, mg/kg

Area within green line represents expected excavation area.

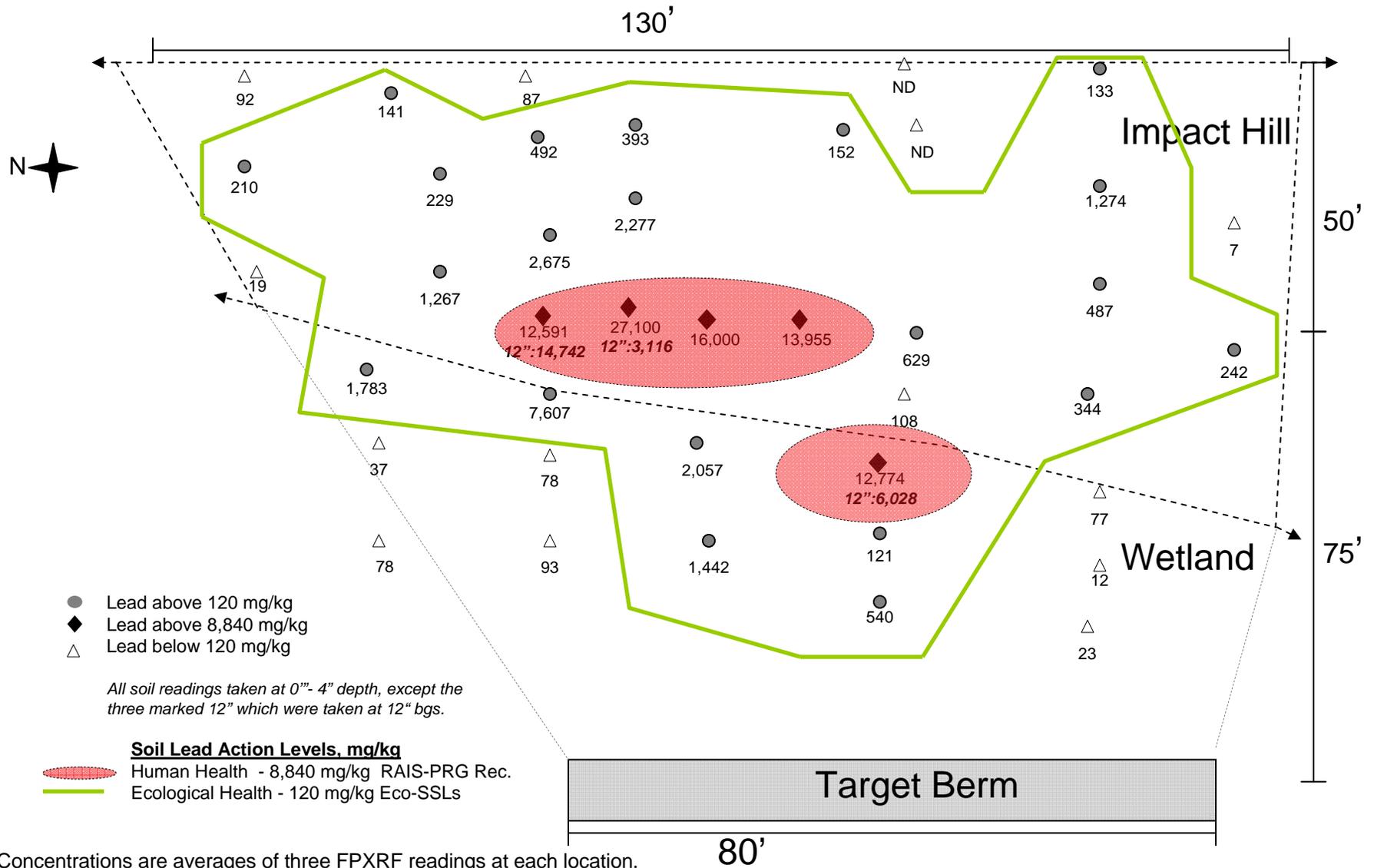


Figure 3 Laboratory Results for Lead Concentrations in Surface Soil (mg/kg)

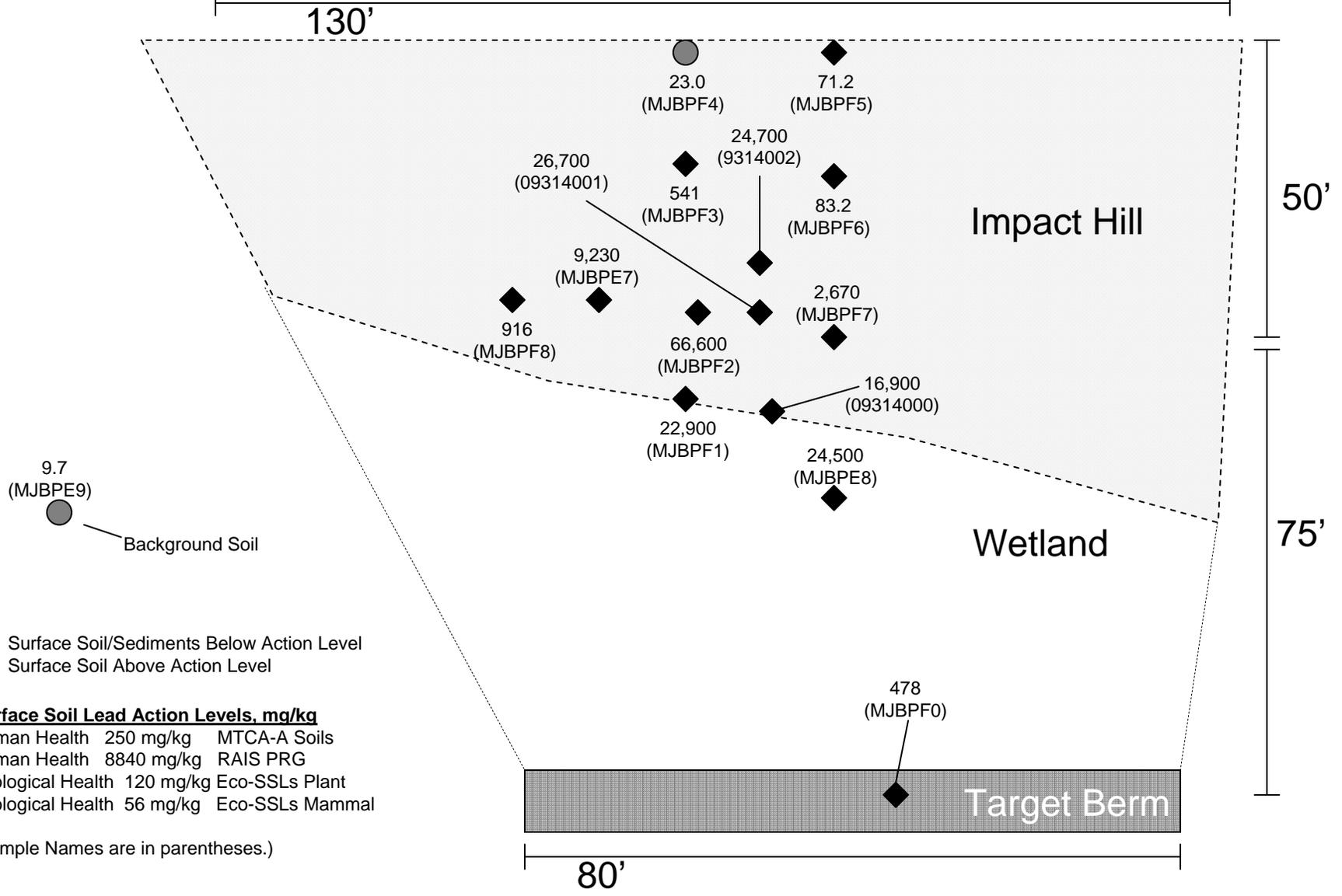
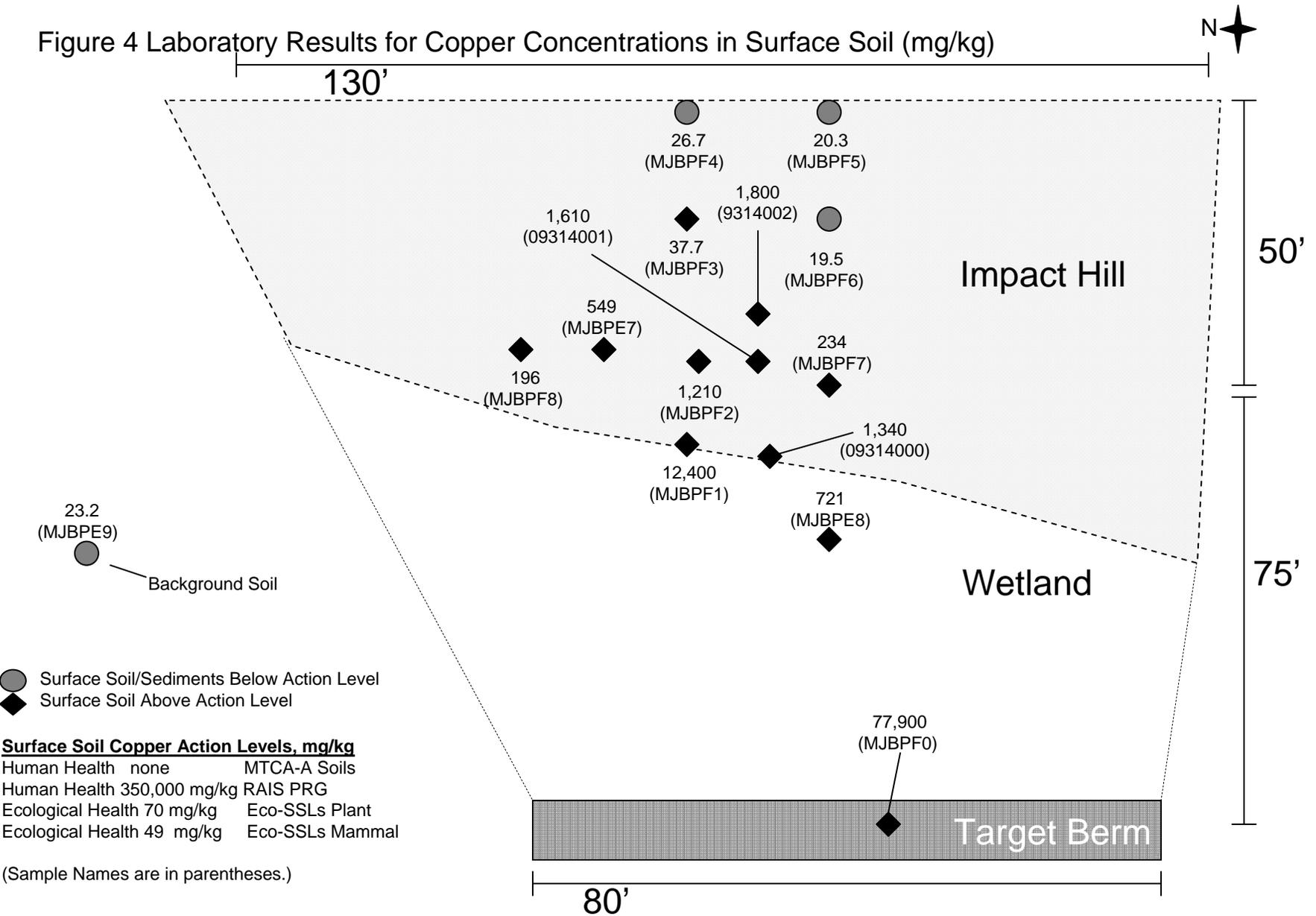


Figure 4 Laboratory Results for Copper Concentrations in Surface Soil (mg/kg)





130'

50'
75'

Figure 5 Wetland Drainage - Laboratory Results for Lead in Sediment (mg/kg) and Surface Water (µg/L)

-  Surface Water Sample Below 3.1 µg/L
-  Surface Sediments Below 56 mg/kg
-  Surface Sediments Above 56 mg/kg

Sediment Lead Action Levels, mg/kg

Human Health	250 mg/kg	MTCA-A Soils
Human Health	8840 mg/kg	RAIS PRG
Ecological Health	120 mg/kg	Eco-SSLs Plant
Ecological Health	56 mg/kg	Eco-SSLs Mammal

Surface Water Lead Action Levels, µg/L

Human Health	86600 µg/L	RAIS PRG
Ecological Health	3.1 µg/L	NRWQC-CCC

(Sample Names are in parentheses)

Direction of surface water movement off site

Impact Hill

Wetland

Target Berm

80'

2.5 µg/L, totals (MJBPG8)

129 mg/kg (MJBPG3)

183 mg/kg (MJBPG0)

75.3 mg/kg (MJBPF9)

2.0 µg/L, dissolved (MJBPG5)

2.9 µg/L, dissolved totals (MJBPG6)

nd, dissolved totals (MJBPG7)

24.4 mg/kg (MJBPG1)

Down Gradient Sediment Samples

36.5 mg/kg (MJBPG2)

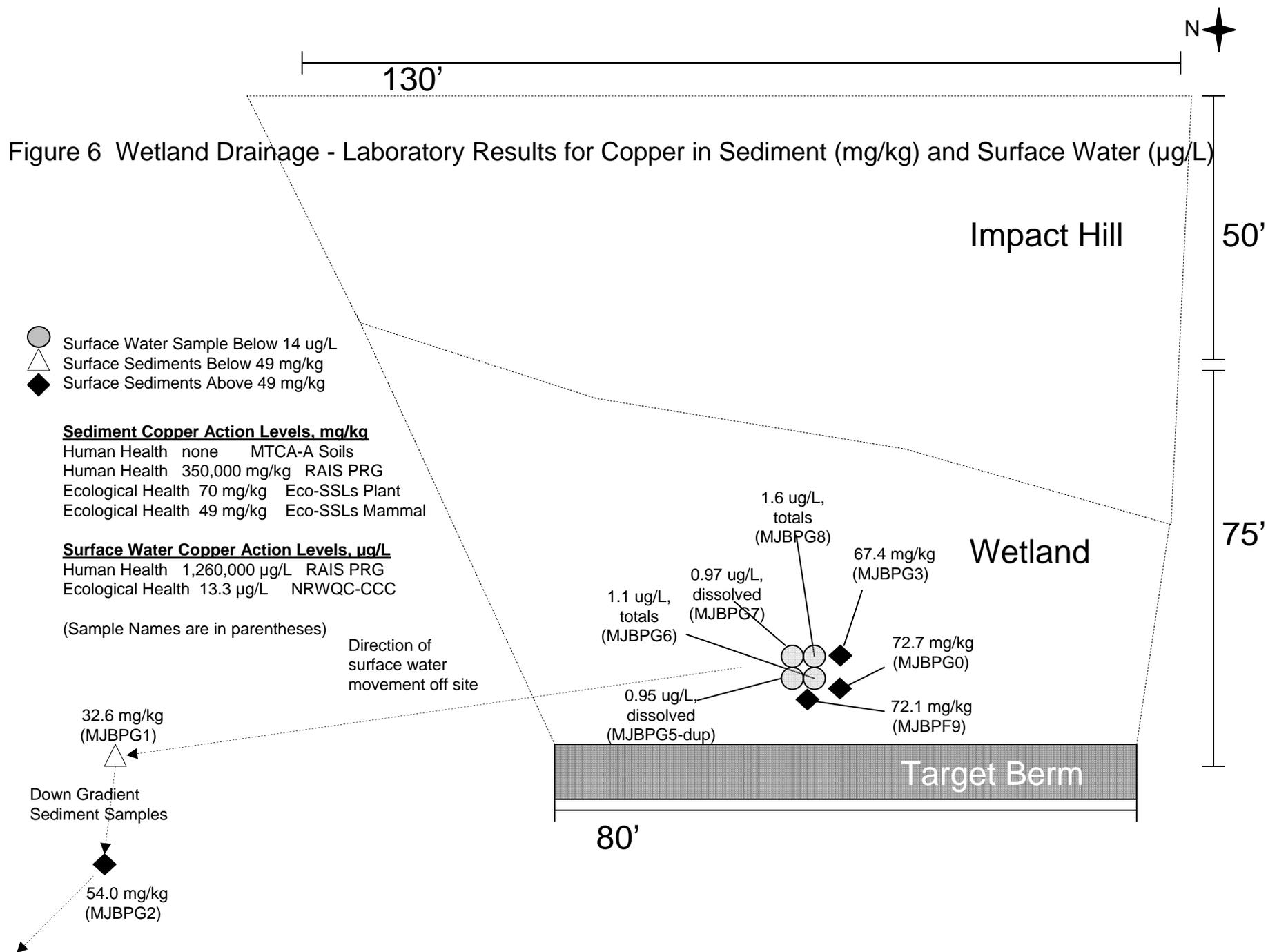


Table 2
Metals Concentrations in Surface Soil
Salt Creek Park Firing Range
Clallam County, Washington

Analyte	Human Health	Human Health	Ecological Health	Ecological Health	CLP Metals Concentrations (mg/kg)												MEL Metals Concentrations (mg/kg)		
	MTCA-A mg/kg	RAIS PRG Recreational mg/kg	Eco-SSLs Plant mg/kg	Eco-SSLs Mammalian mg/kg	MJBPE7	MJBPE8	MJBPE9	MJBPF0	MJBPF1	MJBPF2	MJBPF3	MJBPF4	MJBPF5	MJBPF6	MJBPF7	MJBPF8	09314000	09314001	09314002
	Antimony	--	3,500 (I)	--	0.27	15.3	91.6	1.1	2	98.2	322	1.6	1.8	1.5	0.73	7.2	1.9	130	280
Arsenic	20	21 (D)	18	46	2.6	3.2	2.5	2.7	7.2	8.2	1.7	2	1.7	1.3	2.4	2.4	4.5, u	5.9	5.4
Cadmium	2	3,260 (D)	32	0.36	0.85	0.61	1.1	0.91	1.3	0.62	0.86	1	0.83	0.59	0.38	0.37	0.5, u	0.84	0.82
Copper	--	350,000 (I)	70	49	549	721	23.2	77,900	12,400	1,210	37.7	26.7	20.3	19.5	234	196	1,340	1,610	1,800
Lead	250	8,440 (I)	120	56	9,230	24,500	9.7	478	22,900	66,600	541	23.0	71.2	83.2	2,670	916	16,900	26,700	24,700
Nickel	--	175,000 (I)	38	130	8.4	7.3	10.8	12.6	10.9	5.2	10.4	12.5	11.6	9.2	7.3	14.8	8.7	11	7.1
Zinc	--	2,630,000 (I)	160	79	212	224	109	4,250	1,330	256	150	124	121	142	152	97.8	310	370	370

Key:

- Bold** = Value above action levels
- D = Exposure by Dermal contact
- Eco-SSLs = Ecological Soil Screening Levels
- I = Exposure by Ingestion
- mg/kg = Milligram per Kilogram
- MTCA-A = Washington State Model Toxics Control Act --Method A, Unrestricted Land Use
- PRG = Preliminary Remediation Goals- Dermal, Recreational (exposed 75 days/year)
- CLP = Contract Laboratory Program
- MEL = Manchester Environmental Lab

Table 3
Metals Concentrations in Sediments
Salt Creek Park Firing Range
Clallam County, Washington

Analyte	Human Health	Human Health	EPA Ecological Screening Values 2001	CLP Lab - Metals Concentrations in Sediments (mg/kg)				
	MTCA-A unrestricted land use mg/kg	RAIS PRG-Recreational (75 day/year) mg/kg		MJBPF9	MJBPG0	MJBPG3	MJBPG1	MJBPG2
				in wetland	in wetland	in wetland	100' down-gradient	200' down-gradient
Antimony	--	3,500 (I)	12.0	8	6.4	8	1.2	1.5
Arsenic	20	21 (D)	7.2	9.3 U	9.3 U	9.7 U	1.5	2.4
Cadmium	2	3,260 (D)	1.0	4.7 U	4.7 U	4.9 U	1.1	1.3 U
Copper	--	350,000 (I)	18.7	72.1	72.7	67.4	32.6	54.0
Lead	250	8,440 (I)	30.2	75.3	183	129	24.4	36.5
Nickel	--	175,000 (I)	15.9	10.1	9.7	11.3	11.7	18.6
Zinc	--	2,630,000 (I)	124	168	190	135	106	89.1

Key:

- Bold =** Value above action levels
- D = Exposure by Dermal contact
- I = Exposure by Ingestion
- mg/kg = Milligram per Kilogram
- MTCA-A = Washington State Model Toxics Control Act –Method A, Unrestricted Land Use
- PRG = Preliminary Remediation Goals- Dermal, Recreational (exposed 75 days/year)
- U = Value below indicated detection limit

**Table 4
Metals Concentrations in Surface Waters
Salt Creek Park Firing Range
Clallam County, Washington**

Analyte	Human Health	Ecological Health National Recommended Water Quality Criteria CCC (µg/L)^	CLP Lab - Metals Concentrations in Surface Waters (ug/L) [All waters collected in contaminated area.]			
	RAIS PRG- Recreational (75 day/year, µg/L)		MJBPG5 (dissolved)	MJBPG6 (totals)	MJBPG7 (dissolved)	MJBPG8 (totals)
Antimony	1,890	--	5	7.3	8.1	7
Arsenic	49	--	10 U	10 U	10 U	10 U
Cadmium	--	0.63	5 U	5 U	5 U	5 U
Copper	1,260,000	13.3	0.95 (dup)	1.1	0.97	1.6
Lead	86,600	3.1	2.0	2.9	10 U	2.5
Nickel	--	60.7	40 U	40 U	40 U	0.74
Zinc	15,800,000	138	1.1	2.5	1.4	4.3
Calcium			38000	35000	37500	35800
Magnesium			7710	7500	7670	7860

Key:

- ^ = Corrected for Hardness
- CCC = surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.
- µg/L = Micrograms per Liter
- U = Value below indicated detection limit

Action Level Adjustment for Hardness

	Hardness	CMC Conversion factor	Conversion factor	CMC (ug/L)	CCC (ug/L)
<u>Statewide criteria</u>					
Cadmium	120.02	0.936	0.901	1.56	0.63
Copper	120.02	0.960	0.960	20.2	13.3
Lead	120.02	0.764	0.764	79	3.1
Mercury	120.02	0.850	1.000	NA	NA
Nickel	120.02	0.998	0.997	546	60.7
Silver	120.02	0.850		4.7	
Zinc	120.02	0.978	0.986	137	138

To calculate hardness from Ca and Mg concentrations

Note: Hardness (mg/l as CaCO3) = 2.497 Ca + 4.118 Mg (APHA 1992)

<u>Calcium</u>	<u>Magnesium</u>	<u>Hardness</u>
2.37	0.5	7.977
35400	7680	120020 ug/L
35.4	7.68	120.02 mg/L

**Table 5
Metals Concentrations in Synthetic Precipitation Leaching Procedure Leachates of Surface Soil
Salt Creek Park Firing Range
Clallam County, Washington**

Analyte	Human Health RAIS PRG- Recreational (75 day/year, µg/L)	Ecological Health National Recommended Water Quality Criteria CCC (µg/L)^	Concentration of Metals in SPLP Leachate (µg/L)		
			09314000	09314001	09314002
Antimony	1,890	--	437	335	383
Arsenic	49	--	0.88	0.76	0.68
Cadmium	--	0.63	0.19	0.13	0.15
Copper	1,260,000	13.3	130 J	130 J	75 J
Lead	86,600	3.1	880 J	800 J	1400 J
Nickel	--	60.7	0.62	0.79	0.46
Zinc	15,800,000	138	78.5	59 J	67 J

Key:

^ = Corrected for Hardness

CCC = water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.

J = Estimate Value, quality controls lacked precision (45 RPD at highest) due to heterogeneous soils

PRG = Preliminary Remediation Goals- Dermal, Recreational (exposed 75 days/year)

µg/L = Micrograms per Liter

U = Value below indicated detection limit